PROJECT FILE REPORT

ETOBICOKE CREEK EROSION CONTROL – BLOOR STREET TO PONYTRAIL DRIVE

DRAFT ● JUNE 2021

FINAL ● OCTOBER 2022

REPORT PREPARED FOR:

CITY OF MISSISSAUGA
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EXECUTIVE SUMMARY

KSGS Engineering Corp. (KSGS), along with Beacon Environmental (Beacon), were retained by the City of Mississauga (City) to determine the most appropriate means of alleviating erosion to a section of the Etobicoke Creek. The study reach is bounded by Bloor Street to the South and extends to the first pedestrian bridge on Markland Woods Golf Club.

Erosion along the west side of the Etobicoke Creek base was causing the west side of the creek to exhibit bank and slope erosion that were affecting existing properties along the top of bank. There was evidence of lands along the top of bank slumping into the creek and several existing trees were in danger of eventually falling into the creek.

Due to the deterioration of erosion protection at the northwest abutment of the Bloor Street crossing, the section of Etobicoke Creek underneath Bloor Street was added to the study. A previous design for this area was not constructed as part of the road rehabilitation in an earlier project. The works under Bloor Street would also address continued protection of the Regional sanitary trunk sewer and there is an opportunity to improve for migration upstream of Bloor Street along the Etobicoke Creek.

Notice of Study Commencement was issued in 2018 and due to COVID and passage of time, the Notice of Study Commencement was reissued in 2020.

A physical environment assessment was undertaken for the study area which included:

- detailed photo inventory of the study area
- topographic survey of the channel and adjacent areas
- background on site conditions were reviewed
- existing infrastructure identified which included two Region of Peel sanitary trunk sewers along the creek with one trunk crossing just upstream of Bloor Street
- geotechnical investigation of the site soils and creek base material
- Stage 1 and 2 Archaeological assessments
- utilization of a diving team to assess the erosion along the northwest Bloor Street abutment

A natural environment assessment was undertaken which included:

- Tree inventory
- Terrestrial habitat and species
- Aquatic habitat and species

- Biological environment

An engineering and geomorphic environment which included:

- Hydrologic assessment of flows from the more frequent event to the less frequent Regional storm
- Hydraulic assessment of impacts of flow within the channel and beyond the channel up to the Regional Floodline.
- Geomorphic assessment of the creek processes and impacts that flows will have on these processes
- Impact of the existing drop structure upstream of Bloor Street on the physical and natural environment as well as impacts on Regional trunk sewer

All the background information was collected and formalized within this EA report and Appendices. Based on a review of the collected information alternatives were developed for the section of the Etobicoke Creek from Bloor Street to the golf course crossing approximately 500m upstream and for the section of Etobicoke Creek underneath Bloor Street. Due the unique issues with each of the sections, alternatives were generated separately for each section, but the final design will incorporate both preferred solutions into one solution as part of the final design.

For the section of the Etobicoke Creek from Bloor to the golf course crossing, the following options were generated:

- Do nothing option and leave the present situation as is and allowed it to continue to deteriorate over time and eventually impacting private property at the top of the west bank
- Hard armouring would consist of hard armouring on the west bank to increase bank stability and improve long term sustainability of the west bank. The east bank would be treated with vegetated rock buttresses to improve stability of the banks.
- Channel realigned geomorphically to improve creek stability and decrease pressure on the west bank, but it must be noted that hard armoring will still be required on the west bank of the creek.

For the section under Bloor Street the following options were generated:

- Do nothing option and leave the present situation to continue to deteriorate over time. Unfortunately, since the start of this study in 2018, erosion protection along the northwest abutment has deteriorated significantly and the drop structure upstream of Bloor Street has partially failed. Theses two issues is impacting the Bloor Street abutment and the protection for the Regional trunk sanitary sewer is now compromised.
- Retention of Existing Grade Control option (a) entails retention of the existing grade control drop structure with additional repairs through the construction of reinforcing armourstone weirs immediately upstream and downstream of the structure. Due to the irregular shape of the grade control structure, backfill with stone material will be required to fill any associated voids.

- Replacement of Existing Grade Control option (b) represents a minor refinement to (a) above whereby the existing grade control drop structure would be removed and replaced with a double row armourstone weir. This change will eliminate any unknowns for the existing grade control structure.
- Extend Control Structure Further Upstream option represents an extension of (b) above whereby the grade control drop structure would be removed and replaced with a double-row armourstone weir, and an additional double-row weir would be constructed approximately 10m further upstream to provide enhanced grade control protection of the existing Region's sanitary trunk sewer. To mitigate potential impacts to floodline elevations, the invert elevation of the two upstream-most weirs would match. This option would provide additional protection to the trunk sanitary sewer while having minimal impacts on both the hydraulics and environment.

The generated options were assessed based on a set of five evaluation criteria developed for this study. These criteria relate to the potential impacts and opportunities presented by each option and are presented below:

- Functional
- Social Environment
- Economic Environment
- Natural Environment
- Constructability

A matrix was created to evaluate the five criteria (including sub criterions) against each of the options. A subjective rating was provided for criteria for each option and a preferred option generated for the two sections. The preferred options were:

- Hard armouring for the west embankment and bioengineering for the east embankment from Bloor Street to the golf course pedestrian crossing
- Extend Control Structure Further Upstream for the section under Bloor Street.

Notice for a Public Information Center (PIC) was sent out in early June 2022, and all interested parties that was on the email list was sent an email regarding the PIC in early June. Three mobile signs for the PIC were place in close proximity to the study area. The PIC notice was hand delivered to nearby residents. The virtual Public Information Center was conducted on June 27, 2022. The PIC presentation material was placed on the city website for Etobicoke Creek under https://www.mississauga.ca/etobicokecreek. The general public was provided until July 12, 2022 to provide comments. No comments were received.

Detail design of the preferred is currently underway and will be submitted to the various agencies for review and approval.

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1.1 STUDY OVERVIEW AND PURPOSE

KSGS Engineering Corp. (KSGS), along with Beacon Environmental (Beacon), were retained by the City of Mississauga (City) to determine the most appropriate means of alleviating erosion to a section of the Etobicoke Creek. The study reach area, illustrated in **Figure 1.1** is bounded by Bloor Street to the South and extends to the first pedestrian bridge on Markland Woods Golf Club.

Figure 1.1 Study Area (Google Earth Pro®)

Through its on-going erosion monitoring program, the City has identified this reach of Etobicoke Creek as high priority site in need of rehabilitation, based on the severity of erosion and risk to private properties. This reach of Etobicoke Creek borders on the City of Toronto (East side) and the City of Mississauga (West side). The limit of the project is to focus on the stretch of creek from the golf course pedestrian bridge upstream, to the downstream of Bloor Street as this is the area of the greatest risk. The west side of the creek is on City of Mississauga owned lands up to the valley top-of-slope at the backyard lot lines of the residential properties

along Ponytrail Drive and Steepbank Crescent. The area under Bloor Street is within both the Cities of Toronto and Mississauga

There is significant valley wall erosion along the west bank behind Ponytrail Drive and Steepbank Crescent, which backs onto private property, and in certain cases, beyond the private property fence line. The slope appears unstable and there are numerous trees in danger of collapsing. If the bank is not properly protected and managed, the valley wall will continue to erode and recede further into private property.

Along the top of the west valley slope are residential properties along Steepbank Crescent and Ponytrail Drive. Lands at the rear of some lots and within the adjacent valley show some signs of slumping and potential for future partial failure of portions of the steep slope to naturally achieve a more stable alignment. This area, although within the Study Area is not part of this project and will be subject to further investigation at a future date once the toe of slope is stabilized as part of this project.

This Project File Report documents the development and evaluation of a range of potential alternatives to provide long term erosion protection, maintain hydraulic capacity of the creek, and decrease property and infrastructure loss.

1.2 PROJECT BACKGROUND

1.2.1 PREVIOUS STUDIES

The Toronto and Region Conservation Authority authored and published the Etobicoke-Mimico Creeks Watersheds Technical Update Report (2010). These update reports provide an understanding of the watershed and updates to strategic management recommendations and implementation priorities based on new technical information. The report discusses watersheds in the following areas:

- Groundwater quantity and quality
- Surface water quantity
- Baseflow and water use
- Stormwater management and streamflow
- Surface water quality
- Fluvial geomorphology
- Terrestrial natural heritage system; and
- Aquatic system – instream barriers to fish passage

The report update identified reaches along Etobicoke Creek that are erosion hazard sites, indicating that these areas were at risk due to erosion instability. One such area encompasses the reach of Etobicoke Creek under consideration within this Project File Report. Additionally, the weir near the Bloor Street bridge crossing has

been identified as the “Weir at Bloor Street West of Dixie Mill Road (ECLOW029)”, which is one of the eight barriers for Category A Priority Management, as it does not provide any fish passage and requires mitigation.

1.2.2 PREVIOUS WORKS AT BLOOR STREET

The City of Toronto and the City of Mississauga jointly own the Bloor Street Bridge crossing of Etobicoke Creek. The City of Toronto retained IBI Group (IBI) to rehabilitate the bridge, which included retaining wall replacement, in-creek west pier foundation repair and protection, and creek bed rehabilitation in the proximity of the west pier footing. IBI, with support from Parish Aquatic Services, completed designs for a new proposed channel configuration, complete with new cross-sections and channel characteristics.

The pier and channel works were necessitated due to the alignment of the existing weir structure approximately 10m north of Bloor Street Bridge crossing. The weir was undermined and there was a drop of approximately 1m in elevation. Downstream of the drop, a deep scour pool had formed and was causing significant hydraulic impact to the north-west pier. The deep scour pool had also undermined the base of the stacked armourstone causing them to collapse as shown in **Figure 1.2**.

Figure 1.2 Scour Pool and Failed Armourstone Wall (April 2018)

Parish Aquatic Services (a division of Matrix Solutions Inc.; PARISH, 2014) provided a rehabilitation design to the City of Toronto to address the issues discussed above and to provide fish passage from downstream of the bridge to the top of the weir. To inform the design, a fluvial geomorphic assessment was completed, consisting of two standard rapid assessment protocols (i.e., the Rapid Geomorphic Assessment and Rapid Stream Assessment Technique), and a detailed geomorphic assessment, which included a survey of the longitudinal profile, eight cross sections of Etobicoke Creek adjacent to the Bloor Street Bridge, and characterization of bed and bank materials at each cross section.

The rapid geomorphic assessment was completed in December 2014. The Rapid Geomorphic Assessment (RGA) classified this section of Etobicoke Creek as being 'in regime', implying that instability is isolated or associated with normal river meander propagation processes. The Rapid Stream Assessment Technique (RSAT) characterized this channel as having a 'moderate' degree of stream health.

General reach observations made during the field assessment indicated that both banks of the channel were lined with stone protection. Approaching the Bloor Street bridge, bank protection transitioned to an armourstone retaining wall treatment. Immediately upstream of the bridge, the grade control structure appeared to have partially failed, resulting in the formation of a large knickpoint and plunge pool. Scour associated with the plunge pool was impacting the northwest bridge pier, causing it to be undermined.

In support of the geomorphic assessment, eight channel cross sections were surveyed in the vicinity of the bridge. Bankfull widths ranged between 15-20 m, and average bankfull depths ranged between 0.8-1.0 m. The channel slope upstream and downstream of the bridge were reported to be 0.44% and 0.65%, respectively. A bankfull discharge of 84.06 m^3/s was estimated by extracting the 1.5-year return period flow from the existing HEC-RAS model. This discharge was used to recommend dimensions for the proposed channel.

The proposed design solution to address the failing grade control structure consisted of three, 0.5 m armourstone steps, with an overall gradient of 1%. Between armourstone steps, energy dissipation pools were proposed using angular stone with a D50 of 0.30 m.

Further recommendations were made through the design report to rehabilitate the armourstone retaining walls adjacent to the bridge piers and install rip rap protection around the existing sanitary sewer manhole located on the east bank of the channel.

To date, only the bridge rehabilitation works have been completed. The design that was completed will be reviewed as part of this assignment, options developed, and a preferred solution will be integrated into this design.

1.3 MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT PROCESS

The planning of major municipal projects or activities is subject to the Ontario Environmental Assessment (EA) Act, R.S.O. 1990, and requires the proponent to complete an Environment, including an inventory and description of the existing environment in the area affected by the proposed activity.

The Municipal Class EA was created as a framework for providing Environmental Assessments for recurring municipal projects that were similar in project scope and that had manageable environmental effects. It was first developed by the Municipal Engineers Association and approved by Ministry of the Environment, now Ministry of the Environment, Conservation and Parks (MECP). The latest Municipal Class EA document (October 2000, amended 2007, 2011 & 2015) has been used for this study.

The Class EA are classified by various schedules depending on potential environmental impacts:

Schedule A: Projects are limited in scale, have minimal adverse environmental effects, and include a number of municipal maintenance and operational activities. These projects are pre-approved. Schedule A projects generally include normal or emergency operation and maintenance activities.

Schedule A+: Projects are similar to that of Schedule A. They are also pre-approved; however, the public is to be notified prior to public implementation.

Schedule B: Projects have potential for significant environmental effects. Proponents are required to undertake a screening process, involving mandatory contact with directly affected public and relevant review agencies. If there are no problems, then the proponent may proceed to implementation.

Schedule C: Projects have potential for significant environmental effects and must proceed under full planning and documentation procedures specified in the Class EA document.

The Etobicoke Creek Erosion Control project has the potential for some adverse environmental impacts. Therefore, it is classified as Schedule B project and the following planning phase will apply:

Phase 1: Identify the problem (deficiency) or opportunity

Phase 2: Identify and evaluate alternative solutions to address the problem or opportunity by taking into consideration the existing environment

and establish the preferred solution considering public and review agency input.

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 facility.

A flow chart describing the Class EA planning and design process is shown in **Figure 1.3.** As can be seen, the Class EA process provides an appeal process to change the project status. Members of the public, interest groups and review agencies may request the Minister of the Ministry of Environment, Conservation and Parks (MECP) to require a proponent to comply with Part II of the EA Act, otherwise known as a “Part II Order”, before proceeding with a proposed undertaking. The Minister will determine whether this is necessary, with the decision being final. The procedures surrounding Part II of the Act is outlined in the Municipal Class Environmental Assessment Document.

Following the end of the 30-day public review period and if there are no outstanding Part II Order Requests, the project may proceed to Phase 5 of the Class EA process to complete design, tender documents and move onto construction.

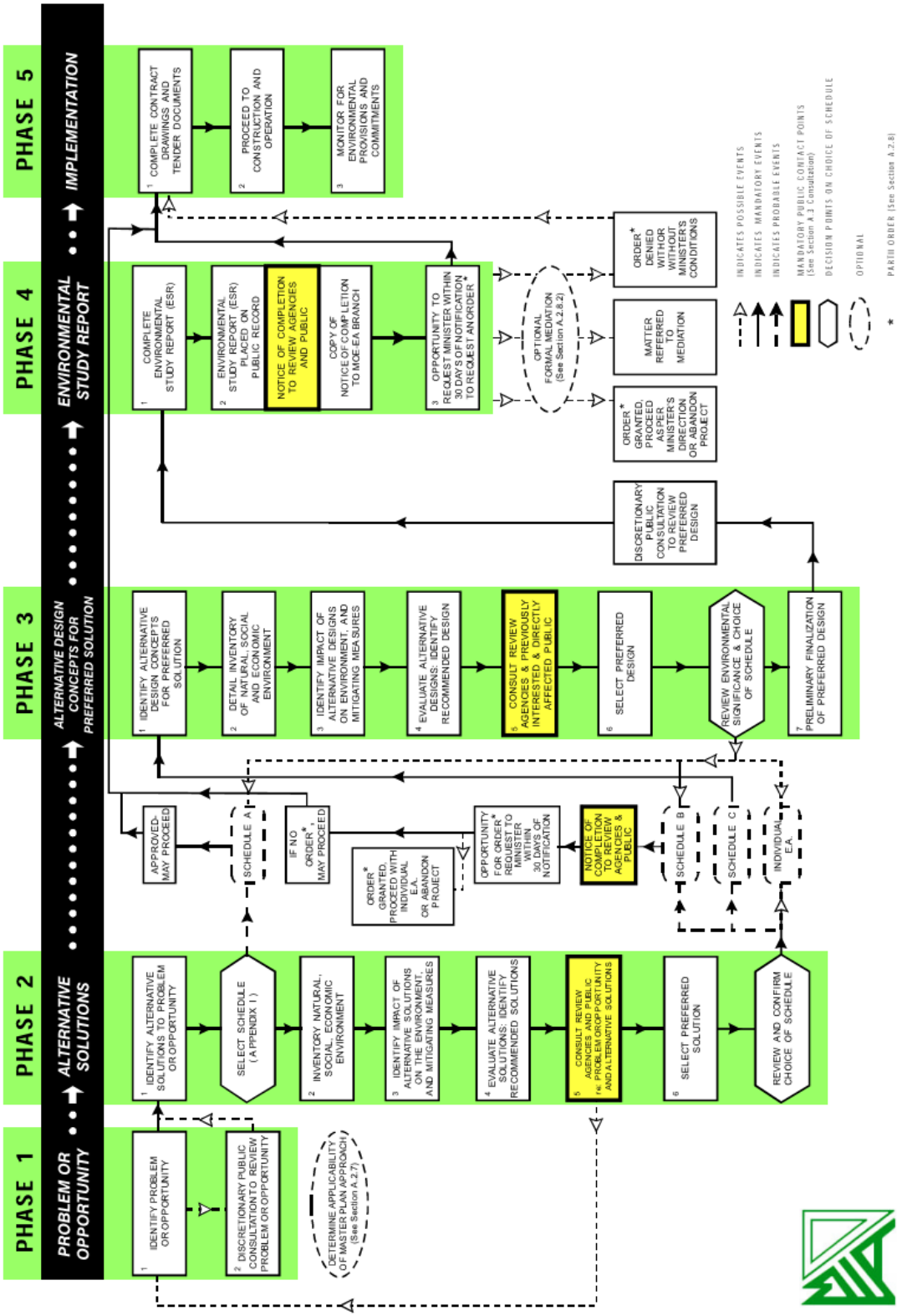


Figure 1.3 Municipal Class EA Flow Chart (MCEA)

1.4 PROBLEM AND OPPORTUNITY STATEMENT

The reach of Etobicoke Creek, from Ponytrail Drive to Bloor Street, has been heavily eroded and is risking damage to private and public infrastructure. The problem and opportunity statement are as follows:

To determine the preferred method(s) of enhancing the valley slopes along the creek to provide long term erosion protection, while maintaining or improving, hydraulic capacity of the creek, providing environmental enhancement, and decreasing property and infrastructure loss.

To assess the existing geomorphic channel upgrades under Bloor Street to provide long term improved erosion protection for both the Bloor Street bridge, the existing channel, and to mitigate possible erosion of protection for an upstream buried Region of Peel sanitary trunk sewer, while maintaining hydraulic capacity of the Bloor Street crossing, providing environmental enhancement, and decreasing property and infrastructure loss.

2 EXISTING ENVIRONMENT

2.1 PHYSICAL ENVIRONMENT

2.1.1 PHYSIOGRAPHY AND TOPOGRAPHY

The Study Area is located within the Etobicoke Creek Watershed and is a reach on the Etobicoke Main Branch. This reach of the creek borders on the municipal boundary between the City of Mississauga and the City of Toronto. The immediate surrounding land uses are predominately low/medium density residential, with a golf course to the east of the Creek.

The area is within the South Slope physiographic region and is characterized by a smooth, faintly drumlinized, clay till plain that slopes gently towards Lake Ontario (TRCA, 2010). Topography within the Etobicoke Creek is characterized by a deeply incised valley corridor.

2.1.2 SOILS AND GROUNDWATER

The Etobicoke and Mimico Creeks Watersheds Technical Update Report (TRCA, 2010) shows that much of the Etobicoke Creek Watershed is dominated by low permeability silt, clay, and silt till of the Halton Till Formation, deposited approximately 13,000 years ago.

Due to the low permeability silt and clay overlaying much of the topography, groundwater recharge is not significant within the Etobicoke Creek Watershed and consequently in the Etobicoke Creek Main branch, where the Study Area is located. The groundwater flow is in the South/Southeasterly direction, through the various aquifers, but do not contribute to any significant groundwater discharge along Etobicoke Creek.

Geotechnical investigations along project area indicated that the site is generally underlain by a stratum of soft to hard silty clay, overlying shale bedrock. Shale was exposed at the face of the slope along the eroded valley walls on the west side of the creek. Examinations of the samples obtained from boreholes revealed that the soft silty clay is confined within the top 1 m of the soil stratigraphy. Boreholes drilled at the site did not yield any significant groundwater (Soil Engineers, 2019). See **Appendix A**.

A slope stability analysis based on available information concluded that the slopes in their existing condition were marginally stable (Soil Engineers, 2019).

2.1.3 STAGE 1 AND 2 ARCHAEOLOGICAL ASSESSMENTS

A Stage 1 and 2 Archaeological Assessment was undertaken to provide input to determine the most appropriate means of alleviating erosion to a section of the Etobicoke Creek. The assessment will provide the context for the archaeological fieldwork, including the development context, the historical context, and the archaeological context.

A Stage 1 background study of the property was conducted to provide information about the property's geography, history, previous archaeological fieldwork, and current land condition in order to evaluate and document in detail the property's archaeological potential and to recommend appropriate strategies for Stage 2 survey.

The archaeological fieldwork of the property was undertaken on November 1, 2021, under partly cloudy skies and warm temperatures (~12°C). No rain occurred during the fieldwork. No previous archaeological assessments have been conducted within the property. *AS&G Archaeological Consulting* is not aware of any other previous archaeological fieldwork conducted immediately adjacent to, or within 50 meters of the property. There are no unusual physical features that may have affected fieldwork strategy decisions or the identification of artifacts or cultural features.

A Stage 2 property assessment was conducted to document all archaeological resources on the property, to determine whether the property contains archaeological resources requiring further assessment, and to recommend next steps. The property is approximately 2.16 hectares in size. The characteristics of the property dictated that the Stage 2 survey be conducted by a test pit survey strategy.

The entire property was surveyed except for areas identified as visibly disturbed. The property was subject to a systematic test pit survey appropriate to the characteristics of the property. Test pits were spaced at maximum intervals of five (5) meters throughout the property identified as having archaeological potential. Test pits were excavated to within one meter of all existing structures. All test pits were at least 30 cm in diameter. Each test pit was excavated by hand, into at least the first 5 cm of subsoil and examined for stratigraphy, cultural features, or evidence of fill.

No stratigraphy or cultural features were noted. Soils were screened through 6 mm mesh. No artifacts were encountered. All test pits were backfilled.

The Stage 2 archaeological assessment did not identify any archaeological sites requiring further assessment or mitigation of impacts and **it is recommended that no further archaeological assessment of the property be required.** The Stage 1 and 2 report is included in **Appendix B**

2.1.4 GEOMORPHOLOGY

A field investigation was completed on December 6, 2018 to confirm existing geomorphic conditions along the relevant portion of Etobicoke Creek. The location of the assessment is shown on **Figure 2.1**.

The following standard rapid visual assessment methods were applied during the field assessment:

i. Rapid Geomorphic Assessment (RGA – MOE, 2003)

The RGA documents observed indicators of channel instability by quantifying observations using an index that identifies channel sensitivity. Sensitivity is based on evidence of aggradation, degradation, channel widening and planimetric form adjustment. The index produces values that indicate whether the channel is stable/in regime (score <0.20), stressed/transitional (score 0.21-0.40) or in adjustment (score >0.41).

ii. Rapid Stream Assessment Technique (RSAT – Galli, 1996)

The RSAT uses an index to quantify overall stream health and includes the consideration of biological indicators (Galli 1996). Observations concerning channel stability, channel scouring/sediment deposition, physical in-stream habitat, water quality, and riparian habitat conditions are used to calculate a rating that indicates whether the channel is in poor (<13), fair (13-24), good (25-34), or excellent (35-42) condition.

iii. Downs Classification Method (Downs, 1995)

The Downs (1995) classification method infers present and future potential adjustments based on physical observations, which indicate the stage of evolution, and type of adjustments that can be anticipated based on the channel evolution model. The resultant index classifies streams as stable, laterally migrating, enlarging, undercutting, aggrading, or recovering.

Results of the rapid assessments are summarized in **Table 2.1** below. A photographic record of site conditions is provided in **Appendix C**.

The reach of Etobicoke Creek within the Study Area (identified as EC-1) was characterized as a well-defined watercourse situated within a confined valley setting (i.e., confined on one side by a valley wall). This reach had a low sinuosity with a moderate gradient and moderate degree of entrenchment. The riparian buffer zone was fragmented, extending less than one channel width in dimension. Vegetation consisted predominantly of manicured grass, with some trees along the toe of slope at Bloor Street.

Bed substrate consisted of boulders, gravel, and cobbles in the riffles, while exposed bedrock was noted in the pools. Existing channel disturbances included armouring of

the channel banks (angular rip rap and armourstone retaining walls), as well as the Bloor Street and golf course cart path crossings. The creek was in contact with the western valley toe of slope along the majority of the Study Area.

The RGA score of 0.24 indicated that this reach was in transition (stressed). Degradation was the main mode of adjustment, based on the presence of exposed bridge footings, undermined armourstone walls, scour pool formation, and headcutting due to knickpoint migration. Evidence of widening was also observed in the form of basal scour along channel banks.

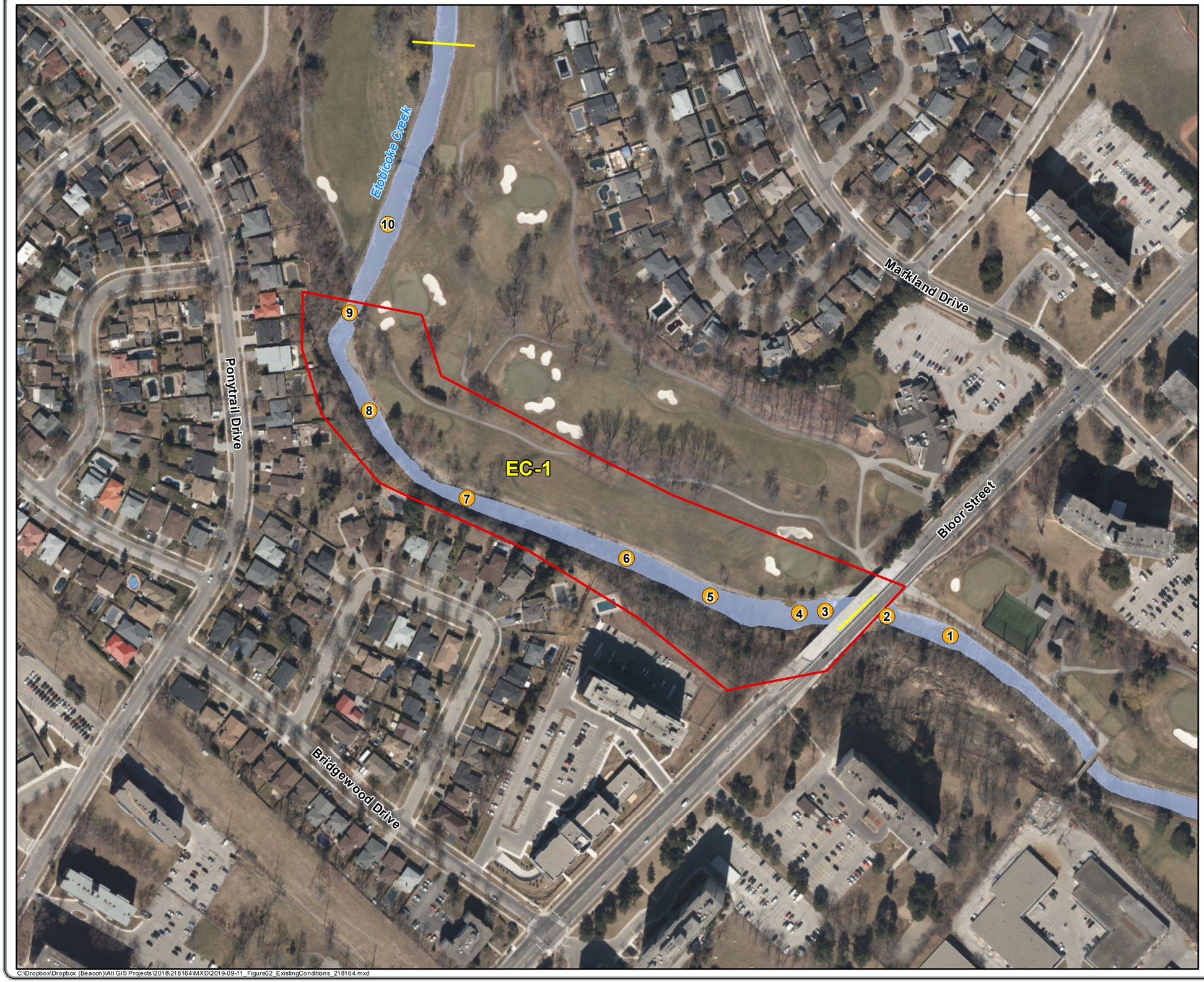
The RSAT score of 27.5 indicated that this reach displayed a relatively good degree of ecological health for an urbanized channel. The main limiting factor was riparian habitat conditions. The Downs model classified this reach as e – 'enlarging', based on the initiation of continuous erosion, often at the channel toe.

Table 2.1 Rapid Assessment Results

Reach	Rapid Geomorphic Assessment			Rapid Stream Assessment Technique			Downs Classification Method
	Score	Condition	Dominant Mode of Adjustment	Score	Condition	Limiting Factor	
EC-1	0.24	In Transition	Degradation	27.5	Good	Riparian habitat conditions	e – 'enlarging'

Detailed geomorphic field data was collected as part of the topographic survey on April 9, 2019. The survey consisted of a longitudinal profile of the channel centerline and ten cross sections. At this time, a detailed pebble count to sample the bed materials at each cross section was undertaken.

Results of the detailed field assessment indicated a governing energy gradient of 0.38%. Bankfull widths ranged from 18-35 m, with an average bankfull width of 25 m. Average bankfull depths ranged between 0.68-1.50 m, with an average bankfull depth of 0.96. Maximum bankfull depths measured in the range of 2.0 m. Pebble count results indicated a median grain size in the very coarse gravel size class; with a D84 in the large cobble size class. Results of the detailed assessment are summarized in **Table 2.2** and **Appendix C.**



Existing Conditions - Geomorphology and Aquatics

Figure 2.1

Etobicoke Creek Erosion Control Project - Bloor Street to Ponytrail Drive

Legend

- Study Area
- Reach Break
- Watercourse (Warmwater Habitat)
- Photo Locations

BEACON ENVIRONMENTAL

KSGS

Project: 218164

Last Revised: September, 2019

Client: City of Mississauga

Prepared by: DU
Checked by: SG

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Table 2.2 Detailed Assessment Results

Channel Parameter	Average Dimension
Measured	
Bed gradient (%)	0.38
Average bankfull width (m)	25
Average bankfull depth (m)	0.94
Maximum bankfull depth (m)	2.0
D50 (mm)	41
D84 (mm)	160
Computed	
Estimated Manning's roughness, n	0.037
Average channel velocity (m/s)	1.7
Average bankfull discharge (m^3/s)	43

2.2 NATURAL ENVIRONMENT

2.2.1 TERRESTRIAL HABITAT

The following background resources were reviewed to assist with characterization of the biophysical environment within the Study Area:

- Mapping, species records and natural areas records from the Ministry of Natural Resources and Forestry's (MNRF's) Natural Heritage Information Centre (NHIC) online make-a-map database.
- MNRF Species at Risk (SAR) Screening.
- City of Mississauga Natural Areas Survey (2015).
- Open data portal for Etobicoke Creek provided by the Toronto and Region Conservation Authority (TRCA).
- Ontario Breeding Bird Atlas (Cadman et al. 2007), and
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2019).

2.2.2 CHARACTERIZATION OF THE BIOLOGICAL ENVIRONMENT

From 2018-2019 Beacon ecologists undertook field investigations to inventory flora and fauna, characterize wildlife habitat, assess soil characteristics, and provide an assessment of the ecological features and functions within and adjacent to the Study Area. Adjacent lands and lands for which permission to access was not granted (i.e., private lands) were surveyed from within the road allowance. Hazardous lands, such as the slope immediately west of Etobicoke Creek, was surveyed from adjacent lands to the extent feasible. The dates of field surveys are presented below in **Table 2.3**. Survey-specific weather condition details are provided in the corresponding subsections below.

Table 2.3 Biophysical Survey Dates

Survey Type	Survey Date(s)
Vegetation Communities and Flora	October 26, 2018
Tree Inventory	October 26, 2018
Breeding Bird Survey	May 31, 2019 and June 28, 2019
Fish Habitat Survey	December 6, 2018
Breeding Bird Survey	May 31, 2019 and June 28, 2019
Fish Habitat Survey	December 6, 2019
Vegetation Communities and Flora	October 26, 2019

2.2.2.1 VEGETATION COMMUNITIES

Ecological communities in the Study Area were classified and mapped in accordance with the methodology of the Ecological Land Classification for Southern Ontario: First Approximation and Its Application (Lee et al., 1998) by an ecologist certified by the MNRF in Ecological Land Classification (**Figure 2.2**). A floristic survey was completed at the same time. Vegetation community information in the Mississauga Natural Areas Survey was also consulted.

To classify the ecological communities, discrete units were delineated as polygons on an aerial photograph of the Study Area. Information on site conditions, soils (where access was available), vegetation composition and structure of each community was recorded, including dominant species, percent cover, and relative abundance of species in each height class.

Vegetation Communities

Figure 2.2

Etobicoke Creek Erosion Control Project - Bloor Street to Ponytrail Drive

Legend

- Study Area
- Vegetation Communities
- Watercourse (Warmwater Habitat)

BEACON ENVIRONMENTAL

KSGS

Project: 218164

Last Revised: September, 2019

Client: City of Mississauga

Prepared by: DU
Checked by: AB

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2.2.2.2 TREE INVENTORY AND ASSESSMENT

An inventory and assessment of all trees with a diameter at breast height (DBH) of 10 cm or more was completed by an Arborist certified by the International Society of Arboriculture (ISA). All trees located within areas that were safe to access and having the potential to be impacted by the proposed channel works were assessed and data collected on the species, diameter, crown size, health, and condition.

Each tree was assigned a condition rating of good, fair, poor, or dead, based on the following criteria:

Poor – Severe dieback, significant lean, missing leader, major defects, significant decay and/or disease presence.

Fair – Moderate dieback and/or lean, limb defects, multiple stems, moderate foliage damage from stress.

Good – Healthy vigorous growth, minor visible defects, or damage; or

Dead – No live growth.

Tree condition was assessed based on presence and severity of flaws, damage, evidence of pests or diseases, structural condition, dead or dying branches, or other decline indicators. A detailed account of Beacon's tree inventory methodology and the limitations of the assessment are contained within Appendix D.

Trees were tagged, with metal, numbered labels, using a staple gun. The location of each tree was surveyed by KSGS shortly after the tree inventory.

2.2.2.3 AVIFAUNA

Two breeding bird surveys were completed using a roving method whereby all portions of the Study Area are walked within 50 m and took place in the early morning on days with low winds (1 or less on the Beaufort scale), temperatures within 5°C of normal and no precipitation. The Study Area was walked such that all singing birds could be heard or observed; evidence of birds was recorded on an aerial photograph of the site. Conditions at the time of the surveys are presented in Table 2.4.

Table 2.4 Breeding Bird Survey Dates

	Survey 1	Survey 2
Date:	May 31, 2019	June 28, 2019
Start Time:	7:20 am	7:00 am
End Time:	8:45 am	8:15 am
Temperature (˚C):	13°C	18 °C
Wind speed (km/h):	1-5 km/h	1-5 km/h
Cloud cover (%):	0 %	0 %
Precipitation:	None	None

2.2.2.4 OTHER WILDLIFE

Incidental observations of other wildlife, evidence of wildlife and habitat structures were recorded over the course of the 2018-2019 field season.

2.2.2.5 FISHERIES

Aquatic habitat in Etobicoke Creek in the vicinity of the bridge was assessed using modified methodology of the Rapid Assessment Methodology as described in Section 4 Module 4 of the Ontario Stream Assessment Protocol (OSAP) (Stanfield et al., 2010). Field investigations characterized the following:

- Upstream and downstream channel width and depth.
- Channel width and depth under the bridge.
- Substrate type and distribution.
- Stream morphology.
- Riparian vegetation coverage type and extent.
- Seepage areas and wetlands.
- Side channels and roadside drainage; and
- Dams and obstructions to fish passage.

The aquatic community in Etobicoke Creek was characterized using background information from the Ontario Hydro Network (OHN) and Aquatic Resource Area

(ARA) databases and data from the Etobicoke Creek open data portal provided by the Toronto and Region Conservation Authority (TRCA).

2.3 NATURAL ENVIRONMENT RESULTS

2.3.1 TERRESTRIAL HABITAT AND SPECIES

2.3.1.1 VEGETATION COMMUNITIES

As illustrated in Figure 2.2, most of the subject property consists of a manicured golf course. The singular natural vegetation community recorded, a Dry-Fresh Sugar Maple - Oak Deciduous Forest (FOD5-3) (**Photograph 1**), is located along the western valley slope adjacent to Etobicoke Creek, and is adjacent to anthropogenic features including roads, residential areas, and the Markland Golf Course. Though some tree willows are scattered along the base of the slope, in the opinion of Beacon, the classification of the entire forest community in the Mississauga Natural Areas Inventory as a Fresh-Moist Willow Lowland Deciduous Forest Type (FOD7-3) is not applicable to the Study Area.

Photograph 1. Dry-Fresh Sugar Maple - Oak Deciduous Forest

The vegetation community showed signs of disturbance, particularly at the top of the slope where the forest abuts the parking lot of an existing apartment building complex near Bloor Street. The forest occupies a steep slope adjacent to Etobicoke Creek and contained areas of bare cliff and slope faces. Due to safety concerns

associated with the terrain, the survey was completed from the tablelands adjacent to the top of slope and no soil sample was taken.

The canopy of the forest is estimated at 10 to 25 m in height, exhibiting >60% cover at the time of assessment and is abundant with Sugar Maple (*Acer saccharum ssp. saccharum*) and Red Oak (*Quercus rubra*), with Basswood (*Tilia americana*) as an associate species. Sugar Maple is also abundant in the subcanopy with the occasional Red Oak. The sparse understorey is dominated by Choke Cherry (*Prunus virginiana ssp. virginiana*) and Common Buckthorn (*Rhamnus cathartica*), and the sparse ground cover has the occasional Canada Goldenrod (*Solidago canadensis var. canadensis*), Zig-zag Goldenrod (*S. flexicaulis*) and Canada Thistle (*Cirsium arvense*).

This forest community is not considered to be rare in Ontario (MNRF 2000). The TRCA has ascribed a local rank of L4 (TRCA 2016), meaning the vegetation community is generally secure in rural areas, but of concern in urban areas.

2.3.1.2 FLORA

A total of 20 species of vascular plants were catalogued during the botanical inventory and vegetation community classification survey within the Study Area. Eighteen were identified to the species level, and of this identified group, ten (50%) are native to Ontario and eight (40%) are introduced species. Some plants (e.g., Hawthorn [*Crataegus* sp.]) could not be identified to the species level due to the timing of the surveys.

Most species inventoried have a high range of habitat tolerances, as evidenced by the high proportion of species with a low coefficient of conservatism (CC) values. No species with narrow habitat tolerances (i.e., with CC values ≥7) were noted. None of the species recorded during surveys are of global, national, or provincial significance. One species, White Spruce (*Picea glauca*) is of regional conservation concern and another, Red Oak, is of concern in urban areas (TRCA 2017).

Species at Risk flora, including and not limited to Butternut (*Juglans cinerea*), were not observed.

An annotated list of flora recorded within the Study Area is contained within Appendix E.

2.3.1.3 TREE INVENTORY

A total of 50 trees were inventoried within the Golf Course lands adjacent to Etobicoke Creek.

Most trees exhibit good health and structure, while most Ash (*Fraxinus* spp.) showed signs of decline because of Emerald Ash Borer (*Agrilus planipennis*) infestation. None of the trees inventoried are of conservation concern, nor are they located within woodlands.

Detailed results of the tree inventory are contained within **Appendix D**. As part of detailed design, additional tree survey maybe required once the final access route is selected.

2.3.1.4 AVIFAUNA

A total of 20 species of breeding birds were recorded on the subject property with an additional two species noted foraging (Appendix F). This is a moderate diversity given the size of the Study Area and is reflective of the vegetative community variety including riverine, treed, and open anthropogenic habitats. This habitat diversity within a small area contributes to the diversity of breeding birds on site.

The majority of the breeding records were common species regularly found in urban and urbanizing areas including the most abundant in descending order: Song Sparrow (*Melodia melodpiza*), American Robin (*Turdus migratorius*), American Goldfinch (*Spinus tristus)* and Baltimore Oriole (*Icterus galbula*). Other species observed included Mourning Dove (*Zenaida macroura*), Black-capped Chickadee (*Poecile atricapillus*), Red-winged Blackbird (*Agelaius phoeniceus*) and Tree Swallow (*Tachycineta bicolor*).

Area-sensitive birds require larger tracts of suitable habitat in which to breed or are those that have a higher breeding success in larger areas of suitable habitat. One such species was recorded. The American Redstart (*Setophaga ruticilla*) is considered to be forest-sensitive species, requiring woodland habitat in which to breed successfully. Given that only a small portion of larger woodland corridor extends onto the subject property relative to the surrounding matrix, it is possible the majority of these birds' territories fall outside of the property boundaries. These birds are one of the more commonly encountered species in urban environments.

No species ranked as S1 through S3 (Critically Imperiled through Vulnerable) by the province, or species protected under the Endangered Species Act (ESA) were encountered as breeding on the subject property. Several Chimney Swift (*Chaetura pelagica*) were observed flying over the site foraging, however observations of these birds entering and exiting a residential apartment building chimney were made. Therefore, these birds are breeding off site adjacent to the golf course and exploiting foraging opportunities within the open areas. Chimney Swift along with Barn Swallow (*Hirundo rustica*) are two species protected under the ESA that typically occur close proximity to human habitation. Staff assessed the possibility for Barn Swallow to nest on the subject property by searching the underside of the two bridges within the

Study Area (the Elmcrest Creek Trail pedestrian bridge and the Bloor Street Bridge). These birds construct mud-based nest cups that are quite conspicuous when present. No nests were encountered at this location and no Barn Swallow were observed foraging or flying over the site.

The TRCA implements a species sensitivity ranking scale (L ranks) to provide a measure of species security, abundance, and adaptability to environmental change. L ranks for native species range from L1 to L5, with L1-L3 wildlife designated as species of conservation concern, and L5 indicating the species are secure throughout the TRCA jurisdiction. No species of conservation concern were identified breeding within the Study Area in 2019 as all birds have received an L4 or L5 status.

2.3.1.5 OTHER WILDLIFE AND WILDLIFE HABITAT

Natural and semi-natural habitat available for wildlife within the Study Area includes an open manicured golf course abutting Etobicoke Creek, a nearly bare steep slope approximately 13 m high on the west side of the creek and a narrow, forested strip atop the slope.

Any wildlife species observed in the Study Area during field investigations not considered within the preceding sections of this report were recorded as incidental observations.

Mammal species documented from the Study Area include Eastern Cottontail (*Sylvilagus flordinaus*) and Gray Squirrel (*Sciurus carolinensis).* Evidence of Eastern Coyote (*Canis latrans*) was also observed. Other common mammal species that are likely present on and adjacent to the Study Area based on habitat present include Raccoon (*Proycon lotor*), Striped Skunk (*Mephitis mephitis*) and/or Red Fox (*Vulpes vulpes*).

2.3.2 AQUATIC SPECIES

2.3.2.1 AQUATIC COMMUNITY

Based on information gathered from the OHN and the ARA databases, Etobicoke Creek is classified as a warmwater permanent watercourse. Fish community sampling was conducted on August 21, 2008 by the TRCA. Fish species were found immediately upstream of the subject property are listed in **Table 2.5**, below.

Table 2.5 Fish Species Present in Etobicoke Creek

Common Name	Scientific Name
Western Blacknose Dace	*Rhinichthys obtusus*
Bluntnose Minnow	*Pimephales notatus*
Central Stoneroller	*Campostoma anomalum*
Common Shiner	*Luxilus cornutus*
Creek Chub	*Semotilus atromaculatus*
Fathead Minnow	*Pimephales promelas*
Green Sunfish	*Lepomis cyanellus*
Johnny Darter	*Etheostoma nigrum*
Longnose Dace	*Rhinichthys cataractae*
White Sucker	*Catostomus commersonii*

None of the fish species recorded are considered locally or provincially rare. Central Stoneroller (*Campostoma anomalum)* is the least common fish species recorded in this section of Etobicoke Creek. This species' provincial rank is S4 (common and apparently secure) and thus is not of conservation concern.

2.3.3 HABITAT ASSESSMENT

2.3.3.1 AQUATIC HABITAT ASSESSMENT

Beacon conducted an aquatic habitat assessment on December 6, 2019. The portion of Etobicoke Creek downstream of the Bloor St. bridge is defined by a riffle sequence (**Photograph 2**). The substrate is predominantly cobble and boulder with sand and silt in between. The banks are lined with rip rap and armourstone. Riparian vegetation consists of deciduous forest with grasses growing closer to the creek. No aquatic vegetation was observed. At the time of the assessment, the average water depth downstream of the bridge was 0.32 m. This portion of the creek provides refuge opportunities for aquatic species among the cobble boulder substrate.

Photograph 2. Conditions downstream of Bloor St. bridge.

Directly below the bridge the channel morphology is a run-riffle sequence (**Photograph 3**). The substrate is predominantly cobble and boulder with sand. There is also rip rap along the banks with armourstone on the right bank. An outfall structure is present on the left bank below the bridge. There is no riparian vegetation below the bridge. At the time of the assessment, the run sequence was approximately 0.5m deep.

Photograph 3. Conditions below the Bloor St. bridge.

Upstream of the bridge there is a concrete weir that is approximately 1 m high. This can prevent fish from migrating upstream. A scour pool has developed in association with the weir. Armourstone retaining walls line the channel banks at the weir. The channel morphology directly upstream of the weir is a run (**Photograph 4**). The channel is primarily composed of cobble gravel substrate with a small segment of the creek having only sand and gravel. Banks are lined with rip rap. The riparian vegetation on the left bank is deciduous forest and the right bank is manicured lawn. Average water depth was 0.5 m at the time of the assessment. The channel upstream of the weir does provide some in stream cover within the cobble and gravel areas. The segment with only sand and gravel substrate provides little in stream cover for aquatic species.

Photograph 4. Conditions upstream of Bloor St. bridge.

2.3.3.2 SPECIES AT RISK

Based on the background review completed by Beacon, there is potential for the following SAR tree, bats, turtle, and birds to occur within the Study Area:

- Butternut – Endangered.
- Eastern Small-footed Myotis (*Myotis leibii*) – Endangered.
- Tri-coloured Bat (*Perimyotis subflavus*) – Endangered.
- Northern Myotis (*M. septentrionalis*) – Endangered.
- Little Brown Myotis (*M. lucifugus*) – Endangered.
- Snapping Turtle (*Chelydra serpentina*) – Special Concern.

- Bank Swallow (*Riparia riparia*) – Threatened.
- Barn Swallow – Threatened; and
- Eastern Wood-pewee (*Contopus virens*) – Special Concern.

A review of the NHIC database indicates that the following SAR have been recorded within the Study Area:

- Henslow's Sparrow (*Ammodramus henslowii*) – Endangered.
- Barn Swallow – Threatened; and
- Two restricted species records.

Furthermore, correspondence with the MNRF (email dated January 30, 2019), no SAR concerns were identified by MNRF for the project[1].

Evidence of Butternut, Bank Swallow, Barn Swallow, Eastern Wood-pewee, and Henslow's Sparrow were not observed during field studies. As mentioned in **Section 2.3.1.4**, Chimney Swift (Threatened) was observed foraging over the Study Area but was not observed to be breeding. Based on the habitats present, there is potential for the occurrence of SAR bats and Snapping Turtle.

Bat maternity roosts may occur in deciduous, coniferous, and mixed forest stands (MNRF 2017). Potentially suitable roosting habitat is present in the forest west of Etobicoke Creek. No evidence of bats roosting under the bridge was observed.

In 2017, Snapping Turtle was recorded within the 10 km x 10 km Ontario Amphibian Atlas square which includes the Study Area. Potentially suitable foraging and dispersal habitat for Snapping Turtle is present within Etobicoke Creek. Exposed gravel areas adjacent to roadsides within and adjacent to the Study Area are limited, and it is not expected that turtles would use the road shoulders for nesting though they may use sand traps on the golf course. No turtles were observed incidentally during field work. While the presence and abundance of this species is unknown, it is unlikely that Etobicoke Creek River represents significant habitat for Snapping Turtle, although the species may occur in the area.

2.3.3.3 SIGNIFICANT WILDLIFE HABITAT ASSESSMENT

The *Significant Wildlife Habitat Technical Guidelines* (MNRF 2000) identify four broad categories of Significant Wildlife Habitat (SWH):

1. Seasonal Concentration Areas of Animals.
2. Rare Vegetation Communities or Specialized Habitat for Wildlife.

[1] Note that as of April 1, 2019, the Ministry of Environment, Conservation and Parks (MECP) is responsible for administering the ESA.

3. Habitat for Species of Conservation Concern; and
4. Animal Movement Corridors.

Within each of these categories, there are multiple types of SWH, each intended to capture a specialized type of habitat that may or may not be captured within other existing feature-based categories (e.g., significant wetlands, significant woodlands).

Areas that may or do support SWH are not specifically identified in the Official Plans of the City of Toronto, Region of Peel and City of Mississauga. However, the Region of Peel has developed criteria for assessing SWH in its jurisdiction. The MNRF has developed SWH criteria for Ecoregion 6E (MNRF 2015) (in which the Study Area is located) which can provide guidance for local planning authorities and be consulted when local direction is lacking.

Based on a review of the MNRF (2015), the Region of Peel's criteria and what is known about the existing conditions, no confirmed or candidate SWH are thought to occur within the Study Area. Although forested areas may be used by some bat species the type and extent of these habitats are not of sufficient quality or extent to warrant identification as SWH.

2.3.3.4 NATURAL HERITAGE SYSTEM AND GREENLANDS

Features of the City of Toronto's Natural Heritage System and the Region of Peel's and City of Mississauga's Greenlands in the Study Area identified through this Ecological Study consist of the following:

- Etobicoke Creek.
- Fish habitat and adjacent lands.
- Valley and stream corridors.
- Significant Valley lands; and
- Significant Woodlands.

Etobicoke Creek, its valley and presumably the floodplain within the Study Area are included in the City of Toronto's Natural Heritage System (City of Toronto, 2019). A significant portion of the Study Area, which includes all areas in which works are proposed, is subject to the City of Toronto's Ravine and Natural Feature Protection By-law.

Etobicoke Creek, the valley, and adjacent woodlands within the Study Area are shown as Core Areas of the Greenlands System on Schedule A of the Region of Peel's Official Plan (2013). These same areas are shown as Significant Natural Areas and Natural Green Spaces in the City of Mississauga's Official Plan.

2.4 ENGINEERING ENVIRONMENT

2.4.1 HYDROLOGY

The Study Area is part of the Etobicoke Creek Watershed which encompasses a drainage area of 22,270 ha. It is a subset of the Etobicoke Creek Main Branch, which drains approximately 2,025 ha. The original model was created by Fred Schaeffers & Associates (1996) and was subsequently updated in 2003 and 2007 by Totten Sims Hubicki Associates (TSH) using similar sub catchment and stream delineation boundaries of the 1996 study. The most recent model update was completed by MMM Group (2013) using VO2 and OTTHYMO-89.

For this study, hydrologic modeling was not required as this study addresses erosion issues along a specific reach of Etobicoke Creek and significant land use changes surrounding the area have not occurred.

2.4.2 HYDRAULICS AND FLOODPLAIN MODELING

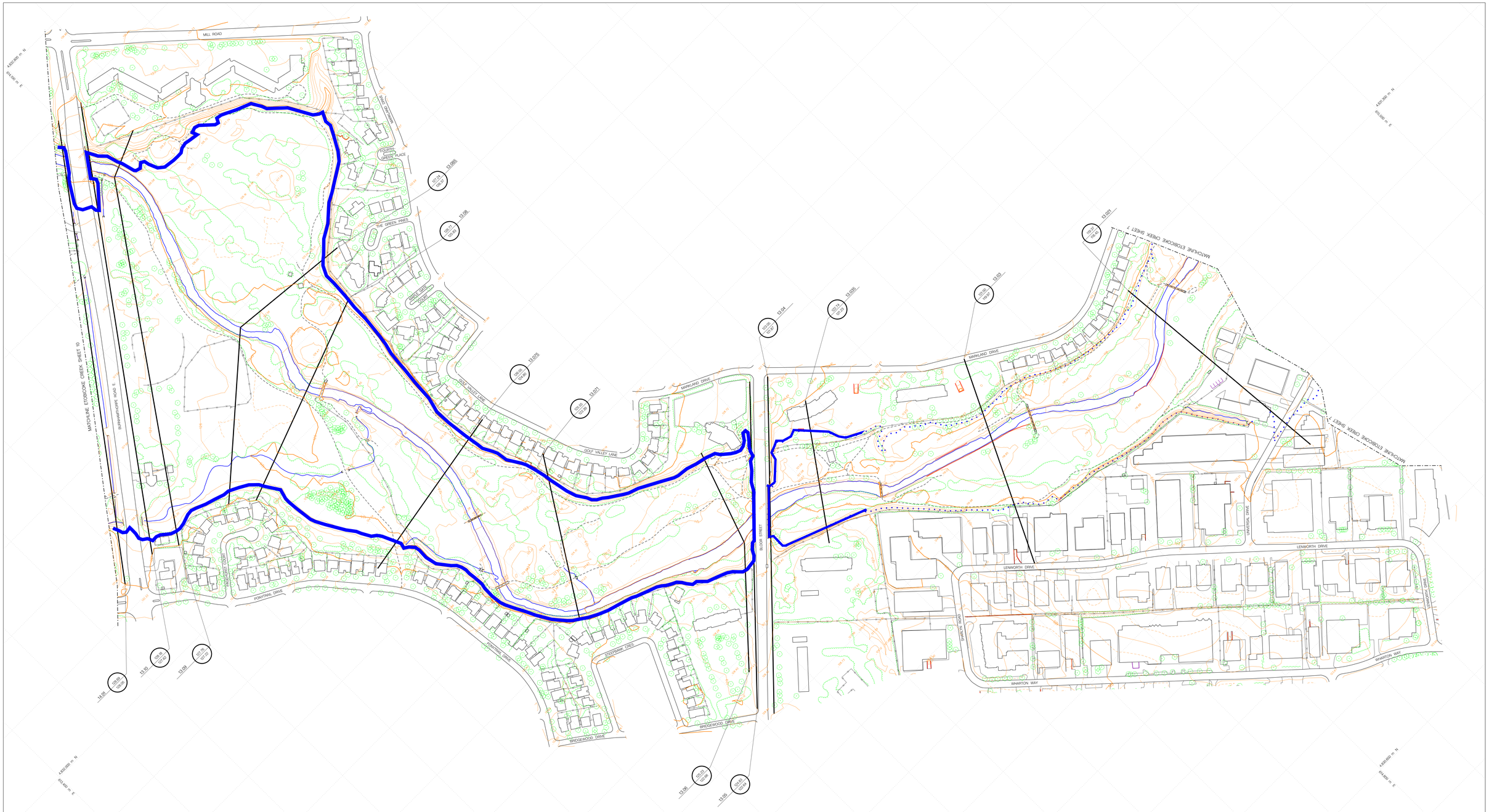
The HEC-RAS hydraulic model for Etobicoke Creek was obtained from the Toronto Region and Conservation Authority (TRCA) and was updated as part of TRCA's floodplain mapping program (Aquafor Beech, 2015). The Study Area is located within Sheet 9 of the TRCA's Floodplain Mapping Program drawings prepared by Aquafer Beech dated April 24, 2015 and is shown in **Figure 2.3**. The existing model has three cross sections that are located within the Study Area. They were:

- Section 13.071 located approximately at the 2/3rd point of the Study Area.
- Section 13.06 located just upstream of Bloor Street; and
- Section 13.05 located at the upstream side of the Bloor Street crossing

The HEC-RAS model was reviewed by KSGS, and the following additional refinements were incorporated as part of this study:

- Cross section 13.071 in the provided model was adjusted within the creek based on detailed survey information.
- New sections were inserted along the Study Area, from the pedestrian bridge near the bend of the creek to just upstream of the Bloor Street bridge crossing using points from KSGS's topographic survey and 1m contour data provided by the city.

With the additional sections the HEC-RAS modelling was revised and a new base model for the Study Area created. **Figure 2.4** shows the locations of the cross sections along Etobicoke Creek. Outlined in **Table 2.6** is the original model and the



REVISIONS

NO.	DESCRIPTION	BY	DATE

LEGEND

Cross-Section Label
Regional Flood Elevation (m)
Cross-Section Number → 14.060 172.00
100 Year Existing Flood Elevation (m) 172.00
Cross-Section Leader Line
Cross-Section Length

REGULATORY FLOOD ELEVATION IS THE HIGHER OF THE TWO ELEVATIONS DISPLAYED

LEGEND

- Contour Index
- Contour Intermediate
- Contour Auxiliary
- Contour Depression
- Contour Text (100.20)
- Spot Height (100.0)
- Road
- Parking Lot
- Race Track
- Wall
- Retaining Wall
- Rail Line
- Runway
- Silo, Smoke, Tank
- Marsh Symbol
- Marsh Boundary
- Township Fabric
- Hydro Tower
- Trail
- Bridge
- Wooded Area
- Tree
- Hedge
- Fence
- Water Feature
- Culvert Symbol
- Culvert to Scale
- Dam
- Pool
- Building
- Pit
- Pile
- Regulatory Flood Line

This map was compiled photogrammetrically from 1/10000 aerial photography flown in 2002.

The vertical datum is mean sea level as established by the Geodetic Survey of Canada. CGVD 1928:1978 Ontario Adjusted Version

The horizontal datum is North American Datum 1983, U.T.M. 6° projection Zone 17, Central Meridian 81° W.

Grid interval 100 metres.

PLEASE NOTE: FLOODLINE ELEVATIONS ARE SUBJECT TO CHANGE DUE TO REVISED INFORMATION.

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MARKHAM, ONTARIO L3R 9R6
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FAX (905) 477-3882

DATE ISSUED
JUNE 17, 2004

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LICENSED PROFESSIONAL ENGINEER G.R. FREW PROVINCE OF ONTARIO

FLOOD PLAIN MAPPING PROGRAM

FLOODLINE APPROVED DATE: 2015-04-24

Toronto and Region Conservation for The Living City
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661-6600

Scale 1:2000

100 0 100 200 Metres

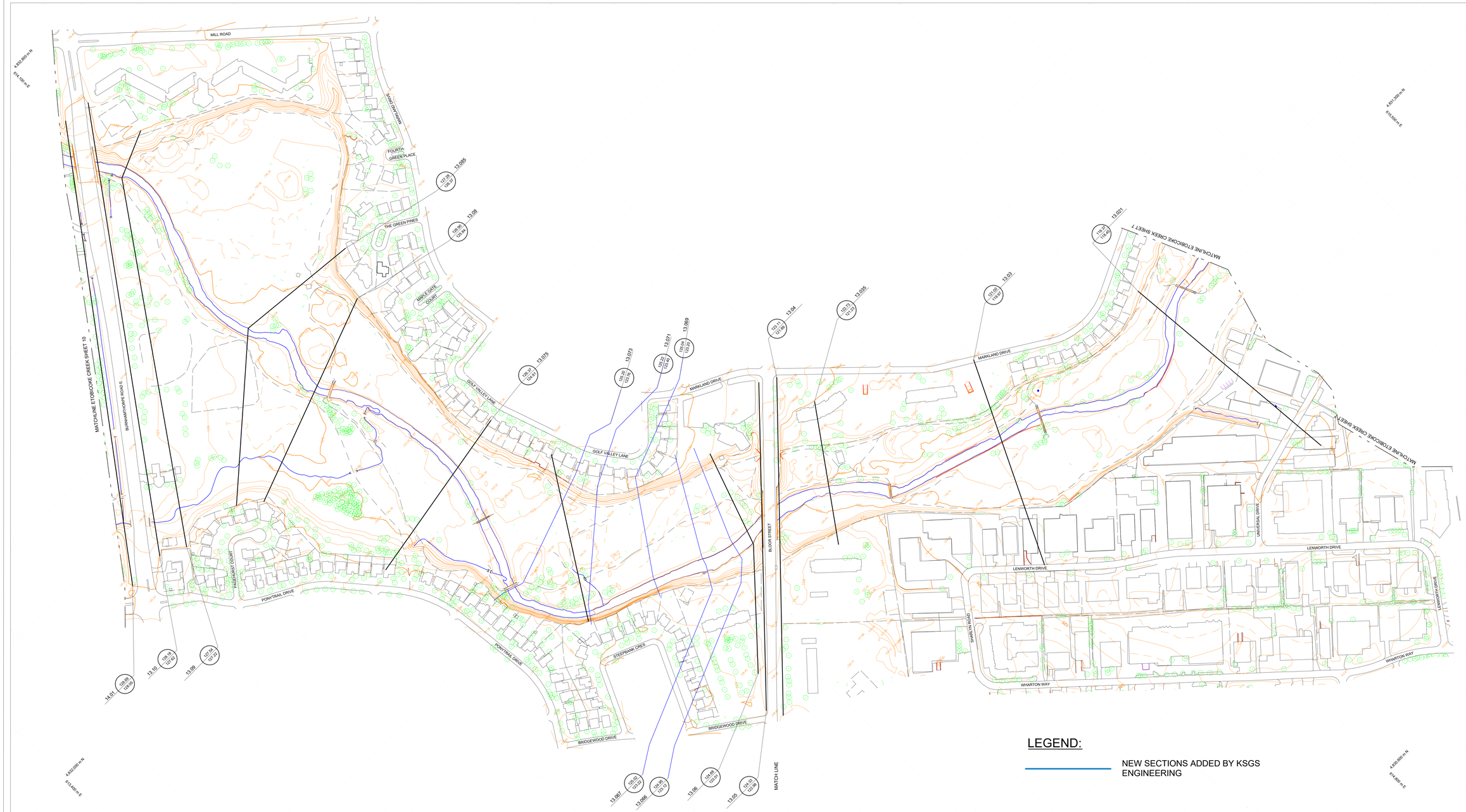
200 0 200 400 600 800 1000 Feet

CONTOUR INTERVAL 1.0 METRE

Figure 2.3

ETOBICOKE CREEK

SHEET No. 9



LEGEND:

NEW SECTIONS ADDED BY KSGS ENGINEERING

NOTES:
1. SECTION 13.071 HAS BEEN REMOVED FROM PLAN

FIGURE REVISED AND REPRODUCED BY KSGS ENGINEERING CORP. 12 OCTOBER 2022

REVISIONS

NO.	DESCRIPTION	BY	DATE
1	REVISED FLOOD PLAN	S.M	12/10/2022

LEGEND
Cross-Section Label
Cross-Section Leader Line
Regional Flood Elevation (m)
Cross-Section Number 14.060 172.00
100 Year Existing Flood Elevation (m) 172.00
Cross-Section Length
REGULATORY FLOOD ELEVATION IS THE HIGHER OF THE TWO ELEVATIONS DISPLAYED

LEGEND

Contour Index	Trail
Contour Intermediate	Bridge
Contour Auxiliary	Wooded Area
Contour Depression	Tree
Contour Text	Hedge
Spot Height	Fence
Road	Water Feature
Parking Lot	Culvert Symbol
Race Track	Culvert to Scale
Wall	Dam
Retaining Wall	Pool
Rail Line	Building
Runway	Pit
Silo, Smoke, Tank	Pile
Marsh Symbol	Regulatory Flood Line
Marsh Boundary	
Township Fabric	
Hydro Tower	

This map was compiled photogrammetrically from 1/10000 aerial photography flown in 2002.
The vertical datum is mean sea level as established by the Geodetic Survey of Canada, CGVD 1928-1978 Ontario Adjusted Version
The horizontal datum is North American Datum 1983, U.T.M. 6° projection Zone 17, Central Meridian 81° W.
Grid Interval 100 metres.

PLEASE NOTE:
FLOODLINE ELEVATIONS ARE SUBJECT TO CHANGE DUE TO REVISED INFORMATION.

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DATE ISSUED
JUNE 17, 2004

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LICENSED PROFESSIONAL ENGINEER
G.R. FREW
PROVINCE OF ONTARIO

FLOOD PLAIN MAPPING PROGRAM

FLOODLINE APPROVED DATE: 2015-04-24

Toronto and Region Conservation for The Living City
5 Shoreham Drive Downsview Ontario M3N 1S4 (416) 661-6600

Scale 1: 2000
Metres 100 0 100 200 Metres
Feet 200 0 200 400 600 800 1000 Feet
CONTOUR INTERVAL 1.0 METRE

FIGURE 2.4

ETOBICOKE CREEK

SHEET No. 9

new model with additional sections with the hydraulic modelling attached in **Appendix G.**

Table 2.6 Existing Etobicoke Creek Storage and Water Levels by Storm Event

Cross-Section ID	Description	2-yr.	5-yr.	10-yr.	25-yr.	50-yr.	100-yr.	350-yr	Reg.
13.075 (existing)	Storage (1000 m^3)	131.77	201.98	247.77	312.47	356.64	401.55	633.87	901.09
	Water Level (m)	123.63	124.06	124.32	124.58	124.74	124.91	125.61	126.37
13.073 (new)	Storage (1000 m^3)	120.68	184.14	225.39	284.5	325.00	366.21	581.47	823.62
	Water Level (m)	122.76	123.08	123.23	123.48	123.63	123.76	124.34	125.20
13.071 (revised)	Storage (1000 m^3)	115.01	176.35	216.24	273.08	312.25	352.03	560.03	790.29
	Water Level (m)	122.28	122.63	122.78	123.01	123.13	123.26	123.86	124.66
13.069 (new)	Storage (1000 m^3)	109.45	168.29	205.93	259.70	297.77	335.99	536.40	755.98
	Water Level (m)	121.90	122.19	122.46	122.79	122.86	122.99	123.54	124.29
13.067 (new)	Storage (1000 m^3)	102.05	157.73	192.82	243.35	280.62	317.49	511.89	723.16
	Water Level (m)	121.94	122.32	122.55	122.84	122.92	123.04	123.58	124.30
13.066 (new)	Storage (1000 m^3)	97.19	150.68	184.22	232.78	269.64	305.74	496.70	703.02
	Water Level (m)	121.75	122.13	122.39	122.71	122.76	122.87	123.36	124.08
13.06 (revised)	Storage (1000 m^3)	95.54	148.02	180.75	228.36	264.21	299.82	488.61	690.83
	Water Level (m)	121.25	121.59	121.8	121.94	122.37	122.47	122.90	123.87
13.05 (revised)	Storage (1000 m^3)	9376	145.45	177.55	224.46	258.59	293.60	479.87	677.37
	Water Level (m)	120.68	121.06	121.32	121.63	121.83	122.01	122.74	123.47

To compare flows and velocities with the geomorphic assessment, a range of flow (5 to 50 m^3/s) were run in HEC-RAS for flows within the creek. This analysis provided a baseline for depth and velocities for flows within the channel. This provided a comparison with material derived from a geomorphic perspective and would act a reasonableness check. The results were in general conformity with values obtained from geomorphic analysis. Geomorphic analysis indicated a bankfull flow of

approximately 43 m^3/s and the hydraulic analysis indicated that the channel had a capacity of under 50 m^3/s. The hydraulic calculations are included in **Appendix G**

2.4.3 EXISTING DROP STRUCTURE UPSTREAM SIDE OF BLOOR STREET

There is an existing grade control structure on the north side of Bloor Street. During low flow conditions, the grade control structure could function as an impediment to passage of certain fish species. However, there is a buried Region of Peel trunk sanitary sewer (1950 mm diameter) about 15-20 m upstream that crosses the Etobicoke Creek. This grade control structure provides protection for that sanitary sewer. The condition of the grade control structure is not well known. As part of the investigation works, KSGS commissioned a diving team to ascertain the shape and overall condition of the grade control structure. The following general information was obtained:

- The northwest Bloor Street pier showed no undermining of the pier footing.
- There is a small 75mm square gouge on the north end of the east face of the pier footing at the bottom of the creek bottom.
- There is a small crack on the east face on the bottom south corner about 30cm in length with no signs of leaching nor exposed rebar.
- The concrete slab of the grade control shows significant erosion and undermining.
- Measurements were taken every meter along the grade control and the depth from the grade control to the bottom varied from 1.6m to 0.8 m. The greatest depths were measured near the west side of the creek.
- The measured amount of undermining varied from 0m to 1.6m.

In general, portions of the grade control structure have been undermined and the depth to existing ground varies significantly. These conditions will be taken into consideration when options are generated for the section under Bloor Street. However, the northwest bridge abutment for the most part has not been affected.

3 ALTERNATIVE SOLUTIONS

3.1 OVERVIEW OF SECTION UPSTREAM OF BLOOR STREET

This section provides an outline of the potential options to address the erosion concerns associated with the reach of Etobicoke Creek, from Ponytrail Drive to Bloor Street, and the risk to private and public infrastructure. This reach of Etobicoke Creek borders on the City of Toronto on the east side and the City of Mississauga on the west side. Existing conditions for this reach are highly urbanized, with degraded aquatic and terrestrial habitat. Minimal riparian community exists, and there is little aquatic habitat diversity. Water quality is degraded, which along with an urbanized flow regime, is contributing to a lower aquatic habitat quality.

The preferred option, as highlighted through the Problem and Opportunity Statement (Section 1.4), will enhance the valley slope along the creek to provide long term erosion protection, while maintaining or improving hydraulic capacity of the creek, providing environmental enhancement, and decreasing property and infrastructure loss.

Three options have been considered to address the future management of this reach of Etobicoke Creek:

- Option 1 - Do nothing
- Option 2 - Hard Armouring
- Option 3 - Channel Realignment

3.1.1 OPTION 1- DO NOTHING

The Class EA process requires a *do-nothing* option, under which, no measures are proposed to address the existing erosion concerns associated with the reach of Etobicoke Creek. As such, the channel will continue to erode laterally into the valley wall and vertically along the channel slope over time. Over the long-term, there remains a higher potential risk for loss of private property and damage to public infrastructure. Habitat degradation will likely result through the loss of trees along the slope and continued sediment input to the watercourse because of slope failure and erosion.

3.1.2 OPTION 2 - HARD ARMOURING

The hard armouring option entails the installation of toe protection (combination of armourstone retaining wall, rock protection and green gabion) along the valley wall to protect the toe of slope. To mitigate the risk of flow deflection along the eastern

channel bank, a bioengineering treatment consisting of a vegetated rock buttress would be implemented along the riverbank adjacent to the golf course lands. Green gabion baskets are an alternative to the traditional wire baskets containing rip rap stone, as they permit the use of soil bioengineering techniques such as live staking, brush layering, and rooted plants to create permanent, vegetated, armoured systems. Vegetated rock buttresses are a hard-bioengineering approach consisting of a combination of stones and vegetation. The buttress stones are hydraulically sized to resist entrainment, and the strength of these stones are augmented through the establishment of the vegetation, which would increase roughness and slow flows along the bank.

There is an existing drop structure just upstream of Bloor Street. This structure is approximately 0.8m higher than the existing creek. Water is backed up behind this structure. To the best of the team's knowledge, the drop structure protects the Region's trunk sanitary sewer located about 15-20 m upstream. This drop structure also prevents the upstream channel bed from being eroded as it is under up to 0.8 m of water. In addition, the upstream creek bottom is mainly in shale and this drop structure prevent the downcutting of the shale creek bottom. As such, erosion protection of the creek bottom is not required.

The proposed conceptual plan for protecting the channel in place is presented in **Appendix H**.

3.1.3 OPTION 3 - CHANNEL REALIGNMENT

Under this option, Etobicoke Creek would be realigned to achieve an offset from the valley slope. The offset from the west valley slope would be limited to minimize impact on the golf course and to limit the cost to backfill material as the channel is moved further away from the west valley wall. Realigning the creek would allow for the installation of toe protection along the channel banks, in addition to backfilling of the valley slope to mitigate risk of future slope adjustments over time. The realigned channel would be constructed using natural channel design principles, incorporating riffle and pool sequences. Riffles would be designed using hydraulically sized riverstone material to ensure vertical downcutting is minimized. A bioengineering technique would be used along the golf course side of the channel to protect against erosion. The proposed conceptual plan for relocating the channel in place is presented in **Appendix H**. This realignment will have measurable impacts on the golf course layout, especially the holes that abut the creek. To provide the geomorphic alignment required, the existing golf course bridge crossing located near the north limit of the Study Area would have to be replaced as the river will be adjusted in that area.

3.2 OVERVIEW OF SECTION UNDER BLOOR STREET

3.2.1 PREVIOUS GRADE CONTROL DESIGN UNDER BLOOR STREET

There is an opportunity to tie the preferred option for the Bloor Street grade control structure to the preferred channel improvement option as discussed in Section 4.2. To accomplish this integrated solution, modifications to a rehabilitation design completed by Parish Aquatic Services (2017) will be required. The 2017 design proposes six 0.3m drops extending from the top of the grade control structure to match the existing channel bottom located approximately 40 m to the south of the grade control structure. The channel will be embedded with appropriately sized riprap to prevent erosion. This design allows for energy dissipation and minimizes the scouring currently experienced at the northwest bridge abutment. Furthermore, it will enable fish passage from downstream of the bridge, pass the grade control structure to upstream of Bloor Street. The plan and cross section drawings of this proposed design has been provided in **Appendix I**. This design will be reviewed and with additional information obtained for the grade control structure, site observation and topographic survey information, options as outlined below were generated.

Due to the severity of the scour/erosion downstream of the grade control structure and at the northwest bridge abutment, a design tie-in with the works north of Bloor Street is recommended. As shown previously, the base of the armourstone wall on the northwest bridge abutment has been compromised and the grade control structure has partially failed. If the existing condition is allowed to persist, public safety is at risk and will have a negative impact on the Region's sanitary trunk sewer due to the continued scouring near the northwest Bloor Street bridge abutment and the continued failure of the grade control structure.

This project will review the existing design proposed at Bloor Street and make the required adjustments such that the existing grade control at Bloor Street is improved and one continuous upgraded channel is provided to the south side of Bloor Street.

This section provides an outline of the potential options to address the erosion concerns associated with the reach of Etobicoke Creek underneath Bloor Street, and the risk to private and public infrastructure. This reach of Etobicoke Creek borders on the City of Toronto on the east side and the City of Mississauga on the west side. Existing conditions for this reach are highly armoured, includes a failing grade control across the creek, failed armourstone protection at the northwest Bloor Street abutment with degraded aquatic and terrestrial habitat. Minimal riparian community exists, and there is little aquatic habitat diversity. Water quality is degraded, which along with an urbanized flow regime, is contributing to a lower aquatic habitat quality.

The preferred option, as highlighted through the Problem and Opportunity Statement (Section 1.4), will improve protection for the northwest bridge abutment, improve the grade control and geomorphically improve this section of the creek to provide long term erosion protection, while maintaining or improving hydraulic capacity of the creek, providing environmental enhancement, improving fish passage, and decreasing property and infrastructure loss.

Three options and one sub option have been considered to address the future management of this reach of Etobicoke Creek:

- Option 1 - Do nothing
- Option 2A - Control Structure Repair
- Option 2B - Control Structure Replacement
- Option 3 - Control Structure Replacement and Extend Remediation

3.2.2 OPTION 1- DO NOTHING

The Class EA process requires a *do-nothing* option, under which, no measures are proposed to address the existing drop structure deterioration and northwest abutment erosion and armourstone protection failure associated with this reach of Etobicoke Creek under Bloor Street. As such, the northwest abutment will continue to erode undermining the stability of the northwest bridge abutment and continued failure of the grade control structure upstream of Bloor Street. Over the long-term, there remains a high potential risk for undermining the stability of the northwest abutment and with the failure of the drop structure would result in the loss of protection to the upstream Region's sanitary trunk sewer.

3.2.3 OPTION 2A – CONTROL STRUCTURE REPAIR

The control structure repair option entails the repair of the existing grade control structure to ensure that present partial failure is corrected, and the existing remaining portion of the grade control structure is repaired to increase its lifespan. Downstream of the control structure a series of geomorphically designed rocky ramps would be installed. These rocky ramps would maintain the flow characteristics through the channel under the bridge, provide increased protection to the northwest abutment and with the smaller individual drop allow increased fish passage from the downstream side to the upstream side of Bloor Street.

The design would tie into the channel improvement upstream to ensure added erosion protection for the northwest bridge abutment of Bloor Street.

3.2.4 OPTION 2B – CONTROL STRUCTURE REPLACEMENT

The control structure replacement option would remove the existing drop structure and construct a new drop at or near its present location. The new drop structure would have a top elevation very similar to the existing structure to maintain the upstream protection of the Region's sanitary trunk sewer. Downstream of the control structure a series of geomorphically designed rocky ramps would be installed. The rocky ramps would maintain the flow characteristics through the channel under the bridge, provide increased protection to the northwest abutment and with the smaller individual drop allow increased fish passage from the downstream side to the upstream side of Bloor Street.

The design would tie into the channel improvement upstream to ensure added erosion protection for the northwest bridge abutment of Bloor Street.

3.2.5 OPTION 3 - CONTROL STRUCTURE REPLACEMENT AND EXTEND REMEDIATION

The control structure replacement would be similar to Option 2B above. However, in addition to the drop structure an addition protection layer would be installed approximately 10 m upstream to provide increased protection for the Region's sanitary trunk sewer as well as protect the water intake area for the golf course. Both protection layers would have the top elevation very similar to the existing grade control structure to maintain hydraulic characteristics. Downstream of the control structure a series of geomorphically designed rocky ramps would be installed. The rocky ramps would maintain the flow characteristics through the channel under the bridge, provide increased protection to the northwest abutment and with the smaller individual drop allow increased fish passage from the downstream side to the upstream side of Bloor Street.

The design would tie into the channel improvement upstream to ensure added erosion protection for the northwest bridge abutment of Bloor Street.

4 EVALUATION OF ALTERNATIVE SOLUTIONS

4.1 EVALUATION CRITERIA

The alternative solutions presented in the previous section were assessed based on a set of five evaluation criteria developed for this study. These criteria relate to the potential impacts and opportunities presented by each alternative and are presented in Table 4.1 below. Table 4.2 presents the alternative solutions evaluated against the developed criteria. The following sections summarize the findings of the analysis.

Table 4.1 Evaluation Criteria for Etobicoke Creek

Criteria	Impacts and Opportunities
Functional	• Opportunity to improve conveyance of watercourse • Opportunity to decrease erosion of watercourse • Opportunity to improve functionality of adjacent lands
Social Environment	• Ability to improve public safety • Impacts to private properties • Impacts to public properties
Economic Environment	• Capital Costs • Maintenance Costs • Risk Management/Future Cost
Natural Environment	• Impacts on aquatic habitat • Impacts to terrestrial habitat • Impacts on channel stability and hydraulics
Constructability	• Ease of construction and accessibility • Expected disturbance to private/public property • Erosion/sedimentation concerns during construction

4.2 OPTIONS NORTH OF BLOOR STREET

Outlined below in **Table 4.2** is an evaluation of the options north of Bloor Street. The impacts were set up as follows:

- Red is high impact
- Yellow is moderate impact
- Green is low impact or beneficial

Using this setup allows for a visual representation of the evaluation and a quick means of determining the preferred option.

Table 4.2 Evaluation of Options North of Bloor Street

CRITERIA	Option 1 – Do Nothing	Option 2 – Hard Armouring	Option 3 – Channel Realignment
Functional			
Opportunity to improve conveyance of watercourse	🟡	🟡	🟢
Opportunity to decrease erosion of watercourse	🔴	🟢	🟢
Opportunity to improve functionality of adjacent lands	🔴	🟢	🟡
Social Environment			
Ability to improve public safety	🔴	🟢	🟢
Impacts to private properties	🔴	🟢	🔴 Encroaching on existing golf course
Impacts to public properties	🔴	🟢	🟢

Table 4.2 Evaluation of Options North of Bloor Street

CRITERIA	Option 1 – Do Nothing	Option 2 – Hard Armouring	Option 3 – Channel Realignment
Economic Environment			
Capital Costs		High cost of armourstone structure	High cost of acquiring land from golf course
Maintenance Costs			
Risk Management/Future Costs	Continued erosion will increase mitigation costs		
Natural Environment			
Impacts on aquatic habitat	Continued erosion and sediment deposition	Minor disturbance during construction	Greater temporary disturbance due to realignment
Impacts to terrestrial habitat	Loss of riparian vegetation	Minimal loss of vegetation	Localized tree removals
Impacts on erosion/channel stability and hydraulics/flooding		Slight increase in water elevation in frequent storms	
Constructability			

Table 4.2 Evaluation of Options North of Bloor Street

CRITERIA	Option 1 – Do Nothing	Option 2 – Hard Armouring	Option 3 – Channel Realignment
Ease of construction and accessibility			
Expected disturbance to private/public property		 construction access through golf course, impacts minimized through winter construction	 significant land loss to golf course, closure may be longer
Erosion/sedimentation concerns during construction			

4.2.1 OPTION 1 - DO NOTHING

Impacts associated with the *do-nothing* approach would include an unmitigated continuation of erosion of the valley wall and vertical downcutting into the channel bed. This would over time, result in the loss of private property and damage to public infrastructure, as well as loss of terrestrial habitat (riparian trees) and disturbance to aquatic habitat due to active erosion. While these impacts are considered unacceptable, this option is presented to provide a baseline condition for comparison. This option has not been selected as there are options that provide a greater net benefit.

4.2.2 OPTION 2 - HARD ARMOURING

The option to protect the channel in place would result in temporary disturbance of aquatic habitat during construction, but over the long-term would decrease sediment input from the eroding slope (thereby enhancing water quality/aquatic habitat). Additionally, protection along the toe of slope would limit risk of damage to private property due to erosion/failure of the valley slope. Minimal impacts to terrestrial habitat are anticipated, as this option would limit the number of trees removed. However, most of the trees at the toe-of-slope are exotic tree willows that could be replaced with native trees. As vertical incision would continue, toe protection will need to be countersunk below the existing channel invert. This alternative would result in temporary impacts to the golf course lands in the form of installation of the proposed bioengineering bank protection, construction access and staging areas. All disturbed areas would be restored to existing condition.

Based on an evaluation using all the metrics outlined in Table 4.2, this option was selected as the preferred option. The key benefits are.

- Provides protection of the west valley wall
- Minimizes disturbance to the existing golf course from both a physical alteration and from a construction duration
- Minimizes disturbance to the channel while work is being done, as this option allows for continuous impact only on one side of the channel
- Minimizes environmental disturbance during construction

4.2.3 OPTION 3 – CHANNEL REALIGNMENT

The option to relocate the channel would result in a greater temporary disturbance to aquatic and terrestrial habitat. This option provides a greater opportunity to mitigate risk of slope failure, which would decrease sediment inputs from the slope into the channel. Natural channel design principals would allow for the enhancement of

aquatic habitat through the incorporation of habitat design elements. Ecological impacts are expected to be minimal and mitigable through implementation of construction best management practices (BMPs) (e.g., silt fencing and tree protection) and would consist of localized tree removals and temporary diversion of the Creek. This design alternative would have the greatest impact on the golf course as the relocation would encroach within the property, affect the playability of several holes, and construction may impact golf course operations during their playing season. This option was not pursued further due to:

- Need to work with both sides of the channel resulting in greater disturbance to the environment during construction
- Impact on the Region's sanitary trunk sewers that cross the creek at several locations
- Greater disturbance to existing activities in the surrounding area
- Will result in a significant impact on the on-going operations of the adjacent land use

4.3 OPTIONS AT BLOOR STREET GRADE CONTROL STRUCTURE

The following sections provide an overview of design options for the Bloor Street grade control structure. Except for the 'Do Nothing' option, all options would tie into the preferred design option from Section 4.2 to address upstream creek erosion concerns. The proposed conceptual plans for each of the Bloor Street grade control structure design alternative are presented in **Appendix I**.

Outlined below in **Table 4.3** is an evaluation of the options for the Bloor Street grade control structure. The impacts were set up as follows:

- Red is high impact
- Yellow is moderate impact
- Green is low impact or beneficial

Using this setup allows for a visual representation of the evaluation and a quick means of determining the preferred option.

Table 4.3 Evaluation of Alternative Bloor Street Grade Control Structure

CRITERIA	Option 1 – Do Nothing	Option 2a – Control Structure Repair	Option 2b – Control Structure Replacement	Option 3 – Control Structure Replacement and Extended Remediation
	Functional			
Opportunity to improve conveyance of crossing				Provides better protection of upstream sanitary trunk crossing
Opportunity to decrease erosion of crossing				
Opportunity to improve functionality of adjacent lands				
	Social Environment			
Ability to improve public safety				
Impacts to private properties				
Impacts to public properties				
	Economic Environment			
Capital Costs		High cost for Repair of existing Structure	High cost of armourstone structure	High cost of armourstone structure

CRITERIA	Option 1 – Do Nothing	Option 2a – Control Structure Repair	Option 2b – Control Structure Replacement	Option 3 – Control Structure Replacement and Extended Remediation
Maintenance Costs		Control structure repairs could result in addition future maintenace		
Risk Management/Future Costs	Continued erosion will increase mitigation costs	Control structure repairs could prove difficult		Provides greatest protection for upstream trunk sanitary sewer
	Natural Environment			
Impacts on aquatic habitat	Continued erosion and sediment deposition	Need for Flow diversion during construction	Need for Flow diversion during construction	Need for Flow diversion during construction
Impacts to terrestrial habitat	Loss of riparian vegetation	Minimal loss of vegetation	Minimal loss of vegetation	Minimal loss of vegetation
Impacts on erosion/channel stability and hydraulics/flooding		Slight increase in water elevation in frequent storms	Slight increase in water elevation in frequent storms	Slight increase in water elevation in frequent storms
	Constructability			
Ease of construction and accessibility				

CRITERIA	Option 1 – Do Nothing	Option 2a – Control Structure Repair	Option 2b – Control Structure Replacement	Option 3 – Control Structure Replacement and Extended Remediation
Expected disturbance to private/public property	🟢	🟡 construction access through golf course lands and need for flow diversion	🟡 construction access through golf course lands and need for flow diversion	🟡 construction access through golf course lands and need for flow diversion
Erosion/sedimentation concerns during construction	🟢	🔴	🔴	🔴

4.3.1 OPTION 1- DO NOTHING

The Class EA process requires a 'do nothing' alternative, under which, no measures are proposed to address the existing erosion concerns associated with the Bloor Street bridge and grade control structure. Under this alternative, the channel will continue to down cut vertically and erode laterally into the grade control structure and bridge abutments. Over the long-term, there remains a high potential risk for damage to both structures. Additionally, if the grade control structure fails, the existing regional sanitary trunk sewer located upstream would then be at high risk of potential damage. Habitat degradation will likely result through the continued sediment input to the watercourse due to erosion.

4.3.2 OPTION 2A - CONTROL STRUCTURE REPAIR

Option 2B entails retention of the existing grade control drop structure with additional repairs through the construction of reinforcing armourstone weirs immediately upstream and downstream of the structure. Due to the irregular shape of the grade control structure, backfill with stone material will be required to fill any associated voids. The upstream armourstone grade control was established to maintain the existing creek elevation to protect the Region's sanitary trunk sewer. To mitigate the existing grade differential and enhance hydraulic and aquatic habitat conditions, a subsequent series of rocky ramps comprised of six armourstone drops is proposed at an approximately 6.5m spacing, extending approximately 10m downstream of the Bloor Street bridge and resulting in a governing energy gradient of 4.70%. Existing

armourstone retaining walls along the northwest bridge abutment will be repurposed and reinstated with a double row of armourstone and additional offset protection. Outlet pools will be reinstated at each of the existing storm outlet structures downstream of Bloor Street. Each of the armourstone weirs would be notched to create a low flow channel to maintain seasonal fish passage.

4.3.3 OPTION 2B - CONTROL STRUCTURE REPLACEMENT

Option 2B represents a minor refinement to Option 2A whereby the existing grade control drop structure would be removed and replaced with a double row armourstone grade control. This change will eliminate any unknowns for the existing grade control structure. There are no existing drawings showing how the structure was previously designed. In addition, the partial failure would make replacement a more logical solution. Although, a diving team did investigate the condition noting the irregular shape, undermining and other conditions, it is only a snapshot of what was observable. Since the partial failure, a more detailed site review has made replacement a more realistic solution. Replacement would provide greater definition as to what has been provided and be easier to tie into the overall design.

4.3.4 OPTION 3 - CONTROL STRUCTURE REPLACEMENT AND EXTENDED REMEDIATION

Option 3 represents an extension of Option 2B whereby the grade control structure would be removed and replaced with a double-row armourstone grade control, and an additional double-row grade control would be constructed approximately 10m further upstream to provide enhanced grade control protection of the existing Region's sanitary trunk sewer and provide protection the golf course water intake. To mitigate potential impacts to floodline elevations, the control elevation of the two upstream grade controls would match. This option would provide additional protection to the trunk sanitary sewer, enhance protection for the water taking inlet for the golf course while having minimal impacts on both the hydraulics and environment.

4.4 PREFERRED OPTION NORTH OF BLOOR STREET

This reach of Etobicoke Creek within the Study Area is highly urbanized, with degraded aquatic and near terrestrial habitat conditions and a flashy hydrologic regime. These issues are symptomatic of land use changes at the watershed-scale. The options presented and evaluated in this study provide opportunities to mitigate risk at the local scale but cannot address these large-scale headwaters management challenges. Therefore, the purpose of the preferred design option is to

provide a design solution that can protect existing residential properties without imposing a substantial burden on the adjacent land uses.

Both Options 2 and 3 can protect the residential properties and provide great opportunities for improving the natural environment. However, as discussed in Section 4.2 Option 2 provides the greatest benefits and is the preferred solution north of Bloor Street.

4.5 PREFERRED OPTION BLOOR STREET GRADE CONTROL STRUCTURE

This section of the Etobicoke Creek from the grade control structure to the downstream side of Bloor Street was to address two major concerns being maintaining grade control to protect an existing Region's sanitary trunk sewer and to reinstate protection of the northwest abutment for Bloor Street. The preferred option will also tie into the preferred option north of Bloor Street. The differences between Options 2A, and 2B is whether to maintain or replace the existing grade control structure. Replacement provides security of design and the was further reinforced as the drop structure has partially as the environmental assessment process proceeded. Option 3 provides added security for the Region's sanitary trunk sewer. Based on a review of the evaluation matrix, Option 3 is the preferred solution for the grade control structure at Bloor Street.

5 DESIGN

5.1 PRELIMINARY DESIGN

The reach of Etobicoke Creek north of Bloor Street is contrasted by high steep slopes on the west embankment and a fairly shallow east embankment adjacent to the golf course. The preliminary design is very difference for the west and east embankments of the Etobicoke Creek along this stretch from Bloor Street to the first golf course crossing. The west bank will be protected with the placement of armourstone wall to protect the base and placement of green gabions along the top 1 m to provide an opportunity to include soil and vegetation to allow plant growth and increased stability as vegetation takes hold. The east embankment which comprised most of the inner bend of the creek would be protected with a vegetated rock buttress. Based on discussion with Markland Wood Golf Club, the preference is to keep the vegetation within the rock buttress short as the view of this section of creek is visually pleasing to those that use the golf course during the golfing season and by those that use the pathways in the golf course during the non-golfing season.

Attached in **Appendix J** are preliminary cross sections for the works on the west side of the creek.

Preliminary design for the preferred option for Bloor Street grade control structure is shown in Drawing No. GC-001 in **Appendix I**. Some key components of the preliminary design include:

- Tie in with preferred option for works north of Bloor Street
- Protection of northwest abutment for Bloor Street
- Anchoring of the drops with both sides of creek under Bloor Street
- Improvement to fish passage and minimizing erosion

5.2 DETAILED DESIGN

The preferred options for the Bloor Street grade control and the section of the Etobicoke Creek from Bloor Street to the first golf course crossing north of Bloor Street will be integrated as part of the detailed design. The grade control structure will entail the replacement of the existing drop structure upstream of Bloor Street and a series of smaller drops under the Bloor Street bridge. The geomorphically designed rocky ramps will allow increased fish passage across Bloor Street and at the same time provide enhanced protection for the existing Region's sanitary trunk sewer that crosses the Etobicoke Creek upstream of Bloor Street. In addition, the

works under Bloor Street will restore the protection of the northwest abutment of Bloor Street.

The proposed works north of Bloor Street will consist of armourstone protection of the west embankment. Where the embankment is quite steep, the top layer of the erosion protection will be green gabions. This will permit the placement of topsoil and planting of vegetation to allow over time vegetative growth to improve both the plant life of the embankment and improve slope stability as the vegetation grows and expands. Due to the high velocities (3 to over 5 m/s) and being the outside curve, only hard armouring was feasible. Along the east bank, it is proposed that bioengineering (vegetated rock buttress) be implemented to provide increased stability to the banks.

5.2.1 STAGING AND PHASING

Access to the site is difficult and there are several factors to take into consideration for staging and phasing of the works. Factors to take into consideration include:

- Existing operating golf course with a limited duration when golfing activity is not taking place
- Existing Region's sanitary trunk sewer that needs to be protected
- Limited available height under Bloor Street to allow for movement of heavy equipment and material from one side of Bloor Street to the other
- Steep embankment along the west side of Etobicoke Creek limiting movement of equipment and material
- Limited access from the golf course lands to the site

It is recommended that the work progress in three stages during the non-golfing season (late November to early April). This will also be the lowest water levels in the Etobicoke Creek and the colder weather will also allow for easier movement within the site. Completion of construction over one construction season (mid-November to March 31) is possible if weather conditions permit. The works under Stage 2 and Stage 3 may occur concurrently to take advantage of the temporary crossing of the Etobicoke Creek under Bloor Street. A brief description of the proposed staging is described in the sections below.

5.2.2 STAGE 1 – WEST EMBANKMENT WORKS

The first construction stage will consist of setting up erosion and sediment control systems on the access to the construction site on the south side of Bloor Street west of the creek. The construction of the construction access on the south side and under Bloor Street will facilitate the constriction of the first stage. Access to Stage 1

will not require the diversion of the creek below Bloor Street. The access to the west embankment will allow for the placement of the armourstone reinforced cofferdam adjacent to the west embankment. It is proposed that the armourstone cofferdam be constructed for the full length along the west embankment of the Etobicoke Creek. Periodic pumping within the work area will be required to allow construction to proceed in the dry. In addition, close attention needs to be paid to the flows in the creek and the weather forecast to ensure equipment is not within the work area when large flow or storm runoff exceeds the height of the armourstone cofferdam. Construction would commence at the upstream end and proceed downstream. As the construction proceeds downstream, the armourstone cofferdam would also be scaled back and the armourstone reused for the embankment construction. Green gabions along with erosion control blanket and topsoil will be placed along the top 1 m of the wall. The green gabions will be planted with native seed mixes tolerant to low moisture conditions. The armourstone wall will tie into the reconstructed drop structure at Bloor Street to be completed as part of Stage 2. Upon completion of the west embankment erosion control works, pumping equipment, armourstone cofferdam, and all disturbed areas will be reinstated to its original condition.

5.2.3 STAGE 2 – WORKS UNDER BLOOR STREET

At the completion of Stage 1, constructing of a by-pass for the Etobicoke Creek such that the existing remnant drop structure under Bloor Street can be remove and the new drop structure and geomorphically designed works under Bloor Street can be completed in the dry. As part of the diversion of the channel a construction crossing of this diversion channel is required such that equipment and material can cross the creek. In addition, an existing storm outfall will need to be removed on the west side of the creek and flow from the storm sewer will outlet into the diversion channel.

An armourstone cofferdam will be constructed at the upstream end of the proposed works. Periodic pumping within the work area will be required to allow construction to proceed in the dry. In addition, close attention needs to be paid to the flows in the creek and the weather forecast to ensure equipment is not within the work area when large flow or storm runoff exceeds the height of the armourstone cofferdam. Once the new drop structure and geomorphically designed channel has been constructed, all disturbed areas will be restored.

5.2.4 STAGE 3 – EAST EMBANKMENT BIOENGINEERING

The construction of the east embankment improvements from the first crossing north of Bloor Street downstream to Bloor Street can be constructed once a portion of Stage 2 is completed to allow equipment and material to cross along or adjacent to the new drop structure. Installation of a cofferdam adjacent to the creek to allow

construction in the dry will be required. The full length of the works along the east embankment is over 400m but the length of the cofferdam can be much shorter as the Contractor can move the cofferdam as construction proceeds downstream from the upstream limits. The east embankment works entails the construction of bioengineering along the east embankment adjacent to the golf course. This work is to be constructed in the dry and as such intermittent pumping may be required to keep the work area dry and to move the cofferdam as construction proceeds. Stage 2 and 3 can occur in a concurrent manner once Stage 2 reaches a certain stage. Upon completion of Stages 2 and 3 works, the diversion channel can be removed, and all flows diverted back into the new grade control structures under Bloor Street. The existing storm sewer on the west side of Bloor Street shall be reconnected to its original outlet and the diversion channel area filled. All disturbed areas are to be planted or seeded and returned to its original grades. All silt fences and erosion control measures are to be removed.

6 CONSTRUCTION IMPACTS AND MITIGATION

6.1 EXISTING GOLF COURSE/PROPERTY IMPACTS

The creek works will require access onto the Markland Wood Golf Club. Due to the steep slopes along the western banks of the creek (i.e., abutting the properties along Ponytrail Drive and Steepbank Crescent), access from these areas will not be feasible. Access locations are discussed in Section 6.5 and any access through the Markland Wood Golf Club lands will require rehabilitation as heavy machinery will be passing through the area to access the creek. In addition, the staging area will likely infringe on the golf course lands south of the creek on the west side of Bloor Street. The disturbed areas will be mitigated after construction.

The impact to the golf course can be minimized by ensuring that construction occurs during the course's off-season (Winter to early Spring).

Etobicoke Creek is classified by the Etobicoke Creek Fisheries Management Plan (TRCA, 2006) as an intermediate riverine warmwater system, any in-creek works must be completed from July 1 to March 31. The window will be further reduced as interference with the operations to the golf course must be minimized.

Other private properties will not be impacted by construction works.

6.2 NATURAL ENVIRONMENT

Impacts to the natural environment during construction are expected to be limited to the short-term effects of construction activities on the surrounding area. The extents of the restoration works will be confirmed through detailed design, which will identify the need for additional mitigating measures beyond those outlined below. Opportunities for wildlife habitat enhancement will be considered.

6.2.1 GEOMORPHOLOGY

Potential impacts associated with the construction of the preferred option are primarily associated with the introduction of sediment during construction, and impedance of flow because of construction activities. The use of appropriate BMPs, phasing construction activities, and implementation of erosion and sediment control (ESC) measures will limit these impacts. The duration of in-water work should be minimized, and work should be completed during low flow periods, to the greatest extent possible.

6.2.2 TERRESTRIAL HABITAT (VEGETATION, TREES, WILDLIFE HABITAT)

While the preferred alternative reduces the number of tree removals, site access may necessitate removal of some trees. A detailed tree inventory and preservation plan will be prepared during the detailed design stage. Trees identified to be protected will be delineated prior to construction, using appropriate tree protection fencing. Vegetation clearing if required, should occur outside the breeding bird season to prevent nest destruction. Removal of trees within woodlands is not proposed.

6.2.3 AQUATIC HABITAT

Potential impacts to fish and aquatic habitat can be identified as a direct loss of habitat, direct injury to fish because of construction, or indirect changes to fish habitat that may occur over the long-term. Implementation of BMPs and ESC measures during construction will ensure that sediment loading to the creek is minimized because of construction. The work area should be dewatered prior to construction, and all aquatic species in the work area should be relocated by a qualified environmental professional prior to commencement of construction. Any pumping activities should include the use of a fish screen, to ensure that fish are not injured by pumps.

6.3 PHASING, ESC

Phasing, sediment and erosion control plans and environmental mitigation measures should be developed in conformance with TRCA Guidelines to mitigate the release of fine sediment to the system and should be monitored for performance during construction. All instream activities should be undertaken in isolation of open or flowing water to maintain the natural flow of water downstream and avoid introducing sediment into the watercourse. All ESC measures should be installed prior to construction and inspected regularly throughout construction phasing. Any damaged ESC measures should be repaired or replaced within 48 hours of the inspection. All machinery will arrive on site in a clean condition and will be maintained for the duration of the works. Whenever possible, machinery will be operated above the high-water mark. Wash, refuel and service of machinery will be undertaken in such a way as to prevent any deleterious substances from entering the water.

6.4 SURFACE WATER MANAGEMENT

The work area will be isolated such that all works will be done in the dry. All surface water that enters the work area will be pumped out and release at least 30m away from the receiving stream through a containment system. Any rainfall that may fall

within the work area will also be pumped and released through a containment system at least 30m from the receiving stream.

6.5 TRAFFIC AND ACCESS

There are several accesses to the site. They include coming in from the golf course lands south of Bloor Street, on the south side of Bloor Street west of the creek. Each of these accesses will be further investigated during the detailed design stage. The preferred route for the site would be on the west side of the creek on the south side of Bloor Street. Due to the tight entrance and restricted space for large equipment, there will likely be a requirement for traffic control and blocking of live lanes for delivery of large equipment and large material such as armourstones. The access routes and traffic impacts will be finalized as part of the detailed design.

6.6 ENVIRONMENTAL SOIL MANAGEMENT PLAN

The management or movement of excess soil should consider incorporation of best management practices specifying the need for a Soil Management Plan at a source site, and the need to identify the appropriateness of receiving site(s) based on a Fill Management Plan. This is recommended to ensure that, before the transportation of excess soil to a receiving site(s) the owner and operator of the source site is aware of excess soil management considerations and the ultimate destination(s) of the excess soil. Since this project commenced before implementation of such requirements, additional boreholes, soil testing, and review of site use history is underway to develop a soil management plan to deal with excess material before it leaves the site.

6.7 PERMITS AND APPROVALS

6.7.1 FISHERIES AND OCEANS CANADA (DFO)

6.7.1.1 FISHERIES ACT

The federal Fisheries Act requires that projects avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada. This applies to work being conducted in or near waterbodies that support fish that are part of or that support a commercial, recreational, or Aboriginal fishery. To protect fish and fish habitat, efforts should be made to avoid, mitigate and/or offset harm.

Any works proposed below high-water level within direct fish habitat will require DFO review. To initiate DFO review, a ‘Request for Review Form’ should be completed and submitted to the DFO Fisheries Protection Program.

6.7.2 MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS (MECP)

6.7.2.1 ENDANGERED SPECIES ACT

No further requirements under the ESA (2007) are anticipated in support of this project. However, as part of detailed design, the team will check back with MECP to make sure that no additional species have been added or if there are changes to existing requirements.

6.7.2.2 PERMIT TO TAKE WATER (PTTW) OR ENVIRONMENTAL ACTIVITY AND SECTOR REGISTRY (EASR)

A Permit to Take Water or an Environmental Activity and Sector Registry issued by the MECP may be required for water taking or pumping associated with the proposed works. The need for a Permit to Take Water or Environmental Activity and Sector Registry will be confirmed as part of detailed design.

6.7.3 MINISTRY OF NATURAL RESOURCES AND FORESTRY (MNRF)

6.7.3.1 FISH AND WILDLIFE COLLETION PERMIT

A fish and wildlife collection permit will be required from MNRF to relocate fish and other wildlife in advance of the works under Bloor Street and the west and east embankment works upstream of Bloor Street.

6.7.3.2 PUBLIC LANDS ACT

As Etobicoke Creek represents a navigable stream, the bed of the creek is Crown land, and a work permit may be required under the Public Lands Act. As part of detail design, the team will confirm if a permit is required from the Public Lands Act.

6.7.4 TORONTO AND REGION CONSERVATION AUTHORITY (TRCA)

The proposed design solution will require works within the TRCA regulated area and will require permits under Ontario Regulation 166/06. Appropriate mitigation measures will need to be implemented to reduce potential impacts to the regulated features.

The application for permit will be made as part of detailed design.

7 PUBLIC CONSULTATION

7.1 NOTICE OF COMMENCEMENT

A Notice of Commencement was prepared and circulated in late 2018. A copy of the notice is provided in **Appendix K**. The Notice was mailed directly to relevant agencies, utilities, and surrounding property owners. The Notice of Commencement was advertised in the Public Notices section of the City's webpage. The Notice summarized the purpose and scope of the study and invited interested parties to provide comments. Due to the passage of time the Notice was reissued in June 2021. All comment forms received are included in **Appendix K**.

7.2 PUBLIC INFORMATION CENTRE

A virtual Public Information Centre (PIC) was held on June 27, 2022. The Notice of Public Information were hand delivered to several residences adjacent to the study area in early June. Shown in **Appendix K** is the hand distribution area. In additional, all interested party that provided information to the study team during the Notice of Commencement and subsequent contacts were emailed a copy of the PIC. The names are listed in **Appendix K** along with whether they received the PIC notice. Two names failed to deliver, and a number had "out of Office" replies. In addition, the city placed mobile signs near the study area to notify the public of the upcoming PIC. A sample of the sign is included in **Appendix K.**

In preparation of the PIC a PowerPoint presentation was prepared for the study area. The PowerPoint material was presented at the PIC and is included as part of **Appendix K**. There were several questions asked at the PIC and the consultant team were able to provide verbal answers at the PIC, but due to technical difficulties neither the questions nor the responses were recorded.

A Web portal was created for this study by the city and the Notices, PowerPoint presentation and Comment Sheets were uploaded to the Web Portal. The deadline for returning of the comment sheet was July 5, 2022. Due to the virtual nature of the presentation and to provide the participants more time to return comments via email back to the team, the team waited until July 10, 2022, to collect the comments. No comments were received.

7.3 PUBLIC COMMENTS

No public comments were received

7.4 NOTICE OF COMPLETION

Upon completion of the report, a notice of completion will be issued, and the report will be posted on the Environmental Registry, where the public has 30 days to comment on the report.

7.5 AGENCY AND STAKEHOLDER CONSULTATION

The design drawings and Draft EA report have been submitted to:

1. City of Mississauga
2. City of Toronto
3. Markland Wood Golf Club
4. Regional Municipality of Peel
5. Toronto and Region Conservation Authority

Comments received and how they were addressed are enclosed in **Appendix L.**

8 REFERENCES

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List of TRCA Vegetation Communities.

Toronto and Region Conservation Authority. 2017.

Flora Species for Entire TRCA Jurisdiction.

APPENDICES

APPENDIX A

A Slope Stability Assessment for Proposed Erosion Control Measures Etobicoke Creek, from West of Bloor Street to Pedestrian Bridge Crossing

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL (416) 754-8515 · FAX (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	PETERBOROUGH	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

August 2, 2019 Reference No. 1904-S070

KSGS Engineering Corp.
470 Hensall Circle, Unit 300
Mississauga, Ontario
L5A 3V4

Attention: Mr. Ken Chow

Re: A Slope Stability Assessment for
Proposed Erosion Control Measures
Etobicoke Creek, from West of Bloor Street to Pedestrian Bridge Crossing
City of Mississauga

Dear Sir:

In accordance with the written authorization dated April 8, 2019, Soil Engineers Ltd. has carried out a soil investigation and global stability assessment for the proposed erosion control measures at the captioned site. This report presents the results of the investigation. The recommendation for the design and construction of the erosion control measures is also discussed.

Background

The investigated area is located along the south bank of Etobicoke Creek, from the west side of Bloor Street to a pedestrian bridge crossing within the golf course, approximately 400 m from Bloor Street. The investigated area consists of a steep slope, with heights varying from 5 to 8 m and gradients varying from 1V:1.1 to 3.7 H. The tableland beyond the top of slope consists of residential properties with various features, such as pools, sheds, parking lot, etc.

It is understood that the west bank of the creek will be protected against erosion using mass gravity retaining structures.

Field Work

The field work, consisting of drilling three (3) sampled boreholes to depths of 1.5 to 2.7 m below the existing ground surface, was carried out on May 13 and 22, 2019. Borehole 3 was cancelled due to accessibility issue. The locations of the boreholes are illustrated on the Borehole and Cross Section Location Plan, Drawing No. 1.

The boreholes were advanced using mobile hand hammering equipment for continuous soil sampling. The field work was supervised and the findings recorded by the geotechnical technician.

The ground elevation of each borehole is interpreted from the topographic survey plan provided by the client.

Findings

Detailed descriptions of the encountered subsurface conditions are presented on Borehole Logs 1, 2 and 4.

The investigation has revealed that beneath a topsoil veneer, 10 to 15 cm in thickness, the site is generally underlain by a stratum of soft to hard silty clay, overlying shale bedrock.

Sample examination revealed that the soft silty clay is confined within the top 1 m of the soil stratigraphy, likely weakened by weathering.

Groundwater was encountered in Borehole 1 at a depth of 1.2 m below existing grade. The remaining boreholes were dry and open upon their completion. Groundwater yield from the silty clay and shale is expected to be slow in rate and limited in quality.

Visual Inspection

Visual inspection of the valley slopes was completed on April 1, 2019. The slope is generally vegetated with trees and shrubs. At the time of inspection, fallen trees were observed and surficial erosion and sloughing were evident along the slope face. Shale was exposed along the slope face in some areas with no topsoil/vegetation cover. Water seepage was not observed at the surface of the slope. A floodplain was observed at the bottom of the eastern portion of the slope. Boulders were observed along the south creek bank. The width of the creek varies from 8 to 13 m. Bedrock can be observed at the creek bed.

Modeling

The slope stability analysis was carried out at two (2) cross-sections (Cross-Sections A-A and D-D), which represent the highest and steepest slope sections spanning across the concerned slope. The surface profile of the slope section was obtained through the contour lines from the topographic survey provided. The subsurface soil information was derived from the borehole findings. The locations of the cross-sections are shown on Drawing No. 1. The details of the existing slope condition at the cross-sections are presented on Drawing Nos. 2 and 3.

The analyses were carried out with computer-aided program, SLIDE created by Rocscience Inc., using force-moment-equilibrium criteria with the soil strength parameters shown in the following table.

Strength Parameters For Slope Stability Analysis			
Material Type	**Unit Weight (kN/m^3)**	**Effective Cohesion (kPa)**	**Effective Internal Friction Angle (degrees)**
Silty Clay	21.0	5	26
Shale	24.0	Infinite Strength	

Where applicable, the highest water level detected in the boreholes was incorporated into the analysis as a phreatic surface.

Results

The resulting factors of safety (FOS) for the existing slope condition at the Cross Sections A-A and D-D are 1.1 and 1.2, respectively, and do not meet the Ontario Ministry of Natural Resources and Forestry (OMNRF) guideline requirement for 'Active' land use (FOS of 1.5). Therefore, the slope in its existing condition is considered marginally stable and remedial measures should be considered. Remedial measures to the existing slope are outside our scope of work for this project.

Erosion Control Measures

As mentioned above, the proposed erosion control measures will consist of an Armourstone retaining structure with the upper 1 m being green gabion, which will be used to replace the existing boulders along the creek bank.

The schematics of the proposed structure are provided by the client and global stability assessment is performed on the proposed structure. The schematics are illustrated on Drawing Nos. 4 and 5 for Cross Sections A-A and D-D, respectively.

The resulting FOS for the proposed erosion control measures at Cross-Sections A-A and D-D are 3.3 and 4.0, which exceed the required FOS of 1.5 and is considered geotechnically stable.

It should be noted that the purpose of the Armourstone retaining structure is to protect the toe of slope and the exposed shale from erosion and is not utilized to stabilize the steep overburden slope above the proposed retaining structure. The overburden slope is a pre-existing condition and it will remain as is, if it is not disturbed by the proposed works. Disturbance to the overburden slope must be avoided. If disturbed, the overburden slope should be restored to condition better than its original due to its existing steep slope gradient.

Discussion and Other Considerations

The armour stone retaining structure will be situated on shale bedrock below the scouring depth of the creek bed. A recommended bearing pressure of 500 kPa (SLS) can be used for the design of the retaining structure founded on the shale bedrock.

Pneumatic hammer and/or excavator equipped with rock ripper will be required for excavating into the shale bedrock. Any loose shale fragments must be removed within the founding subgrade level prior to the placement of leveling pad. The footing subgrade must be inspected by the project geotechnical engineer or a geotechnical technician under the supervision of the geotechnical engineer to verify the subgrade condition.

Given that it is difficult to provide a level surface for the construction of the Armourstone retaining structure, a leveling pad, consisting of lean-mix concrete, can be used instead of 19-mm CRL to avoid washing out of fines and small particles.

Rip-rap or river stone may be placed at the toe of the retaining structure to protect against erosion from the river flow.

Behind the armour stone retaining structure, a chimney drain consisting of a mixture of 50-mm clear stone and rip-rap should be provided to avoid build-up of hydrostatic pressure behind the retaining structure. The chimney drain must be wrapped with geotextile fabric filter to avoid infiltration of fine particles. A perforated subdrain wrapped with geotextile fabric filter should be placed behind the retaining structure above the creek water level, and the water collected can be drained into the creek.

Excavation should be carried out in accordance with Ontario Regulation 213/91.

We trust the above satisfies your present requirements. Should you have any further queries, please feel free to contact this office.

Yours truly,
SOIL ENGINEERS LTD.

Kin Fung Li, P.Eng.

LICENSED PROFESSIONAL ENGINEER
Aug 2, 2019
K. F. LI
100169280
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
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Bernard Lee, P.Eng.
KFL/BL:dd

ENCLOSURES

Borehole Logs	Figures 1 to 4
Borehole and Cross Section Location Plan	Drawing No. 1
Slope Stability Analyses (Existing Condition)	Drawing Nos. 2 and 3
Global Stability Analysis (Proposed Condition)	Drawing Nos. 4 and 5

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS Auger sample
CS Chunk sample
DO Drive open (split spoon)
DS Denison type sample
FS Foil sample
RC Rock core (with size and percentage recovery)
ST Slotted tube
TO Thin-walled, open
TP Thin-walled, piston
WS Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH Sampler advanced by static weight
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
NP No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding

△ Laboratory vane test

□ Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres
1lb = 0.454 kg
1 inch = 25.4 mm
1ksf = 47.88 kPa

JOB NO.: 1904-S070

LOG OF BOREHOLE NO.: 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Erosion Control Measures

METHOD OF BORING: Hand Hammer

PROJECT LOCATION: Etobicoke Creek, west of Bloor Street to Pedestrian Bridge
City of Mississauga

DRILLING DATE: May 13, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
126.4	Ground Surface							
0.0	**15 cm TOPSOIL**				0			
	Brown, soft to hard							
	SILTY CLAY	1	DO	2			32	
	a trace of sand occ. gravel							
	weathered	2	DO	10	1		20	
		3	DO	59			21	
	occ. shale fragments							
124.3		4	DO	50/10	2		11	
2.1	**END OF BOREHOLE** **Refusal to sampling due to probable bedrock**				3			
					4			
					5			
					6			

W.L. @ El. 125.2 m upon completion
W.L. @ El. 124.6 m upon completion

Soil Engineers Ltd.

JOB NO.: 1904-S070

LOG OF BOREHOLE NO.: 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Erosion Control Measures

METHOD OF BORING: Hand Hammer

PROJECT LOCATION: Etobicoke Creek, west of Bloor Street to Pedestrian Bridge
City of Mississauga

DRILLING DATE: May 22, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
121.5	Ground Surface							
0.0	**13 cm TOPSOIL**				0			
	Soft to firm **SILTY CLAY** a trace of sand occ. shale fragments weathered	1	DO	3			29	
	brown grey	2	DO	7	1		14	
120.0								
1.5	**END OF BOREHOLE** **Refusal to sampling due to probable bedrock**				2			
					3			
					4			
					5			
					6			

Dry upon completion

Soil Engineers Ltd.

JOB NO.: 1904-S070

LOG OF BOREHOLE NO.: 3

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Erosion Control Measures

METHOD OF BORING: -

PROJECT LOCATION: Etobicoke Creek, west of Bloor Street to Pedestrian Bridge City of Mississauga

DRILLING DATE: -

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
0.0								
	CANCELLED DUE TO ACCESSIBILITY ISSUE				0 1 2 3 4 5 6			

JOB NO.: 1904-S070

LOG OF BOREHOLE NO.: 4

FIGURE NO.: 4

PROJECT DESCRIPTION: Proposed Erosion Control Measures

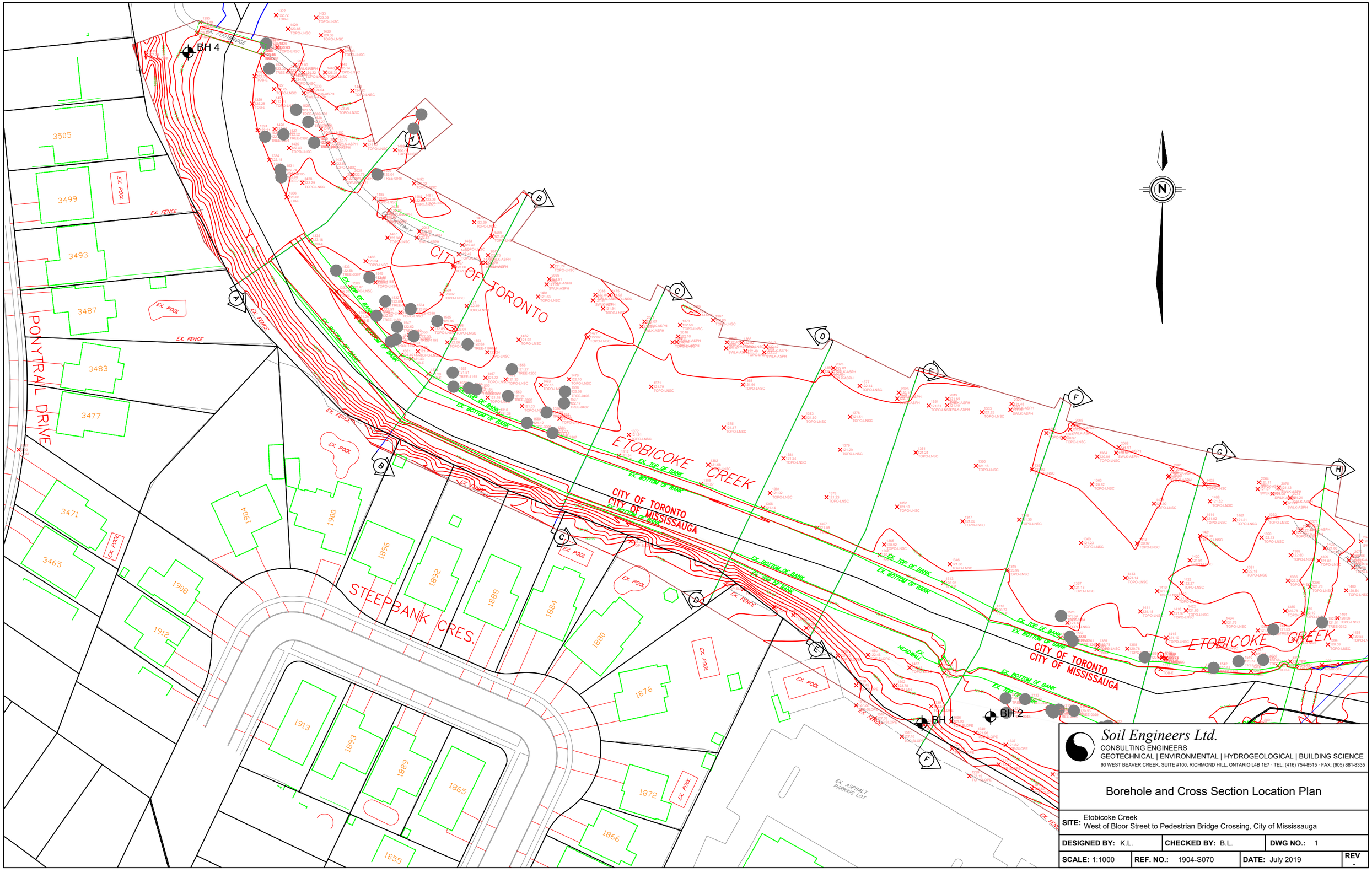
METHOD OF BORING: Hand Hammer

PROJECT LOCATION: Etobicoke Creek, west of Bloor Street to Pedestrian Bridge
City of Mississauga

DRILLING DATE: May 22, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
122.2	Ground Surface							
0.0	**10 cm TOPSOIL**				0			
	Firm to hard **SILTY CLAY** a trace to some sand occ. gravel and shale fragments weathered	1	DO	6			21	
		2	DO	10	1		12	
		3	DO	14	2		17	
	brown grey	4	DO	66/23			15	
119.5 2.7	**END OF BOREHOLE** **Refusal to sampling due to probable bedrock**				3 4 5 6			Dry upon completion

Soil Engineers Ltd.



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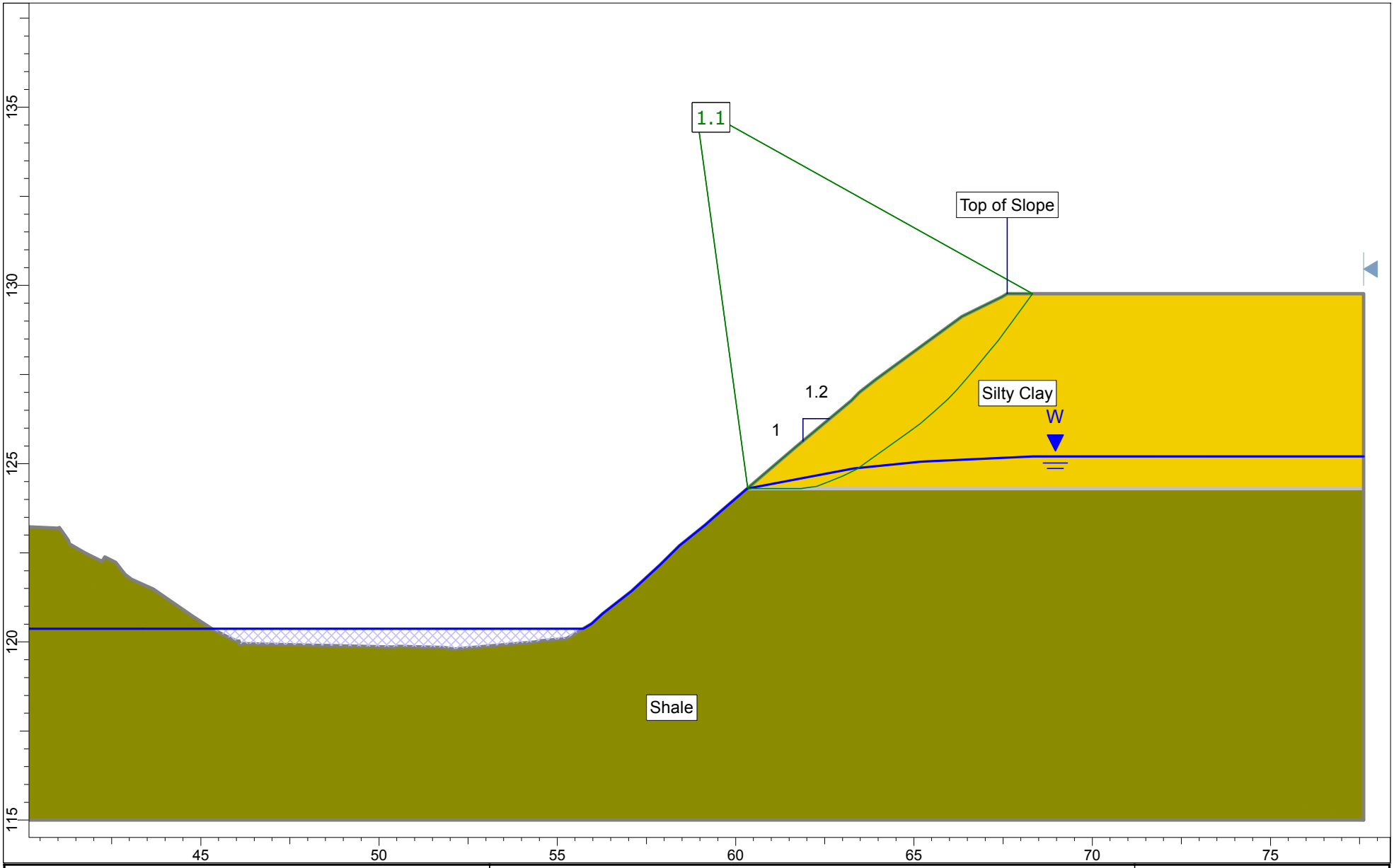
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

Borehole and Cross Section Location Plan

SITE: Etobicoke Creek
West of Bloor Street to Pedestrian Bridge Crossing, City of Mississauga

DESIGNED BY: K.L.	**CHECKED BY:** B.L.	**DWG NO.:** 1	
SCALE: 1:1000	**REF. NO.:** 1904-S070	**DATE:** July 2019	**REV** -



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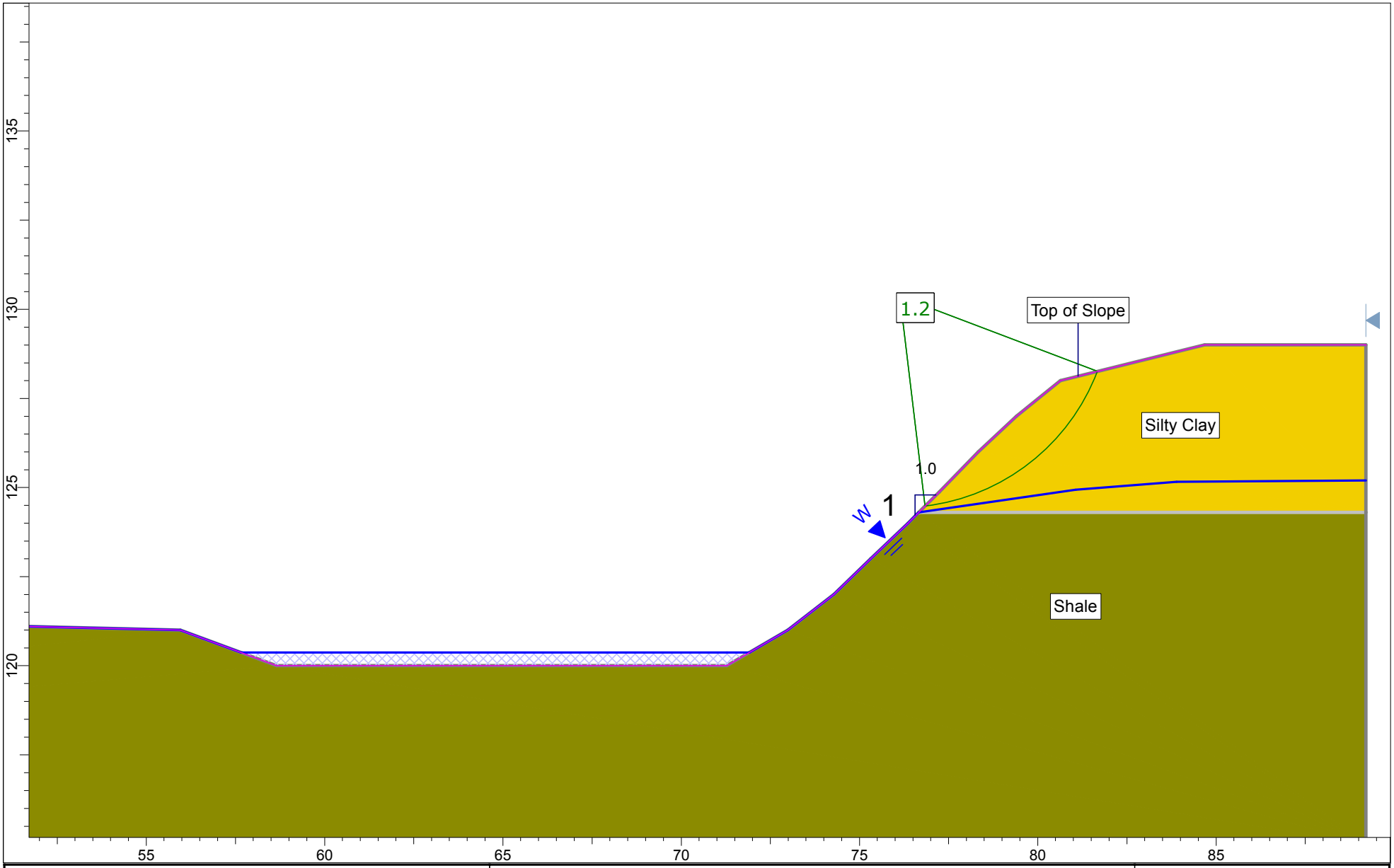
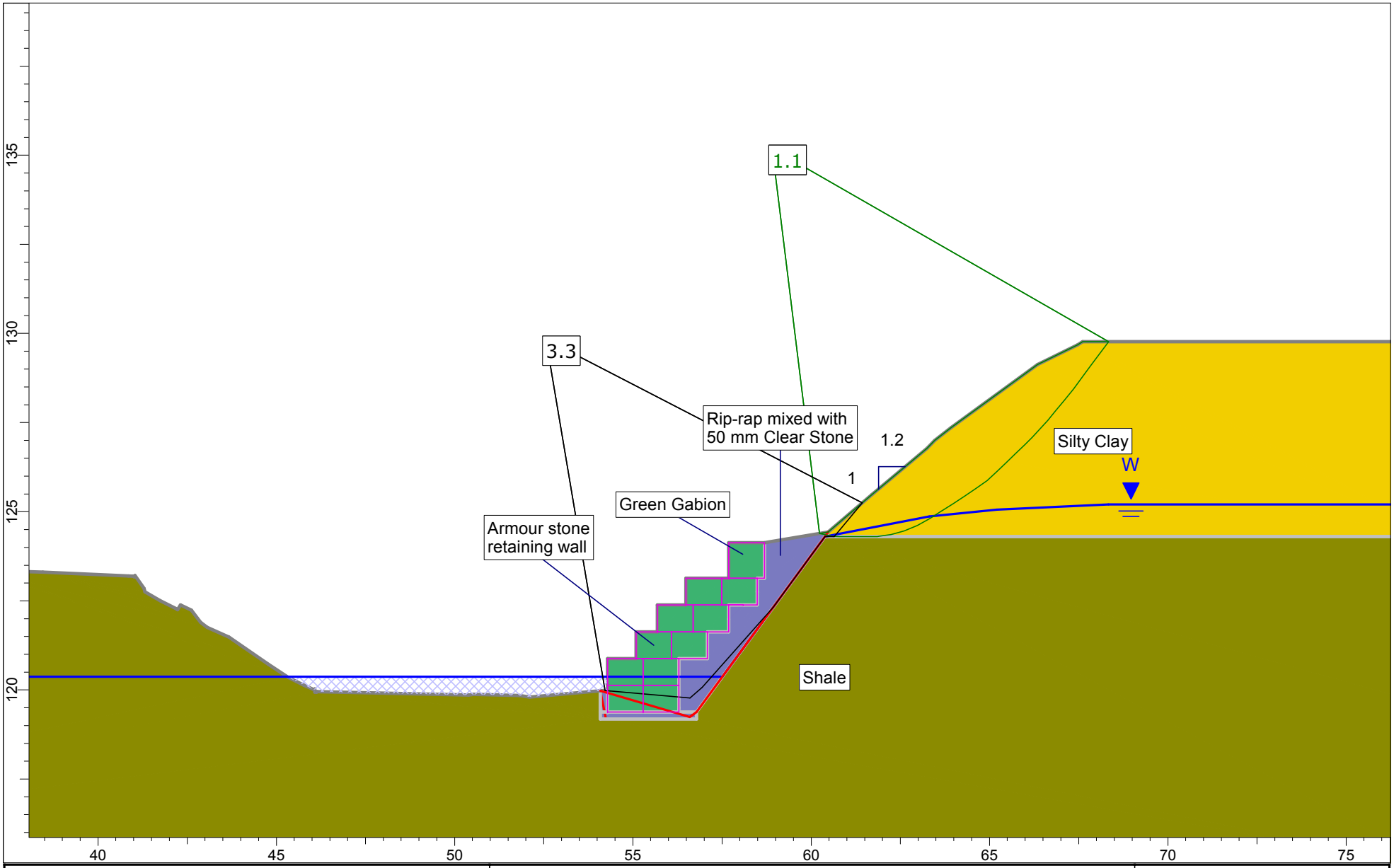
100 NUGGET AVENUE, TORONTO, ONTARIO M1S 3A7 · TEL: (416) 754-8515 · FAX: (416) 754-8516

Project Title: Proposed Erosion Control Measures - Cross Section A-A			Load Case: Existing Condition
Location: Etobicoke Creek, west of Bloor Street to Pedestrian Bridge, City of Missisauga			
Drawn By: K.L.	Checked By: B.L.	Scale: 1:150	Revision: -
Date: July 2019		Reference No.: 1904-S070	Drawing No.: 2



Soil Engineers Ltd. CONSULTING ENGINEERS GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE 100 NUGGET AVENUE, TORONTO, ONTARIO M1S 3A7 · TEL: (416) 754-8515 · FAX: (416) 754-8516	Project Title: Proposed Erosion Control Measures - Cross Section D-D			Load Case: Existing Condition
	Location: Etobicoke Creek, north of Bloor Street to Pedestrian Bridge, City of Brampton			
	Drawn By: K.L.	Checked By: B.L.	Scale: 1:150	Revision: -
	Date: July 2019		Reference No.: 1906-C061	Drawing No.: 3



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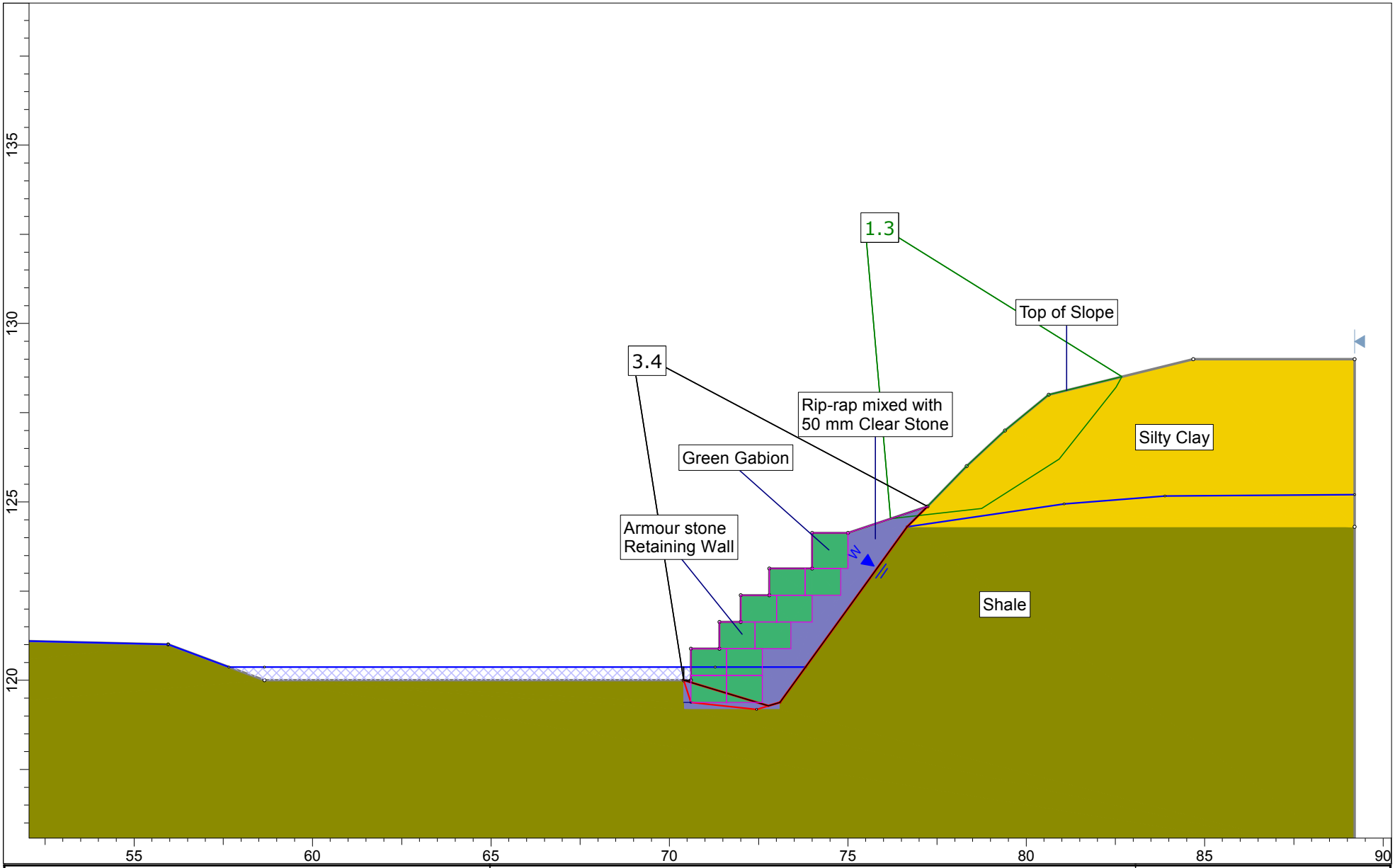
Project Title: Proposed Erosion Control Measures - Cross Section A-A			Load Case: Proposed Condition
Location: Etobicoke Creek, north of Bloor Street to Pedestrian Bridge, City of Brampton			
Drawn By: K.L.	Checked By: B.L.	Scale: 1:150	Revision: -
Date: July 2019		Reference No.: 1906-C061	Drawing No.: 4



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Project Title: Proposed Erosion Control Measures - Cross Section D-D			Load Case: Proposed Condition
Location: Etobicoke Creek, north of Bloor Street to Pedestrian Bridge, City of Brampton			
Drawn By: K.L.	Checked By: B.L.	Scale: 1:150	Revision: -
Date: July 2019		Reference No.: 1906-C061	Drawing No.: 5

APPENDIX B

Stage 1 and 2 Archaeological Site Assessment

Stage 1 and 2 Archaeological Assessment of Etobicoke Creek Erosion Control Part of Lot G, Concession Etobicoke River, Former Geographic Township of Etobicoke, County of York, Now in the City of Toronto and Part of Lot 2, Concession 1 NDS, Former Geographic Township of Toronto South, County of Peel, Now in the City of Mississauga

Prepared by

Licensee: Helen R. Haines
Archaeological Consulting Licence P124
Project Information Number P124-0082-2021

ORIGINAL REPORT
Report Dated: January 19, 2022

EXECUTIVE SUMMARY

AS&G Archaeological Consulting was contracted to conduct a Stage 1 and 2 Archaeological Assessment of Etobicoke Creek Erosion Control, Part of Lot G, Concession Etobicoke River, Former Geographic Township of Etobicoke, County of York, Now in the City of Toronto, and Part of Lot 2, Concession 1 North of Dundas Street, Former Geographic Township of Toronto South, County of Peel, Now in the City of Mississauga. The proposed project was triggered by the Ontario Environmental Assessment (EA) Act, R.S.O. 1990, and requires the proponent to complete a Municipal Class Environmental Assessment (MCEA), which includes the current archaeological assessment.

A Stage 1 background study of the property was conducted to provide information about the property's geography, history, previous archaeological fieldwork and current land condition in order to evaluate and document in detail the property's archaeological potential and to recommend appropriate strategies for Stage 2 survey. A Stage 2 property assessment was conducted to document all archaeological resources on the property, to determine whether the property contains archaeological resources requiring further assessment, and to recommend next steps. The property is approximately 2.16 hectares in size. The characteristics of the property dictated that the Stage 2 survey be conducted by a test pit survey strategy.

The Stage 1 background study found that the property exhibits potential for the recovery of archaeological resources of cultural heritage value and concluded that the property requires a Stage 2 assessment. The Stage 2 property assessment, which consisted of a systematic test pit survey, did not result in the identification of archaeological resources within the property. **The report recommends that no further archaeological assessment of the property is required**.

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PROJECT PERSONNEL

Project Manager:	Dr. Helen R. Haines (P124)
Project Director:	Mr. Norbert Stanchly (R149)
Field Director:	Mr. Norbert Stanchly
Field Archaeologists:	Mr. Norbert Stanchly Ms. Katherine Triglav
Report Preparation:	Mr. Norbert Stanchly Mr. Pete Demarte (R1073)
Graphics:	Mr. Norbert Stanchly Mr. Pete Demarte

INTRODUCTION

The *Ontario Heritage Act*, R.S.O. 1990 c. O.18, requires anyone wishing to carry out archaeological fieldwork in Ontario to have a license from the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI). All licensees are to file a report with the MHSTCI containing details of the fieldwork that has been done for each project. Following standards and guidelines set out by the MHSTCI is a condition of a licence to conduct archaeological fieldwork in Ontario. **AS&G Archaeological Consulting** confirms that this report meets Ministry report requirements as set out in the *2011 Standards and Guidelines for Consultant Archaeologists* and is filed in fulfillment of the terms and conditions an archaeological license.

1.0 PROJECT CONTEXT

This section of the report will provide the context for the archaeological fieldwork, including the development context, the historical context, and the archaeological context.

1.1 Development Context

AS&G Archaeological Consulting was contracted to conduct a Stage 1 and 2 Archaeological Assessment of Etobicoke Creek Erosion Control, Part of Lot G, Concession Etobicoke River, Former Geographic Township of Etobicoke, County of York, Now in the City of Toronto, and Part of Lot 2, Concession 1 North of Dundas Street, Former Geographic Township of Toronto South, County of Peel, Now in the City of Mississauga. The proposed project was triggered by the Ontario Environmental Assessment (EA) Act, R.S.O. 1990, and requires the proponent to complete a Municipal Class Environmental Assessment (MCEA), which includes the current archaeological assessment, in order to determine the most appropriate means of alleviating erosion to a section of the Etobicoke Creek.

The legal description of the property is: Part of Lot G, Concession Etobicoke River, Former Geographic Township of Etobicoke, County of York, Now in the City of Toronto, and Part of Lot 2, Concession 1 North of Dundas Street, Former Geographic Township of Toronto South, County of Peel, Now in the City of Mississauga. The property is approximately 2.16 hectares in size and is bounded by Bloor Street to the south and extends to the first pedestrian bridge on Markland Woods Golf Club (KSGS 2021:1).

Project Overview and Purpose

"Through its on-going erosion monitoring program, the City has identified this reach of Etobicoke Creek as high priority site in need of rehabilitation, based on the severity of erosion and risk to private properties. This reach of Etobicoke Creek borders on the City

of Toronto (East side) and the City of Mississauga (West side). The limit of the project is to focus on the stretch of creek from the golf course pedestrian bridge upstream, to the downstream of Bloor Street as this is the area of the greatest risk. The west side of the creek is on City of Mississauga owned lands up to the valley top-of-slope at the backyard lot lines of the residential properties along Ponytrail Drive and Steepbank Crescent. The area under Bloor Street is within both the Cities of Toronto and Mississauga

There is significant valley wall erosion along the west bank behind Ponytrail Drive and Steepbank Crescent, which backs onto private property, and in certain cases, beyond the private property fence line. The slope appears unstable and there are numerous trees in danger of collapsing. If the bank is not properly protected and managed, the valley wall will continue to erode and recede further into private property.

Along the top of the west valley slope are residential properties along Steepbank Crescent and Ponytrial Drive. Lands at the rear of some lots and within the adjacent valley show some signs of slumping and potential for future partial failure of portions of the steep slope to naturally achieve a more stable alignment (KSGS 2021:1-2).

Permission to access the property to conduct all required archaeological fieldwork activities, including the recovery of artifacts was given by the landowner and their representative.

1.2 Historical Context

In advance of the Stage 2 assessment, a Stage 1 background study of the property was conducted in order to document the property's archaeological and land use history and present condition. Several sources were referenced to determine if features or characteristics indicating archaeological potential for pre-contact and post-contact resources exist.

Characteristics indicating archaeological potential include the near-by presence of previously identified archaeological sites, primary and secondary water sources, features indicating past water sources, accessible or inaccessible shoreline, pockets of well-drained sandy soil, distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases, resource areas, (including food or medicinal plants, scarce raw materials, early Euro-Canadian industry), areas of early Euro-Canadian settlement, early historical transportation routes, property listed on a municipal register or designated under the *Ontario Heritage Act* or that is a federal, provincial or municipal historic landmark or site, and property that local histories or informants have identified with possible archaeological sites, historical events, activities, or occupations.

Archaeological potential can be determined not to be present for either the entire property or a part of it when the area under consideration has been subject to extensive and deep land alterations that have severely damaged the integrity of any archaeological resources. This is commonly referred to as 'disturbed' or 'disturbance', and may include: quarrying, major landscaping involving grading below topsoil, building footprints, and sewage and infrastructure development. Archaeological potential is not removed where there is documented potential for deeply buried intact archaeological resources beneath land alterations, or where it cannot be clearly demonstrated through background research and property inspection that there has been complete and intensive disturbance of an area. Where complete disturbance cannot be demonstrated in Stage 1, it will be necessary to undertake Stage 2 assessment.

The background study determined that the following features or characteristics indicate archaeological potential for the property:

- There is one (1) known archaeological site within a one-kilometre radius of the property
- The property lies within the South Slope physiographic region and is characterized by a smooth, faintly drumlinized, clay till plain that slopes gently towards Lake Ontario, and dominated by low permeability silt, clay and silt till of the Halton Till Formation (KSGS 2021).
- The property is located within 100 metres of historic transportation routes

- The property is located within 100 metres of an area of early Euro-Canadian settlement.
- The property is located within 100 metres of a primary water source (i.e. Etobicoke Creek)

Pre-contact Period

The Precontact period began with the arrival of nomadic peoples with the gradual retreat of the glaciers approximately 12,000 years ago (Karrow and Warner 1990). Between 12,000 and 10,000 years before present, the Paleo-Indian period was characterized by people that lived in small family groups, subsisting on large game and other fauna associated with the cooler environments of the period (Ellis and Deller 1990).

Archaic Period (10,000 – 2800 BP) – As the climate in southern Ontario warmed, Aboriginal populations adapted to these new environments. New technologies and subsistence strategies were introduced and developed. Woodworking implements such as groundstone axes, adzes and gouges began to appear, as did net-sinkers (for fishing), numerous types of spear points and items made from native copper, which was mined from the Lake Superior region. The presence of native copper on archaeological sites in southern Ontario and adjacent areas suggests that Archaic groups were involved in long range exchange and interaction. The trade networks established at this time were to persist between Aboriginal groups until European contact. Archaic peoples became seasonal hunters and gatherers to exploit seasonably available resources in differing geographic areas. As the seasons changed, these bands split into smaller groups and moved inland to exploit other resources that were available during the fall and winter such as deer, rabbit, squirrel and bear, which thrived in the forested margins of these areas (Ellis et al. 1990).

The Woodland Period (2800 BP to AD 750) saw the gradual establishment of technological and social changes, especially the appearance of clay pots (Spence et al. 1990). Population increases also led to the establishment of larger camps and villages with more permanent structures. Elaborate burial rituals and the interment of numerous exotic grave goods with the deceased began to take place. Increased trade and interaction between southern Ontario populations and groups as far away as the Atlantic coast and the Ohio Valley was also taking place. The Late Woodland period is marked by the introduction of maize to Southern Ontario, ca. AD 700. With the development of horticulture as the predominant subsistence base, the Late Woodland Period gave rise to a tremendous population increase and the establishment of permanent villages. Social changes were also taking place and distinct clustering of both longhouses within villages (clan development) and villages within a region (tribal development). The Late Woodland groups that inhabited the Toronto area eventually moved their villages northward toward Georgian Bay. It was these and other groups in southwest Ontario that eventually evolved into the Aboriginal nations who interacted with and were described by

French missionaries and explorers during the early seventeenth century (Williamson 2013).

Post-Contact History of York County and Township of Etobicoke

York County was first purchased by the British in 1783 from the Mississauga people and became the Province of Upper Canada in 1791. One year later the first lieutenant-governor, Colonel John Graves Simcoe, formed 19 counties including York County which originally comprised modern day York Region, Peel Region, Halton Region, Toronto, parts of Durham Region and the City of Hamilton. Eleven townships formed York County and included East Gwillimbury, East York, Etobicoke, Georgina, King, Markham, North Gwillimbury, North York, Scarborough, Vaughan, Whitchurch and York.

The name "Etobicoke" originates with the Mississauga First Nation, who called Etobicoke Creek and the area around it "Adobigok", meaning "where the alders grow." The Mississaugas had moved from the Mississagi River area on Lake Huron to the north shore of Lake Ontario around 1700. This area fell under British rule following the defeat of the French and the signing of the Treaty of Paris in 1763. However, it was not until 1787 that the British signed the Toronto Purchase agreement with the Mississaugas which included land from the Scarborough Bluffs to Etobicoke Creek. The Mississaugas, however, believed that the western boundary was to have been the Humber River. Nevertheless, a "Plan of Toronto" drawn by surveyor Alexander Aitken in 1788 shows the "Tobecoak River" as the western boundary and the dispute was not officially resolved until a new Toronto Purchase agreement was signed in 1805 (Etobicoke Historical Society 2021).

Britain passed the Constitutional Act of 1791, which provided for the division of the original Province of Quebec into the provinces of Lower Canada (Quebec) and Upper Canada (Ontario) and the subdivision of each province into counties, townships and towns. Etobicoke was part of York County, and the township's boundaries (using today's names) were set as: Steeles Avenue on the north; the Humber River on the east; Lake Ontario on the south; and on the west, Etobicoke Creek from the lake to Eglinton Avenue, then northeast along Eglinton to Renforth Drive, and then north more or less on Renforth and Highway 427.

Upper Canada's First Lieutenant Governor, John Graves Simcoe, arrived in Canada in 1791. He had served as a Captain in the American Revolutionary War where he led the Queen's Rangers regiment. He reconstituted the Queen's Rangers in Upper Canada to aid in defence and the development of this new province in Britain's image, with British names, systems and institutions. The new settlement of Toronto was renamed York, and the Toronto River was renamed the Humber River. Simcoe wanted to rename the Etobicoke River and the new township on its eastern bank "Smith," after Lieutenant

Colonel Samuel Smith who had been Simcoe's protégé in the Queen's Rangers. However, Simcoe was outvoted by his Executive Council, perhaps feeling that a Mississauga name should remain in place while the Toronto Purchase boundary dispute was unresolved. Thus, Etobicoke became the official name of both the river and this fledgling township in 1795 (ibid.).

When Simcoe arrived the population of Upper Canada was only 14,000, primarily in the eastern part of the province and on the Niagara Peninsula. One of his main goals was to increase the population so that there would be enough people to defend this British colony from possible future attacks by Americans or by natives. He offered free land to anyone willing to immigrate to Upper Canada and take an oath of allegiance to the King. His plan worked immediately, and 4,000 land petitions were received in the first year, 75% from Americans. By 1812, when war with the United States had become a reality, the population of Upper Canada had increased to 75,000, with 60% of the population now what were known as "Late Loyalists" from the United States.

The first survey of Etobicoke was completed in 1795 by Abraham Iredell, who divided the township's 31,000 acres into 100 acre farm lots. At that time, there were still no permanent residents of European descent in Etobicoke. The first land grant was made in 1797 to Sergeant Patrick Mealey of the Queen's Rangers, who received Lot 1, Concession 1, which today would be on the west side of Royal York Road, running north from Lake Ontario. Some early counts of Etobicoke's inhabitants show 8 residents in 1799, 40 in 1804, 84 in 1805, and 140 in 1808 (ibid.).

In 1791, Simcoe had the first road through Etobicoke surveyed going west from York along the shore of Lake Ontario, following an ancient aboriginal trail. This road is Lake Shore Boulevard today. In 1793, he built the King's Sawmill on the Humber River, adjacent to today's Old Mill Inn – the first industrial building in the Toronto area. That same year, Simcoe ordered the opening of Dundas Street, starting at the King's Mill and running west along today's Bloor Street to about Islington Avenue, and then dipping south and following the route Canadian Pacific does today to Etobicoke Creek, and west to Burlington Bay and eventually London. In 1814, Dundas Street was moved further north to its present location.

Simcoe felt that the provincial capital of Newark (now Niagara-on-the-Lake) was too close to the United States for safety, so in 1793 he moved it to York with its well-protected harbour. At the same time, he set aside 4,150 acres of land in Southern Etobicoke as "Militia Lands" and granted the lots to members of his Queen's Rangers, reasoning that these experienced soldiers could quickly be called into action to defend York in the event of an attack. Unfortunately, most of these retired soldiers did not take up residence on their land, but rather sold it or rented it out. Lt. Col. Samuel Smith was granted 2,600 of the 4,150 acres, a piece that ran from the lake north to Bloor Street, and from Etobicoke Creek east to Kipling Avenue. In 1797, Smith expanded a log cabin

already standing on the property near Etobicoke Creek, south of Lake Shore Blvd. and used it as his residence. He possessed a surfeit of land and social status but was never able to develop his vast property on the meagre income he earned as a half-pay officer. His descendants also left the land mostly unused until well into the 19th century, which proved a deterrent to early development in that area of Etobicoke (ibid.).

When the War of 1812 started, the population of Etobicoke was about 250. At least fifty-five men from Etobicoke served in the York Militia or regular British army during this war. At that time, the township was still on the frontier, with no churches, no schools, no villages, no post offices, no stores, no hotels, and no services. The only commercial enterprises were mills: two on the Humber River and two on Etobicoke Creek. What the residents did have was lots of trees, and the prospect of many more years of back breaking work to clear the land for farming.

After the War of 1812 and into the 1820s, both Canada and Britain experienced a depression. By 1850, over eight million people had left Britain for Canada. By 1839, Etobicoke's population had grown to 1,874. In 1850, there were 2900 residents and half of the land had been cleared and was under cultivation. Over the next 30 years, most of the remaining original forest was cleared so that by 1881, while the population was still around 2,900, 90% of the land was now under cultivation. Etobicoke had excellent soil for agriculture, and farmers were soon specializing in wheat, dairy, livestock, and fruit farming. In the late 19th and early 20th centuries, market gardening became popular in several areas of the township, including Humber Bay, Sunnylea and Richview (ibid.).

In early Upper Canada, local authority came from magistrates and justices of the peace appointed by the government. In late 1849, each township was finally granted the authority to elect its own council. The first council meeting in Etobicoke was held on January 21, 1850 in Mr. Kay's Inn on Dundas Street. For the next 38 years, council meetings rotated among various taverns across the township. In 1888, Etobicoke Township purchased and renovated the former Islington Methodist Church at 4946 Dundas St. W. to be their first Township Hall, making the village of Islington the centre of the township's municipal government. Soon the village also became the site of the headquarters for other municipal services such as the board of education, fire services, and electric power.

As the township grew in population, so too did improvements in housing, transportation, and the availability of services. Initially, most houses were log cabins, with the occasional frame or stone dwelling. By the late 1800s, log cabins were being replaced by frame or brick homes. You start to see the first appearances of schools, churches, hotels and stores in the 1830s. Initially settlers made use of aboriginal trails to travel throughout the township. In the 1840s, several plank toll roads opened in Etobicoke, including Albion Road and the Etobicoke and Mono Sixth Line Road (now Burnhamthorpe.) Other roads, while not planked, collected tolls to pay for maintenance, including Lakeshore

Road, Dundas Street, and Steeles. The first railway across Etobicoke was the Great Western Railway (now CN) which began service in 1854 along lake shore. The Grand Trunk Railway (now CN) opened a line in 1856 that ran northwest from Weston across Etobicoke. In 1877, the Credit Valley Railway (now CP) opened in between the other two lines, parallel to Dundas Street (ibid.).

Apart from a few larger centres of population, like Humber Bay, Mimico, New Toronto, The Kingsway, Lambton Mills and Islington, most of Etobicoke's 31,000 acres continued to be used for farming until after World War II when the post war baby boom changed Etobicoke forever. Suddenly the land was needed to provide housing for growing families and places for people to work. In the first quarter of 1946, Etobicoke recorded an unprecedented $2,000,000 in new building starts, and over the next few decades, almost all farm land was turned into housing, industry or support services such as schools and retail stores. It had taken Etobicoke 146 years to reach a population of 19,000 in 1941. Just 10 years later, in 1951, the population had almost tripled to 54,000; by 1961, it had almost tripled again to 156,000; and by 1971, that number had doubled to 283,000.

Despite numerous additions made to the Etobicoke Township Hall in Islington since 1888, by 1955 Etobicoke's Council could no longer manage the work generated by all of this growth in their old Township Hall. The Township purchased 22 acres of land on the west side of Highway 27, south of Burnhamthorpe Road, and in 1958 opened a new Municipal Centre and Board of Education building there (ibid.).

As the township grew, and subdivisions were built, the names of those developments were added to the lexicon of Etobicoke communities, including now familiar areas such as Rexdale, Humber Valley Village, Kipling Heights, Humberwood, Beaumonde Heights, and Markland Wood. To the industrial area in New Toronto were added even larger industrial areas in the Norseman /North Queen area, in Rexdale, and in the Claireville area in the northwest corner of the township. These business developments gave Etobicoke a strong tax base that was the envy of many other municipalities.

In the first half of the 20th century, Mimico, New Toronto and Long Branch had become independent villages or towns. In 1967, they were amalgamated once again with Etobicoke to form the new Borough of Etobicoke. In 1983, this Borough became the City of Etobicoke. When Etobicoke, along with Scarborough, North York, East York, and York, became part of one large, amalgamated City of Toronto in 1998, "Etobicoke" ceased to exist as a legal entity (ibid.).

Post-Contact History of Peel County and Township of Toronto South

"During most of the 1600s the Iroquois Confederacy or Five Nations controlled vast portions of Southern Ontario, including the area that is now Peel. Around 1700 the Iroquois, weakened by disease and warfare with the French, were pushed out of the area

by the Anishinabeg, a group migrating southward. The Anishinabeg who settled along the north shore of Lake Ontario were given a different name by the European settlers: The Mississaugas.

After the Seven Years War between Great Britain and France concluded in 1763, the French ceded overall control of what would become Quebec and Ontario to the British, who were then maintaining forts at Kingston and Niagara. The American Revolution (1775-1783) and the subsequent migration of Loyalist settlers from the newly formed United States of America to British lands convinced the British Crown of the desirability of formally acquiring new lands for settlement. As a result, the Crown began to purchase land from the Mississaugas via treaties: between 1783 and 1788 vast tracts of land within Ontario were purchased and surveyed for settlement. In 1798 the British built an inn at the mouth of the Credit River. The building, known as "The Government House," served as a waystation for couriers who carried dispatches between Niagara and the newly created Town of York (1793).

On August 2nd, 1805 the British and Mississaugas signed a treaty covering the southern portion of the "Mississauga Tract" on the Lake Ontario waterfront, reaching from the Etobicoke Creek on the east to Burlington Bay on the west, and running north to what in Peel is known as the Second Concession North of Dundas Street (also known as Eglinton Avenue). Within a year the land was surveyed and divided into "Townships" for settlement purposes. The township in the Peel area was known as Toronto Township (now the City of Mississauga). It is interesting to note that the naming of this Township predated the incorporation of the City of Toronto in 1834 (founded as the Town of York in 1793).

When Toronto Township was purchased the Mississaugas withheld a strip of land one mile wide on either side of the Credit River. The rest of the land was surveyed, and settlement began in earnest. Small hamlets sprung up at crossroads throughout the Township, including Summerville and Dixie. These hamlets were usually composed of a blacksmith shop, general store, church, and perhaps an inn or hotel. By 1818 the need for more land was apparent, and negotiations were started to purchase the remaining Mississauga land north of Eglinton Avenue. That same year 648,000 additional acres were purchased, and by 1819 the land was surveyed and divided into Townships. The Peel area now included an enlarged Toronto Township, as well as four additional townships: Chinguacousy, Toronto Gore, Albion, and Caledon. In February 1820 the Mississaugas surrendered the last of their lands along the Credit River, only keeping a small piece for a village that they subsequently abandoned in 1847 (now the Mississaugua Golf and Country Club).

When the various Peel Townships came into existence between 1805 and 1819, they were administered by the Home District Court of Quarter Sessions out of York. This body was appointed by the Lieutenant-Governor and was composed of Justices of the Peace (also

known as Magistrates of the Quarter Sessions) and other officials including a Clerk, a Sheriff, and a Treasurer. Townships were allowed to elect officials for minor matters, but they had very little authority and were always under the supervision of the magistrates. In 1841 legislation was passed changing the various District Courts from appointed bodies to elected bodies (thus creating a "Home District Council"), and then in 1850 the Districts themselves were dissolved in favour of smaller administrative units – Counties. From January 1850 to December 1851 the Peel area townships were administered by the County of York, composing the "Second Riding" of that county.

Peel County, named after Sir Robert Peel (1788-1850), a British politician who had previously served as both the Home Secretary and Prime Minister of Great Britain, was created in 1852 as part of the United Counties of York, Peel, and Ontario. Upon formation Peel was composed of the Townships of Toronto, Chinguacousy, Toronto Gore, Albion, and Caledon. Ontario County separated in 1854, leaving York and Peel joined, administered out of the City of Toronto. In 1867, after much discussion and debate, Peel officially separated from York, having built the necessary administrative buildings: a courthouse (with council chamber) and a jail.

As of 1850 each township was able to elect a council and to manage various local affairs, including upkeep of municipal roads, assessment of properties for tax purposes, provision of public utilities (water and electricity), operation of libraries, and providing firefighting and policing services. The County was responsible for (among other things) the operation of the jail and courthouse, the construction and maintenance of County roads and bridges, the operation of a Home for the Aged, oversight of a Health Unit, and drafting and implementing Peel's emergency operational plan (in the advent of natural disaster or war).

The Peel area was originally settled as a rural farming community, composed of vast tracts of farmland punctuated with small crossroad hamlets. With the building of grist and woolen mills and the coming of the railroad through Peel, various settlements grew in prominence, including Port Credit, Streetsville, and Malton in Toronto Township, Brampton in Chinguacousy Township, Caledon East in Caledon Township, and Bolton in Albion Township. As settlements grew there was a shift away from self-sufficient family farms to the creation of larger farms with a more urban focus, and the economy saw an upswing in industrial growth. Rail connections to Guelph, Barrie, and Toronto ensured that people and products could be moved at an ever increasing rate, driving both migration and innovation.

The extent of urban and industrial growth after the Second World War put great pressure on many County governments within Ontario. More Regional cooperation was seen as a possible solution. Under the proposed "Regional Government" model, regional planning initiatives and costly large scale programs & services would be administered by the upper tier government, with more local services provided by the lower tier government. The

model was first implemented in York County, with the creation of the Regional Municipality of Metropolitan Toronto (1953).

In 1974, after much research, discussion, and debate, a regional government structure was created for Peel by provincial legislation. The old County of Peel was dissolved and was replaced with the Region of Peel as the upper tier municipality.

This new regional government was given more responsibility than the former county and by 2015 it was responsible for (among other things) water delivery, public health, waste management, paramedic services, long-term care facilities, and policing. The former five Townships along with their respective towns and villages were amalgamated into the Cities of Mississauga and Brampton and the Town of Caledon. They, as lower tier governments, were given control over local affairs, including property assessment & tax collection, parks & recreation, public transit, firefighting, and libraries. Development and population growth continued to accelerate. In 1974 the population of the Peel area was 334, 750; by 2014 it had grown to over 1,350,000. Immigration was a driving factor in this growth, with new immigrants comprising 49% of the total" (PAMA 2021).

Property History: Part Lot G, Concession Etobicoke River and Part Lot 2, Concession 1 North of Dundas Street

The property is located within Part of Lot G, Concession Etobicoke River, in the former Township of Etobicoke, County of York, and Part of Lot 2, Concession 1 North of Dundas Street, in the former Township of Toronto South, County of Peel. According to Tremaine's *1859 Historical Atlas Map of Peel County*, Lot 2, Concession 1 North of Dundas Street in Toronto South Township was owned by a George Shunk, although the map does not depict any structures within the limits of the property. According to Tremaine's *1860 Historical Atlas Map of York County*, Lot G, Concession Etobicoke River in Etobicoke Township was owned by an Aaron Silverthorn, and similarly, the map does not depict any structures within the limits of the property.

Additionally, according to the *1877 Illustrated Historical Atlas of the County of Peel*, Lot 2, Concession 1 North of Dundas Street in Toronto South Township continued to be owned by George Shunk, and although there are two structures within the lot, none are depicted within the limits of the property. However, this does not negate the possibility that a homestead or other structure may have existed within the property. Lastly, according to the *1878 Illustrated Historical Atlas of the County of York*, Lot G, Concession Etobicoke River in Etobicoke Township was owned by an N. Silverthorn, and although there is one structure within the lot, it is not depicted within the limits of the property.

It must be borne in mind that inclusion of names of property owners and depictions of structures within properties on these maps were sold by subscription. While information

included within these maps may provide information about occupation of the property at a specific point in time, the absence of such information does not indicate that the property was not occupied.

The following information was obtained by accessing Abstract Indices online. We were not able to access Census Data as it is not available online at this time, and all land registry offices and archives are currently closed due to the Covid-19 pandemic and emergency measures that have been put into place within the City of Toronto and the Province of Ontario.

The initial Crown Patent of Lot G, Concession Etobicoke River, in the former Township of Etobicoke, County of York was made to John Campbell for all 200 acres in 1807. Mr. Campbell and his wife then sold the entire lot to John Silverthorn in 1811. The property was owned by the Silverthorn family for over 100 years and has exchanged hands many times over the course of the last few decades and these records are briefly listed below:

Abstract Indices

Lot G, Concession Etobicoke River, Etobicoke Township, York County

- February 1807: The Crown to John Campbell (patent, all)
- April 1811: John Campbell & Eliza Campbell, his wife to John Silverthorn (B&S, £100.0.0, all 200 acres)
- December 1929: Supreme Court of Ontario to Est. Newman Silverthorn (certificate, parts in al 2 8/100 acres)

The initial Crown Patent of Lot 2, Concession 1 North of Dundas Street, in the former Township of Toronto South, County of Peel was made to Abraham Cook for all 200 acres in 1819. Mr. Cook and his wife then sold the north part of the lot to George Shunk, and the remaining 100 acres of the lot to George Silverthorn, in 1823. The property then exchanged hands many times over the course of the following century and these records are briefly listed below:

Lot 2, Concession 1 North of Dundas Street, Toronto South Township, Peel County

- April 1819: The Crown to Abraham Cook (patent, all)
- June 1823: Abraham Cook et ux. to George Shunk (B&S, £67.10/, N. pt.)
- June 1823: Abraham Cook et ux. to George Silverthorn (B&S, £250, 100 acres front part coming to northern limit between 2 & 3 thence northwest to 44.44 chains from rear x E1713 of centre of E. River x along centre to line between 1 & 2 x south to Dundas x W 20 chains to pofc.)
- December 1833: George Silverthorn et ux. to John Bagwell (B&S, £150, 100 acres, front part)

- December 1841: John Bagwell to George Silverthorn (B&S, £150, 100 acres, front part)
- (B&S, £150, 100 acres, front part)
- December 1841: George Silverthorn et ux. to John Bagwell (B&S, £300, 100 acres, front part)
- (B&S, £150, 100 acres, front part)
- January 1844: George Shunk to George Shunk, Junior (D.Poll, north part)
- June 1849: John Elgie et ux. to John Bagewll (Mortgage, £400, 50 acres, east part of west half)
- August 1852: John Brown to John Bagewll (assignment of mortgage, £300, 50 acres)
- February 1854: John Elgie et ux. to William Hard (release, £700, 50 acres, coming at southeast thence north 45.81 chains to centre of Etobicoke x north and west along river to a point 49.45 chains from Dundas St. x south 38^0 west 9.60 chains from centre of river to centre of lot x south 45^0 east 49.95 chains to Dundas St. x east 10.13 ½ chains to pofc.)
- October 1854: John Elgie et ux. to James Alderson (B&S, £900, 65 acres, all front part except part in 298)
- June 1855: John Bagwell to William Ward (B&S, £104, east half of front part)
- January 1859: George Shunk Jr. et ux. to George Shunk Sr. (B&S, £100)
- August 1861: William Ward et ux. to Aaron Silverthorn ($3000.00, 50 acres)
- August 1865: James Alderson et ux. to William J. Shaver et al. Bethesda Church (B&S, £57, ¼ acre, Trustee. Coming at southwestern limit thence north 8 rods x south 5 rods x south 8 rods x west 5 rods to pofc.)
- July 1873: Aaron Silverthorn (will, east half)
- September 1890: Catherine Alderson et al. to William Alderson (trust deed, $1.00, from 65 acres and other lands upon certain trusts etc. re: James Alderson estate)
- March 1895: Francis Silverthorn to Aaron Silverthorn et al. (will, east half)
- November 1899: George Shunk Sr. to George Shunk (son) (will, 100 acres and other lands)
- November 1899: George Shunk to Daniel Granger et al. executors (will, in trust to sell)
- November 1899: Daniel Granger et al. executors, George Shunk estate to Jane M. Shunk, widow (B&S, $4,400.00, northerly part, 100 acres)
- October 1900: Jane M. Shunk (widow) to James Pellet (probate, among other bequests)

In summary, the Stage 1 background study indicates that there is potential for the recovery of pre-contact and post-contact Euro-Canadian archaeological resources within the property. As it cannot be clearly demonstrated through the background study that

there has been complete and intensive disturbance of the area, archaeological potential is not removed.

1.3 Archaeological Context

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (O.A.S.D.), an inventory of the documented archaeological record in Ontario.

Summary information on the known archaeological sites in the vicinity of the property was obtained from the MHSTCI site database. There are no known archaeological sites within the property or within a 300 metre radius, however, there is one (1) known archaeological site within a one-kilometre radius of the property (Table 1).

Table 1: Known Archaeological Sites within 1-Km of Property

Borden Number	**Site Name**	**Time Period**	**Affinity**	**Site Type**	**Current Development Review Status**
AjGv-24	Merton	Woodland, Late	Iroquoian	village	

The AjGv-24 Merton Site is listed as a Late Woodland village site with an Iroquoian cultural affinity. There is no other information available regarding this site on the MHSTCI site database other than it has recently been destroyed by a townhouse development project.

The property is approximately 2.16 hectares in size and is bounded by Bloor Street to the south and extends to the first pedestrian bridge on Markland Woods Golf Club (KSGS 2021:1).

The property falls within the “Etobicoke Creek Watershed and is a reach on the Etobicoke Main Branch. This reach of the creek borders on the municipal boundary between the City of Mississauga and the City of Toronto. The immediate surrounding land uses are predominately low/medium density residential, with a golf course to the east of the Creek.

The property is within the South Slope physiographic region and is characterized by a smooth, faintly drumlinized, clay till plain that slopes gently towards Lake Ontario. Topography within the Etobicoke Creek is characterized by a deeply incised valley corridor.

The Etobicoke and Mimico Creeks Watersheds Technical Update Report shows that much of the Etobicoke Creek Watershed is dominated by low permeability silt, clay and silt till of the Halton Till Formation, deposited approximately 13,000 years ago.

Due to the low permeability silt and clay overlaying much of the topography, groundwater recharge is not significant within the Etobicoke Creek Watershed and consequently in the Etobicoke Creek Main branch, where the Study Area is located. The groundwater flow is in the South/Southeasterly direction, through the various aquifers, but do not contribute to any significant groundwater discharge along Etobicoke Creek.

Geotechnical investigations along project area indicated that the site is generally underlain by a stratum of soft to hard silty clay, overlying shale bedrock. Shale was exposed at the face of the slope along the eroded valley walls on the west side of the creek. Examinations of the samples obtained from boreholes revealed that the soft silty clay is confined within the top 1 m of the soil stratigraphy. Boreholes drilled at the site did not yield any significant groundwater" (KSGS 2021:9).

The archaeological fieldwork of the property was undertaken on November 1, 2021, under partly cloudy skies and warm temperatures (~12°C). No rain occurred during the fieldwork.

No previous archaeological assessments have been conducted within the property. *AS&G Archaeological Consulting* is not aware of any other previous archaeological fieldwork carried out immediately adjacent to, or within 50 metres of the property.

We are unaware of any previous findings and recommendations relevant to the current stage of work with the exception of those discussed above.

There are no unusual physical features that may have affected fieldwork strategy decisions or the identification of artifacts or cultural features.

There is no additional archaeological information that may be relevant to understanding the choice of fieldwork techniques or the recommendations of this report.

2.0 FIELD METHODS

This section of the report addresses Section 7.8.1 of the 2011 Standards and Guidelines for Consultant Archaeologists. It does not address Section 7.7.2 because no property inspection was done as a separate Stage 1.

The entire property was surveyed with the exception of areas identified as visibly disturbed.

As relevant, we provide detailed and explicit descriptions addressing Standards 2a and b.

The general standards for property survey under Section 2.1 of the 2011 Standards and Guidelines for Consultant Archaeologists were addressed as follows:

- Section 2.1, S1 – All of the property was surveyed including lands immediately adjacent to built structures within the property, as applicable.
- Section 2.1, S2a (land of no or low potential due to physical features such as permanently wet areas, exposed bedrock, and steep slopes) – There are several areas of steep slope within the property limits that are assessed as having no or low potential. Etobicoke Creek represents a permanent water source with no potential.
- Section 2.1, S2b (no or low potential due to extensive and deep land alterations) – There are areas of extensive and deep disturbance associated with the golf course construction, its walkways and bridges, as well as construction of the Bloor Street bridge and previous channelization work along Etobicoke Creek within the property limits. These areas have no archaeological potential.
- Section 2.1, S2c (lands recommended not to require Stage 2 assessment by a previous Stage 1 report where the Ministry has accepted that Stage 1 into the register) – n/a
- Section 2.1, S2d (lands designated for forest management activity w/o potential for impacts to archaeological sites, as determined through Stage 1 forest management plans process) – n/a
- Section 2.1, S2e (lands formally prohibited from alterations) – n/a
- Section 2.1, S2f (lands confirmed to be transferred to a public land holding body, etc.) – n/a
- Section 2.1, S3 – The Stage 2 survey was conducted when weather and lighting conditions permitted excellent visibility of features.
- Section 2.1, S4 – No GPS recordings were taken as no artifacts were found during the Stage 2 assessment.
- Section 2.1, S5 – All field activities were mapped in reference to either fixed landmarks, survey stakes and development markers as appropriate. See report section *9.0 Maps*.
- Section 2.1, S6 – See report section *8.0 Images* for photo documentation of examples of field conditions encountered.

The property was subject to a systematic test pit survey appropriate to the characteristics of the property. The test pit survey of the property followed the standards within Section 2.1.2 of the *2011 Standards and Guidelines for Consultant Archaeologists*. Test pit survey was only conducted where ploughing was not possible or viable, as per Standard 1. Test pits were spaced at maximum intervals of five (5) metres throughout the property

identified as having archaeological potential. Test pits were excavated to within one metre of all existing structures. All test pits were at least 30 cm in diameter. Each test pit was excavated by hand, into at least the first 5 cm of subsoil and examined for stratigraphy, cultural features, or evidence of fill. No stratigraphy or cultural features were noted. Soils were screened through 6 mm mesh. No artifacts were encountered. All test pits were backfilled.

Areas of significant disturbance are documented by photos in section 8.0 Images of this report.

3.0 RECORD OF FINDS

This section documents all finds discovered as a result of the Stage 1 and 2 archaeological assessment of the property.

No archaeological resources or sites were identified in the Stage 2.

An inventory of the documentary record generated in the field is provided in Table 2.

Table 2: Inventory of Documentary Record

Document Type	**Description**
Field Notes	• This report constitutes the field notes for this project
Photographs	• 37 digital photographs
Maps	• The report figures represent all of the maps generated in the field.

Information detailing exact site locations on the property is not submitted because no sites or archaeological resources were identified in the Stage 2 assessment.

4.0 ANALYSIS AND CONCLUSIONS

No archaeological sites were identified within the property. Standard 2 is not addressed because no sites were identified.

5.0 RECOMMENDATIONS

The report makes recommendations only regarding archaeological matters.

The Stage 2 archaeological assessment did not identify any archaeological sites requiring further assessment or mitigation of impacts and **it is recommended that no further archaeological assessment of the property be required.**

6.0 ADVICE ON COMPLIANCE WITH LEGISLATION

Section 7.5.9, Standard 1a
This report is submitted to the Minister of Heritage, Sport, Tourism and Culture Industries as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 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 fieldwork and report recommendations ensure the conservation, protection and preservation 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 Heritage, Sport, Tourism and Culture Industries, 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.

Section 7.5.9, Standard 1b
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 fieldwork 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 Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

Section 7.5.9, Standard 1c
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 Section 48 (1) of the *Ontario Heritage Act*.

Section 7.5.9, Standard 1d
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.

Section 7.5.9, Standard 2
Not applicable

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Additional Sources

Onland.ca Lot G, Concession Etobicoke River, Etobicoke Township, York County & Lot 2, Concession 1 North of Dundas Street, Toronto South Township, Peel County.

8.0 IMAGES

Image 1: Conditions for test pit survey.

Image 2: Shows disturbed area with no archaeological potential.

Image 3: Shows Etobicoke Creek, disturbance associated with channelization of creek and overlying Bloor Street bridge.

Image 4: Shows conditions for test pit survey.

Image 5: Shows wooden bridge and associated disturbance as well as Etobicoke Creek.

Image 6: Shows steep slope and erosion on west bank of Etobicoke Creek.

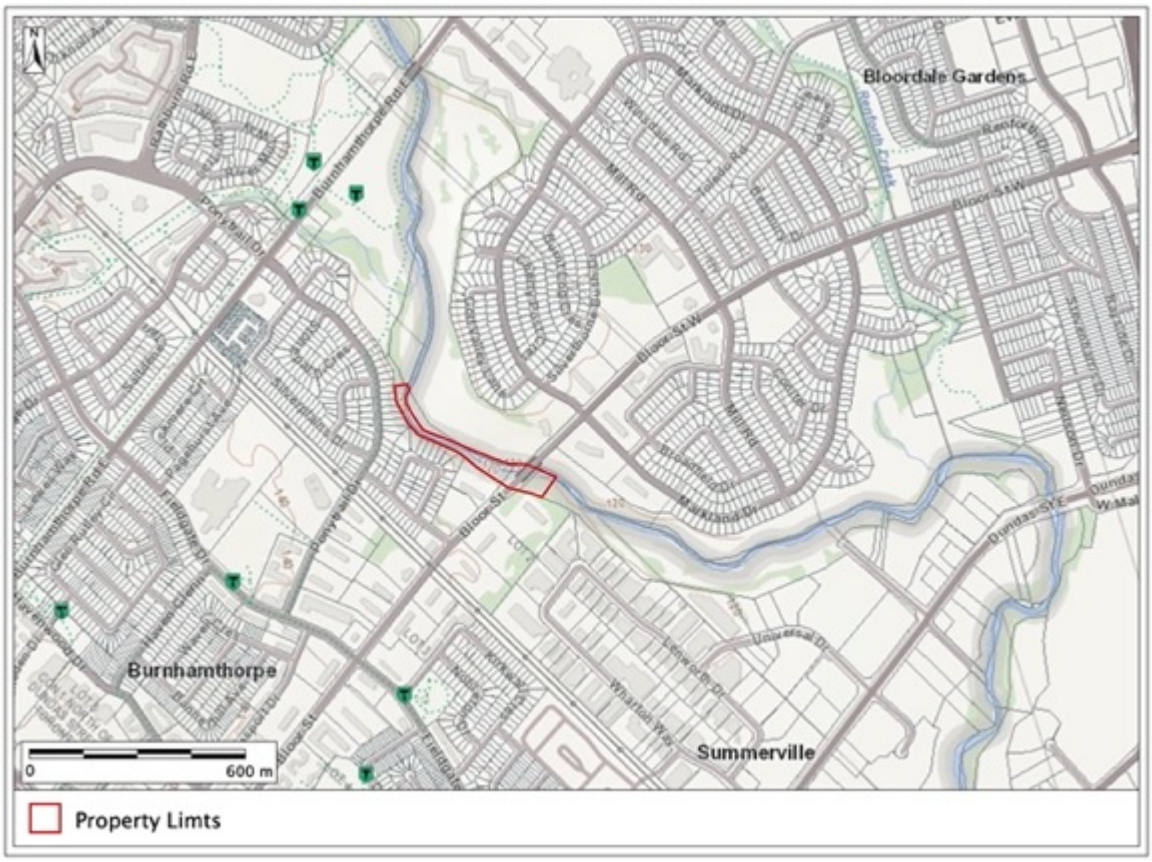
Image 7: Shows conditions for test pit survey.

Image 8: Shows steep slope (no archaeological potential).

Image 9: Shows conditions for test pit survey.

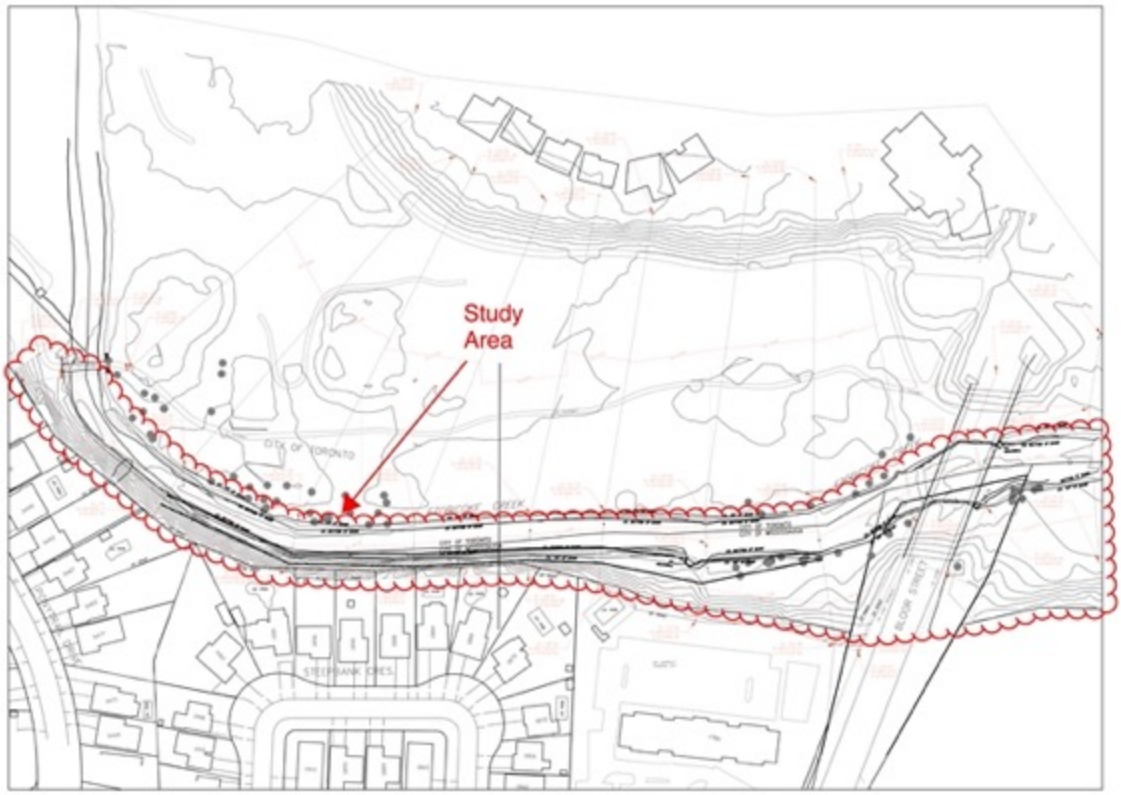
Image 10: Shows area of disturbance.

9.0 MAPS

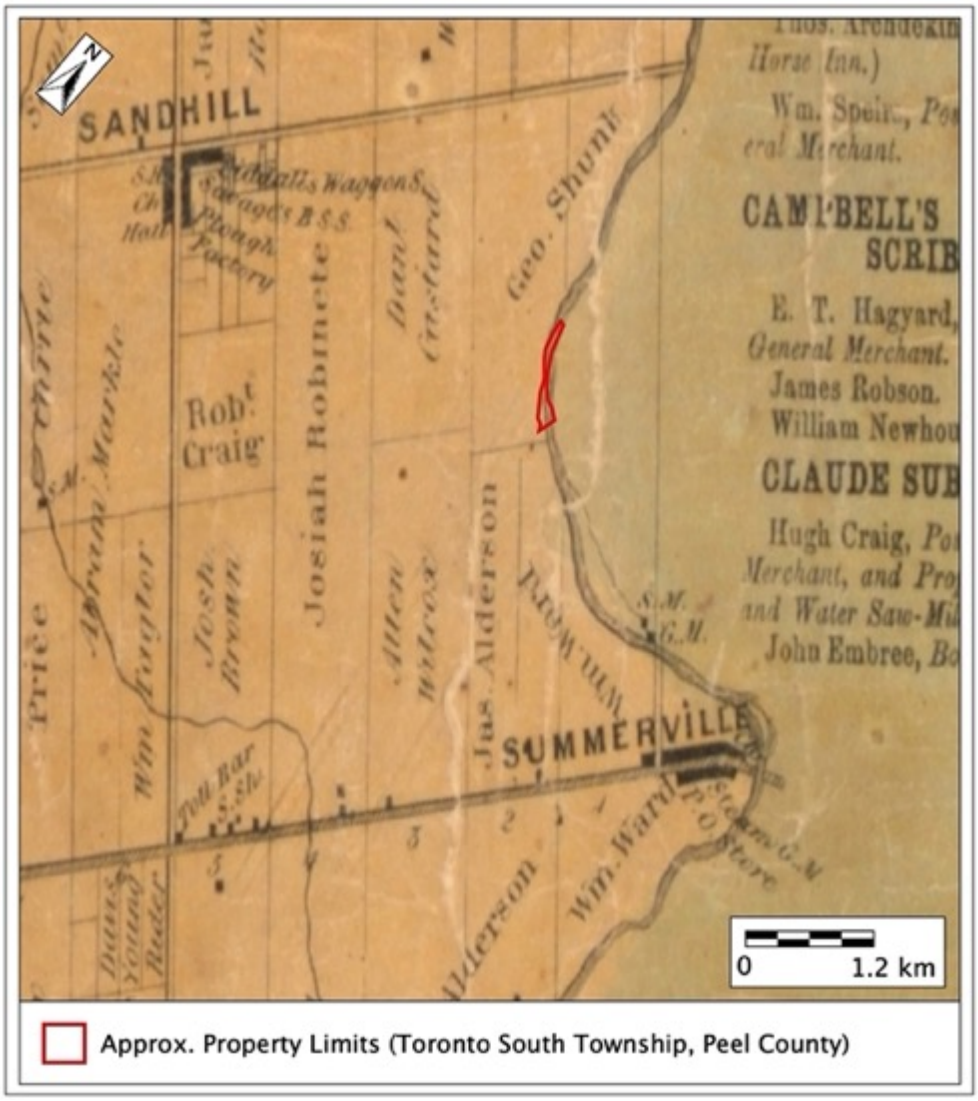


Map 1: General Location of Property (MNRF 2021)

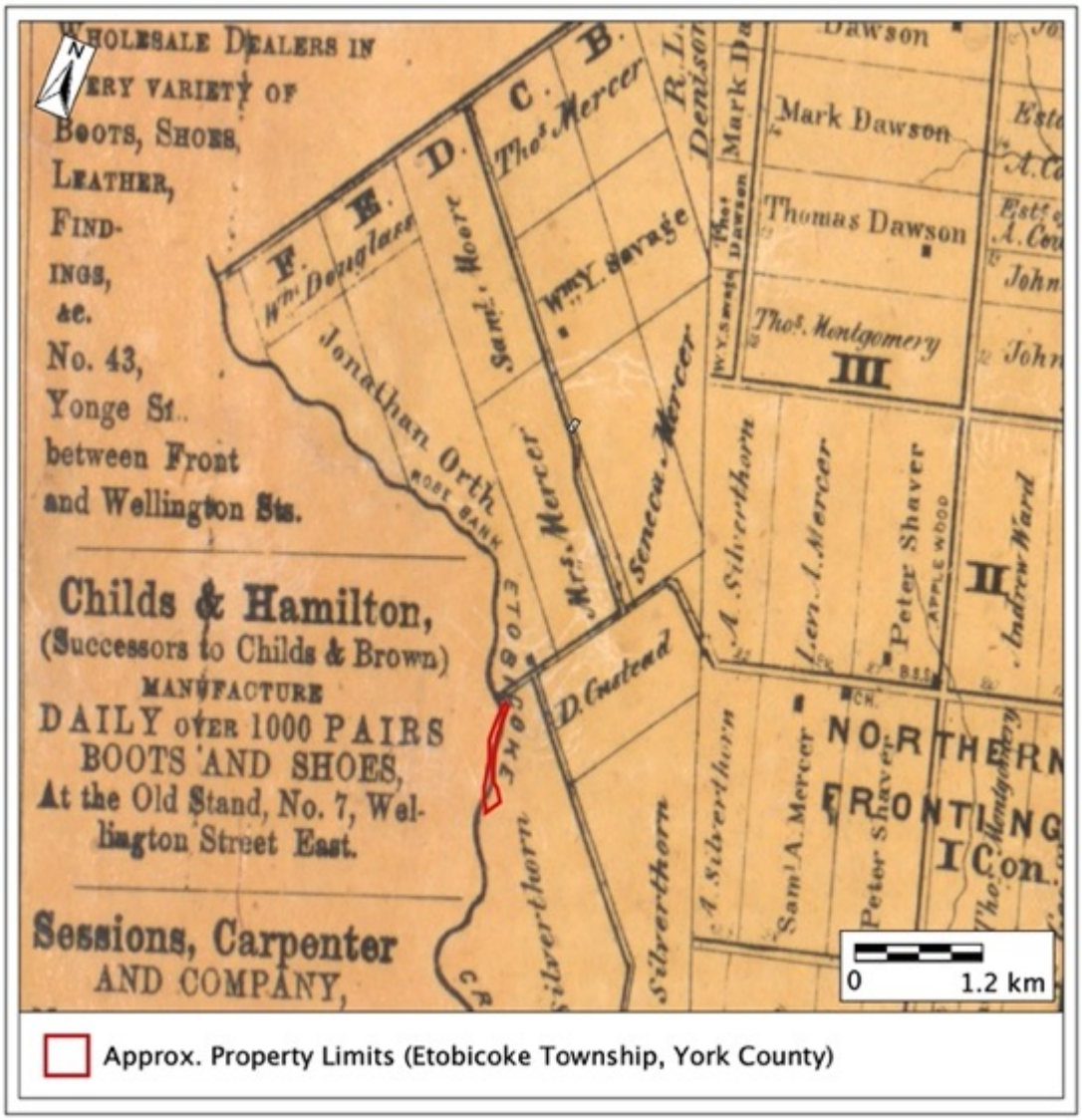
Map 2: Property Overlaid on Recent Aerial Mapping (MNRF 2021)



Map 3: Development Plan Map (Provided by Proponent)

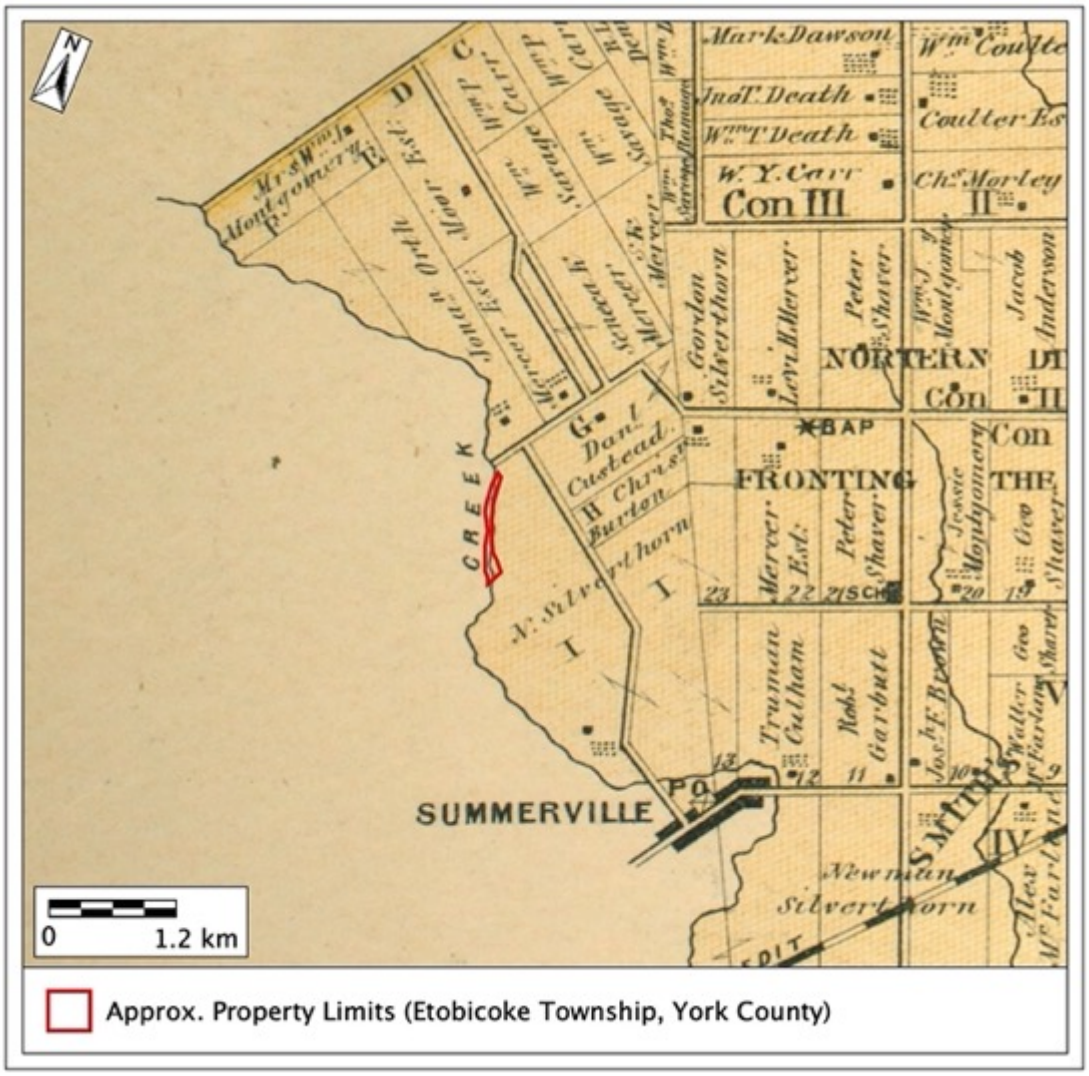


Map 4: Property Overlaid on 1859 Historical Atlas Mapping (Tremaine 1859)

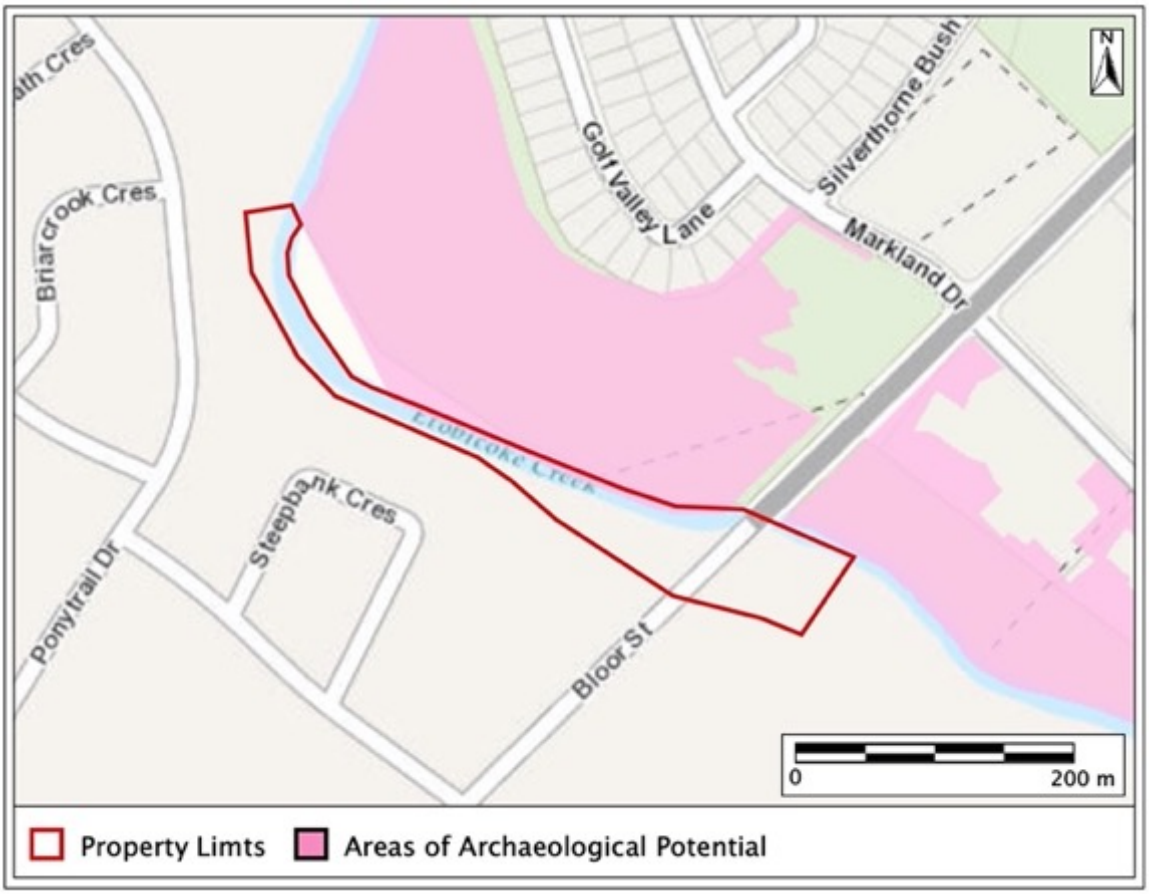


Map 5: Property Overlaid on 1860 Historical Atlas Mapping (Tremaine 1860)

Map 6: Property Overlaid on 1877 Historical Atlas Mapping (Walker & Miles 1877)

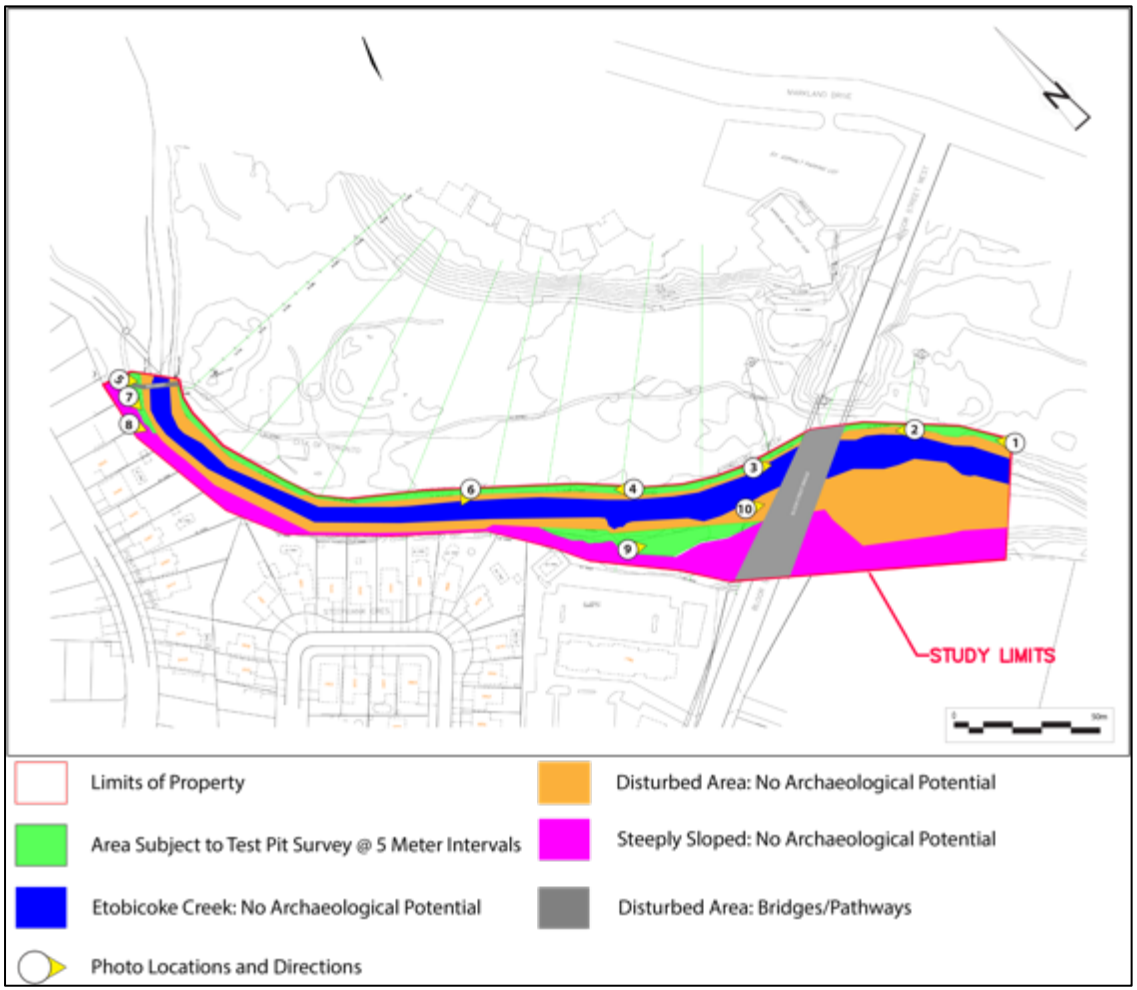


Map 7: Property Overlaid on 1878 Historical Atlas Mapping (Walker & Miles 1878)



Map 8: Limits of Property Overlaid on City of Toronto Map of Archaeological Potential (City of Toronto 2021)

Map 9: Clear copy of property limits mapping provided by proponent.



Map 10: Results of the Stage 2 Archaeological Assessment.

APPENDIX C

Photographic Record of Site Conditions

And Summary of Detailed Field Data

Photo 1.

Photo Location 1
Upstream view of the Bloor Street bridge. Note bank erosion along the right bank (left side of photo).

Photo 2.

Photo Location 1
Existing stone bank treatment immediately downstream of Bloor Street bridge (left/east bank).

Photo 3.

Photo Location 2
Existing conditions under Bloor Street bridge. Failed armour stone and bank protection stone has formed a medial bar under the bridge.

Photo 4.

Photo Location 2
Upstream-facing view of the failing weir structure, scour pool and concrete retaining walls.

Photo 5.

Photo Location 3

Upstream view of Etobicoke Creek from weir structure. Note: backwater influence from weir.

Photo 6.

Photo Location 3

Evidence of active bank erosion along right (west) bank.

Photo 7.

Photo Location 4

Existing stormwater outlet on right (west) bank.

Photo 8.

Photo Location 4

Downstream view of Bloor Street bridge.

Photo 9.

Photo Location 4
Upstream view of Etobicoke Creek within Markland Golf Club. Note: existing stone protection along both banks.

Photo 10.

Photo Location 4
Existing stone protection along left (east) bank within golf course.

Photo 11.

Photo Location 5
Downstream view of existing conditions.

Photo 12.

Photo Location 6
Upstream view of valley wall contact with existing stone toe protection.

Photo 13.

Photo Location 7
Point bar formation (shale bedrock) along left (east) bank.

Photo 14.

Photo Location 8
Upstream facing view of creek and cart path crossing at limit of study area.

Photo 15.

Photo Location 9
Downstream view of valley wall contact from cart path crossing. Note: shale point bar (photo left) and existing stone protection along toe of valley slope.

Photo 16.

Photo Location 10
Downstream facing view of study area limit at cart path crossing.

BEACON ENVIRONMENTAL

Geomorphology Group
Summary of Detailed Field Data

Date:	April 09, 2019	**Project:**	218164
Client:	City of Mississauga	**Watercourse:**	Etobicoke Creek
Location:	Markland Golf Club	**Reach:**	EC-1
Length Surveyed:	**437 m**	Number of Cross Sections:	**10**

General Site Characteristics

Geology/Soils: **Shale**

Surrounding Land Use: **Residential**

Channel Disturbances: **Stormwater outlet, Bloor Street crossing, weir structure, cart crossing, bank protection**

Aquatic Vegetation:
- Dominant Type: **None**
- Portion of Reach: **0%**

Riparian Vegetation:
- Dominant Type: **Maincured grass**
- Buffer Zone Continuity: **Fragmented**
- Channel Encroachment: **Low**

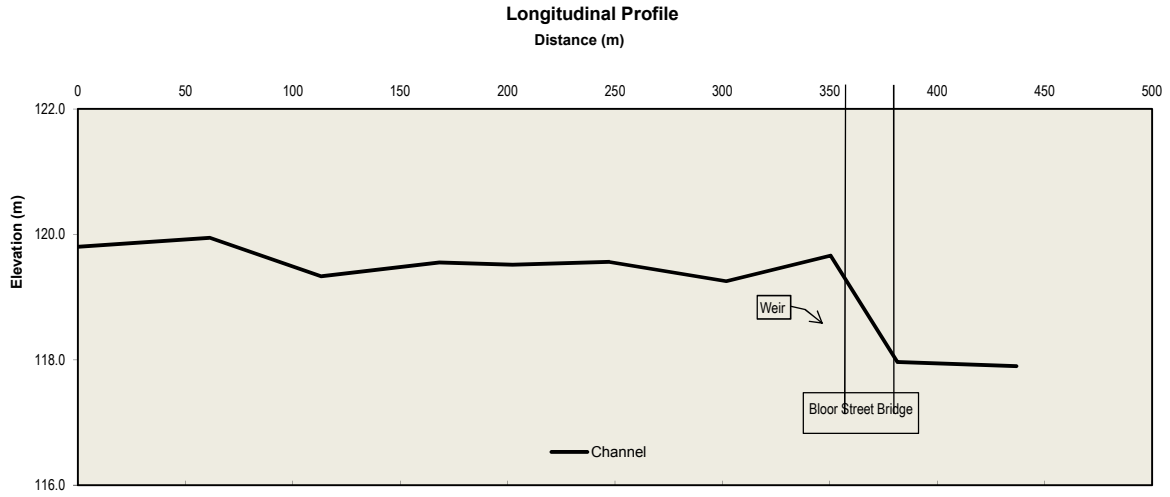
Large Woody Debris: **None**

Planform Characteristics

Bankfull Gradient: **0.38** %

Channel Bed Gradient: **0.38** %

Sinuosity: **1.00**



Bank Characteristics

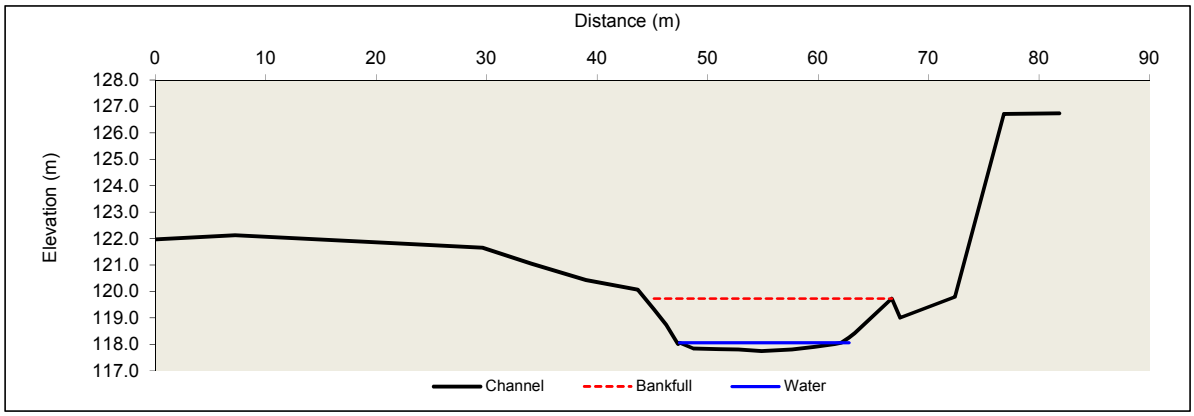
	Minimum	*Maximum*	*Average*
Bank Height (m):	**0.80**	**7.00**	**2.49**
Bank Angle (degrees):	**10**	**90**	**65**
Root Depth (m):	**0.05**	**0.8**	**0.21**
Root Density (%):	**2**	**90**	**41**
Undercut Banks (%)		**8**	
Depth of Undercut (m):		**0.50**	

Bank Material (range): **Sand and silt/clay, shale, stone revetment**

Cross-sectional Characteristics

	Minimum	*Maximum*	*Average*
Bankfull Width (m):	**18**	**35**	**25**
Average Bankfull Depth (m):	**0.68**	**1.50**	**0.94**
Bankfull Width/Depth:	**14**	**38**	**28**
Wetted Width (m):	**7.9**	**27**	**16**
Average Water Depth (m):		**0.94**	
Average Wetted Width/Depth:		**136**	
Max. Wetted Depth (m):		**0.75**	
Manning's n:		**0.037**	

Representative Cross-Section (#1)



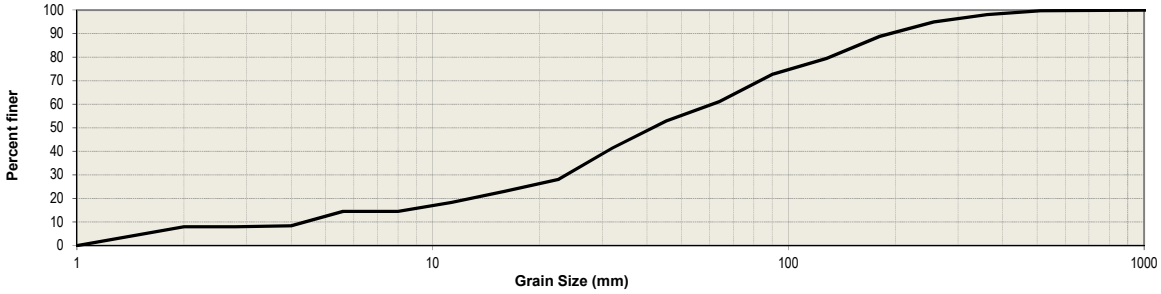
Substrate Characterization

Particle size

D_{10}	**3.3** mm
D_{50}	**41** mm
D_{84}	**160** mm

Subpavement:	**till**
Particle shape:	**sub-angular**
Embeddedness (%):	**10-20**
Particle range (riffle):	**clay/silt**
Particle Range (pool):	**N/A - No pool-riffle morphology**

Cumulative Particle Size Distribution



Hydrology

Measured Discharge:	**Not measured**	m^3/s	Calculated Bankfull Discharge:	**43.4**	m^3/s
Modelled 2-year Discharge:	**40-50**	m^3/s	Calculated Bankfull Velocity:	**1.70**	m/s
Modelled 2-year Velocity:	**N/A**	m/s			

General Field Observations

The reach was situated within a confined valley setting, with a low degree of sinuosity, moderate gradient and entrenchment. The riparian buffer was fragmented, extending <1 channel width in dimension. Vegetation consisted predominantly of manicured grass. Banks of the channel were lined with large, angular rip rap and armourstone blocks. Bank angles ranged between 10-90 degrees. The reach exhibited evidence of degradation, with an RGA score of 0.24 indicating that the channel was in transition or stressed. The RSAT score of 27.5 indicated that this reach was in relatively good ecological health for an urbanized stream, limited by riparian habitat conditions.

APPENDIX D

Tree Inventory Assessment

Tag/Tree #	Species	Common Name	DBH (cm)	Crown Dia. (m)	Health	Structure	Notes/Comments
1179	*Fraxinus pennsylvanica*	Green Ash	20	4	P	G	Emerald Ash Borer
388	*Acer saccharum ssp. saccharum*	Sugar Maple	27	4	G	G	None
389	*Tilia americana*	Basswood	48	7	G	G	None
393	*Tilia americana*	Basswood	51	7	G	G	None
394	*Tilia americana*	Basswood	51	8	G	G	None
392	*Tilia americana*	Basswood	31	4	G	G	None
391	*Tilia americana*	Basswood	36	5	G	G	None
1180	*Morus alba*	White Mulberry	13,5,7	4	F	G	None
1181	*Fraxinus pennsylvanica*	Green Ash	13	3	F	G	Emerald Ash Borer
395	*Acer platanoides*	Norway Maple	40	5	G	G	None
1182	*Ulmus pumila*	Siberian Elm	29	6	G	F	Codominant stems
397	*Picea abies*	Norway Spruce	69	10	G	G	None
1183	*Acer negundo*	Manitoba Maple	12,7,7	3	G	F	Crown Unbalanced
1184	*Acer platanoides*	Norway Maple	14	4	G	G	None
1185	*Acer negundo*	Manitoba Maple	15	3	G	F	Minor Lean
1186	*Picea abies*	Norway Spruce	33	4	F	G	None
1187	*Prunus avium*	Sweet Cherry	13	4	F	G	None
1188	*Morus alba*	White Mulberry	18	4	F	F	Cultivar?
396	*Acer saccharum ssp. saccharum*	Sugar Maple	41	7	G	G	None
1189	*Acer saccharum ssp. saccharum*	Sugar Maple	36	5	G	G	Crown Unbalanced
398	*Tilia americana*	Basswood	40	8	G	G	None
1190	*Tilia americana*	Basswood	32	7	G	G	None
1191	*Prunus avium*	Sweet Cherry	13	4	G	G	None
1192	*Acer negundo*	Manitoba Maple	25	4	G	F	None
1193	*Acer saccharum ssp. saccharum*	Sugar Maple	13	4	G	G	Girdled
399	*Picea glauca*	White Spruce	25	3	P	G	Crown Dieback
1194	*Fraxinus pennsylvanica*	Green Ash	16	3	P	F	Emerald Ash Borer
1195	*Fraxinus pennsylvanica*	Green Ash	20	4	P	F	Emerald Ash Borer, Sprouts at Base
1196	*Fraxinus pennsylvanica*	Green Ash	18	4	P	G	None
1197	*Fraxinus pennsylvanica*	Green Ash	19	4	P	G	None
1198	*Salix sepulcralis*	Hybrid Willow	29	6	G	G	None
1199	*Salix sepulcralis*	Hybrid Willow	16	4	G	P	Minor Lean
1200	*Salix sepulcralis*	Hybrid Willow	24	5	G	P	Minor Lean
3905	*Salix sepulcralis*	Hybrid Willow	25,30	10	G	F	None
3906	*Fraxinus pennsylvanica*	Green Ash	12	4	P	F	None
401	*Tilia americana*	Basswood	46	5	G	G	None
402	*Tilia americana*	Basswood	50	6	G	G	None
403	*Tilia americana*	Basswood	42	5	G	G	None
3907	*Fraxinus pennsylvanica*	Green Ash	11,12,12	4	P	F	None
414	*Acer platanoides*	Norway Maple	27	5	G	G	None
3261	*Populus deltoides ssp. deltoides*	Eastern Cottonwood	25	4	G	F	None
3265	*Fraxinus pennsylvanica*	Green Ash	15	2	P	G	None
415	*Picea glauca*	White Spruce	25	4	G	G	None
416	*Salix fragilis*	Crack Willow	60	10	G	F	None
417	*Picea glauca*	White Spruce	18	4	G	G	None
418	*Picea glauca*	White Spruce	21	4	G	G	None
419	*Acer platanoides*	Norway Maple	22	4	G	G	Crimson King
421	*Acer X freemanii*	Freeman's Maple	49	8	G	G	None
3266	*Fraxinus pennsylvanica*	Green Ash	12	3	P	F	var. rubra
3267	*Ulmus americana*	White Elm	20	3	G	F	None
314	*Acer negundo*	Manitoba Maple	62	7	G	F	None

APPENDIX E

Annotated List of Flora

Species		CC	CW	Status					Introduced 0=n 1=y	Vegetation Community
Scientific Name	Common Name			COSEWIC	COSSARO	G-Rank	S-Rank	TRCA Rank		ELC Com. 1: FOD5-3
Acer ginnala	Amur Maple	0	5			G?	SE1	-	I	x
Acer negundo	Manitoba Maple	0	-2			G5	S5	L+?	0	x
Acer platanoides	Norway Maple	0	5			G?	SE5	L+	I	x
Acer saccharum ssp. saccharum	Sugar Maple	4	3			G5	S5	L5	0	x
Amelanchier sp	Serviceberry Species	-	-			-	-	-	0	x
Arctium minus ssp. minus	Common Burdock	0	5			G?	SE5	L+	I	x
Cirsium arvense	Canada Thistle	0	3			G?	SE5	L+	I	x
Crataegus sp	Hawthorn Species	-	-			-	-	-	0	x
Fraxinus pennsylvanica	Green Ash	3	-3			G5	S5	L5	0	x
Lonicera tatarica	Tartarian Honeysuckle	0	3			G?	SE5	L+	I	x
Picea glauca	White Spruce	6	3			G5	S5	L3	0	x
Pinus sylvestris	Scots Pine	0	5			G?	SE5	L+	I	x
Prunus virginiana ssp. virginiana	Choke Cherry	2	1			G5	S5	L5	0	x
Quercus rubra	Red Oak	6	3			G5	S5	L4	0	x
Rhamnus cathartica	Common Buckthorn	0	3			G?	SE5	L+	I	x
Salix x fragilis	Crack Willow	0	-1			G?	SE5	L+	I	x
Solidago canadensis var. canadensis	Canada Goldenrod	1	3			G5	S5	L5	0	x
Solidago flexicaulis	Zig-zag Goldenrod	6	3			G5	S5	L5	0	x
Tilia americana	Basswood	4	3			G5	S5	L5	0	x
Vitis riparia	Riverbank Grape	0	-2			G5	S5	L5	0	x

APPENDIX F

Avifauna

Breeding Bird Survey Results

Common Name	Scientific Name	Status					# Pairs/Breeding Territories
		National Species at Risk COSEWICa	Species at Risk in Ontario Listing a	Provincial breeding season SRANK [b]	TRCA Status d	Area-sensitive (OMNR)c	
Canada Goose	*Branta canadensis*			S5	L5		F
Mallard	*Anas platyrhynchos*			S5	L5		1
Killdeer	*Charadrius vociferus*			S5	L4		1
Mourning Dove	*Zenaida macroura*			S5	L5		1
Chimney Swift	*Chaetura pelagica*	THR	THR	S4	L4		F
Downy Woodpecker	*Dryobates pubescens*			S5	L5		1
Tree Swallow	*Tachycineta bicolor*			S4	L4		1
Blue Jay	*Cyanocitta cristata*			S5	L5		1
Black-capped Chickadee	*Poecile atricapillus*			S5	L5		1
House Wren	*Troglodytes aedon*			S5	L5		1
American Robin	*Turdus migratorius*			S5	L5		3
Gray Catbird	*Dumetella carolinensis*			S4	L4		1
Cedar Waxwing	*Bombycilla cedrorum*			S5	L5		1
European Starling	*Sturnus vulgaris*			SE	L+		1
Warbling Vireo	*Vireo gilvus*			S5	L5		1
Red-eyed Vireo	*Vireo olivaceus*			S5	L4		1
American Redstart	*Setophaga ruticilla*			S5	L4	A	1
Song Sparrow	*Melospiza melodia*			S5	L5		5
Red-winged Blackbird	*Agelaius phoeniceus*			S4	L5		1
Common Grackle	*Quiscalus quiscula*			S5	L5		1
Baltimore Oriole	*Icterus galbula*			S4	L5		2
American Goldfinch	*Spinus tristis*			S5	L5		3

Field Work Conducted On: May 31 and June 28, 2019
F denotes foraging birds
Number of Species: 22 (2 only foraging)
Number of (provincial and national) Species at Risk: 0 breeding
Number of S1 to S3 Species: 0
Number of TRCA L1, L2 and L3 Species (Species of Concern): 0
Number of Area-sensitive Species: 1 (American Redstart)

KEY
a COSEWIC = Committee on the Status of Endangered Wildlife in Canada
a Species at Risk in Ontario List (as applies to ESA) as designated by COSSARO (Committee on the Status of Species at Risk in Ontario)
END = Endangered, THR = Threatened, SC = Special Concern

[b] SRANK (from Natural Heritage Information Centre) for breeding status if:
S1 (Critically Imperiled), S2 (Imperiled),S3 (Vulnerable), S4 (Apparently Secure), S5 (Secure)
SNA (Not applicable…'because the species is not a suitable target for conservation activities'; includes non-native species)

c Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide (Appendix G). 151 p plus appendices.

d Toronto and Region Conservation Authority L rank (2019):
L1 to L3 Regional species of concern from highest to lowest; L4 Urban concern; L5 Secure through region; L+ Non-native

APPENDIX G

Hydraulic Calculations

Existing - As Received

Reach	River Sta	Profile	Volume (1000 m3)	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Sections 13_15	13.1	2 Year	203.01	105.01	124.8	126.75	126.42	127.11	0.005712	2.67	39.37	47.04	0.72
Sections 13_15	13.1	5 Year	299.71	146.14	124.8	126.92	126.75	127.48	0.007741	3.32	44.04	51.67	0.85
Sections 13_15	13.1	10 Year	370.22	177.14	124.8	127.24	127.24	127.58	0.004389	2.78	125.37	334.68	0.66
Sections 13_15	13.1	25 Year	465.27	217.95	124.8	127.38	127.38	127.72	0.004373	2.92	173.41	381.87	0.67
Sections 13_15	13.1	50 Year	529.8	249	124.8	127.49	127.49	127.8	0.004044	2.91	216.78	408.95	0.65
Sections 13_15	13.1	100 year	591.49	281.59	124.8	127.62	127.55	127.88	0.003461	2.8	271.62	431.27	0.6
Sections 13_15	13.1	350 year	905.59	455.83	124.8	127.84	127.84	128.21	0.00493	3.56	368.42	472.04	0.73
Sections 13_15	13.1	Regional	1335.25	727.56	124.8	128.18	128.18	128.58	0.005286	4.03	546.44	541.71	0.77
Sections 13_15	13.09	2 Year	200.13	105.01	124.7	126.55	126.55	126.89	0.005038	2.96	77.41	177.92	0.7
Sections 13_15	13.09	5 Year	295.82	146.14	124.7	126.77	126.77	127.13	0.005094	3.21	109.99	206.85	0.72
Sections 13_15	13.09	10 Year	364.53	177.14	124.7	126.87	126.87	127.28	0.005767	3.53	125.3	220.89	0.77
Sections 13_15	13.09	25 Year	457.4	217.95	124.7	127.05	127.05	127.44	0.005367	3.6	157.21	431.03	0.76
Sections 13_15	13.09	50 Year	520.29	249	124.7	127.13	127.13	127.55	0.00567	3.78	171.87	469.81	0.78
Sections 13_15	13.09	100 year	580.05	281.59	124.7	127.22	127.22	127.65	0.005886	3.95	187.16	484.89	0.8
Sections 13_15	13.09	350 year	889.37	455.83	124.7	127.49	127.49	127.79	0.005071	3.93	434.98	532.29	0.76
Sections 13_15	13.09	Regional	1312.49	727.56	124.7	127.76	127.76	128.1	0.006188	4.62	579.81	560.4	0.85
Sections 13_15	13.085	2 Year	171.78	105.01	123	125.44		125.54	0.001381	1.76	144.78	155.39	0.38
Sections 13_15	13.085	5 Year	251.86	146.14	123	125.9		125.98	0.001009	1.71	261.13	349.92	0.34
Sections 13_15	13.085	10 Year	314.93	177.14	123	126.02		126.11	0.001115	1.85	305.13	374.88	0.36
Sections 13_15	13.085	25 Year	398.52	217.95	123	126.17		126.25	0.001158	1.95	359.65	379.74	0.37
Sections 13_15	13.085	50 Year	455.02	249	123	126.27		126.36	0.001161	2	400.53	382.43	0.37
Sections 13_15	13.085	100 year	508.58	281.59	123	126.37		126.46	0.001191	2.07	437.07	384.82	0.38
Sections 13_15	13.085	350 year	793.82	455.83	123	126.76		126.87	0.001405	2.44	590.84	396.36	0.42
Sections 13_15	13.085	Regional	1188.65	727.56	123	127.24		127.37	0.001603	2.83	782.78	404.21	0.45
Sections 13_15	13.08	2 Year	159.21	104.8	122.2	124.57	124.32	125.14	0.006083	3.69	46.92	39.27	0.79
Sections 13_15	13.08	5 Year	232.55	145.46	122.2	124.87	124.87	125.61	0.007088	4.33	59.73	46.89	0.87
Sections 13_15	13.08	10 Year	288.87	176.55	122.2	125.39	125.39	125.82	0.003812	3.6	141.49	236.92	0.66
Sections 13_15	13.08	25 Year	366.72	217.16	122.2	125.63	125.63	125.99	0.003355	3.55	203.62	284.45	0.62
Sections 13_15	13.08	50 Year	419.22	247.92	122.2	125.77	125.77	126.1	0.00323	3.58	243.94	292.55	0.62
Sections 13_15	13.08	100 year	470.16	280.98	122.2	125.83	125.83	126.19	0.00354	3.79	261.91	294.08	0.65
Sections 13_15	13.08	350 year	743.5	454.48	122.2	126.13	126.13	126.56	0.004476	4.51	353.58	299.69	0.74
Sections 13_15	13.08	Regional	1119.37	726.44	122.2	126.77		127.08	0.003494	4.41	546.14	305.72	0.67
Sections 13_15	13.075	2 Year	141.23	104.8	121.29	123.93		124.12	0.00264	2.61	115.75	142.37	0.52
Sections 13_15	13.075	5 Year	208.42	145.46	121.29	124.22		124.4	0.002427	2.69	160.05	153.95	0.51
Sections 13_15	13.075	10 Year	252.93	176.55	121.29	124.42		124.58	0.002315	2.74	190.14	158.03	0.5
Sections 13_15	13.075	25 Year	322.22	217.16	121.29	124.53		124.73	0.002753	3.07	208.66	160.48	0.55
Sections 13_15	13.075	50 Year	368.24	247.92	121.29	124.66		124.87	0.002802	3.18	229.22	163.23	0.56
Sections 13_15	13.075	100 year	414.87	280.98	121.29	124.8		125.01	0.002808	3.27	251.67	166.25	0.57
Sections 13_15	13.075	350 year	670.67	454.48	121.29	125.22		125.51	0.003671	4.04	324.67	174.85	0.66
Sections 13_15	13.075	Regional	1010.05	726.44	121.29	126.05		126.34	0.003214	4.31	474.78	188.64	0.64
Sections 13_15	13.071	2 Year	114.43	104.8	120.1	122.6	122.6	122.98	0.005918	3.56	74.9	104.76	0.73
Sections 13_15	13.071	5 Year	172.43	145.46	120.1	122.8	122.8	123.25	0.006969	4.07	92.04	127.17	0.8
Sections 13_15	13.071	10 Year	210.3	176.55	120.1	122.94	122.94	123.43	0.007627	4.41	104.11	151.76	0.84
Sections 13_15	13.071	25 Year	270.68	217.16	120.1	123.23	123.23	123.6	0.005856	4.13	167.52	169.01	0.75
Sections 13_15	13.071	50 Year	312.02	247.92	120.1	123.32	123.32	123.7	0.006198	4.33	181.58	171.93	0.78
Sections 13_15	13.071	100 year	353.91	280.98	120.1	123.39	123.39	123.8	0.006711	4.57	194.05	176.14	0.81
Sections 13_15	13.071	350 year	581.04	454.48	120.1	124.13	123.63	124.39	0.004294	4.19	337.93	204.97	0.67
Sections 13_15	13.071	Regional	861.35	726.44	120.1	125.55	124.2	125.67	0.001642	3.18	634.82	213.21	0.44
Sections 13_15	13.06	2 Year	96.1	104.8	118.6	121.27	120.04	121.45	0.001427	1.92	61.96	47.39	0.38
Sections 13_15	13.06	5 Year	148.54	145.46	118.6	121.63	120.4	121.89	0.001728	2.31	75.72	65.58	0.43
Sections 13_15	13.06	10 Year	181.39	176.55	118.6	121.89	120.65	122.2	0.001878	2.54	87.07	100.5	0.45
Sections 13_15	13.06	25 Year	229.89	217.16	118.6	122.23	120.96	122.53	0.001751	2.62	149.82	152.78	0.44
Sections 13_15	13.06	50 Year	265.01	247.92	118.6	122.45	121.18	122.74	0.001623	2.63	184.88	156.51	0.43
Sections 13_15	13.06	100 year	301.18	280.98	118.6	122.66	121.41	122.94	0.001548	2.66	217.5	159.25	0.42
Sections 13_15	13.06	350 year	490.65	454.48	118.6	123.59	122.64	123.83	0.001261	2.76	371.5	169.22	0.4
Sections 13_15	13.06	Regional	697.11	726.44	118.6	125.23	123.26	125.4	0.000727	2.53	658.77	180.76	0.31
Sections 13_15	13.05	2 Year	93.9	104.8	118.46	121.28	120.25	121.38	0.001067	1.43	80.61	51.72	0.33
Sections 13_15	13.05	5 Year	145.55	145.46	118.46	121.66	120.48	121.79	0.001112	1.64	100.81	54.44	0.34
Sections 13_15	13.05	10 Year	177.68	176.55	118.46	121.93	120.64	122.08	0.001113	1.77	115.95	56.23	0.35
Sections 13_15	13.05	25 Year	224.79	217.16	118.46	122.25	120.77	122.42	0.001129	1.92	134.23	59.29	0.36
Sections 13_15	13.05	50 Year	258.88	247.92	118.46	122.45	120.99	122.65	0.001157	2.04	146.73	61.38	0.37
Sections 13_15	13.05	100 year	294.09	280.98	118.46	122.64	121.15	122.87	0.001209	2.16	158.5	63.28	0.38
Sections 13_15	13.05	350 year	479.22	454.48	118.46	123.39	121.82	123.75	0.001526	2.78	208.21	68.52	0.44
Sections 13_15	13.05	Regional	677.49	726.44	118.46	124.84	122.68	125.28	0.001314	3.16	313.15	85.49	0.43
Sections 13_15	13.045		Bridge										
Sections 13_15	13.04	2 Year	91.76	104.8	118.4	120.57	119.66	120.71	0.001492	1.71	70.74	50.03	0.38
Sections 13_15	13.04	5 Year	142.83	145.46	118.4	120.94	119.93	121.12	0.001563	1.95	91.02	59.76	0.4
Sections 13_15	13.04	10 Year	174.49	176.55	118.4	121.2	120.12	121.41	0.00157	2.1	107.53	63.81	0.41

Sections 13_15	13.04	25 Year	221.05	217.16	118.4	121.51	120.35	121.74	0.001568	2.26	127.35	66.01	0.42
Sections 13_15	13.04	50 Year	254.77	247.92	118.4	121.7	120.53	121.96	0.001603	2.38	140.24	67.07	0.43
Sections 13_15	13.04	100 year	289.64	280.98	118.4	121.87	120.7	122.16	0.001677	2.52	151.98	68.03	0.44
Sections 13_15	13.04	350 year	473.38	454.48	118.4	122.54	121.46	123	0.002194	3.26	198.22	71.39	0.52
Sections 13_15	13.04	Regional	669.81	726.44	118.4	123.05	122.29	123.9	0.003554	4.5	235.17	73.92	0.68
Sections 13_15	13.035	2 Year	86.44	104.8	117.66	120.26		120.53	0.002275	2.42	62.16	52.45	0.48
Sections 13_15	13.035	5 Year	136.22	145.46	117.66	120.49		120.88	0.003064	2.97	75.09	58.79	0.57
Sections 13_15	13.035	10 Year	166.76	176.55	117.66	120.69		121.15	0.003358	3.26	87.54	64.19	0.6
Sections 13_15	13.035	25 Year	211.97	217.16	117.66	120.92	120.51	121.46	0.00373	3.6	102.58	70.49	0.64
Sections 13_15	13.035	50 Year	244.69	247.92	117.66	121.07	120.71	121.67	0.003907	3.81	115.84	95.89	0.66
Sections 13_15	13.035	100 year	278.52	280.98	117.66	121.23	120.92	121.86	0.004029	3.98	131.22	100.17	0.68
Sections 13_15	13.035	350 year	457.73	454.48	117.66	121.9	121.74	122.66	0.004448	4.69	204.26	120.29	0.73
Sections 13_15	13.035	Regional	648.43	726.44	117.66	122.74	122.54	123.58	0.004407	5.28	319.42	145.71	0.75
Sections 13_15	13.03	2 Year	72.71	104.8	116.4	118.62	118.62	119.39	0.008467	4.21	37.95	32.49	0.91
Sections 13_15	13.03	5 Year	114.11	145.46	116.4	119.32	119.32	119.85	0.004618	3.75	85.97	104.42	0.7
Sections 13_15	13.03	10 Year	140.21	176.55	116.4	119.51	119.51	120.05	0.004767	3.97	105.51	110.49	0.72
Sections 13_15	13.03	25 Year	180.1	217.16	116.4	119.71	119.71	120.28	0.004942	4.22	128.72	117.41	0.74
Sections 13_15	13.03	50 Year	208.86	247.92	116.4	119.84	119.84	120.44	0.005131	4.41	144.11	121.79	0.76
Sections 13_15	13.03	100 year	238.38	280.98	116.4	119.97	119.97	120.59	0.005289	4.59	160.21	126.34	0.78
Sections 13_15	13.03	350 year	398.42	454.48	116.4	120.48	120.48	121.22	0.006152	5.42	227.74	136.32	0.86
Sections 13_15	13.03	Regional	563.78	726.44	116.4	121	121	121.98	0.007822	6.62	300.88	144.9	0.99
Sections 13_15	13.021	2 Year	48.65	104.8	116	117.38		117.49	0.002664	1.83	109.78	115.94	0.5
Sections 13_15	13.021	5 Year	76.23	145.46	116	117.72		117.83	0.002141	1.9	149.46	122.05	0.46
Sections 13_15	13.021	10 Year	96.04	176.55	116	117.89		118.01	0.002175	2.03	170.23	125.12	0.47
Sections 13_15	13.021	25 Year	127.68	217.16	116	118.12		118.26	0.002171	2.19	200	136.63	0.48
Sections 13_15	13.021	50 Year	150.77	247.92	116	118.26		118.42	0.002246	2.33	221.04	148.53	0.5
Sections 13_15	13.021	100 year	173.33	280.98	116	118.45		118.61	0.002176	2.42	249.73	163.35	0.49
Sections 13_15	13.021	350 year	312.12	454.48	116	118.84		119.12	0.003229	3.25	319.27	194.66	0.62
Sections 13_15	13.021	Regional	448.1	726.44	116	119.37		119.79	0.003991	4.06	435.94	235.4	0.71
Sections 13_15	13.02	2 Year	31.26	104.8	115	116.78	116.5	117	0.003704	2.55	85.38	102.9	0.61
Sections 13_15	13.02	5 Year	46.69	145.46	115	117.31	116.73	117.47	0.002252	2.37	142.61	210.81	0.5
Sections 13_15	13.02	10 Year	58.27	176.55	115	117.58	116.89	117.7	0.001644	2.18	234.01	239.06	0.43
Sections 13_15	13.02	25 Year	79.61	217.16	115	117.87	117	117.97	0.00128	2.07	308.77	275.35	0.39
Sections 13_15	13.02	50 Year	95.92	247.92	115	118.05	117	118.13	0.001167	2.05	356.65	279.87	0.38
Sections 13_15	13.02	100 year	109.33	280.98	115	118.27	117.34	118.35	0.000971	1.96	420.93	284.38	0.35
Sections 13_15	13.02	350 year	232.46	454.48	115	118.59	117.82	118.71	0.001494	2.59	511.17	291.17	0.44
Sections 13_15	13.02	Regional	342.57	726.44	115	119.09	118.2	119.25	0.001856	3.15	657.88	295.2	0.5
Sections 13_15	13.01	2 Year	19.47	105.6	113.11	115.7	115.24	116.2	0.00442	3.32	44.55	31.48	0.66
Sections 13_15	13.01	5 Year	26.6	146.71	113.11	116.06	115.75	116.79	0.005371	4	57.85	51.62	0.75
Sections 13_15	13.01	10 Year	32.01	177.65	113.11	116.28	115.97	117.11	0.005767	4.35	70.17	61.7	0.78
Sections 13_15	13.01	25 Year	44.29	218.88	113.11	116.7	116.7	117.49	0.004942	4.39	105.19	103.91	0.74
Sections 13_15	13.01	50 Year	54.91	250.44	113.11	116.89	116.89	117.68	0.004886	4.51	126.44	119.43	0.74
Sections 13_15	13.01	100 year	63.03	282.51	113.11	116.89	116.89	117.89	0.006218	5.09	126.44	119.43	0.84
Sections 13_15	13.01	350 year	158.17	459.22	113.11	117.84	117.84	118.3	0.003217	4.26	382.05	345.39	0.63
Sections 13_15	13.01	Regional	244.75	738.41	113.11	118.24	118.24	118.76	0.003984	5	523.72	362.92	0.71

Existing - KSGS Revised

Reach	River Sta	Profile	Volume (1000 m3)	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Sections 13_15	13.1	2 Year	192.56	105.01	124.8	126.75	126.42	127.11	0.005712	2.67	39.37	47.04	0.72
Sections 13_15	13.1	5 Year	290.83	146.14	124.8	126.92	126.75	127.48	0.007741	3.32	44.04	51.67	0.85
Sections 13_15	13.1	10 Year	361.26	177.14	124.8	127.24	127.24	127.58	0.004389	2.78	125.37	334.68	0.66
Sections 13_15	13.1	25 Year	452.03	217.95	124.8	127.38	127.38	127.72	0.004373	2.92	173.41	381.87	0.67
Sections 13_15	13.1	50 Year	518.28	249	124.8	127.49	127.49	127.8	0.004044	2.91	216.78	408.95	0.65
Sections 13_15	13.1	100 year	582.61	281.59	124.8	127.62	127.55	127.88	0.003518	2.82	269.28	430.26	0.61
Sections 13_15	13.1	350 year	890.24	455.83	124.8	127.84	127.84	128.21	0.00493	3.56	368.42	472.04	0.73
Sections 13_15	13.1	Regional	1275.66	727.56	124.8	128.18	128.18	128.58	0.005286	4.03	546.44	541.71	0.77
Sections 13_15	13.09	2 Year	189.69	105.01	124.7	126.55	126.55	126.89	0.005038	2.96	77.41	177.92	0.7
Sections 13_15	13.09	5 Year	286.93	146.14	124.7	126.77	126.77	127.13	0.005094	3.21	109.99	206.85	0.72
Sections 13_15	13.09	10 Year	355.97	177.14	124.7	126.77	126.87	127.3	0.007457	3.89	110.19	206.97	0.87
Sections 13_15	13.09	25 Year	444.84	217.95	124.7	126.96	127.05	127.45	0.006782	3.94	141.99	340.74	0.85
Sections 13_15	13.09	50 Year	509.23	249	124.7	127.08	127.13	127.55	0.006423	3.97	163.12	447.42	0.83
Sections 13_15	13.09	100 year	571.22	281.59	124.7	127.22	127.22	127.65	0.005886	3.95	187.16	484.89	0.8
Sections 13_15	13.09	350 year	874.02	455.83	124.7	127.49	127.49	127.79	0.005071	3.93	434.98	532.29	0.76
Sections 13_15	13.09	Regional	1255.34	727.56	124.7	127.54	127.76	128.2	0.011301	5.93	458.84	536.82	1.14
Sections 13_15	13.085	2 Year	161.03	105.01	123	125.46	124.75	125.55	0.001335	1.74	147.04	156.52	0.38
Sections 13_15	13.085	5 Year	243.18	146.14	123	125.89	124.96	125.97	0.001026	1.72	259.09	349.46	0.34
Sections 13_15	13.085	10 Year	307.75	177.14	123	126.02	125.22	126.11	0.001116	1.85	305.04	374.87	0.36
Sections 13_15	13.085	25 Year	388.16	217.95	123	126.17	125.39	126.25	0.001158	1.95	359.65	379.74	0.37
Sections 13_15	13.085	50 Year	445.44	249	123	126.27	125.49	126.36	0.001165	2	400.05	382.39	0.37
Sections 13_15	13.085	100 year	499.9	281.59	123	126.37	125.63	126.45	0.001202	2.08	435.51	384.72	0.38
Sections 13_15	13.085	350 year	778.48	455.83	123	126.76	126.17	126.87	0.001406	2.44	590.74	396.36	0.42
Sections 13_15	13.085	Regional	1137.82	727.56	123	127.28	126.47	127.39	0.001523	2.78	796.54	404.44	0.44
Sections 13_15	13.08	2 Year	147.8	104.8	122.2	124.76		125.2	0.004422	3.32	54.7	44.22	0.68
Sections 13_15	13.08	5 Year	223.86	145.46	122.2	124.9	124.9	125.61	0.006737	4.25	61.11	47.28	0.85
Sections 13_15	13.08	10 Year	281.68	176.55	122.2	125.39	125.39	125.82	0.003804	3.6	141.7	237.17	0.66
Sections 13_15	13.08	25 Year	356.37	217.16	122.2	125.63	125.63	125.99	0.003355	3.55	203.62	284.45	0.62
Sections 13_15	13.08	50 Year	409.61	247.92	122.2	125.77	125.77	126.1	0.003196	3.56	245.14	292.65	0.61
Sections 13_15	13.08	100 year	461.36	280.98	122.2	125.84	125.84	126.19	0.003428	3.74	265.63	294.4	0.64
Sections 13_15	13.08	350 year	728.16	454.48	122.2	126.14	126.14	126.56	0.004468	4.5	353.83	299.7	0.74
Sections 13_15	13.08	Regional	1066.24	726.44	122.2	126.88		127.14	0.002969	4.13	578.07	306.71	0.62
Sections 13_15	13.075	2 Year	133.07	104.8	121.29	123.63	123.63	124.03	0.005497	3.46	78.04	110.87	0.74
Sections 13_15	13.075	5 Year	202.19	145.46	121.29	124.07	123.87	124.33	0.003601	3.15	135.91	150.52	0.62
Sections 13_15	13.075	10 Year	247.34	176.55	121.29	124.32	124.08	124.53	0.002858	2.98	175.05	156	0.56
Sections 13_15	13.075	25 Year	311.1	217.16	121.29	124.58	124.21	124.76	0.002522	2.96	215.72	161.41	0.53
Sections 13_15	13.075	50 Year	357.05	247.92	121.29	124.74	124.29	124.92	0.002407	2.99	242.75	165.03	0.52
Sections 13_15	13.075	100 year	403.66	280.98	121.29	124.91	124.38	125.08	0.002316	3.03	270.38	168.69	0.52
Sections 13_15	13.075	350 year	647.83	454.48	121.29	125.61	124.75	125.79	0.002129	3.28	394.04	181.09	0.51
Sections 13_15	13.075	Regional	947.97	726.44	121.29	126.32		126.55	0.002382	3.85	526.56	192.15	0.55
Sections 13_15	13.073	2 Year	121.99	104.8	120.26	122.76	122.16	123.16	0.00346	2.86	45.25	49.48	0.6
Sections 13_15	13.073	5 Year	184.36	145.46	120.26	123.07	122.68	123.6	0.00396	3.33	66.83	87.29	0.66
Sections 13_15	13.073	10 Year	224.96	176.55	120.26	123.23	123.18	123.84	0.004405	3.66	81.3	94.95	0.7
Sections 13_15	13.073	25 Year	283.12	217.16	120.26	123.48	123.48	124.11	0.004399	3.87	106.45	105.5	0.71
Sections 13_15	13.073	50 Year	325.41	247.92	120.26	123.63	123.63	124.29	0.004465	4.02	122.63	114.23	0.72
Sections 13_15	13.073	100 year	368.31	280.98	120.26	123.76	123.76	124.45	0.004598	4.2	138.67	122.75	0.74
Sections 13_15	13.073	350 year	595.42	454.48	120.26	124.34	124.34	125.16	0.005104	4.93	216.36	144.32	0.8
Sections 13_15	13.073	Regional	866.55	726.44	120.26	125.47		126.03	0.003152	4.6	425.31	198.29	0.66
Sections 13_15	13.071	2 Year	116.31	104.8	119.61	122.29	122.11	122.7	0.003986	3.09	58.7	64.59	0.65
Sections 13_15	13.071	5 Year	176.53	145.46	119.61	122.64	122.44	123.1	0.004025	3.41	87.9	118.95	0.67
Sections 13_15	13.071	10 Year	215.81	176.55	119.61	122.78	122.78	123.29	0.004379	3.69	105.38	121.84	0.71
Sections 13_15	13.071	25 Year	271.8	217.16	119.61	122.99	122.98	123.51	0.004357	3.86	132.69	133.21	0.71
Sections 13_15	13.071	50 Year	312.51	247.92	119.61	123.15	123.1	123.65	0.004173	3.91	154.67	141.88	0.7
Sections 13_15	13.071	100 year	353.79	280.98	119.61	123.31	123.21	123.81	0.004073	4	178.29	153.19	0.7
Sections 13_15	13.071	350 year	572.05	454.48	119.61	124.14	123.83	124.52	0.002919	3.93	320.31	175.26	0.62
Sections 13_15	13.071	Regional	825.22	726.44	119.61	125.49		125.72	0.001541	3.44	559.91	179.74	0.47
Sections 13_15	13.069	2 Year	110.63	104.8	119.57	121.93	121.64	122.29	0.003626	2.81	59.15	62.56	0.61
Sections 13_15	13.069	5 Year	168.46	145.46	119.57	122.18	121.98	122.66	0.004405	3.34	85.01	118.78	0.69
Sections 13_15	13.069	10 Year	205.64	176.55	119.57	122.44	122.37	122.85	0.0037	3.27	116.82	127.01	0.64
Sections 13_15	13.069	25 Year	258.81	217.16	119.57	122.73		123.09	0.003121	3.22	155.6	134.96	0.6
Sections 13_15	13.069	50 Year	297.4	247.92	119.57	122.94		123.27	0.00279	3.19	183.32	136.73	0.57
Sections 13_15	13.069	100 year	336.61	280.98	119.57	123.12		123.44	0.002632	3.22	208.33	138.51	0.56
Sections 13_15	13.069	350 year	543.62	454.48	119.57	123.98		124.26	0.00207	3.32	331.31	146.44	0.52
Sections 13_15	13.069	Regional	777.82	726.44	119.57	125.36		125.59	0.001313	3.2	538	151.29	0.43
Sections 13_15	13.067	2 Year	102.92	104.8	119.42	121.98		122.07	0.001018	1.57	143.43	145.64	0.33
Sections 13_15	13.067	5 Year	157.96	145.46	119.42	122.31		122.4	0.000967	1.67	192.18	147.82	0.33
Sections 13_15	13.067	10 Year	192.74	176.55	119.42	122.53		122.63	0.00095	1.75	224.65	149.1	0.33
Sections 13_15	13.067	25 Year	242.97	217.16	119.42	122.8		122.89	0.000927	1.83	264.38	150.62	0.33
Sections 13_15	13.067	50 Year	279.48	247.92	119.42	122.98		123.08	0.000914	1.89	292.57	151.69	0.33

Sections 13_15	13.067	100 year	316.78	280.98	119.42	123.16		123.26	0.000923	1.97	318.76	152.7	0.34
Sections 13_15	13.067	350 year	514.4	454.48	119.42	123.99		124.11	0.000913	2.26	447.36	157.5	0.35
Sections 13_15	13.067	Regional	732.61	726.44	119.42	125.36		125.49	0.000709	2.4	668.61	163.56	0.32
Sections 13_15	13.066	2 Year	97.79	104.8	119.29	121.81		122	0.001771	2.02	86.69	115.22	0.43
Sections 13_15	13.066	5 Year	150.95	145.46	119.29	122.12		122.33	0.001874	2.26	127.41	149.55	0.46
Sections 13_15	13.066	10 Year	184.28	176.55	119.29	122.36		122.56	0.00167	2.27	164.33	152.37	0.44
Sections 13_15	13.066	25 Year	232.73	217.16	119.29	122.65		122.83	0.001482	2.29	208.88	155.66	0.42
Sections 13_15	13.066	50 Year	267.99	247.92	119.29	122.85		123.02	0.001389	2.31	240.07	158.59	0.41
Sections 13_15	13.066	100 year	304.14	280.98	119.29	123.03		123.2	0.001358	2.37	268.38	161.65	0.41
Sections 13_15	13.066	350 year	496	454.48	119.29	123.89		124.06	0.001156	2.54	411.61	169.3	0.39
Sections 13_15	13.066	Regional	704.33	726.44	119.29	125.31		125.46	0.00078	2.52	656.07	175.18	0.34
Sections 13_15	13.06	2 Year	95.29	104.8	118.81	121.79		121.95	0.001372	1.88	88.69	97.51	0.38
Sections 13_15	13.06	5 Year	147.39	145.46	118.81	122.08		122.28	0.001593	2.18	119.63	115.91	0.42
Sections 13_15	13.06	10 Year	179.78	176.55	118.81	122.29		122.51	0.001626	2.32	145.47	123.33	0.43
Sections 13_15	13.06	25 Year	227.07	217.16	118.81	122.56		122.78	0.001613	2.45	180.49	142.74	0.43
Sections 13_15	13.06	50 Year	261.48	247.92	118.81	122.73		122.98	0.001673	2.58	206.41	162.45	0.45
Sections 13_15	13.06	100 year	296.8	280.98	118.81	122.91		123.15	0.001658	2.65	235.5	167.42	0.45
Sections 13_15	13.06	350 year	484.37	454.48	118.81	123.81		124.02	0.001285	2.71	389.16	172.65	0.41
Sections 13_15	13.06	Regional	685.47	726.44	118.81	125.27		125.43	0.000816	2.61	646.5	181.94	0.34
Sections 13_15	13.05	2 Year	94.02	104.8	119.8	121.8	120.99	121.91	0.001301	1.61	95.18	66.87	0.36
Sections 13_15	13.05	5 Year	145.72	145.46	119.8	122.09	121.23	122.23	0.001499	1.89	114.68	68.31	0.4
Sections 13_15	13.05	10 Year	177.8	176.55	119.8	122.29	121.4	122.47	0.001585	2.06	129.12	69.36	0.42
Sections 13_15	13.05	25 Year	224.66	217.16	119.8	122.55	121.58	122.75	0.001666	2.25	146.91	70.64	0.43
Sections 13_15	13.05	50 Year	258.78	247.92	119.8	122.72	121.7	122.94	0.001735	2.39	158.89	71.48	0.45
Sections 13_15	13.05	100 year	293.78	280.98	119.8	122.88	121.83	123.13	0.001827	2.54	170.21	72.28	0.46
Sections 13_15	13.05	350 year	479.74	454.48	119.8	123.54	122.42	123.94	0.002318	3.26	218.07	75.69	0.54
Sections 13_15	13.05	Regional	677.99	726.44	119.8	124.81	123.18	125.31	0.002026	3.71	313.58	99.83	0.53
Sections 13_15	13.045		Bridge										
Sections 13_15	13.04	2 Year	91.67	104.8	117.95	120.6	119.61	120.72	0.001483	1.54	68.07	40.32	0.38
Sections 13_15	13.04	5 Year	142.85	145.46	117.95	120.97	119.87	121.12	0.001503	1.74	85.21	55.87	0.39
Sections 13_15	13.04	10 Year	174.49	176.55	117.95	121.24	120.05	121.41	0.001446	1.85	100.76	61.16	0.39
Sections 13_15	13.04	25 Year	220.81	217.16	117.95	121.54	120.29	121.74	0.001401	1.99	120.15	64.22	0.39
Sections 13_15	13.04	50 Year	254.56	247.92	117.95	121.74	120.45	121.96	0.00141	2.09	132.81	65.44	0.4
Sections 13_15	13.04	100 year	289.23	280.98	117.95	121.92	120.62	122.16	0.001453	2.21	144.5	66.54	0.41
Sections 13_15	13.04	350 year	473.82	454.48	117.95	122.61	121.33	122.99	0.001783	2.82	192.23	70.68	0.47
Sections 13_15	13.04	Regional	670.27	726.44	117.95	123.22	122.15	123.9	0.002621	3.79	236.18	74.25	0.59
Sections 13_15	13.035	2 Year	86.43	104.8	117.66	120.26		120.53	0.002282	2.42	62.06	52.39	0.48
Sections 13_15	13.035	5 Year	136.42	145.46	117.66	120.49		120.88	0.003081	2.98	74.88	58.7	0.57
Sections 13_15	13.035	10 Year	166.98	176.55	117.66	120.69		121.15	0.00339	3.27	87.11	64.02	0.6
Sections 13_15	13.035	25 Year	211.93	217.16	117.66	120.92	120.51	121.46	0.003724	3.6	102.66	70.52	0.64
Sections 13_15	13.035	50 Year	244.69	247.92	117.66	121.07	120.71	121.67	0.00391	3.81	115.8	95.87	0.66
Sections 13_15	13.035	100 year	278.3	280.98	117.66	121.23	120.92	121.86	0.004006	3.97	131.64	100.28	0.67
Sections 13_15	13.035	350 year	458.33	454.48	117.66	121.89	121.74	122.66	0.004497	4.71	203.15	119.93	0.73
Sections 13_15	13.035	Regional	648.77	726.44	117.66	122.73	122.55	123.58	0.004454	5.3	317.86	145.29	0.75
Sections 13_15	13.03	2 Year	72.7	104.8	116.4	118.62	118.62	119.39	0.008406	4.2	38.09	32.58	0.91
Sections 13_15	13.03	5 Year	114.28	145.46	116.4	119.33	119.33	119.85	0.004575	3.74	86.46	104.58	0.7
Sections 13_15	13.03	10 Year	140.36	176.55	116.4	119.51	119.51	120.05	0.004694	3.94	106.4	110.76	0.72
Sections 13_15	13.03	25 Year	180.07	217.16	116.4	119.71	119.71	120.28	0.004953	4.22	128.57	117.37	0.74
Sections 13_15	13.03	50 Year	208.87	247.92	116.4	119.84	119.84	120.44	0.005127	4.41	144.17	121.8	0.76
Sections 13_15	13.03	100 year	238.23	280.98	116.4	119.96	119.96	120.59	0.005353	4.61	159.28	126.05	0.78
Sections 13_15	13.03	350 year	398.82	454.48	116.4	120.5	120.5	121.22	0.005986	5.36	230.31	136.63	0.85
Sections 13_15	13.03	Regional	564.06	726.44	116.4	121.01	121.01	121.98	0.007704	6.58	302.8	145.33	0.98
Sections 13_15	13.021	2 Year	48.61	104.8	116	117.38	116.97	117.49	0.002664	1.83	109.78	115.94	0.5
Sections 13_15	13.021	5 Year	76.31	145.46	116	117.72	117.16	117.83	0.002139	1.9	149.5	122.05	0.46
Sections 13_15	13.021	10 Year	96.05	176.55	116	117.89	117.27	118.01	0.002175	2.03	170.24	125.12	0.47
Sections 13_15	13.021	25 Year	127.67	217.16	116	118.12	117.39	118.26	0.002171	2.19	200	136.63	0.48
Sections 13_15	13.021	50 Year	150.76	247.92	116	118.26	117.48	118.42	0.002246	2.33	221.04	148.53	0.5
Sections 13_15	13.021	100 year	173.33	280.98	116	118.45	117.57	118.61	0.002176	2.42	249.73	163.35	0.49
Sections 13_15	13.021	350 year	312.12	454.48	116	118.84	117.98	119.12	0.003229	3.25	319.27	194.66	0.62
Sections 13_15	13.021	Regional	448.09	726.44	116	119.37	118.6	119.79	0.003991	4.06	435.94	235.4	0.71
Sections 13_15	13.02	2 Year	31.22	104.8	115	116.78	116.5	117	0.003707	2.55	85.36	102.85	0.61
Sections 13_15	13.02	5 Year	46.74	145.46	115	117.31	116.73	117.47	0.002247	2.36	142.76	210.97	0.5
Sections 13_15	13.02	10 Year	58.28	176.55	115	117.58	116.89	117.7	0.001643	2.18	234.06	239.07	0.43
Sections 13_15	13.02	25 Year	79.61	217.16	115	117.87	117	117.97	0.00128	2.07	308.77	275.35	0.39
Sections 13_15	13.02	50 Year	95.91	247.92	115	118.05	117	118.13	0.001167	2.05	356.65	279.87	0.38
Sections 13_15	13.02	100 year	109.33	280.98	115	118.27	117.34	118.35	0.000971	1.96	420.93	284.38	0.35
Sections 13_15	13.02	350 year	232.46	454.48	115	118.59	117.82	118.71	0.001494	2.59	511.17	291.17	0.44
Sections 13_15	13.02	Regional	342.55	726.44	115	119.09	118.2	119.25	0.001856	3.15	657.88	295.2	0.5
Sections 13_15	13.01	2 Year	19.43	105.6	113.11	115.7	115.24	116.21	0.004403	3.32	44.64	31.52	0.66
Sections 13_15	13.01	5 Year	26.66	146.71	113.11	116.06	115.75	116.79	0.005422	4.02	57.52	51.31	0.75

Sections 13_15	13.01	10 Year	32.02	177.65	113.11	116.28	115.97	117.11	0.005775	4.35	70.11	61.66	0.79
Sections 13_15	13.01	25 Year	44.28	218.88	113.11	116.7	116.7	117.49	0.004942	4.39	105.19	103.91	0.74
Sections 13_15	13.01	50 Year	54.9	250.44	113.11	116.89	116.89	117.68	0.004886	4.51	126.44	119.43	0.74
Sections 13_15	13.01	100 year	63.02	282.51	113.11	116.89	116.89	117.89	0.006218	5.09	126.44	119.43	0.84
Sections 13_15	13.01	350 year	158.17	459.22	113.11	117.84	117.84	118.3	0.003217	4.26	382.05	345.39	0.63
Sections 13_15	13.01	Regional	244.73	738.41	113.11	118.24	118.24	118.76	0.003984	5	523.72	362.92	0.71

Proposed Reach	River Sta	Profile	Volume (1000 m3)	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Sections 13_15	13.1	2 Year	193.13	105.01	124.8	126.75	126.42	127.11	0.005712	2.67	39.37	47.04	0.72
Sections 13_15	13.1	5 Year	292.67	146.14	124.8	126.92	126.75	127.48	0.007741	3.32	44.04	51.67	0.85
Sections 13_15	13.1	10 Year	363.16	177.14	124.8	127.24	127.24	127.58	0.004389	2.78	125.37	334.68	0.66
Sections 13_15	13.1	25 Year	454.7	217.95	124.8	127.38	127.38	127.72	0.004373	2.92	173.41	381.87	0.67
Sections 13_15	13.1	50 Year	521.29	249	124.8	127.49	127.49	127.8	0.004044	2.91	216.78	408.95	0.65
Sections 13_15	13.1	100 year	585.99	281.59	124.8	127.62	127.55	127.88	0.003518	2.82	269.28	430.26	0.61
Sections 13_15	13.1	350 year	893.72	455.83	124.8	127.84	127.84	128.21	0.00493	3.56	368.42	472.04	0.73
Sections 13_15	13.1	Regional	1255.35	727.56	124.8	128.18	128.18	128.58	0.005286	4.03	546.44	541.71	0.77
Sections 13_15	13.09	2 Year	190.26	105.01	124.7	126.55	126.55	126.89	0.005038	2.96	77.41	177.92	0.7
Sections 13_15	13.09	5 Year	288.77	146.14	124.7	126.77	126.77	127.13	0.005094	3.21	109.99	206.85	0.72
Sections 13_15	13.09	10 Year	357.87	177.14	124.7	126.77	126.87	127.3	0.007457	3.89	110.19	206.97	0.87
Sections 13_15	13.09	25 Year	447.5	217.95	124.7	126.96	127.05	127.45	0.006782	3.94	141.99	340.74	0.85
Sections 13_15	13.09	50 Year	512.24	249	124.7	127.08	127.13	127.55	0.006423	3.97	163.12	447.42	0.83
Sections 13_15	13.09	100 year	574.6	281.59	124.7	127.22	127.22	127.65	0.005886	3.95	187.16	484.89	0.8
Sections 13_15	13.09	350 year	877.49	455.83	124.7	127.49	127.49	127.79	0.005071	3.93	434.98	532.29	0.76
Sections 13_15	13.09	Regional	1235.02	727.56	124.7	127.54	127.76	128.2	0.011301	5.93	458.84	536.82	1.14
Sections 13_15	13.085	2 Year	161.6	105.01	123	125.46	124.75	125.55	0.001335	1.74	147.04	156.51	0.38
Sections 13_15	13.085	5 Year	245.02	146.14	123	125.89	124.96	125.97	0.001026	1.72	259.09	349.46	0.34
Sections 13_15	13.085	10 Year	309.65	177.14	123	126.02	125.22	126.11	0.001116	1.85	305.04	374.87	0.36
Sections 13_15	13.085	25 Year	390.83	217.95	123	126.17	125.39	126.25	0.001158	1.95	359.65	379.74	0.37
Sections 13_15	13.085	50 Year	448.45	249	123	126.27	125.49	126.36	0.001165	2	400.05	382.39	0.37
Sections 13_15	13.085	100 year	503.28	281.59	123	126.37	125.63	126.45	0.001202	2.08	435.51	384.72	0.38
Sections 13_15	13.085	350 year	781.96	455.83	123	126.76	126.17	126.87	0.001406	2.44	590.74	396.36	0.42
Sections 13_15	13.085	Regional	1117.16	727.56	123	127.28	126.47	127.4	0.001503	2.76	799.98	404.5	0.44
Sections 13_15	13.08	2 Year	148.37	104.8	122.2	124.76		125.2	0.004423	3.32	54.7	44.21	0.68
Sections 13_15	13.08	5 Year	225.7	145.46	122.2	124.9	124.9	125.61	0.006737	4.25	61.11	47.28	0.85
Sections 13_15	13.08	10 Year	283.58	176.55	122.2	125.39	125.39	125.82	0.003804	3.6	141.7	237.17	0.66
Sections 13_15	13.08	25 Year	359.03	217.16	122.2	125.63	125.63	125.99	0.003355	3.55	203.62	284.45	0.62
Sections 13_15	13.08	50 Year	412.62	247.92	122.2	125.77	125.77	126.1	0.003196	3.56	245.14	292.65	0.61
Sections 13_15	13.08	100 year	464.74	280.98	122.2	125.84	125.84	126.19	0.003428	3.74	265.63	294.4	0.64
Sections 13_15	13.08	350 year	731.63	454.48	122.2	126.14	126.14	126.56	0.004468	4.5	353.83	299.7	0.74
Sections 13_15	13.08	Regional	1045.08	726.44	122.2	126.9		127.16	0.002875	4.08	584.6	306.91	0.61
Sections 13_15	13.075	2 Year	133.64	104.8	121.29	123.63	123.63	124.03	0.005497	3.46	78.04	110.87	0.74
Sections 13_15	13.075	5 Year	204.31	145.46	121.29	124.05	123.87	124.32	0.003761	3.21	133.39	150.1	0.63
Sections 13_15	13.075	10 Year	249.47	176.55	121.29	124.31	124.08	124.52	0.002949	3.02	172.89	155.71	0.56
Sections 13_15	13.075	25 Year	313.76	217.16	121.29	124.58	124.21	124.76	0.002522	2.96	215.72	161.41	0.53
Sections 13_15	13.075	50 Year	360.06	247.92	121.29	124.74	124.29	124.92	0.002407	2.99	242.75	165.03	0.52
Sections 13_15	13.075	100 year	407.04	280.98	121.29	124.91	124.38	125.08	0.002316	3.03	270.38	168.69	0.52
Sections 13_15	13.075	350 year	651.3	454.48	121.29	125.61	124.75	125.79	0.002129	3.28	394.04	181.09	0.51
Sections 13_15	13.075	Regional	925.2	726.44	121.29	126.37		126.58	0.002273	3.79	535.13	192.73	0.54
Sections 13_15	13.073	2 Year	122.28	104.8	120.26	122.82	122.16	123.2	0.003131	2.77	48.49	57.53	0.58
Sections 13_15	13.073	5 Year	186.37	145.46	120.26	123.12	122.68	123.61	0.003684	3.25	70.41	88.18	0.64
Sections 13_15	13.073	10 Year	226.93	176.55	120.26	123.27	123.18	123.84	0.00411	3.57	85.24	99.19	0.68
Sections 13_15	13.073	25 Year	285.79	217.16	120.26	123.48	123.48	124.11	0.004399	3.87	106.45	105.5	0.71
Sections 13_15	13.073	50 Year	328.42	247.92	120.26	123.63	123.63	124.29	0.004465	4.02	122.63	114.23	0.72
Sections 13_15	13.073	100 year	371.7	280.98	120.26	123.76	123.76	124.45	0.004598	4.2	138.67	122.75	0.74
Sections 13_15	13.073	350 year	598.9	454.48	120.26	124.34	124.34	125.16	0.005104	4.93	216.36	144.32	0.8
Sections 13_15	13.073	Regional	847.73	726.44	120.26	125.2	125.2	125.97	0.004459	5.26	370.74	197.01	0.77
Sections 13_15	13.071	2 Year	116.3	104.8	119.61	122.38	122.18	122.77	0.003855	3.07	62.95	66.28	0.63
Sections 13_15	13.071	5 Year	177.62	145.46	119.61	122.82	122.54	123.16	0.003128	3.09	108.09	124.6	0.59
Sections 13_15	13.071	10 Year	217.34	176.55	119.61	122.86	122.82	123.32	0.004226	3.63	113.41	128.47	0.68
Sections 13_15	13.071	25 Year	274.16	217.16	119.61	123.07	123.02	123.54	0.004189	3.79	141.41	133.82	0.69
Sections 13_15	13.071	50 Year	315.16	247.92	119.61	123.24	123.14	123.68	0.003977	3.82	165.03	147.92	0.68
Sections 13_15	13.071	100 year	356.76	280.98	119.61	123.4	123.27	123.84	0.003871	3.9	190.31	159.2	0.67
Sections 13_15	13.071	350 year	575.08	454.48	119.61	124.24	123.84	124.57	0.002777	3.82	333.76	175.6	0.59
Sections 13_15	13.071	Regional	810.74	726.44	119.61	125.22	124.32	125.5	0.002153	3.86	507.68	178.76	0.54
Sections 13_15	13.069	2 Year	110.59	104.8	119.57	121.93	121.71	122.33	0.004506	3.05	56.38	61.63	0.66
Sections 13_15	13.069	5 Year	168.94	145.46	119.57	122.17	121.97	122.72	0.005552	3.63	80.72	117.57	0.75
Sections 13_15	13.069	10 Year	206.78	176.55	119.57	122.48	122.43	122.89	0.004042	3.36	119.22	126.68	0.65
Sections 13_15	13.069	25 Year	260.58	217.16	119.57	122.81		123.14	0.003177	3.21	162.23	134.34	0.59
Sections 13_15	13.069	50 Year	299.37	247.92	119.57	123.02		123.32	0.002826	3.17	190.37	136.13	0.56
Sections 13_15	13.069	100 year	338.81	280.98	119.57	123.2		123.49	0.002646	3.18	216.14	137.82	0.55
Sections 13_15	13.069	350 year	545.86	454.48	119.57	124.06		124.32	0.002106	3.29	338.63	146.76	0.51
Sections 13_15	13.069	Regional	767.98	726.44	119.57	125.04		125.32	0.001929	3.61	483.29	150.2	0.5
Sections 13_15	13.067	2 Year	103.1	104.8	119.42	121.99		122.08	0.001091	1.6	140.64	145.87	0.34
Sections 13_15	13.067	5 Year	158.64	145.46	119.42	122.34		122.43	0.001005	1.69	191.34	147.96	0.33
Sections 13_15	13.067	10 Year	193.76	176.55	119.42	122.57		122.66	0.000964	1.75	225.81	149.31	0.33
Sections 13_15	13.067	25 Year	244.36	217.16	119.42	122.86		122.95	0.000913	1.81	268.66	150.95	0.32
Sections 13_15	13.067	50 Year	281.02	247.92	119.42	123.05		123.14	0.000896	1.86	297.65	152.05	0.32

Sections 13_15	13.067	100 year	318.48	280.98	119.42	123.22		123.32	0.000902	1.94	324.76	153.15	0.33
Sections 13_15	13.067	350 year	516.12	454.48	119.42	124.06		124.18	0.000898	2.22	454.57	157.92	0.34
Sections 13_15	13.067	Regional	727.08	726.44	119.42	125.02		125.18	0.000969	2.63	608.68	162.45	0.36
Sections 13_15	13.066	2 Year	98.09	104.8	119.29	121.81		122	0.002038	2.09	84.96	115.1	0.45
Sections 13_15	13.066	5 Year	151.61	145.46	119.29	122.15		122.35	0.001987	2.26	130.34	149.92	0.45
Sections 13_15	13.066	10 Year	185.15	176.55	119.29	122.42		122.59	0.001678	2.22	171.02	152.93	0.42
Sections 13_15	13.066	25 Year	233.82	217.16	119.29	122.73		122.89	0.001426	2.2	219.72	156.63	0.4
Sections 13_15	13.066	50 Year	269.2	247.92	119.29	122.93		123.09	0.001336	2.22	251.73	160.01	0.39
Sections 13_15	13.066	100 year	305.46	280.98	119.29	123.12		123.27	0.001299	2.27	281.32	163.18	0.39
Sections 13_15	13.066	350 year	497.3	454.48	119.29	123.98		124.13	0.00112	2.43	425.48	169.71	0.37
Sections 13_15	13.066	Regional	701.45	726.44	119.29	124.95		125.13	0.001106	2.76	592.5	173.76	0.38
Sections 13_15	13.06	2 Year	95.61	104.8	118.81	121.79		121.95	0.001367	1.88	88.88	97.64	0.38
Sections 13_15	13.06	5 Year	147.95	145.46	118.81	122.11		122.3	0.001509	2.14	123.26	117.22	0.41
Sections 13_15	13.06	10 Year	180.46	176.55	118.81	122.35		122.55	0.001484	2.24	152.36	126.09	0.41
Sections 13_15	13.06	25 Year	227.84	217.16	118.81	122.63		122.84	0.001469	2.37	191.33	148.58	0.42
Sections 13_15	13.06	50 Year	262.32	247.92	118.81	122.82		123.04	0.001479	2.47	221.13	166.77	0.42
Sections 13_15	13.06	100 year	297.68	280.98	118.81	123.01		123.22	0.001408	2.49	253.39	168.03	0.41
Sections 13_15	13.06	350 year	485.24	454.48	118.81	123.9		124.09	0.001159	2.61	404.75	173.17	0.39
Sections 13_15	13.06	Regional	684.52	726.44	118.81	124.88		125.09	0.001127	2.93	576.51	178.26	0.4
Sections 13_15	13.05	2 Year	94.34	104.8	119.53	121.8	120.95	121.91	0.001283	1.56	96.28	66.89	0.35
Sections 13_15	13.05	5 Year	146.24	145.46	119.53	122.12	121.2	122.25	0.001417	1.81	117.76	68.48	0.38
Sections 13_15	13.05	10 Year	178.39	176.55	119.53	122.35	121.37	122.51	0.001458	1.95	133.84	69.65	0.39
Sections 13_15	13.05	25 Year	225.31	217.16	119.53	122.63	121.55	122.81	0.001501	2.12	153.33	71.04	0.4
Sections 13_15	13.05	50 Year	259.45	247.92	119.53	122.81	121.67	123.01	0.00155	2.24	166.23	71.95	0.41
Sections 13_15	13.05	100 year	294.46	280.98	119.53	122.98	121.8	123.2	0.001623	2.38	178.35	72.79	0.43
Sections 13_15	13.05	350 year	480.44	454.48	119.53	123.67	122.38	124.03	0.002054	3.05	228.47	76.4	0.5
Sections 13_15	13.05	Regional	677.94	726.44	119.53	124.33	123.14	124.95	0.002939	4.06	278.05	88.75	0.61
Sections 13_15	13.045		Bridge										
Sections 13_15	13.04	2 Year	91.88	104.8	117.95	120.58	119.58	120.7	0.001258	1.59	74.06	50.16	0.35
Sections 13_15	13.04	5 Year	143.17	145.46	117.95	120.95	119.84	121.11	0.00134	1.83	94.52	59.96	0.38
Sections 13_15	13.04	10 Year	174.84	176.55	117.95	121.21	120.02	121.4	0.001356	1.98	111.14	63.85	0.38
Sections 13_15	13.04	25 Year	221.18	217.16	117.95	121.52	120.25	121.73	0.001365	2.13	131.19	66.09	0.39
Sections 13_15	13.04	50 Year	254.94	247.92	117.95	121.71	120.41	121.95	0.001404	2.25	144.14	67.15	0.4
Sections 13_15	13.04	100 year	289.61	280.98	117.95	121.89	120.55	122.15	0.001475	2.39	156	68.11	0.42
Sections 13_15	13.04	350 year	474.17	454.48	117.95	122.57	121.35	122.99	0.001932	3.1	203.43	71.53	0.49
Sections 13_15	13.04	Regional	670.41	726.44	117.95	123.11	122.19	123.89	0.003082	4.25	242.79	74.06	0.63
Sections 13_15	13.035	2 Year	86.43	104.8	117.66	120.26		120.53	0.002282	2.42	62.06	52.39	0.48
Sections 13_15	13.035	5 Year	136.42	145.46	117.66	120.49		120.88	0.003081	2.98	74.88	58.7	0.57
Sections 13_15	13.035	10 Year	166.98	176.55	117.66	120.69		121.15	0.00339	3.27	87.11	64.02	0.6
Sections 13_15	13.035	25 Year	211.93	217.16	117.66	120.92	120.51	121.46	0.003724	3.6	102.66	70.52	0.64
Sections 13_15	13.035	50 Year	244.69	247.92	117.66	121.07	120.71	121.67	0.00391	3.81	115.8	95.87	0.66
Sections 13_15	13.035	100 year	278.3	280.98	117.66	121.23	120.92	121.86	0.004006	3.97	131.64	100.28	0.67
Sections 13_15	13.035	350 year	458.33	454.48	117.66	121.89	121.74	122.66	0.004497	4.71	203.15	119.93	0.73
Sections 13_15	13.035	Regional	648.77	726.44	117.66	122.73	122.55	123.58	0.004454	5.3	317.86	145.29	0.75
Sections 13_15	13.03	2 Year	72.7	104.8	116.4	118.62	118.62	119.39	0.008406	4.2	38.09	32.58	0.91
Sections 13_15	13.03	5 Year	114.28	145.46	116.4	119.33	119.33	119.85	0.004575	3.74	86.46	104.58	0.7
Sections 13_15	13.03	10 Year	140.36	176.55	116.4	119.51	119.51	120.05	0.004694	3.94	106.4	110.76	0.72
Sections 13_15	13.03	25 Year	180.07	217.16	116.4	119.71	119.71	120.28	0.004953	4.22	128.57	117.37	0.74
Sections 13_15	13.03	50 Year	208.87	247.92	116.4	119.84	119.84	120.44	0.005127	4.41	144.17	121.8	0.76
Sections 13_15	13.03	100 year	238.23	280.98	116.4	119.96	119.96	120.59	0.005353	4.61	159.28	126.05	0.78
Sections 13_15	13.03	350 year	398.82	454.48	116.4	120.5	120.5	121.22	0.005986	5.36	230.31	136.63	0.85
Sections 13_15	13.03	Regional	564.06	726.44	116.4	121.01	121.01	121.98	0.007704	6.58	302.8	145.33	0.98
Sections 13_15	13.021	2 Year	48.61	104.8	116	117.38	116.97	117.49	0.002664	1.83	109.78	115.94	0.5
Sections 13_15	13.021	5 Year	76.31	145.46	116	117.72	117.16	117.83	0.002139	1.9	149.5	122.05	0.46
Sections 13_15	13.021	10 Year	96.05	176.55	116	117.89	117.27	118.01	0.002175	2.03	170.24	125.12	0.47
Sections 13_15	13.021	25 Year	127.67	217.16	116	118.12	117.39	118.26	0.002171	2.19	200	136.63	0.48
Sections 13_15	13.021	50 Year	150.76	247.92	116	118.26	117.48	118.42	0.002246	2.33	221.04	148.53	0.5
Sections 13_15	13.021	100 year	173.33	280.98	116	118.45	117.57	118.61	0.002176	2.42	249.73	163.35	0.49
Sections 13_15	13.021	350 year	312.12	454.48	116	118.84	117.98	119.12	0.003229	3.25	319.27	194.66	0.62
Sections 13_15	13.021	Regional	448.09	726.44	116	119.37	118.6	119.79	0.003991	4.06	435.94	235.4	0.71
Sections 13_15	13.02	2 Year	31.22	104.8	115	116.78	116.5	117	0.003707	2.55	85.36	102.85	0.61
Sections 13_15	13.02	5 Year	46.74	145.46	115	117.31	116.73	117.47	0.002247	2.36	142.76	210.97	0.5
Sections 13_15	13.02	10 Year	58.28	176.55	115	117.58	116.89	117.7	0.001643	2.18	234.06	239.07	0.43
Sections 13_15	13.02	25 Year	79.61	217.16	115	117.87	117	117.97	0.00128	2.07	308.77	275.35	0.39
Sections 13_15	13.02	50 Year	95.91	247.92	115	118.05	117	118.13	0.001167	2.05	356.65	279.87	0.38
Sections 13_15	13.02	100 year	109.33	280.98	115	118.27	117.34	118.35	0.000971	1.96	420.93	284.38	0.35
Sections 13_15	13.02	350 year	232.46	454.48	115	118.59	117.82	118.71	0.001494	2.59	511.17	291.17	0.44
Sections 13_15	13.02	Regional	342.55	726.44	115	119.09	118.2	119.25	0.001856	3.15	657.88	295.2	0.5
Sections 13_15	13.01	2 Year	19.43	105.6	113.11	115.7	115.24	116.21	0.004403	3.32	44.64	31.52	0.66
Sections 13_15	13.01	5 Year	26.66	146.71	113.11	116.06	115.75	116.79	0.005422	4.02	57.52	51.31	0.75

Sections 13_15	13.01	10 Year	32.02	177.65	113.11	116.28	115.97	117.11	0.005775	4.35	70.11	61.66	0.79
Sections 13_15	13.01	25 Year	44.28	218.88	113.11	116.7	116.7	117.49	0.004942	4.39	105.19	103.91	0.74
Sections 13_15	13.01	50 Year	54.9	250.44	113.11	116.89	116.89	117.68	0.004886	4.51	126.44	119.43	0.74
Sections 13_15	13.01	100 year	63.02	282.51	113.11	116.89	116.89	117.89	0.006218	5.09	126.44	119.43	0.84
Sections 13_15	13.01	350 year	158.17	459.22	113.11	117.84	117.84	118.3	0.003217	4.26	382.05	345.39	0.63
Sections 13_15	13.01	Regional	244.73	738.41	113.11	118.24	118.24	118.76	0.003984	5	523.72	362.92	0.71

Existing KSGS Revised River Sta	Profile	W.S. Elev (m)	Proposed River Sta	Profile	W.S. Elev (m)	W.S. Elev Diff
13.1	2 Year	126.75	13.1	2 Year	126.75	0
13.1	5 Year	126.92	13.1	5 Year	126.92	0
13.1	10 Year	127.24	13.1	10 Year	127.24	0
13.1	25 Year	127.38	13.1	25 Year	127.38	0
13.1	50 Year	127.49	13.1	50 Year	127.49	0
13.1	100 year	127.62	13.1	100 year	127.62	0
13.1	350 year	127.84	13.1	350 year	127.84	0
13.1	Regional	128.18	13.1	Regional	128.18	0
13.09	2 Year	126.55	13.09	2 Year	126.55	0
13.09	5 Year	126.77	13.09	5 Year	126.77	0
13.09	10 Year	126.77	13.09	10 Year	126.77	0
13.09	25 Year	126.96	13.09	25 Year	126.96	0
13.09	50 Year	127.08	13.09	50 Year	127.08	0
13.09	100 year	127.22	13.09	100 year	127.22	0
13.09	350 year	127.49	13.09	350 year	127.49	0
13.09	Regional	127.54	13.09	Regional	127.54	0
13.085	2 Year	125.46	13.085	2 Year	125.46	0
13.085	5 Year	125.89	13.085	5 Year	125.89	0
13.085	10 Year	126.02	13.085	10 Year	126.02	0
13.085	25 Year	126.17	13.085	25 Year	126.17	0
13.085	50 Year	126.27	13.085	50 Year	126.27	0
13.085	100 year	126.37	13.085	100 year	126.37	0
13.085	350 year	126.76	13.085	350 year	126.76	0
13.085	Regional	127.28	13.085	Regional	127.28	0
13.08	2 Year	124.76	13.08	2 Year	124.76	0
13.08	5 Year	124.9	13.08	5 Year	124.9	0
13.08	10 Year	125.39	13.08	10 Year	125.39	0
13.08	25 Year	125.63	13.08	25 Year	125.63	0
13.08	50 Year	125.77	13.08	50 Year	125.77	0
13.08	100 year	125.84	13.08	100 year	125.84	0
13.08	350 year	126.14	13.08	350 year	126.14	0
13.08	Regional	126.88	13.08	Regional	126.9	0.02
13.075	2 Year	123.63	13.075	2 Year	123.63	0
13.075	5 Year	124.07	13.075	5 Year	124.05	-0.02
13.075	10 Year	124.32	13.075	10 Year	124.31	-0.01
13.075	25 Year	124.58	13.075	25 Year	124.58	0
13.075	50 Year	124.74	13.075	50 Year	124.74	0
13.075	100 year	124.91	13.075	100 year	124.91	0
13.075	350 year	125.61	13.075	350 year	125.61	0
13.075	Regional	126.32	13.075	Regional	126.37	0.05
13.073	2 Year	122.76	13.073	2 Year	122.82	0.06
13.073	5 Year	123.07	13.073	5 Year	123.12	0.05

13.073	10 Year	123.23	13.073	10 Year	123.27	0.04
13.073	25 Year	123.48	13.073	25 Year	123.48	0
13.073	50 Year	123.63	13.073	50 Year	123.63	0
13.073	100 year	123.76	13.073	100 year	123.76	0
13.073	350 year	124.34	13.073	350 year	124.34	0
13.073	Regional	125.47	13.073	Regional	125.2	-0.27
13.071	2 Year	122.29	13.071	2 Year	122.38	0.09
13.071	5 Year	122.64	13.071	5 Year	122.82	0.18
13.071	10 Year	122.78	13.071	10 Year	122.86	0.08
13.071	25 Year	122.99	13.071	25 Year	123.07	0.08
13.071	50 Year	123.15	13.071	50 Year	123.24	0.09
13.071	100 year	123.31	13.071	100 year	123.4	0.09
13.071	350 year	124.14	13.071	350 year	124.24	0.1
13.071	Regional	125.49	13.071	Regional	125.22	-0.27
13.069	2 Year	121.93	13.069	2 Year	121.93	0
13.069	5 Year	122.18	13.069	5 Year	122.17	-0.01
13.069	10 Year	122.44	13.069	10 Year	122.48	0.04
13.069	25 Year	122.73	13.069	25 Year	122.81	0.08
13.069	50 Year	122.94	13.069	50 Year	123.02	0.08
13.069	100 year	123.12	13.069	100 year	123.2	0.08
13.069	350 year	123.98	13.069	350 year	124.06	0.08
13.069	Regional	125.36	13.069	Regional	125.04	-0.32
13.067	2 Year	121.98	13.067	2 Year	121.99	0.01
13.067	5 Year	122.31	13.067	5 Year	122.34	0.03
13.067	10 Year	122.53	13.067	10 Year	122.57	0.04
13.067	25 Year	122.8	13.067	25 Year	122.86	0.06
13.067	50 Year	122.98	13.067	50 Year	123.05	0.07
13.067	100 year	123.16	13.067	100 year	123.22	0.06
13.067	350 year	123.99	13.067	350 year	124.06	0.07
13.067	Regional	125.36	13.067	Regional	125.02	-0.34
13.066	2 Year	121.81	13.066	2 Year	121.81	0
13.066	5 Year	122.12	13.066	5 Year	122.15	0.03
13.066	10 Year	122.36	13.066	10 Year	122.42	0.06
13.066	25 Year	122.65	13.066	25 Year	122.73	0.08
13.066	50 Year	122.85	13.066	50 Year	122.93	0.08
13.066	100 year	123.03	13.066	100 year	123.12	0.09
13.066	350 year	123.89	13.066	350 year	123.98	0.09
13.066	Regional	125.31	13.066	Regional	124.95	-0.36
13.06	2 Year	121.79	13.06	2 Year	121.79	0
13.06	5 Year	122.08	13.06	5 Year	122.11	0.03
13.06	10 Year	122.29	13.06	10 Year	122.35	0.06
13.06	25 Year	122.56	13.06	25 Year	122.63	0.07
13.06	50 Year	122.73	13.06	50 Year	122.82	0.09
13.06	100 year	122.91	13.06	100 year	123.01	0.1
13.06	350 year	123.81	13.06	350 year	123.9	0.09

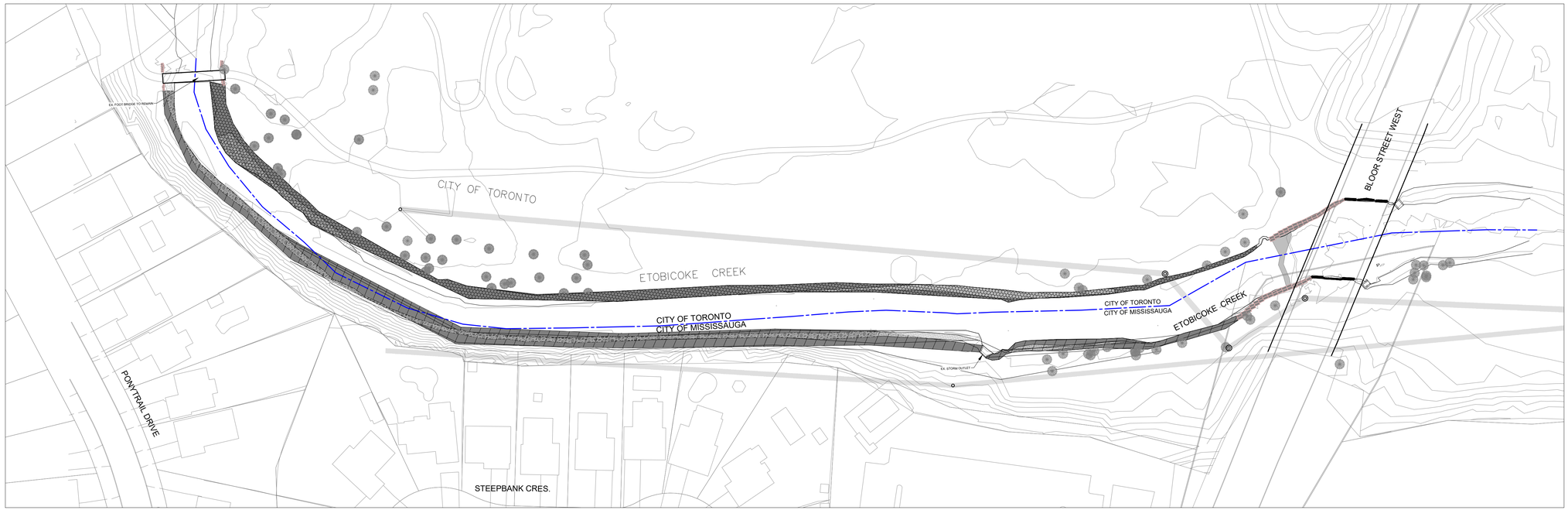
13.06	Regional	125.27	13.06	Regional	124.88	-0.39
13.05	2 Year	121.8	13.05	2 Year	121.8	
13.05	5 Year	122.09	13.05	5 Year	122.12	
13.05	10 Year	122.29	13.05	10 Year	122.35	0.06
13.05	25 Year	122.55	13.05	25 Year	122.63	0.08
13.05	50 Year	122.72	13.05	50 Year	122.81	0.09
13.05	100 year	122.88	13.05	100 year	122.98	0.1
13.05	350 year	123.54	13.05	350 year	123.67	0.13
13.05	Regional	124.81	13.05	Regional	124.33	-0.48
						0
13.045			13.045			0
13.04	2 Year	120.6	13.04	2 Year	120.58	-0.02
13.04	5 Year	120.97	13.04	5 Year	120.95	-0.02
13.04	10 Year	121.24	13.04	10 Year	121.21	-0.03
13.04	25 Year	121.54	13.04	25 Year	121.52	-0.02
13.04	50 Year	121.74	13.04	50 Year	121.71	-0.03
13.04	100 year	121.92	13.04	100 year	121.89	-0.03
13.04	350 year	122.61	13.04	350 year	122.57	-0.04
13.04	Regional	123.22	13.04	Regional	123.11	-0.11
13.035	2 Year	120.26	13.035	2 Year	120.26	0
13.035	5 Year	120.49	13.035	5 Year	120.49	0
13.035	10 Year	120.69	13.035	10 Year	120.69	0
13.035	25 Year	120.92	13.035	25 Year	120.92	0
13.035	50 Year	121.07	13.035	50 Year	121.07	0
13.035	100 year	121.23	13.035	100 year	121.23	0
13.035	350 year	121.89	13.035	350 year	121.89	0
13.035	Regional	122.73	13.035	Regional	122.73	0
13.03	2 Year	118.62	13.03	2 Year	118.62	0
13.03	5 Year	119.33	13.03	5 Year	119.33	0
13.03	10 Year	119.51	13.03	10 Year	119.51	0
13.03	25 Year	119.71	13.03	25 Year	119.71	0
13.03	50 Year	119.84	13.03	50 Year	119.84	0
13.03	100 year	119.96	13.03	100 year	119.96	0
13.03	350 year	120.5	13.03	350 year	120.5	0
13.03	Regional	121.01	13.03	Regional	121.01	0
13.021	2 Year	117.38	13.021	2 Year	117.38	0
13.021	5 Year	117.72	13.021	5 Year	117.72	0
13.021	10 Year	117.89	13.021	10 Year	117.89	0
13.021	25 Year	118.12	13.021	25 Year	118.12	0
13.021	50 Year	118.26	13.021	50 Year	118.26	0
13.021	100 year	118.45	13.021	100 year	118.45	0
13.021	350 year	118.84	13.021	350 year	118.84	0
13.021	Regional	119.37	13.021	Regional	119.37	0
13.02	2 Year	116.78	13.02	2 Year	116.78	0

13.02	5 Year	117.31	13.02	5 Year	117.31	0
13.02	10 Year	117.58	13.02	10 Year	117.58	0
13.02	25 Year	117.87	13.02	25 Year	117.87	0
13.02	50 Year	118.05	13.02	50 Year	118.05	0
13.02	100 year	118.27	13.02	100 year	118.27	0
13.02	350 year	118.59	13.02	350 year	118.59	0
13.02	Regional	119.09	13.02	Regional	119.09	0
13.01	2 Year	115.7	13.01	2 Year	115.7	0
13.01	5 Year	116.06	13.01	5 Year	116.06	0
13.01	10 Year	116.28	13.01	10 Year	116.28	0
13.01	25 Year	116.7	13.01	25 Year	116.7	0
13.01	50 Year	116.89	13.01	50 Year	116.89	0
13.01	100 year	116.89	13.01	100 year	116.89	0
13.01	350 year	117.84	13.01	350 year	117.84	0
13.01	Regional	118.24	13.01	Regional	118.24	0

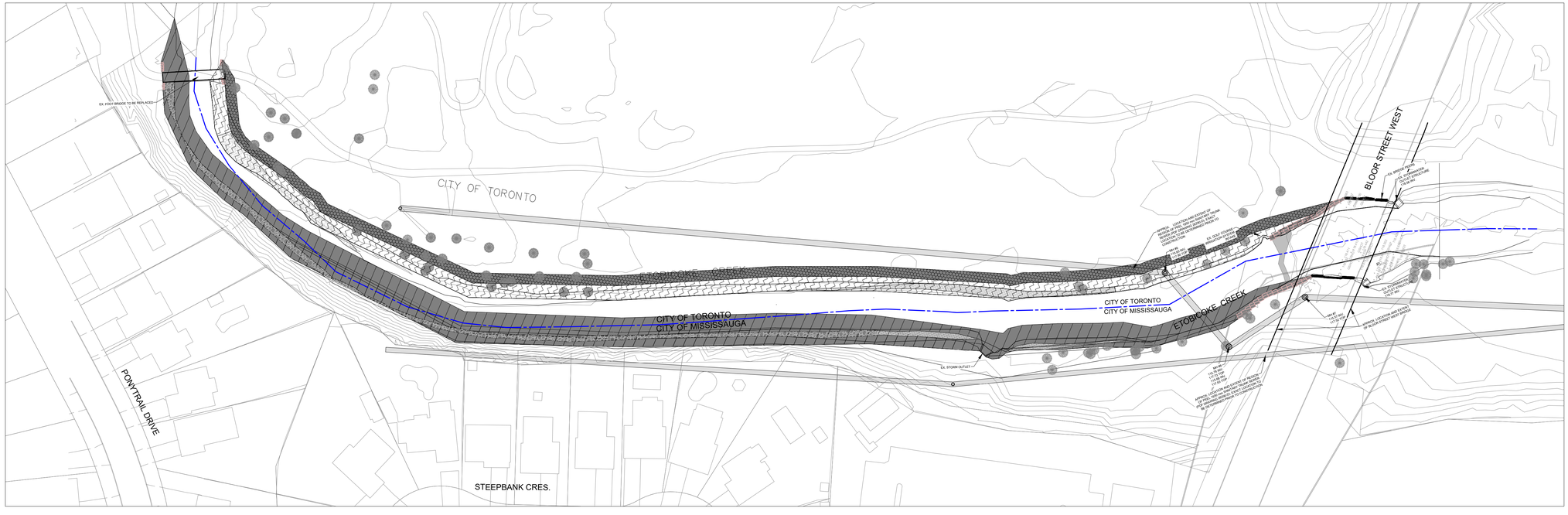
APPENDIX H

Alternatives Upstream of Bloor Street

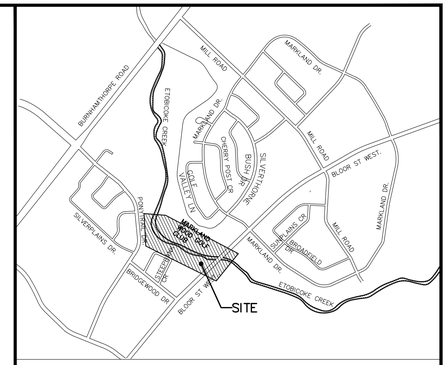
DESIGN ALT #2 - HARD ARMOURING



DESIGN ALT #3 - GEOMORPHIC ADJUSTMENTS



NOT FOR CONSTRUCTION



LEGEND

- EX. SANITARY SEWER
- EX. RIP RAP BANK TREATMENT
- PR. ARMOURSTONE BANK TREATMENT
- PR. VEGETATED ROCK BUTTRESS
- PR. CUT

DRAFT FOR DISCUSSION

FIRST DATE	SECOND DATE	INTERIM DATE	FINAL DATE

DESIGNED BY

CHKD.

APPROVED BY

KSGS ENGINEERING
470 HENDALL CIRCLE, UNIT 300, MISSISSAUGA, ON, L5A 1V4, 905-232-1711

BEACON ENVIRONMENTAL

ETOBICOKE CREEK EROSION CONTROL

ALTERNATIVES 2 HARD ARMOURING AND 3 GEOMORPHIC ADJUSTMENTS

MISSISSAUGA

GENERAL PLAN

SCALE : 1:500	AREA Z:	PROJECT No. PROJ_NO
DRAWN BY: M.C.	CHECKED BY: K.C.	PLAN No. PLAN_NO
DATE: 2021-06-18	SHEET 1 OF 1	DWG. No. C-002

APPENDIX I

Parish 2017 Design and Alternatives Bloor Street Grade Control Structure

GENERAL CONSTRUCTION NOTES

1. ALL MEASUREMENTS FOR THIS PROJECT ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE INDICATED. ELEVATIONS ARE RELATIVE.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LAYOUT, SURVEY AND LOCATION OF UTILITIES.
3. DURING CONSTRUCTION ALL VEGETATION AND STRUCTURES ADJACENT TO THE WORK SHALL BE PROTECTED. ALL DAMAGE SHALL BE RESTORED TO ORIGINAL CONDITION AT THE EXPENSE OF THE CONTRACTOR.
4. SURPLUS AND WASTE MATERIAL IS NOT TO BE STORED IN CHANNEL AREA OVERNIGHT IN CASE OF HIGH FLOW EVENT.
5. ALL GENERAL BACKFILL TO BE APPROVED MATERIAL COMPACTED TO 85% STANDARD PROCTOR DENSITY. DUE TO POTENTIAL GROUND WATER CONCERNS A FILTER LAYER OF GRAVEL AND SANDS MAY BE REQUIRED AS A BASE FOR BACKFILL AS DIRECTED BY THE DESIGNER IN THE FIELD.
6. ALL EXCESS TOPSOIL TO BE DISPOSED OFF SITE.
7. THE CONTRACTOR SHALL MAINTAIN ALL SILTATION CONTROLS ON A REGULAR BASIS THROUGHOUT THE CONSTRUCTION OF THE PROJECT.
8. CONSTRUCTION ACCESS TO BE RESTORED TO ORIGINAL CONDITION AT COMPLETION OF PROJECT.
9. ALL EQUIPMENT REFUELLING TO BE COMPLETED IN DESIGNATED AREAS ONLY.
10. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR:
    a. TO REMOVE ALL CONSTRUCTION DEBRIS FROM WORK SITE AT THE COMPLETION OF THE WORK.
    b. TO REMOVE ALL TEMPORARY EROSION CONTROL MEASURES BOTH ON THE FLOOD PLAIN AND IN THE CHANNEL AFTER THE CHANNEL AND FLOODPLAIN IS STABLIZED OR BY DIRECTION OF THE DESIGNER.
11. WORK WILL NOT BE CONSIDERED COMPLETE UNTIL SIGNED OFF BY THE DESIGNER/GEOMORPHOLOGIST.

CHANNEL CONSTRUCTION PROCEDURE:

METHOD OF CONSTRUCTION:

1. THE CONSTRUCTION WORK IS TO BE COMPLETED IN DRY, HENCE, A TEMPORARY DIVERSION SCHEME WOULD NEED TO BE USED TO DIVERT THE STREAMFLOW FROM THE MAIN BRANCH OF THE ETOBICOKE CREEK, ISOLATE THE WORK AREA AND ALLOW THE PROPOSED CONSTRUCTION WORK TO BE COMPLETED IN DRY.
2. THE CONSTRUCTION WORK IS TO BE COMPLETED WITHIN THE MONTHS OF NOVEMBER-JANUARY, WHICH ALSO COINCIDES WITH THE WARM WATER FISHERIES WINDOW.
3. THE 2-YEAR FLOW OF ETOBICOKE CREEK IS 103M3/S, AS THE FLOW IS QUITE HIGH, A MORE REASONABLE FLOW IS ASSUMED THAT CAN BE USED AS THE DESIGN FLOW DURING THE PERIOD OF CONSTRUCTION.
4. BASED ON A STATISTICAL ANALYSIS OF DAILY STREAM FLOW DATA, IN PARTICULAR FOR THE MONTHS BETWEEN NOVEMBER TO MARCH, THE MAXIMUM DAILY FLOW OR THE DESIGN FLOW OF 9.2M3/S WAS DETERMINED. THE TEMPORARY DIVERSION SYSTEM WOULD BE DESIGNED FOR THE DESIGN FLOW OF 9.2M3/S. SEE 'HYDROLOGY: TEMPORARY WORKS DURING CONSTRUCTION' TECHNICAL MEMORANDUM (BI DECEMBER, 2016) FOR DETAILED ANALYSES. CONSTRUCTION PHASING:

A. TEMPORARY DIVERSION CHANNEL:

1. CONSTRUCT A TEMPORARY DIVERSION CHANNEL WITH BOTTOM WIDTH OF 2M, SIDE SLOPES OF 1.25H:1V. FROM THE UPSTREAM SIDE OF EXISTING WEIR TO THE DOWNSTREAM SIDE (SOUTH OF THE EXISTING STORM OUTLET), LOCATED WEST OF THE ETOBICOKE CREEK. THE APPROXIMATE LONGITUDINAL SLOPE OF THE DIVERSION CHANNEL IS 1.08%. THE LOCATION OF THE PROPOSED DIVERSION CHANNEL IS SHOWN IN THE DRAWING. RELOCATE/REMOVE ARMOUR STONE WALLS ON THE WEST SIDE TO MAKE ROOM FOR THE TEMPORARY DIVERSION CHANNEL.
2. THE TEMPORARY DIVERSION CHANNEL TO BE LINED WITH RIP-RAP WITH D50 OF 150MM. THE RIP-RAP LAYER SHOULD BE PLACED ON TOP OF IMPERMEABLE FILTER FABRIC LINING.
3. BEFORE CONSTRUCTING THE DIVERSION CHANNEL, THE WEST BANK OR THE STARTING POINT OF THE DIVERSION CHANNEL TO BE OBSTRUCTED WITH COFFERDAM, ALLOWING THE DIVERSION CHANNEL CONSTRUCTION WORK TO COMMENCE IN DRY.
4. FOLLOWING THE CONSTRUCTION OF THE PROPOSED TEMPORARY DIVERSION CHANNEL, THE COFFERDAMS OBSTRUCTING THE ENTRANCE TO THE DIVERSION CHANNEL TO BE REMOVED, ALLOWING STREAM FLOW TO GRADUALLY DIVERT THROUGH THE PROPOSED CHANNEL.
5. THE PROPOSED TEMPORARY DIVERSION CHANNEL WILL BE IN CONFLICT WITH THE 600MM CSP EXISTING STORM SEWER DISCHARGING FROM THE WEST SIDE OF THE ETOBICOKE CREEK, SOUTH OF THE EXISTING BRIDGE.
6. DURING THE PERIOD OF CONSTRUCTION, THE EXISTING 600MM CSP STORM SEWER TO BE DISCONTINUED AT THE TEMPORARY DIVERSION CROSSING.
7. DURING THE CONSTRUCTION PERIOD, THE EXISTING 600MM CSP STORM SEWER TO DISCHARGE TO THE TEMPORARY DIVERSION CHANNEL, INSTEAD OF THE MAIN BRANCH OF THE ETOBICOKE CREEK.

B. PROPOSED DROP STRUCTURE:

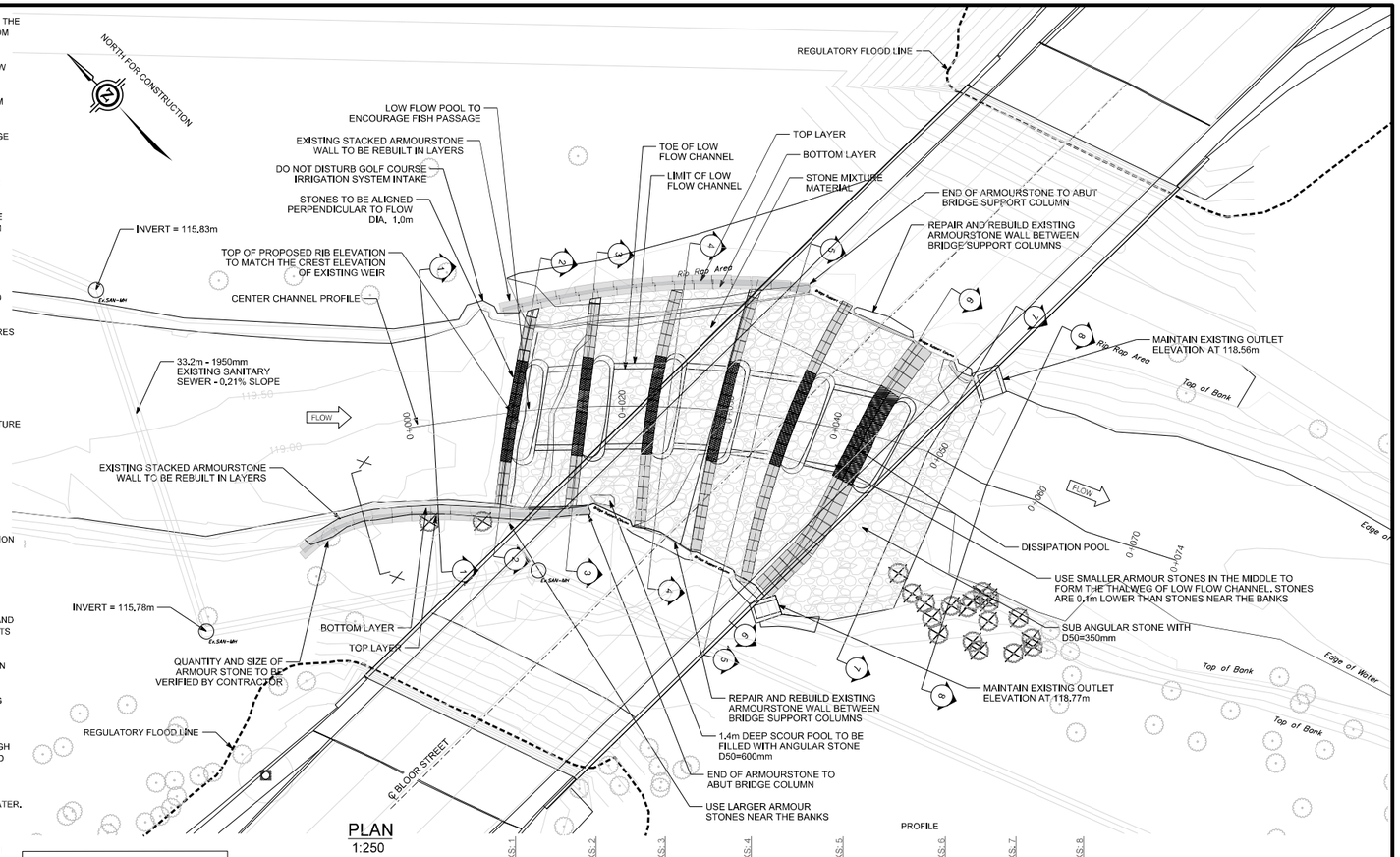
8. SIMULTANEOUSLY COFFERDAMS TO BE PLACED FROM EAST TO WEST OBSTRUCTING THE MAIN BRANCH OF THE ETOBICOKE CREEK. THE HEIGHT OF THE COFFERDAMS SHALL BE 1.5M. THE LOCATION OF THE NORTH COFFERDAMS ON THE MAIN BRANCH OF ETOBICOKE CREEK IS SHOWN IN THE ESC AND CONSTRUCTION STAGING FIGURE.
9. ON THE DOWNSTREAM END COFFERDAMS TO BE PLACED FROM EAST TO WEST ON THE MAIN BRANCH OF ETOBICOKE CREEK. THE HEIGHT OF THE COFFERDAMS SHALL BE 1.5 M. THE LOCATION OF THE SOUTH COFFERDAMS ON THE MAIN BRANCH OF ETOBICOKE CREEK IS SHOWN IN THE CONSTRUCTION STAGING FIGURE.
10. THE NORTH AND SOUTH COFFERDAMS ENABLE THE ISOLATION OF THE WORK SITE.
11. REMAINING WATER WITHIN THE ISOLATED WORK AREA TO BE PUMPED OUTSIDE OF THE SOUTH COFFERDAMS INTO A TEMPORARY STILLING BASIN LOCATED 30M AWAY FROM THE SITE.
12. RELOCATE THE ARMOUR STONE WALLS ON THE EAST SIDE AND PLACE THEM IN NEW LOCATION.
13. CONSTRUCTION WORK OF THE PROPOSED DROP STRUCTURE TO COMMENCE FROM THE UPSTREAM TO THE DOWNSTREAM SIDE WITHIN THE ISOLATED WORK AREA.
14. THE EXISTING NON-FUNCTIONAL WEIR STRUCTURE, LOCATED NORTH OF THE BRIDGE TO BE DISMANTLED AS FOLLOWS:
    a. EXISTING CONCRETE CAP TO BE CUT AND REMOVED.
    b. EXISTING GABION / STONE STRUCTURE TO BE CAREFULLY INSPECTED FOR THEIR LEVEL OF COMPACTNESS AND STABILITY.
    c. CONTINUE TO CUT CONCRETE CAP AND REMOVE EXISTING GABION / STONE STRUCTURE, UNTIL A SMOOTH, STABLE, COMPACT SURFACE IS FOUND, FROM WHICH POINT THE STREAM REHABILITATION DESIGN CAN BE INITIATED.
15. THE MOST UPSTREAM DROP STRUCTURE TO FIRST BE CONSTRUCTED BY PLACING ARMOUR STONES FROM WEST TO EAST, UP TO THE EAST BANK.
16. THE NEXT DOWNSTREAM ARMOUR STONE DROP STRUCTURE TO BE CONSTRUCTED FROM WEST TO EAST, UP TO THE EAST BANK.
17. FILL THE SPACE BETWEEN THE TWO COMPLETED ARMOUR STONE DROP STRUCTURES WITH SUB-ANGULAR STONES WITH A MEAN DIAMETER OF 350 MM (AS SHOWN IN DRAWING) TO CREATE THE INTERMEDIATE RIFFLE SPACE.
18. THE INTERMEDIATE RIFFLE SPACE SHOULD CONTAIN A LOW FLOW CHANNEL TO ACCOMMODATE FISH PASSAGE. THE DETAILS OF THE LOW FLOW CHANNEL IN THE INTERMEDIATE RIFFLE SPACE HAS BEEN PROVIDED IN THE DRAWING.
19. REPEAT STEPS AND CONTINUE TO CONSTRUCT THE ARMOUR STONE DROP STRUCTURE AND INTERMEDIATE RIFFLE SPACES FROM NORTH TO SOUTH.
20. REMOVE THE COFFERDAMS FROM THE MAIN BRANCH OF THE ETOBICOKE CREEK.
21. INSTALL COFFERDAMS UPSTREAM OF THE DIVERSION CHANNEL.
22. FILL IN THE TEMPORARY DIVERSION CHANNEL AND PLACE EXISTING 600MM STORM SEWER BACK IN PLACE OR RE-ESTABLISH CONNECTION.
23. REMOVE THE COFFERDAM FROM THE UPSTREAM END OF THE TEMPORARY DIVERSION CHANNEL.
24. REPOSITION THE EXISTING ARMOUR STONE WALLS ON THE WEST SIDE

CONSTRUCTION AND STAGING NOTES:

1. ALL MATERIALS AND EQUIPMENT USED FOR THE PURPOSE OF SITE PREPARATION AND PROJECT COMPLETION TO BE OPERATED AND STORED IN A MANNER THAT PREVENTS ANY DELETERIOUS SUBSTANCES FROM ENTERING THE WATER.
2. STOCKPILED MATERIALS TO BE STORED AND STABILIZED AWAY FROM THE WATER IN DESIGNATED AREAS.
3. REFUELLING OF ANY EQUIPMENT USED FOR THE PURPOSES OF THE WATER TAKING SHALL NOT OCCUR WITHIN 30 M OF ANYWATER BODY.
4. THE CONTRACTOR SHALL ANTICIPATE AND PREPARE FOR RAIN EVENTS. THIS WILL INCLUDE ENSURING THAT ANY FLOODING OF THE WORK SITE IS MITIGATED THROUGH PROPER TEMPORARY STABILIZATION OF DISTURBED AREAS WITHIN THE CREEK AND FLOODPLAIN AREAS.
5. THE EQUIPMENT SHALL BE FREE OF FLUID LEAKS AND EXTERNALLY CLEANED AND DEGREASED TO PREVENT ANY DELETERIOUS SUBSTANCE FROM ENTERING THE WATER.
6. ALL EQUIPMENT OPERATING NEAR THE WATER TO BE EQUIPPED WITH A SPILL KIT.
7. NO EQUIPMENT IS TO ENTER THE WATER, ALL WET WORK TO BE COMPLETED FROM BANK AND PLATFORMS.
8. ONLY MATERIAL FREE OF FINE PARTICULATE MATTER SHALL BE PLACED IN THE WATER UNLESS OTHERWISE DIRECTED.
9. ALL MATERIAL ASSOCIATED WITH CONSTRUCTION TO BE DISPOSED OF OFF-SITE FOLLOWING PROJECT COMPLETION.
10. ALL DISTURBED AREAS TO BE STABILIZED AS SOON AS POSSIBLE FOLLOWING CONSTRUCTION AND RE-VEGETATED ONCE WEATHER PERMITS.
11. AS THIS IS A WARM WATER SYSTEM, IN-WATER WORKS ARE TO BE RESTRICTED BETWEEN JULY 1 AND MARCH 31 OF ANY GIVEN YEAR.
12. THE CONTRACTOR WILL BE RESPONSIBLE FOR MONITORING THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS WILL BE CONDUCTED DURING FAVOURABLE WEATHER CONDITION. SHOULD AN UNEXPECTED STORM ARISE, THE CONTRACTOR WILL REMOVE ALL UNFIXED ITEMS FROM THE REGIONAL STORM FLOOD PLAIN THAT WOULD HAVE THE POTENTIAL TO CAUSE A SPILL OR AN OBSTRUCTION TO FLOW, E.G. FUEL TANKS, PORTA-POTTIES, MACHINERY, EQUIPMENT, CONSTRUCTION MATERIALS, ETC.
13. STEEL PLATES AND/OR MUD MATS MUST BE INSTALLED AT MACHINE CROSSINGS INFRASTRUCTURE CROSSINGS.
14. STAGING AND STOCKPILING AREA TO BE LOCATED AT LEAST 15 M FROM TOP OF BANK SPACE PERMITTING, OR A MIN. 6M FROM TOP OF BANK WITH MATERIALS STORED AT A MAXIMUM HEIGHT OF 2M.

CONSTRUCTION IMPLEMENTATION

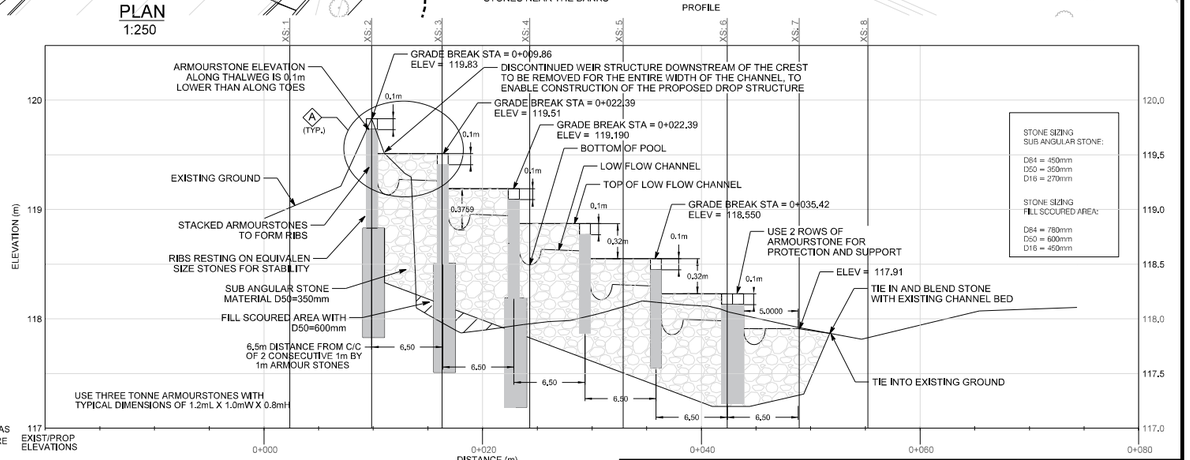
1. THE CHANNEL WORK SHALL BE CARRIED OUT UNDER THE DIRECTION OF THE FLUVIAL GEOMORPHOLOGIST.
2. CONSTRUCTION PHASING - IMPLEMENTATION OF CHANNEL CONSTRUCTION SHOULD BE BASED ON THE DETAILED LAYOUT PROVIDED IN THE DESIGN PLANS, FOLLOWED BY SYSTEMATIC EXCAVATION, GRADING, AND STONE PLACEMENT FROM UPSTREAM TO DOWNSTREAM, AS THE PREFERRED DIRECTION. CONSTRUCTION SHOULD PROCEED IN WET CONDITIONS. REFER TO CHANNEL CONSTRUCTION PROCEDURE NOTES BELOW.
3. EROSION CONTROL - DURING, AND IMMEDIATELY AFTER CONSTRUCTION, SOIL AND BANK MATERIAL FILL BE ESPECIALLY SUSCEPTIBLE TO EROSION, AS VEGETATION WILL NOT HAVE ESTABLISHED. STABILIZATION AND SEEDING OF ALL DISTURBED AREAS ALONG WITH INSTALLATION, WHERE NECESSARY, OF BANK EROSION CONTROL (I.E., COIR CLOTH, JUTE MAT OR SIMILAR BIODEGRADABLE FIBRE MAT) SHOULD OCCUR IMMEDIATELY AFTER SECTIONS OF CHANNEL CONSTRUCTION ARE COMPLETED, TO MINIMIZE THE RISK OF SEDIMENT-RELATED IMPACTS TO THE DOWNSTREAM WATERCOURSE.
4. VEGETATION - RAPID ESTABLISHMENT OF VEGETATION ON THE CHANNEL BANKS AND ADJACENT FLOODPLAIN WILL MINIMIZE POTENTIAL EROSION. VEGETATION ALSO PROVIDES COVER, WHICH IMPROVE AQUATIC HABITAT AND WATER-QUALITY.
5. GENERAL MONITORING - GENERAL FIELD RECONNAISSANCE ALONG THE ENTIRE LENGTH OF THE CHANNEL SHOULD BE COMPLETED AFTER CONSTRUCTION AND AFTER THE FIRST LARGE FLOODING EVENT TO IDENTIFY ANY POTENTIAL AREAS OF EROSION CONCERN.



PLAN
1:250

LEGEND
- EDGE OF WATER
- CENTER OF CHANNEL
- STONE MIX
- STONE RIB (LOW FLOW)
- STONE RIB
- BANK ARMOUR STONE
- DISSIPATION POOL

PROFILE



PROFILE
1:250 HORZ.
1:25 VERT.

STONE SIZING

1. MATERIAL USED TO FORM RIBS ACROSS CHANNEL ARE TO BE LARGE STACKABLE ARMOURSTONES.
2. MATERIAL BETWEEN RIBS IS TO BE ANGULAR STONE (D16 = 270mm, D50 = 350mm, D84 = 450mm)
3. STONE WALL UPSTREAM OF BRIDGE TO BE RECONSTRUCTED USING EXISTING ARMOURSTONE

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No.	DATE	REVISIONS	INITIAL	SIGNED
	05/15/2017	ISSUED FOR TENDER	RJM	

DIGITAL INFORMATION

TORONTO Engineering and Construction Services

LICENSED PROFESSIONAL ENGINEER A. CHARDER 100128903 PROVINCE OF ONTARIO

PROFESSIONAL GEOSCIENTIST JOHN D. PARISH 1137

FRANK CLARIZIO, P.ENG, DIRECTOR, DESIGN & CONSTRUCTION TRANSPORTATION INFRASTRUCTURE

MICHAEL D'ANDREA, P. ENG. EXECUTIVE DIRECTOR ENGINEERING & CONSTRUCTION SERVICES

LUIS DE JESUS, P.ENG., PMP ACTING MANAGER BRIDGES, STRUCTURES & EXPRESSWAYS

BLOOR STREET BRIDGE OVER ETOBICOKE CREEK

CREEK WORK

PLAN AND PROFILE

DESIGN	A.Q.	DRAWN	D.R.	CHECKED	J.P.	CONTRACT No.	14ECS-TI-01BE
SCALE:	AS NOTED			DRAWING NUMBER	317-S-634-35	SHEET	7
DATE:	MAY 15, 2017						

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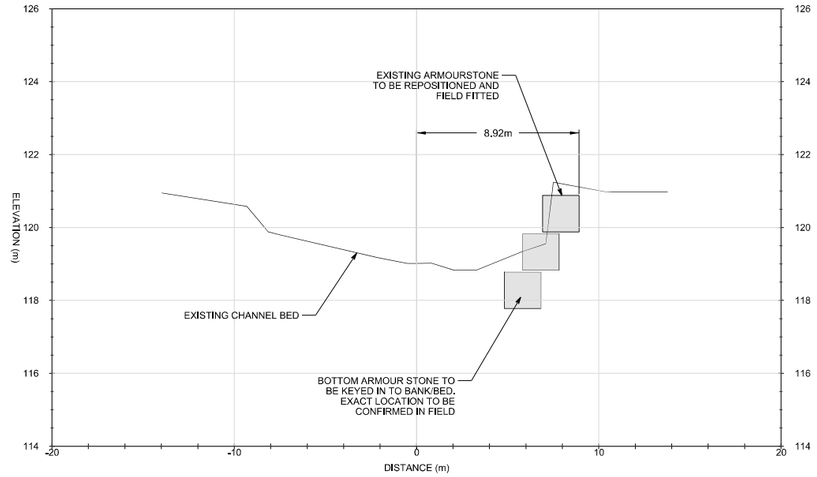

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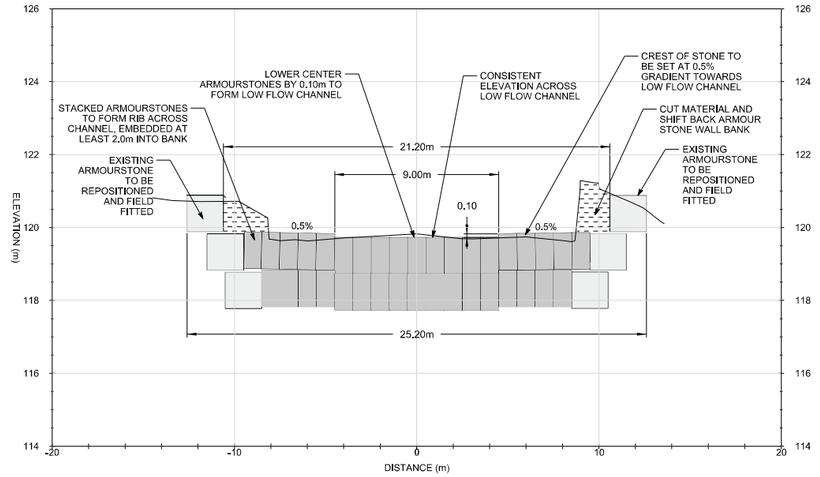
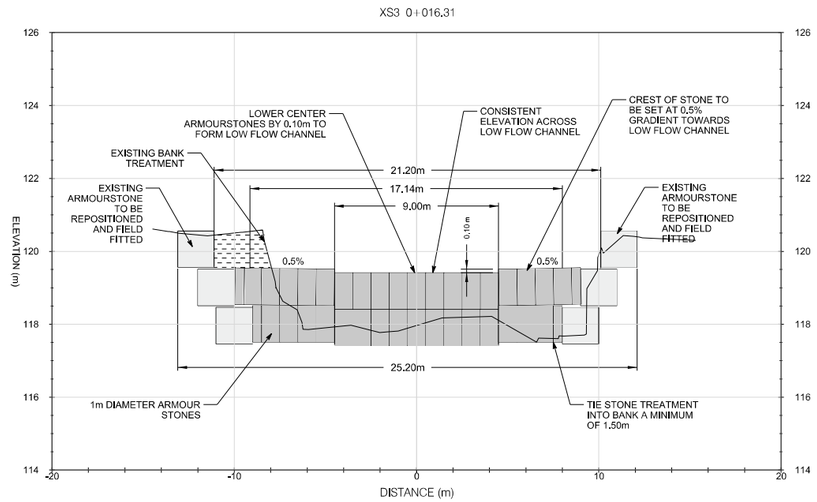


LEGEND

- EXISTING GROUND
- PROPOSED CHANNEL
- CUT
- FILL
- STONE MIX
- STONE RIB
- BANK ARMOUR STONE

CHANNEL BED STONE MIX SIZING
D84: 450mm
D50: 350mm
D16: 270mm

XS3 0+016.31



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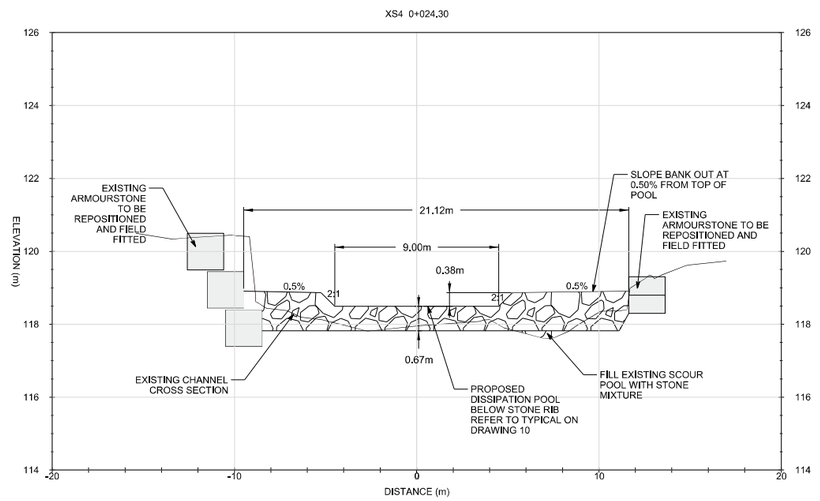

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SCALES

1:150 SECTION - HORIZ.
1:75 SECTION - VERT.

	05/15/2017	ISSUED FOR TENDER	R.J.M		
DIGITAL INFORMATION	No.	DATE	REVISIONS	INITIAL	SIGNED

TORONTO Engineering and Construction Services

A. QUADER 100120003 PROFESSIONAL ENGINEER PROVINCE OF ONTARIO

JOHN D. PARISH PROFESSIONAL GEOSCIENTIST 1137 May 15/17

MICHAEL D'ANDREA, P. ENG.
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FRANK CLARIZIO, P.ENG.
DIRECTOR, DESIGN & CONSTRUCTION
TRANSPORTATION INFRASTRUCTURE

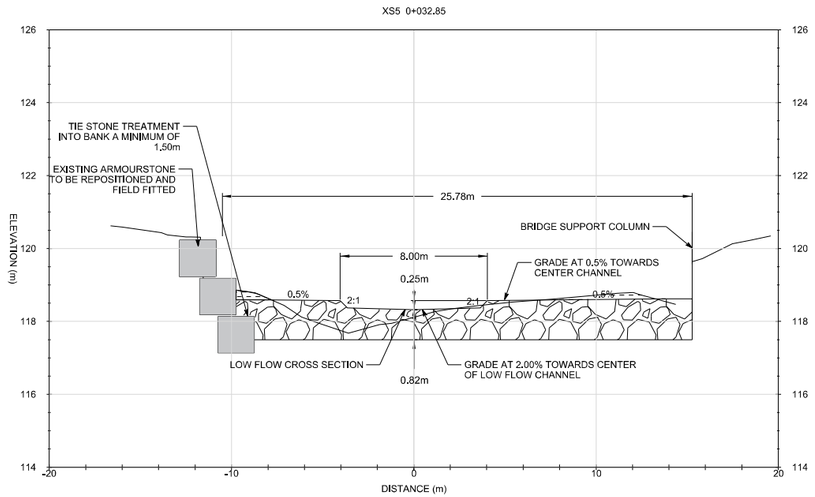
LUIS DE JESUS, P.ENG., PMP
ACTING MANAGER
BRIDGES, STRUCTURES & EXPRESSWAYS

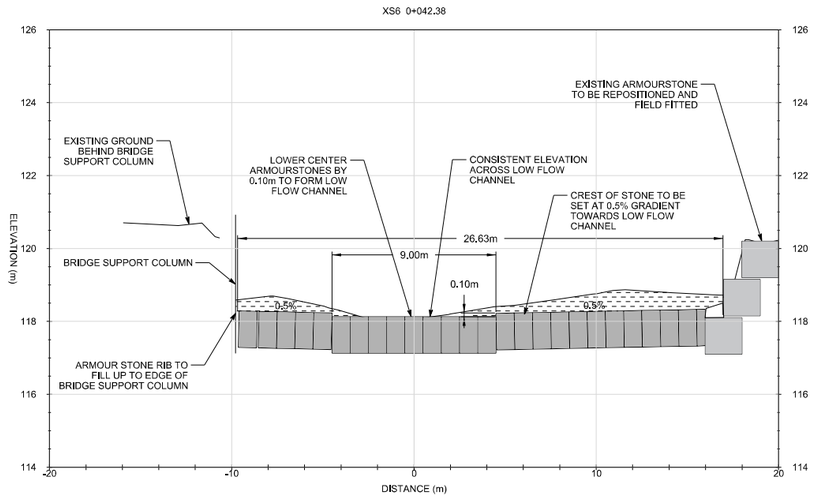
BLOOR STREET BRIDGE OVER ETOBICOKE CREEK

CREEK WORK

CROSS SECTION 1

DESIGN	A.Q.	DRAWN	D.R.	CHECKED	J.P.	CONTRACT No.	14ECS-TI-01BE
SCALE:	AS NOTED			DRAWING NUMBER	317-S-634-36	SHEET	8
DATE:	MAY 15, 2017						

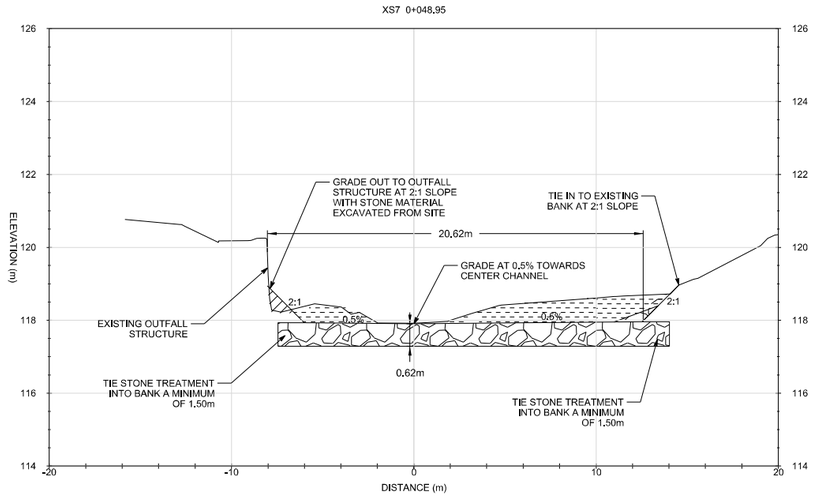


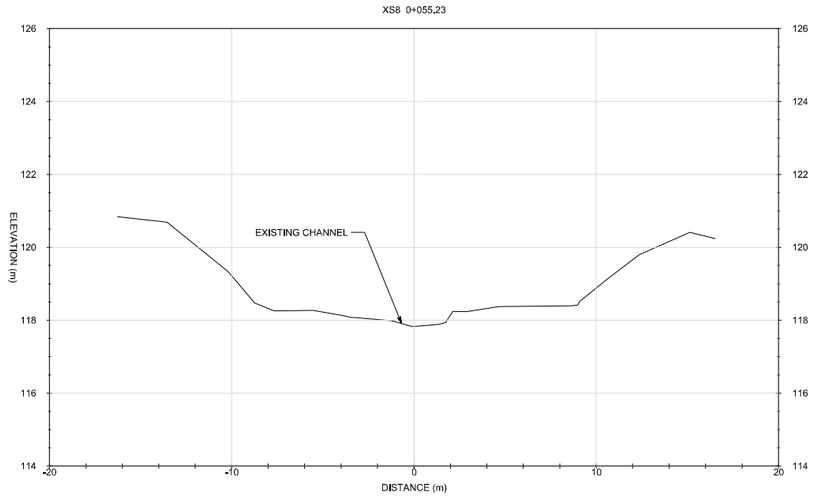


LEGEND

- EXISTING GROUND
- PROPOSED CHANNEL
- CUT
- FILL
- STONE MIX
- STONE RIB
- BANK ARMOUR STONE

CHANNEL BED STONE MIX SIZING
D84: 450mm
D50: 350mm
D16: 270mm





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SCALES

1:150	SECTION - HORIZ.
1:75	SECTION - VERT.

No.	DATE	REVISIONS	INITIAL	SIGNED
	05/15/2017	ISSUED FOR TENDER	R.J.M	

DIGITAL INFORMATION

TORONTO Engineering and Construction Services

A. QUADER 100120903 PROFESSIONAL ENGINEER PROVINCE OF ONTARIO — May 15/17

JOHN D. PARISH PRACTISING MEMBER 1137 PROFESSIONAL GEOSCIENTIST — May 15/17

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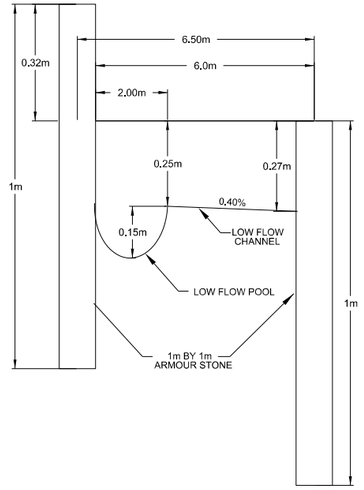
BLOOR STREET BRIDGE OVER ETOBICOKE CREEK

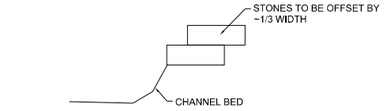
CREEK WORK

CROSS SECTION 2

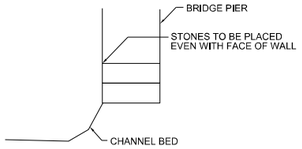
DESIGN	A.Q.	DRAWN	D.R.	CHECKED	J.P.	CONTRACT No. 14ECS-TI-01BE
SCALE:	AS NOTED			DRAWING NUMBER	317-S-634-37	SHEET 9
DATE:	MAY 15, 2017					



DETAILS OF POOL AFTER EACH DROP (A)
N.T.S.

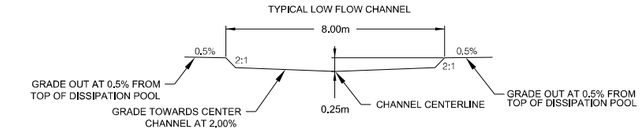


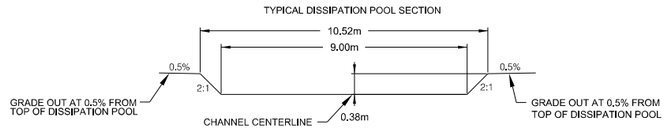
SECTION X-X
TYPICAL CROSS SECTION THROUGH RECONSTRUCTED ARMOURSTONE WALL ADJACENT TO AND AWAY FROM BRIDGE STRUCTURE

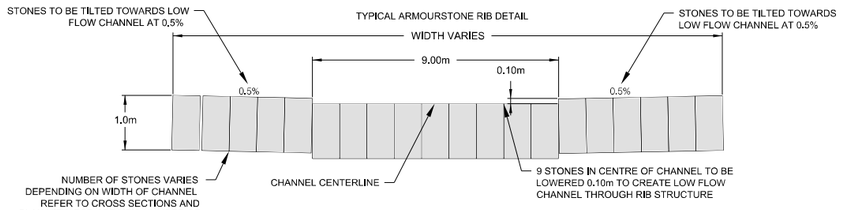


SECTION Y-Y
TYPICAL CROSS SECTION THROUGH RECONSTRUCTED ARMOURSTONE WALL AT BRIDGE ABUTMENT
CONDITIONS TO BE REPLICATED ON BOTH SIDES OF CHANNEL UPSTREAM OF BRIDGE, AS PER PLAN (NTS)

POSITIONING OF ARMOURSTONES ALONG THE CHANNEL REACH (ADJACENT TO AND AWAY FROM BRIDGE) (C)
N.T.S.



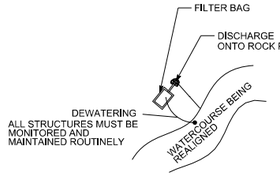




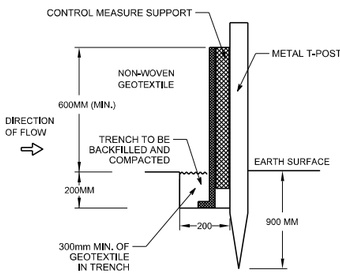
TYPICAL CROSS SECTIONS (B)
N.T.S.

FILTER BAGS

- FILTER BAG LOCATED 30M FROM EDGE OF WATERCOURSE
- LOCATED ON GRASS AREA, OR IF NONE AVAILABLE, ON A ROCK PAD AND SURROUNDED BY SILT FENCE
- SIZE AND MANUFACTURER TO BE DETERMINED DURING FINAL DESIGN



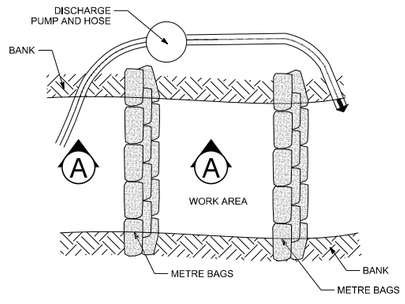
TYPICAL FILTER BAG SEDIMENT TREATMENT (T1)
N.T.S.



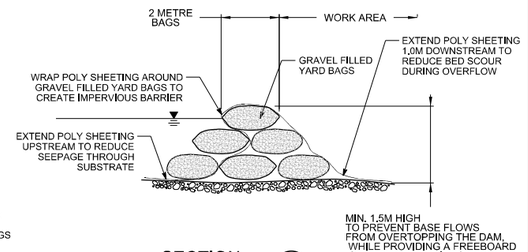
HEAVY DUTY SILT FENCE BARRIER (T2)
N.T.S.

NOTES:

- METRE BAG COFFER DAM TO BE PLACED ABOVE AND BELOW IN A METHOD SIMILAR TO DRAWING DETAIL. PUMPED WATER SHOULD BE AS ILLUSTRATED IN DRAWING DETAIL OR PUMPED THROUGH A STORM WATER OUTLET WITH APPROPRIATE ENERGY DISSIPATION TECHNIQUE (IE. HAY BALES) AND PROPER SEDIMENT CONTROL SUCH AS SEDIMENT FILTER BAG OR RING.
- ALL MATERIALS USED IN COFFER DAM MUST BE REMOVED FROM CHANNEL IN THEIR ENTIRETY IMMEDIATELY FOLLOWING COMPLETION OF CONSTRUCTION.
- CHANNEL BED SHOULD NOT BE SIGNIFICANTLY DISTURBED DURING INSTALLATION OR REMOVAL OF COFFER DAM.



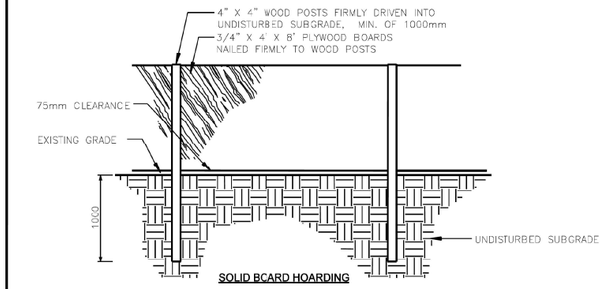
PLAN



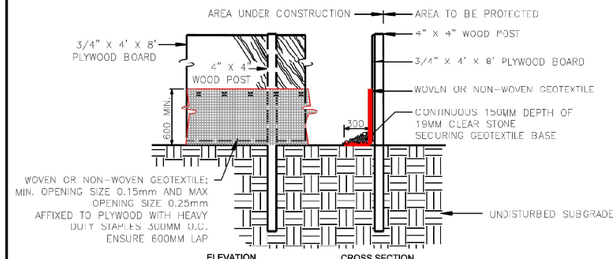
SECTION (A)

TYPICAL METER BAG COFFER DAM (T3)
N.T.S.

SOLID BOARD CONSTRUCTION HOARDING



SOLID BOARD HOARDING



SOLID BOARD HOARDING WITH SEDIMENT CONTROL BARRIER

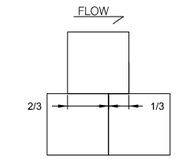
NOTES:

1. HOARDING MUST BE SUPPLIED, INSTALLED AND MAINTAINED BY THE APPLICANT AND/OR CONTRACTOR IN SOUND FUNCTIONING CONDITION THROUGHOUT ALL PHASES OF CONSTRUCTION AND SITE PRESERVICING, UNTIL APPROVAL TO REMOVE HOARDING IS OBTAINED FROM THE COMMUNITY SERVICES DEPARTMENT.
2. HOARDING TO BE INSPECTED/APPROVED BY AND BE INSTALLED TO THE SATISFACTION OF THE COMMUNITY SERVICES DEPARTMENT.
3. DO NOT ALLOW WATER TO COLLECT AND POND BEHIND OR WITHIN HOARDING.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

MISSISSAUGA Community Services

SCALE: N.T.S.
DATE: MARCH 2, 2006
DRAWN BY: P & D
NUMBER: 02830-2

02830-2_boardhd.dgn
\\02830-2_boardhd.dgn 2006/03/02 1:46:21 PM



STACKED ARMOURSTONE CONFIGURATION IN PROPOSED DROP STRUCTURE (D)
N.T.S.

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CONSULTANTS

No.	DATE	REVISIONS	INITIAL	SIGNED
	05/15/2017	ISSUED FOR TENDER	R.J.M	

DIGITAL INFORMATION

TORONTO Engineering and Construction Services

A. QUADER 100120093 LICENSED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO

JOHN D. PARISH 1137 PROFESSIONAL GEOSCIENTIST PROVINCE OF ONTARIO May 15/17

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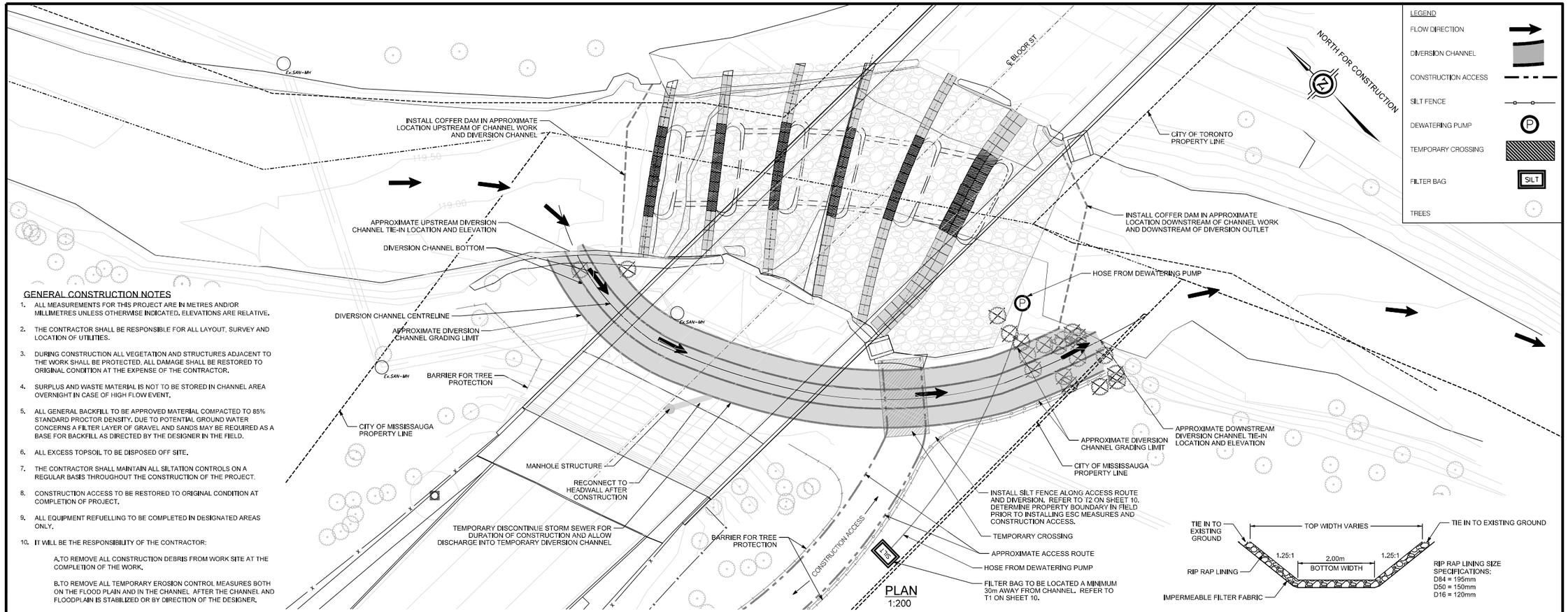
EXECUTIVE DIRECTOR
ENGINEERING & CONSTRUCTION SERVICES

LUIS DE JESUS, P.ENG., PMP
ACTING MANAGER
BRIDGES, STRUCTURES & EXPRESSWAYS

BLOOR STREET BRIDGE OVER ETOBICOKE CREEK
CREEK WORK
CHANNEL CONSTRUCTION AND SEDIMENT AND EROSION CONTROL TYPICALS

DESIGN	A.Q.	DRAWN	D.R.	CHECKED	J.P.	CONTRACT No.	14ECS-TI-01BE
SCALE:	AS NOTED			DRAWING NUMBER	317-S-634-38	SHEET	10
DATE:	MAY 15, 2017						



GENERAL CONSTRUCTION NOTES

1. ALL MEASUREMENTS FOR THIS PROJECT ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE INDICATED. ELEVATIONS ARE RELATIVE.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LAYOUT, SURVEY AND LOCATION OF UTILITIES.
3. DURING CONSTRUCTION ALL VEGETATION AND STRUCTURES ADJACENT TO THE WORK SHALL BE PROTECTED. ALL DAMAGE SHALL BE RESTORED TO ORIGINAL CONDITION AT THE EXPENSE OF THE CONTRACTOR.
4. SURPLUS AND WASTE MATERIAL IS NOT TO BE STORED IN CHANNEL AREA OVERNIGHT IN CASE OF HIGH FLOW EVENT.
5. ALL GENERAL BACKFILL TO BE APPROVED MATERIAL COMPACTED TO 85% STANDARD PROCTOR DENSITY. DUE TO POTENTIAL GROUND WATER CONCERNS A FILTER LAYER OF GRAVEL AND SANDS MAY BE REQUIRED AS A BASE FOR BACKFILL AS DIRECTED BY THE DESIGNER IN THE FIELD.
6. ALL EXCESS TOPSOIL TO BE DISPOSED OFF SITE.
7. THE CONTRACTOR SHALL MAINTAIN ALL SILTATION CONTROLS ON A REGULAR BASIS THROUGHOUT THE CONSTRUCTION OF THE PROJECT.
8. CONSTRUCTION ACCESS TO BE RESTORED TO ORIGINAL CONDITION AT COMPLETION OF PROJECT.
9. ALL EQUIPMENT REFUELLING TO BE COMPLETED IN DESIGNATED AREAS ONLY.
10. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR:

    A.TO REMOVE ALL CONSTRUCTION DEBRIS FROM WORK SITE AT THE COMPLETION OF THE WORK.

    B.TO REMOVE ALL TEMPORARY EROSION CONTROL MEASURES BOTH ON THE FLOOD PLAIN AND IN THE CHANNEL AFTER THE CHANNEL AND FLOODPLAIN IS STABILIZED OR BY DIRECTION OF THE DESIGNER.
11. WORK WILL NOT BE CONSIDERED COMPLETE UNTIL SIGNED OFF BY THE DESIGNER/GEOMORPHOLOGIST.

EROSION, SEDIMENT CONTROL AND DEWATERING NOTES:

E1. THE FOLLOWING DE-WATERING, EROSION CONTROL AND CONSTRUCTION PHASING METHODS ARE RECOMMENDED BASED ON THE DESIGNER'S KNOWLEDGE OF THE SITE AND OF NATURAL CHANNEL CONSTRUCTION PROCESS AND TECHNIQUES, THE CONTRACTOR MAY WISH OR NEED TO ALTER THE METHODS BASED ON SITE CONDITIONS IDENTIFIED AT THE TIME OF CONSTRUCTION. ALTERNATIVE METHODS MUST BE APPROVED BY THE CA PRIOR TO COMMENCEMENT OF CONSTRUCTION.

E2. CONSTRUCTION ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, WILL BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. CONTRACTOR SHALL HAVE A SPILLS KIT ON HAND AT ALL TIMES.

E3. THE FIVE DAY WEATHER FORECAST SHALL BE MONITORED DAILY BY THE CONTRACTOR TO ANTICIPATE WEATHER CONDITIONS AND SHALL BE PREPARED TO LEAVE THE SITE IN A STABLE AND SECURE CONDITION SHOULD WATER LEVELS RISE. WORK SHOULD NOT RESUME UNTIL WATER LEVELS HAVE RETURNED TO BASE FLOWS.

E4. THE LIMITS OF COFFER DAMS FOR THE PROPOSED WORKS ARE SHOWN IN THE DRAWING AND DETAILED IN THE CONSTRUCTION PHASING. INSTALLATION SHOULD OCCUR IN WORKABLE LENGTHS, OR THE FULL LENGTH OF THE AREA OF CONCERN. AS DESIRED, A SUMP PUMP SHALL BE INSTALLED TO DEWATER THE AREA, AND ALL WORKS SHOULD BE COMPLETED IN ISOLATION FROM FLOWS. WATER IS TO BE DISCHARGED TO A SEDIMENT BAG OR STILLING BASIN A MINIMUM 30M FROM THE WATERCOURSE. COFFER DAMS MUST PROVIDE A 0.30M FREEBOARD AT ALL TIMES TO PREVENT BASE FLOWS FROM OVERTOPPING THE DAM.

E5. ALL DISTURBED AREAS ARE TO BE RESTORED AS SOON AS POSSIBLE FOLLOWING DISTURBANCE. AREAS THAT ARE DISTURBED SHOULD HAVE SILT CONTROL FENCES INSTALLED PRIOR TO CONSTRUCTION UNTIL THE SITE HAS BEEN STABILIZED.

E6. ALL STOCKPILE AREAS ARE TO BE ENCLOSED WITH SILT CONTROL FENCING AND LOCATED AS FAR AS POSSIBLE FROM THE WATERCOURSE.

E7. THE EROSION AND SEDIMENT CONTROL MEASURES ARE SUBJECT TO CHANGE BASED ON CHANGES IN SITE CONDITIONS.

E8. THE CONTRACTOR IS RESPONSIBLE FOR EROSION AND SEDIMENT CONTROL WITHIN THE CONSTRUCTION

CHANNEL CONSTRUCTION PROCEDURE:

METHOD OF CONSTRUCTION:

1. THE CONSTRUCTION WORK IS TO BE COMPLETED IN DRY. A TEMPORARY DIVERSION SCHEME IS TO BE USED TO DIVERT THE STREAMFLOW FROM THE MAIN BRANCH OF THE ETOBICOKE CREEK, ISOLATE THE WORK AREA AND ALLOW THE PROPOSED CONSTRUCTION WORK TO BE COMPLETED IN DRY.
2. THE CONSTRUCTION WORK IS TO BE COMPLETED WITHIN THE MONTHS OF NOVEMBER-JANUARY, WHICH ALSO COINCIDES WITH THE WARM WATER FISHERIES WINDOW.
3. THE 2-YEAR FLOW OF ETOBICOKE CREEK IS 103M3/S, AS THE FLOW IS QUITE HIGH, A MORE REASONABLE FLOW IS ASSUMED THAT CAN BE USED AS THE DESIGN FLOW DURING THE PERIOD OF CONSTRUCTION, REFER TO NOTE #4 BELOW.
4. BASED ON A STATISTICAL ANALYSIS OF DAILY STREAM FLOW DATA, IN PARTICULAR FOR THE MONTHS BETWEEN NOVEMBER TO MARCH, THE MAXIMUM DAILY FLOW OR THE DESIGN FLOW OF 9.2M3/S WAS DETERMINED. THE TEMPORARY DIVERSION SYSTEM IS TO BE CONSTRUCTED FOR THE DESIGN FLOW OF 9.2M3/S, SEE 'HYDROLOGY: TEMPORARY WORKS DURING CONSTRUCTION' TECHNICAL MEMORANDUM (IBI DECEMBER, 2016) FOR DETAILED ANALYSES.

CONSTRUCTION PHASING:

A.TEMPORARY DIVERSION CHANNEL:

1. CONSTRUCT A TEMPORARY DIVERSION CHANNEL WITH BOTTOM WIDTH OF 2M, SIDE SLOPES OF 1.25H:1V, FROM THE UPSTREAM SIDE OF EXISTING WEIR TO THE DOWNSTREAM SIDE (SOUTH OF THE EXISTING STORM OUTLET), LOCATED WEST OF THE ETOBICOKE CREEK. THE APPROXIMATE LONGITUDINAL SLOPE OF THE DIVERSION CHANNEL IS 1.08%. RELOCATE/REMOVE ARMOUR STONE WALLS ON THE WEST SIDE TO MAKE ROOM FOR THE TEMPORARY DIVERSION CHANNEL.
2. THE TEMPORARY DIVERSION CHANNEL IS TO BE LINED WITH RIP-RAP WITH D50 OF 150MM, THE RIP-RAP LAYER SHOULD BE PLACED ON TOP OF IMPERMEABLE FILTER FABRIC LINING.
3. BEFORE CONSTRUCTING THE DIVERSION CHANNEL, THE WEST BANK OR THE STARTING POINT OF THE DIVERSION CHANNEL IS TO BE OBSTRUCTED WITH COFFERDAM, ALLOWING THE DIVERSION CHANNEL CONSTRUCTION WORK TO COMMENCE IN DRY.
4. FOLLOWING THE CONSTRUCTION OF THE PROPOSED TEMPORARY DIVERSION CHANNEL, THE COFFERDAMS OBSTRUCTING THE ENTRANCE TO THE DIVERSION CHANNEL IS TO BE REMOVED, ALLOWING STREAM FLOW TO GRADUALLY DIVERT THROUGH THE PROPOSED CHANNEL.
5. THE PROPOSED TEMPORARY DIVERSION CHANNEL WILL BE IN CONFLICT WITH THE 600MM CSP EXISTING STORM SEWER DISCHARGING FROM THE WEST SIDE OF THE ETOBICOKE CREEK, SOUTH OF THE EXISTING BRIDGE.
6. DURING THE PERIOD OF CONSTRUCTION, THE EXISTING 600MM CSP STORM SEWER IS TO BE DISCONTINUED TEMPORARILY AT THE TEMPORARY DIVERSION CROSSING.
7. DURING THE CONSTRUCTION PERIOD, THE EXISTING 600MM CSP STORM SEWER SHOULD DISCHARGE TO THE TEMPORARY DIVERSION CHANNEL, INSTEAD OF THE MAIN BRANCH OF THE ETOBICOKE CREEK.

B. PROPOSED DROP STRUCTURE:

8. SIMULTANEOUSLY COFFERDAMS ARE TO BE PLACED FROM EAST TO WEST OBSTRUCTING THE MAIN BRANCH OF THE ETOBICOKE CREEK. THE HEIGHT OF THE COFFERDAMS SHALL BE 1.5M, THE LOCATION OF THE NORTH COFFERDAMS ON THE MAIN BRANCH OF ETOBICOKE CREEK IS SHOWN IN THE ESC AND CONSTRUCTION STAGING FIGURE.
9. ON THE DOWNSTREAM END COFFERDAMS ARE TO BE PLACED FROM EAST TO WEST ON THE MAIN BRANCH OF ETOBICOKE CREEK. THE HEIGHT OF THE COFFERDAMS SHALL BE 1.5 M. THE LOCATION OF THE SOUTH COFFERDAMS ON THE MAIN BRANCH OF ETOBICOKE CREEK IS SHOWN IN THE CONSTRUCTION STAGING FIGURE.
10. THE NORTH AND SOUTH COFFERDAMS ENABLE THE ISOLATION OF THE WORK SITE.
11. REMAINING WATER WITHIN THE ISOLATED WORK AREA IS TO BE PUMPED OUTSIDE OF THE SOUTH COFFERDAMS INTO A TEMPORARY STILLING BASIN LOCATED 30M AWAY FROM THE SITE.
12. RELOCATE THE ARMOUR STONE WALLS ON THE EAST SIDE AND PLACE THEM IN NEW LOCATION.
13. CONSTRUCTION WORK OF THE PROPOSED DROP STRUCTURE IS TO COMMENCE FROM THE UPSTREAM TO THE DOWNSTREAM SIDE WITHIN THE ISOLATED WORK AREA.
14. THE EXISTING NON-FUNCTIONAL WEIR STRUCTURE, LOCATED NORTH OF THE BRIDGE SHOULD BE DISMANTLED.
15. THE MOST UPSTREAM DROP STRUCTURE IS TO BE BE CONSTRUCTED BY PLACING ARMOUR STONES FROM WEST TO EAST, UP TO THE EAST BANK.
16. THE NEXT DOWNSTREAM ARMOUR STONE DROP STRUCTURE IS TO BE CONSTRUCTED FROM WEST TO EAST, UP TO THE EAST BANK.
17. FILL THE SPACE BETWEEN THE TWO COMPLETED ARMOUR STONE DROP STRUCTURES WITH SUB-ANGULAR STONES WITH A MEAN DIAMETER OF 350 MM (AS SHOWN IN DRAWING) TO CREATE THE INTERMEDIATE RIFFLE SPACE.
18. THE INTERMEDIATE RIFFLE SPACE IS TO CONTAIN A LOW FLOW CHANNEL TO ACCOMMODATE FISH PASSAGE. THE DETAILS OF THE LOW FLOW CHANNEL IN THE INTERMEDIATE RIFFLE SPACE HAS BEEN PROVIDED IN THE DRAWING.
19. REPEAT STEPS AND CONTINUE TO CONSTRUCT THE ARMOUR STONE DROP STRUCTURE AND INTERMEDIATE RIFFLE SPACES FROM NORTH TO SOUTH.
20. REMOVE THE COFFERDAMS FROM THE MAIN BRANCH OF THE ETOBICOKE CREEK.
21. INSTALL COFFERDAMS UPSTREAM OF THE DIVERSION CHANNEL.
22. FILL IN THE TEMPORARY DIVERSION CHANNEL AND PLACE EXISTING 600MM STORM SEWER BACK IN PLACE OR RE-ESTABLISH CONNECTION.
23. REMOVE THE COFFERDAM FROM THE UPSTREAM END OF THE TEMPORARY DIVERSION CHANNEL.
24. REPOSITION THE EXISTING ARMOUR STONE WALLS ON THE WEST SIDE

CONSTRUCTION AND STAGING NOTES:

1. ALL MATERIALS AND EQUIPMENT USED FOR THE PURPOSE OF SITE PREPARATION AND PROJECT COMPLETION SHOULD BE OPERATED AND STORED IN A MANNER THAT PREVENTS ANY DELETERIOUS SUBSTANCES FROM ENTERING THE WATER.
2. STOCKPILED MATERIALS ARE TO BE STORED AND STABILIZED AWAY FROM THE WATER IN DESIGNATED AREAS.
3. REFUELLING OF ANY EQUIPMENT USED FOR THE PURPOSES OF THE WATER TAKING SHALL NOT OCCUR WITHIN 30 M OF ANY WATER BODY.
4. THE CONTRACTOR SHALL ANTICIPATE AND PREPARE FOR RAIN EVENTS. THIS WILL INCLUDE ENSURING THAT ANY FLOODING OF THE WORK SITE IS MITIGATED THROUGHPROPER TEMPORARY STABILIZATION OF DISTURBED AREAS WITHIN THE CREEK AND FLOODPLAIN AREAS.
5. THE EQUIPMENT SHALL BE FREE OF FLUID LEAKS AND EXTERNALLY CLEANED AND DEGREASED TO PREVENT ANY DELETERIOUS SUBSTANCE FROM ENTERING THE WATER.
6. ALL EQUIPMENT OPERATING NEAR THE WATER ARE TO BE EQUIPPED WITH A SPILL KIT.
7. NO EQUIPMENT IS TO ENTER THE WATER, ALL WET WORK TO BE COMPLETED FROM BANK AND PLATFORMS.
8. ONLY MATERIAL FREE OF FINE PARTICULATE MATTER IS TO BE PLACED IN THE WATER UNLESS OTHERWISE DIRECTED.
9. ALL MATERIAL ASSOCIATED WITH CONSTRUCTION TO BE DISPOSED OF OFF-SITE FOLLOWING PROJECT COMPLETION.
10. ALL DISTURBED AREAS TO BE STABILIZED AS SOON AS POSSIBLE FOLLOWING CONSTRUCTION AND RE-VEGETATED ONCE WEATHER PERMITS.
11. AS THIS IS A WARM WATER SYSTEM, IN-WATER WORKS ARE TO BE RESTRICTED BETWEEN JULY 1 AND MARCH 31 OF ANY GIVEN YEAR.
12. THE CONTRACTOR IS BE RESPONSIBLE FOR MONITORING THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS WILL BE CONDUCTED DURING FAVOURABLE WEATHER CONDITION. SHOULD AN UNEXPECTED STORM ARISE, THE CONTRACTOR WILL REMOVE ALL UNFIXED ITEMS FROM THE REGIONAL STORM FLOOD PLAIN THAT WOULD HAVE THE POTENTIAL TO CAUSE A SPILL OR AN OBSTRUCTION TO FLOW, E.G. FUEL TANKS, PORTA-POTTIES, MACHINERY, EQUIPMENT, CONSTRUCTION MATERIALS, ETC.
13. STEEL PLATES AND/OR MUD MATS MUST BE INSTALLED AT MACHINE CROSSINGS INFRASTRUCTURE CROSSINGS.
14. STAGING AND STOCKPILING AREA IS TO BE LOCATED AT LEAST 15 M FROM TOP OF BANK SPACE PERMITTING, OR A MIN. 6M FROM TOP OF BANK WITH MATERIALS STORED AT A MAXIMUM HEIGHT OF 2M.

TYPICAL TEMPORARY DIVERSION CHANNEL
NTS

PARISH aquatic services
2500 Meadowpine Blvd.
Suite 200
Mississauga, Ontario
L5N 6C4
TEL: 905-877-9531
FAX: 905-877-4143
www.parishgeomorphic.com
www.matrix-solutions.com
CONSULTANTS

DIGITAL INFORMATION	No.	DATE	REVISIONS	INITIAL	SIGNED
		05/15/2017	ISSUED FOR TENDER	R.J.M	

TORONTO Engineering and Construction Services

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JOHN D. PARISH 1137 PROFESSIONAL GEOSCIENTIST May 15/17

MICHAEL D'ANDREA, P. ENG. EXECUTIVE DIRECTOR ENGINEERING & CONSTRUCTION SERVICES

FRANK CLARIZIO, P.ENG. DIRECTOR, DESIGN & CONSTRUCTION TRANSPORTATION INFRASTRUCTURE

LUIS DE JESUS, P.ENG., PMP ACTING MANAGER BRIDGES, STRUCTURES & EXPRESSWAYS

BLOOR STREET BRIDGE OVER ETOBICOKE CREEK

CREEK WORK

CONSTRUCTION PHASING, EROSION & SEDIMENT CONTROL PLAN

DESIGN	A.Q.	DRAWN	D.R.	CHECKED	J.P.	CONTRACT No.	14ECS-TI-01BE
SCALE:	AS NOTED			DRAWING NUMBER	317-S-634-39	SHEET	11
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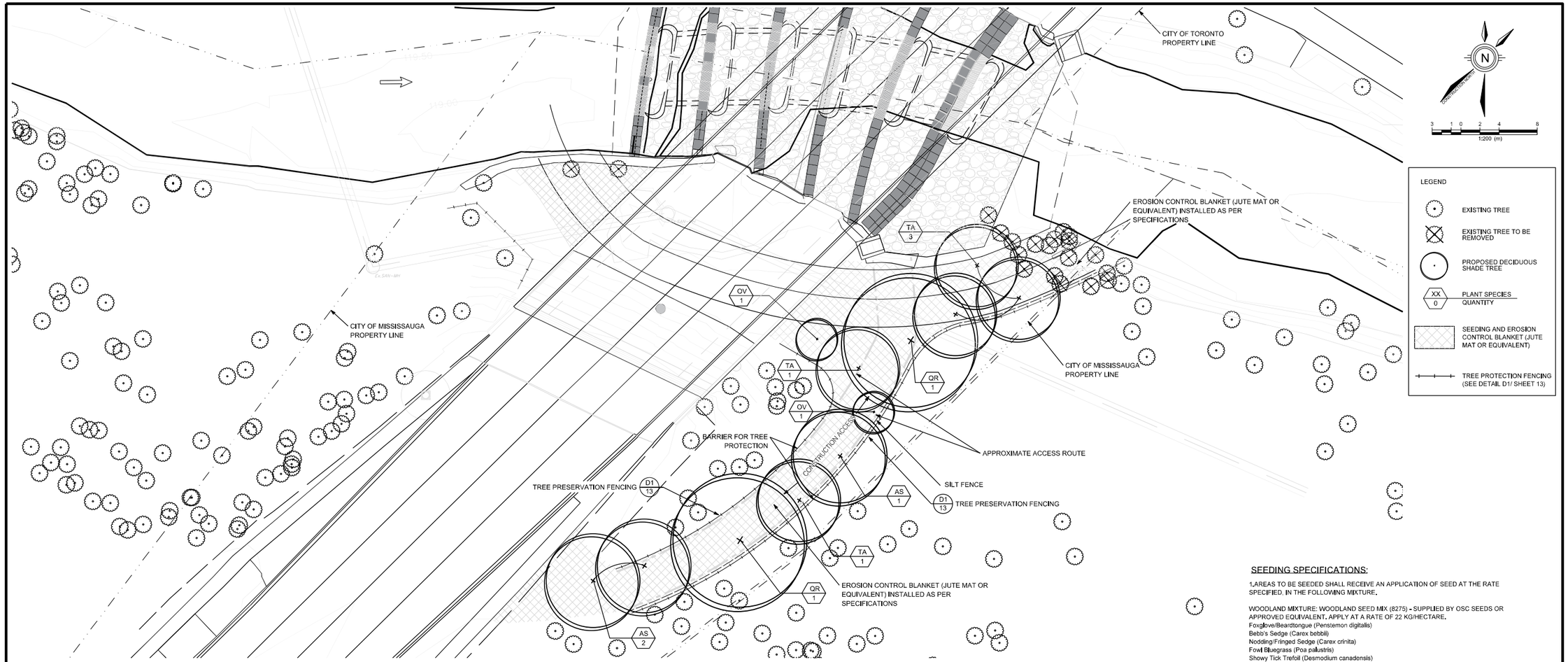

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	CAL.	SIZE	COND	MATURE HEIGHT (m)	MATURE SPREAD (m)	O.C. SPACING (m)	QNTY.
	TREES								
AS	Acer saccharum	Sugar Maple	70mm		W.B.	18.0	15.0	5.0	3
OV	Ostrya virginiana	Hop Hornbeam	70mm		W.B.	9.0	6.0	5.0	2
QR	Quercus rubra	Red Oak	70mm		W.B.	21.0	21.0	5.0	2
TA	Tilia americana	Basswood	70mm		W.B.	21.0	13.0	5.0	5

NOTE: ANY SPECIES SUBSTITUTIONS MUST BE TO THE SATISFACTORY OF THE MUNICIPALITY.

LANDSCAPE NOTES:

1. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH BY-LAWS AND CODES HAVING JURISDICTION OVER SITE LOCATION.

2. COMPLETE ALL WORK TO THE SATISFACTION OF THE LANDSCAPE ARCHITECT.

3. REPORT ANY CHANGES, DISCREPANCIES OR SUBSTITUTIONS TO THE LANDSCAPE ARCHITECT FOR REVIEW. OBTAIN APPROVAL FROM THE LANDSCAPE ARCHITECT BEFORE PROCEEDING.

4. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE EXISTING SERVICE LOCATIONS.

5. EXACT LOCATIONS OF PLANT MATERIAL WILL BE DETERMINED BY PLACEMENT OF SITE SERVICES SUCH AS HYDRO VAULTS, METERS, UTILITIES, ROOF RAIN WATER LEADERS, DRIVEWAYS, LIGHT STANDARDS, ETC.

6. ALL PLANT MATERIAL LOCATIONS TO BE STAKED OR MARKED OUT AND APPROVED BY LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.

7. SUPPLY ALL PLANT MATERIAL IN ACCORDANCE WITH THE CANADIAN STANDARDS FOR NURSERY STOCK (8th Ed.).

8. INSTALL PLANT MATERIAL ACCORDING TO DETAILS SHOWN.

9. DISTURBED SOIL AREAS AROUND TREES AND SHRUBS ARE TO BE COVERED WITH SHREDDED CONIFER BARK MULCH SUCH AS 'CANADA RED' OR 'GRO-BARK' SPM MULCH, OR APPROVED EQUIVALENT. NO DYE IS TO BE USED IN MULCH. ALTERNATIVE MULCHES MUST BE APPROVED BY THE LANDSCAPE ARCHITECT.

10. CONTRACTOR TO UTILIZE LAYOUT DIMENSIONS WHERE PROVIDED.

11. PROVIDE PLANTING BED AREA AS NOTED ON THE DRAWING OR TO ACCOMMODATE MATURE SIZE OF PLANT MATERIAL.

12. ALL SUPPORT SYSTEMS MUST BE REMOVED BY THE CONTRACTOR AT TIME OF FINAL ACCEPTANCE. NO EXTRAS WILL BE PAID TO COMPLETE THIS WORK.

13.SUPPLY AND PLACE TOPSOIL, IN ALL DISTURBED AREAS, IN ACCORDANCE WITH OPSS 802 TO A MINIMUM DEPTH OF 150mm UNLESS OTHERWISE SPECIFIED.

14. PRIOR TO PLANTING, AREAS DISTURBED FOR CONSTRUCTION ACCESS SHALL BE DECOMPACTED AS SHOWN IN DETAIL D3 ON SHEET 13.

15. SUPPLY AND PLACE SEED IN ACCORDANCE WITH OPSS MUNI 804 UNLESS OTHERWISE SPECIFIED. ALL 5:1 OR GREATER SLOPES TO BE SEEDED WITH TACIFIER. CONTRACTOR TO PROVIDE NECESSARY EROSION CONTROL PROTECTION AS REQUIRED TO ENSURE SOIL STABILIZATION AND PROPER SEED GERMINATION.

16. ALL DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.

17. IF DISCREPANCIES ARISE BETWEEN PLANT MATERIAL COUNT SHOWN ON DRAWING AND PLANT LIST, THE DRAWING SHALL BE CONSIDERED CORRECT.

18. CONTRACTOR TO PROVIDE MINIMUM TWO (2) YEAR WARRANTY FROM DATE ACCEPTED ON ALL WORK UNLESS OTHERWISE SPECIFIED.

19. ANY SITE PLAN OR GRADING AND SERVICING SHOWN IS FOR INFORMATION ONLY. REFER TO APPROVED DRAWINGS.

20. NOT FOR CONSTRUCTION UNLESS STAMPED, SIGNED AND DATED BY LANDSCAPE ARCHITECT.

21. DRAWINGS NOT TO BE REPRODUCED WITHOUT WRITTEN CONSENT FROM LANDSCAPE ARCHITECT.

22. APPROVAL OF LANDSCAPE PLAN TO BE OBTAINED FROM MUNICIPALITY.

23. FOR GRADING AND SERVICING INFORMATION REFER TO THE CONSULTING ENGINEER'S DRAWINGS.

24. FOR LIGHTING INFORMATION AND POWER DISTRIBUTION REFER TO THE ELECTRICAL CONSULTANT'S DRAWINGS.

25. ALL TREE PLANTING IS TO BE COMPLETED PRIOR TO SEEDING AND PLACEMENT OF EROSION CONTROL BLANKET.

SEEDING SPECIFICATIONS:

1.AREAS TO BE SEEDED SHALL RECEIVE AN APPLICATION OF SEED AT THE RATE SPECIFIED, IN THE FOLLOWING MIXTURE.

WOODLAND MIXTURE: WOODLAND SEED MIX (8275) - SUPPLIED BY OSC SEEDS OR APPROVED EQUIVALENT. APPLY AT A RATE OF 22 KG/HECTARE.
Foxglove/Beardtongue (Penstemon digitalis)
Bebb's Sedge (Carex bebbii)
Nodding/Fringed Sedge (Carex crinita)
Fowl Bluegrass (Poa palustris)
Showy Tick Trefoil (Desmodium canadensis)
Fowl Mannagrass (Glyceria striata)
Spotted Joe Pye Weed (Eupatorium maculatum)
Canada Anemone (Anemone canadensis)
White Avens (Geum canadense)

2.CONTRACTOR TO SOW NURSE CROP OF CANADA WILD RYE (Elymus canadensis) OVER ENTIRE AREA: TO BE SEEDED AT A RATE OF 22KG/ HECTARE.

3.THE CONTRACTOR SHALL NOT CARRY OUT THE WORK UNDER ADVERSE WEATHER CONDITIONS SUCH AS HIGH WIND, FROZEN GROUND OR GROUND COVERED WITH SNOW, ICE OR STANDING WATER.

4.GRADE SUB-GRADE, ELIMINATE UNEVEN AREAS AND LOW SPOTS. ENSURE POSITIVE DRAINAGE. REMOVE DEBRIS, ROOTS, BRANCHES, STONES IN EXCESS OF 50MM DIAMETER AND OTHER DELETERIOUS MATERIALS. REMOVE SUBSOIL THAT HAS BEEN CONTAMINATED WITH OIL, GASOLINE OR CALCIUM CHLORIDE, DISPOSE OF REMOVED MATERIAL AS DIRECTED BY LANDSCAPE ARCHITECTS.

5.GRADE SUB-GRADE FOR SEEDING TO A UNIFORM SURFACE AND REMOVE VEGETATION WHICH MAY INTERFERE WITH SEEDING OPERATIONS. LOOSEN SOIL TO DEPTH OF 25MM MINIMUM AND REMOVE STONES AND FOREIGN MATERIAL WHICH PROTRUDE MORE THAN 75MM ABOVE THE SURFACE.

6.SEEDED AREAS TO BE MAINTAINED BY CONTRACTOR ENSURING ADEQUATE WATER, FERTILIZER, MAINTENANCE AND REPAIR UNTIL SEEDED AREAS ARE PROPERLY ESTABLISHED. AREAS SEEDED IN FALL WILL BE ACCEPTED IN FOLLOWING SPRING, ONE MONTH AFTER START OF GROWING SEASON PROVIDED ACCEPTANCE CONDITIONS ARE FULFILLED.

7.EROSION CONTROL BLANKET TO BE INSTALLED AFTER SEED SETTLES.

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CONSULTANTS

DIGITAL INFORMATION	No.	DATE	REVISIONS	INITIAL	SIGNED
		05/15/2017	ISSUED FOR TENDER	R.J.M	

TORONTO Engineering and Construction Services

ASSOCIATION OF LANDSCAPE ARCHITECTS SARA A. BROWN MAY 15, 2017 OALA MEMBER ONTARIO

FRANK CLARIZIO, P.ENG.
DIRECTOR, DESIGN & CONSTRUCTION
TRANSPORTATION INFRASTRUCTURE

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BRIDGES, STRUCTURES & EXPRESSWAYS

BLOOR STREET BRIDGE OVER ETOBICOKE CREEK

REHABILITATION

LANDSCAPE PLAN

DESIGN	S.W.	DRAWN	S.W.	CHECKED	Z.B.	CONTRACT No. 14ECS-TI-01BE	
SCALE:	AS NOTED			DRAWING NUMBER	317-S-634-40	SHEET	12
DATE:	MAY 15, 2017						

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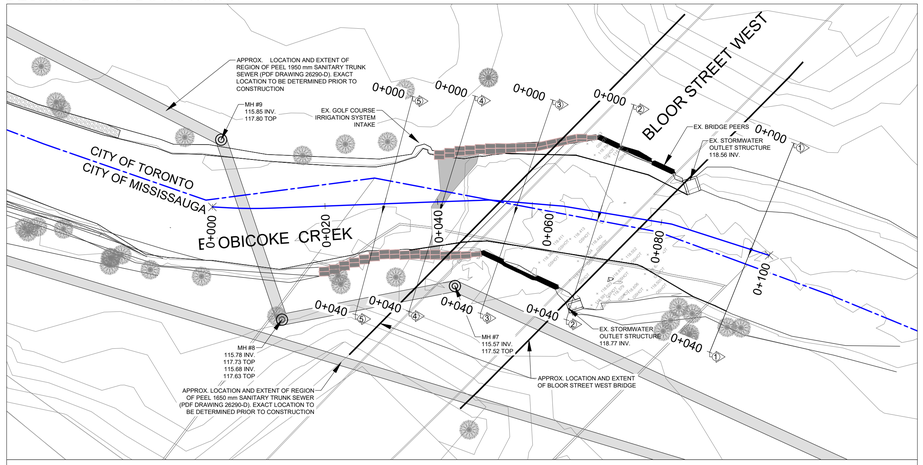
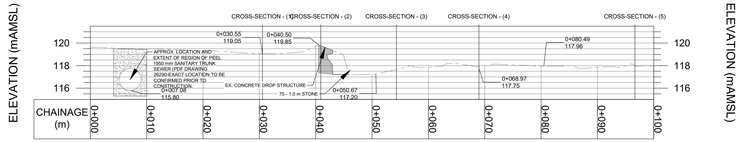
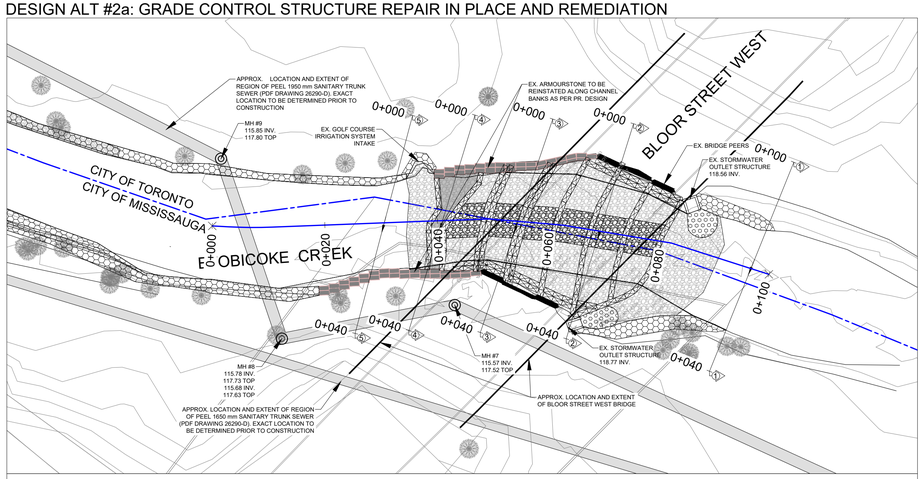
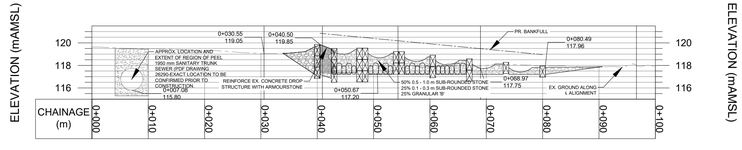




DESIGN ALT #2a: GRADE CONTROL STRUCTURE REPAIR IN PLACE AND REMEDIATION





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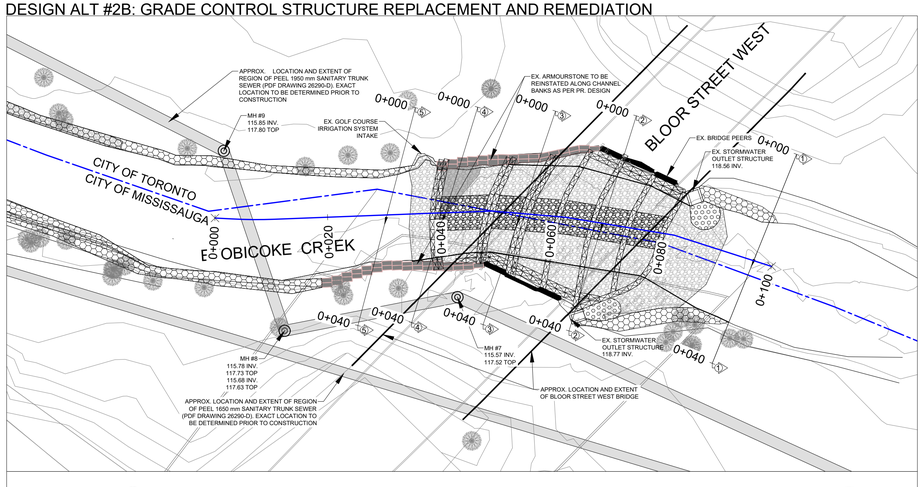

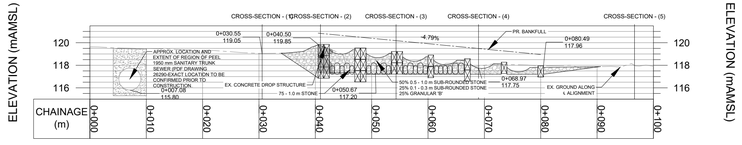

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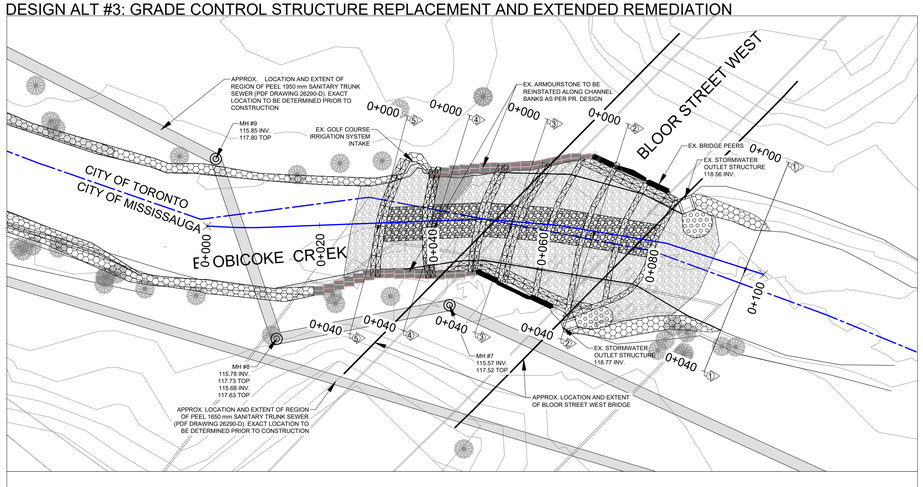

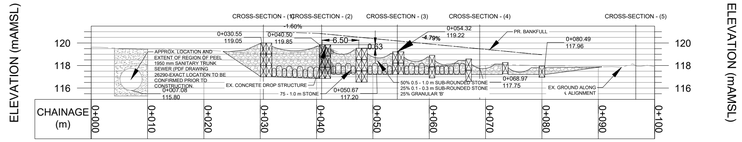

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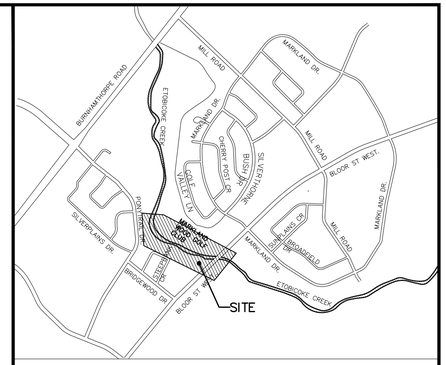


DRAFT FOR DISCUSSION

FIRST	SECOND	INTERIM	FINAL
DATE	DATE	DATE	DATE

DESIGNED BY

CHKD.

APPROVED BY

KSGS ENGINEERING
470 HENDALL CIRCLE, UNIT 300, MISSISSAUGA, ON. L5A 5V4. 905-232-1711

BEACON ENVIRONMENTAL

ETOBICOKE CREEK EROSION CONTROL

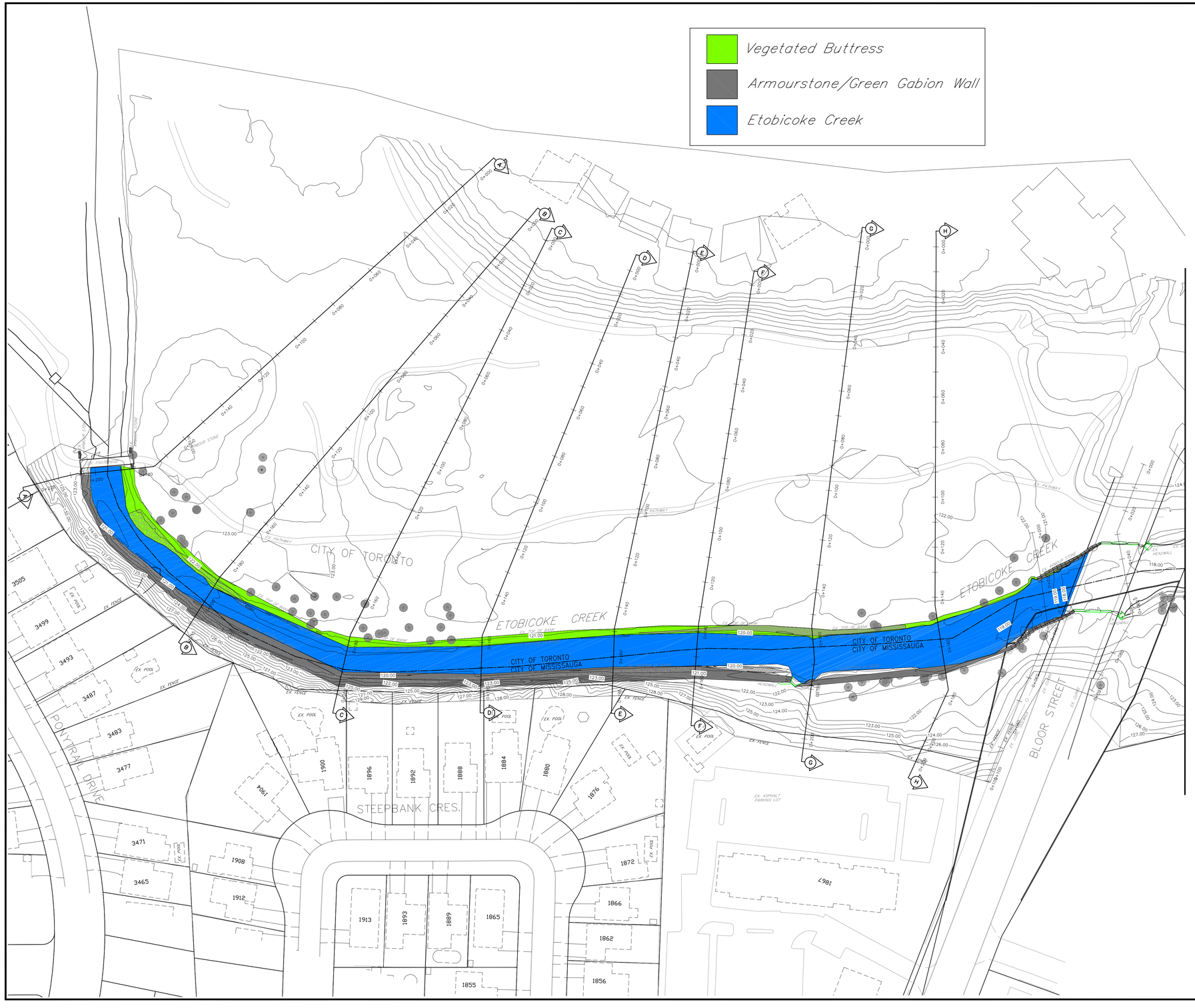
MISSISSAUGA

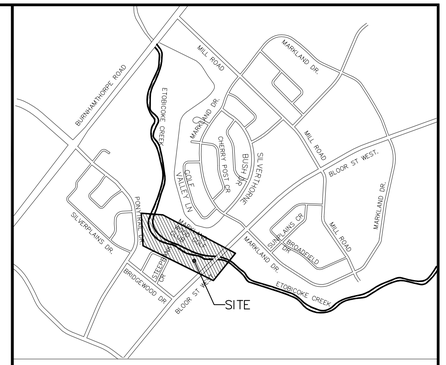
BLOOR STREET GRADE CONTROL STRUCTURE DESIGN ALTERNATIVES

SCALE : 1:500	AREA Z:	PROJECT No. 18014
DRAWN BY: M.C.	CHECKED BY: K.C.	PLAN No.
DATE: 2021-06-18	SHEET I OF I	DWG. No. GC-001

APPENDIX J

Preliminary Cross Sections north of Bloor Street





FIRST DATE	SECOND DATE	INTERIM DATE	FINAL DATE
DESIGNED BY		APPROVED BY	
CHKD.			

KSGS
ENGINEERING CORP.
470 HENSALL CIRCLE, UNIT 300. MISSISSAUGA, ON. L5A 3V4. 905-232-7717.

ETOBICOKE CREEK EROSION CONTROL

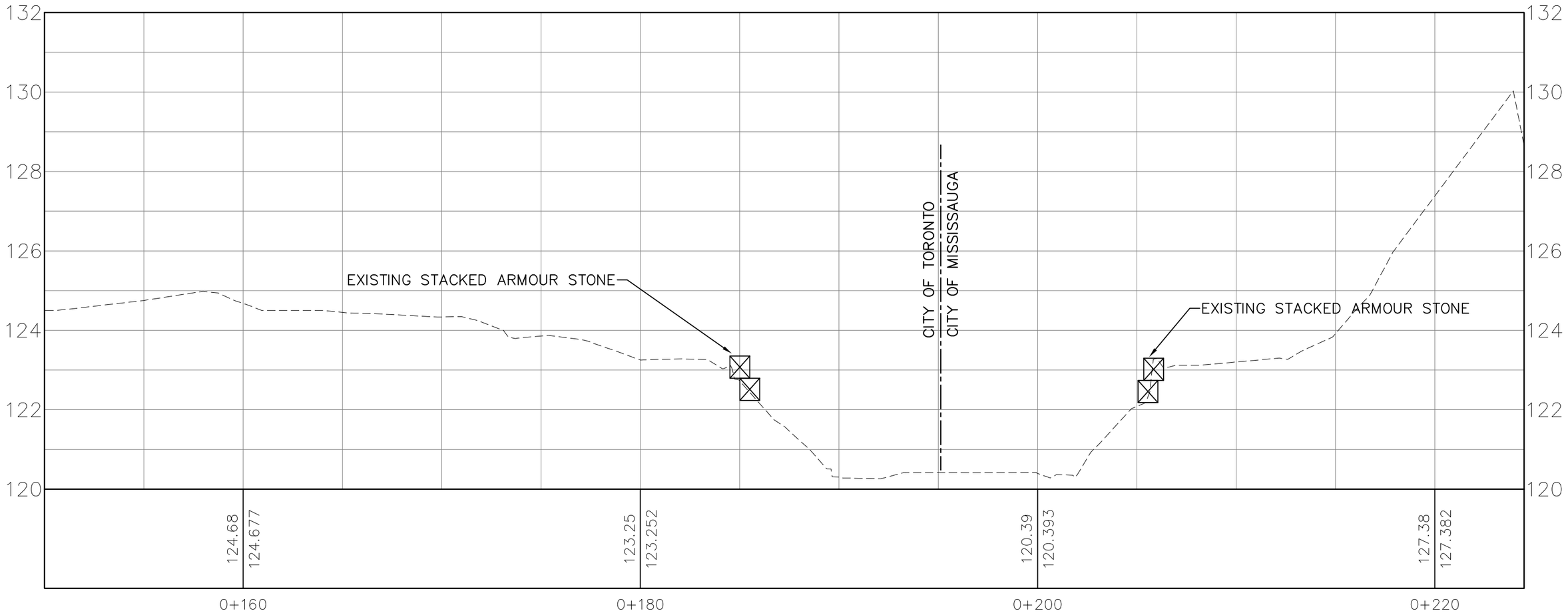
ALTERNATIVE 2

MISSISSAUGA

GENERAL PLAN

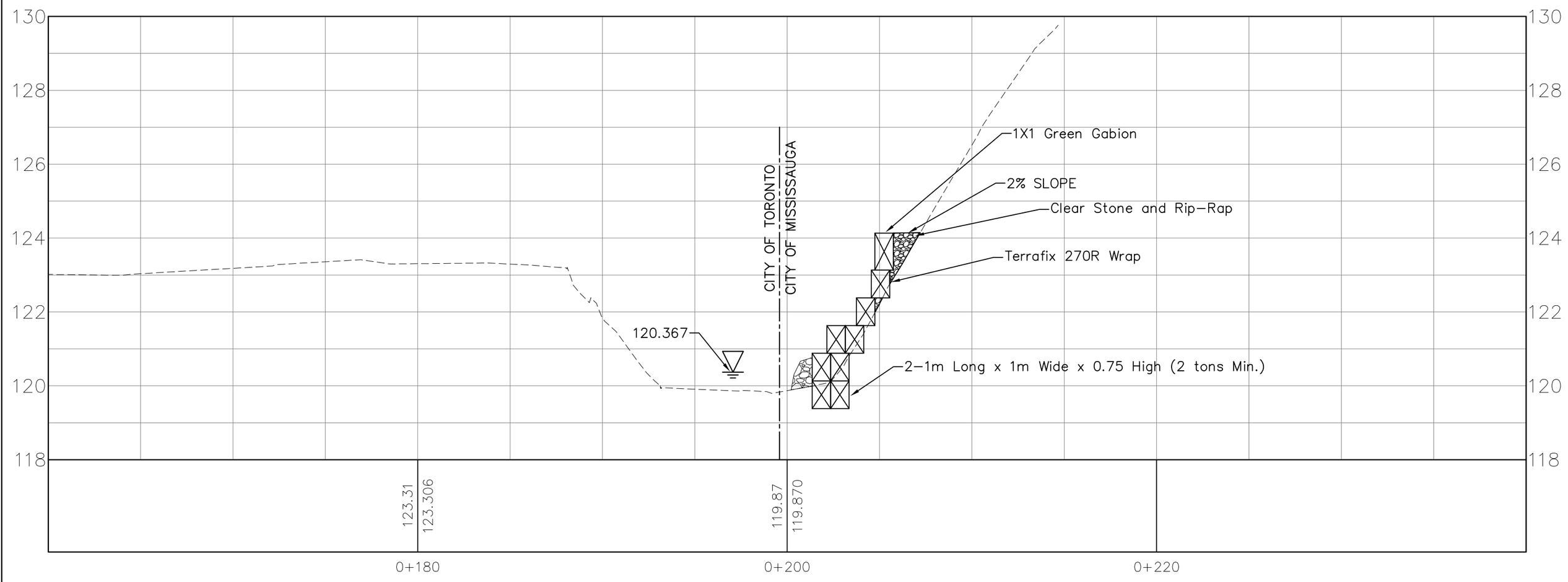
SCALE : 1:750	AREA Z:	PROJECT No. 18014
DRAWN BY: V.G.	CHECKED BY: K.C.	PLAN No. xxxx
DATE: AUG 2019	SHEET 1 OF X	DWG. No. C-001

CROSS SECTION A–A

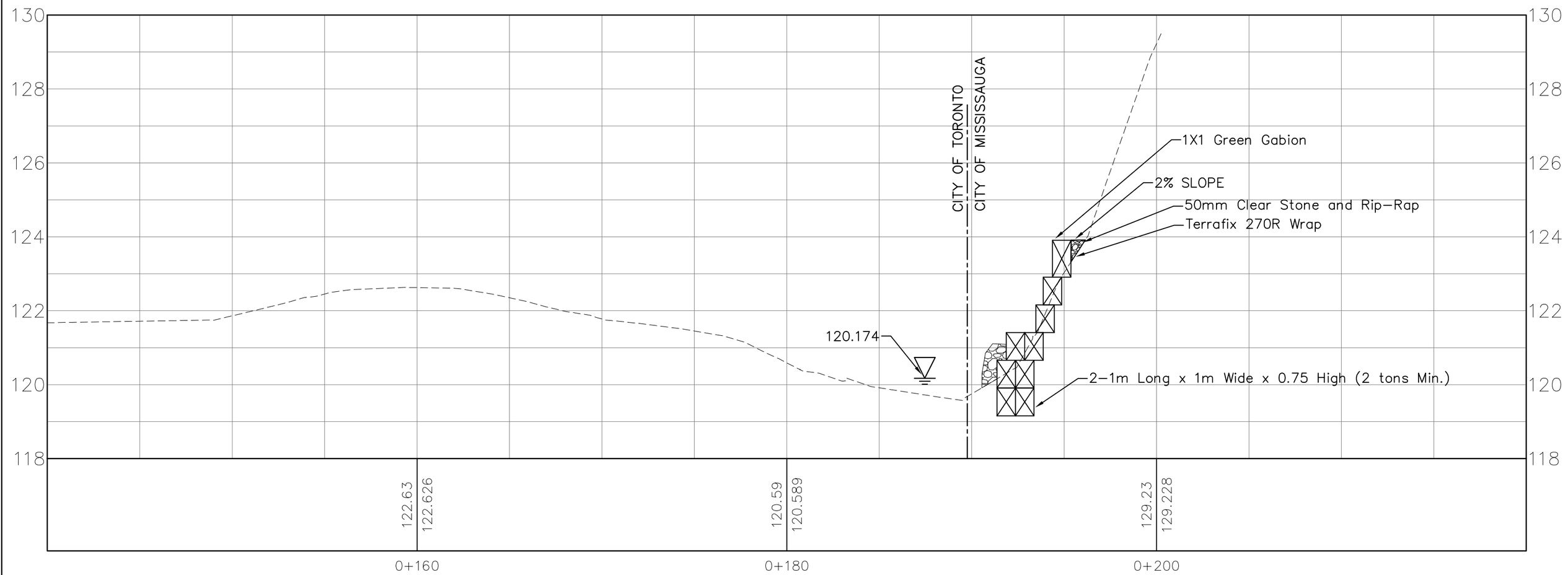


HORIZONTAL SCALE = 200
VERTICAL SCALE = 100
VERTICAL EXAGGERATION = 2

CROSS SECTION B–B

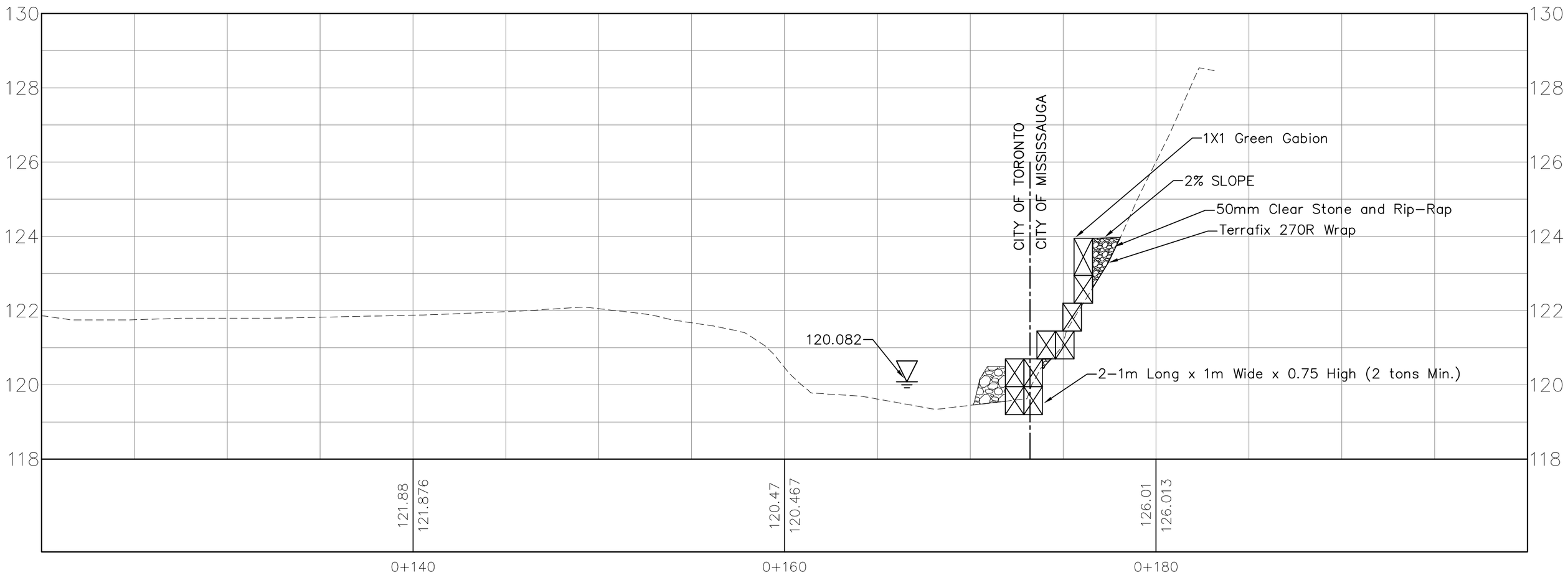


CROSS SECTION C–C



HORIZONTAL SCALE = 200
VERTICAL SCALE = 100
VERTICAL EXAGGERATION = 2

CROSS SECTION D–D



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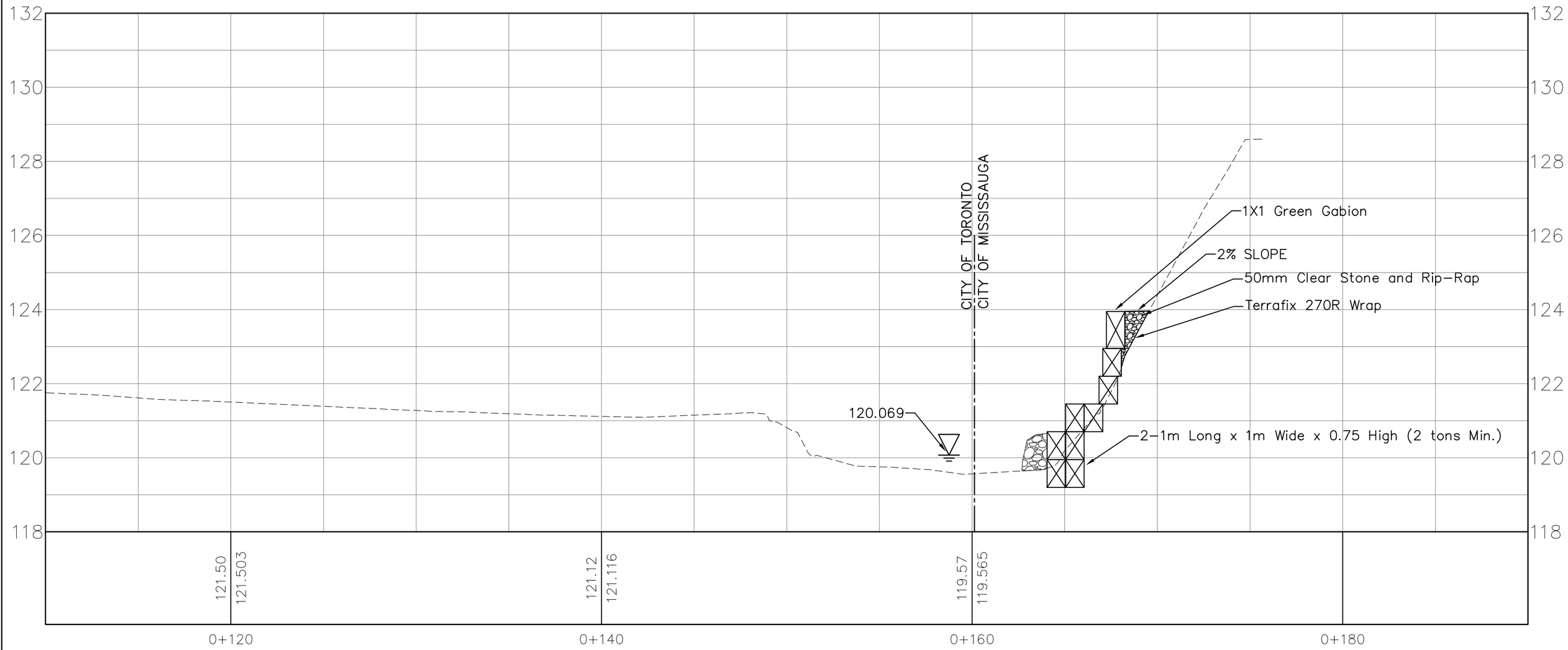
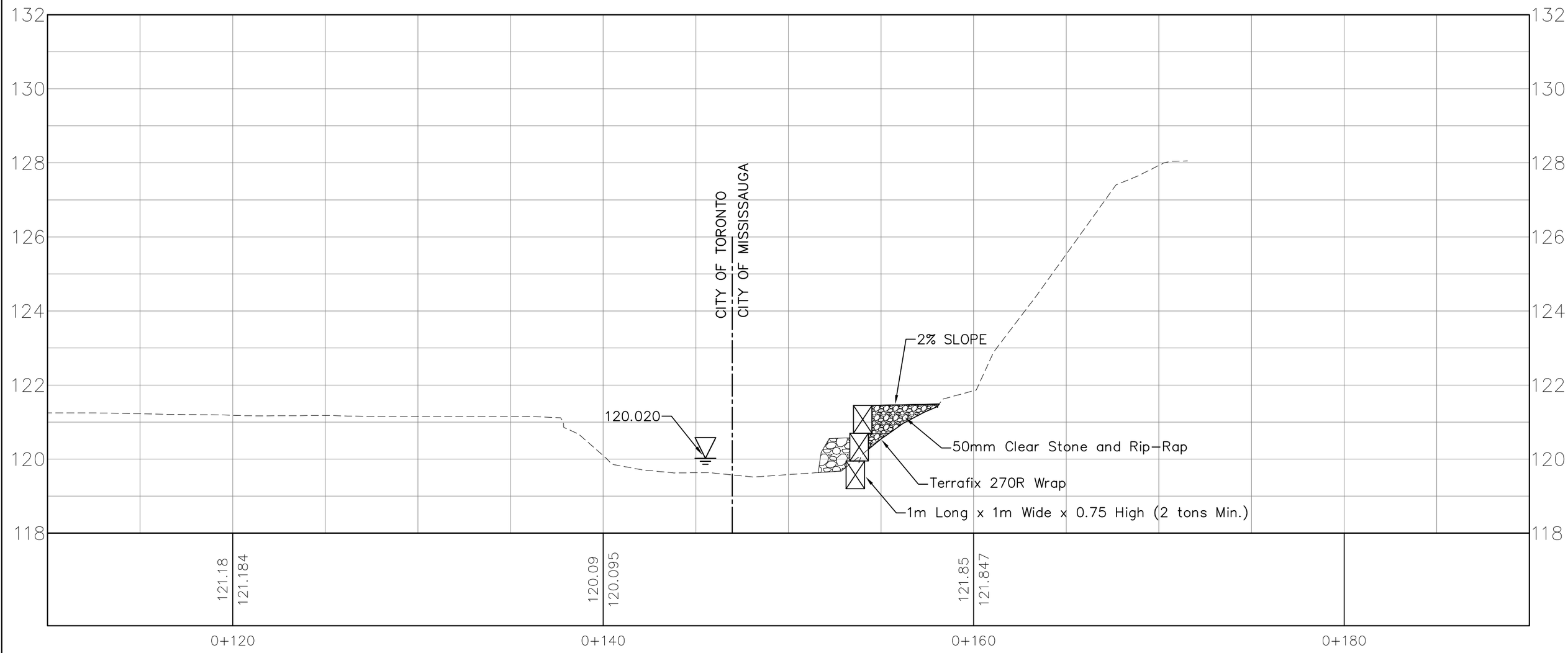
VERTICAL SCALE = 100
VERTICAL EXAGGERATION = 2

CROSS SECTION E–E



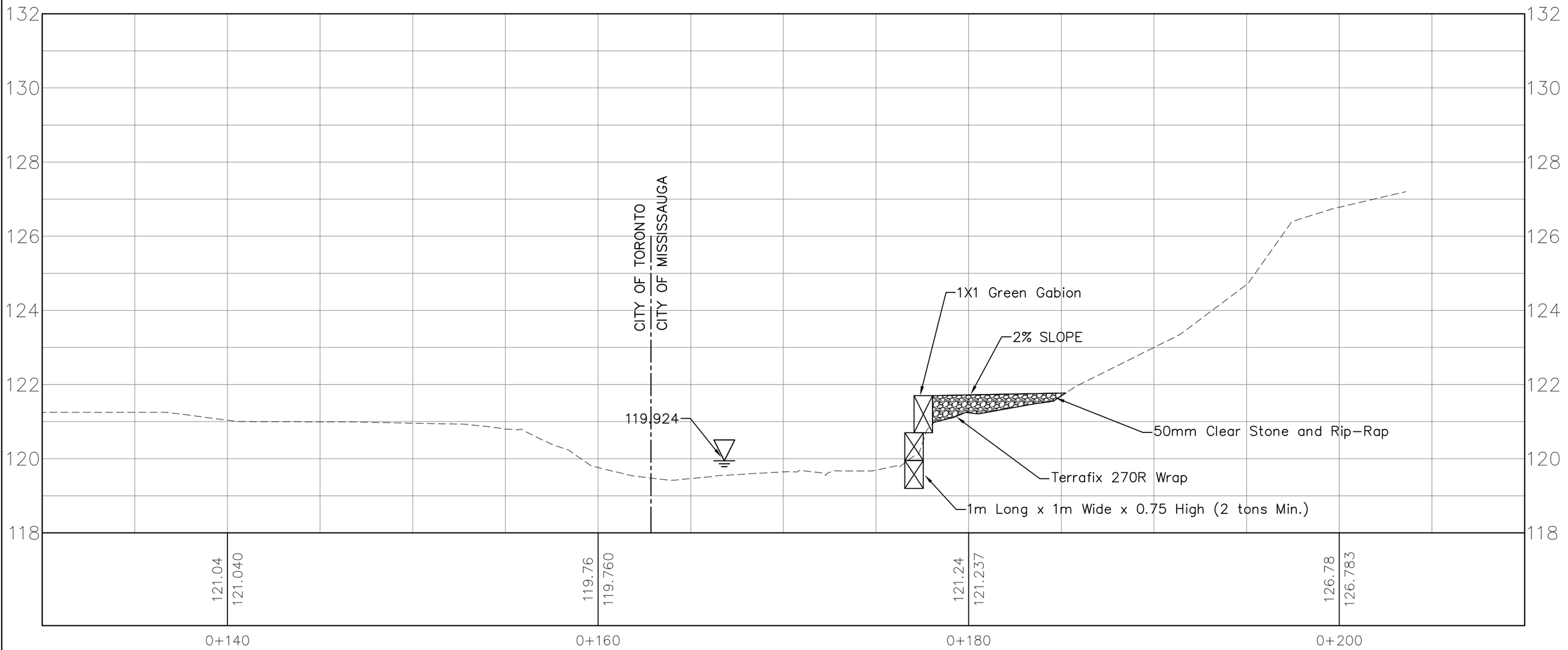
HORIZONTAL SCALE = 200
VERTICAL SCALE = 100
VERTICAL EXAGGERATION = 2

CROSS SECTION F–F



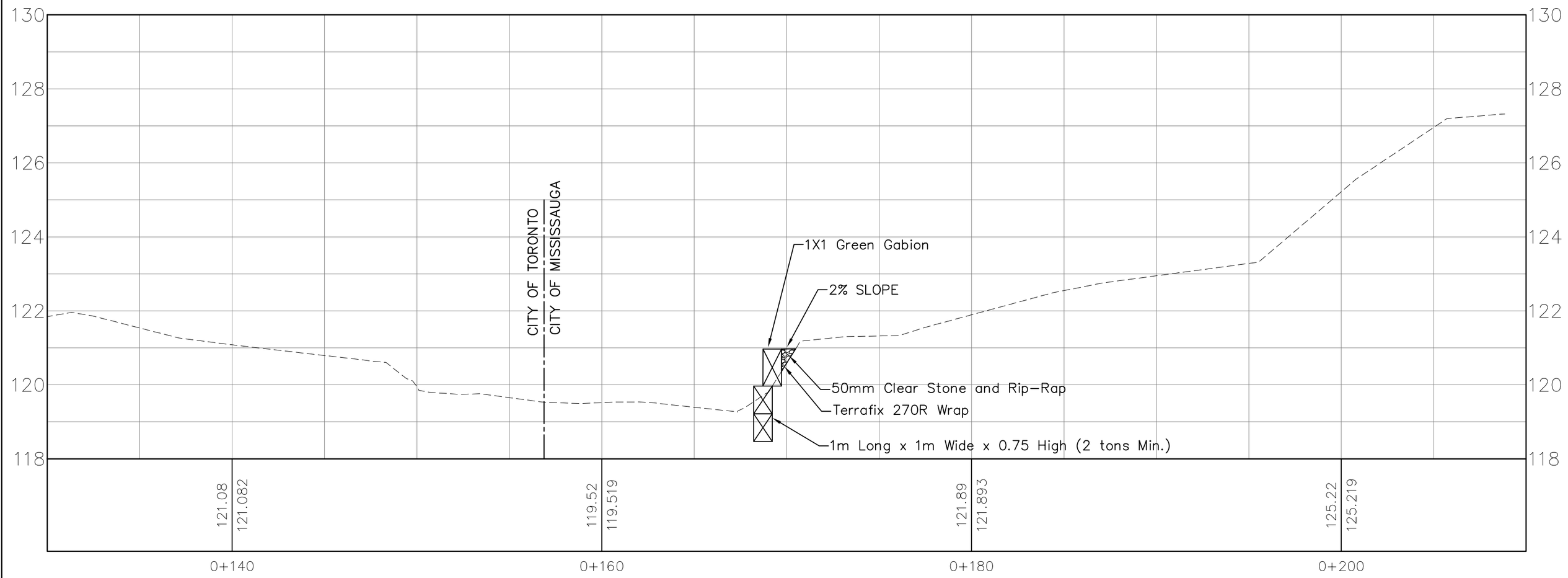
HORIZONTAL SCALE = 200
VERTICAL SCALE = 100
VERTICAL EXAGGERATION = 2

CROSS SECTION G–G



HORIZONTAL SCALE = 200
VERTICAL SCALE = 100
VERTICAL EXAGGERATION = 2

CROSS SECTION H–H



HORIZONTAL SCALE = 200
VERTICAL SCALE = 100
VERTICAL EXAGGERATION = 2

APPENDIX K

Notice of Study Commencement, Notice of Public Virtual Information Center, and PIC material

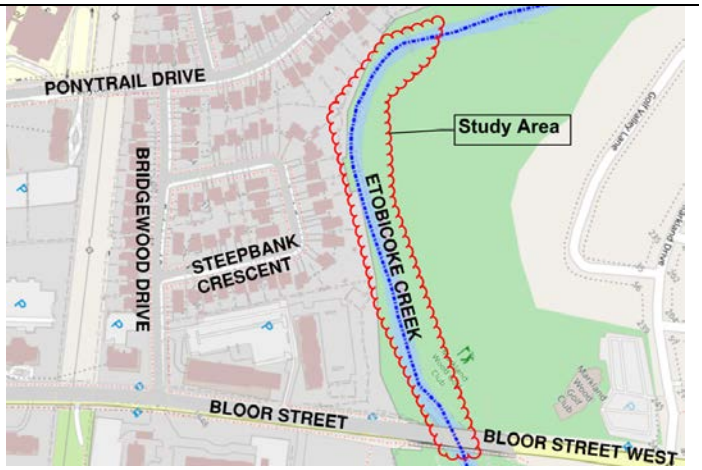
CITY OF MISSISSAUGA --- NOTICE OF STUDY COMMENCEMENT

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT STUDY
ETOBICOKE CREEK EROSION CONTROL

WHAT?

- The City of Mississauga has initiated a study to review a reach of Etobicoke Creek and to provide detail design for remediation and stabilization of the creek.
- The study area, as shown on the key plan, includes a reach of Etobicoke Creek from the golf course pedestrian bridge upstream to the downstream side of Bloor Street. Etobicoke Creek lies on the east limit of the City. The reach is approximately 500m in length.

WHERE?



WHY?

- Through its ongoing erosion monitoring program, the City of Mississauga has identified this reach of Etobicoke Creek as a high priority site in need of rehabilitation.
- The study will consider designs to provide long-term erosion protection along the creek and mitigate risks to people, property and infrastructure.

HOW?

- The project is being planned under Schedule B of the Municipal Class Environmental Assessment (October 2000, as amended in 2015) process.
- The study will define the problem, identify alternative solutions, analyze, and evaluate each alternative based on the potential impacts to the natural, social and economic environments. In consultation with the public and external agencies, the preferred creek improvements will be determined.
- The project team will provide detail design drawings of the preferred alternative.
- At the end of the study, a Project File Report consolidating the information gathered from the study process will be available for public review.

GET INVOLVED!

- A key component of this study is public and agency consultation. Throughout the study and design, contact will be made with various agencies and members of the community. Their comments and opinions will be considered as part of any decisions that are made.
- One Public Information Centre (PIC) will be held to present the study progress and obtain public input.
- PIC details will be advertised closer to the consultation dates under a separate notice

If you have any questions regarding the study, or would like to be included on the project mailing list, please contact one of the Project Team members below:

Linda Bai, P. Eng.
City Project Manager
City of Mississauga
201 City Centre Drive
Mississauga, ON L5B 4E4
Tel: 905-615-3200 ext. 8184
Email: linda.bai@mississauga.ca

Ken Chow, P. Eng.
Consultant Project Manager
KSGS Engineering Corp.
470 Hensall Circle, Unit 300
Mississauga, ON L5A 3V4
Tel: 416-818-6180
Email: Ken.Chow@ksgsengineering.com

Comments and information are being collected to assist in meeting the requirements of the Environmental Assessment Act. With the exception of personal information, all comments shall become part of the public record.

This notice was first issued on April 20, 2020. Revised June 4, 2021. Revised May 27, 2022

CITY OF MISSISSAUGA

NOTICE OF PUBLIC INFORMATION CENTRE

ETOBICOKE CREEK EROSION CONTROL

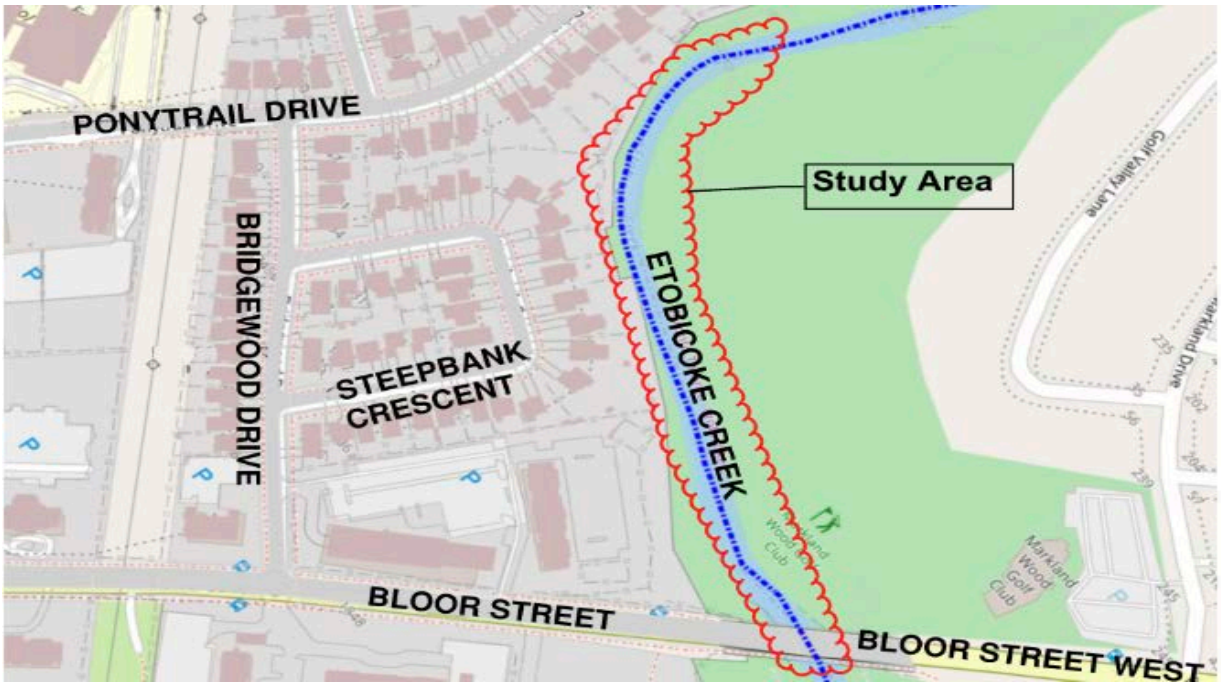
BLOOR STREET TO PONYTRAIL DRIVE

Municipal Class Environmental Assessment

The Study

The City of Mississauga has initiated a study to review alternatives to investigate erosion along the Etobicoke Creek from downstream side of Bloor Street to approximately 500m upstream of Bloor Street. The Project is planned under 'Schedule B' of the Municipal Class Environmental Assessment process.

The Study has completed the evaluation of alternative solutions has identified a preliminary preferred solution for erosion upstream of Bloor Street and at Bloor Street.



Public Information Centre

The purpose of this Public Information Centre is to facilitate feedback from the public on the Study and on the preliminary preferred solution.

The Public Information Centre will be held virtually and will include a presentation and a Question and Answer segment with the Project Team. Please see pertinent information regarding the PIC below:

Date:	**Monday, June 27, 2022**
Time:	**6:30 p.m.**
Virtually:	https://mississauga.webex.com
	Meeting No: 2315 947 7942
	Password: etobicokecreek

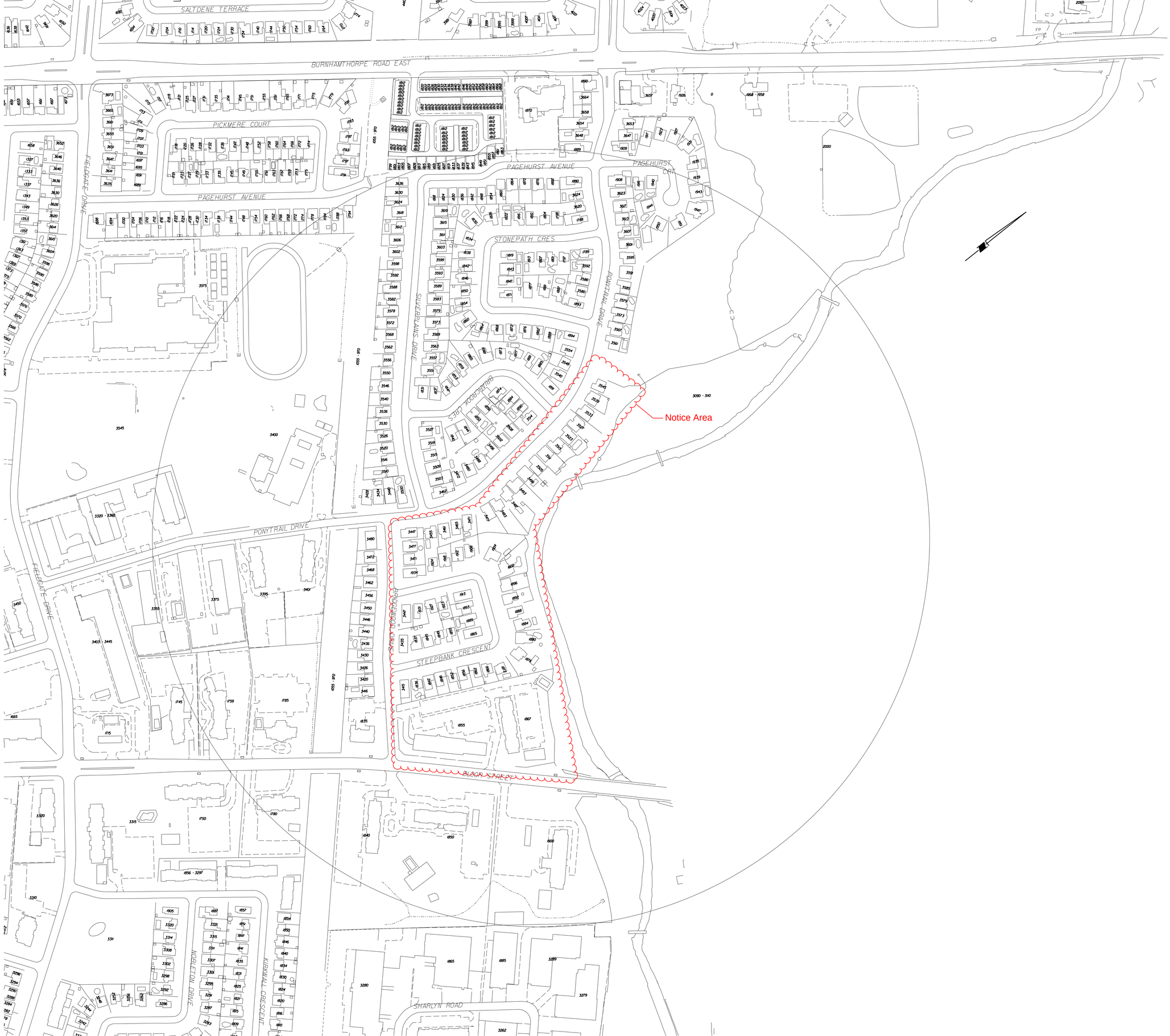
Alternatively, if you are unable to join the presentation and virtual question and answer segment, you can still view the Public Information Centre materials online and submit any comments you may have until July 5th, 2022.

After input from the public and external agencies, the preferred solution will be confirmed, and the Project File Report will be completed.

An online comment form will be available once the Public Information Centre meeting is complete, please visit www.mississauga.ca/etobicokecreek to complete this form or if you should have any questions or comments, please contact either Linda Bai or Ken Chow by July 5th, 2022.

Linda Bai, P. Eng. Capital Project Manager City of Mississauga 201 City Centre Drive, 8th Floor Mississauga, Ontario L5B 2T4 Tel: 905-615-3200 ext. 8184 linda.bai@mississauga.ca	Ken Chow, P. Eng. Project Manager KSGS Engineering Corporation 470 Hensall Circle, Unit 300 Mississauga, Ontario L5A 3V4 Tel: 416-818-6180 ken.chow@ksgsengineering.com

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.


BURNHAMTHORPE ROAD EAST
SALTDENE TERRACE
PICKMERE COURT
PAGEHURST AVENUE
FIELDGATE DRIVE
STONEPATH CRES
SWEETGRASS DRIVE
PAINTBALL DRIVE
PONYTRAIL DRIVE
STEEPBANK CRESCENT
SHARLYN ROAD
NOBLETON DRIVE
KIRKWALL CRESCENT
Notice Area

Organization	Name	Position	Notice of PIC	Provided Comment(s)	Email delivery notes
Indian and Northern Affairs Canada	Environmental Unit	Environmental and Natural Resources Lands and Trusts Services	No		
Lands & RRBG, Indian and Northern Affairs Canada	Mr. Ken Brosseau	Manager	No		
Consultation and Accommodation Unit Aboriginal Affairs and Northern Development Canada	Ms. Allison Berman	Program Officer	No		
Indian and Northern Affairs Canada	Mr. Bryan O'Meara	Litigation Case Manager	No		
Office of the Federal Interlocutor for Métis and Non-status Indians Indian and Northern Affairs Canada	Mr. Jeffrey Betker	Senior Policy Analyst	No		
Specific Claims Branch, Ontario Research Team Indian and Northern Affairs Canada	Mr. Don Boswell	Senior Claims Analyst	No		
Métis Nation of Ontario	Ms. Melanie Paradis	Director of Lands, Resources and Consultation	No		
Environment and Climate Change Canada	Rob Dobos	Manager	No		
Health Canada	Kitty Ma	Regional EA Coordinator, Safe Environments Program, Ontario Region	No		
Health Canada	Melanie Lalani	Business Analyst	No		
Transport Canada	Ms. Monique Mousseau	Regional Manager, Environmental and Engineering	No		
Ministry of the Environment Conservation and Parks	Annamaria Cross	Director, EA Modernization (Acting)	No		
Ministry of Natural Resources and Forestry - Aurora District	Dan L Thompson	District Manager (Acting)	No		
Ministry of Heritage, Sport, Tourism and Culture Industries	Chris Schiller	Manager- Culture Services Unit	No		
Ministry of Health Promotion	Craig Stewart	Manager, Recreation Unit	No		
GO Transit and Metrolinx	Dan Francey	Manager, Environmental Liaison	No		
Region of Peel	Christina Marzo	Manager, Development Services	No		
Markland Wood Golf Club	Owen Russell		No		
Consultation Unit Ministry of Aboriginal Affairs	Ms. Heather Levecque	Manager	Yes		
Strategy Policy & Planning Division Ministry of Aboriginal Affairs	Ms. Ashley Johnson	Advisor	Yes		Out of office till June 9
Mississauga's of the New Credit, Lands/ Research/ Membership Department	Ms. Margaret Sault	Director of Lands, Membership and Research	Yes		
Mississaugas of the New Credit First Nation	Megan DeVries		Yes		
Six Nations of the Grand River	Robbin Vanstone		Yes		
Six Nations of the Grand River	Haudenosaunee Confederac	Haudenosaunee Confederacy	Yes		
Huron-Wendat Nation	Mario Groslouis		Yes		
Huron-Wendat Nation			Yes		
Canadian Environmental Assessment Agency	Anjala Puvananathan	Director, Ontario Regional Office	Yes		
Department of Fisheries and Oceans	Amanda Conway	Fisheries Protection Biologist	Yes		out of office till June 10
Department of Fisheries and Oceans			Yes		
Environment and Climate Change Canada		Senior Environmental Assessment Officer	Yes		
Transport Canada			Yes		
Ministry of the Environment Conservation and Parks	Ross Lashbrook	Senior Manager, EA Modernization (Acting)	Yes		
Ministry of the Environment Conservation and Parks - Central Region	Jimena Caicedo	Manager (Acting)	Yes		
Ministry of the Environment Conservation and Parks - Central Region			Yes	Require a completed Project Information Form	
Ministry of the Environment Conservation and Parks		For report filing only	Yes		
Ministry of Natural Resources and Forestry - Aurora District	Steven Strong	A/Policy Advisor - Planning and Aggregates	Yes		
Ministry of Natural Resources and Forestry - Aurora District	Natosha Fortini	Management Biologist	Yes		
Ministry of Natural Resources and Forestry - Aurora District	Maria Jawaid	District Planner	Yes		
Ministry of Agriculture, Food and Rural Affair	Renee Bowler	Director	Yes		
Ministry of Agriculture, Food and Rural Affairs	Jocelyn Beatty	Rural Planner - City f Toronto	Yes		Out of office till June 10
Ministry of Agriculture, Food and Rural Affairs	Nancy Rutherford	Rural Planner - Region of Peel	Yes		
Ministry of Heritage, Sport, Tourism and Culture Industries	Karla Barboza	Team Lead (A) - Heritage	Yes		
Ministry of Heritage, Sport, Tourism and Culture Industries	Dan Minkin	Heritage Planner	Yes		
Ministry of Municipal Affairs and Housing	Heather Watt	Manager	Yes		
Ministry of Transportation - Central Region	Jason White	Manager Engineering Office	Yes		
Ministry of Transportation - Highway Engineering Peel and Halton	Rina Kulathinal	Head	Yes		
Ministry of Advanced Education, Skills & Training	Kelly Shields		Yes		
Infrastructure Ontario	Lisa Myslicki	Environmental Specialist Realty Portfolio Planning, Environmental Services	Yes		
Infrastructure Ontario	Marion Birkenhead	Director, Capital Planning	Yes		
Metrolinx	Stefan Linder	Senior Manager, Rail Corridor Access Control	Yes		
Canadian National Railway	Michael Vallins	Manager, Public Works Design & Construction	Yes		Leave of absence (no return date)
Canadian National Railway	Davor Javorac		Yes		
Canadian Pacific Railway	David Lukianow	Manager - Public Works	Yes		
Toronto and Region Conservation Authority	Anil Wijesooriya	Director, Restoration & Infrastructure	Yes		
Toronto and Region Conservation Authority	Shirin Varzgani	Planner - Infrastructure Planning and Permits	Yes	No Comment	
Toronto and Region Conservation Authority	Suzanne Bevan	Senior Planner	Yes		
Toronto and Region Conservation Authority	Brennan Paul	Senior Planning Ecologist	Yes		

Organization	Name	Position	Notice of PIC	Provided Comment(s)	Email delivery notes
Toronto and Region Conservation Authority	Dilnesaw Chekol	Senior Water Resources Engineer	Yes		
City of Mississauga	Chris Fonseca	Ward 3, Councillor	Yes		
City of Mississauga - CMS/Parks Planning	Sangita Manandhar	Team Leader Park Assets	Yes		
City of Mississauga - CMS/Parks Planning	Katie Henley	Landscape Architect	Yes		
Mississauga Fire and Emergency Services	Deryn Rizzi	Fire Chief	Yes		
Mississauga Fire and Emergency Services		Fire Prevention and Life Safety Division	Yes		
City of Toronto	Christopher Loader	Senior Engineer	Yes		
City of Toronto	Wenlong He	Engineer	Yes		
City of Toronto	Bill Snodgrass	Senior Engineer	Yes		
Region of Peel	Sally Rook	Manager, Infrastructure Planning and Studies	Yes		
Region of Peel	Joanna Pietkiewicz	Capital Works Wastewater Collection and Conveyance	Yes		
Region of Peel			Yes		
Peel Regional Police	Nishan Duraiappah	Chief, Peel Regional Police	Yes		
Peel Regional Paramedic Services	Brian Gibson	Deputy Chief, Peel Regional Paramedic Services	Yes		
Peel Regional Paramedic Services	Patrick McColm	Supervisor, Risk and Audit	Yes		
Region of Peel	Asha Saddi		Yes	No Comment	
Region of Peel			Yes		
Region of Peel	Nicholas Gan	Manager, Engineering	Yes	"Study area contains two large diameter trunk sewers (1650mm and 1950mm) and works will have to be coordinated between Peel and Mississauga."	
	Abid Al Hadi, Maad	Technical Analyst, Engineering	Yes		Out of office till June 10
Alectra Utilities	Chris Kafel	Manager, Design	Yes		
Alectra Utilities	Jimmy Truong	Manager, Operations	Yes		
Alectra Utilities			Yes		
Beanfield Metroconnect			Yes	"No infrastructure in working area"	
Bell Canada	Dayton Dumesnil	Access Network Project Manager	Yes		
Bell Canada	Kathryn Kula	Cell Lead - Program management	Yes		
TELECON BELL MOC			Yes		
Cogeco			Yes		
Enbridge			Yes		
Enbridge	Enzo Greco	Advisor Construction Project Management	Yes		
Enbridge			Yes		
Group Telecom			Yes		
Hydro One Telecom			Yes		
Hydro One		Secondary Land Use	Yes		
Hydro One	Jim Oriotis	Senior Real Estate Coordinator	Yes		
Hydro One Networks			Yes	No Comment	
Ontario Power Generation	TammyWong	Senior Environment Specialist	Yes		
City of Mississauga - Information Technology - PSN			Yes	No Comment	
Rogers Communications	Lily Apa	Planning Coordinator	Yes		
Rogers Communications			Yes		
Rogers Communications			Yes		
Rogers Communications			Yes		
Telus			Yes	No Comment	
Zayo			Yes	No Comment	
Markland Wood Golf Club	Alfredo Colalillo	General Manager	Yes		
Markland Wood Golf Club	Wanda Symington	Office Manager	Yes		
Rockwood Homeowners Association (RHA)	Joe Silva		Yes		
Applewood Hills & Heights Residents' Association (AHHRA)			Yes		
Environmental Action Committee	Dayna Obaseki	Legislative Coordinator	Yes		
Heritage Advisory Committee	Martha Cameron	Legislative Coordinator	Yes		
Road Safety Committee	Angie Melo	Legislative Coordinator	Yes		
Traynors	Traynors		Yes		

Mini B® Proof
(Ad Panel - 58”h x 96”w)
(Topper - 12”h x 58”w)

3 LOCATIONS

KSGS ENGINEERING

BEACON ENVIRONMENTAL

ETOBICOKE CREEK EROSION CONTROL --- BLOOR STREET TO PONYTRAIL DRIVE PUBLIC INFORMATION CENTER

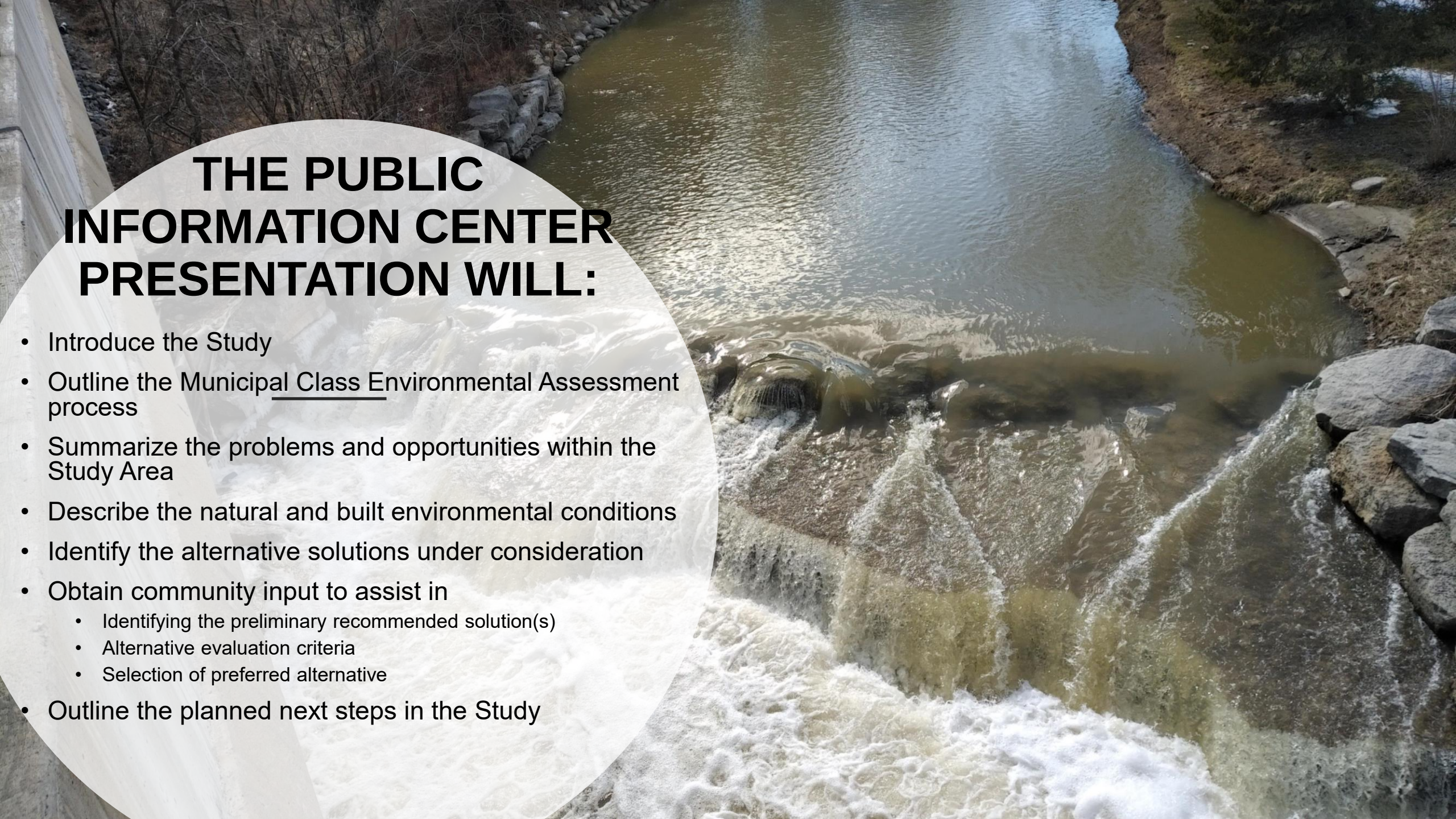
June 27, 2022

MISSISSAUGA

WELCOME

THE PURPOSE OF THE VIRTUAL PUBLIC INFORMATION CENTRE IS TO:

- Identify the project purpose and objectives
- Detail the work area and proposed works
- Seek input and comments from the public for input and consideration in the design
- Establish channels of communication with the public and stakeholders



THE PUBLIC INFORMATION CENTER PRESENTATION WILL:

- Introduce the Study
- Outline the Municipal Class Environmental Assessment process
- Summarize the problems and opportunities within the Study Area
- Describe the natural and built environmental conditions
- Identify the alternative solutions under consideration
- Obtain community input to assist in
  - Identifying the preliminary recommended solution(s)
  - Alternative evaluation criteria
  - Selection of preferred alternative
- Outline the planned next steps in the Study

BACKGROUND

- Etobicoke Creek is a watershed with the headwaters in Caledon and Brampton draining through Mississauga and bordering on Toronto before outletting to Lake Ontario
- Etobicoke Creek is under the jurisdiction of the Toronto Region Conservation Authority (TRCA)
- Urbanization over the years has increased flow rates within the creek and beyond its banks
    - This has increased erosion in certain areas putting property, infrastructure and public safety at risk. Erosion can occur quickly, or progressively over time

STUDY AREA

- Study area extends from the downstream side of Bloor Street upstream to existing golf course creek crossing (about 500m upstream of Bloor Street)
- Residential lots are located on the west side of the study area
- Existing golf course is located on the east side of the study area
- Bloor Street crosses the study area

OBJECTIVE

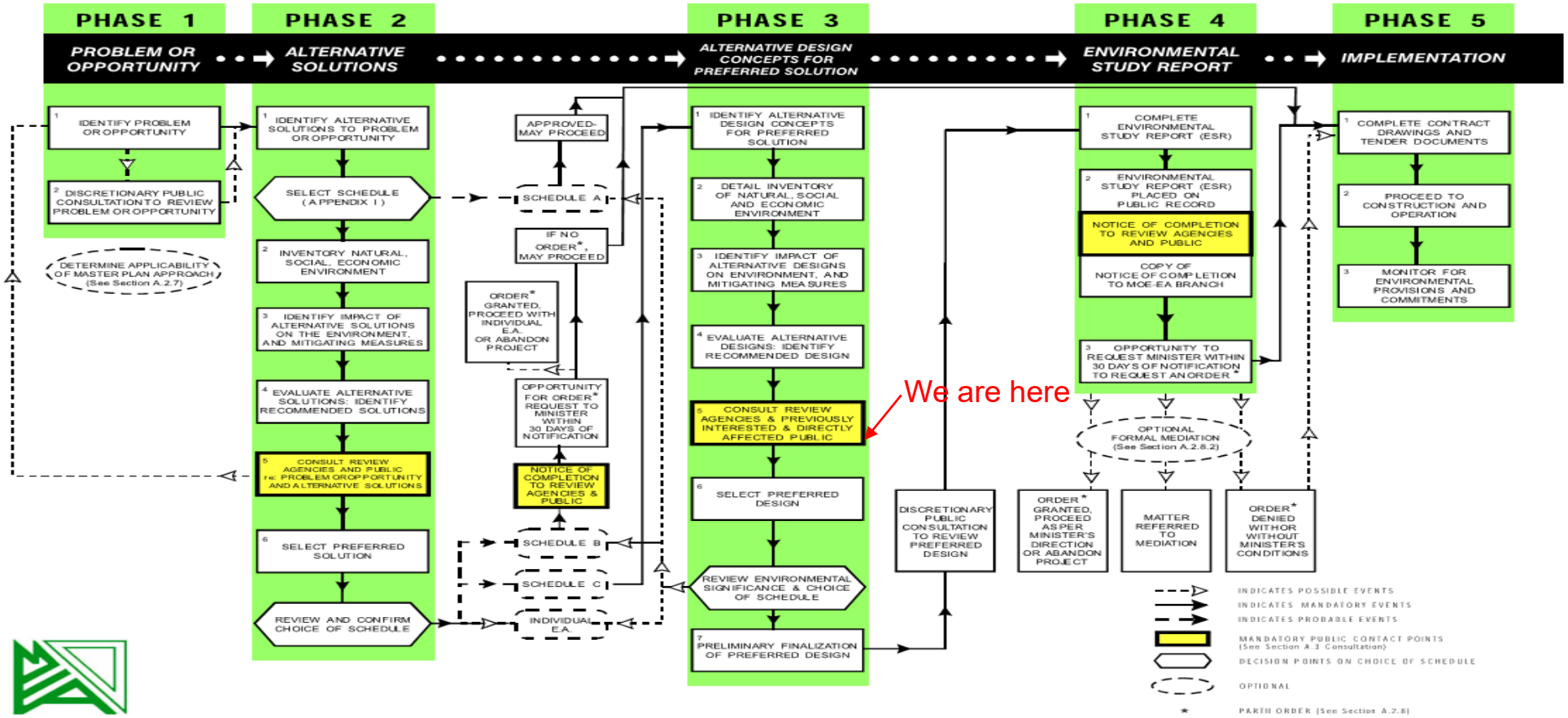
- Improve existing erosion protection along the west side of the creek
  - Proposed works will improve erosion protection along the base of the slope
  - Will enable future erosion control works to stabilize top of bank
  - Eventually provide improved protection along entire slope
- Provide erosion protection for Bloor Street abutments
- Provide continued protection of Region of Peel Sanitary Trunk sewers that runs across and adjacent to the creek by replacing existing drop structure
- Improve channel stability and aquatic habitat through drop structure replacement design and minor creek alignment adjustments
- Study and design will follow the Municipal Class Environmental Assessment process

TOP OF EMBANKMENT (WEST SIDE)

- Propose works deals with erosion within creek and base of embankment
  - Works along top of embankment will be addressed as part of another project
- For lands at top of embankment, landowners are encouraged to:
  - Keep structures away from edge of embankment
  - Reduce the amount of drainage that drains to the embankment
  - For drainage travelling to embankment do not concentrate flows but encourage “sheet” flow
  - Keep area vegetated to discourage erosion and increase stability.

CLASS ENVIRONMENTAL PROCESS

- The City of Mississauga is undertaking this Study in accordance with the requirements as set out in Schedule B of the Municipal Engineers Association's flow chart outlined below.



FLUVIAL GEOMORPHIC ASSESSMENT

- Fluvial geomorphology is the study of river processes (e.g., erosion and sedimentation)
- Data collection for the study included:
  - General assessment of channel stability (rapid assessments)
  - Detailed topographic survey to confirm existing watercourse dimensions
- Field data was used to guide the development of design alternatives to ensure:
  - Restored sections of Etobicoke Creek will improve existing conditions
  - Erosion protection measures remain stable under a range of flow conditions (e.g.,base flows to flood flows)

ENVIRONMENTAL IMPACT STUDY

- The Etobicoke Creek valley lands are identified in the City of Mississauga's Official Plan as Significant Natural Areas and Natural Green Spaces
- Field data collected for the study included:
  - Assessment of fish habitat conditions
  - Inventory of existing vegetation communities
  - Tree inventory and assessment for all trees with a diameter of 10 cm or greater
  - Breeding bird surveys
- Consultation with the Ministry of Environment, Conservation and Parks confirmed no Species at Risk in the study area
- Field data was used to guide the development of design alternatives to ensure:
  - Restored sections of Etobicoke Creek would provide improved fish habitat conditions
  - Removal of existing trees and natural vegetation would be minimized where possible
  - Restoration plantings would reflect existing vegetation communities

STAGE 1 AND 2 ARCHAEOLOGICAL ASSESSMENT

- Stage 1 Background Study
  - Provides information about the site's geography, history, previous archaeological fieldwork, and current land condition
  - To evaluate and document the property's archaeological potential
  - Recommend appropriate strategies for Stage 2 survey
  - Stage 1 background study determined potential for recovery of archaeological resources of cultural heritage value
- Stage 2 Detailed Property Assessment
  - As part of Stage 2 assessment the detailed property assessment identified no Archaeological resources or sites
  - Recommends that no further archaeological assessment of the site was required
  - Report has been submitted for review and approval to the Ministry of Heritage, Sports, Tourism and Culture Industries

HYDROLOGIC AND HYDRAULIC ASSESSMENT

- Hydrologic information was obtained from TRCA for the Etobicoke Creek
  - Flows were obtained for the 2-year to Regional Storms
  - Bankfull flows were generated based on fluvial geomorphic assessment
- Hydraulic (HEC-RAS) model was also obtained from TRCA.
  - Additional cross sections were added to reflect the study area and cross sections adjusted based on field obtained topographic survey information
  - Existing floodlines were generated from the 2-year to Regional Flows
  - Hydraulic check of bankfull flows closely reflected what was generated via fluvial geomorphic assessment.
  - Proposed works were hydraulically assessed to determine impact on upstream and downstream floodlines as well within the study area

EROSION IMPROVEMENT OPTIONS

- Separate design alternatives were developed to specifically address the two identified issues:
  - Erosion protection requirements along the west side of the creek
  - Erosion protection requirements for the Region's Sanitary Sewer and Bloor Street abutments and improve fish passage at Bloor
- The preferred alternatives for each issue will be integrated into one overall design solution

SECTION NORTH OF BLOOR STREET

1) Do Nothing
   - Status quo (do not undertake erosion protection works)
   - Creek erosion would continue and eventually affect private property west of creek
2) Implement erosion protection
   - Provide erosion protection on east and west sides of creek
   - Protect creek while minimizing impacts to natural features and property
3) Realign creek and implement erosion protection
   - Realign creek to move it away from the slope and provide erosion protection on east and west sides of creek
   - Potential for enhanced erosion protection along west side of creek but will impact property east of creek (golf course) and impact sanitary trunk sewer

EVALUATION MATRIX

Criteria	Impacts and Opportunities
Functionality	• Opportunity to improve conveyance of watercourse • Opportunity to decrease erosion of watercourse • Opportunity to improve functionality of adjacent lands
Social Environment	• Ability to improve public safety • Impacts to private properties • Impacts to public properties
Economic Environment	• Capital Costs • Maintenance Costs • Risk Management/Future Cost
Natural Environment	• Impacts on aquatic habitat • Impacts to terrestrial habitat • Impacts on channel stability and hydraulics
Constructability	• Ease of construction and accessibility • Expected disturbance to private/public property • Erosion/sedimentation concerns during construction

Evaluation of Alternative Solutions North of Bloor Street

CRITERIA	Option 1 – Do Nothing	Option 2 – Hard Armouring	Option 3 – Channel Realignment
Functional			
Opportunity to improve conveyance of watercourse	🟡	🟡	🟢
Opportunity to decrease erosion of watercourse	🔴	🟢	🟢
Opportunity to improve functionality of adjacent lands	🔴	🟢	🟡
Social Environment			
Ability to improve public safety	🔴	🟢	🟢
Impacts to private properties	🔴	🟢	🔴 Encroaching on existing golf course
Impacts to public properties	🔴	🟢	🟢
Economic Environment			
Capital Costs	🟢	🔴 High cost of armourstone structure	🔴 High cost of acquiring land from golf course
Maintenance Costs	🟢	🟢	🟢
Risk Management/Future Costs	🔴 Continued erosion will increase mitigation costs	🟢	🟢
Natural Environment			
Impacts on aquatic habitat	🔴 Continued erosion and sediment deposition	🟢 Minor disturbance during construction	🟡 Greater temporary disturbance due to realignment
Impacts to terrestrial habitat	🔴 Loss of riparian vegetation	🟢 Minimal loss of vegetation	🟡 Localized tree removals
Impacts on erosion/channel stability and hydraulics/flooding	🔴	🟡 Slight increase in water elevation in frequent storms	🟢
Constructability			
Ease of construction and accessibility	🟢	🔴	🔴
Expected disturbance to private/public property	🟢	🟡 construction access through golf course, impacts minimized through winter construction	🔴 significant land loss to golf course, closure may be longer
Erosion/sedimentation concerns during construction	🟢	🔴	🔴

BLOOR STREET CROSSING

1) Do nothing
   - Status quo (do not undertake erosion protection works)
   - Creek erosion would continue and eventually drop structure would fail, affecting Regional Trunk Sewer and Bloor Street bridge

2) Implement erosion protection
   a) Repair drop structure
      - Reinforce drop structure and provide erosion protection for Bloor Street abutments and Regional sewer
   b) Replace drop structure
      - Remove existing drop structure and provide erosion protection for Bloor Street abutments and Regional sewer

3) Implement enhanced erosion protection
   - Remove existing drop structure, provide erosion protection for Bloor Street abutments and enhanced erosion protection for Regional sewer

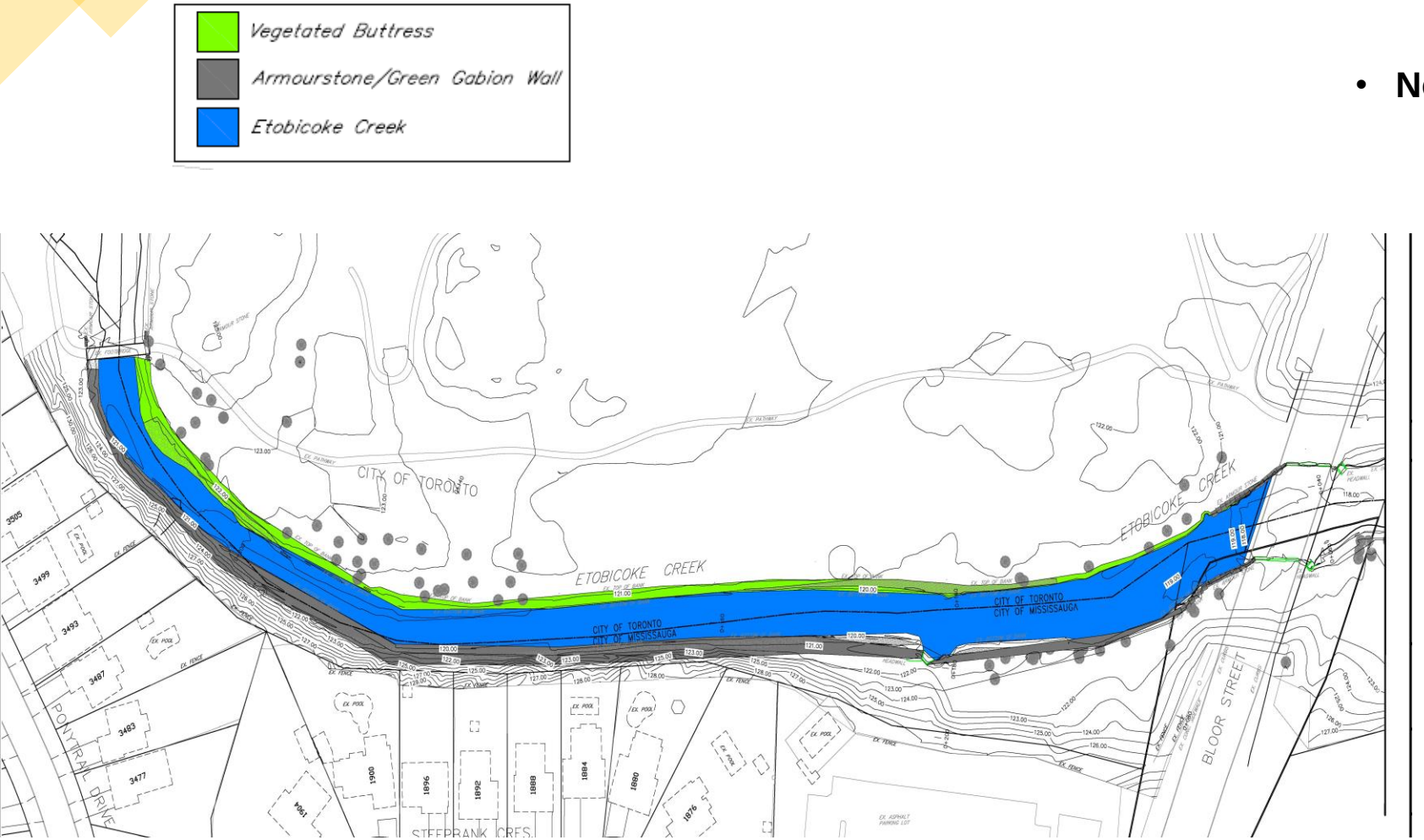

Drop Structure Jan 2022


Drop Structure 2019

Evaluation of Alternative Solutions Bloor Street Grade Control Structure

CRITERIA	Option 1 – Do Nothing	Option 2a – Control Structure Repair	Option 2b – Control Structure Replacement	Option 3 – Control Structure Replacement and Extend Upstream Remediation
	Functional			
Opportunity to improve conveyance of crossing	🟡	🟡	🟡	🟢 Provides better protection of upstream sanitary trunk crossing
Opportunity to decrease erosion of crossing	🔴	🟢	🟢	🟢
Opportunity to improve functionality of adjacent lands	🔴	🟢	🟢	🟡
	Social Environment			
Ability to improve public safety	🔴	🟡	🟢	🟢
Impacts to private properties	🔴	🟢	🟢	🟢
Impacts to public properties	🔴	🟢	🟢	🟢
	Economic Environment			
Capital Costs	🟢	🔴 High cost for Repair of existing Structure	🔴 High cost of armourstone structure	🔴 High cost of armourstone structure
Maintenance Costs	🟢	🟡 Control structure repairs could result in addition future maintenace	🟢	🟢
Risk Management/Future Costs	🔴 Continued erosion will increase mitigation costs	🟡 Control structure repairs could prove difficult	🟢	🟢 Provides greatest protection for upstream trunk sanitary sewer
	Natural Environment			
Impacts on aquatic habitat	🔴 Continued erosion and sediment deposition	🟡 Need for Flow diversion during construction	🟡 Need for Flow diversion during construction	🟡 Need for Flow diversion during construction
Impacts to terrestrial habitat	🔴 Loss of riparian vegetation	🟢 Minimal loss of vegetation	🟢 Minimal loss of vegetation	🟢 Minimal loss of vegetation
Impacts on erosion/channel stability and hydraulics/flooding	🔴	🟡 Slight increase in water elevation in frequent storms	🟡 Slight increase in water elevation in frequent storms	🟡 Slight increase in water elevation in frequent storms
	Constructability			
Ease of construction and accessibility	🟢	🔴	🔴	🔴
Expected disturbance to private/public property	🟢	🟡 construction access through golf course lands and need for flow diversion	🟡 construction access through golf course lands and need for flow diversion	🟡 construction access through golf course lands and need for flow diversion
Erosion/sedimentation concerns during construction	🟢	🔴	🔴	🔴

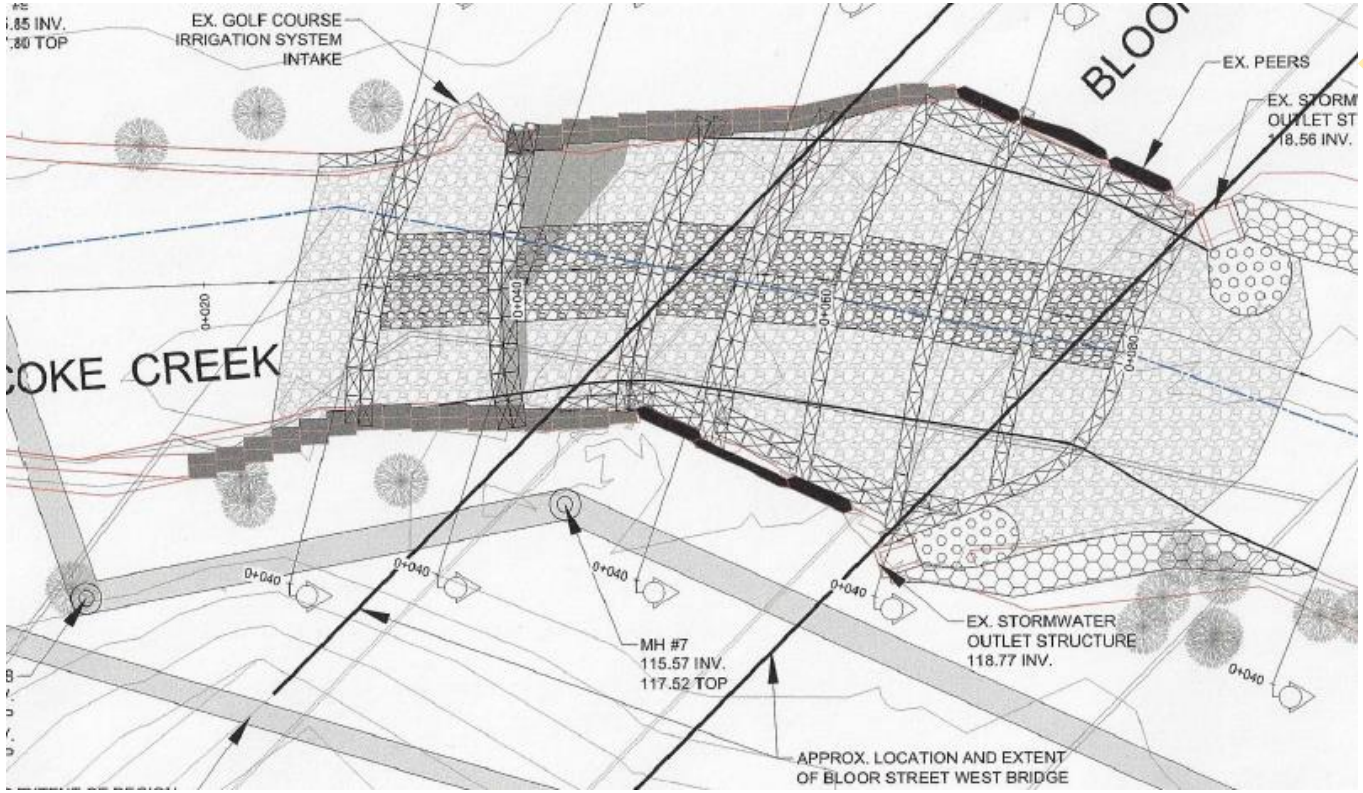
PRELIMINARY PREFERRED SOLUTION

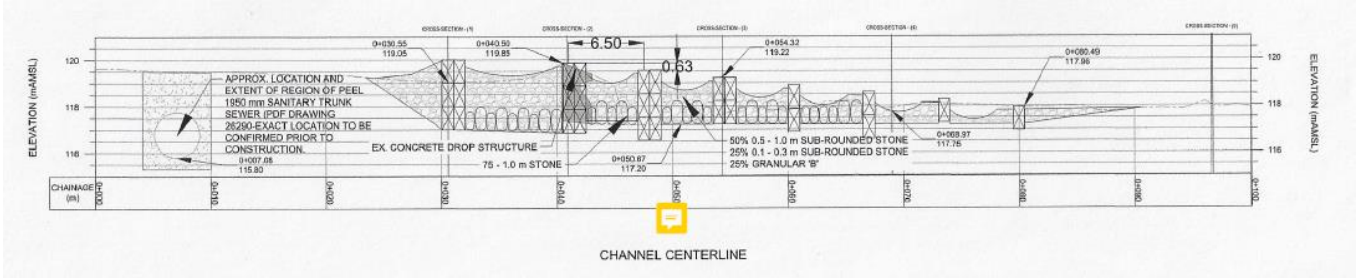


- **North of Bloor Street**
  - ➢ Implement erosion protection
    - Provide erosion protection on east and west sides of creek
    - Protects creek while minimizing impacts to natural features and property
  - ➢ Main benefits are:
    - Lower impact to natural environment during construction
    - Less impact on terrestrial habitat overall
    - Minimizes impact to public property
    - Least impact to private property

PRELIMINARY PREFERRED SOLUTION Con’t

- **Bloor Street Crossing**
  - **Drop Structure Replacement and Extend Upstream Remediation**
    - Remove existing drop structure, provide erosion protection for Bloor Street abutments and enhanced erosion protection for Regional sewer
  - Main benefits are:
    - Improve conveyance of crossing
    - Improve protection of upstream Trunk Sanitary Sewer
    - Minimal Loss of Vegetation
  - Small additional benefits compared to Option 2b





CONSTRUCTION ACCESS

- Access is restricted and difficult. Three access point will need to be used
    1. From west side of creek and north side of Bloor Street with one westbound lane partially closed
        - To unload Armourstone and other material
    2. From west of creek and south side of Bloor Street
        - To do works under Bloor Street
        - To bring material in and out
        - Low clearance under bridge will limit type of equipment that can be move
    3. From Markland Woods Golf Course
        - To bring equipment and material in and out of site

NEXT STEPS

- Take into consideration input from the Public Meeting
- Finalize Preferred Solution
- Finalize Environmental Assessment Report and post it for public record as per EA requirements
- Prepare Detail Design and obtain all required approvals

APPENDIX L

Agency Comments

April 8, 2020 CFN 62803

BY E-MAIL ONLY (alice.kong@mississauga.ca)

Alice Kong
Project Manager
City of Mississauga
201 City Centre Drive, Suite 800
Mississauga, ON L5B 2T4

Dear Ms. Kong:

Re: Draft Project File Report
Etobicoke Creek Erosion Control, Bloor Street to Ponytail Drive
Municipal Class Environmental Assessment – Schedule B
Etobicoke Creek Watershed; Cities of Mississauga and Toronto; Regional Municipality of Peel

Toronto and Region Conservation Authority (TRCA) staff received the draft Project File Report (PFR) dated June 2019 for the above noted project on December 17, 2019. As identified in the letter dated January 29, 2020 in response to the Notice of Study Commencement also received on December 17, 2019, TRCA has interests in this project.

As requested in the January 29, 2020 letter and in subsequent email correspondence, TRCA staff would like to schedule a meeting via teleconference to discuss the proposed alternative solutions, as well as other potential solutions.

PROJECT OVERVIEW

Staff understands that this undertaking involves the evaluation of alternatives to address erosion issues along a 500 m reach of Etobicoke Creek from a pedestrian bridge crossing at Markland Woods Golf Course to the north to Bloor Street to the south. Etobicoke Creek serves as the boundary between the City of Mississauga on the west side and the City of Toronto on the east side. Through the City of Mississauga's on-going erosion monitoring program, this section of Etobicoke Creek has been identified as a high priority site for rehabilitation, based on the severity of erosion and risk to properties.

The draft PFR proposed (3) alternative solutions to address these erosion issues along Etobicoke Creek:

1. Do nothing
2. Hard Armouring in-place with a combination of armourstone retaining wall, rock protection, green gabion and vegetated buttress
3. Geomorphic Adjustments including realignment of Etobicoke Creek to achieve an offset of 5 m from the valley slope

Hard Armouring (Option 2) was selected as the preferred alternative within the draft PFR.

PROJECT REVIEW

As it is staff understanding that the submitted draft PFR is a work in progress and background reports have not yet been provided for review, TRCA staff has only completed a high-level review of the draft PFR at this point in time. Staff understand that Hard Armouring (Option 2) was selected as the preferred alternative within the draft

PFR. Please note that TRCA policy does not generally support proposals to harden watercourses in-place, unless it can be demonstrated to the satisfaction of TRCA that other more ecologically and hydrologically beneficial alternative solutions are not feasible. Preliminary comments on the draft PFR are provided in **Appendix A**. Please note that these comments should be addressed within the next submission of the revised PFR.

RESUBMISSION REQUIREMENTS

Please ensure TRCA receives a copy of the revised PFR and any other associated background reports, studies and materials. The revised PFR should be accompanied by a covering letter that identifies how the comments within this letter and Appendix A have been addressed, using the numbering scheme provided in this letter. Digital materials must be submitted in PDF format, with any drawings pre-scaled to print on 11"x17" pages. Materials may be submitted via e-mail (if less than 25 MB) or through file transfer protocol (FTP) sites (if posted for a minimum of two weeks).

REVIEW FEES

Please be advised that this application is subject to a **$12,805** application review fee as per our 2018 Fee Schedule. Please note:

1. **To ensure accurate processing of your fee, please ensure your accounting department references CFN 62803 when making any payments.**
2. Payment method and timing must be noted in your covering letter response.
3. Payments can be made by:
   a. Cheque: please attach the cheque to your resubmission. Alternatively, if sending separately through your accounting department, please request your accounting department submit the cheque to the attention of Oxana Stanislavskaya - Accounting Clerk, Finance Corporate Services, TRCA.
   b. Credit Card: please contact Rina Bhagat at extension 5681 for payments made over the phone.
   c. Electronic Fund Transfer: this option may be available through your accounting department.

Should you have any questions or require any additional information please contact me at extension 6443 or at annette.lister@trca.ca.

Regards,

Annette Lister
Planner, Infrastructure Planning and Permits
Development and Engineering Services

Attached: Appendix A - TRCA Comments and Proponent Responses
Enclosed: Appendix A - TRCA Comments and Proponent Responses, WORD digital file for consultant/proponent response purposes
Geotechnical Investigation Slope Stability Risk Assessment, Phase 2 Storm Damage, Area J: 3487 to 3505, 3523, 3533 Ponytail Drive, Mississauga; prepared by Terraprobe Inc.; dated February 5, 2014
Geotechnical Investigation Slope Stability Risk Assessment, Phase 2 Storm Damage, Area J: 1880 to 1892 Steepbank Crescent, Mississauga; prepared by Terraprobe Inc.; dated February 5, 2015

BY E-MAIL

cc:
Consultant: Ken Chow, Project Manager, KSGS Engineering Corp. (ken.chow@ksgsengineering.com)
TRCA: Ashour Rehana, Manager, Capital and Special Projects
Renee Afoom-Boateng, Senior Planner, Infrastructure Planning and Permits

APPENDIX A: TRCA COMMENTS

ITEM	TRCA COMMENTS (April 8, 2020)	PROPONENT/ CONSULTANT RESPONSE
Geotechnical and Slope Stability		
1.	Please note that Terraprobe Inc. has previously completed detailed geotechnical investigations on behalf of TRCA within the EA study area following the July 8, 2013 severe weather event. Based on the Long-Term Stable Slope Crest (LTSSC) determined by the Terraprobe reports, the structures are not at risk in the long-term and only some tableland will be at risk of further recession in the long-term (100 year timeframe). Please ensure that the Terraprobe reports are reviewed and considered as a part of this EA study. Please revise the draft PFR accordingly. The Terraprobe reports are enclosed for your review.	
2.	The upper slope, which is made up of fill and overburden materials, is very steep with some areas at about 60 degrees or more as per cross-sections in the Terraprobe slope stability analyses. Thus any channel work to reduce the toe protection may only reduce the rate of erosion in the long-term, and does not address the oversteepened areas close to the tableland. As a result, those areas will continue recession despite any channel work prior to being halted in a more stable slope inclination. To eliminate the risk of further recession on the table land in the short to medium term, the upper slope will also need to be stabilized in addition to the toe protection, which will reduce the rate in the long-term. Please ensure that upper slope stabilization is reviewed and considered as a part of this EA study, and revise the draft PFR accordingly.	
3.	Considering the two distinct sources of erosion indicated in Comments 1 and 2 above, please assess the level of potential risk to structures, properties and tableland, considering the long-term risk as a result of the LTSSC, as well as the short to medium term risk as a result of the upper slope materials. This risk assessment should be completed by a geotechnical engineer.	
Alternative Solutions and Evaluation		
4.	TRCA policy generally does not support proposals to harden watercourses in-place, unless it can be demonstrated to the satisfaction of TRCA that other more ecologically and hydrologically beneficial alternative solutions are not feasible. As such, please consider other alternative solutions such as erosion protection measures that include more flexible, natural and bioengineered solutions (i.e. soil lifts, root wads, etc.) along with upper slope stabilization works. Please explore the feasibility of these softer options along both banks, while considering Comments 1 to 3 above and the information provided within the Terraprobe reports.	
5.	Please note that although Hard Armouring (Option 2) may result in less temporary disturbance to the aquatic habitat during construction, the proposed armourstone retaining wall will result in greater permanent impact to aquatic habitat (permanent loss of fish habitat) in relation to a natural channel realignment design or an alternative with more natural bioengineered solutions. Please revise Table 4.2 accordingly.	
Natural Heritage and Erosion and Sediment Control		
6.	It is recommended that an assessment of possible bat maternity roost be included in the tree inventory discussion to determine impacts to potential bat species occurring within the study area.	

7.	At detailed design, an Erosion and Sediment Control (ESC) Plan is required detailing the location and typical drawings of ESC measures implemented on-site, as well as phasing and staging of ESC measures before, during and post construction. Please refer to TRCA's Erosion and Sediment Control Guide (2019) for further information, and include all application TRCA Standard Notes on drawings at detailed design.	
8.	In addition to the detailed tree inventory and preservation plan identified in Section 6.2.2, a restoration and removals plan is required at the detailed design stage. Please refer to TRCA's Post Construction Restoration Guidelines for further information.	
Water Resources		
9.	Please provide the revised existing model details, the proposed condition modifications, and their comparison results. Please also provide Appendix G and Figure 2.4.	
10.	Please provide the HEC-RAS model of the subject location with both the revised existing and proposed plans. Please note, as the area is highly urbanized, the Regional water level at the creek and upstream should be maintained without any increase.	
General		
11.	Please provide appendices and background reports and studies for TRCA staff review, along with the revised PFR, as these were missing from the current submission.	
12.	At detailed design, there may be opportunities to partner with TRCA Restoration and Infrastructure staff on the design and implementation of the final recommended alternative.	
13.	Staff identified that TRCA property is present within the study area in the letter dated January 29, 2020. Please disregard this comment as our mapping incorrectly identified this parcel as TRCA property.	

APPENDIX A: TRCA COMMENTS

ITEM	TRCA COMMENTS (April 7, 2020)	PROPONENT/ CONSULTANT RESPONSE
Geotechnical and Slope Stability		
1.	Please note that Terraprobe Inc. has previously completed detailed geotechnical investigations on behalf of TRCA within the EA study area following the July 8, 2013 severe weather event. Based on the Long-Term Stable Slope Crest (LTSSC) determined by the Terraprobe reports, the structures are not at risk in the long-term and only some tableland will be at risk of further recession in the long-term (100 year timeframe). Please ensure that the Terraprobe reports are reviewed and considered as a part of this EA study. Please also quantify the level of risk to properties and provide a timeframe within which this risk will occur. Please revise the draft PFR accordingly. The Terraprobe reports are enclosed for your review.	This was discussed in detailed on April 14, 2020. There were significant discussions on works along the top of bank. The City of Mississauga has informed us that they will not be proceeding with the top of bank works at this time.
2.	The upper slope, which is made up of fill and overburden materials, is very steep with some areas at about 60 degrees or more as per cross-sections in the Terraprobe slope stability analyses. Thus channel work to reduce the toe protection may only reduce the rate of erosion in the long-term, and does not address the oversteepened areas close to the tableland. As a result, those areas will continue recession prior to being halted in a more stable slope inclination. To eliminate the risk of further recession on the table land in the short to medium term, the upper slope will also need to be stabilized in addition to the toe protection, which will reduce the rate in the long-term. Please ensure that upper slope stabilization is reviewed and considered as a part of this EA study, and revise the draft PFR accordingly.	Please see response above
Alternative Solutions and Evaluation		
3.	TRCA policy generally does not support proposals to harden watercourses in-place, unless it can be demonstrated to the satisfaction of TRCA that other more ecologically and hydrologically beneficial alternative solutions are not feasible. As such, please consider other alternative solutions such as erosion protection measures that include more flexible, natural and bioengineered solutions (i.e. soil lifts, root wads, etc.) along with upper slope stabilization works. Please explore the feasibility of these softer options along both banks, while considering Comments 1 and 2 above and the information provided within the Terraprobe reports.	A review has been completed on velocities within and outside of the channel and KSGS believes that hard armouring is the most practical mean of providing the required protection. Green gabions are proposed for the top 1m to allow planting and vegetation growth
4.	Please note that although Hard Armouring (Option 2) may result in less temporary disturbance to the aquatic habitat during construction, the proposed armourstone retaining wall will result in greater permanent impact to aquatic habitat in relation to a natural channel realignment design or an alternative with more natural bioengineered solutions. Please revise Table 4.2 accordingly.	Since KSGS believes that natural bioengineering is not a realistic option for the west embankment in this situation, Table 4.2 was not adjusted.
Natural Heritage and Erosion and Sediment Control		

5.	It is recommended that an assessment of possible bat maternity roost be included in the tree inventory discussion to determine impacts to potential bat species occurring within the study area.	The Team consulted with MNRF at the time and no species at risk were identified within the project area including SAR bat habitat.
6.	At detailed design, an Erosion and Sediment Control (ESC) Plan is required detailing the location and typical drawings of ESC measures implemented on-site, as well as phasing and staging of ESC measures before, during and post construction. Please refer to TRCA's Erosion and Sediment Control Guide (2019) for further information, and include all application TRCA Standard Notes on drawings at detailed design.	As part of detailed design an ESC plan for the various stages and phases will be prepared in accordance with TRCA requirements.
	In addition to the detailed tree inventory and preservation plan identified in Section 6.2.2, a restoration and removals plan is required at the detailed design stage. Please refer to TRCA's Post Construction Restoration Guidelines for further information.	As part of the detailed design a removal and restoration plan will be provided to TRCA for review.
Water Resources		
7.	Please provide the revised existing model details, the proposed condition modifications, and their comparison results. Please also provide Appendix G and Figure 2.4.	The existing model, existing, revised existing, and proposed HEC-RAS analysis has been provided in the Appendix G and Figure 2.4 is included in the document
8.	Please provide the HEC-RAS model of the subject location with both the revised existing and proposed plans. Please note, as the area is highly urbanized, the Regional water level at the creek and upstream should be maintained without any increase.	See response to Item 7.
General		
9.	Please provide appendices and background reports and studies for TRCA staff review, along with the revised PFR, as these were missing from the current submission.	The updated PDR has all the Appendices included.
10.	At detailed design, there may be opportunities to partner with TRCA Restoration and Infrastructure staff on the design and implementation of the final recommended alternative.	These discussion will take place with TRCA as detailed design proceeds.
11.	Staff identified that TRCA property is present within the study area in the letter dated January 29, 2020. Please disregard this comment as our mapping incorrectly identified this parcel as TRCA property.	

September 3, 2021 CFN 62803

BY E-MAIL ONLY (alice.kong@mississauga.ca)

Alice Kong
Project Manager
City of Mississauga
201 City Centre Drive, Suite 800
Mississauga

Dear Alice Kong,

Re: Draft Project File Report (PFR)
Etobicoke Creek Erosion Control, Bloor Street to Ponytail Drive
Municipal Class Environmental Assessment – Schedule B
Etobicoke Creek Watershed; Cities of Mississauga and Toronto; Regional Municipality of Peel and Toronto

Toronto and Region Conservation Authority (TRCA) staff received the draft Project File Report (PFR) dated June 2021, and comment table response on June 30, 2021 and a digital copy of the HEC-RAS Model on July 23, 2021.

PROJECT OVERVIEW

Staff understands that this undertaking involves the evaluation of alternatives to address erosion issues along a 500 m reach of Etobicoke Creek from the pedestrian bridge crossing at Markland Woods Golf Course to Bloor Street. The Etobicoke Creek serves as the boundary between the City of Mississauga on the west side and the City of Toronto on the east side. Through the City of Mississauga's on-going erosion monitoring program, this section of Etobicoke Creek has been identified as a high priority site for rehabilitation, based on the severity of erosion and risk to properties.

WORKS NORTH OF BLOOR STREET

The draft PFR proposed three (3) alternative solutions evaluated to address these erosion issues along Etobicoke Creek north of Bloor Street:

1. Do nothing.
2. Hard armouring in-place with a combination of armourstone retaining wall, rock protection, green gabion and vegetative buttress
3. Geomorphic Adjustments including realignment of Etobicoke Creek to achieve an offset of 5 m from the valley slope

WORKS AT BLOOR STREET GRADE CONTROL STRUCTURE

Staff note that additional works under the Bloor Street bridge have been included in the draft PFR that were not initially part of the proposed works. The Bloor Street Bridge crossing Etobicoke Creek is owned jointly by the City of Mississauga and City of Toronto. The City of Toronto had undertaken the design of rehabilitation of the bridge that also included retaining wall replacement, in-creek west pier foundation repair and protection, and creek bed rehabilitation in the proximity of the west pier footing. The City of Toronto retained IBI Group for these bridge rehabilitation works. IBI, with support from Parish Aquatic Services, completed designs for a new proposed channel configuration, complete with new cross-sections and channel characteristics. As per Section 1.2.2 of the draft PFR, the works were identified due to the alignment of the existing undermined grade control weir structure approximately 10 m north of Bloor Street Bridge crossing. The report further explained that the deep scour pool downstream of the weir structure is causing significant hydraulic impact to the north-west pier as well as undermining the base of existing stacked armour stone retaining wall causing them to collapse.

Though some of the works related to the bridge rehabilitation have been completed, the in-creek works have not been completed to date. The PFR provide an opportunity to undertake all in-creek works at the same time, the in-creek design portion of the City of Toronto project has been integrated in this PFR. The PFR also states that if the existing condition is allowed to persist, there is risk to public safety and infrastructure.

The following are the proposed alternative solutions evaluated to address erosion issues at the west pier foundation and creek bed rehabilitation under Bloor Street:

1. Do nothing.
2. Rehabilitation and/or Replacement of the grade control
3. Improvements to the existing grade control

PREFERRED ALTERNATIVES

- Hard armouring (Option 2) was selected as the preferred alternative within the draft PFR for works upstream of Bloor Street, and,
- Improvements to the existing grade control (Option 3) was selected as the preferred alternative for works at grade control structure.

PROJECT REVIEW

Based on the review of the draft PFR and its background reports, staff understands that the reach of Etobicoke Creek within the Study Area is highly urbanized with flashy hydrologic regime. A review of velocities within and outside of the channel was completed and based on the results of the analysis, hard armouring (Option 2 – preferred alternative) was proposed as the most practical means of providing the required bank erosion protection and hence, provides the greatest benefit at this location. It is noted that the purpose of the study was to address and mitigate risk at the local scale of the Study Area and not the largescale headwaters management challenges of the watershed.

As discussed previously in project meetings and further detailed in Appendix A, please note that staff are concerned that the proposed bank erosion protection work north of Bloor Street will not stop the slope stability issue at the upper slope. TRCA staff understands that the City of Mississauga has indicated that they will not be proceeding with the top of bank works at this time. Please note that if the City does not want to address this issue at this time, it is recommended that the residents in the project area be notified accordingly.

While staff has no objection in principle to the preferred alternative, the TRCA comments in Appendix A shall be addressed by the proponent to the satisfaction of TRCA. Additional detailed comments are provided in Appendix A. These comments should be included in the final EA report.

RESUBMISSION REQUIREMENTS

Please ensure TRCA receives a digital copy of the Notice of Study Completion and the final PFR. The final EA document should be accompanied by a covering letter which uses the numbering scheme provided in this letter and identifies how these comments have been addressed. Digital materials must be submitted in PDF format, via e-mail (if less than 5 MB), or through file transfer protocol (FTP) sites (if posted for a minimum of two weeks).

REVIEW FEES

With reference to the TRCA staff correspondence dated April 8, 2020 regarding the EA application review fee, our records indicate that the application review fee of $12, 805.00 is outstanding. Please make this fee payment as soon as possible. Please refer to the letter dated April 8, 2020 concerning fee payment method.

Should you have any questions or require any additional information please contact me at extension 5785 or at shirin.varzgani@trca.ca.

Regards,

Shirin Varzgani

Shirin Varzgani
Planner, Infrastructure Planning and Permits
Development and Engineering Services

Attached: Appendix A – TRCA Comments and Proponent Responses

BY E-MAIL

cc: KSGS: Ken Chow, Manager, KSGS Engineering Corp. (ken.chow@ksgsengineering.com)
TRCA: Ashour Rehana, Manager, Capital and Special Projects
Suzanne Bevan, Senior Manager, Infrastructure Planning and Permits
Sharon Lingertat, Senior Manager, Infrastructure Planning and Permits

APPENDIX A: TRCA COMMENTS AND PROPONENT RESPONSES

ITEM	TRCA COMMENTS (April 7, 2020)	PROPONENT/CONSULTANT RESPONSE (June 30, 2021)	TRCA COMMENTS (September 3, 2021)
Geotechnical and Slope Stability			
1.	Please note that Terraprobe Inc. has previously completed detailed geotechnical investigations on behalf of TRCA within the EA study area following the July 8, 2013 severe weather event. Based on the Long-Term Stable Slope Crest (LTSSC) determined by the Terraprobe reports, the structures are not at risk in the long-term and only some tableland will be at risk of further recession in the long-term (100 year timeframe). Please ensure that the Terraprobe reports are reviewed and considered as a part of this EA study. Please also quantify the level of risk to properties and provide a timeframe within which this risk will occur. Please revise the draft PFR accordingly. The Terraprobe reports are enclosed for your review.	This was discussed in detailed on April 14, 2020. There were significant discussions on works along the top of bank. The City of Mississauga has informed us that they will not be proceeding with the top of bank works at this time.	As discussed previously, the proposed bank erosion protection work will not stop the slope stability issue at the upper slope. Appendix A in the Draft PFR (June 2021) confirmed this. However, as the City will not be proceeding with the top of bank works at this time, this should be communicated to the residents.
2.	The upper slope, which is made up of fill and overburden materials, is very steep with some areas at about 60 degrees or more as per cross-sections in the Terraprobe slope stability analyses. Thus channel work to reduce the toe protection may only reduce the rate of erosion in the long-term, and does not address the oversteepened areas close to the tableland. As a result, those areas will continue recession prior to being halted	Please see response above.	Please see the comment above.

ITEM	TRCA COMMENTS (April 7, 2020)	PROPONENT/CONSULTANT RESPONSE (June 30, 2021)	TRCA COMMENTS (September 3, 2021)
	in a more stable slope inclination. To eliminate the risk of further recession on the table land in the short to medium term, the upper slope will also need to be stabilized in addition to the toe protection, which will reduce the rate in the long-term. Please ensure that upper slope stabilization is reviewed and considered as a part of this EA study and revise the draft PFR accordingly.		
3.	Considering the two distinct sources of erosion indicated in Comments 1 and 2 above, please assess the level of potential risk to structures, properties and tableland, considering the long-term risk as a result of the LTSSC, as well as the short to medium term risk as a result of the upper slope materials. This risk assessment should be completed by a geotechnical engineer.		No response received to this comment. Please provide response.
Alternative Solutions and Evaluation			
4.	TRCA policy generally does not support proposals to harden watercourses in-place, unless it can be demonstrated to the satisfaction of TRCA that other more ecologically and hydrologically beneficial alternative solutions are not feasible. As such, please consider other alternative solutions such as erosion protection measures that include more flexible, natural and bioengineered solutions (i.e. soil lifts, root wads, etc.) along with upper slope stabilization works. Please explore	A review has been completed on velocities within and outside of the channel and KSGS believes that hard armouring is the most practical mean of providing the required protection. Green gabions are proposed for the top 1m to allow planting and vegetation growth	Addressed.

ITEM	TRCA COMMENTS (April 7, 2020)	PROPONENT/CONSULTANT RESPONSE (June 30, 2021)	TRCA COMMENTS (September 3, 2021)
	the feasibility of these softer options along both banks, while considering Comments 1 and 2 above and the information provided within the Terraprobe reports.		
5.	Please note that although Hard Armouring (Option 2) may result in less temporary disturbance to the aquatic habitat during construction, the proposed armourstone retaining wall will result in greater permanent impact to aquatic habitat in relation to a natural channel realignment design or an alternative with more natural bioengineered solutions. Please revise Table 4.2 accordingly.	Since KSGS believes that natural bioengineering is not a realistic option for the west embankment in this situation, Table 4.2 was not adjusted.	Please provide supporting calculations that clarifies how KSGS concluded that bioengineering is not a realistic option for the west bank embankment.
Natural Heritage and Erosion and Sediment Control			
6.	It is recommended that an assessment of possible bat maternity roost be included in the tree inventory discussion to determine impacts to potential bat species occurring within the study area.	The Team consulted with MNRF at the time and no species at risk were identified within the project area including SAR bat habitat.	Comment addressed.
7.	At detailed design, an Erosion and Sediment Control (ESC) Plan is required detailing the location and typical drawings of ESC measures implemented on-site, as well as phasing and staging of ESC measures before, during and post construction. Please refer to TRCA's Erosion and Sediment Control Guide (2019) for further information, and include all application TRCA Standard Notes on drawings at detailed design.	As part of detailed design an ESC plan for the various stages and phases will be prepared in accordance with TRCA requirements.	Comment addressed. ESC plan to be submitted at detail design.

ITEM	TRCA COMMENTS (April 7, 2020)	PROPONENT/CONSULTANT RESPONSE (June 30, 2021)	TRCA COMMENTS (September 3, 2021)
8.	In addition to the detailed tree inventory and preservation plan identified in Section 6.2.2, a restoration and removals plan is required at the detailed design stage. Please refer to TRCA's Post Construction Restoration Guidelines for further information.	As part of the detailed design a removal and restoration plan will be provided to TRCA for review.	Comment addressed. Restoration plan to be submitted at detail design.
Water Resources			
9.	Please provide the revised existing model details, the proposed condition modifications, and their comparison results. Please also provide Appendix G and Figure 2.4.	The existing model, existing, revised existing, and proposed HEC-RAS analysis has been provided in the Appendix G and Figure 2.4 is included in the document.	Addressed.
10.	Please provide the HEC-RAS model of the subject location with both the revised existing and proposed plans. Please note, as the area is highly urbanized, the Regional water level at the creek and upstream should be maintained without any increase.	See response to Item 7.	Please confirm if the response referred to item #9.
General			
11.	Please provide appendices and background reports and studies for TRCA staff review, along with the revised PFR, as these were missing from the current submission.	The updated PDR has all the Appendices included.	Addressed.
12.	At detailed design, there may be opportunities to partner with TRCA Restoration and Infrastructure staff on	These discussions will take place with TRCA as detailed design proceeds.	Noted.

ITEM	TRCA COMMENTS (April 7, 2020)	PROPONENT/CONSULTANT RESPONSE (June 30, 2021)	TRCA COMMENTS (September 3, 2021)
	the design and implementation of the final recommended alternative.		
13.	Staff identified that TRCA property is present within the study area in the letter dated January 29, 2020. Please disregard this comment as our mapping incorrectly identified this parcel as TRCA property.		

ITEM	APPENDIX A: TRCA COMMENTS AND PROPOSNENT RESPONSES			
	TRCA COMMENT (April 7, 2020)	**PROPONENT/CONSULTANT RESPONSES (June 30, 2021)**	**TRCA COMMENT (September 30, 2021)**	**PROPONENT/CONSULTANT RESPONSES (Septmeber 12, 2022)**
Geotechnical and Slope Stability				
1	Please note that Terraprobe Inc. has previously completed detailed geotechnical investigations on behalf of TRCA within the EA study area following the July 8, 2013 severe weather event. Based on the Long-Term Stable Slope Crest (LTSSC) determined by the Terraprobe reports, the structures are not at risk in the long-term and only some tableland will be at risk of further recession in the long-term (100 year timeframe). Please ensure that the Terraprobe reports are reviewed and considered as a part of the EA study. Please also quantify the level of risk to properties and provide a timeframe within which this risk will occur. Please review the draft PFR accordingly. The Terraproble reports are enclosed for your review.	This was discused in detail on April 14, 2020. There were significant discussions on works along the top of bank. The City of Mississauga has informed us that they will not be proceeding with the top of banks works at this time.	As discussed previously, the proposed bank erosion protection work will not stop the slope stability issue at the upper slope. Appendix A in the draft PFR (June 2021) confirmed this. However, as the City will not be proceeding with the top of bank works at this time, this should be communicated to the residets.	This was communicated on a slide within the PowerPoint presentation at the Public Open House held in June 27, 2022. The appropriate slide is enclosed.
2	The upper slope, which is made up of fill and overburden materials, is very steep with some areas at above 60 degrees or more as per cross-sections in the Terraprobe slope stability analysis. Thus channel work to reduce the toe protection may only reduce the rate of erosion in the long-term, and does not address the oversteepened areas close to the tableland. As a result, those areas will continue recession prior to being halted in a more stable slope inclination. To eliminate the risk of further recession on the table land in the short to medium term, the upper slopewill also need to be stabilized in addition to the toe protection, which will reduce the rate in the long-term. Plaese ensure that upper slope stabilization is reviewed and considered as a part of the EA study and revise the draft PFR accordingly	Please see response above	Please see response above	This was communicated on a slide within the PowerPoint presentation at the Public Open House held in June 27, 2022. The appropriate slide is enclosed.
3	Considering the two distint sources of erosion indicated in Comment 1 and 2 above, please assess		No response received to this comment. Please provide response.	KSGS is working for the City of Mississauga on the toe protecrion along this section of the

ITEM	APPENDIX A: TRCA COMMENTS AND PROPOSNENT RESPONSES			
	TRCA COMMENT (April 7, 2020)	**PROPONENT/CONSULTANT RESPONSES (June 30, 2021)**	**TRCA COMMENT (September 30, 2021)**	**PROPONENT/CONSULTANT RESPONSES (Septmeber 12, 2022)**
	the level of potential risk to structures, properties and tableland, considering the long-term risk as a result of the LTSSC, as well as the short to medium term risk as a result of the upper slope materials. This risk assessment should be completed by a geotechnical engineer.			Etobicoke Creek. The City of Mississauga has not authorized KSGS to assess the level of potential risk along the upper embankment and tableland. It is KSGS' understanding that the City will be loking at upper embankment at a later time.
Alternative Solutions and Evaluation				
4	TRCA policy generally does not support proposals to harden watercourses in-place, unless it can be demonstrated to the satisfaction of TRCA that other more ecologivally and hydraulically beneficial alternatives solutions are not feasible. As such, please consider other alternative solutions such as erosion protection measures that include more flexible natural and bioengineered solutions (i.e. soil lifts, root wads, etc.) along with upper slope stabilization works. Please explore the feasibility of these softer options along both banks, while considering Comment 1 and 2 above and the information provided within the Terraprobe reports.	A review has been completed on the velocities within and outside of the channel and KSGS believes that hard armouring is the most practical means of providing the required protection. Green gabions are proposed for the top 1m to allow planting and vegetation growth.	Addressed	
5	Please note that although Hard Armouring (Option 2) may result in less temporary disturbance to the aquatic habitat during construction, the proposed armourstone retaining wall results in greater permanent impact to aquatic habitat in relation to a natural channel realignment design or an alternative with more natural bioengineering solutions. Please revise Table 4.2 accordingly	Since KSGS believs that natural bioengineering is not a realistic option for the west embankment in this situation, Table 4.2 was not adjusted.	Please provide supporting calculations that clarifies how KSGS concluded that bioengineering is not a realistic option for the west bank embankment.	As outlined in the HEC-RAS anlysis, velocities in the creek for even the 2-year return storms run in the 3 m/s range and for the Regional Storm from 3.6 m/s to over 5m/s. KSGS is not comfortable using bioengineering on the west bank with these velocities for the Regional Storm. The proposed condition HEC-RAS summary is enclosed .
Natural Heritage and Erosion and Sediment Control				
6	It is recommended that an assessment of possible bat maternity roost be included in the tree inventory discussion to determine impacts to potential bat	The Team consulted with MNRF at the time and no species at risk were identified within the project area including SAR bat habitat.	Comment addressed	

ITEM	APPENDIX A: TRCA COMMENTS AND PROPOSNENT RESPONSES			
	TRCA COMMENT (April 7, 2020)	PROPONENT/CONSULTANT RESPONSES (June 30, 2021)	TRCA COMMENT (September 30, 2021)	PROPONENT/CONSULTANT RESPONSES (Septmeber 12, 2022)
	species occuring within the study area.			
7	At detailed design, an Erosion and Sediment Control (ESC) Plan is required detailing the location and typical drawings of ESC measures implemented on-site, as well as phasing and staging of ESC measures before, during, and post construction. Please refer to TRCA's Erosion and Sediment Control Guide (2019) for further information, and include all applicable TRCA Standard Notes on drawings at detailed design.	As part of detailed design an ESC plan for the various stages and phases will be prepared in accordance with TRCA requirements	Comment addressed. ESC plan to be submitted at detailed design.	
8	In addition to the detailed tree inventory and preservation plan identified in Section 6.2.2. a restoration and removals plan is required at the detailed design stage. Plesae refer to TRCA's Post Construction Restoration Guidelines for further information	As part of detailed design a removal and restoration plan will be provided to TRCA for review.	Addressed	
Water Resourcse				
9	Please provide the revised existing model details, the proposed condition modifications, and their comparison results. Please also provide Appendix G and Figure 2.4	The existing model, existing, revised existing and proposed HEC-RAS analysis has been provided in Appendix G and Figure 2.4 is included in the doocument.	Addressed	
10	Please provide the HEC-RAS model of the subject locationwith both the revised existing and proposed plans. Plaese note, as the area is highly urbanized, the Regional water level at the creek and upstream should be maintained without any increase.	See repsonse to Item 7	Please confirm if the response referred to Item #9	The response should have referred to Item #9
General				

ITEM	APPENDIX A: TRCA COMMENTS AND PROPOSNENT RESPONSES			
	TRCA COMMENT (April 7, 2020)	PROPONENT/CONSULTANT RESPONSES (June 30, 2021)	TRCA COMMENT (September 30, 2021)	PROPONENT/CONSULTANT RESPONSES (Septmeber 12, 2022)
11	Please provide appendices and background reports and studies for TRCA staff review, along with the revised PFR, as these were missing from the current submission.	The updated PDR has all the Appendices included.	Addressed	
12	At deatiled design, there may be opportunities topartner with TRCA Restoration and Infrastructure staff on the design and implementation of the final recommended alternative.	These discussions will take place with TRCA as detailed design proceeds.	Noted	
13	Staff identified that TRCA properties is present within the study area in the letter dated Januray 29, 2020. Please disregard this comment as our mapping incorrectky identifiedthis parcel as TRCA property.			

TOP OF EMBANKMENT (WEST SIDE)

- Propose works deals with erosion within creek and base of embankment
  - Works along top of embankment will be addressed as part of another project
- For lands at top of embankment, landowners are encouraged to:
  - Keep structures away from edge of embankment
  - Reduce the amount of drainage that drains to the embankment
  - For drainage travelling to embankment do not concentrate flows but encourage “sheet” flow
  - Keep area vegetated to discourage erosion and increase stability.

Proposed Reach	River Sta	Profile	Volume (1000 m3)	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Sections 13_15	13.1	2 Year	193.13	105.01	124.8	126.75	126.42	127.11	0.005712	2.67	39.37	47.04	0.72
Sections 13_15	13.1	5 Year	292.67	146.14	124.8	126.92	126.75	127.48	0.007741	3.32	44.04	51.67	0.85
Sections 13_15	13.1	10 Year	363.16	177.14	124.8	127.24	127.24	127.58	0.004389	2.78	125.37	334.68	0.66
Sections 13_15	13.1	25 Year	454.7	217.95	124.8	127.38	127.38	127.72	0.004373	2.92	173.41	381.87	0.67
Sections 13_15	13.1	50 Year	521.29	249	124.8	127.49	127.49	127.8	0.004044	2.91	216.78	408.95	0.65
Sections 13_15	13.1	100 year	585.99	281.59	124.8	127.62	127.55	127.88	0.003518	2.82	269.28	430.26	0.61
Sections 13_15	13.1	350 year	893.72	455.83	124.8	127.84	127.84	128.21	0.00493	3.56	368.42	472.04	0.73
Sections 13_15	13.1	Regional	1255.35	727.56	124.8	128.18	128.18	128.58	0.005286	4.03	546.44	541.71	0.77
Sections 13_15	13.09	2 Year	190.26	105.01	124.7	126.55	126.55	126.89	0.005038	2.96	77.41	177.92	0.7
Sections 13_15	13.09	5 Year	288.77	146.14	124.7	126.77	126.77	127.13	0.005094	3.21	109.99	206.85	0.72
Sections 13_15	13.09	10 Year	357.87	177.14	124.7	126.77	126.87	127.3	0.007457	3.89	110.19	206.97	0.87
Sections 13_15	13.09	25 Year	447.5	217.95	124.7	126.96	127.05	127.45	0.006782	3.94	141.99	340.74	0.85
Sections 13_15	13.09	50 Year	512.24	249	124.7	127.08	127.13	127.55	0.006423	3.97	163.12	447.42	0.83
Sections 13_15	13.09	100 year	574.6	281.59	124.7	127.22	127.22	127.65	0.005886	3.95	187.16	484.89	0.8
Sections 13_15	13.09	350 year	877.49	455.83	124.7	127.49	127.49	127.79	0.005071	3.93	434.98	532.29	0.76
Sections 13_15	13.09	Regional	1235.02	727.56	124.7	127.54	127.76	128.2	0.011301	5.93	458.84	536.82	1.14
Sections 13_15	13.085	2 Year	161.6	105.01	123	125.46	124.75	125.55	0.001335	1.74	147.04	156.51	0.38
Sections 13_15	13.085	5 Year	245.02	146.14	123	125.89	124.96	125.97	0.001026	1.72	259.09	349.46	0.34
Sections 13_15	13.085	10 Year	309.65	177.14	123	126.02	125.22	126.11	0.001116	1.85	305.04	374.87	0.36
Sections 13_15	13.085	25 Year	390.83	217.95	123	126.17	125.39	126.25	0.001158	1.95	359.65	379.74	0.37
Sections 13_15	13.085	50 Year	448.45	249	123	126.27	125.49	126.36	0.001165	2	400.05	382.39	0.37
Sections 13_15	13.085	100 year	503.28	281.59	123	126.37	125.63	126.45	0.001202	2.08	435.51	384.72	0.38
Sections 13_15	13.085	350 year	781.96	455.83	123	126.76	126.17	126.87	0.001406	2.44	590.74	396.36	0.42
Sections 13_15	13.085	Regional	1117.16	727.56	123	127.28	126.47	127.4	0.001503	2.76	799.98	404.5	0.44
Sections 13_15	13.08	2 Year	148.37	104.8	122.2	124.76		125.2	0.004423	3.32	54.7	44.21	0.68
Sections 13_15	13.08	5 Year	225.7	145.46	122.2	124.9	124.9	125.61	0.006737	4.25	61.11	47.28	0.85
Sections 13_15	13.08	10 Year	283.58	176.55	122.2	125.39	125.39	125.82	0.003804	3.6	141.7	237.17	0.66
Sections 13_15	13.08	25 Year	359.03	217.16	122.2	125.63	125.63	125.99	0.003355	3.55	203.62	284.45	0.62
Sections 13_15	13.08	50 Year	412.62	247.92	122.2	125.77	125.77	126.1	0.003196	3.56	245.14	292.65	0.61
Sections 13_15	13.08	100 year	464.74	280.98	122.2	125.84	125.84	126.19	0.003428	3.74	265.63	294.4	0.64
Sections 13_15	13.08	350 year	731.63	454.48	122.2	126.14	126.14	126.56	0.004468	4.5	353.83	299.7	0.74
Sections 13_15	13.08	Regional	1045.08	726.44	122.2	126.9		127.16	0.002875	4.08	584.6	306.91	0.61
Sections 13_15	13.075	2 Year	133.64	104.8	121.29	123.63	123.63	124.03	0.005497	3.46	78.04	110.87	0.74
Sections 13_15	13.075	5 Year	204.31	145.46	121.29	124.05	123.87	124.32	0.003761	3.21	133.39	150.1	0.63
Sections 13_15	13.075	10 Year	249.47	176.55	121.29	124.31	124.08	124.52	0.002949	3.02	172.89	155.71	0.56
Sections 13_15	13.075	25 Year	313.76	217.16	121.29	124.58	124.21	124.76	0.002522	2.96	215.72	161.41	0.53
Sections 13_15	13.075	50 Year	360.06	247.92	121.29	124.74	124.29	124.92	0.002407	2.99	242.75	165.03	0.52
Sections 13_15	13.075	100 year	407.04	280.98	121.29	124.91	124.38	125.08	0.002316	3.03	270.38	168.69	0.52
Sections 13_15	13.075	350 year	651.3	454.48	121.29	125.61	124.75	125.79	0.002129	3.28	394.04	181.09	0.51
Sections 13_15	13.075	Regional	925.2	726.44	121.29	126.37		126.58	0.002273	3.79	535.13	192.73	0.54
Sections 13_15	13.073	2 Year	122.28	104.8	120.26	122.82	122.16	123.2	0.003131	2.77	48.49	57.53	0.58
Sections 13_15	13.073	5 Year	186.37	145.46	120.26	123.12	122.68	123.61	0.003684	3.25	70.41	88.18	0.64
Sections 13_15	13.073	10 Year	226.93	176.55	120.26	123.27	123.18	123.84	0.00411	3.57	85.24	99.19	0.68
Sections 13_15	13.073	25 Year	285.79	217.16	120.26	123.48	123.48	124.11	0.004399	3.87	106.45	105.5	0.71
Sections 13_15	13.073	50 Year	328.42	247.92	120.26	123.63	123.63	124.29	0.004465	4.02	122.63	114.23	0.72
Sections 13_15	13.073	100 year	371.7	280.98	120.26	123.76	123.76	124.45	0.004598	4.2	138.67	122.75	0.74
Sections 13_15	13.073	350 year	598.9	454.48	120.26	124.34	124.34	125.16	0.005104	4.93	216.36	144.32	0.8
Sections 13_15	13.073	Regional	847.73	726.44	120.26	125.2	125.2	125.97	0.004459	5.26	370.74	197.01	0.77
Sections 13_15	13.071	2 Year	116.3	104.8	119.61	122.38	122.18	122.77	0.003855	3.07	62.95	66.28	0.63
Sections 13_15	13.071	5 Year	177.62	145.46	119.61	122.82	122.54	123.16	0.003128	3.09	108.09	124.6	0.59
Sections 13_15	13.071	10 Year	217.34	176.55	119.61	122.86	122.82	123.32	0.004226	3.63	113.41	128.47	0.68
Sections 13_15	13.071	25 Year	274.16	217.16	119.61	123.07	123.02	123.54	0.004189	3.79	141.41	133.82	0.69
Sections 13_15	13.071	50 Year	315.16	247.92	119.61	123.24	123.14	123.68	0.003977	3.82	165.03	147.92	0.68
Sections 13_15	13.071	100 year	356.76	280.98	119.61	123.4	123.27	123.84	0.003871	3.9	190.31	159.2	0.67
Sections 13_15	13.071	350 year	575.08	454.48	119.61	124.24	123.84	124.57	0.002777	3.82	333.76	175.6	0.59
Sections 13_15	13.071	Regional	810.74	726.44	119.61	125.22	124.32	125.5	0.002153	3.86	507.68	178.76	0.54
Sections 13_15	13.069	2 Year	110.59	104.8	119.57	121.93	121.71	122.33	0.004506	3.05	56.38	61.63	0.66
Sections 13_15	13.069	5 Year	168.94	145.46	119.57	122.17	121.97	122.72	0.005552	3.63	80.72	117.57	0.75
Sections 13_15	13.069	10 Year	206.78	176.55	119.57	122.48	122.43	122.89	0.004042	3.36	119.22	126.68	0.65
Sections 13_15	13.069	25 Year	260.58	217.16	119.57	122.81		123.14	0.003177	3.21	162.23	134.34	0.59
Sections 13_15	13.069	50 Year	299.37	247.92	119.57	123.02		123.32	0.002826	3.17	190.37	136.13	0.56
Sections 13_15	13.069	100 year	338.81	280.98	119.57	123.2		123.49	0.002646	3.18	216.14	137.82	0.55
Sections 13_15	13.069	350 year	545.86	454.48	119.57	124.06		124.32	0.002106	3.29	338.63	146.76	0.51
Sections 13_15	13.069	Regional	767.98	726.44	119.57	125.04		125.32	0.001929	3.61	483.29	150.2	0.5
Sections 13_15	13.067	2 Year	103.1	104.8	119.42	121.99		122.08	0.001091	1.6	140.64	145.87	0.34
Sections 13_15	13.067	5 Year	158.64	145.46	119.42	122.34		122.43	0.001005	1.69	191.34	147.96	0.33
Sections 13_15	13.067	10 Year	193.76	176.55	119.42	122.57		122.66	0.000964	1.75	225.81	149.31	0.33
Sections 13_15	13.067	25 Year	244.36	217.16	119.42	122.86		122.95	0.000913	1.81	268.66	150.95	0.32
Sections 13_15	13.067	50 Year	281.02	247.92	119.42	123.05		123.14	0.000896	1.86	297.65	152.05	0.32

Sections 13_15	13.067	100 year	318.48	280.98	119.42	123.22		123.32	0.000902	1.94	324.76	153.15	0.33
Sections 13_15	13.067	350 year	516.12	454.48	119.42	124.06		124.18	0.000898	2.22	454.57	157.92	0.34
Sections 13_15	13.067	Regional	727.08	726.44	119.42	125.02		125.18	0.000969	2.63	608.68	162.45	0.36
Sections 13_15	13.066	2 Year	98.09	104.8	119.29	121.81		122	0.002038	2.09	84.96	115.1	0.45
Sections 13_15	13.066	5 Year	151.61	145.46	119.29	122.15		122.35	0.001987	2.26	130.34	149.92	0.45
Sections 13_15	13.066	10 Year	185.15	176.55	119.29	122.42		122.59	0.001678	2.22	171.02	152.93	0.42
Sections 13_15	13.066	25 Year	233.82	217.16	119.29	122.73		122.89	0.001426	2.2	219.72	156.63	0.4
Sections 13_15	13.066	50 Year	269.2	247.92	119.29	122.93		123.09	0.001336	2.22	251.73	160.01	0.39
Sections 13_15	13.066	100 year	305.46	280.98	119.29	123.12		123.27	0.001299	2.27	281.32	163.18	0.39
Sections 13_15	13.066	350 year	497.3	454.48	119.29	123.98		124.13	0.00112	2.43	425.48	169.71	0.37
Sections 13_15	13.066	Regional	701.45	726.44	119.29	124.95		125.13	0.001106	2.76	592.5	173.76	0.38
Sections 13_15	13.06	2 Year	95.61	104.8	118.81	121.79		121.95	0.001367	1.88	88.88	97.64	0.38
Sections 13_15	13.06	5 Year	147.95	145.46	118.81	122.11		122.3	0.001509	2.14	123.26	117.22	0.41
Sections 13_15	13.06	10 Year	180.46	176.55	118.81	122.35		122.55	0.001484	2.24	152.36	126.09	0.41
Sections 13_15	13.06	25 Year	227.84	217.16	118.81	122.63		122.84	0.001469	2.37	191.33	148.58	0.42
Sections 13_15	13.06	50 Year	262.32	247.92	118.81	122.82		123.04	0.001479	2.47	221.13	166.77	0.42
Sections 13_15	13.06	100 year	297.68	280.98	118.81	123.01		123.22	0.001408	2.49	253.39	168.03	0.41
Sections 13_15	13.06	350 year	485.24	454.48	118.81	123.9		124.09	0.001159	2.61	404.75	173.17	0.39
Sections 13_15	13.06	Regional	684.52	726.44	118.81	124.88		125.09	0.001127	2.93	576.51	178.26	0.4
Sections 13_15	13.05	2 Year	94.34	104.8	119.53	121.8	120.95	121.91	0.001283	1.56	96.28	66.89	0.35
Sections 13_15	13.05	5 Year	146.24	145.46	119.53	122.12	121.2	122.25	0.001417	1.81	117.76	68.48	0.38
Sections 13_15	13.05	10 Year	178.39	176.55	119.53	122.35	121.37	122.51	0.001458	1.95	133.84	69.65	0.39
Sections 13_15	13.05	25 Year	225.31	217.16	119.53	122.63	121.55	122.81	0.001501	2.12	153.33	71.04	0.4
Sections 13_15	13.05	50 Year	259.45	247.92	119.53	122.81	121.67	123.01	0.00155	2.24	166.23	71.95	0.41
Sections 13_15	13.05	100 year	294.46	280.98	119.53	122.98	121.8	123.2	0.001623	2.38	178.35	72.79	0.43
Sections 13_15	13.05	350 year	480.44	454.48	119.53	123.67	122.38	124.03	0.002054	3.05	228.47	76.4	0.5
Sections 13_15	13.05	Regional	677.94	726.44	119.53	124.33	123.14	124.95	0.002939	4.06	278.05	88.75	0.61
Sections 13_15	13.045		Bridge										
Sections 13_15	13.04	2 Year	91.88	104.8	117.95	120.58	119.58	120.7	0.001258	1.59	74.06	50.16	0.35
Sections 13_15	13.04	5 Year	143.17	145.46	117.95	120.95	119.84	121.11	0.00134	1.83	94.52	59.96	0.38
Sections 13_15	13.04	10 Year	174.84	176.55	117.95	121.21	120.02	121.4	0.001356	1.98	111.14	63.85	0.38
Sections 13_15	13.04	25 Year	221.18	217.16	117.95	121.52	120.25	121.73	0.001365	2.13	131.19	66.09	0.39
Sections 13_15	13.04	50 Year	254.94	247.92	117.95	121.71	120.41	121.95	0.001404	2.25	144.14	67.15	0.4
Sections 13_15	13.04	100 year	289.61	280.98	117.95	121.89	120.55	122.15	0.001475	2.39	156	68.11	0.42
Sections 13_15	13.04	350 year	474.17	454.48	117.95	122.57	121.35	122.99	0.001932	3.1	203.43	71.53	0.49
Sections 13_15	13.04	Regional	670.41	726.44	117.95	123.11	122.19	123.89	0.003082	4.25	242.79	74.06	0.63
Sections 13_15	13.035	2 Year	86.43	104.8	117.66	120.26		120.53	0.002282	2.42	62.06	52.39	0.48
Sections 13_15	13.035	5 Year	136.42	145.46	117.66	120.49		120.88	0.003081	2.98	74.88	58.7	0.57
Sections 13_15	13.035	10 Year	166.98	176.55	117.66	120.69		121.15	0.00339	3.27	87.11	64.02	0.6
Sections 13_15	13.035	25 Year	211.93	217.16	117.66	120.92	120.51	121.46	0.003724	3.6	102.66	70.52	0.64
Sections 13_15	13.035	50 Year	244.69	247.92	117.66	121.07	120.71	121.67	0.00391	3.81	115.8	95.87	0.66
Sections 13_15	13.035	100 year	278.3	280.98	117.66	121.23	120.92	121.86	0.004006	3.97	131.64	100.28	0.67
Sections 13_15	13.035	350 year	458.33	454.48	117.66	121.89	121.74	122.66	0.004497	4.71	203.15	119.93	0.73
Sections 13_15	13.035	Regional	648.77	726.44	117.66	122.73	122.55	123.58	0.004454	5.3	317.86	145.29	0.75
Sections 13_15	13.03	2 Year	72.7	104.8	116.4	118.62	118.62	119.39	0.008406	4.2	38.09	32.58	0.91
Sections 13_15	13.03	5 Year	114.28	145.46	116.4	119.33	119.33	119.85	0.004575	3.74	86.46	104.58	0.7
Sections 13_15	13.03	10 Year	140.36	176.55	116.4	119.51	119.51	120.05	0.004694	3.94	106.4	110.76	0.72
Sections 13_15	13.03	25 Year	180.07	217.16	116.4	119.71	119.71	120.28	0.004953	4.22	128.57	117.37	0.74
Sections 13_15	13.03	50 Year	208.87	247.92	116.4	119.84	119.84	120.44	0.005127	4.41	144.17	121.8	0.76
Sections 13_15	13.03	100 year	238.23	280.98	116.4	119.96	119.96	120.59	0.005353	4.61	159.28	126.05	0.78
Sections 13_15	13.03	350 year	398.82	454.48	116.4	120.5	120.5	121.22	0.005986	5.36	230.31	136.63	0.85
Sections 13_15	13.03	Regional	564.06	726.44	116.4	121.01	121.01	121.98	0.007704	6.58	302.8	145.33	0.98
Sections 13_15	13.021	2 Year	48.61	104.8	116	117.38	116.97	117.49	0.002664	1.83	109.78	115.94	0.5
Sections 13_15	13.021	5 Year	76.31	145.46	116	117.72	117.16	117.83	0.002139	1.9	149.5	122.05	0.46
Sections 13_15	13.021	10 Year	96.05	176.55	116	117.89	117.27	118.01	0.002175	2.03	170.24	125.12	0.47
Sections 13_15	13.021	25 Year	127.67	217.16	116	118.12	117.39	118.26	0.002171	2.19	200	136.63	0.48
Sections 13_15	13.021	50 Year	150.76	247.92	116	118.26	117.48	118.42	0.002246	2.33	221.04	148.53	0.5
Sections 13_15	13.021	100 year	173.33	280.98	116	118.45	117.57	118.61	0.002176	2.42	249.73	163.35	0.49
Sections 13_15	13.021	350 year	312.12	454.48	116	118.84	117.98	119.12	0.003229	3.25	319.27	194.66	0.62
Sections 13_15	13.021	Regional	448.09	726.44	116	119.37	118.6	119.79	0.003991	4.06	435.94	235.4	0.71
Sections 13_15	13.02	2 Year	31.22	104.8	115	116.78	116.5	117	0.003707	2.55	85.36	102.85	0.61
Sections 13_15	13.02	5 Year	46.74	145.46	115	117.31	116.73	117.47	0.002247	2.36	142.76	210.97	0.5
Sections 13_15	13.02	10 Year	58.28	176.55	115	117.58	116.89	117.7	0.001643	2.18	234.06	239.07	0.43
Sections 13_15	13.02	25 Year	79.61	217.16	115	117.87	117	117.97	0.00128	2.07	308.77	275.35	0.39
Sections 13_15	13.02	50 Year	95.91	247.92	115	118.05	117	118.13	0.001167	2.05	356.65	279.87	0.38
Sections 13_15	13.02	100 year	109.33	280.98	115	118.27	117.34	118.35	0.000971	1.96	420.93	284.38	0.35
Sections 13_15	13.02	350 year	232.46	454.48	115	118.59	117.82	118.71	0.001494	2.59	511.17	291.17	0.44
Sections 13_15	13.02	Regional	342.55	726.44	115	119.09	118.2	119.25	0.001856	3.15	657.88	295.2	0.5
Sections 13_15	13.01	2 Year	19.43	105.6	113.11	115.7	115.24	116.21	0.004403	3.32	44.64	31.52	0.66
Sections 13_15	13.01	5 Year	26.66	146.71	113.11	116.06	115.75	116.79	0.005422	4.02	57.52	51.31	0.75

Sections 13_15	13.01	10 Year	32.02	177.65	113.11	116.28	115.97	117.11	0.005775	4.35	70.11	61.66	0.79
Sections 13_15	13.01	25 Year	44.28	218.88	113.11	116.7	116.7	117.49	0.004942	4.39	105.19	103.91	0.74
Sections 13_15	13.01	50 Year	54.9	250.44	113.11	116.89	116.89	117.68	0.004886	4.51	126.44	119.43	0.74
Sections 13_15	13.01	100 year	63.02	282.51	113.11	116.89	116.89	117.89	0.006218	5.09	126.44	119.43	0.84
Sections 13_15	13.01	350 year	158.17	459.22	113.11	117.84	117.84	118.3	0.003217	4.26	382.05	345.39	0.63
Sections 13_15	13.01	Regional	244.73	738.41	113.11	118.24	118.24	118.76	0.003984	5	523.72	362.92	0.71