Prepared for:

City of Guelph

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Schedule B Class Environmental Assessment – Project File
Emma Street to Earl Street Pedestrian Bridge

Submitted by:

Aquafor Beech Ltd.

in association with

Lura & ASi

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Executive Summary

The City of Guelph's projected population growth highlights the need for additional bridge connections within the City. The Emma Street to Earl Street Pedestrian Bridge connection was first identified within the *Guelph Trail Master Plan* in 2005. The proposed bridge would connect Emma Street to Earl Street over the Speed River, providing a car-free route for cyclists and pedestrians traveling between downtown and the northeast corner of the City.

This EA study on the **Emma St to Earl St Pedestrian Bridge** is classified as a Municipal Class EA Schedule B project and follows Phases 1 and 2 of the planning and design process. The EA study was undertaken to determine if the pedestrian bridge is warranted at this location and, if so, the bridge type and configuration to be constructed. The study involved environmental inventories, generation and evaluation of alternatives, public consultation, and selection of the preferred solution.

Consultation, an essential requirement of the Municipal Class EA process, included the identification of interested and potentially affected parties, and informing them about the project in an effort to solicit knowledge of the local environment, and receive input about key project decisions. Public Information Centre #1, on October 25th, 2016, rated evaluation criteria based on public input, with natural environment being the most valued criteria for consideration. The PIC defined the EA study's Problem Statement as follows:

> "The Emma Street to Earl Street bridge shall ultimately be designed as a pedestrian and cycling bridge, that provides a car free route for cyclists and pedestrians traveling between downtown and the north-east corner of the City of Guelph, with the least impact on the natural environment within Speedvale River Valley."

The EA study involved several environmental inventories to defined the existing conditions, including a geomorphic assessment, a hydraulic analysis, natural heritage inventories (terrestrial, aquatic, species-at-risk), an archeological assessment, and source water and geology reviews. The geomorphic assessment confirmed limited scour or erosion within the study area, with mature vegetation and riffles providing protection against lateral migration and channel bed scour. The hydraulic analysis results defined conditions at a range of flows, from the 2 year flood throughout to the Regulatory, all of which are contained within the Speed River corridor. The natural heritage inventories concluded that only 14% of the trees in the study area are of high preservation priority. Species-at-risk screening identified potential foraging and mating habitat for Snapping Turtle, as well as bat maternity roost sites within the anticipated disturbance areas. The Stage 1 archaeological assessment identified two previously registered archaeological sites located within one kilometre of the study area, and recommended a Stage 2 assessment during the detailed design stage. The source water review confirmed that groundwater in the study area has been classified as vulnerable and there is a municipal well approximately 400m from the study area. The geology review suggested that the study area maintains a competent bedrock elevation close to the surface elevation.

As part of the EA process, alternative solutions were generated and considered, including:

- **Do-Nothing or Null Alternative**, where a bridge connection would not be implemented within this area. The closest crossing of the Speed River for pedestrians would be the Speedvale Avenue Bridge.

- **Alternative 1 – Single Span Bridge** involves a single span cable-stayed bridge over the Speed River corridor. This alternative provides an opportunity to implement the pedestrian bridge with minimal impacts on the natural environment. However, a swath of trees would need to be cleared to accommodate the bridge alignment over the valley. This alternative has the highest capital cost.

- **Alternative 2a – Double Span Bridge (Overhead Hydro Relocation)** involves a two-span truss bridge with one support pier within the easterly overbank area of the valley. The alignment of the bridge will be offset from the overhead hydro transmission lines, widening the existing clearing. This alternative provides a more cost-efficient crossing alternative than a single span bridge, with moderate environmental impacts, as well as the opportunity to remove historic fill and restore the wetland feature.

- **Alternative 2b – Double Span Bridge (Hydro within Structure)** involves a two-span truss bridge with one support pier, while using the existing clearing for the hydro lines, and incorporating the utility within the structure. Though utilization of the existing infrastructure footprint, this alternative minimizes disturbance within the natural corridor, while still providing a more cost-efficient crossing alternative than a single span bridge. Similar opportunities to remove historic fill and restore wetland features are also included.

- **Alternative 3 – Triple Span Bridge** would involve a three-span truss bridge with two support piers in addition to the existing hydro pole within the valley. This alternative is the most economical (least costly), but would have the largest environmental impact. A channel crossing would be required to construct the second pier within the centre island, as well as a swath of tree clearing to accommodate the bridge alignment.

The alternatives were considered using a cumulative evaluation matrix with four categories of criteria. The evaluation process considered and scored each alternative with respect to the following categories: physical and natural environment, social and cultural criteria, technical and engineering criteria, and economic criteria.

Public Information Centres 1 & 2 offered interested residents an opportunity to provide feedback on the existing conditions, evaluation criteria, preliminary evaluation of alternatives, and preferred alternative. Both PICs were well attended. Written and oral feedback from approximately half the residents suggested strong support for a bridge, either Alternative 1 or 2, with the other half conversely not wanting a bridge at all.

Based on feedback from PIC #2, Alternative 2 was refined to that described as 2B, using the existing hydro clearing while providing a more cost effective crossing than Alternative 1. Evaluation criteria and scoring were also updated based on feedback from the public and the City project team.

The evaluation of alternatives presented within this Project File defines Alternative 2b – Double Span Bridge (Hydro within Structure) as the preferred alternative. Alternative 1 is also deemed a viable option with minimal environmental impacts, but has a much greater Capital Cost.

Following completion of this EA, implementation of the preferred alternative will require a detailed design process. The document outlines expectations for the design stage, and recommends additional technical investigations, including structural design, geotechnical investigation, and hydraulic analysis. Amendment of the City Official Plan, regulatory permitting, and post construction monitoring are also recommended.

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1 INTRODUCTION

1.1 Study Background

Aquafor Beech Limited (Aquafor), with subconsultants Lura Consulting (Lura), and Archaeological Services Incorporated (ASI), were retained by the City of Guelph to complete a Class Environmental Assessment (EA) for the Emma Street to Earl Street Pedestrian Bridge. The Municipal Class EA study was conducted as a Schedule B, including consultation with the public to evaluate alternative solutions.

The bridge connection between Emma Street and Earl Street was identified in 2005, within the Guelph Trail Master Plan. In 2007, the City's Local Growth Management Strategy endorsed a 2031 population of 169,000 and an additional 31,000 jobs over the 25-year planning horizon within the area. The infill and intensification projects within the City's built boundary would add additional strain to the City's infrastructure, in particular, increased traffic on the existing bridges and the need for additional bridge connections. Most recently, on July 22nd, 2015, City Council approved a resolution directing City Staff to conduct an Environmental Assessment for a possible bridge connecting Emma Street to Earl Street, as a result of Speedvale Avenue Road Design limitations for pedestrians and cyclists.

This Project File is intended to document the Municipal Class EA process to determine if a pedestrian bridge is warranted at this location and, if so, the bridge type and configuration to be constructed. The proposed bridge would connect Emma Street to Earl Street over the Speed River, providing a car-free route for cyclists and pedestrians traveling between downtown and the northeast corner of the city. The proposed location for the pedestrian bridge within the study area is presented in Figure 1-1 below.

Figure 1-1. Study Area Figure Showing Location of Proposed Bridge Connection.

1.2 Class Environmental Assessment Process

The Environmental Assessment Act was legislated by the Province of Ontario in 1980 to ensure that an Environmental Assessment is conducted prior to the onset of development and development related (servicing) projects. Depending on the individual project or Master Plan to be completed, there are different processes that municipalities must follow to meet Ontario's Environmental Assessment requirements.

Class Environmental Assessments (Class EAs) are prepared for approval by the Minister of the Environment, Conservation and Parks. A Class EA is an approved planning document that defines groups of projects and activities and the Environmental Assessment (EA) process which the proponent commits to for each project undertaking. Provided the process is followed, projects and activities included under the Class EA do not require formal review and approval under the EA Act. In this fashion, the Class EA process expedites the environmental assessment of smaller, recurring projects.

This Class Environmental Assessment document reflects the following five key principles of successful planning under the Environmental Assessment Act.

1. Consultation with affected parties early in and throughout the process, such that the planning process is a cooperative venture.
2. Consideration of a reasonable range of alternatives, both functionally different "alternatives to" and the "alternative methods" of implementing the solution.
3. Identification and consideration of the effects of each alternative on all aspects of the environment.
4. Systematic evaluation of alternatives in terms of their advantages and disadvantages, to determine their net environmental effects.
5. Provision of clear and complete documentation of the planning process followed, to allow "traceability" of decision-making with respect to the project.

The accompanying flow chart (Figure 1-2) illustrates the process followed in the planning and design of projects covered by this Class Environmental Assessment. The five phases, as defined in the flow chart, are summarized in the document as follows:

Phase 1: Identify the problem or deficiency.

Phase 2: Identify alternative solutions to the problem, by taking into consideration the existing environment, and establish the preferred solution taking into account public and agency review and input. At this point, identify approval requirements (e.g., Ontario Water Resources Act, Lakes and Rivers Improvement Act, and Environmental Protection Act) and determine the appropriate schedule for the project and proceed through the appropriate phases (Figure 1-2).

Phase 3: Examine alternative methods of implementing the preferred solution, based upon the existing environment, public and government agency input, anticipated environmental effects, and methods of minimizing negative effects and maximizing positive effects.

Phase 4: Document, in an Environmental Study Report, a summary of the rationale and the planning, design, and consultation process of the project as established throughout the above phases, and make such documentation available for scrutiny by review agencies and the public.

Phase 5: Complete contract drawings and documents, and proceed to construction and operation; monitor construction for adherence to environmental provisions and commitments. Where special conditions dictate, also monitor the operation of the completed facilities.

Public and agency consultation is also an important and necessary component of the five phases.

The Municipal Engineers Association's Class EA document classifies projects as Schedule A, B or C depending on their level of environmental impact and public concern.

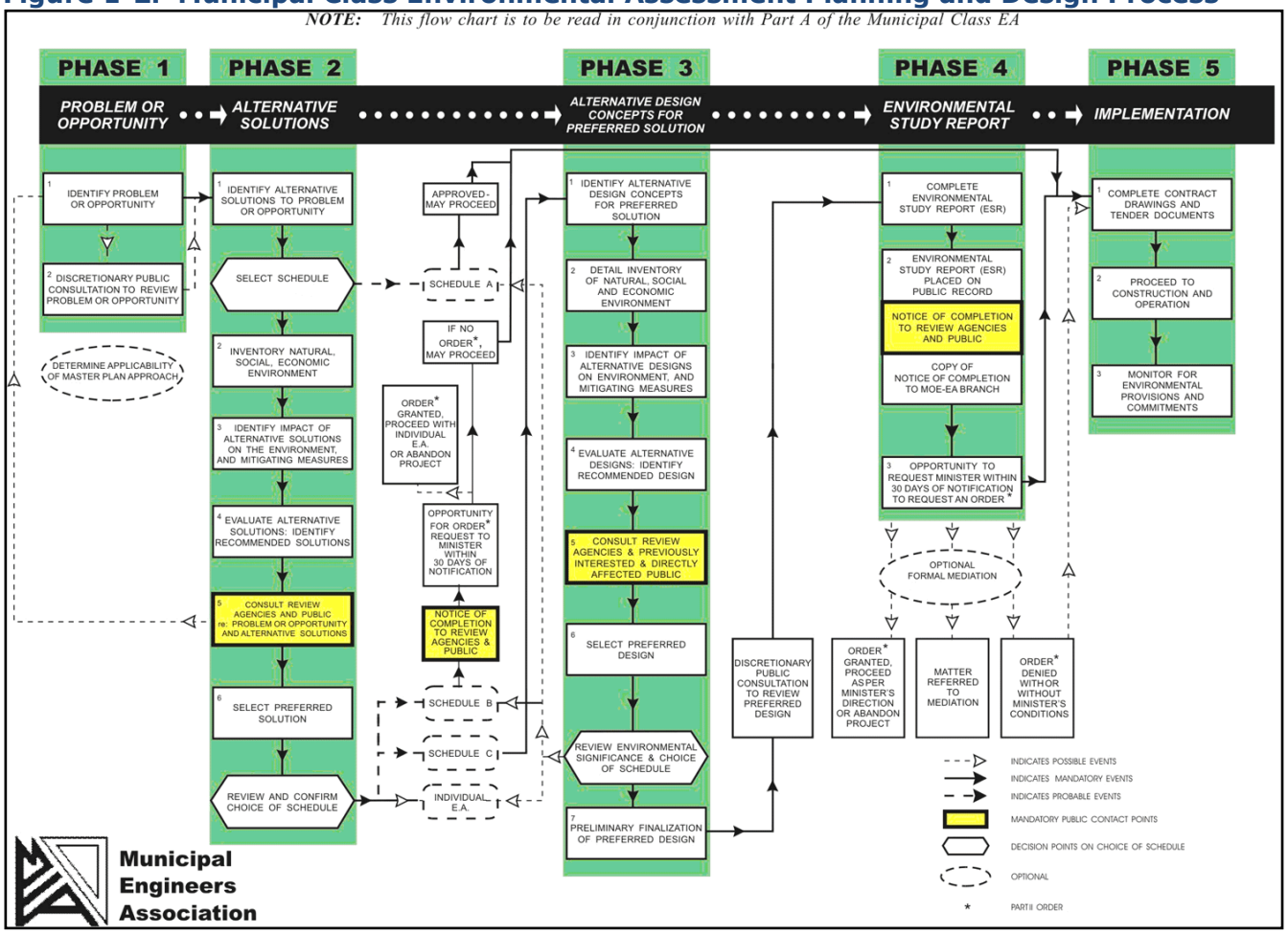
- **Schedule 'A'** projects are generally routine maintenance and upgrade projects; they do not have big environmental impacts or need public input. Schedule 'A' projects are all so routine that they are generally pre-approved without any further public consultation.

- **Schedule 'B'** projects have more environmental impact and do have public implications. Examples would be stormwater ponds, river crossings, expansion of water or sewage plants beyond up to their rated capacity, new or expanded outfalls and intakes, and the like. Schedule 'B' projects require completion of Phases 1 and 2 of the Class EA process.

- **Schedule 'C'** projects have the most major public and environmental impacts. Examples would be storage tanks and tunnels with disinfection, anything involving chemical treatment, or expansion beyond a water or sewage plant's rated capacity. Schedule 'C' projects require completion of Phases 1 through 4 of the Class EA process, before proceeding to Phase 5 implementation.

The current study on the **Emma St to Earl St Pedestrian Bridge** is classified as a Schedule B project and follows Phases 1 and 2 of the planning and design process with Phase 5 to follow at a subsequent stage. This report outlines Phases 1 and 2 of the EA process.

Figure 1-2. Municipal Class Environmental Assessment Planning and Design Process



2 PHASE 1 – IDENTIFICATION OF PROBLEMS & OPPORTUNITIES

2.1 Problem Identification & Background

The City of Guelph is one of the fastest growing regions in Ontario, with the City's Local Growth Management Strategy gradually increasing the overall share of infill and intensification within the City's built boundary. This type of intensification adds both strain and the requirement for continued improvement to the City's existing infrastructure.

To accommodate this growth, the City of Guelph completed Speedvale Avenue Improvements (from Manhattan Court to Woolwich Street), which included replacement of the bridge over the Speed River. The roadway accommodates four lanes of vehicular traffic, however, due to limited available space and other constraints between Manhattan Court to Woolwich Street, bike lanes were not included. The exclusion of bike lanes from the redesign of Speedvale Avenue East, an arterial road, is in contradiction with the City's *2009 Bike Policy* and *2013 Cycling Master Plan.* To address this issue, the preferred alternative of the Speedvale Avenue EA recommended a future pedestrian / bike bridge crossing between Emma to Earl Streets, subject to the EA presently being undertaken.

A recreational connection was identified in the Guelph Trail Master Plan (2005), as shown in Figure 2-1. The City's Official Plan adopted this recommendation, as illustrated in Figure 2-2, with the preferred alternative from Speedvale EA (2015) illustrated in Figure 2-3.

Figure 2-1. Guelph Trail Master Plan, 2005 (Map 4: Trail Network (modified to highlight study area)).

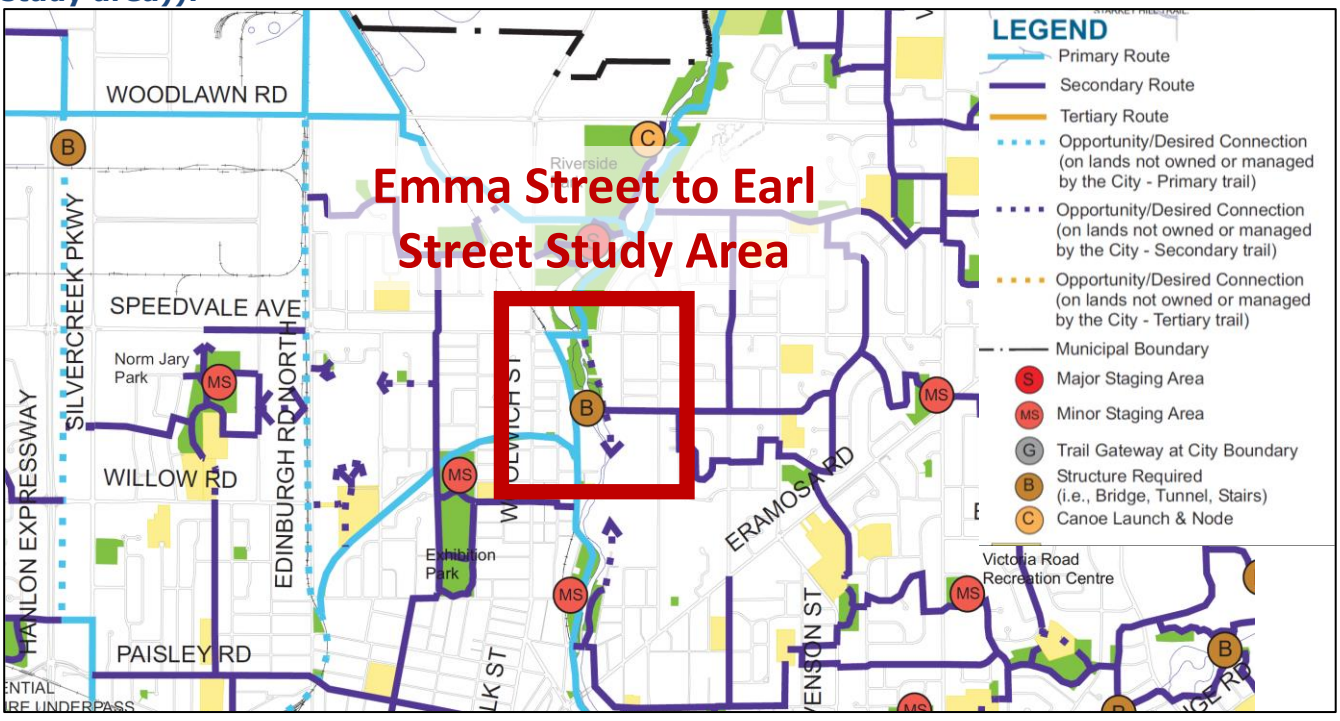


Figure 2-2. City of Guelph Official Plan Amendment Number 48: Five-year Review – Schedule 6: Open Space System: Trail Network (modified to highlight study area).

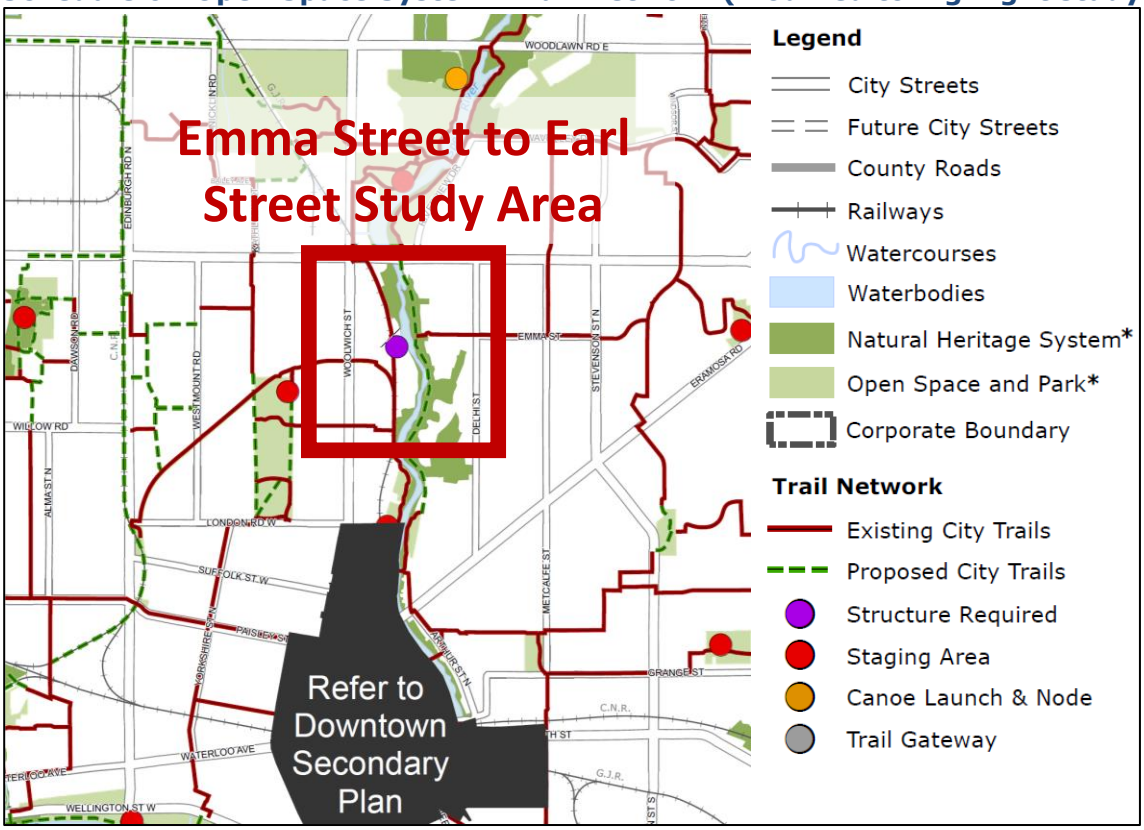
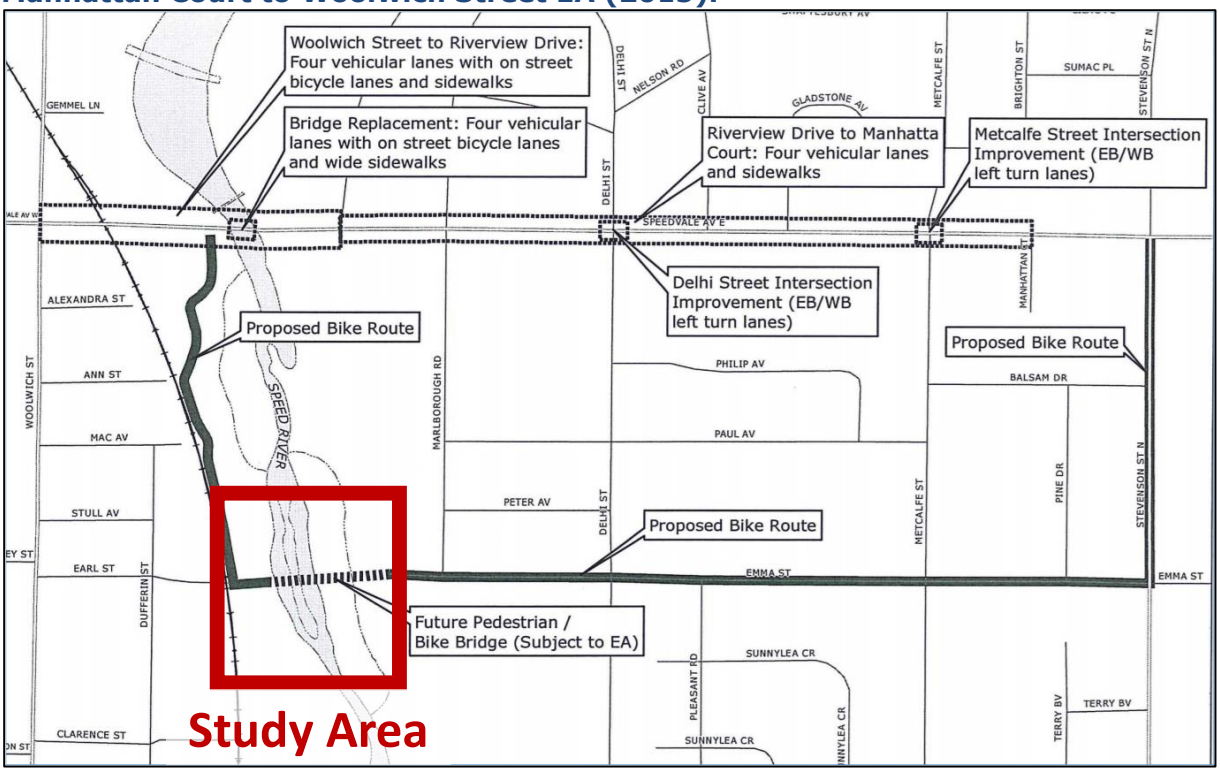


Figure 2-3. Preferred Alternative as Defined in Speedvale Avenue improvements from Manhattan Court to Woolwich Street EA (2015).



2.2 Opportunity Definition

To conform with the City's Biking Policy and Cycling Master Plan principles and objectives, the City Council approved, on July 22nd, 2015, an Environmental Assessment for a pedestrian bridge connecting Emma Street to Earl Street, over the Speed River.

On October 25th, 2016, Aquafor conducted Public Information Centre #1 (PIC#1) to refine the Opportunity Statement as follows:

> "The Emma Street to Earl Street bridge shall ultimately be designed as a pedestrian and cycling bridge, that provides a car free route for cyclists and pedestrians traveling between downtown and the north-east corner of the City of Guelph, with the least impact on the natural environment within Speedvale River Valley."

3 PHASE 2 – EXISTING CONDITION INVENTORIES

3.1 Topographic Survey, Infrastructure, and Utilities

At the onset of the field assessments, a detailed total station survey was undertaken to accurately define the topographic conditions of the developed lands at the edges of Emma Street and Earl Street, with a focus on the Speed River valley setting in which a bridge would need to cross. The survey was completed in detail for the purposes of geomorphic analysis, hydraulic modeling, and preliminary design, with key parameters including:

- Longitudinal profile of the Speed River, surveying the channel thalweg, top and bottom of banks;
- Cross-sections perpendicular to the channel, extended in sufficient detail beyond the top of slope for undertaking hydraulic analysis;
- Municipal infrastructure and utilities, including storm sewer outlets, sewer manholes, hydro poles;
- Mature vegetation potentially impacted as a result of the bridge construction; and
- City Right-of-Way (ROW) and potential construction access routes / staging areas.

The survey was completed using a combination of a total station and GPS techniques in order to confirm accuracy of survey consistent with UTM NAD 83 Zone 17 projection, and overlays the base mapping provided by the City, which includes property parcels and contours. The topographic information was compiled into a planform and cross section (Figure 3-2), which highlights the following:

- The Speed River corridor spans a width of approximately 90m, with mature vegetation lining the slopes, and development encompassing the table lands.
- Emma Street maintains a rounded court with mixed density residential properties to the north and Homewood Health Centre to the south. A sidewalk extends along the northerly side of Emma Street.
- Earl Street ends at the Speed River without a curb, and provides access to the Armtech industrial facility to the south, and an additional Armtech storage area to the north. No sidewalks extend along Earl Street.
- The Downtown Trail crosses Earl Street, running parallel to the railway line.

- Storm sewers outlet near the toe of slope at both Emma and Earl Street, with both sewers providing tertiary treatment (i.e. Oil Grit Separators) prior to outletting into the river.
- A watermain extends under the river, which was open cut, and concrete encased. Chamber 29 along with a drain valve and manhole are located approximately 3m away from the left bank.
- Above ground hydro lines extend across the river, with one hydro pole within the left overbank area.
- A small island segments the Speed River into two low flow channels.

Select photos have been included below to further illustrate the existing conditions at the ends of Emma and Earl Streets, as well as an as-built drawing of the watermain that was open-cut across the channel in 1962.

Photo A. Emma Street Towards Vantage Towards Speed River, with Homewood Health Centre (left), and Emma Street Apartment Complex (right).

Photo B. Earl Street Vantage Towards Speed River, crossing the Downtown Trail & Railway, followed by Armtech Entrances.

Figure 3-1. Watermain As-Built Drawing Crossing the Speed River Between Emma & Earl Streets (1962).

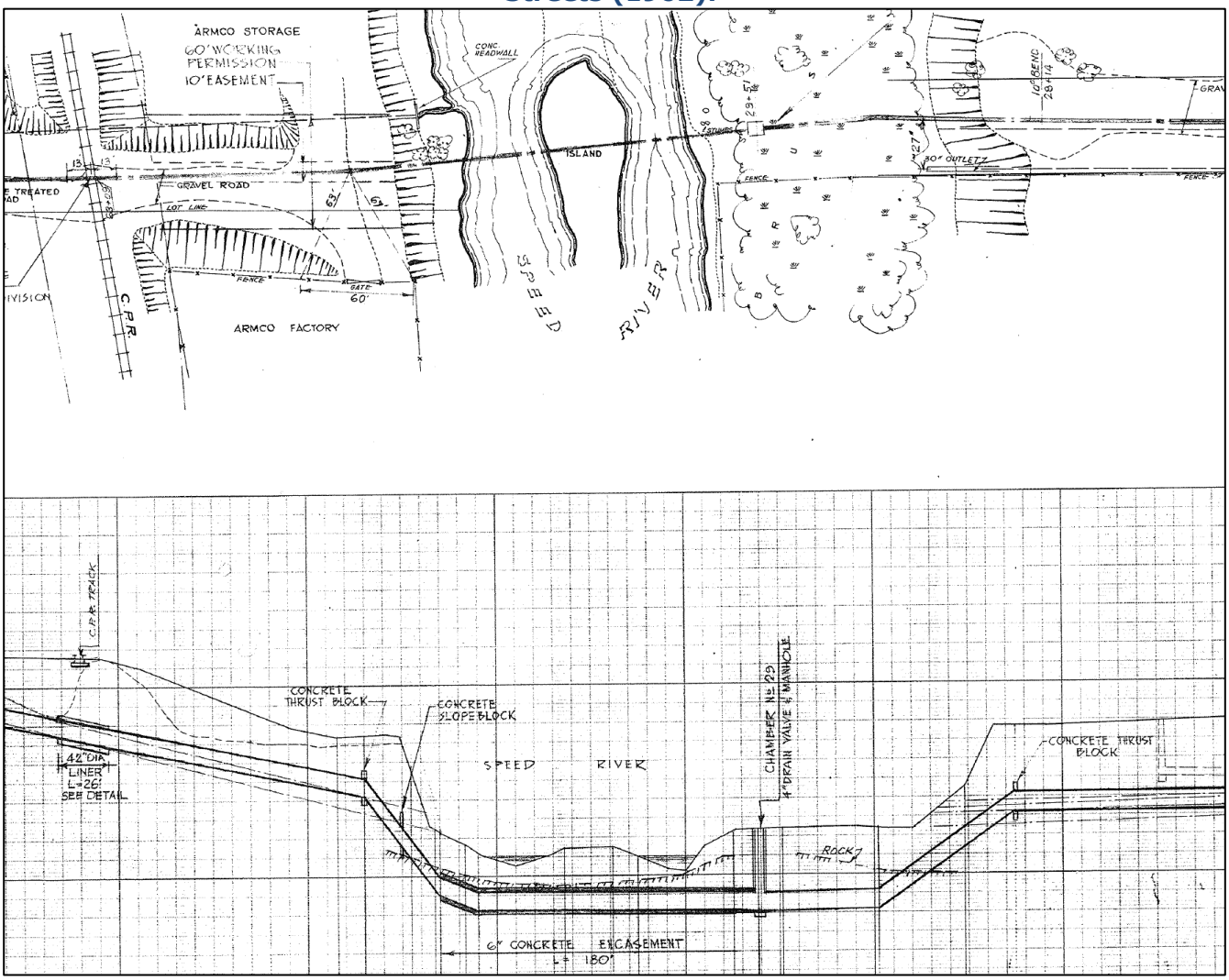
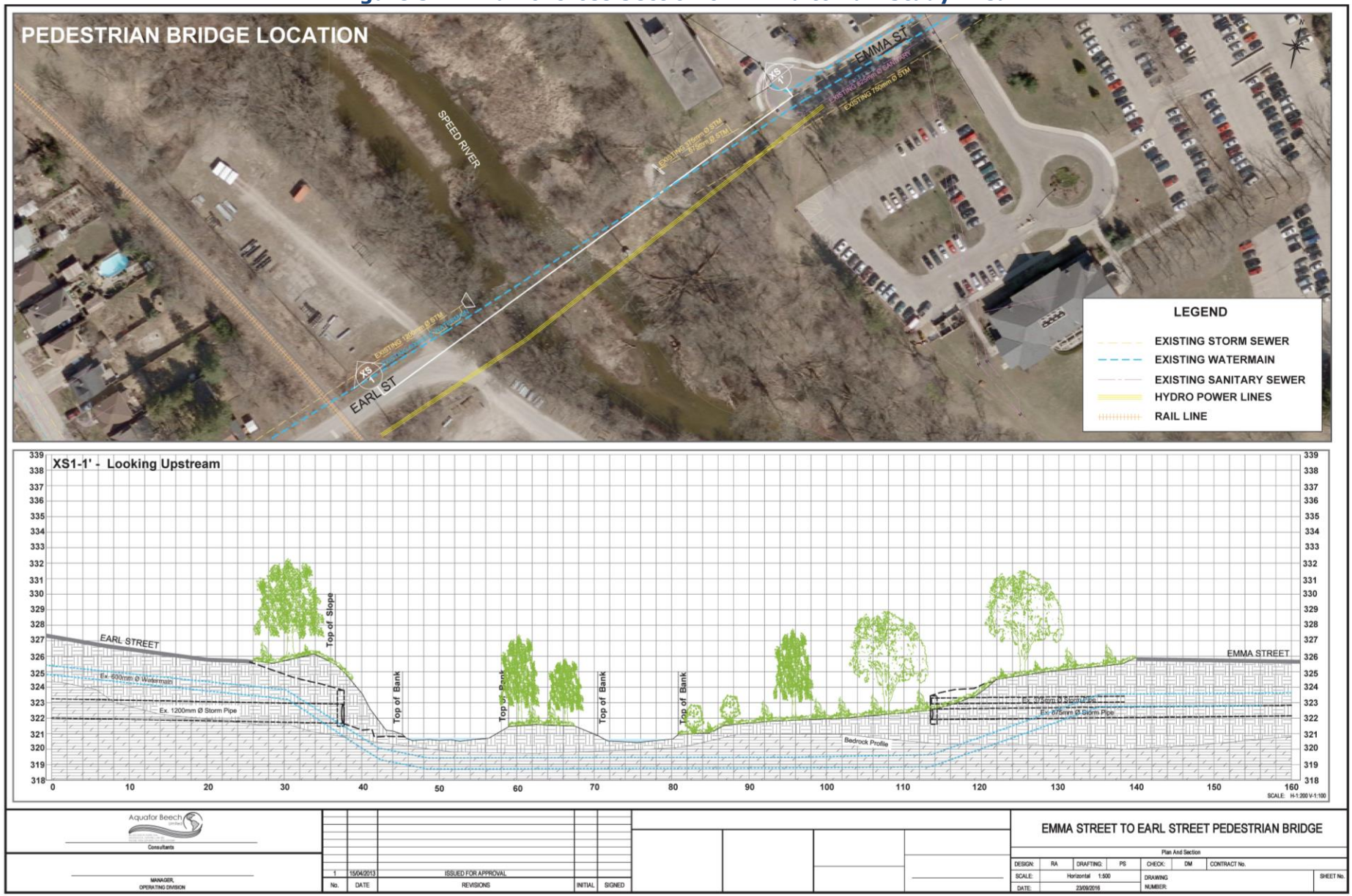


Figure 3-2. Plan & Cross Section of Emma to Earl Study Area.



3.2 Hydraulic Analysis

The primary objective of the hydraulic modelling component of this study is to refine our understanding of the range of flood flows, the forces exerted on the channel and overbank areas, and the flood elevations within the vicinity of the potential bridge location.

At the onset of the study, Aquafor obtained a hydraulic model of the Speed River from the Grand River Conservation Authority (GRCA). The HEC-RAS model, named "Speed Reach 4", consists of a single reach extending from the Guelph Reservoir Dam to Gordon Street, downstream of the confluence with the Eramosa River. The GRCA model was created in 2010, using estimated 2-year to 100-year return period flows, as well as approved regulatory flows from the 1988 Grand River Hydrology Study. Since then, the model has been maintained by the GRCA, and most recently updated in June 2015. The latest scenario file is "Plan 33", which was used for hydraulic analysis of the existing conditions within the study area.

Upon review of the existing conditions model, River Station 26398, which is approximately 40m upstream of the proposed bridge location, was identified as the most relevant cross section for hydraulic analysis. Comparison of RS 26398 to the surveyed cross section in Figure 3-2 showed relatively consistent elevations and of the channel and overbank areas. The major difference was the omission of the island mass within the channel, which was determined to be an acceptable compromise for the purposes of this exercise.

The hydraulic results of the existing conditions at RS 26398 are presented in Table 3-1 below. A water surface profile plot of the 5-year, 50-year, and Regional flood flows was generated (Figure 3-3). The floodlines and water surface elevations were also plotted on the surveyed planform and cross section (Figure 3-4).

The hydraulic results confirm that all flows up to and including the Regional flood are confined within the Speed River valley walls, and do not spill beyond the top of slope. Any pedestrian bridge proposed to span the corridor will require confirmation of 'no negative impacts to flooding'. Furthermore, channel and overbank shear values within the study area are relatively low (< 100 N/m^2), indicating scouring around pier supports would be unlikely.

Table 3-1 HEC-RAS Results for RS 26398

Return Period	Total Flow (m^3/s)	Channel Flow (m^3/s)	W.S. Elevation (m)	Channel Shear (N/m^2)	Left Overbank Shear (N/m^2)	Right Overbank Shear (N/m^2)
2-year	94	93.32	321.82	55.07	8.10	9.94
5-year	129	126.17	322.05	64.79	12.70	14.77
10-year	152	146.55	322.18	69.13	17.16	17.28
20-year	175	166.15	322.32	72.15	21.71	19.31
50-year	205	191.05	322.49	75.08	26.48	21.48
100-year	228	209.75	322.61	76.72	29.41	21.81
Regional	542	446.62	324.09	88.87	46.58	20.93

Figure 3-3 Water Surface Profile at Proposed Bridge Location.

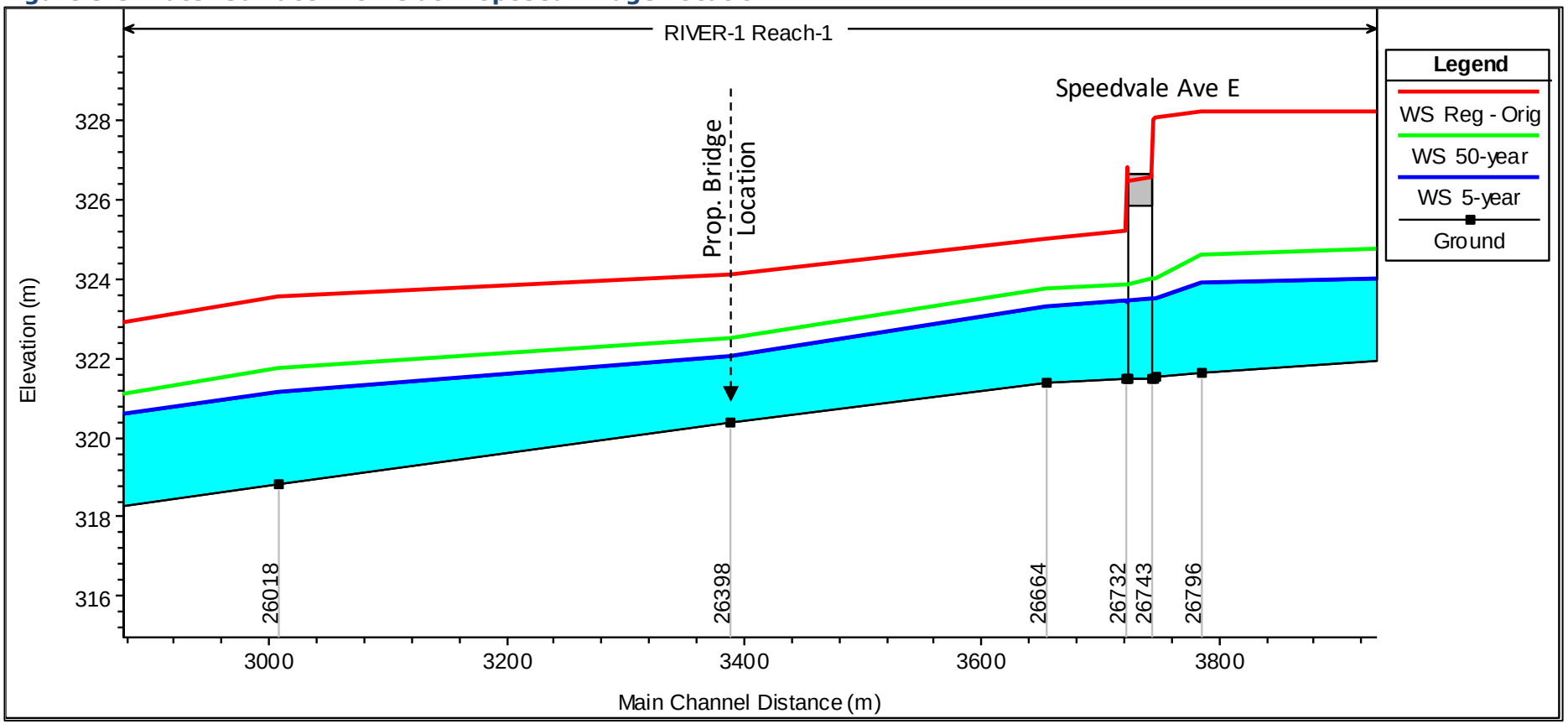
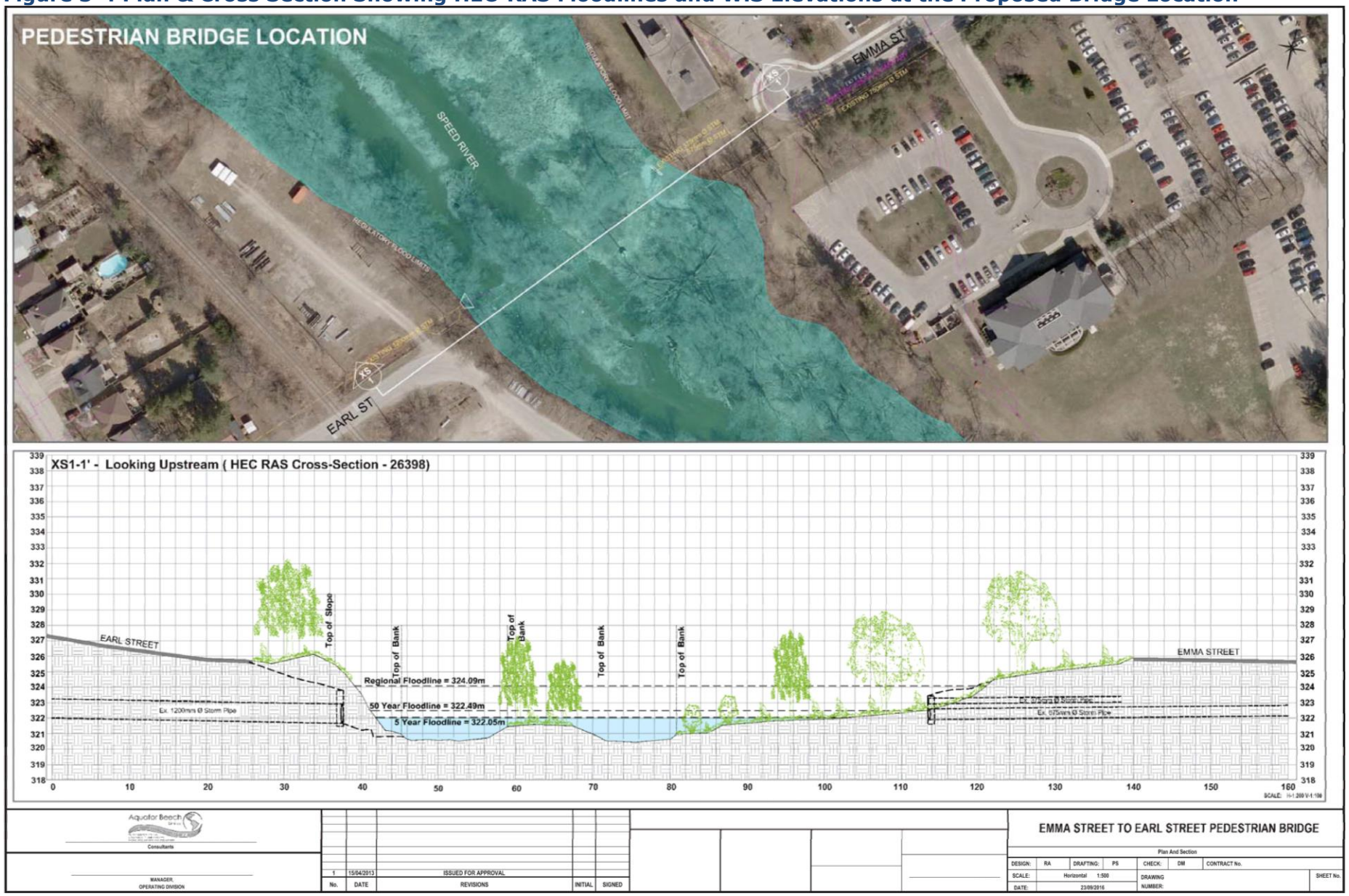


Figure 3-4 Plan & Cross Section Showing HEC-RAS Floodlines and W.S Elevations at the Proposed Bridge Location



3.3 Geomorphic & Stream System Assessment

A geomorphic assessment of the study area was undertaken to define the existing conditions of the Speed River at the proposed bridge location. This assessment was used to provide recommendations regarding span, erosion hazard risks, abutment offsets, and orientation of the bridge in order to maximize the longevity of the bridge within minimal impacts to the river and/or future maintenance works.

The Speed River, between Speedvale Avenue and Eramosa Road is relatively natural, with limited channel hardening or anthropogenic influences, particularly in comparison to the significant alterations of the adjacent reaches where damming of the river both upstream and downstream exists. The riparian corridor between Speedvale and Eramosa ranges in width from ~100m to 150m in width, with a sinuous planform which meanders between both valley slopes. The slope of the valley is relatively shallow, ranging from 5-10 metres in height, which is sufficient to keep the regulatory flood flows within the corridor. Additionally, limited risks of slope oversteepening or failure were observed along the length of the reach.

The bed and bank substrate are composed primarily of gravels, cobbles, and some boulders, with a stable channel morphology in which limited erosion risks presently exist. Rates of lateral erosion based on the stability of the channel would are estimated in the 4 - 5 metre range over a 100 year timeframe, which would allow for natural planform development with minimal risk to existing infrastructure.

When considering erosion hazard risks and stable slope conditions, the Technical Guide River & Stream Systems: Erosion Hazard Limit (MNR, 2002) applies throughout the GRCA jurisdiction, with confirmation required at the detailed design stage to confirm no negative impacts to erosion or slope risks occur as a result of channel manipulation or augmentation to the corridor. The erosion hazard limit is illustrated in cross section in Figure 3-5, followed by Table 3-2 which summarizes the typical erosion hazards associated with a natural channel setting. This erosion information is presented as reference to highlight the susceptibility to erosion of the bridge abutments should they be placed within the erosion hazard limit, furthering the requirement of erosion and scour protection.

Figure 3-5 MNRF (2002) Guideline for Determining an Erosion Hazard Corridor within Confined Systems.

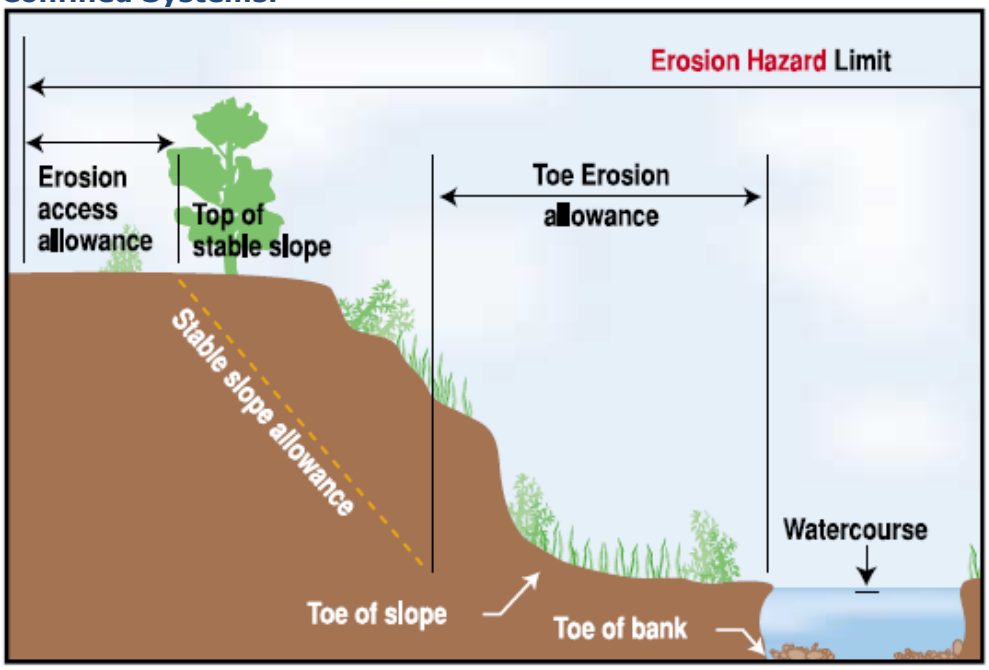


Table 3-2 MNR Erosion Allowance Guidelines for Watercourses in Valley Settings

MINIMUM TOE EROSION ALLOWANCE - River within 15 m of Slope Toe *				
Type of Material Native Soil Structure	Evidence of Active Erosion** or Bankfull Flow Velocity > Competent Flow Velocity***	No evidence of Active Erosion** or Flow Velocity << Competent Flow Velocity***		
		Bankfull Width		
		< 5 m	5 - 30 m	> 30 m
1. Hard Rock (granite)	0 - 2 m	0 m	0 m	1 m
2. Soft Rock (shale, limestone) Cobbles, Boulders	2 - 5 m	0 m	1 m	2 m
3. Stiff/Hard Cohesive Soil (clays, clayey silt) Coarse Granular (gravels) Tills	5 - 8 m	1 m	2 m	4 m
4. Soft/Firm Cohesive Soil Fine Granular (sand, silt) Fill	8 - 15 m	1 - 2 m	5 m	7 m

* If a valley floor is > 15 m width, still may require study or inclusion of a toe erosion allowance.

** Active Erosion is defined as: bank material is bare and exposed directly to stream flow under normal or flood flow conditions and, where undercutting, over steepening, slumping of a bank or high down stream sediment loading is occurring. An area may be exposed to river flow but may not display "active erosion" (i.e. is not bare or undercut) either as a result of well rooted vegetation or as a result of shifting of the channel or because flows are relatively

low velocity. The toe erosion allowances presented in the right half of Table 2 are suggested for sites with this condition.

*** Competent Flow velocity; the flow velocity that the bed material in the stream can support without resulting in erosion or scour. Consideration must also be given to potential future meandering of the watercourse channel. **Source**: Ontario Ministry of Natural Resources (2002), "Technical Guide River & Stream Systems: Erosion Hazard Limit, pp38

The river corridor is relatively wide (~ 90m), with steep banks, that provide sufficient space for natural migration of the river. Within the extents of the study area, there is a large permanent island (Figure 3-6) that has formed in the center of the channel, splitting the river into two branches. The majority of the flow is contained to the south side of the island, where the channel has an approximate bankfull width of 13m. The bankfull width along the northern side of the island is approximately 14m.

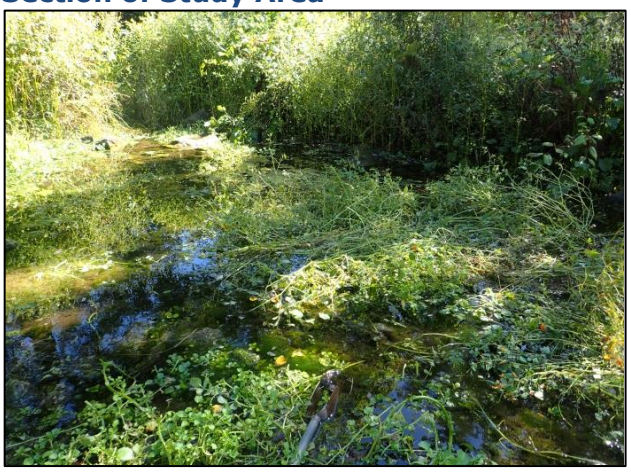
A long steep riffle has been constructed at this location, created from large cobble and riprap material, which might have been done to protect underlying utilities, or as an erosion protection measure for the two storm sewers that discharge along the southern embankment. A third storm sewer outlet discharges along the northern bank of the channel. The outlets have headwalls, and there is minimal erosion at these locations. The proposed bridge alignment should consider the locations of these outfalls, and avoid realigning the sewers if possible.

An area of groundwater upwelling area (Figure 3-7) was noted along the northern bank of the river, described as a Mineral Shallow Marsh (discussed in Section 3.4.1 and Figure 3-9). This area is low lying, making it more susceptible to flooding, and has soft, wet mineral soil which is less desirable for bridge foundations. The proposed bridge alignment should avoid this area if possible.

There was no excessive scour or erosion within the study area. The mature vegetation along the banks suggests that this section of the Speed River is stable, and not undergoing any significant lateral channel migration. The riffle within the study area is also providing protection against any channel bed scour.

Figure 3-6 Upstream View of Speed River at Proposed Bridge Location, Showing Island Mass

Figure 3-7 Groundwater Seepage Area Along Northern Bank in the Upstream Section of Study Area



3.4 Natural Heritage Assessment

The Speed River corridor provides important natural heritage to the City of Guelph, with prominent features such as woodlands, wetlands, and open aquatic habitat. Natural heritage field inventories were undertaken in support of the study, including a vegetation community survey, a botanical inventory, a tree inventory, targeted wildlife surveys, and an aquatic habitat assessment. Wetland boundaries were staked in consultation with GRCA and subsequently surveyed. An Ecological Impact Study (EIS) for the Emma St to Earl St Pedestrian Bridge EA has been prepared and submitted to the City, and is included as Appendix A.

3.4.1 Vegetation Communities

Vegetation communities within and approximately 120m from the anticipated area(s) of impact were classified according to the Ecological Land Classification (ELC) System for Southern Ontario (Lee et al., 1998). The boundaries of each vegetation community are delineated and mapped in Figure 3-9.

A total of nine (9) vegetation polygons were identified capturing eight (8) distinct community types. According to information available from the NHIC and the City of Guelph's OP, **none of the vegetation communities present in the study area are globally, nationally, provincially, or locally rare.** On the landscape level, the vegetation communities within the study area are in a river valley system and tablelands. Further information, including detailed descriptions, of the various vegetation communities are provided within the ESR.

3.4.2 Flora

A summer botanical inventory was conducted during vegetation community assessment surveys using an area search methodology. A total of 118 species of vascular plants were catalogued during three-season botanical inventories, vegetation community classification surveys, and wetland evaluations within the study area. Of the 107 species identified to the species level, 76 (64%) are native to Ontario and 42 (36%) are introduced species, which is reflective of the disturbed nature of the vegetation communities within the valley corridor. The majority of species recorded have a high range of habitat tolerances, as evidenced by the high proportion of species with low coefficients of conservatism (CC) values. Species with narrow habitat tolerances, of which there were 3, are located within ELC polygon 4 (Figure 3-9).

None of the species recorded during surveys are of global, national, or provincial significance. **Two species recorded during surveys are considered rare in Guelph: Cut-leaved Coneflower and Riverbank Wild Rye.** These species are growing on an island in the middle of the Speed River (ELC polygon 4).

An annotated list of flora recorded within the study area is provided within the ESR.

3.4.3 Tree Inventory

A detailed tree survey was completed within areas anticipated to be impacted by potential bridge footings and construction access routes. Fieldwork was completed by an Aquafor's ISA Certified Arborist on September 20th, 2016. Trees 100 mm diameter or greater at breast height (DBH) were tagged and numbered; pertinent information such as species, DBH, crown reserve (diameter), tree health, and location was recorded. An

additional 12 trees were recorded on April 6th, 2018 during candidate bat maternity roost surveys.

A total of 91 trees equal to or greater than 100 mm DBH were surveyed within the study area. These trees are mostly in fair (29%) condition or dead (26%), and most living trees are mid-aged to mature. Manitoba Maple and Black Locust are the dominant species, making up 29% and 26% of the surveyed trees, respectively. No endangered species was identified in the study area during the tree surveys.

A summary of the existing trees, their species name, and preservation priority is listed below in Table 3-3, and a tree inventory mapping prepared for preliminary design (Figure 3-8). **The Arborist assessment concluded that only 14% of the trees in the study area are of high preservation priority.** The detailed tree inventory is included in the ESR. A detailed tree preservation plan should be developed for the preferred alternative during the preliminary design stage.

Table 3-3 Summary of Tree Inventory.

Species Common Name	Count	Preservation Priority		
		Low (Includes Dead Trees)	Medium	High
Black Locust	24	24	0	0
Black Walnut	10	1	0	9
Crack Willow	15	15	0	0
Manitoba Maple	26	26	0	0
Norway Maple	3	3	0	0
Siberian Elm	1	1	0	0
Silver Maple	6	2	0	4
Small-leaved Linden	1	1	0	0
White Elm	5	1	4	0
TOTAL	**91**	**74**	**4**	**13**

Figure 3-8 Tree Inventory Mapping.

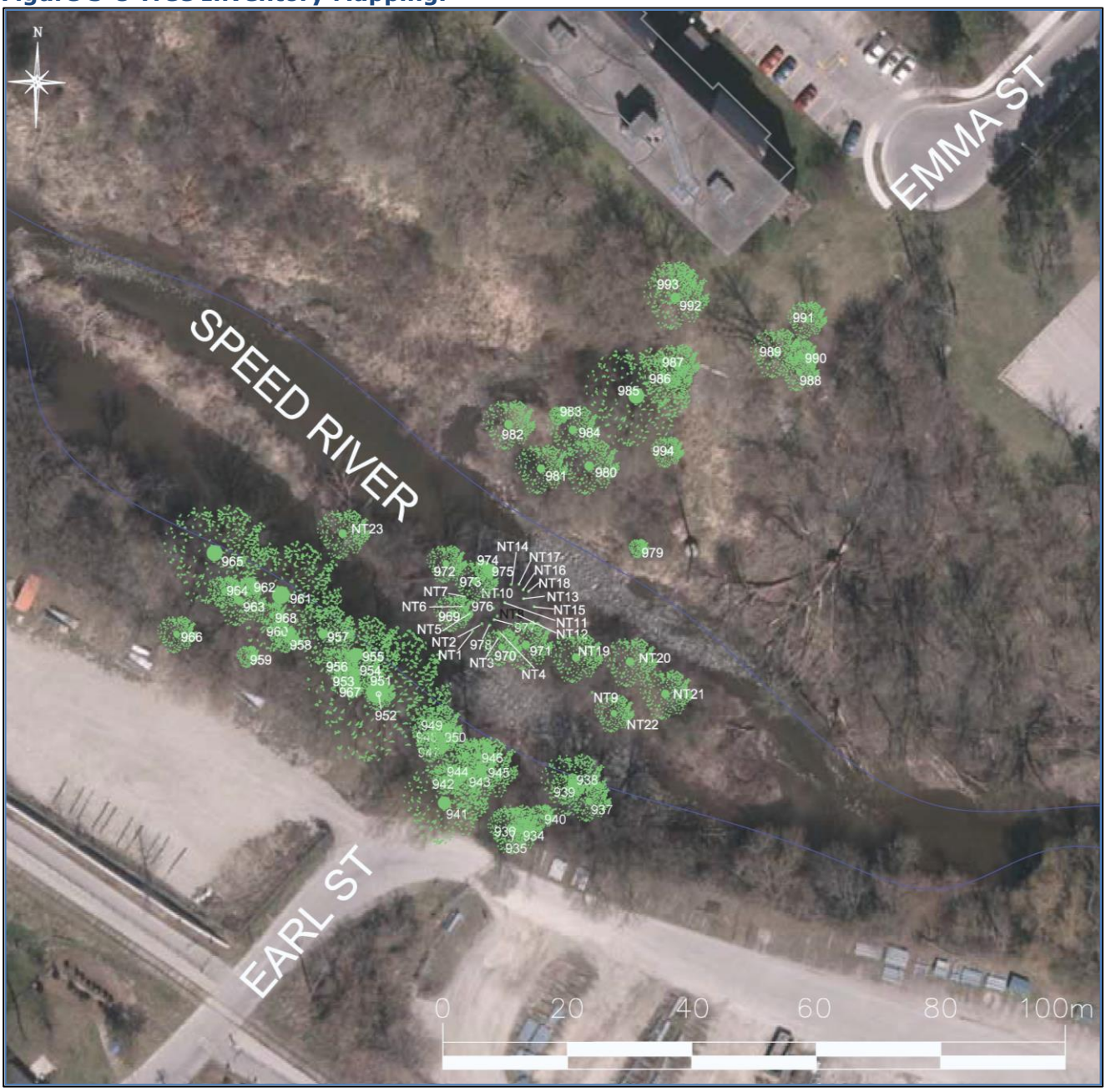
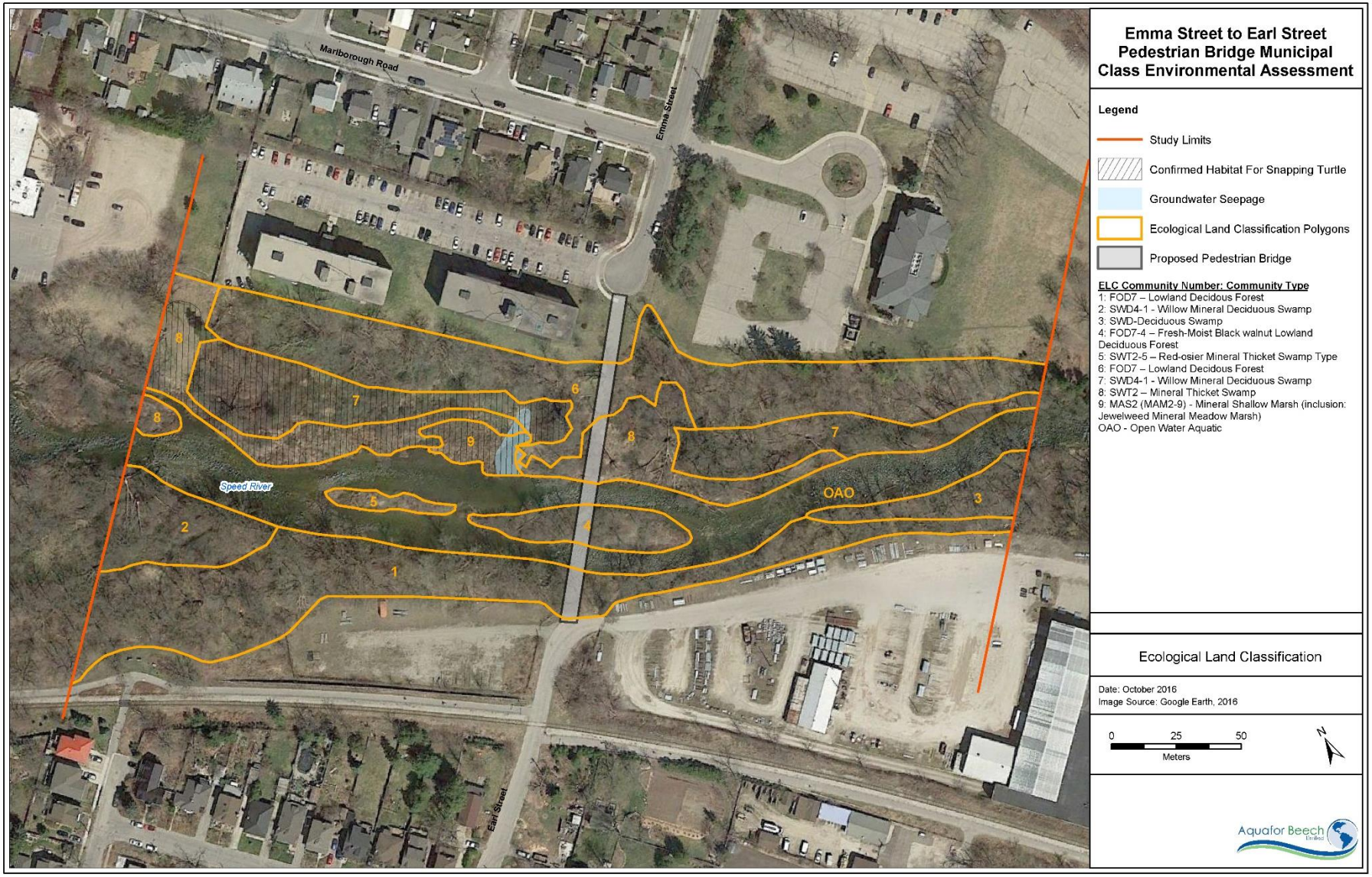


Figure 3-9 Vegetation Communities & Significant Wildlife Habitat.



3.4.4 Fisheries & Aquatic Habitat

Fisheries information solicited from the Ministry of Natural Resources and Forestry (MNRF) indicates that the **Speed River is listed as a cool-water system**. There are no fish collection records within the study area, but MNRF fisheries survey points at downstream stations yielded records of Yellow Perch, Largemouth Bass, and Rock Bass. Common Carp was also observed during field investigations. These are warm to cool-water species, common in Ontario, and fairly tolerant to disturbance within their habitats.

Aquatic habitat mapping of the Speed River was conducted using the Environmental Guide for Fish and Fish Habitat (MTO, 2009). Detailed observations and descriptions of the aquatic habitat is provided in the ESR (Appendix A). **The exercise identified potential foraging and mating habitat for Snapping Turtle, a species-at-risk, within ELC polygons 2-5 and 7-9** (i.e., wetland habitat; see Figure 3-9).

The proposed bridge works would be conducted in or near the Speed River, which is considered a recreational fishery containing fish at all given times throughout the year. In turn, a Self-Assessment was conducted on December 22, 2016 to determine the need to apply for a Department of Fisheries and Oceans (DFO) Request for Review. The Assessment states that DFO Review is not required for clear-span bridge construction projects if no new fill is placed below the High Water Mark, and fish passage is not completely obstructed during timing windows. **Should the preferred alternative selection process result in bridge design meeting the aforementioned criteria, a DFO Review would not be necessary.** Otherwise, a DFO Request for Review application should be undertaken to confirm if a DFO Permit would require.

3.5 Wildlife & Species-at-Risk

3.5.1 Resident Wildlife

Aquafor completed breeding bird surveys, calling amphibian surveys, and active hand searches for snakes within the study area. Incidental wildlife observations were documented on all site visits.

No snakes were found on the site. Low numbers of mainly common and widespread bird and amphibian species were documented during surveys; full details of survey results are found in the ESR in Appendix A. Eastern wood-pewee, a Special Concern bird species, was recorded during breeding bird surveys as a possible breeder in the river valley.

3.5.2 *Species-at-Risk*

Aquafor consulted a number of primary and secondary information sources to assess the presence of species-at-risk (SAR) and species of conservation concern within the study area. Correspondence with the MNRF (Appendix B) indicates that species-at-risk were not previously recorded within the study area. However, review of the NHIC online database, Ontario Reptile Amphibian Atlas, and Mammals of Ontario Atlas indicates that the study area could support or contain Endangered bat species and/or several species of conservation concern. These species and their likelihood of occurrence within the study area are listed in Table 3-4 below.

Table 3-4 Species-at-Risk Screening.

Species Common Name	Status	Data Source	Likelihood of Occurrence in Study Area
Halloween Pennant	Significant in Guelph	NHIC Database	Unlikely
Carey's Sedge	S2	NHIC Database	Not Present
Butternut	Endangered	MNRF	Not Present
Eastern Ribbonsnake	Special Concern	NHIC Database	Unlikely
Blanding's Turtle	Threatened	NHIC Database	Unlikely
Snapping Turtle	Special Concern	Guelph Resident	**Present**
Northern Map Turtle	Special Concern	NHIC Database	Unlikely
Jefferson / Blue-spotted Salamander Complex	Endangered	Ontario Reptile & Amphibian Atlas	Not Present
Western Chorus Frog	Significant in Guelph	Ontario Reptile & Amphibian Atlas	Unlikely
Little Brown Myotis	Endangered	Atlas of Mammals of Ontario	**Potentially Present**
Eastern Small-footed Bat	Endangered	MNRF	**Potentially Present**
Northern Myotis	Endangered	MNRF	**Potentially Present**
Tricolored Bat	Endangered	MNRF	**Potentially Present**
Great Blue Heron	Significant in Guelph	Guelph Resident	**Present**
Eastern Wood-pewee	Special Concern	Aquafor Beech Field Survey	**Present**
Cut-leaved Coneflower	Significant in Guelph	Aquafor Beech Field Survey	**Present**
Riverbank Wild-rye	Significant in Guelph	Aquafor Beech Field Survey	**Present**

Further information of the characteristics of preferred habitat for each species, as well as foraging, breeding, and nesting habitat observed during Aquafor's field surveys is provided in the ESR (Appendix A).

Surveys were completed to identify potential bat roosting trees (i.e., standing snags, cavity trees, etc.) within the study area. **A total of 39 candidate bat maternity roost sites are within or adjacent to anticipated disturbance areas** (see Figure 3-8). For project alternatives requiring removal of potential bat habitat trees, an **Information Gathering Form (IGF) should be completed and submitted by the proponent to the MNRF due to potential impacts to habitat of Endangered species (i.e., bats) by the proposed development.** Special Concern species (e.g., snapping turtle, eastern wood-pewee) do not receive regulatory protection under the *Endangered Species Act.*

3.5.3 Significant Wildlife Habitat

Aquafor used the MNRF's *Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E* as a guiding document in determining the presence of significant wildlife habitat (SWH) on the subject property. The corresponding analysis and assessment are detailed in ESR Report.

SWH types that were confirmed within the study area are: Seeps and Springs and Habitat for Special Concern Species (i.e., snapping turtle and possibly eastern wood-pewee**).** These SWH have been mapped and cover parts of ELC polygons 7, 8 and 9 (Figure 3-9). The groundwater seep is likely part of a larger complex of wetlands within the greater Speed River corridor, some of which could be influenced by groundwater, and thus qualifies as SWH under the category "Specialized Wildlife Habitat: Seeps and Springs". As snapping turtle was confirmed in the bottomlands on the north side of the River and it is most likely that the species is also using the River itself, these habitats are also confirmed SWH under the category "Habitat of Special Concern and Rare Species".

Candidate SWH within the study area consists of maternity habitat for bats. As previously discussed, thirty-nine (39) candidate maternity roosting sites are within or adjacent to anticipated disturbance areas.

3.6 Archeological Assessment

Archaeological Services Inc. (ASi) conducted a Stage 1 archaeological assessment of the study area in accordance with the *Ontario Heritage Act (2005)* and the *2011 Standards and Guidelines for Consultant Archaeologists*, administered by the Ministry of Tourism, Culture and Sport (MTCS). The objectives of the assessment were as follows:

- To provide information about the history, current land conditions, geography, and previous archaeological fieldwork of the study area;
- To evaluate in detail the archaeological potential of the study area that can be used, if necessary, to support recommendations for Stage 2 archaeological assessment;
- To recommend appropriate strategies for Stage 2 archaeological assessment, if necessary.

The assessment process included several exercises including review of historical context, historical mapping, twentieth-century mapping, land use and geography, previous archaeological research, as well as in-field property inspection. The property inspection was conducted on November 23rd, 2016 and involved visual inspection only (no excavation). Results of the desktop and field exercises are presented within ASi's report (Appendix C).

Analysis of historical and archaeological contexts concluded that the study area meets the following criteria indicative of archaeological potential:

- Previously identified archaeological sites (AjHb-83, AjHb-84 from the OASD);
- Water sources: primary, secondary, or past water source (Speed River);
- Early historic transportation routes (Woolwich St, Delhi St, Emma St, Earl St, GJR);
- Proximity to early settlements (historic Town of Guelph); and
- Well-drained soils (Burford Loam).

The property inspection determined that parts of the study area retain archaeological potential (Plates 3, 4 & 7, Figure 3-10) and require Stage 2 archaeological assessment by test pit survey prior to any development.

In light of these results, ASi's Stage 1 report concluded and recommended the following:

1. Two previously registered archaeological sites are located within one kilometre of the study area.
2. Parts of the study area possess archaeological potential and require Stage 2 assessment during the detailed design stage, prior to any proposed works.

Figure 3-10 Results of Archaeological Property Inspection for Emma St to Earl St Pedestrian Bridge

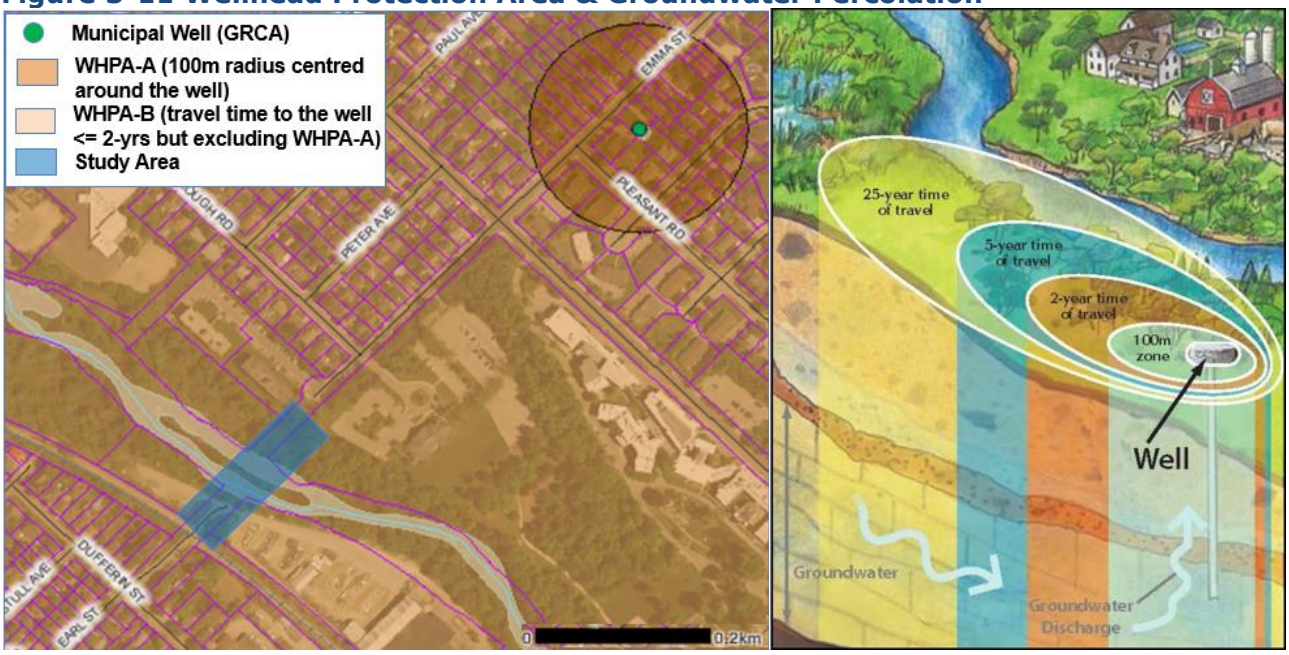
Figure 8: Emma Street to Earl Street Pedestrian Bridge - Results of the Property Inspection

3.7 Source Water Protection & Geology

The City of Guelph Official Plan (2014) and the Grand River Source Protection Plan (2015) contain policies that protect Guelph's water resources. The plans have designated vulnerable areas and are mapped in the source water protection assessment reports under the Clean Water Act (CWA).

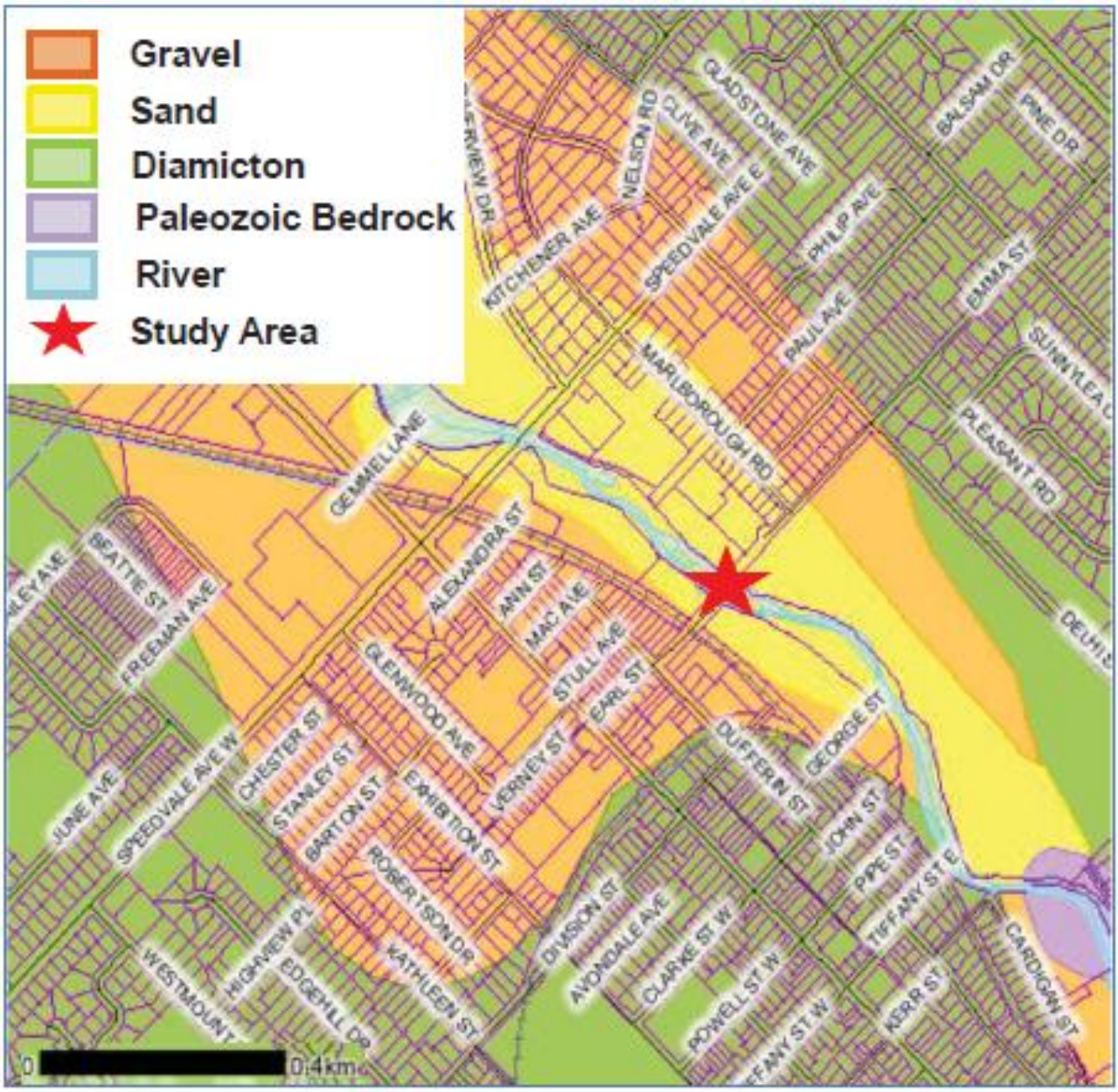
Information from the plans show that the groundwater in the study area has been classified as vulnerable and there is a municipal well approximately 400m from the study area (Figure 3-11).

Figure 3-11 Wellhead Protection Area & Groundwater Percolation



An investigation into the geology of the study area was conducted. The purpose of this investigation was to find the soil composition and bed rock locations. Information provided by the City of Guelph and the Ministry of Northern Development and Mines (MNDM) have classified the bedrock elevation to be between 315 – 326.5m in the study area. GRCA has created the Grand River Information Network (GRIN) which offers a variety of maps and data resources that can be used to identify the surficial geology. The surficial geology was identified as mainly sand based on GRIN's mapping tools (Figure 3-12). Base on this investigation, the study area is mainly sand and bedrock elevation is close to the surface elevation.

Figure 3-12 Surficial Geology of Study Area



4 PHASE 2 – ALTERNATIVE SOLUTIONS & PREFERRED DESIGN

A series of five (5) alternatives for the Emma to Earl Street bridge configuration were developed as part of this EA study. The following section discusses the five alternatives and summarizes an evaluation of these alternatives based on background information, site specific understanding of the existing conditions, cost estimates, and public input. A brief summary of alternatives, along with conceptual images are included, followed by the evaluation and selection of the preferred solution.

4.1 Description of Alternatives

4.1.1 Null Alternative – Existing Conditions Remain with No Bridge Connection

The null or 'do nothing' alternative would involve eliminating the Emma Street to Earl Street pedestrian bridge proposal, leaving pedestrians and cyclists with reduced connectivity between downtown and the north-east part of the City.

The proposed cycling route, as defined within the preferred alternative within Speedvale Avenue - from Manhattan Court to Woolwich Street, would require reconfiguration to provide an alternate crossing of the Speed River. This alternative would not address the bridge crossing identified in the Official Plan (Schedule 6: Open Space - Trail Network), and would limit connectivity between the Primary Route along the Speed River, and Secondary Route along Emma Street as defined within the Guelph Trail Master Plan (2005). The Cycling Master Plan identified Speedvale Avenue for upgrades to accommodate bike lanes. Through the EA process, this was determined infeasible and that a connection between Emma to Earl should be explored through an EA.

As Speedvale Avenue was constructed without bike lanes, alternate crossing of the Speed River for cyclists may be undertaken to the south at Norwich Street or Eramosa Road.

This alternative eliminates any impacts on the Natural Heritage System and aquatic / wetland habitat, and has no capital costs to the City. However, it also disregards the opportunity to remove the upstream historic fill (mapped as projection of Lowland Deciduous Forest FOD7 on Figure 3-9). No amendment to the Official Plan would be required.

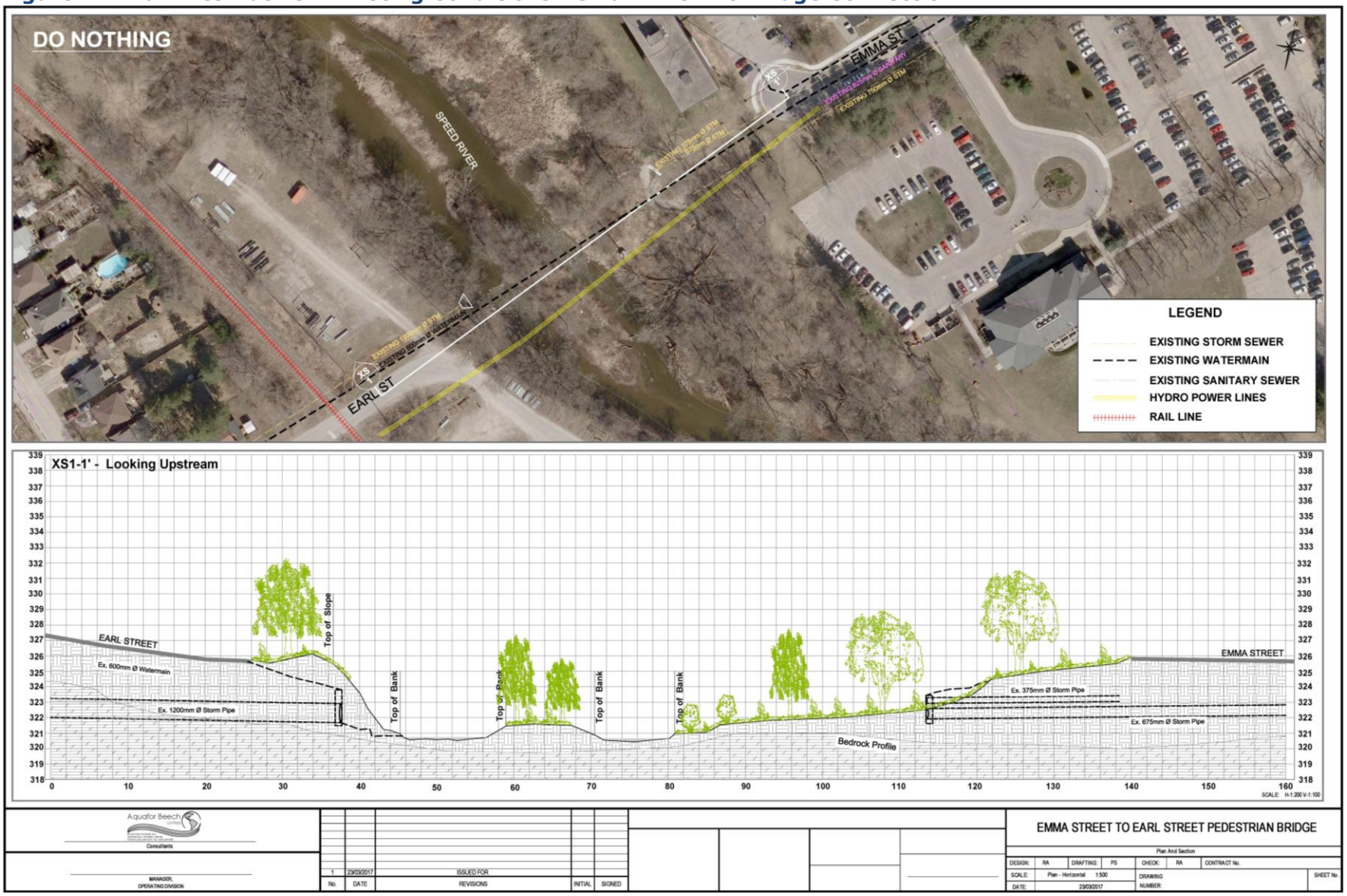
Pros:

- No impact on Natural Heritage System
- Consistent with Official Plan policy. No OPA required.
- No capital or maintenance costs
- Limits bike and pedestrian traffic raised as a concern by local landowners

Cons:

- Safety risk for pedestrians and cyclists using Speedvale Ave
- Reduced connectivity for pedestrians and cyclists between downtown and the northeast
- Inconsistent with the Guelph Trail Master Plan (2005), Official Plan Schedule 6, and Speedvale EA Preferred Alternative (2015)

Figure 4-1 Null Alternative – Existing Conditions Remain with No Bridge Connection.



4.1.2 Alternative 1 – Steel Cable Single Span Bridge

Alternative 1 provides an opportunity to implement the pedestrian bridge as a single span (~90m) cable-stayed bridge, with no new structures constructed in the river corridor. The bridge deck would be supported by steel cables running directly to two girders located beyond top of slope, but within the limits of the Natural Heritage System (Significant Woodland). This alternative has a higher level of architectural interest than the more common box truss type bridges considered as Alternatives 2 & 3, and may be considered a stark contrast to the existing natural condition.

The main advantage of Alternative 1 would be the reduced impacts on the Natural Heritage System within the valley. Construction of a steel cable single span bridge would be completed using cranes from the top of slope, without accessing the valley. Furthermore, no new structures would be constructed in the valley. However, a new permanent corridor of cleared vegetation would be required for the bridge alignment, in addition to the existing hydro corridor, resulting in an ~18m gap in the tree canopy within the Natural Heritage System. There would be no opportunity to remove the upstream historic fill (mapped as projection of Lowland Deciduous Forest FOD7 on Figure 3-9).

The main disadvantage of a single span cable-stayed bridge are the higher capital costs. The construction and material costs for this type of bridge are generally higher than a conventional girder or truss bridge. Erection of the bridge would require more complex construction methods such as cantilevers and post-tensioning. On the other hand, by avoiding having a pier within the river valley, this alternative would involve a less intensive permitting process by reducing impacts to the regulated valley and avoiding in-water works.

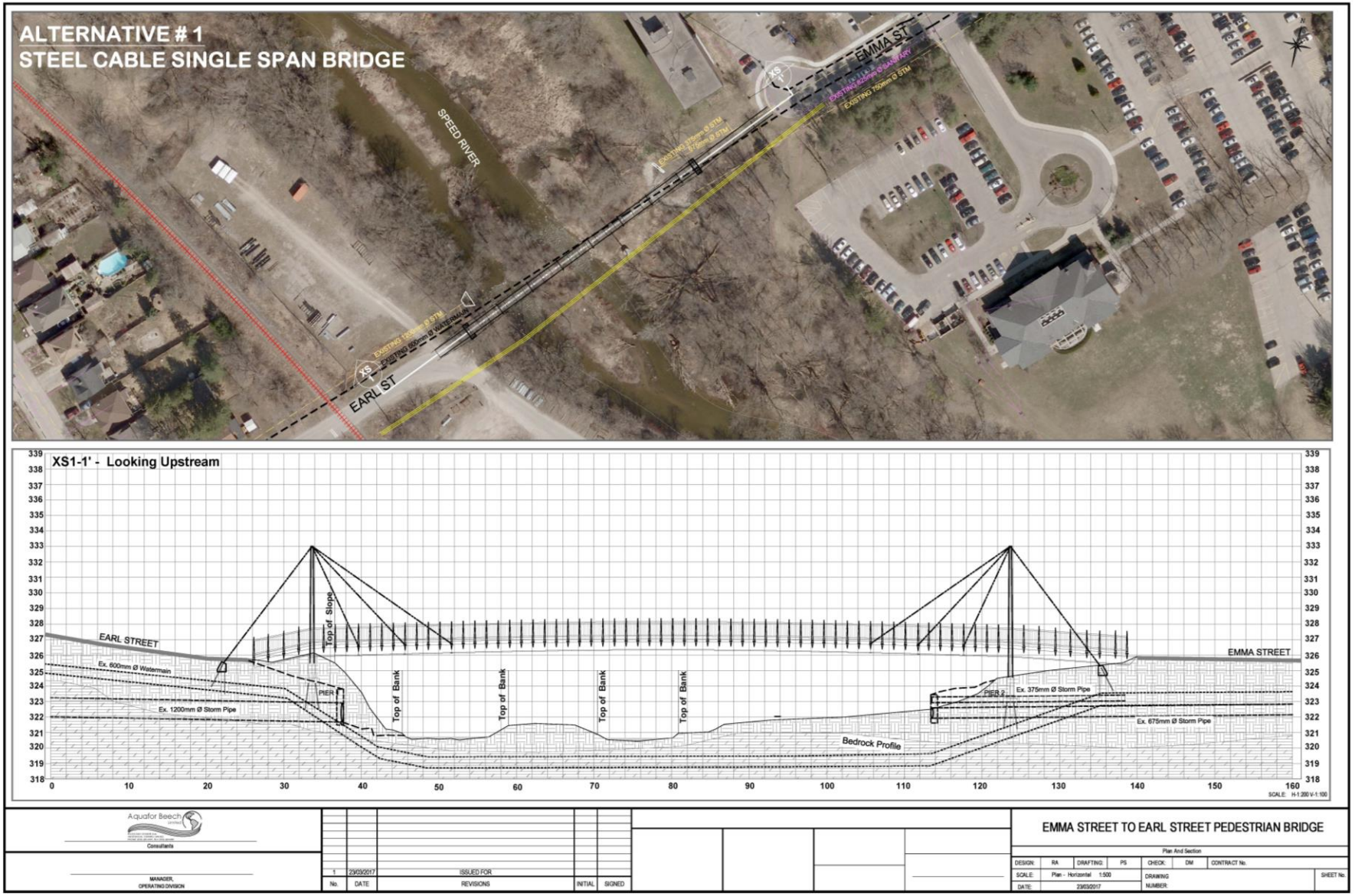
Pros:

- Separates Speedvale traffic and recreational users; provides designated route for pedestrians and cyclists.
- No new structures constructed within the valley.
- No impacts on hydraulic conveyance
- Enhanced appearance.
- Less intensive permitting process.

Cons:

- Highest capital and maintenance costs.
- Complex / expensive construction methods
- Requires a site-specific Official Plan amendment to address inconsistency with NHS policy.
- Existing hydro corridor of cleared vegetation remains, in addition to a new bridge corridor, resulting in an approximately 18m gap in the tree canopy.
- No opportunity for removal of historic fill and restoration of riparian wetlands.

Figure 4-2 Alternative 1: Steel Cable Single Span Bridge.



4.1.3 Alternative 2a – Double Span Steel Truss Bridge (Overhead Hydro Relocation)

Alternative 2a would involve a two-span truss bridge with one support pier within the left overbank area of the valley. The bridge structure would consist of one continuous truss (~60m) and one simple truss (~30m) spanning over the entire valley. This alternative proposes alignment of the bridge through the existing hydro corridor with minor relocation of the hydro lines.

The two-span truss bridge would require installation of a single pier within the left overbank area of the valley, creating a permanent footprint within wetland habitat. Access into the valley and construction of the support structure would require significant vegetation/tree removal within the Natural Heritage System. Additionally, relocation of the northern hydro pole (~12m north) would further impact the surrounding wetland habitat and result in a second permanent structure in the valley. The existing hydro corridor width would also increase, resulting in an ~13m wide gap in the tree canopy within riparian habitat. However, construction within the valley provides opportunity for removal of historic fill placed within riparian wetland upstream of proposed bridge location (mapped as projection of Lowland Deciduous Forest FOD7 on Figure 3-9). Impacts on hydraulic conveyance are slightly higher (compared to Alternative 1) due to the insertion of a flood obstruction within the overbank area.

From an economic perspective, this alternative would be ~$2M less expensive than Alternative 1, with lower capital costs associated with the box trusses, and minimal maintenance costs. Erection of the bridge would involve traditional construction methods, building the truss in-situ with cranes on either bank. Relocation of the hydro lines would be coordinated and completed by Alectra. Permitting requirements for this alternative would typically involve comprehensive reviews by the Grand River Conservation Authority (GRCA), Ministry of Environment, Conservation and Parks (MECP) and the Department of Fisheries and Oceans to address construction proposed within GRCA's regulated area, potential Species at Risk habitat and fish habitat respectively.

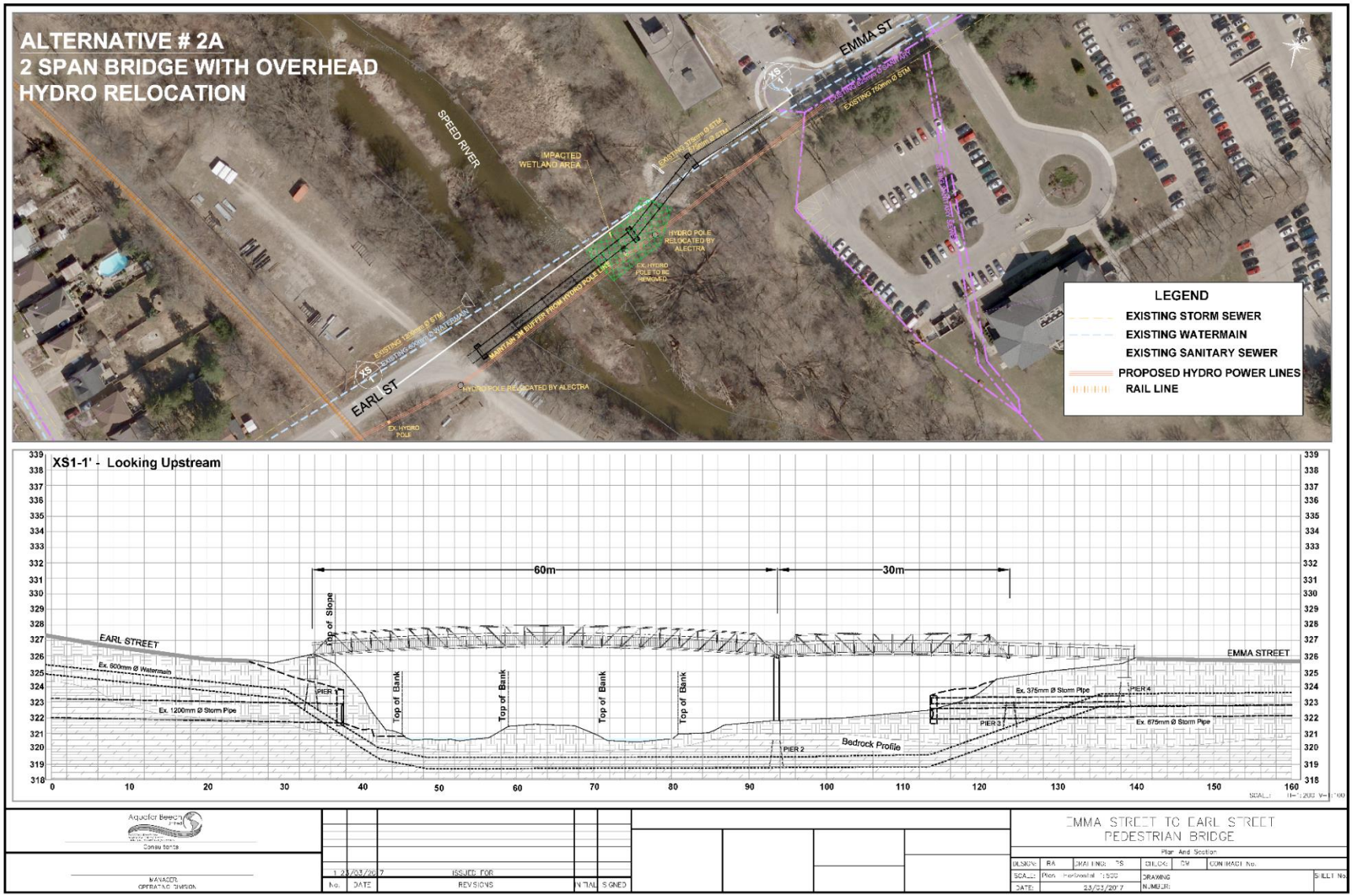
Pros:

- Separates pedestrians and cyclists from Speedvale traffic.
- Moderate capital costs and low maintenance costs
- Low impact on hydraulic conveyance.
- Utilizes existing gap in tree canopy via reuse of hydro corridor.
- Opportunity for removal of historic fill and restoration of riparian wetland.

Cons:

- Construction impacts to the wetland area due to construction of the bridge pier and relocation of the northern hydro pole.
- Vegetation / Tree removals due to access and construction in the valley.
- Result in one additional permanent structure within the valley.
- Increase in width of existing hydro corridor, resulting in an approximately 13m wide gap in the tree canopy.
- Comprehensive environmental permitting process by GRCA, MECP and DFO.
- Requires a site-specific Official Plan amendment to address inconsistency with NHS policy.
- Relocation of Alectra Hydro poles required. Coordination and review by Alectra Hydro required.

Figure 4-3 Alternative 2a: Double Span Steel Truss Bridge Through Hydro Corridor (Overhead Hydro Relocation)



4.1.4 Alternative 2b – Double Span Steel Truss Bridge (Hydro within Structure)

Alternative 2b would involve a two-span truss bridge with one support pier within the left overbank area of the valley. The bridge structure would consist of one continuous truss (~60m) and one simple truss (~30m) spanning over the entire valley. This alternative proposes aligning the bridge through the existing hydro corridor and incorporating the hydro lines within the structure.

The two-span truss bridge would require installation of a single pier within the left overbank area of the valley, utilizing the existing hydro pole footprint within wetland habitat. Access into the valley and construction of the support structure would require significant vegetation/tree removal within the Natural Heritage System. However, impacts to the surrounding riparian and wetland habitat are mitigated (compared to Alternative 2a) with removal of the existing hydro pole and utilizing its footprint for the bridge. Integration of the hydro pole into the bridge structure would also utilize the existing cleared hydro corridor, resulting in an ~10m gap in the tree canopy. This alternative also provides opportunity for removal of historic fill placed within riparian wetland upstream of proposed bridge location (mapped as projection of Lowland Deciduous Forest FOD7 on Figure 3-9). Impacts on hydraulic conveyance are slightly higher (compared to Alternative 1) due to the insertion of a flood obstruction within the overbank area.

From an economic perspective, this alternative would be significantly less expensive than Alternative 1 but slightly more expensive than Alternative 2a due to the integration of the hydro line within the structure. The alternative involves lower capital costs associated with the box trusses, and minimal maintenance costs. Erection of the bridge would involve traditional construction methods, building the truss in-situ with cranes on either bank.

Accommodation of the hydro lines within the bridge structure will require comprehensive coordination and review with Alectra. Permitting requirements for this alternative would typically involve comprehensive reviews by the GRCA, MECP and DFO to address construction proposed within GRCA's regulated area, potential Species at Risk habitat and fish habitat respectively.

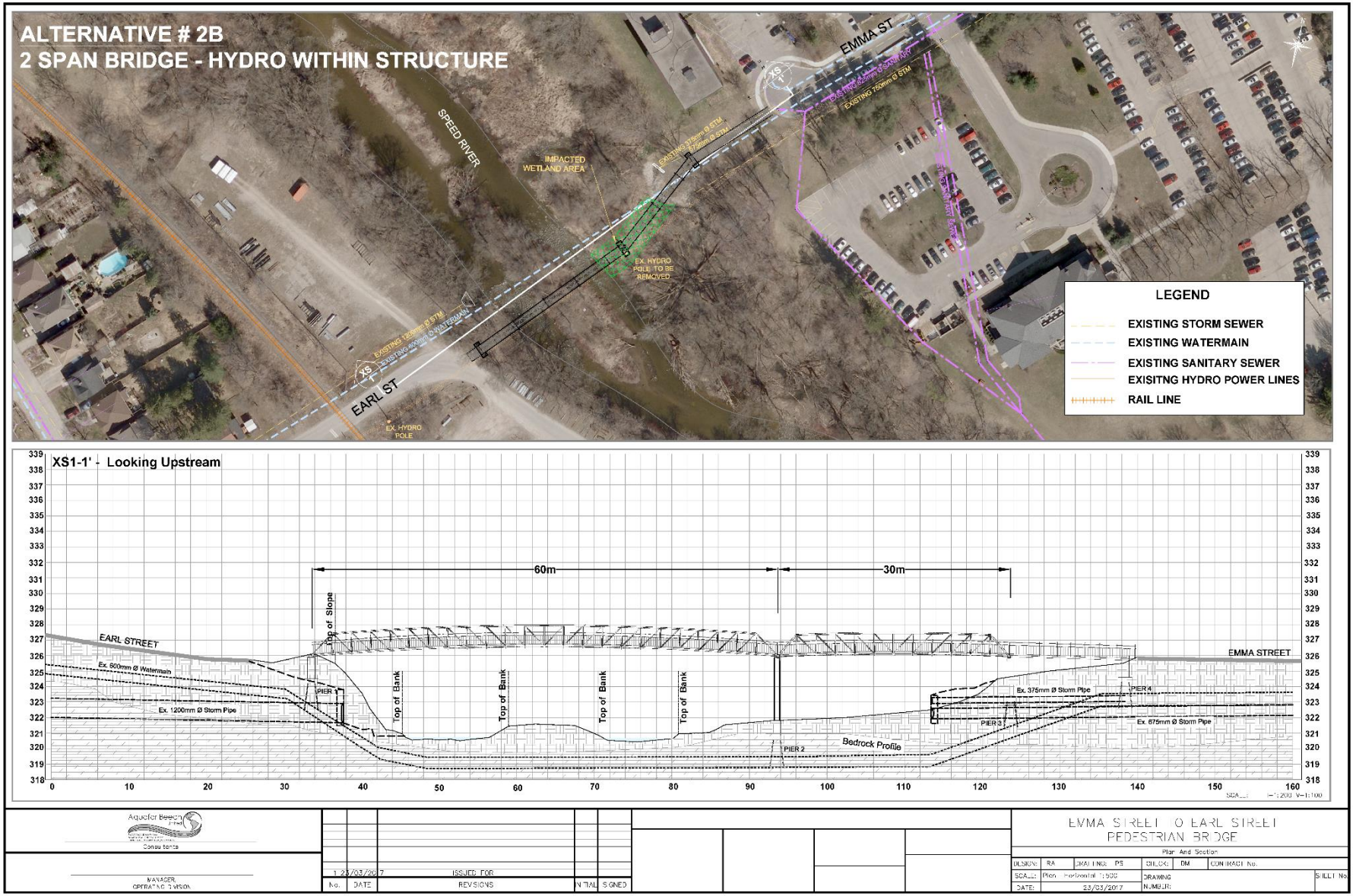
Pros:

- Separates pedestrians and cyclists from Speedvale traffic.
- Moderate capital costs and low maintenance costs.
- Low impact on hydraulic conveyance.
- Utilizes and maintains existing ~10m gap in tree canopy via reuse of hydro corridor.
- Replaces existing hydro pole structure with bridge pier, resulting in one permanent structure within the valley.
- Opportunity for removal of historic fill and restoration of riparian wetland.

Cons:

- Construction impacts to the wetland area due construction of the pier. Impacts are mitigated by utilizing footprint of existing hydro pole.
- Vegetation / Tree removals due to access and construction in the valley.
- Requires a site-specific Official Plan amendment to address inconsistency with NHS policy. Coordination and review by Alectra Hydro required.
- Comprehensive environmental permitting process by GRCA, MECP and DFO.

Figure 4-4 Alternative 2b: Double Span Steel Truss Bridge Through Hydro Corridor (Hydro within Structure)



4.1.5 Alternative 3 – Triple Span Steel Truss Bridge

Alternative 3 would involve a three-span truss bridge with two support piers within the valley. The bridge structure would consist of three simple trusses (~30m each) spanning over the entire valley. This alternative is the least expensive option, but would have the largest environmental impacts.

The three-span truss bridge would require the installation of two support piers within the valley, one on the river island and the other within the left overbank area in wetland habitat. Access into the valley and construction of the support structures would require significant vegetation/tree removal, as well as a new permanent footprint within wetland habitat, separate from the existing hydro pole footprint. Construction of the southern pier would also require a channel crossing to the river island. A new cleared corridor would be required for the bridge, in addition to the existing hydro corridor, resulting in a total ~17m wide gap in the tree canopy within riparian habitat. Thus, this alternative would create the largest impacts on terrestrial and aquatic habitat out of the four alternatives. Furthermore, impacts on hydraulic conveyance would also be the highest due to the insertion of flow obstructions within the channel and overbank areas.

From an economic perspective, this alternative would be the least expensive, with the lowest capital costs associated with simple box trusses, and minimal maintenance costs. Erection of the bridge would involve traditional construction methods, building the truss in-situ with cranes on either bank. Permitting requirements for this alternative would typically involve comprehensive reviews by the GRCA, MECP and DFO to address construction proposed within GRCA's regulated area, potential Species at Risk habitat and fish habitat respectively.

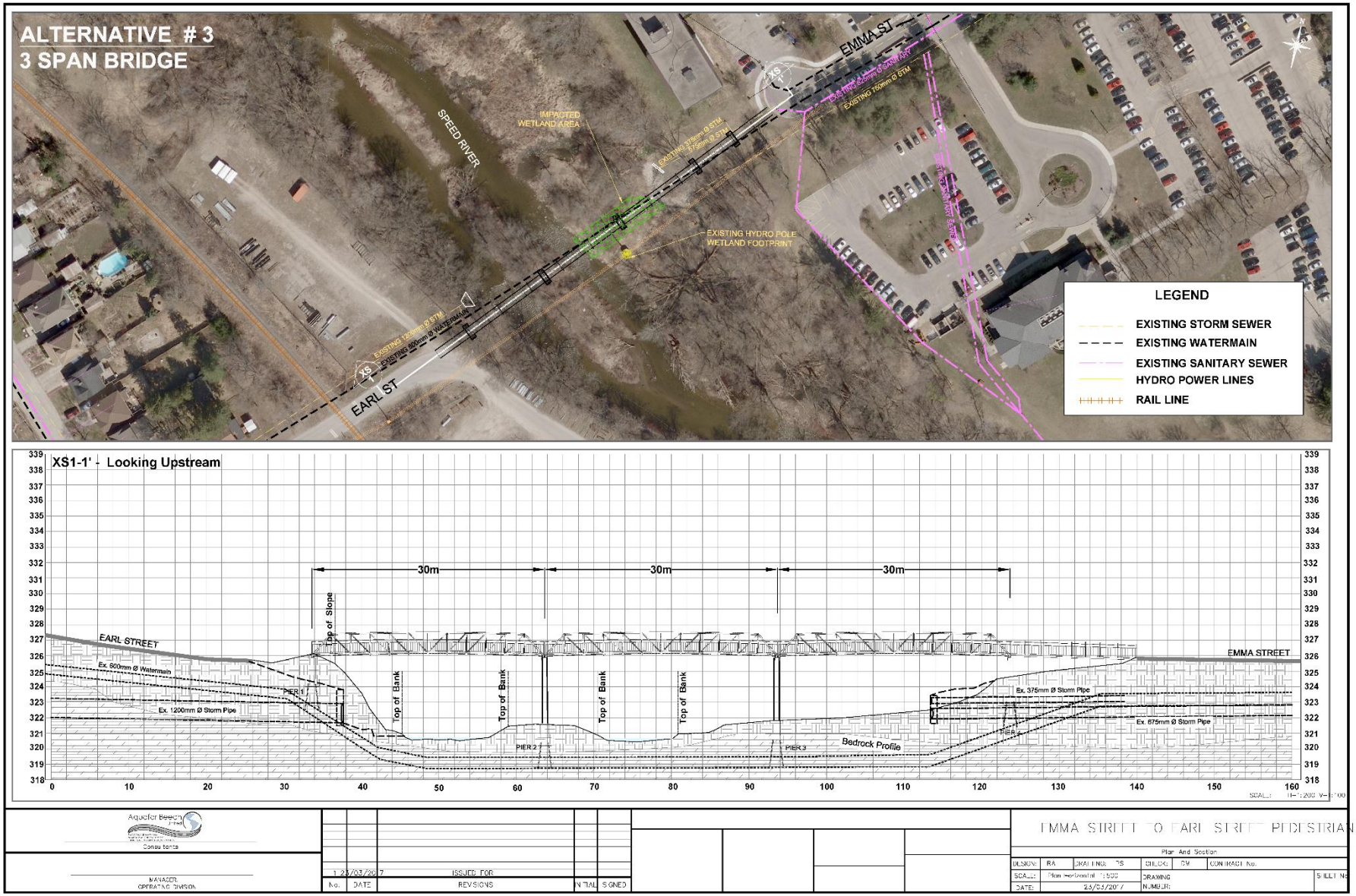
Pros:

- Separates pedestrians and cyclists from Speedvale traffic.
- Lowest capital costs and low maintenance costs.
- Opportunity for removal of historic fill and restoration of riparian wetland.

Cons:

- Construction impacts to the wetland area due to construction of the bridge pier.
- Vegetation / Tree removals due to access and construction in the valley.
- Channel crossing required. Largest impact on terrestrial and aquatic habitat.
- Existing hydro corridor of cleared vegetation remains, in addition to a new bridge corridor, resulting in an approximately 17m gap in the tree canopy.
- Large impact on hydraulic conveyance.
- Result in two additional permanent structures within the valley (existing hydro pole footing would remain).
- Comprehensive environmental permitting process by GRCA, MECP and DFO
- Requires a site-specific Official Plan amendment to address inconsistency with NHS policy.

Figure 4-5 Alternative 3: Triple Span Steel Truss Bridge.



4.2 Cost Estimates of Alternatives

Comprehensive cost estimates, including detailed design services and construction have been prepared for each alternative. As noted within the description of alternatives, Alternative 1 – Single Span Bridge would be the most costly, with Alternatives 2a, 2b & 3 estimated to be less than half. A summary of alternative costing is presented in Table 4-1, with Table 4-2 an example of the detailed costing. Additional costing detail for each alternative is included in Appendix E.

Table 4-1 Costing Summary of Alternatives 1, 2, 3

Alternative 1 - Single Span Bridge	
Engineering & Design	$185,000.00
Construction	
Section A - Site Preparation and Removal (Excl of taxes)	$121,600.00
Section B - Bridge Structure (Excl of taxes)	$2,500,000.00
Section C - Restoration (Excl of taxes)	$40,000.00
Section E - Contingency (20%)	$569,320.00
Sub Total (Excl of taxes)	**$3,230,920.00**
HST @ 13%	$420,019.60
Total Bid Price (Incl of taxes)	**$3,650,939.60**

Alternative 2a - Two-Span Bridge (Hydro Relocation)	
Engineering & Design	$105,000.00
Construction	
Section A - Site Preparation and Removal (Excl of taxes)	$185,600.00
Section B - Bridge Structure (Excl of taxes)	$900,000.00
Section C - Restoration (Excl of taxes)	$107,000.00
Section E - Contingency (20%)	$259,520.00
Sub Total (Excl of taxes)	**$1,452,120.00**
HST @ 13%	$188,775.60
Total Bid Price (Incl of taxes)	**$1,640,895.60**

Alternative 2b - Two-Span Bridge (Hydro within Structure)	
Engineering & Design	$105,000.00
Construction	
Section A - Site Preparation and Removal (Excl of taxes)	$390,600.00
Section B - Bridge Structure (Excl of taxes)	$900,000.00
Section C - Restoration (Excl of taxes)	$107,000.00
Section E - Contingency (20%)	$300,520.00
Sub Total (Excl of taxes)	**$1,698,120.00**
HST @ 13%	$220,755.60
Total Bid Price (Incl of taxes)	**$1,918,875.60**

Alternative 3 - Three-Span Bridge	
Engineering & Design	Total
Construction	
Section A - Site Preparation and Removal (Excl of taxes)	$220,600.00
Section B - Bridge Structure (Excl of taxes)	$800,000.00
Section C - Restoration (Excl of taxes)	$127,000.00
Section E - Contingency (20%)	$254,520.00
Sub Total (Excl of taxes)	**$1,402,120.00**
HST @ 13%	$182,275.60
Total Bid Price (Incl of taxes)	**$1,584,395.60**

Table 4-2 Detailed Costing Estimate for Alternative 2b – Double Span Bridge (Hydro within Structure).

Pedestrian Bridges - Alternative 2b (Hydro within Structure)					
City of Guelph					
Engineering & Design					
1	Geotechnical Investigation for Bridge Design	1	LS	$25,000.00	$25,000.00
2	Design & Administration of Bridge Structure	1	LS	$80,000.00	$80,000.00
				Subtotal (Excl of HST)	$105,000.00
Section "A" – Site Preparation & Removal					
Item No.	Description	Est. Qty.	Unit	Unit Price	Total
A1	Performance, Labour, and Material Bonds	1	LS	$20,000.00	$20,000.00
A2	Project Signage	2	EA	$800.00	$1,600.00
A3	Field Office	1	LS	$5,000.00	$5,000.00
A4	Mobilization & Demobilization	1	LS	$20,000.00	$20,000.00
A5	Construction Layout and Utility Locates	1	LS	$8,000.00	$8,000.00
A6	Hydro Integration into Bridge Structure	1	LS	$265,000.00	$265,000.00
A7	Access, Staging Area, Crane Pads, and Rehabilitation	1	LS	$25,000.00	$25,000.00
A8	Traffic Control and Signage	1	LS	$6,000.00	$6,000.00
A9	Clearing, grubbing, and tree removals	1	LS	$15,000.00	$15,000.00
A10	Supply, install, and remove construction fence	1000	m	$10.00	$10,000.00
A11	Supply, install, and remove sediment fence	1000	m	$15.00	$15,000.00
				Subtotal (Excl of HST)	$390,600.00
Section "B" – Bridge Structure Design and Construction - Alternative					
Item No.	Description	Est. Qty.	Unit	Unit Price	Total
B1	Fabrication, Supply, and Erection of Two Span Steel Bridge, Including Foundations, Helical Piers, Superstructure and Handrails)	1	LS	$900,000.00	$900,000.00
				Subtotal (Excl of HST)	$900,000.00
Section "C" – Restoration					
Item No.	Description	Est. Qty.	Unit	Unit Price	Total
C1	Supply and Placement of Erosion Control Blanket	1	LS	$18,000.00	$18,000.00
C2	Supply and Application of Topsoil (300mm)	1	LS	$20,000.00	$20,000.00
C3	Supply and Application of Terraseed Mixture	1	LS	$19,000.00	$19,000.00
C4	Additional Ecological Restoration	1	LS	$50,000.00	$50,000.00
				Subtotal (Excl of HST)	$107,000.00
Section "D" – Contingency					
Item No.	Description	Est. Qty.	Unit	Unit Price	Total
D1	Contingency (20%)	1	LS		$300,520.00
				Subtotal (Excl of HST)	$300,520.00

Alternative 2b - Two-Span Bridge (Hydro within Structure)					
Engineering & Design					$105,000.00
Construction					
Section A - Site Preparation and Removal (Excl of taxes)					$390,600.00
Section B - Bridge Structure (Excl of taxes)					$900,000.00
Section C - Restoration (Excl of taxes)					$107,000.00
Section E - Contingency (20%)					$300,520.00
Sub Total (Excl of taxes)					$1,698,120.00
HST @ 13%					$220,755.60
Total Bid Price (Incl of taxes)					$1,918,875.60

4.3 Evaluation of Alternatives

As part of the Municipal Class Environmental Assessment Process, each alternative must be evaluated based on a set of criteria categories, including physical and natural environment, social and cultural, technical and engineering, and economic. For each category, a set of criteria were developed by Aquafor and reviewed by the City of Guelph. The list of criteria and the associated scoring is presented in Table 4-3.

Table 4-3 Evaluation Matrix to Assess Alternatives.

EVALUATION CRITERIA	
Physical and Natural Criteria	
Hydraulics & Flooding	Impact on conveyance of the Speed River.
Aquatic Habitat	Impact on aquatic habitat.
Terrestrial Habitat	Impact on tree canopy, diversity and quantity/quality of terrestrial habitat.
Social and Cultural Criteria	
Public Safety	Impact on public safety.
Landowner Impacts	Impact on City of Guelph road right of way and adjacent landowners.
Benefit to Community	Access to trails, enjoyment of surrounding lands.
Cultural & Archaeological Impacts	Impact on areas of archaeological potential or built or cultural heritage resources.
Technical and Engineering Criteria	
Impact on Existing Infrastructure (local)	Potential impacts on existing infrastructure (watermain, storm sewer, hydro, roadway).
Impact on Existing Infrastructure (external)	Potential impacts on alternative routes.
Lifespan of Works	Expected lifespan of alternative.
Policy Conformity	Conformity with City's Natural Heritage Policies (2 or 0).
Economic Criteria	
Capital Costs	One time design and construction costs to City.
Operations & Maintenance Costs	Requirement for regular, irregular or no maintenance activities.

For each criteria, an absolute score was applied ranging from 0 to 4, where:

- 0 = high negative impact
- 1 = moderate negative impact
- 2 = low negative impact
- 3 = minimal / mitigated negative impact
- 4 = no negative impact / positive impact

These rankings were colour coded, as shown in Table 4-4.

Table 4-4 Ranking Scheme for Criteria Evaluation of Each Alternative.

Ranking Scale						
High Negative Impact	0	1	2	3	4	**No Negative Impact**

The evaluation was completed with input from Aquafor technical staff and the City of Guelph project team, accounting for input from the public and stakeholders. Scores were applied to each alternative for each criteria.

Criteria scores are summed up for the four categories, and the category scores are added up to present a final cumulative score and ranking for each alternative. A summary of scores are presented in Table 4-5. A preliminary ranking was presented to the public, landowners, and relevant stakeholders, and updated based on feedback. The ranking was further updated with the addition of Alternative 2b to integrate the hydro line into the bridge structure. Through the ranking process, the preferred alternatives have been defined.

Table 4-5 EA Evaluation of the Five Alternatives for Emma to Earl Street Bridge.

EVALUATION CRITERIA		Null Alternative - Do Nothing		Alt 1 - Steel Cable Suspension - Single Span		Alt 2a - Steel Box Truss - Double Span - Hydro relocated		Alt 2b - Steel Box Truss - Double Span - Hydro within structure		Alt 3 - Steel Box Truss - Triple Span	
		Score	Explanation	Score	Explanation	Score	Explanation	Score	Explanation	Score	Explanation
Physical and Natural Criteria		**11**		**10**		**7**		**10**		**3**	
Hydraulics & Flooding	Impact on conveyance of the Speed River	4	Existing hydraulic conveyance maintained. Existing hydro pole and upstream historic fill within floodplain.	4	Existing hydraulic conveyance maintained. Existing hydro pole and upstream historic fill within floodplain.	2	Potential impact under high flood flows due to new pier structure in floodplain. Existing hydro pole remains within floodplain.	3	Potential impact under high flood flows due to new pier structure in floodplain. Mitigated by removing existing hydro pole.	1	Significant impact under high flood flows due to two new pier structures within floodplain / channel.
Aquatic Habitat	Impact on aquatic habitat	3	No impact on aquatic habitat. No opportunity to remove upstream historic fill and restore wetland feature.	3	No impact on aquatic habitat. No opportunity to remove upstream historic fill and restore wetland feature.	3	Some impact due to new pier footprint within wetland. Opportunity to remove upstream historic fill and restore wetland feature.	4	Minimal impact due to removal of hydro pole and utilization of existing footprint for new pier within wetland. Opportunity to remove upstream historic fill and restore wetland feature.	1	Significant impact on wetland and aquatic habitat due to two new piers within wetland and channel. Channel crossing required. Partially offset by opportunity to remove upstream historic fill and restore wetland feature.
Terrestrial Habitat	Impact on tree canopy, diversity and quantity/quality of terrestrial habitat	4	Vegetation / tree removal not required. No opportunity to remove upstream historic fill and replant native species.	3	No access into valley required. New cleared corridor to accommodate bridge. No opportunity to remove upstream historic fill and replant native species.	2	Vegetation / tree removal required for access and construction of new pier and relocation of hydro pole. Existing hydro corridor widened to accommodate bridge. Opportunity to remove upstream historic fill and replant native species.	3	Vegetation / tree removal required for access and construction of new pier. Existing hydro corridor width maintained. Opportunity to remove upstream historic fill and replant native species.	1	Vegetation / tree removal required for longer access and construction of two new piers. New cleared corridor to accommodate bridge. Opportunity to remove upstream historic fill and replant native species.
Social and Cultural Criteria		**6**		**13**		**12**		**12**		**11**	
Public Safety	Impact on public safety	0	Crossing alternative at Speedvale puts users in close proximity to high speed vehicles	4	Allows for separation between Speedvale traffic and recreational users	4	Allows for separation between Speedvale traffic and recreational users	4	Allows for separation between Speedvale traffic and recreational users	4	Allows for separation between Speedvale traffic and recreational users
Landowner Impacts	Impact on City of Guelph road right of way and adjacent landowners	1	Council resolution for bridge consideration not implemented	2	Increased pedestrian & cyclist traffic to low volume Earl and Emma Streets. Sidewalks along Earl Street.	2	Increased pedestrian & cyclist traffic to low volume Earl and Emma Streets. Sidewalks along Earl Street.	2	Increased pedestrian & cyclist traffic to low volume Earl and Emma Streets. Sidewalks along Earl Street.	2	Increased pedestrian & cyclist traffic to low volume Earl and Emma Streets. Sidewalks along Earl Street.
Benefit to Community	Access to trails, enjoyment of surrounding lands	1	Reduced opportunities for access to Downtown Trail	4	Connection to Downtown Trail, hospital, Bullfrog Park/Mall.	4	Connection to Downtown Trail, hospital, Bullfrog Park/Mall.	4	Connection to Downtown Trail, hospital, Bullfrog Park/Mall.	4	Connection to Downtown Trail, hospital, Bullfrog Park/Mall.
Cultural & Archaeological Impacts	Impact on areas of archaeological potential or built or cultural heritage resources	4	No impacts to existing heritage potential.	3	Impacts associated with construction generally contained beyond top of bank.	2	Disturbance to area of potential archaeological significance associated with construction of pier and relocation of hydro pole.	2	Disturbance to area of potential archaeological significance associated with construction of pier.	1	Significant disturbance to area of potential archaeological significance associated with construction of two piers.
Technical and Engineering Criteria		**10**		**11**		**10**		**10**		**7**	
Impact on Existing Infrastructure (local)	Potential impacts on existing infrastructure (watermain, storm sewer, hydro, roadway)	4	No impacts on existing infrastructure.	4	Some interaction and conflict with existing infrastructure.	3	Some interaction and conflict with existing infrastructure.	3	Some interaction and conflict with existing infrastructure.	1	Most interaction and conflict with existing infrastructure.
Impact on Existing Infrastructure (external)	Potential impacts on alternative routes	0	Negative impact on Speedvale Avenue or alternate route for cycling.	4	Remainder of pedestrian/cyclist infrastructure remains unimpacted.	4	Remainder of pedestrian/cyclist infrastructure remains unimpacted.	4	Remainder of pedestrian/cyclist infrastructure remains unimpacted.	4	Remainder of pedestrian/cyclist infrastructure remains unimpacted.
Lifespan of Works	Expected lifespan of alternative	4	No lifespan considerations.	3	Bridge design for ~50 year timeframe.	3	Bridge design for ~50 year timeframe.	3	Bridge design for ~50 year timeframe.	2	Minor reduction in lifespan due to potential scour around second pier within channel.
Policy Conformity	Conformity with City's Natural Heritage Policies (2 or 0)	2	Consistent with OP Natural Heritage System policies	0	Site specific OP amendment required	0	Site specific OP amendment required	0	Site specific OP amendment required	0	Site specific OP amendment required
Economic Criteria		**8**		**2**		**5**		**5**		**5**	
Capital Costs	One time design and construction costs to City.	4	No capital costs $ -	1	Highest costs associated with single span suspension bridge $ 3,650,939.60	2	Moderate costs associated with double span box truss. $ 1,640,895.60	2	Moderate costs associated with double span box truss. $ 1,918,875.60	3	Lowest costs associated with three span box truss. $ 1,584,395.60
Operations & Maintenance Costs	Requirement for regular, irregular or no maintenance activities	4	No O&M costs, however, Speedvale Ave may be impacted.	1	Most maintenance to confirm safety.	3	Minimal maintenance, 3 year monitoring program.	3	Minimal maintenance, 3 year monitoring program.	2	Some additional maintenance may be required due to pier within channel.
CUMULATIVE TOTAL SCORE		**35**		**36**		**34**		**37**		**26**	
RANKING		**3**	Third Alternative	**2**	Second Alternative	**4**	Fourth Alternative	**1**	Preferred Alternative	**5**	Least Preferred

4.4 Selection of Preliminary Preferred Alternative

The preferred alternative was selected based on the highest total points for all categories.

For the physical and natural environment category, the Null alternative scored the highest, with Alternatives 1 and 2b scoring second highest. By definition, the Null Alternative involves no proposed works and thus has no impacts on flooding, natural heritage system, aquatic and wetland habitat. However, this also disregards the opportunity to remove the upstream historic fill from the floodplain. Alternatives 1 and 2b both provide the opportunity to implement the pedestrian bridge with minimal impacts to the environment. Alternative 1 – Single Span Bridge avoids impacts by constructing the bridge from the top of slope without accessing the valley. Alternative 2b – Double Span (Hydro within Structure) mitigates access and construction impacts by utilizing (replacing) the existing hydro pole footprint as well as the cleared hydro corridor. It also provides the opportunity to remove the upstream historic fill and restore the wetland feature. Alternatives 2a and 3 have significant impacts due to access and construction impacts related to the required hydro pole relocation and channel crossing, respectively.

For the social and cultural category, Alternative 1 scored the highest, with Alternatives 2a and 2b scoring the second highest. All three alternatives provide the opportunity to implement the pedestrian bridge, allowing for separation between Speedvale Avenue traffic and recreational users and providing a connection to Downtown Trail hospital and Bullfrog Park / Mall. However, Alternative 1 – Single Span Bridge leads this category by mitigating disturbance to areas of potential archaeological significance by avoiding access into the valley. Alternatives 2a and 2b have moderate impacts on potential archeological areas due to the required access into the valley, while Alternative 3 scores the lowest due to the extended access and channel crossing required to construct the second southern pier.

For the technical and engineering category, Alternative 1 scored the highest, with Alternatives Null, 2a and 2b scoring second highest. Alternative 1 – Single Span Bridge leads the category by minimizing impacts on existing watermain, storm sewer, and hydro infrastructure. Alternatives 1, 2a and 2b all mitigate impacts on Speedvale Avenue by providing alternative pedestrian / cyclist infrastructure. The Null Alternative is the only option that conforms with the City's Natural Heritage Policies. Alternative 3 scored the lowest due the largest impacts on watermain and storm sewer infrastructure within the valley, as well as the reduced lifespan due to potential scour of the second pier within the channel.

For the economic category, the Null Alternative scored the highest with no capital or operational costs. Alternatives 2a, 2b and 3 scored second highest, providing a solution with low capital costs as well as minimal maintenance costs. It is worth mentioning that Alternative 3 – Triple Span Bridge has the lowest capital costs, however, maintenance costs were higher due to anticipated repairs for two piers within the floodplain. Alternative 1 – Single Span Bridge scored the lowest with the highest capital costs associated with the complex and expensive suspension bridge.

The overall ranking suggests that Alternative 2b – Double Span Bridge (Hydro within Structure) is the preferred alternative with the highest score, followed by Alternative 1 –

Single Span Bridge, then the Null Alternative. Alternative 3 – Triple Span Bridge was the least preferred option.

As the preferred solution, Alternative 2b – Double Span Bridge (Hydro within Structure) provides a cost-efficient pedestrian bridge design with minimized environmental impacts. Alternative 2b balances tradeoffs between cost and environmental impacts by utilizing (replacing) the existing hydro footprint and corridor to implement a box truss bridge without adding additional permanent structures within the valley.

5 PUBLIC CONSULTATION

Consultation is an essential requirement of the Municipal Class EA process. Consultation is the process of identifying interested and potentially affected parties and informing them about the project, soliciting knowledge of the local environment, and receiving input about key project decisions before those decisions are finalized. Consultation and outreach activities have included providing project information to, and requesting comments/feedback from members of the public, public agencies, and other stakeholders.

A list of public engagement actives completed include the following:

- Notice of Commencement
- Public Information Centres (PIC)
- Stakeholder Meetings and Notification
- Online Engagements
- Engagement Reporting

The results of several of these activities are summarized below.

5.1 Notice of Commencement

A notice of commencement was prepared and distributed to residents and stakeholders by the consulting team and the city. The purpose of the notice of commencement was to inform stakeholders about the Emma Street to Earl Street Bridge over the Speed River municipal class EA being written. Stakeholders can learn more about the study and engage with the City of Guelph and Aquafor Beech Limited through the contact information provided in the notice.

5.2 Summary of Public & Stakeholder Comments & Responses

Throughout the study public and stakeholders were given the ability to engage with the EA study. The public and stakeholders have engaged with the EA study through emails and by attending public information centres. These locations were the main locations where the public and stakeholders have inputted their support, concerns, and or their review of the communication process with the consulting team. The following below summarizes the comments and response received about the EA study.

5.2.1 Public Information Centre #1 Comments & Responses

During PIC #1 participants' feedback focused on the EA study's problem / opportunity statement, evaluation criteria, issues relating to the study, and preliminary bridge types.

5.2.1.1 Problem/ Opportunity Statement

Most participants have agreed with the existing statement. Few participants have issued their concerns with the project. A request was made to alter the statement to make the exact purpose of the bridge more explicit, identify that the bridge is an immediate priority, and recognition that constructing a bridge has the least impact on the natural environment.

5.2.1.2 Evaluation Criteria

Participants were asked to rate the evaluation criteria as least important, important, and most important. The four categories for the criteria were: social environment, natural environment, technical, and cost. Overall the natural environment was said to be the most important criteria.

Additionally, participants have asked to further breakdown the criteria to involve additional sub categories. Safety, connectivity, impacts to active transportation, enjoyment, health benefits, accessibility, and impacts on the adjacent neighbourhoods were suggested to be included in the social environment criteria. Biodiversity of the study area was suggested to be a part of the natural environment criteria. Several participants have suggested to include materials, construction methods, and operation and maintenance concerns into the evaluation criteria. Most participants that responded suggest that the social environment criteria should have additional subcategories, which were implemented in the finalized evaluation matrix.

5.2.1.3 Issue Relating to the Study

Participants were asked to share any issues or concerns they have to the project team as the project progresses. The main concern participants have been the impacts to the habitat, impacts to the adjacent neighbourhood, the need for safe transportation connection, safety, and study scope. Residents have highlighted additional animals they have seen in the area and a question was asked if an inventory of affected species was conducted. There were concerns that people may dump garbage into the river. Participants wanted to know how the bridge would affect the neighbourhood. Some participants believe that a bridge would increase the existing illegal actives occurring in the trails (vandalism, drug use, and theft). Some participants suggest to improve the overall connectivity of active transportation while improving safety. Resulting from the close proximity to the Armtec property, participants suggest additional safety factors involving trucks (guarded sidewalks). A few participants suggest to increase the study area to properly access the bridge's impacts. Many of the opinions expressed center around the environment and safety concerns.

5.2.1.4 Preliminary Bridge Types

Preliminary bridge types were presented to participants. Most participants preferred a steel truss or steel cable bridge due to cost efficiencies and aesthetics. Participants wanted to have wide lanes and have the bridge look simple. An individual did not want the view of the river to be obstructed by upper beams. There was support for single span or two-span bridges in order to reduce the impacts to the environment. Overall, participants wanted a type of bridge that would minimize the obstruction to the natural beauty of the area.

5.2.1.5 Additional Comments

Additional comments were received at the PIC. Participants continued emphasis on prioritizing the environment at all stages. Participants want the bridge to be constructed prior to the reconstruction of Speedvale Ave. Some express concerns with inaccuracies existing with the environmental data. Some residents wanted privacy measures added on their properties, such as fences, due to increased traffic. Finally, a participant requested to put the EA study on hold until the Trail Master Plan update has been completed.

Additional comments focused on ensuring the environment is protected and were about the status on bridges outside the study area.

5.2.2 Public Information Centre #2 Comments & Responses

During PIC #2 participants' feedback were focused on the existing conditions, evaluation criteria, preliminary evaluation of alternatives, preferred alternative, and additional feedback.

5.2.2.1 Existing Conditions

A majority of participants did not provide a comment on the existing information presented. Comments received express concern on missing information and one expressed their support for the existing conditions. Areas that participants felt were missing are: explanation of the site's history, a more detailed wildlife observation list, an explicit reason for the construction of the bridge, and a study into the safety of the neighbourhood. Overall, most participants did not feel the need to express additional statements while those who have provided additional information inside and outside the study area.

5.2.2.2 Evaluation Criteria

Only nine participants have provided comments on the evaluation criteria. Several of the comments supported the evaluation criteria while a select few felt that there should be additional evaluation criteria. Those participants have expressed that the existing criteria lack safety impacts due to potential increase in crime and interaction with trucks from Armtec Plant. Participants suggested a greater focus on impacts to fish habitat and wildlife. Participants also want to have a more detailed look at the economics for each alternative (constructing sidewalks to connect to the bridge, garbage cleanup, and policing). In conclusion, some participants desired to have a more detailed evaluation process.

5.2.2.3 Preliminary Evaluation of Alternatives

Community members provided feedback on the ranking system of the alternatives and commentary provided by the project team. Some participants voiced the concern that the project should not continue until the Trail Master Plan has been updated, reconstruction of the Speedvale bridge is complete, and connections at Speedvale and Eramosa have been addressed. Other participants want to see a more detailed costing scheme for each alternative. Some expressed concern that several issues such as: increase in crime, tree loss, impacts to homeowners, and operating cost were inadequately addressed. One participant suggested to change the ranking system to allow negative impacts to be represented by negative numbers. Overall, participants wanted to see a more detailed evaluation of alternative process.

Following PIC #2, the evaluation matrix and scoring were updated. Evaluation criteria and scoring within each category were reorganized and expanded based on input from the public and City project team, as presented in
Table 4-5.

5.2.2.4 Preferred Alternative

Preliminary scoring of the alternatives in PIC#2 suggest that Alternative 1 – Steel Cable Single Span Bridge is the preferred alternative. Twenty-four participants have commented on the choice. Approximately half of the participants supported the preferred alternative stating that it had the lowest impact on the surrounding environment. A few participants were satisfied with alternatives 1 and 2. A little over half the participants express their disapproval with the preferred alternative. Several reasons for disapproval of the alternative include the cost associated with the alternative, unfactored costs (installation and maintaining sidewalks), other projects should be approved first, the criteria used to evaluate the alternative, and the lack of safety considerations. Many of those that have disapproved of the preferred alternative have expressed their support for the Null Alternative - Do Nothing. Participants have justified this alternative by commenting that the money can be spent on other projects and/ or services, there will not be a negative impact on crime rates or public safety, and this alternative has the lowest impact on both landowners and the environment. Only one participant preferred Alternative 3 – Three – Span Steel Truss Bridge. Participants did not explicitly state why they preferred alternative 2 or 3 over alternative 1 or the null alternative.

The updated evaluation matrix scores presented a new preferred alternative, Alternative 2b – Double Span Bridge (Hydro within Structure) that provides a second "low environmental impact" option. The evaluation scores were updated based on input and recommendations from the public and City staff. However, the final preferred alternative was not presented for public consultation.

5.2.2.5 Additional Comments

Participants reserved some comments for the "additional comments" section. Two participants have expressed their displeasure with the engagement process with the City of Guelph. A couple reasons stated was that there was a lack of communication surrounding the PICs, limited interaction with the project team, and the sample size were not provided. One participant gave additional background information on increase of crime due to trail issues and lack of capacity to increase security. Other participants have made suggestion to improve the overall safety in the area (removal of benches and additional lights). Some participants have suggested other bridges to be retrofitted to address the cause of the project. A participant questioned the usage of the bridge and who would benefit from it. Some participants want the bridge built as soon as possible. One participant commented that sidewalks are not needed and the road can be painted to indicate a walking area for bridge users. Comments received either give more information about the study area or are solutions to possible problems that may occur.

5.2.3 Emails from the Public

Stakeholders were given an email address to engage with the project team. Contents vary between stakeholders and are filled with either support for the bridge, opposition to the bridge, submitting their comment sheet from the PIC, and enquires about the study. A majority of email received are either requests to be placed on the mailing list or voiced their support for the project. Several reasons people have stated their support for the project are: it will help their commute especial with dropping off children to school, the bridge will make it a lot safer to travel due to issues at the existing bridge crossing at Speedvale, and it will improve global health through interaction with nature and other

sections of the city. There were few emails sent that expressed concerns with constructing a bridge and EA study. These concerns are that the EA study should be put on hold until the Trail Master Plan has been updated in order to avoid spending money inefficiently, one person commented that there may not be a lot of bridge users since the only desirable location to travel to is Exhibition Park, and residences are worried that the environment will be polluted. Overall, the majority of emails received were about how building a bridge will improve the daily lives.

5.3 Public Information Centre

There were 2 Public Information Centres (PIC) that occurred. The first happened on October 25, 2016 at the Evergreen Centre and the second occurred on June 7, 2017 at the Evergreen Centre. Fifty-five people have attended PIC 1 and thirty-three people attended PIC 2. A series of posters questionnaires were presented at each PIC.

At PIC 1 the following information was presented:

- Study Purpose / Problem Definition
- Study Area
- Municipal Class Environmental Assessment Process
- Study History & Background
- Topography & Utilities
- Hydrology & Hydraulics
- Tree Inventories
- Fisheries & Aquatic Habitat
- Natural Heritage Assessment
- Terrestrial Natural Heritage
- Sources Water Protection
- Geology
- Alternative Evaluation Criteria
- Preliminary Alternatives Bridge Type
- Preliminary Alternatives Spans & Abutments

A comment sheet was provided to participants to solicit input on the project and obtain input on the information presented. Several attendees completed the comment forms. A summary of the questions asked are provided below:

1. A Problem/Opportunity statement is the starting point in undertaking a Municipal Class EA and helps define what will be addressed by the project. Do you agree with the draft Problem/Opportunity Statement below? What changes, if any, would you suggest?

   The City of Guelph (City) has initiated a Class Environmental Assessment (EA) for a proposed pedestrian bridge connecting Emma Street to Earl Street over the Speed River. A bridge in this location is recommended in the Guelph Trail Master Plan (2005). It will provide a connection to the Downtown Trail. The purpose of the EA study is to determine if a pedestrian bridge is warranted at this location and if so, which style of bridge will be constructed.

2. Draft evaluation criteria are proposed to be used to evaluate the various alternatives for the type and location of the Emma Street to Earl Street pedestrian bridge and identify a recommended solution.

a. Please review the list of draft criteria below (Table 5-1) and indicate whether each one is least important, important, or most important.

Table 5-1 Draft Evaluation Criteria

Criteria	Least Important	Important	Most Important
Social Environment **Aesthetics of Bridge**			
Natural Environment **Impact on Woodlands, Wetlands and Wildlife Habitats**			
Technical **Service Life Expectancy**			
Cost **Capital Costs for Bridge Construction**			

b. Have any criteria been missed? Do you have any other feedback on the proposed criteria?

3. The Guelph Trail Master Plan (2005) recommends a bridge over the Speed River to connect Emma Street to Earl Street and provide a connection to the Downtown Trail. The purpose of this EA study is to determine if a pedestrian bridge is warranted at this location, and if so, which style of bridge will be constructed.

   Are there any other issues or concerns that the project team should be aware of in moving forward with the study? Have we missed anything?

4. Do you have any feedback on the preliminary bridge alternatives that have been identified by the project team?

5. Please share any additional comments that you have regarding the study.

6. Was the information provided helpful to you?

At PIC 2 the following information was presented:

- Study Purpose / Problem Definition
- Study Area
- Municipal Class Environmental Assessment Process
- Study History & Background
- Public Input From PIC#1

- Topography & Utilities
- Hydrology & Hydraulics
- Tree Inventories
- Fisheries & Aquatic Habitat
- Natural Heritage Assessment
- Terrestrial Natural Heritage
- Wildlife Observations
- Species at Risk
- Sources Water Protection
- Geology
- Assessment of Alternative Null Alternative / Do Nothing
- Alternative 1 – Steel Cable Single Span Bridge
- Alternative 2 – Two – Span Steel Truss Bridge
- Alternative 3 – Three – Span Steel Truss Bridge
- Alternative Evaluation Criteria
- Preliminary Alternative Evaluation
- Preliminary Alternative Evaluation Overview

A comment sheet was provided to participants to solicit input on the project and obtain input on the information presented. Several attendees completed the comment forms. A summary of the questions asked are provided below:

1. Background studies have been completed by the project team to better understand existing conditions in the study area. Please review the display panels summarizing the key results from the background studies listed below and let us know if you feel anything important has been missed or if you have any questions or concerns:

Table 5-2 Existing Conditions

• Topography and utilities • Hydrology and hydraulics • Tree inventories • Fisheries and aquatic habitat • Natural heritage assessment	• Terrestrial natural heritage • Wildlife observations • Species at risk • Source water protection • Geology

2. Four alternatives have been identified and evaluated for a proposed pedestrian bridge connecting Emma Street to Earl Street over the Speed River. These alternatives include: Alternative 1 – Steel Cable Single Span Bridge; Alternative 2 –Two-Span Steel Truss Bridge; Alternative 3 – Three-Span Steel Truss Bridge; and Null Alternative / Do Nothing (as required under a Municipal Class Environmental Assessment).
    a. Evaluation Criteria – Please review the list of criteria below that have been used to evaluate the four alternatives and let us know if you feel anything important has been missed or if you have any questions or concerns.

Table 5-3 Evaluation Criteria

Physical and Natural Criteria • Hydraulics and flooding • Aquatic habitat • Terrestrial Habitat	**Social and Cultural Criteria** • Public safety • Landowner impacts • Benefits to community • Cultural and archaeological impacts
Technical Criteria • Impacts on existing infrastructure • Lifespan of work	**Economic and Costing Criteria** • Capital costs (engineering, land and construction) • Annual operating and maintenance costs • Life cycle cost

b. Preliminary Alternative Evaluation – Please review the panels entitled "Preliminary Alternative Evaluation" and "Preliminary Alternative Evaluation Overview". Do you have any feedback on preliminary scoring of the alternatives or commentary provided by the project team?

c. Preferred Alternative – The preliminary scoring of the alternatives by the project team suggests Alternative 1 – Steel Cable Single Span Bridge as the preferred alternative. Do you support this outcome? Why or why not?

3. Please share any additional comments that you have regarding any aspect of the study.

4. Was the information provided helpful to you?

5.4 Notice of Completion

The Emma Street to Earl Street Pedestrian Bridge class EA study has been completed by Aquafor Beech, the City of Guelph, subconsultants, and contribution from stakeholders. The purpose of the study was to determine the best solution for the long-term impacts resulting from the exclusion of bike lanes from the redesign of Speedvale Avenue East. Information on the study area was collected and solutions were presented to the city and stakeholders. Stakeholders and the public were able to express their opinion on the study through virtual and physical mediums. Five alternatives were presented in the study and the preferred solution is to construct Alternative 2b – Double Span Bridge (Hydro within Structure).

6 NEXT STEPS

6.1 Detailed Design and Additional Investigations

Following completion of the EA, the Emma St to Earl St Pedestrian Bridge project will require a detailed design process prior to construction. The detailed design will include additional technical investigations and inventories, with the primary deliverable a design package used for construction. This package will be subject to regulatory review and permitting. A brief overview of additional inventories and design package is summarized below.

The detail design package will include the preparation of 60%, 90% and final design drawings for review by the City, GRCA and relevant stakeholders. A detail design package will include the following components:

- General Arrangement (plan and profile view of the bridge with dimensions and component assignment);
- Bridge Framing Details (detailing steel truss dimensions and detailing chords, joints, bearing plates);
- Utilities Relocation (detailing required removals and relocation of utilities within the work area);
- Abutment / Pier Details (detailing pier / footing with dimensions, depth, and construction notes);
- Access and Staging Plan (including site access, staging and stockpile area delineation);
- Erosion and Sediment Control Plan (as per the Erosion and Sediment Guidelines for Urban Construction, GGHACA);
- Landscape Restoration Plan (including tree removal, preservation and restoration plan to remove historic fill and restore riparian wetlands);
- Associated Design Brief

As part of the design process, additional inventories and plans will be required to further inform the design.

Structural Design
This EA study investigated the need for a bridge connection from Emma St to Earl St, as well as the most suitable and preferred bridge style for the area. However, the study did not conduct any structural design or analysis. As such, a full structural design is required at the detailed design stage, including loading and stress analyses, component and material selection, and pier design.

Geotechnical Investigation
A comprehensive geotechnical investigation is recommended for the study area to confirm subsurface soil conditions, slope stability, and ground water levels. Boreholes would typically be required at the proposed pier locations. The investigation should inform the design process on the type and depth of pier required for long-term stability of the Double Span bridge.

Utilities Coordination
All utility organizations should be contacted for as-constructed drawings and field marking of all underground services within the proposed bridge area. The utilities may include, but are not limited to, electricity, natural gas, cable television, telephone, water, sanitary sewer, and storm sewer. Furthermore, comprehensive coordination is anticipated with Alectra. Alectra will have to be involved in the design and review of the bridge to accommodate the hydro lines within the structure itself.

Hydraulic Assessment
A hydraulic / conveyance assessment of the proposed bridge will be conducted and the results will be included in the design brief. Modeling of the bridge conveyance, hydraulic conditions and flooding elevations will be required. The assessment will be used to confirm that no significant negative flooding impacts will result from the proposed bridge, a condition of the GRCA permit. The assessment would also enable scour analysis to inform the design of the recommended scour protection for the piers within the floodplain.

Tree Impact & Removals Plan
Considering the important natural heritage of the project area, tree protection fencing following City guidelines should be erected along all construction access routes and work areas. If possible, it is also recommended that planting areas are fenced off for two years to protect newly planted materials, and allow time for growth and to anchor soils.

Construction Staging, Erosion and Sediment Control Measures
Appropriate plans are to be included within the detailed design package, based on consultations with the City and GRCA. These plans will include information such as access route and staging areas, with comprehensive erosion and sediment control requirements to be implemented throughout construction. This will include detailed fencing and delineation of the extents of disturbance to avoid slope failures and/or sediment deposition into the Speed River below.

6.2 Permits

Prior to construction it will be necessary to coordinate environmental approvals and permits necessary to complete the intended works. At this time, it is Aquafor's understanding that reviews or approvals from GRCA, MECP, DFO, and the City's may be required. A brief summary of permits and approvals is included below:

GRCA – O. Reg. 150/06 Permit - This typically involves two submissions (70% & 95% design), and will include supporting design brief information.

DFO – Assessment under the Federal Fisheries Act – A certified fisheries biologist will complete a Self-Assessment based on the detailed design for the proposed works. Based on the implemented alternative, DFO review might be required.

MECP 17(2) (b / c) Endangered Species Act Permit or Authorization - Depending on the results of the IGF and further field investigations, MECP will confirm whether an ESA permit or authorization is required.

6.3 Construction Services

All tender documentation would be completed applicable to the City of Guelph or GRCA standards, with Special Provisions and Schedule of Quantities with refined engineering cost estimates provided. A typical package would include Project Description, Special Provisions, Specifications, Form of Tender and a Schedule of Prices. The final detailed design drawings would be issued as a set of contract drawings with the completed tender package. The contract drawings must be stamped by a Professional Engineer, signed, and labeled "Issued for Tender" complete with all necessary material and performance specifications. The consultant would typically assist the City during the tendering and procurement period as required, providing responses and clarification to bidders during the procurement process.

Inspection and administration services during construction under the guidance of a Professional Engineer who has been integrated in the design and well versed in similar construction projects. Tasks undertaken as part of the supervision role will include:

- Attend regular (bi-weekly) progress meetings, including pre-construction meeting, prepare and distribute meeting minutes within 3 days of the meeting;
- Respond to inquiries and request for information from external agencies, public stakeholders;
- Preparation of progress payment certificates and recording material quantities as they arrive to site;
- Overseeing the day-to-day construction and providing interpretation of the drawings;
- Ensuring that contractor's methodology complies with requirements of design;
- Monitor the traffic control measures to ensure they are consistent with traffic control plans;
- Inspect all layout and construction work to ensure compliance with the contract specifications and drawings;
- Provide advice to the contractor regarding the interpretation of the contract drawings and specifications and the preparation of supplemental details, instruction and clarifications as required;
- Notify the contractor of any deficiencies in the construction of the work, instructing the contractor to take appropriate corrective measures, confirm and report results of the corrective measures during construction. The deficiency list will be maintained and coordination of rectification throughout the 2-year maintenance period;
- Review, monitor and ensure compliance with contractor environmental conditions (i.e. Erosion and Sediment Control Plan).
- Preparation and issuance of substantial Performance certificate and recommendations; and
- Undertake a complete and thorough inspection of the contractor's work and prepare a report which lists all outstanding deficiencies at the end of the warranty period and coordinate and ensure that contractor corrects all warranty deficiencies expeditiously and to the satisfaction of the City.

6.4 Monitoring Program

A 5-year annual monitoring plan is recommended following implementation for any project within a significant natural heritage area, which will include Warranty Period engineering review, as well as assessment of the efficacy of restoration plantings. The program should include time for inspection of both the bridge works and vegetation plantings by the project engineer, as well as arborist. Both the monitoring and warranty would be defined to suit the detailed design, and satisfy City of Guelph, GRCA, and other agency requirements.

6.5 As-Constructed Drawings and Analysis

This task would set baseline conditions following construction, which will enable future monitoring and comparative analysis. Specifically, the consultant would undertake an as-built survey of completed bridge and restoration works (plan, profile, and cross sections) to verify implementation of design within reasonable tolerances. As-constructed drawings, together with a report summarizing pre- and post-construction conditions would be provided. The report would comment on significant deficiencies found with recommendations for correction or adaptive management as required.

The HEC-RAS hydraulic model should be updated to match as-built conditions (should the comparative analysis to the design highlight differential condition) to confirm no significant negative impacts to flooding.