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Old Shiloh Road Bridge

TECHNICAL MEMORANDUM NO. 1

Town of Georgina

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Issue	Date	Description
00	March 7, 2023	Draft Report
01	June 23, 2023	Final Report

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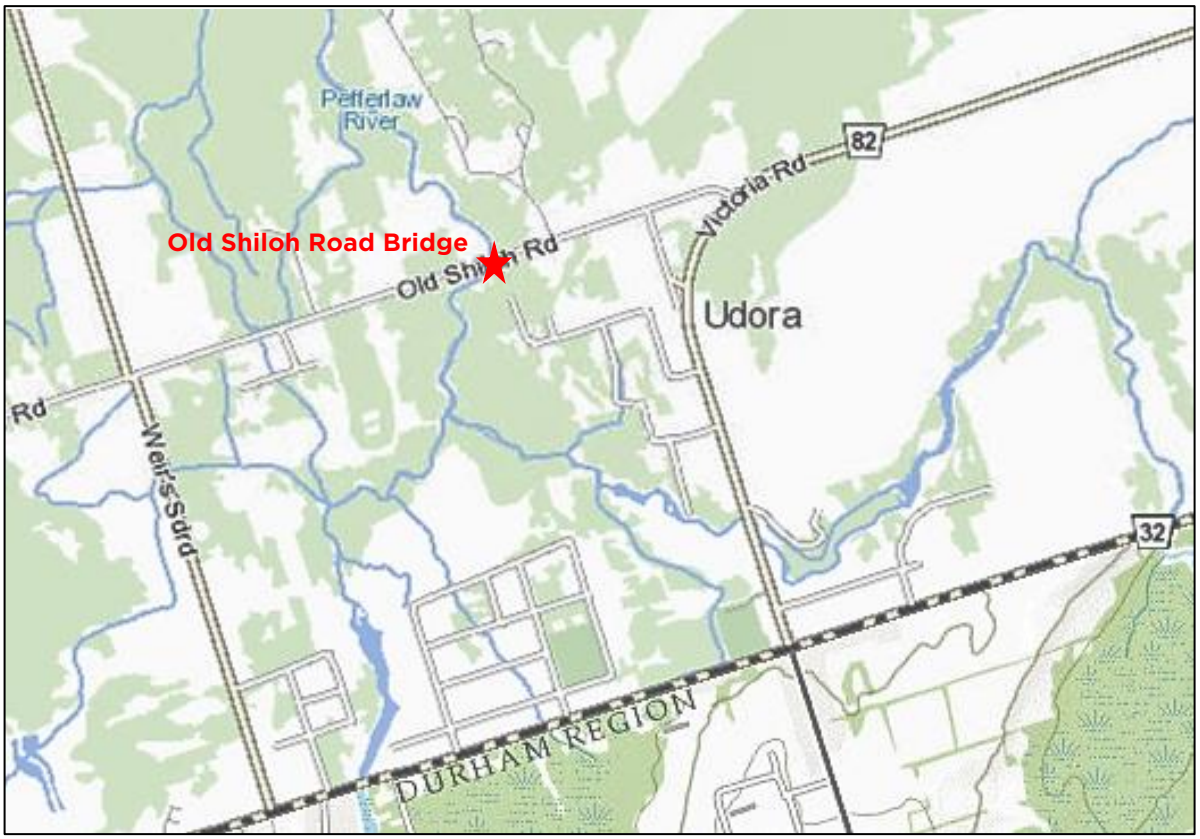
1 Introduction & Background

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). 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

Schedule A

Schedule A projects generally include normal or emergency operational and maintenance activities. 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 A+

Schedule A+ includes projects that are typically limited in size and scope, and thus have minimal associated environmental impacts. While these projects are also pre-approved, they require notification to the public prior to implementation. No reports or Study documents need to be prepared outside of the notification.

Schedule B

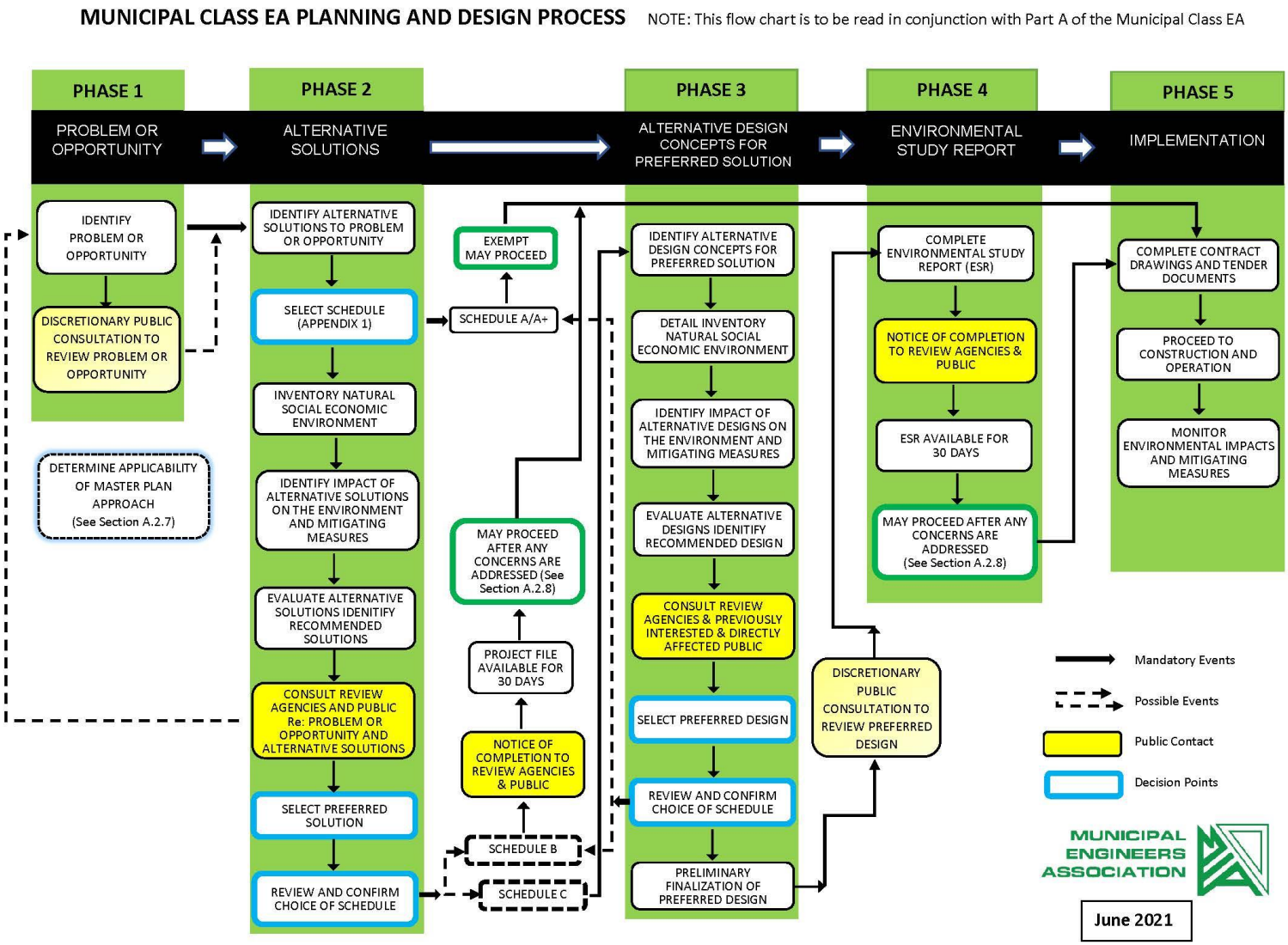
Schedule B projects generally include improvements and minor expansions to existing facilities. As there is the potential for some adverse environmental impacts, the municipality is required to conduct a screening process whereby members of the public and review agencies are informed of the project and 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



1.1.3 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.

1.1.4 Selected Schedule

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

- Schedule A 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.
- Schedule A+ 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;
- Schedule A+ for retirement of existing roads and road related facilities;
- Schedule A+ for installation of guide rail;

- Schedule B for the reconstruction of a water crossing where the reconstructed facility will not be for the same purpose, use, capacity (refers to either hydraulic capacity or road capacity) or at the same location and provided the cost is less than $2.6 M;
- Schedule B for reconstruction or alteration if found to have heritage value;
- Schedule C for the above noted Schedule B projects which exceed $2.6 M.

In consideration of the above Class EA guidelines, heritage value, potential alternative solutions and the associated costs (the rehabilitation of the existing bridge, or construction of a new bridge can each be implemented for less than $2.6M), 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 TECHNICAL MEMORANDUM

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; and
- to outline the remaining steps involved to complete the Class EA Study.

1.3 FORMAT OF THE TECHNICAL MEMORANDUM

This Technical Memorandum 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; and
- Chapter 6 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 can 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;
- 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. No evidence was found to support that any subsequent rehabilitation work has been completed to strengthen the bridge beyond this capacity. As such, the Town has 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 water levels at the subject bridge.

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 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. Additional road grade raises and potentially greater impact to upstream water levels would result if a deck on girder bridge were to be considered.

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 B.

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 to match the geometry of the approach road would be installed.

The new 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, and the load posting will be removed.

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 effect 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 is included in the draft 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 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.

The Environmental Impact Study report can be found in Appendix E.

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 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, 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
  - 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)

- York Region 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 F.

5.3.3 Cultural Heritage Evaluation and Heritage Impact Assessment

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 this 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 G.

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 Next Steps

This Technical Memorandum documents the existing conditions, identifies the problem at the structure, and documents the affected/applicable environments and design criteria to assess the potential solutions to the problem.

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

- Evaluate the alternative solutions;
- Select a preliminary preferred solution;
- Public Information Centre (PIC) to present all alternatives;
- Finalize evaluation of alternative solutions based on feedback obtained from the PIC;
- Confirm the preferred solution;
- Stage 2 Archaeological Assessment;
- Heritage Impact Assessment;
- Finalize Project File;
- Issue Notice of Study Completion and make the Project File available for public and agency review and comment for a 30-day period; and
- Implement the chosen alternative.