TATHAM ENGINEERING

Enhancing our communities

# Old Shiloh Road Bridge

## CLASS ENVIRONMENTAL ASSESSMENT PROJECT FILE REPORT

Town of Georgina

File 122279 | February 6, 2024

# Document Control

File:

**122279**

Date:

**February 6, 2024**

Prepared by:

**Tatham Engineering Limited**
115 Sandford Fleming Drive, Suite 200
Collingwood, Ontario L9Y 5A6

**T** 705-444-2565
**tathameng.com**

Prepared for:

**Town of Georgina**
26557 Civic Centre Road
Keswick, Ontario L4P 3G1

| Authored by: | Reviewed by: |
|---|---|
| | |
| Emma Wilkinson, HBA, B.E.Sc., P.Eng.<br>Senior Engineer, Project Manager | Brian Wood, P.Eng.<br>Manager - Bridges |



| Disclaimer | Copyright |
|---|---|
| The information contained in this document is solely for the use of the Client identified on the cover sheet for the purpose for which it has been prepared and Tatham Engineering Limited undertakes no duty to or accepts any responsibility to any third party who may rely upon this document. | This document may not be used for any purpose other than that provided in the contract between the Owner/Client and the Engineer nor may any section or element of this document be removed, reproduced, electronically stored or transmitted in any form without the express written consent of Tatham Engineering Limited. |

| Issue | Date | Description |
|---|---|---|
| 00 | January 22, 2024 | Draft Report |
| 01 | February 6, 2024 | Revised Draft Report |

# Document Contents

### Figures

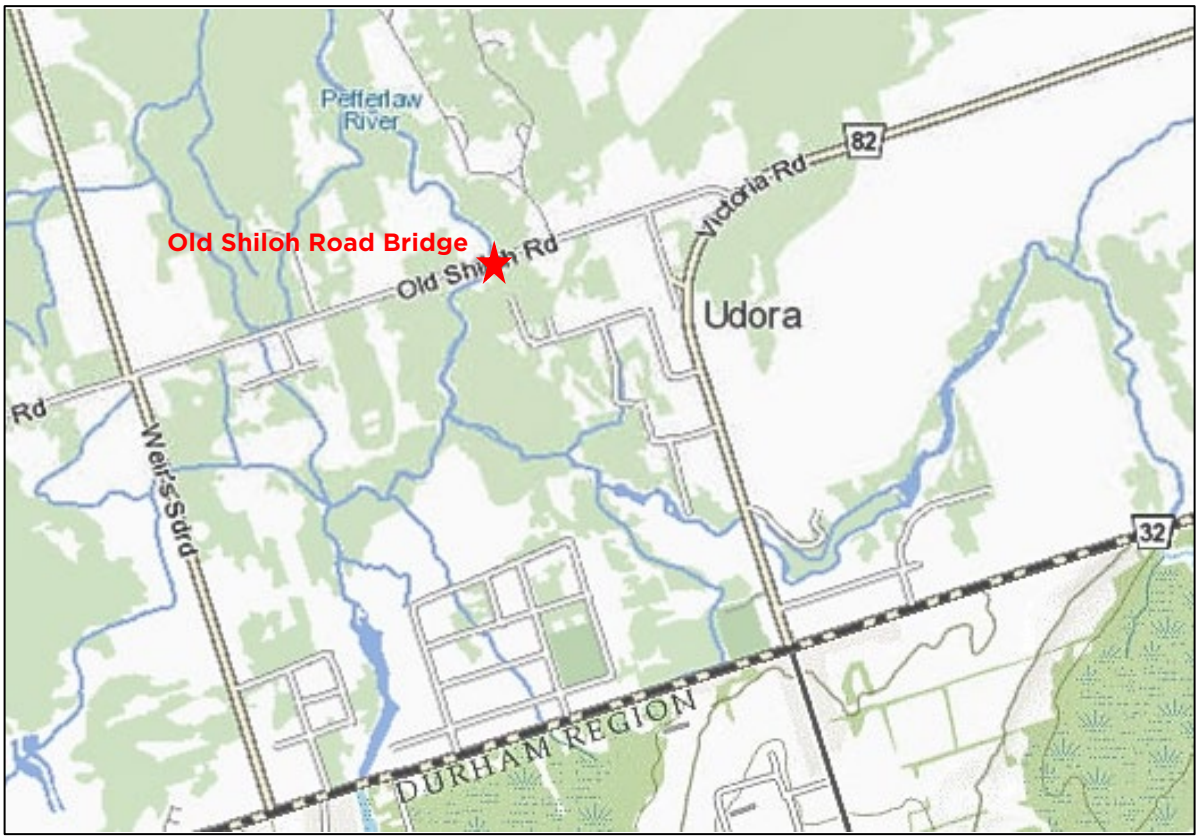


### Appendices

# 1 Introduction & Background

The Town of Georgina (Town) is considering improvements to the Old Shiloh Road Bridge, located on Old Shiloh Road spanning the Pefferlaw River. A key map showing the site location can be seen in Figure 1.

**Figure 1: Key Map**




Tatham Engineering Limited (Tatham) was retained by the Town to undertake a Municipal Class Environmental Assessment Study (Class EA) in accordance with the applicable guidelines (*Municipal Class Environmental Assessment*, Municipal Engineers Association, October 2000 as amended in 2007, 2011, 2015, & 2023). The objective of the Class EA Study is to confirm the need for improvements and consider the most appropriate manner in which they can be implemented.

## 1.1 CLASS ENVIRONMENTAL ASSESSMENT PROCESS

The Class EA process is defined in the *Municipal Class Environmental Assessment* document. Applying to all municipal road improvement projects, a number of Study categories or schedules have been established recognizing the range of environmental impacts. These are briefly described below, whereas the process corresponding to each is illustrated in Figure 2.

### 1.1.1 Class EA Schedules

**Exempt (Previously Schedule A or A+)**

Various maintenance, operation, rehabilitation, and other small projects that are limited in scale and have minimal adverse environmental effects. As the environmental effects of these activities are usually minimal, these projects are pre-approved and may proceed directly to implementation without the need to complete the design and planning process. No reports or Study documents need to be prepared.

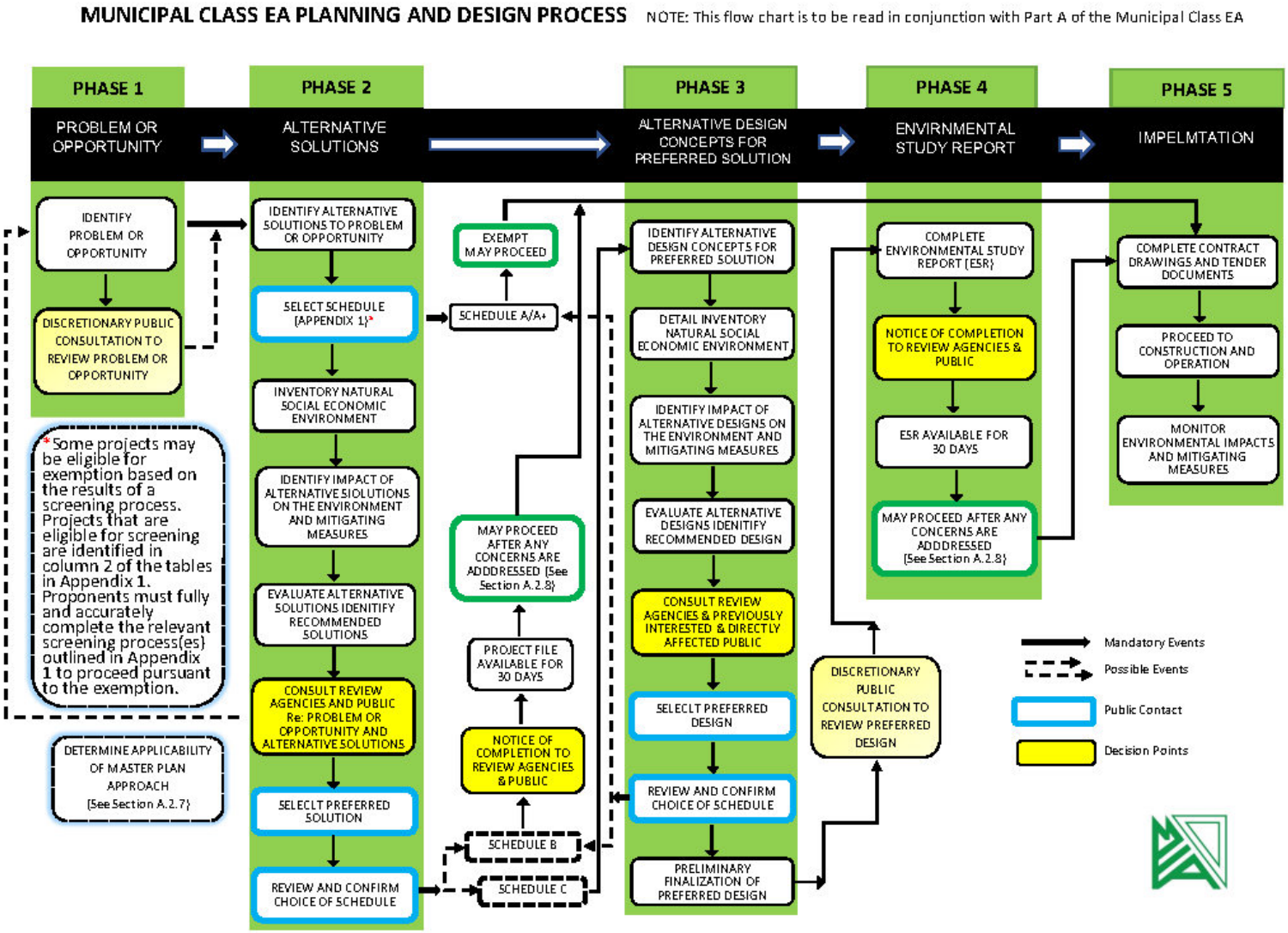
**Schedule B**

Schedule B projects generally include improvements and minor expansions to existing facilities. As there is the potential for some adverse environmental impacts, the municipality is required to conduct a screening process whereby members of the public and review agencies are informed of the project and given the opportunity to provide comment. Documentation of the planning and design process is required under a Schedule B Study. As these studies are generally straightforward and do not require detailed technical investigations to arrive at the preferred solution, a formal report is not required. Rather, a Project File shall be prepared to demonstrate that the appropriate steps have been followed. The Project File is to be made available for review by the public and review agencies.

**Schedule C**

Schedule C projects generally include the construction of new facilities and major expansions to existing facilities. As they have the potential for environmental impacts, they must proceed under the full planning and documentation procedures specified by the Municipal Class EA document. Schedule C projects require an Environmental Study Report (ESR) to be prepared and appropriately filed for review by the public and review agencies.

Figure 2: Class EA Guidelines Flow Chart



### 1.1.2 Class EA Terminology

Prior to determining the appropriate Class EA schedule, an understanding of the defining terminology is required as noted below:

**Hydraulic Capacity**

The volume of water that can be conveyed under or through a water crossing structure.

**Road Capacity**

The number of travelled lanes and does not differentiate between various lane widths to accommodate differing traffic volumes.

**Same Purpose, Use, Capacity & Location**

The replacement or upgrading of a structure or facility or its performance, where the objective and application remain unchanged, and the volume, size and capability do not exceed the minimum municipal standard, or the existing rated capacity, and there is no substantial change of location. Works carried out within an existing road allowance such that no land acquisition is required are considered to be in the same location. Conversely, it is thus inferred that should improvements extend beyond the existing road allowance and additional property is required, the location is considered to have changed.

**Watercourse**

Flowing water, though not necessarily continuous, within a defined channel and with a bed and banks which usually discharges itself into some other watercourse or body of water.



### 1.1.3 Selected Schedule

As per the Class EA guidelines and in consideration of the improvement works, the following apply:

- Exempt for the reconstruction of a water crossing for the same purpose, use, capacity (refers to either hydraulic capacity or road capacity) and at the same location;
- Exempt for the reconstruction or alteration of a structure or the grading adjacent to it when the structure is over 40 years old which after appropriate evaluation is found not to have cultural heritage value or interest;
- Exempt for retirement of existing roads and road related facilities;
- Exempt for installation of guide rail;

- Schedule B (Eligible for Screening for Exemption) for the reconstruction of, or alteration to a structure or the grading adjacent to it when the structure is over 40 years old, the structure is found to have cultural heritage value or interest, and the heritage attributes will be conserved in accordance with the recommendations of a Heritage Impact Assessment (no increase to travel lanes);
- Schedule B for the reconstruction of, or alteration to a structure or the grading adjacent to it when the structure is over 40 years old, the structure is found to have cultural heritage value or interest, and the heritage attributes will be conserved in accordance with the recommendations of a Heritage Impact Assessment (increase in travel lanes);
- Schedule B for the reconstruction of, or alteration to a structure or the grading adjacent to it, when the structure is over 40 years old the structure is found to have cultural heritage value or interest, but heritage attributes will not be conserved in accordance with the recommendations of a Heritage Impact Assessment; and
- Schedule B for the reconstruction of a water crossing where the reconstructed facility will not be for the same purpose, use, capacity or at the same location.

In consideration of the above Class EA guidelines, anticipated heritage value, the potential alternative solutions, and to ensure appropriate public consultation throughout the Study, the Schedule B Class EA process has been adopted. As illustrated in Figure 2, a Schedule B requires completion of Phases 1 and 2 of the Municipal Class EA planning and design process.

## 1.2 OBJECTIVES OF THE PROJECT FILE REPORT

The overall objective of this report is to document the planning process undertaken during the Class EA process related to the development and evaluation of alternative solutions and designs. Specifically, the objectives of this report are as follows:

- to prepare a detailed description of the existing conditions;
- to prepare a detailed description of the problem;
- to prepare detailed inventories of the affected/applicable environments (physical, natural, social, economic, cultural heritage, and climate change);
- to develop the design criteria to assess the potential solutions to the problem;
- to establish alternatives to address the problem;
- to outline the evaluation criteria;
- to complete a preliminary evaluation of the alternative solutions and identify a preliminary technically preferred alternative;

- to summarize the PIC;
- to summarize the public consultation;
- to complete a life cycle cost analysis of Alternatives B and C2;
- to report on consideration of stakeholder feedback in the evaluation of alternatives and selection of the preferred alternative;
- to identify the preferred alternative;
- to summarize the results of the amended Stage 1 archaeological assessment;
- to summarize the additional environmental investigations completed;
- to summarize the heritage impact assessment and mitigation measures recommended;
- to review the options for the existing bridge; and
- to outline the remaining steps involved to complete the Class EA Study.

## 1.3 FORMAT OF THE PROJECT FILE REPORT

This Report has been prepared in accordance with the chronological order of the Class EA process and is structured as follows:

- Chapter 2 presents the need and justification of the study and the preparation of a problem statement to guide the Municipal Class EA process;
- Chapter 3 addresses the first point of public consultation - Notice of Study Commencement;
- Chapter 4 details the alternative solutions developed to address the problem statement;
- Chapter 5 identifies the affected environments and provides an inventory of such to be considered in the subsequent evaluation;
- Section 6 details the evaluation of the alternative solutions and how they satisfy the problem statement and potential impacts to the environments;
- Section 7 outlines the Public Information Centre;
- Section 8 summarizes the additional traffic study;
- Section 9 summarizes the life cycle cost analysis;
- Section 10 summarizes the re-evaluation of the evaluation criteria and importance weighting of each criteria based on comments received;
- Section 11 summarizes the results of the Stage 2 archaeological assessment and heritage impact assessment;

- Section 12 summarizes the results of the additional environmental investigation;
- Section 13 details how and why the preferred solution was selected;
- Section 14 outlines the design criteria and conceptual design; and
- Section 15 outlines the remaining tasks in the Municipal Class EA process.

# 2 Need & Justification

The purpose of this Class EA Study is to identify the most appropriate improvement strategy to best address the needs of the Old Shiloh Road Bridge. In doing so, it is first necessary to establish/understand the existing conditions from which the needs are determined. Once these existing conditions and needs are identified, the overall problem statement can be defined. These tasks have been completed in accordance with Phase 1 of the Class EA process, which culminates with the creation of the problem statement.

The main areas of concern are:

- identifying, evaluating and selecting long-term cost-effective strategies to address the condition of the existing bridge;
- providing the necessary improvements to the roadway approaches to suit the bridge;
- minimizing and/or avoiding impacts to adjacent private property;
- provision of proven environmental protection and mitigation measures given the proximity of construction activities to the watercourse; and
- acquisition of necessary approvals, in a timely manner.

## 2.1 EXISTING CONDITIONS

The Old Shiloh Road Bridge is a 24 m single span concrete bowstring arch bridge spanning the Pefferlaw River, constructed in 1925. It has a clear roadway width of 5.18 m and an overall structure width of 6.7 m. It was rehabilitated in 1988 and 2011 and was resurfaced in 2014. It is generally in fair to poor condition with signs of concrete deterioration.

A Photographic Inventory of the site is included in Appendix A.

### 2.1.1 Roadway Geometry

The single lane bridge is a constriction along this section of two-lane roadway. The Town is not aware of any history of accidents occurring at the bridge within the past 10 years. The posted speed limit in the vicinity of the bridge is 60 km/hr. There is a turn-around area at the west approach. The road has an average annual daily traffic value of 919 vehicles per day (provided by the Town of Georgina).

The approach roadway signage includes Narrow Bridge ahead. With a roadway width of 5.2 m the bridge slightly exceeds the recommended maximum lane width for single lane structures on low volume roads of 4.9 m outlined in the MTO Structural Manual Guidelines for Bridges on Low

Volume Roads. This maximum is based on perception of motorists that the bridge is wide enough to pass two vehicles even if it is signed as a single lane. Single lane bridges can be acceptable on some low volume roads, generally for design speeds less than or equal to 60 km/hr and with traffic volumes less than or equal to 200 AADT.

It is noted that due to the rural nature of the bridge location, it is possible that farm equipment may be traversing the local roads. Often times, farm equipment or other special vehicles require wider lanes.

The roadway alignment is generally straight and flat across the bridge, with the grade increasing east of the bridge, and gradually increasing further west of the bridge.

### 2.1.2 Structure Condition

The bridge is 98 years old. It was rehabilitated in 1988 and again in 2011. The 1988 rehabilitation drawings indicate the work included concrete repairs, replacement of deck drains, installation of a latex modified concrete deck overlay, installation of steel beam guide rail over wingwall railing, and 10 m of approach road resurfacing to match the new top of deck. The OSIM reports indicate the 2011 rehabilitation work included superstructure rehabilitation, installation of approach guide rail, curb repair and replacement, and improvements to the railings.

Tatham reviewed existing OSIM reports from 2018 and 2020 provided by the Town and completed a supplementary visual inspection of the bridge on December 16, 2022. At the time of inspection, the deck curbs and other elements were covered in snow and ice. Select areas were cleared to inspect the element below. The following observations confirmed or supplemented the OSIM results:

- Spalling, delamination and scaling, narrow to medium cracks noted in concrete curbs, isolated honeycombing;
- Spalling, delamination and scaling, narrow to medium cracks with and without efflorescence noted in concrete arch top chords, isolated honeycombing;
- Spalling, and narrow to medium cracks with and without efflorescence noted in concrete arch bottom chords;
- Spalling, delamination, and narrow to medium cracks with and without efflorescence noted in concrete arch vertical chords;
- Existing railing is substandard;
- Spalling, delamination, scaling, and narrow to wide cracks, efflorescence noted in concrete railing;
- Severe corrosion of the existing deck drains;

- Narrow cracking, light scaling, and isolated medium cracks in top of exposed concrete deck;
- Narrow cracking with and without efflorescence and spalling in soffit of concrete deck;
- Scaling, delamination, spalls, and narrow to wide cracks with efflorescence in concrete floor beams;
- Narrow to wide cracks, scaling and spalling, and efflorescence in abutments, wingwalls, and ballast walls;
- There is evidence of older shotcrete repairs as well as more recent concrete patch repairs; and
- Light to medium concrete erosion is occurring at the base of the abutment walls.

The 2018 OSIM report indicates that a Detailed Deck Condition Survey was undertaken and supported a recommendation of replacement. A copy of this report was unavailable.

### 2.1.3 Load Capacity

The structure did not have a load posting, however through the collection of background data for this study it was found that the 1988 rehabilitation included a triple load posting of 20 tonnes, 21 tonnes, and 27 tonnes restricting the maximum permitted gross vehicle weights for a single vehicle unit (e.g., a cube truck), a combination of two vehicle units (e.g., a tractor and trailer), and a combination of three vehicle units (e.g., a tractor and two trailers) respectively. No evidence was found to support that any subsequent rehabilitation work has been completed to strengthen the bridge beyond this capacity. As such, in the spring of 2023 the Town erected load restriction signage at the bridge to reflect the posting recommended in 1988.

### 2.1.4 Hydrologic/Hydraulic Assessment

A hydraulic analysis of the bridge was completed to confirm the capacity of the existing structure. The Lake Simcoe Region Conservation Authority (LSRCA) provided 2008 hydrologic data and a HEC2 model of the Pefferlaw River. No topographic survey was completed at the bridge and as such the model is considered to be conservative. Additional survey data could be used to refine the model and the results.

Using Environment Canada hydrometric data from station 02EC018 located adjacent to the bridge, a statistical streamflow analysis was conducted using HEC-SSP to confirm the LSRCA flows. However, due to the limited available hydrometric data the statistical return frequency design flows were considered unrepresentative. As a result, the LSRCA flows were used in this analysis.

The HEC2 data was used to create a HEC-RAS model to confirm the capacity of the existing structure. The existing model results showed the downstream Pefferlaw Dam and Pefferlaw Road bridge were possibly affecting the water level at the Old Shiloh Road bridge, so additional survey data of the downstream structures was requested from the Town to confirm these results. After a review of the dam and downstream bridge, it was determined they had minimal impact on the model.

The MTO Highway Drainage Design Standard (2008) requires design flow return periods on collector roads for this span to satisfy or exceed the 1:50-year return frequency design storm peak flows. Based on modelling, the existing bridge conveys the 1:50-year return frequency design storm peak flow.

In addition to hydraulic capacity, the MTO Highway Drainage Design Standard requires a 1.0 m clearance between the High Water Level associated with the design flow and the lowest point of the soffit. The available clearance at the Old Shiloh Road Bridge for the 1:50-year flow is 0.17 m.

To satisfy both the hydraulic capacity and clearance requirements various scenarios were modelled to increase the span and/or raise the soffit. In addition, scenarios were also modelled to review the impact of widening the bridge to a two-lane structure. The water level at the bridge is governed by the low gradient downstream and therefore increasing the bridge span does not increase the clearance. With the relatively thin superstructure associated with the existing bridge structure, raising the soffit to achieve a 1.0 m clearance requires raising the road grade. Although raising the road was found to achieve the necessary clearance, it does increase the water level upstream of the bridge during larger storm events as the water is required to reach a higher elevation before overtopping the road. During the Regional Storm, the upstream water level was found to increase by 30 mm. Widening the bridge to two-lanes also results in an additional 20 mm increase to upstream water level during the Regional Storm.

The structure type modelled to obtain these results utilized a 900 mm superstructure thickness. This would not be representative of a deck on girder structure type, but rather a truss or similar arch style bridge. An additional scenario was also modelled using an adjacent box girder bridge configuration. The downstream Pefferlaw dam and the flat river profile downstream provide the majority of the control at the bridge, and the resulting impacts to the upstream water levels are similar whether the soffit is lowered to maintain a similar road profile as the truss option or the soffit elevation is maintained.

Water level elevations and clearances are summarized for each scenario, and cross sections are provided for the existing and replacement scenarios in Appendix B.

### 2.1.5 Barrier Protection

The barrier across the structure is substandard and is generally in poor condition. It has spalled sections with exposed corroded reinforcing steel.

### 2.1.6 Utilities

Visible utilities on Old Shiloh Road include utility poles along the both the north and south sides with overhead wires. These overhead utilities should not be in conflict for rehabilitation options, however for some of the removal and replacement options they could require temporary deenergizing or permanent relocation to permit lifting and movement of the bridge elements to avoid encroaching on the required clearance envelopes.

Bell Canada has been identified as potentially having infrastructure in the area and have been contacted to confirm the presence of any buried utilities. Vianet has confirmed they do not have infrastructure in the vicinity of the bridge. HydroOne has confirmed they have primary and secondary single phase overhead wires in the area.

### 2.1.7 Road Use

The bridge is a single lane structure along a two-lane collector road. Old Shiloh Road is not designated as a cycling route or shared roadway on the York Region GIS.

## 2.2 PROBLEM/OPPORTUNITY STATEMENT

In consideration of the existing conditions, the Problem/Opportunity Statement, which sets the framework for the remainder of the Study, is as follows:

**“Old Shiloh Road Bridge has exceeded its design service life, is deteriorating, and has been posted with a 20, 21, 27 tonne triple load posting limit. The Town of Georgina has identified the need to assess alternative solutions at this crossing to address the deteriorating condition and best meet current standards while minimizing impacts to the surrounding residents and environments.”**

# 3 Consultation - Study Commencement

As per the Class EA process (refer to Figure 2), there are a number of points of stakeholder contact. The first point of contact, as discussed in this chapter, is the Notice of Study Commencement, which is used to inform the general public and stakeholders of the start of the Study.

## 3.1 NOTIFICATION

### 3.1.1 Direct Notices

A Notice of Study Commencement, which is a discretionary point of contact, was mailed to all property owners (as determined from Town of Georgina records) on Old Shiloh Road between Weirs Sideroad and Victoria Road on March 30, 2023. Additional notices were sent to residents of Victoria Street and Wier Street on April 5, 2023, as well as additional first nations communities identified by the MECP on April 13, 2023. The notice identified the Study area, the Study methodology and EA guidelines to be followed. In addition, it invited public input and comments early in the process such that they could be considered in the overall Study design and completion. A copy of the Notice of Study Commencement is provided in Appendix C.

These notices were also submitted to the appropriate review agencies, stakeholder groups and special interest groups, a listing of which is provided in Appendix C.

### 3.1.2 Website

The Town of Georgina posted a copy of the notice on the project website.

https://www.georgina.ca/municipal-government/building-georgina/old-shiloh-bridge-environmental-assessment

### 3.1.3 Signage

A project sign was installed at each approach to the bridge identifying the commencement of the Study and directing interested parties to visit the project website for more information.

# 4 Alternative Solutions

A number of reasonable and feasible solutions to addressing the Problem/Opportunity Statement were developed and are otherwise presented in this chapter.

## 4.1 ALTERNATIVE A – DO NOTHING

Under this alternative, only basic improvements and maintenance needs of the bridge are to be addressed, which will essentially maintain the status quo. No structural improvements or changes to the bridge would be made to solve the problem/opportunity statement.

While costs will be negligible for this alternative in the short-term, long-term maintenance costs will become substantial, especially as the bridge ages. The structure is approaching 100 years old and has exceeded its expected service life.

The bridge will remain as a single lane constriction, the barriers will remain substandard, and the load restriction will remain in place.

Traffic will continue to be restricted by the load limit, and eventually the load restriction will increase until full closure of the structure is required which will further impact traffic movement. The 20 tonne limit for single unit vehicles restricts the use of the bridge for vehicles such as gravel trucks and concrete trucks, but does not restrict the use by school buses or emergency vehicles.

## 4.2 ALTERNATIVE B – REHABILITATE THE EXISTING BRIDGE

Under this alternative, some structural deficiencies will be addressed. Considering the age of the bridge, it is likely that additional structural concerns will become apparent in the near future. In order to significantly extend the lifespan of the bridge, rehabilitation works will need to be extensive.

Concrete repairs would be completed on all structure elements, the railing would be replaced, and erosion protection would be installed.

Existing drawings are available and indicate that the initial design load was lower than the current standards. Minor improvements to the load restriction may be possible with strengthening of the existing members, but it is unlikely that it would be economical to complete the required improvements to remove the load restriction altogether.

Roadside safety can be improved by the installation of new roadside barriers both along the bridge and on the approaches.

Due to the single-lane configuration, construction work is expected to require a temporary road closure at the bridge with traffic detours.

### 4.3 ALTERNATIVE C – REMOVE AND REPLACE THE BRIDGE

Under this alternative, the existing bridge would be removed and replaced with a new bridge. Based on the existing traffic volumes and posted speed limit, replacement with another single lane bridge would not meet current standards. A two-lane bridge would be required to meet current standards.

The new two-lane structure will have a larger footprint than the existing to accommodate the two-lane configuration.

Roadside safety will be improved by the installation of new roadside barriers, and the load posting will be removed.

Replacement of the structure will require temporary full road closure, which can be managed with detour routes.

### 4.4 ALTERNATIVE D – CONSTRUCT A NEW BRIDGE ADJACENT TO THE EXISTING BRIDGE

In consideration of the expected heritage value of the bridge, this alternative involves the installation of a new bridge along a new alignment while leaving the existing bridge in place.

The existing municipal right-of-way is noted to be approximately 28.75 m wide at the bridge in the York Region GIS Mapping utility. It reduces to 23 m in width approximately 68 m from the west end of the bridge. The road appears to generally be centred within the right-of-way. The current road alignment is straight and relatively flat, introducing a second bridge will require the introduction of a horizontal curve to move traffic onto the new bridge. A new two-lane bridge will not fit within the current right-of-way and will require the purchase of additional property. A new single lane bridge could possible be installed but would not meet current geometric standards unless traffic was to continue to use the existing bridge for one direction.

The new structure will have a larger footprint than the existing to accommodate a two-lane configuration, assuming the current bridge is closed to vehicular traffic.

Roadside safety will be improved by the installation of new roadside barriers. There would be no load posting for the new bridge.

Traffic could continue to use the existing bridge throughout construction of the new bridge negating the need for a road closure and detour. The existing bridge would remain triple load posted at 20 tonnes, 21 tonnes, and 27 tonnes.

# 5 Environment Inventories

A description of the Study area has been developed considering the following environments:

- Physical Environment;
- Natural Environment;
- Social Environment;
- Economic Environment; and
- Climate Change.

Detailed investigations and analyses with respect to the environmental inventories were completed as a part of this study. Brief descriptions of the various environments investigated are provided below.

## 5.1 PHYSICAL ENVIRONMENT

Several elements of the physical environment were presented in Section 2.1, particularly with respect to the structural condition of the bridge. Additional elements of the physical environment are presented below.

A copy of the Existing Site Plan is provided in Appendix D.

### 5.1.1 Existing Bridge Structure

As described in Section 2.1, the age and condition of the bridge, and the triple load posting of 20, 21, 27 tonnes, has resulted in recommendations for replacement. Without repair or replacement, the bridge will continue to deteriorate until such time as the load posting becomes more restrictive, ultimately needing to be closed to traffic. Original construction drawings, and some of the rehabilitation drawings are available, with limited details.

The bridge is approaching 100 years old and has exceeded its expected lifespan. Rehabilitation works are only expected to provide minimal extension to service life. The original design loads are lower than current standards, and the extensive strengthening required to enable the capacity to be increased to meet current standards would not be economical. The current load capacity does permit crossing of emergency services vehicles such as fire trucks. Snow removal vehicle loads would need to be reviewed to ensure they do not exceed 20 tonnes fully loaded with sand/salt mixtures.

### 5.1.2 Existing Approaches

The approach roadway signage includes Narrow Bridge ahead and legal speed posting of 60 km/hr. The signage does not include a single lane bridge tab, however one is warranted as the clear width between curbs is less than 5.5 m. The Town has recently reinstated load posting signage confirming the triple load posting of 20, 21, 27 tonnes.

The horizontal and vertical alignment of the road is generally straight and flat across the bridge. Existing roadside protection consisting of steel beam guide rail is in generally good condition. The approach roadway is a two-lane configuration transitioning to a single lane over the bridge. The wearing surface consists of a bituminous surface and is in generally fair to good condition.

### 5.1.3 Hydraulics

As noted in Section 2.1.4, the hydraulic capacity of the bridge passes the 1:50 year storm design flow requirement but does not achieve the standard 1 m clearance to the soffit from high-water level. The water level is largely controlled by the downstream river gradient, and any increase in clear span has little to no effect on the water levels. To achieve a 1 m clearance to the high-water level, the bridge and road would need to be raised, which will negatively affect the upstream water levels under larger storm events.

Further review with the conservation authority during the design phase is recommended to confirm the preferred design criteria at this structure.

### 5.1.4 Traffic Operations

Old Shiloh Road is classified as a collector road in the Town of Georgina's Official Plan and has a rural cross section. The Town's most recent traffic data indicates the road has an average annual daily traffic count of 919 vehicles per day.

Traffic volumes and road speed limits do not fall within the low volume road bridge criteria under the MTO Structural Manual. Low volume road bridge guidelines are applied to bridges on roads with average annual daily traffic volumes of 400 vehicles or less. There are no reports of accidents related to this restriction.

Typically, peak hour volumes account for 10% of the daily volumes and thus 90 vehicles per hour are expected during the peak hours (total of both directions). For planning purposes, collector roads are assumed to have hourly capacities in the order of 700-800 vehicles per hour per lane.

As the anticipated future traffic volumes are well below these levels, no operational improvements are required to increase the road capacity beyond two lanes. Traffic volumes are not expected to increase significantly in the context of reserve capacity remaining on the road system.

### 5.1.5 Geotechnical Considerations

A geotechnical investigation was not completed as part of this study. However, one will be required during detail design under alternate solutions C and D. The original design drawings indicate the bridge is currently supported on piles.

## 5.2 NATURAL ENVIRONMENT

The bridge is located in the planning jurisdictions of the provincial Greenbelt Plan and Lake Simcoe Protection Plan, as administered by the Town and the Lake Simcoe Region Conservation Authority (LSRCA).

An Environmental Impact Study was completed by Riverstone Environmental Solutions Inc., and a site investigation was undertaken on December 7, 2022. The primary tasks associated with the site investigation included: ecological land classification, wetland and drainage feature assessment, fish habitat assessment, vegetation inventory, and general wildlife habitat assessment.

Most of the study area was found to be in a naturalized state, composed of mixed successional forest communities and low-lying riparian zones. There are no signs of active land use in the study area, although the bridge area may be used for fishing or launching of watercraft.

The immediately adjacent lands to Pefferlaw River are composed of a complex of sandy loams. Pefferlaw River was identified as the single drainage feature within the study area. Areas up gradient from the watercourse were noted to appear to be imperfect to poorly draining.

The study area was identified to have potential habitat for primarily generic wildlife species (White tailed deer, Raccoon, Grey Squirrel, Chipmunk etc.) and common generalist bird species (Black capped chickadee, American crow, Mourning dove, and Downy woodpecker, were observed).

The following observations and assumptions related to habitat were also made:

- One inactive bird nest was found under the bridge, likely to be last utilized by either a barn swallow or eastern phoebe;
- Suitable habitat features are assumed to be present for certain reptile and amphibian species (i.e. turtles);
- Floodplain pools may be present to support amphibian breeding habitat; and
- Fish habitat is assumed to be present.

The LSRCA's Pefferlaw River/Brook Subwatershed Plan indicates that 45 species of fish have been recorded in the system over the last 80 years. It is expected that fisheries timing windows will need to address both warmwater and coldwater habitat considerations.

Initial screening for habitat for endangered and threatened species identified the potential for the following species to be present:

- Butternut – NHIC contains no records of element occurrence in the 1 km grid, and none were observed on site.
- Black Ash - NHIC contains no records of element occurrence in the 1 km grid, and none were observed on site.
- Endangered Bat Species – there is no expectation that the study area supports highly functional habitat for bats, however the area may be amenable to supporting foraging habitat for bats.

Various mitigation measures are summarized below. Fully tabulated impacts and mitigation measures related to the various alternate solutions can be found in the Environmental Impact Study report.

- Restore natural bed substrates within and adjacent to replaced crossing structures following construction.
- In-water works (if required) and diversion of flows should avoid relevant fisheries timing windows, which may include both cold water and warm water migration/spawning windows. Timing windows should be confirmed with MNRF and/or LSRCA.
- Implement sediment and erosion control measures as per applicable best management practices to isolate the development footprint.
    - Sediment fencing must be constructed of heavy material and solid posts and be properly installed (trenched in) to maintain its integrity during inclement weather events.
    - Additional sediment fencing and appropriate control measures must be available on site so that any breach can be immediately repaired.
    - Regular inspection and monitoring will be necessary to ensure that the structural integrity and continued functioning of the sediment control measures is maintained (i.e., proper installation is not the only action necessary to satisfy the mitigation requirements).

  - An on-site supervisor should be responsible for daily inspections of the sediment and erosion control measures and record the time and date of inspections, the status of the mitigation measures, and any repairs undertaken.
  - Removal of non-biodegradable erosion and sediment control materials should occur once construction is complete, and the site is stabilized.

- Best Management practices should be utilized with all machinery and fill being imported to the subject property to ensure that material and tracks are free from invasive species (*Phragmites australis*, etc.).
- Machinery should arrive on site in clean condition and is to be checked and maintained free of fluid leaks.
- Machinery must be refueled, washed, and serviced within the area isolated by sediment fencing, a minimum of 30 m from wetlands and the top of watercourse bank.
- Locate all fuel and other potentially deleterious substances within the area isolated by sediment fencing, a minimum of 30 m from wetlands and the top of watercourse bank.
- Temporary storage locations of aggregate/fill material (where required) should be located within the area isolated by sediment fencing. Storage areas should be sited to the west of Pefferlaw River. This material is to be contained by heavy-duty sediment fencing, a minimum of 30 m from wetlands and the top of watercourse bank.
- Offloading of construction and aggregate/fill materials (where required) should be completed during fair weather conditions, a minimum of 30 m from wetlands and the top of watercourse bank.
- All stockpiled topsoil/overburden (where required) should be piled in low piles and stabilized as quickly as possible (e.g., erosion-prone areas covered with textile) to minimize the potential for runoff and wind erosion.
- Minimize vegetation removal and disturbance to the extent possible, particularly adjacent to the watercourse.
- Prepare a Tree Inventory and Preservation Plan (TIPP) to determine the extent of potential tree removals following selection of preferred alternative. Construction exclusion, staging, and tree protection measures should be included in the TIPP for mitigation planning.
- Following preparation of the TIPP, review opportunities for re-planting of trees that require removal.
- Any minor tree removals required to accommodate the selected alternative must be completed outside of the season in which endangered bats may be active, *i.e.*, April – Oct,

inclusive. If substantial tree removals are determined to be required (*i.e.*, beyond the ROW), additional assessment of habitat usage and significance may be warranted.

- Work site isolation must utilize sediment and erosion control that represents suitable wildlife exclusion fencing as per best management practices endorsed by the MECP.
- If any individual turtles are encountered within the works area, activities that have the potential to harm such individuals should stop immediately. A qualified biologist or MECP should then be contacted to determine the most appropriate mitigation measure.
- Grading and other activities that cause disturbance outside of the development envelope should be minimized to the extent possible during the construction period.
- In the spring prior to construction, install temporary bird exclusion mesh underneath bridges to prevent establishment of nests within the season of construction.
- Clearing of vegetation must be restricted to times outside of the period April 15 to October 30. If development and site alteration must occur within the period of April 1 to Aug 30, a nest survey should be conducted by a qualified avian biologist prior to commencement of construction activities to identify and locate active nests of migratory bird species covered by the MBCA. If a nest is located or evidence of breeding noted, then a mitigation plan should be developed to address any potential impacts on migratory birds or their active nests. Mitigation may require establishing appropriate buffers around active nests or delaying construction activities until the conclusion of the nesting season. If any clearing of mature trees must occur within the period April 15 to Oct 30, further measures may need to be taken with respect to mitigating harm to endangered bats which have the potential occur on site.

Additional investigation was undertaken following the identification of the preliminary preferred alternative and recommendations were refined. The results of which are discussed further in section 12. The Environmental Impact Study report can be found in Appendix J.

### 5.2.1 Provincial Policy Statement (PPS)

To fulfill the requirement under the PPS, natural features were inventoried and assessed for potential and actual impacts from the proposed bridge construction. The study area includes a 120 m radius as measured from the center of the bridge on 2nd Concession, consistent with direction in the Natural Heritage Reference Manual (NHRM) under the PPS.

### 5.2.2 Federal Fisheries Act

The Pefferlaw River is considered a fish-bearing water, and the area and fish are protected under the Federal Fisheries Act. Work must avoid causing serious harm to fish and fish habitat unless

authorized to do so by the Department of Fisheries and Oceans Canada (DFO). A DFO self-assessment or DFO request for review of the proposed work at Old Shiloh Road Bridge will be needed to ensure compliance under the Fisheries Act. If it is determined that proposed actions may cause serious harm to fish that cannot be mitigated for, then a Fisheries Act Authorization would be required.

### 5.2.3 Lake Simcoe Region Conservation Authority

The structure is located entirely within the Lake Simcoe Region Conservation Authority (LSRCA) regulatory area. A permit or other authorization is expected to be required from the Conservation Authority. Pre-consultation will be requested.

Watercourse crossings are preferred to have an open footing, an alignment compatible with stream morphology, size and location such that there is no increase in upstream or downstream erosion or flooding, and consideration of fish and wildlife passage.

Hydrological impacts to the watercourse and changes to flood capacity should be minimized through detailed design, and appropriate mitigation measures should be applied through design and construction planning and disturbed areas restored or enhanced where appropriate.

### 5.2.4 Town of Georgina Official Plan

The Town has zoned the study area as an Environmental Protection Area and Greenlands System, with a Hamlet area noted to the southeast. Infrastructure projects where the need has been demonstrated through an Environmental Assessment or other similar environmental approval where there is no reasonable alternative is an approved use within this zone.

### 5.2.5 Source Water Protection

The project location was reviewed using the MECP Source Protection Information Atlas mapping. The project is not located within an intake protection zone, an area of a highly vulnerable aquifer, a well head protection area, or a significant groundwater recharge area.

### 5.2.6 Air Quality, Dust, & Noise

Permanent impacts to air quality, dust and noise, vary based on the various alternatives. Closure or removal of the existing bridge, which is the potential result for Alternatives A, B, and C found in Section 6 Evaluation of Alternatives, would result in local traffic requiring to detour. The additional travel time will result in slightly increased vehicle emissions, however the traffic volumes are relatively low. Rehabilitation under alternative B or replacement in Alternative C or D with a two lane bridge will reduce the incidents of queuing thus reducing vehicle emissions.

Temporary impacts during construction will result from all alternatives other than A, do nothing. Dust and noise control measures will be addressed and included in the construction plans during detail design. Mitigation measures could include limiting working hours to correspond with local noise by-laws, and application of non-chloride dust-suppressants between asphalt removal and repaving operations.

## 5.3 SOCIAL ENVIRONMENT

The social environment includes any matters related to existing residents and area tenants, as well as the general public. Several matters for consideration in relation to the social environment include the following:

- Noise impacts to area residents. This will have the greatest impact to adjacent properties during construction;
- The safety of the crossing is of utmost importance;
- The structure does not meet current geometric standards, and although the Town has not reported any operational issues (collisions or traffic delays) or concerns, a single lane bridge is not recommended. As previously noted, an expansion of the right-of-way and property acquisition is likely to be required under Alternative D only.

Traffic management will be an important aspect of both alternatives B & C. The nearest alternate crossing of the Pefferlaw River is Ravenshoe Road to the south, providing approximately a 6 km or 7-minute detour.

### 5.3.1 Municipal, Provincial, and Federal Planning Policies

The municipal and provincial goals that are applicable to the bridge improvement project and should be considered in the evaluation of alternatives are:

- Provincial Policy Statement, 2020
  - Provide transportation systems which are safe, energy efficient, facilitate the movement of people and goods, and are appropriate to address projected needs. (1.6.7.1)
  - Support active transportation (1.8.1, 1.1.3.2)
  - Protect natural features and functions (2.1.1)
  - Avoid disruption to cultural and built heritage (1.7.1)
  - Account for impacts of climate change (1.1.3.2)
  - Minimize impacts to air quality (1.1.3.2)
  - Be financially viable over the life cycle of the asset (1.6.1)

- Optimize the use of existing infrastructure (1.6.3)

- Regional Municipality of York, 2022 Regional Official Plan
  - Enhance York Region's urban structure through a comprehensive integrated growth management process that provides for healthy, sustainable, complete communities with a strong economic base (Goal 2)
  - To protect and enhance the natural environment for current and future generations so that it will sustain life, maintain health, and provide a high quality of life (Goal 3)
  - To provide the services required to support York Region's Residents and businesses to 2051 and beyond, in a financially and environmentally sustainable manner (Goal 6)
  - To ensure resiliency and the ability to adapt to changing economic and environmental conditions and increasing social diversity (Goal 7)
- Town of Georgina Official Plan
  - To be responsible and efficient in the use of land, resources, services and infrastructure in order to meet the needs of the present without compromising the ability of future generations to meet their own needs. (2.2.1.1)
  - To ensure Georgina's growth and development is carried out in a compact and efficient manner, in order to make efficient use of land and existing and future infrastructure. (2.2.2.1)
  - To maintain the financial stability and integrity of the Town by managing its financial resources and by undertaking its public works and other development decision making in a fiscally responsible and prudent manner. (2.2.2.2)
  - To ensure that all land use decisions consider the impact of future development on air, water, soil and climate including the availability of clean drinking water, agricultural lands and products, and natural resources (2.2.2.4)
  - To develop and promote climate change mitigation and adaption strategies. (2.2.2.5)
  - To encourage and actively promote the use of sustainable design principles or technologies and climate change resilient design in community development, site design and buildings. Such design principles may be further expressed in the Town's Development Design Criteria (2.2.2.6)
  - To conserve, protect and enhance the Town's cultural heritage resources and promote cultural expression in the Town. (2.2.2.9)

- To provide for safe and accessible active transportation linkages between, workplaces, homes, shopping, services, schools, public facilities, points of interest and areas of scenic agriculture or environmental significance, by incorporating appropriate urban design measures such as the provision of walkways, sidewalks, more direct street patterns, and adequate illumination of such facilities in communities to be served by transit. (2.2.2.11)
- The preservation, protection, enhancement and support of the natural heritage and hydrologic features, functions, attributes and interconnections of the natural environment is essential in order to maintain a sustainable ecosystem, not only to provide a healthy environment, but also as an important component of the Town's economic and community health; and to preserve the visual landscape in Georgina, for this and future generations. (2.2.3.1)
- To utilize an ecosystem approach to planning to ensure that environmental matters are balanced with economic and social considerations in the decision-making process. (2.2.4.1)
- To recognize and establish a permanent Greenlands System in the Official Plan. (2.2.4.2)
- To protect key natural heritage features and key hydrologic features from land uses and activities that may adversely affect those features and their associated ecological functions. (2.2.4.3)
- To protect the natural environment and its functions by providing appropriate buffers around features and linkages between them. (2.2.4.4)
- To manage the placement and removal of fill and other site alteration activities in order to minimize the impact of those activities on the environment and residents of the Town. (2.2.4.8)
- To implement the Lake Simcoe Protection Plan, 2009 in order to protect and restore the ecological health of Lake Simcoe and its watershed, which includes contributing to the achievement of healthy phosphorus levels in Lake Simcoe. (2.2.6.1)
- To promote the establishment of a natural vegetation buffer along the Lake Simcoe shoreline and its tributaries to maintain cold water temperatures, reduce erosion and enhance fish habitat and wildlife habitat. (2.2.6.5)
- To recognize, conserve and promote cultural heritage resources and to perpetuate their value and benefit to the community as outlined in the Town's Municipal Cultural Plan. (2.2.12.6)

The Environmental Protection Act requires that for any soils that are moved off-site during construction, testing shall be conducted to determine contaminant levels and appropriate disposal options, consistent with Part XV.1 of the Act and O.Reg. 153/04.

### 5.3.2 Archaeological Investigation

A Stage 1 Archaeological Assessment was carried out by AMICK Consultants Limited.

The entirety of the study area was subject to a desktop Stage 1 Archaeological Background Study on 11 January 2023. All records, documentation, field notes, photographs, and artifacts (as applicable) related to the conduct and findings of these investigations are held at the corporate offices of AMICK Consultants Limited until such time that they can be transferred to an agency or institution approved by the MCM on behalf of the government and citizens of Ontario.

The study area has been identified as a property that exhibits potential to yield archaeological deposits of cultural heritage value or interest (CHVI). The objectives of the Stage 1 Background Study have therefore been met and in accordance with the results of this investigation, the following recommendations are made:

- The proposed undertaking has potential for archaeological resources and a Stage 2 Archaeological Property Assessment is recommended.

No soil disturbances or removal of vegetation shall take place within the study area prior to the MCM acceptance of a report into the Provincial Registry of Archaeological Reports that recommends all archaeological concerns for the proposed undertaking have been addressed and no further archaeological investigations are required.

A copy of the Archaeological Assessment Report is included in Appendix E.



### 5.3.3 Cultural Heritage Evaluation

A Cultural Heritage Evaluation was carried out by AMICK Consultants Limited, and a Cultural Heritage Evaluation Report (CHER) has been prepared.

The Old Shiloh Road Bridge is an early and idiosyncratic example of a very common built form throughout the province. This bridge does meet the criteria set forth in O. Reg. 9/06: Criteria for Determining Cultural Heritage Value or Interest. The primary reasons for this determination are that it is a rare or unique example of a bridge structure, and it may express or reflect the work or ideas of a specific designer that has been executed in an idiosyncratic fashion by another builder. In addition, this bridge has previously been identified as a structure of cultural heritage value and significance within Arch, Truss and Beam: The Grand River Watershed Heritage Bridge Inventory (Benjamin et al. 2013).

Given that the bridge has surpassed its serviceable life, and replacement of the structure is being considered, the following recommendations should be considered and implemented:

- The CHER should be filed with the Township of Georgina.
- The CHER should be filed with the Ministry of Tourism, Culture, and Sport for review and comment.
- Due to the significance of this bridge a Heritage Impact Assessment (HIA) is recommended.

The concrete arch design of the structure does not easily allow for superstructure relocation, and the unknown factors associated with the structure's original design, and its current condition, do not easily allow for lifting and moving of the superstructure to an alternate location.

A copy of the CHER is included in Appendix F.

## 5.4 ECONOMIC ENVIRONMENT

With respect to the economic environment, the costs associated with each alternative will be considered including construction costs and/or maintenance costs. For the purposes of preliminary assessments, the costs will be considered on a qualitative basis only, e.g., least costly, most costly. In addition, impacts to abutting lands will be considered as part of the economic environment given the associated costs to acquire land.

## 5.5 CLIMATE CHANGE

With respect to Climate Change, two factors are considered: The increase in greenhouse gas emissions by fabrication of components and construction, or by the completion of the project; and the alternative's resiliency to climate change. Road and bridge construction projects can incorporate the use of new and recycled materials to reduce emissions related to manufacture and fabrication of materials and components. Once constructed the structure would not contribute to further emissions, other than through normal activities such as maintenance, repairs, and future works. Bridges are primarily impacted by climate change due to increased strength of storms and flooding from climate change. Their resiliency to this is based on structural integrity and hydraulic capacity.

# 6 Evaluation of Alternatives

This section will discuss the initial evaluation of the alternative solutions as previously described in Technical Memorandum No. 1. The results of the evaluation are preliminary given the need to solicit agency and public input. The evaluation took into consideration agency and public input received prior to May 1, 2023, in order to be presented at the PIC and solicit further input. The evaluation is descriptive or qualitative in nature allowing for a comparative evaluation of the pros and cons associated with each option.

Section 7 provides a re-evaluation of alternatives based on feedback from the Public Information Centre.

## 6.1 EVALUATION CRITERIA

In completing the evaluation, several criteria were considered as outlined below.

Physical Environment

- Road geometry and alignment
- Structural stability and load restrictions
- Roadside protection
- Traffic operations
- Maintenance and Snow Removal

Natural Environment

- Fisheries/aquatic impacts
- Wildlife/terrestrial impacts
- Hydrology & hydraulics
- Vegetation impacts
- Water quality

Social Environment

- Noise/construction impacts
- Emergency services
- Community impacts

Cultural Heritage Environment

- Archaeological impacts
- Heritage impacts
- First Nations Impacts

Economic Environment

- Construction costs
- Future maintenance costs
- Property acquisition costs

Climate Change

- Impact on the climate change
- Resiliency to climate change

The key evaluation criteria will focus on issues such as cost (including initial capital costs, and long-term life cycle maintenance and operational costs), structural performance, public safety, environmental impacts, and use and justification.

## 6.2 ENVIRONMENTAL IMPACTS

The potential effects and impacts associated with each alternative are noted in Table 1 and the weighted scoring of each alternative against the evaluation criteria is noted in Table 2.

**Table 1: Preliminary Qualitative Evaluation of Alternative Solutions**

| *Assessment Criteria* | **Alternative A** | **Alternative B** | **Alternative C1** | **Alternative C2** | **Alternative D** |
|---|---|---|---|---|---|
| | **Do Nothing** | **Rehabilitate the Existing Bridge** | **Remove and Replace with Single Lane Bridge** | **Remove and Replace with Two Lane Bridge** | **Construct a New Single Lane Bridge Adjacent to the Existing Bridge** |
| *Physical Environment* | ✗ safety of bridge will decrease over time and will need to be closed or replaced<br>✗ continuing decline to load carrying capacity<br>✗ remains a single lane constriction<br>✗ no improvement to barrier protection | ✓ safety of bridge can be improved but will decrease over time<br>✓ barrier protection can be upgraded<br>✓ no improvement to load carrying capacity<br>✗ shortest extension of service life<br>✗ remains a single lane constriction | ✓ increased load capacity to current standard<br>✓ barrier protection upgraded to current standard<br>✓ roadside safety improved<br>✓ longest extension of service life<br>✗ remains a single lane constriction | ✓ increased load capacity to current standard<br>✓ barrier protection upgraded<br>✓ roadside safety improved<br>✓ longest extension of service life<br>✓ removes traffic constriction<br>✗ larger disturbance to land and surroundings than single lane | ✓ increased load capacity to current standard on new bridge<br>✓ barrier protection upgraded<br>✓ roadside safety improved<br>✓ longest extension of service life<br>✓ removes traffic constriction<br>✗ largest disturbance to land and surroundings than single lane<br>✗ existing bridge safety can be improved but will decrease over time |
| *Natural Environment* | ✓ no impacts to environment or habitat | ✓ no significant impacts to environment or habitat<br>✓ potential impacts can be mitigated with best practices | ✓ potential for impacts in areas adjacent to existing substructure during construction | ✗ increased impacts in areas widened beyond existing substructure and road layout<br>✓ potential impacts can be mitigated with best practices | ✗ greatest impacts in areas widened beyond existing substructure and road layout |
| *Social Environment* | ✓ no impacts to existing abutting lands<br>✓ no construction delays or road closures<br>✗ high likelihood of near-term additional load restrictions requiring alternate traffic rerouting | ✓ no impacts to existing abutting lands<br>✓ shortest construction time and road closure<br>✓ potential additional load restrictions or closure will be delayed | ✓ no impacts to existing abutting lands<br>✗ longer construction time and length of road closure | ✓ no impacts to existing abutting lands<br>✗ longer construction time and length of road closure | ✗ potential for impacts to abutting lands<br>✗ longest construction time and length of road closure<br>✗ high likelihood of near-term additional load restrictions on existing bridge resulting in need for replacement |
| *Legend* | ✓ reflects a positive impact to the noted environment | | | | |
| | ✗ reflects a negative impact to the noted environment | | | | |

| *Assessment Criteria* | **Alternative A**<br>**Do Nothing** | **Alternative B**<br>**Rehabilitate the Existing Bridge** | **Alternative C1**<br>**Remove and Replace with Single Lane Bridge** | **Alternative C2**<br>**Remove and Replace with Two Lane Bridge** | **Alternative D**<br>**Construct a New Bridge Adjacent to the Existing Bridge** |
|---|---|---|---|---|---|
| *Cultural Heritage Environment* | ✓ no archaeological or cultural heritage impacts | ✓ no archaeological or cultural heritage impacts | ✖ cultural heritage impact by removing existing bridge<br>✖ some potential for archaeological impacts should works extend beyond existing ROW /constructed areas<br>✓ Stage 2 archaeological assessment to be completed to mitigate impacts<br>✖ Heritage impact assessment to be completed to provide recommendations to mitigate cultural heritage impact | ✖ cultural heritage impact by removing existing bridge<br>✖ greatest potential for archaeological impacts as works will extend beyond existing ROW or previously disturbed/constructed areas<br>✓ Stage 2 archaeological assessment to be completed to mitigate impacts<br>✖ Heritage impact assessment to be completed to provide recommendations to mitigate cultural heritage impact | ✓ No cultural heritage impacts<br>✖ greatest potential for archaeological impacts as works will extend beyond existing ROW or previously disturbed/constructed areas<br>✖ Stage 2 archaeological assessment to be completed to mitigate impacts |
| *Economic Environment* | ✓ lowest overall construction cost<br>✓ greater maintenance costs | ✓ low construction cost<br>✓ greater maintenance costs | ✖ greater construction cost<br>✓ lesser maintenance costs | ✖ greater construction cost<br>✓ lesser maintenance costs | ✖ greatest construction cost<br>✓ greatest maintenance costs |
| *Climate Change* | ✓ no effect on the environment<br>✓ no improvements to hydraulic capacity or resistance to the effects of climate change | ✓ no effect on the environment<br>✓ no improvements to hydraulic capacity or resistance to the effects of climate change | ✓ no long-term effect on the environment<br>✓ potential to improve hydraulic capacity and resistance to the effects of climate change | ✓ no long-term effect on the environment<br>✓ potential to improve hydraulic capacity and resistance to the effects of climate change | ✓ no long-term effect on the environment<br>✖ no improvements to hydraulic capacity or resistance to the effects of climate change |
| *Legend* | ✓ reflects a positive impact to the noted environment | | | | |
| | ✖ reflects a negative impact to the noted environment | | | | |

**Table 2: Preliminary Evaluation of Alternative Solutions with Weighted Scoring**

| | *Assessment Criteria* | Weight | Alternative A | | Alternative B | | Alternative C1 | | Alternative C2 | | Alternative D | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Do Nothing | | Rehabilitate the Existing Bridge | | Remove and Replace with Single Lane Bridge | | Remove and Replace with Two Lane Bridge | | Construct a New Bridge Adjacent to the Existing Bridge | |
| | | | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score |
| *Physical Environment* | road geometry and alignment | 6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 12.0 | 1.0 | 6.0 |
| | structural stability and load restrictions | 10 | 0.0 | 0.0 | 1.0 | 10.0 | 2.0 | 20.0 | 2.0 | 20.0 | 1.5 | 15.0 |
| | roadside protection | 6 | 0.0 | 0.0 | 1.0 | 6.0 | 2.0 | 12.0 | 2.0 | 12.0 | 1.5 | 9.0 |
| | traffic operations | 7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 14.0 | 1.5 | 10.5 |
| | maintenance and snow removal | 6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 3.0 | 2.0 | 12.0 | 0.5 | 3.0 |
| | **Sub-Total** | **35** | | **0.0** | | **16.0** | | **35.0** | | **70.0** | | **43.5** |
| *Natural Environment* | fisheries/aquatic impacts | 6 | 0.0 | 0.0 | -0.5 | -3.0 | -1.0 | -6.0 | -1.5 | -9.0 | -1.0 | -6.0 |
| | wildlife/terrestrial impacts | 6 | 0.0 | 0.0 | -0.5 | -3.0 | -1.0 | -6.0 | -1.5 | -9.0 | -1.0 | -6.0 |
| | hydrology & hydraulics | 6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 3.0 | 0.5 | 3.0 | 0.0 | 0.0 |
| | vegetation impacts | 3 | 0.0 | 0.0 | 0.0 | 0.0 | -0.5 | -1.5 | -1.0 | -3.0 | -2.0 | -6.0 |
| | water quality | 4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | **Sub-Total** | **25** | | **0.0** | | **-6.0** | | **-10.5** | | **-18.0** | | **-18.0** |
| *Social Environment* | noise/construction impacts | 5 | 0.0 | 0.0 | -0.5 | -2.5 | -1.0 | -5.0 | -1.0 | -5.0 | -1.0 | -5.0 |
| | emergency services | 5 | 0.0 | 0.0 | 0.5 | 2.5 | 1.0 | 5.0 | 2.0 | 10.0 | 1.5 | 7.5 |
| | community impacts | 5 | 0.0 | 0.0 | 0.5 | 2.5 | 1.0 | 5.0 | 1.5 | 7.5 | -1.0 | -5.0 |
| | **Sub-Total** | **15** | | **0.0** | | **2.5** | | **5.0** | | **12.5** | | **-2.5** |
| *Cultural Heritage Environment* | archaeological impacts | 4 | 0.0 | 0.0 | -0.5 | -2.0 | -1.0 | -4.0 | -1.5 | -6.0 | -2.0 | -8.0 |
| | heritage impacts | 6 | 0.0 | 0.0 | 2.0 | 12.0 | 1.0 | 6.0 | 0.5 | 3.0 | 1.5 | 9.0 |
| | first nations impacts | 5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | **Sub-Total** | **15** | | **0.0** | | **10.0** | | **2.0** | | **-3.0** | | **1.0** |
| *Weight* | reflects the relative importance of each evaluation criteria within each project environment, and the relative importance of each project environment in relation to one another | | | | | | | | | | | |
| *Score* | reflects the effect of each alternative as it relates to the evaluation criteria in comparison to Do Nothing (status quo); -2 denotes a significant negative impact, 0 denotes no impacts and +2 denotes a significant positive impact | | | | | | | | | | | |
| *Weighted Score* | product of weight x score | | | | | | | | | | | |

| | *Assessment Criteria* | Weight | Alternative A<br>Do Nothing | | Alternative B<br>Rehabilitate the Existing Bridge | | Alternative C1<br>Remove and Replace with Single Lane Bridge | | Alternative C2<br>Remove and Replace with Two Lane Bridge | | Alternative D<br>Construct a New Bridge Adjacent to the Existing Bridge | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score |
| *Economic Environment* | construction costs | 10 | 0.0 | 0.0 | -0.5 | -5.0 | -1.0 | -10.0 | -1.5 | -15.0 | -2.0 | -20.0 |
| | future maintenance costs | 10 | 0.0 | 0.0 | -1.5 | -15.0 | -1.5 | -15.0 | -1.0 | -10.0 | -2.0 | -20.0 |
| | property acquisition costs | 5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.0 | -5.0 |
| | **Sub-Total** | **25** | | **0.0** | | **-20.0** | | **-25.0** | | **-25.0** | | **-45.0** |
| *Climate Change* | impact on climate change | 2 | 0.0 | 0.0 | -0.5 | -1.0 | -1.0 | -2.0 | -1.5 | -3.0 | -1.0 | -2.0 |
| | resiliency to climate change | 3 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 3.0 | 1.0 | 3.0 | 0.5 | 1.5 |
| | **Sub-Total** | **5** | | **0.0** | | **-1.0** | | **1.0** | | **0.0** | | **-0.5** |
| | *Total* | **120** | | **0.00** | | **1.50** | | **7.50** | | **36.50** | | **-21.50** |
| | *Overall Ranking* | | | **4** | | **3** | | **2** | | **1** | | **5** |
| | ***Weight*** | reflects the relative importance of each evaluation criteria within each project environment, and the relative importance of each project environment in relation to one another | | | | | | | | | | |
| | ***Score*** | reflects the effect of each alternative as it relates to the evaluation criteria in comparison to Do Nothing (baseline); -2 denotes a significant negative impact, 0 denotes no impacts and +2 denotes a significant positive impact | | | | | | | | | | |
| | ***Weighted Score*** | product of weight x score | | | | | | | | | | |

### 6.2.1 Alternative A – Do Nothing

Under this alternative, only basic improvements and maintenance needs of the bridge are to be addressed, which will essentially maintain the status quo. No structural improvements or changes to the bridge would be made to solve the problem/opportunity statement.

The bridge will remain as a single lane constriction, the barriers will remain substandard, and the load restriction will remain in place.

Traffic will continue to be restricted by the load limit, and eventually the load restriction will increase until full closure of the structure is required which will impact traffic movement. The current 20 tonne limit for single unit vehicles restricts the use of the bridge for vehicles such as gravel trucks, larger fire trucks, and concrete trucks, but does not restrict the use by school buses or smaller emergency vehicles, and as this load limit is reduced further school buses and smaller fire trucks would be restricted from using the bridge. Snow ploughs may be restricted under the 20 tonne posting depending on gross vehicle weight, and as the load restriction becomes more restrictive snow removal options will become limited to a pickup truck with a blade. This will require modifications to the snow removal operations of the Town.

The Do Nothing alternative does not adequately address the problem statement. While costs will be negligible for this alternative in the short-term, long-term maintenance costs will become substantial, especially as the bridge ages. The structure is approaching 100 years old and has exceeded its expected service life. A benefit to this alternative is that no negative impacts will be endured by the natural environment (although such impacts are expected to be minimal with the other alternative solutions when appropriately mitigated). This alternative does not address public safety, or structural inadequacy issues, and thus does not consider the problem statement and does not achieve the goals of the study.



### 6.2.2 Alternative B – Rehabilitate the Existing Bridge

Under this alternative, some structural deficiencies will be addressed. Considering the age of the bridge, it is likely that additional structural concerns will become apparent in the near future. In order to extend the lifespan of the bridge, rehabilitation works will be extensive, and are expected to be limited in terms of the overall extension of service life. The bridge has previously undergone at least two major rehabilitations in the past 30 years, with the last repair occurring just under 10 years ago and showing signs of required maintenance.

Concrete repairs would be completed on all structure elements, the railing would be replaced with an upgraded barrier.

Existing drawings are available and indicate that the initial design load was lower than the current standards. Minor improvements to the load restriction may be possible with strengthening of the

existing members, but it is unlikely that it would be economical to complete the required improvements to significantly improve or remove the load restriction altogether.

Due to the single-lane configuration, construction work is expected to require a temporary road closure at the bridge with traffic detours.

Other than the Do Nothing alternative, this option is the least costly from a capital perspective, but it is most costly from a maintenance cost perspective with the exception of maintaining the existing bridge and constructing a new bridge adjacent to the existing. While some structural deficiencies will be addressed with this alternative, considering the age of the bridge, it is likely that additional structural problems will become apparent in the near future. To extend the lifespan of the bridge, rehabilitation works will need to be extensive and ongoing maintenance effort will be required, increasing the economic impact.

This alternative does however best maintain the local heritage value of the bridge asset identified by the cultural heritage evaluation report.

### 6.2.3 Alternative C1 – Remove and Replace with Single Lane Bridge

Under this alternative, the existing bridge would be removed and replaced with a new bridge. Based on the existing traffic volumes and posted speed limit, replacement with another single lane bridge will not meet current standards. The existing speed limit and Average Annual Daily Traffic (AADT) exceed the standards for a single-lane bridge according to the MTO Structural Manual's guidelines for low-volume roads.

Roadside safety will be improved by the installation of new roadside barriers, and the load posting will be removed.

Replacement of the structure will require temporary full road closure, which can be managed with detour routes.

Replacement of the existing structures is more expensive and intrusive than the do nothing or rehabilitation alternatives. Impacts to the environment are increased, since work will occur within and adjacent to the watercourse. However, these impacts can be mitigated through best management practices. Considering the condition of the bridge, replacement will fully address the problem statement, including safety, structural condition, performance, and compliance with current design standards.

The removal of the existing bridge will result in the removal of an asset identified as having local heritage value. This impact can be mitigated through various methods to document the original asset and incorporation of aesthetic features or plaques to commemorate the heritage value provided by the bridge. A heritage impact assessment will be completed to provide recommendations.

This alternative does not fully consider the problem statement, as the new bridge would not meet current standards.

### 6.2.4 Alternative C2 – Remove and Replace with Two Lane Bridge

Alternative C2 has similar impacts and constraints to Alternative C1, with a higher initial capital cost than Alternative C1.

Under this alternative, the existing bridge would be removed and replaced with a new bridge. A two-lane bridge to match the geometry of the approach road would be installed to meet current design standards.

The new structure will have a larger footprint than the existing to accommodate the two-lane configuration. The impacts to the environment are increased with a two-lane structure, as it will require more extensive excavation, however it is not expected to require property acquisition.

Roadside safety will be improved by the installation of new roadside barriers, and the load posting will be removed.

Construction of a two-lane bridge will improve the safety of the crossing and bring the asset up to current standards. This alternative fully addresses the problem statement.

### 6.2.5 Alternative D – Construct a New Single Lane Bridge Adjacent to The Existing Bridge

In consideration of the expected heritage value of the bridge, this alternative involves the installation of a new bridge along a new alignment while leaving the existing bridge in place.

The existing municipal right-of-way is noted to be approximately 28.75 m wide at the bridge in the York Region GIS Mapping utility. It reduces to 23 m in width approximately 68 m from the west end of the bridge. The road appears to generally be centred within the right-of-way. The current road alignment is straight and relatively flat, introducing a second bridge will require the introduction of a horizontal curve to move traffic onto the new bridge. A new two-lane bridge will not fit within the current right-of-way and will require the purchase of additional property. A new single lane bridge could be installed but would not meet current geometric standards due to traffic volumes requiring two lanes, therefore the continued use of the existing bridge for one direction would be required.

The new structure configuration will have a larger footprint than the existing to accommodate a new bridge and maintaining the existing bridge.

Roadside safety will be improved by the installation of new roadside barriers, and the load posting will be removed for one direction only.

Traffic would continue to use the existing bridge throughout construction of the new bridge negating the need for a road closure and detour. The existing bridge would remain triple load posted at 20 tonnes, 21 tonnes, and 27 tonnes. The bridge will continue to deteriorate, and the load limit will in time need to be reduced. At one point, the bridge would need to be replaced with a new single lane bridge.

Construction of a new single lane bridge will improve the safety of the crossing, however it does not fully address the problem statement as it does not minimize the impacts to the environment.

## 6.3 PRELIMINARY PREFERRED ALTERNATIVE

In consideration of the above, Alternative A is not considered suitable as it does not address the problem statement. Existing deficiencies will persist and continue to worsen over time if the structure is left alone, resulting in eventual road closure.

Alternative B is expected to have positive benefits such as increasing the service life of the existing bridge, and improving roadside protection, but it will not allow elimination of the load posting across the bridge. The bridge will remain as a single lane constriction on a two-lane collector road, and although the roadway width across the bridge could be reduced to suit the maximum recommended single lane width, it will remain substandard for the traffic volumes, posted speed, and road class. The future maintenance costs will also continue to be very high. For these reasons, the extent of the improvements is not considered sufficient to fully address the problem statement.

Alternatives C1 and C2 will both address the issues within the problem statement, as the safety and condition of the existing crossing will be improved. Both alternatives allow for elimination of load posting and improvement of roadside and approach safety. However, the design traffic volumes, road class, and design speed exceed the standards for a single lane bridge. For this reason, Alternative C2 fully addresses the problem statement whereas Alternative C1 does not.

Alternative D also addresses the problem statement; however, it will require a significant increase to the footprint of the bridge site resulting in greater environmental impacts and will continue to require ongoing maintenance of the original structure until it eventually needs to be closed or replaced.

Based on the evaluation of the above-noted alternatives, Alternative C2, removing the existing bridge and replacing with a two-lane bridge, best resolves the problem statement.

This preliminary preferred solution is based on an evaluation completed with information received prior to May 1, 2023, and does not reflect the comments received following the Public Information Centre.

# 7 Public Information Centre (PIC)

Under a Schedule B Class EA Study there are two points of mandatory stakeholder contact – notification of the public at commencement of the study to invite comment, and notification at the completion of the study to advise of the results. Based on the anticipated interest in this project, the Town opted to proceed with the non-mandatory Public Information Centre (PIC) in order to acquire more in-depth public feedback and determine the solution that best meets the needs of the community, Town, and environment. For this reason, a non-mandatory Public Information Centre (PIC) was held inviting stakeholder comment and input at the end of Phase 2.

## 7.1 NOTIFICATION

In accordance with the Class EA guidelines, notification of the PIC was issued on April 27, 2023 to all property owners (as determined from Town of Georgina records) on Old Shiloh Road between Weir's Sideroad and Victoria Road and residents of Victoria Road and Weir's Sideroad. Stakeholders include review agencies and the public and thus notices were directed to each, in the same manner in which the Notice of Commencement was circulated (copies of the notice are provided in Appendix C).

These notices were also submitted to the appropriate review agencies, stakeholder groups and special interest groups, a listing of which is provided in Appendix C.

Notices were posted on the Town website, starting on April 26th, 2023. Notices were published in the local newspaper, the Georgina Advocate on May 11, 2023 preceding the PIC.

In addition, the date of the public meeting was advertised on the project signs installed at each approach to the bridge and directing interested parties to visit the project website for more information.

## 7.2 PUBLIC INFORMATION CENTRE

The purpose of the PIC was to provide information to the public and agencies and seek their input with respect to the following:

- Identification of the problem;
- Development and evaluation of alternative solutions to the problem;
- General inventory of the affected environments in order to determine the possible impacts; and
- Identification of the preliminary recommended alternative.

The PIC was held on Wednesday May 17, 2023 from 5:00 PM to 7:00 PM at the Udora Community Hall. No formal presentation was made; people were invited to drop by to review the display boards of the presentation material, which were displayed around the room's perimeter, and ask questions. Representatives from the Town and Tatham Engineering Limited were in attendance to answer any questions and provide assistance as necessary.

Fourteen people signed in as attending the PIC.

Various display boards were prepared for viewing by the public (as provided in Appendix G), which addressed the following:

- The Municipal Class EA process and those tasks relevant to this study;
- Existing conditions;
- Existing concerns;
- Hydraulic conditions;
- Alternative solutions for improvements to the bridge;
- Replacement criteria and options;
- The remaining steps to completion; and
- Contact details for additional information.



## 7.3 PUBLIC COMMENT

Comments were received from 49 stakeholders either at the PIC or shortly thereafter via the comment sheets and by email.

The comment period following the PIC was extended to June 14, 2023, following a request from interested residents for more time to review the presented material.

**Table 3** summarizes all comments that were received throughout the study process, including comments received prior to the PIC.

**Table 3: Public Comment Summary**

| # OF TIMES RECEIVED | COMMENT |
|---|---|
| 21 | Expressed concerns regarding increased traffic volumes and speeds on road |
| 13 | Heritage value should be maintained through the rehabilitation of the existing bridge |
| 11 | Expressed interest in increased pedestrian safety measures |
| 4 | New structure should accommodate wider farm equipment and eliminate load restriction |
| 3 | Heritage value could be maintained through sympathetic design elements & documentation |
| 3 | Expressed concerns with environmental impacts of widened bridge footprint |
| 3 | Would like to maintain the load restriction |
| 2 | Expressed need to maintain or increase hydraulic capacity and clearance to water for canoeists |
| 2 | Concern with duration of construction and associated detours |
| 1 | Would like trail access maintained |
| 1 | Expressed concerns with construction costs |



Some of the respondents further included their preferred alternatives, as noted in **Table 4** below.

**Table 4: Public Preferences**

| | |
|---|---|
| Alternative A – Do Nothing | 5 |
| Alternative B – Rehabilitate the Existing Bridge | 21 |
| Alternative C1 – Remove and Replace with Single Lane Bridge | 4 |
| Alternative C2 – Remove and Replace with Two-Lane Bridge | 10 |
| Alternative D – Construct a New Bridge Adjacent to the Existing Bridge | 3 |

The review of the feedback following the Public Information Centre resulted in an adjustment of the weighting of a number of assessment criteria to better represent the importance and impact of each criterion in assessing the alternatives. Section 7 of this document summarizes the

adjustments that were made. Some specific points of feedback that most impacted the weight of the criteria are as follows:

- Heritage value of the bridge is important to the community; and
- Farm equipment is currently needing to detour due to the narrow structure and load restrictions.

Although there were a number of comments related to the traffic operations, this criteria has a significant weighting which was not adjusted.

A copy of the letter response and FAQ sheet distributed to those that submitted comments can be found in Appendix G.

## 7.4 AGENCY COMMENT

In follow-up to the Notice of Study Commencement and Notice of Public Information Centre, comments were received from the Lake Simcoe Region Conservation Authority (LSRCA), and the Ministry of Environment Conservation and Parks.

### 7.4.1 LSRCA

This site is located within an area that is entirely regulated by the LSRCA under Ontario Regulation 179/06 made pursuant to the *Conservation Authorities Act (CA Act)*. The site includes the following hazards:

- Regulatory floodplain hazard of the Pefferlaw River.
- Meanderbelt hazard of the Pefferlaw River.
- Unevaluated Wetland and lands adjacent.
- Significant woodland (map attached only as reference as the Town will be reviewing natural heritage related policies associated with the bridge works).

They confirmed that the bridge works will require a permit under the CA Act.

The LSRCA provides the following suggestions to avoid or mitigate impacts associated with the potential bridge rehab/replacement:

- Existing drainage and conveyance be maintained and or improved with no change to upstream or downstream flows to avoid impacts to control of flooding and erosion.
- No increase in velocities that result in increased erosion.
- Quantity control/peak flow controls be applied to avoid impacting erosion and floodplains in accordance with LSRCA Stormwater Management Guidelines (on LSRCA website).

- Any fill placement in the floodplain be avoided or compensated for with an incremental cut.
- Maintain existing grades within the regulated area.
- Proper erosion and sediment control measures be undertaken to prevent sediment migration and impact to watercourses.
- Any interference with wetlands be avoided or supported with a supporting Environmental Impact Study.

A copy of the LSRCA HEC-RAS model was obtained and utilized for the completion of the hydrologic and hydraulic analysis.

It was also recommended that further consultation through the detailed design or environmental discipline studies be undertaken.

### 7.4.2 MECP

The MECP advised that where the Crown's duty to consult with Aboriginal communities is triggered in relation to the proposed project, they are delegating the procedural aspects of rights-based consultation to the Town.

They also provided a list of communities identified as potentially affected by the proposed project:

- Chippewas of Rama First Nation
- Chippewas of Georgina Island First Nation
- Beausoleil First Nation
- Alderville First Nation
- Curve Lake First Nation
- Hiawatha First Nation
- Mississaugas of Scugog Island First Nation

If any archaeological studies have been undertaken or work-related archaeological resources are required, communication shall also include:

- Huron-Wendat

They also advised that the Director of Environmental Assessment Branch is to be contacted under the following circumstances after initial discussions with the communities identified above:

- Aboriginal or treaty rights impacts are identified to you by the communities;

- You have reason to believe that your proposed project may adversely affect an Aboriginal or treaty right;
- Consultation with Indigenous communities or other stakeholders has reached an impasse; or
- A Section 16 Order request is expected based on impacts to Aboriginal or treaty rights.

In addition, they requested that a draft copy of the project file report be sent to them for review prior to the filing of the final report, allowing a minimum of 30 days for the ministry's technical reviewers to provide comments.

Copies of the following documents were also provided:

- Areas of Interest Mapping:
  - Regulated Area.
  - Floodplain.
  - Meanderbelt.
  - Wetland.
  - York Significant Woodland.
- Client's Guide to Preliminary Screening for Species and Risk.
- A Proponent's Introduction to the Delegation of Procedural Aspects of Consultation with Aboriginal Communities.

# 8 Traffic Volumes

During the PIC, some residents noted that the traffic volumes used in the initial evaluation of alternatives appeared to be higher than what they have observed. In response, following the PIC the Town undertook a 14-day study to provide updated traffic counts along Old Shiloh Road in the vicinity of the bridge.

An armadillo tracker unit was installed on May 20, 2023, and collected traffic speed and volume data until June 3, 2023.

During this period, a total of 8,847 vehicles were counted, with 96% noted to be of medium size such as a sedan. The average daily traffic volumes over a 7-day period being 556. Using the data collected, the AADT volumes were calculated at 554. This value is lower than the 919 previously recorded in the Town's files.

The road is posted with a regulatory speed limit of 60 km/hr. Over the course of the study, the average recorded speed was 56.42 km/hr, and the 85$^{th}$ percentile speed was noted to be 68 km/hr.

The two criteria for determining suitability for the installation of a single lane bridge under current standards relate to the design speed and the traffic volumes. On roads designed for speeds less than or equal to 60 km/hr and AADT values of 200 or less, a single lane bridge can be considered as the probability of 2 vehicles meeting on the bridge is low. If the volumes are between 200 and 400 AADT and the design speeds are 40 km/hr or less, a single lane bridge can also be considered.

Although it is within the Town's authority to override the criteria noted above to install a single lane bridge where no operational or safety issues have been noted to date, in review of the updated traffic volumes, it is noted that these 2023 volumes are currently 38.5% higher than the limit of 400 on roads designed for speeds less than 40 km/hr.

New bridges are to be designed to last 75 years with appropriate maintenance over the course of their life cycle. As such, the design needs to account for not only current traffic volumes but also projected traffic volumes for the future in order to ensure the Town is not committed to a condition that becomes unsafe in the future due to growth. Using a 0.5% to 2% annual growth rate, the projected AADT will be between 805 and 2446 in 75 years, and between 582 and 675 in the next 10 years. As such, over the life of a new structure, the traffic volumes could far exceed the capacity of a single lane bridge resulting in the need for the Town to consider early replacement to accommodate the traffic and improve safety.

Review of the recorded average speeds encountered on the roadway indicate speeding is not currently an issue as many motorists are slowing down at the bridge. The settlement on the approaches has resulted in a bump at each end, and the roadway constriction and potential to have to yield to oncoming traffic could be contributing to this.

Some residents have expressed an interest in maintaining a single lane bridge at this location in order to provide traffic calming. With a 75-year design life and a significant capital cost associated with a new bridge, it is recommended that alternate measures such as enforcement be considered should speeding at this location become an issue.

# 9 Life Cycle Cost Analysis

It is rarely the case that the capital cost of a structure is a one-time cost. A structure requires periodic maintenance, rehabilitation, replacement of various components and, eventually, replacement of the structure itself throughout its life cycle. A comparison of the net present values of projects can give an indication of which one will be most economical overall. The net present value is the value of the rehabilitation and replacement alternative expended at future dates throughout the life cycle of the alternative converted back to today's dollars. A discount rate is used to obtain the net present value of each alternative. This discount rate is the rate of interest, expected rate of return on investment, or cost of borrowing, used to discount future cash flows of an investment such as the bridge rehabilitation or replacement and continued maintenance costs.

Following the review of public comments received with respect to this project, two of the alternatives were identified as being preferred by the community: Alternative B - rehabilitation of the existing bridge, and the Alternative C2 - replacement with a two-lane bridge. To better understand the overall financial impacts of these alternatives over the life of the bridge, the Town has expanded the study to include a life cycle cost analysis of these two alternatives.

All costs are estimated in 2023 dollars in the analysis, and annual costs are computed over a long-term planning horizon and summarized through life cycle cost analysis. The life cycle for the analysis is taken as 75 years, based on the required design life of new bridges noted in the Canadian Highway Bridge Design Code (CHBDC).

Costs include capital construction costs and operating and maintenance (O&M) costs for the bridge. The alternative capital cost estimates as well as the life cycle costs and the years at which they were applied for each alternative are summarized in Appendix H. Residual values for all alternatives are based on all rehabilitation and replacement requirements for the individual alternative. The residual value of Alternative B assumes the structure would be replaced in year 10. The residual value of Alternative C2 assumes that full structure replacement would not be required until year 76.

The Structural Financial Analysis Manual (SFAM) prepared by the MTO recommends a discount rate of 6%. However, a sensitivity analysis was completed by completing the analysis using various discount rates of 4%, 6% and 8%. The results are summarized in Table 5.

**Table 5: Summary of Net Present Values (NPV) with Various Discount Rates (DR)**

| | Alternative | Initial Cost | Costs Years 1-75 | Total Cost | NPV (4% DR) | NPV (6% DR) | NPV (8% DR) |
|---|---|---|---|---|---|---|---|
| B | Rehabilitate Existing Bridge | $1,877,000 | $9,342,000 | $11,219,000 | $6,637,000 | $5,733,000 | $5,088,000 |
| C2 | Remove and Replace with Two Lane Bridge | $4,883,000 | $3,175,000 | $8,058,000 | $5,534,000 | $5,202,000 | $5,046,000 |

**Notes**

1. costs rounded to nearest $1,000

The life-cycle cost analysis using a 4%, 6%, or 8% discount rate indicates the more economical alternative over the life of the structure is to replace the bridge with a two-lane structure versus rehabilitation. However, as the discount rate is increased to 8% the NPV values become closer and could be considered equivalent. The overall cost to the Town over the 75-year life remains lower when replacement is completed sooner.

# 10 Re-Evaluation of Alternatives

Following the Public Information Centre, the preliminary assessment was revisited to consider comments and input received from the various stakeholders.

In consideration of the above, Alternative A Do Nothing is not considered suitable as it does not address the problem statement. Existing deficiencies will persist and continue to worsen over time if the structure is left alone, resulting in eventual road closure.

Alternative B Rehabilitate the Existing Bridge is expected to have positive benefits such as increasing the service life of the existing bridge, and improving roadside protection, but it will not allow elimination of the load restrictions on the bridge. The bridge will remain as a single lane constriction on a two-lane collector road, and although the roadway width across the bridge could be reduced to suit the maximum recommended single lane width, it will remain substandard for the traffic volumes, posted speed, and road class. The future maintenance costs will also continue to be very high. For these reasons, the extent of the improvements is not considered sufficient to fully address the problem statement.

Alternatives C1 Remove and Replace with Single Lane Bridge and C2 Remove and Replace with Two-Lane Bridge will both address the issues within the problem statement, as the safety and condition of the existing crossing will be improved. Both alternatives allow for elimination of the load posting and improvement of roadside and approach safety. However, the design traffic volumes, road class, and design speed exceed the standards for a single lane bridge. For this reason, Alternative C2 fully addresses the problem statement whereas Alternative C1 does not.

Alternative D Construct a New Bridge Adjacent to the Existing Bridge also addresses the problem statement; however, it will require a significant increase to the footprint of the bridge site resulting in greater environmental impacts and will continue to require ongoing maintenance of the original structure until it eventually needs to be closed or replaced. As such, this alternative is less desirable than Alternative C2.

## 10.1 CONSIDERATION OF STAKEHOLDER INPUT

During the PIC, some residents noted that the traffic volumes used in the initial evaluation of alternatives appeared to be higher than what they have observed. In response, following the PIC the Town undertook a 14-day study to provide updated traffic counts along Old Shiloh Road in the vicinity of the bridge. Using the data collected, the AADT volumes were calculated at 554. This value is lower than the 919 previously recorded in the Town's files, however it is greater than recommended for a single lane structure with a design speed of 60 km/hr (200 AADT). Using a 0.5% to 2% annual growth rate, the projected AADT will be between 805 and 2446 in 75 years, and

between 582 and 675 in the next 10 years. As such, over the 75-year design life of a new structure, the traffic volumes could far exceed the capacity of a single lane bridge resulting in the need for the Town to consider early replacement to accommodate the traffic and improve safety.

Old Shiloh Road has an AADT of 554, which is greater than recommended for a single lane structure and is expected to increase over time. As such alternatives A, B, C1 would not meet current geometric design standards and would result in a reduced level of service and safety for users. Alternative C2, Remove and replace with a Two-Lane Bridge will meet current design standards and remove the constriction to traffic. Alternative D will also provide two lanes of traffic and meet the minimum design standards.

Some residents also expressed the opinion that the heritage value of the bridge should be maintained through the rehabilitation of the existing bridge. In response, the Town reviewed the weighting and importance applied to the associated evaluation criteria. In addition, as discussed in section 9, a life cycle cost analysis was completed to further evaluate the impact of delaying the replacement and maintaining the existing structure for as long as possible. Ultimately over a 75-year life cycle, the overall cost to the Town was reduced by completing the replacement sooner. In addition, the level of service to the community is improved sooner.

With regards to maintaining the heritage value of the bridge Alternatives A, B and D would best address this comment, however they will only limit the impact over a short term and will result in eventual replacement or closure of the bridge. While Alternatives C1 and C2 result in immediate removal of the heritage bridge, there are options available to mitigate the impact to the heritage value which are discussed further in sections 14 of this report.

There were also comments received in relation to improving the safety for pedestrians as well as accommodating wider farm equipment as well as eliminating the load restrictions. Bridge replacement with a structure that meets the current geometric design standards will provide a much wider bridge and side clearances from the edge of lane to the curb that would match a minimum shoulder width. This will improve pedestrian safety to match the level of the approach road, and permit farm equipment to pass. There is also an opportunity to consider the implementation of additional pedestrian safety measures such as a sidewalk or multi-use path.

With respect to increased safety of pedestrians and the use of the bridge by farm equipment, Alternatives A and B do not provide any opportunity to incorporate safer conditions for pedestrians or widening or significant strengthening of the structure to permit use by large farm equipment. Alternatives C1 and D provide opportunity to incorporate pedestrian considerations, of which some may provide the required side clearance for wider farm equipment to utilize the bridge when pedestrians are not crossing. Alternative C2 provides the most opportunity for pedestrian consideration and use by large farm equipment simultaneously.

Following the revised weighting and scoring of all alternatives, ***the technically preferred alternative remains alternative C2, replacement of the bridge with a new two lane*** bridge. Although it is noted that Alternative B's overall score improved, and the spread between Alternative B and C2 decreased, the overall ranking of the alternatives remains unchanged.

Table 6 summarizes the updated evaluation, and details of the changes in the assessment presented are detailed in Section 7.1.

## 10.2 ASSESSMENT OF ALTERNATIVE SOLUTIONS

In consultation with the Town, the evaluation matrix scoring was updated to better reflect the positive and negative impacts of the baseline Alternative A, do nothing rather than remaining as 0.0 across all environments for consideration as a neutral baseline, with the impact scores of the other alternatives being set relative to that baseline of 0.0. As such, the scoring of the other alternatives was also updated accordingly to reflect this change.

### 10.2.1 Score

Traffic Operations – the scores associated with Alternative C2 were reduced for consideration of the comments received regarding the current operations at the bridge and the reduced traffic volumes confirmed during the traffic counts. Although there will still be a significant improvement in traffic operations in terms of meeting standards, the improvement relative to the existing operations was considered to be less.

Maintenance and Snow Removal – the scores associated with Alternative C2 was reduced for consideration of the score assigned to Alternatives C1 and D and the relative impact of improved access for snow removal equipment as well as the minor increase in maintenance requirements for the larger bridge.

Future Maintenance Costs – the scores associated with Alternatives C1 and C2 were reduced for consideration of the larger negative impact on future maintenance costs associated with maintaining the existing bridge under Alternatives B and D.

### 10.2.2 Weight

The most significant modifications to the assessment of the alternatives, which addressed public comments, related to the weighting factors employed, particularly for the social environment and the cultural heritage environment. The weight of noise/construction impacts, archaeological impacts, and First Nations impacts was decreased while emergency services, community impacts (such as farm equipment access), and heritage impacts were increased to reflect a greater emphasis on these impacts.

### 10.2.3 Results

Following the revised weighting and scoring of all alternatives, ***the technically preferred alternative remains Alternative C2, replacement of the bridge with a new two-lane bridge***. Although it is noted that Alternative B's overall score improved, and the spread between Alternative B and C2 decreased, the overall ranking of the alternatives remains unchanged.

**Table 6: Revised Evaluation of Alternative Solutions with Weighted Scoring (red text indicates a variation from the initial scoring)**

| | *Assessment Criteria* | Weight | Alternative A | | Alternative B | | Alternative C1 | | Alternative C2 | | Alternative D | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Do Nothing | | Rehabilitate the Existing Bridge | | Remove and Replace with Single Lane Bridge | | Remove and Replace with Two Lane Bridge | | Construct a New Bridge Adjacent to the Existing Bridge | |
| | | | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score |
| *Physical Environment* | road geometry and alignment | 6 | -2.0 | -12.0 | -2.0 | -12.0 | -2.0 | -12.0 | 2.0 | 12.0 | 1.0 | 6.0 |
| | structural stability and load restrictions | 10 | -2.0 | -20.0 | -1.0 | -10.0 | 2.0 | 20.0 | 2.0 | 20.0 | 1.5 | 15.0 |
| | roadside protection | 6 | -1.0 | -6.0 | 1.0 | 6.0 | 2.0 | 12.0 | 2.0 | 12.0 | 1.5 | 9.0 |
| | traffic operations | 7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 14.0 | 1.5 | 10.5 |
| | maintenance and snow removal | 6 | -2.0 | -12.0 | -1.0 | -6.0 | 0.5 | 3.0 | 2.0 | 12.0 | 0.5 | 3.0 |
| | **Sub-Total** | **35** | | **-50.0** | | **-22.0** | | **23.0** | | **70.0** | | **43.5** |
| *Natural Environment* | fisheries/aquatic impacts | 6 | 0.0 | 0.0 | -0.5 | -3.0 | -1.0 | -6.0 | -1.5 | -9.0 | -1.0 | -6.0 |
| | wildlife/terrestrial impacts | 6 | 0.0 | 0.0 | -0.5 | -3.0 | -1.0 | -6.0 | -1.5 | -9.0 | -1.0 | -6.0 |
| | hydrology & hydraulics | 6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 3.0 | 0.5 | 3.0 | 0.0 | 0.0 |
| | vegetation impacts | 3 | 0.0 | 0.0 | 0.0 | 0.0 | -0.5 | -1.5 | -1.0 | -3.0 | -2.0 | -6.0 |
| | water quality | 4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | **Sub-Total** | **25** | | **0.0** | | **-6.0** | | **-10.5** | | **-18.0** | | **-18.0** |
| *Social Environment* | noise/construction impacts | 3 | 0.0 | 0.0 | -0.5 | -1.5 | -1.0 | -3.0 | -1.0 | -3.0 | -1.0 | -3.0 |
| | emergency services | 6 | -1.0 | -6.0 | -1.0 | -6.0 | 1.0 | 6.0 | 2.0 | 12.0 | 1.5 | 9.0 |
| | community impacts | 6 | 0.0 | 0.0 | 0.5 | 3.0 | 1.0 | 6.0 | 1.5 | 9.0 | -1.0 | -6.0 |
| | **Sub-Total** | **15** | | **-6.0** | | **4.5** | | **9.0** | | **18.0** | | **0.0** |
| *Cultural Heritage Environment* | archaeological impacts | 4 | 0.0 | 0.0 | -0.5 | -2.0 | -1.0 | -4.0 | -1.5 | -6.0 | -2.0 | -8.0 |
| | heritage impacts | 6 | 0.0 | 0.0 | 2.0 | 12.0 | 1.0 | 6.0 | 0.5 | 3.0 | 1.5 | 9.0 |
| | first nations impacts | 5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | **Sub-Total** | **15** | | **0.0** | | **10.0** | | **2.0** | | **-3.0** | | **1.0** |
| *Weight* | reflects the relative importance of each evaluation criteria within each project environment, and the relative importance of each project environment in relation to one another | | | | | | | | | | | |
| *Score* | reflects the effect of each alternative as it relates to the evaluation criteria in comparison to Do Nothing (baseline); -2 denotes a significant negative impact, 0 denotes no impacts and +2 denotes a significant positive impact | | | | | | | | | | | |
| *Weighted Score* | product of weight x score | | | | | | | | | | | |

| | *Assessment Criteria* | Weight | Alternative A | | Alternative B | | Alternative C1 | | Alternative C2 | | Alternative D | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Do Nothing | | Rehabilitate the Existing Bridge | | Remove and Replace with Single Lane Bridge | | Remove and Replace with Two Lane Bridge | | Construct a New Bridge Adjacent to the Existing Bridge | |
| | | | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score |
| *Economic Environment* | construction costs | 10 | 0.0 | 0.0 | -0.5 | -5.0 | -1.0 | -10.0 | -1.5 | -15.0 | -2.0 | -20.0 |
| | future maintenance costs | 10 | 0.0 | 0.0 | -1.5 | -15.0 | -1.0 | -10.0 | -0.5 | -5.0 | -2.0 | -20.0 |
| | property acquisition costs | 5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.0 | -5.0 |
| | **Sub-Total** | **25** | | **0.0** | | **-20.0** | | **-20.0** | | **-20.0** | | **-45.0** |
| *Climate Change* | impact on climate change | 2 | 0.0 | 0.0 | -0.5 | -1.0 | -1.0 | -2.0 | -1.5 | -3.0 | -1.0 | -2.0 |
| | resiliency to climate change | 3 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 3.0 | 1.0 | 3.0 | 0.0 | 1.5 |
| | **Sub-Total** | **5** | | **0.0** | | **-1.0** | | **1.0** | | **0.0** | | **-2.0** |
| | *Total* | **120** | | **-56.0** | | **-34.5** | | **4.5** | | **47.0** | | **-20.50** |
| | *Overall Ranking* | | | **5** | | **4** | | **2** | | **1** | | **3** |

| | |
|---|---|
| ***Weight*** | reflects the relative importance of each evaluation criteria within each project environment, and the relative importance of each project environment in relation to one another |
| ***Score*** | reflects the effect of each alternative as it relates to the evaluation criteria in comparison to Do Nothing (status quo); -2 denotes a significant negative impact, 0 denotes no impacts and +2 denotes a significant positive impact |
| ***Weighted Score*** | product of weight x score |

# 11 Stage 2 Archaeological Assessment & Heritage Impact Assessment

Following the completion of the Stage 1 Archaeological Assessment and the Cultural Heritage Evaluation Report (CHER), which were completed and documented under Technical Memorandum No. 1, further studies were completed. This section will discuss the results of the Archaeological Assessment and Heritage Impact Assessment that were completed.

## 11.1 AMENDED ARCHAEOLOGICAL ASSESSMENT

The previously completed Stage 1 archaeological assessment that was completed as a desktop background study in January 2023 recommended the completion of a Stage 2 assessment. AMICK Consultants Ltd. completed a property inspection at the project site in November 2023 with the intention of completing a Stage 2 Archaeological Assessment. During the course of the inspection, it was noted that the area no longer retains potential for archaeological resources due to the previous extensive subsurface disturbances and presence of steep slopes throughout the study area.

The following are the results summarized in the archaeological assessment executive summary:

> *"The study area has been identified as a property that exhibits potential to yield archaeological deposits of cultural heritage value or interest (CHVI). The objectives of the Stage 1 Background Study have therefore been met and in accordance with the results of this investigation, the following recommendations are made:*
>
> 1. *Due to previous extensive subsurface disturbances and presence of steep slopes throughout the entirety of the study area, the proposed undertaking no longer retains potential for archaeological resources.*
> 2. *No further archaeological assessment of the study area is warranted.*
> 3. *The Provincial interest with respect to archaeological resources within the limits of the study area has been addressed."*
>
> *AMICK Consultants Ltd., December 12, 2023*
> *MCM# P058-2273-2022*

The amended Stage 1 archaeological assessment report is included in Appendix E. A copy of the report has been submitted to the Ministry of Citizenship and Multiculturalism (MCM).

## 11.2 HERITAGE IMPACT ASSESSMENT

Based on the results of research, site investigation and application of the criteria from Ontario Regulation 9/06, the Old Shiloh Road bridge was determined to have elements of moderate Cultural Heritage Value or Interest (CHVI). The results of the Cultural Heritage Evaluation Report (CHER) are documented in Technical Memorandum No. 1.

Based on the conclusions of the CHER and that the existing bridge does not meet current road or bridge safety standards and is operating beyond its expected lifespan, the following recommendations were made by the heritage consultant for consideration by the Municipality during detailed design of the replacement structure:

1. *If the existing bridge is to be replaced, it is recommended that the Town undertake full recording and documentation of the existing structure in situ prior to removal of the existing bridge structure.*
2. *If the existing bridge is to be replaced, it should be reinstated in the same general location to preserve the historic crossing.*
3. *The Cultural Heritage Value of the Bridge could be commemorated through reflection of the architectural form of the existing bridge in the design of the replacement bridge.*
4. *The Cultural Heritage Value of the Bridge could be remembered with a commemorative monument, memorial, or art installation.*
5. *The Old Shiloh Road Bridge HIA should be consulted when considering viable alternatives to maintain the function of this bridge while respecting its CHVI.*
6. *This report should be filed with the Town of Georgina as part of the documentation for the EA.*
7. *This report should be filed with the Ministry of Citizenship and Multiculturalism (MCM) for review and comment as supporting documentation for the EA.*

*AMICK Consultants Ltd., January 22, 2024*

The practicality and affordability of the alternative recommendations 2 and 3 related to the commemoration of the heritage value are further discussed in Section 6.5.

# 12 Natural Environment Impact Study

Riverstone Environmental completed an additional field investigation and prepared an Environmental Impact Study Report. The report was prepared as an update to the preliminary assessment of site-specific natural heritage features and functions that may be present proximate to the bridge, which was presented in Technical Memorandum No. 1. The updated assessment refines the impact assessment focusing on potential impacts of the preferred solution selected through the Environmental Assessment. Several preliminary mitigation planning measures are recommended to ensure that works do not result in a net negative impact to the natural environment. The recommended measures are listed below.

Prepare and submit a request for project review to the Department of Fisheries and Oceans (DFO) and adhere to all requirements of DFO in project planning and implementation.

Prepare a post-construction stabilization and restoration plan for any new surfaces, embankments, or areas otherwise directly disturbed by construction staging. Apply a restoration seed mix composed of native species only (except for stabilizing cover crop).

Minimize riverbank and bed hardening to the extent possible (if replacement structures are required, these should be designed to maintain the existing natural substrates and gradients and allow continued fish passage, i.e., open bottom).

Minimize removal of overhanging vegetation to the extent possible.

In-water works (if required) and diversion of flows should avoid relevant fisheries timing windows, which has been confirmed with MNRF as March 15 to July 15 of any given year.

Implement sediment and erosion control measures as per applicable best management practices to isolate the development footprint.

Sediment fencing must be constructed of heavy material and solid posts and be properly installed (trenched in) to maintain its integrity during inclement weather events.

Additional sediment fencing and appropriate control measures must be available on site so that any breach can be immediately repaired.

Regular inspection and monitoring will be necessary to ensure that the structural integrity and continued functioning of the sediment control measures is maintained (i.e., proper installation is not the only action necessary to satisfy the mitigation requirements).

When construction activities are occurring, and before a precipitation event, an on-site supervisor should be responsible for daily inspections of the sediment and erosion control

measures and record the time and date of inspections, the status of the mitigation measures, and any repairs undertaken.

Removal of non-biodegradable erosion and sediment control materials should occur once construction is complete, and the site is stabilized.

Best Management practices should be utilized with all machinery and fill being imported to the subject property to ensure that material and tracks are free from invasive species (Phragmites australis, etc.).

Machinery should arrive on site in clean condition and is to be checked and maintained free of fluid leaks.

Machinery must be refueled, washed, and serviced within the area isolated by sediment fencing, a minimum of 30 m from wetlands and the top of watercourse bank.

Locate all fuel and other potentially deleterious substances within the area isolated by sediment fencing, a minimum of 30 m from wetlands and the top of watercourse bank.

Minimize vegetation removal and disturbance to the extent possible, particularly adjacent to the watercourse.

Prepare a Tree Inventory and Planting Plan (TIPP) to determine the extent of potential tree removals following bridge design. Construction exclusion, staging, and tree protection measures should be included in the TIPP for mitigation planning.

Work site isolation must utilize sediment and erosion control that represents suitable wildlife exclusion fencing as per best management practices endorsed by the MECP.

If any individual turtles are encountered within the work area, activities that have the potential to harm such individuals should stop immediately. A qualified biologist or MECP should then be contacted to determine the most appropriate mitigation measure.

Grading and other activities that cause disturbance outside of the development envelope should be minimized to the extent possible during the construction period.

In the spring prior to construction, install temporary bird exclusion mesh underneath bridges to prevent establishment of nests within the season of construction.

In addition, recommended best practice mitigation measures were also provided to be applied as applicable based on the final design to be implemented:

- Consult with LSRCA regarding any requirements for regulated feature offsetting/compensation related to minor encroachment into wetlands. (as applicable)

- Activities and works in water must be designed and planned such that loss or disturbance to aquatic habitat is minimized. (as applicable)
- All in-water work must be isolated and completed in 'dry' conditions, with the work area dewatered. (as applicable)
- Fish salvage must be undertaken prior to any de-watering of stream areas and following any work area flooding. Permits must be obtained from MNRF prior to fish salvage. (as applicable)
- Avoid disturbance to submerged boulders and woody debris material outside of the bridge development footprint and consider opportunities to replace in-stream fish habitat structure post-construction. (as applicable)
- Restore natural bed substrates within and adjacent to replaced crossing structures following construction. (as applicable)
- Temporary storage locations of aggregate/fill material (where required) should be located within the area isolated by sediment fencing. Storage areas should be sited to the west of Pefferlaw Brook. This material is to be contained by heavy-duty sediment fencing, a minimum of 30 m from wetlands and the top of watercourse bank. (as applicable)
- Offloading of construction and aggregate/fill materials (where required) should be completed during fair weather conditions, a minimum of 30 m from wetlands and the top of watercourse bank. (as applicable)
- All stockpiled topsoil/overburden (where required) should be piled in low piles and stabilized as quickly as possible (e.g., erosion-prone areas covered with textile) to minimize the potential for runoff and wind erosion. (as applicable)
- Following preparation of the TIPP, review opportunities for re-planting of trees that require removal. (as applicable)
- Any minor tree removals required to accommodate the bridge replacement design must be completed outside of the season in which endangered bats may be active, i.e., April – Oct, inclusive. If substantial tree removals are determined to be required (i.e., beyond the ROW), additional assessment of habitat usage and significance may be warranted. (as applicable)
- Clearing of vegetation must be restricted to times outside of the period April 15 to October 30. If development and site alteration must occur within the period of April 1 to Aug 30, a nest survey should be conducted by a qualified avian biologist prior to commencement of construction activities to identify and locate active nests of migratory bird species covered by the MBCA. If a nest is located or evidence of breeding noted, then a mitigation plan should be developed to address any potential impacts on migratory birds or their active

nests. Mitigation may require establishing appropriate buffers around active nests or delaying construction activities until the conclusion of the nesting season. If any clearing of mature trees must occur within the period April 15 to Oct 30, further measures may need to be taken with respect to mitigating harm to endangered bats which have the potential occur on site. (as applicable)

# 13 Preferred Alternative Solution

In consideration of the above, Alternative A Do Nothing is not considered suitable as it does not address the problem statement. Existing deficiencies will persist and continue to worsen over time if the structure is left alone, resulting in eventual road closure.

Alternative B Rehabilitate the Existing Bridge is expected to have positive benefits such as increasing the service life of the existing bridge, and improving roadside protection, but it will not allow elimination of the load restrictions on the bridge. The bridge will remain as a single lane constriction on a two-lane collector road, and although the roadway width across the bridge could be reduced to suit the maximum recommended single lane width, it will remain substandard for the traffic volumes, posted speed, and road class. The future maintenance costs will also continue to be very high. For these reasons, the extent of the improvements is not considered sufficient to fully address the problem statement.

Alternatives C1 Remove and Replace with Single Lane Bridge and C2 Remove and Replace with Two-Lane Bridge will both address the issues within the problem statement, as the safety and condition of the existing crossing will be improved. Both alternatives allow for elimination of the load posting and improvement of roadside and approach safety. However, the design traffic volumes, road class, and design speed exceed the standards for a single lane bridge. For this reason, Alternative C2 fully addresses the problem statement whereas Alternative C1 does not.

Alternative D Construct a New Bridge Adjacent to the Existing Bridge also addresses the problem statement; however, it will require a significant increase to the footprint of the bridge site resulting in greater environmental impacts and will continue to require ongoing maintenance of the original structure until it eventually needs to be closed or replaced. As such, this alternative is less desirable than Alternative C2.



## 13.1 CONSIDERATION OF STAKEHOLDER INPUT

Further to the discussions in section 2.6, the stakeholder concerns related to single or two lane bridge configurations and traffic volumes, pedestrian safety and farm equipment access, and the heritage value of the structure were reviewed in relation to each alternative solution.

Old Shiloh Road has an AADT of 554, which is greater than recommended for a single lane structure and is expected to increase over time. As such alternatives A, B, C1 would not meet current geometric design standards and would result in a reduced level of service and safety for users. Alternative C2, Remove and replace with a Two-Lane Bridge will meet current design standards and remove the constriction to traffic. Alternative D will also provide two lanes of traffic and meet the minimum design standards.

With regards to maintaining the heritage value of the bridge Alternatives A, B and D would best address this comment, however they will only limit the impact over a short term and will result in eventual replacement or closure of the bridge. While Alternatives C1 and C2 result in immediate removal of the heritage bridge, there are options available to mitigate the impact to the heritage value which are discussed further in sections 6 and 7 of this report.

With respect to increased safety of pedestrians and the use of the bridge by farm equipment, Alternatives A and B do not provide any opportunity to incorporate safer conditions for pedestrians or widening or significant strengthening of the structure to permit use by large farm equipment. Alternatives C1 and D provide opportunity to incorporate pedestrian considerations, of which some may provide the required side clearance for wider farm equipment to utilize the bridge when pedestrians are not crossing. Alternative C2 provides the most opportunity for pedestrian consideration and use by large farm equipment simultaneously.

## 13.2 PREFERRED SOLUTION

Based on the evaluation of the alternative solutions, which considered several technical and ancillary criteria and stakeholder consultation feedback received, the following alternative has been identified as the recommended solution.

- Alternative C2, removing the existing bridge and replacing with a two-lane bridge.

This preferred solution best resolves the problem statement.

## 13.3 CONFIRMATION OF CLASS EA SCHEDULE

In accordance with the Municipal Class Environmental Assessment Guidelines 2023, the Schedule B guidelines are applicable to both:

- Reconstruction of, or alteration to a structure or the grading adjacent to it when the structure is over 40 years old, the structure is found to have cultural heritage value or interest, and the heritage attributes will be conserved in accordance with the recommendations of a Heritage Impact Assessment.
- Reconstruction of, or alteration to a structure or the grading adjacent to it, when the structure is over 40 years old the structure is found to have cultural heritage value or interest, but heritage attributes will not be conserved in accordance with the recommendations of a Heritage Impact Assessment.

As such, the Schedule B guidelines that have been adopted are appropriate.

# 14 Conceptual Design

There are various alternative structure types that could be considered for the replacement of the Old Shiloh Road Bridge with a two-lane bridge. To confirm the most appropriate structure to select for the replacement various criteria and constraints need to be considered.

## 14.1 DESIGN CRITERIA

The existing bridge is founded on piles. With no information on the condition or capacity of these piles, and the cost associated with removing them, it is proposed that the replacement bridge be designed to a slightly longer span to allow a new pile foundation to be installed without conflicting with the existing piles.

As previously discussed in Technical Memorandum No. 1, the existing bridge opening is sufficient to pass the required design storm event flows but does not fully achieve a recommended 1.0 m clearance between the soffit and the design storm high water level. The water levels are largely controlled by backwatering from the nearby downstream dam, and an increase in span does not significantly impact the clearance. To improve the clearance the soffit of the bridge would need to be raised, however raising the road has a negative effect on the upstream water levels during higher design storm events due to increased backwatering from the road embankments prior to overtopping. As such it is important that the new bridge structure type has a shallow depth of superstructure.

In addition to these two constraints, design criteria have been developed based on Town standards, the Canadian Highway Bridge Design Code, MTO Structural Manual, and MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads.

- Road Classification – Collector Rural (Town Official Plan)
- Posted speed – 60 km/hr, design speed 60 km/hr (Town Development Standards)
- AADT – 554, with expectation to increase over a 75-year design life
- $AADT_{10}$ – 675 (2%/yr growth assumed)
- $AADT_{75}$ – 2450 (2%/yr growth assumed)
- Existing Span – 23.5 m clear
- Proposed Span – 26.0 m (25.0 m clear)
- Minimum soffit elevation – 230.29 m
- Minimum Road Width – 3.0 m lanes, 1.0 m shoulders (TAC Geometric Design Guide)

- Existing Pavement Width – 6.0 m
- Minimum Pavement Width – 6.7 m (Town development standards – Rural Road)
- Min longitudinal grade – 0.5%, Max longitudinal grade – 6% (Town development standards)
- Pavement design: 40 mm HL3, 90 mm HL8, 150 mm 19 mm crusher run limestone, 300 mm 50 mm crusher run limestone (Town development standards)
- Minimum Sidewalk Width – 1.5 m

Although there are no existing pedestrian sidewalk or multiuse trails along Old Shiloh Road, there is potential for future active transportation accommodations to be considered for this roadway. Consideration during detailed design to accommodate a future sidewalk or multiuse trail on one side of the bridge should be given to mitigate the risk of the bridge being too narrow to accommodate the future considerations.

## 14.2 PERMIT REQUIREMENTS

The following permits have been identified as required for proceeding with the bridge replacement:

- A request for project review to the Department of Fisheries and Oceans (DFO).
- Lake Simcoe Region Conservation Authority permit, and regulated feature offsetting/compensation related to minor encroachment into wetlands.
- MNRF fish salvage permit will be required prior to any de-watering of stream areas and following any work area flooding.
- Town of Georgina Road Occupancy Permit.



## 14.3 ADDITIONAL STUDIES

Prior to finalizing the detailed design and proceeding with construction the following additional studies have been identified for completion:

- Geotechnical investigation
- Heritage Recording and Documentation of Structure
- Tree inventory and Planting Plan
- Bat Habitat Investigation (if tree removal is planned)
- Turtle mitigation (if encountered during construction)
- Nest survey (if vegetation removal between April 1 to Aug 30)

## 14.4 TWO-LANE BRIDGE REPLACEMENT

Based on the above constraints and criteria, the proposed span exceeds the normal range for a concrete rigid frame structure. To minimize the structure depth to meet the above constraints, an adjacent concrete box girder bridge or truss bridge are considered the most appropriate for this site.

A conceptual plan of an adjacent box girder bridge, PGA-01, is included in Appendix K.

## 14.5 OPTIONS FOR MITIGATING LOSS OF HERITAGE ATTRIBUTES

The cultural heritage evaluation identified the Old Shiloh Bridge as having heritage value. The heritage impact assessment provided recommendations for consideration to mitigate the impact to the loss of heritage value by removal of the bridge.

### 14.5.1 Reflection of Bridge Form

One of those options was to commemorate the existing bridge through reflection of the architectural form of the existing bridge in the design of the replacement bridge.

In order to reflect the bridge form, two additional design concepts were considered:

1. Install a new bowstring arch truss. (wood or steel)
2. Install a deck on girder bridge, with a façade of a bowstring arch truss.

Both options will result in additional costs to the project. Conceptual plans for each of these options, PGA-02 and PGA-03, are included in Appendix K.

Both of these options can be implemented with no additional environmental impacts beyond the base replacement option. However, there will be increased financial impact for both, which is discussed further in section 6.6. There will however be some impacts to the road profile related to the installation of a new bowstring arch style structure. The overall structure thickness will be greater than that of the precast box girder design and will require a greater increase to the road profile elevation, introducing a vertical cure and opportunity for negative impacts to upstream water levels during large storm events. The façade option will have no additional impact to the geometry.

### 14.5.2 Reuse at Alternate Location

An alternate option for retaining the existing bridge and its heritage value that was considered is to reuse the bridge at an alternate site.

The nature of the design, construction, and weight of this cast-in-place concrete structure is not conducive to transporting it to another nearby site. There are risks of damaging the structure

associated with lifting and moving it off the waterway, transportation, then installation at its final location. These operations require heavy lift and heavy transportation equipment.

The existing bridge superstructure is approximately 3.9 m high, 6.65 m wide, and 24.4 m long. It weighs approximately 120,300 kg. These dimensions in addition to the weight exceed the limits for single trip permits for oversized loads. Superload permits are required for loads wider than 5 m as well as for gross vehicle weights exceeding 120,000 kg.

To be considered for relocation, a detailed structural evaluation and design for the support and lifting of the bridge would be required, as well as a detailed submission for a superload permit. These are not considered routine and require a thorough project justification submission to be reviewed by the MTO for necessity. In addition, rehabilitation to ensure stability and integrity of the deteriorated structure would be required prior to transportation. There will be an associated cost to rehabilitate the bridge in addition to transport costs. Consideration will also need to be given to the required route and any overhead constraints such as overpasses or hydro lines. Some overhead wires may need to be raised in order to accommodate the load. There is also a risk that once the design is reviewed a permit may not be granted.

Alternatively, a portion of the bridge could be removed from the rest of the structure to reduce the complexity and overall weight and size of the relocation. Two possible locations were considered by the Town for the location:

- Pioneer Village
- Local Park

Pioneer Village is run by the Georgina Historical Society, and is dedicated to the collection, preservation, and promotion of the heritage associated with the early pioneer times of Upper Canada. Although this would be a good location for the public to view the bridge or parts of the bridge as a heritage piece, the bridge was built in 1925 and does not align with the pioneer times heritage promoted by the Pioneer Village.

Udora Hall and Park is located in the general area of the bridge and would be a good place to preserve the memory of the bridge for the local residents of Udora who have expressed their love for the bridge. It is also quite close to the bridge site and would reduce the transportation route and associated potential fees to move parts of the bridge. The area is small and there is no need for a 24 m long bridge crossing. A portion of the bridge could however be commemorated in the park.

There will also be environmental impacts associated with any new site where the bridge would be installed. Many of these impacts would be temporary and are expected to be able to be

mitigated with best construction practices, but a detailed review would be required once a site was chosen to confirm the specific impacts and mitigation measures required.

### 14.5.3 Heritage Commemoration

An alternate option provided in the Heritage Impact Assessment is to remember the existing bridge and heritage with a commemorative monument, memorial, or art installation.

This would be a more economical approach, as well as eliminate the introduction of additional environmental impacts. As there are many options that could be considered for an appropriate commemoration, a local committee could be created with a mandate to review and evaluate commemoration options and locations. This will allow the opportunity for further consultation with members of the public who have expressed their love for the existing bridge to contribute their ideas. It will also provide the Town the opportunity to set a budget for the heritage commemoration that is appropriate to the site, community, and does not impose as great an impact to the taxpayers of the Town of Georgina as the other options.

## 14.6 CLASS 'C' COST ESTIMATE

Based on the recommended replacement option of a concrete deck on adjacent box girder bridge, the estimated probable construction cost is $4.9M. The estimated costs are considered preliminary and do not include any allowances for inclusion of heritage attributes, and without geotechnical information some assumptions have been made regarding the foundations.

To install a new steel arched truss bridge, it is estimated that it will increase the construction cost by $1.5M. It will also have a slightly increased maintenance cost over the life of the bridge as it will require periodic cleaning and recoating of the structural steel to achieve the full design service life. Although weathering steel could be considered to reduce the need for recoating, it is not ideal for colour matching the existing bridge to best recreate the aesthetic and is more prone to deterioration due to salt spray.

Installation of a façade of a truss on a deck on girder bridge is expected to increase costs in the order of $0.75M and will also require periodic cleaning and recoating to maintain the façade. Deterioration of the façade would not affect the structural integrity of the bridge, however it would still require maintenance.

These costs are based on historical tender pricing, and it is recommended that a 15-30% contingency value be carried in the budget to account for the preliminary nature of the conceptual design and the recent volatility in construction pricing and inflation.

For budgeting purposes, it is also recommended that an additional 10-15% be budgeted to cover the costs for detailed design as well as contract administration and construction inspection.

**Table 7: Probable Costs of Various Options**

| ALTERNATIVE | COST OF HERITAGE COMMEMORATION | ESTIMATED COST |
|---|---|---|
| Deck on Precast Concrete Girder Configuration (Base Option – PGA-01) | N/A | $4,900,000 |
| Arched Truss Structure (PGA-02) | $1,500,000 | $6,400,000 |
| Truss Façade added to Deck on Girder Bridge (PGA-03) | $750,000 | $5,650,000 |
| Reuse of the Existing Bridge at an Alternate Site | $500,000[1] | $5,400,000 |
| Relocation of a Portion of the Existing Bridge to an Alternate Site | $100,000[1] | $5,050,000 |
| Heritage Commemoration | TBD | $4,900,000+ |

1. Actual costs will vary based on required rehabilitation to suit the moving company's requirements, permit fees, temporary work along the chosen route, distance to the final chosen location.



In addition to the capital costs noted above, there will also be increased maintenance costs associated with the arched truss, truss façade, and reuse of the existing bridge options. The highest of these costs will be associated with reuse of the existing bridge.

The cost of a new arched truss bridge resulting in an almost 25% increase in the capital cost as well as an increase in maintenance costs. The installation of an arched truss façade mounted to the sides results in an increase of 15% to the capital cost as well as increased maintenance costs.

Relocation costs of reusing the truss or portions of the truss are very high level and will change based on the final relocation design and where the bridge is relocated to. They carry the highest risk having the greatest potential for the costs to increase significantly during the planning as well as following the move if any repairs are required to the structure or to an infrastructure that may be damaged along the route.

## 14.7 RECOMMENDATION

The preferred alternative is to remove and replace the existing bridge with a two-lane bridge. To minimize the structure depth to best suit the hydraulics, and in consideration of the economical impacts, an adjacent concrete box girder bridge is considered the most appropriate for this site.

Removal and replacement of the bridge will result in impacts to the identified heritage elements associated with the existing bridge. While there are various options to mitigate these impacts which have been discussed above, many of them result in significant financial impacts to the Town and ultimately the taxpayers. Construction of a bridge which reflects the architectural form of the existing bridge carries a significant cost with ongoing maintenance requirements imposed on the Town and while it will provide visual similarity, the historic charm of the single lane concrete bowstring bridge cannot be fully replicated while meeting current design standards and providing increased safety needs for pedestrians.

There is a significant risk to the Town associated with moving the existing structure both in liability for damages to other infrastructure as well as financial risk associated with permitting and design of the relocation. As the need for this large of a bridge at another locale within the Town has not been specifically identified, the cost and risk is not offset in savings against the acquisition of a new purpose built structure. It will also require a location with significant space to accommodate the installation.

Based on the options reviewed for mitigating the loss of heritage value through replacement of the bridge, it is recommended that the Town form a committee to develop a heritage commemoration monument, memorial, or art installation, including the type and location for the installation which will provide the best value to the community.

# 15 Next Steps

In order to complete the Municipal Class Environmental Assessment process, the following steps remain to be completed:

| TASK | TIMING |
|---|---|
| Finalize Project File | February 2024 |
| Issue Notice of Study Completion and make the Project File available for public and agency review and comment for a 30-day period | March - April 2024 |

Following the completion of the Municipal Class Environmental Assessment, the following steps remain to complete the project.

| TASK | TIMING |
|---|---|
| Procurement | May 2024 |
| Additional Investigations | Summer 2024 |
| Detailed Design | Fall / Winter 2024 |
| Obtaining Permits | Winter 2024 |
| Tendering | February 2025 |
| Constructing the Chosen Alternative | Summer / Fall 2025 |