Prepared for:

The Corporation of the City of Mississauga

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Schedule B Class Environmental Assessment – Project File

Applewood Creek Erosion Control Project – Lakeview Golf Course

A project file submitted by:

Aquafor Beech Ltd.

August 31st , 2020

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Aquafor Beech Reference: 66514

NOTICE OF STUDY COMPLETION

Municipal Class Environmental Assessment Study:
Applewood Creek Erosion Control Project at Lakeview Golf Course

The City of Mississauga has completed a Municipal Class Environmental Assessment (Class EA) Study for erosion control and restoration of Applewood Creek through Lakeview Golf Course. This Study was conducted in accordance with the planning process for Schedule "B" projects as outlined in the *Municipal Engineers Association Municipal Class Environmental Assessment* (October 2000, as amended in 2015), which is approved under the *Ontario Environmental Assessment Act*.

The Study was undertaken to address existing erosion and safety issues along the creek. The existing creek banks are lined with stone-filled gabion baskets that are approaching the end of their lifespan.

Based on the Study findings, including feedback received from public, stakeholders and other government agencies, realignment of Applewood Creek through the golf course using a natural channel restoration approach was selected as the preferred solution to provide long-term erosion control while also maintaining the playability and heritage value of Lakeview Golf Course. The configuration of the creek and modifications to the golf course will be established during the future design phase.

A Project File has been prepared to document the planning and decision-making process for this study. In consideration of the unprecedented circumstances posed by the current pandemic, the Project File is being made available for review over an extended timeframe of 45 days.

The City is keeping the community safe by complying with regional and provincial guidelines, supporting physical distancing, and postponing in-person public meetings. Engagement for essential and priority projects continues online paired with universally accessible methods.

Interested members of the public may view the Project File on the City's website. Should a member of the public request a hard copy of the Project File, the City will assess how this might be prepared and delivered in a manner that is consistent with regional and provincial guidelines supporting physical distancing.

By this Notice, the Project File is being placed on the public record for review from September 3, 2020 to October 19, 2020 and is available online on the City's website at http://www.mississauga.ca/portal/stormwater/new-projects

If you have any questions, comments or concerns, please contact the City of Mississauga Project Manager or Consultant Project Manager by October 19, 2020:

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If there are concerns regarding the project, please resolve through direct discussion with the City of Mississauga Project Manager. In the event there are outstanding concerns regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, Part II Order requests on those matters should be addressed in writing to:

Minister Jeff Yurek
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
Minister.mecp@ontario.ca

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ace. W, 1st Floor
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EACBirector@ontario.ca

Personal information is collected under the authority of the Environmental Assessment Act and will be used in the assessment process. With exception of personal information, all comments shall become part of the public record. Questions about this collection should be directed to the Project Manager listed in the Notice.

This Notice issued on **September 3, 2020**.

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1 INTRODUCTION

1.1 Overview of Study and Problem

Aquafor Beech Limited (Aquafor), in conjunction with Schollen & Company Inc. (Schollen) were retained by the City of Mississauga to provide comprehensive engineering, geomorphic, ecological, golf course architectural and Environmental Assessment (EA) services to complete the Schedule B Municipal Class EA Applewood Creek Erosion Control project.

This Project File is intended to document the process used to determine the preferred restoration strategy for the deteriorated Applewood Creek corridor within the City of Mississauga's Lakeview Golf Course. The project will improve long-term stability and health of the watercourse, minimize maintenance and operational requirements, and enhance the playability and aesthetics of the golf course. The general extent of the study area is illustrated in Figure 1-1.

Figure 1-1. Applewood Creek Study Area – Lakeview Golf Course.

1.2 The Environmental Assessment Process

The Environmental Assessment Act was legislated by the Province of Ontario in 1975 to ensure that an Environmental Assessment (EA) is conducted prior to the onset of development and development-related (servicing) projects. The "environment" as defined by the EA Act is understood broadly to include the biophysical, socio-cultural, built and economic environments and the interrelationships between them. The EA Act applies primarily to public sector undertakings and extends to private sector projects where designated under the regulation. Depending on the individual project to be completed, there are different processes that municipalities must follow to meet Ontario's Environmental Assessment requirements.

The EA Act draws a distinction between "Individual" and "Class" environmental assessments. Individual EAs are prepared for large, complex projects in which significant environmental impacts are foreseeable. A "Terms of Reference" are devised which outline the EA process, and the final EA document is submitted to the Ministry of the Environment, Conservation and Parks (MECP) for approval. Alternatively, a Class EA is a streamlined

approval process for a group of routine undertakings with predictable environmental impacts. Once a Class EA planning document is approved by the MECP, all projects of this type are pre-approved provided that they adhere to its design. In this fashion, the Class EA process expedites approval for smaller, recurring projects.

The Municipal Class EA, which is followed here, outlines how municipal infrastructure projects are planned in accordance with the EA Act. The Municipal Class EA is consistent with the EA Act's five key principles for successful planning:

- Consultation with affected parties early on and throughout the process, such that the planning process is a cooperative venture;
- Consideration of a reasonable range of alternatives, both the functionally different "alternatives to" and the "alternative methods" of implementing the solution;
- 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; and,
- Provision of clear and complete documentation of the planning process followed, to allow "traceability" of decision-making with respect to the project.

As the project being undertaken is defined as an Erosion project, the Schedule B process as defined in the Municipal EA (2015) document is applicable.

A summary of the Class EA process and phases is provided below, with the accompanying flow chart (Figure 1-2) illustrating the process followed in the planning and design of projects covered by this Class Environmental Assessment:

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 this point, determine the appropriate Schedule for the undertaking and document decisions in a Project File for Schedule B projects, or proceed through the following phases for Schedule C projects.

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 also classifies projects as Schedule A, A^+, B or C depending on their level of environmental impact and public concern.

- Schedule 'A' projects are limited in scale, have minimal adverse environmental effects and generally include routine maintenance and operational activities. These projects are pre-approved and may proceed to implementation without following the full Class EA planning process.

- Schedule 'A+' projects have minimal adverse environmental effects and are pre-approved, however the public is to be advised prior to project implementation."

- Schedule 'B' projects have the potential for some adverse environment effects. Projects generally include improvements and minor expansions to existing facilities. These projects require completion of Phases 1 and 2 of the Class EA process, before proceeding to Phase 5 Implementation.

- Schedule 'C' projects have the potential for significant environment effects. Projects generally include the construction of new facilities and major expansions to existing facilities. These projects require completion of Phases 1 through 4 of the Class EA process, before proceeding to Phase 5 Implementation."

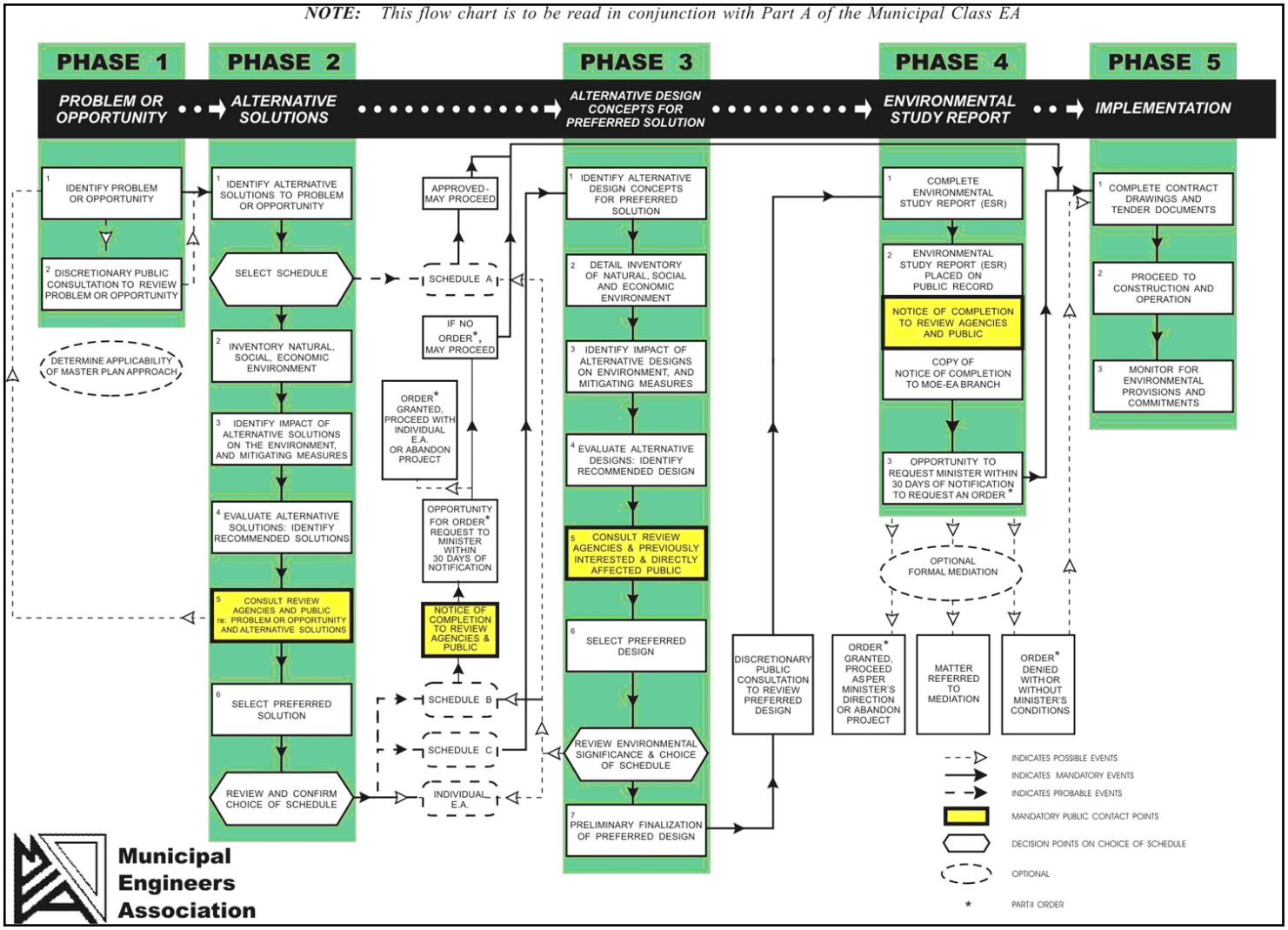


Figure 1-2. Municipal Class Environmental Assessment Planning and Design Process (MCEA, 2015).

2 PHASE 1 – PROBLEM IDENTIFICATION

2.1 Problem Identification

Applewood Creek, with a total length of 2.9km, is the easternmost watercourse within the jurisdiction of Credit Valley Conservation (CVC) and flows directly into Lake Ontario. The watercourse has a drainage area of approximately 411 hectares and it is located within an urbanized watershed that encompasses various land uses, including residential, commercial and open space.

Specific to the study area, Applewood Creek runs through the Lakeview Golf Course between the Dixie Outlet Mall and CN railway. The creek is channelized and was previously lined with engineered gabion banks along its entire length as a means to mitigate erosion and channel migration. Although great efforts have been made by the golf course to constantly patch and repair the gabion baskets, these structures are approaching the end of their life-span. As observed during the site reconnaissance exercise, the baskets have become outflanked and are devoid of stone at the base, causing the top courses to fall into the creek and posing significant risks to the safety of golf course users.

Moreover, in this case Applewood Creek is regarded as a natural hazard within the golf course, which if creatively integrated with the golf course layout, will improve aesthetics and enhance playability and the strategy of play, providing golfers with an enjoyable and memorable golf experience. However, in its existing condition, Applewood Creek does not add any beauty to the course and the current alignment of the watercourse is not very well incorporated to complement the playability of some of the golf holes. For example, the existing creek crossing Lakeview's 8th hole presents a 160-200-yard distance for a golfer's tee shot to carry the creek. This is a significant carry for beginner, intermediate and senior golfers. A proposed realignment could explore the option of relocating the creek closer to the tee, reducing the distance of the carry, easing golfer tensions, enhancing the playability of the golf course and improving the speed of play.

2.2 Study Objective

The objective of this study is to assess the existing condition of Applewood Creek and explore and assess alternatives to address the erosion concerns within the Lakeview Golf Course.

The main focus of this study is to identify the preferred alternative that will provide long-term stability of the watercourse at a reasonable cost, while enhancing the layout and value of the golf course as a product of the implementation of the proposed restoration works. The preferred solution will include erosion mitigation and prevention measures for Applewood Creek and the adjacent tablelands, and will ensure that the playability and heritage value of the golf course are maintained, and where possible, enhanced.

A. Downstream culverts under CN railway, with mixed headwall materials – historical brick and more recent gabion baskets.

B2. Slumping gabion baskets undermining and scouring around chamber structure

E. Bridge #8 in good condition with irrigation main in saddle.

F. Deteriorated gabion baskets with top layer leaning towards the creek, posing safety risks to golf course users

B1. Bank scour and planform adjustment due to failure of gabion baskets.

C. Failure of gabion and unstable slope undermining mature vegetation in proximity to maintenance building & parking

D. Creek in proximity to 12th fairway and 16th green. Constraints of limited space to form natural meanders.

G. Applewood Creek at the upstream limit of the golf course, through a confined channel adjacent to Dixie Mall.

Figure 2-1. A Photographic Compilation of the Existing Conditions.

3 PHASE 2 – SITE SPECIFIC INVENTORIES

To address Phase 2 of the EA process, site-specific studies were conducted to support the selection and design of the preferred alternative. A summary of the site-specific inventories that were conducted as part of the study process is provided below.

3.1 Surveys and Property Assessment

At the onset of the field assessments, a detailed total-station survey was undertaken to accurately define the topographic features within the study area, including the Applewood Creek corridor, bridge crossings, golf course features and irrigation infrastructure. The survey was completed in sufficient detail to enable the completion of geomorphic analysis, hydraulic modelling and detailed design. The key parameters of the survey included:

- Longitudinal profile of Applewood Creek, surveying the channel alignment;
- Cross-sections perpendicular to the channel and extended in sufficient detail beyond the top of bank for undertaking hydraulic analysis;
- Golf course features within the extent of the areas of potential impact (tees, greens, fairways, cart paths);
- Irrigation infrastructure including sprinklers and watermains;
- Bridge crossings (9 in total) and the culvert crossing under CN railway,
- Mature trees that could potentially be impacted as a result of the implementation of the restoration works; and,
- Potential construction access routes.

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 geodetic elevations consistent with City horizontal controls, and overlays the base-mapping provided by the City, which includes property parcels, building limits, storm sewer network alignment and contours.

The topographic information was compiled into planform and profile drawings as shown in Figure 3-1 to Figure 3-3. These drawings highlight the confined nature of the Applewood Creek and its position and context within the golf course setting.

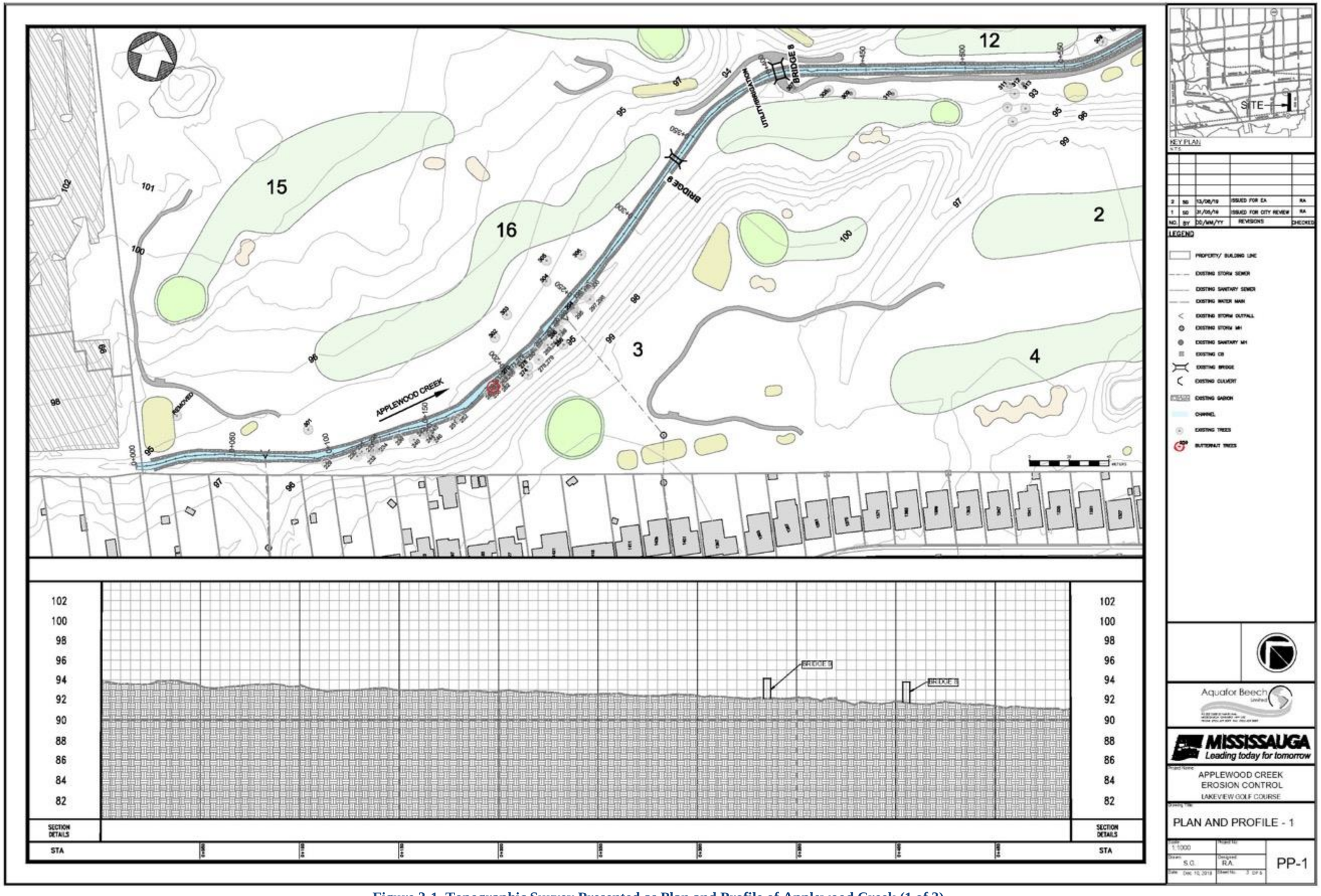


Figure 3-1. Topographic Survey Presented as Plan and Profile of Applewood Creek (1 of 3).

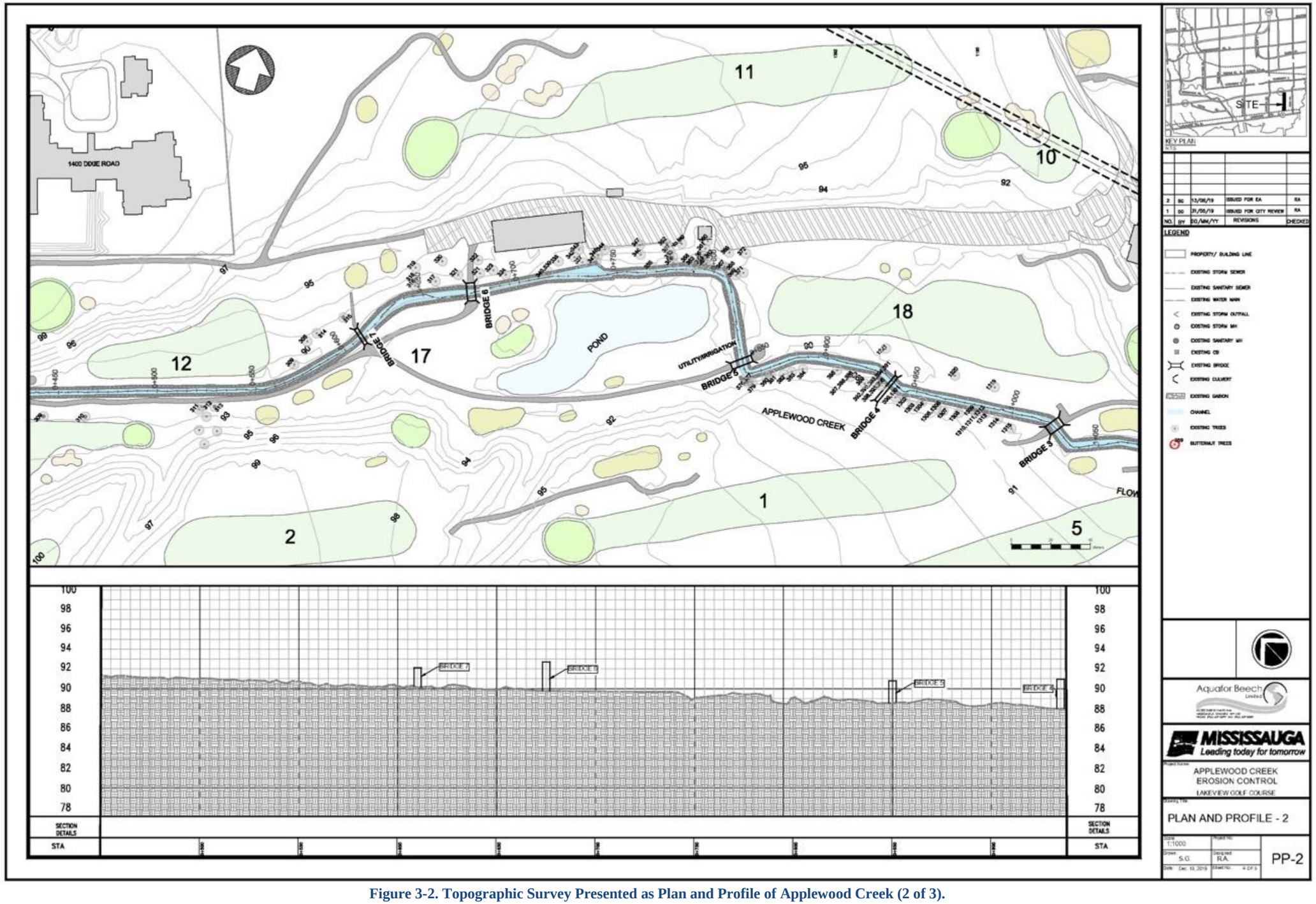


Figure 3-2. Topographic Survey Presented as Plan and Profile of Applewood Creek (2 of 3).

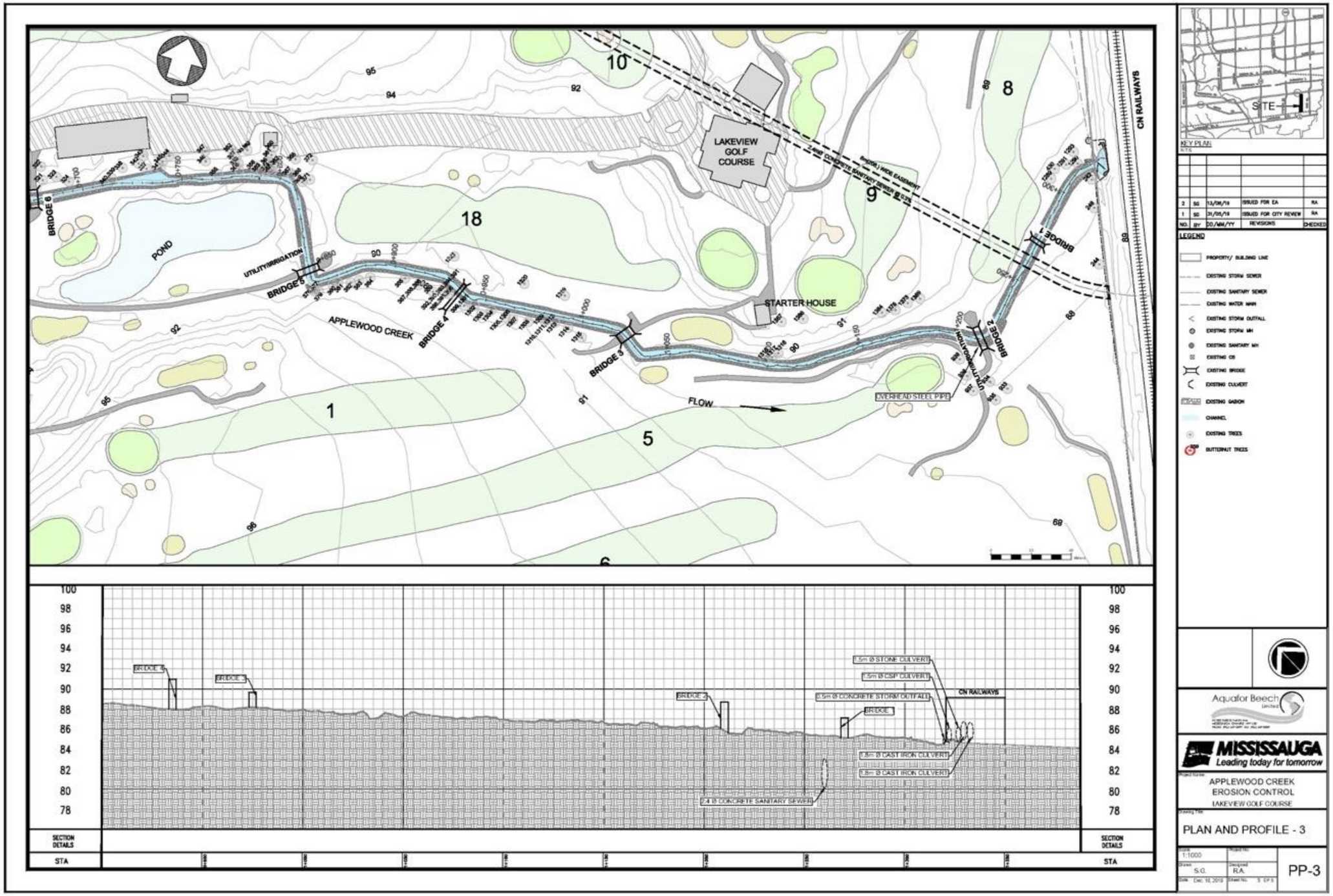


Figure 3-3. Topographic Survey Presented as Plan and Profile of Applewood Creek (3 of 3).

3.2 Geographic and Geotechnical Investigations

The Applewood Creek watershed is situated on bevelled till and sand plains within the Iroquois Plain physiographic region of southern Ontario (Chapman and Putman, 1984). Bordering Lake Ontario, the entire watershed is within the shoreline region, which is typically characterized as flat and formed by deltaic and lacustrine deposits (Figure 3-4). In turn, the surficial geology of the study area mostly consists of course-textured deposits of sand and gravel, pebbly flow till and rainout deposits, and modern alluvial deposits (Ontario Geological Survey, 2010).

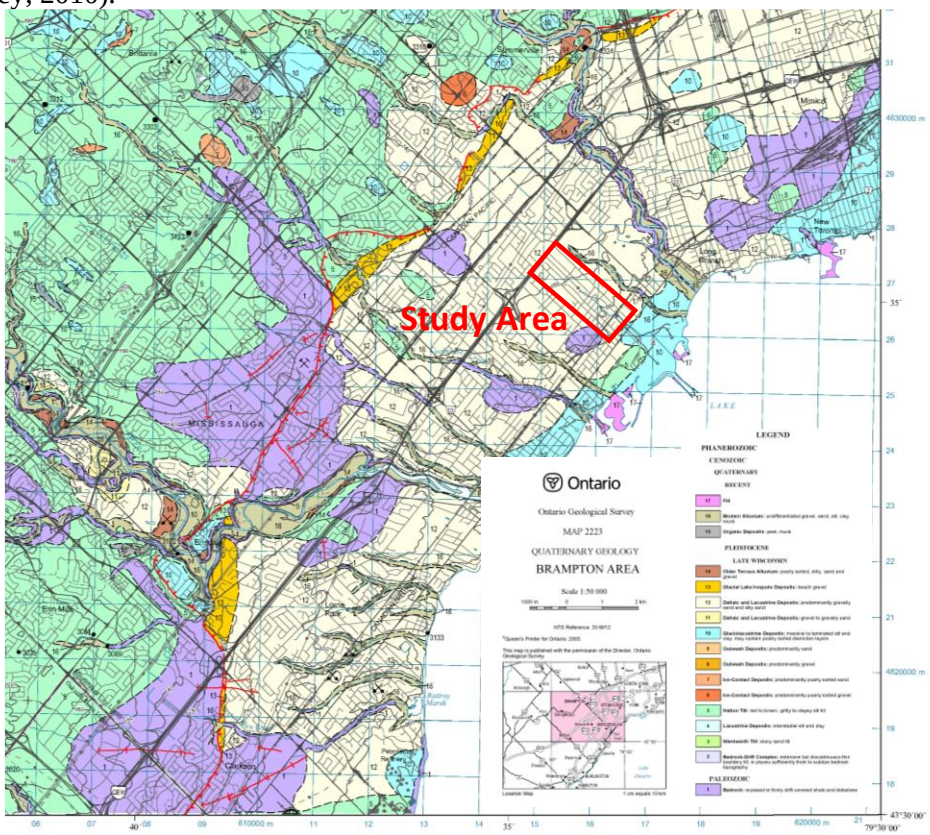


Figure 3-4. Modified Quaternary Geology Map 2223 – Brampton Area. (Ontario Geological Survey, 1991)

It is recommended that a thorough geotechnical investigation of the study area be carried out in order to accurately characterize the depth of overburden layers, as well as to provide insight to stable slope formation at the detailed design stage.

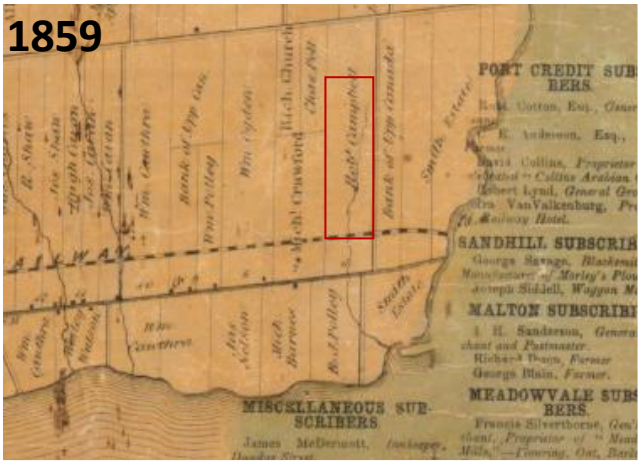
3.3 Geomorphic and Erosion Assessment

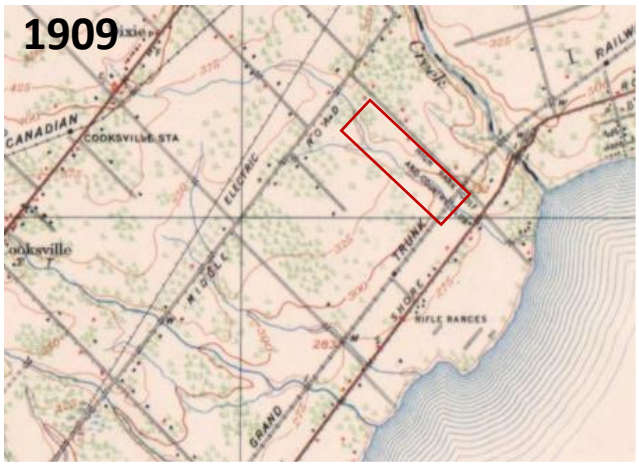
The Applewood Creek watershed is an urbanized watershed which lies within the lowland area of Lake Ontario. The watershed has relatively low gradients and is sensitive to water level fluctuations in Lake Ontario. Engineered erosion protection measures, in the form of gabion-lining along the banks, have been installed along the creek throughout the golf course. These gabions have been deteriorating and failing since the time of their installation and have required significant maintenance efforts from the golf course on an annual basis to minimize erosion impacts on the golf course.

An investigation of the historical alignments of the creek corridor provided insight into, and an understanding of the existing conditions, particularly related to mass changes to the alignment, and the natural tendencies of the creek to return to pre-disturbed conditions, while establishing parameters for unstable levels of shearing and flow velocities.

A compilation of the historical maps and aerial photos is presented in Figure 3-5 below, which highlights some of the following key features:

- 1859 – Applewood Creek in its historical alignment running down the centre of one single lot between Lakeshore Road and Middle Road. The property was owned at that time by Robert Campbell.
- 1877 – The lot was subdivided into three parcels. The historical alignment of Applewood Creek remained unchanged.
- 1909 & 1918 – The High Park Golf and Country Club was relocated to the area in 1907 and was renamed as the 'Lakeview Golf and Country Club' in 1912. The historical alignment of Applewood Creek remained unchanged throughout this period.
- 1954 – Applewood Creek was re-aligned into its present planform within the golf course. The bridges were installed. The Toronto Golf Club was constructed on the east side of Dixie Road. The residential neighborhood which presently surrounds the Lakeview Golf and Country Club was partially constructed.
- 1966 – The residential neighborhood continued to grow, occupying the remaining farm lands on the east side of Applewood Road. Dixie Mall was constructed north of the golf course, with the upstream section of the creek truncated and piped beneath the mall property.
- 1977 – The irrigation pond was constructed southwest of the 90-degree bends in the alignment of Applewood Creek. The 'Fairway' condominium building at 1400 Dixie Road was also constructed at around this time.
- 1992 – The Dixie Mall was further expanded to include the building and parking areas to the southwest of the existing mall, resulting in the removal of the remaining vacant/vegetated lands. Applewood Creek was lined with gabion baskets in the1980s.
- 2015 – Erosion and undermining of gabion baskets necessitated significant maintenance efforts from the golf course. A number of trees on the northeastern slope between the pond and the maintained building fell. The last remaining piece of the open land in the area (Owls Head Road, Carnegie Drive, and Haig Blvd) was developed into a residential townhouse community.
- 2019 – Existing conditions included failing gabion baskets and undermined bridge abutments. The creek became unsighty and did not contribute to the aesthetic quality of the golf course.




1909
CANADIAN
COOKSVILLE STA
ELECTRIC
MIDDLE
TRUNK
SHORE
RIFLE RANGES
GRAND


1918
COOKSVILLE STA
POWER
ELECTRIC
MIDDLE
TRUNK
SHORE
POWER STATION
RIFLE RANGES
GRAND


1954


1966


1977


1992

Figure 3-5. Historic Comparison of Maps and Aerial Imagery.

When completing a geomorphic assessment, it is common practice to refer a segment of watercourse that exhibits similar channel form, floodplain access, adjacent landuse and valley setting as a 'Reach'. Based upon the historic aerial imagery and field reconnaissance, Applewood Creek within the study area is considered as a single reach of uniformly gabion-lined watercourse with a consistent depth and width throughout. Moreover, since each restoration alternative that is assessed within this EA will be applied at a reach scale, the various alternatives that have been explored within the EA were applied to the entire length of Applewood Creek within the golf course.

The geomorphic conditions of a watercourse which is gabion lined are negligible, as the entirety of the channel is considered engineered. That said, there is evidence of intermittent baselevel lowering, which can further exacerbate the gabion basket failure through undermining the structures.

The bed materials (substrate) is primarily composed of thin layer of gabion stone actively being sourced from areas where gabion baskets are failing at the base. There are intermittent outcroppings of shale bedrock amongst the gabion, however, degradation rates are controlled by the veneer of gabion.

With regards to planform development and consideration of horizontal erosion hazards, the Technical Guide River & Stream Systems: Erosion Hazard Limit (MNRF, 2002) can be applied to this study area. The erosion hazard limit is illustrated in cross section in Figure 3-6, followed by Table 3-1 which summarizes the typical erosion allowances associated with a natural channel setting. This information is presented as reference to inform the susceptibility to erosion of Applewood Creek over a long-term horizon. As identified above that the creek banks are entirely engineered along its length and exhibit signs of stress and erosion, the existing erosion hazards within the creek corridor are relatively low. Moreover, no slope stability concerns are present within the study area where no valley slopes exist. However, if the existing baskets continue to fall without intervention, extensive erosion and loss of tableland are expected to happen in a short timeframe. This elevated erosion rate can be as great as 15 meters in a 100-year time span, which is consistent with the 15m buffer applied to the existing bank lines under the do-nothing alternative.

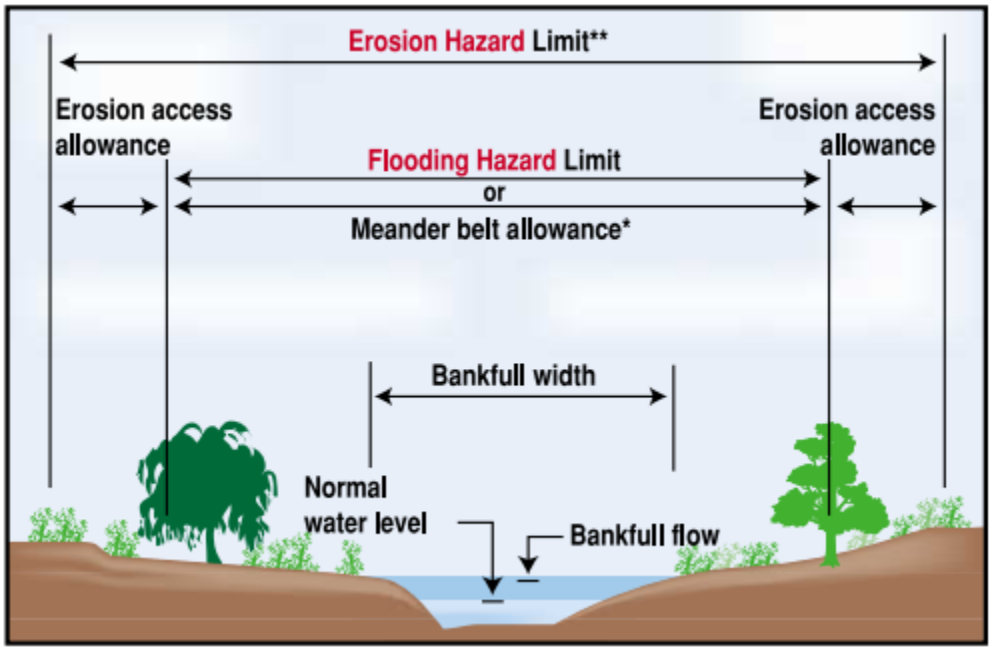


Figure 3-6. MNRF Guideline for Determining an Erosion Hazard Corridor within Unconfined Systems Such as Applewood Creek.

Table 3-1. MNRF 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

3.4 Hydrologic & Hydraulic Assessment

A review of the study area hydrology and hydraulic conditions was undertaken to determine the existing flood levels / floodlines of Applewood Creek through the golf course, as well as to gain an understanding of the hydraulic parameters observed under the range of flood flow conditions which attribute to erosion and channel alteration.

3.4.1 *Applewood Creek Hydrology*

At the onset of the study, a hydraulic (HEC-RAS) model was obtained from CVC which addresses a range of hydrologic conditions (i.e. flood flow scenarios), including the Regional event and return period events for 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year storms, respectively. Table 3-2 below summarizes the range of flood flows of Applewood Creek through Lakeview Golf Course.

Table 3-2. Summary of Applewood Creek Flow Regime through Lakeview Golf Course.

Return Period	2-year	5-year	10-year	25-year	50-year	100-year	Regional
Flow (m^3/s)	12.7	19.7	27.5	34.7	41.8	49.7	42.3

3.4.2 *Applewood Creek Hydraulics*

CVC has been recently updating the hydraulic models and floodplain mapping for the major watercourses within its jurisdiction, including Applewood Creek from the most upstream limit at the Dixie Outlet Mall, through the study area and downstream to Lake Ontario. It is noted that CVC had not finalized the hydraulic model for Applewood Creek at the time of initiation of this study, pending completion of 2D analysis for the spill areas over the CN railway, which defines the downstream boundary of the study area for this EA.

In turn, for the purposes of this EA, the existing draft HEC-RAS model for Applewood Creek was used to define the existing hydraulic conditions within the golf course. The schematics and cross-section arrangement of the existing HEC model within the study boundary are depicted in Figure 3-7. The model was run under a mix flow regime and a summary of the hydraulic modeling results for each of the various flood flow events is provided below in Table 3-3. The detailed model results are included in Appendix A.

Review of the model and results confirms all existing bridges have been included in the modelling, all of which are inundated under the regulatory flood. The regulatory floodlines are presently being finalized by CVC, however, review of draft results confirms no flooding occurs beyond the limits of the golf course. Structures such as the maintenance building and clubhouse are outside of the regulatory flood extents.

Figure 3-7. Existing HEC-RAS Schematic of Applewood Creek within the Study Area.

Table 3-3. Summary of Hydraulic Parameters for Flood Flow Events.

Flood Event	Flow (m3/s)	Hydr. Depth (m)	Velocity (m/s)		Channel Shear (N/m^2)		Channel Power (N/m*s)		Top Width (m)
		Avg.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.
2-year	12.7	0.43	1.7	2.5	53.0	113.5	101.3	287.2	33.1
5-year	19.7	0.44	1.8	3.0	56.0	143.7	111.8	428.1	46.0
10-year	27.5	0.56	1.8	2.8	55.4	116.8	114.4	308.9	61.2
25-year	34.7	0.65	1.8	2.8	57.7	131.8	125.7	312.2	69.0
50-year	41.8	0.70	1.9	2.9	61.6	147.6	139.1	344.8	71.3
100-year	49.7	0.76	2.0	3.1	65.5	164.4	153.7	408.7	73.4
Regional	42.3	0.71	1.9	2.9	61.7	149.7	139.8	352.5	72.0

The results of the hydraulic assessment demonstrate that Applewood Creek experiences moderate velocities, shearing forces, and channel power under the range of flood flow conditions, which can contribute to continuous erosion and an increase in the level of channel activity under extreme wet-weather flow events. These conditions have been considered in the process of defining the types of restoration options, the sizing and resistance thresholds for materials, and appropriate channel planform configurations.

In order to provide further insight into the impact of the hydraulics parameters, Aquafor reviewed the published data on the critical erosional thresholds for river bed and bank materials as presented in Table 3-4. A comparison between Table 3-3 and Table 3-4 suggested that the permissible erosion thresholds for a range of stone materials and techniques which are commonly utilized in natural channel restoration projects, such as 300mm non-uniform gravels, live fascines, brush layering, etc., exceed the hydraulic conditions as defined through the modeling exercise.

Table 3-4. Erosion Thresholds for Stream Bed and Bank Materials. (Fischenich, 2001)

	Permissible Shear Stress		Permissible Velocity	
	N/m^2	N/m^2	m/s	m/s
Fine Gravels	3.6		0.76	
Stiff Clay	12.4		0.91	1.37
Alluvial Silt	12.4		1.14	
Graded Silt to Cobble	18.2		1.14	
Shales and Hardpan	32.1		1.83	
Non-Uniform Gravel / Cobble				
2-inch	32.1		0.91	1.83
6-inch	95.8		1.22	2.29
12-inch	191.5		1.68	3.66
Long native grasses	57.5	81.4	1.22	1.83
Short native and bunch grass	33.5	45.5	0.91	1.22
Reed plantings	4.8	28.7		
Hardwood tree plantings	19.2	119.7		
Wattles	9.6	47.9	0.91	
Reed fascine	28.7	59.8	1.52	
Coir roll	143.6	239.4	2.44	
Vegetated coir mat	191.5	383.0	2.90	
Live brush mattress (initial)	19.2	196.3	1.22	
Live brush mattress (grown)	186.7	392.6	3.66	
Brush layering (initial/grown)	19.2	299.2	3.66	
Live fascine	59.8	148.4	1.83	2.44
Live willow stakes	100.5	148.4	0.91	3.05
Gabions	478.8		4.27	5.79
Concrete / Armourstone	598.5		5.49	

3.5 Fish Habitat Assessment

A fish habitat assessment was completed on April 9, 2019, using the Rapid Assessment Methodology for Channel Structure of the Ontario Stream Assessment protocol (OSAP) (Section 4: Module 1, Stanfield 2017). The site used for the OSAP assessment was located upstream of the northern side of the GO Train line culvert and extended approximately 1.4 km upstream to the southern limit of the Dixie Outlet Mall. This site was selected to provide a representative view of the study area. The fish habitat assessment field sheets are provided in **Appendix B**. A field inspection of the watercourse was conducted downstream of the study area to gain an

understanding of the condition beyond the southern limit of the study area. Photos of this section of the watercourse are also included in this report.

At the time of sampling, the average wetted width of Applewood Creek was 2.5 m. The average depth of the watercourse at crossovers was approximately 15 mm, with a maximum sampled depth of nearly 600 mm. This deep plunge pool exists one of three pool habitats that were observed throughout the site and it is located approximately 5 m downstream of a pedestrian/cart path bridge. This pool is depicted in **Photo 1**. The pool was likely formed as a result of the realignment of the creek, as demonstrated by a nearly 90-degree bend in the gabion- lined banks. Also shown in **Photo 1** is a sewer outfall that could have contributed to the formation of the deep pool. The other pools were also likely formed as a result of anthropogenic disturbance. The furthest downstream pool, illustrated in **Photo 2**, can be directly attributed to the GO Line crossing culvert(s) and the riffle crest elevation that exists upstream of them (potential sediment loading). These culverts and elevated riffle crest did not represent significant barriers to fish movement at the time of assessment. The furthest upstream pool, shown in **Photo 3**, was observed to have been formed as a result of a weir structure that consists of two steel I-beams and wooden stop logs, that would have likely been used to control water levels upstream of the structure. This weir structure did not represent a significant barrier to fish movement at the time of assessment. Adjacent to the weir structure is an offline pond that outlets into the creek via corrugated steel pipe outlets, also shown in **Photo 3**.

The remainder of the habitat observed throughout the site consisted predominantly of shallow-to-medium-depth glides (hydraulic head of 4-7 mm), slow riffles (8-17 mm), and fast riffles (> 17 mm). Instream cover was fairly consistent throughout the site with much of it found to be in the form of unembedded round and flat rock, likely attributed to the failing gabion baskets that line the bank. Typical substrate is shown in **Photo 4 (**with an example of a failing gabion bank shown in **Photo 5**. Instream vegetation was moderate at the time of assessment, consisting of filamentous algae and some macrophytes) (**Photo 6**). Overhanging vegetation was observed to be minimal at the time of assessment since the banks were predominantly comprised of gabion baskets (**Photo 7**). However, some vines and dogwood contributed to shade/cover and three stretches of forested banks (**Photo 8**) are located along the watercourse. Throughout the study reach, riparian vegetation contributed to a canopy cover of 15%, since the vegetation community that is located along much of the length of the banks comprised maintained turf grass right up to the edge of the gabion-lined banks **Photo 7**. Substrate point particles consisted mainly of fine sand and gravel, with cobble comprising the maximum particle as depicted in **Photo 4**.

As discussed, nearly all of the banks consist of gabion baskets, all of which observed to be leaning at an angle of 45 degrees or greater. The gabion baskets exhibit undercutting, which presents an acute risk of failure (as shown in **Photo 9)**. Some gabions have already failed as discussed above.

No major barrier to fish passage were observed within the watercourse. No fish were observed within the Reach at the time of the assessment, however a dead *Lepomis* species was observed within the pool downstream of the footbridge.

Photo 1. Plunge Pool Downstream of Footbridge.

Photo 2. Pool Upstream of GO Crossing Culverts.

Photo 3. Pool Downstream of Weir Structure.

Photo 4. Typical Substrate.

Photo 5. Failed Gabion Bank.

Photo 6. Typical Instream Vegetation.

Photo 7. Typical Bank Composition.

Photo 8. Example of Forested Bank.

Photo 9. Failing Gabion Bank Protection.

3.5.1 *Fish Communities*

The Action Plan to Restore the Mississauga Shoreline (CVC, 2018) noted that Applewood Creek receives flow from Etobicoke Creek during high flow events; i.e., it has connectivity with a fish-bearing watercourse. That document further noted that warmwater fish species can access the creek upstream of Lakeshore Road as a result of culvert improvements (CVC, 2018). This was confirmed during site investigations that were conducted by qualified biologists who walked the corridor from the confluence at Lake Ontario to the downstream limit of the study area. No barriers were observed downstream of the GO Train crossing. While no specific fish community information was available for the study area, multiple sources, including an Angler Workshop conducted by CVC indicated that multiple (5) fish species had been found within the tributary (MacMull, 2015). This information, combined with the noted connectivity to a fish-bearing watercourse (Etobicoke Creek) and Lake Ontario, along with the observation of an unknown *Lepomis* species within the study area, indicated that Applewood Creek (within the study area) should be considered to be fish habitat, since it meets the test of supporting fish at any time during any given year and/or connected to waterbodies that support fish at any time during any given year.

According to the Department of Fisheries and Oceans Canada (DFO) Aquatic Species at Risk (SAR) Map tool, no SAR are found (or potentially found) within the study area and no critical habitat for aquatic species at risk is present within the study area (DFO, 2019).

3.5.2 *Department of Fisheries and Oceans (DFO) Request for Regulatory Review*

The federal *Fisheries Act* requires that projects avoid causing the death of fish and the harmful alteration, disruption or destruction of fish habitat (HADD) unless authorized by the Minister of Fisheries and Oceans Canada (DFO). This applies to work being conducted in or near waterbodies that support fish at any time during any given year or that are connected to waterbodies that support fish at any time during any given year.

Upon completion of the detailed design for the channel works at each site, the works should be cross-referenced with the DFO "Projects Near Water" online service to determine if a request for regulatory review under the federal *Fisheries Act* is required (Department of Fisheries and Oceans, 2019). Within the online service, the Minister details steps for determining if a project requires regulatory review. Steps include "Measures to protect fish and fish habitat" as well as "Waterbodies where review isn't required" (Department of Fisheries and Oceans, 2019). The detailed design package should include a detailed mitigation plan to reduce the potential of causing the death of fish and the harmful alteration, disruption or destruction of fish habitat, including all mitigation measures set forth by the DFO. In projects where impacts to fish and fish habitat cannot be fully mitigated using the DFO measures, and the project does not fall within waterbodies where regulatory review isn't, required or the scope of the project is not covered under standards and code of practice, proponents are asked to submit a request for review to their region's Fish and Fish Habitat Protection Program office.

Based on the permanent nature of the creek and proposed works with the potential to cause the death of fish and the harmful alteration, disruption or destruction of fish habitat, it is expected that this project will require a DFO Request for Review.

3.6 Terrestrial Resources Assessment

3.6.1 *Vegetation Communities and Flora*

Due to its location on an active golf course, the study area contains no natural vegetation communities except for a narrow, linear wooded feature that is located on the south side of Applewood Creek near the northwestern project limits. This community was described in the City of Mississauga's 2018 Natural Areas System Update (Site LV14) as a Willow Lowland Deciduous Forest (FOD7-3) community type. The 2018 Natural Areas System Updates and associated mapping for the study area (Site LV14) are included in Appendix C. Species observed by Aquafor Beech's field staff in this area include: Crack Willow (*Salix x rubens*), Manitoba Maple (*Acer negundo*), Sweet Cherry (*Prunus avium*), Green Ash (*Fraxinus pennsylvanica*), Siberian Elm (*Ulmus pumila*), Black Walnut (*Juglans nigra*), and Silver Maple (*Acer saccharinum*). Ash trees in this area were noted to be affected by invasive pest species Emerald Ash Borer (*Agrilus planipennis*). Invasive species such as Garlic Mustard (*Alliaria petiolata*), European Buckthorn (*Rhamnus cathartica*), and Dog-strangling Vine or European Swallow-wort (*Vincetoxicum rossicum*) were documented in this unit and it was noted to be highly disturbed by adjacent human activities/developments.

A single Butternut (*Juglans cinerea*) tree was observed directly adjacent to Applewood Creek in this vegetation community. Butternut is an Endangered species due to the widespread effects of the introduced Butternut Canker fungus (*Ophiognomonia clavigignenti-juglandacearum*). A Butternut Health Assessment (BHA) per provincial requirements was completed for this tree on July 4, 2019, at which time it was determined to be a Category 2 tree ("retainable"). DNA testing for hybridity was not completed but a visual inspection did not provide any evidence to suggest the tree was not a genetically-pure Butternut. The observed butternut was tagged as No. 259 and is depicted in Figure 3-8.

The rest of the site consists of scattered trees within a manicured turf grass landscape. A comprehensive tree inventory was completed for the Lakeview Golf Course by SJM Arboricultural Consulting Ltd. in 2012. Aquafor Beech supplemented this inventory in 2019 as trees within the FOD7-3 forest unit described above had not been previously inventoried. The combined inventory data provides a complete overview of the trees that are growing along Applewood Creek within the study area such that any proposed tree removals may be quantified to determine compensation requirements in accordance with City of Mississauga and CVC standards. A summary of the identified mature trees within the anticipated limit of disturbance is presented below in Table 3-5, and the full inventory of the trees is included in Appendix D.

Figure 3-8. Observed Butternut Tree within Study Area.

Table 3-5. A Summary of Tree Inventory with Study Area.

Species Name		Number of Trees	%
Scientific Name	**Common Name**		
Cornus alternifolia	Alternate-leaved Dogwood	3	1.5%
Malus sp.	Apple Species	1	0.5%
Tilia americana	Basswood	5	2.4%
Prunus serotina	Black Cherry	5	2.4%
Juglans nigra	Black Walnut	13	6.3%
Juglans cinerea	Butternut	1	0.5%
Salix x rubens	Crack Willow	13	6.3%
Fraxinus pennsylvanica	Green Ash	33	16.1%
Acer negundo	Manitoba Maple	50	24.4%
Acer platanoides	Norway Maple	6	2.9%
Prunus sp.	Plum species	2	1.0%
Ulmus rubra	Red Elm	1	0.5%
Pinus sylvestris	Scots Pine	4	2.0%
Ulmus pumila	Siberian Elm	6	2.9%
Acer saccharinum	Silver Maple	12	5.9%
Acer saccharum	Sugar Maple	12	5.9%
Prunus avium	Sweet Cherry	5	2.4%
Fraxinus americana	White Ash	12	5.9%
Betula papyrifera	White Birch	5	2.4%
Thuja occidentalis	White Cedar	10	4.9%
Ulmus americana	White Elm	1	0.5%
Morus alba	White Mulberry	4	2.0%
Picea glauca	White Spruce	1	0.5%
	Total	**205**	

3.6.2 *Breeding Birds*

The City of Mississauga's Natural Areas System Update (2018) lists a number of bird species in association with Site LV14 which overlaps the study area. Most of these bird species are common in suburban parkland and residential neighborhoods. However, one species is a designated SAR: Chimney Swift, which is listed as Threatened both provincially and federally. This species nests almost exclusively in human-made structures (i.e., chimneys) and therefore does not have any nesting habitat present in the study area. It could, however, be nesting in nearby buildings and foraging over the golf course property.

The active nests of most migratory birds are protected under the federal *Migratory Birds Convention Act* and/or the provincial *Fish and Wildlife Conservation Act*. Actions that may cause harm to bird nests (e.g., removal of vegetation) should preferentially be planned to occur outside of the typical bird nesting season which extends from April 1 to August 31 in any given year.

3.7 Ministry of Natural Resources and Forestry (MNRF) Species at Risk Screening

For the purpose of this study, SAR are defined as those species designated as Endangered (END), Threatened (THR), or Special Concern (SC) under the provincial *Endangered Species Act* and/or the federal *Species at Risk Act*. Aquafor Beech completed a screening exercise for SAR within the study area using background data (e.g., the NHIC's database, the City's Natural Areas System Update, citizen science databases such as eBird and iNaturalist, etc.) and correspondence with the Ontario Ministry of the Environment, Conservation, and Parks (MECP) to identify species with the potential to occur in the vicinity. These species were then assessed by comparing their habitat requirements with the habitat present in the study area.

3.7.1 *Butternut – Present – Endangered*

As previously documented, Butternut (END) was found in the study area directly adjacent to Applewood Creek in lowland forest habitat. It was observed growing right at the edge of the gabion basket and therefore has a high likelihood of being affected by the project. Anticipated impacts to this tree will need to be confirmed during detailed design, and the Butternut Health Assessment Report must subsequently be submitted to the MECP along with an Information Gathering Form (IGF) once it is known whether the tree is proposed for removal or retention. Removal of a Category 2 Butternut may be allowed by the MECP with a requirement for compensation via replanting and post-construction monitoring; the IGF submission process will allow MECP to review the proposed works and determine the requirements for registration, permitting, or other actions regarding the Butternut on the property.

3.7.2 *Bats (Eastern Small-footed Myotis, Little Brown Myotis, Northern Myotis, and Tri-colored Bat) – Potentially Present – Endangered*

There are four species of bat in Ontario that are currently designated as Endangered. These species all use forested habitats for summer maternity and roosting, and could therefore potentially find habitat in the Willow Lowland Forest community located in the northwest portion of the study area. Trees preferred for bat roosting typically include those with cavities or loose/peeling bark, and large diameter maples and oaks (COSEWIC, 2013; MNRF, 2017). During detailed design, proposed tree removals within the forest community should be reviewed for their potential to provide bat habitat. The IGF submission to MECP should quantify impacts to potential bat habitat and provide for mitigation as appropriate (e.g., installation of a 'Rocket Box' type bat house).

In both of the above cases, avoidance of impacts should be considered as the preferred option to be pursued during the detailed design stage of the project. Detailed design options that avoid impacts to the forest community, and therefore avoid tree removal within this area, are preferred from the environmental perspective.

3.7.3 *Chimney Swift – Potentially Present / Non-Breeding – Threatened*

Chimney Swift historically nested in deciduous and coniferous, usually wet forest types, all with a well-developed, dense shrub layer. Nesting sites today are mostly found in urban areas in large and uncapped

chimneys. Chimney Swift was documented by background sources as being present in the vicinity of the study area; however, this species is not considered to have any suitable nesting habitat in the study area.

3.7.4 *Barn Swallow – Potentially Present / Non-Breeding – Threatened*

Barn Swallow (*Hirundo rustica*), a Threatened bird species, was noted in the vicinity of the study area by several background sources. This species, like Chimney Swift, typically nests on human-made structures; it is known to use the underside of bridges for nest construction (COSEWIC, 2011). However, Barn Swallow is not considered to be a factor in this project due to the absence of suitable nesting habitat (i.e., vertical riverbanks or other eroded faces; COSEWIC, 2013) in the study area. While Aquafor Beech's field staff did not note any Barn Swallow nests on the underside of golf course bridges along Applewood Creek, it is recommended that the site be reviewed again prior to construction to confirm the absence of nests as nesting sites are not necessarily static from year to year.

3.8 Archaeological Assessment

A Stage 1 archaeological assessment was carried out by Archaeological Services Inc. (ASI) in May 2019. The assessment included review of background documentation and field investigations to determine if the project exhibits archaeological potential and therefore, whether a Stage 2 assessment will be required.

The Stage 1 background study determined that one previously registered archaeological site is located within one kilometer of the study area. The assessment also indicated that part of the study area exhibits archaeological potential and will require Stage 2 assessment by test pit survey at five-meter intervals, prior to any proposed impacts to the property, to be undertaken at the detailed design stage.

A summary of the assessment results is shown in Figure 3-9 and the full archaeological report is included in Appendix E.

Figure 3-9. Results of the Stage 1 Archaeological Assessment. (ASI, 2019)

3.9 Heritage Impact Assessment (HIA)

Lakeview Golf Course is designated by the City of Mississauga as a 'Heritage Landscape' under Part IV of the Ontario Heritage Act. As such, it is essential that the proposed erosion control and watercourse restoration/stabilization works do not have a negative impact on the features of the golf course that have heritage values based on the designation and that the proposed works are fully integrated with the golf course landscape. In response, a Heritage Impact Assessment (HIA) for the golf course was completed as part of this study. The HIA identified existing cultural heritage features and all of the proposed alternatives were assessed in terms of potential impact on those features and their heritage value. Key findings and recommendations of the assessment are summarized below, with the complete HIA report included within Appendix F:

- Lakeview Golf Course (1190 Dixie Road) was designated by the City of Mississauga in January of 2010 under Part IV of the Ontario Heritage Act (City of Mississauga By-law no. 008-2010).
- As stated in is designation statement, Lakeview Golf Course's cultural heritage value lies it being one of few remaining traditional tree-lined, parkland layout golf courses in an urban setting and one of few remaining courses that was designed by golf course architect Herbert Strong. Its cultural heritage value also lies in its association with important golf tournaments and their players, as well as its history as a resort/recreation facility for York (Toronto) residents.
- Key physical heritage attributes of Lakeview Golf Course include:
    - Its location, orientation and dimensions;
    - Its mature trees and vegetation and their placement;
    - The placement and orientation of the original tees, fairways, greens, bunkers and other hazards, natural or otherwise, on varying topographical features;
    - Especially, original 11th and 18th tees, bunker in front of the 9th green, and the shape and form of the greens; and'
    - The staff dwelling at 1392 Dixie Road.
- Three properties adjacent to Lakeview Golf Course are also on Mississauga's Heritage Register. These properties include 1147, 1140, & 1455 Dixie Road.
- Alternatives 1, 2 or 3 are not anticipated to have substantial disturbance to any of the attributes that contribute to the cultural heritage value of the property.
- Alternative 4 involves alterations to the golf course, however, significant negative impacts to the cultural heritage value of the golf course are not anticipated. The configuration of Applewood Creek is an original feature and a heritage attribute of the course.
- Where possible, efforts should be made to protect mature trees within the golf course. All proposed impacts to or removals of trees should be done in accordance with the requirements of the City of Mississauga and CVC.

Since Lakeview Golf Course is designated under the Ontario Heritage Act, a Heritage Permit will be required to facilitate any alterations of the property. In turn, upon completion of the detailed design of the proposed erosion protection project, an application to secure a Heritage Permit will need to be submitted, and the City's Heritage Advisory Committee will need to be consulted.

3.10 Land Ownership and Easements

Lakeview Golf Course is currently owned by the City of Mississauga. In addition, the Region of Peel owns an easement over top of the sanitary sewer infrastructure that traverses the southeast corner of the golf course. The sanitary sewer crosses the creek in the vicinity of the culverts under the CN railway. All work that is proposed to be undertaken within the sanitary sewer easement will need to be approved by the Region of Peel.

4 DEVELOPMENT OF THE PREFERRED SOLUTION

4.1 Alternative No. 1 – Do Nothing

This alternative involves leaving the existing creek, particularly the gabion baskets which line both banks, to continue to actively degrade and fail. As mentioned above, the creek corridor at this present state provides little aesthetic value and playability to the golf course, which will not be improved through this alternative. In addition, existing risks with regards to undermining of bridge abutments, failure of asphalt cart paths, loss of golf course features and public safety, will also remain.

Figure 4-1 and Figure 4-2 included below depict the on-going deterioration of the gabion baskets and safety risks to the golf course users. A 10 m buffer has been applied to line that denotes the location of the existing banks of Applewood Creek in planform as shown in Figure 4-3. This figure also highlights the long-term erosion hazards.

Although capital costs associated with creek rehabilitation would not be incurred with this alternative, maintenance, monitoring and repair costs would accrue. The implementation of an on-going erosion risk monitoring program for the channel and the golf course is recommended. In addition, ongoing gabion failure would require emergency repairs on an as-needed basis. Cost estimate for Alternative 1 is included in Table 4-1. Throughout the estimated remaining lifespan of the gabion baskets (~10 year), a total cost of $600,000 might be expected.

Figure 4-1. Existing Conditions of Applewood Creek with Failing Gabion Banks.

Figure 4-2. Bank Erosion and Loss of Tableland due to Gabion Basket Failure.

Table 4-1. Preliminary Cost Estimates for Alternative 1 – Do Nothing.

Item	Description	Quantity	Unit	Unit Price	Extended price (Excl. HST)
Section "A" – Risk Monitoring and Emergency Repairs					
1	Ongoing Risk Monitoring	1	Year	$15,000.00	$15,000.00
2	Emergency Repairs to Gabion Baskets and Bridges	1	Year	$30,000.00	$30,000.00
Subtotal Section A (Excl of HST)					**$45,000.00**
Section "B" – Contingency					
3	Contingency (30%)	1	LS	$13,500.00	$13,500.00
Subtotal Section B (Excl of HST)					**$13,500.00**
	Section A – Risk Monitoring and Emergency Repairs				$45,000.00
	Section B – Contingency				$13,500.00
	Total (Excl of HST)				**$58,500.00**

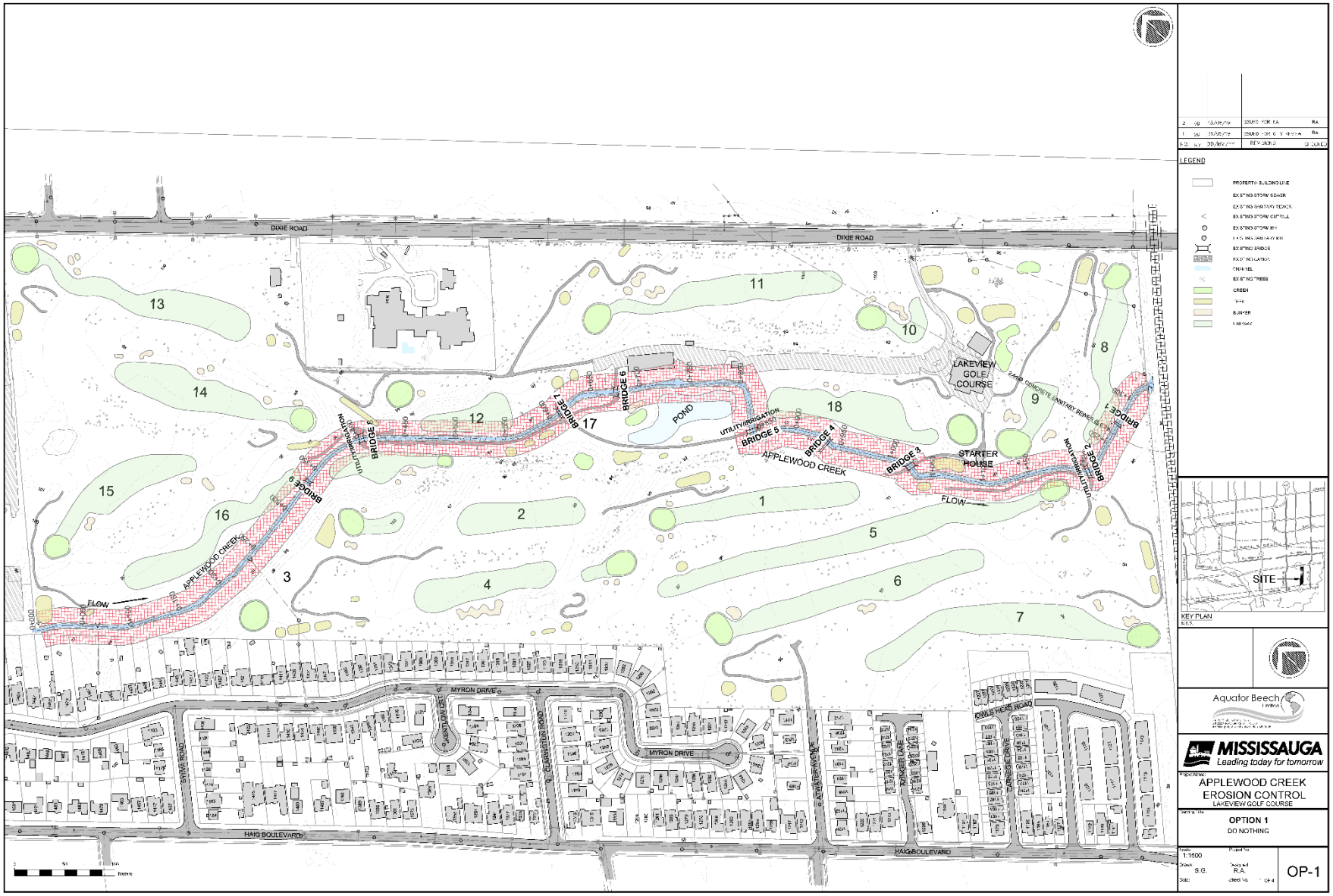


Figure 4-3. Alternative No. 1 – Do Nothing.

4.2 Alternative No. 2 – Replacing Gabion Baskets with Armourstone

This alternative would involve the restoration of Applewood Creek along its entire length within the golf course. The intent is to replace all of the existing gabion basket banks with armourstone walls, while maintaining the width and alignment of the existing channel.

This alternative would require limited disruption to the golf course and the existing bridges and would achieve long-term protection from erosion along the length of the watercourse. It is expected that the construction would be carried out in two phases, each happening from November 1 to the first week of April, with the intent of avoiding any delay to the golf course opening date, assuming that no ancillary golf course improvements are undertaken.

Should additional golf course improvements be added to the project (i.e. Hole 16 - fairway contour, tree removal, green adjustment; Hole 17 - upper tee expansion; Hole 18 - tee re-build, fairway contouring, Hole 1 - tee re-build, and Hole 8 - fairway contour), an extended timeframe with partial closure is expected to be required. These works are considered optional, since the basic premise of the alternative does not require significant alteration beyond the limits of the existing channel.

An example of engineered channel with armourstone walls is shown in Figure 4-4, and the preliminary design planform of Alternative 2 is also included in Figure 4-5. With respect to cost, this option is estimated to have a higher cost due to the significant amount of hard armouring materials that will be required to be used. The preliminary construction cost estimate for Alternative 2 is set out in Table 4-2.

Figure 4-4. An Example of Engineered Channel Restoration with Armourstone.

Table 4-2. Preliminary Cost Estimate for Alternative 2 – Replacing Gabion Baskets with Armourstone.

Item	Description	Quantity	Unit	Unit Price	Extended price (Excl. HST)
Section "A" – Site Preparation and Removal					
1	Field Office	1	LS	$3,000.00	$3,000.00
2	Utility & Service Locates	1	LS	$5,000.00	$5,000.00
3	Project Signage	2	ea.	$1,000.00	$2,000.00
4	Mobilization & Demobilization	1	LS	$15,000.00	$15,000.00
5	Access Route & Staging Areas	1	LS	$32,000.00	$32,000.00

6	Clearing, Grubbing & Tree Removals	1	LS	$15,000.00	$15,000.00
7	Supply, Install & Remove Erosion & Sediment Control and Construction Fencing	1	LS	$65,000.00	$65,000.00
8	Stream Control, Bypass Pumping & Dewatering	1	LS	$60,000.00	$60,000.00
9	Removal & Disposal of Gabion Basket Banks	1330	m	$80.00	$106,400.00
10	Obtain MNRF Fish Collection Permit and Fish Rescues	1	LS	$8,000.00	$8,000.00
Subtotal Section A (Excl of HST)					**$311,400.00**
Section "B" – Engineered Channel Works and Restoration					
11	Additional Excavation, Earthwork & Grading	1	LS	$50,000.00	$50,000.00
12	Channel Restoration with Armourstone Retaining Walls & Roundstone Bed Features	1330	m	$4,000.00	$5,320,000.00
13	Extension / Replacement of Existing Drainage Pipes (x40)	1	LS	$10,000.00	$10,000.00
14	Minor Golf Cart Asphalt Trail Repair	1	LS	$5,000.00	$5,000.00
15	Supply & Placement of Topsoil (300mm)	1	LS	$26,000.00	$26,000.00
16	Supply & Placement of Sodding 2m Beyond Limit of Disturbance	5830	m^2	$12.00	$69,960.00
17	Supply & Planting Trees and Shrubs	1	LS	$20,000.00	$20,000.00
Subtotal Section B (Excl of HST)					**$5,500,960.00**
Section "C" – Golf Course Improvements - OPTIONAL					
18	Hole 16 Tee Area	1	LS	$42,000.00	$42,000.00
19	Hole 16 Fairway Contour and Tree removal	1	LS	$30,000.00	$30,000.00
20	Hole 16 Green Expansion and Fairway Contouring	1	LS	$25,500.00	$25,500.00
21	Cart Path Construction along 16 Green Past 17 Tees	1	LS	$20,000.00	$20,000.00
22	Hole 17 Upper Tee Expansion	1	LS	$57,500.00	$57,500.00
23	Hole 18 Tee Re-build	1	LS	$55,000.00	$55,000.00
24	Hole 18 Fairway Contouring and Re-grade	1	LS	$36,700.00	$36,700.00
25	Hole 1 Tee Re-build	1	LS	$67,500.00	$67,500.00
26	Changes to Holes 5 and 6	1	LS	$98,500.00	$98,500.00
27	Hole 8 Fairway Contour	1	LS	$21,500.00	$21,500.00
28	Loss of Revenue Due to Partial Closure - 7 holes closed / temporary features from Oct. 15th – June 30th	1	LS	TBD	TBD
Subtotal Section C (Excl of HST)					**$454,200.00**
Section "D" – Contingency					
29	Contingency (20%)	1	LS	$1,253,312.00	$1,253,312.00
Subtotal Section D (Excl of HST)					**$1,253,312.00**
	Section A – Site Preparation and Removal				$311,400.00
	Section B – Engineered Channel Works and Restoration				$5,500,960.00
	Section C – Golf Course Improvements - OPTIONAL				$454,200.00
	Section D – Contingency				$1,253,312.00
	Total (Excl of HST)				**$7,519,872.00**

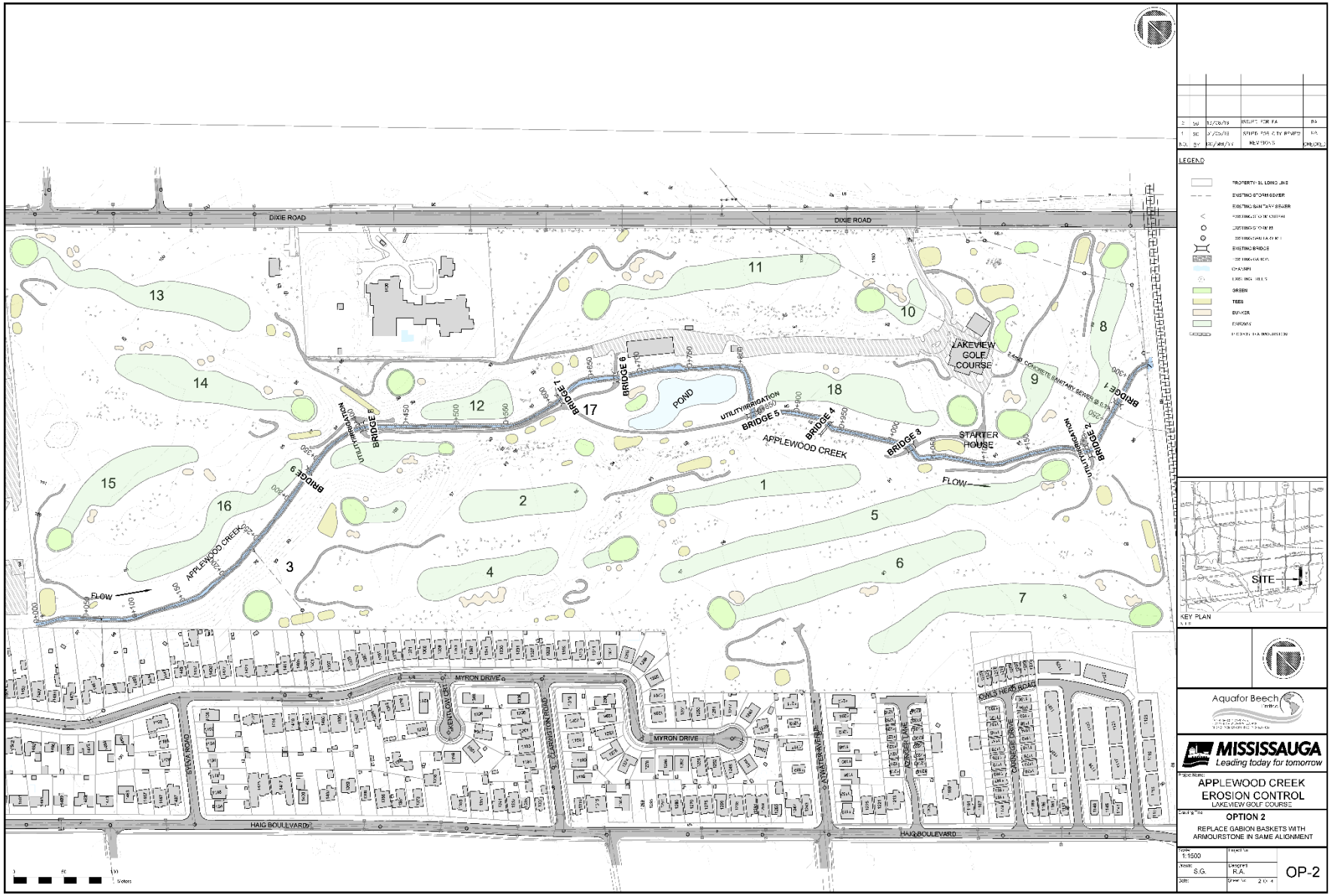


Figure 4-5. Alternative No. 2 – Replacing Gabion Baskets with Armourstone.

4.3 Alternative No. 3 – Replacing Gabion Baskets with Vegetated Roundstone

Similar to Alternative 2, this alternative would also involve the restoration of Applewood Creek along its entire length within the golf course. The banks of the channel would be reconstructed and stabilized with vegetated roundstone and the bed would be reinforced with boulders. Within this alternative, the width of the channel would be enlarged but the existing alignment of the watercourse will be maintained. The banks would be vegetated and buried stone would be installed as toe protection to provide bank stability and to establish an appropriate transition to the golf course landscape.

This alternative would require minor to moderate disruption to the golf course and would also require the replacement of 4 out of 9 existing bridges. Long-term erosion protection and improved aesthetic value would be provided as a result of this alternative. It is expected that the construction would be carried out in two phases, with each happening from November 1 to the first week of April, to avoid any delay to the golf course opening date, assuming that no ancillary golf course improvements are undertaken.

The optional improvements of the golf course similar to those that were described for Alternative 2 also apply to this alternative (i.e. Hole 16 - fairway contour, tree removal, green adjustment; Hole 17 - upper tee expansion; Hole 18 - tee re-build, fairway contouring, Hole 1 - tee re-build, and Hole 8 - fairway contour), which would require an extended construction timeframe and partial closure of the course.

An example of an engineered channel with a vegetated roundstone installation is shown in Figure 4-6. The preliminary design planform of Alternative 3 is illustrated in Figure 4-7. As for cost, the implementation of this option would have relatively high cost as well. The preliminary construction cost estimate for Alternative 3 is set out in Table 4-3.

Figure 4-6. An Example of Engineered Channel Restoration with Vegetated Roundstone.

Table 4-3. Preliminary Cost Estimate for Alternative 3 – Replacing Gabion Baskets with Vegetated Roundstone.

Item	Description	Quantity	Unit	Unit Price	Extended price (Excl. HST)
Section "A" – Site Preparation and Removal					
1	Field Office	1	LS	$3,000.00	$3,000.00
2	Utility & Service Locates	1	LS	$5,000.00	$5,000.00
3	Project Signage	2	ea.	$1,000.00	$2,000.00
4	Mobilization & Demobilization	1	LS	$15,000.00	$15,000.00

5	Access Route & Staging Areas	1	LS	$32,000.00	$32,000.00
6	Clearing, Grubbing & Tree Removals	1	LS	$22,500.00	$22,500.00
7	Supply, Install & Remove Erosion & Sediment Control and Construction Fencing	1	LS	$80,000.00	$80,000.00
8	Stream Control, Bypass Pumping & Dewatering	1	LS	$60,000.00	$60,000.00
9	Remove & Dispose of Gabion Basket Banks	1330	m	$80.00	$106,400.00
10	Removal & Disposal of Bridges (x4)	4	ea.	$15,000.00	$60,000.00
11	Obtain MNRF Fish Collection Permit and Fish Rescues	1	LS	$8,000.00	$8,000.00
Subtotal Section A (Excl of HST)					**$393,900.00**
Section "B" – Engineered Channel Works and Restoration					
12	Additional Excavation, Earthwork & Grading	1	LS	$75,000.00	$75,000.00
13	Channel Restoration with Vegetated Roundstone Buttress & Roundstone Bed Features	1330	m	$3,200.00	$4,256,000.00
14	Extension / Replacement of Existing Drainage Pipes (x40)	1	LS	$10,000.00	$10,000.00
15	Full Asphalt Cart Path Replacement (Removal, Granular Placement, New Asphalt)	770	m^2	$110.00	$84,700.00
16	Bridge Replacement (4 Bridges x 12m Span)	4	ea.	$120,000.00	$480,000.00
17	Supply & Placement of Topsoil (300mm)	1	LS	$26,000.00	$26,000.00
18	Supply & Placement of Sodding 2m Beyond Limit of Disturbance	5830	m^2	$12.00	$69,960.00
Subtotal Section B (Excl of HST)					**$5,031,660.00**
Section "C" – Golf Course Improvements - OPTIONAL					
19	Hole 16 Tee Area	1	LS	$42,000.00	$42,000.00
20	Hole 16 Fairway Contour and Tree removal	1	LS	$30,000.00	$30,000.00
21	Hole 16 Green Expansion and Fairway Contouring	1	LS	$25,500.00	$25,500.00
22	Cart Path Construction along 16 Green Past 17 Tees	1	LS	$20,000.00	$20,000.00
23	Hole 17 Upper Tee Expansion	1	LS	$57,500.00	$57,500.00
24	Hole 18 Tee Re-build	1	LS	$55,000.00	$55,000.00
25	Hole 18 Fairway Contouring and Re-grade	1	LS	$36,700.00	$36,700.00
26	Hole 1 Tee Re-build	1	LS	$67,500.00	$67,500.00
27	Changes to Holes 5 and 6	1	LS	$98,500.00	$98,500.00
28	Hole 8 Fairway Contour	1	LS	$21,500.00	$21,500.00
29	Loss of Revenue Due to Partial Closure - 7 holes closed / temporary features from Oct. 15th – June 30th	1	LS	TBD	TBD
Subtotal Section C (Excl of HST)					**$454,200.00**
Section "D" – Contingency					
30	Contingency (20%)	1	LS	$1,175,952.00	$1,175,952.00
Subtotal Section D (Excl of HST)					**$1,175,952.00**
	Section A – Site Preparation and Removal				$393,900.00
	Section B – Engineered Channel Works and Restoration				$5,031,660.00
	Section C – Golf Course Improvements - OPTIONAL				$454,200.00
	Section D – Contingency				$1,175,952.00
	Total (Excl of HST)				**$7,055,712.00**

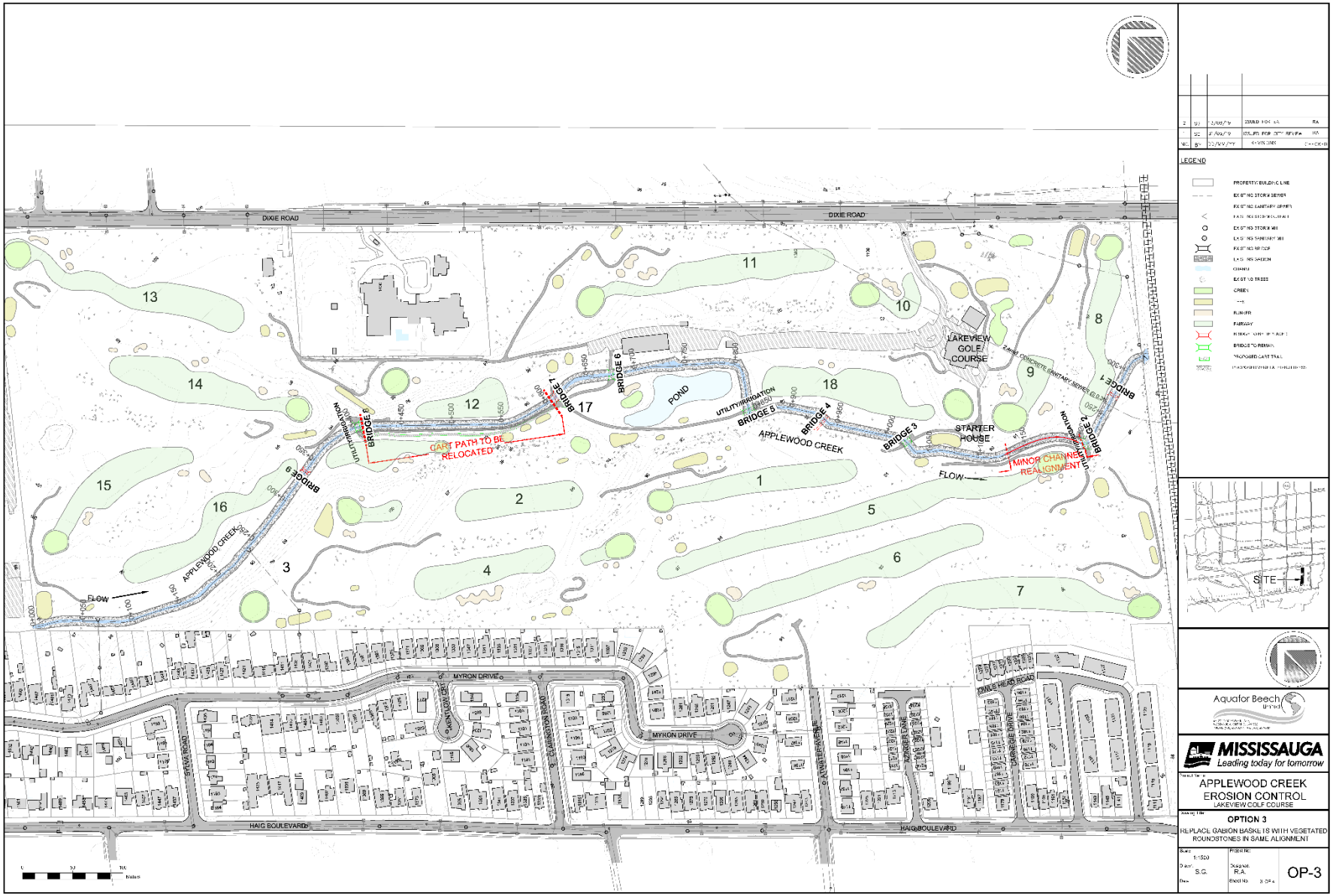


Figure 4-7. Alternative No. 3 – Replacing Gabion Baskets with Vegetated Roundstone.

4.4 Alternative No. 4 – Natural Channel Realignment

For this alternative, the creek would be restored to a more naturalized form while maintaining a fixed (existing) alignment where golf course related constraints dictate. The channel restoration would involve a continuous realignment of the Applewood Creek through the golf course, recreating the channel bed and banks using a combination of natural channel design techniques in combination with engineered methods. This alternative would involve the highest level of disruption to the study area, due in particular to the requirement to alter existing golf course features in order to accommodate the proposed channel stabilization works, including:

- Hole 16 tee re-alignment / relocation, fairway contouring, tree removal, and green expansion;
- Hole 13 tee re-build;
- Hole 17 green restore / re-built and upper tee expansion;
- Hole 18 tee re-build, fairway contouring and re-grading;
- Hole 8 fairway contouring and forward tee re-build;
- Hole 1 tee re-build;
- Changes to Holes 5 and 6;
- Cart path construction from the 16 Fairway to the 18 Fairway;
- Filling in of the existing pond and parking lot expansion; and,
- Irrigation mainline and infrastructure adjustments.

Due to the significant modifications to the golf course that would be required to implement this alternative, an extended construction timeframe is anticipated, during which 7 of 18 holes would be closed (#12-18) during golf season. Once construction is completed however, the implementation of this alternative would result in significant improvements in terms of the natural function and processes of the watercourse and enhanced channel stability, as well as improved playability of the golf course and golfer experience, since Applewood Creek would be positioned as a more prominent feature within the landscape.

An example of natural channel restoration is shown in Figure 4-8, and the preliminary design planform of Alternative 4 is illustrated in Figure 4-9. The preliminary construction cost estimate for Alternative 4 is set out in Table 4-4.

Figure 4-8. An Example of Natural Channel Restoration with Golf Course Improvement.

Table 4-4. Preliminary Cost Estimates for Alternative 4 – Natural Channel Realignment.

Item	Description	Quantity	Unit	Unit Price	Extended price (Excl. HST)
Section "A" – Site Preparation and Removal					
1	Field Office	1	LS	$3,000.00	$3,000.00
2	Utility & Service Locates	1	LS	$5,000.00	$5,000.00
3	Project Signage	2	ea.	$1,000.00	$2,000.00
4	Mobilization & Demobilization	1	LS	$15,000.00	$15,000.00
5	Access Route & Staging Areas	1	LS	$32,000.00	$32,000.00
6	Clearing, Grubbing & Tree Removals	1	LS	$27,000.00	$27,000.00
7	Supply, Install & Remove Erosion & Sediment Control and Construction Fencing	1	LS	$25,000.00	$25,000.00
8	Stream Control, Bypass Pumping & Dewatering	1	LS	$60,000.00	$60,000.00
9	Remove & Dispose of Gabion Basket Banks	1330	m	$80.00	$106,400.00
10	Removal & Disposal of Bridges (x6)	6	ea.	$15,000.00	$90,000.00
11	Obtain MNRF Fish Collection Permit and Fish Rescues	1	LS	$8,000.00	$8,000.00
Subtotal Section A (Excl of HST)					**$433,400.00**
Section "B" – Natural Channel Works and Restoration					
12	Additional Excavation, Earthwork & Grading	1	LS	$40,000.00	$40,000.00
13	Natural Channel Restoration with Roundstone Bed Features	1295	m	$3,000.00	$3,885,000.00
14	Bridge Replacement (5 Bridges x 25m Span)	5	ea.	$250,000.00	$1,250,000.00
15	Supply & Placement of Topsoil (300mm)	1	LS	$26,000.00	$26,000.00
16	Supply & Placement of Sodding 2m Beyond Limit of Disturbance	5830	m^2	$12.00	$69,960.00
17	Supply & Planting Trees and Shrubs	1	LS	$45,000.00	$45,000.00
Subtotal Section B (Excl of HST)					**$5,315,960.00**
Section "C" – Golf Course Improvements- MANDATORY					
18	Hole 16 Tee Area	1	LS	$55,500.00	$55,500.00
19	Hole 16 Fairway Contour and Tree removal	1	LS	$45,000.00	$45,000.00
20	Hole 16 Green Expansion and Fairway Contouring	1	LS	$25,500.00	$25,500.00
21	Hole 13 Tee Re-build	1	LS	$52,500.00	$52,500.00
22	Hole 17 Restoration/Rebuilding of 17 Green	1	LS	$88,000.00	$88,000.00
23	Cart Path Construction From 16 Fairway to 18 Fairway	1	LS	$44,000.00	$44,000.00
24	Hole 1 7 Tee Expansion	1	LS	$57,500.00	$57,500.00
25	Hole 1 8 Tee Re-build	1	LS	$55,000.00	$55,000.00
26	Hole 18 Fairway Contouring and Re-grade	1	LS	$49,000.00	$49,000.00
27	Hole 1 Tee Re-build	1	LS	$67,500.00	$67,500.00
28	Changes to Holes 5 and 6	1	LS	$98,500.00	$98,500.00
29	Hole 8 Fairway Contour	1	LS	$21,500.00	$21,500.00
30	Hole 8 Reconstruction of Forward Tee	1	LS	$16,500.00	$16,500.00
31	Fill in Pond and Parking Expansion	1	LS	$112,000.00	$112,000.00
32	Restore Haul Routes	1	LS	$33,000.00	$33,000.00
33	Irrigation Mainline Adjustments Over Bridges	1	LS	$15,000.00	$15,000.00
34	Loss of Revenue Due to Partial Closure - 7 holes closed from Oct. 15th - July 14th	1	LS	TBD	TBD
Subtotal Section C (Excl of HST)					**$836,000.00**
Section "D" – Contingency					

35	Contingency (20%)	1	LS	$1,317,072.00	$1,317,072.00
Subtotal Section D (Excl of HST)					**$1,317,072.00**
	Section A – Site Preparation and Removal				$433,400.00
	Section B – Natural Channel Works and Restoration				$5,315,960.00
	Section C – Golf Course Improvements - MANDATORY				$836,000.00
	Section D – Contingency				$1,317,072.00
	Total (Excl of HST)				**$7,902,432.00**

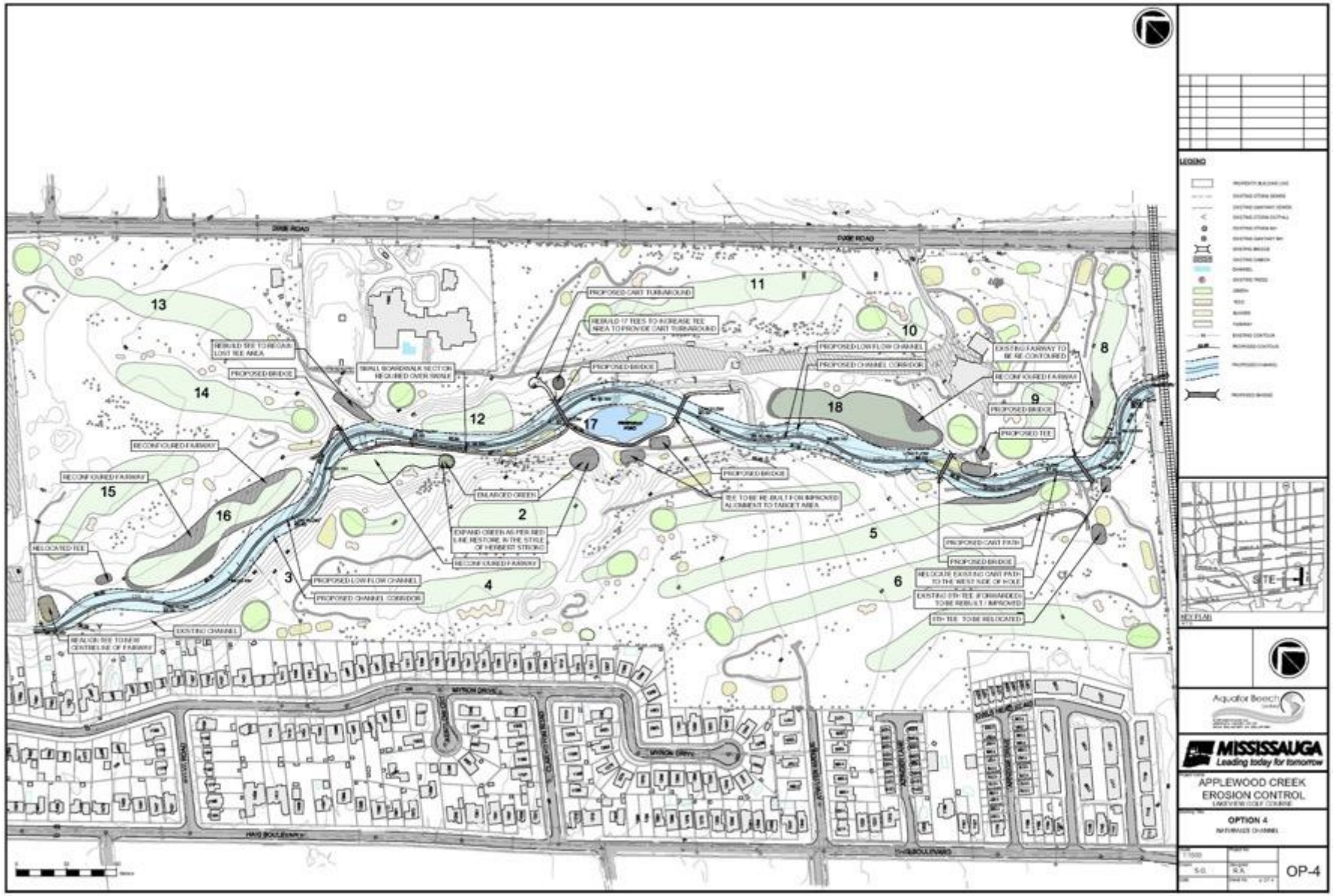


Figure 4-9. Alternative No. 4 – Natural Channel Realignment.

4.5 Evaluation of Alternatives

Each alternative was compared using selected criteria in order to apply a ranking and select the most appropriate remediation alternative. The criteria that were used as the basis for this evaluation included:

1. Physical and Natural
    a. Erosion
    b. Water Quality
    c. Aquatic Habitat
    d. Terrestrial Habitat
    e. Terrestrial Vegetation

2. Social and Cultural
    a. Public Safety
    b. Landowner Impacts
    c. Heritage Designation
    d. Archaeology
    e. Aesthetic Value

3. Technical and Engineering
    a. Impact on Existing Infrastructure
    b. Lifespan of Proposed Works

4. Economic
    a. Capital Costs
    b. Operations and Maintenance Costs

For each criterion, a score was applied that ranged from 0 to 4 (Table 4-5), where:

- 0 = Unfavourable, no improvement or negative impact;
- 2 = Acceptable; and,
- 4 = Favourable, most improvement or most positive impact.

Table 4-5. Ranking Scheme for Criteria Evaluation of Each Alternative.

Ranking Scale						
Unfavourable / No Improvement / Negative Impact	0	1	2	3	4	**Favourable Most Improvement / Most Positive Impact**

The evaluation was completed with input from technical staff from Aquafor and Schollen, as well as representatives of the City of Mississauga (including Lakeview Golf and Country Club), by assigning a preliminary ranking score to each alternative. The ranking scores were then been normalized to provide equal weighting for each category of evaluation criteria.

The sum of the scores related to each category of evaluation criteria was determined for each alternative and the alternative with the highest total score was deemed to be the preferred alternative. A summary of scores of all four alternatives is presented in Table 4-6.

This ranking was presented to the public, landowners and relevant stakeholders, and was then updated based on comments received as well as based on supplementary technical investigations.

Table 4-6. Evaluation of Alternatives.

		Alternative 1 - Do Nothing		Alternative 2 - Replacing Gabion Baskets with Armourstone		Alternative 3 - Replacing Gabion Baskets with Vegetated Roundstone		Alternative 4 - Natural Realignment	
EVALUATION CRITERIA		**Score**	**Explanation**	**Score**	**Explanation**	**Score**	**Explanation**	**Score**	**Explanation**
Physical and Natural Criteria		***0.0***		***1.4***		***1.4***		***2.1***	
Erosion	Rate of erosion, slope failures, and loss of tablelands	**0**	Continued erosion, slope failures and loss of table / golf course lands	**3**	Long-term erosion protection with minimal opportunities for planform adjustment	**3**	Long-term erosion protection to the watercourse and adjacent golf course land	**4**	Minimized rate of erosion and loss of table / golf course land, provided stable slopes
Water Quality	Impact on water quality	**0**	Gabion wires continue to rust and lack of tree canopy keeps water warmer. No improvement to water quality.	**1**	Limited improvement of water quality by removing gabion baskets.	**2**	Improvements to the water quality by creating in-water vegetation	**3**	Future vegetation cover from new riparian plantings will help to shade creek and keep the water cooler, as well as holding the banks together to reduce sedimentation from bank erosion.
Aquatic Habitat	Impact on contributing aquatic habitat	**0**	No improvement to habitat. Possibility the habitat will degrade as gabions continue to fail and collect debris.	**1**	Limited improvement of aquatic habitat which may be suitable for different types of forage for fish.	**2**	Introduction of in-water vegetation would provide shade to creek and provide habitat for forage. However, the constraints of the existing narrow corridor will limit natural meandering pattern and river functions.	**4**	Restoring the creek to a meandering form would encourage proper river function in the development of runs/riffles/pools, providing better habitat for fish and their forage. New riparian plantings would provide shade to creek and provide habitat for forage.
Terrestrial Habitat	Impact on connectivity, diversity and quantity/quality of habitat	**0**	Habitat stays in current condition; Habitat quality potentially degrades over time as exotic and invasive species outcompete native species.	**3**	Localized loss of vegetation due to construction will be mitigated by planting native species. Likely removal of candidate bat maternity roosting sites.	**2**	Likely removal of candidate bat maternity roosting sites and potential impact on the Butternut near Hole 3 (SAR), Enhance biodiversity through native species planting making up loss of forest canopy cover until plantings mature.	**3**	Likely removal of candidate bat maternity roosting sites and potential impact on the Butternut near Hole 3 (SAR), Enhance biodiversity through native species planting and creation of wetlands within the floodplain.
Terrestrial Vegetation	Impact on existing riparian vegetation, including mature trees	**0**	Vegetation composition remains the same. Continued loss of herbaceous, shrubs, and some trees from erosion.	**3**	Potential removal of dead ash trees and trees that are leaning towards the creek.	**2**	Vegetation loss due to construction will be mitigated through native species plantings throughout the reach; Removal of dead ash trees and invasive shrubs; Potential transplant of Butternut required.	**3**	Vegetation loss due to construction will be mitigated through native species plantings. Removal of dead ash trees and invasive shrubs.
Social and Cultural Criteria		***0.9***		***1.5***		***1.9***		***2.1***	
Public Safety	Impact on public safety	**1**	Continued erosion and unstable banks would create risks to golfers	**2**	Improved public safety by reducing erosions and stabilizing banks. However, certain safety measures may be required due to deep channel (~2m) with steep bank slopes.	**3**	Improved public safety by reducing erosions and stabilizing banks.	**4**	Stable slope and natural meander form, flooding risks minimized
Landowner Impacts	Impact on Lakeview Golf Course and adjacent private properties	**1**	Continued erosion, slope failures and loss of table / golf course lands	**3**	Limited disturbance to golf course features during construction. Reduced risks of property loss	**2**	Minor disturbance to golf course features due to channel widening. Reduced risks of property loss	**3**	Major disturbance to golf course however will ultimately enhance the outstanding playability of the golf course. Opportunity to remove the spare 17th hole.
Heritage Designation	Impact on the heritage designation and attributes of the golf course	**2**	No immediate impacts on the designation. Potential long-term risks to heritage designated features	**1**	No impacts on golf course heritage designated features. However, hard materials lining the creek provide relatively lower natural and cultural heritage values.	**3**	No impacts on golf course heritage designated features.	**4**	No impacts on golf course heritage designation. Opportunities to bring the layout of the course closer to the original/historical design intent.
Archaeology	Impact on the archaeological potentials within the golf course	**2**	No immediate impacts on potential archaeological resources. Potential long-term risks exists.	**4**	No impacts on potential archaeological resources within the golf course.	**4**	No impacts on golf course archaeological potentials.	**2**	Limited impacts on golf course archaeological potentials.
Aesthetic Value	Impact on existing and proposed aesthetic value	**1**	Low aesthetic value due to aging/failing gabion-lined banks throughout the creek within golf course	**2**	Minor improvement of the natural look and aesthetic value of the creek corridor.	**3**	Some improvement of the natural look and aesthetic value of the creek corridor.	**4**	Significant enhancement of the natural look of the creek corridor and aesthetic value of the golf course
Technical and Engineer Criteria		***0.6***		***1.9***		***1.3***		***1.6***	
Impact on Existing Infrastructure	Protection or potential failure of infrastructure (bridges, utilities, irrigation system, cart path)	**1**	All existing bridges to remain, with undermining abutments due to gabion failure. Continued erosion would lead to cart path failure.	**3**	Existing bridges to remain, with abutments protected from undermining.	**2**	2 bridges in poor conditions & 2 bridges in fair conditions to be replaced. All bridge abutments protected from undermining. Potential impact on existing drainage and irrigation system.	**1**	2 bridges in poor conditions & 7 bridges in fair conditions to be replaced. All bridge abutments protected from undermining. Potential impact on existing drainage and irrigation system.
Lifespan of Works	Expected lifespan / years of works before intervention needs to be repeated	**1**	Majority of gabions approaching end of lifespan	**3**	Long-term life span ~ 50 years.	**2**	Moderate lifespan of works	**4**	Long lifespan of works > 50 years.
Economic Criteria		***1.7***		***1.3***		***1.7***		***0.8***	
Capital Costs	One time cost to City	**4**	No capital cost to City	**1**	2nd highest construction costs associated with significant amount of hard materials.	**2**	3rd Highest construction costs	**0**	Highest construction costs
Operations & Maintenance Costs	Requirement for regular, irregular or no maintenance activities and ensure effectiveness of implemented measures	**0**	Regular monitoring and maintenance to mitigate the deterioration of the channel and tablelands. Emergency repairs on as-needed bases in perpetuity	**2**	Long-term maintenance required to meet lifespan expectations.	**3**	Minimal maintenance required.	**4**	Minimal maintenance required.
Golf Course Revenue / Season	Impact on revenue due to delay of golf course opening season to accommodate construction	**4**	No impact on golf course revenue / season	**3**	Limited impact on golf course revenue / season	**3**	Limited impact on golf course revenue / season	**0**	Potential loss of revenue as a result of extended golf course closure
TOTAL SCORE		**3.2**		**6.0**		**6.2**		**6.6**	

4.6 Public, Stakeholder, and Agency Consultation

Throughout the study process, an extensive consultation program that involved the pubic, stakeholders and representatives of the various agencies was implemented. The process included a Public Information Centre (PIC) and a site walk and meetings with CVC staff.

These points of contact satisfied the general criteria defined within the Municipal Class EA process for Schedule B projects, where a mandatory two (2) points of public contact are required. Moreover, the following public and agency interactions were completed:

- Notice of Study Commencement;
- EA Study Information Slides (presented at the PIC); and
- Notice of Completion.

An overview of the PIC boards and a summary of the consultation program are presented below.

4.7 Notice of Commencement

The Notice of Commencement for the study was published in the Mississauga News on July 4th, 2019 and on the City of Mississauga's website.

Review agencies, First Nations, and key stakeholders were also notified, including Ministry of the Environment, Conservation and Parks (MECP), CVC, MNRF, Region of Peel, Ministry of Tourism, Culture and Sport (MTSC), Fisheries and Oceans Canada (DFO), etc. Copies of the notice are included in Appendix G1 and a list of the stakeholders that participated in the process is included as Appendix G2.

The purpose of the notice was to notify the public that a Class EA study had been initiated, to provide background on the problem definition, and to provide contact information for the representatives of the City and Aquafor who people could engage with throughout the study process.

4.8 Pubic & Stakeholder Consultation

4.8.1 *Public Information Centre*

A PIC was held on November 7th, 2019 in the Heritage Room at the Lakeview Golf and Country Club. Notice regarding this PIC was advertised in the Mississauga News on October 24th, 2019.

The open house consisted of display boards that outlined the purpose of the study and provided background information, as well as a description of the study process. The display boards addressed the following items:

- The objectives of the study and of the public information package;
- The characteristics of the study area;
- The EA process;
- The existing conditions within the Applewood Creek corridor;
- The cultural heritage value of Lakeview Golf Course;
- The problems and opportunities;
- The requirements for necessary permits and approvals to enable the implementation of the works;
- The alternatives for the study areas;
- The evaluation criteria and preliminary scoring; and
- The next steps in the process.

The PIC was attended by approximately 5 people (signed-in & not signed-in), including local residents that live in the vicinity of the study area. A comment sheet was provided to the attendees to solicit input on the project,

and obtain input on the information presented. The comment form included the following questions as a means to gain insights from PIC participants:

- Do you feel anything important has been missed or if you have any questions or concerns with regard to the background studies?
- Do you have any comments related to the evaluation criteria and process used to select the preferred alternative?
- Do you have any feedback on preliminary scoring of the alternatives or commentary provided by the project team?
- Do you have any comments, concerns, questions or suggestions regarding the preferred alternative?
- Do you have any additional questions and comments?
- Is the information provided helpful? Is the information too technical, about right, or not detailed enough?

City staff, as well as staff from Aquafor and Schollen provided clarification related to the technical aspects of the project as well as responses to questions that were raised by the public. No followup comments were received from the public after the PIC. The PIC invitation letter, public information package (display boards), sign in sheet, and blank comment sheet are provided in Appendix G3.

4.8.2 *Region of Peel*

Following issuance of the Notice of Commencement and subsequent to the PIC, a review meeting was held that involved representatives from the City, the Region and Aquafor to review the findings of the EA and to identify potential constraints related to Region's infrastructure. As identified through the site inventory exercise and information that was provided by the Region, a 2.4m diameter concrete sanitary sewer with a 6m wide permanent easement exists within the study area. This sewer also crosses Applewood Creek at ~90m upstream of the inlet at CN railway. It is understood by the City and Aquafor that the identified sewer crossing is critical to Region's collection system, as it serves as the Region's main eastern trunk sanitary sewer and conveys effluent to the G.E. Booth Wastewater Treatment Facility.

In response, it is important to ensure that the proposed design minimizes the potential for disturbance to the sanitary sewer crossing and that a sufficient depth of cover over the sewer is maintained. Although the preferred alternative would involve works over top of the sewer pipe and within the easement of the sewer, no modifications to the infrastructure itself is expected to be required as part of the Applewood Creek restoration project. To confirm the proposed works would not impact the sewer infrastructure, an engineering analysis of loading and crack propagation of the sewer crossing will need to be conducted during detailed design stage. In addition, mitigation measures for construction and access will be investigated and incorporated in the design to avoid excessive point loading over top of the sewer. Mitigation measures may include the use of steel plates or timber mats over top of the existing ground to reinforce the equipment crossing area.

It was confirmed that continued consultation with the Region at multiple points throughout the detailed design process will be carried out, in order to ensure that all necessary mitigation measures are included in the design and that the Region's expectations that the proposed works for this project will not have any impact on the integrity of the sanitary sewer are met. Relevant correspondence and the minutes of meetings related to this subject are included in Appendix G4.

4.8.3 *First Nations*

First Nations, including the Mississaugas of the Credit First Nation, the Haudenosaunee Development Institute. the Six Nations of the Grand River, and the Huron-Wendat Nation were notified about the project at the time of initiation of the study and prior to the date of the PIC. In addition, all four First Nations were invited to participate in the Stage 2 Archaeologic investigation for the project. In response to the invitation, confirmation of a desire to participate was received from three First Nations, with the exception being the Six Nations of the Grand River.

The Stage 2 archaeology investigation is scheduled to be undertaken before the golf course opens in 2020, which typically involves test pit surveys. During the field investigation, monitors from the First Nations will be present and inspect the work. Invitation letters and copies of correspondence related to this aspect of the project are provided in Appendix G5.

4.8.4 *Credit Valley Conservation Authority (CVC)*

Credit Valley Conservation was notified of the project at the time of initiation and since then consulted throughout the EA. A draft Project File report was submitted to CVC prior to filing the EA for their review, upon which the following comments were received and Aquafor's responses were provided:

- **Comment 1**: As specified within the Environmental Assessment (Aquafor Beech, dated April 2020), proposed conditions hydraulic analysis will be completed for the proposed design alternative at detailed design. *Please note that a portion of the study area is located within 2D hydraulic model which will need to be taken into consideration at detailed design. Based on correspondence from Aquafor Beech, it is our understanding that no fill placement within the floodplain will be required as part of preferred natural channel realignment. This will need to be demonstrated during the detailed design process.

  Response: Comprehensive proposed conditions hydraulic analysis will be completed at the detailed design stage limiting the negative impacts on flooding. It is intended that the proposed works will be limited beyond the right of way of CN railway and the 2D hydraulic modelling extent.

- **Comment 2**: Please note that the five (5) new bridge crossings proposed within the preferred design alternative (alternative no. 4) will need to be designed in accordance with CVC Technical Guidelines for Watercourse Crossing (CVC, September 2019). Please refer to the following link for these guidelines: https://cvc.ca/wp-content/uploads/2019/10/CVCCrossingGuidelines_2f_20191025.pdf Please acknowledge this required within the EA document.

  Response: Noted. This requirement is also acknowledged in Section 6 of the Project File.

- **Comment 3**: In the Design Brief submitted at detailed design, please append records of consultation with external agencies (e.g. DFO, MECP) addressing their respective regulatory approvals.

  Response: Noted.

- **Comment 4**: Please refer to CVC's Plant Selection Guideline (https://cvc.ca/wp-content/uploads/2018/04/Plant-Selection-Guideline-FINAL-APRIL-24th-2018.pdf) and Healthy Soils Guideline for the Natural Heritage System (https://cvc.ca/wp-content/uploads/2017/09/CVC-Healthy-Soils-Guidelines-NHS-Web-V5.pdf) when developing the restoration planting plans for the channel restoration design. As this watercourse serves as a linkage between City of Mississauga Significant Natural Areas LV14 and LV1, please ensure that the restoration planting plan is designed with this function kept in mind. Due to the property's proximity to Lake Ontario, CVC recommends designing this linkage with a priority for migratory birds and butterflies.

  Response: Noted. This requirement is also acknowledged in Section 6 of the Project File.

5 SELECTION AND DESCRIPTION OF PREFERRED ALTERNATIVE

5.1 Selection of Preferred Alternative

Based on the evaluation criteria, consultation with the City, stakeholders and the public, the preferred alternative for the restoration of Applewood Creek within the study area is **Alternative No. 4 – Natural Channel Realignment**. The preferred alternative involves the restoration of the entire length Applewood Creek within the golf course to achieve a more sinuous form that will provide long-term erosion control and stability while accommodating the natural dynamic tendencies of the watercourse. Furthermore, the preferred alternative will enhance playability of the golf course, as well as improving aquatic and terrestrial habitat.

This alternative will provide the necessary erosion protection for the creek bed and banks, and will require a minimal amount of hard materials, which is more consistent with natural channel restoration approach. Since an extended construction duration is anticipated to be required to implement this alternative, a phased construction and golf course operation plan will be required. This phased approach will need to be addressed at the design and tendering stages of the project. To enable the construction of works within the Region's easement, approval will need to be obtained from the Region (as noted in Section 3.10).

5.2 Conceptual Design of Preferred Alternative

The conceptual design for the preferred alternative is illustrated in Figure 4-9. The proposed creek alignment, locations of new bridge crossings, and improvements to golf course features are highlighted in the general plan. Technical details will be refined during the detailed design process.

The concept drawings are typically of interest to the CVC, in order to confirm that the preferred alternative will be consistent with permitting requirements.

5.3 Description of Preferred Alternative

To accommodate a natural realignment of Applewood Creek within the study area, the existing gabion banks will be required to be completely removed. The creek will then be restored to a meandering form to minimize the rate of erosion, provide stable slopes, and to encourage proper river function through the introduction of runs/riffles/pools, wetlands and other features that will enhance biodiversity. However, some segments of the creek are expected to be engineered with harder materials where constraints due to golf course features dictate. Moreover, the existing 9 bridge crossings will be removed and replaced with 5 new bridges, each of which will have a larger span than the existing bridges. Existing cart paths will also be retrofitted to serve the modified course features.

As described in Section 4.4, the preferred alternative will also involves the restoration to a number of golf course features, which is intended to contribute positively to the course's cultural heritage value, consistent with the findings of the Heritage Impact Assessment. Detailed description of the proposed alterations to each hole is included in the section below, highlighting the sympathetic restoration approach taken by the design team and the improvement to the golf course as a result of the proposed works.

Following construction, full vegetative restoration will be undertaken, with native grasses/sod, shrubs and trees. The plantings will compensate for loses resulting from construction activities, and will provide additional bank stability and reinforcement. To minimize the potential impacts on SARs, it is recommended that potentially suitable maternity roosting sites are retained on the landscape; construction designs should avoid these trees if possible. In addition, it is recommended that once the detailed design for the proposed erosion control works is completed, an IGF is to be completed so that the MNRF can determine if a permit is required under the ESA (2007).

5.4 Enhancement to Golf Course Features

Given the architectural pedigree and cultural heritage value of Lakeview Golf Course, it is critical that any alterations to the golf features are designed in a restorative fashion, so that the restoration does not undermine the principles and style of the original design while accommodating the erosion protection objectives.

To accommodate the proposed natural realignment as per the preferred alternative, some changes to the golf course features are required, including some tees, fairways, greens, trees, and cart path. Therefore, Aquafor has worked collaboratively with Schollen's golf course architect throughout the EA, with the intention to bring back the original layout (~1920s by Mr. Strong) where possible and to allow the proposed Applewood Creek corridor to become a more aesthetically and strategically prominent part of the golf course. The proposed restorative changes to each hole are summarized below.

Hole 1:
The 1st tee is proposed to be relocated and restored as an elevated tee shot as the proposed creek alignment traverse through the existing tees. Research suggested that the hole played at 350-yards during the 1923 Canadian Open, which is approximately 15-yards longer than its current length (Toronto Star 1923). As such, elevating the tee and lengthening the hole will be consistent with its original design.

Hole 5:
The restoration of Hole 5, a par 5, will be focused on enhancing the prominence of Applewood Creek and strengthening sightlines to the north side of the second landing area. This will require the removal of two spruce trees that are located to the left (northwest) of the green and the reconstruction of the cart path along the right (south) side of the hole.

Hole 8:
The alterations to Hole 8 will include the provision of connection from the forward tee-off to the fairway area by constructing a bridge over the watercourse. A new forward tee will also be re-constructed. The fairway is proposed to be re-contoured with additional landing width to improve playability of this hole, which can be achieved by changing the grass-cutting strategies.

Hole 16:
The restoration of Hole 16 will recapture the opportunity to use the natural topography on the left (north) side to direct the ball into the ideal landing area with a clearer sightline. This will require the removal of one spruce tree in the left rough, expansion of the fairway, realignment of the back tee, and relocation of the front tee. A review of historical aerial photographs suggests that there was no tree historically located on the left-hand side of the fairway prior to the 1980's, therefore, removal of the spruce tree will assist in restoring this hole to its pre-1980s state.

Moreover, the green is proposed to be enlarged to its anticipated original size, which is considered important in maintaining adequate turf health to the course (which hosts over 32,000 rounds of play each season). The green expansion will involve probing beyond the existing perimeter of the green and searching for remnants of the original green profile. If the green can be restored to its original size via this approach, it would be seen as a positive impact on the cultural heritage value of the course. Otherwise, if no remnants of the former green can be found, the expansion will be achieved by carefully matching surface grades and strategic grass-cutting to achieve a seamless transition. It is also important to note that the internal slope percentages within the green shall be maintained.

Hole 17:
The novelty of Hole 17 is its two sets of tees and greens (upper and lower). Based upon research of historical photographs and literature, the upper set appears to be original as designed by Mr. Strong in 1921, whereas the lower set was created in 1950-1960s and has since been altered several times, with the pond being constructed in 1977. The proposed alterations to Hole 17 include the restoration of the upper green size, to achieve the character and bunker configuration to that of 1921 green, as well as the removal of the lower green. A historic

photo of the original 17th green is included in the Figure below, which is a strong example of the artistry and character of Mr. Strong who boldly located greens near ridgelines.

Figure 5-1. Lakeview Golf Course 17th Hole – 1921, Exiting & Proposed Conditions.

5.5 Construction Timing

The City plans to proceed with the construction of the preferred alternative following the completion of the detailed design.

Due to the steepness of bank slopes and the existing erosion, it is recommended that these works be undertaken in the winter months, when the ground is frozen and more solid. This will generally provide more stable conditions for the heavy machinery. Moreover, it's anticipated that the proposed creek and golf course restoration works will require an extended construction period. Therefore, in order to avoid significant disturbance and revenue loss to the golf course, construction is anticipated to be carried out in two phases during golf course closure periods. Closure of some holes is also anticipated during the open seasons. The Clubhouse will remain open during construction; however, parking restrictions may apply. The construction is preliminarily scheduled for the first phase in October, 2021.

Should any construction works be undertaken during the summer season, it is recommended that vegetation removal occur prior to the generalized nesting period (i.e. between April 1st and August 31st), to ensure that the proposed works do not contravene the federal Migratory Birds Convention Act (1994), which protects the nests of most breeding bird species in Ontario. Should work occur within the generalized nesting period, it is recommended that a Qualified Avian Ecologist conduct a nest search prior to construction and, if applicable, establish temporary Nest Protection Zones for any found nests which will remain in place until all fledged birds have left the vicinity or as advised by a qualified wildlife biologist.

5.6 Preliminary Cost Estimate

A preliminary cost estimate for the preferred alternative has been summarized in Table 4-4 in Section 4.4 of this report. Cost estimates are based on unit prices of similar projects that have been recently completed. These costs do not include additional fees such as engineering services, contractor mobilization or traffic control (if necessary). The total approximate cost to implement the preferred solution is approximately $8.2M (excluding HST). As indicated, this is an approximate, preliminary cost estimate, and will be refined as part of the detailed design.

6 IMPLEMENTATION PLAN

This chapter summarizes the implementation considerations associated with the various elements of the Preferred Alternative as described in Chapter 5.

The next steps for implementation of the preferred alternative include:

- Issuance of the Notice of Completion;
- Detailed design and associated investigations;
- Easement negotiations;
- Permits and Approvals;
- Contract document preparation and tender;
- Construction; and,
- Post Construction Monitoring.

The steps required to address the above tasks have been outlined below.

6.1 Notice of Completion

The Notice of Completion will be published in the Mississauga News and copies of the Project File report will be available for review by the public. The notice will be also distributed to all stakeholders and agencies as noted on the distribution list.

6.2 Detailed Design and Investigations

The detail design package should include the preparation of 60%, 90% and final design drawings for review by the City, CVC 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 existing utilities and existing bridge);
- Erosion and sediment control plan (as per the Erosion and Sediment Guidelines for Urban Construction, GGHACA);
- Landscape restoration plan (including tree removal, preservation and planting plan);
- Golf Course restoration plan and details,
- Storm outfall restoration plan;
- Sanitary sewer protection plan; and
- Associated design brief

The following implementation measures must be considered at the detailed design and implementation stages:

Construction Staging, Erosion and Sediment Control Measures

Appropriate plans are to be included within the detailed design package, based on consultations with the City, the Region of Peel and CVC. 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 both flow management plans to enable working in dry conditions, as well as detailed fencing and delineation of the extents of disturbance. In this regard, all areas of disturbance will be fully restored and stabilized to prevent loss and contribution of sediments downstream.

Tree Protection and Restoration Plan

Tree protection fences following the specifications in CVC's Landscaping and Tree Protection Guidelines should be erected along all construction access routes and work areas. If possible, it is also recommended that

planting areas be fenced off for two years to protect newly planted vegetation and to allow time for growth and to anchor soils. Some mature trees will need to be removed to accommodate construction. To compensate, native trees and shrubs that fit the golf course setting will be included within the restoration plan of the detailed design drawings. CVC's Plant Selection Guideline and Healthy Soils Guideline for the Natural Heritage System will be reviewed when developing the plan.

Utility Locations

All utility organizations should be contacted for as-constructed drawings and to complete field-marking of all underground services within the proposed restoration area. The utilities may include, but are not limited to, electricity, natural gas, cable television, telephone, water, sanitary sewer and storm sewer. All utility relocation is to be completed prior to the tender of the Erosion Control Works. At storm outfalls, the structure stability and flow hydraulics of the outfall channel must be considered in the detailed design.

Hydraulic Assessment

A hydraulic assessment of the proposed conditions will be conducted and the results will be included in the detailed design brief. Computation of peak velocities for bank full and peak floods will be included and incorporated into evaluation of the proposed remedial measures. All proposed new bridge crossings will be included in the proposed condition model and designed in accordance with CVC Technical Guidelines for Watercourse Crossing (CVC, September 2019). The assessment will be used to confirm that no negative flooding impacts will result from the proposed works, a condition of the CVC permit, and to size the granular material for the channel bed and banks. It is also noted that a portion of the study area is located within 2D hydraulic model which will be taken into consideration at detailed design stage.

Tendering Support for Construction

All tender documentation will be completed applicable to the City of Mississauga standards, with Special Provisions and Schedule of Quantities with refined engineering cost estimates provided. The package will include Project Descriptions, Special Provisions, Specifications, Form of Tender and a Schedule of Prices. The final detailed design drawings will be issued as a set of contract drawings with the completed tender package. The contract drawings will be stamped by a professional engineer, signed, and labeled "Issued for Tender" complete with all necessary material and performance specifications. Aquafor will typically assist the City during the tendering and procurement period as required, providing responses and clarification to bidders during the procurement process.

6.3 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 approvals from City's Heritage Advisory Committee, Region of Peel, CVC, MNRF, and DFO may be required. A brief summary of permits and approvals is included below:

City of Mississauga – Heritage By-Law
A heritage permit application will be submitted to the City's Heritage Advisory Committee, including the detailed design and Heritage Impact Assessment report.

CVC – O. Reg. 166/06 Permit
This typically involves two submissions (70% & 95% design), and will include supporting design brief information.

DFO – Assessment under the Federal Fisheries Act
Aquafor's certified fisheries biologist will complete a Self-Assessment based on the detailed design for the proposed works. Based on similar experiences, at minimum a Letter of Advice will be required from DFO.

MECP 17(2) (b/ c) Species at Risk Permit

Depending on the results of the IGF and further field investigations, MECP will confirm whether a SAR permit will be required.

Approvals may be also required from the Region of Peel and other utilities for working adjacent to their infrastructure.

6.4 Construction Services

Aquafor will provide inspection and resident 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. E&SC 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.

6.5 Monitoring Program

A 3-year annual monitoring plan is recommended following completion of construction, 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 channel works and vegetation plantings by the project geomorphologist/engineer, as well as the Landscape Architect and Golf Course Architect. Both the monitoring and warranty will be defined to suit the detailed design, and satisfy City, CVC and other agency requirements.

6.6 As-Constructed Drawings and Analysis

This task will set baseline conditions following construction, which will enable future monitoring and comparative analysis. Specifically, Aquafor will undertake an as-built survey of completed channel 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.

Should CVC or the City wish the HEC model be updated to match as-built conditions (should the comparative analysis to the design highlight differential condition), Aquafor will update the HEC model accordingly to confirm no negative impacts to flooding.

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Appendix A – Detailed HECRAS Results

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	12843	2yr	12.7	2.23	100.36	223.31	97.92	5.71	7.98	0.72	97.83	0.015148	0.84
2241	12843	5yr	19.7	2.47	117.35	290.16	98.19	7.97	8.98	0.89	98.08	0.014425	0.84
2241	12843	10yr	27.5	2.47	111.47	275.04	98.52	11.15	10.4	1.07	98.3	0.011405	0.76
2241	12843	25yr	34.7	2.72	132.66	360.36	98.67	12.77	11.1	1.15	98.49	0.012648	0.81
2241	12843	50yr	41.8	2.91	148.49	432.21	98.81	14.38	11.79	1.22	98.65	0.013013	0.83
2241	12843	100yr	49.7	3.1	164.57	510.97	98.95	16.09	12.67	1.27	98.8	0.013261	0.85
2241	12843	Regional	42.3	2.92	149.5	437.04	98.82	14.49	11.83	1.22	98.66	0.013023	0.83
2241	12839	2yr	12.7	2.56	127.44	325.69	97.77	4.97	7.46	0.67	97.77	0.020608	1
2241	12839	5yr	19.7	2.84	150.87	428.95	98.02	6.93	8.43	0.82	98.02	0.01996	1
2241	12839	10yr	27.5	2.43	104.01	252.27	98.49	11.34	10.56	1.07		0.010614	0.75
2241	12839	25yr	34.7	2.68	124.93	335.31	98.63	12.93	11.31	1.14		0.011806	0.8
2241	12839	50yr	41.8	2.88	140.6	405.41	98.77	14.55	12.08	1.2		0.012201	0.82
2241	12839	100yr	49.7	3.07	157.47	483.67	98.91	16.33	14.01	1.17	98.75	0.01292	0.85
2241	12839	Regional	42.3	2.9	141.6	410.08	98.78	14.66	12.14	1.21		0.012222	0.82
2241	12831	2yr	12.7	1.57	43.62	68.29	97.73	8.11	8.57	0.95	97.34	0.005064	0.51
2241	12831	5yr	19.7	1.68	47.56	79.69	98.12	11.76	9.89	1.19	97.58	0.004448	0.49
2241	12831	10yr	27.5	1.69	46.63	78.65	98.55	16.3	11.62	1.4		0.00371	0.45
2241	12831	25yr	34.7	1.91	58.27	111.26	98.7	18.2	12.6	1.44		0.004262	0.49
2241	12831	50yr	41.8	2.09	67.78	141.76	98.85	20.21	14.58	1.39		0.004517	0.52
2241	12831	100yr	49.7	2.27	77.73	176.6	99	22.49	15.74	1.43		0.004757	0.54
2241	12831	Regional	42.3	2.1	68.4	143.88	98.86	20.36	14.68	1.39		0.004532	0.52
2241	12816	2yr	12.7	1.74	59.91	104.04	97.6	7.31	9.28	0.79	97.32	0.008192	0.62
2241	12816	5yr	19.7	1.59	62.29	98.98	98.05	12.59	15.35	0.82	97.58	0.006545	0.5
2241	12816	10yr	27.5	1.38	41.55	57.29	98.53	22.22	23.92	1.01	97.81	0.003156	0.37
2241	12816	25yr	34.7	1.5	47.07	70.39	98.71	26.04	25.86	1.17	97.97	0.003204	0.38
2241	12816	50yr	41.8	1.58	50.89	80.44	98.87	29.77	27.24	1.32	98.14	0.003136	0.38
2241	12816	100yr	49.7	1.67	55.04	91.84	99.04	33.56	28.63	1.47	98.33	0.003098	0.38
2241	12816	Regional	42.3	1.59	51.13	81.1	98.88	30.03	27.33	1.33	98.16	0.003131	0.38
2241	12800	2yr	12.7	1.57	46.29	72.78	97.52	8.08	7.8	1.04	97.03	0.005047	0.49
2241	12800	5yr	19.7	1.64	46.96	76.9	97.96	12.4	11.98	1.04	97.31	0.004039	0.46
2241	12800	10yr	27.5	1.54	38.53	59.21	98.46	19.7	18.27	1.26	97.58	0.002627	0.38
2241	12800	25yr	34.7	1.74	48.13	83.8	98.61	22.08	19.36	1.39	97.79	0.003019	0.41
2241	12800	50yr	41.8	1.9	55.97	106.5	98.76	24.46	20.48	1.51	97.97	0.003245	0.43
2241	12800	100yr	49.7	2.07	64.56	133.53	98.91	26.85	21.48	1.63	98.21	0.003481	0.46
2241	12800	Regional	42.3	1.91	56.5	108.09	98.77	24.62	20.55	1.52	97.99	0.003259	0.44
2241	12785	2yr	12.7	2.39	89.83	214.31	97.2	5.44	5.58	0.97	96.94	0.010326	0.7
2241	12785	5yr	19.7	2.68	103.24	276.83	97.6	8	7.96	1	97.32	0.008937	0.68
2241	12785	10yr	27.5	2.04	52.46	106.94	98.35	18.52	19.71	0.94	97.71	0.003088	0.43
2241	12785	25yr	34.7	2.26	62.96	142.02	98.49	21.59	21.65	1	98.02	0.003487	0.46
2241	12785	50yr	41.8	2.36	67.43	159.14	98.66	25.37	23.75	1.07	98.23	0.003497	0.46
2241	12785	100yr	49.7	2.44	70.57	172.25	98.84	29.93	26.56	1.13	98.42	0.00343	0.46
2241	12785	Regional	42.3	2.37	67.64	160.01	98.67	25.65	24.05	1.07	98.25	0.003492	0.46
2241	12779	14-Pedestrian Br	Bridge										
2241	12774	2yr	12.7	4.36	366.46	1597.37	96.17	2.91	5.08	0.57	96.47	0.075972	1.84
2241	12774	5yr	19.7	2.75	119.4	327.9	96.95	7.3	6.46	1.13	96.77	0.011973	0.78
2241	12774	10yr	27.5	3.37	172.66	581.92	97.12	8.4	6.94	1.21	97.05	0.01532	0.9
2241	12774	25yr	34.7	3.75	205.9	772.59	97.29	9.67	7.47	1.29	97.29	0.016274	0.94
2241	12774	50yr	41.8	3.99	224.3	895.06	97.48	11.17	8.32	1.34	97.48	0.015845	0.95
2241	12774	100yr	49.7	3.88	200.98	780.55	97.81	14.41	12.14	1.19	97.81	0.012018	0.85
2241	12774	Regional	42.3	3.98	222.66	887.05	97.51	11.35	8.49	1.34	97.51	0.015537	0.94
2241	12753	2yr	12.7	1.67	48.06	80.1	96.65	7.72	10.07	0.77	96.33	0.005745	0.56
2241	12753	5yr	19.7	2.09	72.39	151.35	96.84	10.43	24.66	0.42	96.57	0.007404	0.65
2241	12753	10yr	27.5	1.87	55.29	103.62	97.16	20.85	34.3	0.61	96.94	0.004644	0.53
2241	12753	25yr	34.7	1.77	48.1	85.29	97.39	28.66	35.41	0.81	97.1	0.003613	0.47
2241	12753	50yr	41.8	1.72	44.54	76.57	97.58	35.47	36.49	0.97	97.19	0.003112	0.44
2241	12753	100yr	49.7	1.89	53.27	100.41	97.65	38.27	36.95	1.04	97.29	0.003626	0.48
2241	12753	Regional	42.3	1.72	44.28	75.95	97.59	35.95	36.57	0.98	97.2	0.00308	0.44
2241	12737	2yr	12.7	1.62	49.21	79.7	96.55	7.84	9.51	0.82		0.006368	0.57
2241	12737	5yr	19.7	2.34	101.72	237.78	96.61	8.43	9.83	0.86		0.012671	0.81
2241	12737	10yr	27.5	2.97	162.89	484.36	96.69	9.25	10.26	0.9	96.69	0.019323	1
2241	12737	25yr	34.7	3.06	169.94	519.88	96.88	11.45	13.23	0.87	96.88	0.018488	0.99

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	12737	50yr	41.8	3.17	176.69	560.46	97.03	13.63	15.88	0.86	97.03	0.017184	0.97
2241	12737	100yr	49.7	2.59	111.06	287.83	97.37	26.26	52.46	0.5	97.37	0.008822	0.71
2241	12737	Regional	42.3	3.19	178.56	569.74	97.04	13.73	16.02	0.86	97.04	0.017291	0.97
2241	12691	2yr	12.7	2.09	82.67	173.09	96.06	6.07	25.05	0.69	95.95	0.012747	0.81
2241	12691	5yr	19.7	1.6	48.08	77.02	96.34	17.82	52.05	0.39	96.19	0.006401	0.57
2241	12691	10yr	27.5	1.49	39.33	58.51	96.53	28.83	57.34	0.5	96.35	0.004397	0.49
2241	12691	25yr	34.7	1.44	35.76	51.56	96.67	37.03	58.99	0.63	96.41	0.003573	0.45
2241	12691	50yr	41.8	1.43	34.44	49.32	96.79	44.1	60.03	0.73	96.49	0.003172	0.43
2241	12691	100yr	49.7	1.43	33.74	48.24	96.91	51.33	61.04	0.84	96.55	0.002906	0.41
2241	12691	Regional	42.3	1.43	34.37	49.2	96.8	44.58	60.09	0.74	96.5	0.00315	0.42
2241	12654	2yr	12.7	1.43	38.02	54.22	95.88	9.14	15.21	0.72	95.45	0.004335	0.47
2241	12654	5yr	19.7	1.62	46.76	75.92	96.12	15.22	30.93	0.49	95.7	0.004482	0.49
2241	12654	10yr	27.5	1.77	54.19	96.01	96.29	20.91	34.05	0.61	95.93	0.004724	0.51
2241	12654	25yr	34.7	1.81	55.5	100.22	96.45	26.32	36.28	0.73	96.19	0.00456	0.5
2241	12654	50yr	41.8	1.86	57.52	107.16	96.57	31.19	40.67	0.77	96.3	0.00435	0.5
2241	12654	100yr	49.7	1.92	59.43	114.12	96.7	36.46	43.76	0.83	96.39	0.004132	0.49
2241	12654	Regional	42.3	1.87	57.7	107.76	96.58	31.52	40.92	0.77	96.31	0.004339	0.5
2241	12627	2yr	12.7	1.2	26.04	31.14	95.81	10.62	13.92	0.95	95.23	0.002926	0.39
2241	12627	5yr	19.7	1.46	39.04	57.16	96.01	14.87	22.94	0.65	95.46	0.004151	0.47
2241	12627	10yr	27.5	1.8	57.39	103.02	96.13	17.54	23.85	0.74	95.68	0.005644	0.55
2241	12627	25yr	34.7	2.06	74.57	153.38	96.22	19.69	26.06	0.76	95.94	0.007033	0.62
2241	12627	50yr	41.8	2.29	90.28	206.47	96.29	21.8	29.01	0.75	96.08	0.007995	0.67
2241	12627	100yr	49.7	2.51	106.79	268.31	96.37	24	30.12	0.8	96.21	0.008907	0.71
2241	12627	Regional	42.3	2.3	91.35	210.3	96.3	21.94	29.11	0.75	96.08	0.008057	0.67
2241	12605	2yr	12.7	1.71	49.73	85.06	95.66	9.74	25.85	0.38		0.005459	0.53
2241	12605	5yr	19.7	1.69	45.12	76.34	95.92	17.47	32.95	0.53		0.003946	0.47
2241	12605	10yr	27.5	2.04	64.29	131.36	96.02	20.62	34.64	0.6		0.005252	0.55
2241	12605	25yr	34.7	2.34	83.31	195.21	96.08	22.87	35.68	0.64		0.00651	0.62
2241	12605	50yr	41.8	2.57	99.09	254.98	96.14	25.17	36.66	0.69		0.007422	0.66
2241	12605	100yr	49.7	2.81	116.54	327.39	96.21	27.47	37.62	0.73	96.16	0.008391	0.71
2241	12605	Regional	42.3	2.59	100.17	259.29	96.15	25.32	36.73	0.69		0.007482	0.67
2241	12591	2yr	12.7	1.75	87.36	153.17	95.52	7.24	10.41	0.7	95.29	0.013067	0.66
2241	12591	5yr	19.7	2.16	133.27	287.82	95.68	9.9	32.03	0.38	95.53	0.016897	0.75
2241	12591	10yr	27.5	2.04	116.84	238.06	95.87	18.11	49.95	0.36	95.87	0.012484	0.65
2241	12591	25yr	34.7	2.19	131.83	288.59	95.94	21.71	50.98	0.43	95.94	0.013144	0.68
2241	12591	50yr	41.8	2.34	147.57	344.77	96	24.66	52.2	0.47	96	0.013965	0.7
2241	12591	100yr	49.7	2.49	164.4	408.71	96.05	27.61	53.55	0.52	96.05	0.014825	0.73
2241	12591	Regional	42.3	2.35	149.73	352.48	96	24.77	52.25	0.47	96	0.014143	0.71
2241	12555	2yr	12.7	1.67	49.33	82.21	95.24	9.27	30.22	0.31	94.94	0.00561	0.54
2241	12555	5yr	19.7	1.94	64.04	124.51	95.39	16.04	52.62	0.3	95.36	0.006313	0.59
2241	12555	10yr	27.5	2.06	69.44	143.17	95.51	22.96	56.7	0.41	95.48	0.006139	0.59
2241	12555	25yr	34.7	2.13	72.46	154.62	95.61	28.8	60.05	0.48	95.55	0.005922	0.59
2241	12555	50yr	41.8	2.16	72.37	156.11	95.71	34.6	62.12	0.56	95.62	0.005519	0.58
2241	12555	100yr	49.7	2.19	73.31	160.87	95.8	40.52	64.29	0.63	95.68	0.005245	0.57
2241	12555	Regional	42.3	2.16	72.43	156.42	95.72	34.98	62.25	0.56	95.62	0.0055	0.58
2241	12504	2yr	12.7	1.53	36.95	56.53	95.01	13.02	44.43	0.29		0.004462	0.51
2241	12504	5yr	19.7	1.72	44.76	77.19	95.15	19.65	49.24	0.4		0.004677	0.54
2241	12504	10yr	27.5	1.84	49.06	90.39	95.29	26.48	52.6	0.5		0.004546	0.54
2241	12504	25yr	34.7	1.92	51.52	98.7	95.39	32.32	54.32	0.59		0.004369	0.54
2241	12504	50yr	41.8	2	54.9	109.91	95.49	37.73	57.59	0.66		0.00433	0.54
2241	12504	100yr	49.7	2.07	57.37	118.78	95.59	43.59	60.77	0.72		0.004222	0.54
2241	12504	Regional	42.3	2.01	55.1	110.58	95.5	38.09	57.76	0.66		0.004325	0.54
2241	12461	2yr	12.7	1.16	30.41	35.3	94.87	16.88	49.24	0.34		0.003922	0.41
2241	12461	5yr	19.7	1.26	34.02	42.93	95.02	24.31	52.25	0.47		0.003726	0.41
2241	12461	10yr	27.5	1.35	37.11	50.02	95.15	31.88	56.5	0.56		0.003553	0.41
2241	12461	25yr	34.7	1.42	39.77	56.38	95.27	38.48	60.7	0.63		0.003456	0.41
2241	12461	50yr	41.8	1.47	41.55	61.03	95.37	44.91	64.69	0.69		0.003332	0.41
2241	12461	100yr	49.7	1.52	43.6	66.42	95.47	51.92	69.77	0.74		0.003243	0.41
2241	12461	Regional	42.3	1.47	41.66	61.32	95.38	45.34	64.95	0.7		0.003324	0.41
2241	12396	2yr	12.7	1.42	37.44	53.04	94.57	14.02	42.27	0.33		0.004379	0.47
2241	12396	5yr	19.7	1.46	37.2	54.2	94.77	22.71	46.72	0.49		0.003599	0.44

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	12396	10yr	27.5	1.53	39.35	60.28	94.93	30.36	49.18	0.62		0.003333	0.43
2241	12396	25yr	34.7	1.61	42.3	68.19	95.05	36.31	50.79	0.71		0.003281	0.43
2241	12396	50yr	41.8	1.69	45.5	76.98	95.15	41.72	52.94	0.79		0.003286	0.44
2241	12396	100yr	49.7	1.77	48.67	86.14	95.26	47.34	54.65	0.87		0.003288	0.44
2241	12396	Regional	42.3	1.7	45.71	77.58	95.16	42.08	53.05	0.79		0.003286	0.44
2241	12345	2yr	12.7	1.9	49.4	93.82	94.24	9.85	28.34	0.35	93.96	0.005189	0.56
2241	12345	5yr	19.7	2.28	68.75	157.02	94.38	14.02	31.28	0.45	94.36	0.006445	0.64
2241	12345	10yr	27.5	2.57	84.52	217.37	94.51	18.14	33.73	0.54	94.49	0.007216	0.69
2241	12345	25yr	34.7	2.76	94.87	261.51	94.61	21.65	34.99	0.62	94.6	0.007554	0.71
2241	12345	50yr	41.8	2.91	103.82	302.24	94.7	24.85	36.09	0.69	94.68	0.007806	0.73
2241	12345	100yr	49.7	3.06	112.45	343.86	94.79	28.19	37.16	0.76	94.76	0.008002	0.75
2241	12345	Regional	42.3	2.92	104.37	304.87	94.71	25.07	36.15	0.69	94.68	0.007818	0.73
2241	12301	2yr	12.7	1.55	41.6	64.66	94.05	12.66	38.62	0.33		0.005717	0.55
2241	12301	5yr	19.7	1.68	46.02	77.11	94.2	18.6	40.36	0.46		0.005401	0.55
2241	12301	10yr	27.5	1.79	50.25	90	94.34	24.26	42.29	0.57		0.005149	0.55
2241	12301	25yr	34.7	1.9	54.93	104.43	94.45	28.72	44.24	0.65		0.005137	0.56
2241	12301	50yr	41.8	2	59.09	117.95	94.54	32.85	46.09	0.71		0.00513	0.56
2241	12301	100yr	49.7	2.09	63.04	131.52	94.63	37.34	48.61	0.77		0.005096	0.57
2241	12301	Regional	42.3	2	59.33	118.76	94.54	33.15	46.2	0.72		0.005125	0.56
2241	12271	2yr	12.7	1.9	50.32	95.7	93.83	11.3	32.18	0.35	93.78	0.005373	0.5
2241	12271	5yr	19.7	1.91	48.35	92.18	94.04	18.87	38.12	0.5	93.95	0.004517	0.47
2241	12271	10yr	27.5	1.98	50.51	99.93	94.2	25.29	43.29	0.58	94.05	0.004307	0.47
2241	12271	25yr	34.7	2.1	55.79	117.07	94.3	29.94	45.92	0.65	94.13	0.004502	0.48
2241	12271	50yr	41.8	2.19	59.79	130.91	94.39	34.27	47.68	0.72	94.17	0.004603	0.49
2241	12271	100yr	49.7	2.27	63.42	144.1	94.49	38.91	49.5	0.79	94.17	0.004662	0.5
2241	12271	Regional	42.3	2.19	60.03	131.75	94.4	34.58	47.87	0.72	94.17	0.004606	0.49
2241	12268 13-Access Way	Bridge											
2241	12266	2yr	12.7	1.53	31.36	47.98	93.88	14.38	36.15	0.4	93.34	0.003052	0.39
2241	12266	5yr	19.7	1.72	38.49	66.32	94.04	20.74	39.54	0.52	93.88	0.003387	0.42
2241	12266	10yr	27.5	1.88	44.49	83.49	94.18	26.65	48.05	0.55	94.02	0.003623	0.44
2241	12266	25yr	34.7	2	49.52	98.94	94.28	31.64	48.99	0.65	94.1	0.003823	0.45
2241	12266	50yr	41.8	2.09	53.33	111.42	94.38	36.26	50.47	0.72	94.17	0.003931	0.46
2241	12266	100yr	49.7	2.17	56.92	123.77	94.47	41.11	52.04	0.79	94.24	0.004011	0.47
2241	12266	Regional	42.3	2.1	53.58	112.27	94.38	36.57	50.58	0.72	94.18	0.003937	0.47
2241	12229	2yr	12.7	1.87	58.42	109.54	93.64	10.19	37.86	0.27	93.37	0.006125	0.56
2241	12229	5yr	19.7	2.17	75.44	163.51	93.76	15.09	39.76	0.38	93.76	0.007133	0.61
2241	12229	10yr	27.5	2.43	92.39	224.43	93.86	19.17	40.87	0.47	93.86	0.008098	0.66
2241	12229	25yr	34.7	2.59	102.9	266.43	93.95	22.7	41.66	0.54	93.94	0.008494	0.68
2241	12229	50yr	41.8	2.75	114.11	313.55	94.02	25.64	42.31	0.61	94.01	0.00899	0.71
2241	12229	100yr	49.7	2.91	126.2	367.36	94.09	28.58	42.95	0.67	94.07	0.009517	0.73
2241	12229	Regional	42.3	2.76	114.87	316.86	94.03	25.84	42.35	0.61	94.01	0.009023	0.71
2241	12204	2yr	12.7	1.23	25.56	31.54	93.6	17.69	41.77	0.42	93.39	0.002757	0.33
2241	12204	5yr	19.7	1.71	48.59	82.94	93.65	19.87	46.95	0.45	93.52	0.005108	0.45
2241	12204	10yr	27.5	1.87	57.3	107.35	93.76	25.55	56.73	0.45	93.64	0.005635	0.47
2241	12204	25yr	34.7	2.02	65.56	132.41	93.83	29.92	58.91	0.51	93.71	0.006155	0.5
2241	12204	50yr	41.8	2.16	74.39	160.97	93.89	33.47	60.1	0.56	93.78	0.006742	0.53
2241	12204	100yr	49.7	2.3	83.32	191.9	93.95	37.1	61.23	0.61	93.84	0.007299	0.55
2241	12204	Regional	42.3	2.17	74.96	162.9	93.9	33.72	60.17	0.56	93.79	0.006779	0.53
2241	12199 12-Access Way	Bridge											
2241	12195	2yr	12.7	1.9	57.86	109.78	93.27	10.31	41.77	0.25	92.84	0.006773	0.54
2241	12195	5yr	19.7	1.96	59.61	117.12	93.43	17.19	44.46	0.39	93.4	0.006185	0.53
2241	12195	10yr	27.5	2.02	61.28	123.97	93.57	23.47	47.55	0.49	93.5	0.005795	0.52
2241	12195	25yr	34.7	2.08	63.4	131.9	93.67	28.78	53.48	0.54	93.56	0.005617	0.52
2241	12195	50yr	41.8	2.13	65.05	138.26	93.76	33.6	55.68	0.6	93.63	0.005469	0.52
2241	12195	100yr	49.7	2.16	65.83	141.97	93.85	38.78	57.59	0.67	93.69	0.005258	0.51
2241	12195	Regional	42.3	2.13	65.13	138.6	93.77	33.94	55.82	0.61	93.63	0.005457	0.52
2241	12155	2yr	12.7	1.64	42.76	70.29	93.09	11.91	36.03	0.33	93.02	0.004397	0.5
2241	12155	5yr	19.7	1.81	49.71	90.1	93.25	17.98	45.17	0.45	93.15	0.004466	0.52
2241	12155	10yr	27.5	1.95	55.32	107.63	93.39	23.67	49.03	0.56	93.26	0.004479	0.53
2241	12155	25yr	34.7	1.98	55.71	110.24	93.51	31.03	52.47	0.59	93.34	0.004158	0.51

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	12155	50yr	41.8	2.04	58.27	119.1	93.6	35.89	53.32	0.67	93.41	0.004101	0.51
2241	12155	100yr	49.7	2.1	60.53	127.29	93.69	41.01	54.15	0.76	93.49	0.004021	0.51
2241	12155	Regional	42.3	2.05	58.43	119.68	93.6	36.22	53.37	0.68	93.42	0.004097	0.51
2241	12140	2yr	12.7	1.67	51.23	85.68	93	10.41	34.05	0.31	92.89	0.006063	0.55
2241	12140	5yr	19.7	1.85	59.66	110.4	93.15	16	38.85	0.41		0.00607	0.56
2241	12140	10yr	27.5	1.97	65.14	128.53	93.29	21.8	44.15	0.49		0.005876	0.57
2241	12140	25yr	34.7	2.06	69.16	142.6	93.4	26.94	49.19	0.55		0.00573	0.57
2241	12140	50yr	41.8	2.1	70.14	147.39	93.5	31.88	50.73	0.63		0.005414	0.56
2241	12140	100yr	49.7	2.14	71.02	151.86	93.6	37.06	51.8	0.72		0.005124	0.55
2241	12140	Regional	42.3	2.1	70.2	147.69	93.51	32.22	50.8	0.63		0.005394	0.56
2241	12109	2yr	12.7	1.74	50.14	87.47	92.81	10.79	35.55	0.3	92.75	0.005738	0.57
2241	12109	5yr	19.7	1.79	50.02	89.75	93	17.62	38.74	0.45		0.004804	0.54
2241	12109	10yr	27.5	1.91	54.22	103.33	93.14	23.39	40.73	0.57		0.004619	0.54
2241	12109	25yr	34.7	2.01	58.83	118.36	93.25	27.87	41.76	0.67		0.004622	0.54
2241	12109	50yr	41.8	2.1	62.62	131.45	93.35	31.96	42.42	0.75		0.0046	0.55
2241	12109	100yr	49.7	2.19	66.73	146.16	93.44	36.16	43.18	0.84		0.004599	0.55
2241	12109	Regional	42.3	2.11	62.89	132.38	93.35	32.23	42.47	0.76		0.0046	0.55
2241	12076	2yr	12.7	1.54	41.57	63.94	92.65	11.41	31.21	0.37		0.004588	0.49
2241	12076	5yr	19.7	1.81	55.16	100.03	92.81	16.7	39.18	0.43		0.005293	0.54
2241	12076	10yr	27.5	1.96	62.13	121.95	92.95	22.69	43.4	0.52		0.005304	0.55
2241	12076	25yr	34.7	2.05	65.85	134.96	93.07	27.83	45.05	0.62		0.005164	0.55
2241	12076	50yr	41.8	2.14	70.27	150.44	93.17	32.41	47.2	0.69		0.005152	0.55
2241	12076	100yr	49.7	2.23	74.83	167.08	93.27	37.25	49.66	0.75		0.005147	0.56
2241	12076	Regional	42.3	2.15	70.56	151.48	93.17	32.72	47.34	0.69		0.00515	0.55
2241	12054	2yr	12.7	1.49	38.95	58.05	92.56	11.7	32.24	0.36	92.19	0.004089	0.46
2241	12054	5yr	19.7	1.82	56.29	102.63	92.68	15.7	34.08	0.46	92.59	0.005322	0.53
2241	12054	10yr	27.5	2.11	73.05	153.82	92.79	19.35	35.39	0.55	92.71	0.006355	0.59
2241	12054	25yr	34.7	2.3	84.98	195.11	92.88	22.55	36.48	0.62	92.8	0.006924	0.62
2241	12054	50yr	41.8	2.44	94.19	229.87	92.96	25.62	37.52	0.68	92.88	0.007247	0.64
2241	12054	100yr	49.7	2.57	102.61	263.86	93.05	28.93	38.66	0.75	92.95	0.007459	0.65
2241	12054	Regional	42.3	2.45	94.79	232.2	92.97	25.83	37.6	0.69	92.88	0.007265	0.64
2241	12027	2yr	12.7	2.22	87.41	194.33	92.24	6.99	22.7	0.31	92.06	0.01002	0.69
2241	12027	5yr	19.7	2.16	77.35	167.09	92.47	15.45	42.22	0.37	92.47	0.007296	0.61
2241	12027	10yr	27.5	2.3	85.04	195.74	92.6	21.01	44.36	0.47		0.007291	0.62
2241	12027	25yr	34.7	2.34	85.85	201.13	92.71	26.19	46.08	0.57		0.006808	0.61
2241	12027	50yr	41.8	2.39	87.17	207.94	92.81	30.82	47.15	0.65		0.00649	0.6
2241	12027	100yr	49.7	2.43	88.68	215.56	92.92	35.66	48.25	0.74		0.006215	0.59
2241	12027	Regional	42.3	2.39	87.32	208.64	92.82	31.12	47.22	0.66		0.006476	0.6
2241	11998	2yr	12.7	1.83	49.36	90.26	92.11	8.67	27.34	0.65	91.51	0.004498	0.43
2241	11998	5yr	19.7	1.98	56	110.98	92.31	16.85	41.58	0.41	92.23	0.004599	0.45
2241	11998	10yr	27.5	2.03	57.2	116.04	92.47	23.78	43.95	0.54	92.36	0.004349	0.44
2241	11998	25yr	34.7	2.09	59.83	125.21	92.58	28.97	45.74	0.63	92.44	0.004319	0.44
2241	11998	50yr	41.8	2.15	62.33	134.12	92.68	33.64	47.53	0.71	92.51	0.004312	0.44
2241	11998	100yr	49.7	2.19	63.93	140.29	92.79	38.71	49.32	0.78	92.57	0.004237	0.44
2241	11998	Regional	42.3	2.16	62.53	134.8	92.69	33.94	47.64	0.71	92.51	0.004314	0.44
2241	11995	11-Access Way	Bridge										
2241	11992	2yr	12.7	1.91	61.99	118.13	91.97	8.32	26.76	0.31	91.57	0.006531	0.54
2241	11992	5yr	19.7	2.07	69.69	144.05	92.15	15	42.33	0.35	92.15	0.006409	0.55
2241	11992	10yr	27.5	2.28	82.73	188.46	92.25	19.46	44.29	0.44	92.25	0.007098	0.59
2241	11992	25yr	34.7	2.47	95.65	236.07	92.32	22.62	45.5	0.5	92.32	0.007848	0.62
2241	11992	50yr	41.8	2.61	106.01	277.18	92.39	25.52	46.57	0.55	92.38	0.008368	0.65
2241	11992	100yr	49.7	2.65	106.95	283.25	92.47	29.64	49.73	0.6	92.44	0.008026	0.64
2241	11992	Regional	42.3	2.62	106.01	277.37	92.39	25.79	46.67	0.55	92.38	0.00834	0.65
2241	11966	2yr	12.7	1.15	21.72	24.98	91.95	19.12	54.22	0.35	91.5	0.001946	0.33
2241	11966	5yr	19.7	1.29	26.24	33.76	92.09	26.76	55.85	0.48	91.9	0.002117	0.35
2241	11966	10yr	27.5	1.44	32.18	46.42	92.19	32.83	56.74	0.58	91.99	0.002408	0.38
2241	11966	25yr	34.7	1.59	38.37	60.94	92.27	37.12	57.33	0.65	92.06	0.002734	0.4
2241	11966	50yr	41.8	1.69	42.88	72.55	92.34	41.38	57.85	0.72	92.11	0.002919	0.42
2241	11966	100yr	49.7	1.78	46.51	82.61	92.43	46.13	58.43	0.79	92.17	0.003016	0.43
2241	11966	Regional	42.3	1.7	43.13	73.23	92.35	41.69	57.89	0.72	92.11	0.002926	0.42

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	11937	2yr	12.7	0.82	11.45	9.36	91.92	25.09	61.51	0.41	91.18	0.00108	0.23
2241	11937	5yr	19.7	0.94	14.64	13.76	92.06	33.52	64.78	0.53	91.77	0.00125	0.25
2241	11937	10yr	27.5	1.08	18.82	20.3	92.16	40.06	69.31	0.62	91.86	0.0015	0.28
2241	11937	25yr	34.7	1.2	23.11	27.82	92.23	44.57	81.91	0.69	91.92	0.001762	0.3
2241	11937	50yr	41.8	1.29	26.27	33.96	92.3	49.18	82.96	0.76	91.98	0.001918	0.32
2241	11937	100yr	49.7	1.36	28.78	39.25	92.38	54.42	84.89	0.84	92.03	0.002005	0.33
2241	11937	Regional	42.3	1.3	26.44	34.31	92.31	49.52	83.05	0.76	91.98	0.001925	0.32
2241	11932	10-Access Way	Bridge										
2241	11928	2yr	12.7	2.07	62.21	128.97	91.66	7.58	37.28	0.2	91.17	0.006747	0.55
2241	11928	5yr	19.7	2.04	57.75	117.99	91.87	17.44	57.32	0.3	91.87	0.00548	0.51
2241	11928	10yr	27.5	2.27	69.73	157.99	91.97	22.97	60.96	0.38	91.97	0.006257	0.55
2241	11928	25yr	34.7	2.32	72.06	167.35	92.05	28.45	63.77	0.45	92.04	0.006151	0.55
2241	11928	50yr	41.8	2.17	61.6	133.7	92.17	36.04	71.24	0.56	92.09	0.004931	0.5
2241	11928	100yr	49.7	2.13	58.11	123.57	92.28	42.65	84.68	0.66	92.14	0.00442	0.48
2241	11928	Regional	42.3	2.16	61.17	132.38	92.18	36.52	71.85	0.56	92.09	0.004878	0.5
2241	11910	2yr	12.7	1.5	37.83	56.76	91.63	12.76	38.75	0.33	91.31	0.004169	0.47
2241	11910	5yr	19.7	1.73	48.15	83.18	91.76	18.57	45.41	0.42	91.66	0.004695	0.5
2241	11910	10yr	27.5	2	62.83	125.59	91.86	22.88	50.85	0.49	91.77	0.005675	0.56
2241	11910	25yr	34.7	2.2	74.41	163.44	91.94	26.56	55.75	0.54	91.84	0.006345	0.6
2241	11910	50yr	41.8	2.43	90.12	219.13	91.99	29.04	58.93	0.57	91.91	0.007417	0.65
2241	11910	100yr	49.7	2.63	103.97	273.32	92.04	31.98	60.06	0.62	91.99	0.008226	0.69
2241	11910	Regional	42.3	2.44	90.89	222.04	91.99	29.25	59.01	0.57	91.92	0.007458	0.65
2241	11886	2yr	12.7	1.62	37.04	59.96	91.53	18.15	84.83	0.21	91.53	0.004189	0.49
2241	11886	5yr	19.7	1.19	18.78	22.32	91.75	37.12	86.2	0.43		0.001766	0.33
2241	11886	10yr	27.5	1.27	21.04	26.81	91.86	46.28	86.79	0.53		0.001831	0.34
2241	11886	25yr	34.7	1.34	22.86	30.67	91.95	53.69	87.18	0.62		0.001877	0.35
2241	11886	50yr	41.8	1.45	26.47	38.45	92	58.56	87.43	0.67		0.002096	0.37
2241	11886	100yr	49.7	1.54	29.47	45.48	92.06	64.16	87.71	0.73		0.002241	0.39
2241	11886	Regional	42.3	1.46	26.63	38.81	92.01	58.96	87.45	0.67		0.002102	0.37
2241	11861	2yr	12.7	2.54	113.12	287.16	91.1	5.12	35.93	0.86		0.01327	0.79
2241	11861	5yr	19.7	1.99	61.3	121.74	91.56	19.19	66.21	0.29	91.56	0.004996	0.52
2241	11861	10yr	27.5	2.22	75.14	166.76	91.65	25.19	70.65	0.36	91.65	0.005784	0.56
2241	11861	25yr	34.7	2.4	86.8	208.58	91.72	30.63	78.67	0.39	91.68	0.006396	0.59
2241	11861	50yr	41.8	2.26	75.27	170.13	91.82	38.88	79.14	0.49	91.78	0.00522	0.54
2241	11861	100yr	49.7	2.39	83.07	198.28	91.88	43.27	79.38	0.55	91.83	0.005587	0.56
2241	11861	Regional	42.3	2.24	73.52	164.39	91.83	39.7	79.18	0.5	91.78	0.005069	0.53
2241	11820	2yr	12.7	1.75	57.09	100.1	90.84	7.26	39	0.88	90.51	0.006921	0.58
2241	11820	5yr	19.7	2.16	81.64	176.1	91.01	10.98	50.74	0.44	90.78	0.008354	0.66
2241	11820	10yr	27.5	2.45	101.25	248.1	91.15	14.83	56.23	0.49	91.13	0.009196	0.71
2241	11820	25yr	34.7	2.64	113.83	299.96	91.26	18.31	60.34	0.54	91.26	0.009491	0.73
2241	11820	50yr	41.8	2.65	111.91	296.89	91.38	24.09	70.25	0.34	91.38	0.008517	0.7
2241	11820	100yr	49.7	2.53	98.75	249.73	91.52	33.86	74.36	0.46	91.52	0.006882	0.64
2241	11820	Regional	42.3	2.68	114.6	307.67	91.38	24.09	70.25	0.34	91.38	0.008722	0.71
2241	11761	2yr	12.7	1.3	23.82	31.01	90.7	13.11	36.84	0.36	89.78	0.001808	0.31
2241	11761	5yr	19.7	1.91	50.69	96.62	90.74	14.84	42.54	0.35	90.12	0.003754	0.45
2241	11761	10yr	27.5	1.75	41.06	72.06	91	29.77	67.62	0.44	90.81	0.002658	0.39
2241	11761	25yr	34.7	1.77	40.86	72.25	91.13	38.55	70.69	0.55	90.95	0.002492	0.38
2241	11761	50yr	41.8	1.84	43.76	80.58	91.22	44.8	72.1	0.62	91.03	0.002566	0.39
2241	11761	100yr	49.7	1.94	48.09	93.35	91.29	50.4	73.02	0.69	91.1	0.002727	0.4
2241	11761	Regional	42.3	1.85	44.25	81.97	91.22	45.07	72.15	0.62	91.04	0.00259	0.39
2241	11757	9-Access Way	Bridge										
2241	11754	2yr	12.7	1.24	18.64	23.08	90.59	11.55	11.65	1.09	89.6	0.001379	0.29
2241	11754	5yr	19.7	1.81	39.38	71.4	90.67	13.43	40.31	0.33	89.92	0.002785	0.42
2241	11754	10yr	27.5	2.21	57.18	126.14	90.79	19.14	57.83	0.33	90.24	0.00381	0.5
2241	11754	25yr	34.7	2.42	67.95	164.67	90.88	24.72	63.36	0.39	90.87	0.00433	0.54
2241	11754	50yr	41.8	2.52	72.52	182.84	90.97	30.82	69.08	0.45	90.97	0.004427	0.55
2241	11754	100yr	49.7	2.64	78.8	208.27	91.05	36.2	71.12	0.51	91.05	0.004647	0.56
2241	11754	Regional	42.3	2.52	72.4	182.5	90.98	31.33	69.44	0.45	90.98	0.004405	0.54
2241	11717	2yr	12.7	2.07	79.35	164.42	90.3	7.12	22.18	0.32	90.21	0.010685	0.75
2241	11717	5yr	19.7	1.99	67.62	134.58	90.51	17.19	55.06	0.31	90.51	0.007173	0.64

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	11717	10yr	27.5	2.24	82.94	185.45	90.6	22.14	55.98	0.4	90.6	0.008078	0.68
2241	11717	25yr	34.7	2.37	91.11	216.03	90.68	26.58	56.73	0.47	90.67	0.008273	0.7
2241	11717	50yr	41.8	2.42	92.78	224.59	90.76	31.37	57.63	0.54	90.72	0.007861	0.69
2241	11717	100yr	49.7	2.51	97.7	245.11	90.84	35.84	58.47	0.61	90.78	0.007797	0.7
2241	11717	Regional	42.3	2.42	92.82	224.9	90.77	31.71	57.69	0.55	90.73	0.007827	0.69
2241	11702	2yr	12.7	1.8	60.74	109.25	90.2	8.99	32.37	0.28	89.97	0.007468	0.6
2241	11702	5yr	19.7	1.81	57.69	104.39	90.39	18.41	52.66	0.35	90.35	0.005857	0.55
2241	11702	10yr	27.5	1.88	59.61	111.78	90.52	25.56	54.01	0.47	90.44	0.005391	0.54
2241	11702	25yr	34.7	2.01	67.01	134.69	90.61	30.12	54.95	0.55	90.51	0.005673	0.56
2241	11702	50yr	41.8	2.12	72.79	153.96	90.68	34.4	57.19	0.6	90.57	0.005822	0.57
2241	11702	100yr	49.7	2.25	81	182.19	90.75	38.4	60.02	0.64	90.63	0.006175	0.6
2241	11702	Regional	42.3	2.12	73.02	154.8	90.69	34.72	57.44	0.6	90.58	0.005816	0.57
2241	11676	2yr	12.7	1.41	30.67	43.1	90.13	13.86	49.39	0.29	89.25	0.002611	0.33
2241	11676	5yr	19.7	2.13	70.58	150.63	90.14	14.54	52.23	0.29	89.65	0.005963	0.5
2241	11676	10yr	27.5	1.68	41.68	70.04	90.42	30.61	60.47	0.53	90.28	0.003048	0.37
2241	11676	25yr	34.7	1.81	47.82	86.55	90.5	36.17	61.29	0.59	90.35	0.003378	0.39
2241	11676	50yr	41.8	1.95	55.01	107.3	90.56	40.11	61.99	0.65	90.41	0.003775	0.42
2241	11676	100yr	49.7	2.15	66.09	141.78	90.61	43.04	62.51	0.69	90.47	0.004443	0.45
2241	11676	Regional	42.3	1.96	55.24	108.03	90.57	40.45	62.05	0.65	90.42	0.003782	0.42
2241	11673 8-Access Way	Bridge											
2241	11672	2yr	12.7	1.59	34.76	55.1	90.07	12.26	52.32	0.23	89.29	0.003013	0.38
2241	11672	5yr	19.7	2.02	55.57	112.4	90.17	18.43	66.98	0.28	89.67	0.004559	0.48
2241	11672	10yr	27.5	2.2	64.33	141.32	90.27	25.76	69.16	0.37	90.27	0.004988	0.5
2241	11672	25yr	34.7	2.37	74.33	176.52	90.34	30.49	70.63	0.43	90.34	0.00557	0.53
2241	11672	50yr	41.8	2.59	87.78	227.4	90.39	33.75	71.65	0.47	90.38	0.006432	0.58
2241	11672	100yr	49.7	2.56	84.81	217.49	90.48	40.3	72.56	0.56	90.48	0.005953	0.56
2241	11672	Regional	42.3	2.61	88.95	232.02	90.39	34.03	71.71	0.47	90.39	0.006506	0.58
2241	11655	2yr	12.7	1.45	36.6	53.11	90.02	13.66	53.57	0.26	89.63	0.004113	0.46
2241	11655	5yr	19.7	1.89	60.63	114.55	90.1	18.26	64.46	0.28	90.1	0.006346	0.58
2241	11655	10yr	27.5	2.28	86.71	197.52	90.15	21.75	65.21	0.33	90.18	0.008645	0.68
2241	11655	25yr	34.7	2.45	98.15	240.04	90.21	25.89	65.92	0.39	90.24	0.00927	0.71
2241	11655	50yr	41.8	2.45	96.6	236.89	90.29	31.1	66.64	0.47	90.29	0.008562	0.69
2241	11655	100yr	49.7	2.38	89.06	212.27	90.39	37.6	67.52	0.56	90.34	0.007335	0.65
2241	11655	Regional	42.3	2.46	97.34	239.7	90.3	31.33	66.68	0.47	90.29	0.008604	0.7
2241	11630	2yr	12.7	2.26	84.6	191.39	89.7	6.95	33.73	0.21	89.51	0.00951	0.71
2241	11630	5yr	19.7	2.29	82.93	190.16	89.85	17.67	80.16	0.22	89.91	0.008102	0.67
2241	11630	10yr	27.5	1.78	47.8	85.29	90.04	33.15	82.09	0.4	89.98	0.004025	0.48
2241	11630	25yr	34.7	1.7	42.06	71.34	90.16	42.75	83.18	0.51	90.03	0.003267	0.44
2241	11630	50yr	41.8	1.67	39.99	66.85	90.26	50.83	84.16	0.6		0.002918	0.42
2241	11630	100yr	49.7	1.66	38.76	64.42	90.36	59.17	85.25	0.69		0.002664	0.41
2241	11630	Regional	42.3	1.67	39.84	66.51	90.26	51.41	84.23	0.61		0.002895	0.42
2241	11607	2yr	12.7	2.22	79.19	175.67	89.48	7.87	34.42	0.23	89.31	0.00945	0.7
2241	11607	5yr	19.7	1.92	54.96	105.49	89.74	18.69	47.61	0.39	89.71	0.005226	0.54
2241	11607	10yr	27.5	1.89	50.93	96.01	89.91	26.66	48.84	0.55		0.004286	0.5
2241	11607	25yr	34.7	2.02	57.48	116.28	90	31.05	49.56	0.63		0.004554	0.52
2241	11607	50yr	41.8	2.12	62.01	131.48	90.08	35.29	50.31	0.7		0.004654	0.53
2241	11607	100yr	49.7	2.2	65.65	144.57	90.17	39.94	51.27	0.78		0.004663	0.54
2241	11607	Regional	42.3	2.12	62.07	131.78	90.09	35.64	50.38	0.71		0.004639	0.53
2241	11592	2yr	12.7	0.98	14.58	14.34	89.57	21.13	44.75	0.47	88.73	0.001178	0.25
2241	11592	5yr	19.7	1.13	18.51	20.9	89.75	29.2	47.56	0.61	89.05	0.001343	0.28
2241	11592	10yr	27.5	1.27	23	29.31	89.89	36.04	51.77	0.7	89.53	0.001544	0.3
2241	11592	25yr	34.7	1.44	29.15	42.09	89.96	40.04	53.49	0.75	89.62	0.00188	0.33
2241	11592	50yr	41.8	1.57	34.21	53.87	90.04	44.14	55.84	0.79	89.68	0.002124	0.35
2241	11592	100yr	49.7	1.69	38.65	65.13	90.12	48.94	58.81	0.83	89.76	0.002304	0.37
2241	11592	Regional	42.3	1.58	34.42	54.38	90.05	44.5	55.98	0.79	89.69	0.00213	0.36
2241	11587 7-Access Way	Bridge											
2241	11582	2yr	12.7	1.96	55.79	109.55	89.32	7.32	13.3	0.55	88.89	0.005247	0.53
2241	11582	5yr	19.7	2.49	86.09	214.22	89.5	10.74	28.66	0.37	89.34	0.00718	0.64
2241	11582	10yr	27.5	2.31	71.02	164.2	89.73	21.5	60.61	0.35	89.73	0.005166	0.55
2241	11582	25yr	34.7	2.42	76.2	184.11	89.82	27.6	65.51	0.42	89.82	0.005261	0.56

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	11582	50yr	41.8	2.34	69.89	163.21	89.93	34.84	67.71	0.51	89.88	0.004561	0.53
2241	11582	100yr	49.7	2.23	62.76	140.23	90.05	42.96	69.54	0.62	89.94	0.003866	0.49
2241	11582	Regional	42.3	2.32	69.14	160.73	89.94	35.42	67.89	0.52	89.89	0.004493	0.53
2241	11542	2yr	12.7	2.27	82.82	188.34	88.97	6.1	9.98	0.61	88.78	0.00908	0.7
2241	11542	5yr	19.7	2.26	75.76	171.59	89.26	13.97	36.39	0.38	89.26	0.006516	0.62
2241	11542	10yr	27.5	2.77	111.47	308.86	89.34	16.63	37.57	0.44	89.39	0.009111	0.74
2241	11542	25yr	34.7	2.81	111.22	312.16	89.46	21.56	39.88	0.54	89.48	0.008357	0.71
2241	11542	50yr	41.8	2.87	113.52	325.34	89.57	25.75	41.49	0.62	89.57	0.008006	0.71
2241	11542	100yr	49.7	3.05	127.03	387.79	89.64	28.8	42.65	0.68	89.64	0.008587	0.74
2241	11542	Regional	42.3	2.88	114.56	329.96	89.57	25.93	41.56	0.62	89.57	0.008058	0.71
2241	11500	2yr	12.7	2.16	76.73	165.67	88.65	9.04	40.72	0.22	88.65	0.008097	0.63
2241	11500	5yr	19.7	2.98	143.7	428.09	88.71	11.86	49.51	0.24	88.83	0.014435	0.85
2241	11500	10yr	27.5	2.33	83.4	194.47	88.93	23.56	56.25	0.42	88.92	0.007123	0.62
2241	11500	25yr	34.7	1.61	37.51	60.48	89.22	41.18	62.02	0.66	88.98	0.002661	0.39
2241	11500	50yr	41.8	1.74	43.29	75.47	89.29	45.31	63.01	0.72	89.03	0.00296	0.41
2241	11500	100yr	49.7	1.87	48.93	91.25	89.36	49.77	64.5	0.77	89.09	0.003221	0.43
2241	11500	Regional	42.3	1.67	39.3	65.5	89.33	47.66	63.78	0.75	89.04	0.002633	0.39
2241	11477	2yr	12.7	1.46	34.92	50.82	88.56	14.15	36.51	0.39	88.44	0.003606	0.43
2241	11477	5yr	19.7	1.75	49.38	86.51	88.67	18.63	43.73	0.46	88.56	0.004707	0.49
2241	11477	10yr	27.5	2.02	63.55	128.05	88.79	24.41	56.74	0.43	88.67	0.005572	0.54
2241	11477	25yr	34.7	1.22	21.46	26.21	89.19	50.38	69.85	0.72	88.79	0.001462	0.29
2241	11477	50yr	41.8	1.35	25.75	34.64	89.25	54.57	70.71	0.77	88.85	0.001698	0.31
2241	11477	100yr	49.7	1.46	30.06	43.94	89.31	59.15	72.09	0.82	88.89	0.001916	0.34
2241	11477	Regional	42.3	1.28	23.23	29.78	89.29	57.57	71.61	0.8	88.86	0.001497	0.3
2241	11450	2yr	12.7	2.49	113.5	283.06	88.13	5.38	11.28	0.48	88.07	0.014993	0.86
2241	11450	5yr	19.7	2.1	72.56	152.53	88.45	15.22	44.48	0.34	88.45	0.006981	0.62
2241	11450	10yr	27.5	1.82	51.46	93.8	88.68	25.75	47.9	0.54		0.004151	0.49
2241	11450	25yr	34.7	1.17	19.13	22.34	89.16	56.1	78.98	0.71		0.00115	0.27
2241	11450	50yr	41.8	1.3	23.65	30.85	89.21	60.36	80.64	0.75		0.001382	0.3
2241	11450	100yr	49.7	1.43	28.06	40.07	89.27	65.15	81.72	0.8		0.001592	0.32
2241	11450	Regional	42.3	1.23	21.02	25.95	89.26	64.21	81.51	0.79		0.001199	0.28
2241	11407	2yr	12.7	2.24	80.08	179.39	87.64	5.86	8.81	0.66	87.4	0.009886	0.7
2241	11407	5yr	19.7	1.7	42.97	73.2	88.2	16.4	51.32	0.54	87.81	0.003811	0.45
2241	11407	10yr	27.5	1.26	21.78	27.49	88.6	34.59	79.97	0.69	88.14	0.001516	0.3
2241	11407	25yr	34.7	0.62	4.75	2.92	89.15	95.43	101.04	0.94	88.27	0.000255	0.13
2241	11407	50yr	41.8	0.7	6.16	4.34	89.2	100.66	104.7	0.96	88.36	0.000324	0.14
2241	11407	100yr	49.7	0.79	7.69	6.06	89.26	106.63	107.47	0.99	88.44	0.000395	0.16
2241	11407	Regional	42.3	0.68	5.67	3.84	89.25	105.78	107.24	0.99	88.36	0.000293	0.14
2241	11402	6-Access Way	Bridge										
2241	11396	2yr	12.7	1.64	46.02	75.47	87.53	7.75	7.61	1.02	86.95	0.005629	0.51
2241	11396	5yr	19.7	2.35	92.85	217.95	87.61	8.45	16.82	0.9	87.34	0.010708	0.71
2241	11396	10yr	27.5	0.88	10.53	9.23	88.57	51.95	97.36	0.89	87.63	0.000652	0.2
2241	11396	25yr	34.7	0.65	5.34	3.47	89.13	86.7	117.35	1.31	88.03	0.00026	0.13
2241	11396	50yr	41.8	0.76	7.2	5.44	89.17	89.66	119.81	1.34	88.13	0.000344	0.15
2241	11396	100yr	49.7	0.87	9.42	8.17	89.22	92.9	122.71	1.37	88.23	0.000442	0.17
2241	11396	Regional	42.3	0.74	6.8	5.02	89.22	93	122.79	1.37	88.14	0.000319	0.14
2241	11369	2yr	12.7	2.32	101.2	234.48	87.12	5.83	17.61	0.33	87.07	0.015112	0.87
2241	11369	5yr	19.7	1.93	61.6	118.97	87.48	15.11	34.68	0.44	87.36	0.006189	0.59
2241	11369	10yr	27.5	0.58	4.45	2.59	88.57	89.02	137.91	0.96	87.52	0.000222	0.13
2241	11369	25yr	34.7	0.33	1.35	0.45	89.13	197.88	165.05	1.2	87.62	0.000054	0.06
2241	11369	50yr	41.8	0.39	1.84	0.72	89.18	205.65	172.71	1.19	87.73	0.000072	0.07
2241	11369	100yr	49.7	0.45	2.38	1.06	89.23	214.4	178.76	1.2	87.82	0.000091	0.08
2241	11369	Regional	42.3	0.38	1.72	0.65	89.23	214.38	178.76	1.2	87.73	0.000066	0.07
2241	11350	2yr	12.7	1.74	39.65	68.87	87.07	10.71	33.91	0.32	86.47	0.0036	0.44
2241	11350	5yr	19.7	1.36	22.49	30.53	87.47	26.5	44.16	0.6	87.16	0.001634	0.31
2241	11350	10yr	27.5	0.52	2.81	1.45	88.57	104.07	161.38	1	87.28	0.000132	0.09
2241	11350	25yr	34.7	0.31	0.94	0.29	89.13	227.29	186.68	1.36	87.38	0.000037	0.05
2241	11350	50yr	41.8	0.36	1.26	0.45	89.18	234.9	189.54	1.4	87.46	0.000049	0.06
2241	11350	100yr	49.7	0.41	1.63	0.66	89.23	243.2	193.88	1.44	87.54	0.000063	0.07
2241	11350	Regional	42.3	0.35	1.18	0.41	89.23	243.21	193.89	1.44	87.47	0.000046	0.06

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	11346 5-Access Way		Bridge										
2241	11341	2yr	12.7	2.44	91.38	223.34	86.71	5.37	6.36	0.84	86.46	0.01006	0.71
2241	11341	5yr	19.7	1.32	22.82	30.17	87.46	25.6	38.25	0.67	87.07	0.001559	0.3
2241	11341	10yr	27.5	0.59	3.91	2.31	88.57	87.12	132.47	1.06	87.22	0.000171	0.11
2241	11341	25yr	34.7	0.37	1.43	0.52	89.13	193.9	165.1	1.17	87.33	0.000053	0.06
2241	11341	50yr	41.8	0.42	1.91	0.81	89.18	201.45	170.69	1.18	87.41	0.00007	0.07
2241	11341	100yr	49.7	0.48	2.47	1.2	89.23	209.98	178.22	1.18	87.5	0.000089	0.08
2241	11341	Regional	42.3	0.41	1.79	0.74	89.23	210.11	178.34	1.18	87.42	0.000064	0.07
2241	11310	2yr	12.7	2.1	68.19	143.03	86.48	8.87	28.33	0.31	86.48	0.008415	0.7
2241	11310	5yr	19.7	0.78	7.31	5.67	87.45	45.63	43.19	1.06	86.64	0.000436	0.18
2241	11310	10yr	27.5	0.51	2.7	1.37	88.56	100.04	148.15	1.73	86.76	0.000101	0.09
2241	11310	25yr	34.7	0.4	1.57	0.63	89.13	251.97	255.29	0.99	86.85	0.00005	0.07
2241	11310	50yr	41.8	0.46	2.07	0.95	89.17	263.51	261.08	1.01	86.94	0.000065	0.08
2241	11310	100yr	49.7	0.52	2.64	1.37	89.22	276.26	265.3	1.04	87.02	0.000081	0.09
2241	11310	Regional	42.3	0.44	1.9	0.84	89.22	276.65	265.43	1.04	86.94	0.000059	0.07
2241	11294	2yr	13.3	0.55	6.44	3.53	86.54	24.84	52.17	1.2	85.42	0.000482	0.15
2241	11294	5yr	20.7	0.5	4.57	2.29	87.45	43.71	157.02	2.12	85.58	0.000208	0.11
2241	11294	10yr	28.5	0.46	3.34	1.53	88.56	66.53	285.74	3.22	85.73	0.000103	0.08
2241	11294	25yr	35.6	0.21	0.65	0.14	89.13	322.03	355.51	2.32	85.85	0.000017	0.03
2241	11294	50yr	43	0.17	0.44	0.07	89.18	595.5	362.7	1.64	85.96	0.000011	0.03
2241	11294	100yr	51.1	0.2	0.58	0.11	89.22	613.23	367.29	1.67	86.08	0.000015	0.03
2241	11294	Regional	51.9	0.2	0.6	0.12	89.22	613.6	367.41	1.67	86.09	0.000015	0.03
2241	11276 4-CNR		Culvert										
2241	11258	2yr	13.3	0.77	9.86	7.56	85.69	17.75	16.89	1.05	84.69	0.000789	0.2
2241	11258	5yr	20.7	0.87	11.77	10.21	86.12	25.47	30.92	1.41	84.89	0.000746	0.2
2241	11258	10yr	28.5	1.07	17.53	18.71	86.29	28.51	34.33	1.58	85.06	0.001031	0.24
2241	11258	25yr	35.6	1.07	17.33	18.51	86.41	38.49	39.34	0.98	85.2	0.00097	0.23
2241	11258	50yr	43	1.17	20.48	23.88	86.5	42.21	39.95	1.06	85.34	0.001105	0.25
2241	11258	100yr	51.1	1.27	23.98	30.35	86.59	45.58	40.1	1.14	85.48	0.001254	0.27
2241	11258	Regional	51.9	1.28	24.32	31.01	86.59	45.89	40.11	1.14	85.49	0.001268	0.27
2241	11208	2yr	13.3	0.98	13	12.79	85.62	13.62	13.87	1.3	84.65	0.001052	0.26
2241	11208	5yr	20.7	1.05	14.51	15.3	86.05	24.17	33.5	0.72	84.9	0.000967	0.25
2241	11208	10yr	28.5	1.24	19.5	24.19	86.21	31.73	65.09	0.49	85.13	0.001194	0.29
2241	11208	25yr	35.6	1.37	23.32	31.89	86.31	38.39	72.94	0.53	85.3	0.001359	0.31
2241	11208	50yr	43	1.46	26.26	38.39	86.4	45.16	77.91	0.58	85.46	0.001465	0.32
2241	11208	100yr	51.1	1.52	27.94	42.42	86.49	52.2	80.38	0.65	85.63	0.001496	0.33
2241	11208	Regional	51.9	1.52	28.08	42.75	86.5	52.88	80.84	0.65	85.65	0.001497	0.33
2241	11196 3-St. Mary Ave		Bridge										
2241	11184	2yr	13.3	1.67	50.94	84.86	85.28	8.15	9.76	0.83	84.75	0.006289	0.51
2241	11184	5yr	20.7	1.65	46.69	77.03	85.65	14.82	26.13	0.57	85.09	0.004561	0.45
2241	11184	10yr	28.5	1.8	53.25	95.7	85.82	19.77	43.17	0.53	85.54	0.004618	0.46
2241	11184	25yr	35.6	1.85	54.92	101.65	85.96	25.95	54.83	0.53	85.7	0.004378	0.46
2241	11184	50yr	43	1.86	54.28	101.12	86.09	32.87	65.67	0.58	85.77	0.004017	0.44
2241	11184	100yr	51.1	1.93	57.18	110.32	86.18	38.51	67.41	0.66	85.94	0.004015	0.45
2241	11184	Regional	51.9	1.94	57.59	111.56	86.19	38.99	67.51	0.67	85.95	0.004025	0.45
2241	11168	2yr	13.3	2.75	138.13	379.39	84.8	4.84	6.33	0.76	84.8	0.020178	1
2241	11168	5yr	20.7	2.92	154.31	449.9	85.12	7.11	8.25	0.86	85.11	0.01929	0.99
2241	11168	10yr	28.5	2.55	104.88	267.8	85.5	14.35	39.8	0.49	85.5	0.009121	0.72
2241	11168	25yr	35.6	2.69	112.71	303.06	85.63	18.07	61.29	0.6	85.63	0.008921	0.72
2241	11168	50yr	43	2.83	121.9	345.04	85.74	21.38	66.27	0.63	85.74	0.00897	0.74
2241	11168	100yr	51.1	2.85	120.63	344.32	85.86	26.83	81.72	0.55	85.86	0.008181	0.71
2241	11168	Regional	51.9	2.86	120.59	344.53	85.88	27.38	82.17	0.56	85.88	0.008123	0.71
2241	11121	2yr	13.3	1.88	57.92	108.71	84.38	7.09	8.24	1.04	83.98	0.006529	0.59
2241	11121	5yr	20.7	1.96	63.62	124.41	84.8	10.97	19.15	0.81	84.3	0.006303	0.58
2241	11121	10yr	28.5	2.26	81.01	183.28	84.98	13.71	26.74	0.88	84.63	0.006907	0.62
2241	11121	25yr	35.6	2.6	104.93	273.18	85.08	15.24	35.93	0.89	84.87	0.008366	0.69
2241	11121	50yr	43	2.63	104.29	274.28	85.2	21.25	46.7	0.79	85.03	0.007682	0.67
2241	11121	100yr	51.1	2.83	118.32	334.85	85.29	23.9	55.25	0.88	85.22	0.008201	0.7
2241	11121	Regional	51.9	2.81	116.48	327.78	85.32	24.49	60.48	0.9	85.22	0.007969	0.69

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	11085	2yr	13.3	1.43	29.85	42.63	84.27	9.31	7.82	1.38	83.45	0.002677	0.39
2241	11085	5yr	20.8	1.31	27.06	35.46	84.73	17.72	43.88	0.66	83.76	0.002341	0.35
2241	11085	10yr	28.5	1.3	25.43	33.16	84.96	24.22	56.11	0.8	84.05	0.001885	0.33
2241	11085	25yr	35.6	1.26	22.94	28.82	85.11	34.53	65.27	0.63	84.65	0.001559	0.3
2241	11085	50yr	43	1.28	23.2	29.61	85.22	41.04	69.28	0.7	84.75	0.001481	0.3
2241	11085	100yr	51.2	1.29	23.12	29.77	85.34	48.46	74.87	0.75	84.84	0.001388	0.29
2241	11085	Regional	52.6	1.28	22.81	29.22	85.36	49.89	75.49	0.77	84.85	0.001354	0.29
2241	11075	2-St. James Ave	Bridge										
2241	11064	2yr	13.3	1.66	51.1	85.03	83.77	7.99	9.14	0.87	83.35	0.00646	0.57
2241	11064	5yr	20.8	1.85	62.58	116	84.08	11.22	11.39	0.99	83.68	0.006967	0.6
2241	11064	10yr	28.5	1.97	69.54	137.07	84.34	14.46	13.14	1.1	83.92	0.006908	0.6
2241	11064	25yr	35.6	2.05	76.57	157.24	84.55	17.34	14.6	1.19	84.09	0.007029	0.6
2241	11064	50yr	43	2.12	82.28	174.82	84.74	20.26	17.28	1.17	84.25	0.006999	0.6
2241	11064	100yr	51.2	2.01	71.54	143.99	84.99	27.72	88	0.57	84.41	0.005396	0.54
2241	11064	Regional	52.6	1.92	64.4	123.67	85.04	30.35	115.73	0.63	84.44	0.004687	0.5
2241	11047	2yr	13.3	2.27	98.42	223.15	83.45	5.87	8.16	0.72	83.36	0.014891	0.85
2241	11047	5yr	20.8	2.51	115.61	290.68	83.72	8.27	9.3	0.89	83.62	0.014231	0.85
2241	11047	10yr	28.5	2.7	130.96	353.41	83.95	10.56	10.66	0.99	83.84	0.014468	0.87
2241	11047	25yr	35.6	2.87	144.09	413.89	84.12	12.52	13.39	0.94	84.02	0.014289	0.87
2241	11047	50yr	43	3.04	157.16	478.16	84.27	14.58	14.67	0.99	84.18	0.014162	0.88
2241	11047	100yr	51.2	3.34	186.77	624.57	84.36	16.01	20.64	1.03	84.34	0.015908	0.94
2241	11047	Regional	52.6	3.4	192.92	656.34	84.37	16.19	26	1.04	84.37	0.016321	0.96
2241	11015	2yr	13.3	1.91	71.34	136.12	83.12	6.97	8.83	0.79	82.89	0.009789	0.69
2241	11015	5yr	20.8	2.25	97.13	218.92	83.36	9.23	10.35	0.89	83.17	0.011774	0.76
2241	11015	10yr	28.5	2.53	119.84	302.75	83.55	11.28	11.62	0.97	83.39	0.013327	0.82
2241	11015	25yr	35.6	2.72	137.48	374.08	83.7	13.08	12.77	1.02	83.57	0.014447	0.86
2241	11015	50yr	43	2.87	152.03	436.9	83.84	14.98	21.31	0.93	83.73	0.015259	0.89
2241	11015	100yr	51.2	2.97	156.85	465.96	83.97	17.74	39.11	0.82	83.97	0.01412	0.87
2241	11015	Regional	52.6	2.98	157.38	469.71	83.99	18.2	42.84	0.83	83.99	0.01392	0.86
2241	10962	2yr	13.3	2.18	109.2	238.38	82.28	6.09	12.6	0.48	82.28	0.023683	1
2241	10962	5yr	20.8	2.46	129.24	318.52	82.46	8.44	13.59	0.62	82.46	0.021879	1
2241	10962	10yr	28.5	2.69	145.89	391.71	82.62	10.61	14.4	0.74	82.62	0.020868	1
2241	10962	25yr	35.6	2.86	158.98	453.93	82.74	12.47	14.94	0.83	82.74	0.020126	1
2241	10962	50yr	43	3.01	172.04	518.69	82.86	14.26	15.43	0.92	82.86	0.019718	1
2241	10962	100yr	51.2	3.25	195.16	633.56	82.96	15.77	15.84	1	82.99	0.020796	1.04
2241	10962	Regional	52.6	3.28	198.54	651.26	82.98	16.04	15.91	1.01	83.01	0.020906	1.04
2241	10914	2yr	13.4	0.79	11.56	9.17	80.48	16.89	14.25	1.19	79.66	0.001073	0.23
2241	10914	5yr	20.9	0.94	15.3	14.41	80.84	22.19	14.97	1.48	79.84	0.001163	0.25
2241	10914	10yr	28.7	1.03	17.54	18.1	81.2	27.81	16.04	1.75	80	0.001148	0.25
2241	10914	25yr	35.8	1.08	18.28	19.68	81.54	33.24	17.39	2.01	80.13	0.001043	0.24
2241	10914	50yr	43.1	1.1	18.35	20.24	81.89	39.07	18.42	2.31	80.25	0.000915	0.23
2241	10914	100yr	51.3	1.11	17.69	19.57	82.31	46.37	19.89	2.64	80.38	0.000773	0.22
2241	10914	Regional	53.4	1.1	17.43	19.23	82.42	48.39	20.31	2.72	80.41	0.000738	0.21
2241	10898	1-Lakeshore Rd E	Culvert										
2241	10874	2yr	13.4	0.59	5.53	3.27	80.44	22.7	17.84	1.27	79.36	0.000468	0.17
2241	10874	5yr	20.9	0.75	8.61	6.46	80.72	27.85	18.88	1.48	79.55	0.000631	0.2
2241	10874	10yr	28.7	0.89	11.75	10.44	80.95	32.3	19.72	1.64	79.72	0.000779	0.22
2241	10874	25yr	35.8	1	14.75	14.81	81.12	35.66	20.34	1.75	79.84	0.000915	0.24
2241	10874	50yr	43.1	1.12	18.15	20.34	81.26	38.46	20.84	1.85	79.96	0.001071	0.26
2241	10874	100yr	51.3	1.24	22.04	27.36	81.39	41.32	21.42	1.93	80.07	0.001246	0.29
2241	10874	Regional	53.4	1.27	23.05	29.31	81.42	42	21.56	1.95	80.1	0.00129	0.29
2241	10868	2yr	13.4	0.62	9.49	5.91	80.43	21.5	18.29	1.18		0.000858	0.18
2241	10868	5yr	20.9	0.78	14.72	11.49	80.71	26.76	19.46	1.38		0.001142	0.21
2241	10868	10yr	28.7	0.92	20.09	18.4	80.94	31.32	20.42	1.53		0.001401	0.24
2241	10868	25yr	35.8	1.03	25.23	25.97	81.11	34.78	21.11	1.65		0.001642	0.26
2241	10868	50yr	43.1	1.14	31.07	35.56	81.24	37.66	21.68	1.74		0.00192	0.28
2241	10868	100yr	51.3	1.26	37.73	47.67	81.38	40.61	22.31	1.82		0.002228	0.3
2241	10868	Regional	53.4	1.29	39.47	51.01	81.41	41.31	22.46	1.84		0.002307	0.3
2241	10822	2yr	13.4	1.85	58.58	108.16	80.2	8.22	13.35	0.62	80.06	0.007882	0.66
2241	10822	5yr	20.9	2.07	69.23	143.21	80.43	11.5	14.78	0.78	80.25	0.007503	0.66

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	10822	10yr	28.7	2.24	77.94	174.47	80.62	14.58	19.48	0.75	80.43	0.007316	0.66
2241	10822	25yr	35.8	2.36	84.02	197.98	80.78	18.15	25.5	0.71	80.55	0.00714	0.66
2241	10822	50yr	43.1	2.61	100.94	263.29	80.85	20.45	31.82	0.64	80.71	0.008084	0.71
2241	10822	100yr	51.3	2.83	116.15	328.33	80.94	23.37	35.31	0.66	80.85	0.008744	0.75
2241	10822	Regional	53.4	2.87	119.36	342.93	80.96	24.16	36.06	0.67	80.88	0.008851	0.76
2241	10769	2yr	13.4	1.55	37.89	58.59	79.91	9.47	13.01	0.73		0.004449	0.52
2241	10769	5yr	20.9	1.9	54.5	103.38	80.11	12.68	21.48	0.59		0.005436	0.58
2241	10769	10yr	28.7	2.34	81.81	191.8	80.19	14.83	28.99	0.51	80.05	0.007666	0.7
2241	10769	25yr	35.8	2.61	100.09	261.63	80.27	17.47	35.72	0.49	80.23	0.008837	0.76
2241	10769	50yr	43.1	2.67	102.16	272.58	80.39	22.16	42.52	0.52	80.39	0.008375	0.74
2241	10769	100yr	51.3	2.79	109.24	304.68	80.48	26	43.43	0.6	80.48	0.008388	0.75
2241	10769	Regional	53.4	2.82	111.43	314.62	80.5	26.85	43.63	0.62	80.5	0.008439	0.75
2241	10741	2yr	13.4	1.38	31.41	43.3	79.81	10.04	25.33	0.7	79.41	0.003798	0.47
2241	10741	5yr	20.9	1.9	57.98	110.3	79.92	11.69	40.03	0.72	79.63	0.006328	0.61
2241	10741	10yr	28.7	1.95	59.27	115.73	80.05	19.64	41.54	0.47	79.83	0.005815	0.6
2241	10741	25yr	35.8	2.03	62.73	127.62	80.16	24.15	42.61	0.57	80.07	0.005661	0.59
2241	10741	50yr	43.1	2.11	65.81	138.93	80.26	28.37	43.88	0.65	80.14	0.00549	0.59
2241	10741	100yr	51.3	2.18	68.65	149.91	80.36	32.96	46.24	0.71	80.21	0.005309	0.59
2241	10741	Regional	53.4	2.2	69.34	152.61	80.38	34.09	46.7	0.73	80.23	0.00527	0.59
2241	10704	2yr	13.4	1.75	56.11	98.16	79.56	7.84	23.09	0.64	79.27	0.007089	0.61
2241	10704	5yr	20.9	1.51	38.61	58.47	79.8	18.28	38.63	0.53	79.54	0.003782	0.46
2241	10704	10yr	28.7	1.7	47.32	80.57	79.91	23.15	41.12	0.56	79.71	0.004225	0.5
2241	10704	25yr	35.8	1.76	48.85	85.79	80.02	28	42.58	0.66	79.82	0.003978	0.49
2241	10704	50yr	43.1	1.81	50.78	92.08	80.13	32.5	44.06	0.74	79.9	0.003832	0.49
2241	10704	100yr	51.3	1.87	52.53	98.08	80.24	37.33	45.86	0.81	79.97	0.003686	0.48
2241	10704	Regional	53.4	1.88	53.08	99.9	80.26	38.5	46.28	0.83	79.99	0.003664	0.48
2241	10668	2yr	13.4	2.26	114.21	258.25	79.07	6.31	13.55	0.58	79.02	0.01712	0.86
2241	10668	5yr	20.9	2.71	154.66	419.64	79.25	8.48	22.71	0.67	79.25	0.019263	0.94
2241	10668	10yr	28.7	2.56	129.66	331.93	79.48	15.91	32.01	0.5	79.48	0.013464	0.81
2241	10668	25yr	35.8	2.71	140.98	382.74	79.59	19.56	34.58	0.57	79.59	0.01323	0.81
2241	10668	50yr	43.1	2.85	151.19	430.94	79.69	23.06	36.64	0.63	79.69	0.013061	0.82
2241	10668	100yr	51.3	3.02	166.16	502.21	79.77	26.36	38.31	0.69	79.77	0.013402	0.84
2241	10668	Regional	53.4	3.05	168.56	514.67	79.8	27.28	38.79	0.7	79.8	0.013354	0.84
2241	10633	2yr	13.4	2.22	82.61	183	78.63	10.11	25.7	0.39	78.63	0.011744	0.81
2241	10633	5yr	20.9	2.64	114.71	302.96	78.76	13.53	27.76	0.49	78.77	0.014575	0.91
2241	10633	10yr	28.7	3.26	172.86	563.08	78.81	15.13	28.83	0.52	78.89	0.020995	1.1
2241	10633	25yr	35.8	3.47	193.59	671.86	78.9	17.76	30.19	0.59	79.03	0.022014	1.13
2241	10633	50yr	43.1	3.02	146.33	442	79.11	24.45	36.77	0.66	79.05	0.015155	0.94
2241	10633	100yr	51.3	3.08	146.78	452.22	79.23	29.06	39.74	0.73	79.16	0.013625	0.91
2241	10633	Regional	53.4	3.09	146.5	452.84	79.26	30.25	40.21	0.75	79.17	0.013262	0.9
2241	10591	2yr	13.4	1.27	27.85	35.49	78.28	12.01	23.53	0.51	77.8	0.003037	0.41
2241	10591	5yr	20.9	1.59	41.11	65.45	78.46	16.59	26.32	0.63	78.03	0.003789	0.47
2241	10591	10yr	28.7	1.85	53.12	98.11	78.61	20.71	28.09	0.74	78.28	0.004334	0.51
2241	10591	25yr	35.8	2.05	63.54	130.19	78.73	24.09	29.97	0.8	78.44	0.004766	0.55
2241	10591	50yr	43.1	2.21	71.97	158.9	78.84	27.48	30.62	0.9		0.005008	0.57
2241	10591	100yr	51.3	2.41	83.78	201.57	78.94	30.42	31.12	0.98		0.005491	0.6
2241	10591	Regional	53.4	2.45	86.46	211.85	78.96	31.19	31.25	1		0.005583	0.61
2241	10574	2yr	13.4	1.68	48.14	81.04	78.15	10.76	29.48	0.36	77.98	0.006358	0.6
2241	10574	5yr	20.9	1.88	55.92	105.29	78.35	16.71	30.43	0.55		0.005916	0.6
2241	10574	10yr	28.7	2.06	63.45	130.55	78.52	21.92	32.95	0.67		0.005757	0.61
2241	10574	25yr	35.8	2.2	69.99	153.9	78.64	26.27	34.91	0.75		0.005722	0.62
2241	10574	50yr	43.1	2.33	76.46	178.26	78.76	30.45	37.07	0.82		0.005734	0.63
2241	10574	100yr	51.3	2.53	88.48	224.22	78.85	33.92	39.5	0.86		0.006238	0.66
2241	10574	Regional	53.4	2.58	90.95	234.31	78.87	34.86	39.66	0.88		0.006312	0.67
2241	10556	2yr	13.4	2.32	77	178.53	77.85	6.18	18.28	0.5	77.8	0.011302	0.86
2241	10556	5yr	20.9	2.45	79.66	195.49	78.08	12.37	27.84	0.44	78.08	0.009264	0.81
2241	10556	10yr	28.7	2.71	92.48	250.54	78.23	16.69	30.79	0.54	78.23	0.009308	0.83
2241	10556	25yr	35.8	2.9	102.4	296.83	78.35	20.34	32.63	0.62	78.35	0.009324	0.84
2241	10556	50yr	43.1	3.08	112.32	345.66	78.45	23.86	37.04	0.64	78.45	0.009422	0.86
2241	10556	100yr	51.3	3.13	112.41	351.67	78.58	29.21	41.37	0.71	78.58	0.008565	0.83
2241	10556	Regional	53.4	3.16	114.38	361.95	78.61	30.22	41.53	0.73	78.61	0.008569	0.83

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	10525	2yr	13.4	1.59	45.76	72.66	77.72	14.98	35.3	0.42	77.55	0.006425	0.56
2241	10525	5yr	20.9	1.92	63.29	121.57	77.89	22.29	48.84	0.46	77.7	0.007437	0.62
2241	10525	10yr	28.7	2.07	70.75	146.56	78.01	28.26	49.27	0.57	77.73	0.007391	0.63
2241	10525	25yr	35.8	2.19	77.21	169.47	78.11	33.08	49.85	0.66	77.82	0.007409	0.64
2241	10525	50yr	43.1	2.34	85.99	201.35	78.19	37.14	50.39	0.74	78.04	0.007727	0.66
2241	10525	100yr	51.3	2.51	97.17	244.32	78.27	41.15	51.47	0.8	78.1	0.008224	0.69
2241	10525	Regional	53.4	2.56	100.02	255.72	78.29	42.1	51.63	0.82	78.11	0.008353	0.7
2241	10504	2yr	13.4	2.17	88.44	191.83	77.4	9.17	24.75	0.37	77.4	0.014569	0.86
2241	10504	5yr	20.9	2.36	97.89	230.8	77.58	14.88	39.3	0.38	77.58	0.012975	0.84
2241	10504	10yr	28.7	2.45	100.08	245.3	77.72	21.77	50.46	0.43	77.72	0.01123	0.8
2241	10504	25yr	35.8	2.65	114.23	302.93	77.8	25.61	51.04	0.5	77.8	0.01188	0.83
2241	10504	50yr	43.1	2.76	120.16	331.23	77.89	30.07	51.97	0.58	77.87	0.011531	0.83
2241	10504	100yr	51.3	2.8	120.01	335.6	77.99	35.63	53.26	0.67		0.010526	0.81
2241	10504	Regional	53.4	2.78	117.48	326.47	78.03	37.37	53.55	0.7		0.010036	0.79
2241	10457	2yr	13.4	1.25	28.73	35.9	77.18	18.15	36.25	0.5	76.93	0.003555	0.43
2241	10457	5yr	20.9	1.62	46.34	75.02	77.28	22.2	38.91	0.57	77.06	0.005092	0.53
2241	10457	10yr	28.7	1.85	58.08	107.44	77.41	27.31	42.49	0.64	77.19	0.005639	0.57
2241	10457	25yr	35.8	2.01	66.67	134.31	77.52	32.29	44.54	0.72	77.28	0.005864	0.59
2241	10457	50yr	43.1	2.11	70.87	149.39	77.63	37.22	45.08	0.83	77.35	0.00571	0.59
2241	10457	100yr	51.3	2.19	74.57	163.56	77.75	42.59	50.99	0.93	77.41	0.005511	0.59
2241	10457	Regional	53.4	2.16	71.59	154.79	77.81	44.98	52.06	0.98	77.41	0.005104	0.57
2241	10424	2yr	13.4	1.15	23.77	27.28	77.09	22	44.92	0.49	76.73	0.00263	0.38
2241	10424	5yr	20.9	1.82	59.8	108.7	77.08	21.65	44.89	0.48	76.85	0.006672	0.6
2241	10424	10yr	28.7	1.9	62.04	117.77	77.24	28.51	45.5	0.63	76.87	0.005957	0.58
2241	10424	25yr	35.8	1.95	62.79	122.21	77.37	34.52	46.02	0.75	77.15	0.00538	0.56
2241	10424	50yr	43.1	2	64.16	128.27	77.49	40.22	46.47	0.87	77.22	0.004993	0.55
2241	10424	100yr	51.3	2.05	65.68	134.93	77.62	46.31	47.58	0.99	77.28	0.004659	0.54
2241	10424	Regional	53.4	1.99	60.86	121.27	77.69	49.69	50.73	0.98	77.3	0.004124	0.51
2241	10396	2yr	13.4	2.34	90.42	211.84	76.72	6.61	45.18	0.45	76.67	0.011083	0.8
2241	10396	5yr	20.9	1.65	41.25	68.01	76.96	26.52	49.06	0.54	76.81	0.003953	0.5
2241	10396	10yr	28.7	1.73	43.16	74.49	77.12	34.71	50.11	0.69	76.89	0.0036	0.49
2241	10396	25yr	35.8	1.79	44.86	80.31	77.26	41.87	52.2	0.8	76.96	0.003372	0.48
2241	10396	50yr	43.1	1.83	45.69	83.8	77.4	48.84	52.87	0.92	77.03	0.00314	0.47
2241	10396	100yr	51.3	1.88	46.74	87.95	77.53	56.2	53.44	1.05	77.09	0.002948	0.46
2241	10396	Regional	53.4	1.81	42.52	76.91	77.62	60.58	53.77	1.13	77.11	0.002558	0.43
2241	10344	2yr	13.4	1.11	19.22	21.39	76.67	22.15	44.36	0.5	76.36	0.002073	0.36
2241	10344	5yr	20.9	1.3	24.85	32.34	76.85	29.97	44.95	0.67	76.55	0.002272	0.39
2241	10344	10yr	28.7	1.43	28.58	40.8	77.01	37.57	45.51	0.83	76.65	0.002279	0.4
2241	10344	25yr	35.8	1.51	31	46.9	77.16	44.18	46.03	0.96	76.73	0.002227	0.4
2241	10344	50yr	43.1	1.59	33.37	53.16	77.29	50.43	46.54	1.08	76.8	0.002195	0.4
2241	10344	100yr	51.3	1.68	35.9	60.15	77.43	56.99	47.1	1.21	76.87	0.00217	0.41
2241	10344	Regional	53.4	1.62	32.81	53.02	77.53	61.49	47.57	1.29	76.89	0.00188	0.38
2241	10311	2yr	12.7	1.14	20.06	22.96	76.6	21.04	50.25	0.42		0.001994	0.35
2241	10311	5yr	19.9	1.32	25.49	33.71	76.78	29.83	51.07	0.58		0.002182	0.38
2241	10311	10yr	27.6	1.43	28.37	40.44	76.95	38.79	51.85	0.75		0.002131	0.38
2241	10311	25yr	34.4	1.48	29.43	43.46	77.1	46.67	52.6	0.89		0.001999	0.38
2241	10311	50yr	41.5	1.54	30.96	47.57	77.24	54.04	53.42	1.01		0.001932	0.37
2241	10311	100yr	49.5	1.6	32.8	52.56	77.38	61.77	54.55	1.13		0.001889	0.38
2241	10311	Regional	55	1.64	33.99	55.89	77.48	66.92	55.41	1.21		0.001864	0.38
2241	10298	2yr	12.7	2.09	86.5	180.69	76.39	8.95	30.95	0.29	76.39	0.012927	0.78
2241	10298	5yr	19.9	2.06	76.96	158.62	76.62	16.63	35.19	0.47		0.008782	0.67
2241	10298	10yr	27.6	2.04	70.51	143.72	76.82	23.97	36.18	0.66		0.006616	0.61
2241	10298	25yr	34.4	2.05	68.03	139.25	76.99	29.95	36.96	0.81		0.005593	0.57
2241	10298	50yr	41.5	2.11	69.77	147.08	77.13	35.19	37.68	0.93		0.005184	0.56
2241	10298	100yr	49.5	2.18	72.56	158.42	77.27	40.87	44.56	0.92		0.004913	0.55
2241	10298	Regional	55	2.23	74.3	165.69	77.36	45.23	48.28	0.94		0.004752	0.55
2241	10268	2yr	12.7	1.28	27.32	34.87	76.3	12.78	34.36	0.51	75.79	0.003198	0.42
2241	10268	5yr	19.9	1.47	33.54	49.25	76.54	19	40.13	0.69	76.05	0.003139	0.43
2241	10268	10yr	27.6	1.4	28.53	39.89	76.79	34.45	46.72	0.74	76.34	0.0022	0.37
2241	10268	25yr	34.4	1.45	29.46	42.67	76.96	42.57	48.86	0.87	76.46	0.002029	0.37
2241	10268	50yr	41.5	1.51	31.19	47.17	77.1	49.76	49.96	1	76.56	0.001968	0.37
2241	10268	100yr	49.5	1.58	33.32	52.79	77.25	57.16	51.16	1.12	76.65	0.001938	0.37

Reach	River Sta	Profile	Q Total	Vel Chnl	Shear Chan	Power Chan	W.S. Elev	Flow Area	Top Width	Hydr Depth	Crit W.S.	E.G. Slope	Froude # Chl
			(m3/s)	(m/s)	(N/m2)	(N/m s)	(m)	(m2)	(m)	(m)	(m)	(m/m)	
2241	10268	Regional	55	1.63	34.61	56.34	77.34	62.11	51.96	1.2	76.71	0.001915	0.37
2241	10243	2yr	12.7	1.04	22.97	23.91	76.24	17.57	62.25	0.31	75.81	0.003088	0.37
2241	10243	5yr	19.9	0.97	18.03	17.45	76.52	33.68	69.18	0.58	76.05	0.00181	0.3
2241	10243	10yr	27.6	0.94	15.86	14.92	76.77	48.65	73.23	0.82	76.27	0.001286	0.26
2241	10243	25yr	34.4	0.97	16.03	15.48	76.95	58.99	82.52	0.99	76.35	0.001149	0.25
2241	10243	50yr	41.5	1.01	17.01	17.18	77.1	67.82	85.51	1.13	76.42	0.00111	0.25
2241	10243	100yr	49.5	1.06	18.24	19.35	77.24	76.76	87.98	1.27	76.48	0.001091	0.25
2241	10243	Regional	55	1.09	19.01	20.77	77.34	82.65	88.89	1.36	76.52	0.001079	0.25
2241	10189	2yr	12.7	0.67	8.47	5.65	76.19	28.37	62.3	0.53	75.46	0.000784	0.2
2241	10189	5yr	19.9	0.72	9.19	6.63	76.48	43.68	67.38	0.81	75.64	0.000677	0.19
2241	10189	10yr	27.6	0.77	9.87	7.59	76.74	57.8	69.6	1.06	75.81	0.000614	0.19
2241	10189	25yr	34.4	0.83	10.98	9.06	76.92	67.44	80.13	1.22	76.01	0.000618	0.19
2241	10189	50yr	41.5	0.89	12.44	11.06	77.06	75.57	82.56	1.36	76.08	0.000648	0.2
2241	10189	100yr	49.5	0.96	14.07	13.47	77.21	83.77	84.35	1.5	76.19	0.000683	0.21
2241	10189	Regional	55	1	15.1	15.09	77.31	89.18	85.3	1.59	76.24	0.000701	0.21
2241	10151	2yr	12.7	1	17.1	17.08	76.12	13.87	18.2	0.76	75.55	0.00188	0.33
2241	10151	5yr	19.9	1.16	22.08	25.64	76.39	20.3	34.6	0.59	75.76	0.002026	0.35
2241	10151	10yr	27.6	1.17	27.61	32.18	76.66	32.27	58.95	0.59	75.93	0.002341	0.33
2241	10151	25yr	34.4	1.18	26.82	31.53	76.84	42.42	61.71	0.76	76.07	0.001981	0.32
2241	10151	50yr	41.5	1.22	27.86	33.93	76.99	50.79	63.9	0.89	76.19	0.001863	0.31
2241	10151	100yr	49.5	1.27	29.56	37.65	77.13	59.3	66.95	1	76.34	0.001808	0.31
2241	10151	Regional	55	1.3	30.3	39.41	77.23	65.11	68.5	1.08	76.51	0.001753	0.31
2241	10110	2yr	12.7	1.42	33.89	48.09	75.96	10.93	17.09	0.64	75.58	0.003854	0.46
2241	10110	5yr	19.9	1.63	42.45	69.24	76.22	15.49	18.11	0.86	75.86	0.003984	0.48
2241	10110	10yr	27.6	1.81	49.59	89.66	76.45	19.72	18.99	1.04	76.03	0.003954	0.49
2241	10110	25yr	34.4	1.96	56.29	110.49	76.61	22.9	19.59	1.17	76.16	0.004005	0.51
2241	10110	50yr	41.5	2.18	67.96	148.26	76.72	25.04	20	1.25	76.28	0.004519	0.54
2241	10110	100yr	49.5	2.43	83.02	202.03	76.81	26.94	21.44	1.32	76.39	0.005222	0.59
2241	10110	Regional	55	2.59	92.76	240.05	76.88	28.27	25.51	1.34	76.47	0.005628	0.62
2241	10060	2yr	12.7	2.29	93.06	213.46	75.41	5.54	10.29	0.54	75.41	0.018095	1
2241	10060	5yr	19.9	2.62	113.73	297.7	75.61	7.6	10.83	0.7	75.61	0.017116	1
2241	10060	10yr	27.6	2.89	131.65	380.14	75.79	9.58	11.62	0.82	75.79	0.016387	1
2241	10060	25yr	34.4	3	135.56	406.03	75.95	11.86	19.35	0.61	75.95	0.014436	0.96
2241	10060	50yr	41.5	2.88	118.08	340.21	76.17	17.55	35.95	0.49	76.17	0.010417	0.84
2241	10060	100yr	49.5	2.9	114.9	333.16	76.32	23.3	38.46	0.61	76.32	0.008994	0.79
2241	10060	Regional	55	2.98	119.36	355.76	76.39	26.1	39.08	0.67	76.39	0.008873	0.79

Appendix B – Fish Habitat Assessment Field Sheets

Site Identification

Stream Name: APPLEWOOD

Stream Code: APLWD

Date (yyyy-mm-dd): 2019-04-09

Site Code: APLWD-01

Alternate Site Code:

Sample: 01

Site Length (m): 1350.0

*** Record using NAD83 datum

	Zone	Easting	Northing
Uncorr. UTM	17	616256.0	4827198.0
Corr. UTM	1	.	.

OR → Lat. / Long. (DD MM SS.sss)

Source of Uncorrected UTM Coord.
- GPS/DGPS ☐
- GIS ☒
- OBM ☐
- Other

Source of CorrectedUTM Coordinates
- FWIS ☐
- Ortho-photos ☐
- GIS ☐
- Other

Name of Layer Used for Correction

Access Route

SOUTH ON DIXIE FROM QEW, LAKEVIEW GOLF CLUB ON RIGHT SIDE, PARK IN LOT, CREEK TO THE WEST

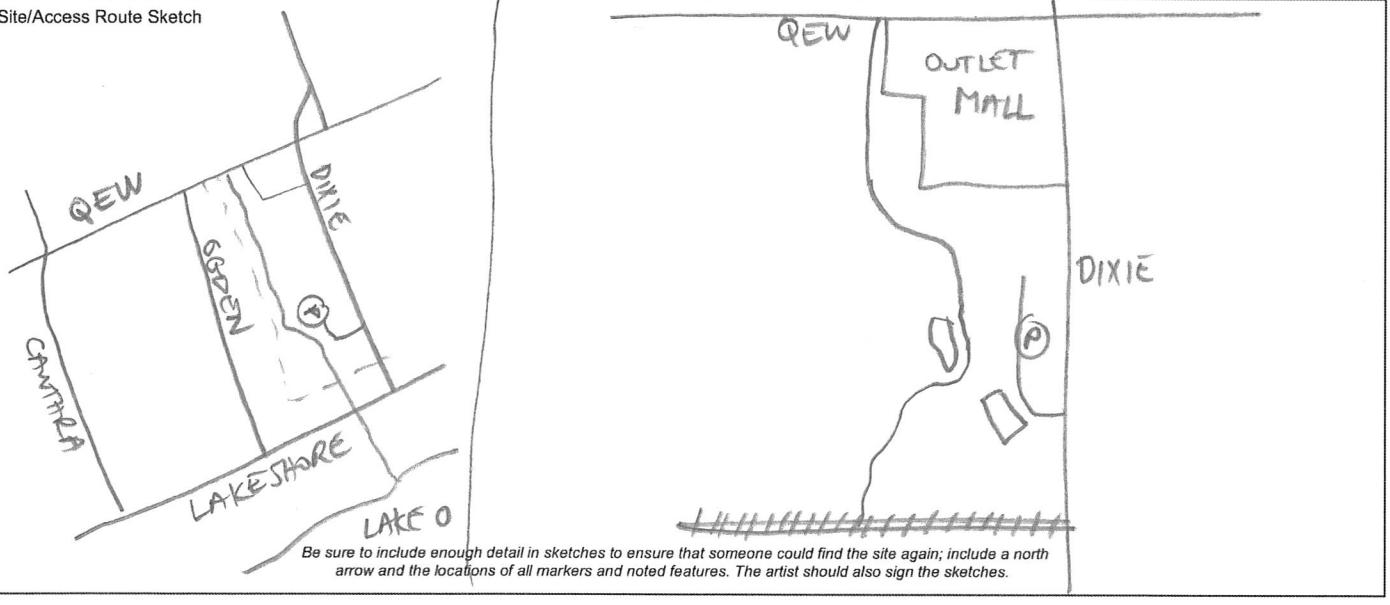
Site Description

LAKEVIEW GOLF CLUB - SITE FROM SOUTH BOUNDARY TO NORTH BOUNDARY

☐ **Site Was Unsampleable** - *add reason on reverse*

Sketches

Site/Access Route Sketch



Be sure to include enough detail in sketches to ensure that someone could find the site again; include a north arrow and the locations of all markers and noted features. The artist should also sign the sketches.

Photo No.	Photo Name	Photo Description

Comments

GOLF COURSE, REALIGNED W GABION BANKS,

Crew Leader (init. & last name)	Crew	Recorder	Entered	Verified	Corrected
GEBY	N JANETZ	GE			

Site Features

Mandatory Fields In Grey
Must be filled out for processing

Stream Code: APLWD | Site Code: APLWD-01 | Sample: 01 | Date (mm-dd): 2019 04-09

Stream Name: APPLEWOOD CREEK

For each landuse, check box that applies. Be sure to include comments explaining the particulars, including names and numbers of contacts

Site Features	Ongoing & Active	Historical Evidence	No Evidence but Reported	No Evidence	Unknown	Comments
Potential Point or Non-point Source Contaminant Sources	☒	☐	☐	☐	☐	GOLF CLUB
Major Nutrient Sources Upstream	☒	☐	☐	☐	☐	GOLF CLUB
Channel Hardening or Straightening	☒	☐	☐	☐	☐	GOLF CLUB, GABION LINED
Adjacent Landuses that Destabilize Banks	☒	☐	☐	☐	☐	GOLF CLUB
Sediment Loading or Deprivation	☐	☐	☐	☒	☐	
Instream Habitat Modifications	☒	☐	☐	☐	☐	GABION LINED
Barriers and/or Dams in the Vicinity of the Site	☐	☐	☐	☒	☐	
High Fishing Pressure	☐	☐	☐	☒	☐	
Log Jam Deflectors	☐	☐	☐	☒	☐	
Springs or Seeps at the Site	☐	☐	☐	☒	☐	
Impervious Substrate Limiting Burrowing Depth of Fish	☐	☐	☐	☒	☐	
Fish Stocked Near Sample Site	☐	☐	☐	☒	☐	
Other Activities that Could Influence Biota or Habitat	☐	☐	☐	☒	☐	
Intensive Logging Activitties within the Riparian Zone	☐	☐	☐	☒	☐	

Sources of Information
Visual Immediate ☒ Visual Extended ☐ Interview ☐ Maps & Photos ☐

Temperatures
Time (24hr): ~~1200~~ Air Temp (°C):
Water Temp (°C): Max Air Temp (°C):
Max. Water Temp (°C): Source of Max. Air Temp:

Riparian Vegetation Community
Only check one box for each bank and zone.

Riparian Zone	Left Bank: None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-lands	Right Bank: None	Lawn	Crop-land	Mea-dow	Scrub-land	Forest	Wet-lands
1.5-10m	☐	☒	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐
10-30m	☐	☒	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐
30-100m	☐	☒	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐

Comments: SPOTS W WOODLAND ON BANKS (SEE PHOTOS)

Crew Leader (initial & last name): GEBY

Crew Initials: N SCHWETZ | Recorder: CB | Ent/Scanned | Verified | Corrected

Rapid Assessment Methodology Field Form

Mandatory Fields In Grey
Must be filled out for processing

Stream Code: APLWD | Site Code: APLWD-02 | Sample: 01

Date: YY 19 – MM 04 – DD 09

Site Type: ☐ Calibration ☒ Survey

Stream Name: APPLEWOOD CREEK

Crew Leader (initial & last name): GEBY

Crew: N. SCHWETZ

Recorder: GE

Channel Structure

Depth (mm)	Pools (Hydraulic Head = 0-3 mm)		Glides (Hydraulic Head = 4-7 mm)		Slow Riffles (Hydraulic Head = 8-17 mm)		Fast Riffles (Hydraulic Head > 17 mm)	
	No Cover	Cover Present	No Cover	Cover Present	No Cover	Cover Present	No Cover	Cover Present
0 - 100 mm				01		18	03	14
101 - 600 mm	14	04	07	17				05
601 - 1000 mm								
> 1000 mm								
Total # Points	14	04	07	18		18	03	19

Note: Grey hatched areas are for tally marks.

Instream Cover

Cover Types	Flat Rock	Round Rock	Wood	Macrophytes	Bank	Other
Number of Points	21	30	02	01	11	

Substrate Types

	Fines (<2 mm)	Gravel (2-100 mm)	Cobble (100-1000mm)	Bedrock (>1000mm)	gavia feces
Point Particle	33	36	07		
Maximum Particle		32	48		

Bank Stability

Mean Stream Width (m): 2.5 | Mean Depth at Crossover (mm): 15 | Maximum Particle Size (mm): 400

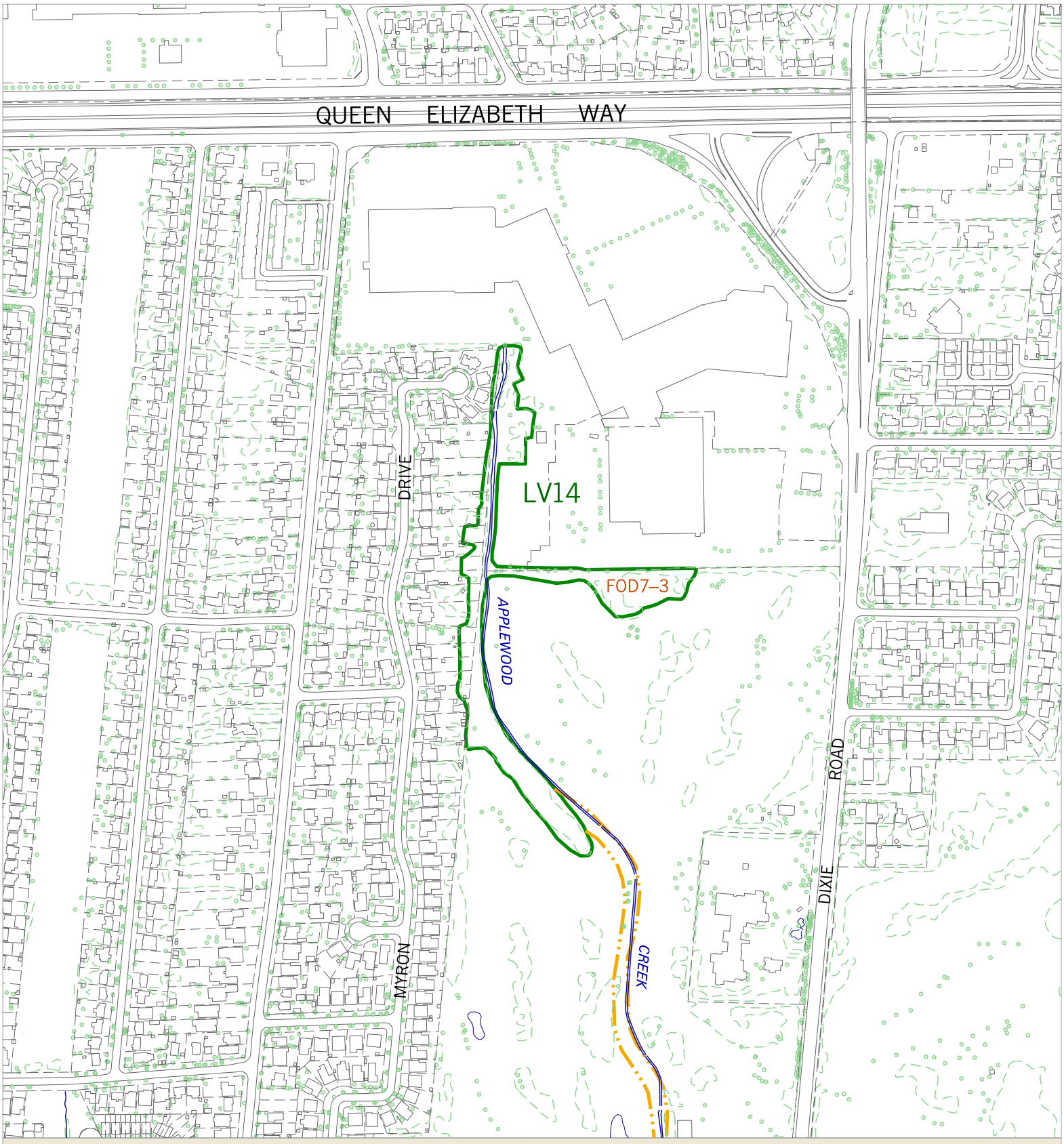
Eroding Bank		Angle > 45°, erodible soil, undercut or bare soil
Vulnerable Bank	11 FAILED GABION	Angle > 45°, erodible soil, no sign of recent erosion ☒
Protected Bank	15 GABION LINED	Angle > 45°, non-erodible material/soil ☒
Deposition Zone		Angle < 45°, (gradual slope from river), fine grained sediments

Comments

ISLAND PRESENT MACROPHYTES 13 TRANSECTS
DEAD CYPRINID ALGA - FILAMENTOUS/ATTACHED

Ent/Scanned	Verified	Corrected

Appendix C – 2018 Natural Areas System Updates, Site LV14



Natural AREAS SYSTEM

2017 NATURAL AREAS UPDATE

SITE LV14

NATURAL AREAS SYSTEM CLASSIFICATION

- NATURAL AREAS
- VEGETATION COMMUNITIES
- SPECIAL MANAGEMENT AREAS
- LINKAGES

0 20 40 60 80
metres

MISSISSAUGA

City of Mississauga Natural Areas Survey (2016)

Natural Areas Fact Sheet

Natural Area Name	Planning District	Area (ha)	UTM Grid Reference
LV14 (Lakeview Golf Course)	Lakeview	2.31	6156 48272

1. **Location**
South of the Queen Elizabeth Way, between Dixie Road and Myron Drive. Applewood Creek links this site with natural area LV1.

2. **Classification**
Significant Natural Area

3. **Description**

A. **Physical Features**

This site is located in the floodplain of Applewood Creek. The creek is engineered through this site. The topography is level. Soil is well drained Fox sandy loam in the north half of the site, and imperfectly drained Chinguacousy clay loams in the south, both which developed within the Iroquois Sand Plain deposits. These deposits are underlain by bedrock geology consisting of the grey shales of the Georgian Bay Formation.

B. **Biota**

There are 100 floral species and 24 faunal species documented for this site. This site (see accompanying figure) is comprised of fresh-moist willow lowland deciduous forest type (FOD7-3).

Fresh-moist Willow Lowland Deciduous Forest Type (FOD7-3)

The canopy is comprised of Norway Maple (*Acer platanoides*), Manitoba Maple (*Acer negundo*), and scattered mature willows (*Salix* spp.). Canopy trees are 10-25 m in height and cover 25- 60% of the community. Sub-canopy trees are Manitoba Maple, willows, and White Mulberry (*Morus alba*). Sub-canopy trees are 2-10 m in height and cover 25-60% of the community. The understory is dominated by Riverbank Grape (*Vitis riparia*), Hedge Bindweed (*Calystegia sepium*), and the invasive species Multiflora Rose (*Rosa multiflora*), and Tartarian Honeysuckle (*Lonicera tatarica*). Understory vegetation is 1-2 m in height and covers greater than 60% of the community. Ground layer vegetation is dominated by a dense layer of garlic mustard (*Alliaria petiolata*). Riverbank Grape and Spotted Lady's-thumb (*Persicaria maculosa*) also occur in the ground layer. The ground layer is 0.2-0.5 m height and covers greater than 60% of the community.

There are 23 bird and 1 mammal (Grey Squirrel) species recorded for this area. This natural area supports common species of forest edges, such as American Robin, Northern Cardinal and Common Grackle. Eastern Kingbird and Yellow Warbler were noted in 2012. No area-sensitive species have been documented from this site. Applewood Creek is classified as a type 2 fishery in this site.

4. **Condition**

This site is currently in poor condition and disturbances are prevalent. Within many of the private lots that back onto the creek and within the golfcourse, the ground has been manicured to the creek banks. Some erosion is occurring on the creek banks and gabion baskets and concrete have been used in places to control erosion. The channel behind Dixie Outlet Mall has been repaired. Some gully erosion on the east slope, adjacent to the bridge, was noted in 1999 and one of the retaining walls north of the bridge was leaning. The presence of a layer of silt on the floodplain vegetation in 2012 indicates excessive flooding episodes which severely impacts native floodplain ground flora. Invasive plant species include Garlic Mustard, Multiflora Rose, European Buckthorn (*Rhamnus cathartica*), Manitoba Maple, Norway Maple,

4. **CONDITION** continued…

and Tartarian Honeysuckle. Fifty-one introduced plant species are present at this site (representing 51.00% of the total number of species present). This is a very high proportion of exotic species. The native FQI is 18.71 and the native mean coefficient is 2.67[1], both of which are very low values. The native FQI and the native mean coefficient have increased since 2012 from 16.66 and 2.57, respectively. Surrounding land use is a golf course, residential and commercial (mall).

5. **SIGNIFICANCE**

- 1 Credit Valley Conservation flora Species of Conservation Concern (Tier 1-3): Red Pine (*Pinus resinosa*) which is likely planted.
- 7 Credit Valley Conservation fauna Species of Conservation Concern (Tier 1-3).
- Contributes to the linkage function of Applewood Creek.
- Floodplain provides floodwater storage for Applewood Creek.

6. **MANAGEMENT NEEDS**

- The City Park, Lakeview Golf Course, is included within this natural area.
- A naturalization programme for the golf course should be investigated.
- Riparian vegetation along the creek should be restored and an un-manicured buffer established.

7. **PRINCIPLE REFERENCES**

City of Mississauga (1978b)
Transportation and Works (1998)

1. Floristic quality is explained in the introduction.

Appendix D – Detailed Tree Inventory

Tag #	Species Name		Tree Dimensions		Health Condition	Notes
	Scientific Name	Common Name	DBH (cm)	Crown Reserve (m)		
217	*Tilia americana*	Basswood	62, 35	12.0	P-F	Cavity at base of tree. Dead and broken branches.
218	*Acer negundo*	Manitoba Maple	64	10.0	F	Broken leader and cracks.
219	*Acer negundo*	Manitoba Maple	14, 7	5.0	P-F	Broken branches, suckers. Previously pruned.
220	*Acer negundo*	Manitoba Maple	17, 16	5.0	F	Codominant leaders. Extensive grape on tree.
221	*Tilia americana*	Basswood	20	6.0	G	
222	*Acer negundo*	Manitoba Maple	47	10.0	P-F	Main branch split and cracked off. Now large open wound.
223	*Acer negundo*	Manitoba Maple	18, 10, 10, 6	6.0	F	Grape on tree. Epicormic shoots.
225	*Acer negundo*	Manitoba Maple	20, 16, 7	4.0	F	Grape on tree.
226	*Acer negundo*	Manitoba Maple	26, 12, (6<10)	7.0	F	Grape on tree.
227	*Acer negundo*	Manitoba Maple	36, 40	14.0	F	Broken branches with decaying third stump.
228	*Acer negundo*	Manitoba Maple	41	9.0	F	Broken branches with decaying third stump.
229	*Acer negundo*	Manitoba Maple	28	6.0	F-G	
230	*Acer saccharum*	Sugar Maple	52	12.0	F-G	Lean towards creek 75 degrees.
231	*Tilia americana*	Basswood	20, 16	7.0	F	Suckers; dead twigs. Growth impeded by #230.
232	*Acer saccharum*	Sugar Maple	8	14.0	G	
233	*Acer negundo*	Manitoba Maple	10	31.0	F	
234	*Fraxinus americana*	White Ash	40, 53	10.0	P	Emerald Ash Borer (EAB).
235	*Acer negundo*	Manitoba Maple	16	5.0	F	
236	*Fraxinus americana*	White Ash	19	4.0	P	EAB.
237	*Acer negundo*	Manitoba Maple	19	5.0	F	Dead twigs.
238	*Acer negundo*	Manitoba Maple	17	5.0	F	
239	*Juglans nigra*	Black Walnut	23	7.0	F	Canopy pushed down by woodland trees.
240	*Acer saccharum*	Sugar Maple	55	14.0	G	
241	*Fraxinus americana*	White Ash	33	10.0	P	EAB.
242	*Acer saccharum*	Sugar Maple	13	7.0	G	
243	*Acer saccharum*	Sugar Maple	13	7.0	G	
244	*Fraxinus americana*	White Ash	35	10.0	P	EAB.
245	*Juglans nigra*	Black Walnut	15	6.0	F-G	
246	*Prunus serotina*	Black Cherry	23	7.0	G	
247	*Acer negundo*	Manitoba Maple	42	10.0	G	
248	*Fraxinus americana*	White Ash	16	5.0	P	EAB.
249	*Fraxinus americana*	White Ash	17	5.0	P	EAB.
250	*Acer saccharum*	Sugar Maple	12	5.0	G	
251	*Acer saccharum*	Sugar Maple	27	12.0	G	
252	*Acer saccharum*	Sugar Maple	11	5.0	G	
253	*Acer negundo*	Manitoba Maple	20	7.0	F-G	Suckers. Previously pruned.
254	*Acer negundo*	Manitoba Maple	26	7.0	F-G	Lean towards creek. 2 stems joined.
255	*Acer negundo*	Manitoba Maple	19, 22, 37	12.0	F	Dead branches.
256	*Acer platanoides*	Norway Maple	22	6.0	G	
257	*Acer negundo*	Manitoba Maple	13	4.0	F	Broken branches.
258	*Acer platanoides*	Norway Maple	14	5.0	G	
259	*Juglans cinerea*	Butternut	19	5.0	F	
260	*Acer platanoides*	Norway Maple	36	7.0	G	
261	*Acer platanoides*	Norway Maple	24	10.0	G	
262	*Fraxinus americana*	White Ash	20	6.0	P	
263	*Acer negundo*	Manitoba Maple	12	5.0	F	Suckers.
264	*Acer platanoides*	Norway Maple	15	6.0	G	
265	*Acer negundo*	Manitoba Maple	26, 20	10.0	G	
266	*Ulmus pumila*	Siberian Elm	18	6.0	F-G	
267	*Acer negundo*	Manitoba Maple	14	5.0	F-G	
268	*Acer negundo*	Manitoba Maple	15	6.0	P-F	
269	*Acer negundo*	Manitoba Maple	16	5.0	P-F	
270	*Acer negundo*	Manitoba Maple	24	7.0	F	
271	*Acer negundo*	Manitoba Maple	11	4.0	F	
272	*Prunus avium*	Sweet Cherry	11	4.0	F	
273	*Acer negundo*	Manitoba Maple	14	5.0	F	
274	*Acer negundo*	Manitoba Maple	43	11.0	F	
275	*Acer negundo*	Manitoba Maple	17, 13	6.0	F	
276	*Acer saccharum*	Sugar Maple	10	4.0	G	
277	*Fraxinus americana*	White Ash	14	0.0	D	
278	*Fraxinus americana*	White Ash	32	0.0	D	
279	*Salix x rubens*	Crack Willow	44	10.0	P	Decay at base. Tree fallen over and leaning.
280	*Acer platanoides*	Norway Maple	17	6.0	F-G	
281	*Fraxinus americana*	White Ash	21	4.0	P	EAB.
282	*Acer negundo*	Manitoba Maple	12	4.0	F-G	
283	*Fraxinus americana*	White Ash	35	10.0	P	EAB.
284	*Salix x rubens*	Crack Willow	~80 (2 stems)	12.0	F	Broken branches. Base rot in 1 stem.
285	*Prunus avium*	Sweet Cherry	14	5.0	F-G	
286	*Acer negundo*	Manitoba Maple	13	4.0	F-G	
287	*Acer negundo*	Manitoba Maple	11	4.0	F-G	
288	*Acer negundo*	Manitoba Maple	12	4.0	F-G	
289	*Salix x rubens*	Crack Willow	~100 (3 stems)	18.0	P-F	Trunk rot at base.
290	*Prunus avium*	Sweet Cherry	12	4.0	F-G	
291	*Betula papyrifera*	White Birch	19	5.0	F-G	Growing from #290.
292	*Ulmus pumila*	Siberian Elm	20	6.0	F-G	
293	*Salix x rubens*	Crack Willow	~60	10.0	P-F	Rot in trunk.
294	*Acer negundo*	Manitoba Maple	18	5.0	F-G	
295	*Acer negundo*	Manitoba Maple	11	4.0	G	
296	*Juglans nigra*	Black Walnut	17	5.0	G	
297	*Prunus serotina*	Black Cherry	13	5.0	G	
298	*Prunus serotina*	Black Cherry	13	5.0	G	
299	*Ulmus pumila*	Siberian Elm	13	4.0	F	
300	*Prunus serotina*	Black Cherry	19	6.0	F	

Tag #	Species Name		Tree Dimensions		Health Condition	Notes
	Scientific Name	Common Name	DBH (cm)	Crown Reserve (m)		
301	*Acer saccharinum*	Silver Maple	129	24.0	F	Internal rot between 2 stems. DBH taken below joint.
302	*Acer saccharum*	Sugar Maple	48	8.0	G	
303	*Acer saccharum*	Sugar Maple	49	10.0	G	
304	*Acer saccharinum*	Silver Maple	67	9.0	G	
305	*Acer saccharinum*	Silver Maple	64	9.0	G	
306	*Acer saccharinum*	Silver Maple	48	9.0	G	
307	*Fraxinus pennsylvanica*	Green Ash	49	0.0	D	
308	*Fraxinus pennsylvanica*	Green Ash	56	10.0	P	
309	*Fraxinus pennsylvanica*	Green Ash	35	7.0	P	
310	*Juglans nigra*	Black Walnut	54	14.0	G	
311	*Thuja occidentalis*	White Cedar	34	6.0	F-G	
312	*Thuja occidentalis*	White Cedar	37	6.0	F-G	
313	*Fraxinus americana*	White Ash	68	10.0	P	EAB and suckers.
314	*Ulmus rubra*	Red Elm	82	20.0	G	
315	*Prunus avium*	Sweet Cherry	17, 20	5.0	F	Dead stem. Previously pruned.
316	*Fraxinus pennsylvanica*	Green Ash	13	5.0	P	EAB.
317	*Acer negundo*	Manitoba Maple	15	6.0	F	Growing into gabion basket.
318	*Juglans nigra*	Black Walnut	26	8.0	G	Growing into gabion basket.
319	*Fraxinus pennsylvanica*	Green Ash	22	6.0	P	EAB.
320	*Juglans nigra*	Black Walnut	25	6.0	F	Topped. No central leader.
321	*Fraxinus pennsylvanica*	Green Ash	13	3.0	P	EAB.
322	*Fraxinus pennsylvanica*	Green Ash	16	4.0	P	EAB.
323	*Salix x rubens*	Crack Willow	~100	15.0	F	Broken limbs and cracked bark.
324	*Salix x rubens*	Crack Willow	68	15.0	F	1 stem removed.
325	*Acer saccharum*	Sugar Maple	9	4.0	G	
326	*Acer saccharinum*	Silver Maple	28, 40	10.0	F-G	2 main stems. Lean towards creek.
327	*Acer saccharinum*	Silver Maple	23, 20, 24, 25, 15	15.0	G	Lean towards creek.
328	*Acer saccharinum*	Silver Maple	23	6.0	G	Lean towards creek.
329	*Acer negundo*	Manitoba Maple	17	10.0	F	Lean towards creek, tree almost horizontal. Rubbing branches.
330	*Acer saccharinum*	Silver Maple	15	5.0	F	Suckers.
331	*Ulmus pumila*	Siberian Elm	12	2.0	F	Trunk wounds and suckers.
332	*Fraxinus pennsylvanica*	Green Ash	8	3.0	P	Suckers.
333	*Acer saccharinum*	Silver Maple	24, 26	6.0	P	Growing into gabion basket. Lean towards creek.
334	*Acer saccharinum*	Silver Maple	9	3.0	F	Suckers.
335	*Acer saccharinum*	Silver Maple	18	5.0	P-F	Suckers. Improperly pruned (split branches).
336	*Acer negundo*	Manitoba Maple	11	4.0	F	Suckers. Lean towards creek.
337	*Acer negundo*	Manitoba Maple	13, 10	4.0	F	Suckers. Lean towards creek.
338	*Salix x rubens*	Crack Willow	65	11.0	F	Suckers. Lean towards creek.
339	*Salix x rubens*	Crack Willow	75	12.0	P-F	1 stem removed. Decay and suckers.
340	*Acer negundo*	Manitoba Maple	25	4.0	P-F	1 stem removed.
341	*Acer negundo*	Manitoba Maple	10	3.0	F	Lean towards creek.
342	*Acer negundo*	Manitoba Maple	13	4.0	F-G	Lean towards creek.
343	*Malus* sp.	Apple Species	11	3.0	F-G	
344	*Acer negundo*	Manitoba Maple	25	7.0	F-G	Lean towards creek.
345	*Acer negundo*	Manitoba Maple	11, 11, 8	6.0	F-G	
346	*Salix x rubens*	Crack Willow	32, 23, 42	15.0	F-G	Suckers. 1 stem previously removed.
347	*Salix x rubens*	Crack Willow	54, 81	12.0	F	Cavity ~2.5 m up tree.
348	*Fraxinus pennsylvanica*	Green Ash	21	4.0	P	EAB.
349	*Acer negundo*	Manitoba Maple	28	5.0	P	Lean over creek. Broken and dead branches.
350	*Acer negundo*	Manitoba Maple	12	5.0	F-G	
351	*Acer negundo*	Manitoba Maple	14	5.0	F-G	
352	*Salix x rubens*	Crack Willow	80	18.0	F-G	
353	*Acer negundo*	Manitoba Maple	16, 34, 17, 18	8.0	F-G	Lean over creek.
354	*Tilia amercana*	Basswood	9	3.0	G	
355	*Fraxinus pennsylvanica*	Green Ash	15, 7	3.0	P	EAB.
356	*Fraxinus pennsylvanica*	Green Ash	30	4.0	P	EAB.
357	*Fraxinus pennsylvanica*	Green Ash	12	3.0	P	Previously pruned. Root girdling. Ash growing with tree.
358	*Acer negundo*	Manitoba Maple	25, 36, 18-ash	8.0	F	EAB.
359	*Salix x rubens*	Crack Willow	66	10.0	F-G	Broken twigs. Gypsey moth egg masses.
360	*Salix x rubens*	Crack Willow	~80, ~70	12.0	F-G	Broken twigs. Growing next to pipe.
361	*Fraxinus pennsylvanica*	Green Ash	13, 10	2.0	P	EAB.
362	*Fraxinus pennsylvanica*	Green Ash	28	6.0	P	
363	*Ulmus americana*	White Elm	10	2.0	F-G	
NT1	*Fraxinus pennsylvanica*	Green Ash	10	2.0	P	Beside #363 at creek. EAB.
364	*Morus alba*	White Mulberry	12, 7, 6	3.0	F-G	
365	*Fraxinus pennsylvanica*	Green Ash	10, 8	4.0	P	In gabion basket. EAB.
366	*Acer negundo*	Manitoba Maple	10	3.0	F-G	
367	*Ulmus pumila*	Siberian Elm	23	5.0	P	In gabion basket.
368	*Ulmus pumila*	Siberian Elm	20	5.0	P	In gabion basket.
369	*Morus alba*	White Mulberry	16	4.0	P-F	On slope above gabion.
370	*Morus alba*	White Mulberry	14, 10	4.0	F	On slope above gabion.
371	*Pinus sylvestris*	Scots Pine	32, 37	7.0	F	Codominant stems.
372	*Fraxinus pennsylvanica*	Green Ash	28	7.0	P	EAB.
373	*Prunus serotina*	Black Cherry	23, 22	8.0	F-G	
374	*Juglans nigra*	Black Walnut	25	7.0	F-G	Roots in gabion.
375	*Juglans nigra*	Black Walnut	17	7.0	F-G	Roots in gabion.
376	*Fraxinus pennsylvanica*	Green Ash	10	3.0	P	EAB.
377	*Prunus avium*	Sweet Cherry	10	3.0	F-G	
378	*Fraxinus pennsylvanica*	Green Ash	11	3.0	P	EAB.
379	*Betula papyrifera*	White Birch	61	11.0	P	Decay at base. Dead branches.
380	*Fraxinus pennsylvanica*	Green Ash	11	3.0	P	EAB.
381	*Fraxinus pennsylvanica*	Green Ash	17	4.0	P	EAB.
382	*Fraxinus pennsylvanica*	Green Ash	12	3.0	P	EAB.

Tag #	Species Name		Tree Dimensions		Health Condition	Notes
	Scientific Name	Common Name	DBH (cm)	Crown Reserve (m)		
383	*Betula papyrifera*	White Birch	34	7.0	F	Exposed roots lifting up.
384	*Betula papyrifera*	White Birch	26	6.0	F	Exposed roots lifting up.
385	*Thuja occidentalis*	White Cedar	30, 25, 12	6.0	F-G	Included bark.
386	*Cornus alternifolia*	Alternate-leaved Dogwood	10	3.0	G	
387	*Fraxinus pennsylvanica*	Green Ash	57	9.0	P	EAB.
388	*Thuja occidentalis*	White Cedar	24, 13	4.0	F	Growing with #387
389	*Thuja occidentalis*	White Cedar	20	4.0	F	Sealing trunk wound.
390	*Cornus alternifolia*	Alternate-leaved Dogwood	11	4.0	G	
391	*Thuja occidentalis*	White Cedar	25	4.0	F	Roots lifting.
392	*Thuja occidentalis*	White Cedar	23	4.0	G	
393	*Morus alba*	White Mulberry	19	5.0	G	
394	*Thuja occidentalis*	White Cedar	28	4.0	F-G	Lean towards creek.
395	*Thuja occidentalis*	White Cedar	34, 21	5.0	G	
396	*Fraxinus pennsylvanica*	Green Ash	12	3.0	P	EAB.
397	*Acer saccharinum*	Silver Maple	14	4.0	F-G	Suckers.
398	*Fraxinus pennsylvanica*	Green Ash	12	4.0	P	EAB.
399	*Betula papyrifera*	White Birch	15	4.0	F	Lean towards creek.
400	*Fraxinus pennsylvanica*	Green Ash	13	3.0	P	EAB.
1301	*Thuja occidentalis*	White Cedar	16	3.0	F	Bleaching 1/2 of trunk.
1302	*Fraxinus pennsylvanica*	Green Ash	16	4.0	P	EAB.
1303	*Tilia americana*	Basswood	24, 42, 42	11.0	F	Previously pruned. Decaying in pruned trunk.
1304	*Cornus alternifolia*	Alternate-leaved Dogwood	10	4.0	G	
1305	*Prunus* sp.	Plum species	10	4.0	G	
1306	*Prunus* sp.	Plum species	9	4.0	G	
1307	*Fraxinus pennsylvanica*	Green Ash	13	4.0	P	EAB.
1308	*Juglans nigra*	Black Walnut	26	7.0	G	
1309	*Fraxinus pennsylvanica*	Green Ash	16	3.0	P	EAB.
1310	*Fraxinus pennsylvanica*	Green Ash	11	3.0	P	EAB.
1311	*Fraxinus pennsylvanica*	Green Ash	10	3.0	P	EAB.
1312	*Fraxinus pennsylvanica*	Green Ash	11	3.0	P	EAB.
1313	*Fraxinus pennsylvanica*	Green Ash	21	4.0	P	EAB.
1314	*Juglans nigra*	Black Walnut	12	6.0	G	
1315	*Picea glauca*	White Spruce	20	5.0	G	
1316	*Pinus sylvestris*	Scots Pine	57	9.0	G	
1317	*Pinus sylvestris*	Scots Pine	47	8.0	G	
1318	*Pinus sylvestris*	Scots Pine	35	6.0	F-G	1 broken branch.
1319	*Juglans nigra*	Black Walnut	52	12.0	G	
1320	*Juglans nigra*	Black Walnut	60	12.0	F	Trunk wound - sealing with rot.
1321	*Juglans nigra*	Black Walnut	56	12.0	G	

Appendix E – Stage 1 Archaeological Study Report by ASI

STAGE 1 ARCHAEOLOGICAL ASSESSMENT
APPLEWOOD CREEK EROSION CONTROL
PART OF LOT 6, CONCESSION 2 SDS
(FORMER TOWNSHIP OF TORONTO, COUNTY OF PEEL)
CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL, ONTARIO

ORIGINAL REPORT

Prepared for:

Aquafor Beech Ltd.
2600 Skymark Avenue, Building 6, Suite 202
Mississauga, ON L4W 5B2

Archaeological Licence #P094 (Merritt)
Ministry of Tourism, Culture and Sport PIF# P094-0309-2019
ASI File: 18EA-211

28 June 2019

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Stage 1 Archaeological Assessment
Applewood Creek Erosion Control
Part of Lot 6, Concession 2 SDS
(Former Township of Toronto, County of Peel)
City of Mississauga
Regional Municipality of Peel, Ontario

EXECUTIVE SUMMARY

ASI was contracted by Parsons to conduct a Stage 1 Archaeological Assessment (Background Research and Property Inspection) as part of the Applewood Creek Restoration, in the City of Mississauga. This project involves the restoration of approximately 1,300 meters of Applewood Creek, from the south of the Dixie Outlet Mall to the CN Rail, extending through Lakeview Golf Course.

The Stage 1 background study determined that one previously registered archaeological site is located within one kilometre of the Study Area. The property inspection determined that the Study Area exhibits archaeological potential.

In light of these results, the following recommendations are made:

1. The Study Area exhibits archaeological potential. These lands require Stage 2 archaeological assessment by test pit survey at five metre intervals, if impacted, prior to any proposed construction activities;

2. Parts of the Lakeview Golf Course should be subject to Stage 2 judgmental test pit survey to confirm the extent of disturbance due to past landscaping. Should intact soils be identified, test pit survey should resume at five metre intervals;

3. The remainder of the Study Area does not retain archaeological potential on account of deep and extensive land disturbance or slopes in excess of 20 degrees. These lands do not require further archaeological assessment; and,

4. Should the proposed work extend beyond the current Study Area, further Stage 1 archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

ASI

PROJECT PERSONNEL

Senior Project Manager:	Lisa Merritt, MSc. (P094) *Partner | Director* *Environmental Assessment Division*
Project Coordinator:	Katrina Thach, Hon. BA (R1225) *Archaeologist | Project Coordinator* *Environmental Assessment Division*
Project Director (Licensee):	Jessica Lytle, MSc (P1066) *Associate Archaeologist | Project Manager* *Environmental Assessment Division*
Project Manager:	Eliza Brandy, MA (R1109) *Associate Archaeologist | Project Manager* *Environmental Assessment Division*
Field Director:	Andrew Clish, BES (P046) *Senior Archaeologist | Senior Field Director, Laboratory and Fieldwork Services* *Operations Division*
Report Preparation:	Eliza Brandy
Graphics:	Jonas Fernandez, MSc (R281) *Archaeologist | Assistant Manager - Fleet & Geomatics Specialist* *Operations Division*
Report Reviewer:	Lisa Merritt

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1.0 PROJECT CONTEXT

Archaeological Services Inc. (ASI) was contracted by Parsons to conduct a Stage 1 Archaeological Assessment (Background Research and Property Inspection) as part of the Applewood Creek Restoration, in the City of Mississauga. This project involves the restoration of approximately 1,300 meters of Applewood Creek, from the south of the Dixie Outlet Mall to the CN Rail, extending through Lakeview Golf Course (Figure 1).

All activities carried out during this assessment were completed in accordance with the *Ontario Heritage Act* (1990, as amended in 2018) and the 2011 *Standards and Guidelines for Consultant Archaeologists* (S & G), administered by the Ministry of Tourism, Culture and Sport (MTCS 2011).

1.1 Development Context

All work has been undertaken as required by the *Environmental Assessment Act*, RSO (Ministry of the Environment 1990 as amended 2010) and regulations made under the Act, and are therefore subject to all associated legislation. This project is being conducted in accordance with the Municipal Engineers' Association document *Municipal Class Environmental Assessment* (2000 as amended in 2007, 2011 and 2015).

Authorization to carry out the activities necessary for the completion of the Stage 1 archaeological assessment was granted by Aquafor Beech Limited on May 3, 2019.

1.2 Historical Context

The purpose of this section, according to the S & G, Section 7.5.7, Standard 1, is to describe the past and present land use and the settlement history and any other relevant historical information pertaining to the Study Area. A summary is first presented of the current understanding of the Indigenous land use of the Study Area. This is then followed by a review of the historical Euro-Canadian settlement history.

1.2.1 Indigenous Land Use and Settlement

Southern Ontario has been occupied by human populations since the retreat of the Laurentide glacier approximately 13,000 years before present (BP) (Ferris 2013). Populations at this time would have been highly mobile, inhabiting a boreal-parkland similar to the modern sub-arctic. By approximately 10,000 BP, the environment had progressively warmed (Edwards and Fritz 1988) and populations now occupied less extensive territories (Ellis and Deller 1990).

Between approximately 10,000-5,500 BP, the Great Lakes basins experienced low-water levels, and many sites which would have been located on those former shorelines are now submerged. This period produces the earliest evidence of heavy wood working tools, an indication of greater investment of labour in felling trees for fuel, to build shelter, and watercraft production. These activities suggest prolonged seasonal residency at occupation sites. Polished stone and native copper implements were being produced by approximately 8,000 BP; the latter was acquired from the north shore of Lake Superior, evidence of extensive exchange networks throughout the Great Lakes region. The earliest evidence for cemeteries dates to approximately 4,500-3,000 BP and is indicative of increased social organization, investment of

labour into social infrastructure, and the establishment of socially prescribed territories (Ellis et al. 1990; Ellis et al. 2009; Brown 1995:13).

Between 3,000-2,500 BP, populations continued to practice residential mobility and to harvest seasonally available resources, including spawning fish. The Woodland period begins around 2,500 BP and exchange and interaction networks broaden at this time (Spence et al. 1990:136, 138) and by approximately 2,000 BP, evidence exists for macro-band camps, focusing on the seasonal harvesting of resources (Spence et al. 1990:155, 164). By 1,500 BP there is macro botanical evidence for maize in southern Ontario, and it is thought that maize only supplemented people's diet. There is earlier phytolithic evidence for maize in central New York State by 2,300 BP - it is likely that once similar analyses are conducted on Ontario ceramic vessels of the same period, the same evidence will be found (Birch and Williamson 2013:13–15). Bands likely retreated to interior camps during the winter. It is generally understood that these populations were Algonquian-speakers during these millennia of settlement and land use.

From the beginning of the Late Woodland period at approximately 1,000 BP, lifeways became more similar to that described in early historical documents. Between approximately 1000-1300 Common Era (CE), the communal site is replaced by the village focused on horticulture. Seasonal disintegration of the community for the exploitation of a wider territory and more varied resource base was still practised (Williamson 1990:317). By 1300-1450 CE, this episodic community disintegration was no longer practised and populations now communally occupied sites throughout the year (Dodd et al. 1990:343). From 1450-1649 CE this process continued with the coalescence of these small villages into larger communities (Birch and Williamson 2013). Through this process, the socio-political organization of the First Nations, as described historically by the French and English explorers who first visited southern Ontario, was developed. By 1600 CE, the communities within Simcoe County had formed the Confederation of Nations encountered by the first European explorers and missionaries. In the 1640s, the traditional enmity between the Haudenosaunee[1]and the Huron-Wendat (and their Algonquian allies such as the Nippissing and Odawa) led to the dispersal of the Huron-Wendat.

Shortly after dispersal of the Wendat, Ojibwa began to expand into southern Ontario and Michigan from along the east shore of Georgian Bay, west along the north shore of Lake Huron, and along the northeast shore of Lake Superior and onto the Upper Peninsula of Michigan (Rogers 1978:760–762). This history was constructed by Rogers using both Anishinaabek oral tradition and the European documentary record, and notes that it included Chippewa, Ojibwa, Mississauga, and Saulteaux or "Southeastern Ojibwa" groups. Ojibwa, likely Odawa, were first encountered by Samuel de Champlain in 1615 along the eastern shores of Georgian Bay. Etienne Brule later encountered other groups and by 1641, Jesuits had journeyed to Sault Sainte Marie (Thwaites 1896:11:279) and opened the Mission of Saint Peter in 1648 for the occupants of Manitoulin Island and the northeast shore of Lake Huron. The Jesuits reported that these Algonquian peoples lived "solely by hunting and fishing and roam as far as the "Northern sea" to trade for " Furs and Beavers, which are found there in abundance" (Thwaites 1896-1901, 33:67), and "all of these Tribes are nomads, and have no fixed residence, except at certain seasons of the year, when fish are plentiful, and this compels them to remain on the spot" (Thwaites 1896-1901, 33:153). Algonquian-speaking groups were historically documented wintering with the Huron-Wendat, some who abandoned their country on the shores of the St. Lawrence because of attacks from the Haudenosaunee (Thwaites 1896-1901, 27:37).

[1] The Haudenosaunee are also known as the New York Iroquois or Five Nations Iroquois and after 1722 Six Nations Iroquois. They were a confederation of five distinct but related Iroquoian–speaking groups – the Seneca, Onondaga, Cayuga, Oneida, and Mohawk. Each lived in individual territories in what is now known as the Finger Lakes district of Upper New York. In 1722 the Tuscarora joined the confederacy.

Other Algonquian groups were recorded along the northern and eastern shores and islands of Lake Huron and Georgian Bay - the "Ouasouarini" [Chippewa], the "Outchougai" [Outchougai], the "Atchiligouan" [Achiligouan] near the mouth of the French River and north of Manitoulin Island the "Amikouai, or the nation of the Beaver" [Amikwa; Algonquian] and the "Oumisagai" [Missisauga; Chippewa] (Thwaites 1896-1901, 18:229, 231). At the end of the summer 1670, Father Louys André began his mission work among the Mississagué, who were located on the banks of a river that empties into Lake Huron approximately 30 leagues from the Sault (Thwaites 1896-1901, 55:133-155).

After the Huron had been dispersed, the Haudenosaunee began to exert pressure on Ojibwa within their homeland to the north. While their numbers had been reduced through warfare, starvation, and European diseases, the coalescence of various Anishinaabek groups led to enhanced social and political strength (Thwaites 1896-1901, 52:133) and Sault Sainte Marie was a focal point for people who inhabited adjacent areas both to the east and to the northwest as well as for the Saulteaux, who considered it their home (Thwaites 1896-1901, 54:129-131). The Haudenosaunee established a series of settlements at strategic locations along the trade routes inland from the north shore of Lake Ontario. From east to west, these villages consisted of Ganneious, on Napanee Bay, an arm of the Bay of Quinte; Quinte, near the isthmus of the Quinte Peninsula; Ganaraske, at the mouth of the Ganaraska River; Quintio, at the mouth of the Trent River on the north shore of Rice Lake; Ganatsekwyagon (or Ganestiquiagon), near the mouth of the Rouge River; Teyaiagon, near the mouth of the Humber River; and Quinaouatoua, on the portage between the western end of Lake Ontario and the Grand River (Konrad 1981:135). Their locations near the mouths of the Humber and Rouge Rivers, two branches of the Toronto Carrying Place, strategically linked these settlements with the upper Great Lakes through Lake Simcoe. The inhabitants of these villages were agriculturalists, growing maize, pumpkins and squash, but their central roles were that of portage starting points and trading centres for Iroquois travel to the upper Great Lakes for the annual beaver hunt (Konrad 1974; Williamson et al. 2008:50–52). Ganatsekwyagon, Teyaiagon, and Quinaouatoua were primarily Seneca; Ganaraske, Quinte and Quintio were likely Cayuga, and Ganneious was Oneida, but judging from accounts of Teyaiagon, all of the villages might have contained peoples from a number of the Iroquois constituencies (ASI 2013).

During the 1690s, some Ojibwa began moving south into extreme southern Ontario and soon replaced, the Haudenosaunee by force. By the first decade of the eighteenth century, the Michi Saagiig Nishnaabeg (Mississauga Nishnaabeg) had settled at the mouth of the Humber, near Fort Frontenac at the east end of Lake Ontario and the Niagara region and within decades were well established throughout southern Ontario. In 1736, the French estimated there were 60 men at Lake Saint Clair and 150 among small settlements at Quinte, the head of Lake Ontario, the Humber River, and Matchedash (Rogers 1978:761). This history is based almost entirely on oral tradition provided by Anishinaabek elders such as George Copway (Kahgegagahbowh), a Mississauga born in 1818 near Rice Lake who followed a traditional lifestyle until his family converted to Christianity (MacLeod 1992:197; Smith 2000). According to Copway, the objectives of campaigns against the Haudenosaunee were to create a safe trade route between the French and the Ojibwa, to regain the land abandoned by the Huron-Wendat. While various editions of Copway's book have these battles occurring in the mid-seventeenth century, common to all is a statement that the battles occurred around 40 years after the dispersal of the Huron-Wendat (Copway 1850:88; Copway 1851:91; Copway 1858:91). Various scholars agree with this timeline ranging from 1687, in conjunction with Denonville's attack on Seneca villages (Johnson 1986:48; Schmalz 1991:21–22) to around the mid- to late-1690s leading up to the Great Peace of 1701 (Schmalz 1977:7; Bowman 1975:20; Smith 1975:215; Tanner 1987:33; Von Gernet 2002:7–8).

Robert Paudash's 1904 account of Mississauga origins also relies on oral history, in this case from his father, who died at the age of 75 in 1893 and was the last hereditary chief of the Mississauga at Rice

Lake. His account in turn came from his father Cheneebeesh, who died in 1869 at the age of 104 and was the last sachem or Head Chief of all the Mississaugas. He also relates a story of origin on the north shore of Lake Huron (Paudash 1905:7–8) and later, after the dispersal of the Huron-Wendat, carrying out coordinated attacks against the Haudenosaunee. Francis Assikinack, an Ojibwa of Manitoulin Island born in 1824, provides similar details on battles with the Haudenosaunee (Assikinack 1858:308–309).

Peace was achieved between the Haudenosaunee and the Anishinaabek Nations in August of 1701 when representatives of more than twenty Anishinaabek Nations assembled in Montreal to participate in peace negotiations (Johnston 2004:10). During these negotiations captives were exchanged and the Iroquois and Anishinaabek agreed to live together in peace. Peace between these nations was confirmed again at council held at Lake Superior when the Iroquois delivered a wampum belt to the Anishinaabek Nations.

From the beginning of the eighteenth century to the assertion of British sovereignty in 1763, there is no interruption to Anishinaabek control and use of southern Ontario. While hunting in the territory was shared, and subject to the permission of the various nations for access to their lands, its occupation was by Anishinaabek until the assertion of British sovereignty, the British thereafter negotiating treaties with them. Eventually, with British sovereignty, tribal designations changed (Smith 1975:221–222; Surtees 1985:20–21). According to Rogers (1978), by the twentieth century, the Department of Indian Affairs had divided the "Anishinaubag" into three different tribes, despite the fact that by the early eighteenth century, this large Algonquian-speaking group, who shared the same cultural background, "stretched over a thousand miles from the St. Lawrence River to the Lake of the Woods." With British land purchases and treaties, the bands at Beausoleil Island, Cape Croker, Christian Island, Georgina and Snake Islands, Rama, Sarnia, Saugeen, the Thames, and Walpole, became known as "Chippewa" while the bands at Alderville, New Credit, Mud Lake, Rice Lake, and Scugog, became known as "Mississauga." The northern groups on Lakes Huron and Superior, who signed the Robinson Treaty in 1850, appeared and remained as "Ojibbewas" in historical documents.

In 1763, following the fall of Quebec, New France was transferred to British control at the Treaty of Paris. The British government began to pursue major land purchases throughout Ontario in the early nineteenth century, and entered into negotiations with various Nations for additional tracts of land as the need arose to facilitate European settlement.

In 1805, the Mississaugas were granted one mile (approximately 1.6 km) on either side of the Credit River, Twelve Mile Creek and Sixteen Mile Creek. In 1818, the majority of the Mississauga Tract was acquired by the Crown excluding the lands tracts flanking the Credit River, Twelve Mile Creek and Sixteen Mile Creek. In 1820, the remainder of Mississauga land was surrendered except approximately 81 hectares (ha) along the Credit River (Heritage Mississauga 2012:18). In 1825-26 the Credit Indian Village was established as an agricultural community and Methodist mission near present day Port Credit (Heritage Mississauga 2009; Mississaugas of the New Credit First Nation 2014). By 1840 the village was under significant pressure from Euro-Canadian settlement that plans begun to relocate the settlement. In 1847 the Credit Mississaugas were made a land offer by the Six Nations Council to relocate at the Grand River. In 1847, 266 Mississaugas settled at New Credit, approximately 23 km southwest of Brantford. In 1848 a mission of the Methodist Church was established there by Rev. William Ryerson (Woodland Indian Cultural Education Centre 1985). Although the majority of the former Mississague Tract had been surrendered from the Mississauga by 1856 (Gould 1981), this does not exclude the likelihood that the Mississauga continued to utilise the landscape at large during travel (Ambrose 1982) and for resource extraction.

The eighteenth century saw the ethnogenesis in Ontario of the Métis, when Métis people began to identify as a separate group, rather than as extensions of their typically maternal First Nations and paternal European ancestry (Métis National Council n.d.). Métis populations were predominantly located north and west of Lake Superior, however, communities were located throughout Ontario (MNC n.d.; Stone and Chaput 1978:607,608). During the early nineteenth century, many Métis families moved towards locales around southern Lake Huron and Georgian Bay, including Kincardine, Owen Sound, Penetanguishene, and Parry Sound (MNC n.d.). Recent decisions by the Supreme Court of Canada (Supreme Court of Canada 2003; Supreme Court of Canada 2016) have reaffirmed that Métis people have full rights as one of the Indigenous people of Canada under subsection 91(24) of the Constitution Act, 1867.

The Study Area is within Treaty 13a, or the Toronto Purchase, signed on August 2, 1805 by the Mississaugas and the British Crown in Port Credit at the Government Inn. A provisional agreement was reached with the Crown on August 2, 1805, in which the Mississaugas ceded 70,784 acres of land bounded by the Toronto Purchase of 1787 in the east, the Brant Tract in the west, and a northern boundary that ran six miles back from the shoreline of Lake Ontario. The Mississaugas also reserved the sole right of fishing at the Credit River and were to retain a 1 mile strip of land on each of its banks, which became the Credit Indian Reserve. On September 5, 1806, the signing of Treaty 14 confirmed the Head of the Lake Purchase between the Mississaugas of the Credit and the Crown (Mississauga of the New Credit First Nation 2017; Mississauga of the New Credit First Nation 2001).

1.2.2 Euro-Canadian Land Use: Township Survey and Settlement

Historically, the Study Area is located in part of Lot 6, Concession 2 South of Dundas Street (SDS) in the Former Township of Toronto, County of Peel.

The S & G stipulates that areas of early Euro-Canadian settlement (pioneer homesteads, isolated cabins, farmstead complexes), early wharf or dock complexes, pioneer churches, and early cemeteries are considered to have archaeological potential. Early historical transportation routes (trails, passes, roads, railways, portage routes), properties listed on a municipal register or designated under the *Ontario Heritage Act* or a federal, provincial, or municipal historic landmark or site are also considered to have archaeological potential.

For the Euro-Canadian period, the majority of early nineteenth century farmsteads (i.e., those that are arguably the most potentially significant resources and whose locations are rarely recorded on nineteenth century maps) are likely to be located in proximity to water. The development of the network of concession roads and railroads through the course of the nineteenth century frequently influenced the siting of farmsteads and businesses. Accordingly, undisturbed lands within 100 m of an early settlement road are also considered to have potential for the presence of Euro-Canadian archaeological sites.

The first Europeans to arrive in the area were transient merchants and traders from France and England, who followed Indigenous pathways and set up trading posts at strategic locations along the well-traveled river routes. All of these occupations occurred at sites that afforded both natural landfalls and convenient access, by means of the various waterways and overland trails, into the hinterlands. Early transportation routes followed existing Indigenous trails, both along the lakeshore and adjacent to various creeks and rivers (ASI 2006).

Toronto Township

The Township of Toronto was original surveyed in 1806 by Mr. Wilmot, Deputy Surveyor. The first settler in this Township, and also the County of Peel, was Colonel Thomas Ingersoll. The whole population of the Township in 1808 consisted of seven families, scattered along Dundas Street. The number of inhabitants gradually increased until the war broke out in 1812, which gave considerable check to its progress. When the war was over, the Townships growth revived and the rear part of the Township was surveyed and called the "New Survey". The greater part of the New Survey was granted to a colony of Irish settlers from New York City, who suffered persecution during the war.

The Hamilton and Toronto Railway (H&TR) was formed in 1852, and in 1855, completed its lake shore route. In 1871, the railway was amalgamated with the Great Western Railway, which in turn, was amalgamated in 1882, with the Grand Trunk Railway. The Grand Trunk Railway was amalgamated in 1923, with Canadian National Railway (Andreae 1997:126–127).

Lakeview Golf Course

In 1896, the High Park Golf Club was formed, with a headquarters in Toronto, with an 18-hole course near Grenadier Pond in High Park. The club relocated in 1907 due to urban expansion in the city to the 97-acre Dunn farm property on Dixie Road (now 1190 Dixie Road) north of Lakeshore in Mississauga and in 1912 changed the name to The Lakeview Golf and Country Club Limited. The historic farmhouse was used as the clubhouse until 1911 when a new structure was built (Image 1). The Canadian Professional Golf Association Championships took place at the course in 1914. A greenskeeper house was located on the north end of the course (1392 Dixie Road). In 1921 the course was redesigned, including a watering system. Lakeview was considered one of the most popular courses in the Canada – it has twice hosted the Canadian Open won by C.W Hackney in 1923 and won by Tommy Armour in 1934 (City of Mississauga 2019). In 1939, the clubhouse burned down. The course was purchased by Henry Phelan who had the clubhouse rebuilt in 1940 using cinderblock on the original foundations. Phelan prohibited women from playing the course "because he did not like having to constantly wear his shirt" and preferred to play the course topless to sunbathe (Hicks 2005:69). In 1957 the course was leased to the township and the ban on women was lifted, making the news in Toronto. A centennial commemorative plaque was installed in 1996 dedicated to the course's history and in 1999, the clubhouse was renovated. The course is currently owned by the City of Mississauga (Hicks 2005:67–70; City of Mississauga 2019).

1.2.3 Historical Map Review

The 1859 Map of the County of Peel (Tremaine 1859) and the south half of Toronto Township in the 1877 Illustrated Historical Atlas of the County of Peel (Walker and Miles 1877) were examined to determine the presence of historic features within the Study Area during the nineteenth century (Table 1; Figures 2-3).

It should be noted, however, that not all features of interest were mapped systematically in the Ontario series of historical atlases, given that they were financed by subscription, and subscribers were given preference with regard to the level of detail provided on the maps. Moreover, not every feature of interest would have been within the scope of the atlases.

In addition, the use of historical map sources to reconstruct/predict the location of former features within the modern landscape generally proceeds by using common reference points between the various sources.

These sources are then geo-referenced in order to provide the most accurate determination of the location of any property on historic mapping sources. The results of such exercises are often imprecise or even contradictory, as there are numerous potential sources of error inherent in such a process, including the vagaries of map production (both past and present), the need to resolve differences of scale and resolution, and distortions introduced by reproduction of the sources. To a large degree, the significance of such margins of error is dependent on the size of the feature one is attempting to plot, the constancy of reference points, the distances between them, and the consistency with which both they and the target feature are depicted on the period mapping.

Table 1: Nineteenth-century property owner(s) and historical features(s) within or adjacent to the Study Area

		1859		*1877*	
Con #	**Lot #**	**Property Owner(s)**	**Historical Feature(s)**	**Property Owner(s)**	**Historical Feature(s)**
2 SDS	6	Robert Campbell	H&TR	Chas. Pallett	House, orchards
				Dan Death	None
				Reuben Dunn	GWR, House, orchards

The 1859 map illustrates Dixie Road, Middle Road, and Lakeshore Road were historically surveyed transportation routes. The H&TR is shown cutting through the southern end of the lot. Applewood Creek's historical alignment can be seen running roughly down the centre of the lot. By 1877, the lot was subdivided, with a farmhouse just south of the intersection of Middle Road and Dixie Road, and fronting Lakeshore Road south of the railway.

1.2.4 Twentieth-Century Mapping Review

The 1909 National Topographic System (NTS) Brampton Sheet, 1954 aerial photograph of Mississauga, and the 1974 NTS Port Credit Sheet (Department of Militia and Defence 1909; Hunting Survey Corporation Limited 1954; Department of Energy, Mines and Resources 1974) were examined to determine the extent and nature of development and land uses within the Study Area (Figures 4-7).

The 1909 map illustrates a brick house fronting Dixie Road adjacent to the Study Area, and that the land was within the High Park Golf and Country Club. The natural historical alignment of Applewood Creek can be seen between Middle Road and the railway. By this time, the railway was part of the Grand Trunk. The topography is shown as gently sloping south of Middle Road towards the lake.

The 1954 photograph shows the golf course and the historical alignment of the creek. The northern half of the creek mainly follows its present alignment. The Toronto Golf Club is also shown on the east side of Dixie Road.

The 1974 map and 1992 photograph illustrate significant development had occurred by the late twentieth-century surrounding the golf course, including construction of the Fairways condo on Dixie Road adjacent to the Study Area between 1974 and 1992. The creek is shown to have been channelized through the course in its present alignment.

1.3 Archaeological Context

This section provides background research pertaining to previous archaeological fieldwork conducted within and in the vicinity of the Study Area, its environmental characteristics (including drainage, soils or surficial geology and topography, etc.), and current land use and field conditions. Three sources of information were consulted to provide information about previous archaeological research: the site record forms for registered sites available online from the MTCS through "Ontario's Past Portal"; published and unpublished documentary sources; and the files of ASI.

1.3.1 Current Land Use and Field Conditions

A review of available Google satellite imagery shows that Study Area has remained relatively unchanged since 2005.

A Stage 1 property inspection was conducted on June 10, 2019 that noted Applewood Creek has been channelized through Lakeview Golf Course west of Dixie Road, from north of the GO Transit Lakeshore West rail corridor and south of the commercial plaza on the south side of Queen Elizabeth Way. Fairways condo is located at 1400 Dixie Road surrounded by the golf course. The clubhouse is located near the south end of the course within a renovated historic house. The Study Area also includes the fairways, greens and wooded areas.

1.3.2 Geography

In addition to the known archaeological sites, the state of the natural environment is a helpful indicator of archaeological potential. Accordingly, a description of the physiography and soils are briefly discussed for the Study Area.

The S & G stipulates that primary water sources (lakes, rivers, streams, creeks, etc.), secondary water sources (intermittent streams and creeks, springs, marshes, swamps, etc.), ancient water sources (glacial lake shorelines indicated by the presence of raised sand or gravel beach ridges, relic river or stream channels indicated by clear dip or swale in the topography, shorelines of drained lakes or marshes, cobble beaches, etc.), as well as accessible or inaccessible shorelines (high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh, etc.) are characteristics that indicate archaeological potential.

Water has been identified as the major determinant of site selection and the presence of potable water is the single most important resource necessary for any extended human occupation or settlement. Since water sources have remained relatively stable in Ontario since 5,000 BP (Karrow and Warner 1990:Figure 2.16), proximity to water can be regarded as a useful index for the evaluation of archaeological site potential. Indeed, distance from water has been one of the most commonly used variables for predictive modeling of site location.

Other geographic characteristics that can indicate archaeological potential include: elevated topography (eskers, drumlins, large knolls, and plateaux), pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground, distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases. There may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings. Resource

areas, including; food or medicinal plants (migratory routes, spawning areas) are also considered characteristics that indicate archaeological potential (S & G, Section 1.3.1).

The Study Area is on bevelled till and sand plains within the Iroquois Plain physiographic region of southern Ontario (Figure 7). This is a lowland region bordering Lake Ontario. This region is characteristically flat, and formed by lacustrine deposits laid down by the inundation of Lake Iroquois, a body of water that existed during the late Pleistocene. This region extends from the Trent River, around the western part of Lake Ontario, to the Niagara River, spanning a distance of 300 km (Chapman and Putnam 1984:190). The old shorelines of Lake Iroquois include cliffs, bars, beaches and boulder pavements. The old sandbars in this region are good aquifers that supply water to farms and villages. The gravel bars are quarried for road and building material, while the clays of the old lake bed have been used for the manufacture of bricks (Chapman and Putnam 1984:196).

Figure 8 depicts surficial geology for the Study Area. The surficial geology mapping demonstrates that the Study Area is underlain by coarse-textured glaciolacustrine deposits of sand and gravel, clay to silt-textured till, modern alluvial deposits (Ontario Geological Survey 2010). Figure 8 illustrates soil drainage within the Study Area (Hoffman and Richards 1953). Soils in the Study Area consist of:

- Fox sandy loam, a grey-brown podzolic, stonefree, well sorted outwash soils with good drainage;
- Chinguacousy clay loam, a grey-brown podzolic with few stones and imperfect drainage;
- Bottom Land, alluvial deposits of variable drainage that are subject to flooding and show little horizontal differentiation

The Study Area includes Applewood Creek, a tributary of Etobicoke Creek. Applewood Creek north of Lakeshore Road is heavily modified, while downstream of Lakeshore Road, the channel banks are exposed bedrock due to deepening of the channel during the installation of the sanitary trunk sewer in the 1960s (SENES Consultants 2014). Etobicoke is derived from the Algonkian word “Wah-do-be kaug” meaning “place where the alders grow”. The Etobicoke Creek watershed, including its major tributaries Spring Creek, Little Etobicoke Creek, and West Etobicoke Creek, drains an area of approximately 211 square kilometres within the cities of Brampton, Mississauga, Toronto, and the Town of Caledon. The creeks flow south from its headwaters in Caledon into Lake Ontario through 68% urban, 27% rural and 5% urbanizing land (Toronto and Region Conservation Authority 2018).

1.3.3 Previous Archaeological Research

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (OASD) maintained by the MTCS. This database contains archaeological sites registered within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and longitude. A Borden block is approximately 13 km east to west, and approximately 18.5 km north to south. Each Borden block is referenced by a four-letter designator, and sites within a block are numbered sequentially as they are found. The Study Area under review is located in Borden block *AjGv*.

According to the OASD, one previously registered archaeological site is located within one kilometre of the Study Area (Ministry of Tourism, Culture and Sport 2018).

Table 2: List of previously registered sites within one kilometre of the Study Area

Borden	Site Name	Cultural Affiliation	Site Type	Researcher
AjGv-7	Robinson	Unknown	Unknown	1971

According to the background research, no previous reports details fieldwork within 50 m of the Study Area.

2.0 FIELD METHODS: PROPERTY INSPECTION

A Stage 1 property inspection must adhere to the S & G, Section 1.2, Standards 1-6, which are discussed below. The entire property and its periphery must be inspected. The inspection may be either systematic or random. Coverage must be sufficient to identify the presence or absence of any features of archaeological potential. The inspection must be conducted when weather conditions permit good visibility of land features. Natural landforms and watercourses are to be confirmed if previously identified. Additional features such as elevated topography, relic water channels, glacial shorelines, well-drained soils within heavy soils and slightly elevated areas within low and wet areas should be identified and documented, if present. Features affecting assessment strategies should be identified and documented such as woodlots, bogs or other permanently wet areas, areas of steeper grade than indicated on topographic mapping, areas of overgrown vegetation, areas of heavy soil, and recent land disturbance such as grading, fill deposits and vegetation clearing. The inspection should also identify and document structures and built features that will affect assessment strategies, such as heritage structures or landscapes, cairns, monuments or plaques, and cemeteries.

The Stage 1 archaeological assessment property inspection was conducted under the field direction of Andrew Clish (P046) of ASI, on June 10, 2019, in order to gain first-hand knowledge of the geography, topography, and current conditions and to evaluate and map archaeological potential of the Study Area. It was a visual inspection only and did not include excavation or collection of archaeological resources. Fieldwork was only conducted when weather conditions were deemed suitable, per S & G Section 2. Previously identified features of archaeological potential were examined; additional features of archaeological potential not visible on mapping were identified and documented as well as any features that will affect assessment strategies. Field observations are compiled onto the existing conditions of the Study Area in Section 7.0 (Figure 10) and associated photographic plates are presented in Section 8.0 (Plates 1-18).

3.0 ANALYSIS AND CONCLUSIONS

The historical and archaeological contexts have been analyzed to help determine the archaeological potential of the Study Area. These data are presented below in Section 3.1. Results of the analysis of the Study Area property inspection are presented in Section 3.2.

3.1 Analysis of Archaeological Potential

The S & G, Section 1.3.1, lists criteria that are indicative of archaeological potential. The Study Area meets the following criteria indicative of archaeological potential:

- Water sources: primary, secondary, or past water source (Applewood Creek);
- Early historic transportation routes (Lakeshore Rd., Middle Road, Dixie Rd., H&TR);
- Proximity to early settlements (village of Dixie); and
- Well-drained soils (Fox sandy loam)

According to the S & G, Section 1.4 Standard 1e, no areas within a property containing locations listed or designated by a municipality can be recommended for exemption from further assessment unless the area can be documented as disturbed. The City of Mississauga's Municipal Heritage Register was consulted and The Lakeview Golf Course is Designated under the Ontario Heritage Act.

These criteria are indicative of potential for the identification of Indigenous and Euro-Canadian archaeological resources, depending on soil conditions and the degree to which soils have been subject to deep disturbance.

3.2 Analysis of Property Inspection Results

The property inspection determined that parts of the Study Area exhibit archaeological potential within the wooded areas of the golf course (Plates 5, 6, 13, 14; Figure 10: areas highlighted in green). These areas will require Stage 2 archaeological assessment, if impacted, prior to any proposed construction activities. According to the S & G Section 2.1.2, test pit survey is required on terrain where ploughing is not viable, such as wooded areas, properties where existing landscaping or infrastructure would be damaged, overgrown farmland with heavy brush or rocky pasture, and narrow linear corridors up to 10 metres wide.

Parts of the Study Area within the fairways and greens of the golf course have been landscaped but are considered to retain archaeological potential due to the age of the course and the proximity to Lake Ontario and the Credit River and Cooksville Creek. These areas should be subject to judgmental test pit survey to confirm the extent of disturbance, in accordance with S & G Section 2.1.8 (Plates 1-4, 9-12, 18; Figure 10: areas highlighted in red). The Stage 2 survey should resume at five metre intervals should intact soils be located.

The property inspection and contour mapping determined that some of lands within the Study Area are naturally sloped in excess of 20 degrees, and according to the S & G Section 2.1 do not retain potential (Plates 13-17; Figure 10: areas highlighted in pink). The remainder of the Study Area has been subjected to deep soil disturbance events, including the channelized banks of Applewood Creek, and according to the S & G Section 1.3.2 do not retain archaeological potential (Plates 1-4, 6-18; Figure 10: areas highlighted in yellow). These areas do not require further survey.

3.3 Conclusions

The Stage 1 background study determined that one previously registered archaeological site is located within one kilometre of the Study Area. The property inspection determined that the Study Area exhibits archaeological potential.

4.0 RECOMMENDATIONS

In light of these results, the following recommendations are made:

1. The Study Area exhibits archaeological potential. These lands require Stage 2 archaeological assessment by test pit survey at five metre intervals, if impacted, prior to any proposed construction activities;

2. Parts of the Lakeview Golf Course should be subject to judgmental test it survey to confirm the extent of disturbance due to past landscaping. Should intact soils be identified, test pit survey should resume at five metre intervals;

3. The remainder of the Study Area does not retain archaeological potential on account of deep and extensive land disturbance or slopes in excess of 20 degrees. These lands do not require further archaeological assessment; and,

4. Should the proposed work extend beyond the current Study Area, further Stage 1 archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

NOTWITHSTANDING the results and recommendations presented in this study, ASI notes that no archaeological assessment, no matter how thorough or carefully completed, can necessarily predict, account for, or identify every form of isolated or deeply buried archaeological deposit. In the event that archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Cultural Programs Unit of the MTCS should be immediately notified.

5.0 ADVICE ON COMPLIANCE WITH LEGISLATION

ASI also advises compliance with the following legislation:

- This report is submitted to the Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, RSO 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological field work and report recommendations ensure the conservation, preservation and protection of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism, Culture and Sport, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

- It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological field work on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act.*

- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the *Ontario Heritage Act*.

- The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

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7.0 MAPS

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Figure 1: Applewood Creek Erosion Control Study Area

ASI
Providing Archaeological & Cultural Heritage Services
528 Bathurst Street Toronto, ONTARIO M5S 2P9
T 416-966-1069 F 416-966-9723 asiheritage.ca

X:\2018 Projects\EA\18EA-211 Applewood Creek\View\18EA211_hist2panel.mxd

Figure 2: Study Area (Approximate Location) Overlaid on the 1859 Map of the County of Peel

Figure 3: Study Area (Approximate Location) Overlaid on the 1877 Illustrated Historical Atlas of the County of Peel

ASI

STUDY AREA

Sources:
1859 Map of the County of Peel
1877 Illustrated Historical Atlas of the County of Peel

Projection: NAD 1983 UTM Zone 17N
Scale: 1:20,000
Page Size: 8.5 x 11

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DATE: 6/11/2019

DRAWN BY: JF
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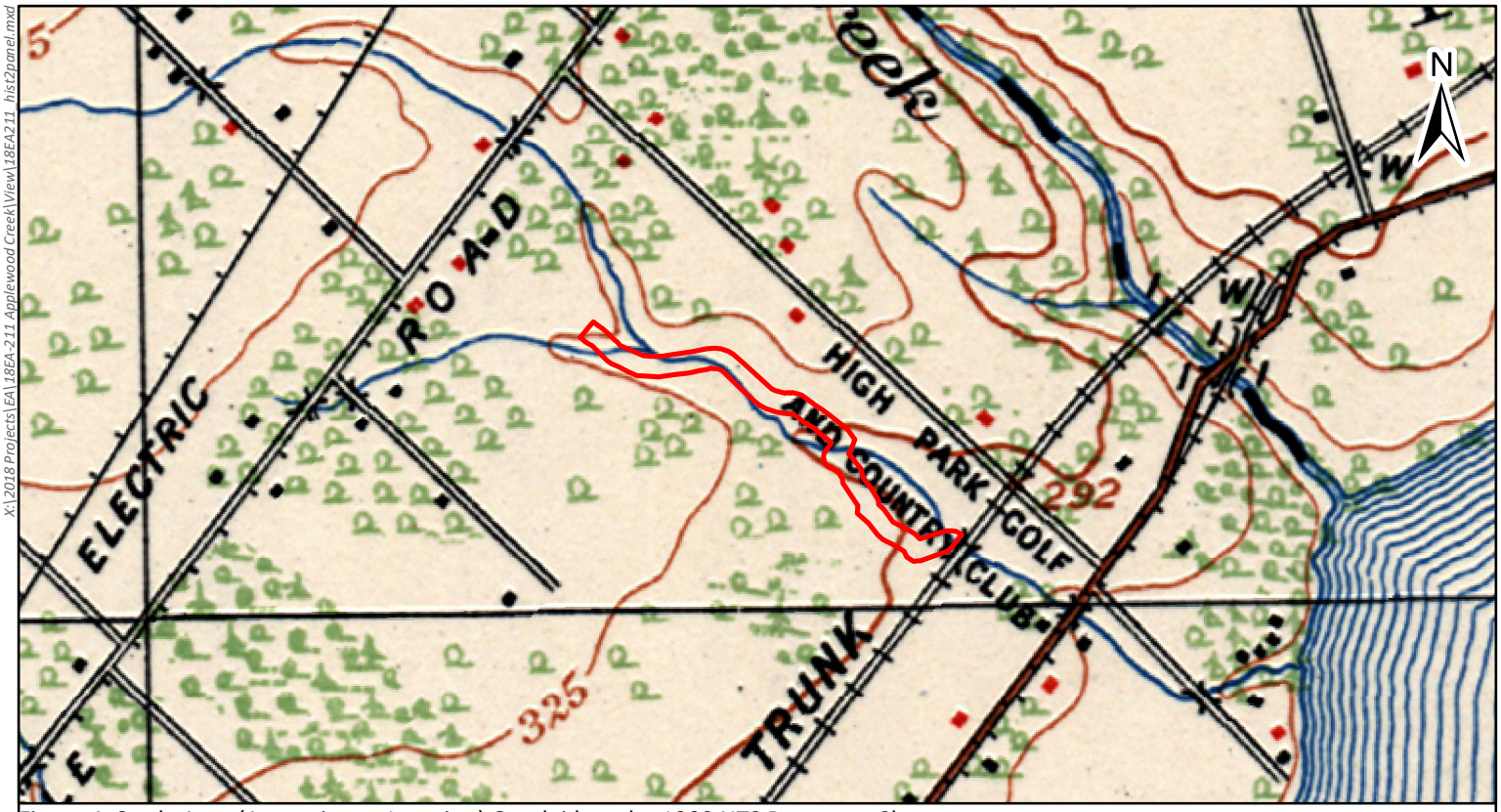

Figure 4: Study Area (Approximate Location) Overlaid on the 1909 NTS Brampton Sheet

Figure 5: Study Area (Approximate Location) Overlaid on the 1956 Aerial Photograph of Mississauga

ASI

STUDY AREA

Sources:
1909 NTS Brampton Sheet
1956 Aerial Photograph of Mississauga

Projection: NAD 1983 UTM Zone 17N
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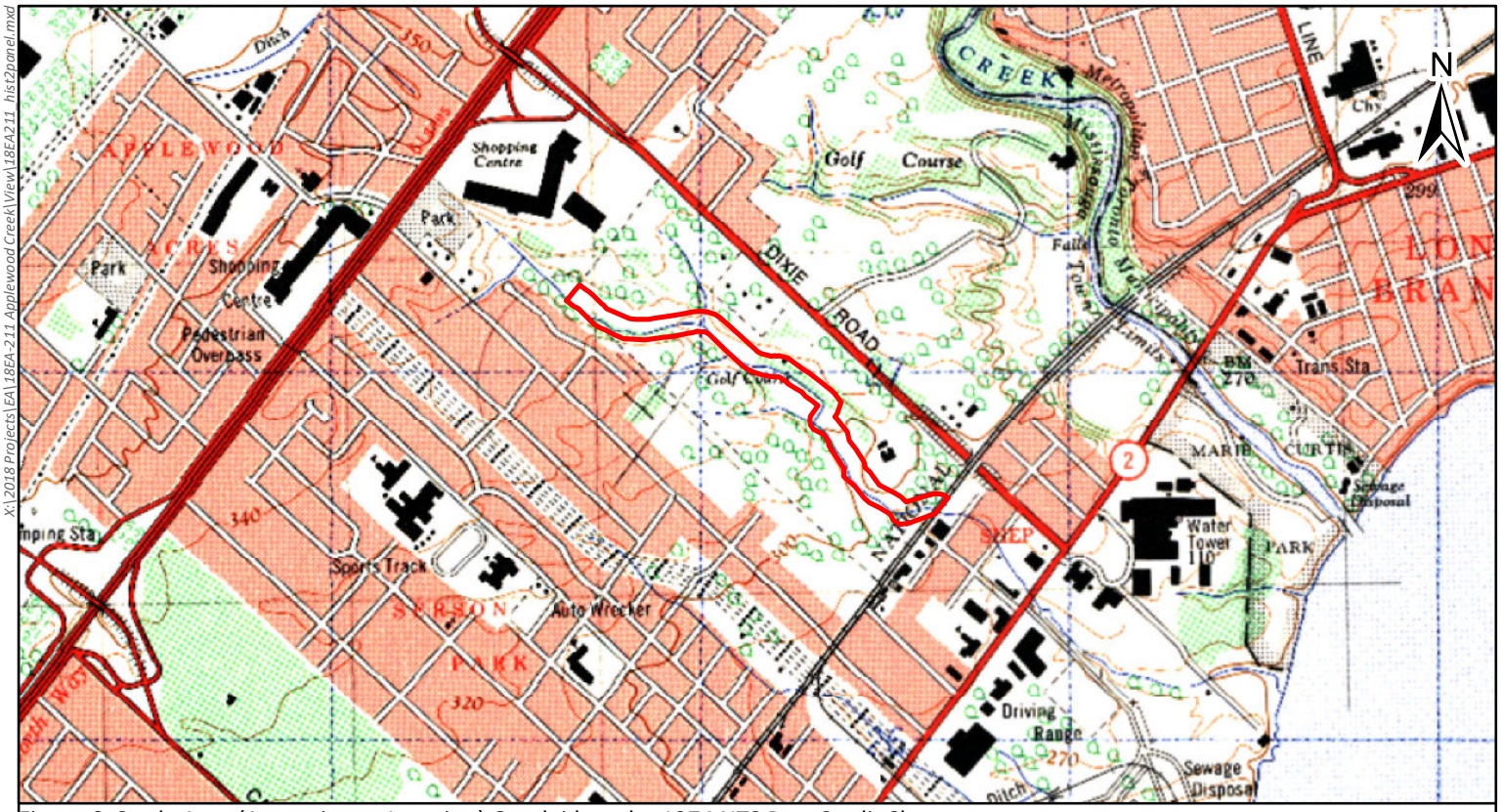

Figure 6: Study Area (Approximate Location) Overlaid on the 1974 NTS Port Credit Sheet

Figure 7: Study Area (Approximate Location) Overlaid on the 1992 Aerial Photograph of Mississauga

ASI

STUDY AREA

Sources:
1974 NTS Port Credit Sheet
1992 Aerial Photograph of Mississauga

Projection: NAD 1983 UTM Zone 17N
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Page Size: 8.5 x 11

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ASI PROJECT NO.: 18EA-211
DATE: 6/11/2019

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Figure 8: Study Area – Surficial Geology

Figure 9: Study Area – Soil Drainage

ASI

STUDY AREA

Sources:
Soild Data
Guelph Geomatics Services,
Ontario Ministry of Agriculture
and AgriFood

Projection: NAD 1983 UTM Zone 17N
Scale: 1:20,000
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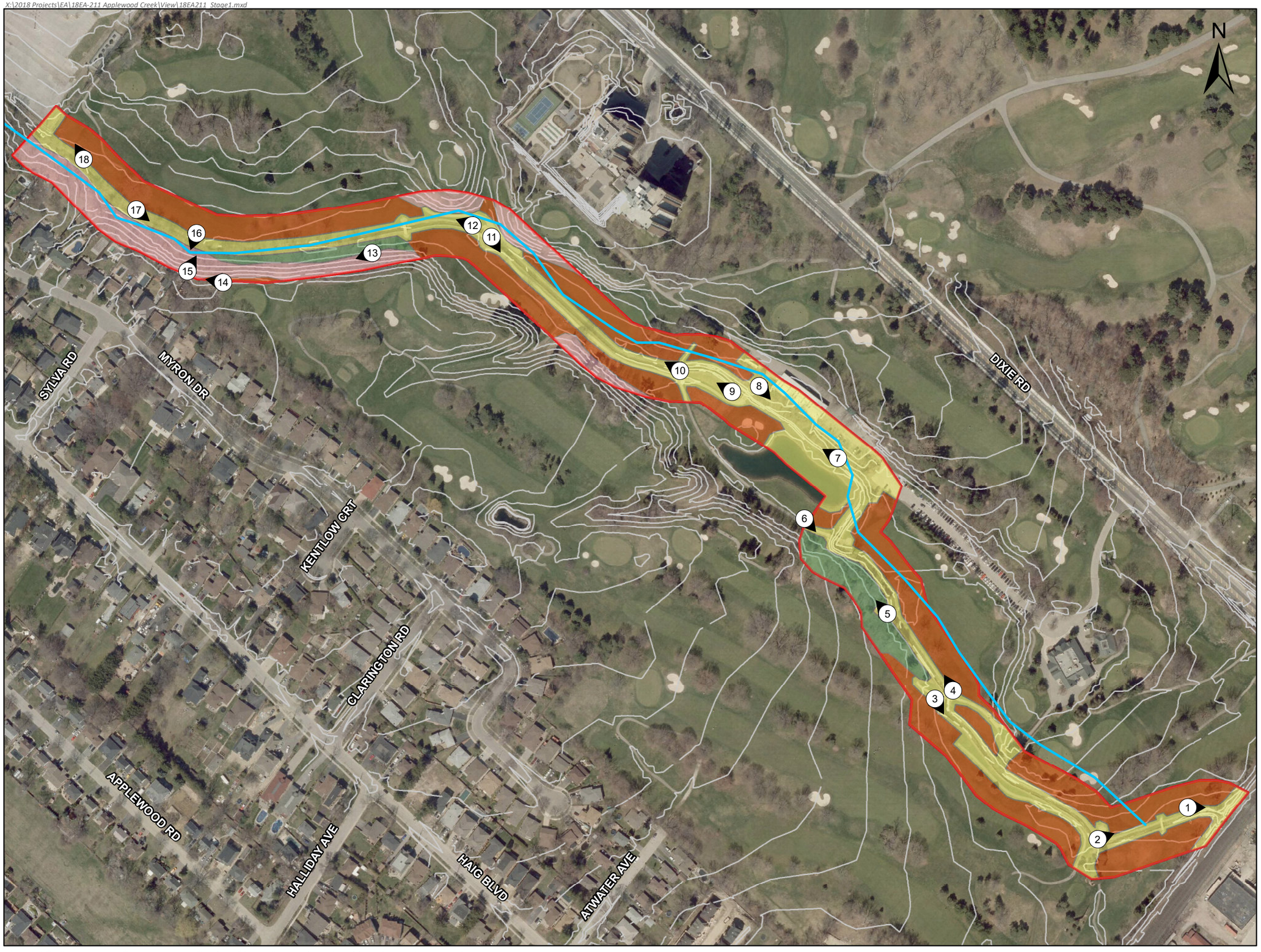

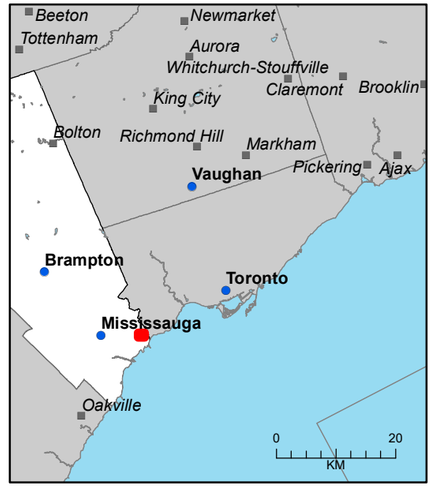

STUDY AREA

PHOTO LOCATION AND DIRECTION

HISTORICAL CREEK ALIGNMNET (1956)

DISTURBED - NO POTENTIAL

SLOPE - NO POTENTIAL

POTENTIAL - JUDGMENTAL TEST PIT SURVEY RECOMMENDED

POTENTIAL - TEST PIT SURVEY RECOMMENDED

Sources:
Ortho: ESRI

Projection: NAD 1983 UTM Zone 17N

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ASI PROJECT NO.: 18EA-211
DATE: 6/21/2019

DRAWN BY: JF
FILE: 18EA211_Stage1

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Figure 10: Applewood Creek Erosion Control Study Area - Results of the Property Inspection

8.0 IMAGES

Historical Images

Image 1: 1923 original Lakeview Golf Course club house (City of Toronto 2016)

Property Inspection

Plate 1: East view of Study Area; Area beyond disturbed channelized creek requires Stage 2 test pit survey

Plate 2: Northeast view of Study Area; Area beyond disturbed channelized creek requires Stage 2 test pit survey

Plate 3: Southeast view of Study Area; Area beyond disturbed channelized creek requires judgmental Stage 2 survey

Plate 4: Northwest view of Study Area; Area beyond disturbed channelized creek requires judgmental Stage 2 survey

Plate 5: Northwest view of Study Area; Area requires Stage 2 survey

Plate 6: Southeast view of Study Area; Area beyond disturbed channelized creek requires Stage 2 survey


Plate 7: Northwest view of Study Area.; Area is disturbed, no potential


Plate 8: Southeast view of Study Area; Area is disturbed, no potential


Plate 9: Northwest view of Study Area; Area beyond disturbed channelized creek requires Stage 2 survey

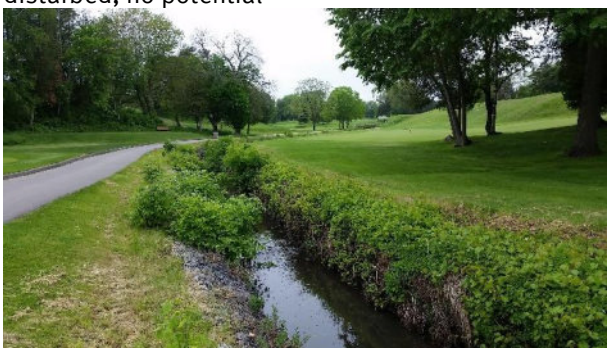
Plate 10: Northwest view of Study Area; Area beyond disturbed channelized creek requires Stage 2 survey


Plate 11: Southeast view of Study Area; Area beyond disturbed channelized creek requires Stage 2 survey


Plate 12: Northwest view of Study Area; Area beyond disturbed channelized creek requires Stage 2 survey


Plate 13: West view of Study Area; Area at toe of slope requires Stage 2 survey

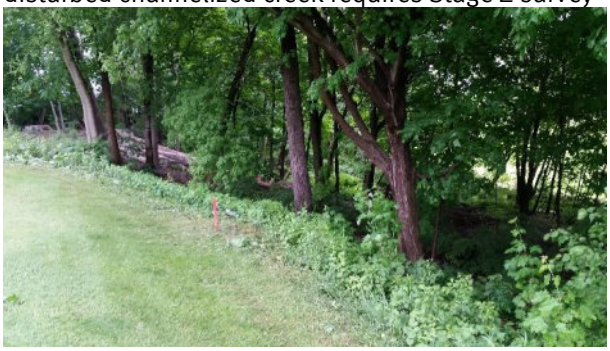
Plate 14: West view of Study Area; Area at toe of slope requires Stage 2 survey

Plate 15: Northeast view of Study Area; Area is sloped, no potential

Plate 16: South view of Study Area; Area is sloped, no potential

Plate 17: Southeast view of Study Area; Area north of disturbed channelized creek and slope requires Stage 2 survey

Plate 18: Northwest view of Study Area; Area northeast of disturbed channelized creek and slope requires Stage 2 survey

Appendix F – Heritage Impact Assessment Report by ASI

HERITAGE IMPACT ASSESSMENT

Applewood Creek Restoration
Lakeview Golf Course
1190 Dixie Road
Mississauga, Ontario

Prepared for:
Aquafor Beech Ltd.
2600 Skymark Avenue, Building 6, Suite 202
Mississauga, ON L4W 5B2

ASI File: 19CH-036

August 2019 (Updated November 2019, December 2019)

ASI Providing Archaeological & Cultural Heritage Services
528 Bathurst Street Toronto, ONTARIO M5S 2P9
416-966-1069 F 416-966-9723 asiheritage.ca

HERITAGE IMPACT ASSESSMENT

Applewood Creek Restoration
Lakeview Golf Course
1190 Dixie Road
Mississauga, Ontario

EXECUTIVE SUMMARY

ASI was contracted by Aquafor Beech Ltd. to prepare a Heritage Impact Assessment (HIA) for the Lakeview Golf Course as part of the Applewood Creek Restoration in the City of Mississauga. This project involves the restoration of approximately 1,300 meters of Applewood Creek, from the south of the Dixie Outlet Mall to the GO Transit Lakeshore West rail corridor, extending through Lakeview Golf Course (1190 Dixie Road), which is designated under Part IV of the Ontario Heritage Act and included in the City of Mississauga's *Cultural Landscape Inventory*.

This HIA addresses four proposed Alternatives proposed for the Applewood Creek Restoration. Based on the property's cultural heritage value as determined by the City of Mississauga, a preliminary assessment of Alternatives 1, 2 and 3 determined that there are no anticipated significant impacts to any of the attributes that contribute to the property's cultural heritage value. The preliminary assessment of Alternative 4 determined that impacts on the cultural heritage value of the golf course are anticipated for this option. The Municipal Class EA process (which included public and stakeholder consultation) determined that Alternative 4 is the preferred option for the restoration of the creek, and this option has been further assessed in this report to determine the full extent of the impact of the proposed alterations.

The evaluation of the proposed Alternative 4 alterations determined that significant negative impacts to the cultural heritage value of the golf course are not anticipated. The orientation of Applewood Creek is an original feature and a heritage attribute of the course. However, the original layout will not be affected by the alteration, and the creek is anticipated to become a more visually and strategically prominent part of the course. Though the alteration to Applewood Creek will involve the removal of mature trees, many of the other elements of the course that are proposed for alteration are not original to the course or the alterations are reversible. Additionally, the restoration of the 17th hole to its original configuration will contribute positively to the course's cultural heritage value.

Based on the conclusions of this report, the following recommendations are proposed as part of the Applewood Creek Restoration:

1. Where possible, efforts should be made to protect mature trees that are currently proposed for removal. Any trees impacted or removed should adhere to the City of Mississauga and Credit Valley Conservation requirements.

2. A documentation report should be considered by the City of Mississauga prior to construction. The report should provide photographs and plans of each hole as a means of documenting the features that contribute to the cultural heritage value of the golf course prior their alteration.

3. Staging and construction activities should be suitably planned and undertaken to avoid impacts to identified attributes.

4. Should future work require additional alterations to the golf course, a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.

5. This report should be submitted to the City of Mississauga's Heritage Planning Department for review.

PROJECT PERSONNEL

Senior Project Manager:	Lindsay Graves, MA CAHP Cultural Heritage Specialist | Senior Project Manager - Cultural Heritage Division
Cultural Heritage Specialist:	James Neilson, MES (Planning) Cultural Heritage Specialist - Cultural Heritage Division
Project Administrator	Katrina Thach, Hon. BA Archaeologist | Project Coordinator – Environmental Assessment Division
Historical Research:	Kirstyn Allam, Hon. BA, Dip. Adv. Museum Studies Cultural Heritage Assistant – Cultural Heritage Division James Neilson
Field Review	Andrew Clish, BES (P046) *Senior Archaeologist | Senior Field Director, Laboratory and Fieldwork Services* *Operations Division*
Report Preparation:	James Neilson Kirstyn Allam
Graphics Preparation:	Jonas Fernandez, MSc Lead Archaeologist | Assistant Manager – Fleet & Geomatics Specialist – Operations Division
Report Reviewer:	John Sleath Cultural Heritage Specialist | Project Manager Cultural Heritage Division Lindsay Graves

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1.0 INTRODUCTION

ASI was contracted by Aquafor Beech Ltd. to prepare a Heritage Impact Assessment (HIA) for the Lakeview Golf Course as part of the Applewood Creek Restoration in the City of Mississauga. This project involves the restoration of approximately 1,300 meters of Applewood Creek, from the south of the Dixie Outlet Mall to the GO Transit Lakeshore West rail corridor, extending through Lakeview Golf Course (1190 Dixie Road) (Figure 1), which is designated under Part IV of the *Ontario Heritage Act* and included in the City of Mississauga's Cultural Landscape Inventory.

This HIA addresses four proposed Alternatives proposed for the Applewood Creek Restoration. Based on the property's cultural heritage value as determined by the City of Mississauga, Alternatives 1, 2 and 3 are not anticipated to have significant impacts to any of the attributes that contribute to the property's cultural heritage value. However, Alternative 4 is anticipated to have an impact on the cultural heritage value of the golf course. The Municipal Class EA process (which included public and stakeholder consultation) determined that Alternative 4 is the preferred option for the restoration of the creek, and this option has been further assessed to determine the full extent of the impact of the proposed alterations.

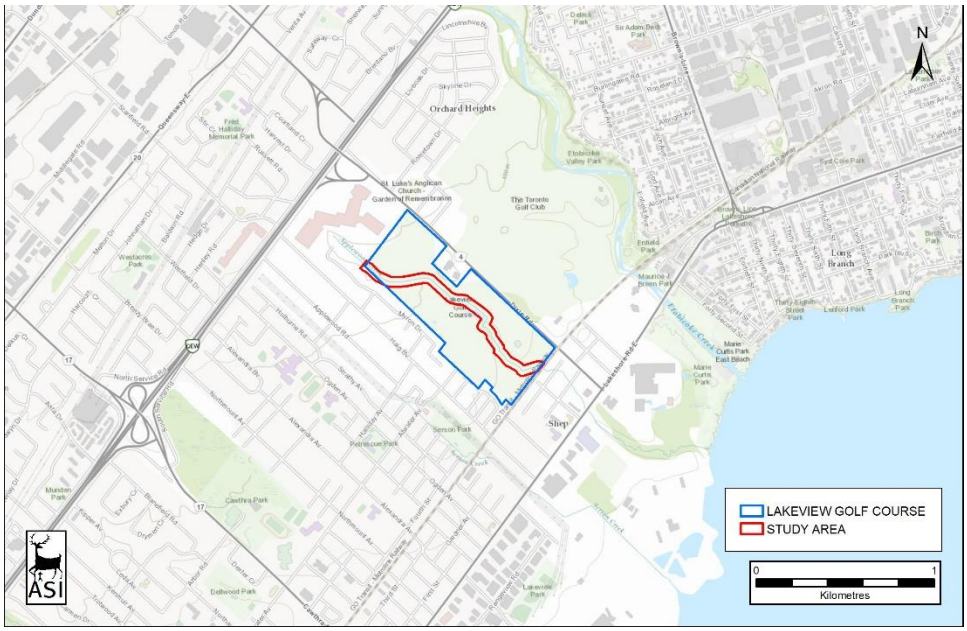

Figure 1: Location map of the proposed work at Lakeview Golf Course (Base Map: Open Street Maps)

The research and analysis were conducted by James Neilson, Cultural Heritage Specialist, and Kirstyn Allam, Cultural Heritage Assistant, ASI. The fieldwork was conducted by Andrew Clish, Senior Archaeologist/ Senior Field Director, ASI. Senior project direction was provided by Lindsay Graves, Cultural Heritage Specialist and Senior Project Manager of the Cultural Heritage Division, ASI. This CHIA follows the Ministry of Tourism, Culture and Sports' *Ontario Heritage Toolkit* (2006), the City of Mississauga's Cultural Landscape Heritage Impact Assessment (HIA) Terms of Reference (2014); and the *Standards and Guidelines for the Conservation of Historic Places in Canada* (2010) (Ministry of Tourism, Culture and Sport 2006a; City of Mississauga 2014; Parks Canada 2010). Research was completed to

investigate, document, and evaluate the cultural heritage resources within and adjacent to the study area.

This document will provide:

- a description of the subject property, including location, and photographic documentation;
- a scoped history of the property,
- a description of the proposed Alternatives,
- an assessment of impacts of the proposed work on the cultural heritage resource; and,
- Recommendations related to the proposed work.

1.1 Location and Study Area Description

Lakeview Golf Course is located at 1190 Dixie Road in the City of Mississauga (Figure 2). The property is bounded by Dixie Road to the east, the GO Transit Lakeshore West rail corridor to the south, Dixie Mall to the north and a residential subdivision to the west[1]. Applewood Creek runs through the property from the GO Transit Lakeshore West rail corridor in the south to the Dixie Mall in the north. The Study Area also consists of the fairways, greens and wooded areas of the golf course. The clubhouse is located near the south end of the course within a renovated historic house. Fairways condo is located at 1400 Dixie Road surrounded by the golf course.

Figure 2: Satellite image of the proposed work at Lakeview Golf Course (Google)

[1] For ease of description, directions have been re-oriented by 45-degrees to reflect the orientation of the City of Mississauga in relation to Lake Ontario.

1.2 Property Ownership

The subject property is currently owned by the City of Mississauga.

City of Mississauga
300 City Centre Drive
Mississauga, ON
L5B 3C1

1.3 Policy Framework

The authority to request this heritage assessment arises from the following legislation and policy documents:

- *Ontario Heritage Act (2005)*;
- Ministry of Tourism, Culture and Sports' *Ontario Heritage Toolkit* (2006);
- *Planning Act*;
- *Provincial Policy Statement* (2014);
- *City of Mississauga Official Plan* (2019);
- City of Mississauga's Cultural Landscape Inventory (2005);
- the City of Mississauga's Cultural Landscape Heritage Impact Assessment (HIA) Terms of Reference (2014);
- The Growth Plan for the Greater Golden Horseshoe (2017); and
- *Standards and Guidelines for the Conservation of Historic Places in Canada* (2010).

1.4 Project Consultation

The following organizations, websites, online heritage documents, and online heritage mapping tools were consulted to confirm the level of significance of the subject property, the location of additional previously identified cultural heritage resources adjacent to the study area, and to request additional information generally:

- City of Mississauga Heritage Property Search Interactive Map [Accessed 3 July, 2019] at https://www.mississauga.ca/portal/services/property?DPSLogout=true;
- Heritage Register for Mississauga [Accessed 3 July, 2019] at https://www7.mississauga.ca/documents/culture/heritage/2018-07-01_Mississauga_Heritage_Register_Web.pdf;
- City of Mississauga's Cultural Landscape Inventory [Accessed 3 July 2019] at http://www5.mississauga.ca/pdfs/Cultural_Landscape_Inventory_Jan05.pdf
- Canadian Register of Historic Places (Parks Canada) [Accessed 3 July, 2019] at http://www.historicplaces.ca/en/pages/about-apropos.aspx;
- Parks Canada website (national historic sites) [Accessed 3 July, 2019] at http://www.pc.gc.ca/eng/progs/lhn-nhs/index.aspx;

- Ontario Heritage Trust *Ontario Heritage Plaque Guide*, an online, searchable database of Ontario Heritage Plaques [Accessed 3 July, 2019] at https://www.heritagetrust.on.ca/en/online-plaque-guide;
- Email communication with City of Mississauga Heritage Planner Paula Wubbenhorst (Dated 11 July 2019, Response received 11 July 2019)

1.5 Cultural Heritage Recognition

Lakeview Golf Course (1190 Dixie Road) was designated by the City of Mississauga in January 2010 under Part IV of the Ontario Heritage Act (City of Mississauga By-law no. 008-2010). The property is also included in the City of Mississauga's Cultural Landscape Inventory (2005). See Appendix A for the Statement of Significance and Appendix B for the Cultural Landscape Inventory sheet. The Lakeview Golf Course is identified with a single plaque on the property.

Additionally, there are three properties adjacent to Lakeview Golf Course that are on Mississauga's Heritage Register. These include:

- 1147 Dixie Rd – Listed
- 1400 Dixie Rd – Listed
- 1455 Dixie Rd – Listed

2.0 HISTORICAL RESEARCH

The subject property consists of the Lakeview Golf Course, located in Lot 6, Concession 2 South of Dundas Street in the former Toronto Township, now known as the City of Mississauga, Ontario.

2.1 Township and Settlement History

2.1.1 Toronto Township

The Township of Toronto was original surveyed in 1806 by Mr. Wilmot, Deputy Surveyor. The first settler in this Township, and also the County of Peel, was Colonel Thomas Ingersoll. The whole population of the Township in 1808 consisted of seven families, scattered along Dundas Street. The number of inhabitants gradually increased until the war broke out in 1812, which gave considerable check to its progress. When the war was over, the Townships growth revived and the rear part of the Township was surveyed and called the "New Survey". The greater part of the New Survey was granted to a colony of Irish settlers from New York City, who suffered persecution during the war.

The Hamilton and Toronto Railway (H&TR) was formed in 1852, and in 1855, completed its lake shore route. In 1871, the railway was amalgamated with the Great Western Railway, which in turn, was amalgamated in 1882, with the Grand Trunk Railway. The Grand Trunk Railway was amalgamated in 1923, with Canadian National Railway (Andreae 1997:126–127).

2.1.2 Lakeview Golf Course

The following historical summary derives from the City of Mississauga's written history for the Lakeview Golf Course and from *Lakeview: Journey from Yesterday* by Kathleen A. Hicks (2005). No additional research has been conducted as part of this Heritage Impact Assessment[2].

In 1896, the High Park Golf Club was formed in Toronto, with an 18-hole course near Grenadier Pond in High Park. Due to urban expansion within the city, the club relocated in 1907 to the 97-acre Dunn farm property on Dixie Road (now 1190 Dixie Road) north of Lakeshore in Mississauga. Originally, the course was split in half by the railway line that now exists to the south of the property. This issue was rectified when additional land was purchased to the north. The historic farmhouse was used as the clubhouse until 1911 when a new structure was built and a greenskeeper house was located on the north end of the course (1392 Dixie Road). The following year, the club changed its name to The Lakeview Golf and Country Club Limited and in 1912, the club hosted the Canadian Professional Golf Association Championships.

In 1921, the course was redesigned by Herbert Strong, a renowned course architect from New York. After the redesign, Lakeview was considered one of the most popular and difficult courses in the country. Soon after it was redesigned, it hosted the Canadian Open in 1923 (won by C.W Hackney) and again in 1934 (won by Tommy Armour). In 1939, the clubhouse burned down. The course was purchased by long-time club members Henry Phelan and Bill Purtle, who had the clubhouse rebuilt in 1940 using cinderblock on the original foundations. The new ownership group also banned women from the course. The club operated semi-privately until 1955. In 1957, the course was leased to the Township and the ban on women was lifted after nearly two decades. The Township would purchase the course in 1965. A centennial commemorative plaque was installed in 1996 dedicated to the course's history and in 1999, the clubhouse was renovated. The course is currently owned by the City of Mississauga (Hicks 2005:67–70; City of Mississauga 2019).

3.0 EXISTING CONDITIONS

3.1 Lakeview Golf Course - 1190 Dixie Road

A field review was conducted by Andrew Clish, Senior Archaeologist/Senior Field Director, ASI, on 10 June 2019 to survey and document the study area and environs.

Lakeview Golf Course contains the typical elements of a golf course, primarily consisting of grassed space (that comprises the fairways, greens, tees and rough), hazards (such as sand bunkers and water features), vegetation and internal asphalt pathways. The course is notable for having two 17th holes. The property consists of undulating terrain. The Applewood Creek traverses through the property from north to south (Plate 1-18). Gabion walls have been used along the banks of the creek throughout its length. From north to south, the creek is adjacent to or traverses through holes 16, 3, 12, 17, 18, 1, 9, 5

[2] As the Lakeview Golf Course is already designated under Part IV of the Ontario Heritage Act, a scoped HIA was discussed and agreed to with City of Mississauga Heritage Planner, Paula Wubbenhorst.

and 6. Pedestrian/cart path bridges are used by golfers to cross the creek at various points throughout the course.

See Appendix C for photographic plates and location map.

4.0 PROPOSED DEVELOPMENT

4.1 Four Alternatives

ASI has evaluated plans and drawings by Schollen & Company Inc. (dated July 2019, see Appendix D). The proposed work contemplates four potential Alternatives for addressing erosion within the Applewood Creek (See Appendix B for plans and drawings). The four Alternatives included:

Alternative 1 - Do nothing

The existing gabion baskets on the banks of the Applewood Creek would not be removed and would continue to fall within the creek. A 10m erosion hazard would be applied along the creek and ongoing maintenance would continue. The existing bridges would be maintained.

Alternative 2 - Replace gabion baskets with armourstone

The existing gabion baskets on the banks of the Applewood Creek would be replaced with armourstone, 300mm of topsoil and Terrafix 270R (or equivalent). The existing bridges would be maintained.

Alternative 3 - Remove Gabions, Replace with Vegetated Buttress in Same Alignment

The existing gabion baskets on the banks of the Applewood Creek would be replaced with vegetated roundstones. The existing channel width of 3.5m would be expanded to 9m. The existing bridges would be maintained.

Alternative 4 – Naturalize the creek and reintroduce sinuosity

The existing Applewood Creek would be realigned to create a natural low flow channel through the golf course. A number of the golf course's holes would be altered with reconfigured fairways, greens and tees. The existing pond adjacent to the 17th hole green and the 18th hole tee would be removed and a new pond would be constructed. New bridges would be constructed as part of this Alternative.

Of the four Alternatives presented above, the Municipal Class EA process (which included public and stakeholder consultation) determined that Alternative 4 is the preferred option for the restoration of the creek.

4.2 Impact Assessment – Four Alternatives

This section includes a preliminary assessment of the potential impacts of each of the four Alternatives (see Appendix D for plans and drawings of the four Alternatives). The Alternatives have been assessed

with regards to their impact on the cultural heritage resource and identified cultural heritage attributes against a range of possible impacts as outlined in the *Ontario Heritage Toolkit*, which include:

- Destruction of any, or part of any, significant heritage attributes or features
- Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance
- Shadows created that alter the appearance of a heritage attribute or change the viability of an associated natural feature or plantings, such as a garden
- Isolation of a heritage attribute from its surrounding environment, context or a significant relationship
- Direct or indirect obstruction of significant views or vistas within, from, or of built and natural features
- A change in land use (such as rezoning a church to a multi-unit residence) where the change in use negates the property's cultural heritage value
- Land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect a cultural heritage resource, including archaeological resources.

4.2.1 Alternative 1 - Do nothing

Table 1: Impact Assessment – Alternative 1

Impact	Analysis
Destruction, removal or relocation	Alternative 1 is not anticipated to result in the destruction, removal or relocation of any of the attributes that contribute to the property's cultural heritage value. However, without ongoing maintenance erosion may occur over the long term, which may have an impact on cultural heritage attributes.
Alteration	Alternative 1 will not result in any alterations to any of the attributes that contribute to the property's cultural heritage value.
Shadows	Alternative 1 will not result in the creation of any shadows on any of the attributes that contribute to the property's cultural heritage value.
Isolation	Alternative 1 will not result in the isolation of any of the attributes that contribute to the property's cultural heritage value.
Direct or indirect obstruction of significant views	Alternative 1 will not result in the direct or indirect obstruction of any significant views that contribute to the property's cultural heritage value.
A change in land use	Alternative 1 will not result in a change of land use.
Soil disturbance	Alternative 1 will not result in soil disturbances that will affect any of attributes that contribute to the property's cultural heritage value.

Based on the above analysis, Alternative 1 is not anticipated to have any significant impacts on the property's cultural heritage value.

4.2.2 Alternative 2 - Replace gabion baskets with armourstone

Table 2: Impact Assessment – Alternative 2

Impact	Analysis
Destruction, removal or relocation	Alternative 2 will not result in the destruction, removal or relocation of any of the attributes that contribute to the property's cultural heritage value.
Alteration	Alternative 2 will not result in any alterations to any of the attributes that contribute to the property's cultural heritage value.
Shadows	Alternative 2 will not result in the creation of any shadows on any of the attributes that contribute to the property's cultural heritage value.
Isolation	Alternative 2 will not result in the isolation of any of the attributes that contribute to the property's cultural heritage value.
Direct or indirect obstruction of significant views	Alternative 2 will not result in the direct or indirect obstruction of any significant views that contribute to the property's cultural heritage value.
A change in land use	Alternative 2 will not result in a change of land use.
Soil disturbance	Alternative 2 will result in localized soil disturbances that is not anticipated to have any significant effect on any of attributes that contribute to the property's cultural heritage value. Post-construction rehabilitation of the creekbank can mitigate any potential impacts.

Based on the above analysis, Alternative 2 is not anticipated to have any significant impacts on the property's cultural heritage value.

4.2.3 Alternative 3 - Remove gabions, replace with vegetated buttress in same alignment

Table 3: Impact Assessment – Alternative 3

Impact	Analysis
Destruction, removal or relocation	Alternative 3 will not result in the destruction, removal or relocation of any of the attributes that contribute to the property's cultural heritage value.
Alteration	Alternative 3 will not result in any alterations to any of the attributes that contribute to the property's cultural heritage value.
Shadows	Alternative 3 will not result in the creation of any shadows on any of the attributes that contribute to the property's cultural heritage value.
Isolation	Alternative 3 will not result in the isolation of any of the attributes that contribute to the property's cultural heritage value.
Direct or indirect obstruction of significant views	Alternative 3 will not result in the direct or indirect obstruction of any significant views that contribute to the property's cultural heritage value.
A change in land use	Alternative 3 will not result in a change of land use.
Soil disturbance	Alternative 3 will result in localized soil disturbances that is not anticipated to have any significant effect on any of attributes that contribute to the property's cultural heritage value. Post-construction rehabilitation of the creekbank can mitigate any potential impacts.

Based on the above analysis, Alternative 3 is not anticipated to have any significant impacts on the property's cultural heritage value.

4.2.4 Alternative 4 - Naturalize the creek and reintroduce sinuosity

Table 4: Impact Assessment – Alternative 4

Impact	Analysis
Destruction, removal or relocation	Alternative 4 will result in the destruction, removal and relocation of elements of the golf course. The existing Applewood Creek would be reoriented throughout the length of the course. This will result in: ○ The relocation of the 1st hole tee. ○ The relocation of the tee and reconfiguration of the fairway and green on the 16th hole. ○ The removal of one of the two existing tee/green/water hazard combinations on the 17th hole. The second 17th hole will have a new pond created in front of an enlarged green. ○ Reconfiguration of the 18th hole fairway ○ The removal of existing bridges and the construction of new bridges The destruction, removal or relocation of these elements of the course will have a significant impact on the following attributes: ○ Mature trees and other vegetation and their/its placement ○ The placement and orientation of the original tees, fairways, greens, bunkers and other hazards, natural or otherwise, on varying topographic features ○ The shape and form of the greens
Alteration	Alternative 4 will result in alterations to elements of the golf course. The existing Applewood Creek would be altered throughout the length of the course. This will result in: ○ The relocation of the 1st hole tee. ○ The relocation of the tee and reconfiguration of the fairway and green on the 16th hole. ○ The removal of one of the two existing tee/green/water hazard combinations on the 17th hole. The second 17th hole will have a new pond created in front of an enlarged green. ○ Reconfiguration of the 18th hole fairway ○ The removal of existing bridges and the construction of new bridges These alterations will have a significant impact on the following attributes: ○ Mature trees and other vegetation and their/its placement ○ The placement and orientation of the original tees, fairways, greens, bunkers and other hazards, natural or otherwise, on varying topographic features ○ The shape and form of the greens
Shadows	Alternative 4 will not result in the creation of any shadows on any of the attributes that contribute to the property's cultural heritage value.
Isolation	Alternative 4 will not result in the isolation of any of the attributes that contribute to the property's cultural heritage value.

Impact	Analysis
Direct or indirect obstruction of significant views	Alternative 4 will not result in the direct or indirect obstruction of any significant views that contribute to the property's cultural heritage value.
A change in land use	Alternative 4 will not result in a change of land use.
Soil disturbance	Alternative 4 will result in soil disturbances due to the reorientation of the Applewood Creek. These soil disturbances will affect the following attributes that contribute to the property's cultural heritage value: ○ Mature trees and other vegetation and their/its placement ○ The placement and orientation of the original tees, fairways, greens, bunkers and other hazards, natural or otherwise, on varying topographic features ○ The shape and form of the greens

Based on the above analysis, Alternative 4 is anticipated to have an impact on the property's cultural heritage value. The following attributes would be altered, removed or relocated:

- Mature trees and other vegetation and their/its placement
- The placement and orientation of the original tees, fairways, greens, bunkers and other hazards, natural or otherwise, on varying topographic features
- The shape and form of the greens

4.2.5 Impact of Proposed Alternatives on Adjacent Properties

With regards to any adjacent properties, the proposed Alternatives are restricted to within the Lakeview Golf Course property and as such there are no impacts to adjacent properties anticipated as part of any of the proposed Alternatives.

4.3 Impact Assessment – Preferred Option (Alternative 4)

Alternative 4 was chosen as the preferred option through the Municipal Class EA process. As described above in Section 4.2.4, a preliminary assessment of impacts determined that Alternative 4 will result in impacts to the cultural heritage value of the golf course. Further information regarding the impacts of Alternative 4 on the golf course and efforts to mitigate these impacts are described below.

4.3.1 Applewood Creek

Alternative 4 involves the naturalization of the Applewood Creek. The Applewood Creek is included as a heritage attribute. More specifically, the attribute addressed the "placement and orientation" of the creek as an "other hazard, natural or otherwise". A survey of the property from 1920 (prior to the construction of the course) depicts the creek on the property (see Appendix E). Over the years, the creek has been altered only minimally though portions of the creek have been filled in over time (Figure 3). However, the main branch of the creek that is extant today appears to have remained throughout the course's history, though gabions have been added. While the creek will remain an important feature on

the course, the changes to the orientation of the creek will be affecting one of the course's heritage attributes. However, the alteration of the creek will not affect the original layout of the golf course, and the creek is anticipated to become a more visually and strategically prominent part of the course. Discussion related to the impacts of the alteration to the Applewood Creek on trees are outlined in Section 4.3.2, while Section 4.3.3 to 4.3.8 will assess the impact the creek on each hole.

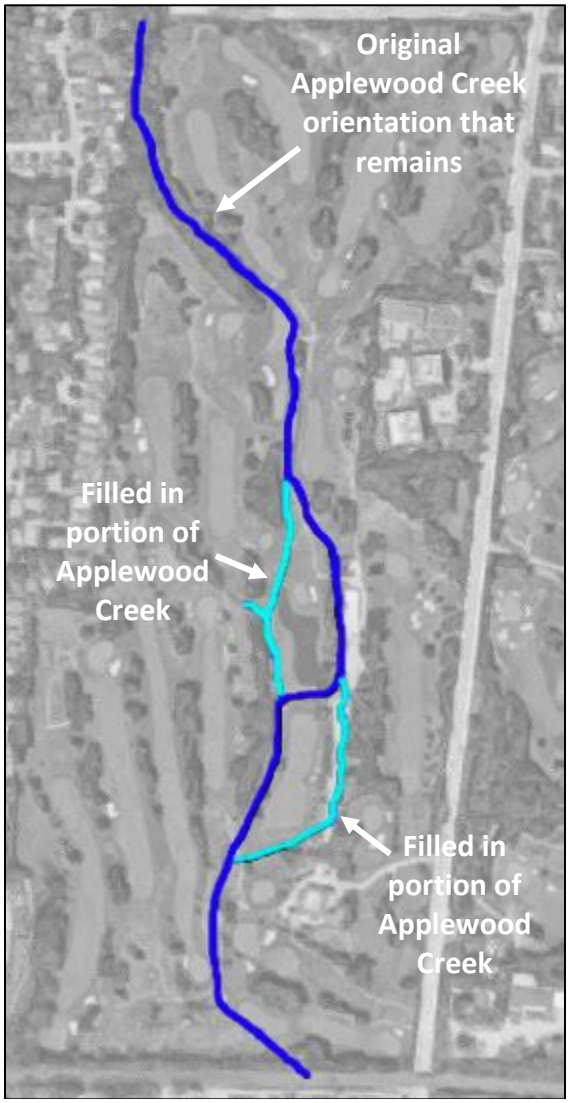

Figure 3: The orientation of the Applewood Creek as surveyed in 1920 overlaid on the existing golf course

4.3.2 Applewood Creek Restoration – Impact on Trees

The proposed restoration of the Applewood Creek will require the removal of approximately fifty trees within the proposed stream corridor (Figure 4). According to historical aerial photography from 1954, it appears that some of the trees proposed for removal were potentially extant on the course at that time. As mature trees have been identified as a heritage attribute, this will have an impact on the course's

cultural heritage value. In order to mitigate this change, trees that are proposed for removal will be replaced based on requirements set by the City of Mississauga and Credit Valley Conservation.

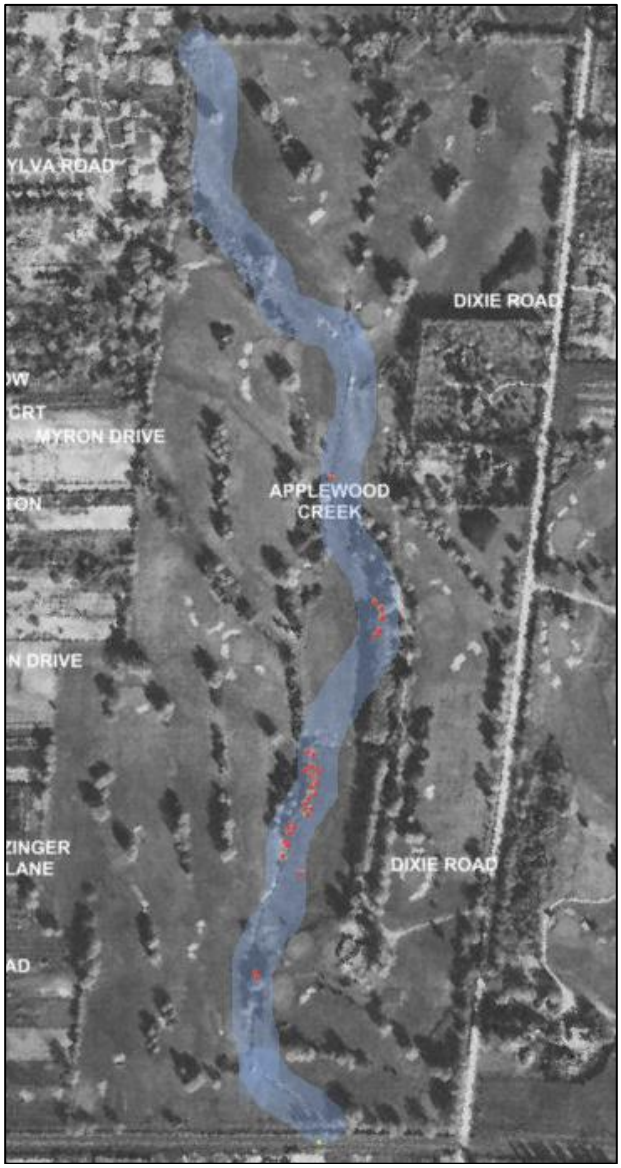

Figure 4: Overview of the proposed stream corridor (in blue) and trees to be removed (in red) overlaid on the 1954 aerial photo (University of Toronto 1954)

4.3.3 1st Hole

The 1st hole tee has been proposed for relocation as Applewood Creek will traverse through the location of the existing tee (Figure 5). While this will alter the location of the existing 1st tee, this hole is not singled out within the designation by-law and as such it is assumed to fall under the attribute described

as "the placement and orientation of the original tees…". According to course architect Cam Tyers,[3] the tee will be moved to restore an elevated tee shot. Further research into the hole determined that the hole played at 350-yards during the 1923 Canadian Open, which is approximately 15-yards longer than its current length (Toronto Star 1923). As such, it may be assumed that the hole was shortened over time, and that the lengthening of the hole is consistent with its original design.

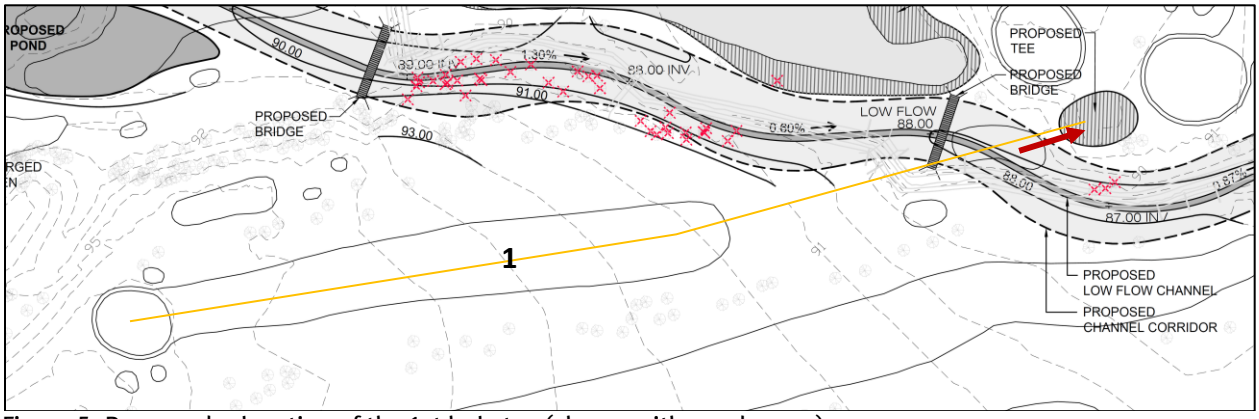

Figure 5: Proposed relocation of the 1st hole tee (shown with a red arrow)

4.3.4 5th Hole

Alterations to the 5th hole include increasing the prominence of the Applewood Creek to the left of the second landing area near the green (Figure 6). At the second landing area, two spruce trees on the left-hand side will be removed. These trees are not original to the course and according to aerial photography, appear to have been added between 1985 and 1989. As such no attributes are affected. According to course architect Cam Tyers, the removal of the trees will strengthen sightlines and restore playing strategies that are likely more in keeping with the original hole. Additionally, the cart path will be shifted to the right hand side of the hole, though this does not affect any heritage attributes.

[3] All references to course architect Cam Tyers' input on the alterations to the course derive from email and telephone correspondence with James Neilson in November 2019. As course architecture is a unique niche that is not typically addressed in heritage impact assessments, it was felt that input from a professional in this field with regards to the intention of the proposed alterations would be helpful information to include in this HIA.

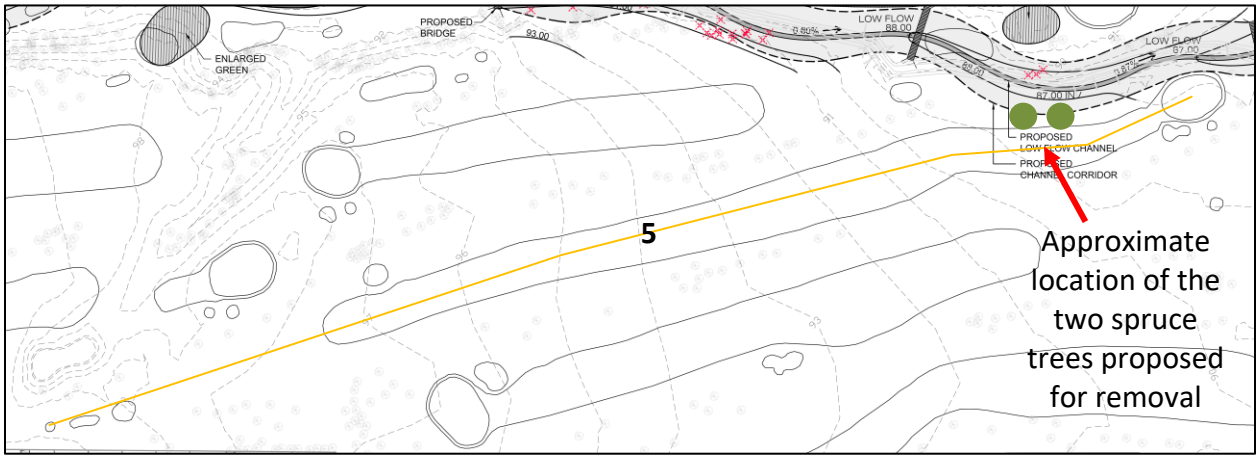

Figure 6: Proposed alterations to the 5th hole

4.3.5 8th Hole

Alterations to the 8th hole (Figure 7) include the construction of two bridges over the Applewood Creek. These new bridges will have no impact on any of the course's heritage attributes. Additionally, two portions of fairway that according to historical aerial photography were separated in 2009 will have their link restored. According to course architect Cam Tyers, this alteration will improve playability and will only require the cutting an area of rough to fairway length. The lack of contrast between fairway and rough in early historical aerial photographs would not allow for confirmation of the early orientation of the fairway. As such, while it is possible that the change made in 2009 was more in line with the original design of the hole, this is currently unknown. The alterations will only be a matter of changes to the cutting of the grass to a shorter length. This change is reversible if additional information about the layout of the hole were to be uncovered in the future.

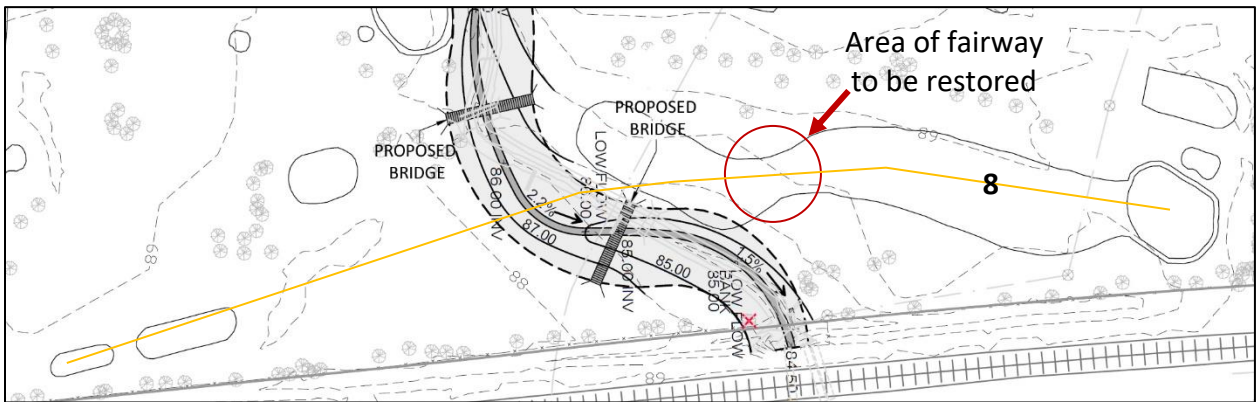

Figure 7: Proposed alterations to the 8th hole

4.3.6 16th Hole

The alterations to the 16th hole include the relocation of one of the tees, the reconfiguration and expansion of the fairway and the enlarging of the green (Figure 8). Three coniferous trees are proposed to be removed in the left rough and a new bridge will be constructed to cross the Applewood Creek.

The original configuration of the 16th hole is unknown. Based on historical aerial photography, it appears that the tee proposed for relocation was created between 1997 and 2000. The tee does not appear to be original to the course, and as such, the relocation of the tee will not have an impact on any of the course's heritage attributes.

The reconfiguration and expansion of the fairway likely has some impact on the original layout of the course, though the full impact is unknown as early historical aerial photography does not adequately express the difference between fairway and rough on this portion of the course. Course architect Cam Tyers has explained that the hole has likely evolved over the years as the option of using the topography to shape the tee shot has been removed due to tree plantings that block the intended line of flight. The width of the fairway has been reduced over time within in the primary landing area. Tyers has stated that the goal is to restore the use of the natural topography on the left side to direct the ball into the ideal landing area. Though the original layout may be impacted, the rationale for the alteration suggests that the hole may be returning closer to how it was intended to play in its early history. The alterations will only be a matter of changes to the cutting of the grass. This change is reversible if additional information about the layout of the hole were to be uncovered in the future.

Related to the alteration of the fairway is the removal of three coniferous trees on the left side of the fairway. Historical aerial photography suggests that the three coniferous trees that are proposed for removal were added to the course in the 1980s. Prior to their installation, the left hand side of the fairway did not appear to contain any trees, and as such, the removal of these trees will help to restore the course to its pre-1980s state.

The expansion of the green is likely an alteration to the original layout of the course. Analysis of historical aerial photographs show that the area around the green has seen some changes over the years, namely two bunkers were created in the mid-1990s and later merged in 2004 to form the bunker near the green. Whether alterations to the size of the green have also been made could not be determined. Course Architect Cam Tyers believes that the green has been reduced in size over the years. The process of expanding the green will involve probing beyond the existing perimeter of the green and searching for remnants of the original green profile. If sufficient expansion cannot be achieved through this method, expansion will be achieved by adding more putting area to the front of the green. This will involve a process of carefully matching surface grades and grass cutting to achieve a seamless expansion. The overall intention is to maintain the internal slopes of the existing green. The expansion of the green will help to maintain the health of the green as its current size is not adequate for the number of rounds played on the course annually, and a larger green will allow areas of the green that are ostensibly "out-of-play" to recover quicker. If the green can be restored to its original size via the probing described above, this would be seen as a positive impact on the cultural heritage value of the course. Otherwise, if no remnants of a larger green can be found, it can be assumed that an element of the course's original layout will be altered, though the slope of the existing green will remain.

Finally, the new bridge will not have an impact on any of the course's heritage attributes.

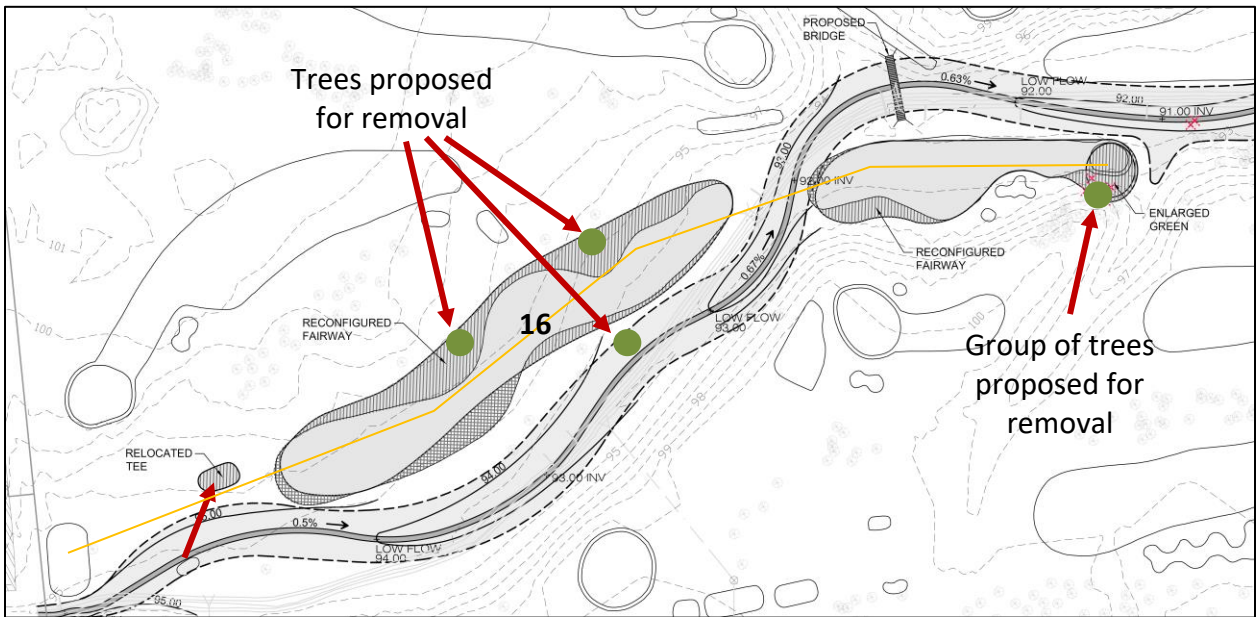

Figure 8: Proposed alterations to the 16th hole

4.3.7 17th Hole

The novelty of the 17th hole has been its two different sets of tees and greens. The east-west hole appears to be original to the golf course though based on historical aerial photography, its bunkers appear to have been removed between 1954 and 1966. According to historical aerial photography, the north-south hole was created between 1954 and 1966. The north-south hole had been altered a number of times over the years with the pond created in 1977 and two bunkers added between 1989 and 1992.

The alterations to the 17th hole involve the removal of the north-south hole that is also currently used (Figure 9) and the restoration of the original east-west hole's green size and bunker configuration to its 1921 configuration based on a historical photo of the hole during construction (Figure 10). According to course architect Cam Tyers, the original green is a strong example of the artistry and character of Herbert Strong and is consistent with Strong's philosophy of locating greens near ridgelines. Furthermore, the current green cannot handle the volume of play and the alternate green shows no design traits that are consistent with Strong's work. The restored green and the 17th tee will be rebuilt to a size that can accommodate the number of rounds played at the course. In addition, a new bridge will be constructed, and the existing pond expanded. Neither are original features and will have no impact on the course's cultural heritage value. The restoration of the 17th green to its historical configuration will have a strong positive impact on the cultural heritage value of the course.

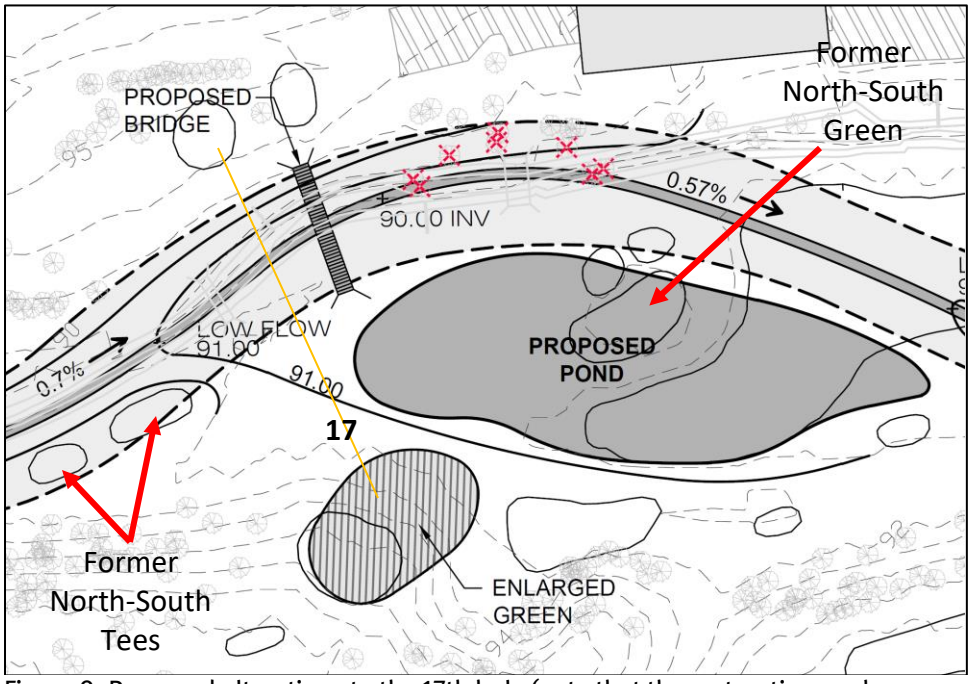

Figure 9: Proposed alterations to the 17th hole (note that the restoration work described above is not reflected in this drawing)

Figure 10: Proposed restoration of the 17th hole (Tyers 2019)

4.3.8 18th Hole

The proposed changes to the 18th hole involve the enlarging of the fairway and the reconfiguration of the Applewood Creek (Figure 11). Two new bridges are proposed. The original layout of the 18th fairway

could not be ascertained via historical aerial photographs and as such, the extent to which the proposed alterations will affect the original layout is unknown. According to course architect Cam Tyers, the intention of the alterations is to restore the prominence of the Applewood Creek and incorporate additional strategic options for the final hole of the course. The alterations will only be a matter of changes to the cutting of the grass to a shorter length. This change is reversible if additional information about the layout of the hole were to be uncovered in the future.

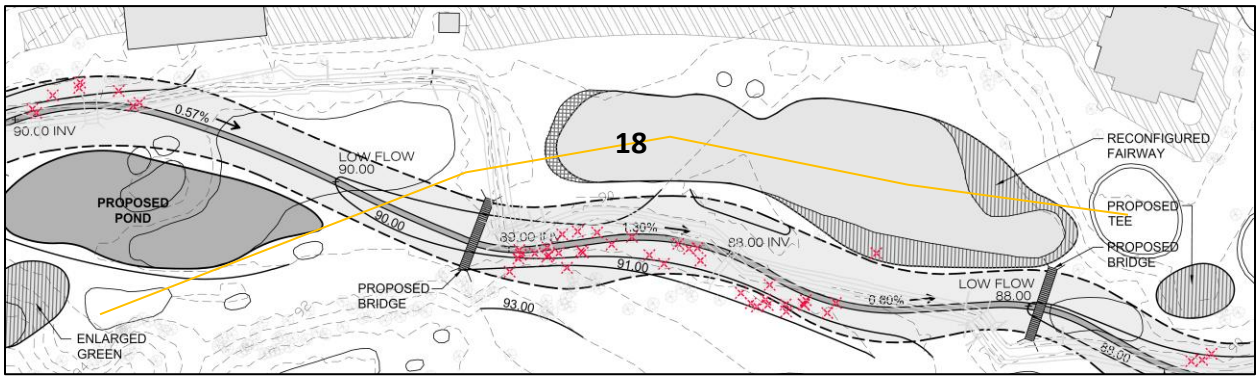

Figure 11: Proposed alterations to the 18th hole

4.3.9 Impact Summary

The proposed alterations required for Alternative 4 have been evaluated based on the existing cultural heritage attributes and after discussions with course architect Cam Tyers. This assessment has determined that the alterations will not have a significant negative impact on the cultural heritage value of the golf course.

The naturalization of the Applewood Creek will alter its orientation and therefore have an impact on an attribute that likely played a roll in the routing of the original layout of the golf course. However, the original layout of the holes will not be affected by the alteration, and the creek is anticipated to become a more visually and strategically prominent part of the course. This alteration will require the removal of some mature trees, though the significance of the removal of these trees is not anticipated to have a significant negative impact. Furthermore, trees will be replaced as required by the City of Mississauga and Credit Valley Conservation.

Beyond Applewood Creek, the proposed alterations largely involve the removal of features that do not appear to be original to the golf course, such as recently added trees and the removal of the north-south 17th hole. Unfortunately the original plans for the golf course have not been discovered, however where potential original features are proposed for alteration (such as the reconfiguration of fairways) the changes are largely reversible and will require only changes to grass cutting to revert to previous layouts. The rationale for the changes are rooted in golf course design theory and/or based on maintaining the playability of certain holes that are affected by the large volume of rounds played on the course. It should be highlighted that 17th hole, which has seen the most change to its original configuration, will be restored to its original configuration. This is a significant intervention that will contribute positively to the course's cultural heritage value.

Overall, the proposed changes to the course are not anticipated to have a significant negative impact on the cultural heritage value of the golf course.

5.0 CONCLUSION AND RECOMMENDATIONS

This report has determined that preferred option for the restoration of Applewood Creek on the Lakeview Golf Course property within the City of Mississauga is not anticipated to have a significant negative impact on the cultural heritage value of the golf course. While the orientation of Applewood Creek is an original feature and a heritage attribute of the course, the original layout will not be affected by the alteration, and the creek is anticipated to become a more visually and strategically prominent part of the course. Though the alteration to Applewood Creek will involve the removal of mature trees, many of the other elements of the course that are proposed for alteration are not original to the course or the alterations are reversible. Additionally, the restoration of the 17th hole to its original configuration will contribute positively to the course's cultural heritage value.

5.1 Recommendations

Based on the conclusions of this report, the following recommendations are proposed as part of the Applewood Creek Restoration:

1. Where possible, efforts should be made to protect mature trees that are currently proposed for removal. Any trees impacted or removed should adhere to the City of Mississauga and Credit Valley Conservation requirements.

2. A documentation report should be considered by the City of Mississauga prior to construction. The report should provide photographs and plans of each hole as a means of documenting the features that contribute to the cultural heritage value of the golf course prior their alteration.

3. Staging and construction activities should be suitably planned and undertaken to avoid impacts to identified attributes.

4. Should future work require additional alterations to the golf course, a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.

5. This report should be submitted to the City of Mississauga's Heritage Planning Department for review.

6.0 REFERENCES

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1997 Lines of Country: An Atlas of Railway and Waterway History in Canada. Boston Mills Press, Erin, Ontario

Canada's Historic Places
2010 *Standards and Guidelines for the Conservation of Historic Places in Canada*.

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Hicks, K.A.
2005 Lakeview: Journey from Yesterday. The Friends of the Mississauga Library System, Mississauga.

Ministry of Culture, Ontario
1981 *Guidelines on the Man-Made Heritage Component of Environmental Assessments*
1992 *Guidelines for Preparing the Cultural Heritage Resource Component of Environmental Assessments*
2005 *Ontario Heritage Act*

Ministry of Tourism and Culture, Ontario
2005 *Ontario Heritage Act.*
2006 *Ontario Heritage Tool Kit*
2010 *Standards and Guidelines for the Conservation of Provincial Heritage Properties.*
2010 *Check Sheet for Environmental Assessments: Screening for Impacts to Built Heritage Resources and Cultural Heritage Landscapes*

Ministry of Environment, Ontario
2006 *Environmental Assessment Act*

Ministry of Municipal Affairs and Housing, Ontario
2005 *Ontario Planning Act*
2005 *Provincial Policy Statement*

Toronto Star
1923 "Gene Sarazen with a 74, Leads Morning Round." Toronto Star, 3 August 1923. p.1

Tyers, Cam
2019 Proposed alterations to the 17th hole, Lakeview Golf Course.

APPENDIX A: Lakeview Golf Course - Statement of Significance

ONTARIO HERITAGE TRUST

An agency of the Government of Ontario

FIDUCIE DU PATRIMOINE ONTARIEN

Un organisme du gouvernement de l'Ontario

Corporate Services Department
Legislative Services Division
Office of the City Clerk

City of Mississauga
300 City Centre Drive
MISSISSAUGA ON L5B 3C1

FAX: 905-615-4181
www.mississauga.ca

MISSISSAUGA

Leading today for tomorrow

January 25, 2010

Paul Mitcham, Commissioner of Community Services
City of Mississauga
201 City Centre Drive, 9th Floor
Mississauga, ON

VIA REGISTERED MAIL
Ontario Heritage Trust
10 Adelaide Street East
Toronto, ON M5C 1J3

Re: Heritage Designation – Lakeview Golf Course
1190 Dixie Road Ward 1
Clerk's File: CS.08.DIX

We are enclosing herewith for your retention, a copy of By-law 0008-2010 passed by Council on January 20, 2010 designating the property located at 1190 Dixie Road as being of cultural heritage value or interest under the *Ontario Heritage Act*.

Regards,

Jessica Reid
Legislative Coordinator
Phone: 905-615-3200 Ext. 5423
E-Mail: Jessica.Reid@mississauga.ca

Enclosure: Copy of By-law 0008-2010

c.c. Councillor Carmen Corbasson, Ward 1 (w/enclosure)
Susan Burt, Director of Culture Division (w/enclosure)
Mark Warrack, Heritage Coordinator, Culture Division (w/enclosure)
John Trace, Manager, Golf Course Operations (w/enclosure)

CERTIFIED A TRUE COPY

GRANT BIVOL DEPUTY CLERK
CITY OF MISSISSAUGA

THE CORPORATION OF THE CITY OF MISSISSAUGA

BY-LAW NUMBER 0008-2010

A By-law to designate the Lakeview Golf Course
located at 1190 Dixie Road
as being of cultural heritage value or interest

WHEREAS the *Ontario Heritage Act,* R.S.O. 1990, Chapter 0.18, as amended, authorizes the Council of a municipality to enact By-laws to designate real property including all the buildings and structures thereon, to be of cultural heritage value or interest;

AND WHEREAS Notice of Intention to designate the Lakeview Golf Course located at 1190 Dixie Road, in the City of Mississauga, has been duly published and served, and no notice of objection to such designation has been received by the Clerk of The Corporation of the City of Mississauga;

NOW THEREFORE the Council of The Corporation of the City of Mississauga hereby ENACTS as follows:

1. That the property, including all the buildings and structures thereon, known as the Lakeview Golf Course located at 1190 Dixie Road, in the City of Mississauga, and legally described in Schedule 'A' attached hereto, is hereby designated as being of cultural heritage value or interest under Part IV of the *Ontario Heritage Act,* R.S.O. 1990, Chapter 0.18, as amended..

2. That the reasons for designating the property known as the Lakeview Golf Course located at 1190 Dixie Road, in the City of Mississauga, under section 1 of this By-law, are duly set out in Schedule 'B'.

3. That the City Clerk is hereby authorized to cause a copy of this By-law to be served upon the owner of the aforesaid property, and upon the Ontario Heritage Trust and to cause notice of this By-law to be published in a newspaper having general circulation in the City of Mississauga.

4. That Schedules 'A' and 'B' form an integral part of this By-law.

5. That the City Solicitor is hereby directed to register a copy of this By-law against the property located at 1190 Dixie Road in the proper land registry office.

ENACTED AND PASSED this 20th day of JANUARY, 2010.

APPROVED
AS TO FORM
City Solicitor
MISSISSAUGA
DS
Date 09 12 22

MAYOR

Crystal Green

CLERK

SCHEDULE 'A' TO BY-LAW 0008-2010

Summary: Part of Lots 6 and 7, Concession 2, South of Dundas Street
(To be designated under the Ontario Heritage Act)

(Ward 1, City Zone 6, in the vicinity of Lakeshore Road East and Dixie Road)

Legal Description: In the City of Mississauga, Regional Municipality of Peel, (Geographic Township of Toronto, County of Peel), Province of Ontario and being all of PIN 13480-0225, more particularly described as part of Lots 6 and 7, Concession 2, South of Dundas Street, as in Inst. TT190553, except Part 1 on Plan 43R-13134.

Alnasihir Jeraj
Ontario Land Surveyor

SCHEDULE 'B' TO BY-LAW NO. 0008-2010

DESIGNATION STATEMENT
Lakeview Golf Course, 1190 Dixie Road

Description of Property – Lakeview Golf Course, 1190 Dixie Road
Lakeview Golf Course is an early twentieth century golf course, located on the west side of Dixie Road, north of the Canadian National Railway, in Lakeview.

Statement of Cultural Heritage Value or Interest

Lakeview Golf Course's cultural heritage value lies in it being one of few remaining traditional tree-lined parkland layout golf courses in an urban setting and one of few remaining courses designed by golf course architect Herbert Strong. Strong's courses were known to be challenging with undulating fairways and severe greens. The course was an early construction project of Thompson, Cumming and Thompson, an important Canadian designer and constructor of golf courses, headed up by Stanley Thompson.

Lakeview Golf Course's cultural heritage value also lies in its association with important golf tournaments and their players. The Course hosted the Canadian Open in 1914, 1923 and 1934. It initiated the Ontario Open, the Ontario Amateur Open and the Champion of Champions Tournament. It also hosted several other provincial championships.

Lakeview Golf Course's cultural heritage value also lays in its history as a resort/recreational facility for York (Toronto) residents.

Description of Heritage Attributes

Key attributes of Lakeview Golf Course that reflect its value as a traditional course, in an urban setting, designed by Herbert Strong:

- its location, orientation and dimensions
- its mature trees and other vegetation and their/its placement
- the inclusion of 18 holes and their layout
- the placement and orientation of the original tees, fairways, greens, bunkers and other hazards, natural or otherwise, on varying topographical features
- the original 11th and 18th tees – these should not be dug up, nor should any vegetation be planted on them
- the bunker in front of the 9th green – this is integral to the original design
- the shape and form of the greens
- the staff dwelling at 1392 Dixie Road, with its broad gently pitched roof that covers the veranda; chimney; Edwardian elements, including a Classical pediment, the short colonettes, with their decorative mouldings, on brick piers that support the veranda roof, the veranda balustrade, the fenestration, including the bay windows and sidelights flanking the main entrance, and wood siding

Key attributes of Lakeview Golf Course that reflect its value as a site of important tournaments and competitors:

- the original Herbert Strong layout with its original par – returning the course to its original 70 par is encouraged

Key attributes of Lakeview Golf Course that reflect its resort/recreational history value:

- its location near to Toronto and immediacy to the railway line

APPENDIX B: Lakeview Golf Course - Cultural Landscape Inventory Sheet

CITY OF MISSISSAUGA

Cultural Landscape Inventory

Lakeview Golf Course L-PA-5

Location West side of Dixie Rd. between Lakeshore Road and the QEW.

Heritage or Other Designation None

Landscape Type Park (Golf Course)

LANDSCAPE ENVIRONMENT

- [x] Scenic and Visual Quality
- [x] Natural Environment
- [x] Horticultural Interest
- [ ] Landscape Design, Type and Technological Interest

BUILT ENVIRONMENT

- [x] Aesthetic / Visual Quality
- [x] Consistent Early Environs (pre-World War II)
- [x] Consistent Scale of Built Features
- [ ] Unique Architectural Features / Buildings
- [ ] Designated Structures

HISTORICAL ASSOCIATION

- [ ] Illustrates Style, Trend or Pattern
- [ ] Direct Association with Important Person or Event
- [ ] Illustrates Important Phase in Mississauga's Social or Physical Development
- [ ] Illustrates Work of Important Designer

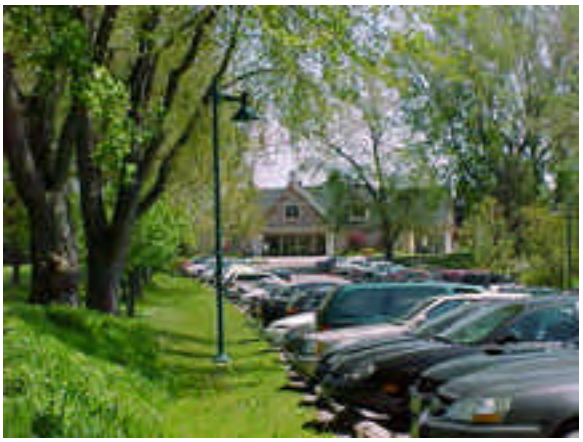
OTHER

- [x] Historical or Archaeological Interest
- [ ] Outstanding Features / Interest
- [ ] Significant Ecological Interest
- [ ] Landmark Value

Lakeview Golf Course L-PA-5

SITE DESCRIPTION

The Lakeview Golf Course was originally known as the High Park Golf Club, formed in 1896. The golf club relocated to its present site in 1907, and in 1912 its name was changed to the Lakeview Golf and Country Club Limited. The club became highly popular, hosting the Canadian Open in both 1923 and 1934. In 1939, a fire destroyed its thiry-room clubhouse. For the next fifteen years, the property was privately and semi-privately owned. Between 1956 and 1964 the Township of Toronto leased the property. Now known as the Lakeview Golf Course, the site was purchased in 1965 by the Township of Toronto and is currently owned and operated by the City of Mississauga. It is now open to the public.



APPENDIX C: Photographic Plates

Figure 12: Map of photo locations (Google; ASI 2019)

Plate 1: East view of Study Area south of the 8th hole (ASI 2019)

Plate 2: Northeast view of Study Area, south of the 5th hole (ASI 2019)

Plate 3: Southeast view of Study Area, north of the 1st hole tee box (ASI 2019)

Plate 4: Northwest view of Study Area, north of the 1st hole tee box (ASI 2019)

Plate 5: Northwest view of Study Area, to the west of the 18th hole (ASI 2019)

Plate 6: Southeast view of Study Area, south of the 18th hole tee box (ASI 2019)

Plate 7: Northwest view of Study Area, east of the 17th hole (ASI 2019)

Plate 8: Southeast view of Study Area, east of the 18th hole (ASI 2019)

Plate 9: Northwest view of Study Area, north of the 17th hole (ASI 2019)

Plate 10: Northwest view of Study Area, north of the 17th hole (ASI 2019)

Plate 11: Southeast view of Study Area, west of the 12th green (ASI 2019)

Plate 12: Northwest view of Study Area, south of the 14th green (ASI 2019)

Plate 13: West view of Study Area, north of the 3rd tee (ASI 2019)

Plate 14: West view of Study Area, west of the 16th hole (ASI 2019)

Plate 15: Northeast view of Study Area, west of the 16th hole (ASI 2019)

Plate 16: South view of Study Area, west of the 16th hole (ASI 2019)

Plate 17: Southeast view of Study Area, west of the 16th hole (ASI 2019)

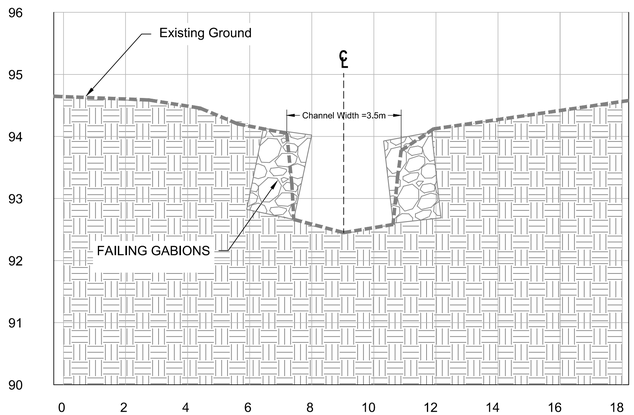
Plate 18: Northwest view of Study Area, west of the 16th hole (ASI 2019)

APPENDIX D: Proposed Alternatives

DO NOTHING

- GABION BASKETS CONTINUE TO FALL
- MINIMUM 10m EROSION HAZARD APPLIED

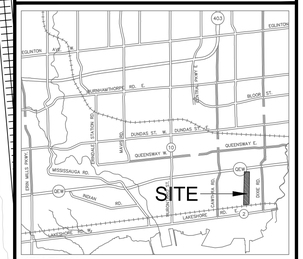
XS1-1'



NO.	BY	DD/MM/YY	REVISIONS	CHECKED
2	SG	13/08/19	ISSUED FOR EA	RA
1	SG	31/05/19	ISSUED FOR CITY REVIEW	RA

LEGEND

- PROPERTY/ BUILDING LINE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATER MAIN
- EXISTING STORM OUTFALL
- EXISTING STORM MH
- EXISTING SANITARY MH
- EXISTING CB
- EXISTING BRIDGE
- EXISTING CULVERT
- EXISTING GABION
- CHANNEL
- SCOUR/EROSION HAZZARD



KEY PLAN
N.T.S.

Aquafor Beech Limited
#6-2022-2600 SKYMARK Ave,
MISSISSAUGA, ONTARIO, L4W 5B2
PHONE: (905) 629-0099, FAX: (905) 629-0089

MISSISSAUGA
Leading today for tomorrow

Project Name:
APPLEWOOD CREEK
EROSION CONTROL
LAKEVIEW GOLF COURSE

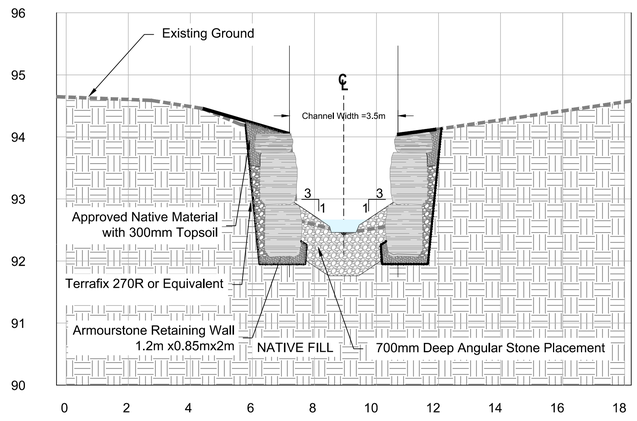
Drawing Title:
OPTION 1
DO NOTHING

Scale: 1:1500	Project No:		OP-1
Drawn: S.G.	Designed: R.A.		
Date:	Sheet No. 1 OF 4		

REPLACE GABION BASKETS WITH ARMOURSTONE IN SAME ALIGNMENT

- REMOVE ALL GABION BASKETS (1.5 Km)
- REPLACE WITH ARMOURSTONE RETAINING WALLS
- LIMITED IMPACT TO GOLF COURSE
- EXISTING BRIDGES TO REMAIN

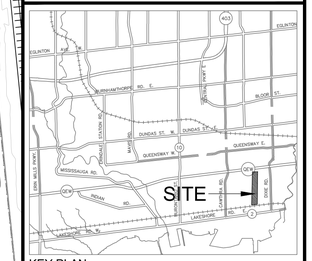
XS2-2'



NO.	BY	DD/MM/YY	REVISIONS	CHECKED
2	SG	13/08/19	ISSUED FOR EA	RA
1	SG	31/05/19	ISSUED FOR CITY REVIEW	RA

LEGEND

- PROPERTY/ BUILDING LINE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATER MAIN
- EXISTING STORM OUTFALL
- EXISTING STORM MH
- EXISTING SANITARY MH
- EXISTING CB
- EXISTING BRIDGE
- EXISTING CULVERT
- EXISTING GABION
- CHANNEL



KEY PLAN
N.T.S.

Aquafor Beech Limited
#6-202-2400 SKYMARK Ave
MISSISSAUGA, ONTARIO, L4W 5B2
PHONE: (905) 629-0299, FAX: (905) 629-0089

MISSISSAUGA
Leading today for tomorrow

Project Name:
APPLEWOOD CREEK EROSION CONTROL
LAKEVIEW GOLF COURSE

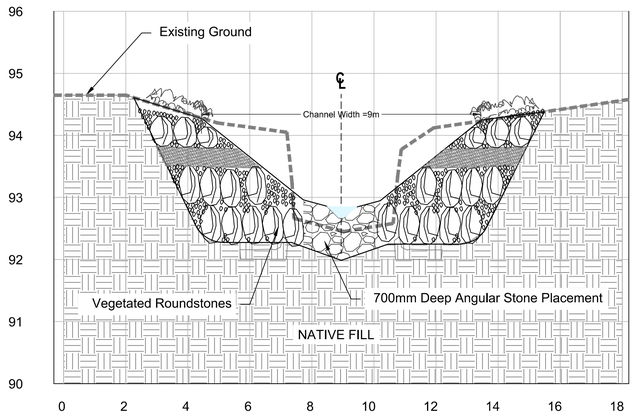
Drawing Title:
OPTION 2
REPLACE GABION BASKETS WITH ARMOURSTONE IN SAME ALIGNMENT

Scale: 1:1500	Project No:	OP-2
Drawn: S.G.	Designed: R.A.	
Date:	Sheet No. 2 OF 4	

REPLACE GABION BASKETS WITH VEGETATED ROUNDSTONE IN SAME ALIGNMENT

- REMOVE ALL GABION BASKETS (1.5 Km)
- REPLACE WITH VEGETATED ROUNDSTONES
- MINOR IMPACT TO GOLF COURSE
- 6 OF 9 BRIDGES TO BE REPLACED

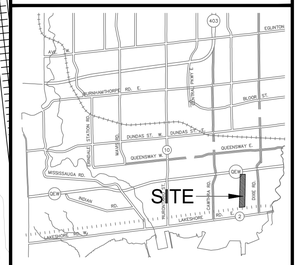
XS3-3'



NO.	BY	DD/MM/YY	REVISIONS	CHECKED
2	SG	13/08/19	ISSUED FOR EA	RA
1	SG	31/05/19	ISSUED FOR CITY REVIEW	RA

LEGEND

- PROPERTY/ BUILDING LINE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATER MAIN
- EXISTING STORM OUTFALL
- EXISTING STORM MH
- EXISTING SANITARY MH
- EXISTING CB
- EXISTING BRIDGE
- EXISTING CULVERT
- EXISTING GABION
- CHANNEL



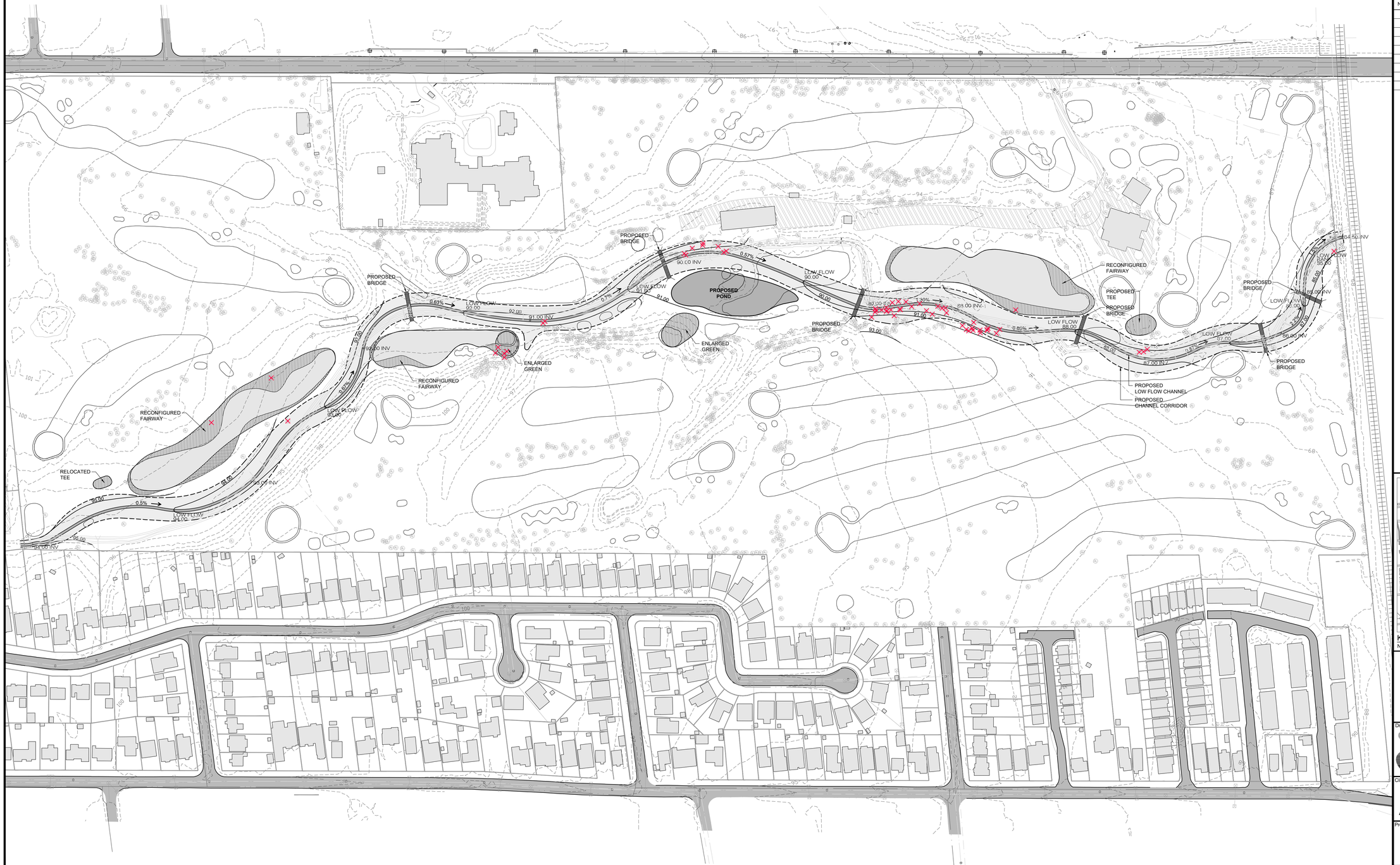
Aquafor Beech Limited
#6-202-2400 SKYMARK Ave,
MISSISSAUGA, ONTARIO, L4W 5B2
PHONE: (905) 629-0099, FAX: (905) 629-0089

MISSISSAUGA
Leading today for tomorrow

Project Name:
APPLEWOOD CREEK EROSION CONTROL
LAKEVIEW GOLF COURSE

Drawing Title:
OPTION 3
REPLACE GABION BASKETS WITH VEGETATED ROUNDSTONES IN SAME ALIGNMENT

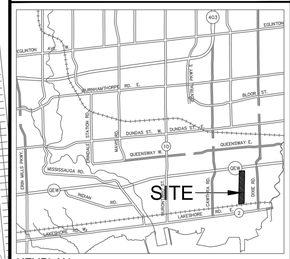
Scale: 1:1500	Project No:	OP-3
Drawn: S.G.	Designed: R.A.	
Date:	Sheet No. 3 OF 4	



No.	Revision	Date	By
1	Issued for Aproval	2019/08/01	RMS

LEGEND

- 95 — EXISTING CONTOUR
- 93.00 — PROPOSED CONTOUR
- EXISTING TREES
- EXISTING TREES TO BE REMOVED
- PROPOSED STREAM CORRIDOR
- PROPOSED LOW FLOW CHANNEL
- +92.00 INV — PROPOSED ELEVATION



KEYPLAN
N.T.S.

Drawing Prepared By:
SCHOLLEN & Company Inc.
30 Wertheim Court, Unit 15
Richmond Hill, Ontario L4B 1B9
T: 289-695-0009
F: 289-695-0010

Client:
MISSISSAUGA
Leading today for tomorrow

Project Name:
APPLEWOOD CREEK EROSION CONTROL
LAKEVIEW GOLF COURSE

Drawing Title:
PROPOSED ALIGNMENT / GRADING CONCEPT PLAN

Scale:	Project No.:	Drawing No.:
1:1500	19003	L1
Drawn: SR	Checked: RMS	
Date: July 2019	Plot Date: 01/08/2019	

S:\Projects\Applewood Creek Erosion Control Project 19003\drawings\working drawings\L-1.dwg

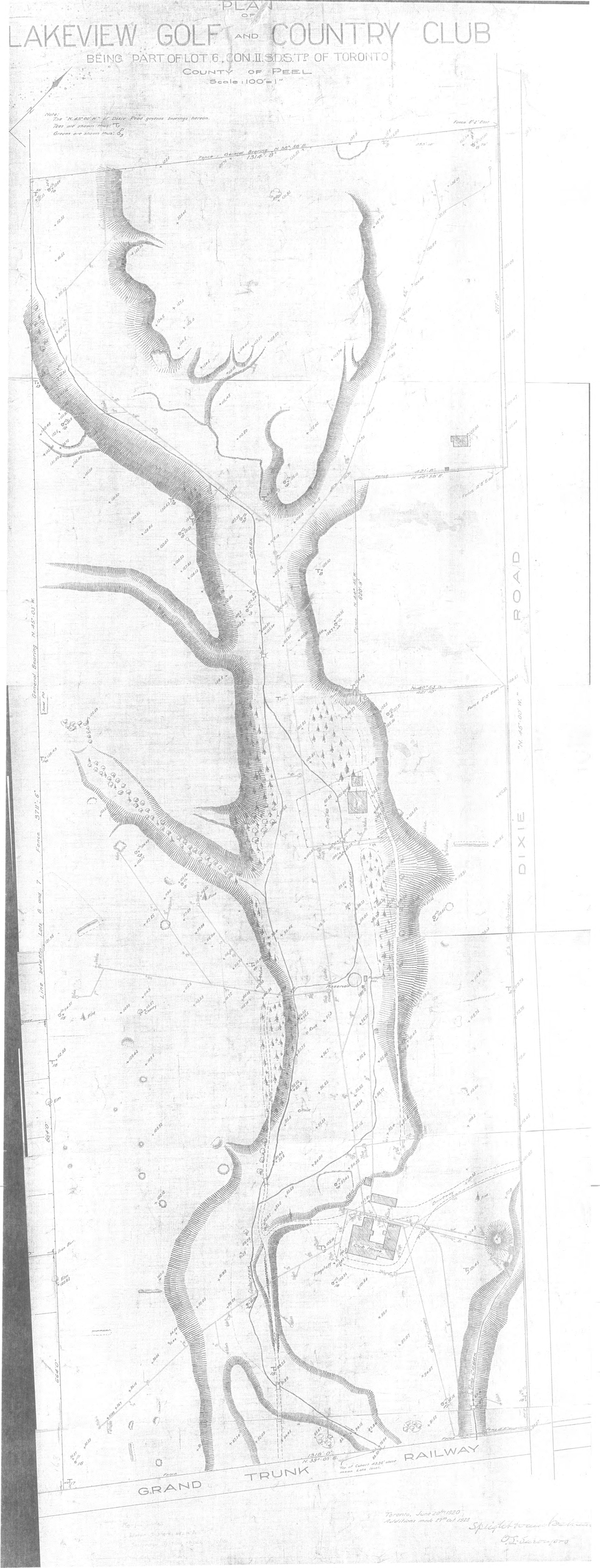
APPENDIX E: 1920 Survey

PLAN OF LAKEVIEW GOLF AND COUNTRY CLUB

BEING PART OF LOT 6, CON. II. S.D.S. TP OF TORONTO

COUNTY OF PEEL

Scale: 100'=1"



Toronto, June 29th 1920.
Additions made 27th Oct. 1923.

Speight Evans & Barlow
O.L.S. Surveyors

Appendix G – Public Consultation

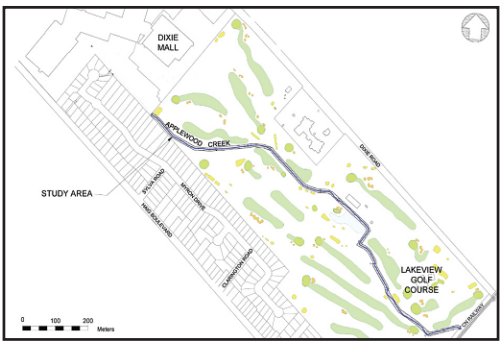
Appendix G1 – Environmental Assessment Study Notices

CITY OF MISSISSAUGA – NOTICE OF STUDY COMMENCEMENT

Municipal Class Environmental Assessment Study: Applewood Creek Erosion Control Project – Lakeview Golf Course (CN Railway to Dixie Outlet Mall)

WHAT?

- The City of Mississauga is undertaking a Schedule B Class Environmental Assessment (Class EA) Study for erosion control and restoration of Applewood Creek through Lakeview Golf Course.



WHY?

- Through its ongoing erosion monitoring program, the City of Mississauga recognizes that this section of Applewood Creek has been impacted by recent large storm events and is in need of rehabilitation to address existing erosion and safety issues.

HOW?

- The study will examine the creek and associated natural resources to identify existing erosion problems, potential future risks, and opportunities for restoration and environmental enhancement.
- Through the Class EA process, multiple alternative solutions will be developed and evaluated by the Study Team and refined through public and agency consultation (see below). The Study Team will then select a Preferred Alternative and proceed with design of the recommended works.
- At the end of the study, a Project File, documenting the study process will be available for public review.

GET INVOLVED!

- Consultation is an important part of the Class EA process. Public input and comment are invited, for incorporation into the planning and design of this project.
- A Public Information Centre (PIC) will be held to present the study findings, the alternative solutions being considered, and to answer any questions you may have. Details regarding the PIC will be advertised publicly as the study progresses.
- If you have any questions or comments regarding the study, wish to provide input on the proposed solutions, or wish to be added or removed from the study mailing list, please contact:

Greg Frew, P.Eng.
Project Manager
City of Mississauga
201 City Centre Dr, Suite 800
Mississauga, ON L5B 2T4
(905) 615-3200, ext. 3362
Greg.Frew@mississauga.ca

Robert Amos, P.Eng.
Consultant Project Manager
Aquafor Beech Ltd.
2600 Skymark Avenue, Unit 6-201
Mississauga, Ontario
(905) 629-0099, ext. 294
amos.r@aquaforbeech.com

This notice signals the commencement of the Class EA, a study which will define the problem, identify/evaluate alternative solutions, and determine a preferred design in consultation with regulatory agencies and the public. The study is being undertaken in accordance with the planning and design process for Schedule 'B' projects, as outlined in the *"Municipal Class Environmental Assessment"* document (October 2000, amended in 2015), which is approved under the Ontario *Environmental Assessment Act.*

Personal information is collected under the authority of the Environmental Assessment Act and will be used in the assessment process. With exception of personal information, all comments shall become part of the public records. Questions about this collection should be directed to the Project Manager listed above.

This notice was first issued July 4, 2019.

CITY OF MISSISSAUGA – PUBLIC INFORMATION CENTRE

Municipal Class Environmental Assessment Study:
Applewood Creek Erosion Control Project – Lakeview Golf Course
(Dixie Outlet Mall to CN Rail)

WHAT?

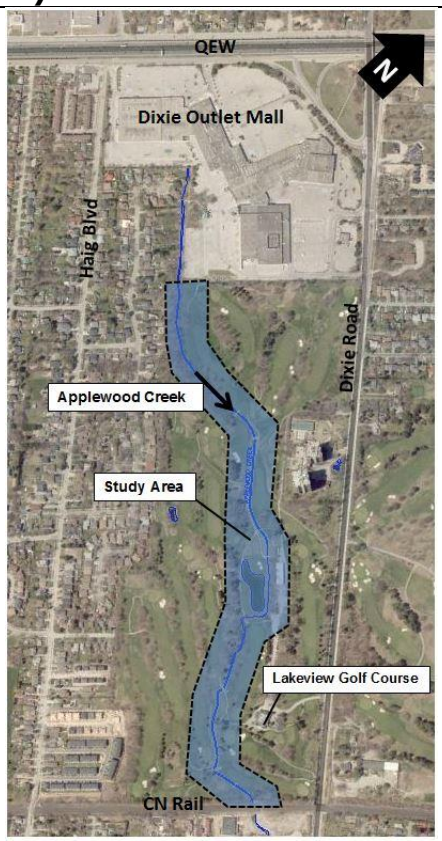
- The City of Mississauga is undertaking a Schedule B Class Environmental Assessment (Class EA) Study to control erosion and restore the section of Applewood Creek through the Lakeview Golf Course.

WHY?

- Through its ongoing erosion monitoring program, the City of Mississauga recognizes that this section of Applewood Creek is in need of rehabilitation to address existing erosion and safety issues.

HOW?

- The study is examining the creek and associated natural resources to identify existing erosion problems, potential future risks, and opportunities for restoration and environmental enhancement.
- Through the Class EA process, multiple alternative solutions are being evaluated by the Study Team and will be refined through public and agency consultation (see below). The Study Team will then select a Preferred Alternative and proceed with design of the recommended works.
- At the end of the study, a Project File, documenting the study process will be available for public review.



PUBLIC CONSULTATION

- Consultation is an important part of the Class EA process. Public input and comment are invited for incorporation into the planning and design of this project.
- A Public Information Centre (PIC) has been scheduled to present the study findings to date, review the alternative solutions being considered, and to answer any questions you may have. The location and date for the PIC are listed below:

DATE: **Thursday November 7th, 2019**
TIME: **4:00 pm to 7:00 pm**
LOCATION: **Lakeview Golf Course – Heritage Room**
190 Dixie Road, Mississauga, Ontario, L5E 2P4

- The PIC will be an "open house" drop-in format with poster board displays illustrating the existing conditions of the study area, the problems, and conceptual designs of alternative solutions that are being considered, including potential impacts to the golf course.
- We invite you to share your input with City staff and the study consultants and designers who will be available to discuss the project and answer your questions.
- If you have any questions or comments regarding the study, require additional information, or wish to be added or removed from the study mailing list, please contact:

Greg Frew, P.Eng.
Project Manager
City of Mississauga
201 City Centre Dr., Suite 800
Mississauga, ON L5B 2T4
(905) 615-3200, ext. 3362
greg.frew@mississauga.ca

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Mississauga, Ontario
(905) 629-0099, ext. 294
amos.r@aquaforbeech.com

This notice was issued 24 October, 2019.

Appendix G2 – Stakeholder List

Federal Agencies	Organization	Suffix	First Name	Last Name	Position	Address	City	Province	Postal Code	Email	Telephone	Fax	Special Notes
	Fisheries and Oceans Canada		Alexandra	Sorckoff	Fish and Fish Habitat Protection Biologis	1028 Parsons Rd SW	Edmonton	AB	T6X 0J4	Alexandra.Sorckoff@dfo-mpo.gc.ca			
	Aboriginal Affairs and Northern Development Canada				Environment Unit	25 St. Clair Avenue East 8th Flr	Toronto	ON	M4T 1M2				
	Ministry of Health & Long Term Care				Integrated Policy & Planning Division	80 Grosvenor Street - 8th Floor, Hepburn Block	Toronto	ON	M7A 1R3				
	Ministry of Public Infrastructure					7 Queen's Park Crescent, 6th Floor, Frost Bldg. South	Toronto	ON	M7A 1Y7				
Ontario Ministry	**Organization**	**Suffix**	**First Name**	**Last Name**	**Position**	**Address**	**City**	**Province**	**Postal Code**	**Email**	**Telephone**	**Fax**	**Special Notes**
	Ministry of Tourism, Culture and Sport	Ms.	Karla	Barboza	Heritage Land Use Planning	Suite 1700, 401 Bay Street	Toronto	ON	M7A 0A7	karla.barboza@ontario.ca	416-314-3108	416-314-7175	
	Ministry of Natural Resources and Forestry - Aurora District	Mr.	Mark	Heaton	Fish and Wildlife Biologist	50 Bloomington Road	Aurora	ON	L4G 0L8	mark.heaton@ontario.ca	905-713-7406		
	Ministry of the Environment and Climate Change	Mr.	Trevor	Bell	Environmental Resource Planner and EA Coordinator	5775 Yonge Street, 8th Floor	Toronto	ON	M2M 4J1	trevor.bell@ontario.ca	416-326-3577		
Conservation Authorities	**Organization**	**Suffix**	**First Name**	**Last Name**	**Position**	**Address**	**City**	**Province**	**Postal Code**	**Email**	**Telephone**	**Fax**	**Special Notes**
	Credit Valley Conservation	Mr.	Jakub	Kilis	Senior Planner, Environmental Assessme	1255 Old Derry Road	Mississauga	ON	L5N 6R4	jakub.kilis@cvc.ca			
City of Mississauga	**Organization**	**Suffix**	**First Name**	**Last Name**	**Position**	**Address**	**City**	**Province**	**Postal Code**	**Email**	**Telephone**	**Fax**	**Special Notes**
	City of Missisauga	Mr.	Stephen	Dasko	Ward 1, Councillor	300 City Centre Drive	Mississauga	ON	L5B 3C1		905-896-5100		
	City of Missisauga	Mr.	Greg	Frew	Project Manager	300 City Centre Drive	Mississauga	ON	L5B 3C1	greg.frew@mississauga.ca	905.615.3200 ext. 3362		
	City of Missisauga	Ms.	Sally	LePage	Park Planning	300 City Centre Drive	Mississauga	ON	L5B 3C1	sally.lepage@mississauga.ca	905.615.3200 ext. 3748		
	City of Missisauga	Mr.	Randy	Jamieson	City Parks & Forestry	300 City Centre Drive	Mississauga	ON	L5B 3C1	Randy.Jamieson@mississauga.ca			
	City of Missisauga	Mr.	Brad	Bell	Lakeview Golf Course Superintendent	300 City Centre Drive	Mississauga	ON	L5B 3C1	Brad.Bell@mississauga.ca			
	City of Missisauga	Mr.	Jamie	Al-Jbouri		300 City Centre Drive	Mississauga	ON	L5B 3C1	Jamie.AlJbouri@mississauga.ca			
Region	**Organization**	**Suffix**	**First Name**	**Last Name**	**Position**	**Address**	**City**	**Province**	**Postal Code**	**Email**	**Telephone**	**Fax**	**Special Notes**
	Region of Peel	Ms.	Sally	Rook	Manager of Infrastructure Programming and Studies	10 Peel Centre Drive, Suite B, 4th Floor	Brampton	ON	L6T 4B9	sally.rook@peelregion.ca	905-791-7800 Ext. 7842		
	Region of Peel		Maad	Abid Al Hadi	Technical Analyst, Capital Works Wastewater Collection and Conveyance Wastewater Division	10 Peel Centre Drive, Suite B	Brampton	ON	L6T 4B9	Maad.AbidAlHadi@peelregion.ca	905-791-7800 ext. 7815		
	Region of Peel	Mr.	Nicholas	Gan	Wastewater Capital	10 Peel Centre Drive, Suite A, 4th Floor	Brampton	ON	L6T 4B9	Nicholas.gan@peelregion.ca	905-791-7800 x5082		
	Region of Peel	Mr.	Frank	Pugliese	Wastewater Capital					frank.pugliese@peelregion.ca			
First Nations	**Organization**	**Suffix**	**First Name**	**Last Name**	**Position**	**Address**	**City**	**Province**	**Postal Code**	**Email**	**Telephone**	**Fax**	**Special Notes**
	Mississaugas of the New Credit First Nation	Mr.	Mark	LaForme	Director fo Department of Consultation & Accommodation	6 First Line Road, Unit 1, RR#6	Hagersville	ON	N0A 1H0	mark.laforme@mncfn.ca	905-768-4260		
			Megan	DeVries						megan.devries@newcreditfirstnation.co	905 768 4260		
	Six Nations of the Grand River	Ms.	Joanne	Thomas	Consultation Supervisor, Land Use Unit	2498 Chiefswood Road, PO Box 5000	Oshweken	ON	N0A 1M0	jthomas@sixnations.ca	519-753-0665		
	Haudenosaunee Confederacy Chiefs Council									hdi2@bellnet.ca			
Utilities	**Organization**	**Suffix**	**First Name**	**Last Name**	**Position**	**Address**	**City**	**Province**	**Postal Code**	**Email**	**Telephone**	**Fax**	**Special Notes**
	Enbridge Pipelines Inc.	Mr.	Samir	Patel		500 Consumers Road,4th Floor - Post A2 - VPC	North York	ON	M2J 1P8	mark-ups@enbridge.com			
	Union Gas	Mr.	Enzo	Greco	Construction Project Manager	918 South Service Road	Stoney Creek	ON	L8E 5M4	egreco@uniongas.com	(289) 649-2061		
	Hydro One									Secondarylanduse@hydroone.com			
	CN	Ms.	Michael	Vallins	Manager, Public Works Design & Construction Eastern Region	1 Administration Road	Concord	ON	L4K 1B9	Michael.Vallins@cn.ca	905-669-3264		
	Canadian Pacific Railway	Mr.	David	Lukianow	Manager - Public Works	1290 Central Parkway West, Suite 700	Mississauga	ON	L5C 4R3				
	Bell Canada	Mr.	Kevin	Lee		c/o Netricom Inc. ,200 Town Centre Blvd, Suite 300	Markham	ON	L3R 8G5	Kevin.li@netricom.com			
	Rogers Communications	Ms.	Lily	Apa		244 Newkirk Road	Richmond Hill	ON	L4C 3S5	Lily.Apa@rci.rogers.com			
	Telus	Ms.	Indira	Sharma		c/o Netricom Inc. ,200 Town Centre Blvd, Suite 300	Markham	ON	L3R 8G5	telusutilitymarkups@netricom.com			
	Southern Ontario Railway	Mr.	John	Winkley	Regional Director - Marketing	241 Stuart St. W.	Hamilton	ON	L8N 3P9				
Residents / Other	**Organization**	**Suffix**	**First Name**	**Last Name**	**Position**	**Address**	**City**	**Province**	**Postal Code**	**Email**	**Telephone**	**Fax**	**Special Notes**
	Lakeview Golf Course - historian	Mr.	Dan	Trout						d.trout@sympatico.ca	416-231-6936		
	Slate Asset Management - Dixie Outlet Mall	Mr.	Shawn	Fujiki						shawn@slateam.cam			
Ratepayer Groups	**Organization**	**Suffix**	**First Name**	**Last Name**	**Position**	**Address**	**City**	**Province**	**Postal Code**	**Email**	**Telephone**	**Fax**	**Special Notes**
	Applewood Homeowners									Applewoodacreshomeowners@hotmail.com			
	Sherway Homeowners									info@sherwayhomeowners.com			
	Lakeview Ratepayers									admin@lakeviewratepayers.com			

Appendix G3 – Public Information Centre Materials

WELCOME

Applewood Creek Erosion Control at Lakeview Golf Course Class Environmental Assessment

PUBLIC INFORMATION CENTRE

November 7th, 2019

Your comments are encouraged and appreciated, as this will provide us an opportunity to address project issues and concerns.

Aquafor Beech Limited

SCHOLLEN & Company Inc.

MISSISSAUGA

STUDY PURPOSE / PROBLEM DEFINITION

The study is being carried out to define the preferred restoration opportunity for Applewood Creek. This will improve the stability and health of the watercourse, minimize maintenance and operational requirements, and enhance the playability and aesthetics of the golf course.

PUBLIC INFORMATION CENTRE PURPOSE

To gain community input on:

- Existing conditions
- Restoration opportunities and preferences
- The evaluation of alternatives including criteria and scoring

This Public Information Centre (PIC) is designed to:

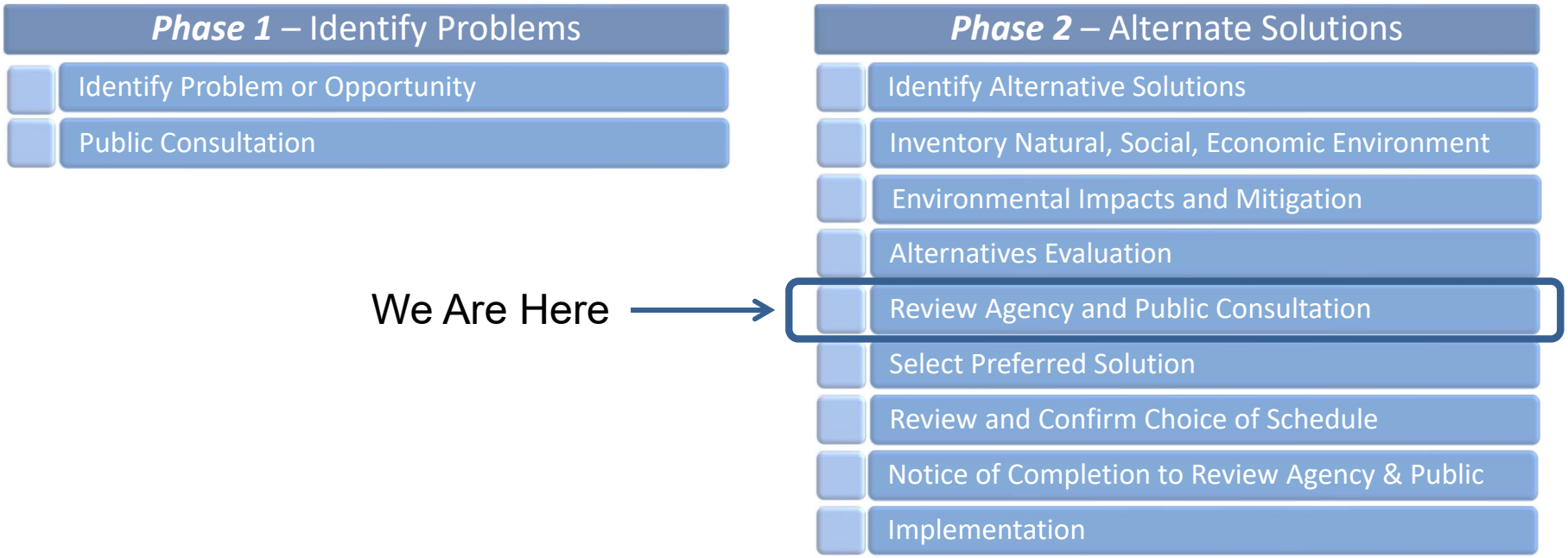
- Present information on existing conditions
- Discuss potential impacts and opportunities for improvement of Applewood Creek and the golf course
- Present alternative approaches to restoration
- Explain the study process and timelines

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT PROCESS

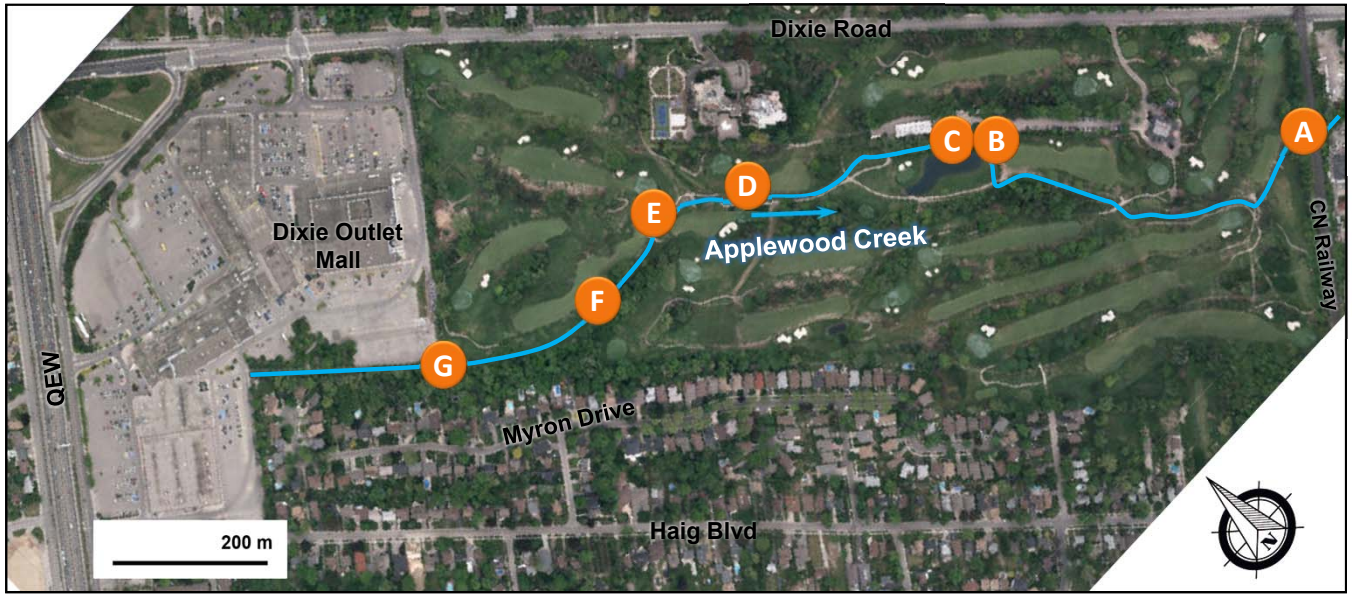
CLASS EA PROCESS - SCHEDULE B

Many projects related to municipal systems that are similar in nature, are carried out routinely, and have predictable and mitigatable environmental effects are addressed in accordance with the Municipal Engineers Association "Municipal Class Environmental Assessment" (October 2000, as amended in 2007 & 2015).

This study is being undertaken as a "Schedule B" project under the Municipal Class Environmental Assessment process. The flow chart below illustrates the key steps to be undertaken as part of the EA process.



EXISTING CONDITIONS



E. Bridge 8 in good condition with irrigation main in saddle.

A. Downstream culverts under CN railway, with mixed headwall materials - historical brick and more recent gabion baskets.

B. Slumping gabion baskets undermining and scouring around chamber structure.

F. Deteriorated gabion baskets with top layer leaning towards the creek, posing safety risks to golf course users.

B. Bank scour and planform adjustment due to gabion basket failure.

C. Failure of gabion baskets and unstable slope undermining mature vegetation in proximity to maintenance building & parking.

D. Creek in proximity to 12th fairway and 16th green. Constraints of limited space to form natural meanders without impacting golf course features.

G. Applewood creek at the upstream limit of the golf course, through a confined channel adjacent to dixie outlet mall.

TERRESTRIAL ECOLOGY

Ecological Land Classification (ELC) is a standard practice used to describe, identify, classify and map vegetation communities on the landscape. Due to its location within a golf course, the study area contains no natural vegetation communities except for a narrow, linear patch of Willow Lowland Deciduous Forest (FOD7-3) that is located on the south creek bank near the northern project limit.

This community was observed to contain Butternut, a Species at Risk tree.

TREE INVENTORY

A comprehensive tree inventory was completed for the Lakeview Golf Course by SJM Arboricultural Consulting Ltd. in 2012. Aquafor supplemented the existing inventory through additional investigations in 2019. This primarily involved confirmation of previous data along the watercourse and completion of additional inventory works in the forest community identified through terrestrial ecology investigations.

Removal of some trees may be required to accommodate creek and golf course works. However, compensation for the removal of trees will be provided in accordance with City of Mississauga and Credit Valley Conversation standards.

Within the FOD7-3 community, one Butternut, classified by MNRF as a Species at Risk tree, was identified. The tree is growing right at the edge of the gabion baskets and was identified as Category 2 under the Ontario's Endangered Species Act (ESA). The tree does not have butternut canker or the disease is not as advanced and it is therefore categorized as "retainable" under the ESA.

AQUATIC ECOLOGY

The study assessed aquatic habitat and fisheries within Applewood Creek to define existing conditions.

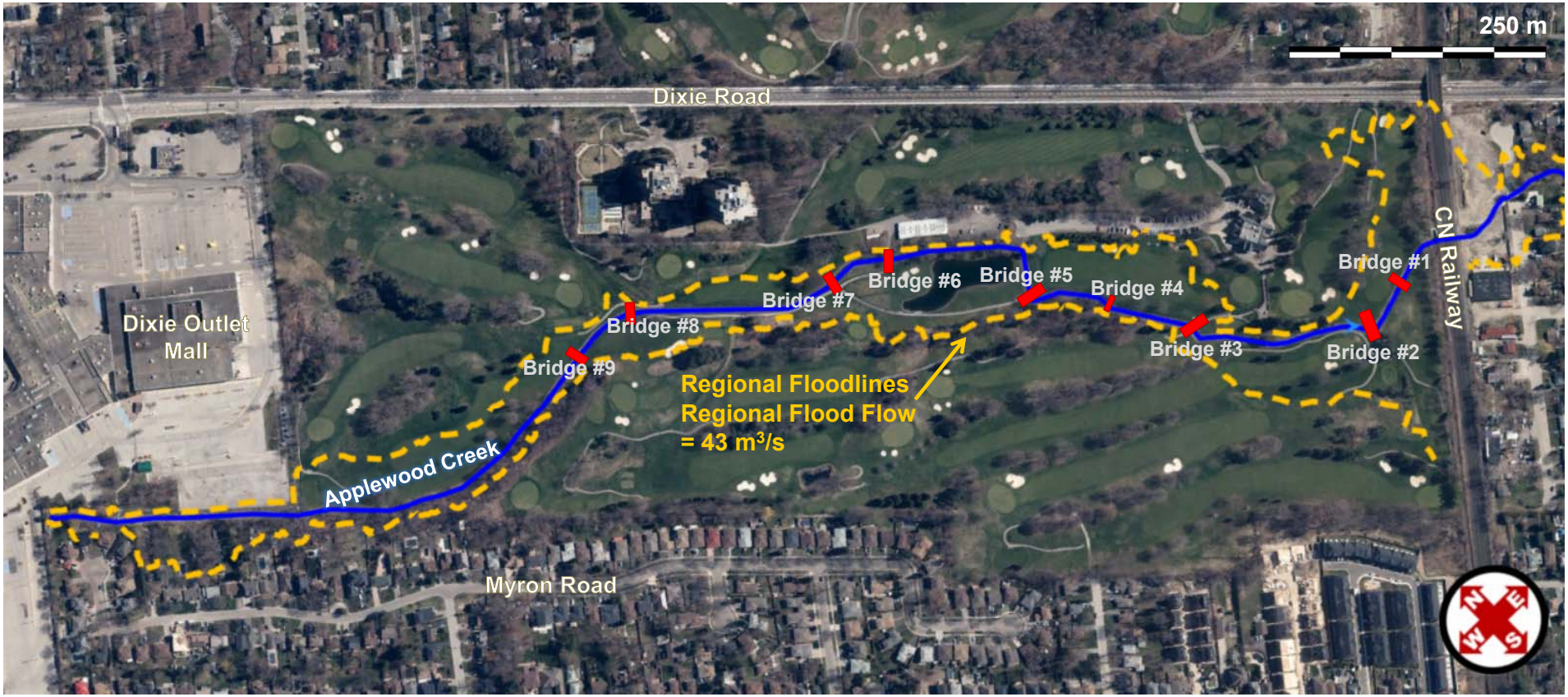
- Fish were not found within the study area but an unidentified dead fish was observed incidentally, suggesting that the creek potentially supports fish populations.
- No major fish barriers were observed within the site.
- Nearly all banks consist of gabion baskets at angles greater than 45º with signs of undercutting, representing a risk of failure. Some gabions have already failed.
- Aquatic habitat is suitable for holding fish but could be improved through restoration by adding more cover and allowing the river to return to a more natural meandering pattern.

TARGET FISHERIES CONDITIONS

- Improved bank structure, providing cover and riparian vegetation
- Increased channel morphology, providing varied habitat and flow
- Improved variety of substrate to provide a better mix of habitat types and potential spawning areas

HYDROLOGY AND HYDRAULICS

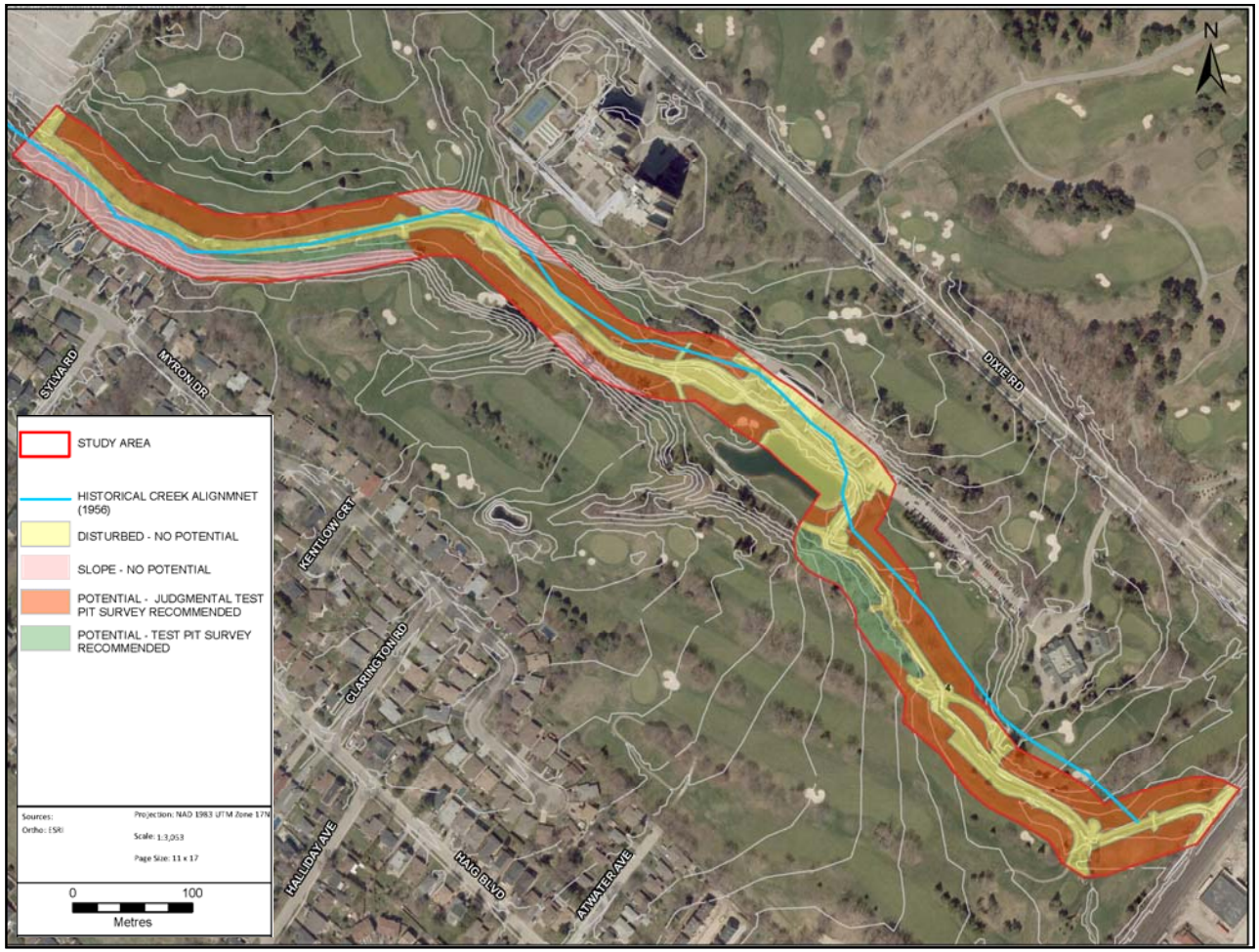
The study looked into Hydrology and Hydraulics of Applewood Creek in order to understand how water flows through the creek, the forces it exerts under normal and extreme conditions, and the extent of flooding, so as to not worsen or impact flood levels. The limits of Regional floodplain is shown below.



ARCHAEOLOGY

A Stage 1 Archaeological Assessment was completed, involving background research and property inspection in order to determine the potential for the presence of archaeological and cultural resources to exist within the site. The following criteria indicative of archaeological potential were found through the assessment, which in turn recommended that a Stage 2 Archaeological Assessment to be completed, including by test pit surveys:

- Water Sources – Applewood Creek;
- Early Historic Transportation Routes – Lakeshore Road, Middle Road, Dixie Road, and CN Railway (formerly Hamilton and Toronto Railway);
- Proximity to Early Settlements – Village of Dixie; and,
- Well Drained Soil – Fox sandy loam.



NATURAL & CULTURAL HERITAGE

History of Lakeview Golf Course

- Opened in 1907 as the “High Park Golf Club”, then relocated from Toronto
- Renamed as Lakeview Golf Club in 1912
- Redesigned by Herbert Strong in 1921
- Hosted the Canadian Open in 1923 and 1934
- Clubhouse burned down in 1939
- Clubhouse rebuilt in 1940

1923 Original Lakeview Golf Course Club House, City of Toronto Archives

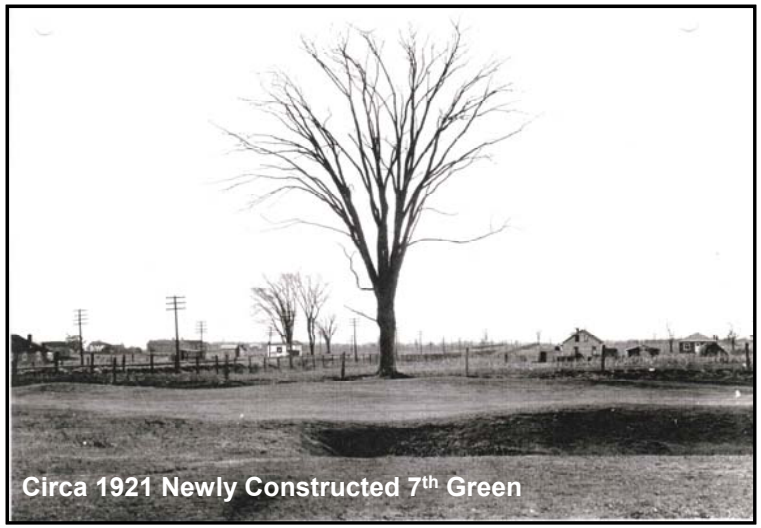
Heritage Designation

Lakeview Golf Course (1190 Dixie Road) was designated by the City of Mississauga in January 2010 under Part IV of the Ontario Heritage Act (City of Mississauga By-law No. 008-2010).

Some of the key heritage attributes include:

- Placement of tees, fairways, greens and bunkers
- The 11th and 18th tees and bunker on the 9th green in particular, should be protected
- Mature trees

The property is also included in the City of Mississauga’s Cultural Landscape Inventory (2005).



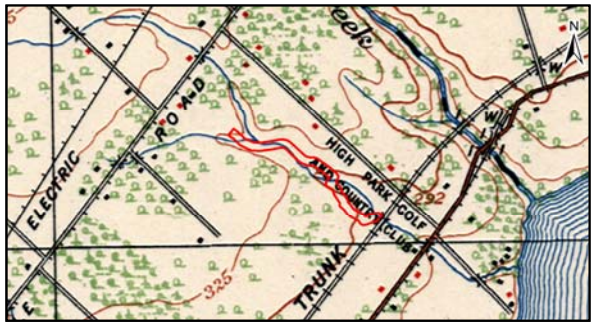
Circa 1921 Newly Constructed 7th Green

Creek Realignment

Review of historical mapping and aerial photos revealed:

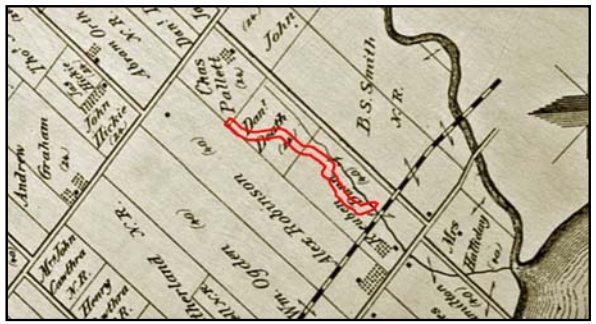
- Natural alignment of Applewood Creek (~ prior to 1956), and
- Realignment of the watercourse following the construction of the golf course, as well as the adjacent land development (~ after 1974).

Approximate study area within 1859
Map of the County of Peel



Approximate study area within 1909
NTS Brampton Sheet

Approximate study area within 1974
NTS Port Credit Sheet



Approximate study area within 1877
Historical Atlas of County of Peel

Approximate study area within 1956
Aerial Photograph of Mississauga

Approximate study area within 1974
NTS Port Credit Sheet

EVALUATION APPROACH AND CRITERIA

There are four alternative approaches being considered for this project:

1. Do Nothing
2. Replacing Gabion Baskets with Armourstone
3. Replacing Gabion Baskets with Vegetated Roundstone
4. Natural Channel Realignment

The following criteria will be used to evaluate each alternative to determine the preferred method for rehabilitation of Applewood Creek throughout Lakeview Golf Course. The evaluation uses a normalized ranking scheme to provide equal weighting for each category of evaluation criteria. A ranking scale from 0 (no / negative impact) to 4 (ideal / most positive impact) is applied to each criterion.

Comment sheets are provided to collect public feedback on the evaluation criteria and preliminary evaluation / outcome.

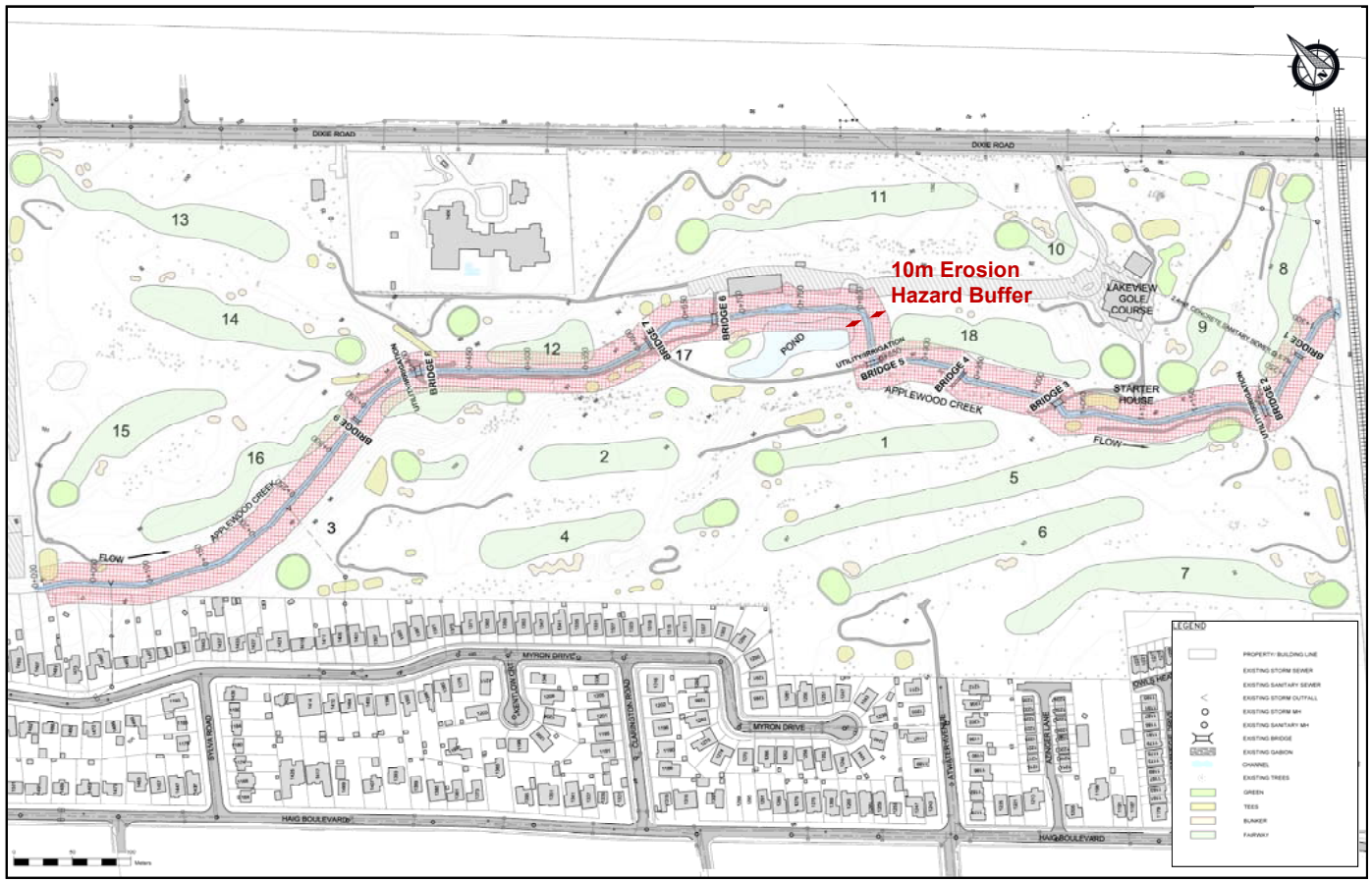
Physical and Natural Criteria	
Erosion	Rate of Erosion, slope failures, and loss of tablelands
Water Quality	Impact on water quality
Aquatic Habitat	Impact on contributing aquatic habitat and linkage
Terrestrial Habitat	Impact on connectivity, diversity, and quantity/quality of habitat
Terrestrial Vegetation	Impact on existing riparian vegetation, including mature trees

Technical and Engineering Criteria	
Existing Infrastructure	Protection or potential failure of infrastructure (bridges, utilities, irrigation system, cart path)
Lifespan of Works	Expected lifespan / years of works before intervention needs to be repeated

Social and Cultural Criteria	
Public Safety	Impact on golf course users safety
Landowner Impacts	Impact on Lakeview Golf Course and adjacent private properties
Heritage Designation	Impact on golf course heritage attributes
Archaeology	Impact on potential archaeological resources
Aesthetic Value	Impact on existing and proposed aesthetic value

Economic Criteria	
Capital Costs	One time cost to City
Operations & Maintenance Costs	Requirement for regular, irregular or no maintenance activities and ensure effectiveness of implemented measures
Golf Course Revenue	Impact on revenue due to delay of opening season to accommodate construction

Potential Alternative #1
Do Nothing



Existing Conditions / Do Nothing

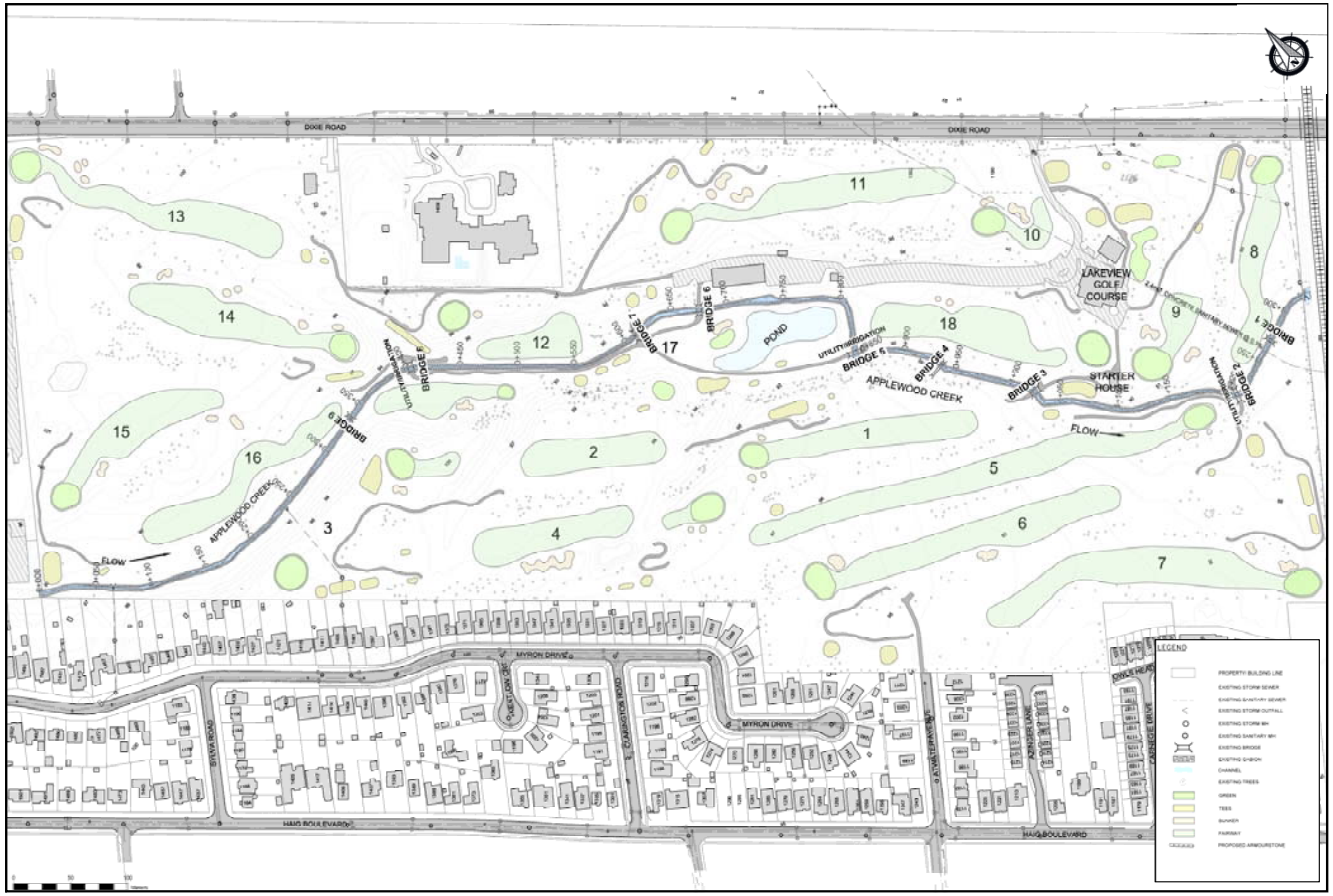
Alternative # 1 – Do Nothing

Definition: No restoration measures taken, except on emergency basis.

Description: This alternative would involve leaving the existing creek, particularly the gabion baskets which line both banks, to continue failing. Existing risks associated with eroding of streambanks, undermining of bridge abutments, failure of asphalt cart path, loss of golf course features, and public safety remain. Habitat conditions would continue to degrade due to erosion.

Although no capital costs have been assigned to this alternative, ongoing operation and maintenance activities would continue. Under emergency conditions (ie. failure) would works occur. Monitoring would be necessary.

Potential Alternative #2
Replacing Gabion Baskets with Armourstone



Example of Engineered Channel Restoration with Armourstone.

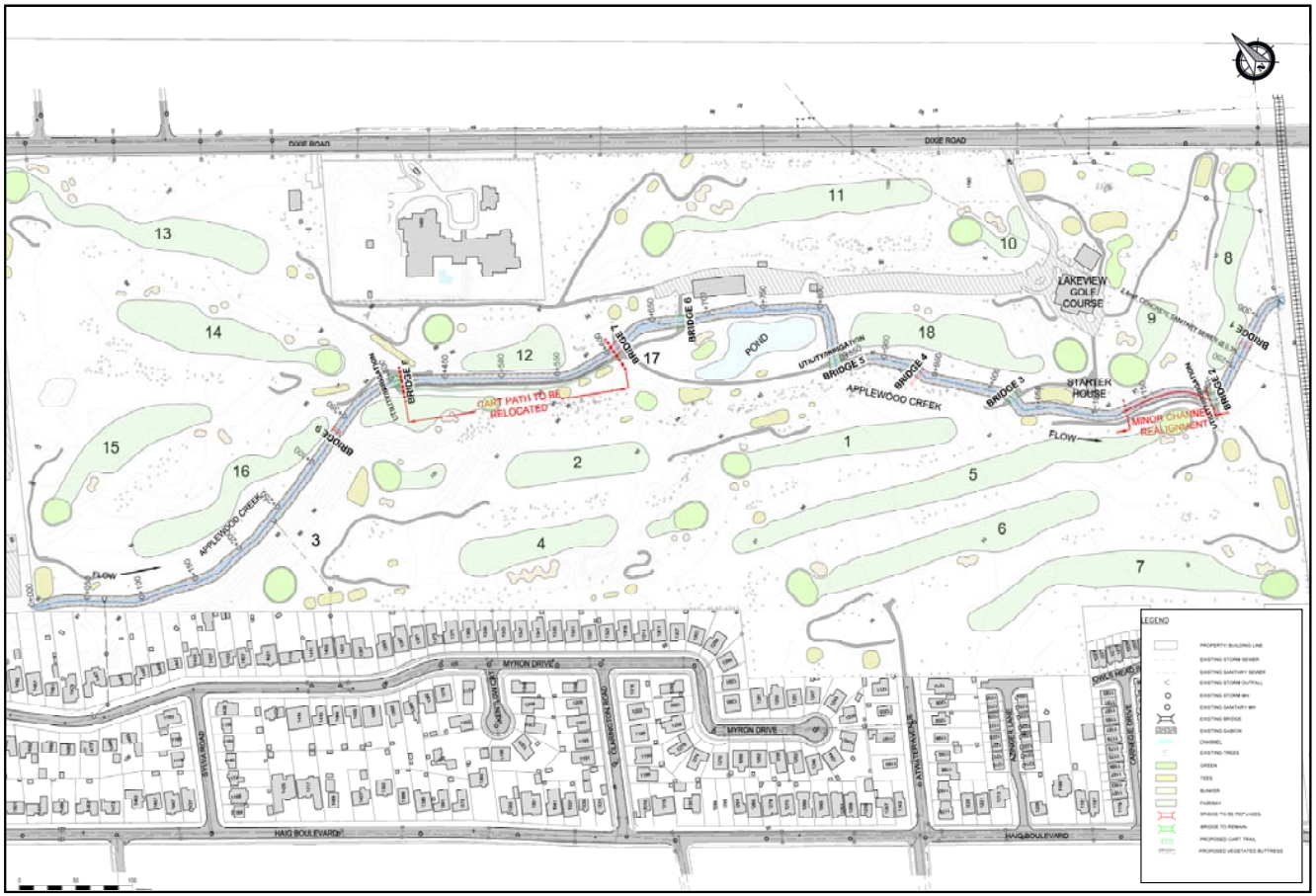
Alternative # 2 – Replacing Gabion Baskets with Armourstone

Definition: Stream restoration in existing alignment, using armourstone as bank protection measures.

Description: This Alternative would involve a continuous restoration of the Applewood Creek throughout the golf course. The intent is to replace all gabion basket banks with armourstone walls, maintaining the existing channel width and alignment. This alternative will require limited disruption to the golf course and the existing bridges, as well as achieving long-term erosion protection to the watercourse.

It is expected that the construction will be carried out in two phases, each happening from November 1 to the first week of April, with the intent to avoid any delay to the golf course opening date, assuming that no ancillary golf course improvements are undertaken. The lifespan of these works are generally defined as long, however, long-term maintenance or repair after significant rainfall will typically required to meet lifespan expectations.

Potential Alternative #3
Replacing Gabion Baskets with Vegetated Roundstone



Example of Engineered Channel Restoration with Vegetated Roundstone.

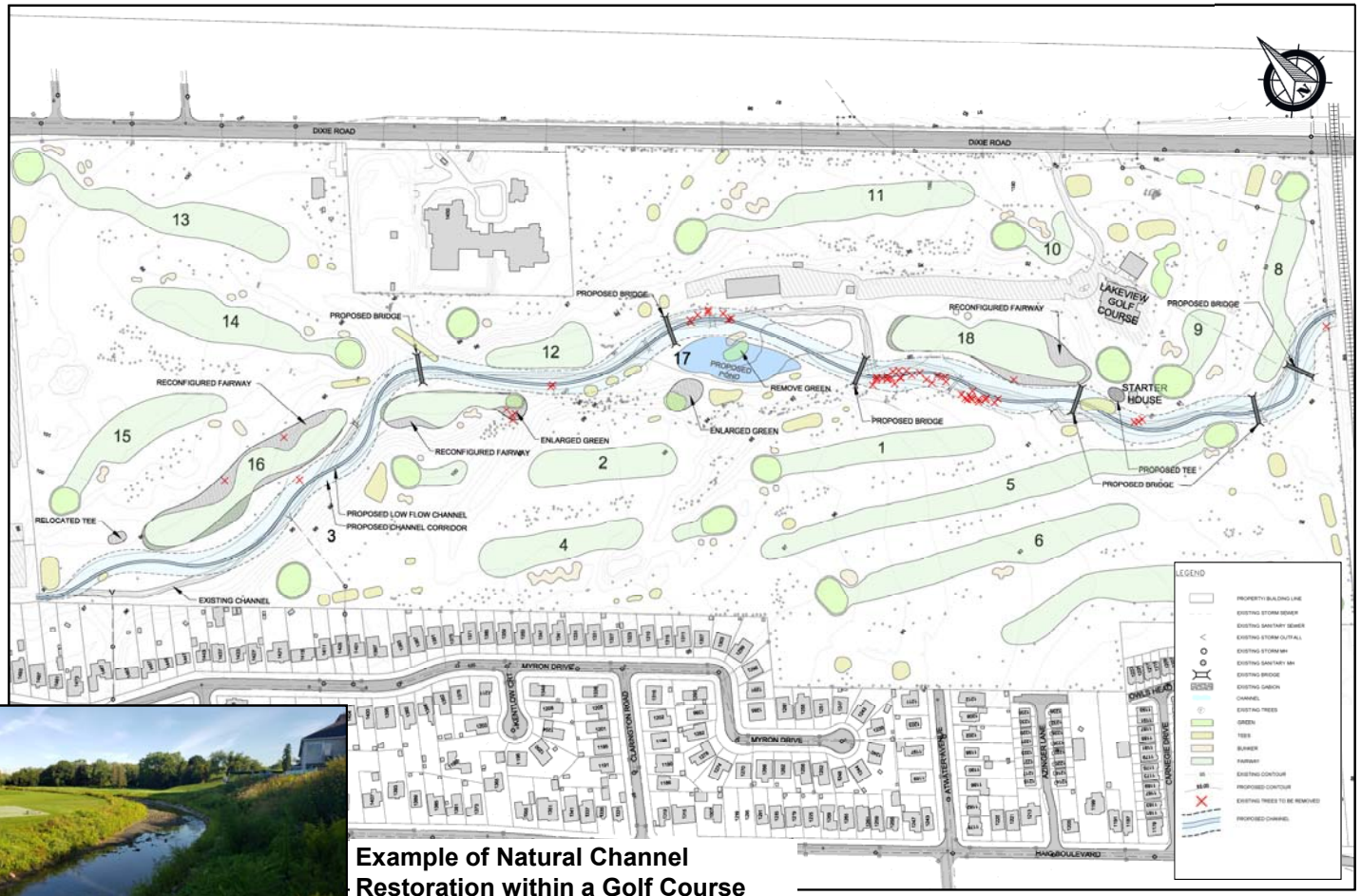
Alternative # 3 – Replacing Gabion Baskets with Vegetated Roundstone

Definition: Stream restoration in existing alignment, using vegetated roundstone as bank protection measures**.**

Description: This Alternative would involve a continuous restoration of the Applewood Creek throughout the golf course. It is intended to reconstruct the channel banks with vegetated roundstone and bed with boulders, where the channel width will be enlarged and existing alignment will be maintained. Vegetated banks with buried hard material as toe protection will provide stable banks and transition smoothly to the golf course lands.

This alternative will require minor to moderate disruption to the golf course and will require replacement of 4 out of 9 bridges. Long-term erosion protection and improved aesthetic value will be provided as a result of this alternative. It is expected that the construction will be carried out in two phases, with each happening from November 1 to the first week of April, to avoid any delay to the golf course opening date, assuming that no ancillary golf course improvements are undertaken.

Potential Alternative #4
Natural Channel Realignment



Example of Natural Channel Restoration within a Golf Course

1921 - Original Design

Current green

Proposed green restoration

Proposed Golf Course Improvements – Lakeview 17th Hole

Alternative # 4 – Natural Channel Realignment

Definition: Restoration of the stream to a more naturalized form, maintaining a fixed (existing) alignment where golf course feature constraints dictate.

Description: This Alternative would involve complete restoration throughout the length of the study area, recreating the sinuosity of channel planform, and restoring the channel bed and banks using a combination of natural channel design techniques as well as engineered methods. This alternative will involve the highest level of disruption to the study area, particularly the mandatory alteration to golf course features to accommodate the proposed channel works. Once completed however, it will provide improved conditions in terms of the natural function and processes of the watercourse, as well as improved playability of the golf course in which Applewood Creek becomes a more prominent feature. All disrupted areas will be restored with native plantings and seed mixes designed to provide stability and sustainability.

Due to the significant modifications proposed for the golf course, an extended construction timeframe is anticipated, in which several holes may be impacted during golf season. The Clubhouse may remain open during construction; however, parking restrictions may apply.

Evaluation of Alternatives

The preliminary evaluation of alternatives is presented below, with Alternative 4 selected as the preliminary preferred alternative for restoration. Your comments on the ranking and preferred method of restoration are encouraged and appreciated. The study team will compile and review all feedback, and will then finalize the selection of preferred alternative for the project.

		Alternative 1 - Do Nothing		Alternative 2 - Replacing Gabion Baskets with Armourstone		Alternative 3 - Replacing Gabion Baskets with Vegetated Roundstone		Alternative 4 - Natural Realignment	
EVALUATION CRITERIA		**Score**	**Explanation**	**Score**	**Explanation**	**Score**	**Explanation**	**Score**	**Explanation**
Physical and Natural Criteria		*0.0*		*1.4*		*1.4*		*2.1*	
Erosion	Rate of erosion, slope failures, and loss of tablelands	0	Continued erosion, slope failures and loss of table / golf course lands	3	Long-term erosion protection with minimal opportunities for planform adjustment	3	Long-term erosion protection to the watercourse and adjacent golf course land	4	Minimized rate of erosion and loss of table / golf course land, provided stable slopes
Water Quality	Impact on water quality	0	Gabion wires continue to rust and lack of tree canopy keeps water warmer. No improvement to water quality.	1	Limited improvement of water quality by removing gabion baskets.	2	Improvements to the water quality by creating in-water vegetation	3	Future vegetation cover from new riparian plantings will help to shade creek and keep the water cooler, as well as holding the banks together to reduce sedimentation from bank erosion.
Aquatic Habitat	Impact on contributing aquatic habitat	0	No improvement to habitat. Possibility the habitat will degrade as gabions continue to fail and collect debris.	1	Limited improvement of aquatic habitat which may be suitable for different types of forage for fish.	2	Introduction of in-water vegetation would provide shade to creek and provide habitat for forage. However, the constraints of the existing narrow corridor will limit natural meandering pattern and river functions.	4	Restoring the creek to a meandering form would encourage proper river function in the development of runs/riffles/pools, providing better habitat for fish and their forage. New riparian plantings would provide shade to creek and provide habitat for forage.
Terrestrial Habitat	Impact on connectivity, diversity and quantity/quality of habitat	0	Habitat stays in current condition; Habitat quality potentially degrades over time as exotic and invasive species outcompete native species.	3	Localized loss of vegetation due to construction will be mitigated by planting native species. Likely removal of candidate bat maternity roosting sites.	2	Likely removal of candidate bat maternity roosting sites and potential impact on the Butternut near Hole 3 (SAR), Enhance biodiversity through native species planting making up loss of forest canopy cover until plantings mature.	3	Likely removal of candidate bat maternity roosting sites and potential impact on the Butternut near Hole 3 (SAR), Enhance biodiversity through native species planting and creation of wetlands within the floodplain.
Terrestrial Vegetation	Impact on existing riparian vegetation, including mature trees	0	Vegetation composition remains the same. Continued loss of herbaceous, shrubs, and some trees from erosion.	3	Potential removal of dead ash trees and trees that are leaning towards the creek.	2	Vegetation loss due to construction will be mitigated through native species plantings throughout the reach; Removal of dead ash trees and invasive shrubs; Potential transplant of Butternut required.	3	Vegetation loss due to construction will be mitigated through native species plantings. Removal of dead ash trees and invasive shrubs.
Social and Cultural Criteria		*0.9*		*1.5*		*1.9*		*2.1*	
Public Safety	Impact on public safety	1	Continued erosion and unstable banks would create risks to golfers	2	Improved public safety by reducing erosions and stabilizing banks. However, certain safety measures may be required due to deep channel (~2m) with steep bank slopes.	3	Improved public safety by reducing erosions and stabilizing banks.	4	Stable slope and natural meander form, flooding risks minimized
Landowner Impacts	Impact on Lakeview Golf Course and adjacent private properties	1	Continued erosion, slope failures and loss of table / golf course lands	3	Limited disturbance to golf course features during construction. Reduced risks of property loss	2	Minor disturbance to golf course features due to channel widening. Reduced risks of property loss	3	Major disturbance to golf course however will ultimately enhance the outstanding playability of the golf course. Opportunity to remove the spare 17th hole.
Heritage Designation	Impact on the heritage designation and attributes of the golf course	2	No immediate impacts on the designation. Potential long-term risks to heritage designated features	1	No impacts on golf course heritage designated features. However, hard materials lining the creek provide relatively lower natural and cultural heritage values.	3	No impacts on golf course heritage designated features.	4	No impacts on golf course heritage designation. Opportunities to bring the layout of the course closer to the original/historical design intent.
Archaeology	Impact on the archaeological potentials within the golf course	2	No immediate impacts on potential archaeological resources. Potential long-term risks exists.	4	No impacts on potential archaeological resources within the golf course.	4	No impacts on golf course archaeological potentials.	2	Limited impacts on golf course archaeological potentials.
Aesthetic Value	Impact on existing and proposed aesthetic value	1	Low aesthetic value due to aging/failing gabion-lined banks throughout the creek within golf course	2	Minor improvement of the natural look and aesthetic value of the creek corridor.	3	Some improvement of the natural look and aesthetic value of the creek corridor.	4	Significant enhancement of the natural look of the creek corridor and aesthetic value of the golf course
Technical and Engineer Criteria		*0.6*		*1.9*		*1.3*		*1.6*	
Impact on Existing Infrastructure	Protection or potential failure of infrastructure (bridges, utilities, irrigation system, cart path)	1	All existing bridges to remain, with undermining abutments due to gabion failure. Continued erosion would lead to cart path failure.	3	Existing bridges to remain, with abutments protected from undermining.	2	2 bridges in poor conditions & 2 bridges in fair conditions to be replaced. All bridge abutments protected from undermining. Potential impact on existing drainage and irrigation system.	1	2 bridges in poor conditions & 7 bridges in fair conditions to be replaced. All bridge abutments protected from undermining. Potential impact on existing drainage and irrigation system.
Lifespan of Works	Expected lifespan / years of works before intervention needs to be repeated	1	Majority of gabions approaching end of lifespan	3	Long-term life span ~ 50 years.	2	Moderate lifespan of works	4	Long lifespan of works > 50 years.
Economic Criteria		*1.7*		*1.3*		*1.7*		*0.8*	
Capital Costs	One time cost to City	4	No capital cost to City	1	2nd highest construction costs associated with significant amount of hard materials.	2	3rd Highest construction costs	0	Highest construction costs
Operations & Maintenance Costs	Requirement for regular, irregular or no maintenance activities and ensure effectiveness of implemented measures	0	Regular monitoring and maintenance to mitigate the deterioration of the channel and tablelands. Emergency repairs on as-needed bases in perpetuity	2	Long-term maintenance required to meet lifespan expectations.	3	Minimal maintenance required.	4	Minimal maintenance required.
Golf Course Revenue / Season	Impact on revenue due to delay of golf course opening season to accommodate construction	4	No impact on golf course revenue / season	3	Limited impact on golf course revenue / season	3	Limited impact on golf course revenue / season	0	Potential loss of revenue as a result of extended golf course closure
TOTAL SCORE		3.2		6.0		6.2		6.6	**Preliminary Preferred Alternative**

NEXT STEPS

PUBLIC CONSULTATION – November, 2019

- Comment forms available for input.
- Consultant team will compile and review feedback, and will confirm or adapt the preliminary preferred alternative in response.

SUBMIT EA PROJECT FILE AND OBTAIN AGENCY APPROVALS – March, 2020

- EA Project file posted for 30 day review period.

DETAILED DESIGN & IMPLEMENTATION

- Detailed design and permitting completed by 2020.
- Construction scheduled for 2021.

TO PROVIDE COMMENT, OR TO BE ADDED TO THE STUDY STAKEHOLDER LIST, PLEASE CONTACT:

Greg Frew, P.Eng.
Project Manager
City of Mississauga
201 City Centre Dr., Suite 800
Mississauga, ON L5B 2T4
(905) 615-3200, ext. 3362
greg.frew@mississauga.ca

Robert Amos, P.Eng.
Consultant Project Manager
Aquafor Beech Ltd.
2600 Skymark Avenue, Unit 6-202
Mississauga, Ontario
(905) 629-0099, ext. 294
amos.r@aquaforbeech.com

THANK YOU

FOR PARTICIPATING IN THE APPLEWOOD CREEK EROSION CONTROL AT LAKEVIEW GOLF COURSE CLASS ENVIRONMENTAL ASSESSMENT

Class Environmental Assessment for Applewood Creek Erosion Control – Lakeview Golf Course (Dixie Outlet Mall to CN Rail)

Public Information Centre
November 7th, 2019, 4:00 p.m. – 7:00 p.m.
Lakeview Golf Course – Heritage Room
190 Dixie Road, Mississauga, Ontario, L5E 2P4

COMMENT FORM

Contact Information (optional):

Name: _____

Address: _____

Telephone Number: _____

Email: _____

☐ Add my Email Address to the Project Notification List

1. Existing Conditions

Background studies have been completed by the project team to inventory the environmental resources and 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:

• Topographic Survey • Gabion Condition Assessment • Hydrology and Hydraulics • Fisheries Assessment	• Terrestrial Ecology • Tree Inventory • Cultural & Natural Heritage • Archaeological Assessment

2. Evaluation of Alternatives

Four alternatives have been identified and evaluated for the rehabilitation of Applewood Creek. These alternatives include:

Alternative 1 – Do Nothing (as required under a Municipal Class Environmental Assessment);
Alternative 2 – Replacing Gabion Baskets with Armourstone;
Alternative 3 – Replacing Gabion Baskets with Vegetated Roundstone; and
Alternative 4 – Natural Channel Restoration with Golf Course Improvements

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.

Physical and Natural Criteria • Erosion • Water Quality • Aquatic Habitat • Terrestrial Habitat • Terrestrial Vegetation	**Social and Cultural Criteria** • Public Safety • Landowner Impacts • Heritage Designation • Archaeology • Aesthetic Value
Technical Criteria • Impacts on Existing Infrastructure • Lifespan of Works	**Economic Criteria** • Capital Costs • Operating and Maintenance Costs • Golf Course Revenue

b) **Preliminary Alternative Evaluation –** Please review the panels for each potential alternative. 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 4 – Natural Channel Realignment with Golf Course Improvements as the preferred alternative. Do you support this outcome? Why or why not?

3. Additional Comments

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

4. PIC/Information Summary

Was the information provided helpful to you?

Were all your questions answered?

Was the information provided:

□ too technical □ about right □ not detailed enough

Thank you for your comments!

Please return completed forms to the Registration Table. Or if you would like more time, please return by June 21, 2017 to either contact listed below:

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Project Manager
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Mississauga, ON L5B 2T4
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greg.frew@mississauga.ca

Robert Amos, P.Eng.
Consultant Project Manager
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Mississauga, Ontario
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Personal information, as defined by the Municipal Freedom of Information and Protection of Privacy Act (MFIPPA) is collected under the authority of the Municipal Act, 2001, and in accordance with the provisions of MFIPPA. Personal information on this form will be used to inform the Cooksville Erosion Control project. If you have questions about this collection; use, and disclosure of this information, contact the City of Mississauga's Freedom of Information and Privacy Co-ordinator at 905-615-3200 extension 5181 / 5952 or privacy.info@mississauga.ca

Class Environmental Assessment for Applewood Creek Erosion Control – Lakeview Golf Course (Dixie Outlet Mall to CN Rail)

Public Information Centre

City of Mississauga

November 7th, 2019

Sign in Sheet (Optional)

Name	Address	Phone Number	E-mail
STEPHEN DASKO.			
Dan Trout	[redacted]		
G. POCCARY	[redacted]		

Appendix G4 – Region of Peel Consultation

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November 1, 2019

Greg Frew, Project Manager
City of Mississauga
201 City Centre Drive, Suite 800
Mississauga, ON L5B 2T4

RE: Notice of Public Information Centre – Municipal Class Environmental Assessment Study: Applewood Creek Erosion Control Project – Lakeview Golf Course (Dixie Outlet Mall to CN Rail)

Dear Mr. Greg Frew,

On October 22, 2019 staff from the Water and Wastewater (W/WW) division received the notice of the Public Information Centre (PIC) for the Municipal Class Environmental Assessment Study: Applewood Creek Erosion Control Project – Lakeview Golf Course (Dixie Outlet Mall to CN Rail).

As part of this project, W/WW would like to inform the Project Team that the Region of Peel (Peel) has a 2400mm Sanitary Trunk sewer that was built in 1972, please see attached as-built drawings (40738_D and 40739_D), that is located within a permanent easement. The 2400mm Sanitary Trunk sewer is integral to Peel's collection system serving as the Region's main eastern trunk sewer collection spine and cannot be isolated.

Given the significance of this asset, Peel requests that the W/WW division be involved as a key stakeholder during the final phases of the EA process, as well preliminary detailed design and detailed design phases. This will ensure that our concerns are discussed and addressed in the most efficient manner. It will also allow us to work together to implement protective measures between the creek invert and sanitary sewer obvert to prevent potential future issues such as channel erosion and sewer exposure due to scour, etc. These works should be coordinated to minimize impacts to area stakeholders and property owners.

W/WW has also included Peel specific overall constraints which provide a general understanding of the limitations allowed to Peel's assets. The constraints include:

1) No removal of material or stockpiling of material will be allowed in construction compounds or over top of sanitary sewers, including maintenance holes;
2) Heavy construction traffic driving over top of sanitary sewers outside of the existing travelled roadway will not be allowed without prior consultation with Peel and may require engineering solutions for protection of the infrastructure prior to being permitted. Engineering analysis and solutions will include, but not be limited to, analysis of loading, zones of influence, crack propagation requirements, effects of mitigation measures, etc. Additionally, vibration and settlement monitoring may be required which is contingent upon the engineering analysis;

/1

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3) No modification of the Peel's existing infrastructure will be permitted without written instruction provided by Peel;
4) Proper clearances and compaction values shall be as per Peel standards;
5) Access to Peel's infrastructure must always be maintained throughout the duration of the construction works for Operational and Maintenance activities and potential emergency works;
6) Pre and Post CCTV inspection of the sewer will be required (see Appendix A – Section #5 – CCTV Inspection of Sewers for specifications); and,
7) Inclusion of Peel specific Special Provisions that must be adhered to by the awarded bidder (please see Appendix A for a list of Peel specific Special Provisions that may be amended as the project progresses).

If you have any questions or wish to set up a meeting to discuss this further, please do not hesitate to contact the undersigned.

Thanks,

Nicholas Gan, P.Eng., PMP
Manager, Wastewater Capital – Condition Assessment and Rehabilitation
Public Works - Region of Peel
Nicholas.Gan@peelregion.ca

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Appendix A - Peel Specific Special Provisions

All designs, specifications and procedure manual for Linear Infrastructure (Watermain and Sanitary Sewer) reference Volume 2 - Contract documents for Road, Watermain and Sanitary Sewer Projects; this document forms part of the contract for capital works projects in Peel. The documents outline general conditions, construction specifications and basis of payment for capital works projects in Peel. Please see link below for URL containing all the necessary information:
http://www.peelregion.ca/pw/other/standards/linear/con-specs/
Peel's standard drawings and lists of approved products shall form part of the Contract Documents. References are also made to various Ontario Provincial Standard Specifications and shall be considered part of the contract documents where noted.
In addition to Volume 2, the following items are to be included and enforced during the design and construction of the watermains and sanitary sewers:

1. **SERVICES PROVIDED BY THE REGION OF PEEL**
   Peel will provide the following field services to the Contractor for the duration of the contract either at no charge or on a time and materials basis as indicated below:

   1.1. **Inspection**
   No Charge
   Peel will provide an on-site inspector, either full or part-time, for the duration of the Contract. This includes a final inspection and preparation of deficiency list and a re-inspection when the Contractor advises that it has completed repair of all deficiencies.
   Time and Materials Charge
   All subsequent re-inspections to confirm repair of outstanding deficiencies.

   1.2. **Valving**
   No Charge
   Peel will provide valving in accordance with a connection procedure and schedule agreed to by the Contractor and the Engineer.

   Time and Materials Charge
   All emergency valving required as a result of an unscheduled or accidental disruption of water supply by the Contractor.

   1.3. **Stake-Outs**
   No Charge
   Peel will provide stake-outs for existing Regional watermains and services and sanitary sewer mains. Stake-outs shall be carefully preserved by the Contractor.

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Time and Materials Charge
Resetting of stake-outs that have been lost as a result of negligence by the Contractor.

2. **SCHEDULING FOR VALVE OPERATIONS AND TAKING WATER**
The Contractor shall not operate any part of Peel's water supply system. In the event the Contractor requires to have the existing valves operated the Contractor is to submit a request **96** hours in advance of the work day it is to be performed.
The Contractor will be permitted to take water from the hydrant if it obtains a temporary hydrant permit and water meter from Peel. In the event the Contractor requires to have the existing valves operated for the purpose of taking water the Contractor is to submit a request 48 hours in advance of the work day it is to be performed.

3. **GRANULAR MATERIALS**
No recycled materials of any kind will be acceptable under this contract. All references to Granular 'B' are to be considered Granular 'B', Type I.

4. **UPDATED STANDARD DRAWINGS – Sanitary AND APPURTENANCES**
The Vendor shall note that the Public Works Design, Specifications and Procedures Manual has been updated, specifically, Standard Drawings – Watermain and Appurtenances. This contract will mandate all requirements outlined in the most recent version of the Standard Drawings.
Standard Drawings – Sanitary Sewer & Appurtenances are available on Peel's internet site at the following location: http://www.peelregion.ca/pw/other/standards/linear/drawings/sanitary-index.htm

5. **CCTV Inspection of Sewers**
The pre-construction and post-construction CCTV inspection of existing sanitary sewers shall be carried out to the specifications detailed below.

5.1 **General**
The specifications cover the requirements for the colour closed circuit television camera inspection of sewers, the data collection and subsequent reporting of the findings. The accuracy and quality of the video recordings and written reports are of paramount importance. Peel's corrective actions and acceptance of constructed works are based on the information obtained and for this reason it must be correct and complete. Sewer inspections shall be performed to observe and record structural conditions, service defects and construction features, to compare the

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pre-construction to post-construction conditions prior to watermain and sanitary sewer work acceptance. All observations shall be coded in accordance with the most current National Association of Sewer Service Companies (NASSCO) for Pipeline Assessment Certification Program (NACP) version and the findings shall be submitted in an inspection report consisting of data file and video recording (in digital format on a portable hard drive). Condition coding shall only be performed by operators who have successfully attained the NASSCO Level of Qualification for PACP Operators or equivalent.

5.2 **Material Provided by Region of Peel**

Peel shall provide the maintenance hole numbers to be used in the CCTV inspection. This will also include all the sewer locations, alignments, and direction of flow.

5.3 **Operator Qualifications – Inspection**

Each inspection unit shall have a minimum of one operator on site at all times who has successfully attained the NASSCO Level of Qualification for PACP and Manhole Assessment Certification Program (MACP Operators or an alternative training program with is acceptable to the City of Brampton). The operator shall perform accurate observations and recording of all conditions, which may be encountered in the sewers.

5.4 **Digital Video and Viewing Software Specifications**

The inspection shall be captured in colour MPEG-4 from the live video source to the computer hard drive with no frame loss. One complete single digital file shall be submitted for each inspection.

Digital video files shall meet the following minimum requirements:

- MPEG-4 Requirements;
- Picture Size: NTSC 702 x 480 @ 29.97 frames per second; and
- Data/Bit Rate: 4Mbps

The GRANITE NET version 3.5.3 as sewer inspection management software (Peel will be upgrading to GRANITE NET 3.6 in the coming months) shall be the software used to perform all inspections. The video and text report window shall be vision on the screen side by side and text report should follow advancing video. At the same time the user shall be able to go to any location of the video by

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selecting items from the report screen. The video window shall be scalable to allow the user to change its size to fill up as much of the monitor screen as possible.

5.4.1 **Planned Region of Peel Software Updates**

- It is Peel's intent to upgrade its current platform to GRANITE NET 3.6 CCTV Inspection System during the duration of this contract. The Vendor must be able to upgrade to GRANITE NET 3.6 and provide deliverables compatible with Peel's system within thirty (30) calendar days of Peel providing notice of software change.

5.5 **Camera System**

A pan-and-tilt closed circuit colour television self-contained camera capable of radial rotation of 360 degrees and a lateral rotation of 270 degrees and produce a continuous picture resolution of not less than 400 lines, equipped with a self-contained lighting system compatible with the camera lens angle, that will not create "shadows" or "hot spots". It will be capable of inspecting sewers 150mm to 1200mm diameter for a minimum distance of 300 metres without reversal.

5.6 **Displays**

The displays shall be suitable character size, type, style, and colour to be clearly visible and easily readable. The display shall be placed in such a manner as not to interfere with the image of the video.

5.7 **Electronic Distance Encoder**

The sewer chainage will be measured simultaneously with the camera travel and recorded automatically using an electronic encoder.

5.8 **Deliverables**

The CCTV Inspection Report is to be delivered as an access database with accompanying video on a portable hard drive (USB). No compact discs shall be accepted for submission. Each Inspection Report shall contain exact distance from the starting maintenance access chamber to defects, abnormalities, and general condition of the sewer line, as follows:

- All observations shall be coded in accordance with the most current (NASSCO) PACP version;

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- The service connections with reference to the distance from starting maintenance access chambers and the periphery using standard clock position, i.e. 1 o'clock; and
- Each report submitted shall include the designated maintenance access chamber numbers.

The on-screen display which will indicate the maintenance access chamber number to maintenance access chamber number, the location (street name), the date, pipe size, type of sewer, the direction of flow, and if the inspection is being done against the flow.

16.0 **Supply and Installation of Sanitary Sewer Pipe Up to and Including 450mm in Diameter**

The sanitary sewer pipes shall match the pipe type and invert elevations shown on the Contract Drawings and conform to the Approved Products List for Linear Wastewater.

PVC Sewers up to an including 400mm in diameter shall be CSA B182.2, ASTM D 3034, DR 35 minimum, with a minimum pipe stiffness of 320 kPa.

PVC sewers 450mm in diameter shall be CSA B182.2, ASTM F 679 (T-1), DR 35 minimum, with a minimum pipe stiffness of 320 kPa.

System components to be tested include manholes, pipes and temporary bulkheads as per the appropriate Standard Drawing.

All items shall be handled, unloaded and stored in accordance with the manufacturers' specifications. Bedding for all pipes is included in this unit price and shall be in accordance with Peel Standard Drawing 3-1 "Granular Bedding". The compaction of all bedding and cover materials shall be 100% Standard Proctor or better. Special care must be given to contouring the bedding material to conform with the pipe bottom and projecting bells, along with proper compaction of the haunches in order to provide even support throughout the pipe.

17.0 **New Sanitary Sewer Maintenance Holes**

Contractor shall supply and install sanitary maintenance holes in accordance with Peel's Standard Drawings 2-5-1, 2-5-2, 2-5-3 for non-pressure tested components or as shown on the Contract Drawings, as well as any other applicable Peel standard drawings. All structures covered under this specification will have the required benching and channeling placed as part of the installation of the structure according to Standard Drawing 2-5-10.

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The unit price includes the removal and disposal off site of the existing maintenance hole(s) including drop structure and its bedding material, where required.

Work for this item as indicated on the Standard Drawings includes but is not limited to the following:

- Field location and protection of existing utilities including Bell, Gas, and other utilities;
- Careful removal, storage and replacement of obstructions including culverts, headwalls, catch basins, fences, curbs, shrubbery, signs, fencing installation and all removal, disposal and restoration;
- Excavation, shoring, bracing, dewatering in soil and rock (if applicable), groundwater treatment and disposal, Granular 'A' base, cover and backfill, insulation, backfill, all disposal, to facilitate the installation and construction of the permanent works;
- Open cut installation shall include for all other underground and overhead utilities;
- Precast components, adjustment units, frame and cover; and,
- Safety platforms supplied according to Peel's Standard Drawings 2-6-13, 2-6-14, 2-6-15 (required if combined height of the chimney and maintenance hole is greater than 5m and shall not be more than 5m apart, safety platform to be placed at midpoint). Safety platform to cover the entire chamber cross section and shall be designed by a qualified Professional Engineer licensed in the Province of Ontario.

18.0 **Connect New Pipe to Existing MH**

Work for this item is related to the connection to existing sanitary chambers shown on the Contract Drawings and includes but is not limited to the following:

- Field location and protection of existing utilities including Bell, Gas, and other utilities;
- Careful removal, storage and replacement of obstructions including culverts, headwalls, catch basins, fences, curbs, shrubbery, signs, fencing installation and all removal, disposal and restoration;
- Excavation, shoring, bracing, dewatering in soil and rock (if applicable, groundwater treatment and disposal, Granular 'A' base, cover and backfill, insulation, thrust blocks, backfill, all disposal, to facilitate the installation and construction of the permanent works;
- Open cut installation shall include all necessary relocation of other underground and overhead utilities;
- Precast and cast-in-place connection components;
- Contractor to ensure there is no leakage into the structure from around the pipe. All chambers to be waterproofed as per Peel Standard Drawing 1-1-6;
- Dewatering; and
- Granular 'B' backfill.

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In addition, the Contractor shall submit detailed layout drawings showing dimensions to ensure there are no conflicts and to ensure the chamber dimensions are adequate. The Contractor shall also provide shop drawings for the following:

- Benching; and,
- Reinforcing steel.

19.0 **By- Temporary Flow Diversion - Bypass Pumping**

This Section specifies the requirements for the provision of all design, labour, installation, removal, 24/7 supervision of bypass pumping, materials, equipment, back-up power, maintenance necessary for the temporary bypass pumping system for the purpose of bypass pumping of sewer flows around portions of existing gravity sewers being replaced and/or modified as per the Contract Documents and Drawings.

19.1 **Submittals**

Submit the following additional detailed shop drawing information:

- Detailed plan and description of the proposed bypass pumping system. Indicate the number, size, material, location and method of installation of suction and discharge piping, size of bypass piping, staging area for pumps at the Construction Compound(s), Construction Compound access points and flow requirements.
- The detailed plan shall include, but not be limited to, the following:
- Staging areas for the pumps at the Construction Compound(s) and other areas required by the Contractor.
- Sewer plugging methods and types of plugs.
- Access point for suction and discharge at maintenance holes.
- Number, size, material, location and method of installation of suction piping.
- Number, size, material, method of installation and location of installation of discharge piping.
- Bypass pump sizes, capacity and number of each size of bypass pump to be at the Construction Compound(s) or other locations required by the Contractor.
- Calculations of static lift, friction losses, and flow velocity (pump curves showing pump operating range).
- Standby power generator size and location, (generator must be supplied in an acoustic enclosure).
- Downstream discharge plan.
- Method of protecting discharge maintenance holes from erosion and damage.
- Thrust and restraint block sizes and locations;
- Sections showing suction and discharge piping pipe depth, embedment, select fill and special backfill.

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- Method showing how discharge piping will cross roadways, driveways, etc.
- Method of noise control for each pump and/or generator.
- Any temporary pipe supports and anchoring requirements.
- Calculations for the selection of bypass pumping and pipe sizing.
- Schedule of installation and maintenance of bypass pumping pipes.
- Plan indicating the selection of the location of bypass pumping lines.

A conceptual layout of the bypass piping route for bypass pumping of sewer flows are included on the Contract Drawings. The conceptual bypass layout drawings are general in nature and illustrate the design intent with respect to the temporary bypass pumping system but shall in no way absolve the Contractor of complete responsibility for the execution of the bypass pumping design.

19.2 **Work of this Section**

Provide bypass pumping equipment with the capacity to convey 100 per cent of peak flows.

The Contractor shall provide all pipeline plugs, pumps of adequate size to handle peak flows, and temporary discharge piping to ensure that the total flow of the main piping system can be safely diverted around the section to be repaired, replaced or modified.

Provide bypass pumping systems to be operated and manned 24 hours per Day, 7 Days per week (24/7).

The Contractor shall have adequate standby equipment at the Work Areas ready for immediate operation and use in the event of an emergency breakdown. One standby pump for each size of pump utilized shall be installed on a separate discharge pipe from the low bypassing locations, ready for use in the event of primary pump failure. Duty pumps and standby pumps on a common discharge header will not be permitted.

Bypass pumping system shall be capable of bypassing the flow around the required work area and shall be sized to accommodate the peak flow.

19.3 **Extra Materials**

Spare parts for pumps and piping shall be kept at the Work Area(s) as required.

Adequate hoisting equipment for each pump and accessories shall be maintained at the Work Area(s).

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19.4 **Measurement and Payment**

The Contractor shall include all costs for labour, equipment and materials within the appropriate unit price items included within the Schedule of Prices for Sanitary Sewer Bypass Pumping as shown on the Contract Drawings and as specified herein.

19.5 **Performance Requirements**

It is essential to the operation of the existing system being bypassed that no interruption in the flow occurs throughout the duration of the project. The Contractor shall provide, maintain, operate and remove all temporary facilities such as plugs, pumping equipment, (both primary and back-up units as required) back-up generator system, conduits, all necessary power, and all other labour and equipment necessary to intercept the incoming flow before it reaches the point where it would be interfering with the Work, carry it past the Work Area and return it to the existing system downstream of this work.

The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility.

The Contractor shall provide all necessary means to safely convey the sewage past the Work Area. The Contractor will not be permitted to stop or impede the main flows under any circumstances.

The Contractor shall divert the flow around the Work Area in a manner that will not cause damage to, or surcharging of, nearby residents and businesses and will protect public and private property from damage and flooding.

The Contractor shall protect all water resources, wetlands, and other natural resources.

The Contractor shall demonstrate that the bypass pumping system is in good working order and is sufficiently sized to successfully handle flows by performing a test run for a period of 24 hours prior to conducting any bypass work.

Schedule and perform work in a manner that does not cause or contribute to the incidence of overflows, releases or spill of sewage from the sanitary sewer system or bypass operation.

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Provide pipeline plugs and pumps of adequate size to handle peak flows, and temporary discharge piping to ensure that the flow of sewer can be safely diverted around the section to be modified or to be replaced.

All temporary facilities shall be removed following the completion of the Work.

19.6 **Equipment**

All pumps to be used shall be fully automatic self-priming units that do not require the use of foot valves or vacuum pumps in the priming system. Provide pumps that are either electric or diesel powered.

Provide the bypass pumping system equipped with the necessary float switches and/or level monitoring devices required for starting and stopping the pump. Float switches shall be provided to sound an alarm if the water level in the pumping system wet well reaches critical depth(s).

Provide all necessary controls for the bypass pumping system.

The Contractor shall provide the necessary stop/start controls for each pump.

It is recommended that the pump be contained inside a temporary portable beam in order to contain any fuel or sewage that may spill during the normal course of operation.

Discharge Piping:

- In order to prevent the accidental spillage of flows all discharge systems shall be temporarily constructed of rigid pipe with positive, restrained joints. In no circumstances will irrigation type piping or glued PVC pipe be allowed.
- The bypass piping shall be encased in a watertight encasement pipe throughout its length in order to contain any sewage that may spill during the normal course of operation plugs shall be selected and installed according to size of line to be plugged, pipe and maintenance hole configurations.

Additional plugs are to be readily available at the Work Area in the event that a plug fails.

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Public Works

10 Peel Centre Dr.
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Brampton, ON
L6T 4B9
tel: 905-791-7800

peelregion.ca

Open channels or trenches shall not be used to convey any bypass flows.

Pumps and the temporary pumping system shall be supplied by:

- Xylem Inc.;
- Atlas Pump Inc.;
- Aquatech Inc.; and
- Region of Peel Approved Equal.

19.7 **Execution**

19.7.1 Preparation

The Contractor is responsible for locating all existing utilities in the area selected for the bypass pipelines. The Contractor shall locate the bypass pipelines in a way which minimizes any disturbance to existing utilities.

During all bypass pumping operations, the Contractor shall protect existing systems (MH's, conveyance system, etc.) from damage inflicted by any equipment. The Contractor shall be responsible for all physical damage to the existing systems caused by human or mechanical failure.

19.7.2 Installation and Removal

The Contractor shall remove maintenance hole sections and construct temporary bypass pumping structures only at the access location indicated on the Contract Drawings and as may be required to provide adequate suction conduit.

Plugging or blocking of flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for the performance and acceptance of the Work, it is to be removed in a manner that permits the sewage flow to slowly return to normal without surge, in order to prevent surcharging or causing other major disturbance downstream.

When working inside a maintenance hole or force main, the Contractor shall exercise caution and comply with all OHSA requirements when working in the presence of sewer gases, combustible or oxygen-deficient atmosphere, and confined spaces.

If possible, the pipeline must be located off streets and sidewalks. When the bypass pipeline crosses streets and private driveways, the Contractor must place the bypass pipelines in trenches and cover them with temporary pavement. Upon

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L6T 4B9
tel: 905-791-7800

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completion of the bypass pumping operations, and after receipt of written permission from the Engineer, the Contractor shall remove all of the piping, restore all property to its preconstruction condition, and restore all pavements. The Contractor is responsible for obtaining any approvals required for the placement of the temporary pipeline from the Peel.

19.7.3 Maintenance

Testing

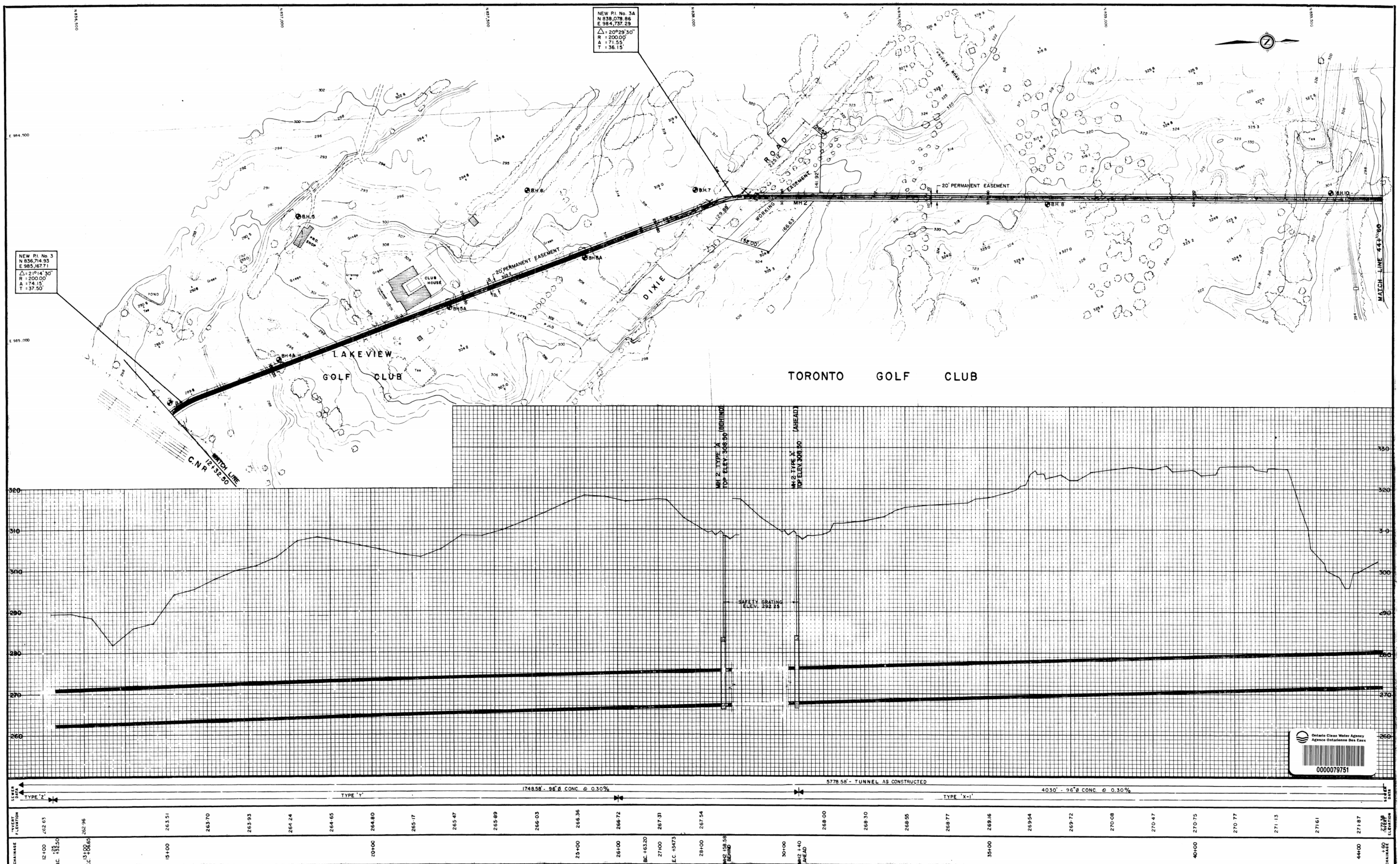
- The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to the actual operation. Provide the Engineer with 24 hours written notice prior to testing.

Inspection

- The Contractor shall inspect the bypass pumping system on a continuous basis to ensure that the system is working correctly.

Maintenance Service

- The Contractor shall ensure that the temporary pumping system is properly maintained, and a responsible operator shall be on hand at all times when the pumping systems are operating.
- The Contractor shall monitor pump fuel levels and make arrangements for timely refueling as needed.



Notes

KEY: LAKESHORE RD. | CNR | DIXIE RD. | Q.E.W. | QUEENSWAY | CPR | DUNDAS ST. — 1 | 2 | 3 | 4 | 5 | 6

No.	Revision	Date	Initial
1	AS CONSTRUCTED	DEC./75	R.H.G.

Approved

Ministry of the Environment

Project No. 1-0053-66-06 Contract No. 15

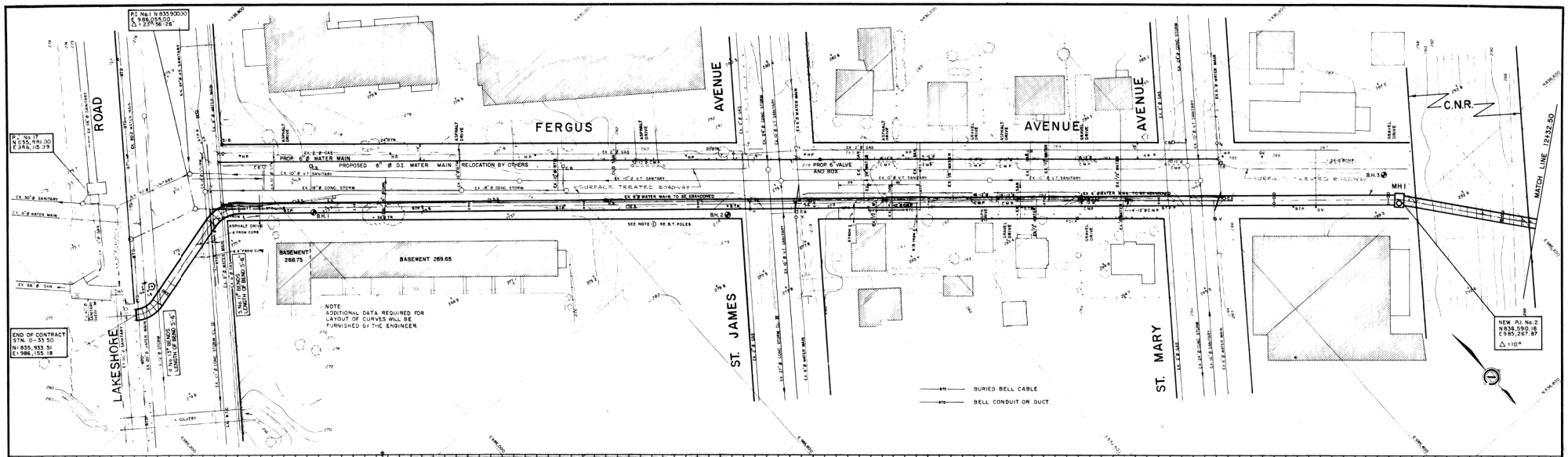
South Peel Sewage System
South Part of East Trunk Sewer

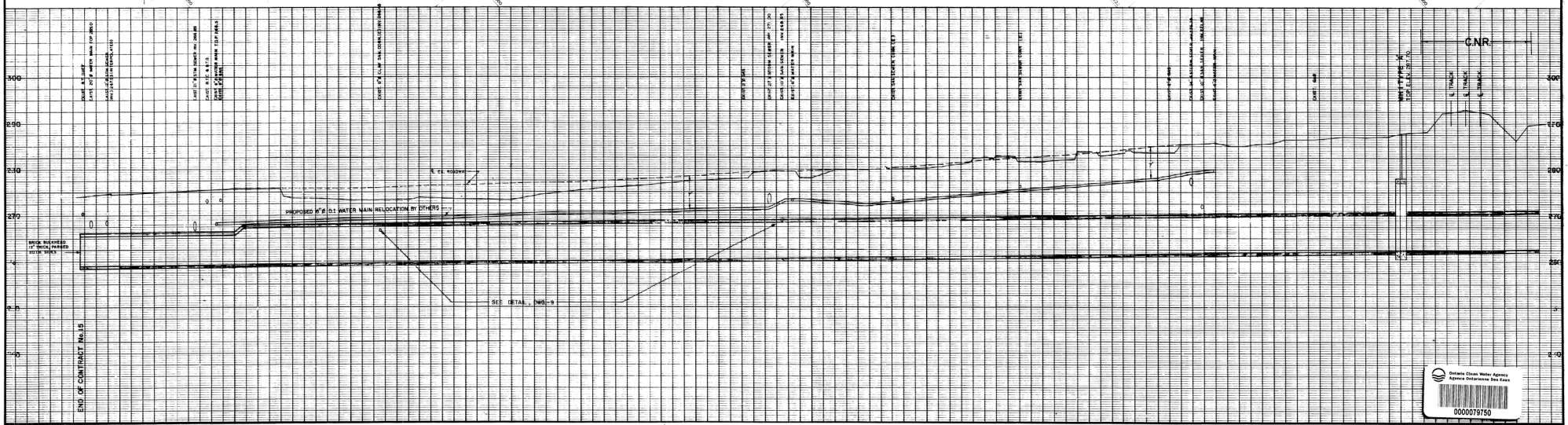
Sheet 2 of 10

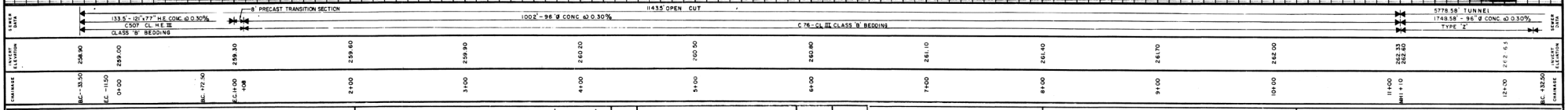
Marshall Macklin Monaghan Limited
Consulting Engineers
Don Mills

Scale HOR. 1" = 100 VER. 1" = 10' Date NOV. 30, 1972

Drawn By | Field Book | Drawing No. 40739-D | Rev.
Ckd. By



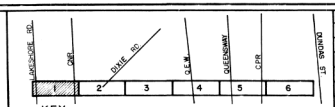




Notes ① BELL CANADA POLES WITHIN 10' OF CENTRE LINE OF SEWER ON FERGUS AVENUE TO BE TEMPORARILY DISPLACED BY OTHERS TO PERMIT SEWER CONSTRUCTION.

BM. No. T-213 Elev. 270.288 (60')
HIGHWAY No. 2 (LAKESHORE RD.) BRIDGE OVER ETOBICOKE CREEK, TABLET IN CENTRE OF EASTERLY FACE (END) OF CONCRETE GUARD RAIL POST ON SOUTHERLY SIDE AND AT EASTERLY END OF BRIDGE, AT GROUND LEVEL.

No. T-252 Elev. 378.985 (60')
HIGHWAY No. 5 (DUNDAS ST.) BRIDGE OVER ETOBICOKE CREEK 0.4 MILE SOUTH WEST OF HIGHWAY 427 INTERSECTION, TABLET IN WESTERLY FACE (END) OF CONCRETE GUARD RAIL POST ON SOUTHERLY SIDE AND AT WESTERLY END OF BRIDGE, IN CENTRE AND 12 INCHES BELOW TOP.



No.	Revision	Date	Initial
1	AS CONSTRUCTED	DEC/75	EK

Approved

Ministry of the Environment

Project No. 1 - 0053-66-06 Contract No. 15

South Peel Sewage System
South Part of East Trunk Sewer

Sheet 1 of 10.

Marshall Macklin Monaghan Limited
Consulting Engineers
Don Mills

Scale HOR. 1" = 40' VER. 1" = 10' Date NOV. 30, 1972

Drawn By
Chd. By
Field Book

40738-D

City of Mississauga's
Applewood Creek at Lakeview Golf Course EA and Detailed Design Project

Golf Course Review

Date/Time: December 12th, 2019 2:30 pm – 3:30pm
Location: 201 City Centre - Superior Room 8F
Procurement No.
Aquafor Ref: 66514
Consultant: Aquafor Beech Ltd
Prepared by: Aquafor Beech Ltd (Rob Amos)

Attendees

Name	Company	Telephone	Email
Greg Frew (GF)	City of Mississauga (City)	905.615.3200 x 3362	Greg.Frew@mississauga.ca
Frank Pugliese (FP)	Region of Peel	905-867-6437	frank.pugliese@peelregion.ca
Rob Amos (RA)	Aquafor Beech (ABL)	416.705.2367	Amos.R@aquaforbeech.com
Chunying Zhao (CZ)	Aquafor Beech	226.808.1516	Zhao.C@aquaforbeech.com
Regrets			
Nicholas Gan	Region of Peel	647-403-3711	nicholas.gan@peelregion.ca

Objective of Meeting: Region of Peel Update on Applewood Creek EA

Items of Discussion

1. Introductions
2. Existing Conditions of Applewood Creek at Lakeview Golf Course
3. Region Sanitary Sewer Infrastructure
4. Review of Alternatives from EA
5. Region Expectations & Requirements for Design
6. Next Steps

	Topic/Comments	Action By:	Deliverable Date
1	**Introduction**		
2	**Existing Conditions** RA – Review of existing conditions of Applewood Creek and the Lakeview Golf Course. RA – A Letter was received from Region in response to the Notice of PIC		
3	**Region Sanitary Sewer Infrastructure** RA – A 2.4m die sanitary sewer crosses the creek near the downstream end of the study area. FP – The crossing is Region's East Trunk Sewer, servicing the G.E. Booth WWTF. RA – The existing cover depth of the crossing is approximately 3m based upon sewer as-constructed drawings (40739-D, 1975) FP – Crossing elevations shall be verified from upstream and downstream manholes. Elevations to be clearly marked on drawings.	ABL	
4	**Review of Alternatives from EA** RA – Review of all four alternatives. Alternative 4 – Natural Channel Realignment has been selected as preferred alternative RA – The intent of Alternative 4 is to restore Applewood Creek into a natural planform with 'soft' erosion control techniques while bringing the creek into the playability of the golf course. RA – The project will involve works over top and within the easement of the sewer crossing. However, no modification or negative impact to the infrastructure is expected as part of the project. RA – As per the Region's Response Letter regarding the PIC Notice, ABL will consult Peel Region throughout all phases of the project and will request for written permission from Region to work within easement prior to construction.	ABL	
5	**Region Expectations & Requirements for Design**		
	FP – Geotechnical investigations should be conducted to confirm soil stratigraphy and bedrock elevation around pipe RA – Geotech programs including boreholes are to be carried out at detailed design phase, will inform as FP noted. FP – Engineering analysis of loading and crack propagation of the sewer crossing should be conducted upon completion of design to confirm no negative impact on the infrastructure. In addition, mitigation measures for construction and access route will need to be designed (i.e. use of steel plates or amts to distribute the load).	ABL ABL Region & ABL	

	FP – Pre and Post CCTV inspection of the sewer crossing is required. Region to send specs. GF – A followup letter will be prepared by City / ABL and sent to Region summarizing proposed works and mitigation measures within the easement / area of influence of the 2.4m sanitary sewer. FP - Region to provide approval of concept design, confirming specific expectations & requirements for design & construction. FP – ABL to provide a "blow-up" detail of the sewer cross-section where the creek and sewer intersect.	City & ABL	
6	**Schedule**		
	- Letter prepared by City and ABL in response to Peel's letter will be provided by December 20 - EA will be finalized in early 2020 - Design will be 2020 - Construction will be 2021		

Next Meeting:
TBD

If you notice any errors or omissions in this document,
please advise Rob Amos within seven days of the issuance of these minutes.

City of Mississauga
Transportation and Works
201 City Centre Drive
Mississauga ON L5B 2T4

February 24, 2020

Mr. Frank Pugliese
Project Manager, Wastewater Capital
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton, ON L6T 4B9
905-791-7800 ext. 5943 | Frank.Pugliese@peelregion.ca

Re: Applewood Creek Erosion Control at Lakeview Golf Course

Mr. Pugliese:

As a follow-up to our 10 December 2019 review meeting regarding the City of Mississauga's Applewood Creek Erosion Control Project through Lakeview Golf Course, a summary of alternative works has been prepared in memo format, as well as considerations to protect the Region's sanitary sewer infrastructure during detailed design of the preferred alternative. Concept drawings of all alternatives are appended to the end of this letter.

Applewood Creek within the study area runs southeasterly through the Lakeview Golf Course, flowing under the CN railway and finally entering Lake Ontario. Engineered erosion protection measures in the form of gabion lined banks were installed along the creek throughout the golf course approximately 30-40 year ago. These gabion banks have been deteriorating and failing since their placement and require significant maintenance efforts from the golf course annually.

In order to prevent the creek from further eroding and causing a loss of the tableland within the golf course, the study has developed alternatives solutions to address the issues. Four alternatives, including a null alternative (do nothing), have been developed and evaluated through the Municipal Class Environmental Assessment (EA) process in which Alternative 4 – Natural Channel Realignment was selected as the preferred alternative. A brief summary of each alternative is provided below. Detailed assessment of the existing conditions and the development and evaluation of the alternatives will be documented in the Project File upon completion of the EA. A copy of the Project File will be provided to the Region for review and comment once available.

Alternative 1 – Do Nothing

This alternative involves leaving the existing creek, particularly the gabion baskets which line both banks, to continue failing. Existing risks with regards to undermining of bridge abutments, failure of asphalt cart paths, loss of golf course tableland, and public safety will remain.

Alternative 2 – Replacing Gabion Baskets with Armourstone

This alternative would involve a continuous restoration of the Applewood Creek throughout the golf course. The intent is to replace all gabion basket banks with armourstone walls, maintaining the existing channel width and alignment. This alternative will require limited disruption to the golf course and the existing bridges, as well as achieving long-term erosion protection to the watercourse. However, this alternative is expected to provide limited enhancement to the aesthetic value of the golf course and require higher construction costs.

Alternative 3 – Replacing Gabion Baskets with Vegetated Roundstone

Similar to Alternative 2, this alternative would also involve a continuous restoration of the Applewood Creek throughout the golf course. The channel banks would be reconstructed with vegetated roundstone and the channel bed with boulders. The existing channel alignment will be maintained, however the channel width would be enlarged. Vegetated banks with buried hard material as toe protection will provide stable banks and transition smoothly to the golf course lands. This alternative will require minor to moderate disruption to the golf course and will require replacement of 4 out of 9 bridges. Long-term erosion protection and improved aesthetic value will be provided as a result of this alternative.

Alternative 4 – Natural Channel Realignment – Preferred Alternative

For this alternative, the creek will be restored to a more naturalized form including a continuous realignment of Applewood Creek through the golf course, subject to course layout constraints. The channel restoration would recreate the channel bed and banks using a combination of natural channel design techniques as well as engineered methods. This alternative will involve the highest level of disruption to the study area, particularly the mandatory alteration to golf course features to accommodate the proposed channel works, including:

- Hole 16 tee re-alignment / relocation, fairway contouring, tree removal, and green expansion
- Hole 13 tee re-build
- Hole 17 green restore / re-built and upper tee expansion
- Hole 18 tee re-build, fairway contouring and re-grade
- Hole 8 fairway contouring and forward tee re-build
- Hole 1 tee re-build
- Changes to holes 5 and 6
- Cart path construction from 16 fairway to 18 fairway
- Fill in pond and parking expansion
- Irrigation mainline adjustments

This alternative will result in the most improved conditions in terms of the natural function and processes of the watercourse, as well as improved playability of the golf course in which Applewood Creek becomes a more prominent feature.

Region of Peel Sanitary Sewer Infrastructure

A 2.4m dia concrete sanitary sewer with a 6m wide easement was identified within the study area, which crosses the watercourse ~90m upstream of the CN railway. The sewer crossing is estimated to have a cover depth of more than 2m based upon a 2019 topographic survey of the creek and as-built drawing (40739-D). As discussed through the meeting, both the City and the Consultant recognize the importance of the noted sewer crossing which is the Region's East Trunk Sewer, servicing the G.E. Booth WWTF.

In turn, it is important to ensure that the proposed creek design minimize the disturbance to the sanitary sewer crossing, and maintains a sufficient cover depth. Although the preferred alternative involve works overtop and within the easement of the sewer, no modification to the sanitary infrastructure itself is expected as part of the project. To confirm the proposed works pose no negative impact on the infrastructure, engineering analysis of loading and crack propagation of the sewer crossing will be conducted during detailed design stage. In addition, mitigation measures for construction and access routes will be investigated and incorporated into the design to avoid excessive point loading. Mitigation measures may include use of steel plates or timber mats over the infrastructure crossing area.

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Transportation and Works
201 City Centre Drive
Mississauga ON L5B 2T4

Upon approval of the EA Project File, detailed design of the selected preferred alternative will be undertaken to further the design, incorporate comments from stakeholders and regulatory agencies, and ultimately prepared for construction purposes. The City and its engineering consultant will continue to consult with the Region and provide design details at multiple points throughout the detailed design process to confirm that all necessary mitigation measures are included in the design, meeting the Region's expectations that the proposed works for this project will have no negative impact to the sanitary sewer crossing.

Should you have any questions, please do not hesitate to contact the undersigned at 905.615.3200 ext. 3362.

Sincerely,

Greg Frew, P. Eng.

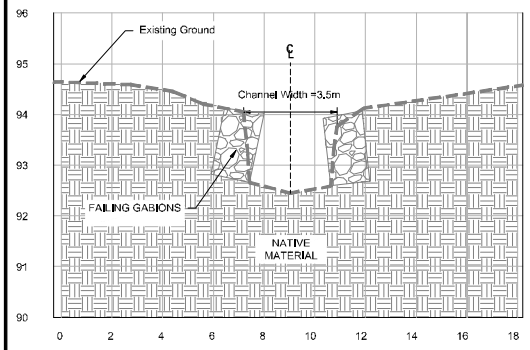
Project Manager
Environmental Services, Infrastructure Planning and Engineering
Tel: 905-615-3200 ext. 3362
Email: Greg.Frew@mississauga.ca

c.c.: R. Amos, Aquafor Beech Ltd.

DO NOTHING

- GABION BASKETS CONTINUE TO FAIL
- MINIMUM 10m EROSION HAZARD APPLIED

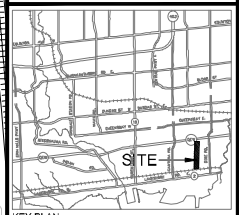
XS1-1'



NO.	BY	DD/MM/YY	REVISIONS	CHECKED
2	SG	13/08/19	ISSUED FOR EA	RA
1	SG	31/05/19	ISSUED FOR CITY REVIEW	RA

LEGEND

- PROPERTY/ BUILDING LINE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATER MAIN
- EXISTING STORM OUTFALL
- EXISTING STORM MH
- EXISTING SANITARY MH
- EXISTING CB
- EXISTING BRIDGE
- EXISTING CULVERT
- EXISTING GABION
- CHANNEL
- SCOUR/EROSION HAZZARD



KEY PLAN

Aquafor Beech Limited

MISSISSAUGA
Leading today for tomorrow

Project Name:
APPLEWOOD CREEK
EROSION CONTROL
LAKEVIEW GOLF COURSE

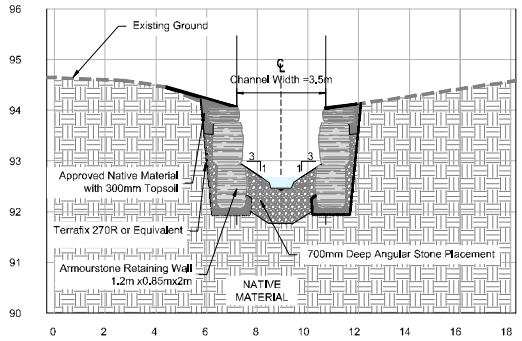
Drawing Title:
OPTION 1
DO NOTHING

Scale: 1:1500	Project No:		OP-1
Drawn: S.G.	Designed: R.A.		
Date:	Sheet No. 1 OF 4		

REPLACE GABION BASKETS WITH ARMOURSTONE

- REMOVE ALL GABION BASKETS (1.5 Km)
- REPLACE WITH ARMOURSTONE RETAINING WALLS ALONG SAME ALIGNMENT
- LIMITED IMPACT TO GOLF COURSE
- EXISTING BRIDGES TO REMAIN

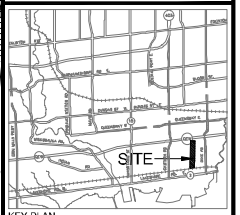
XS2-2'



NO.	BY	DD/MM/YY	REVISIONS	CHECKED
2	SG	13/08/19	ISSUED FOR EA	RA
1	SG	31/05/19	ISSUED FOR CITY REVIEW	RA

LEGEND

- PROPERTY/ BUILDING LINE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATER MAIN
- EXISTING STORM OUTFALL
- EXISTING STORM MH
- EXISTING SANITARY MH
- EXISTING CB
- EXISTING BRIDGE
- EXISTING CULVERT
- EXISTING GABION
- CHANNEL



KEY PLAN

Aquafor Beech Limited

MISSISSAUGA
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Project Name:
APPLEWOOD CREEK EROSION CONTROL
LAKEVIEW GOLF COURSE

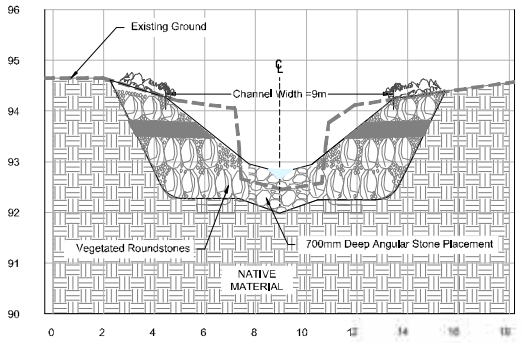
Drawing Title:
OPTION 2
REPLACE GABION BASKETS WITH ARMOURSTONE IN SAME ALIGNMENT

Scale: 1:1500	Proj.ec.No:	OP-2
Drawn: S.G.	Designed: R.A.	
Date:	Sheet No. 2 OF 4	

REPLACE GABION BASKETS WITH VEGETATED ROUNDSTONE

- REMOVE ALL GABION BASKETS (1.5 Km)
- REPLACE WITH VEGETATED ROUNDSTONES ALONG SIMILAR ALIGNMENT WITH INCREASED WIDTH
- MINOR IMPACT TO GOLF COURSE
- 4 OF 9 BRIDGES TO BE REPLACED
- 5 OF 9 BRIDGES TO REMAIN

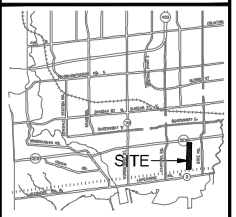
XS3-3'



NO.	BY	DD/MM/YY	REVISIONS	CHECKED
2	SG	13/08/19	ISSUED FOR EA	RA
1	SG	31/05/19	ISSUED FOR CITY REVIEW	RA

LEGEND

- PROPERTY/ BUILDING LINE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATER MAIN
- EXISTING STORM OUTFALL
- EXISTING STORM MH
- EXISTING SANITARY MH
- EXISTING CB
- EXISTING BRIDGE
- EXISTING CULVERT
- EXISTING GABION
- CHANNEL
- BRIDGE TO BE REPLACED
- BRIDGE TO REMAIN
- PROPOSED CART TRAIL



Aquafor Beech Limited

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Project Name:
APPLEWOOD CREEK EROSION CONTROL
LAKEVIEW GOLF COURSE

Drawing Title:
OPTION 3
REPLACE GABION BASKETS WITH VEGETATED ROUNDSTONES IN SAME ALIGNMENT

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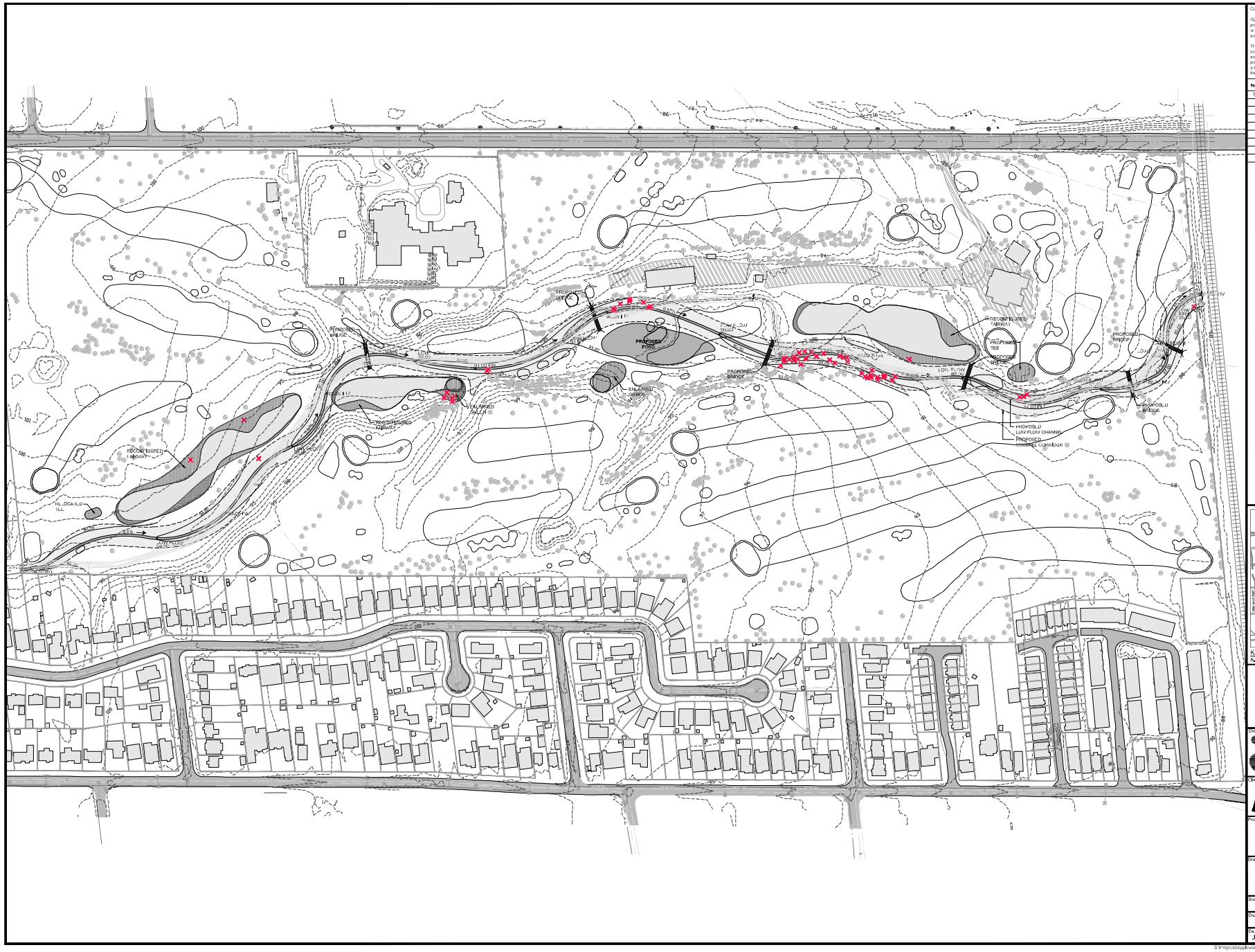
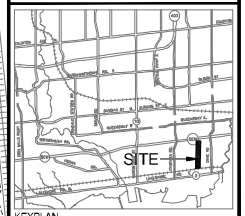
Drawn: S.G.	Designed: R.A.	OP-3
Date:	Sheet No.: 3 OF 4	



No.	Revision	Date	By
1	Issued for Agreed	2019/08/01	RMS

LEGEND

- EXISTING CONTOUR
- PROPOSED CONTOUR
- EXISTING TREES
- EXISTING TREES TO BE REMOVED
- PROPOSED STREAM CORRIDOR
- PROPOSED LOW FLOW CHANNEL
- +92.00 FLV PROPOSED ELEVATION



KEYPLAN
N.T.S.

Drawing Prepared By:
SCHOLLEN & Company Inc.
30 Wertheim Court, Unit 1c
Richmond Hill, Ontario L4B 1B9
T: 289-695-0000
F: 289-695-0010

Client:
MISSISSAUGA
Leading today for tomorrow

Project Name:
APPLEWOOD CREEK EROSION CONTROL
LAKEVIEW GOLF COURSE

Drawing Title:
PROPOSED ALIGNMENT / GRADING CONCEPT PLAN

Scale:	Project No.:	Drawing No.:
1:1500	19003	L1
Drawn: SR	Checked: RMS	
Date: July 2019	Plot Date: 01/08/2019	

S:\Projects\Applewood Creek Erosion Control Project 19003\Drawings\working drawings\L-1.dwg

Appendix G5 – First Nation Consultation

City of Mississauga
Transportation and Works Department
201 City Centre Drive, Suite 800
MISSISSAUGA, ON L5B 2T4
mississauga.ca

07 February, 2020

Six Nations of the Grand River Haudenosaunee Confederacy
Land Use Unit
1695 Chiefswood Road, P.O. Box 5000
Oshweken, ON N0A 1M0

Attention: **Joanne Thomas, Consultant Supervisor**
Re: **City of Mississauga Municipal Class EA Study:**
Applewood Creek Erosion Control at Lakeview Golf Course

As per the project notice of commencement in July 2019, the City of Mississauga is undertaking a Schedule B Class Environmental Assessment (Class EA) Study of Applewood Creek at Lakeview Golf Course. The purpose of the EA is to address erosion issues and deterioration of the watercourse. Please see the attached map of the study area.

As part of the EA, a Stage 1 archaeologic investigation has been completed which recommended further Stage 2 investigations over parts of the study area. Our archaeologic consultant, ASI, plans to undertake the Stage 2 test pit investigations in the coming spring, and we'd like to extend an invitation to the Six Nations of the Grand River Haudenosaunee Confederacy to have archaeologic monitors present during this work. If you would like to have monitors present, please pass along any necessary agreements and we will have ASI contact you to schedule the investigation. The exact timing of the work will be weather-dependant, but we would like the investigation to begin as soon as the ground thaws.

If you have any questions or comments, or would like to receive copies of the Stage 1 and 2 archaeologic studies when they become available, please contact me at (905) 615-3200, ext. 3362, or greg.frew@mississauga.ca.

Sincerely,

Greg Frew, P. Eng.
Project Manager
Environmental Services, Infrastructure Planning and Engineering Division
Transportation and Works Department

cc: Robert Amos, Aquafor Beech Ltd.
Lisa Merritt, ASI.

Figure 1. Applewood Creek Study Area.

zhao.c@aquaforbeech.com

From: Greg Frew <Greg.Frew@mississauga.ca>
Sent: Wednesday, March 11, 2020 3:23 PM
To: Wayne Hill
Cc: Rob Amos (amos.r@aquaforbeech.com); Chunying (Emily) Zhao (zhao.c@aquaforbeech.com); Lisa Merritt (lmerritt@asiheritage.ca)
Subject: RE: City of Mississauga - Archaeology Investigation for Applewood Creek

Hi Wayne.
We hope to be undertaking the work in about 3-4 weeks. Please forward your contract when available.
Thanks,
Greg.

Greg Frew, **P.Eng.**
Acting Manager of Stormwater Projects & Approvals, Environmental Services
Infrastructure Planning and Engineering Services Division
Transportation and Works Department
City of Mississauga
☎ 905.615.3200 ext. 3362
✉ greg.frew@mississauga.ca
www.mississauga.ca

From: Wayne Hill [mailto:tworowarchaeology@gmail.com]
Sent: 2020/03/11 1:56 PM
To: Greg Frew
Cc: Rob Amos (amos.r@aquaforbeech.com); Chunying (Emily) Zhao (zhao.c@aquaforbeech.com); Lisa Merritt (lmerritt@asiheritage.ca)
Subject: Re: City of Mississauga - Archaeology Investigation for Applewood Creek

Good afternoon Greg,

Thank you for the email and attachment. The HDI/HCCC would like to ensure our participation and a contract will be prepared.

Thanks Wayne,

On Tue, Feb 11, 2020 at 3:34 PM Greg Frew <Greg.Frew@mississauga.ca> wrote:

> Attention: Wayne Hill
>
> Mr. Hill:
>
> Please find attached an invitation to participate in an archaeologic investigation being planned for Applewood Creek in Mississauga.

If you have any questions, please do not hesitate to contact me.

Thanks very much,

Greg.

Greg Frew, **P.Eng.**

Acting Manager of Stormwater Projects & Approvals, Environmental Services

Infrastructure Planning and Engineering Services Division

Transportation and Works Department

City of Mississauga

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City of Mississauga
Transportation and Works Department
201 City Centre Drive, Suite 800
MISSISSAUGA, ON L5B 2T4
mississauga.ca

07 February, 2020

Huron-Wendat Nation
255 Place Chef Michel-Laveau
Wendake, QC
G0A 4V0

Attention: **Maxime Picard, Project Coordinator**
Re: **City of Mississauga Municipal Class EA Study:**
Applewood Creek Erosion Control at Lakeview Golf Course

As per the project notice of commencement in July 2019, the City of Mississauga is undertaking a Schedule B Class Environmental Assessment (Class EA) Study of Applewood Creek at Lakeview Golf Course. The purpose of the EA is to address erosion issues and deterioration of the watercourse. Please see the attached map of the study area.

As part of the EA, a Stage 1 archaeologic investigation has been completed which recommended further Stage 2 investigations over parts of the study area. Our archaeologic consultant, ASI, plans to undertake the Stage 2 test pit investigations in the coming spring, and we'd like to extend an invitation to the Huron-Wendat Nation to have archaeologic monitors present during this work. If you would like to have monitors present, please pass along any necessary agreements and we will have ASI contact you to schedule the investigation. The exact timing of the work will be weather-dependant, but we would like the investigation to begin as soon as the ground thaws.

If you have any questions or comments, or would like to receive copies of the Stage 1 and 2 archaeologic studies when they become available, please contact me at (905) 615-3200, ext. 3362, or greg.frew@mississauga.ca.

Sincerely,

Greg Frew, P. Eng.
Project Manager
Environmental Services, Infrastructure Planning and Engineering Division
Transportation and Works Department

cc: Robert Amos, Aquafor Beech Ltd.
Lisa Merritt, ASI.

Figure 1. Applewood Creek Study Area.

zhao.c@aquaforbeech.com

From: Greg Frew <Greg.Frew@mississauga.ca>
Sent: Wednesday, February 12, 2020 5:10 PM
To: Maxime Picard
Cc: Rob Amos; Chunying (Emily) Zhao; Lisa Merritt
Subject: RE: City of Mississauga - Archaeology Investigation for Applewood Creek

Hi Maxime.

I'll forward you a digital copy of the Stage 1 report. The file might be too large for email, so I'll send it to you via file sharing service. Please watch for a link from "wetransfer" file service. Please let me know if you have any trouble receiving it.

Also, if you have a standard agreement for monitoring services, please forward it to me when you have a chance.

Thanks,
Greg.

Greg Frew, **P.Eng.**
Acting Manager of Stormwater Projects & Approvals, Environmental Services
Infrastructure Planning and Engineering Services Division
Transportation and Works Department
City of Mississauga
☎ 905.615.3200 ext. 3362
✉ greg.frew@mississauga.ca
www.mississauga.ca

From: Maxime Picard [mailto:maxime.picard@cnhw.qc.ca]
Sent: 2020/02/12 9:12 AM
To: Greg Frew
Cc: Rob Amos; Chunying (Emily) Zhao; Lisa Merritt
Subject: RE: City of Mississauga - Archaeology Investigation for Applewood Creek

Good morning Greg,

First of all let me thank you for your letter and invitation to co0llaborate with the City of Mississauga on the Archaeological Investigation for Applewood Creek.

Our Nation will be pleased to participate with you and ASI on field by the presence of one of our monitor.
We will wait to hear from ASI for timing and coordination.

In the meantime, could you please provide us with the Stage 1 report ?

Best regards,

Maxime Picard

NATION HURONNE-WENDAT
Bureau du Nionwentsïo

Maxime Picard, B. Sc. A.
Coordonnateur de projets - Ontario
255, Place Chef Michel-Laveau
Wendake (Qc) G0A 4V0
Téléphone : 418-843-3767 # 2105
Courriel : maxime.picard@cnhw.qc.ca

Devez-vous vraiment imprimer ce courriel?
Pensons à l'environnement
Do you really need to print this email?
Think to the environment

De : Greg Frew [mailto:Greg.Frew@mississauga.ca]
Envoyé : 11 février 2020 15:35
À : maxime.picard@cnhw.qc.ca
Cc : Rob Amos (amos.r@aquaforbeech.com); Chunying (Emily) Zhao (zhao.c@aquaforbeech.com); Lisa Merritt (lmerritt@asiheritage.ca)
Objet : City of Mississauga - Archaeology Investigation for Applewood Creek

Attention: Maxime Picard

Please find attached an invitation to participate in an archaeologic investigation being planned for Applewood Creek in Mississauga.
If you have any questions, please do not hesitate to contact me.

Thanks very much,
Greg.

MISSISSAUGA

Greg Frew, **P.Eng.**
Acting Manager of Stormwater Projects & Approvals, Environmental Services
Infrastructure Planning and Engineering Services Division
Transportation and Works Department
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City of Mississauga
Transportation and Works Department
201 City Centre Drive, Suite 800
MISSISSAUGA, ON L5B 2T4
mississauga.ca

07 February, 2020

Mississaugas of the New Credit First Nation
Department of Consultation & Accommodation
2789 Mississauga Road R.R. #6,
Hagersville, ON N0A 1H0

Attention: **Megan DeVries**
Re: **City of Mississauga Municipal Class EA Study:**
Applewood Creek Erosion Control at Lakeview Golf Course

As per the project notice of commencement in July 2019, the City of Mississauga is undertaking a Schedule B Class Environmental Assessment (Class EA) Study of Applewood Creek at Lakeview Golf Course. The purpose of the EA is to address erosion issues and deterioration of the watercourse. Please see the attached map of the study area.

As part of the EA, a Stage 1 archaeologic investigation has been completed which recommended further Stage 2 investigations over parts of the study area. Our archaeologic consultant, ASI, plans to undertake the Stage 2 test pit investigations in the coming spring, and we'd like to extend an invitation to the Mississaugas of the New Credit First Nation to have archaeologic monitors present during this work. If you would like to have monitors present, please pass along any necessary agreements and we will have ASI contact you to schedule the investigation. The exact timing of the work will be weather-dependant, but we would like the investigation to begin as soon as the ground thaws.

If you have any questions or comments, or would like to receive copies of the Stage 1 and 2 archaeologic studies when they become available, please contact me at (905) 615-3200, ext. 3362, or greg.frew@mississauga.ca.

Sincerely,

Greg Frew, P. Eng.
Project Manager
Environmental Services, Infrastructure Planning and Engineering Division
Transportation and Works Department

cc: Robert Amos, Aquafor Beech Ltd.
Lisa Merritt, ASI.

Figure 1. Applewood Creek Study Area.

zhao.c@aquaforbeech.com

From: Megan DeVries <Megan.DeVries@mncfn.ca>
Sent: Friday, February 28, 2020 10:48 AM
To: Greg Frew
Cc: Rob Amos (amos.r@aquaforbeech.com); Chunying (Emily) Zhao (zhao.c@aquaforbeech.com); Lisa Merritt (lmerritt@asiheritage.ca); Mark LaForme
Subject: RE: City of Mississauga - Archaeology Investigation for Applewood Creek
Attachments: MCFN FLR Participation Agreement [2020].docx; DOCA Archaeological Review Agreement [2020].docx

Good morning,

As discussed, please find attached MCFN's 2020 FLR participation agreement.

Please note that this year, in order to continue maintaining DOCA capacity for fulsome project participation, DOCA will be introducing charges for technical review of project information.

In the exercise of its stewardship responsibility, DOCA seeks to work together with project proponents and their archaeological consultants to ensure that archaeological work is done properly and respectfully. DOCA has retained technical advisers with expertise in the field of archaeology. These experts will review the technical aspects and cultural appropriateness of the archaeological assessments and strategies associated with your project. Upon completion of these reviews, MCFN will identify, if necessary, mitigation measures to address any project impacts upon MCFN rights. For cultural materials and human remains, DOCA may advise that this includes ceremonies required by Anishinaabe law, as well as request adjustments to the proposed fieldwork strategy. If you would like me to resend a copy of the MCFN *Standards and Guidelines for Archaeology*, please advise.

The proponent is expected to pay the costs for MCFN to engage in a technical review of the project. DOCA anticipates at this time that all archaeological review will be undertaken by in-house technical experts, but will advise the proponent if an outside peer-review is required. Please find attached the agreement that covers MCFN's inhouse technical review of the archaeological assessments and strategies associated with your project(s). Please fill in the additional required information, highlighted in yellow, and return to us a signed copy for the project, alongside the FLR participation agreement.

Please let me know if you would like to set up a call to discuss.

Sincerely,
Megan.

Megan DeVries, M.A.
Archaeological Operations Supervisor

Department of Consultation and Accommodation (DOCA)
Mississaugas of the Credit First Nation (MCFN)
4065 Highway 6 North, Hagersville, ON N0A 1H0
P: 905-768-4260 | M: 289-527-2763

http://www.mncfn.ca

From: Greg Frew <Greg.Frew@mississauga.ca>
Sent: Wednesday, February 19, 2020 1:19 PM
To: Megan DeVries <Megan.DeVries@mncfn.ca>
Cc: Rob Amos (amos.r@aquaforbeech.com) <amos.r@aquaforbeech.com>; Chunying (Emily) Zhao (zhao.c@aquaforbeech.com) <zhao.c@aquaforbeech.com>; Lisa Merritt (lmerritt@asiheritage.ca) <lmerritt@asiheritage.ca>
Subject: RE: City of Mississauga - Archaeology Investigation for Applewood Creek

Hi Megan.

Yes, please forward the 2020 agreement when ready.
I'll forward you the Stage 1 report via the "wetransfer" file sharing service. Watch for an email shortly with a download link.

Thanks again.
Greg.

Greg Frew, **P.Eng.**
Acting Manager of Stormwater Projects & Approvals, Environmental Services
Infrastructure Planning and Engineering Services Division
Transportation and Works Department
City of Mississauga
☎ 905.615.3200 ext. 3362
✉ greg.frew@mississauga.ca
www.mississauga.ca

From: Megan DeVries [mailto:Megan.DeVries@mncfn.ca]
Sent: 2020/02/18 1:42 PM
To: Greg Frew
Cc: Rob Amos (amos.r@aquaforbeech.com); Chunying (Emily) Zhao (zhao.c@aquaforbeech.com); Lisa Merritt (lmerritt@asiheritage.ca)
Subject: RE: City of Mississauga - Archaeology Investigation for Applewood Creek

Hello Greg,

Thank you for the notice. MCFN-DOCA is finalizing our FLR participation agreements for the 2020 field season, but I will be happy to provide you with a copy for execution as soon as it is available.

In the meantime, can you please provide a copy of the Stage 1 archaeological assessment referenced in the invitation?

Thank you,
Megan.

Megan DeVries, M.A.
Archaeological Operations Supervisor

Department of Consultation and Accommodation (DOCA)
Mississaugas of the Credit First Nation (MCFN)
4065 Highway 6 North, Hagersville, ON N0A 1H0
P: 905-768-4260 | M: 289-527-2763
http://www.mncfn.ca

From: Greg Frew <Greg.Frew@mississauga.ca>
Sent: Tuesday, February 11, 2020 3:35 PM
To: Megan DeVries <Megan.DeVries@mncfn.ca>
Cc: Rob Amos (amos.r@aquaforbeech.com) <amos.r@aquaforbeech.com>; Chunying (Emily) Zhao (zhao.c@aquaforbeech.com) <zhao.c@aquaforbeech.com>; Lisa Merritt (lmerritt@asiheritage.ca) <lmerritt@asiheritage.ca>
Subject: City of Mississauga - Archaeology Investigation for Applewood Creek

Ms. Devries:

Please find attached an invitation to participate in an archaeologic investigation being planned for Applewood Creek in Mississauga.
If you have any questions, please do not hesitate to contact me.

Thanks very much,
Greg.

Greg Frew, **P.Eng.**
Acting Manager of Stormwater Projects & Approvals, Environmental Services
Infrastructure Planning and Engineering Services Division
Transportation and Works Department
City of Mississauga
☎ 905.615.3200 ext. 3362
✉ greg.frew@mississauga.ca
www.mississauga.ca

City of Mississauga
Transportation and Works Department
201 City Centre Drive, Suite 800
MISSISSAUGA, ON L5B 2T4
mississauga.ca

07 February, 2020

Six Nations of the Grand River Haudenosaunee Confederacy
Land Use Unit
1695 Chiefswood Road, P.O. Box 5000
Oshweken, ON N0A 1M0

Attention: **Joanne Thomas, Consultant Supervisor**
Re: **City of Mississauga Municipal Class EA Study:**
Applewood Creek Erosion Control at Lakeview Golf Course

As per the project notice of commencement in July 2019, the City of Mississauga is undertaking a Schedule B Class Environmental Assessment (Class EA) Study of Applewood Creek at Lakeview Golf Course. The purpose of the EA is to address erosion issues and deterioration of the watercourse. Please see the attached map of the study area.

As part of the EA, a Stage 1 archaeologic investigation has been completed which recommended further Stage 2 investigations over parts of the study area. Our archaeologic consultant, ASI, plans to undertake the Stage 2 test pit investigations in the coming spring, and we'd like to extend an invitation to the Six Nations of the Grand River Haudenosaunee Confederacy to have archaeologic monitors present during this work. If you would like to have monitors present, please pass along any necessary agreements and we will have ASI contact you to schedule the investigation. The exact timing of the work will be weather-dependant, but we would like the investigation to begin as soon as the ground thaws.

If you have any questions or comments, or would like to receive copies of the Stage 1 and 2 archaeologic studies when they become available, please contact me at (905) 615-3200, ext. 3362, or greg.frew@mississauga.ca.

Sincerely,

Greg Frew, P. Eng.
Project Manager
Environmental Services, Infrastructure Planning and Engineering Division
Transportation and Works Department

cc: Robert Amos, Aquafor Beech Ltd.
Lisa Merritt, ASI.

Figure 1. Applewood Creek Study Area.