REPORT PREPARED FOR:

HIGHWAY 5 – GRINDSTONE CREEK BRIDGE UTILITY RELOCATION CLASS ENVIRONMENTAL ASSESSMENT AND CONCEPTUAL DESIGN

A draft report submitted by:

Aquafor Beech Ltd.
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EXECUTIVE SUMMARY

INTRODUCTION

Aquafor Beech Limited has been retained by the City of Hamilton to undertake a Class Environmental Assessment (EA) for the Highway 5 Grindstone Creek Bridge Utility Relocation Study.

The Highway 5 Grindstone Creek Bridge in Waterdown, Hamilton (see Figure ES-1) was constructed in 1966 and is now reaching the end of its lifespan. The bridge is slated to be reconstructed or rehabilitated within the next 10 years. The existing bridge conveys a considerable amount of traffic and is an integral part of the local Waterdown transportation system. In an effort to reduce closure times of Highway 5 and thereby reduce inconvenience to local residents and businesses the City has initiated this study to look at the feasibility of relocating existing utilities which are part of the existing bridge prior to rehabilitation or reconstruction of the existing bridge.

STUDY PURPOSE

The study purpose has been defined as follows:

To identify and evaluate the alternative solutions to permit the replacement and potential relocation of existing utilities (water, wastewater, hydro, telecommunications utilities, etc.) as part of future bridge rehabilitation works.

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT (EA) PROCESS

The current study has been classified by the City 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.

PHASE 1 – PROBLEM AND OPPORTUNITY DEFINITION

Constructed in 1966, the Highway 5 Grindstone Creek bridge, which is located in Waterdown, is reaching the end of its lifespan. The City of Hamilton will initiate reconstruction or rehabilitation of the bridge within 10 years. Prior to the commencement of work, this Class EA will identify and evaluate the alternative solutions to permit the replacement and/or potential relocation of existing utilities (water, wastewater, hydro, telephone, gas etc.) as part of the future bridge rehabilitation works.
Figure ES-1

GRINDSTONE CREEK UTILITY BRIDGE

Legend

- Study Area
- Contours
- Railways
Completing these options will require making potential arrangements including consultation with approval agencies, potential construction of a utility bridge as well as land purchasing, prior to the formal rehabilitation or replacement of the existing Highway 5 bridge.

PHASE 2 - EVALUATION OF ALTERNATIVE SOLUTIONS

Definition of Existing Conditions

A variety of information was collected and reviewed in order to define existing conditions. In addition to collecting and reviewing existing information, fieldwork was undertaken in order to better define existing conditions.

A summary of the existing conditions is provided below.

Natural Environment

The study area is located in the Niagara Escarpment physiographic region of southern Ontario. The bridge is located over Grindstone Creek as well as a Canadian Pacific rail line.

An Ecological Characterization & Natural Heritage Assessment was completed by Dougan & Associates in 2015.

All vegetation community types found on the site are considered to be relatively common within the Southern Ontario landscape except for an area which includes the watercourse at the base and the valley slope up to a commercial parking lot. This area is classified as Fresh - Moist Black Walnut Lowland Deciduous Forest.

Eleven (11) species of birds were detected during the breeding bird surveys, with 7 species recorded on May 26 and 9 on June 5. Of the 11 species observed, 9 of them were likely breeding on-site or in the local area, with 2 of them – Canada Goose and American Crow – noted flying or foraging over the site only.

No amphibian breeding habitat is present within the study area. The reptile active hand searches detected the presence of two herpetofaunal species; Eastern Red-backed Salamander (Plethodon cinereus) and Eastern Gartersnake (Thamnophis sirtalis sirtalis). Both are considered to be locally abundant in Hamilton (Lamond & Duncan, 2003) and neither are listed as a federal or provincial Species at Risk (COSEWIC, 2015; OMNRF, 2015).
No rare or critical aquatic habitats were identified at the bridge location. Overall, the low habitat diversity, but high amount of instream cover, supports a low to medium diversity fish community of at least 7 species in the general vicinity of the bridge.

A Stage 1 archaeological assessment was undertaken by Historic Horizons Inc. in 2015. The Stage 1 report describes the study area as being within the historic urban core of the Town of Waterdown, on parts of Lots 6 & 7, Concession 3, East Flamborough Twp. Initially an agricultural settlement, urbanization began quickly in the early 19th Century, as Grindstone Creek was utilized to power a number of early mills and industries. A number of 19th century buildings remain in the study area, and a portion of the community of Waterdown, west of the creek, has been incorporated into a Heritage Conservation District. Archaeological potential in the area is related to its proximity to Grindstone Creek and the Niagara Escarpment, and its location in an early industrial settlement along an early roadway.

The Stage 1 report makes the following recommendation.

1) The study area is deemed to have intermittent archaeological potential in part of the creek ravine, around remaining 19th century buildings and under older parking areas. A Stage 2 archaeological assessment is recommended for these portions of the study area prior to any subsurface impacts.

Socio-Economic Environment

The area surrounding the existing Grindstone Creek crossing is predominately a mix of residential and commercial properties. To the northeast of the study area, residential development is the most common land use. To the southwest, the intersection of Mill St. South and Dundas Street East form the eastern boundary of the commercial hub for the community of Waterdown. This is also the boundary of the Waterdown Business Improvement Area.

Dundas Street East is a major East-West thoroughfare in this area of Hamilton. An active railway line (Canadian Pacific) runs along the Grindstone Creek valley system through the community of Waterdown. As noted previously, this rail line passes under the existing crossing.

The bridge also falls within the Niagara Escarpment Planning Area, which is under the jurisdiction of the Niagara Escarpment Commission (NEC).

Technical Environment

Figure ES-2 illustrates the existing utilities that are attached to the bridge or are in the vicinity of the existing bridge. As can be seen from the figure, there are a significant number of existing utilities either attached to, or adjacent to, the bridge. In summary the following utilities would need to be addressed as part of a relocation project.

- A 500 mm diameter insulated sanitary sewer forcemain (see also Photo ES.1):
- A 200 mm diameter insulated ductile iron pipe watermain which is tunneled under Grindstone Creek;
- A 250 mm sanitary sewer which is embedded within the existing bridge structure;
- Bell communications infrastructure including 8 embedded 108 mm diameter Bell ducts in the north sidewalk, an 89 mm Bell duct supported on the exterior girder (see Photo 4.2);
- One 76 mm diameter electrical duct in each sidewalk; and
- A union gas line located under Grindstone Creek

**Photo ES.1 – A 500 mm Diameter Insulated Sanitary Sewer Forcemain**

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**EVALUATION OF ALTERNATIVES**

Three alternative solutions were initially developed to address the problem and associated issues as noted above. The three alternatives are described briefly below.

1.1 Alternative #1 – Existing Utilities Remain on Bridge

For this alternative, the existing utilities would be temporarily relocated during rehabilitation of the bridge. The utilities would then be relocated to the bridge during the construction process. As a result, the anticipated 10 month period to rehabilitate the bridge would take longer.

**Figure ES-3** illustrates the location of the existing utilities as they presently exist on, or adjacent to the existing bridge.
Figure ES-3
GRINDSTONE CREEK BRIDGE
Existing Utilities and Primary Lands Ownership
The primary advantages (or opportunities) for this alternative include:

- All works (rehabilitation of the existing bridge and relocation of the utilities) will be completed during one period thereby potentially facilitating a streamlined approval process.

The primary disadvantages (or constraints) for this alternative include:

- Increased construction time during rehabilitation of the bridge, thereby resulting in significant impact to businesses, residents and commuters;
- Long term operation and maintenance of existing utilities (i.e. existing watermain, sanitary sewer) is not optimal due to their respective locations under Grindstone Creek and within the existing bridge; and
- A higher capital cost as a result of the lengthened construction process

The estimated capital cost for this alternative is $3.8 million.

It should also be noted that as part of the Environmental Assessment process the Do Nothing alternative is to be carried forward as a benchmark for evaluation purposes. For the purpose of this study Alternative #1 has been defined as the Do Nothing alternative.

1.2 Alternative #2 – Relocation of Existing Utilities

For this alternative, all utilities would be located to a separate utility bridge in advance of the bridge rehabilitation. Relocation of the utilities would allow for an expedited rehabilitation of the bridge.

Figure ES-4 illustrates the proposed location and realignment of the existing utilities. All of the existing utilities which include the watermain, sanitary sewers (forcemain and gravity sewer), Bell telecommunications conduits and electrical duct would be located on the bridge. The storm sewer would likely be relocated so as not to be in conflict with the proposed utility bridge. The union gas main would remain as is, under the Grindstone Creek.

The primary advantages (or opportunities) for this alternative include:

- Reduced bridge closure time during rehabilitation thereby minimizing impact to businesses, residents and commuters.
- Ease of long term operation and maintenance of utilities as they are now easily accessible; and
- The lowest capital cost of the three alternatives that are being considered.
The primary disadvantages (or constraints) for this alternative include:

- Short term partial closures of Grindstone Creek bridge during construction of the utility bridge; and
- Requirements for approval from Conservation Halton, Bell utilities and Canadian Pacific Railway

The estimated capital cost for this alternative is $2.5 million.

1.3 Alternative #3 – Relocation of Some of Existing Utilities

For this alternative, the existing sanitary forcemain and watermain would be relocated subsurface (under Grindstone Creek) in advance of the bridge rehabilitation. Relocation of the other utilities (bell and gravity fed sanitary sewer) would be placed on the utility bridge thus allowing for a somewhat expedited rehabilitation/replacement of the bridge.

Figure ES-5 illustrates the proposed location and realignment of the existing utilities. As noted above the watermain would remain in place while the sanitary forcemain, which is presently attached to the existing bridge, would be tunneled under Grindstone Creek. The gravity fed sanitary sewer, Bell and electrical conduits would be placed on the utility bridge.

The primary advantages (or opportunities) for this alternative include:

- Somewhat reduced bridge closure time during rehabilitation thereby minimizing impact to businesses, residents and commuters; and
- Ease of long term operation and maintenance of some utilities as they are now easily accessible;

The primary disadvantages (or constraints) for this alternative include:

- Short term partial closures of Grindstone Creek bridge during construction of the utility bridge;
- Higher capital cost associated with tunnelling of the sanitary forcemain;
- Requirements for approval from Conservation Halton, Bell utilities and Canadian Pacific Railway; and
- Potential requirement of temporary or permanent acquisition of property to construct and maintain the sanitary forcemain

The estimated capital cost for this alternative is $3.8 million.
GRINDSTONE CREEK BRIDGE

Alternative #3 - Relocation of Some of Existing Utilities
Each of the alternatives were then evaluated against a series of criteria which are broadly categorized as follows:

- Natural Environment
- Social and Cultural Environment
- Economic and Financial
- Legal and Jurisdictional
- Technical

**SELECTION OF THE PREFERRED ALTERNATIVE**

Based on the results of the alternatives evaluation and in consultation with the City, agencies and the public, Alternative #2 (Relocation of Existing Utilities) was selected as the preferred alternative. Figure ES-6 and Figure ES-7 provide a plan and profile view of the proposed structure. In summary, this alternative has a nominal impact on the natural environment, is preferred with respect to impact on adjacent businesses, residents and commuters, is the least costly alternative, has no requirements from a property acquisition perspective and is technically feasible.

As noted previously, this project should occur prior to the replacement of the existing bridge and should be coordinated with other works including the proposed North Waterdown Drive by-pass road in order to minimize the overall inconvenience to residents, commuters and local businesses.

**Implementation**

The next steps for implementation of the preferred alternative will include:

- Conceptual design
- Detailed design and associated investigations
- Approvals
- Contract document preparation and tender; and
- Construction

From an approvals perspective section 8.1 of the report outlines various considerations that will have to be met in order to obtain approval from Canadian Pacific. The appropriate discussions will be required to ensure that the necessary permits are received and that CP staff are on site during the undertaking of the proposed works.

Conservation Halton requested that a geotechnical assessment be undertaken during the Environmental Assessment process. In this regard, Terraprobe Inc. were retained to undertake a Preliminary Geotechnical Assessment.
PLAN VIEW OF PREFERRED ALTERNATIVE
Figure ES-7

SECTION VIEW OF PREFERRED ALTERNATIVE
Cost

The estimated cost to construct the utility bridge is $2,500,000 which includes 25% for engineering design and contingencies. Appendix A provides further details with respect to the cost breakdown.

Public Consultation

Two Public Information Centres (PICs) were held. The first PIC described the study area, defined problems and opportunities as well as a long list of alternatives and evaluation criteria.

The second PIC presented the alternative solutions, evaluation criteria and the preliminary preferred solution. A summary of the findings and input is provided in Sections 4.4 and 5.4.
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1 INTRODUCTION

1.1 Background

Aquafor Beech Limited has been retained by the City of Hamilton to undertake a Class Environmental Assessment (EA) for the Highway 5 Grindstone Creek Bridge Utility Relocation Study.

The Highway 5 Grindstone Creek Bridge in Waterdown, Hamilton (see Figure 1.1) was constructed in 1966 and is now reaching the end of its lifespan. The bridge is slated to be reconstructed or rehabilitated within the next 10 years. The existing bridge conveys a considerable amount of traffic and is integral part of the local Waterdown transportation system. In an effort to reduce closure times of Highway 5 and thereby reduce inconvenience to local residents and businesses the City has initiated this study to look at the feasibility of relocating existing utilities which are part of the existing bridge prior to rehabilitation or reconstruction of the existing bridge.

1.2 The Class Environmental Assessment Process

The Municipal Class Environmental Assessment (Class EA), Municipal Engineers Association (MEA) document (October 2000, as amended in 2007 & 2011), describes the process that municipalities must follow in order to meet Ontario’s Environmental Assessment requirements for water, wastewater and road projects, including Master Plans. 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. 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.

- Consultation with affected parties early on, such that the planning process is a cooperative venture.
- Consideration of a reasonable range of alternatives.
- Identification and consideration of the effects of each alternative on all aspects of the environment.
- Systematic evaluation of alternatives in terms of their advantages and disadvantages, to determine their net environmental effects.
Figure 1.1
GRINDSTONE CREEK UTILITY BRIDGE
• 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 has been classified by the City 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.

1.3 Study Area Characteristics

The primary study area is the Highway 5 Dundas street (Vinegar Hill) bridge spanning Grindstone Creek and the utilities that run beside, beneath, and within the bridge. The ultimate area has been expanded to ensure that all items relating to social, environmental, transportation, economic and other areas such as archaeology are addressed. The general study area is illustrated in Figure 1.1.

Land use in the proximity of the bridge includes both local businesses together with single family homes and a senior citizens complex.

The bridge itself is located over Grindstone Creek which forms part of the Conservation Halton watersheds. Furthermore, the bridge is located over a Canadian Pacific railway line.
1.4 Study Purpose and Primary Tasks

The study purpose has been defined as follows:

To identify and evaluate the alternative solutions to permit the replacement and potential relocation of existing utilities (water, wastewater, hydro, telecommunications utilities, etc.) as part of future bridge rehabilitation works.

The primary tasks which were undertaken as part of this study and the associated chapters in which information is provided are summarized below:

Chapter 1 – Define the study purpose
Chapter 2 – Define the problems and opportunities associated with the study
Chapter 3 – Establish existing environmental and social conditions
Chapter 4 – Define the condition of the existing bridge
Chapter 5 – Present and evaluate the alternative solutions
Chapter 6 – Present and select the preferred alternative
Chapter 7 – Provide estimated planning level costs
Chapter 8 – Provide conclusions and recommendations
2 PROBLEM AND OPPORTUNITY IDENTIFICATION

2.1 General

Phase 1 of the municipal Class Environmental Assessment process involves identification of the problem to be resolved together with the opportunities to resolve the problem. Provided below is a summary of the problem(s) and opportunity(ies).

2.2 Identification of Problems and Opportunities

Constructed in 1966, the Highway 5 Grindstone Creek bridge, which is located in Waterdown, is reaching the end of its lifespan. The City of Hamilton will initiate reconstruction or rehabilitation of the bridge within 10 years. Prior to the commencement of work, this Class EA will identify and evaluate the alternative solutions to permit the replacement and/or potential relocation of existing utilities (water, wastewater, hydro, telephone, gas etc.) as part of the future bridge rehabilitation works.

Completing these options will require making potential arrangements including consultation with approval agencies, potential construction of a utility bridge as well as land purchasing, prior to the formal rehabilitation or replacement of the existing Highway 5 bridge.
3 EXISTING CONDITIONS

3.1 Study Area

The existing bridge is located on Highway 5 over Grindstone Creek. Adjacent streets include Reynold Street and William Street to the north as well as Mill Street and Main Street to the south.

3.2 Natural Environment

3.2.1 General

This section will describe the natural environment within and adjacent to the study area. The objective of the following sections is to describe the natural (as well as social and economic) environment from a study area perspective.

3.2.2 Geology, Physiography and Soils

The study area is located in the Niagara Escarpment physiographic region of southern Ontario. The Niagara Escarpment extends from the Niagara River to the northern tip of the Bruce Peninsula, continuing through the Manitoulin Islands (Chapman and Putman 1984: 114-122). Vertical cliffs along the brow outline most of the edge of the dolostone of the Lockport and Amabel Formations, and the slopes below are carved in red shale. Flanked by landscapes of glacial origin, the rock-hewn topography stands in striking contrast, and its steep-sided valleys are strongly suggestive of non-glacial regions. The highest section of the Niagara Escarpment is the Blue Mountain section, which stands over 300 metres above Georgian Bay. In this section the dolostone cap rock is exposed in cliffs 45 metres high, while huge stone blocks that have broke away from the wall have left deep crevasses in the area known as “the caves.” Blue Mountain is located northwest of the study area and “the caves” are located to the north.

Soils within the study area consist of Grimsby sandy loam and Oneida loam as well as stream course, ravine and escarpment (Dept. of Agriculture, 1967). The Grimsby soil series is of alluvial and lacustrine origin. These soils are prone to erosion on moderate to steep slopes. The area immediately west of the bridge crossing is characterized by Grimsby sandy loam. The Oneida soil series consist of well drained clay loam. The area immediately east of the bridge crossing is characterized by Oneida loam.

3.2.3 Terrestrial Communities

An Ecological Characterization & Natural Heritage Assessment was completed by Dougan & Associates in 2015 for the study area. A copy of the report can be found in Appendix B. The information contained in this section is a summary of the 2015 Dougan & Associates Report. For further details, the original report should be used as a comprehensive resource. Figure 3.1: illustrates the 120 m radius study area used for the Natural Heritage Assessment.
Figure 3.1: Study Area for the Ecological Characterization & Natural Heritage Assessment was completed by Dougan & Associates in 2015

The Hamilton Nature Counts Natural Areas Inventory (Dwyer, 2003a) provides a site summary for the Grindstone Creek Escarpment Valley (Flam-50); a natural area which begins at Highway 5 East (Mill Street) and extends southward along the steep-sided Grindstone Creek valley corridor. The flora of this area includes Carolinian and southern species. 47 species of local, provincial or national significance were recorded within this area including American Columbo (Frasera caroliniensis) and Red Mulberry (Morus rubra) (Dwyer, 2003a).

**Natural Heritage Information Centre (NHIC)**

Results of a NHIC query included 29 records in total, including 21 flora species, 4 fauna species and three natural area records. Natural area records for the general area include:

- Niagara Escarpment Biosphere Reserve (International Biosphere Reserve)
- Lake Meded Valley Wetland Complex  (Provincially Significant Wetland)
- Grindstone Creek (Earth Science ANSI, Provincial)
Vegetation Communities

Based on Ecological Land Classification (ELC) vegetation communities, the majority of the study area is mapped as anthropogenic, which includes roads, residential lots, commercial buildings and parking lots. All vegetation community types found on the site are considered to be relatively common within the Southern Ontario landscape except for an area which includes the watercourse at the base and the valley slope up to a commercial parking lot. This area is classified as Fresh - Moist Black Walnut Lowland Deciduous Forest.

109 vascular plant species were recorded for the study area. Of these, 102 were identified to species level including 52 (51%) native species and 50 (49%) introduced species. This is a relatively high proportion of introduced species, which may be attributed to the urban setting and high level of human disturbance in and surrounding the study area. No species of global, national or provincial significance were observed. Four species of local significance were recorded.

Breeding Birds

Eleven (11) species of birds were detected during the breeding bird surveys, with 7 species recorded on May 26 and 9 on June 5. Of the 11 species observed, 9 of them were likely breeding on-site or in the local area, with 2 of them – Canada Goose and American Crow – noted flying or foraging over the site only. Two (2) of the species potentially breeding on the site are considered non-native (introduced): European Starling and House Sparrow. None of the 11 species are considered Species at Risk (SAR), either federally (Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 2014) or provincially (Ontario Ministry of Natural Resources and Forestry (OMNRF), 2015). At a provincial level, all of the observed native breeding species have been assigned an S-rank of either S4 or S5 by the Natural Heritage Information Centre (NHIC, 2015b), which indicates that their provincial populations are “apparently secure” or “secure”, respectively (NHIC, 2015a). At a local level, all of the potentially breeding species are considered common to abundant and widespread in the City of Hamilton (Curry, 2003). Also, none of the species recorded are considered area sensitive by the Ontario Ministry of Natural Resources and Forestry (OMNR, 2000), indicating that they do not require large areas of suitable habitat for their long-term survival and are therefore less sensitive to development.

Amphibians

Bridge 451 crosses the fast-flowing Grindstone Creek within a highly developed urban area. No amphibian breeding habitat is present within the study area, however during the June 15 survey, approximately 12 Gray Treefrogs (Hyla versicolor) were heard calling approximately 400 m north-east of the bridge.

Reptiles

The reptile active hand searches detected the presence of two herpetofaunal species; Eastern Red-backed Salamander (Plethodon cinereus) and Eastern Gartersnake (Thamnophis sirtalis sirtalis). Both are considered to be locally abundant in Hamilton (Lamond & Duncan, 2003) and neither are listed as a federal or provincial Species at Risk (COSEWIC, 2015; OMNRF, 2015).
Odonates

Three species of damselflies and dragonflies were documented during the July 15, 2015 field survey. This included 10 Ebony Jewelwing (Calopteryx maculata), 2 female Common Whitetail (Plathemis lydia), and 1 male White-faced Meadowhawk (Sympetrum obtrusum). One additional unidentified Meadowhawk species (Sympetrum sp.) was observed. All three of the identified species have a provincial conservation rank of S5, or “secure” (NHIC, 2015b). Similarly, all three are considered “common” in Halton Region (Rothfels, 2006).

3.2.4 Aquatic Communities

No rare or critical aquatic habitats were identified at the bridge location, and the type of habitat in the immediate vicinity of bridge 451 occurs upstream and downstream of the bridge in the reach examined. Overall, the low habitat diversity, but high amount of instream cover, supports a low to medium diversity fish community of at least 7 species in the general vicinity of bridge 451.

Of the fish that are, or have been, known to occur in the vicinity of Bridge 451, none are listed under the Federal Species at Risk Act (SARA, 2002) or are considered to be at risk under the Ontario Endangered Species Act (ESA, 2007). However, a couple of fishes (Brassy Minnow and Pearl Dace) are considered uncommon in Hamilton, and one (Finescale Dace) is considered rare in Hamilton (Hamilton Conservation Authority, 2014). All three of these prefer coolwater habitats with gentle or no flow, and Brassy Minnow and Finescale Dace also prefer boggy conditions with soft detritus substrate and aquatic vegetation (Scott and Crossman 1973). These habitat conditions do not exist in the vicinity of Bridge 451, and consequently these fish have not been collected in close proximity to the bridge. The habitat beneath and surrounding Bridge 451 may provide spawning habitat for the common species found there, such as White Sucker, Creek Chub, Longnose Dace and Blacknose Dace, but these same types of habitat occur in ample amounts upstream and downstream of the bridge location and are not considered limiting.

3.2.5 Archaeological and Cultural Heritage Assessments

A Stage 1 Archaeological assessment was undertaken by Historic Horizons Inc. in 2015. A copy of the report can be found in Appendix C. The Stage 1 report describes the study area as being within the historic urban core of the Town of Waterdown, on parts of Lots 6 & 7, Concession 3, East Flamborough Twp. Initially agricultural settlement, urbanization began quickly in the early 19th Century, as Grindstone Creek was utilized to power a number of early mills and industries. A number of 19th century buildings remain in the study area, and a portion of the community of Waterdown, west of the creek, has been incorporated into a Heritage Conservation District. Archaeological potential in the area is related to its proximity to Grindstone Creek and the Niagara Escarpment, and its location in an early industrial settlement along an early roadway.

The Stage 1 report makes the following recommendations:
2) The study area is deemed to have intermittent archaeological potential in part of the creek ravine, around remaining 19th century buildings and under older parking areas. These areas are identified via the accompanying figure (Figure 17 from the 2015 Stage 1 Archaeological Assessment, reproduced as Figure 3.2 below) in green shading. Stage 2 archaeological assessment is recommended for these portions of the study area prior to any subsurface impacts.

3) The Union Cemetery lies within the study area (approximately 65 m upstream of the crossing). No construction activity must be allowed to impact any portion of the cemetery.

3.3 Socio-Economic Environment

The area surrounding the existing Grindstone Creek crossing is predominately a mix of residential and commercial properties. To the northeast of the study area, residential development is the most common land use. To the southwest, the intersection of Mill St. South and Dundas Street East form the eastern boundary of the commercial hub for the community of Waterdown. This is also the boundary of the Waterdown Business Improvement Area.

3.3.1 Land Use

According to the City of Hamilton’s zoning mapping, the land use in the vicinity of the existing crossing includes:

- Business District Zone (BD) to the southwest of the crossing
- Public Use Zone (P4) to the north in the cemetery lands
- Core Area Residential (R5) to the northeast of the crossing
- Parkway Belt Open Space Zone (01-1) in the valley lands

3.3.2 Proposed Land Use

Based on the Hamilton Official Plan, no significant land use change by the City is proposed within the study area. There is significant growth area to the south of the study area downstream of Dundas Street East.

3.3.3 Transportation

Dundas Street East is a major East-West thoroughfare in this area of Hamilton. An active railway line (Canadian Pacific) runs along the Grindstone Creek valley system through the community of Waterdown. This rail line passes under the existing crossing. A by-pass road (North Waterdown Drive) is also proposed to alleviate traffic congestion within the area.
3.3.4 Planning Policy

Niagara Escarpment Plan (Updated 2012): The Grindstone Creek crossing falls within the Niagara Escarpment Planning Area, which is under the jurisdiction of the Niagara Escarpment Commission (NEC). The Niagara Escarpment Planning Area utilizes designations which apply to the study area and are shown below in Figure 3.3. They include:

- Escarpment Protection Area (orange)
- Escarpment Natural Area (green)
- Urban Area (pink)
Figure 3.3: NEPA Mapping (Source: MNRF’s Natural Heritage Information Centre (NHIC) online mapping tool “Make a Map: Natural Heritage Areas”. Accessed June 21 2016)

The valley lands within the project area are defined as having an Escarpment Natural Area land use designation. The objectives of the Niagara Escarpment Commission in creating this land use designation are:

1. To maintain the most natural Escarpment features, stream valleys, wetlands and related significant natural areas and associated cultural heritage features.
2. To encourage compatible recreation, conservation and educational activities.
3. To maintain and enhance the landscape quality of Escarpment features.

There are 25 permitted uses of lands that are designed Escarpment Natural Area listed in the Niagara Escarpment Plan. One of these land uses is “Essential transportation and utility facilities”.

On both sides of Grindstone Creek, the area outside of the valley is defined as having an Urban Area land use designation. The objective of the Niagara Escarpment Commission in creating this land use designation is to “minimize the impact and further encroachment of urban growth on the Escarpment environment”. Changes to permitted uses, expansions and alterations of existing uses or the creation of new lots within the Urban Area designation will not require an amendment to the Niagara Escarpment Plan.
Approximately 400 m to the west of the existing crossing, there is an area adjacent to Flanders Drive that is classified as having an Escarpment Protection Area land use designation. Per the 2015 Niagara Escarpment Plan, Escarpment Protection Areas are important because of their visual prominence and their environmental significance. They are often more visually prominent than Escarpment Natural Areas. Included in this designation are Escarpment features that have been significantly modified by land use activities such as agriculture or residential development, land needed to buffer prominent Escarpment Natural Areas, and natural areas of regional significance. The objectives of the Niagara Escarpment Commission in creating this land use designation are:

1. To maintain and enhance the open landscape character of Escarpment features.
2. To provide a buffer to prominent Escarpment features.
3. To maintain natural areas of regional significance and cultural heritage features.
4. To encourage agriculture, forestry and recreation.

Within the Niagara Escarpment Plan there is a list of 37 permitted uses of land designated as Escarpment Protection Area. Transportation and utility facilities are permitted; however only linear facilities are permitted in prime agricultural areas and specialty crop areas.

### 3.3.5 Natural Hazards

**Figure 3.4** illustrates the flood line and CA Generic Regulated Area adjacent to Grindstone Bridge. As noted within the figure, the flood lines are contained well within the valley. The generic regulated area, which represents an extent based on the worst of the flood line, stable top of bank, meander belt or wetland together with associated setbacks extends well onto the tableland.
FIGURE 3.4 Conservation Halton Floodlines and Generic Regulated Areas
4 EXISTING CONDITIONS

4.1 General

This section provides an overview as to the existing conditions of the existing bridge together with the utilities that are located on the bridge. In defining the existing systems, a variety of information was collected and reviewed. This information included plan and profile drawings which describe the existing infrastructure, relevant background reports from the city and outside agencies as well as field visits to confirm specific items.

4.2 Grindstone Creek Bridge

The Highway 5 Grindstone Creek bridge was constructed in 1966 and is reaching the end of its lifespan. The City has proposed to rehabilitate or reconstruct the existing bridge within the next 10 years.

Two reports relating to the existing bridge as well as alternatives to rehabilitate the bridge were prepared by the MMM Group.

The first report, entitled ‘Structural Alternatives Assessment Report’ was completed in September 2014. This objective of this report was to undertake an investigation and preliminary design of the bridge.

The report provides some history with respect to previous investigations. It is noted that, in 1989, a condition survey was undertaken. The survey identified severe levels of corrosion potential in the deck. Based on these findings a series of rehabilitation measures were undertaken.

MMM also conducted a limited condition survey of the structure in May 2014. The Structural Alternatives Report described the rehabilitation alternatives to be considered together with preliminary cost estimates and a recommended course of action.

The second report, entitled ‘Preliminary Structural Design Report’ discussed three bridge replacement alternatives and recommended a preferred option. Original drawings of the bridge were also presented (see Figure 4.1). The existing bridge, constructed in 1966 is a three span, cast in place continuous concrete T-beam structure with an asphalt wearing surface, reinforced abutments and piers. The bridge is approximately 50 m in length and 20 m in width.

The preferred option includes replacement of the bridge. The proposed cross section (see Figure 4.2) will consist of a 4.5 m wide lane/shared bike lane and 2.0 m sidewalk in each direction with one 3.5 m wide median left turn lane. The bridge will consist of a single span slab on steel girder superstructure composed of 1810 mm deep steel plate girders with a 225 mm thick reinforced concrete deck slab. The estimated cost to replace the bridge is approximately $3,000,000. The
PROFILE VIEW OF EXISTING BRIDGE

Figure 4.1

NOTE
PROFILE VIEW OF PROPOSED BRIDGE

NOTE
report also notes that it is understood that the City will reconstruct a new utility bridge adjacent to the existing bridge in advance of the replacement contract to relocate all of the existing utilities off of the existing bridge.

4.3 Grindstone Creek Bridge – Existing Utilities

Figure 4.3 illustrates the existing utilities that are attached to the bridge or are in the vicinity of the existing bridge. As can be seen from the figure, there are a significant number of existing utilities either attached to, or adjacent to, the bridge. In summary the following utilities would need to be addressed as part of a relocation project.

- A 500 mm diameter insulated sanitary sewer forcemain (see also Photo 4.1);
- A 200 mm diameter insulated ductile iron pipe watermain which is tunneled under Grindstone Creek;
- A 250 mm sanitary sewer which is embedded within the existing bridge structure;
- Bell communications infrastructure including 8 embedded 108 mm diameter Bell ducts in the north sidewalk, an 89 mm Bell duct supported on the exterior girder (see Photo 4.2);
- One 76 mm diameter electrical duct in each sidewalk; and
- A union gas line located under Grindstone Creek

Photo 4.1 – A 500 mm Diameter Insulated Sanitary Sewer Forcemain
Figure 4.3
GRINDSTONE CREEK BRIDGE
Existing Utilities and Primary Lands Ownership
A sanitary sewage pumping station is also located approximately 300 m upstream (easterly). The water main is one of four feeds providing water to the Waterdown area. In addition, CP Rail has significant infrastructure in the area including a rail line that runs under the bridge as well as associated including CP communications lines and Fiber-optics located approximately 1.8 m from the edge of the railway tie/rail. Also shown on the map is the primary ownership of lands within the area.

4.4 Overview of Public Information Centre No.1

The Notice of Study Commencement was published in the October 29 edition of the Flamborough Review. A copy of the notice and a comment sheet was mailed out to all relevant government agencies, local interest groups, Aboriginal contacts, and persons requesting to be a part of the study.

The first Public Information Centre was held on November 5, 2015 at the Knox Presbyterian Church from 6:00 p.m. to 8:00 p.m. The purpose of this open house was to present an overview of the study, to present some of the initial findings, to solicit feedback from the public, and to outline the next steps in the process. The open house consisted of display boards outlining the study purpose and background, as well as next steps. A copy of display panels was presented and is attached in Appendix D.
In total, approximately fifteen (15) people attended the meeting and each was given a Comment Sheet to provide feedback. Eight (8) people signed in. City staff, as well as staff from Aquafor Beech Limited provided responses and clarification to questions raised by the public. No formal response forms were received.
5 EVALUATION OF UTILITY BRIDGE RELOCATION ALTERNATIVES

5.1 General

This chapter:

- Provides a general description of the types of alternative solutions that were considered in order to assess the problems and opportunities as defined in Section 2.2 and meet the study purpose as defined in Section 1.4; and
- Provides an evaluation of the effectiveness of the alternative solutions.

5.2 Description of the Alternatives

A description of the alternatives that were considered for this study is provided in the following sections.

5.2.1 Alternative #1 – Existing Utilities Remain on Bridge

For this alternative, the existing utilities would be temporarily relocated during rehabilitation of the bridge. The utilities would then be relocated to the bridge during the construction process. As a result, the anticipated 10 month period to rehabilitate the bridge would take longer. **Figure 5.1** illustrates the location of the existing utilities as they presently exist on, or adjacent to the existing bridge.

The primary advantages (or opportunities) for this alternative include:

- All works (rehabilitation of the existing bridge and relocation of the utilities) will be completed during one period thereby potentially facilitating a streamlined approval process.

The primary disadvantages (or constraints) for this alternative include:

- Increased construction time during rehabilitation of the bridge, thereby resulting in significant impact to businesses, residents and commuters;
- Long term operation and maintenance of existing utilities (i.e. existing watermain, sanitary sewer) is not optimal due to their respective locations under Grindstone Creek and within the existing bridge;
- A higher capital cost as a result of the lengthened construction process

The estimated capital cost for this alternative is $3.8 million.
Figure 5.1
GRINDSTONE CREEK BRIDGE
Existing Utilities and Primary Lands Ownership
It should also be noted that as part of the Environmental Assessment process the Do Nothing alternative is to be carried forward as a benchmark for evaluation purposes. For the purpose of this study Alternative #1 has been defined as the Do Nothing alternative.

5.2.2 Alternative #2 – Relocation of Existing Utilities

For this alternative, all utilities would be located to a separate utility bridge in advance of the bridge rehabilitation. Relocation of the utilities would allow for an expedited rehabilitation of the bridge.

Figure 5.2 illustrates the proposed location and realignment of the existing utilities. All of the existing utilities which include the watermain, sanitary sewers (forcemain and gravity sewer), Bell telecommunications conduits and electrical duct would be located on the bridge. The storm sewer would likely be relocated so as not to be in conflict with the proposed utility bridge. The union gas main would remain as is, under the Grindstone Creek.

The primary advantages (or opportunities) for this alternative include:

- Reduced bridge closure time during rehabilitation thereby minimizing impact to businesses, residents and commuters.
- Ease of long term operation and maintenance of utilities as they are now easily accessible; and
- The lowest capital cost of the three alternatives that are being considered.

The primary disadvantages (or constraints) for this alternative include:

- Short term partial closures of Grindstone Creek bridge during construction of the utility bridge; and
- Requirements for approval from Conservation Halton, Bell utilities and Canadian Pacific Railway

The estimated capital cost for this alternative is $2.5 million.

5.2.3 Alternative #3 – Relocation of Some of Existing Utilities

For this alternative, the existing sanitary forcemain and watermain would be relocated subsurface (under Grindstone Creek) in advance of the bridge rehabilitation. Relocation of the other utilities (bell and gravity fed sanitary sewer) would be placed on the utility bridge thus allowing for a somewhat expedited rehabilitation/replacement of the bridge.
GRINDSTONE CREEK BRIDGE
Alternative #2 - Relocation of Existing Utilities
Figure 5.3 illustrates the proposed location and realignment of the existing utilities. As noted above the watermain would remain in place while the sanitary forcemain, which is presently attached to the existing bridge, would be tunneled under Grindstone Creek. The gravity fed sanitary sewer, Bell and electrical conduits would be placed on the utility bridge.

The primary advantages (or opportunities) for this alternative include:

- Somewhat reduced bridge closure time during rehabilitation thereby minimizing impact to businesses, residents and commuters; and
- Ease of long term operation and maintenance of some utilities as they are now easily accessible;

The primary disadvantages (or constraints) for this alternative include:

- Short term partial closures of Grindstone Creek bridge during construction of the utility bridge;
- Higher capital cost associated with tunnelling of the sanitary forcemain;
- Requirements for approval from Conservation Halton, Bell utilities and Canadian Pacific Railway; and
- Potential requirement of temporary or permanent acquisition of property to construct and maintain the sanitary forcemain

The estimated capital cost for this alternative is $3.8 million.

5.3 Evaluation Criteria

As part of the Municipal Class Environmental process, each alternative must be evaluated based on a set of Physical/Natural Environment, Social/Cultural and Economic criteria. Two additional categories, Legal/Jurisdictional and Technical, were also included as part of this assessment. The set of criteria was developed by Aquafor Beech Limited and reviewed by the City.

A score was then established through a multidisciplinary evaluation process for each alternative design for each of the criteria which were established. The score for each option ranged from least preferred (designated by ◯) to most preferred (designated by ●).

A score (or assessment) of ◯ indicated that the alternative scored the lowest in relation to the criteria. Alternatively, an assessment of ● indicated that the option scored the highest in satisfying the respective criteria. Three intermediate assessments ( ◯ ◯ ◯ ) were also used to evaluate the alternatives.
Figure 5.3
GRINDSTONE CREEK BRIDGE
Alternative #3 - Relocation of Some of Existing Utilities
The overall preferred option was then based on an aggregate score from the criteria. Provided in Table 5.1 is a summary of the criteria used in the evaluation process. Table 5.2 to Table 5.6 provide further information with respect to description of the criteria used.

Table 5.1: Criteria used in Evaluation Process for selecting the Preferred Retrofit Options

<table>
<thead>
<tr>
<th>Environmental Assessment Categories</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Environment</td>
<td>• Impact on existing vegetation</td>
</tr>
<tr>
<td></td>
<td>• Impact on erosion &amp; flooding</td>
</tr>
<tr>
<td></td>
<td>• Impact on fish &amp; aquatic habitat</td>
</tr>
<tr>
<td></td>
<td>• Impact on wildlife &amp; wildlife habitat</td>
</tr>
<tr>
<td></td>
<td>• Impact on groundwater</td>
</tr>
<tr>
<td>Social/ Cultural</td>
<td>• Impact on traffic &amp; transit</td>
</tr>
<tr>
<td></td>
<td>• Impact on businesses</td>
</tr>
<tr>
<td></td>
<td>• Impact on residents (e.g., noise, dust, mud)</td>
</tr>
<tr>
<td>Economic/Financial</td>
<td>• Estimated construction cost – including bridge rehabilitation</td>
</tr>
<tr>
<td></td>
<td>• Estimated operation &amp; maintenance cost</td>
</tr>
<tr>
<td></td>
<td>• Potential cost for property acquisition</td>
</tr>
<tr>
<td>Legal/Jurisdiction</td>
<td>• Need for property acquisition</td>
</tr>
<tr>
<td></td>
<td>• Ease of approvals/potential for delays</td>
</tr>
<tr>
<td>Technical</td>
<td>• Impact on existing utilities</td>
</tr>
<tr>
<td></td>
<td>• Impact on bridge rehabilitation</td>
</tr>
<tr>
<td></td>
<td>• Ease of construction – including proposed bridge rehabilitation</td>
</tr>
<tr>
<td></td>
<td>• Construction risks (e.g., deep tunnels)</td>
</tr>
<tr>
<td></td>
<td>• Ease of maintenance</td>
</tr>
<tr>
<td></td>
<td>• Coordination with other capital projects</td>
</tr>
</tbody>
</table>
### Table 5.2: Description of Natural Environment Criteria used in the Selection of the Preferred Alternative

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description of Criteria</th>
<th>Measures for Assigning Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact on existing vegetation</td>
<td>• Potential to impact existing vegetation</td>
<td>• Scoring ranges from ✅ if the alternative will have a marginal impact on vegetation to ❌ if there is considerable potential impact on vegetation.</td>
</tr>
<tr>
<td>Impact on erosion &amp; flooding</td>
<td>• Potential to impact existing erosion issues or increase floodlines.</td>
<td>• Scoring ranges from ✅ if erosion and flooding is not impacted to ❌ if there is considerable potential impact to erosion or flooding.</td>
</tr>
<tr>
<td>Impact on fish &amp; aquatic habitat</td>
<td>• Potential to impact existing aquatic habitats within the study reach.</td>
<td>• Scoring ranges from ✅ if the alternative will have a marginal impact on aquatic habitat to ❌ if there is considerable potential impact.</td>
</tr>
<tr>
<td>Impact on wildlife &amp; wildlife habitat</td>
<td>• Potential to impact existing wildlife and associated wildlife habitat</td>
<td>• Scoring ranges from ✅ if the alternative will have a marginal impact on wildlife to ❌ if there is considerable potential impact.</td>
</tr>
<tr>
<td>Impact on groundwater</td>
<td>• Potential to impact existing groundwater system</td>
<td>• Scoring ranges from ✅ if the alternative has no impact on the groundwater system to ❌ if there is considerable potential impact.</td>
</tr>
</tbody>
</table>

### Table 5.3: Description of Social/ Cultural Criteria used in the Selection of the Preferred Alternative

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description of Criteria</th>
<th>Measures for Assigning Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact on traffic &amp; transit</td>
<td>• Potential for the alternative to have an impact on traffic &amp; transit as a result of closing Dundas Street.</td>
<td>• Scoring ranges from ✅ if the alternative has a short duration of closing off Dundas Street at the bridge to ❌ if there is the potential for a closure of considerable length.</td>
</tr>
<tr>
<td>Impact on businesses</td>
<td>• Potential for the proposed alternative to impact businesses as a result of construction practices, rerouting of traffic or items associated with proposed construction (e.g. noise, disruption of municipal services).</td>
<td>• Scoring ranges from ✅ if the alternative has a marginal impact on businesses to ❌ if the alternative has considerable potential to impact businesses.</td>
</tr>
<tr>
<td>Impact on residents (e.g. noise, dust, mud)</td>
<td>• Potential for the proposed alternative to impact residents as a result of construction practices, rerouting of traffic or items associated with proposed construction (e.g. noise, disruption of municipal services).</td>
<td>• Scoring ranges from ✅ if the alternative has a marginal impact on residents to ❌ if the alternative has considerable potential to impact residents.</td>
</tr>
</tbody>
</table>
Table 5.4: Description of Economic/Financial Criteria used in the Selection of the Preferred Alternative

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description of Criteria</th>
<th>Measures for Assigning Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Construction Costs – including bridge Rehabilitation</td>
<td>• The relative Capital cost as compared to the other alternatives</td>
<td>• Scoring ranges from ○ if the relative cost, based on the identified factors is low to ● if the relative cost is high.</td>
</tr>
<tr>
<td>Estimated Operation &amp; Maintenance Cost</td>
<td>• The relative cost of maintaining the works in the short and long-term based on factors such as access/ egress, ownership implications, future risks due to failures or flooding, overall operation frequency and intensity.</td>
<td>• Scoring ranges from ○ if the relative cost, based on the identified factors, is low to ● if the relative cost is high.</td>
</tr>
<tr>
<td>Potential Cost for Property Acquisition</td>
<td>• Potential cost to acquire any lands that may be necessary in order to construct or maintain proposed infrastructure.</td>
<td>• Scoring ranges from ○ if there are no costs associated with the alternative to ● if there are considerable potential costs.</td>
</tr>
</tbody>
</table>

Table 5.5: Description of Legal/Jurisdictional Considerations Criteria used in the Selection of the Preferred Alternative

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description of Criteria</th>
<th>Measures for Assigning Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need for Property Acquisition</td>
<td>• The need for potential property acquisition in order to construct or maintain the alternative</td>
<td>• Scoring ranges from ● if the alternative does not require property acquisition to ○ if there is considerable potential for property acquisition.</td>
</tr>
<tr>
<td>Ease of Approvals/Potential for Delays</td>
<td>• The relative ease with which the alternative can be implemented taking into consideration approvals, community/ landowner acceptance &amp; length of time to implement</td>
<td>• Scoring ranges from ● if the alternative can be implemented easily to ○ if there are considerable potential hurdles to implementation.</td>
</tr>
</tbody>
</table>
Table 5.6: Description of Technical Considerations Criteria used in the Selection of the Preferred Alternative

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description of Criteria</th>
<th>Measures for Assigning Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact on existing utilities</td>
<td>• The potential impact on existing utilities during or after construction.</td>
<td>• Scoring ranges from  ◂ if the alternative has limited impact on the function of the existing utilities to ◁ if there are considerable potential impacts associated with the function of the existing utilities.</td>
</tr>
<tr>
<td>Impact on Bridge Rehabilitation</td>
<td>• The potential impact on the proposed bridge rehabilitation including cost and construction logistics.</td>
<td>• Scoring ranges from ◂ if the alternative has a marginal impact on the proposed bridge rehabilitation to ◁ if there are considerable potential impacts with respect to costs or construction logistics.</td>
</tr>
<tr>
<td>Ease of Construction – including proposed bridge Rehabilitation</td>
<td>• The relative ease with which the alternative can be implemented taking into consideration approvals, community landowner acceptance &amp; length of time to implement. Policy or bylaw requirements that may be required to implement the alternative</td>
<td>• Scoring ranges from ◂ if the alternative can be implemented easily to ◁ if there are considerable potential issues related to implementation.</td>
</tr>
<tr>
<td>Construction Risks (e.g., Deep Tunnels)</td>
<td>• The potential construction risks associated with specific measures (e.g. tunneling)</td>
<td>• Scoring ranges from ◂ if there are marginal risks associated with the alternative to ◁ if there are considerable potential risks.</td>
</tr>
<tr>
<td>Ease of Maintenance</td>
<td>• The potential to easily maintain existing utilities during and after the construction process</td>
<td>• Scores range from ◂ if the existing utilities can be easily maintained to ◁ if there are considerable potential issues with respect to short and long term maintenance.</td>
</tr>
<tr>
<td>Coordination with Other Capital Projects</td>
<td>• The potential to coordinate the proposed alternative with other capital projects including the proposed bridge rehabilitation</td>
<td>• Scores range from ◂ if the alternative can be easily coordinated with other projects to ◁ if there are considerable potential issues with respect to coordination.</td>
</tr>
</tbody>
</table>

Table 5.7 shows the detailed evaluation matrix for the Grindstone Utility Bridge project with assessments based on the information Summarized in Table 5.2 to Table 5.6.
<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Alternative #1</th>
<th>Alternative #2</th>
<th>Alternative #3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural Environment</strong></td>
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<td></td>
</tr>
<tr>
<td>• Impact on existing vegetation</td>
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<td><img src="image2" alt="Diagram" /></td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td>• Impact on erosion &amp; flooding</td>
<td><img src="image4" alt="Diagram" /></td>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
<tr>
<td>• Impact on fish &amp; aquatic habitat</td>
<td><img src="image7" alt="Diagram" /></td>
<td><img src="image8" alt="Diagram" /></td>
<td><img src="image9" alt="Diagram" /></td>
</tr>
<tr>
<td>• Impact on wildlife &amp; terrestrial habitat</td>
<td><img src="image10" alt="Diagram" /></td>
<td><img src="image11" alt="Diagram" /></td>
<td><img src="image12" alt="Diagram" /></td>
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<tr>
<td>• Impact on groundwater</td>
<td><img src="image13" alt="Diagram" /></td>
<td><img src="image14" alt="Diagram" /></td>
<td><img src="image15" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>Social/Cultural</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>• Impact on traffic &amp; transit</td>
<td><img src="image16" alt="Diagram" /></td>
<td><img src="image17" alt="Diagram" /></td>
<td><img src="image18" alt="Diagram" /></td>
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<tr>
<td>• Impact on businesses</td>
<td><img src="image19" alt="Diagram" /></td>
<td><img src="image20" alt="Diagram" /></td>
<td><img src="image21" alt="Diagram" /></td>
</tr>
<tr>
<td>• Impact on residents (e.g. noise, disruption of services)</td>
<td><img src="image22" alt="Diagram" /></td>
<td><img src="image23" alt="Diagram" /></td>
<td><img src="image24" alt="Diagram" /></td>
</tr>
<tr>
<td>Evaluation Criteria</td>
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<td>• Impact on bridge rehabilitation</td>
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5.4 Overview of Public Information Centre No.2

The second public meeting was held at the Knox Presbyterian Church on May 3, 2016 from 6:00 p.m. to 8:00 p.m. In anticipation of the second PIC, an advertisement was placed in the April 21 and 28, 2016 editions of the Flamborough Review. A copy of the notice and a comment sheet was mailed out to all relevant government agencies, local interest groups, Aboriginal contacts, and persons requesting to be a part of the study. In addition, the notices were delivered by Canada Post to everyone in the study area.
The purpose of this open house was to present the alternative solutions, evaluation criteria, and the preliminary preferred solution. The open house consisted of display boards outlining the study purpose and background, alternative solutions, evaluation criteria and next steps. A copy of the display panels are attached in Appendix D.

Generally, those whom project staff spoke with were pleased and supportive to see this initiative being undertaken in the area.

In total, six (6) people attended the meeting and each was provided a Comment Sheet to provide feedback.

Input from the public was limited but did include a local resident who expressed support for the project and noted that traffic issues during construction should be addressed.
6 SELECTION AND DESCRIPTION OF THE PREFERRED ALTERNATIVE

6.1 Selection of the Preferred Alternative

Based on the results of the alternatives evaluation and in consultation with the City, agencies and the public, Alternative #2 (Relocation of Existing Utilities) was selected as the preferred alternative. In summary, this alternative has a nominal impact on the natural environment, is preferred with respect to impact on adjacent businesses, residents and commuters, is the least costly alternative, has no requirements from a property acquisition perspective and is technically feasible.

As noted previously, this project should occur prior to the replacement of the existing bridge and should be coordinated with other works including the proposed North Waterdown Drive by-pass road in order to minimize the overall inconvenience to residents, commuters and local businesses.

6.2 Description of the Preferred Alternative

This section of the report identifies the key components of the preferred alternative that were developed for this Environmental Assessment. Preliminary design for several components will be provided at a subsequent date under separate cover.

Figures 7.1 and Figure 7.2 provide plan and profile illustrations of the Preferred Alternative. The proposed utility bridge (see Photo 6.1 for an indication of utility bridge structure type) would be located on the south side of the existing bridge. The existing storm sewer, located south of the bridge may need to be relocated to accommodate the proposed bridge (the potential for relocation will be determined at the design stage).

Figure 7.2 illustrates the profile together with a section showing the approximate location of the utilities to be located on the utility bridge. The specifics, with respect to bridge structure, width, methods of construction will be updated during the conceptual and detail design stages. Chapter 8 provides further details with respect to implementation considerations.

The estimated cost to construct the utility bridge is $2,500,000 which includes 25% for engineering design and contingencies. Appendix A provides further details with respect to the cost breakdown.
SECTION VIEW OF PREFERRED ALTERNATIVE

Figure 7.2
Photo 6.1 – Illustration of Utility Bridge Infrastructure
7 IMPLEMENTATION CONSIDERATIONS

This chapter will summarize the implementation considerations associated with the various elements of the Preferred Alternative as described in Chapter 7.

The next steps for implementation of the preferred alternative include:

- Conceptual design
- Detailed design and associated investigations
- Approvals
- Contract document preparation and tender; and
- Construction

Prior to outlining the steps required for the above tasks key findings / comments as documented through this process from Canadian Pacific Railway and Conservation Halton have been summarized below.

7.1 Canadian Pacific Railway

Staff from Aquafor met with representatives from CP on two occasions. The objective of the first meeting was to introduce CP representatives with the proposed project and to gather any relevant input. CP provided a series of documents. In summary these documents included:

- Guide for Road authorities for Construction of Grade Separations;
- Policy on Use of Electronic Devices;
- Insurance Requirements;
- Minimum Safety Requirements for Contractors Working on CP Property in Canada;
- Overtime Policy for all Canadian Engineering Services Employees;
- Utility Crossing Application Form;
- Application to Enter the Railway Right Of Way;
- CPR Geotechnical Protocol for Pipeline Installations Within Railway ROW;
- Draft Utility Specification and application Process;
- CPR Specification with respect to Pipeline and Utility Installations within CPR ROW; and
- Design Drawing standards

In addition, a clearance drawing was provided. Of particular importance for this project is the minimum clearance height that is required above the top of rail. The minimum value is 7.03 m. Figure 7.2 of this report shows the actual clearance (subject to detail design refinements) will be approximately 7.7 m which exceeds the minimum clearance required. It is important to keep in
mind that the governing criteria that will impact the clearance relates to the grade and elevation of the existing gravity fed sanitary sewer which will be relocated on the utility bridge. All of the elevations, including the top of rail, should also be confirmed at the detail design stage.

The second meeting, held on June 28, 2016 involved discussion regarding the Preferred Alternative. The primary objective of this meeting was to review the preferred alternative and to discuss general approval for the design stage. The two key permits that are required are the Grade Separation Agreement and the Overhead Pipe Utility Agreement. In addition, there will be the requirement for flag persons during construction of the utility bridge. These services are generally required when any works may impact the operation and safety of the existing rail line. Flag personnel will be required when the utility bridge is set in place (likely a couple of days exercise) and may be required during construction of the abutments and potentially the storm sewer relocation. The current rate for flag personnel is $1,500 per day. A lead time of 60 days is required. CP staff also noted that there will be a perpetual fee to cover the cost of utilities being located within CP property (approximate cost $1,000/year).

7.2 Conservation Halton

Aquafor staff, together with City staff, met with CH. The objective was to introduce the project to CH staff and receive input. A letter was received from CH on June 14, 2016.

One of the primary requests by CH was the requirement to undertake a geotechnical analysis of slope stability. This task was not included in the original scope as a detailed assessment is generally undertaken at the detail design stage once additional considerations such as loadings, type of footings required, integration of abutment into infrastructure requirements, integration of design with proposed bridge rehabilitation etc. are defined.

In order to move the project forward Terraprobe was retained in order to undertake a preliminary geotechnical assessment. The report entitled Preliminary Geotechnical Assessment Hwy 5 & Grindstone Creek is included as Appendix E. A summary of the tasks that were undertaken and the key findings is provided below.

The key tasks included:

- A site inspection by a senior geotechnical engineer to obtain information on the nature and present condition of the valley slopes and creek banks in the area of the Hwy 5 bridge;
- A review of available reports, maps and other information to develop an understanding of the subsurface soil, rock and ground water conditions at the site;
- A review of available topographical mapping;
The development of stratigraphy models for the site to be used in slope stability analyses;
Analysis of the stability of the slopes using contemporary software;
Provision of information for the conceptual design of bridge foundations; and preparation of a summary report.

The key findings are summarized below:

**Subsurface Conditions**

The findings from four historical boreholes are summarized below.

The two boreholes drilled in the tableland area, penetrated about 3 to 4m of loose silty sand and gravel fill. The fill was underlain by a silty clay deposit that was penetrated to depths of about 10m. The silty clay was comprised of a generally firm to stiff upper zone and a harder lower zone. The boreholes penetrated bedrock at about elevations 212.5 and 213.4m. Ground water was encountered at depths of about 3m below the existing ground surface.

Two boreholes were drilled in the flood plain on either side of the creek. These boreholes encountered fill overlying bedrock which was encountered at depths of about 2 to 3m or at about elevation 211.6 and 212.9m.

The bedrock was described as being grey shale. A review of geological mapping indicates that the bedrock in the area of the site probably consists of argillaceous dolostone and shale of the Lockport Formation.

**Bridge Foundation Design Considerations**

The following discussion regarding bridge foundations has been presented for conceptual design consideration only and with the understanding that a geotechnical investigation will be needed for the design of the foundations.

- Consideration could be given to supporting the new bridge(s) on a shallow foundation system consisting of conventionally designed spread footings or on a deep foundation consisting of end bearing bored or driven piles.
- The location of the new bridge abutments (and the resulting bridge spans) will need to be designed such that the foundation loading from the new bridges will not impact the stability of the valley wall slopes and the new foundations will not be affected by creek erosion and slope stability over the design life.
- It is considered that foundations constructed at the elevations noted above would be sufficiently deep that the zone of influence would not impact on the stability of the valley

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1 Paleozoic Geology, Hamilton Area, Southern Ontario, Ontario Division of Mines; Map No. 2336; 1976.
wall slopes and the foundations would not be impacted by the effects of creek bank erosion and resulting slope recession.

- The depth of the excavations that would be needed to construct spread footings as outlined above would probably be in the range of about 8 to 9m below the existing ground surface. Depending on the sequence of construction, it is expected that shored excavations would be needed to preserve the integrity of the existing bridge foundations until such time as the bridge is taken out of service, as well as to minimize the impact on the slopes during construction. This will impact the design and construction of both structures (utility bridge and proposed new bridge).

- Deep foundations possibly consisting of HP sections driven to practical refusal in the bedrock that underlies the site, or end bearing caissons socketed into the bedrock; would provide relatively high resistance to the foundation loading. Deep excavations would generally not be required and the excavation support systems are anticipated to be less onerous than would be needed for spread footings. Finally, a deep foundation system will allow for a contemporary n integral abutment design which is favoured for bridge design due to the reduced maintenance costs.

**Slope Stability Assessment**

The discussion provided in Bridge Foundation Design Considerations section indicates that based on the overall height and inclination of the slopes, either of the two foundation design types under consideration will be sufficiently deep so as not to impact on the stability of the valley wall slopes. The actual span of the structures will however be a function of the geometry of the valley wall slopes and the potential for creek bank erosion. Flatter slope inclinations will result in greater spans and the use of properly sized erosion protection will negate the need for additional setback for erosion.

The stability analysis as provided in the report shows that an overall slope inclination of 2.1H:1V or flatter would be required to achieve a Factor of Safety of 1.5.

**Summary**

The report prepared by Terraprobe provides conceptual design information for the new utility bridge proposed for the site. Some aspects of the above discussion may also be applicable to the new highway bridge due to the close proximity of the bridges and the need for continuity with respect such aspects as span length and also the selection of creek bank protection and the like.

The analysis and discussion have been based on a site inspection and a review of the background information on the subsurface soil, rock and ground water conditions at the site, and a review of the draft Class EA report by Aquafor Beech Ltd. and review comments from Conservation Halton.

_Aquafor Beech Limited_  
Reference: 65781
The results of a preliminary analysis of conditions at the site indicated that while it will be feasible to support the new bridge on spread footing foundations, the deep foundation alternative consisting of end bearing or driven piles would be considered preferable from a geotechnical engineering perspective.

The assessment indicated that with either of the two foundation types considered, the foundations would be sufficiently deep that the stability of the valley wall slopes will not be impacted by the foundations.

A long-term stable slope inclination of 2 horizontal to 1 vertical or flatter has been considered for the valley wall slopes based on preliminary slope stability analyses carried out using the stratigraphy inferred from the foundation investigation report and using slope profiles inferred from topographical mapping.

For conceptual design and planning purposes, the bridge abutment locations can be determined based on a maximum 2H:1V stable slope inclination for the valley wall slopes. An additional erosion setback is not required provided that adequate creek bank erosion protection is provided and maintained.

A comprehensive geotechnical investigation will be required to provide parameters for the design of the bridges. The geotechnical investigation should be of sufficient scope to address both bridges to enhance continuity in the foundation design and as well as in the design approach to such issues as creek bank erosion protection.

In addition to the above, Conservation Halton also requested for an assessment for nests under the bridge. This task will need to be completed at the detail design stage.

### 7.3 Ministry of Tourism, Culture and Sport (MTCS)

The report prepared by Historic Horizon Inc. addressed items relating to Archaeology but did not address the Cultural heritage component. MTCS has requested that the existing bridge and any other potential structures (including the proposed utility bridge) be screened for potential cultural heritage value or interest (see page 181 in Appendix D for the Municipal Heritage Bridge Checklist). If potential is found then a Heritage Impact Assessment would need to be undertaken.

MTCS are also in agreement with the Stage 2 Archaeologic requirements in areas with potential as identified in Figure 3.2 of this report.
7.4 Conceptual Design

The City has developed a Consultant Procedural Manual which outlines the requirements for Conceptual Design. The conceptual design for this project will be undertaken after submission and approval of the Environmental Assessment Project File.

In general, the conceptual design will enhance the design elements as presented in this document including:

- Major aspects of the constructability plan;
- Access/egress locations and staging areas;
- Key operational impacts;
- Phasing of construction tasks; and
- Cost estimate (to suggested standard – Public Works and Government Services Canada Class D +/- 30%)

7.5 Detailed Design and Investigations

The detail design package should include the preparation of 60%, 90% and final design drawings for review by the City and relevant stakeholders. The detail design package should include, but not be limited to, the following components:

- General plan (detailing structure, property lines and services);
- Site plan (including site access, staging and stockpile area delineation);
- Plan and profile drawings (detailing location of proposed utility bridge, existing utilities and existing bridge);
- Erosion and sediment control plan (as per the Erosion and Sediment Guidelines for Urban Construction, GGHACA);
- Traffic management plan;
- Landscape restoration plan (including tree removal, preservation and planting plan);
- Storm outfall restoration plan; and
- Associated design brief

A geotechnical investigation, to meet the requirements of CH (see section 7.2 above) as well as the general requirements for the design and construction of the utility bridge and associated infrastructure, should also be provided.

7.6 Permits and Approvals

The following permits and approvals will likely be required prior to undertaking construction activities:
• Conservation Halton watercourse permits under “Schedule ‘A’ Application for Development, Interference With Wetlands and Alterations to Shorelines and Watercourse Permit (Pursuant to Ontario Regulation 150/06)”. Any potential fishery windows should also be discussed and confirmed with CH
• MOECC Environmental Compliance Approval (ECA) – required for the construction or alteration of existing municipal infrastructure
• Canadian Pacific – A Grade Separation Agreement and Overhead pipe Utility Agreement will be required.

7.7 Contract Document Preparation and Tender

A tender document shall be prepared for the project with the intent that the proposed works be publically tendered. The tender will be consistent with the requirements of the City of Hamilton standards. The package shall include several sections common to most tenders, as well as sections on:

• Special specifications (incorporating CP requirements);
• Schedule of prices
• Detailed Cost Estimate based on tender schedule of prices; and
• Final detailed design drawings.

7.8 Construction

The proposed construction timing will be based on subsequent discussions within the City and will be integrated with the proposed timing for the proposed bridge rehabilitation as well as the proposed ring road in order to minimize the level of inconvenience to residents, businesses and commuters.
8 REFERENCES


