Niagara Region

PROJECT FILE REPORT

The Regional Municipality of Niagara

St. Paul Street West Canadian National Railway (CNR) Bridge Replacement
Class Environmental Assessment

SEPTEMBER 2019

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

AE Document Distribution & Control

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EXECUTIVE SUMMARY

INTRODUCTION

The St. Paul Street West Canadian National Rail (CNR) Bridge (Structure No. 081215) is a three-span slab on steel girder structure which carries two lanes of east and westbound vehicular traffic on St. Paul Street West over the CNR right-of-way at Mile 11.68 of the Grimsby Subdivision. The bridge was constructed in 1922 and underwent rehabilitation work in 1977. The three spans of the bridge structure, from west to east are 14.8 metres (m), 17.4m, and 9.3m, respectively, for a total length of 41.5m. The roadway approaches are quite steep, with grades of 7.3% (west approach) and 8.27% (east approach) and result in limited sightlines for users of the bridge. The bridge is 13.9m wide with a cross-section consisting of two travel lanes and narrow paved shoulder, and sidewalk on both sides.

Detailed bridge inspections in 2015 and 2017 and a load capacity evaluation in 2018, identified that the bridge requires replacement to address the aging infrastructure and to improve the vertical alignment of the roadway approaches. Under the existing conditions, a triple-load limit posting of 15, 30 and 40 tonnes has been applied to the bridge thereby limiting the movement of heavy vehicles. In addition, there is an advisory speed limit posted of 20 kilometres per hour (km/hr) due to the steep roadway approaches and limited sightlines.

The Regional Municipality of Niagara (Niagara Region) has identified the assessment of the St. Paul Street West CNR Bridge to determine the optimal solution for addressing the existing structural deficiencies and safety issues as a priority due to the pending implementation of the St. Catharine's GO Transit Station. Associated Engineering (Ont.) Ltd. (AE) was retained by the Niagara Region to assist with the completion of a Municipal Class Environmental Assessment (EA) for the replacement of the St. Paul Street West CNR Bridge in the City of St. Catharines (the Study). The study area, as shown in **Figure E-1-1**, includes the St. Paul Street West CNR Bridge and roadway approaches (between Great Western Street and Leeper Street), and the intersection of St. Paul Street West and Great Western Street.

Figure E-1-1: St. Paul Street West CNR Bridge Replacement Study Area

STUDY OBJECTIVES

The purpose of the Study was to develop alternatives and determine the preferred solution in addressing the aging infrastructure of the St. Paul Street West CNR bridge in accordance with MEA Class EA guidelines. In developing alternatives, the study team took into consideration the objectives of the Study:

- Address structural deficiencies;
- Improve public safety for all modes of transportation (vehicular, cyclist, and pedestrian);
- Improve bridge sightlines;
- Provide connectivity to active transportation network; and
- Improve safety of the access to the proposed GO Transit Station via Great Western Street.

The alternatives proposed to address the structural concerns are outlined in Sections 5 and 6 as are the evaluation of the alternatives and the identification of the preferred alternative(s).

PHASE I: IDENTIFICATION OF PROBLEMS AND OPPORTUNITIES

The various analyses (e.g. geotechnical investigation, cultural heritage assessment, archaeological assessment) and existing conditions provide input for and contribute to the identification and description of the problem or opportunity. The prevailing deficiencies within the study area can be summarized by the following statements.

Problem Statement

The St. Paul Street West Canadian National Railway (CNR) Bridge, constructed circa 1922, is a two-lane, three-span slab on steel girder structure crossing over the CNR right-of-way at Mile 11.68 of the Grimsby Subdivision. As

identified through detailed bridge inspections in 2015 and 2017 and a load capacity evaluation in 2018, the bridge requires replacement to address the aging infrastructure and to improve the vertical alignment of the roadway approaches. Under the existing conditions, a triple-load limit posting of 15, 30 and 40 tonnes has been applied to the bridge thereby limiting the movement of heavy vehicles. In addition, there is an advisory speed limit posted at 20 kilometres per hour (km/hr) due to the steep roadway approaches and limited sightlines.

Opportunity Statement

Given the need to replace the St. Paul Street West CNR Bridge, there is an opportunity to improve public safety for all modes of transportation (vehicular, cyclist, and pedestrian) by shallowing the roadway approach grades and reviewing alternatives to provide a connected active transportation network across the CNR right-of-way. The replacement also provides the opportunity to address structural deficiencies and improve the access to the proposed GO Transit Station via Great Western Street.

A range of feasible, long-term cost-effective alternative solutions were identified to address the deteriorated condition of the existing bridge structure. The development and evaluation of the alternative solutions is the subject of Sections 5 and 6 of this report.

PHASE II: IDENTIFICATION AND EVALUATION OF ALTERNATIVE SOLUTIONS

Specific to the *St. Paul Street West CNR Bridge Replacement* study, three alternative solutions were identified, developed and evaluated. The alternatives include: 1) Do Nothing, 2) Replacement Maintaining Existing Cross-Section, and 3) Replacement with Widened Cross-Section.

Alternative 1: Do Nothing

In the "Do Nothing" alternative, no improvements or changes would be made to solve the identified problem. The existing structure would remain either in existing condition or undergo rehabilitation works. This means that the problem would remain in the system and the structure would still be in overall poor condition. The structure would remain in service until it can no longer perform its intended function. As it continues to deteriorate, maximum load postings would need to be re-evaluated and over time would need to be further reduced.

Alternative 2: Replacement Maintaining Existing Cross-section

In this alternative, the existing bridge would be replaced with a new structure (substructure and superstructure). The new bridge would maintain the existing 13.8m wide cross-section with two 4.8m wide travel lanes (including narrow paved shoulders) and two 1.8m wide sidewalks. This alternative would not improve upon existing active transportation connectivity as designated bicycle lanes would not be included. However, this alternative would optimize the vertical alignment of St. Paul Street West which would improve sight line visibility and would remove the load limit posting. **Figure E-1-2** displays the typical cross-section for this alternative.

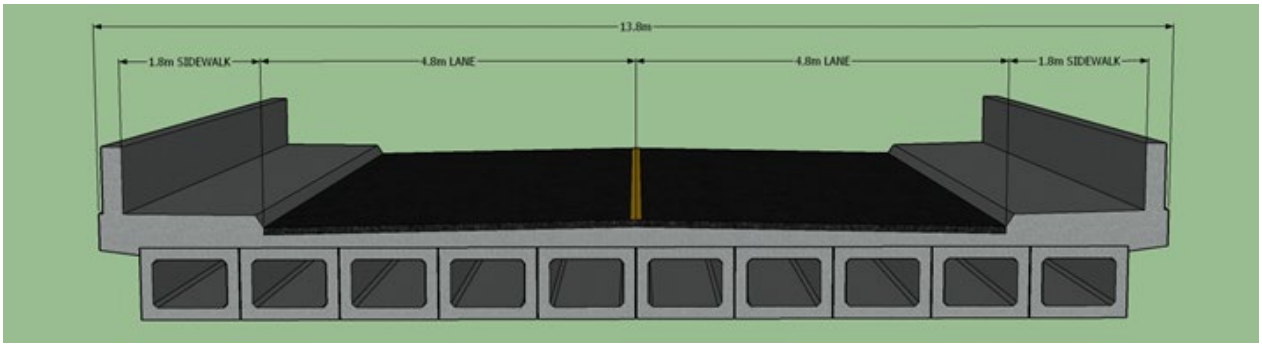


Figure E-1-2: Typical Cross-section for Alternative 2

Alternative 3: Replacement with Widened Cross-section

This alternative involves full replacement of the existing bridge with a new structure (substructure and superstructure) with a widened cross-section. The new cross-section includes two 3.5m wide travel lanes, two 1.8m wide bicycle lanes and two 2.4m wide sidewalks for a total width of 16m. This alternative would improve active transportation connectivity through the inclusion of bicycle lanes and wider sidewalks. The widened cross-section under this approach would provide safer travel for all modes of transportation. This alternative would also optimize the vertical alignment of St. Paul Street West, which would improve the sight line visibility and would remove the load limit posting. **Figure E-1-3** displays the typical cross-section for this solution.

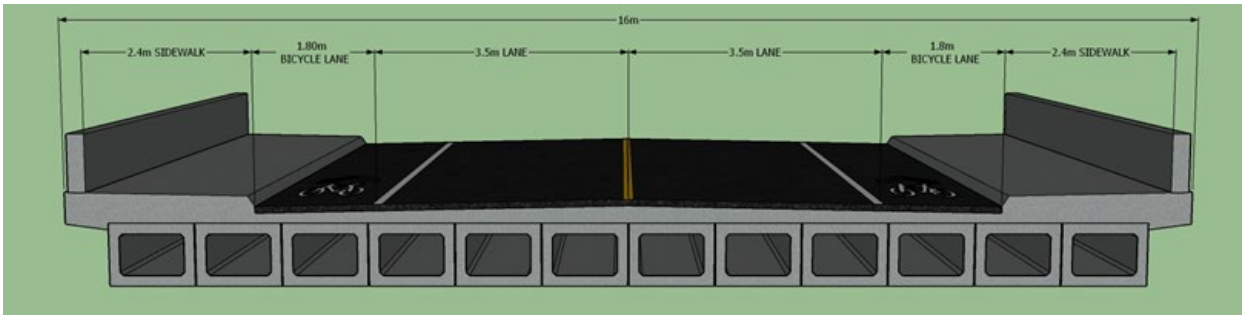


Figure E-1-3: Typical Cross-section for Alternative 3

Evaluation of Alternatives

To evaluate the alternatives, the following set of criteria were developed. Each criterion was evaluated for the three (3) alternative solutions.

Transportation:

- Impact on road user safety/traffic operations
- Impact on active transportation connectivity
- Impact on sight line visibility
- Modifications to reduced speed warning and load limit posting

Engineering/Constructability:

- Potential for constructability issues
- Impact on overall design approach
- Impact on construction schedule

Natural Environment:

- Impact on natural environment including habitats adjacent to the study area
- Impact on natural heritage

Socio-Economic Factors:

- Impact on residents and businesses

Archaeological & Cultural Heritage:

- Impact on archaeological and cultural heritage resources

Cost:

- Anticipated capital costs and/or maintenance costs

Selection of Preferred Alternative

Based on the findings from the analysis and evaluation of alternatives, Alternative 3 – Replacement with Widened Cross-section was identified as the preferred alternative solution. Replacement of the existing bridge structure with a wider cross-section would address all structural deficiencies and safety issues. Sight line issues would be improved, and the reduced advisory speed limit and load limit posting would be removed with a new bridge structure complete with shallower bridge approaches that meet current transportation design standards. Replacement with a wider cross-section which would include two travel lanes, two bicycle lanes and sidewalks on both sides, would provide a bridge crossing that is suited for all modes of transportation and would align with regional objectives of providing active transportation connectivity on regional roads where feasible.

Alternative Design Options

A range of alternative design options to implement the preferred solution were identified, developed and evaluated including: 1) Concrete Box Girders on a Skew, 2) Concrete Box Girders Perpendicular, and 3) Tapered Steel Plate Girders.

Option 1: Concrete Box Girder on a Skew

For this design option, the new bridge would be constructed with 900mm deep precast prestressed concrete box girders oriented on a skew, similar to the existing bridge structure, to the railway tracks. Precast girders would be fabricated off-site and lifted into place, reducing the required amount of staging area required, and increasing the speed of construction. The bridge deck would incorporate a 150mm cast-in-place concrete deck and 90mm of asphalt. The new bridge would be a single span structure with a span of 28.45m spanning the CNR ROW. The bridge width would be 16m incorporating the preferred solution cross-section of two 3.5m travel lanes, two 1.8m wide bicycle lanes and 2.4m wide sidewalks on both sides of the bridge.

Option 2: Concrete Box Girders Perpendicular

For this design option, the new bridge would be constructed with 700mm deep precast prestressed concrete box girders oriented perpendicular to the railway tracks. Precast girders would be fabricated off-site and lifted into place, reducing the required amount of staging area required, and increasing the speed of construction. The bridge deck would incorporate a 150mm cast-in-place concrete deck and 90mm of asphalt. The new bridge would be a single span structure with a span of 17.75m. The perpendicular orientation of the bridge would reduce the length of the girders (17.75m) while still maintaining the 28.45m clearance width for the CNR ROW. The constructed bridge would form a quasi tunnel along the CNR ROW with a length of 50m. St. Paul Street West would continue to cross the structure at a skew to the railway tracks with a cross-section width of 16m incorporating the preferred solution cross-section of two 3.5m travel lanes, two 1.8m wide bicycle lanes and 2.4m wide sidewalks on both sides of the bridge. The resulting

concrete 'dead space' on either side of the roadway could provide opportunity to create landscaped areas with benches, greenery, art pieces, and/or informational plaquing.

Option 3: Tapered Steel Plate Girders
For this design option, the new bridge would be constructed with 900mm deep tapered steel plate girders oriented on a skew, similar to the existing bridge structure, to the railway tracks. The bridge deck would incorporate a 225mm cast-in-place concrete deck and 90mm of asphalt. The new bridge would be a single span structure with a span of 28.45m spanning the CNR ROW. The bridge width would be 16m incorporating the preferred solution cross-section of two 3.5m travel lanes, two 1.8m wide bicycle lanes and 2.4m wide sidewalks on both sides of the bridge.

Evaluation of Design Options
To evaluate the design options, the following set of criteria were developed. Each criterion was evaluated for the three (3) alternative design options.

Transportation:
- Impact on road user safety/traffic operations
- Impact on sight line visibility
- Modifications to reduced speed warning and load limit posting

Constructability:
- Potential for constructability issues
- Impact on overall design approach
- Impact on construction schedule

Property Impact:
- Impact on adjacent property

CN Coordination:
- Degree of CN Coordination required during design and construction

Aesthetics:
- Potential aesthetical value to the surrounding area

Cost:
- Anticipated capital costs

Selection of Preferred Design Option
Based on findings from the analysis and evaluation of options, Option 1 – Concrete Box Girders on a Skew was identified as the preferred design option. This option would provide a bridge structure and approaches that would address the structural and safety issues identified of the existing conditions. The bridge approaches will be regraded in accordance with design standards for a posted speed limit of 50km/h. By optimizing the concrete box girder superstructure the bridge profile will be lowered, while maintaining compliance with CNR clearance requirements, to reduce the impact to adjacent properties from the rise in road centreline profile required to make the approaches less severe. Concrete box girder construction provides an economical design solution that will provide an opportunity to incorporate heritage and decorative features to the bridge, if desired.

Conceptual Design and Costing

Bridge Structure

The new St. Paul Street West CNR Bridge structure will be a single span structure with a span length of 28.45m oriented on a 38° skew to the railway tracks below. The new bridge superstructure will consist of twelve (12) 900mm deep pre-stressed precast box girders, with a cast-in-place concrete deck (150mm thick) and asphalt surface (90mm thick). The overall width of the bridge will be 16m to accommodate the preferred cross-section of two 3.5m travel lanes, two 1.8m wide bicycle lanes, and two 2.4m wide sidewalks. The bridge will also be complete with 0.85m high decorative concrete barrier wall with hand railing (total barrier height of 1.37m) on either side in accordance with safety standards. The bridge abutment walls will be constructed set back from the rail tracks as per CNR clearance requirements. Based on the findings of the geotechnical investigation, particularly the depth of bedrock (greater than 50m below surface level) it is anticipated that a friction pile foundation will be the preferred foundation type for the replacement structure.

The new bridge structure will be constructed maintaining the horizontal alignment of the existing structure and St. Paul Street West. The vertical profile of the new bridge will be raise approximately 890mm higher (at highest point) than the existing bridge to accommodate the improved bridge approaches. The minimum bridge soffit elevation will be 112.92m, which complies with CNR clearance requirements.

To accommodate the raised vertical profile of St. Paul Street West, retaining walls will be required to address severe elevation differences while grading will be used to match existing elevations where achievable. The proposed retaining walls will be precast Retaining Soil System (RSS) walls with earth reinforced tie-backs. The maximum height of the RSS walls will be approximately 7m, immediately adjacent to the bridge structure, with the height varying along the project alignment.

A preliminary general arrangement drawing of the preferred bridge design is provided in Appendix F. During the detailed design stage, the final details regarding the replacement structure will be developed including foundation details, drainage details and additional safety requirements in accordance with CHBDC, MTO and CNR requirements.

Roadway Infrastructure

To address existing safety issues including substandard sight lines at the bridge crossing, St. Paul Street West will be modified to meet current standards in accordance with the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads*. Using a design speed of 60km/h with posted speed of 50km/h, as dictated by the Region, the bridge approaches will be regraded to 4.2% and 5.2% for the west and east approaches, respectively. These grades will provide adequate sight lines at the bridge crossing and remove the advisory speed posting of 20km/h. The regrading of the bridge approaches raises the centreline road profile of St. Paul Street West, with a maximum elevation rise of approximately 2.4m. The existing centreline elevation is matched approximately 135m to the west of the bridge structure and 120m to the east of the bridge structure, dictating the construction limits – a length of approximately 285m. The horizontal alignment of St. Paul Street West will be maintained within these limits.

Great Western Street is proposed to become a one-way right-in only access road from St. Paul Street West to the Railway Station (future GO Transit Station). Due to the rise in elevation of St. Paul Street and the installation of retaining walls, maintaining Great Western Street as a two-way roadway with access onto St. Paul Street West poses a safety hazard to all roadway users (vehicular, cyclist, pedestrian) due to roadway geometry and limited sight lines.

The preliminary roadway alignment and profile is illustrated on the drawings provided in Appendix F. During the detailed design stage, the final details regarding the roadway network will be developed including grading and drainage details and line painting and signage.

Property Requirements

Implementation of the preferred design will require property acquisition. For any property to be acquired, the owner would be reimbursed by the Region for the required land at fair market value. An independent appraisal would be completed for the land to determine fair market value. Any lands disturbed as a result of construction would be restored to their current state. In addition to property acquisition, compensation may also be required due to injurious affection.

Negotiations with impacted property owners to secure lands required to implement the preferred design or who will be negatively impacted by the implementation of the preferred design have been initiated and will continue into the detailed design phase of the study. Actual impacts and/or requirements will be confirmed during detailed design.

Construction Approach

Two construction approaches were presented to the public for consideration: staged (partial closure) construction and full closure with detour. Staged construction would require partial closure of St. Paul Street West, with one lane of traffic maintained throughout construction at the bridge crossing. The traffic flow would be controlled with temporary traffic signals, with no need for a signed detour route. The new bridge structure would be constructed in stages, with multiple demolitions required of the existing structure. It is estimated that staged construction would span two (2) construction seasons, taking approximately twenty (20) months to complete.

A full closure of St. Paul Street West at the bridge crossing would require a signed detour using regional roads. The detour would be approximately 5km in length and would use Ontario Street (RR 42), Fourth Avenue (RR 77) and Louth Street (RR 72). Localized pedestrian and cyclist detour would be provided, as well as planned local detours for emergency services (EMS, Fire, Police) and transit services. The existing structure would be demolished at one time and the new bridge structure would then be constructed. It is estimated that with a full closure construction would span one (1) construction season, taking approximately twelve (12) months to complete.

The full closure with detour approach will be carried forward into detailed design as the preferred construction approach. Detours for vehicular, pedestrian and cyclist traffic will be developed and finalized during detailed design. Consultation will also occur with emergency services and transit providers to identify impacts and develop alternative routes.

Cost Estimate

The preliminary cost estimate to implement the preferred bridge design solution is approximately $8.8 Million. This estimate includes all necessary road works, bridge work and miscellaneous costs; however, excludes property impacts and acquisitions.

Public Consultation

Throughout the project, stakeholders, including the public, property owners, First Nations, municipality, regulatory agencies and utility companies, were given opportunities to review and comment on the project process, key findings, proposed alternatives and recommended solutions. The following opportunities for public and stakeholder review and/or comment were provided:

- Notice of Study Commencement and Initiation of Field Work;
- Notice of Study Commencement;
- Notice of Public Information Centre No. 1 and No. 2;
- Public Information Centre No. 1 and No. 2; and
- Notice of Study Completion.

The first Public Information Centre (PIC) took place on April 3, 2019 to present Study details. The PIC presented the following elements:

- Background information on the Class EA process;
- Background information on the Study;
- Problem/opportunity being considered for the Study;
- A high-level summary of the criteria for the evaluation of the alternatives;
- Description of the existing conditions of the project area;
- Key considerations and issues associated with the Study;
- Description of the alternative solutions;
- Evaluation of the alternative solutions;
- Project impacts and mitigations measures;
- A conceptual review of different construction approaches; and
- Next steps in the Class EA process.

Comments were received via comment form at and proceeding the PIC from several residents supporting the overall Study approach and proposed alternatives. Also, during the two-week public comment period proceeding the PIC, the Region made available an online survey asking the public to weigh in on their preferred alternative solution and construction approach.

The second PIC took place on June 12, 2019 to present an update to the Study. The PIC presented the following elements:

- Background information on the Class EA process;
- Background information on the Study;
- Problem/opportunity being considered for the Study;
- A recap of the alternative solutions presented at the first PIC;
- Summary of comments received during the first PIC comment period;
- Identification of preferred solution and construction approach;
- Description of alternative bridge design options;
- Evaluation of the alternative bridge design options;
- Identification of preferred design;
- Summary of property impacts and construction approach; and
- Next steps in the Class EA process.

Comments were received via comment form at and proceeding the PIC from several residents supporting the overall Study approach and preferred alternative solution.

CONCLUSION AND RECOMMENDATIONS

The preferred design solution includes the replacement of the bridge structure with a new concrete box girder bridge (on a skew) with a widen cross-section including bicycle lanes and wider sidewalks. The preferred alternative achieves

the Study objectives of addressing the structural deficiencies, improving public safety for all modes of transportation (vehicular, cyclist, and pedestrian), improving bridge sightlines, providing connectivity to the active transportation network; and improving safety of the access to the proposed GO Transit Station via Great Western Street. The conceptual design of the bridge replacement has been prepared for the preferred design solution. Following completion of the Class EA Study, detailed design, permitting and construction will be undertaken to implement the preferred alternative and remedy the identified problems.

During the Study, recommendation for additional works and implementation measures were identified. These items should be taken into consideration during the detailed design and include the following items:

- Complete property acquisition to facilitate proposed design;
- Complete Stage 2 Archaeological Assessment, as required;
- Complete Heritage Impact Assessment and implement recommendation;
- Determine appropriate construction staging;
- Determine final traffic detour(s) for vehicular traffic, pedestrian and cyclists, emergency services, and transit providers;
- Confirm utility impacts and relocation requirements and coordinate relocation works;
- Confirm City of St. Catharines underground servicing needs and coordinate replacement/improvement works;
- Confirm CNR design and construction requirements, and obtain CNR Work Permit; and
- Develop Communication Plan to be implemented during construction.

Prior to construction, a final Public Information Centre (PIC) will be held to provide information to the public and adjacent landowners of the upcoming construction work including construction schedule, construction staging, and detour routes.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

Associated Engineering (Ont.) Ltd. (AE) was retained by the Regional Municipality of Niagara (Niagara Region) to assist with the completion of a Municipal Class Environmental Assessment (EA) for the replacement of the St. Paul Street West Canadian National Rail (CNR) Bridge in the City of St. Catharines (the Study). The Study developed and evaluated alternative solutions for the replacement of the bridge to address structural deficiencies, public safety, operational concerns and to improve functionality. In accordance with the Municipal Engineers Association's (MEA) Municipal Class Environmental Assessment process, this Study follows the planning process for a Schedule B.

1.1 Study Background and Purpose

The St. Paul Street West CNR Bridge (Structure No. 081215) is a three-span slab on steel girder structure which carries two lanes of east and westbound vehicular traffic on St. Paul Street West over the CNR right-of-way at Mile 11.68 of the Grimsby Subdivision. The bridge was constructed in 1922 and underwent rehabilitation work in 1977. The three spans of the bridge structure, from west to east are 14.8 metres (m), 17.4m, and 9.3m, respectively, for a total length of 41.5m. The roadway approaches are quite steep, with grades of 7.3% (west approach) and 8.27% (east approach) and result in limited sightlines for users of the bridge. The bridge is 13.9m wide with a cross-section consisting of two travel lanes and narrow paved shoulder, and sidewalk on both sides.

Detailed bridge inspections in 2015 and 2017 and a load capacity evaluation in 2018, identified that the bridge requires replacement to address the aging infrastructure and to improve the vertical alignment of the roadway approaches. Under the existing conditions, a triple-load limit posting of 15, 30 and 40 tonnes has been applied to the bridge thereby limiting the movement of heavy vehicles. In addition, there is an advisory speed limit posted of 20 kilometres per hour (km/hr) due to the steep roadway approaches and limited sightlines.

1.2 Description of Study Area

The study area, as shown in **Figure 1-1**, includes the St. Paul Street West CNR Bridge and roadway approaches (between Great Western Street and Leeper Street), and the intersection of St. Paul Street West and Great Western Street. St. Paul Street West (Regional Road 81) is classified as a Regional Arterial, with a posted speed limit of 50km/h, and is located within the City's urban built-up area. St. Paul Street West is a two-lane road complete with sidewalks on both sides of the road, which provides access and connectivity to the Downtown to the northeast and employment lands to the west.

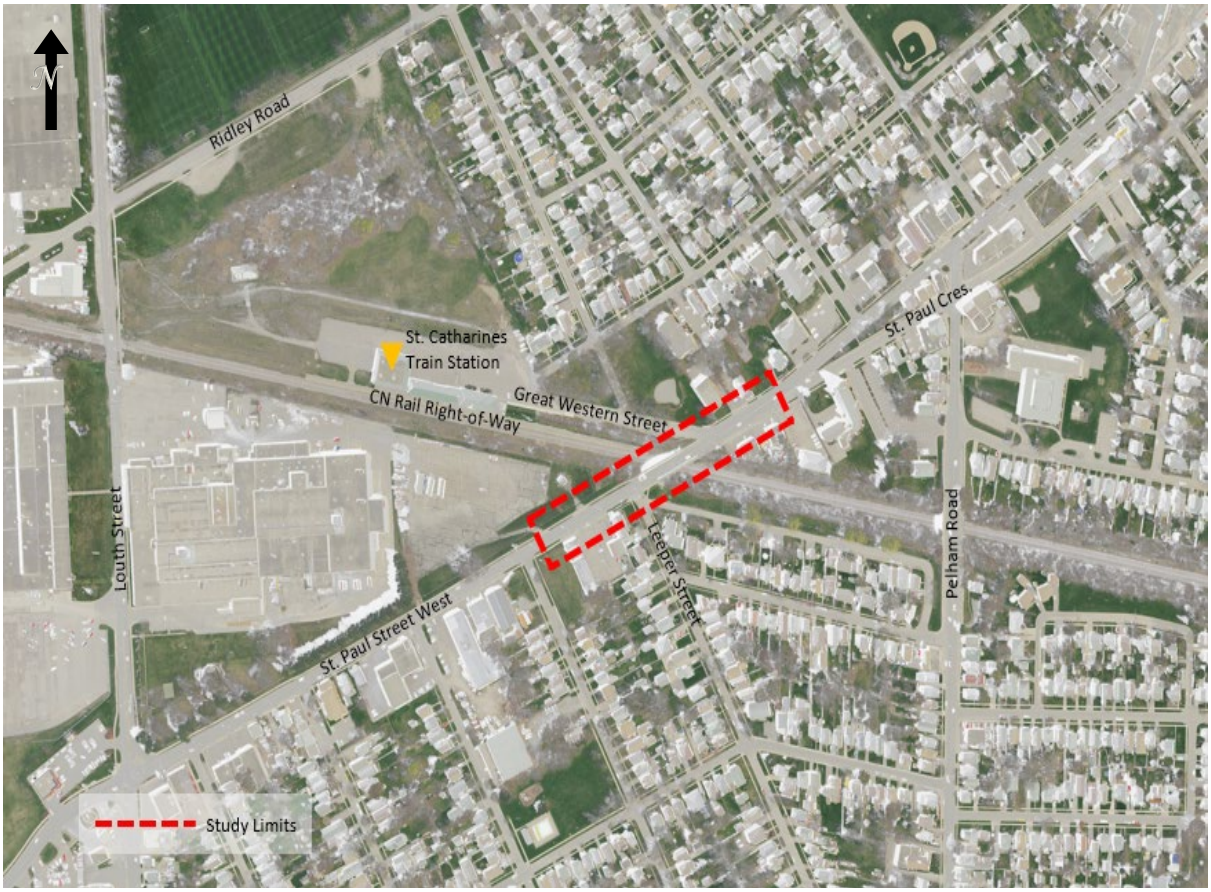


Figure 1-1 : St. Paul Street West CNR Bridge Replacement Study Area

1.3 Study Objectives

The purpose of the Study was to develop alternatives and determine the preferred solution in addressing the aging infrastructure of the St. Paul Street West CNR bridge in accordance with MEA Class EA guidelines. The Study incorporates key planning principles including public consultation, assessment of a reasonable range of alternatives, consideration for the natural, social, economic and technical environments and provides clear documentation. In developing alternatives, the study team took into consideration the objectives of the Study:

- Address structural deficiencies;
- Improve public safety for all modes of transportation (vehicular, cyclist, and pedestrian);
- Improve bridge sightlines;
- Provide connectivity to active transportation network; and
- Improve safety of the access to the proposed GO Transit Station via Great Western Street.

The alternatives proposed to address the structural concerns are outlined in Sections 5 and 6 as are the evaluation of the alternatives and the identification of the preferred alternative(s).

1.4 Planning and Policy

Within the City of St. Catharines Official Plan, it identifies that the St. Paul Street West CNR Bridge resides in the Urban Area, specifically within an Intensification Area. "Urban areas are intended to provide urban development opportunities on full municipal services to accommodate the majority of the City's projected future population and employment growth. While Intensification Areas are established to attract a significant portion of population and employment growth relative to the shape and character of the municipality." Within the urban area boundary, the land is designated as mixed use, neighbourhood residential and natural areas (Cameron Park). The proposed project will need to consider the potential for disruption effects to residents and businesses in the area.

The study area is subject to the Niagara Region's Transportation Master Plan (TMP) and the Niagara Region's Complete Streets Design Guidelines. Anticipating the needs of all users, including active transportation requirements, and balancing these needs during design and construction is important for developing a true regional complete streets network. Additionally, the Niagara Region's Strategic Cycling Network, as part of the TMP, identifies that St. Paul Street West is on the Regional Bicycle Network. Therefore, the proposed solution will need to consider improvements to the existing active transportation connectivity.

St. Paul Street West is identified as a critical street within the City of St. Catharines GO Transit Station Secondary Plan (GTSSP). Under the GTSSP a future GO Station is being planned at the existing St. Catharines train station location. St. Paul Street West is located along the southern boundary of the Station Area and intersects the rail corridor. The plan identifies that the street is a key location for future intensification and urban design improvements, including major streetscape improvements and the provision of new active transportation connections. Also, the GTSSP identified that the St. Paul Street West CNR bridge reconstruction would likely require changes to Great Western Street functionality to provide access to the GO Transit Station from St. Paul Street West. The change in functionality needs to be reviewed and confirmed under this Class EA process.

2 STUDY PROCESS

The *St. Paul Street West CNR Bridge Replacement* Class EA is considered to be a Schedule 'B' undertaking pursuant to the Municipal Class Environmental Assessment (MCEA) document (MEA, 2000 as amended in 2007, 2011, and 2015). The Class EA process is a process used for the planning of municipal infrastructure projects (roads, water and wastewater, and transit) to ensure that project planning and predesign proceeds in accordance with the *Environmental Assessment Act*. A Schedule 'B' project includes public and review agency consultation, an evaluation of alternatives, an assessment of the impacts of the preferred solution, and identification of measures to mitigate any adverse impacts. **Figure 2-1** is an excerpt from the MCEA document and illustrates the process followed in the typical planning and design of projects covered by a Class EA. A further description of the Class EA process is provided in subsequent sections.

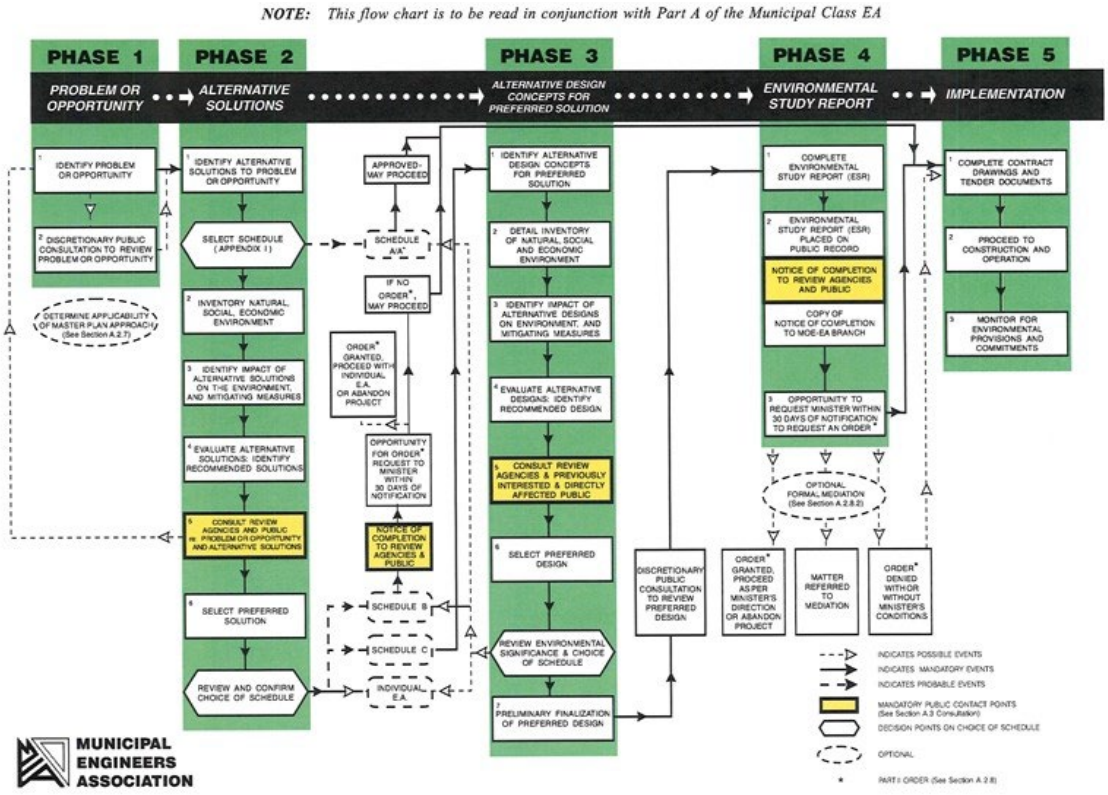


Figure 2-1: MEA Class EA Process

2.1 The Class Environmental Assessment Process

Every municipality in Ontario is subject to the provisions of the *Environmental Assessment Act* (EAA) and its requirements to conduct an Environmental Assessment for most public works projects. The MEA's MCEA document provides municipalities with a five-phase planning procedure approved under the EAA which provides direction on how to plan and undertake all municipal projects that recur frequently, are usually limited in scale and have a predictable range of environmental impacts. Projects considered by the Class EA process include municipal roads and bridges, wastewater, storm water management, water and transit. The MCEA document also requires that the decision-making process followed by the municipalities in the planning and implementation of infrastructure is transparent and provides opportunity for public and stakeholder involvement.

Table 2-1 illustrates the steps followed in the planning and design of projects covered under the Class EA process. This table summarizes steps considered essential for compliance with the requirements of the EAA. With increasing complexity and higher likelihood for adverse environmental impacts, projects are required to complete additional planning steps, termed 'Phases' by the MCEA document, prior to obtaining approval to proceed with a proposed project. The MCEA document provides the following description of the five phases potentially requiring completion before Class EA projects can be approved.

Table 2-1: Phases of the Class EA Process

Phase	Description
Phase 1	Identify the problem (deficiency) or opportunity.
Phase 2	Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment, and establish the preferred solution considering public and review agency input.
Phase 3	Examine alternative methods of implementing the preferred solution, based upon the existing environment, public and review agency input, anticipated environmental effects and methods of minimizing negative effects and maximizing positive effects.
Phase 4	Document, in an Environmental Study Report a summary of the rationale, and the planning, design and consultation process of the project as established through the above phases and make such documentation available for scrutiny by review agencies and the public.
Phase 5	Complete contract drawings and documents and proceed to construction and operation; monitor construction for adherence to environmental provisions and commitments. Where special conditions dictate, also monitor the operation of the completed facilities.

Based on the MCEA document, projects are classified as either Schedule 'A', 'A+', 'B' or 'C' projects. Each of these classifications requires a different level of review to complete the requirements of the Class EA, and thus comply with the EAA, as noted below.

Schedule 'A' projects are limited in scale, have minimal adverse environmental effects and include a number of municipal maintenance and operational activities. These projects are pre-approved and may be implemented without following the Class EA process.

Schedule 'A+' projects are limited in scale and have minimal adverse environmental effects. These projects are pre-approved and may proceed directly to Phase 5 for implementation without following the other phases. However, the public is to be advised prior to project implementation though there is no ability for the public to request a Part II Order.

Schedule 'B' projects have the potential for some adverse environmental effects. The proponent (i.e. The Niagara Region in the case of this Class EA) is required to undertake a screening process involving mandatory contact with directly affected public, First Nations groups and relevant government agencies to ensure that they are aware of the project and that their concerns are addressed. A Schedule 'B' activity requires the proponent to conduct two mandatory points of public contact during Phase 2. Additionally, the proponent may elect to undertake a discretionary public consultation at the end of Phase 1 to present the problem or opportunity identified.

Phases 1 and 2 of the Class EA process must be followed and a Project File Report (PFR) must be prepared and submitted for review by the public. A Notice of Completion must be submitted to review agencies and the public and a period of 30 calendar days are provided for comment and input on the PFR.

As long as there are no outstanding concerns raise by the public and/or relevant government agencies, the proponent may proceed to project implementation. However, should a person or party have a concern or objection, they are expected to consult with the proponent to try to resolve the concern. Alternatively, if concerns cannot be resolved, the person or party with the objection may request a Part II Order from the Minister of the Environment, Conservation and Parks. Further details on the process of requesting a Part II Order can be found in Section 2.3.

Schedule 'C' projects are those that have the potential for significant adverse environmental impact and must proceed under the full planning and documentation procedures (Phases 1 to 5) specified in the MCEA document. A Schedule 'C' project is required to complete an Environmental Study Report (ESR), as opposed to a Project File Report for Schedule 'B' undertakings.

The proponent is required to undertake consultation during multiple phases during the Class EA involving mandatory contact with directly affected public, First Nations groups and relevant government agencies to ensure that they are aware of the project and that their concerns are addressed. Schedule 'C' projects involve 4 points of mandatory public contact: twice during Phase 2, once during Phase 3 and again during Phase 4 after the ESR document is placed on public record. Schedule 'C' projects require that an ESR be prepared and submitted for review by the public. If concerns are raised that cannot be resolved, then a Part II order can be invoked.

2.2 Study Documentation

This Project File Report (PFR) documents the planning and design process followed to determine the recommended undertaking and environmentally significant aspects for the *St. Paul Street West CNR Bridge Replacement* Class EA Study, in accordance with the procedures for Schedule 'B' projects, setting out the planning and decision-making process, including consultation with stakeholders, technical agencies and the public, which has been followed to arrive at the preferred solution. The PFR also sets out the mitigating measures proposed to avoid or minimize environmental impacts.

The PFR is organized chronologically in such a way as to clearly demonstrate that the appropriate steps in Phases 1 and 2 have been followed. The report is intended to be a traceable and easily understood record of the proponent's decision-making process. The PFR generally describes the following:

- The problem or opportunity and other background information;
- A description/inventory of the environment;
- The alternative solutions considered, and the evaluation process followed to select the preferred solution;
- The mitigating measures and follow-up commitments, which will be undertaken to minimize environmental impacts including any monitoring necessary during construction; and
- The consultation process and an explanation of how concerns raised by the public and review agencies have been addressed in developing the project.

2.3 Part II Order

Public, review agency and First Nations consultation is a key part of the Class EA process. In a Schedule 'B' project, such as the bridge replacement considered under this Class EA Study, the proponent is required to provide opportunity for the public to be consulted about the proposed project. Consultation is intended to inform the public and other stakeholders about the proposed project, the various alternative solutions considered and their anticipated environmental impacts, as well as the preliminary preferred solution. It is also intended that the public be given opportunity to provide input or raise concerns prior to completion of the Class EA process. It is intended that issues

be identified early into the project by means of public involvement and that resolutions between the proponent and the person or party with the objection be achieved through consultation.

It is incumbent on the public that concerns about the environmental effects of a proposed project or the planning process being followed are brought to the attention of the proponent early in the planning process, when the proponent has greater flexibility to accommodate changes in the project development and the process.

If the consultation process raises a concern that cannot be resolved between the proponent and the person or party raising the objection, then a Part II order can be invoked. However, prior to a Part II Order being requested, the person or party with the objection may request the proponent to voluntarily elevate a Schedule 'B' project to a Schedule 'C' project, or to elevate a Schedule 'B' or 'C' project to an individual environmental assessment. If the proponent declines this request, the person or party raising the objection may write to the Minister of the Environment, Conservation and Parks or delegate to request a Part II Order. A request for a Part II Order must be copied by the requester to the proponent at the same time that it is submitted to the Minister or delegate.

A Part II Order can be requested after the proponent issues the Notice of Completion and within the specified review period outlined in the Notice (30 calendar days from issuance of Notice of Completion). As of July 1, 2018, a person or party wishing to request a Part II Order must use a *Part II Order Request Form* which can be found on the Forms Repository website (http://www.forms.ssb.gov.on.ca/) by searching "Part II Order" or "012-2206E" (the form ID number). The form will require you to provide the following information:

- Your name and address;
- Project name;
- Proponent name;
- Specific reasons why the request is being made - concerns and issues;
- Why a higher level of environmental assessment would address your concerns;
- Information about efforts to date to discuss and resolve concerns with the proponent;
- The outcome you are seeking from the Minister; and
- Other matters relevant to the request.

Unless you state otherwise in your request, any personal information you provide will become part of the public record and will be released, if requested, to any person.

In your request, you must:

- focus on potential environmental effects of the project or the Class EA process;
- not focus on decisions outside the Class EA process (e.g., land-use planning decisions made under the *Planning Act* or issues related to municipal decision-making about the process); and
- not raise issues unrelated to the project.

Once completed, the form is to be sent to the Minister of Environment, Conservation and Parks, the Director of Environmental Assessment and Permissions Branch and the Proponent at:

Minister
Ministry of the Environment, Conservation and Parks
Floor 11
77 Wellesley St. West
Toronto, ON M7A 2T5
minister.mecp@ontario.ca

Director, Environmental Assessment and Permissions Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Ave. West, 1st Floor
Toronto, ON M4V 1P5
enviropermissions@ontario.ca

Jordan Frost, P.Eng., PTOE
Manager, Transportation Planning & Sustainability
Niagara Region
1815 Sir Isaac Brock Way
Thorold, ON L2V 4T7
jordan.frost@niagararegion.ca

2.4 Study Organization and Project Team

The Niagara Region retained Associated Engineering (AE) to conduct the *St. Paul Street West CNR Bridge Replacement* Class EA Study. The Project Team, as outlined in **Table 2-2**, consisted of Niagara Region staff, AE staff, and sub-consultants providing specific knowledge and expertise to address the requirements for this project in accordance with the *Environmental Assessment Act*.

Table 2-2: Study Team

Team Member	Role	Organization
Jordan Frost, P.Eng., PTOE	Proponent (Project Manager)	Niagara Region
Christian Concolino, P.Eng.	Prime Consultant (Project Manager)	Associated Engineering (Ont.)
Andrea LaPlante, P.Eng.	Environmental Assessment Coordinator	Associated Engineering (Ont.)
Lisa Merritt, M.Sc.	Archaeologist	Archaeological Services Inc.
Annie Veilleux, MA, CAHP	Senior Heritage Specialist	Archaeological Services Inc.
David Liu, P.Eng.	Geotechnical Engineer	GeoPro Consulting Ltd.
Owen Healey, OLS	Survey	Tulloch Engineering Inc.

2.5 Consultation Process

As part of the planning process, several steps have been completed to inform government agencies, affected landowners and the local community/general public of the nature and scope of the project and to solicit any comments.

Throughout the Study, public, stakeholder, First Nations and agency notification included:

- Notice of Study Commencement and Initiation of Field Work — January 11, 2019
- Notice of Study Commencement — February 7, 2019
- Notice of Public Information Centre #1 — March 21, 2019
- Public Information Centre (PIC) #1 — April 3, 2019

- Notice of Public Information Centre #2 May 30, 2019
- Public Information Centre (PIC) #2 June 12, 2019
- Notice of Study Completion September 12, 2019
- Project File Report 30 Day Review Period Ends October 11, 2019

Further consultation process details are provided within Section 9 of this report.

2.6 Study Schedule

The following table (**Table 2-3**) outlines the key milestone dates of the project to date and projected to completion.

Table 2-3: Key Milestone Dates

Schedule Item	Date
Initiate Class EA Study	December 2018
Notice of Study Commencement	February 7, 2019
Public Information Centre No. 1	April 3, 2019
Public Information Centre No. 2	June 12, 2019
Completion of Project File Report	September 2019
Notice of Study Completion	September 12, 2019
Detailed Design	Fall 2019
Construction	2020

PHASE I: IDENTIFICATION OF PROBLEMS & OPPORTUNITIES

3 PROBLEMS AND OPPORTUNITY STATEMENTS

The Problem and Opportunity Statements provide a clear statement of the problem and opportunities that need to be addressed for a specific undertaking. The various analyses (e.g. geotechnical investigation, cultural heritage assessment, archaeological assessment) and existing conditions provide input for and contribute to the identification and description of the problem or opportunity. The prevailing deficiencies within the study area can be summarized by the following statements.

Problem Statement

The St. Paul Street West Canadian National Railway (CNR) Bridge, constructed circa 1922, is a two-lane, three-span slab on steel girder structure crossing over the CNR right-of-way at Mile 11.68 of the Grimsby Subdivision. As identified through detailed bridge inspections in 2015 and 2017 and a load capacity evaluation in 2018, the bridge requires replacement to address the aging infrastructure and to improve the vertical alignment of the roadway approaches. Under the existing conditions, a triple-load limit posting of 15, 30 and 40 tonnes has been applied to the bridge thereby limiting the movement of heavy vehicles. In addition, there is an advisory speed limit posted at 20 kilometres per hour (km/hr) due to the steep roadway approaches and limited sightlines.

Opportunity Statement

Given the need to replace the St. Paul Street West CNR Bridge, there is an opportunity to improve public safety for all modes of transportation (vehicular, cyclist, and pedestrian) by shallowing the roadway approach grades and reviewing alternatives to provide a connected active transportation network across the CNR right-of-way. The replacement also provides the opportunity to address structural deficiencies and improve the access to the proposed GO Transit Station via Great Western Street.

A range of feasible, long-term cost-effective alternative solutions were identified to address the deteriorated condition of the existing bridge structure. The development and evaluation of the alternative solutions is the subject of Sections 5 and 6 of this report.

PHASE II: IDENTIFICATION & EVALUATION OF ALTERNATIVE SOLUTIONS

4 EXISTING CONDITIONS

The following section documents existing conditions within the study area.

4.1 Transportation Facilities and Road Infrastructure

4.1.1 Bridge Structure

The St. Paul Street West CNR Bridge (Structure No. 081215) was constructed in 1922 and underwent rehabilitation works in 1977. The bridge is located on St. Paul Street West between Great Western Street and Leeper Street in the City of St. Catharines. The existing structure is a three-span concrete slab on steel girder structure which carries two lanes of east and westbound vehicular traffic on St. Paul Street West over the CNR right-of-way at Mile 11.68 of the Grimsby Subdivision.

The bridge structure has a total length of 41.5m, with span lengths of 14.8m, 17.4m, and 9.3m, respectively from west to east. The roadway approaches are quite steep, with grades of 7.3% (west approach) and 8.27% (east approach) and result in limited sightlines for users of the bridge. The bridge is 13.8m wide with a cross-section consisting of two travel lanes and narrow paved shoulder, and sidewalk on both sides. The superstructure consists of two longitudinal steel through-plate girders, supporting transverse steel stringers, a reinforced concrete deck, and two reinforced concrete sidewalks. The transverse steel stringers are encased in concrete. The substructure consists of concrete abutments and structural steel piers. The bridge has a skew of approximately 51°. **Figure 4-1** depicts the existing bridge structure.

a) St. Paul Street West CNR Bridge (looking south)

b) St. Paul Street West CNR Bridge (looking north)

c) West Bridge Approach

d) East Bridge Approach

Figure 4-1: St. Paul Street West CNR Bridge Structure

As per the 1977 rehabilitation drawings, work was done on the structure including:

- Full depth replacement of portions of the reinforced concrete bridge deck;
- Replacement of concrete on portions of the transverse stringers;
- Replacement of both reinforced concrete sidewalks;
- Repairs to the north end of the east abutment;
- Waterproofing and asphalt paving; and
- Removal of stairs and construction of a new reinforced concrete retaining wall at the northwest corner.

In 2015, a temporary support was installed at the west abutment to support one of the transverse stringers, where there was an area of severe concrete deterioration. Portions of the original 1922 construction drawings and the 1977 rehabilitation drawings are provided in Appendix A.

Detailed bridge inspections were completed in 2015 and 2017. The 2015 inspection report noted severe corrosion and perforations in the main through-plate girders. Also, the bridge deck soffit was noted to be in poor condition with various areas of severe spalling with exposed corroded reinforcing steel, delamination and leakage. The inspection recommended that the structure be replaced now. The 2017 inspection also identified that the bridge was in poor condition and based on the poor roadway geometry and the level of deterioration throughout the structure, it

recommended to schedule the structure for replacement now. The 2017 bridge inspection report is provided in Appendix B. **Figure 4-2** illustrates the existing conditions of the bridge structure.

a) Section loss of the bottom flange of through plate girder

b) Severe concrete spalling on bridge deck soffit.

Figure 4-2: Existing Condition of Bridge Structure

Under the existing conditions, the bridge has a triple load limit posting of 15, 30, and 40 tonnes on both approaches thereby limiting the movement of heavy vehicles. In addition, there is an advisory speed limit posted of 20km/hr (**Figure 4-3***a*) due to the steep roadway approaches and limited sightlines. The load limit posting was originally installed between 2011 and 2013 by the Niagara Region based on a load capacity evaluation completed by CNR (**Figure 4-3***b*). A subsequent load capacity evaluation was completed in 2018 by Ellis Engineering Inc. to confirm the load rating capacity. The results of the analysis concluded that the main girders are the most over-utilized members and the load capacity evaluation resulted in a triple load posting of 16, 26 and 38 tonnes, which confirmed the current load posting was adequate. This load capacity evaluation agreed with the 2017 inspection report in that the bridge should be replaced now, due to its deteriorated state and poor roadway geometry. The Load Capacity Evaluation Report is provided in Appendix B.

a) Advisory Speed Limit Posting (Approach looking east)

b) Load Limit Posting (Approach looking west)

Figure 4-3: Triple Load Limit Posting (Approach Looking West)

4.1.2 Roadway Network

St. Paul Street West (Regional Road 81) is classified as a Regional Arterial and is located within the City's urban built-up area. St. Paul Street West is a two-lane road complete with sidewalks on both sides of the road, which provides access and connectivity to the Downtown to the northeast and employment lands to the west. It has a posted speed limit of 50km/hr with the exception of the bridge approaches which have advisory speed limits of 20km/hr due to limited visibility approaching and crossing the bridge.

St. Paul Street West is on the Regional Bicycle Network, however, does not have dedicated cycling facilities (bicycle lanes). Currently there are signs on both approaches indicating for vehicles to share the road with cyclists (**Figure 4-3***a*).

Great Western Street is a local two-lane roadway owned by the City of St. Catharines. It provides access primarily to the St. Catharines Train Station, Cameron Park, and the surrounding residential neighbourhood from St. Paul Street West (east of CNR Bridge). It does not have pedestrian or cycling facilities (sidewalks, bicycle lanes). The west side of the street allows for on-street parking via gravel shoulder. Right-turns onto St. Paul Street West from Great Western Street are restricted (**Figure 4-4**). Based on the current geometry of the intersection and bridge approaches and resulting poor sightlines, left-turning movements are allowed, however represent a traffic safety hazard due to sightlines, from Great Western Street onto St. Paul Street West and from St. Paul Street West onto Great Western Street.

Figure 4-4: Great Western Street (looking south to St. Paul Street West)

Leeper Street, west of the bridge, is a local two-lane roadway owned by the City of St. Catharines. It extends from Rykert Street to St Paul Street West and Shickluna Street. The street provides access to residential properties and allows for on-street parking. The street was temporarily closed off from St. Paul Street West between 2009 to 2012 due to poor geometry at the intersection (**Figure 4-5***a*). It has remained closed since with permanent works completed in recent years (**Figure 4-5***b)*. The proposed solution will consider the permanent closure of Leeper Street to remain.

a) Leeper Street Temporary Closure

b) Leeper Street Permanent Closure

Figure 4-5: Leeper Street Closure

4.1.3 Proposed GO Transit Facility

Under the City's GO Transit Secondary Plan (GTSSP) a future GO Station is being planned at the existing St. Catharines Train Station located on Great Western Street. The Secondary Plan Area is occupied by Ridley College, existing stable residential, large scale retail and industrial uses, and other smaller scale non-residential uses. Existing connections will be improved, and new connections will be developed to provide all modes of transportation with safe and convenient access to the station and into the Downtown, employment areas, commercial areas, Ridley College and other key destinations. Objectives will include balancing modes of movement and improve pedestrian connectivity to the station. The plan identifies that St. Paul Street West is a key location for future intensification and urban design improvements, including major streetscape improvements and the provision of new active transportation connections. As part of the St. Paul Street West CNR bridge replacement, improvements to Great Western Street to allow access to the Transit Station site will be assessed. Concurrently, the City is undertaking the *Ridley Neighbourhood Traffic Management* Study to determine the likelihood and magnitude of cut-through traffic expected to be generated on neighbourhood streets by the future GO Transit station, and mitigation measures.

4.2 Utilities

Existing utility companies and agencies, as summarized below, have been contacted to identify the location of infrastructure in the study area.

- Bell Canada*
- Canadian National Railway (CNR)*
- Niagara Regional Broadband Network (NRBN)
- Zayo*
- Alectra*
- Enbridge Gas*
- Cogeco Inc.*
- Hydro One
- Rogers*

*Denotes utility with plant within study area

Within the study area there are numerous aboveground and underground utilities that will need to be considered during detailed design. Only Bell Canada has conduits within/along the bridge structure, with conduits embedded in the south sidewalk over the bridge deck. All other identified utilities are within the bridge approaches, along St. Paul Street West, along Great Western Street, and/or within the CNR right-of-way below the bridge structure. Coordination will occur throughout detailed design and construction with all affected utilities to confirm conflicts, relocations and/or proximity guidelines.

4.3 Municipal Services

The City of St. Catharines has watermains, sanitary and storm sewer infrastructure within the study area located near both approaches, but not on or under the bridge. Existing City infrastructure includes:

- Cast iron watermains of various sizes with appurtenances (services, valves, hydrants);
- Clay sanitary sewers (circa 1913) of 250mm diameter with appurtenances (laterals, manholes); and
- Combined and separate storm sewers of various sizes with appurtenances (catchbasins, manholes).

A bridge replacement will not conflict with any existing infrastructure. However, during detailed design consultation with the City will continue to determine the extent of replacement of City owned infrastructure as part of the bridge replacement project.

4.4 Geotechnical Characteristics

GeoPro Consulting Limited (GeoPro) was retained by AE to conduct a geotechnical investigation for the *St. Paul Street West CNR Bridge Replacement* Class EA. The purpose of the geotechnical investigation was to obtain information on the existing subsurface conditions by means of a limited number of boreholes, in-situ tests and laboratory tests of soil samples to provide geotechnical design information. Field work for the geotechnical investigation was carried out on January 16 to 18 and February 13 to 15, 2019 during which time two (2) boreholes (BH1 and BH2) were advanced to depths ranging from about 37.6m to 57.1m below the existing ground surface. Groundwater condition observations were made in the boreholes during drilling and upon completion of drilling. A monitoring well was installed in the boreholes to measure the groundwater table. All soil samples obtained during the investigation were further examined to evaluate soil conditions, including topsoil and fill material. A detailed description of the subsurface conditions is provided in the Geotechnical Report provided in Appendix C.

The main findings of the soil strata are summarized below:

- A flexible pavement structure was observed with a composition of:
    - Asphalt Concrete = 180mm
    - Granular Base = 220mm
    - Granular Subbase = 220mm
- Fill materials with varying thicknesses were encountered at both borehole locations up to depths varying from 1.4m (BH1, i.e. west of the existing bridge) to 2.9m (BH2, i.e. east of the existing bridge);
- Underlying the fill materials, native cohesive clayey deposits, cohesionless sandy/silty/gravelly deposits and glacial tills were encountered at both boreholes;
- Shale bedrock was encountered in Borehole BH1 at a depth of 51.2m below ground surface; and
- Groundwater table measured in the boreholes ranged from 3.23m to 18.30m below the ground surface.

In order to provide information on the chemical quality of the subsurface soils, selected soil samples were submitted for chemical analyses. The soil analytical results were compared with the Ministry of the Environment, Conservation and Parks (MECP) "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 2011, Table 1: Full Depth Background Site Condition Standards for Residential/Parkland/ Institutional/Industrial/Commercial/ Community Property Uses (2011 MECP Table 1 Standards); Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition (2011 MECP Table 2 Standards), and Table 3: Full Depth Generic Site Condition Standards in a non-potable Ground Water Condition (2011 MECP Table 3 Standards). Based on the analytical results, exceedances of MECP Table 1, Table 2 and Table 3 Standards were noted for Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) in the tested soil samples. It should be noted that the samples with exceedances of EC and SAR values were taken from the borehole located on the roadway. The

elevated EC and SAR values in the tested soil samples may likely be attributed to the application of de-icing salt on the road.

Based on the results of soil sample analysis, the following disposal options were recommended:

- The soils generated near Borehole BH1 at the tested depths with no indicated exceedances can be re-used at the Site or a receiving site would accept the soils as per the test results; and
- The soils generated at the same tested sample depth from Borehole BH2 may be disposed at facilities, which are suitable to accept salt-impacted excess soil (i.e., certain former aggregate sites, mines, etc.) or at a licensed landfill site. However, additional chemical testing may be required by these facilities.

4.5 Natural Environment

The Niagara Peninsula Conservation Authority (NPCA) received notice of the study commencement early in the study process. They identified that there are no NPCA regulated features/areas within the study limits. Also, it is important to note that the bridge does not intersect any significant watercourses. The closest watercourse to the study area is the Twelve Mile Creek, which is approximately 740 m southeast of the bridge.

The study area is located near a well-established treeline that runs adjacent to both sides of the railway tracks. ASI identified in their Cultural Heritage Evaluation Report that this established treeline appears to be striped maple trees. These trees provide suitable habitat for various species (e.g. birds). Tree protection zones should be established to protect the mature treeline.

4.6 Cultural Environment

Archaeological Services Inc. (ASI) was contracted by AE to conduct a Stage 1 Archaeological Assessment and a Cultural Heritage Evaluation Report for the *St. Paul Street West CNR Bridge Replacement* Study.

4.6.1 Archaeological Assessment (Stage 1)

The Stage 1 Archaeological Assessment field work was completed on December 19, 2018 in order to gain first-hand knowledge of the geography, topography, and current conditions and to evaluate and map archaeological potential of the study area.

The study area meets the following criteria indicative of archaeological potential:

- Previously identified archaeological sites;
- Water sources: primary, secondary, or past water source (Twelve Mile Creek);
- Early historic transportation routes (Great Western Railway, St. Paul Street West, Pelham Road, Merigold Street, Leeper Street, and Hamilton Street); and
- Proximity to early settlements (City of St. Catharines).

The property inspection determined that parts of the study area exhibit archaeological potential, and if impacted, these areas will require Stage 2 archaeological assessment, prior to any construction activities. Parts of the study area have been previously assessed and do not require further survey. The remainder of the study area has been subjected to deep soil disturbance events associated with construction of the road and rail ROWs, installation of utilities, and twentieth and twenty-first century residential and commercial construction. These areas do not require further survey. **Figure 4-6** summarizes the archaeological potential of the study area.

Figure 4-6: Archaeological Potential of Study Area

In light of the results, ASI recommended:

- If impacted, the lands identified as exhibiting archaeological potential require Stage 2 Archaeological Assessment by test pit survey prior to any construction activities; and
- The remainder of lands do not retain archaeological potential and do not require further archaeological assessment.

The Stage 1 Archaeological Assessment report prepared by ASI is provided in Appendix D.

4.6.2 Cultural Heritage Evaluation

Background research, data collection, and field review was conducted for the study area. The field review was completed on January 31, 2019 to conduct photographic documentation of the crossing and to collect data relevant for completing a heritage evaluation of the structure. Based on the results of archival research, an analysis of bridge design and construction in Ontario, field investigations, and application of Regulation 9/06 of the *Ontario Heritage Act*, the St. Paul Street West CNR Bridge was determined to possess heritage value. The St. Paul Street West CNR Bridge was determined to retain physical/design value as an early and representative example of a slab on steel girder structure in the local context and is the oldest of this type of structure owned by the Niagara Region. The structure also retains contextual value given the physical, functional, and historical links to its surroundings in the City of St. Catharines.

In summary, character-defining elements associated with St. Paul Street West CNR Bridge include, but are not limited to:

- Riveted steel plate through girders, transverse steel stringers, and other steel structural members;
- Riveted steel bents;
- Steel lattice railing; and
- Cast-in-place concrete abutments.

Key heritage attributes that embody the historical, associative, and contextual value of the subject bridge include:

- Early and representative example of a slab on steel girder bridge in the local context; and
- Physically, historically, and functionally carries St. Paul Street West over the CNR (formerly Grand Trunk Railways) in the City of St. Catharines.

Given the identified heritage value of the St. Paul Street West CNR Bridge and the likelihood of the complete removal of the structure, the following recommendations and mitigation measures should be considered and implemented:

- Conservation Alternatives 1 - 3 (retention of the structure) are the preferred alternatives for the St. Paul Street West CNR Bridge, with Alternative 1 being the most preferred. As part of the selection of the preferred alternatives as part of the Environmental Assessment, a clear rationale for the proposed course of action should be documented.
- Should retention of the subject bridge be chosen as the preferred alternative (one of Conservation Alternatives 1 – 7), the character-defining elements identified above should be retained and treated sympathetically.
- Should removal/replacement of the St. Paul Street West CNR Bridge be chosen as the preferred alternative (Conservation Alternative 8 or 9), three mitigation options should be considered:
    - Replacement/removal of existing bridge and construction of a new bridge with replication of the appearance of the heritage bridge in the new design, with allowances for the use of modern materials. The character-defining elements identified above should be considered for replication.
    - Replacement/removal of existing bridge and construction of a new bridge with historically sympathetic design qualities to the heritage bridge, with allowances for the use of new technologies and materials.
    - In addition to above two options, development of a commemorative strategy, such as plaquing, may be appropriate.
- Should removal and/or replacement of the St. Paul Street West CNR Bridge be chosen, a Heritage Impact Assessment (HIA) should be completed by a qualified heritage specialist and filed with the City of St. Catharines Heritage Advisory Committee, the Ministry of Tourism, Culture and Sport, and any other heritage stakeholders that may have an interest in this project.
- To mitigate direct impacts to the St. Catharines Train Station in the vicinity of the subject bridge, construction and staging activities should be suitably planned and executed to ensure that impacts are minimized and mitigated. Suitable staging activities may include temporary barriers and the establishment of no-go zones throughout construction. On-site workers should be notified of the cultural heritage significance of the subject bridge and the St. Catharines Train Station in advance of construction.
- To mitigate indirect impacts to the mature trees adjacent to the subject bridge, construction and staging activities should be suitably planned and executed to ensure that impacts are minimized and mitigated. Tree protection zones should be established to protect the mature treeline in the west limit of Cameron Park adjacent to Great Western Street. On-site workers should be notified of the tree protection zones in advance of construction.

The Cultural Heritage Evaluation Report prepared by ASI is provided in Appendix E.

4.7 Socio-Economic Environment

4.7.1 Land Use

The study area is within the City's urban built-up area, specifically within an Intensification Area, with commercial and residential properties adjacent to the study area. Within the urban area boundary, the land is designated as mixed use, neighbourhood residential and natural areas (Cameron Park), as specified in the City of St. Catharines Official Plan. The bridge crossing is bounded by commercial structures fronting on St. Paul Street West on the southeast, a wooded area and residences to the southwest on Shickluna Street, undeveloped lands adjacent to an industrial/warehouse facility on the northwest, and a low-rise apartment and Cameron Park adjacent to Great Western Street to the northeast.

4.7.2 Property Ownership

The St. Paul Street West CNR Bridge is owned by CNR and maintained by the Niagara Region as per the Board Order No. R-23162 dated July 8, 1976. The Board Order dictates the agreement between the Niagara Region and CNR with respect to cost associated with replacement and maintenance of the bridge structure. Negotiations between CNR and Niagara Region will continue into design to confirm cost-sharing agreements for any proposed works.

Outside of the CNR right-of-way (ROW) and Region ROW there are numerous properties that will be impacted by a bridge replacement, if deemed to be the preferred solution. These privately-owned properties include commercial and residential properties of which partial or full acquisition may be required. Impacted property owners will be engaged early in the detailed design process and negotiations to provide fair compensation will be made.

5 ALTERNATIVE SOLUTIONS

5.1 Identification of Alternative Solutions

Under Phase 2 of the Class EA planning and design process, all reasonable and feasible solutions to the problem are identified and examined. In order to address the Problem encompassing the deficiencies that were identified as part of the Class EA study, a range of reasonable and feasible "solutions" were identified as alternative ways to solve the Problem.

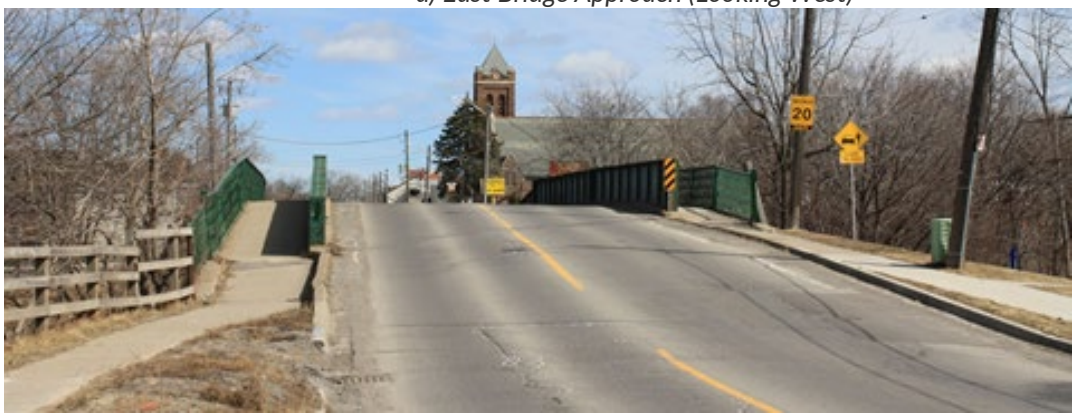
Specific to the *St. Paul Street West CNR Bridge Replacement* study, three alternative solutions were identified, developed and evaluated. The alternatives include: 1) Do Nothing, 2) Replacement Maintaining Existing Cross-Section, and 3) Replacement with Widened Cross-Section. These alternative solutions are discussed and evaluated in the following sections.

5.1.1 Alternative 1: Do Nothing

In the "Do Nothing" alternative, no improvements or changes would be made to solve the identified problem. The existing structure would remain either in existing condition or undergo rehabilitation works. This means that the problem would remain in the system and the structure would still be in overall poor condition. The structure would remain in service until it can no longer perform its intended function. As it continues to deteriorate, maximum load postings would need to be re-evaluated and over time would need to be further reduced.

The previously completed condition assessment and load capacity evaluations identified the bridge structure as being in overall poor condition with severe steel corrosion and concrete spalling leading to the recommendation for full replacement. This alternative would also provide no improvements to existing roadway geometry or sight line issues. Due to the age and condition of the structure, this alternative is not considered feasible but has been considered as a benchmark for comparison. **Figure 5-1** presents the existing conditions of the east and west bridge approaches.

a) East Bridge Approach (Looking West)



b) West Bridge Approach (Looking East)

Figure 5-1: St. Paul Street West CNR Bridge Approaches

5.1.2 Alternative 2: Replacement Maintaining Existing Cross-Section

In this alternative, the existing bridge would be replaced with a new structure (substructure and superstructure). The new bridge would maintain the existing 13.8m wide cross-section with two 4.8m wide travel lanes (including narrow paved shoulders) and two 1.8m wide sidewalks. This alternative would not improve upon existing active transportation connectivity as designated bicycle lanes would not be included. However, this alternative would optimize the vertical alignment of St. Paul Street West which would improve sight line visibility and would remove the load limit posting. **Figure 5-2** illustrates the proposed cross-section for Alternative No. 2.

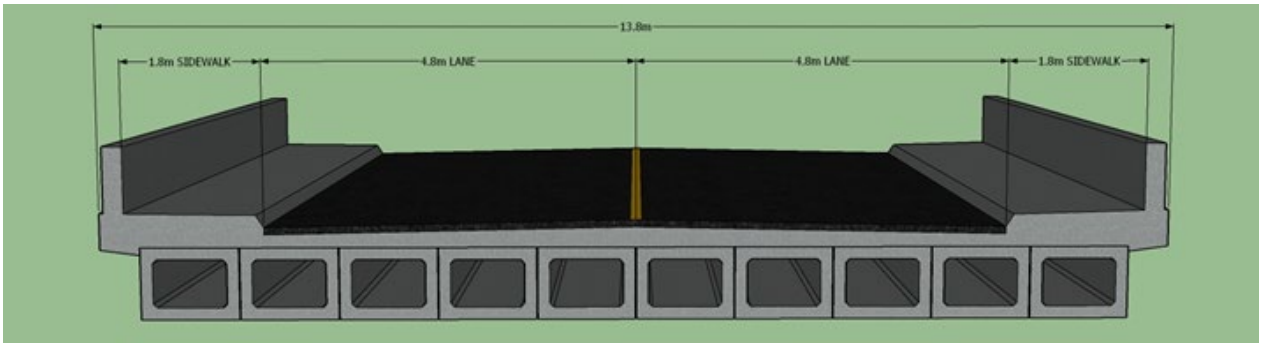


Figure 5-2: Typical Cross-Section for Alternative 2

5.1.3 Alternative 3: Replacement with Widened Cross-Section

This alternative involves full replacement of the existing bridge with a new structure (substructure and superstructure) with a widened cross-section. The new cross-section includes two 3.5m wide travel lanes, two 1.8m wide bicycle lanes and two 2.4m wide sidewalks for a total width of 16m. This alternative would improve active transportation connectivity through the inclusion of bicycle lanes and wider sidewalks. The widened cross-section under this approach would provide safer travel for all modes of transportation. This alternative would also optimize the vertical alignment of St. Paul Street West, which would improve the sight line visibility and would remove the load limit posting. **Figure 5-3** displays the typical cross-section for this solution.

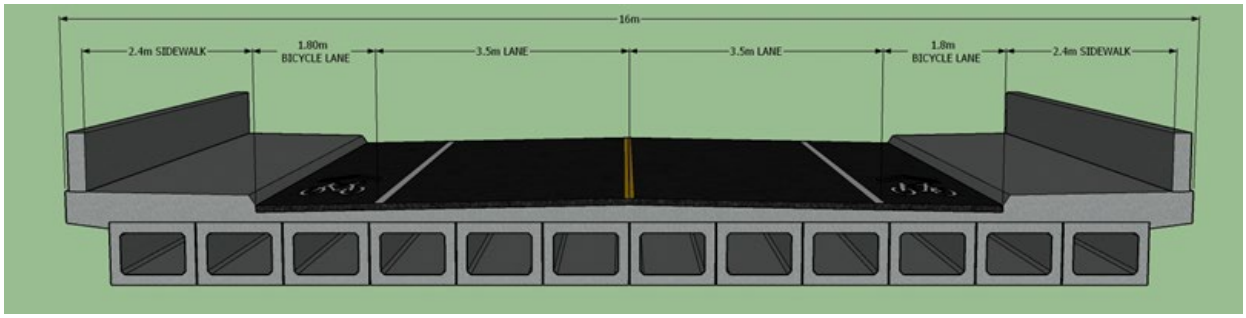


Figure 5-3: Typical Cross-Section for Alternative 3

5.2 Evaluation Criteria

The following categories of evaluation criteria, representing a range of issues, were considered in the evaluation of the alternative solutions and design concepts for this study. The evaluation criteria and their respective considerations were finalized based on input received from affected agencies, stakeholders, the public and Region staff and are summarized in **Table 5-1** with no order of preference or implied importance.

Table 5-1: Evaluation Criteria

Evaluation Criteria	Considerations
Transportation	• Impact on road user safety/traffic operations • Impact on active transportation connectivity • Impact on sight line visibility

Evaluation Criteria	Considerations
	• Modifications to reduced speed warning and load limit posting
Engineering / Constructability	• Potential for constructability issues • Impact on overall design approach • Impact on construction schedule
Natural Environment	• Impact on natural environment including habitats adjacent to the study area • Impact on natural heritage
Socio-Economic Factors	• Impact on residents and businesses
Archaeological & Cultural Heritage	• Impact on archaeological and cultural heritage resources
Cost	• Anticipated capital costs and/or maintenance costs

A comparative evaluation of the alternative solutions was undertaken to determine the overall positive and negative attributes of each solution. In comparing the alternative solutions, it is recognized that more than one of the potential solutions may resolve more than one problem and the feasibility of an alternative design will depend, in part, on a range of factors (criteria) including but not limited to the nature and location of the transportation system, the nature and location of the problem, and comparative costing of the alternative designs.

5.3 Summary of Evaluation Process

To provide an impartial, traceable and consistent evaluation, as required by the Class EA process, the following method was used to illustrate the highest and lowest impact of each alternative relative to the evaluation criteria. The three alternative solutions were evaluated against the six (6) evaluation criteria using a three-point scale as summarized in **Table 5-2**, ranging from more preferred (shown as a green solid circle) to less preferred (shown as a blue solid circle). The alternative that was considered to fall somewhere between the most preferred and less preferred option was evaluated as preferred (shown as a grey solid circle).

Table 5-2: Evaluation Three-Point Scale

Rating	Key
More Preferred	
Preferred	
Less Preferred	

The evaluation of alternatives has been captured in a matrix format to allow for direct comparison between the alternative solutions. Refer to **Table 5-3**. Based on findings from the analysis and evaluation of alternatives using the criteria listed above, Alternative 3 – Replacement with Widened Cross-section has been identified as the preferred alternative solution.

A summary of the evaluation of alternatives solutions are as follows:

Do Nothing –The structural deficiencies of the bridge structure would remain and continue to deteriorate leading to possible closure of the bridge crossing. The existing safety issues including limited sight lines, reduced advisory speed limit, load limit posting and lack of dedicated active transportation facilities (bicycle lanes) would remain. Significant rehabilitation repairs would be required to address the existing structural deficiencies of the bridge which would not address the steep bridge approaches and other safety issues. **This alternative is not recommended.**

Replacement Maintaining Existing Cross-section – Replacement of the existing bridge structure would address all structural deficiencies and most of the safety issues. Sight line issues would be improved, and the reduced advisory speed limit and load limit posting would be removed with a new bridge structure complete with shallower bridge approaches that meet current transportation design standards. Replacement with existing cross-section (two travel lanes and sidewalks on both sides) would not provide active transportation connectivity over the bridge crossing. Considering the pending GO Transit Station and the desire to have a transportation network suited for all modes of transportation, the lack of active transportation facilities is not favourable. **Therefore, this alternative is not recommended.**

Replacement with Widened Cross-section – Replacement of the existing bridge structure with a wider cross-section would address all structural deficiencies and safety issues. Sight line issues would be improved, and the reduced advisory speed limit and load limit posting would be removed with a new bridge structure complete with shallower bridge approaches that meet current transportation design standards. Replacement with a wider cross-section which would include two travel lanes, two bicycle lanes and sidewalks on both sides, would provide a bridge crossing that is suited for all modes of transportation and would align with regional objectives of providing active transportation connectivity on regional roads where feasible. **This alternative is recommended to be carried forward.**

Table 5-3: Evaluation of Alternative Solutions

CRITERIA	ALTERNATIVE 1: DO NOTHING	ALTERNATIVE 2: REPLACEMENT MAINTAINING EXISTING CROSS-SECTION	ALTERNATIVE 3: REPLACEMENT WITH WIDENED CROSS-SECTION
Transportation	Sight line issues, reduced speed warning, load limit posting would remain; potential for bridge closure due to deteriorating condition	Sight line issues would be improved; reduced speed warning and load limit posting would be removed; no active transportation connectivity provided	Sight line issues would be improved; reduced speed warning and load limit posting would be removed; active transportation connectivity would be provided through inclusion of bike lanes
Engineering / Constructability	Potential constructability issues to address deterioration of existing structure if rehabilitation is undertaken	Both alternatives would have similar construction schedules and cross-section would not impact overall design approach of bridge structure	
Natural Environment	All alternatives have the same limited impact on the natural environment; there are no natural heritage assets within the study area		
Socio-economic Factors	No impact on local residences and businesses; unless in event of bridge closure due to condition	Both alternatives would have same limited impact on socio-economic environment from construction disruptions; no post-construction impacts	
Archaeological & Cultural Heritage	No impact on archaeological and cultural heritage resources	Both alternatives would have same impact on archaeological and cultural heritage resources due to removal of existing structure	
Cost	No capital cost for immediate replacement; prolonged maintenance and rehabilitation costs will be incurred and inevitable replacement costs	Capital costs will be relatively similar with magnitude of costs not impacted based on cross-sectional difference of alternatives	
OVERALL	**Pros:** Minimal impact on surrounding environment (natural, social, cultural) **Cons:** Does not address safety issues and condition of structure; potential for bridge closure due to deteriorating condition	**Pros:** Sight line issues and speed and loading reductions would be addressed, as well as condition of structure **Cons:** Active transportation connectivity would not be provided; minor impact to surrounding environment	**Pros:** Sight line issues, speed and loading reductions would be addressed, condition of structure would be improved and active transportation connectivity would be provided **Cons:** Minor impact to surrounding environment

6 ALTERNATIVE DESIGN OPTIONS

6.1 Identification of Alternative Bridge Design Options

Although this Study was carried out as a Schedule 'B' undertaking which requires only alternative solutions to the Problem Statement be developed, evaluated and presented, the Region elected to develop, evaluate and present a range of alternative design options to implement the preferred solution (as identified in Section 5.3). For the *St. Paul Street West CNR Bridge Replacement* study, the design options that were considered included: 1) Concrete Box Girders on a Skew, 2) Concrete Box Girders Perpendicular, and 3) Tapered Steel Plate Girders. These alternative design options are discussed and evaluated in the following sections.

6.1.1 Option 1: Concrete Box Girders on a Skew

For this design option, the new bridge would be constructed with 900mm deep precast prestressed concrete box girders oriented on a skew, similar to the existing bridge structure, to the railway tracks. Precast girders would be fabricated off-site and lifted into place, reducing the required amount of staging area required, and increasing the speed of construction. The bridge deck would incorporate a 150mm cast-in-place concrete deck and 90mm of asphalt. The new bridge would be a single span structure with a span of 28.45m spanning the CNR ROW. The bridge width would be 16m incorporating the preferred solution cross-section of two 3.5m travel lanes, two 1.8m wide bicycle lanes and 2.4m wide sidewalks on both sides of the bridge. **Figure 6-1** to **Figure 6-3** illustrate the plan, elevation and cross-section of this design option.

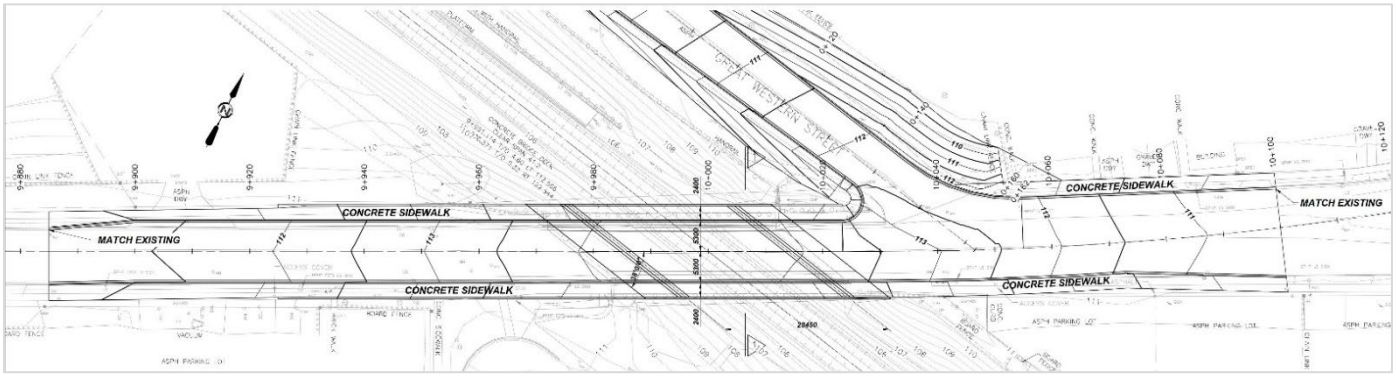


Figure 6-1: Plan View of Design Option 1

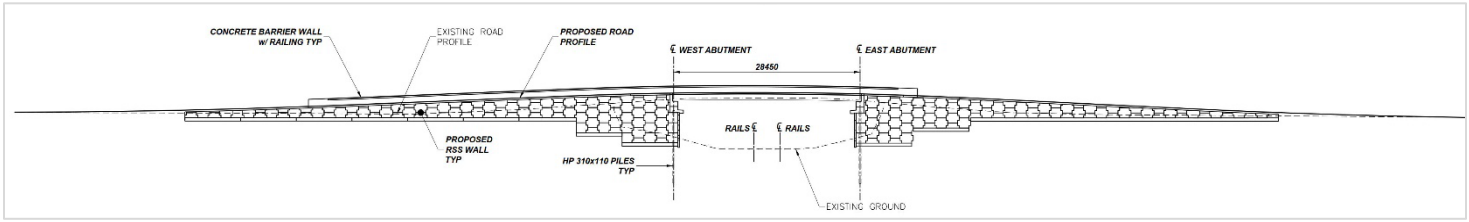


Figure 6-2: Elevation of Design Option 1

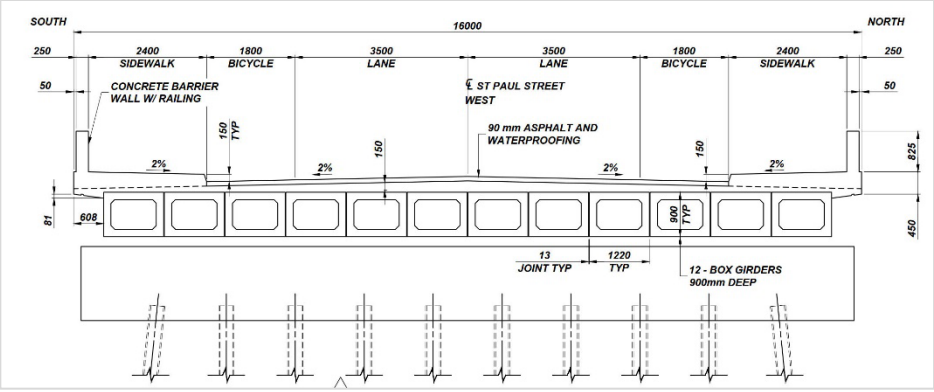


Figure 6-3: Cross-section of Design Option 1

6.1.2 Option 2: Concrete Box Girders Perpendicular

For this design option, the new bridge would be constructed with 700mm deep precast prestressed concrete box girders oriented perpendicular to the railway tracks. Precast girders would be fabricated off-site and lifted into place, reducing the required amount of staging area required, and increasing the speed of construction. The bridge deck would incorporate a 150mm cast-in-place concrete deck and 90mm of asphalt. The new bridge would be a single span structure with a span of 17.75m. The perpendicular orientation of the bridge would reduce the length of the girders (17.75m) while still maintaining the 28.45m clearance width for the CNR ROW. The constructed bridge would form a quasi tunnel along the CNR ROW with a length of 50m. St. Paul Street West would continue to cross the structure at a skew to the railway tracks with a cross-section width of 16m incorporating the preferred solution cross-section of two 3.5m travel lanes, two 1.8m wide bicycle lanes and 2.4m wide sidewalks on both sides of the bridge. The resulting concrete 'dead space' on either side of the roadway could provide opportunity to create landscaped areas with benches, greenery, art pieces, and/or informational plaquing. **Figure 6-4** to **Figure 6-6** illustrate the plan, elevation and cross-section of this design option.

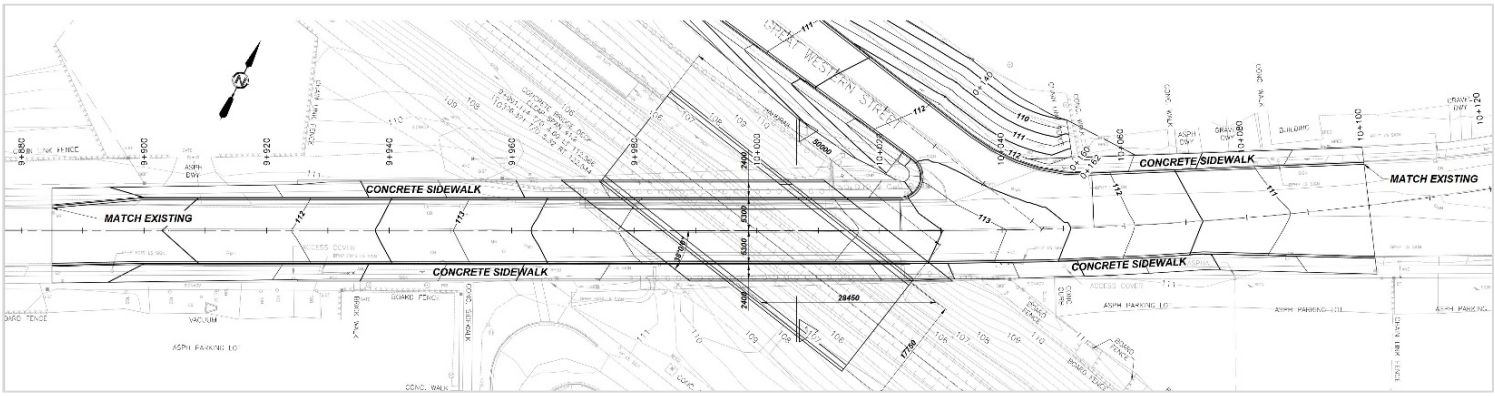


Figure 6-4: Plan View of Design Option 2

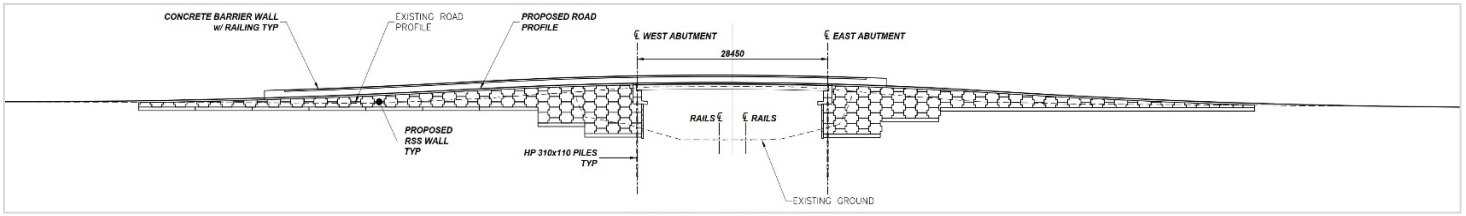


Figure 6-5: Elevation of Design Option 2

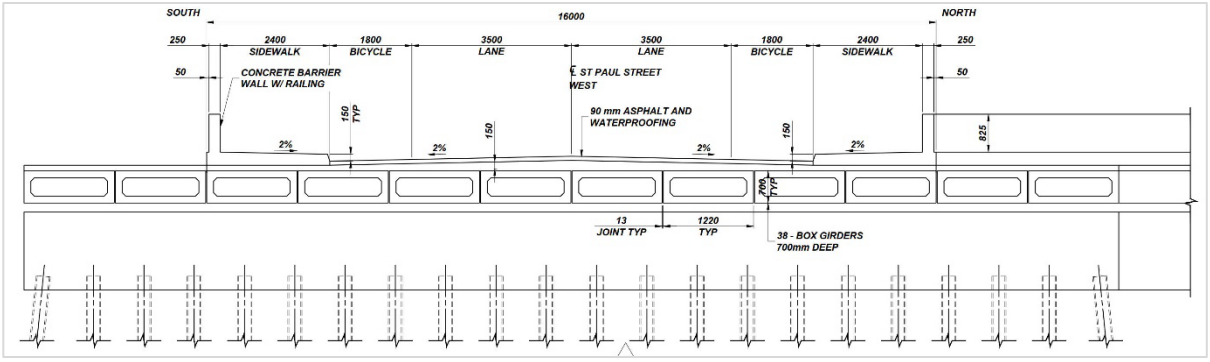


Figure 6-6: Cross-section of Design Option 2

6.1.3 Option 3: Tapered Steel Plate Girders

For this design option, the new bridge would be constructed with 900mm deep tapered steel plate girders oriented on a skew, similar to the existing bridge structure, to the railway tracks. The bridge deck would incorporate a 225mm cast-in-place concrete deck and 90mm of asphalt. The new bridge would be a single span structure with a span of 28.45m spanning the CNR ROW. The bridge width would be 16m incorporating the preferred solution cross-section of two 3.5m travel lanes, two 1.8m wide bicycle lanes and 2.4m wide sidewalks on both sides of the bridge. **Figure 6-7** to **Figure 6-9** illustrate the plan, elevation and cross-section of this design option.

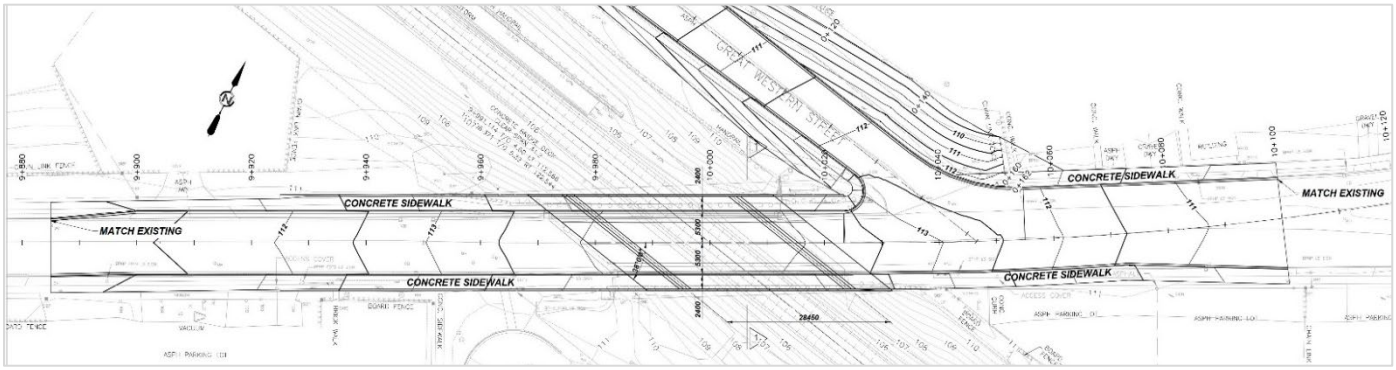


Figure 6-7: Plan View of Design Option 3

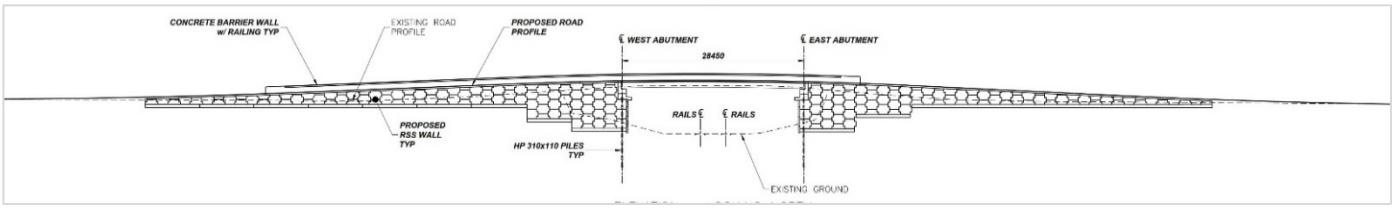


Figure 6-8: Elevation of Design Option 3

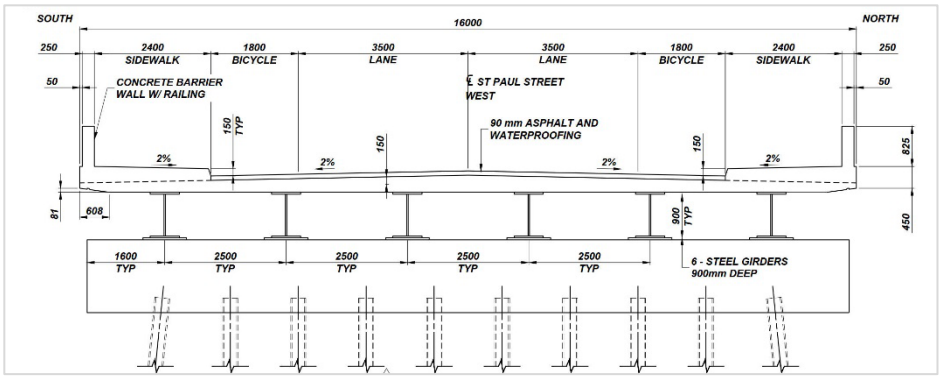


Figure 6-9: Cross-section of Design Option 3

6.2 Evaluation Criteria

The following categories of evaluation criteria, representing a range of issues, were considered in the evaluation of the alternative design options for this study. The evaluation criteria and their respective considerations were finalized based on input received from affected agencies, stakeholders, the public and Region staff and are summarized in **Table 6-1** with no order of preference or implied importance.

Table 6-1: Evaluation Criteria

Evaluation Criteria	Considerations
Transportation	• Impact on road user safety/traffic operations • Impact on sight line visibility • Modifications to reduced speed warning and load limit posting
Constructability	• Potential for constructability issues • Impact on overall design approach • Impact on construction schedule
Property Impact	• Impact on adjacent property
CN Coordination	• Degree of CN coordination required during design and construction
Aesthetics	• Potential aesthetical value to the surrounding area
Cost	• Anticipated capital costs

A comparative evaluation of the alternative design options was undertaken to determine the overall positive and negative attributes of each option. In comparing the alternative design options, it is recognized that more than one of the potential options may resolve more than one problem and the feasibility of an alternative design option will depend, in part, on a range of factors (criteria) including but not limited to the impact on the transportation network, the impact on adjacent properties, and comparative costing of the alternative designs.

6.3 Summary of Evaluation Process

Similar to the evaluation process followed for the Alternative Solutions, to provide an impartial, traceable and consistent evaluation the following method was used to illustrate the highest and lowest impact of each alternative design option relative to the evaluation criteria. The three alternative design options were evaluated against the six (6) evaluation criteria using a three-point scale as summarized in **Table 5-2**, ranging from more preferred (shown as a green solid circle) to less preferred (shown as a blue solid circle). The option that was considered to fall somewhere between the most preferred and less preferred option was evaluated as preferred (shown as a grey solid circle).

The evaluation of options has been captured in a matrix format to allow for direct comparison between the alternative design options. Refer to **Table 6-2**. Based on findings from the analysis and evaluation of options using the criteria listed above, Option 1 – Concrete Box Girders on a Skew has been identified as the preferred design option.

A summary of the evaluation of alternative design options are as follows:

Concrete Box Girders on a Skew – This option would provide a bridge structure and approaches that would address the structural and safety issues identified of the existing conditions. The bridge approaches will be regraded in accordance with design standards for a posted speed limit of 50km/h. By optimizing the concrete box girder superstructure the bridge profile will be lowered, while maintaining compliance with CNR clearance requirements, to reduce the impact to adjacent properties from the rise in road centreline profile required to make the approaches less severe. Concrete box girder construction provides an economical design solution that will provide an opportunity to incorporate heritage and decorative features to the bridge, if desired. **This option is recommended to be carried forward.**

Concrete Box Girders Perpendicular – This option would provide a bridge structure and approaches that would address the structural and safety issues identified of the existing conditions. With the decreased span length of this option the bridge profile can be lowered to provide the greatest improvement to sight line issues with the regrading of the approaches for a posted speed limit of 50km/h. However, the bridge would require an increased number of girders and piles to be installed, compared to Option 1, resulting in a longer, more complex construction period and increased construction cost by approximately 30% (compared to Options 1 and 3). The aesthetic value provided by this type of structure varies. There is an increased amount of hard surface (concrete) visible, particularly from the train station vantage point which would be a disadvantage; however, the 'dead pace' adjacent to the roadway would provide an opportunity to incorporate landscaping features. Overall, the increased cost of construction and longer, more complex construction period does not out-weigh the added benefit of increased sight lines, compared to that of Option 1 or 3. **Therefore, this option is not recommended.**

Table 6-2: Evaluation of Alternative Design Options

CRITERIA	OPTION 1: CONCRETE BOX GIRDERS ON A SKEW	OPTION 2: CONCRETE BOX GIRDERS PERPENDICULAR	OPTION 3: TAPERED STEEL PLATE GIRDERS
Transportation	Sight line issues have better improvement (compared to Option 3) with lowered bridge profile and regraded approaches; posted speed limit of 50km/h	Sight line issues have greatest improvement with lowest bridge profile and regraded approaches; posted speed limit of 50km/h	Sight line issues improved with lowered bridge profile and regraded approaches; posted speed limit of 50km/h
Constructability	Construction can be completed in one construction season; full closure or staged construction are feasible	Construction can be completed in one construction season, however, several months longer than Options 1 or 3; full closure would be preferred as staged construction would require significant road realignment	Construction can be completed in one construction season; full closure or staged construction are feasible
Property Impact	Adjacent properties to bridge would be impacted by rise in road centerline profile to improve bridge approaches	Adjacent properties to bridge would be impacted by rise in road centerline profile to improve bridge approaches	Adjacent properties to bridge would be impacted by rise in road centerline profile to improve bridge approaches
CN Coordination	CN coordination during construction will be required (flagging, etc.) during demolition and girder placement	Greater CN coordination during construction will be required (flagging, etc.) during demolition and girder placement due to longer construction phase and more girders to be installed	CN coordination during construction will be required (flagging, etc.) during demolition and girder placement
Aesthetics	Adequate aesthetic value from all vantage points with opportunity to incorporate heritage and decorative features as necessary	Aesthetic value varies due to increased amount of hard surface (concrete) visible, particularly from train station vantage point; opportunity to incorporate landscaping features within 'dead space' adjacent to roadway	Adequate aesthetic value from all vantage points with opportunity to incorporate heritage and decorative features as necessary
Cost	Capital costs of this alternative and Option 3 will be relatively similar with magnitude of costs not impacted based on concrete versus steel girders	Capital costs of this alternative are approximately 30% higher than Options 1 and 3 due to increased number of piles and girders to be installed	Capital costs of this alternative and Option 1 will be relatively similar with magnitude of costs not impacted based on concrete versus steel girders; volatility of steel costs could impact capital cost
OVERALL	**Pros:** Improves sight line issues, requires straight-forward construction approach, reasonable capital cost **Cons:** Impact to adjacent properties due to rise in road centerline profile	**Pros:** Greatest improvement to sight line issues **Cons:** Most difficult to construct and greatest capital cost	**Pros:** Improves sight line issues, requires straight-forward construction approach, reasonable capital cost **Cons:** Impact to adjacent properties due to rise in road centerline profile; minor steel cost uncertainty

Tapered Steel Plate Girders – This option is similar to Option 1 and would provide a bridge structure and approaches that would address the structural and safety issues identified of the existing conditions. The bridge approaches will be regraded in accordance with design standards for a posted speed limit of 50km/h. By optimizing the steel girder superstructure the bridge profile will be lowered, while maintaining compliance with CNR clearance requirements, to reduce the impact to adjacent properties from the rise in road centreline profile required to make the approaches less severe. However, due to the bridge deck structure requiring thicker concrete deck, compared to Option 1, the sight line improvements are the least favourable of all the options. Also, steel girders tend to have higher maintenance costs than concrete girders, as they are more prone to corrosion. The steel plate girder construction provides an economical design solution, similar to that of Option 1, that will provide an opportunity to incorporate heritage and decorative features to the bridge, if desired. However, due to the volatility of steel costs and the potential impact on the capital cost, compared to Option 1, **this option is not recommended.**

7 IMPLEMENTATION OF THE PREFERRED SOLUTION

7.1 Major Features of Preferred Design

Considering the feedback received from the public and stakeholders during the Class EA study and the evaluation of the alternative solutions and bridge design options, the preferred design that will be implemented for the St. Paul Street West CNR Bridge Replacement will be a **new concrete box girder bridge (on a skew) with a widen cross-section including bicycle lanes and wider sidewalks.**

7.1.1 Bridge Structure

The existing bridge structure will be completely removed, including the superstructure (deck and girders) and substructure (piers and abutment walls). The new bridge will be designed to meet current bridge standards as per the Canadian Highway Bridge Design Code (CHBDC), Ministry of Transportation Ontario (MTO) Structural Manual and requirements of the Region and CNR.

The new bridge structure will be a single span structure with a span length of 28.45m oriented on a 38° skew to the railway tracks below. The new bridge superstructure will consist of twelve (12) 900mm deep pre-stressed precast box girders, with a cast-in-place concrete deck (150mm thick) and asphalt surface (90mm thick). The overall width of the bridge will be 16m to accommodate the preferred cross-section of two 3.5m travel lanes, two 1.8m wide bicycle lanes, and two 2.4m wide sidewalks. The bridge will also be complete with 0.85m high decorative concrete barrier wall with hand railing (total barrier height of 1.37m) on either side in accordance with safety standards. The bridge abutment walls will be constructed set back from the rail tracks as per CNR clearance requirements (as depicted in **Figure 7-1**). Based on the findings of the geotechnical investigation, particularly the depth of bedrock (greater than 50m below surface level) it is anticipated that a friction pile foundation will be the preferred foundation type for the replacement structure.

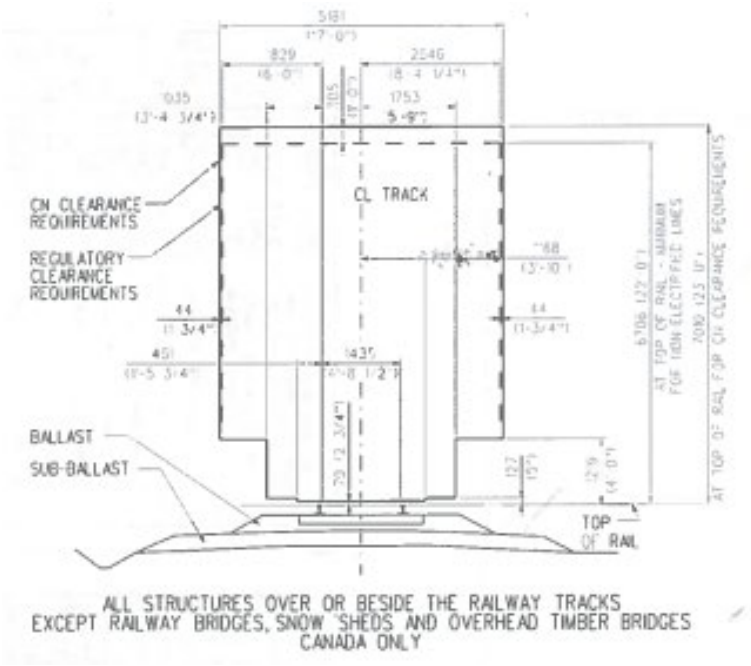


Figure 7-1: CNR Horizontal and Vertical Clearance Requirements

The new bridge structure will be constructed maintaining the horizontal alignment of the existing structure and St. Paul Street West. The vertical profile of the new bridge will be raise approximately 890mm higher (at highest point) than the existing bridge to accommodate the improved bridge approaches. The minimum bridge soffit elevation will be 112.92m, which complies with CNR clearance requirements (refer to **Figure 7-1**).

A preliminary general arrangement drawing of the preferred bridge design is provided in Appendix F. During the detailed design stage, the final details regarding the replacement structure will be developed including foundation details, drainage details and additional safety requirements in accordance with CHBDC, MTO and CNR requirements.

To accommodate the raised vertical profile of St. Paul Street West (refer to Section 7.1.2 for details), retaining walls will be required to address severe elevation differences while grading will be used to match existing elevations where achievable. The proposed retaining walls will be precast Retaining Soil System (RSS) walls with earth reinforced tie-backs (refer to **Figure 7-2**). The maximum height of the RSS walls will be approximately 7m, immediately adjacent to the bridge structure, with the height varying along the project alignment. When considering the overall aesthetics of the bridge and approaches, decorative RSS walls could be used. This can be explored with the Region during detailed design.

Figure 7-2: Typical Retaining Soil System (RSS) Wall Application

The installation of retaining walls and/or regrading to suit the proposed design will impact adjacent properties, which is further discussed in Section 7.1.4.

7.1.2 Roadway Infrastructure

To address existing safety issues including substandard sight lines at the bridge crossing, St. Paul Street West will be modified to meet current standards in accordance with the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads*. Using a design speed of 60km/h with posted speed of 50km/h, as dictated by the Region, the bridge approaches will be regraded to 4.2% and 5.2% for the west and east approaches, respectively. These grades will provide adequate sight lines at the bridge crossing and remove the advisory speed posting of 20km/h. The regrading of the bridge approaches raises the centreline road profile of St. Paul Street West, with a maximum elevation rise of approximately 2.4m. The existing centreline elevation is matched approximately 135m to the west of the bridge structure and 120m to the east of the bridge structure, dictating the construction limits – a length of approximately 285m. The horizontal alignment of St. Paul Street West will be maintained within these limits.

Within the limits of construction, the cross-section of St. Paul Street West will be 2.2m wider than the existing cross-section due to the inclusion of bicycle lanes and wider sidewalks on both sides of the roadway. There will be a transition to the existing condition at the limits of construction. It is the Region's intent to widen St. Paul Street West, to the east and west of the project limits, in the future to incorporate bicycle lanes along the road corridor, which will tie into the new cross-section.

Accesses/Driveways

Within the proposed construction limits there are currently six (6) properties which gain access via St. Paul Street West. The raised centreline of St. Paul Street West will impact all six accesses as summarized in **Table 7-1**.

Table 7-1: Impacts to Existing Property Accesses

Property	Impact on Access
Niagara Klassic Car Wash – 185 St. Paul Street West	• Currently has 2 access points • Eastern access point will be closed to accommodate retaining wall construction • Western access point will be maintained and regraded to suit
Nav Canada – 184 St. Paul Street West	• Access will be maintained and regraded to suit

Property	Impact on Access
Fortis Restaurant – 179 St. Paul Street West	• Currently has 2 access points • Both access points cannot be maintained based on construction of retaining walls and configuration of property buildings • Property acquisition will be required
Morrison's Auto Body & Sales – 175 St. Paul Street West	• Currently has 2 access points • Both access points will be maintained and regraded to suit
Apartment Building – 98 St. Paul Street West	• Access driveway will be maintained and regraded to suit
Duplex – 96 St. Paul Street West	• Access driveway will be maintained and regraded to suit

Refer to Section 7.1.4 for additional details related to property impacts and acquisition.

Great Western Street

Great Western Street is proposed to become a one-way right-in only access road from St. Paul Street West to the Railway Station (future GO Transit Station). Due to the rise in elevation of St. Paul Street and the installation of retaining walls, maintaining Great Western Street as a two-way roadway with access onto St. Paul Street West poses a safety hazard to all roadway users (vehicular, cyclist, pedestrian) due to roadway geometry and limited sight lines.

This modification to Great Western Street was identified as part of the GO Transit Station Site Plan. The ultimate implementation of the GO Station calls for a new access roadway to be built from the station north to Ridley Road. This new access roadway will provide two-way traffic to and from the GO Station. Therefore, limiting Great Western Street as a one-way access point to the station will be offset by the new access road. The Region and the City are coordinating efforts and schedules to minimize the construction impacts to the Ridley Neighbourhood. Timing for the new access road construction and Great Western Street closure is being closely examined. The City's *Ridley Neighbourhood Traffic Management* Study as identified in Section 4.1.3 is investigating short-term and long-term impacts and solutions to traffic management and mitigation for the surrounding neighbourhood, taking into consideration the proposed change to Great Western Street.

The preliminary roadway alignment and profile is illustrated on the drawings provided in Appendix F. During the detailed design stage, the final details regarding the roadway network will be developed including grading and drainage details and line painting and signage.

7.1.3 Utilities and Services

Existing utilities and municipal services were identified within the study area as discussed in Sections 4.2 and 4.3. The potential impact to the utilities will be evaluated during detailed design, including the need for either temporary or permanent relocation. Coordination will occur throughout detailed design and construction with all affected utilities to confirm conflicts, relocations and/or proximity guidelines. In addition, consultation with the City will occur to determine desire to upgrade existing municipal underground infrastructure within the area during construction of the bridge replacement.

Upon initial review of the existing utilities and proposed works, it is anticipated that the following impacts to utilities will need to be addressed:

- Existing Bell conduit embedded in the existing bridge structure will need to be temporarily supported during demolition of the existing structure and embedded into the new bridge structure;
- Existing hydro poles owned by Alectra will require relocation;
- Shared utilities on relocated hydro poles (ie: Cogeco) will need to be relocated; and
- Existing Enbridge gas main may require relocation due to conflict with retaining wall tie-backs.

7.1.4 Property Requirements

Implementation of the preferred design will require property acquisition. For any property to be acquired, the owner would be reimbursed by the Region for the required land at fair market value. An independent appraisal would be completed for the land to determine fair market value. Any lands disturbed as a result of construction would be restored to their current state. In addition to property acquisition, compensation may also be required due to injurious affection.

Negotiations with impacted property owners to secure lands required to implement the preferred design or who will be negatively impacted by the implementation of the preferred design have been initiated and will continue into the detailed design phase of the study. Anticipated preliminary property impacts and/or requirements to implement the study recommendations are summarized in **Table 7-2** and highlighted in **Figure 7-3**. Actual impacts and/or requirements will be confirmed during detailed design.

Table 7-2: Impacts to Adjacent Properties

Property	Impact
Niagara Klassic Car Wash – 185 St. Paul Street West	• Eliminating one access point • Regrading will be required to suit new centreline elevation • Possible injurious affection claim
Residential Home – 177 St. Paul Street West	• Injurious affection due to retaining wall construction
Nav Canada – 184 St. Paul Street West	• Regrading will be required to suit new centreline elevation
Fortis Pizzeria – 179 St. Paul Street West	• Full property acquisition will be required
Morrison's Auto Body & Sales – 175 St. Paul Street West	• Regrading will be required to suit new centreline elevation • Possible injurious affection claim
Apartment Building – 98 St. Paul Street West	• Regrading will be required to suit new centreline elevation • Injurious affection due to retaining wall construction
Duplex – 96 St. Paul Street West	• Regrading will be required to suit new centreline elevation • Injurious affection due to retaining wall construction

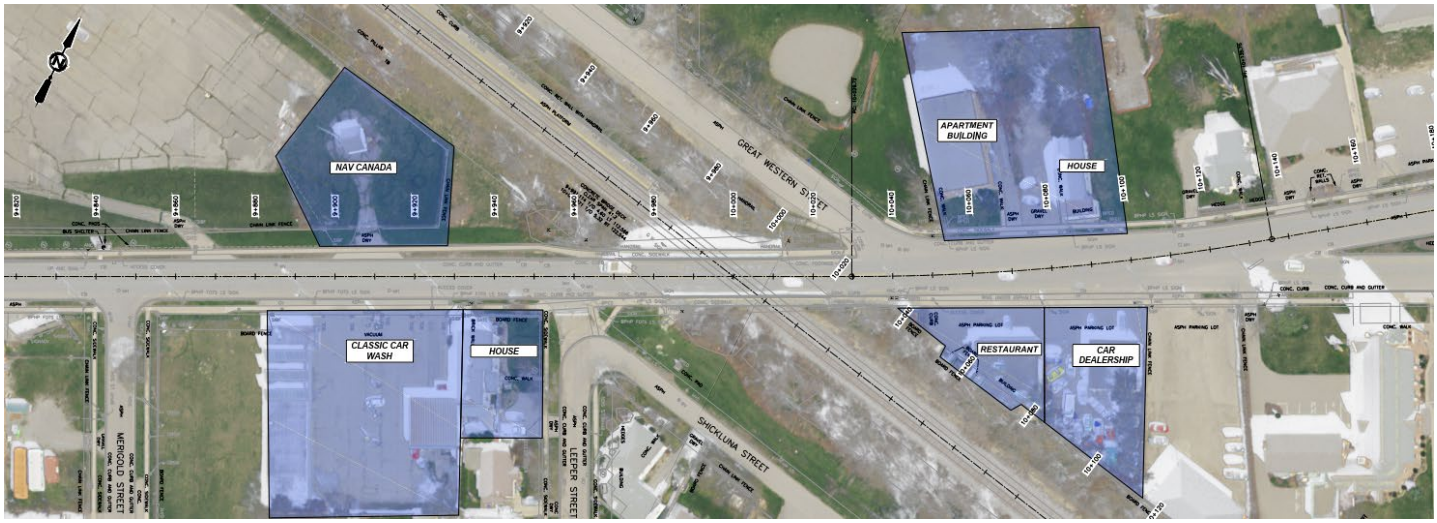


Figure 7-3: Impacted Properties (highlighted in Blue)

7.2 Construction Approach

During Public Information Centre No. 1, two construction approaches were presented to the public for consideration: staged (partial closure) construction and full closure with detour. Based on responses from the public and stakeholders via comment sheets, and the completion of an online survey provided by the Region, the majority indicated full closure with detour was preferred.

Staged Construction Approach

Staged construction would require partial closure of St. Paul Street West, with one lane of traffic maintained throughout construction at the bridge crossing. The traffic flow would be controlled with temporary traffic signals, with no need for a signed detour route. The new bridge structure would be constructed in stages, with multiple demolitions required of the existing structure. It is estimated that staged construction would span two (2) construction seasons, taking approximately twenty (20) months to complete. With limited room on the site as well as the increase in grade line of the road, there is a large cost implication to stage the construction. In addition, the stability of retaining walls during construction (specifically girder erection) may overload or surcharge the walls thus resulting in a risk to public safety.

Full Closure with Detour

A full closure of St. Paul Street West at the bridge crossing would require a signed detour using regional roads. The detour would be approximately 5km in length and would use Ontario Street (RR 42), Fourth Avenue (RR 77) and Louth Street (RR 72) as depicted in **Figure 7-4**. Localized pedestrian and cyclist detour would be provided, as well as planned local detours for emergency services (EMS, Fire, Police) and transit services. The existing structure would be demolished at one time and the new bridge structure would then be constructed. It is estimated that with a full closure construction would span one (1) construction season, taking approximately twelve (12) months to complete.

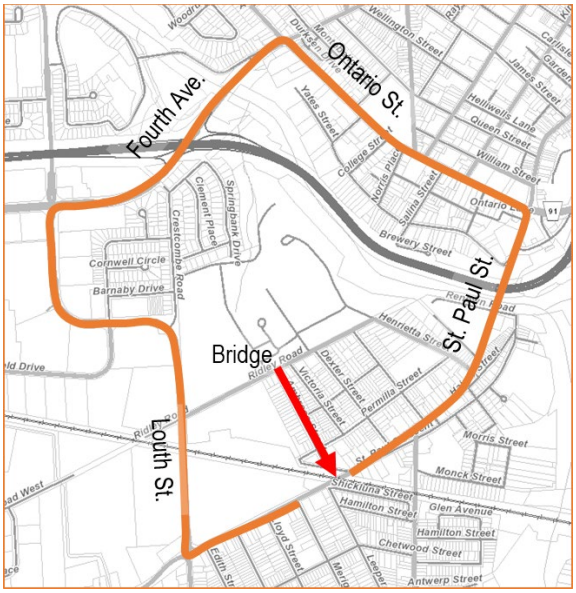


Figure 7-4: Proposed Construction Detour

A brief comparison of the staged approach and full closure approach are summarized in **Table 7-3**.

Table 7-3: Comparison of Construction Approaches

Criteria	Staged Construction	Full Closure with Detour
Construction Schedule	• Two (2) construction seasons • Approx. 20 months	• One (1) construction season • Approx. 12 months
Constructability	• Multiple demolitions required • Longer construction schedule and greater construction costs • Safety concerns with respect to potential conflicts with travelling public and workers in confined construction zone • Issues with stability and tie-backs of retaining walls during construction • Stability of retaining walls questionable for crane loads during girder erection • Increased coordination with CN during construction (flagging, during demolitions, etc.) • Horizontal shift of roadway centreline would be required towards Great Western St. creating tighter constraints in achieving adequate street alignment of Great Western St.	• One demolition required • Less cost and better efficiency for construction of new bridge and retaining walls • Eliminate risk of issues maintaining existing structure • Less coordination (flagging, etc) required with CN during construction • Eliminates risk of conflict with vehicles and pedestrians through construction zone
Vehicular Safety	• Existing sight line issues will remain	• Eliminate sight line issues

Criteria	Staged Construction	Full Closure with Detour
	• Increased risk of safety issues due to proximity with construction area	• Eliminate risk due to proximity to construction zone • Increased traffic volume on detour route and surrounding neighbourhoods • Greater likelihood of traffic infiltration to neighbourhoods due to longer detour route and travel time • Potential conflict/impact with surrounding land uses (schools, senior homes, etc.)
Pedestrian/Cyclist Safety	• Risk due to walking through construction zone • Risk to crossing St. Paul Street West adjacent to construction zone with no proper crossing facilities • No bicycle facilities - would require cyclist to dismount and walk on sidewalk through construction zone	• Pedestrians/cyclists would have to use Hamilton Street and Dexter Street to access St. Paul Street West around construction zone • Reducing risk to pedestrians/cyclists of traversing construction zone • Additional crossing facilities (i.e.: crossing guards, etc.) may be required at additional areas to promote safe crossing, especially for students walking to nearby schools • Increase risk of pedestrian/vehicle conflicts in surrounding neighbourhoods due to increased detour traffic
Impacts on the Public	• Traffic delays and queuing due to construction • Impact to surrounding neighbourhoods and road users for two construction seasons • Impact to local businesses for two construction seasons	• Likelihood of traffic infiltration into surrounding neighbourhoods and local streets due to length of detour route and travel time • Only one season of construction • Impact to local businesses on St. Paul Street West between Louth Street and Pelham Road due to detoured traffic/ less traffic volume • Higher number of sensitive land uses impacted (3 schools, fire station, seniors home)
Impacts to Key Stakeholders	• Greater risk to and coordination with CNR over two seasons of construction • Risk of errors/issues with maintaining existing structure • Chance of delay of schedule impacting GO Transit works	• Less risk to and coordination with CNR over one season of construction • Less chance of schedule delay impacting GO Transit works • More traffic volume on City and regional roads may require additional maintenance works post construction
Impacts to Environment	• Greater vehicle idling times over two construction seasons when waiting at temporary traffic signals contributes to carbon emissions	• Longer detour route results in increased carbon emissions

The full closure with detour approach will be carried forward into detailed design as the preferred construction approach. Detours for vehicular, pedestrian and cyclist traffic will be developed and finalized during detailed design. Consultation will also occur with emergency services and transit providers to identify impacts and develop alternative routes.

7.3 Proposed Construction Schedule & Cost Estimate

Upon completion of the Class EA study, the following schedule has been identified:

- Detailed Design – Fall 2019
- Project Tendering – December 2019
- Start of Construction – January 2020
- Completion of Construction – December 2020

The preliminary cost estimate to implement the preferred bridge design solution is approximately $8.8 Million. This estimate includes all necessary road works, bridge work and miscellaneous costs; however, this estimate excludes property impacts and acquisitions. See Appendix G for details of the preliminary cost estimate.

8 POTENTIAL ENVIRONMENTAL IMPACTS & PROPOSED MITIGATION MEASURES

This section describes the potential effects on the environment (both positive and negative) as a result of the undertaking and the mitigation measures and commitments made to either minimize or offset these effects. The actions taken to reduce the effects of the undertaking on the environment are referred to as 'Mitigation Measures'.

8.1 Transportation

The proposed bridge replacement supports the transportation goals and objectives of the Niagara Region's Transportation Master Plan. The widened cross-section, with the addition of the two 1.8m wide bicycle lanes and two 2.4m wide sidewalks will improve safety for pedestrians and cyclists. The new structure will improve vehicular safety through the optimization of the vertical alignment of St. Paul Street West; thereby improving sight lines and removing the need for the reduced speed warning and load limit posting.

The conversion of Great Western Street to one way right-in access to the train station (future GO Transit Station) will alter the functionality of the local roadway network. Until the construction of a new access roadway from Ridley Road to the train station is complete, local traffic will use the local neighbourhood streets (Permilla Street, Dexter Street, McDonald Street and Henrietta Street) when leaving the train station to access St. Paul Street West. Coordination between the Region and the City to open the new access road prior to closure of Great Western Street is being explored. Temporary and permanent road signage will be installed identifying the change in functionality of Great Western Street during and after construction. As well, recommendations made in the City's *Ridley Neighbourhood Traffic Management* Study (as identified in Section 4.1.3) regarding traffic calming measures will be reviewed and may be implemented for the short-term duration until the new access roadway is constructed.

During construction, there will be numerous transportation impacts including traffic delays, detours, short-term obstruction of entrances/driveways, disruption of pedestrian/cyclist movements, and infiltration of traffic into

surrounding neighbourhoods due to construction delays and/or detours. To help alleviate these impacts the following mitigation measures are proposed:

- Prepare Construction Phasing Plan and Detour Plan during detailed design to be included in contract package;
- Ensure successful contractor develops a Traffic Management Plan including adequately signed detour route(s);
- Develop a Communication Plan during detailed design that will be followed during construction identifying who, when and how the public and stakeholders will be notified of road closures and detours, as well as specialty signage in the vicinity of the project area identifying businesses are open and alternate access routes to local businesses;
- Inform property owners adjacent to the project area prior to construction, provide alternative parking when necessary and construct temporary alternative driveway entrances, as necessary;
- Inform local school(s) about construction in advance; provide crossing guards at key locations to ensure safety of students;
- Consult with school transportation providers and transit providers and inform them of construction phasing and detour routes in advance and throughout construction;
- Consult with emergency service providers and inform them of construction phasing and detour routes in advance and throughout construction;
- Maintain continuity of pedestrian walkway system as much as possible; provide alternative walkway routes to adjacent residential areas, as necessary; and
- Implement temporary traffic calming measures within surrounding neighbourhoods, as required, to reduce traffic infiltration.

8.2 Natural Environment

The proposed bridge improvements will be accommodated within the existing road right-of-way limits wherever possible which will allow for minimal changes to the current roadway and bridge footprint, thereby minimizing potential impacts to the adjacent properties and natural heritage features. To mitigate potential wildlife disturbances due to noise, dust and habitat encroachment, wildlife sweeps will be conducted prior to commencement of construction, and wildlife habitats will be isolated.

Impacts to trees as a result of the proposed bridge replacement will be assessed during detailed design when design and grading limits have been finalized. Efforts will be made to minimize the impacts to trees throughout the study area, including maintaining the existing trees along the east side of Great Western Street. Tree and vegetation removal, where required, will be completed outside of the bird nesting periods. The contract package will identify Tree Protection Zones and provide a re-planting plan, as required.

8.2.1 Air Quality, Dust and Noise

There are no noise sensitive receptors located in close proximity to the study area. There will be construction noise generated during the bridge replacement works due to the required use of heavy machinery and other construction equipment. Measures will be taken to manage construction noise including maintaining equipment to prevent unnecessary noise. Any initial noise complaint will trigger verification that noise control measures are in effect. If persistent noise complaints occur, alternative noise control measures will be considered.

Impacts of air quality during project construction are not considered to be significant. Although dust impacts from heavy construction equipment may impact air quality, this is not a recurring activity as it will be limited to the

construction period. Contract provisions will minimize impacts to adjacent properties during construction. Therefore, the impacts from construction on air quality are not considered significant.

Provisions to minimize air quality impacts during construction include removal of construction-caused debris and dust through regular cleaning and maintenance of construction sites and access roads; dust suppression using non-chloride dust suppressants on unpaved roads, subject to the area being free of sensitive plant, water, or other ecosystems that may be affected by dust suppression chemicals; and prompt cleaning of paved streets/roads where tracking of soil, mud or dust has occurred.

8.2.2 Surface Water

During construction there is a potential impact to surface water quality due to sedimentation and through the introduction of harmful substances to the storm collection system. To mitigate this construction impact, an erosion and sediment control plan (ESCP) will be developed. This plan will include measures for managing fuel, excess materials, debris, and water flows into and out of the site appropriately.

8.3 Socio-Economic and Cultural Environment

The proposed bridge improvement will result in temporary disruption and/or inconvenience to users of adjacent properties. In terms of the existing commercial and residential properties, construction impacts include traffic delays, reduced drive-by traffic volume, and infiltration of traffic into surrounding neighbourhoods due to delays and/or detours. During detailed design detour route(s) will be reviewed and finalized and presented to the public prior to construction.

Methods to mitigate disruptions to property owners will include detailing a construction phasing/detour plan. The plan will consider minimizing periods of disruption to property owners. During construction, local businesses and property owners will be notified well in advance of road closures and detours. Temporary directional signage directing vehicles to businesses in the area will be added at specific locations along the detour routes and along St. Paul Street West.

8.3.1 Archaeological Potential

Based on the Stage 1 Archaeological Assessment, implementation of the preferred design could impact several areas that may have archaeological potential. If impacted, these areas will require a Stage 2 archaeological assessment by test pit/pedestrian survey at five metre intervals, prior to any construction activities. These areas are:

- In front of Saint Mary of the Assumption Roman Catholic Church at 171 St. Paul Street Crescent;
- In front of 90 St. Paul Street West and adjacent vacant lot; and
- Northeast corner of 177 St. Paul Street West;

During design, consideration will be given to avoid impacting these areas.

The remainder of the Study Area does not retain archaeological potential on account of deep soil disturbance events associated with construction of the road and rail ROWs, installation of utilities, and twentieth and twenty-first century residential and commercial construction. These lands do not require further archaeological assessment.

During construction, in the event that archaeological resources or remains are found, alteration of the site must cease immediately and the Archaeology Programs Unit of the Ministry of Tourism, Culture and Sport (MTCS) and the

consultant archaeologist must be notified. The contract for this work should include a provisional item for Archaeological findings and the Contractor must be aware of the protocol to be followed should resources be encountered.

More information is provided in the complete Stage 1 Archaeological Assessment report in Appendix D.

8.3.2 Cultural Heritage Potential

The cultural heritage evaluation of the St. Paul Street West CNR Bridge determined that the existing structure possesses heritage value, in particular, physical/design value as an early and representative example of a slab on steel girder structure in the local context and is the oldest of this type of structure owned by the Niagara Region. The structure also retains contextual value given the physical, functional, and historical links to its surroundings in the City of St. Catharines.

As replacement was selected as the preferred solution for the St. Paul Street West CNR Bridge, the Cultural Heritage Evaluation Report (CHER) recommended consideration of the following mitigation options:

- Construction of a new bridge with replication of the appearance of the heritage bridge in the new design, with allowances for the use of modern materials. The character-defining elements (as identified in Section 5.1 of the CHER) should be considered for replication.
- Construction of a new bridge with historically sympathetic design qualities to the heritage bridge, with allowances for the use of new technologies and materials.
- In addition to the two options above, development of a commemorative strategy, such as plaquing, may be appropriate.
- Completion of a Heritage Impact Assessment (HIA) by a qualified heritage specialist and filed with the City of St. Catharines Heritage Advisory Committee, the Ministry of Tourism, Culture and Sport (MTCS), and any other heritage stakeholders that may have an interest in this project.
- To mitigate direct impacts to the St. Catharines Train Station in the vicinity of the subject bridge, construction and staging activities should be suitably planned and executed to ensure that impacts are minimized and mitigated. Suitable staging activities may include temporary barriers and the establishment of no-go zones throughout construction. On-site workers should be notified of the cultural heritage significance of the subject bridge and the St. Catharines Train Station in advance of construction.
- Submission of the CHER to the City of St. Catharines Heritage Advisory Committee, the Ministry of Tourism, Culture and Sport (MTCS), and other local heritage stakeholders that may have an interest in this project.

8.4 Source Water Protection

Under the MECP 2006 *Clean Water Act*, municipalities are required to conform to Source Protection Plans (SPPs) to protect surface and groundwater sources to municipal drinking water systems. The study area for this project is within the Niagara Peninsula Source Protection Plan (SPP). The SPP identifies where there is potential for significant threat to the quality and quantity of groundwater through delineation of Wellhead Protection Areas (WHPAs), Highly Vulnerable Aquifers (HVAs), Significant Groundwater Recharge Areas (SGRAs), and Intake Protection Zones (IPZs). The study area is located outside the IPZ and is not considered vulnerable to drinking water threats.

8.5 Climate Change Considerations

Climate change is an issue that has and continues to evolve on a global scale. Governments at all levels are acknowledging the need to take actions that reduce greenhouse gas (GHG) emissions into the atmosphere to mitigate the effects of climate change. Project impacts and resiliency to climate change were taken into consideration during the study. Considering how a project contributes to climate change, through its greenhouse gas emissions or its effects on the natural environment, is important to the planning process as it allows proponents to consider climate mitigation measures to avoid, minimize, or offset such effects. As well, considering how climate change may affect a project, such as through increased flooding or drought, is also critical to the planning process through enabling proponents to make informed decisions around how to design a project to withstand such environmental conditions. Approaches for considering and addressing climate change in project planning are through 1) Reducing a project's effect on climate change; and 2) Increasing the project's resilience to climate change.

Upon review of this Study's undertaking it is determined that the project is relatively minor in scale and will not have significant climate change impact. However, key elements that were/will be factored into the replacement of the existing St. Paul Street West CNR Bridge and related infrastructure improvements that could serve to reduce the overall effect on climate change include:

- GHG reduction initiatives including reduced use of GHG producing materials, specifying local materials to reduce related fuel consumption, and inclusion of recycled materials, where feasible; and
- Provision of active transportation features in the preferred design solution. Encouraging active transportation through increased pedestrian and cyclist facilities supports the reduced use of vehicular traffic and GHG emissions.

8.6 Construction Considerations

In summary, the following potential environmental impacts may occur during the construction phase. As such, the following measures detailed in **Table 8-1** are proposed to mitigate any adverse impacts.

Table 8-1: Construction Impacts and Proposed Mitigation Measures

Construction Impacts	Proposed Mitigating Measures
Traffic Delays	• Prepare construction phasing plan/detour plan.
Obstruction to Entrances/Driveways	• Inform property owners prior to construction, provide alternative parking, construct alternative driveway entrances
Delay to School Buses and Disturbance of Students	• Inform school(s) about construction in advance; provide crossing guards at key locations to ensure safety of students.
Delayed Response Time of Emergency Service Vehicles	• Consult with emergency service providers and inform them of construction phasing and/or detour routes in advance and throughout construction.
Disruption of Pedestrian Movements Across Bridge Structure	• Maintain continuity of pedestrian walkway system as much as possible. Provide alternative walkway routes to adjacent residential areas where necessary.

Construction Impacts	Proposed Mitigating Measures
Infiltration of Traffic into Surrounding Neighbourhoods due to Construction Delays and/or Detours	• Ensure designated detour routes avoid infiltration; implement traffic calming measures within surrounding neighbourhoods, if required.
Constructability of Bridge Structure and Retaining Wall Features	• Develop a design and construction approach to minimize risk during construction to workers, Region, City and the public.
Approval and Coordination with Affected Utilities and CN Rail	• Acquire all necessary permits and approvals prior to construction and ensure coordination details during construction are confirmed prior to start.
Acquisition of Property for Bridge Approaches Reconstruction	• Landowners compensated at fair market value for required property.
Air Quality Impacts from Construction Equipment	• Develop a dust control plan, use water and dust suppressants during construction, keep idling of construction equipment to a minimum, address and monitor air quality complaints.
Noise Disturbance to Residents	• Develop a noise control plan, construction must conform to Municipal Noise By-Laws, keep idling on equipment to a minimum, address and monitor noise complaints.
Temporary Disruption and/or Inconvenience to Users of Adjacent Properties	• Notify adjacent property owners of construction scheduling; schedule construction so as to minimize period of disruption.
Temporary Disruption of Open Space Use and Activities (Cameron Park)	• Employ noise and dust control measures; minimize construction area footprint and ensure open space is maintained for public use.
Impacts to Surface Water Quality due to Sedimentation and Introduction of Harmful Substances to Storm Collection Systems	• Develop an Erosion and Sediment Control Plan (ESCP), include measures for managing water flows into and out of the site, manage fuel, excess materials, and debris appropriately.
Wildlife Disturbance due to Noise, Dust and Habitat Encroachment	• Conduct wildlife sweeps prior to commencement of construction and isolate wildlife habitat. Develop a dust control plan.
Tree and vegetation removal	• Minimize impacts to mature trees during detailed design phase; any trees to be removed will require prior approval and/or input by the Region and City

8.7 Monitoring and Maintenance

The mitigation measures identified in this report shall be written into the contract specifications. During construction, the Region's contract administrator shall ensure that full-time monitoring/inspection of the project works be undertaken to ensure that all environmental commitments identified in this report are adhered to by the Contractor(s) and other subsequent agency approvals are met. After a period of one year following completion of the construction (i.e. post construction), a final inspection should be undertaken to ensure the effectiveness of the identified mitigation measures.

8.8 Detailed Design Commitments and Additional Work

Environmental concerns, anticipated impacts and proposed mitigation measures as they relate to the project, have been described in this section. Many of the concerns have been mitigated through the process by which the recommended design was selected, as described in this report. This section provides a list of specific commitments to be carried forward into Phase 5 of the Municipal Class EA process – Implementation Phase (i.e. completion of contract drawings and tender documents, construction and operation and the monitoring for environmental provisions and commitments). Additional works to be completed during the detail design phase of this project, prior to construction, include but are not limited to, the following:

- Confirm design criteria for the bridge structure and roadway approaches;
- Review potential detour routes and complete traffic assessment to determine feasibility;
- Consult with emergency service providers, transit providers and school transportation services regarding impacts of construction on service routes and develop alternative routes, as necessary;
- Confirm detour routes for vehicular traffic and local detour routes for pedestrians and cyclists;
- Determine anticipated construction schedule and level of impact to surrounding community;
- Retain ASI to complete Heritage Impact Assessment, circulate to the City of St. Catharines Municipal Heritage Committee and MTCS for review and comment and incorporate recommendations into bridge design;
- Retain ASI to complete Stage 2 Archaeological Assessment, if necessary;
- Confirm CNR design and construction requirements including clearance requirements, demolition procedures, track protection measures, flagging coordination, and permitting requirements;
- Confirm and obtain required approvals and necessary permits;
- Confirm utility impacts and relocation requirements and coordinate relocation designs, schedule and costs with affected utility agencies;
- Develop landscaping design and tree planting plan;
- Develop illumination requirements along project are and complete lighting design;
- Confirm property requirements and impacts, continue property acquisition negotiations and secure property;
- Develop a Communication Plan to communicate the bridge construction works to affected stakeholders and the public;
- Confirm construction staging and prepare Construction Phasing/Staging Plan to be included in contract package;
- Confirm servicing replacement/improvement requirements with the City of St. Catharines;
- Confirm transit requirements within project limits and pedestrian link to transit stop(s) along St. Paul Street West;
- Finalize capital cost estimate of the project; and
- Ensure construction staging coordinates with other planned activities in the vicinity of the project area by the Region and City.

8.9 Approval Requirements

The following approvals have been identified as potentially being required prior to the implementation of the proposed works:

- Canadian National Rail Work Permit; and
- Environmental Compliance Approval (ECA) could be required in the event the City of St. Catharines identifies replacement/improvements to their underground services (sanitary sewage systems, storm sewer systems and/or water systems).

9 STAKEHOLDER CONSULTATION

Stakeholder consultation is a key feature of the Class EA process. Through an effective consultation program, the proponent can generate meaningful dialogue between the project planners and the public, property owners, First Nations, authorities and agencies allowing an exchange of ideas and the broadening of the information base, leading to better decision-making.

9.1 Summary of Consultation Activities

Throughout the project, stakeholders, including the public, property owners, First Nations, authorities, agencies and utilities, were given a variety of opportunities to review and comment on the project process, key findings, proposed alternatives and recommended solution(s). The Municipal Class EA requires the proponent to undertake two (2) mandatory points of public contact for a Schedule 'B' project. The Project Team exceeded the mandatory number of public contacts, with the following opportunities for review and/or comment provided:

- Notice of Study Commencement and Initiation of Field Work
- Notice of Study Commencement;
- Notice of Public Information Centre No. 1 and No. 2;
- Public Information Centre No. 1 and No. 2; and
- Notice of Study Completion.

Public comments were received throughout the Class EA process and are provided in Appendix J.

9.1.1 Notice of Study Commencement and Initiation of Field Work

A Notice of Study Commencement and Initiation of Field was prepared and hand-delivered to local property owners within the study area on January 11, 2019. A total of 76 notices were delivered.

The purpose of the Notice was to introduce the Study and inform local property owners of the scheduled field work that would be occurring on site. Field work included drilling for the geotechnical investigation, field assessments for the Archaeological Assessment and Cultural Heritage Assessment and completing a topographical survey. Contact information for the Region's Project Manager and AE's Environmental Assessment Coordinator were made available in the event property owners had questions or required additional information.

A copy of the Notice of Study Commencement and Initiation of Field Work is provided in Appendix H.

9.1.2 Notice of Study Commencement

The Notice of Study Commencement was prepared and issued February 7, 2019. The Notice was published in Niagara This Week and posted on the Niagara Region's website. Contact letters including the Notice were mailed directly to relevant stakeholders including First Nations, regulatory agencies, the City of St. Catharines, utilities and local interest groups. In addition, the Notice was hand-delivered to all properties within the Study Impact Area including along Great Western Street, Ambrose Street, Permilla Street, Shickluna Street, Hamilton Street, Leeper Street, and St. Paul Street West from Louth Street to Henrietta Street. A total of 229 notices were delivered on February 8 and February 11, 2019.

The purpose of the Notice was to introduce the project (purpose and objectives), outline the Municipal Class EA process, request public involvement and identify contact persons. Contact information for the Region's Project

Manager and AE's Environmental Assessment Coordinator were made available to the public to elicit any initial feedback on the project. Several comments were received from interested parties following the distribution of the Notice.

A summary list of the stakeholder register, Notice of Commencement and a sample copy of the cover letter are provided in Appendix H. Received comments and project team responses are also provided in Appendix J.

9.1.3 Notice of Public Information Centre 1

A Notice of Public Information Centre (PIC) was prepared and distributed to stakeholders and review agencies. The Notice was published in Niagara This Week on March 21 and March 28, 2019 and posted on the Niagara Region's website. Contact letters including the Notice were mailed directly to relevant stakeholders including First Nations, regulatory agencies, the City of St. Catharines, and local interest groups. In addition, the Notice was hand-delivered to all properties within the Study Impact Area including along Great Western Street, Ambrose Street, Permilla Street, Shickluna Street, Hamilton Street, Leeper Street, and St. Paul Street West from Louth Street to Henrietta Street. A total of 176 notices were delivered on March 22, 2019.

The Notice provided a description of the project, details of the PIC, and included a request for comments and input. Contact information for the Region's Project Manager and AE's Environmental Assessment Coordinator were made available to the public to encourage the submission of comments.

A copy of the Notice of Public Information Centre and a sample copy of the cover letter is provided in Appendix H.

9.1.4 Public Information Centre (PIC) 1 and On-line Survey

A PIC took place on April 3, 2019 at the Rodman Hall Art Centre, 109 St. Paul Crescent in the City of St. Catharines from 6:00pm to 8:00pm to present Study details. The Project Team including representatives from the Region and AE were in attendance to answer any questions that attendees had.

The PIC presented the following elements:

- Background information on the Class EA process;
- Background information on the Study;
- Problem/opportunity being considered for the Study;
- A high-level summary of the criteria for the evaluation of the alternatives;
- Description of the existing conditions of the project area;
- Key considerations and issues associated with the Study;
- Description of the alternative solutions;
- Evaluation of the alternative solutions;
- Project impacts and mitigations measures;
- A conceptual review of different construction approaches; and
- Next steps in the Class EA process.

A copy of the PIC display panels, sign-in sheet and comment form are provided in Appendix I.

Comments were received via comment form at and proceeding the PIC from several residents supporting the overall Study approach and proposed alternatives. Received comments and project team responses are provided in Appendix J.

During the two-week public comment period proceeding the PIC, the Region made available an online survey asking the public to weigh in on their preferred alternative solution and construction approach. A summary of responses received is provided in Appendix J.

9.1.5 Notice of Public Information Centre 2

A Notice of Public Information Centre (PIC) was prepared and distributed to stakeholders and review agencies. The Notice was published in Niagara This Week on May 30 and June 6, 2019 and posted on the Niagara Region's website. Contact letters including the Notice were mailed directly to relevant stakeholders including First Nations, regulatory agencies, the City of St. Catharines, and local interest groups. In addition, the Notice was hand-delivered to all properties within the Study Impact Area including along Great Western Street, Ambrose Street, Permilla Street, Shickluna Street, Hamilton Street, Leeper Street, and St. Paul Street West from Louth Street to Henrietta Street. A total of 176 notices were delivered on June 5, 2019.

The Notice provided a description of the project, details of the PIC, and included a request for comments and input. Contact information for the Region's Project Manager and AE's Environmental Assessment Coordinator were made available to the public to encourage the submission of comments.

A copy of the Notice of Public Information Centre and a sample copy of the cover letter is provided in Appendix H.

9.1.6 Public Information Centre (PIC) 2

The second PIC took place on June 12, 2019 at the Rodman Hall Art Centre, 109 St. Paul Crescent in the City of St. Catharines from 6:00pm to 8:00pm to present Study details. The Project Team including representatives from the Region and AE were in attendance to answer any questions that attendees had.

The PIC presented the following elements:

- Background information on the Class EA process;
- Background information on the Study;
- Problem/opportunity being considered for the Study;
- A recap of the alternative solutions presented at the first PIC;
- Summary of comments received during the first PIC comment period;
- Identification of preferred solution and construction approach;
- Description of alternative bridge design options;
- Evaluation of the alternative bridge design options;
- Identification of preferred design;
- Summary of property impacts and construction approach; and
- Next steps in the Class EA process.

Comments were received via comment form at and proceeding the PIC from several residents supporting the overall Study approach and preferred alternative solution.

A copy of the PIC display panels, sign-in sheet and comment form are provided in Appendix I. Received comments and project team responses are provided in Appendix J.

9.1.7 Notice of Study Completion

The Notice of Study Completion was prepared and issued September 12, 2019. The Notice was published in Niagara This Week and posted on the Niagara Region's website. Contact letters including the Notice were mailed directly to relevant stakeholders including First Nations, regulatory agencies, the City of St. Catharines, utilities and local interest groups. In addition, the Notice was hand-delivered to all properties within the Study Impact Area including along Great Western Street, Ambrose Street, Permilla Street, Shickluna Street, Hamilton Street, Leeper Street, and St. Paul Street West from Louth Street to Henrietta Street.

The Notice informs the public and stakeholders of the completion of the Class EA and provides the locations where interested parties can review the completed Project File Report (PFR). The notice also informs the public of the 30-day review period associated with the conclusion of the Class EA process and provide notification of the provision to request a Part II Order.

The Notice of Completion and a sample copy of the cover letter are provided in Appendix H.

9.1.8 Consultation with the Ministry of the Environment, Conservation and Parks

An acknowledgement letter was provided from the Ministry of the Environment, Conservation and Parks (MECP) in response to the Notice of Commencement provided to the MECP West Central Region. Several areas of interest were provided for consideration and have been included in this Project File Report.

MECP correspondence is provided in Appendix J.

9.1.9 First Nations Consultation

As required as part of the Class EA process, to satisfy the Crown's legal duty to consult Aboriginal communities, First Nations were contacted at project initiation with the Notice of Commencement. As per the acknowledgement letter provided by the MECP, First Nations contacted included Six Nations of the Grand River Territory, Haudenosaunee Confederacy Chiefs Council, and Mississauga of the New Credit.

No response was received from any of the contacted groups.

All correspondence to the First Nation groups is provided in Appendix J.

9.1.10 Key Stakeholder Consultation

Canadian National Railway

A meeting was held on January 30, 2019 with representatives from CNR, the Region and AE. The purpose of the meeting was to introduce the study to CNR and provide background information concerning the need for the project, potential alternatives being considered, and anticipated project timelines. It was also to provide an opportunity to discuss design, construction and permitting requirements of CNR which apply to the proposed St. Paul Street West CNR Bridge replacement, as well as, cost sharing details as per the existing Board Orders.

The meeting agenda and minutes are provided in Appendix J. Further consultation with CNR is expected during detailed design to confirm requirements, discuss cost-sharing agreement, undergo CNR design review and secure CNR Work Permit.

City of St. Catharines

A meeting was held on February 22, 2019 with representatives from the Region and the City of St. Catharines. The purpose of the meeting was to introduce the Class EA study to City representatives including background information, alternatives being considered, potential construction approaches and anticipated project timelines. Coordination between the Region and the City was discussed concerning the City's ongoing *Ridley Neighbourhood Traffic Management* Study, planned improvements to Ridley Road, the implementation of the GO Transit Station, scheduled repair works to Pelham Road CNR Bridge and need for improvements/replacements to the City's underground infrastructure within the project area.

During the meeting, the City expressed the following:

- Concerns with managing two-way active transportation facilities on a one-way roadway (Great Western Street) due to the likelihood that cyclists may travel contra-flow and thereby need to cross St. Paul Street West to access eastbound cycling facilities;
- Preference for full-closure during construction and emphasized the need to manage traffic infiltration during the detours; and
- The City should be consulted with via a separate meeting to discuss the detailed design implications with municipal infrastructure (including costing) as well as adjacent construction projects during the anticipated construction schedule.

Further consultation with the City of St. Catharines representatives will occur during the detailed design phase to coordinate servicing requirements, cost-sharing, and timing of adjacent works.

Proactive Advisory Committee (PAG)

The Proactive Advisory Committee (PAG) is a group formed by residents in the Ridley Neighbourhood area. The PAG has been an active stakeholder group for various regional and municipal capital planning and construction projects including the construction of the *Burgoyne Bridge*, development of the *GO Transit Station Secondary Plan* and the ongoing *Ridley Neighbourhood Traffic Management* Study. As a key stakeholder group to the *St. Paul Street CNR Bridge Replacement* Class EA, a meeting was held on March 19, 2019 with representatives of the PAG, the Region, the City, CIMA+ (consultant representing the City) and AE. The joint meeting for the *St. Paul Street CNR Bridge Replacement* Class EA and *Ridley Neighbourhood Traffic Management* Study presented a study overview for both studies, including background information, purpose of the study, proposed alternatives, overall study process and proposed study schedule.

The meeting provided members of the PAG an opportunity to review study information and provide comments, concerns and questions in advance of the PIC No. 1 scheduled for *St. Paul Street CNR Bridge Replacement* Class EA. The meeting minutes are provided in Appendix J.

All additional stakeholder correspondence is provided in Appendix J.

10 CONCLUSIONS AND RECOMMENDATIONS

This study was carried out as a Schedule B project under the Class Environmental Assessment (Class EA) for Municipal Transportation Projects and is subject to the requirements of the *Environmental Assessment Act*. This document provides relevant information with respect to Phases I and II of the Environmental Assessment Process. Subsequent

phases of the process will involve completion of contract drawings and documents for all proposed works together with appropriate monitoring requirements.

10.1 Conclusions

Based on the deteriorated condition of the existing St. Paul Street West CNR Bridge, constructed circa 1922, and the existing safety issues of the crossing, including limited sight lines, posted advisory speed limit of 20km/h and posted load limits, the Region initiated a Class EA to determine the optimal solution for addressing the problems of the existing bridge structure. The Study reviewed the existing conditions of the bridge and surrounding areas, developed alternative solutions, evaluated these alternatives, identified the preferred solution, and developed the preferred solution through the review and evaluation of various design options. The process included public consultation as well as individual consultation with key stakeholders.

The preferred design solution includes the replacement of the bridge structure with a new concrete box girder bridge (on a skew) with a widen cross-section including bicycle lanes and wider sidewalks. The preferred alternative achieves the Study objectives of addressing the structural deficiencies, improving public safety for all modes of transportation (vehicular, cyclist, and pedestrian), improving bridge sightlines, providing connectivity to the active transportation network; and improving safety of the access to the proposed GO Transit Station via Great Western Street. The conceptual design of the bridge replacement has been prepared for the preferred design solution. Following completion of the Class EA Study, detailed design, permitting and construction will be undertaken to implement the preferred alternative and remedy the identified problems.

10.2 Recommendations

During the Study, recommendation for additional works and implementation measures were identified. These items should be taken into consideration during the detailed design and include the following items:

- Complete property acquisition to facilitate proposed design;
- Complete Stage 2 Archaeological Assessment, as required;
- Complete Heritage Impact Assessment and implement recommendation;
- Determine appropriate construction staging;
- Determine final traffic detour(s) for vehicular traffic, pedestrian and cyclists, emergency services, and transit providers;
- Confirm utility impacts and relocation requirements and coordinate relocation works;
- Confirm City of St. Catharines underground servicing needs and coordinate replacement/improvement works;
- Confirm CNR design and construction requirements, and obtain CNR Work Permit; and
- Develop Communication Plan to be implemented during construction.

Prior to construction, a final Public Information Centre (PIC) will be held to provide information to the public and adjacent landowners of the upcoming construction work including construction schedule, construction staging, and detour routes.

11 CLOSURE

This report was prepared for the Niagara Region to satisfy the requirements of the Municipal Class EA process and *Environmental Assessment Act* and to set the stage for the detailed design and construction of the Preferred Alternative Solution for the Study Area discussed herein.

The services provided by Associated Engineering (Ont.) Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
Associated Engineering (Ont.) Ltd.

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