WELCOME

Applewood Creek Erosion Control at Lakeview Golf Course Class Environmental Assessment

PUBLIC INFORMATION CENTRE

November 7th, 2019

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

Aquafor Beech Limited

SCHOLLEN & Company Inc.

MISSISSAUGA

STUDY PURPOSE / PROBLEM DEFINITION

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

PUBLIC INFORMATION CENTRE PURPOSE

To gain community input on:

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

This Public Information Centre (PIC) is designed to:

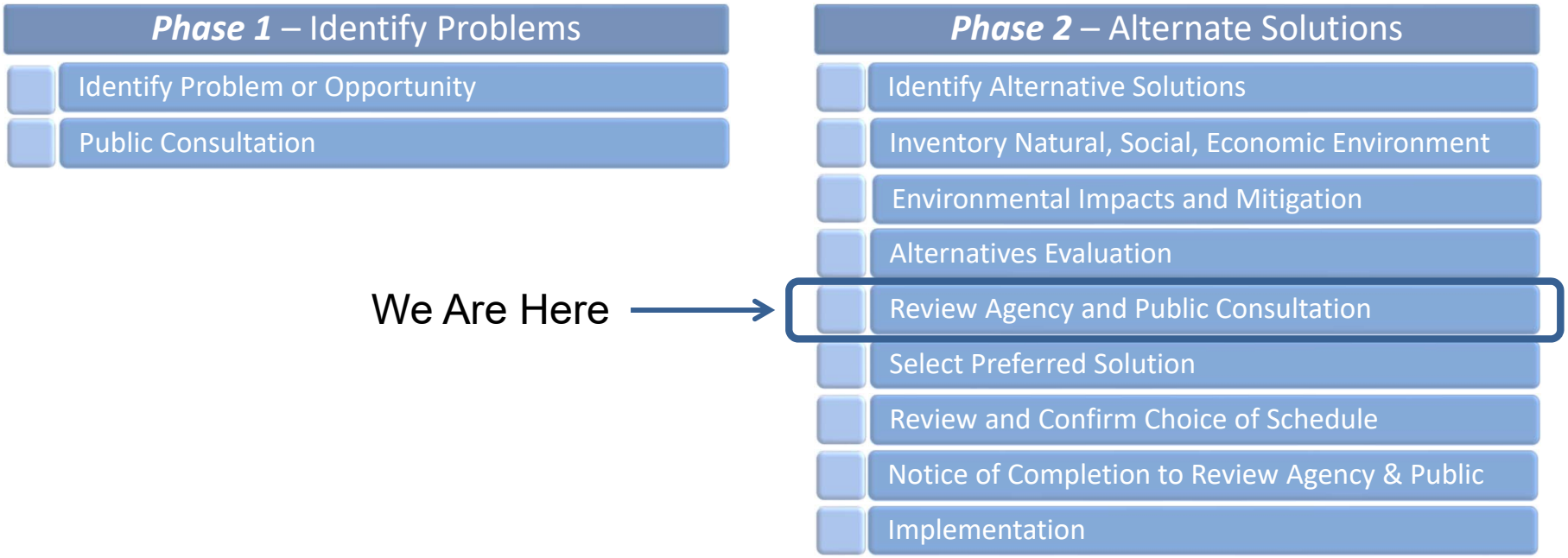
- Present information on existing conditions
- Discuss potential impacts and opportunities for improvement of Applewood Creek and the golf course
- Present alternative approaches to restoration
- Explain the study process and timelines

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT PROCESS

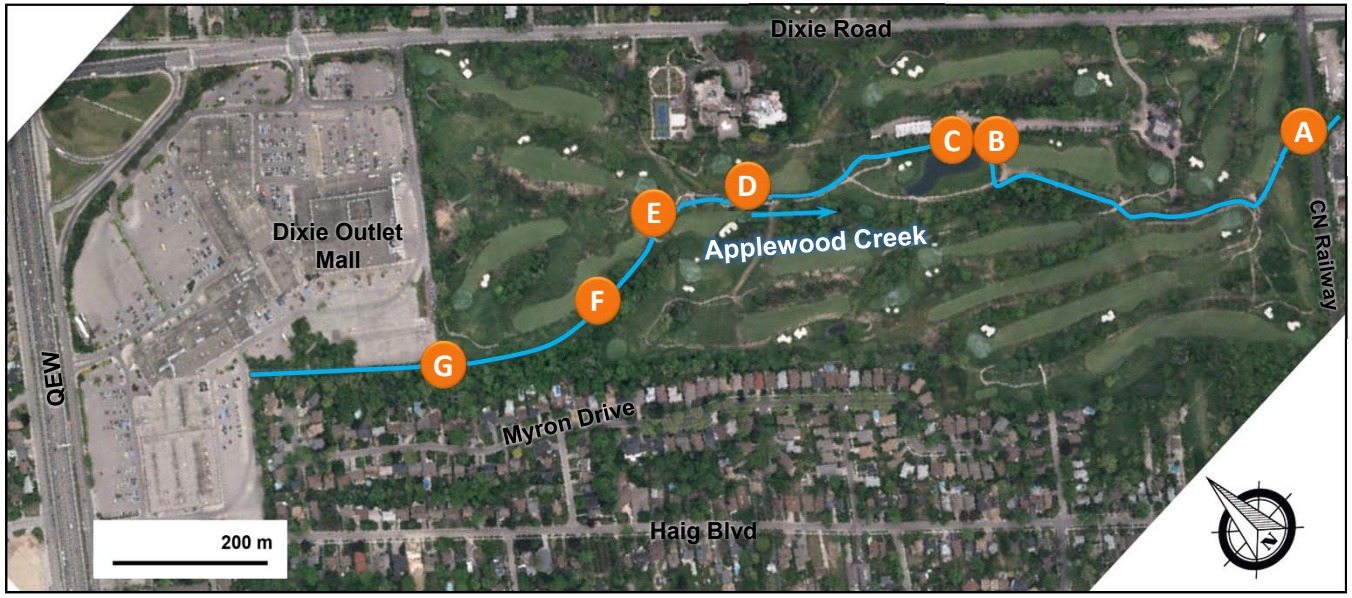
CLASS EA PROCESS - SCHEDULE B

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

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



EXISTING CONDITIONS



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

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

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

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

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

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

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

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

TERRESTRIAL ECOLOGY

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

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

TREE INVENTORY

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

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

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

AQUATIC ECOLOGY

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

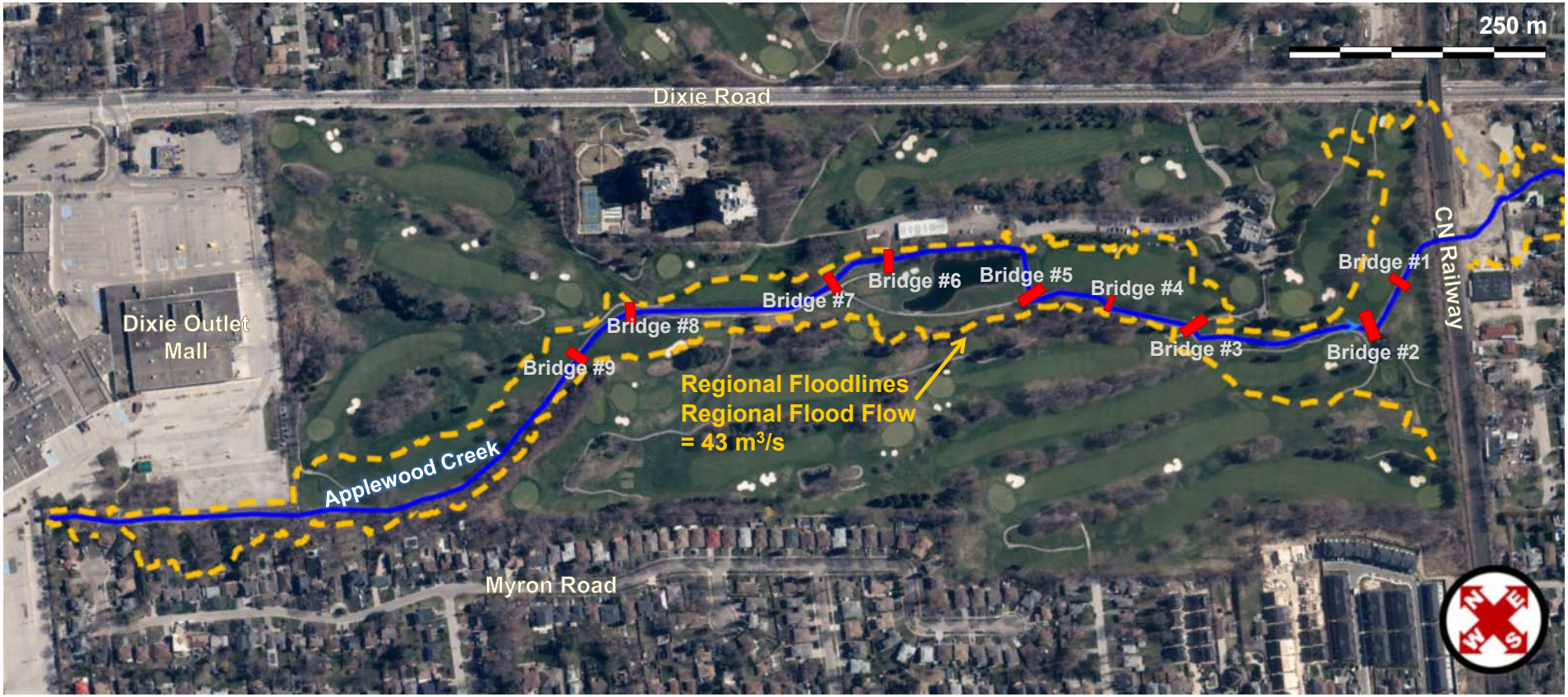
- Fish were not found within the study area but an unidentified dead fish was observed incidentally, suggesting that the creek potentially supports fish populations.
- No major fish barriers were observed within the site.
- Nearly all banks consist of gabion baskets at angles greater than 45º with signs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

TARGET FISHERIES CONDITIONS

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

HYDROLOGY AND HYDRAULICS

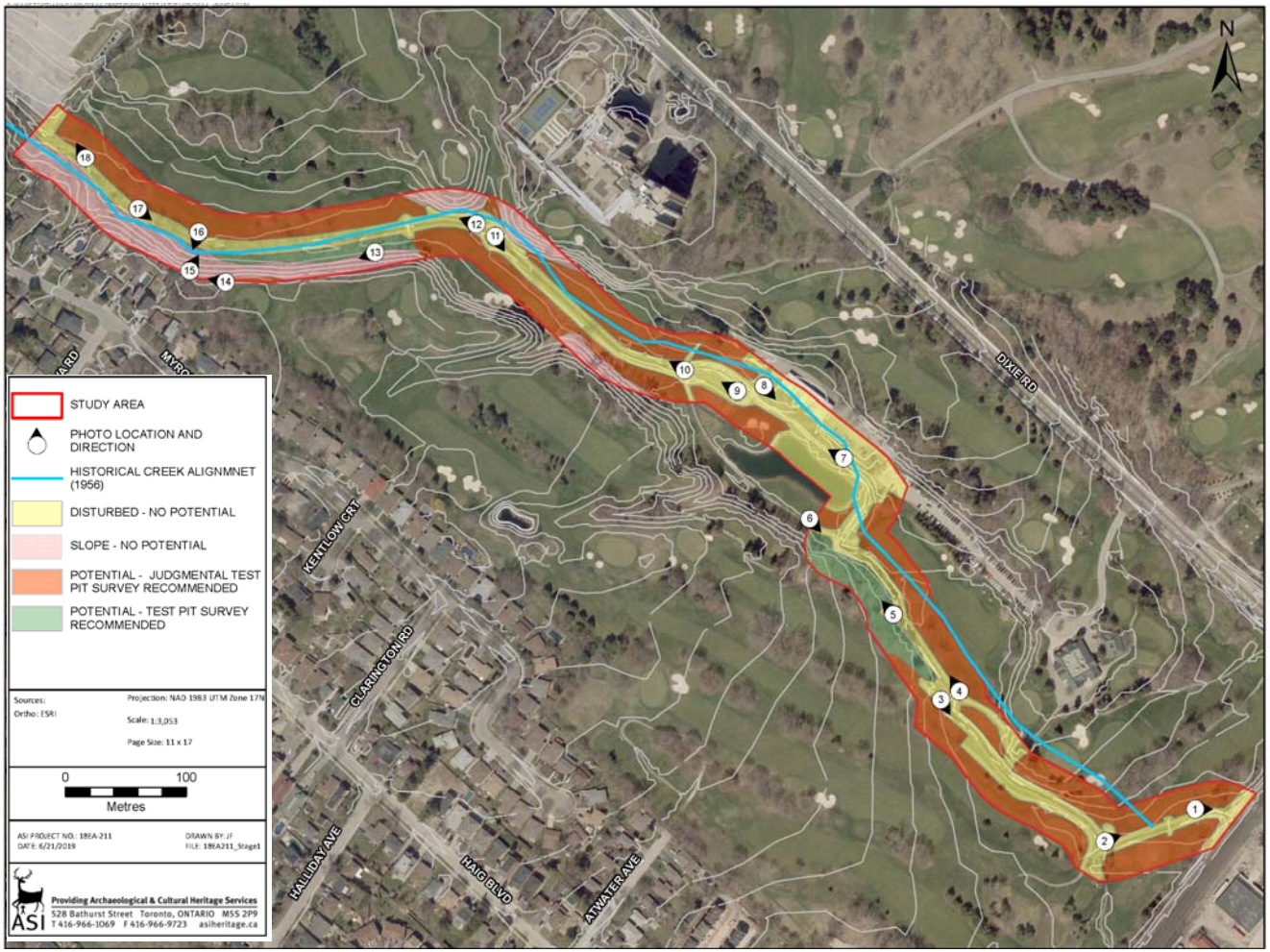
The study looked into Hydrology and Hydraulics of Applewood Creek in order to understand how water flows through the creek, the forces it exerts under normal and extreme conditions, and the extent of flooding, so as to not worsen or impact flood levels. The limits of Regional floodplain is shown below.



ARCHAEOLOGY

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

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



NATURAL & CULTURAL HERITAGE

History of Lakeview Golf Course

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

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

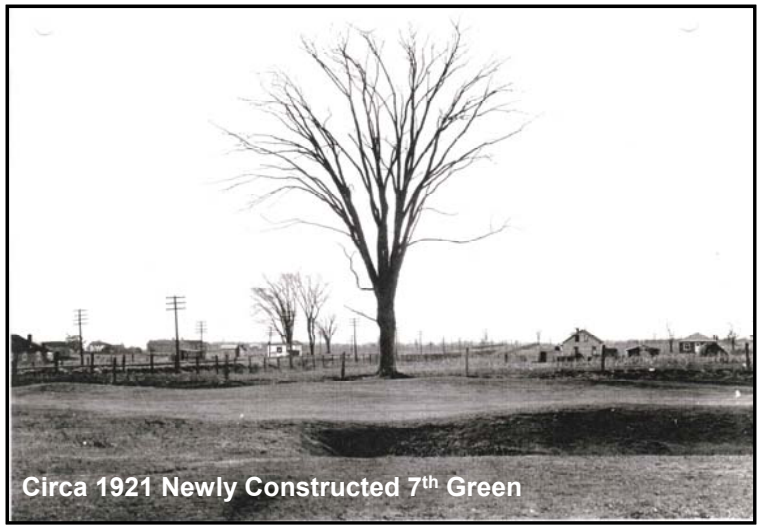
Heritage Designation

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

Some of the key heritage attributes include:

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

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



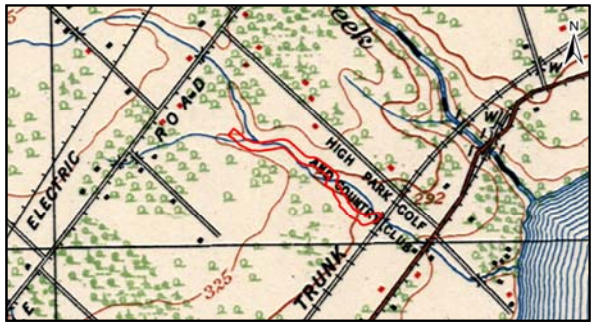
Circa 1921 Newly Constructed 7th Green

Creek Realignment

Review of historical mapping and aerial photos revealed:

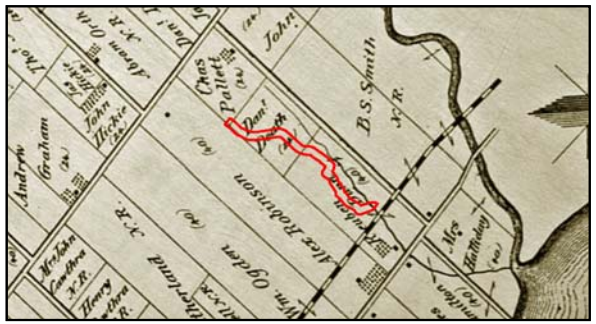
- Natural alignment of Applewood Creek (~ prior to 1956), and
- Realignment of the watercourse following the construction of the golf course, as well as the adjacent land development (~ after 1974).

Approximate study area within 1859
Map of the County of Peel



Approximate study area within 1909
NTS Brampton Sheet

Approximate study area within 1974
NTS Port Credit Sheet



Approximate study area within 1877
Historical Atlas of County of Peel

Approximate study area within 1956
Aerial Photograph of Mississauga

Approximate study area within 1974
NTS Port Credit Sheet

EVALUATION APPROACH AND CRITERIA

There are four alternative approaches being considered for this project:

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

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

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

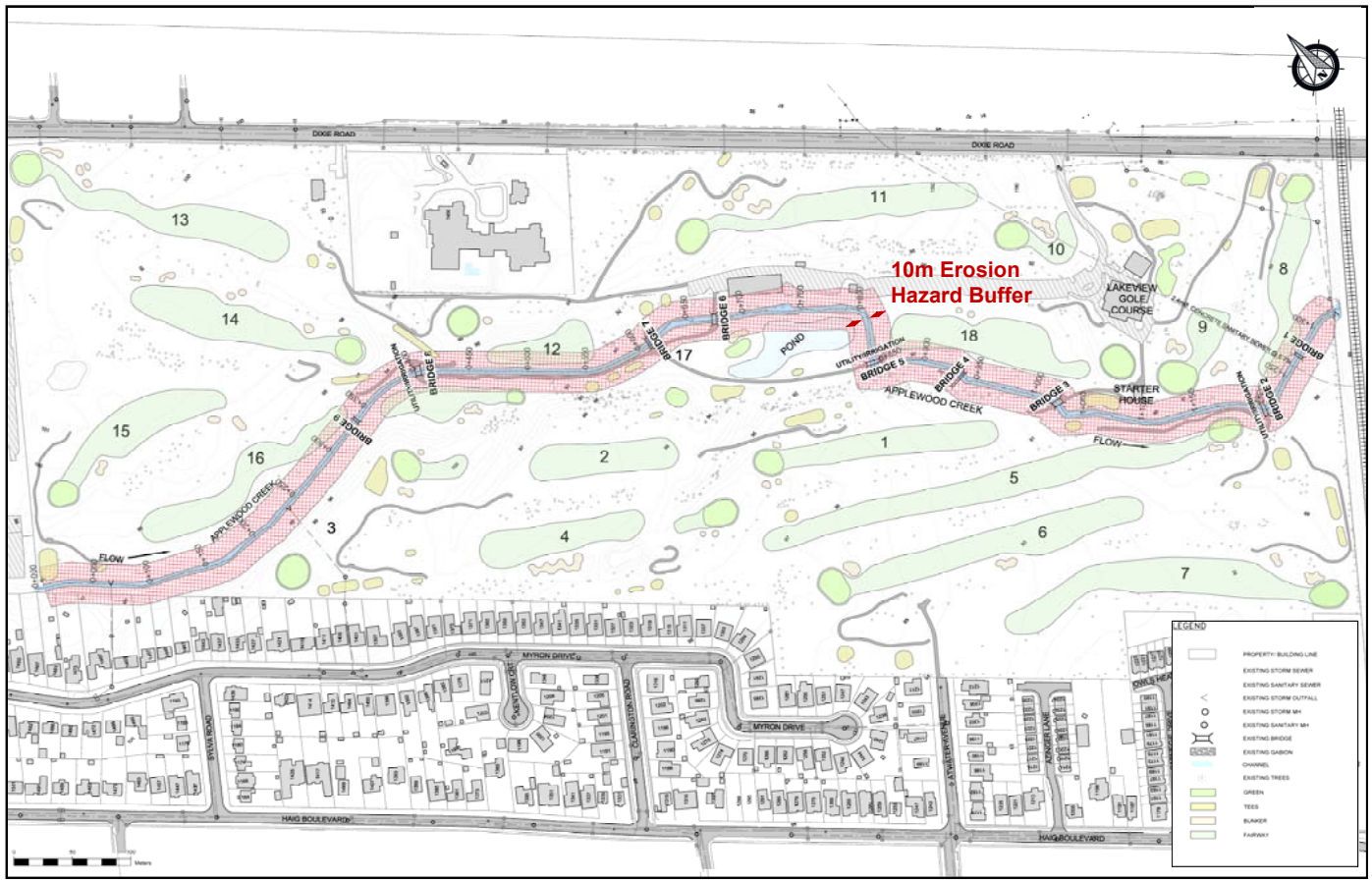
Physical and Natural Criteria	
Erosion	Rate of Erosion, slope failures, and loss of tablelands
Water Quality	Impact on water quality
Aquatic Habitat	Impact on contributing aquatic habitat and linkage
Terrestrial Habitat	Impact on connectivity, diversity, and quantity/quality of habitat
Terrestrial Vegetation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

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

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

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

Potential Alternative #1
Do Nothing



Existing Conditions / Do Nothing

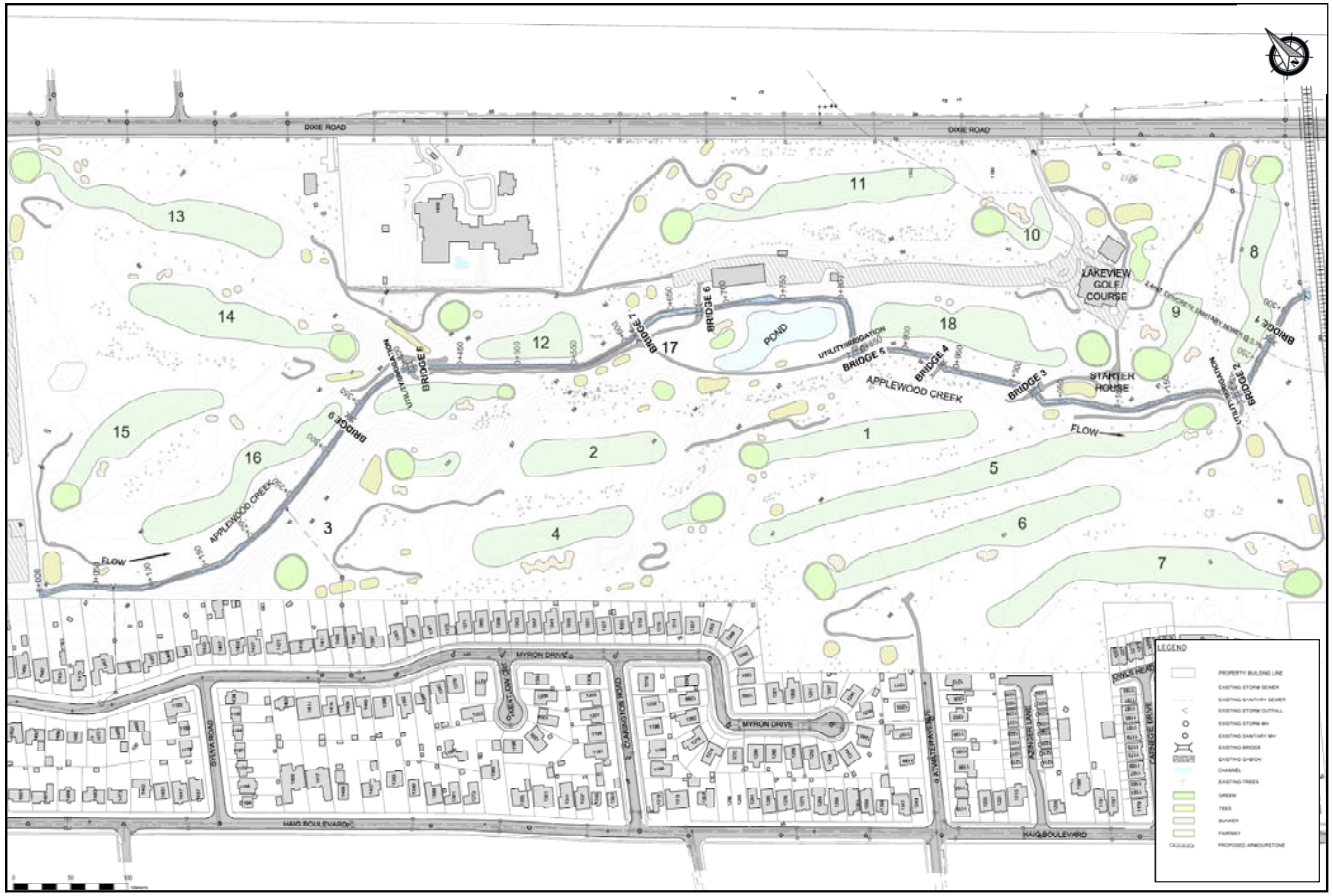
Alternative # 1 – Do Nothing

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

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

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

Potential Alternative #2
Replacing Gabion Baskets with Armourstone



Example of Engineered Channel Restoration with Armourstone.

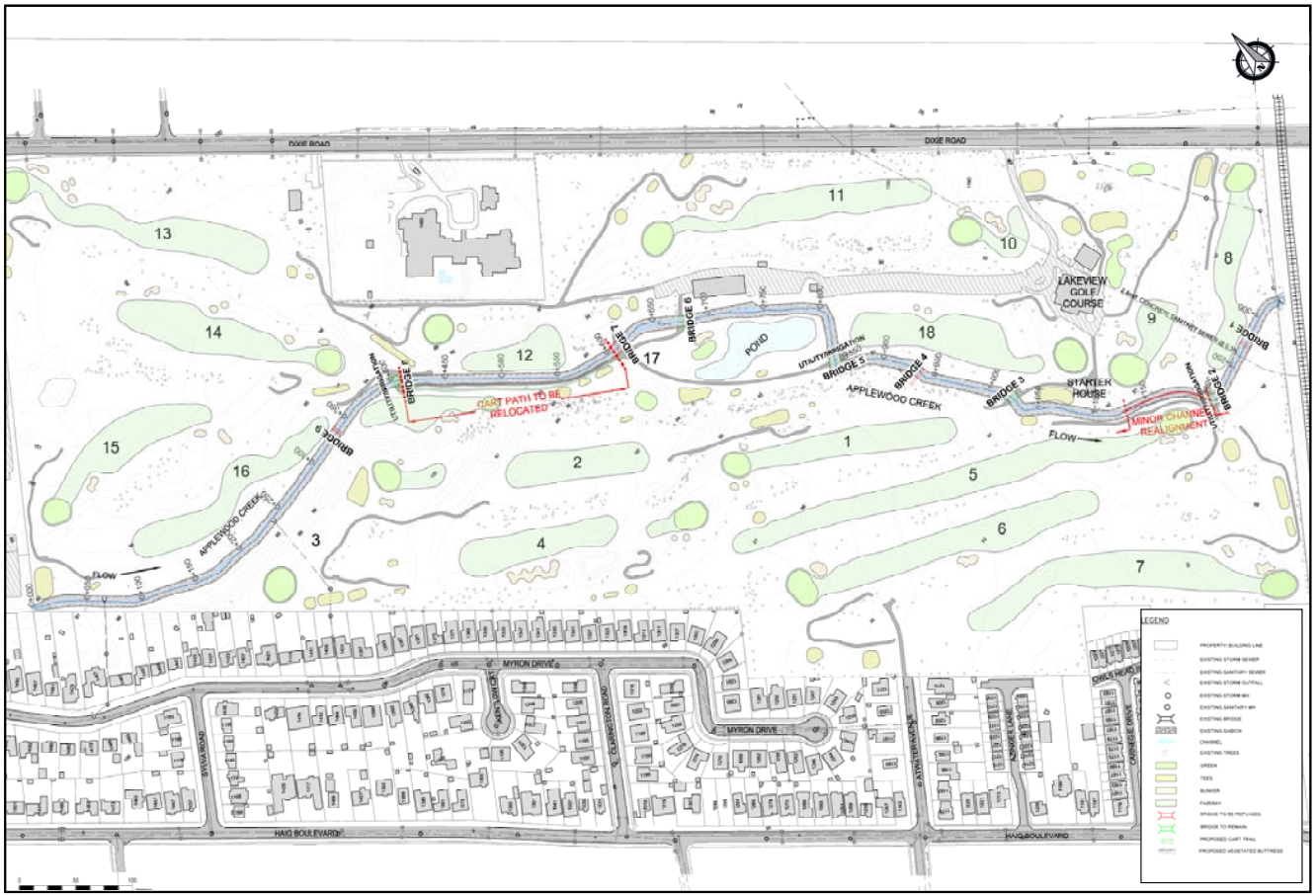
Alternative # 2 – Replacing Gabion Baskets with Armourstone

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

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

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

Potential Alternative #3
Replacing Gabion Baskets with Vegetated Roundstone



Example of Engineered Channel Restoration with Vegetated Roundstone.

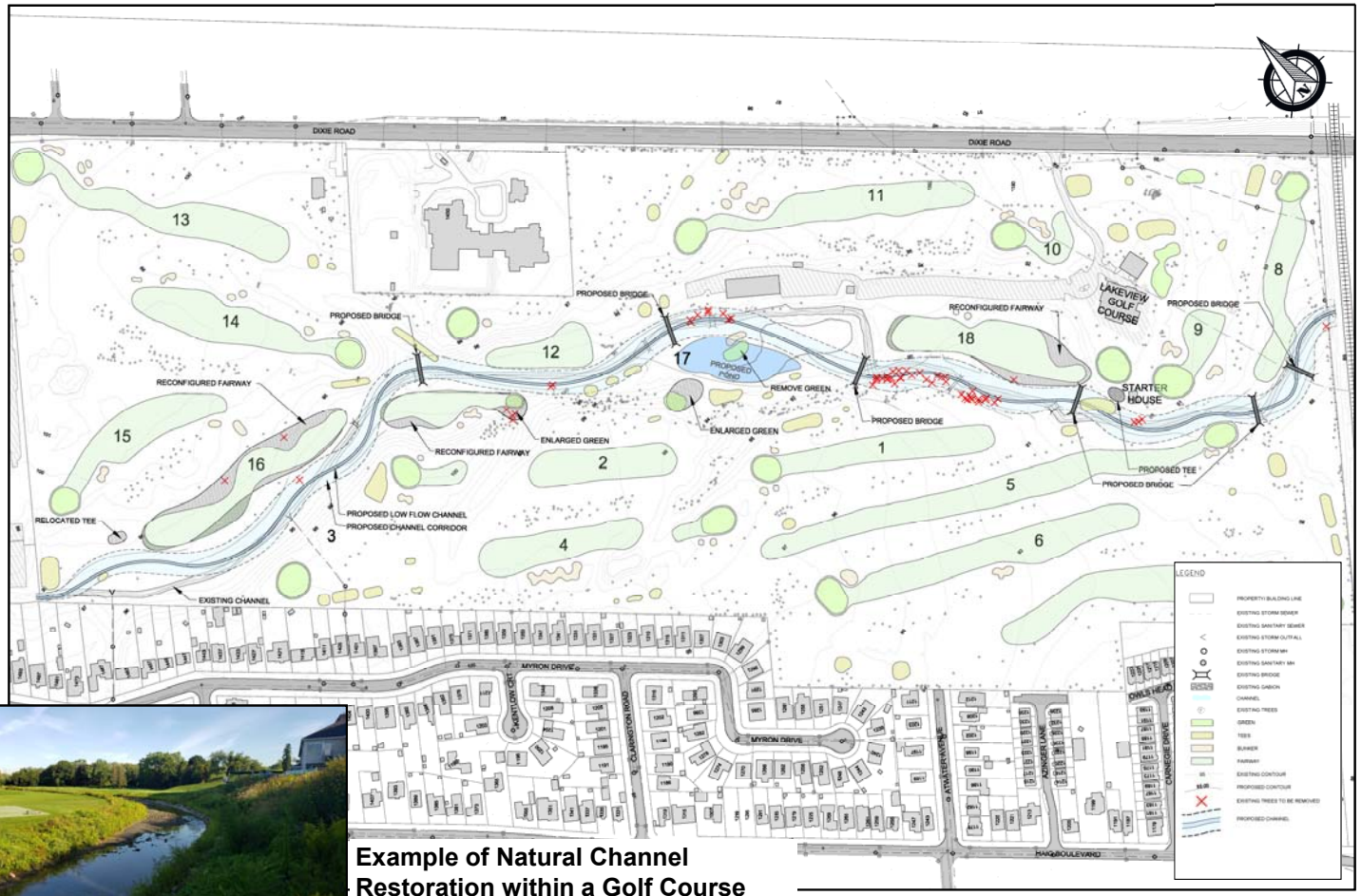
Alternative # 3 – Replacing Gabion Baskets with Vegetated Roundstone

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

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

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

Potential Alternative #4
Natural Channel Realignment



Example of Natural Channel Restoration within a Golf Course

1921 - Original Design

Current green

Proposed green restoration

Proposed Golf Course Improvements – Lakeview 17th Hole

Alternative # 4 – Natural Channel Realignment

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

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

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

Evaluation of Alternatives

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

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

NEXT STEPS

PUBLIC CONSULTATION – November, 2019

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

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

- EA Project file posted for 30 day review period.

DETAILED DESIGN & IMPLEMENTATION

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

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

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THANK YOU

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