

6.0 DESCRIPTION OF THE LWC PROJECT PREFERRED ALTERNATIVE

This chapter describes the conceptual design of the LWC Project Preferred Alternative, construction techniques to build the LWC Project and a proposed phasing plan for construction. To ensure that the EA captures the greatest potential negative effects from the LWC Project, the LWC Project Preferred Alternative presented in this chapter, and the effects assessment presented in Chapter 7, is based on the upset limit of 2.0 million cubic metres of fill. A sensitivity analysis is included in Chapter 7 to assess any potential for increased negative effects at a smaller fill volume.

6.1 OVERVIEW OF THE CONCEPTUAL DESIGN

The conceptual design for the LWC Project includes the following components:

- Shoreline configuration and protection features;
- Naturalization; and
- Recreational features.

The various components are described in their built-out state in the following sections. Recommended habitat targets are described in Section 5.2.1. These recommended habitat targets reflect approximate dimensions (including area) that were developed during conceptual design and should be maintained (or enhanced) during functional and detailed design.

6.1.1 Shoreline Configuration and Protection Features

The LWC Project Preferred Alternative provides for up to 2.0 million cubic metres of fill. The shoreline protection features of the LWC conceptual design include armour stone revetment, cobble beaches, a groyne structure and offshore islands with two creek outlets (Serson and Applewood) incorporated into the footprint (Figure 6.1). The offshore islands are relatively low structures, designed for frequent overtopping to discourage access by both people and terrestrial flora and fauna, including cormorants, with their main coastal function being beach stabilization. The islands are expected to be separated from the shore under average lake levels.

The following subsections describe the conceptual details of these shoreline protection features based on a preliminary assessment of coastal conditions.

*Environmental Assessment
Lakeview Waterfront Connection*

Figure 6.1 Overview of the LWC Project Preferred Alternative



6.1.1.1 Armour Stone Revetment

Armour stone revetments are a common type of shoreline protection feature on the Great Lakes. A revetment is a sloping structure consisting of an outer layer(s) of primary protection armour stone and sub layer(s) of secondary armour stone and rip rap. The slope of the revetment can vary, but 2h:1v is the most common and is the slope proposed for the LWC Project. This slope generally provides suitable stability for the underlying soil material and generally can be built with the reach of shore based equipment.

The lake bottom elevation in the area of the revetment drops as low as elevation 70.0 m and rises as high as 71.0 m. This means that under design high water levels, the depth at the revetment varies between 4.8 m and 5.8 m. Typical average summer water depth will vary between 4.0 m and 5.0 m.

The crest of the revetment will vary between approximately 80.5 m and 81.5 m. The primary layer of armour stone is anticipated to be set 1.0 to 1.5 m below the crest. These crest elevations are high enough to prevent wave overtopping but significant wave spray will be carried into the backshore and can be carried for a substantial distance. The toe of the revetment will be placed on a lakebed cleared of any loose sediment or soft material. The toe will likely consist of two or three stones placed horizontally on the lakebed in front (lakeward) of the revetment slope. The purpose of these horizontal stones is to protect the nearshore in the immediate vicinity of the slope and allow the front stones to potentially move if the nearshore is lowered without impacting the slope stone. The toe stones are likely to have sizable crevices between them, although the stones should be touching adjacent stones.

Structural aquatic habitat features will be incorporated along the toe of the revetment. The aquatic habitat features will need to resist relatively high currents during storms and large cobble or boulder size material would need to be used. Smaller material is expected to be unstable during major storms, however should establish a new form following these events.

The slope of the revetment will consist of a double layer of primary armour stone, a single layer of secondary armour stone and a rip rap layer. The double layer of primary armour stone is expected to be approximately 2.4 m to 2.6 m thick. The secondary armour stone and rip rap layers are each expected to be approximately 0.7 m thick each. Thus, on average, each armour stone will be 1.2 m to 1.3 m thick and is expected to be sized in the order of 4 to 8 tonnes.

The placement of armour stone will be “random”¹⁴ since “special placement”¹⁵ cannot be readily achieved in the depths of water found at this site. Random placement of armour stone can proceed at a faster pace than special placement thus reducing the cost per tonne placed, but the overall quantity of armourstone is larger. It is less susceptible to sudden failure than a single layer “special placement” revetment. The crevices between stones of a randomly placed revetment tend to be larger than between special placement revetment stones. This tends to reduce the wave uprush in comparison to special placement.

6.1.1.2 Cobble Beach

The eastern shoreline section of the LWC Preferred Alternative is a continuous cobble beach approximately 1,110 m long. The beach is fronted by three offshore islands (headlands) which are each approximately 150 m long. This means that approximately 650 m of the beach is exposed to direct wave action. The east end of the beach is anchored with an armour stone groyne located approximately 250 metres from Etobicoke Creek. This groyne structure was added to the design to minimize the extent of existing sand beach affected by the LWC Project. The west end of the existing beach will be anchored by a revetment headland from the most southerly extent of the land creation.

The majority of cobble beach slopes will have similar characteristics; however the most northern portion of the cobble beach shoreline (approximately one quarter of the beach length in the northern portion) will be slightly different as it represents the transition to the existing shoreline. The characteristics of the two different cobble beach sections are described separately below.

The southerly cobble beach (approximately three quarters of the beach length in the southern portion) will consist of cobble material ranging in size from 100 mm to 200 mm. This size of material would result in an above water slope in the order of 2.5h:1v and a below water slope of 6.0h:1v. The estimated crest of the beach under design wave conditions is 4.6 m above water level or approximately 80.4 masl if the 1:100 year water level is assumed.

The most northerly portion of the cobble beach shoreline (approximately one quarter of the beach length in the northern portion) between the groyne and the most northerly offshore island is a transition area that will accommodate smaller beach material, including both gravel and smaller cobble. This section of shoreline is subject to smaller waves than the southerly portions due to the shallower water and rising nearshore elevation which allows for the use of smaller

¹⁴ “Random placement” means that each stone is placed individually and keyed in with adjacent stones so that it touches adjacent stones on at least three sides.

¹⁵ “Special placement” refers to installation where each stone is individually placed and keyed very tightly against adjacent stones so that it touched adjacent stones on all four sides. Special placement is generally used on revetments with a single layer primary protection layer.

beach material. Gravel material from 10 mm to 100 mm would likely be used on this beach cell. The smaller material would be used in the north part of the beach adjacent to the groyne structure and coarser material would be introduced gradually towards the south end of this beach cell. The 50 m of beach west of the groyne will remain similar to the existing sand beach with sandy beach conditions dominating in summer calm weather conditions shifting to more gravel during winter storms. The smaller gravel material is expected to form a slope about 4h:1v slope above water and about 9.3h:1v below water. The crest of the beach is expected to reach an elevation of 78.3 masl. As the cobble size increases moving south (100 mm diameter), the cobble beach will transition to an above water slope of 2.3h:1v and 5.4h:1v below water. The crest of the beach is expected to rise to 78.8 masl. The underwater slope of the beach is expected to match gradually to the existing lake bottom and there will be no perceivable toe of slope for the new beach material in the northern portion of the shoreline. The area to the north of the groyne structure will remain sand.

The cobble beach is designed to be a dynamically stable structure. This means that there will be some movement of the beach material within defined limits. The beach and plan profile will adjust with each storm and change in water level. Beach materials undergo sorting according to grain size based on exposure to wave energy. The smaller size portion of the material appears to be more mobile and moves toward the semi-sheltered parts of the beach. The beach material will undergo attrition due to the constant movement which will lead to a very gradual reduction in size of the beach material. Further sorting and beach plan and slope adjustments will occur over time. The cobble beach will be predominantly free of hard features and obstructions that would influence the movement of the cobble beach material. One exception to this will be at the outlet of the Applewood Creek (see details in Section 6.1.1.4).

6.1.1.3 Offshore Islands (Headlands)

The offshore islands are “rocky outcrops” that influence the shape of, and provide stability to the cobble beaches. They will be constructed as land connected features with the temporary construction access connection removed upon completion.

The offshore islands are essentially long slender structures with revetments on both the exposed and sheltered sides and an armoured crest. They will be constructed with a relatively low crest that will allow some wave overtopping. The slope width of the crest and the crest elevation may vary to provide diversity and a more natural appearance. The crests of the islands are expected to be between 76.5 m and 77.5 masl and the crest width to be a minimum 10 m. Although the structure may be similar on both sides of the islands, wave conditions will be different providing different habitat functions and conditions. In addition, the proximity of the toe of the cobble beach to the toe of the islands will provide additional habitat structure for fish.

The revetment on the exposed side of the offshore islands will be similar to the standard revetment described in Section 6.1.1.1. The back side of the island will have similar protection above water and reduced armouring below low water level.

6.1.1.4 Creek Outlets

Two creek outlets will be provided along the shoreline. An outlet for Serson Creek will occur in the southern portion of the site and an outlet for Applewood Creek will occur in the northern portion of the site.

The Serson Creek channel will outlet through the revetment. The bed of the Serson Creek channel at the outlet is approximately 74.4 masl. Below this elevation the lower slope of the revetment will continue down at 2h:1v slope to the lake bottom. The bed of the creek is approximately 7.1 meters below the crest of the adjacent revetment on both sides. The revetment above the creek bed elevation will turn inland to protect the sides of the channel.

It is expected that waves will penetrate a substantial distance up the channel. The side slopes of the channel, both above and below water level, will slope at 2h:1v at the outlet and then gradually flatten to a more gentle slope further up the channel. The steeper side slope is recommended near the outlet to reduce the wave energy that is allowed to penetrate into the channel. The crest elevation of the side slope revetment can also gradually fall. It is expected that the channel will need to be lined with sufficient protection to withstand wave activity between 50 m and 75 m inland from the outlet. This distance will be refined during the detailed design. The protection works can reduce gradually in their mass as they move inland.

The landform inland from the outlet can be viewed as a valley with a small flow channel in the centre. The “valley” will be in the order of 35 m to 40 m wide at the outlet just behind the shoreline revetment.

The Applewood Creek outlet will be located in a cobble beach shoreline and is not subjected to direct wave action. The outlet is proposed to be positioned behind the southern portion of the most northerly island. It will be well sheltered from direct east quadrant waves and partly sheltered from southwest quadrant waves.

The bed of the Applewood Creek channel will be approximately 74.1 masl. This elevation is about ¼ of the way up the beach profile and will be submerged under most water level conditions. During typical summer conditions the outlet will have approximately 1 m of water and this will decrease to 0.5 m during the typical winter conditions.

The outlet of Applewood Creek will require some structural reinforcement to ensure that the outlet remains at the designed location over time. However, the structural reinforcement will be positioned well behind the location of the estimated beach profile so that under typical conditions the water will run through a cobble lined channel. Within the channel itself, the protection works will also need to extend inland for approximately 50 m to 75 m, similar to Serson Creek. This distance will be refined in the detailed design phase. Any reduction in the extent of the channel protection due to the beach material will be in part offset by deeper water in this channel, in comparison to Serson Creek.

It is expected that the cobble size in this part of the beach will be at the low end of the size range specified for the beach (see Section 6.1.1.2). The beach cobble is likely to continually form a bar across the mouth of the creek during storm events and the flow of the creek will need to break through these bars periodically during major rainfall events. It is likely that under base flow conditions the creek will percolate through the cobble bar. This reduction in flow rate will lead to periodic flooding in the channel which will mimic natural coastal wetland behaviour.

6.1.1.5 Shoreline Protection Grading

The preliminary grades of the lakefill were initially set at 79.0 masl to establish approximate fill quantities. The ultimate site grades determined during detailed design will be based on a number of factors, such as provision for site drainage, landscape features, ecological functions and requirements of shore protection related to wave run up.

It is common practice to extend the crest of an armour stone revetment to the calculated wave uprush elevation. Based on this approach, the land elevation along the back of the revetment structure should be set at about an elevation of 80.5 to 81.5 masl.

Another common approach to site grading in the immediate vicinity of the revetment is to provide a cap stone that is set horizontally at the calculated wave uprush elevation. The fill behind the cap stone is then set 0.3 m to 0.6 m lower, thus the cap stones form a small barrier between the slope of the revetment and the backshore. Other variations of crest treatments can be considered during detailed design.

The elevation of the cobble beach crest is established by waves running up the slope of the beach. It is common on natural cobble beaches that the crest of the beach extends above the beach backshore elevation by about 0.3 m to 0.5 m after a major storm. The crest is then gradually knocked down by beach users until the next major storm. The estimated wave uprush in the southern three quarters of the cobble beach is in the order of 80.4 m. Therefore, the backshore grade in the beach area behind this section of cobble beach will be 79.9 to 80.1 m.

The most easterly section of cobble beach will have a lower crest due to smaller waves. The crest elevation is estimated to be 78.3 m at the north end and 78.8 m at the south end of this section. Following the same approach with the backshore being slightly lower than the calculated beach crest, the backshore could vary from approximately 77.8 m to 78.5 m from north to south.

6.1.2 Naturalization

Approximately 33 ha of naturalized habitat will be created as part of the refinement of the LWC Project Preferred Alternative, including approximately 7.5 ha of wetland habitat, approximately 3.5 ha of treed swamp, 5 ha of upland forest, 14.5 ha of meadow, 1.5 ha of beach and 1 ha of rocky island habitat. In all cases, maximum efforts will be made to use plant species that are phenotypically best suited to the Great Lakes/St. Lawrence Lowlands, including use of Carolinian species where appropriate, recognizing the fact that grassland habitats were historically limited to only a few locations in the City of Mississauga. Additional opportunities to create and improve aquatic habitat conditions within the Project Study Area will be discussed for the nearshore and pelagic zones. It should be noted that none of the natural environment features will increase flooding conditions.

6.1.2.1 Site Grading and Topography

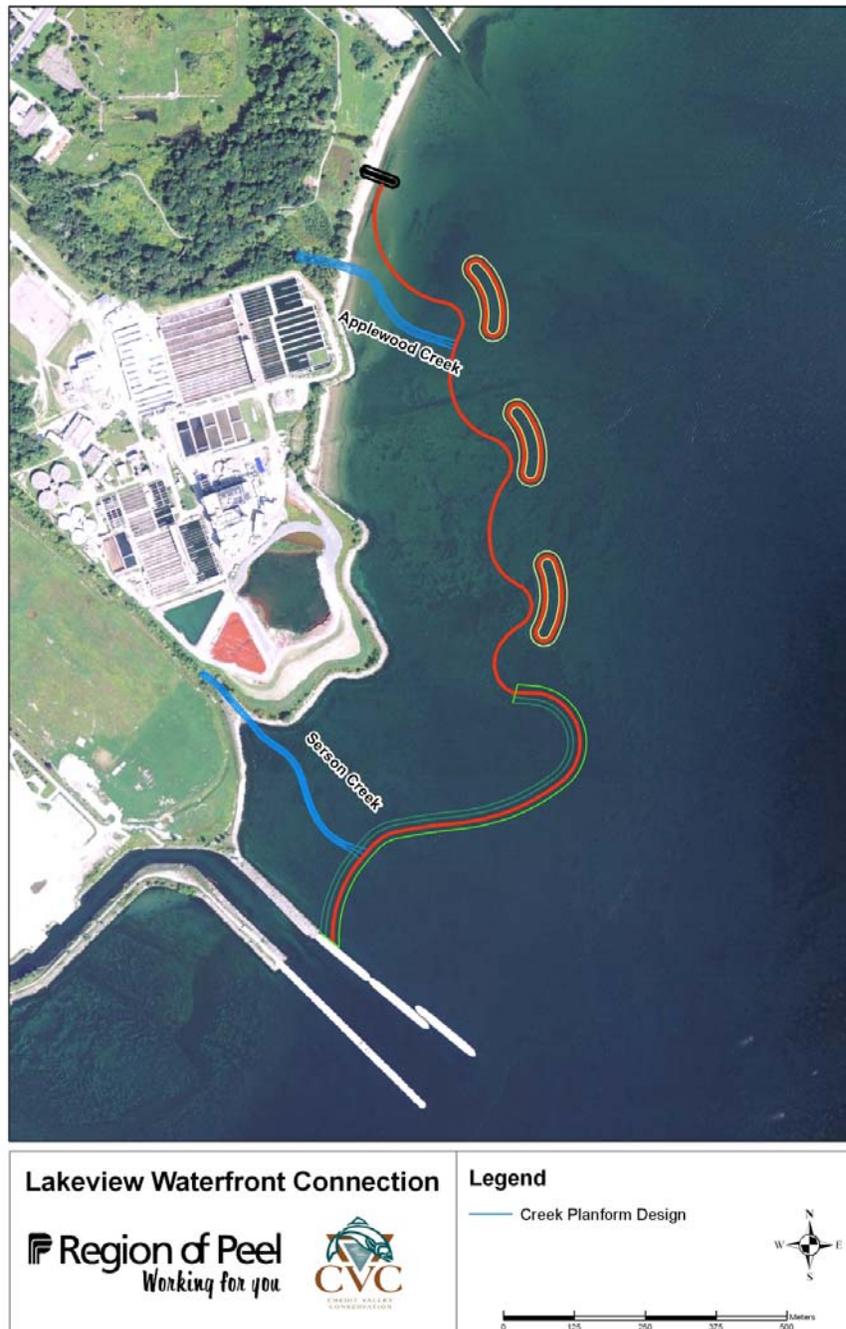
A conceptual grading plan for the LWC Project Preferred Alternative allows for an understanding of both the grading scenario and the landscape amenities that would be accommodated within the Project Study Area. To achieve the overall fill target for the LWC Project, the topography for the wetland and stream areas (cut) and upland areas (fill) must be clearly defined and balanced. In addition to considering the cut/fill balance for the site, defining the topography allows for advantageous (but approximate) placement of landscape features such as primary trails, stream crossings, lookouts, beach access points and connections. The conceptual grading and landscape plan is shown in Figure 6.1. Microhabitat variations in topography, drainage and other habitat structures will be addressed at the detailed design stage.

6.1.2.2 Serson and Applewood Creek

The main goal in designing the two channels was to adequately convey the 2-year flood to the Lake and provide additional capacity for the 5-year flood. The primary constraint in satisfying this goal is maintaining gradient through the channel designs. This is problematic because both creeks are relatively low gradient (0.60% and 0.30%) and extending them 200-300 m downstream would further reduce the gradient. Another consideration was accounting for variations in Lake Ontario surface elevation and ensuring that the creek would function at both high and low levels.

The creeks were designed to be relatively straight with slight sinuosity to preserve channel gradient throughout the length of the design (Figure 6.2). The smooth, gentle bends were also designed to avoid debris and ice-jams that may potentially occur within backwater zones near Lake Ontario.

Figure 6.2 Overview of Creek Planform Configurations



The creeks were designed to deal with the lake level fluctuations by including a slope break at the downstream end. This divides the profile into two segments (referred to as upper and lower segments). The bankfull elevation of the upper segment is tied into the high lake level elevation of 75.2 masl to contain the design discharge within the channel during high lake levels when backwatering is prominent. This results in slopes of 0.38% (Applewood) and 0.48% (Serson) for the upper segments (Figure 6.3 and 6.4). The lower segment is designed to convey flow to Lake Ontario during low lake levels tying in at 73.75 masl. The length of the segments is 35 m resulting in slopes of 1.0% (Applewood) and 1.8% (Serson). Based on the resultant gradient, the designs were tied in at different distances upstream - 315 m (Applewood) and 440 m (Serson).

Figure 6.3 Applewood Creek Conceptual Design Long Profile

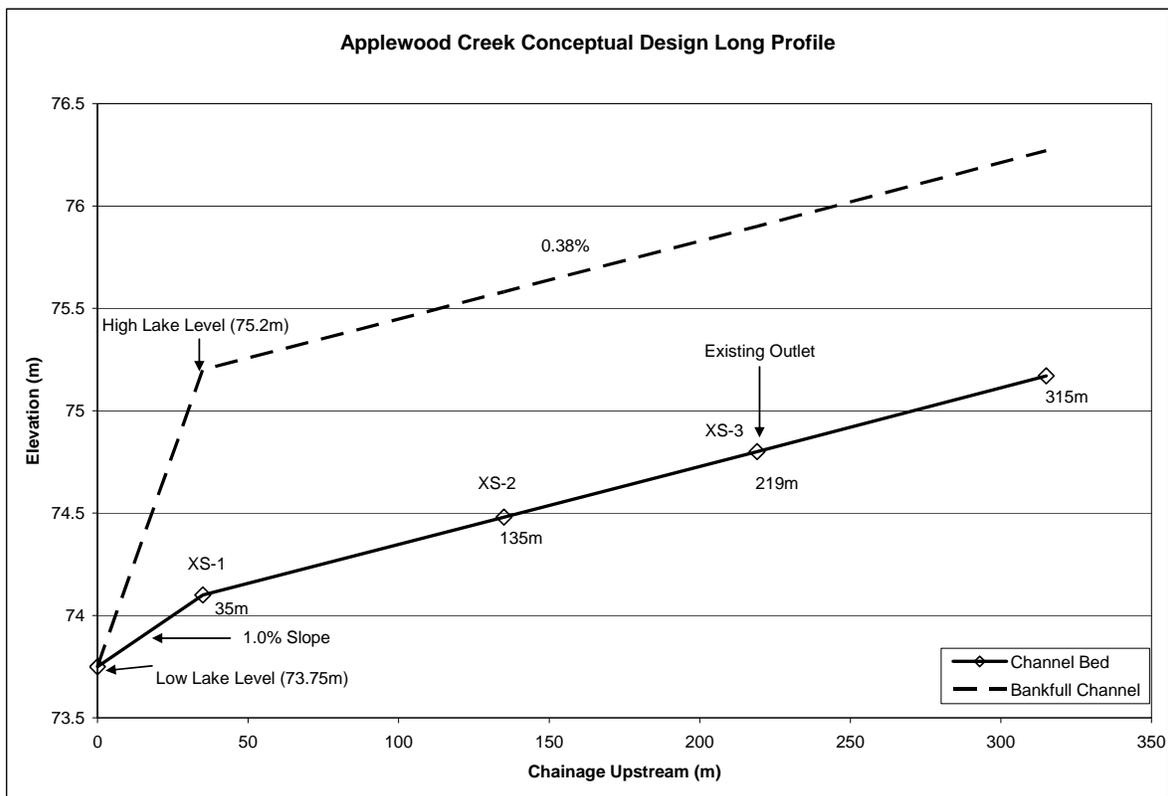
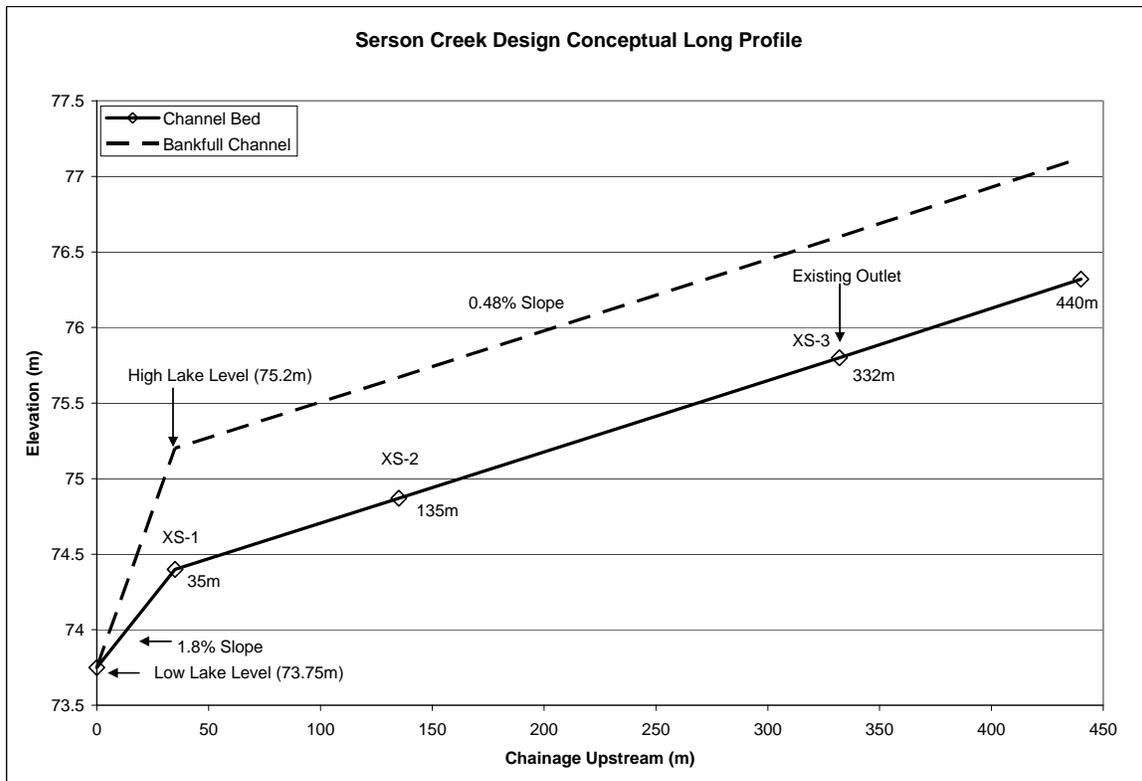


Figure 6.4 Serson Creek Conceptual Long Profile



Three conceptual cross sections were designed for each creek using the energy gradient and the 2-year flood discharges from the HEC-RAS model (Figure 6.5 and 6.6). The design discharge for Applewood was $9.6 \text{ m}^3/\text{s}$ and $4.10 \text{ m}^3/\text{s}$ for Serson. The cross section dimensions were then modeled in HEC-RAS to determine berm elevations which will contain the 5-year flood. Cross section XS-2 (Figures 6.5 and 6.6) was placed 100 m upstream of the bottom of the upper segment to be representative of a section within the wetland area of the waterfront design (Figures 6.7 and 6.8). The other two cross sections located at the upstream end of the design (XS-1) and the downstream end of the upper segment (XS-3) are the same dimensions as XS-2. They were placed in different locations to determine the berm elevations throughout the designs. This procedure was used for both creeks.

Downstream of XS-1 in the lower segment, the channels fan out 20 m and the top of bank and channel bed elevations pinch out at the monthly low lake level (Figures 6.9 and 6.10). It is expected that in this section, all flows will spill out as the banks taper. This was done to compensate for the steep gradient in this section.

Figure 6.5 Applewood Creek Planform with Design Cross-section Locations

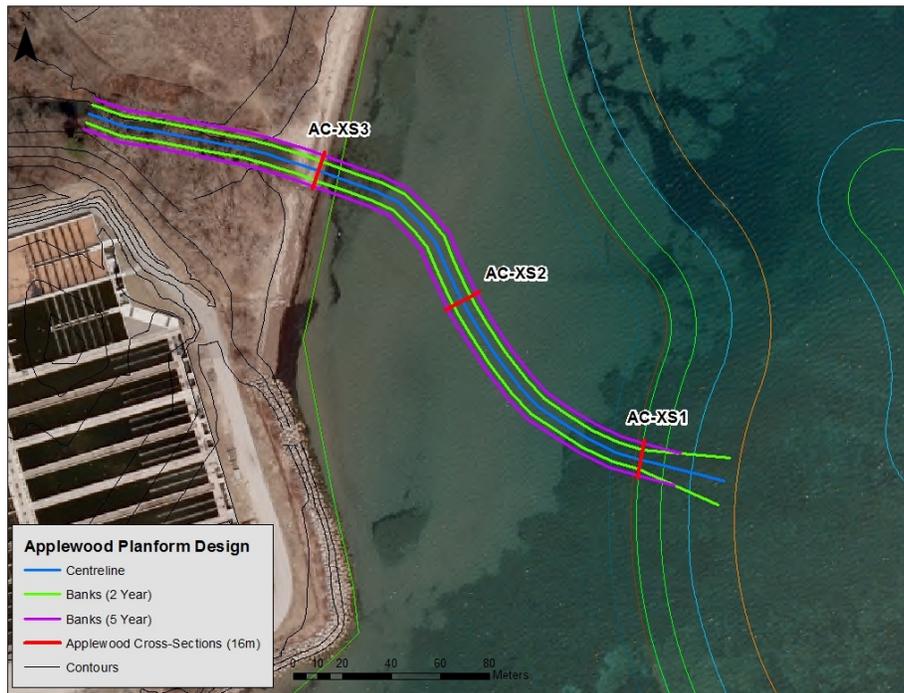


Figure 6.6 Serson Creek Planform with Design Cross-section Locations

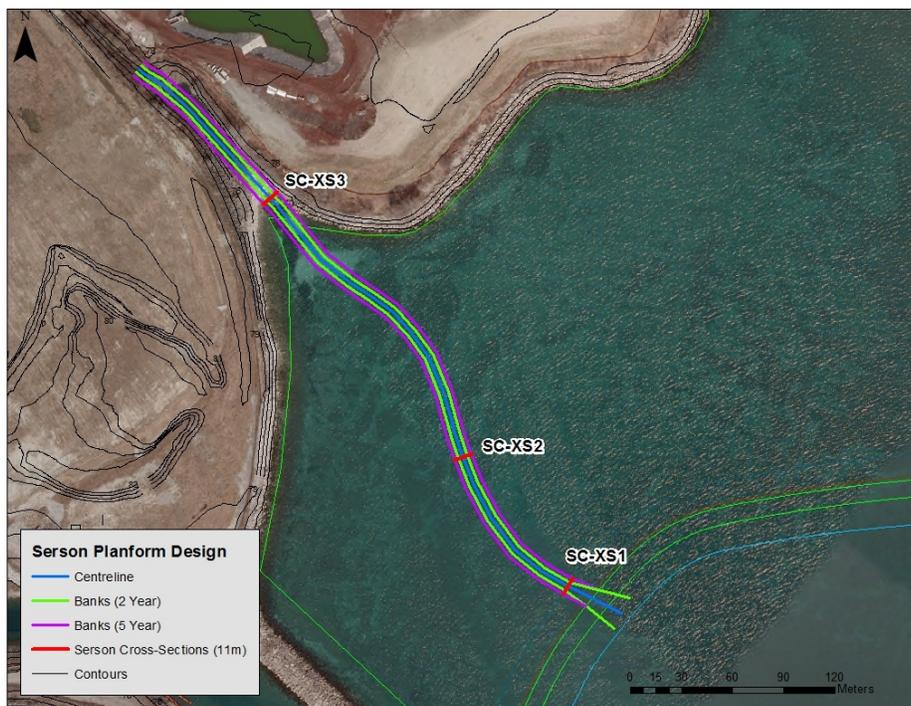


Figure 6.7 Proposed Applewood Creek XS2 (Total Section Width 16 m)

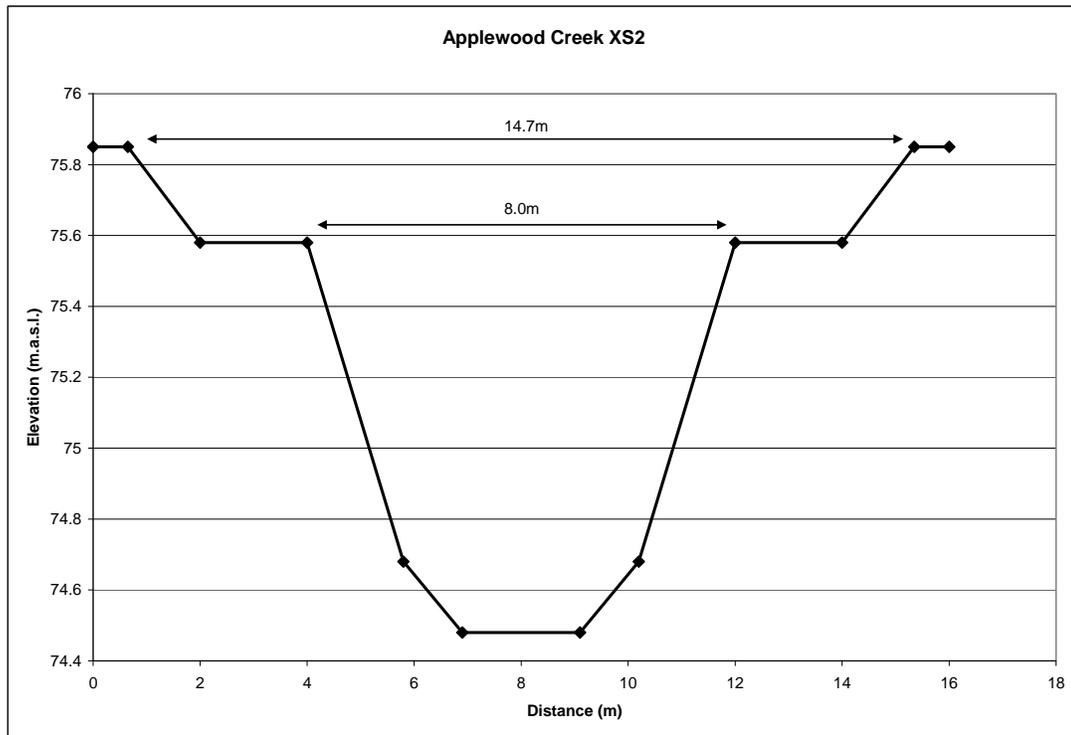


Figure 6.8 Proposed Serson Creek XS2 (total Section Width 11 m)

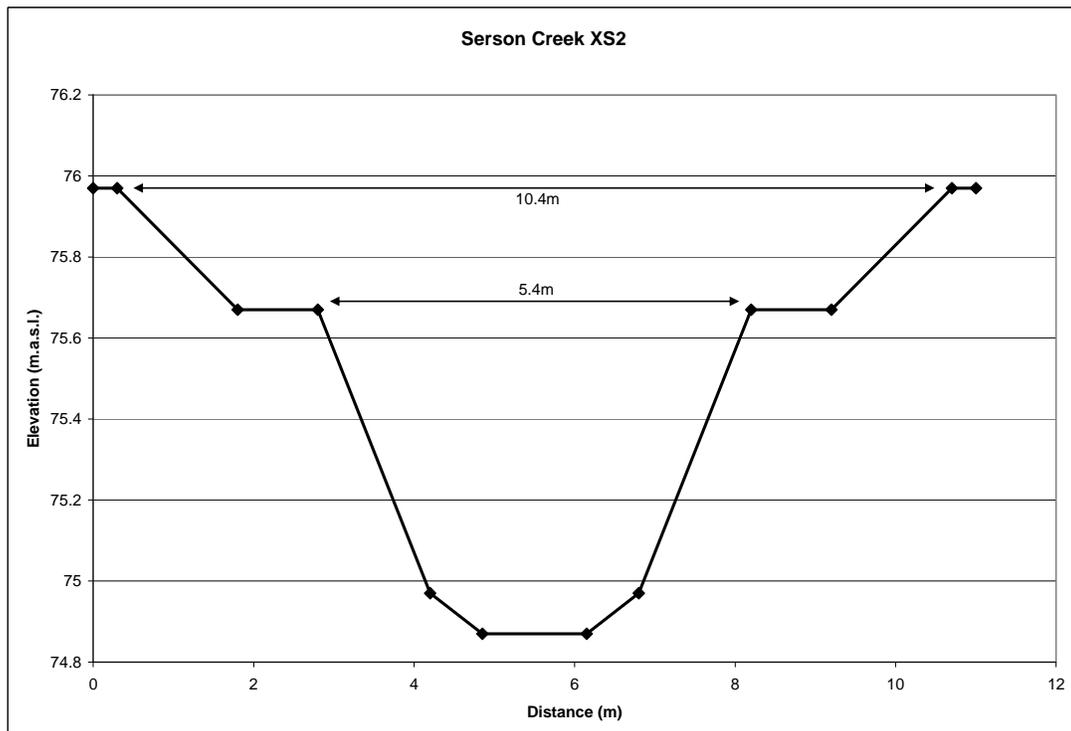


Figure 6.9 Proposed Applewood Creek Planform – Fan Section with Top of Bank Widths

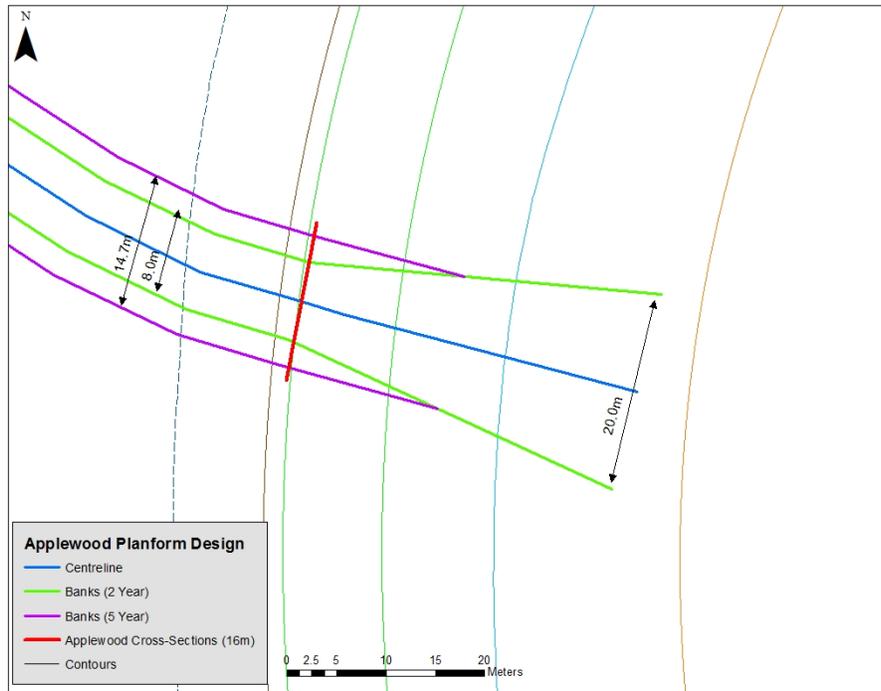
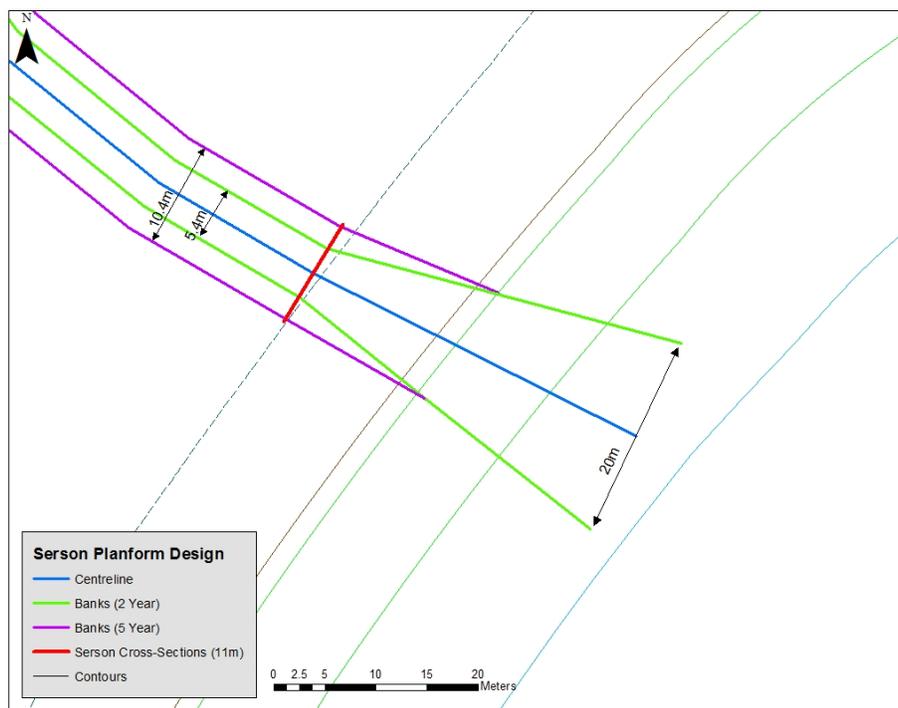


Figure 6.10 Proposed Serson Creek Planform – Fan Section with Top of Bank Widths



Serson Creek – Flow re-routing

In order to ensure that all flows reach Lake Ontario along the Serson Creek overflow channel, the current planform will need to be re-routed/graded away from the existing outlet. At the upstream end of the overflow channel, a flow diversion currently exists where low flows are directed through a small forest before being diverted into a culvert under the WWTF, and high flows (greater than bankfull) top the banks where they are diverted down the high flow channel that borders OPG's Lakeview site and Region of Peel land.

To achieve this, a berm will need to be constructed across the current low flow channel with elevations matching the existing top-of-bank. The channel will need to be gradually routed into the over flow channel, with a less abrupt meander bend geometry than currently exists (Figure 6.11). This channel construction will require some material to be removed along the north and east portions of the creek, for which banks will need to be re-graded (2:1 or 3:1) and stabilized by vegetation or rip rap, or a combination of hard and bio-engineered banks. Figure 6.11 provides the extent of the proposed re-routing of Serson Creek, with the proposed creek location, berm, and bank construction. The constructed bank will tie into existing top of bank locations upstream and downstream.

A minor tributary currently connects with Serson Creek downstream of the WWTF culvert. A plug will be used to either continue to direct flows from this tributary through the forest to the culvert under the WWTF; or divert flows alongside the western-edge of the forest to the Serson Creek overflow channel. The location of the plug, either upstream or downstream of the small tributary, will be explored during detailed design.

Figure 6.11 Conceptual Plan for Serson Creek Flow Re-routing



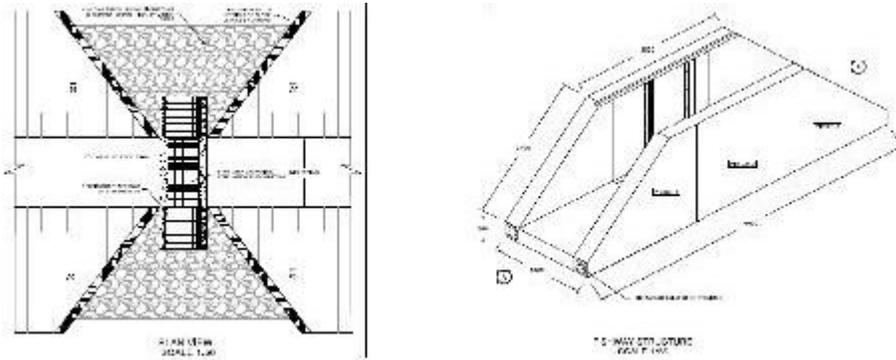
River-Levee Systems

A river-levee system will be used to direct flows from both Applewood Creek and Serson Creek to Lake Ontario. It is anticipated that a constructed levee will form the banks of the meandering channel for Serson Creek within the middle of the Serson Creek wetland complex (see Section 6.1.2.3 for wetland description).

For Applewood Creek, it is anticipated that only one channel bank will take the form of the constructed levee, with the other channel bank tied into the adjacent meadow landform feature. A large contiguous coastal wetland complex will be located to the south of the constructed levee for Applewood Creek (see Section 6.1.2.3 for wetland description). In both wetlands, small feeder channels (or sills) will be constructed through the levees at the downstream end of meanders to allow lake water to decant back into the wetland areas. During flood events in both creeks (greater than the 2 year event), flows from the creeks will overtop the constructed levees and enter the wetlands providing water, sediment and nutrients to the wetland systems. As water levels and the presence of carp (through their spawning and foraging behaviour) can greatly influence the establishment and long-term survival of wetland vegetation, water control structures (likely consisting of stoplogs and a metal grate) will be placed at the mouth of the

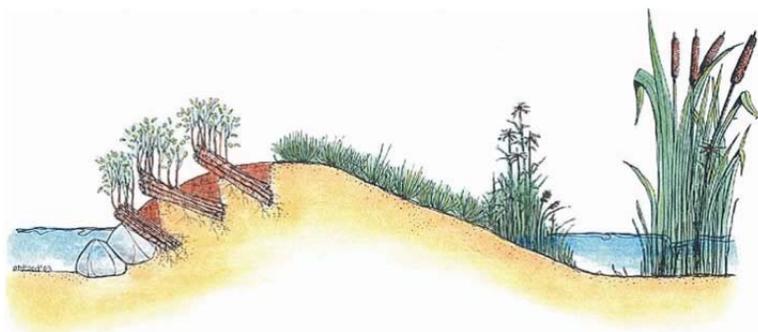
wetland feeder channels to manage water levels and exclude adult carp from entering the wetlands (Figure 6.12). Spaces within the water control structures can be either opened (either partially or fully) or closed to control fish access into the wetlands (e.g. while larger carp may not fit through the spaces, smaller fish may).

Figure 6.12 Example of Water and Carp Control Structure



The variation in topography provided by the levees along the creek channels will provide streambank habitat, supporting a diverse vegetation community, which includes riparian, emergent, and submergent vegetation (Figure 6.13). This streambank habitat increases the area of primary production and essential habitat for cool and cold water riverine and nearshore pelagic fish species, while improving foraging opportunities for both aquatic and terrestrial species.

Figure 6.13 Constructed Levees Separating Creek Channel Conditions (on the left) from Coastal Wetland Conditions (on the right)



In order to prevent debris blockages, and allow for levee overtopping into the wetlands during large flood events, the Serson Creek river-levee channel will outlet downstream of the wetland complex. As the river channel outlets directly to Lake Ontario, it will be designed to maintain a constant lake connection throughout the year. As such, the Serson Creek wetland complex will

be primarily regulated by both riverine and lake inputs. The channel will also provide estuary habitat (i.e., areas which represent a physical connection between the lake and riverine systems), providing more stable thermal conditions, and habitat for species that require access to both open water and riverine systems throughout their lifecycles.

As with the Serson Creek outlet, Applewood Creek will outlet to Lake Ontario downstream of the wetland in order to avoid debris blockages, and allow levee overtopping. Unlike the Serson Creek river-levee channel, the Applewood Creek river-levee channel will outlet through a cobble beach to Lake Ontario. While the Applewood Creek wetland complex may be opened to the Lake following wave overtopping of the beach or breaches caused by large flood events upstream, it is expected that the wetland will be more regulated by inputs from Applewood Creek. It is also noted that watershed-wide restoration efforts to be undertaken as part of LOISS will help improve watershed inputs and flow regime and attract more fish upstream from these newly created refuge areas in the estuaries.

6.1.2.3 Wetland Features

The primary function of the wetland complexes is to provide diverse aquatic habitat that supports a range of migratory and resident fish, waterfowl, herpetofauna and aquatic mammals. A total of 7.5 ha of coastal wetland habitat will be created as part of the LWC Project in the form of two river channels and wetland complexes located at the outlets of Serson Creek and Applewood Creek (see Section 5.2.4.1). The Serson Creek wetland complex is approximately 2.5 ha in size, and the Applewood Creek wetland complex is approximately 5.0 ha in size. While the total wetland habitat will be approximately 7.5 ha, the final size and orientation of the Serson Creek and Applewood Creek wetland complexes may be further refined during detailed design.

The wetlands will be designed to mimic coastal wetlands found along the north shore of Lake Ontario. The Serson Creek wetland complex will act as a drowned-river mouth and flooded delta wetland. A drowned river mouth and flooded delta wetland has direct surface-water connections, occupies flooded river valleys or cap drowned deltas, and is driven by both lake and riverine water inputs. The Applewood Creek wetland complex will act as a drowned-river mouth and protected wetland. A drowned river mouth and protected wetland has direct surface-water connections through the river-levee system and the wetland is protected behind a cobble beach, shielding the wetland from the direct hydraulic processes generated by Lake Ontario. These new wetlands will also provide connectivity between habitats along the north western Lake Ontario shoreline and attract biota from neighbouring wetlands.

The Applewood Creek wetland complex will extend south from the outlet of Applewood Creek to the outlet of the Serson Creek baseflow channel, and then south to Lake Ontario. The Serson Creek wetland complex will be located at the outlet of the Serson Creek stormwater channel, and extend directly towards Lake Ontario.

Wetland Depth and Vegetation

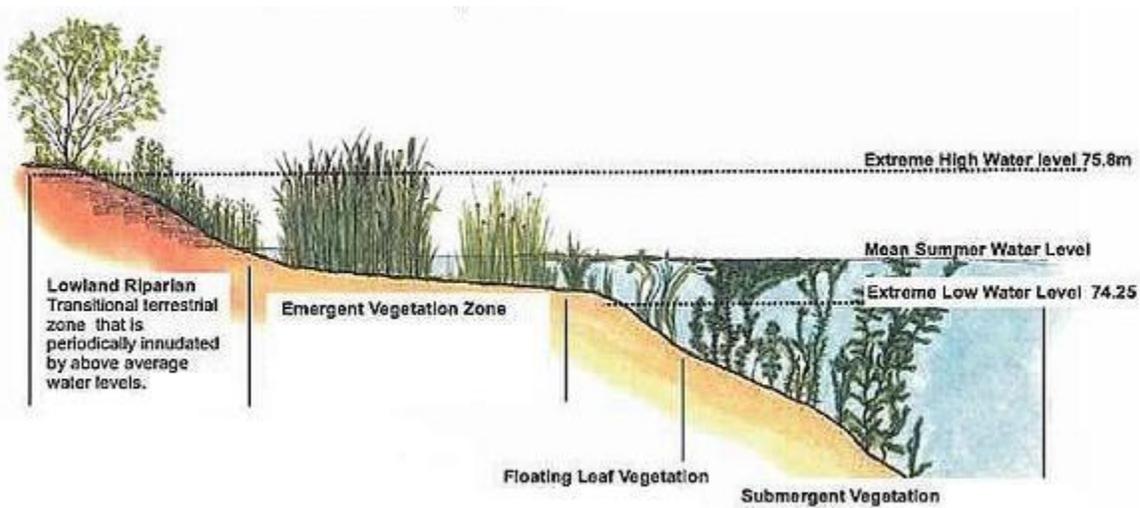
For the north shore of Lake Ontario, efficient primary production of coastal wetland plants occurs between 72.5 m and 75.0 masl. The type of vegetation that occurs within this range of elevation can be further refined as: lowland riparian vegetation (such as grasses, sedges and shrubs) occurs between 75.0 and 75.8 masl; the emergent vegetation zone (such as cattails) is restricted to elevations between 74.5 and 75.0 masl; and submergent vegetation is found at depths greater than 74.25 masl. As such, the wetlands within the LWC Project will have diverse bathymetry and microtopography, in order to provide for the establishment of various habitat communities and to provide sufficient diversity to allow the wetlands to adapt over a range lake levels in Lake Ontario. Table 6.1 provides a relative breakdown of the amount of wetland area available at each depth range. The functional wetland depth for the Serson Creek and Applewood Creek wetlands will be finalized during detailed design to optimize the diversity of habitat created. Figure 6.14 depicts the various habitat types based on wetland bathymetry.

Table 6.1 Relative Breakdown of Wetland Bathymetry for each Wetland

Target Depth Range	Applewood Creek (% depth)	Serson Creek (% depth)	Description of Habitat
Less than 72.5 masl	~ 25%	~10%	Produces open water and submergent habitat
72.5 to 75 masl	~ 25%	~ 45%	Produces submergent and emergent habitat, depending on seasonal lake levels
Greater than 75.0 masl	~ 50%	~ 45%	Produces emergent and low land riparian habitat

The variation in wetland vegetation communities will provide a range of habitat features. Wide vegetation stands of lowland riparian and emergent vegetation around the edges of the Serson Creek and Applewood Creek wetlands will provide a buffer from upland terrestrial habitats and provide opportunities for foraging, spawning, and nesting for waterfowl, herpetofauna, invertebrates, and aquatic mammals. Zones of submergent vegetation will be located near the feeder channels (in order to ensure these areas remain wet for longer periods), and will provide important habitat features for invertebrates, fish, and waterfowl, including shelter, feeding, and spawning habitat.

Figure 6.14 Wetland Vegetation Types Expected for Various Bathymetric Conditions



6.1.2.4 Terrestrial Features

Approximately 23 ha of naturalized terrestrial habitat is proposed in the conceptual design for the LWC Project. Terrestrial habitat features include treed swamp, upland forest and meadow habitat. The habitats described in this section are at a coarse community level. Site level details and specific habitats will be determined at the detailed design stage of LWC Project planning. These habitat types are recommended based on similar shoreline sites found along the north shore of Lake Ontario. Species will be chosen that are consistent with CVC's approved planting lists however, due to the unique location and climate along the lake, Carolinian species that would not otherwise be considered appropriate may be used. All vegetation to be installed will be approved by CVC and other applicable agencies. A detailed description of the desired habitat types are found below.

Treed Swamp

Approximately 3.5 ha of wet forest will be created between the WWTF, upland forest, and wetlands. Vernal pool features will be seasonally wet and will detain water in the spring or after larger rain events, periodically receiving water from high Lake Ontario levels during spring and early summer possibly receiving water during larger flood events in Serson and Applewood Creeks. Portions of the landform will be sloped to maximize overland drainage into the treed swamp. Runoff will be directed from the adjacent upland forest and meadow communities and will drain to the wetlands. The treed swamp will be located at elevations above the normal wetland and lake levels (75.4 masl - 75.8 masl) within an internally drained area.

The plant community within the treed swamp could consist of softwood species such as cottonwoods, willows and silver maple. Other shrub, tree and herbaceous species appropriate to seasonally wet habitat such as Red Osier Dogwood, Boneset, Blue Vervain, and Spotted Jewel Weed could also be included within this community.

The treed swamp will also connect the Applewood and Serson Creek wetland complexes for increased habitat and connectivity functions and act as a visual barrier to the WWTF.

Upland Forest

Approximately 5 ha of upland forest will be created as part of the LWC Project. The upland forest will be located adjacent to the treed swamp community forming a continuous large forest block adjacent to the meadow and wetland communities. Portions of the landform will be sloped to drain towards the treed swamp and will be located at elevations above the treed swamp and normal water levels of the wetlands and lake.

The upland forest plant community could include native Carolinian species that are appropriate for the site such as oak species, hickory species, Wood Anemone, Maple Leaf Viburnum and Witch Hazel. Pioneering softwood species such as cottonwoods, willows and poplars could also be included.

Meadow Habitat

Approximately 14.5 ha of meadow habitat will be created as part of the LWC Project. This plant community will be located along the shoreline between the shoreline treatments (beach/revetment), forest and wetlands. Some of this landform should be sloped to drain towards the wetlands and the rest towards the lake to provide an appropriate water to land transition and sight lines desired by the public.

The meadow habitat will be designed to provide a number of habitat functions including, but not limited to, habitat elements for mammals, herpetofauna, migratory bird and butterflies and breeding birds. The community will consist largely of meadow species intermingled with nectar producing flowers, fruits and seeds. Carolinian species appropriate to the site will also be incorporated. Some characteristic species could include: Heath Aster, New England Aster, Canada Golden Rod, Staghorn Sumac, St. Johns Wort, Virginia Wildrye, milkweeds and Black Eyed Susan.

This habitat will serve as important migratory rest and launching habitat for birds and butterflies flying over the lake. The largely un-treed area would also serve as potential breeding and raptor prey habitat.

6.1.2.5 Aquatic Habitat

The LWC Project Preferred Alternative results in the creation of approximately 1,110 m of new beach including 795 m of cobble (median grain size of 15 cm), 295 m of cobble/gravel (median grain size of 5 cm) and 50 m of sand/gravel (grain size ranging from 1 to 5 cm with finer material dominating in the summer), 485 m of lee island shoreline, and 1,285 m of revetment. Creation of cobble beaches will help maintain biodiversity in the Great Lakes since they are considered globally rare. (United States Environmental Protection Agency & Environment Canada, 2009). Beaches are highly productive for pelagic forage fish that support and feed the economically important pelagic salmonids and other top predators. The new open coast shoreline will provide excellent forage, spawning and nursery habitat conditions and the lee side islands habitat will provide sheltered habitat for Lake Ontario species. Important feeder fish species such as Emerald Shiner, Lake Chub and Spottail Shiner will be provided habitat. This will provide an excellent foundation for a healthier and broader fisheries community.

The islands provide sheltered habitat between the shoreline and the islands, providing refuge from coastal processes. The leeward side of the islands provides high quality cool and cold water fish habitat for spawning and foraging, which will be augmented through areas surcharged with point shoal and rock piles.

Structural aquatic habitat features will be incorporated along the toe of the revetment, as noted in Section 6.1.1, in order to improve relatively poor habitat along the open coast. The habitat features would provide shelter and additional habitat elements for fish along the harsh open coast.

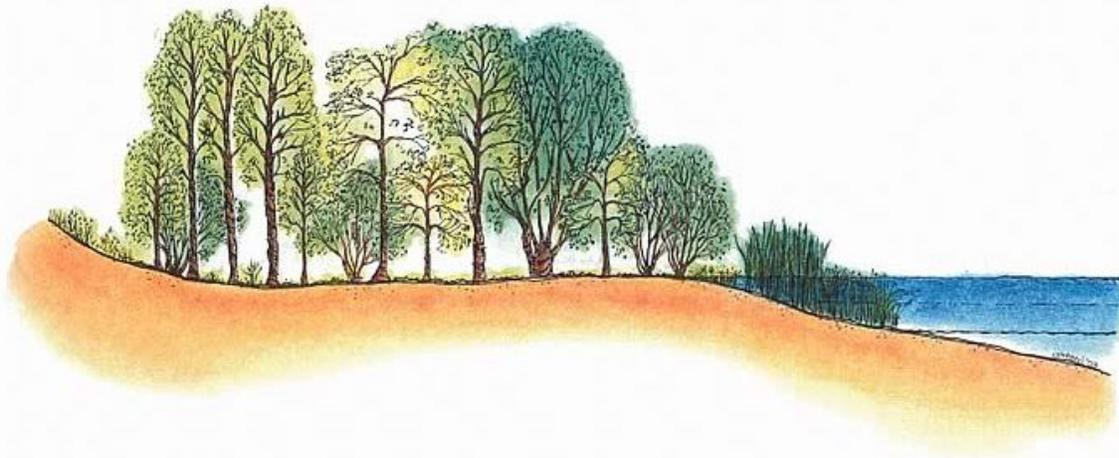
6.1.2.6 Serson Creek Stormwater Channel Habitat Enhancement

The current configuration of the Serson Creek stormwater channel consists of approximately 680 m of straightened stream length offering limited functional habitat for fish and wildlife. This channel accepts water during precipitation events and as a result may remain dry during certain periods of the year and thereby provides poor quality fish habitat. In addition, the channel is lined with boulder and rip-rap sized substrates which may result in a barrier to fish migration in low flow conditions. The LWC Project Preferred Alternative seeks to incorporate baseflow into the overflow channel. With the addition of baseflow inputs, the capacity for functional habitat is expected to increase considerably.

The primary function of habitat enhancements to the stormwater channel is to facilitate the movement of fish and invertebrates by creating transitional habitat elements between the lower reach of Serson Creek and the newly created wetland complex. A primary component of this

enhancement is the creation of riparian planting nodes as shown in Figure 6.15. These nodes will act to provide a forage base for fish and invertebrates as well as provide structural habitat for resting and refuge. In addition, riparian plantings aid in the stabilization of stream banks and mitigate soil erosion caused by flowing water. Supplementary streambed habitat may be provided through the select placement of boulders, rock and secured large woody material in areas that require structural augmentation to provide refuge and feeding areas for fish and invertebrates. It is of critical importance that the habitat features proposed above, do not impede the capacity of the channel to efficiently convey storm water discharges to Lake Ontario.

Figure 6.15 Example of Riparian Planting Node Cross-Section



6.1.3 Recreational Spaces

In addition to the naturalization components described in Section 6.1.2, the conceptual design identifies primary trails throughout the naturalized area that are intended to accommodate passive recreational uses. Secondary and tertiary trails will be considered during detailed design. Although not part of the EA for approval purposes, such uses include walking, cycling, in-line skating, birding, fishing, accessing the water's edge, nature appreciation, cultural interpretation, spiritual expression, and retreat from urban life.

Recreational trails will be developed using appropriate materials and construction techniques in order to minimize effects on water quality. In addition, they will be developed to ensure the safety of park users and the sustainability of the vegetation communities. There are no active recreational facilities proposed within the LWC Project footprint.

There will be a primary trail system that generally follows the newly constructed shoreline. The trail system will meet the appropriate Trail Guidelines for the City of Mississauga, Waterfront Trail and Credit Valley Conservation. . It will be a major connecting link between the existing waterfront trail at Marie Curtis Park in the east and future trail connections west of the WWTF. The general trail configuration is illustrated on Figure 6.1. The path will be cited above the lake and river 10 year flood level to minimize flooding, damages and maintenance costs for the trail. Where crossings of the two wetland areas must occur, this may take advantage of raised trails and boardwalk strategies to provide the protection needed and minimize the length of bridge spans required.

6.2 MAINTENANCE ASSOCIATED WITH THE LWC PROJECT PREFERRED ALTERNATIVE

The LWC Project Preferred Alternative will require on-going maintenance activities associated with a number of the design components. These include maintenance of sediment, debris and ice management features, naturalized areas (including terrestrial, wetland and aquatic habitat), flood protection and recreational features. A description of the maintenance activities associated with each of the design components of the LWC Project Preferred Alternative is provided below.

Shoreline Protection

- Inspection and maintenance of shoreline protection features to ensure that their function is maintained.
- Periodic site reviews should be carried out in accordance with Public Works Canada and Transport Canada, 1985. Guidelines for Inspection and Maintenance of Marine Facilities.

Sediment and Debris

- Removal of debris along streams and river outlets if deemed a hazard to flood conveyance.
- Continued debris removal for sandier portions (first 50 m or so) as currently done at MCP.

Naturalization

- Removal of invasive and undesired plant & animal species from naturalized areas, as deemed necessary.
- Removal of invasive fish species and plants from the lake-connected wetlands if deemed to be negatively affecting the local vegetation communities.

- Removal of debris from wetlands and the low flow channel within Serson and Applewood Creeks following flood and rainfall events, as deemed necessary.
- Maintenance of constructed levee and wetlands systems will be required to ensure wetland function. Water control and carp exclusion structures associated with wetland feeder channels will require ongoing maintenance and monitoring.
- Periodic mowing, burning or manual removal of woody species in order to maintain meadow.
- AEM including monitoring of ecological elements may dictate additional actions required to sustain the intended ecological communities.

Recreational Trails

- Trail maintenance would be conducted on a regular and “as required” basis, in accordance with CVC conservation land management policies.
- Informal trails will be monitored and decommissioned as needed to ensure public health and safety and to minimize ecological impacts on the communities.

6.3 CONSTRUCTION ACCESS ROUTES

At present, there is no vehicular access to the construction area; as such, a new, temporary access route is required. The access route will allow trucks carrying fill and other required materials to reach the construction site. A 7 to 10 year construction period is anticipated for the placement of fill so the access route would be in place for 7 to 10 years to complete the LWC Project (although it could be longer depending on construction timelines). The construction planning team anticipates a maximum of 250 truck deliveries per day with a more typical volume being 200 trucks per day. Once construction is complete the route will be decommissioned, removed and restored.

Alternative routes were identified to the east of the LWC Project Study Area. Construction access through the OPG lands is not available at this time. Furthermore, access is unavailable through the WWTF site due to the constrained nature of the site and associated site operations.

6.3.1 Alternative Site Access Routes

The alternative site access routes were developed by looking at logical historic and existing access points along Lakeshore Road. Three potential access points were identified (Figure 6.16):

1. The existing eastern access to the WWTF;

2. The intersection of Lakeshore and Dixie (southside of Lakeshore) or the former entrance to the Small Arms Building in the Arsenal Lands; and
3. 1400 Lakeshore Road which is a former driveway on the southside of Lakeshore and is part of the Arsenal Lands.

The existing entrance and access road to Marie Curtis Park was not considered for the following reasons:

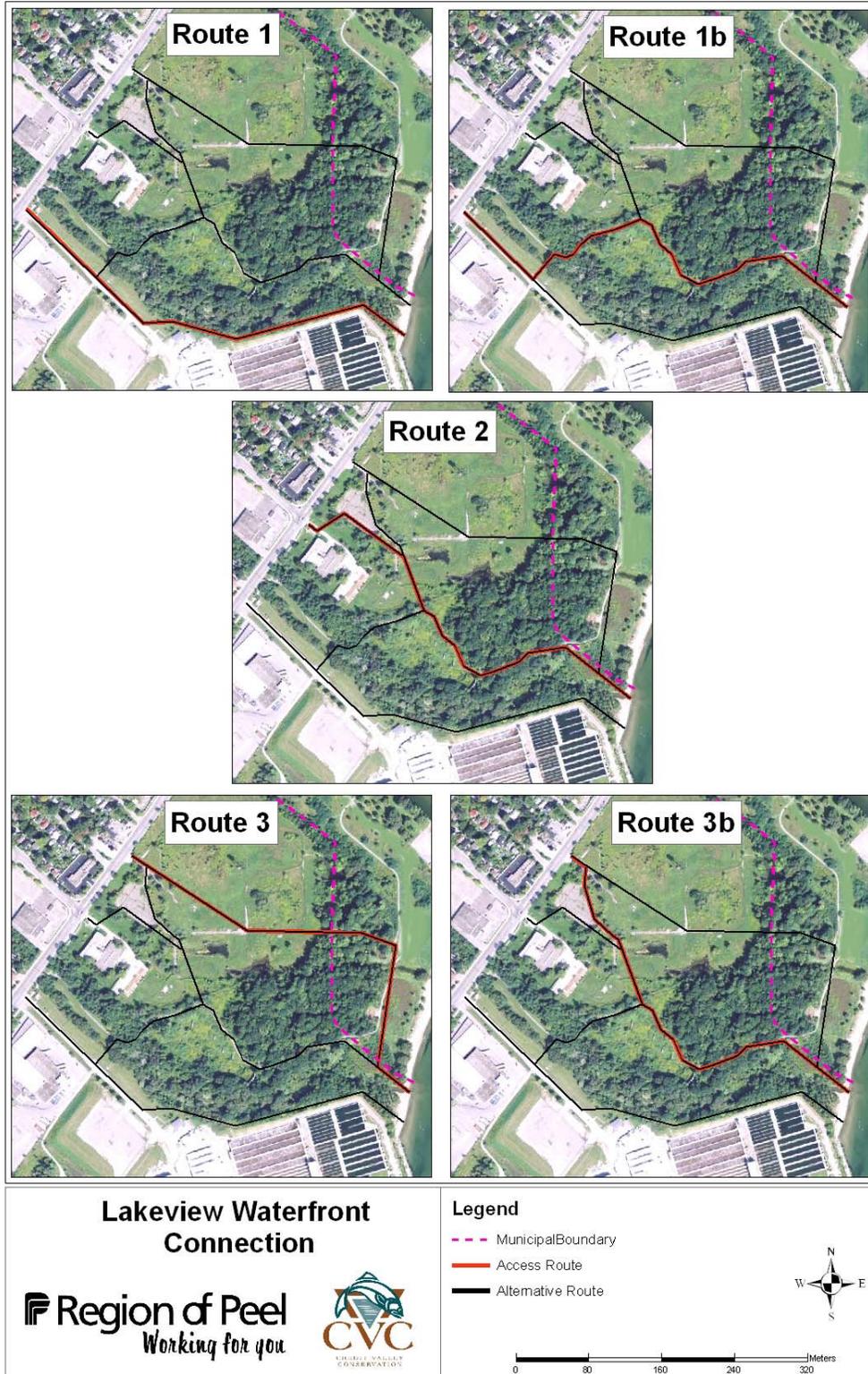
- The west bank of Etobicoke Creek, underlying most of the access road, is a former municipal landfill with very little overlying topsoil. Costs would be significant to re-grade and reconstruct the access road to withstand anticipated truck traffic.
- Marie Curtis Park will have just completed (Spring 2013) extensive park enhancements on the west side of Etobicoke Creek, paid for by the City of Toronto. These park enhancements are extremely popular to the local community in Toronto and Mississauga. The public would not support being excluded from the park for several years immediately after these enhancements have been completed.

The end point for the potential access points is one of two locations on the beach to the east of the WWTF. These end points provide access to the northern extent of the land creation area. Between the access points and the end point there are a number of constraints that could result in effects to environmental, social and cultural resources. These constraints include:

- The waterfront trail;
- Heritage resources such as the former shooting range and small arms buildings;
- Soil contamination;
- Natural features such as woodlots, Species at Risk (Butternut trees) and Applewood Creek;
- Sections of Marie Curtis Park which are a former municipal landfill site;
- Potential for archaeological resources to be unearthed;
- Potential traffic impacts to Lakeshore Road; and
- Enhancements planned and underway for the existing local parks.

Five alternative routes were developed between the alternative access points and end point. Each route crosses or affects some or all of the constraints listed above. Figure 6.16 illustrates the alternative access routes. It is assumed that all routes will include a 12 m wide road bed, allowing 2 way traffic and that the road beds will be built to high quality standards to minimize maintenance due to wear and tear by the anticipated truck volumes.

Figure 6.16 Alternative Site Access Routes



6.3.2 Construction, Operation and Decommissioning of Construction Access Routes

The following bullets describe the construction process for establishing the access route and mitigation measures that would reduce negative effects:

- Develop tree removal (include plant salvage and relocation) and compensation/restoration plan.
- Obtain all relevant Municipal and/or Regional occupancy permits.
- Conduct locates for all buried utilities.
- Arrange for curb cutting if required.
- Install construction signage as required – i.e. Caution trucks turning.
- Undertake grubbing and clearing as required.
- Install tree protection measures as required.
- Install sediment control fencing around the perimeter of the laydown area including site trailer and parking area.
- Install sediment control fencing along the length of the haul road where runoff could potentially enter watercourses.
- Remove asphalt cover (Waterfront Trail) and dispose off-site at an approved recycling facility.
- Strip granular base from Waterfront Trail (below asphalt) and re-use as final cover for haul road (above the brick rubble).
- Strip topsoil as required from proposed haul road and laydown area. Stockpile adjacent to haul road for re-use / restoration upon project completion.
- Import and place $\frac{3}{4}$ inch crusher run for laydown (assume 200 mm). Laydown would be located within the road footprint to allow placement of a construction trailer and port-o-potties. The majority of laydown will occur within the LWC Project footprint as fill is placed.
- Install mudmat as per municipal or regional specifications – typically 10 m by 60 m using 2 inch clear stone.
- Import and place brick rubble along length of proposed haul road – (minimum 300 mm to 750 mm) or as required for stable long term haul road. Road width will be approximately 9 m within a 12 m ROW.
- Topdressing for haul road will be imported purchased aggregate – $\frac{3}{4}$ inch crusher run (assume depth of 150 mm). Compaction if required.
- Maintenance will include grading, importing and placing additional brick rubble and purchased aggregate as required.
- Mitigation measures will include water application as dust suppressant. Calcium chloride will be considered as an alternative if required.
- Mud tracking onto municipal or regional roads will be mitigated via street sweeper.

- Establish a communication strategy and protocol for managing communications between cities, agencies, and the public throughout construction.
- Coordination with City of Toronto for construction signage and advanced notification as needed.
- Coordination with TRCA and City of Toronto for tree removals and restoration as required.

All areas of the site disturbed by the haul road will be restored to original conditions upon completion of LWC Project. This will include removal and off-site disposal of imported materials that cannot be reused, re-construction of the Waterfront Trail, landscaping, tree planting, seeding, etc.

6.3.3 Evaluation of Alternative Site Access Routes

The evaluation of the alternative site access routes has been structured around environmental, social, cultural, technical and cost components and seeks to identify the site access route which minimizes effects to each component. Similar to the evaluation of Alternative Methods presented in Chapter 5, the evaluation is framed around criteria and indicators that measure the relative effects of each alternative on each component. The evaluation of alternative site access routes follows the same methods described for the evaluation of Alternative Methods.

Based on a review of available baseline information and information presented in Section 6.3.2, a comparative evaluation and assessment of environmental effects has been carried out for each alternative site access route. Table 6.2 presents a summary of the comparative evaluation and effects assessment for each route based on the identified criteria and indicators. The mitigation measures as well as basic best management practices for construction (e.g. safe fuel handling) listed above have been assumed in the assessment of effects such that the information presented in the table represents net environmental effects. A detailed evaluation table including the rationale for each criterion and indicator is provided in Appendix D.

Table 6.2 Alternative Construction Site Access Route Evaluation

Environmental Component	Criteria	Indicator	Alternative Route				
			Route 1	Route 1B	Route 2	Route 3	Route 3B
Natural Environment	Vegetation/habitat removed or disturbed during construction of site access road and laydown area	Area and significance of vegetation removed	<ul style="list-style-type: none"> largest amount of vegetated habitat removal habitat removed includes communities of higher conservation concern <p>Least Preferred</p>	<ul style="list-style-type: none"> removal of ~25 mature trees habitat removed includes communities of lower conservation concern <p>Moderately Preferred</p>	<ul style="list-style-type: none"> limited vegetation removal habitat removed includes communities of lower conservation concern <p>Most Preferred</p>	<ul style="list-style-type: none"> limited vegetation removal habitat removed includes communities of higher conservation concern <p>Moderately Preferred</p>	<ul style="list-style-type: none"> limited vegetation removal habitat removed includes communities of lower conservation concern <p>Most Preferred</p>
		Potential for forest habitat fragmentation	<ul style="list-style-type: none"> largest amount of tree removal largest potential for fragmentation additional interior trees require removal to realign the Applewood Creek channel <p>Least Preferred</p>	<ul style="list-style-type: none"> removal of ~25 mature trees limited increase in fragmentation <p>Moderately Preferred</p>	<ul style="list-style-type: none"> removal of only a few trees no increase in fragmentation <p>Most Preferred</p>	<ul style="list-style-type: none"> limited tree removal road bisects centre of woodlot causing fragmentation potential for tree mortality if roots are damaged <p>Least Preferred</p>	<ul style="list-style-type: none"> removal of only a few trees no increase in fragmentation <p>Most Preferred</p>
	Disruption to Applewood or Serson Creek	Length and nature of disruption to waterbodies (including Applewood, Serson and Etobicoke Creeks, and wetlands)	<ul style="list-style-type: none"> highest potential for changes to fish habitat, water quality and riparian vegetation due to realignment of stream channel habitat (200 m) <p>Least Preferred</p>	<ul style="list-style-type: none"> moderate potential for changes to fish habitat, water quality and riparian vegetation due to temporary road crossing over Applewood Creek <p>Moderately Preferred</p>	<ul style="list-style-type: none"> no waterbody disruption <p>Most Preferred</p>	<ul style="list-style-type: none"> no waterbody disruption <p>Most Preferred</p>	<ul style="list-style-type: none"> no waterbody disruption <p>Most Preferred</p>
		Potential to impair water quality in Arsenal Lands wetland areas.	<ul style="list-style-type: none"> no Arsenal Lands wetland areas affected <p>Most Preferred</p>	<ul style="list-style-type: none"> no Arsenal Lands wetland areas affected <p>Most Preferred</p>	<ul style="list-style-type: none"> ~50 m from amphibian breeding pond potential water quality degradation due to erosion, siltation and other contaminants <p>Moderately Preferred</p>	<ul style="list-style-type: none"> ~25 m from amphibian breeding grounds ~ 50 m from marsh area potential for water quality to be degraded due to erosion, siltation and other contaminants <p>Least Preferred</p>	<ul style="list-style-type: none"> ~50 m from amphibian breeding pond potential water quality degradation due to erosion, siltation and other contaminants <p>Moderately Preferred</p>
		Disruption related to natural hazards (floodplain, erosion)	Nature of change to flood capacity and exposure to natural hazards	<ul style="list-style-type: none"> greatest risk due to erosion potential from Applewood Creek valley slopes <p>Least Preferred</p>	<ul style="list-style-type: none"> temporary bridge crossing has potential to restrict Applewood Creek flows upstream <p>Moderately Preferred</p>	<ul style="list-style-type: none"> not located near hazard areas <p>Most Preferred</p>	<ul style="list-style-type: none"> crosses small ephemeral stream to the east of Applewood Creek <p>Moderately Preferred</p>

Table 6.2 Alternative Construction Site Access Route Evaluation (Cont'd)

Environmental Component	Criteria	Indicator	Alternative Route				
			Route 1	Route 1B	Route 2	Route 3	Route 3B
SUMMARY			LEAST PREFERRED	MODERATELY PREFERRED	MOST PREFERRED	LEAST PREFERRED	MOST PREFERRED
Social Environment	Disruption to use and enjoyment of Waterfront Trail	Length of trail disrupted	<ul style="list-style-type: none"> one trail crossing near Lakeshore will not likely require flagging for user safety <p>Most Preferred</p>	<ul style="list-style-type: none"> requires closure of the trail through the Arsenal lands requires dead-ending of the trail within Marie Curtis Park temporary trail will be constructed along the south side of Lakeshore during construction will not likely require flagging at the one point of crossing for user safety <p>Least Preferred</p>	<ul style="list-style-type: none"> requires closure of the trail through the Arsenal lands requires dead-ending of the trail within Marie Curtis Park temporary trail will be constructed along the south side of Lakeshore during construction will not likely require flagging at the one point of crossing for user safety <p>Least Preferred</p>	<ul style="list-style-type: none"> one trail crossing near beach volleyball courts in Marie Curtis Park will require flagging for user safety <p>Moderately Preferred</p>	<ul style="list-style-type: none"> requires closure of the trail through the Arsenal lands requires dead-ending of the trail within Marie Curtis Park temporary trail will be constructed along the south side of Lakeshore during construction will not likely require flagging at the one point of crossing for user safety <p>Least Preferred</p>
	Disruption to use and enjoyment of Marie Curtis Park	Area of Marie Curtis Park disrupted	<ul style="list-style-type: none"> no disruption <p>Most Preferred</p>	<ul style="list-style-type: none"> no disruption <p>Most Preferred</p>	<ul style="list-style-type: none"> no disruption <p>Most Preferred</p>	<ul style="list-style-type: none"> disruption to woodlot south of Arsenal Lands and southwestern most parts of Marie Curtis Park, possibly including the beach volleyball courts <p>Least Preferred</p>	<ul style="list-style-type: none"> no disruption <p>Most Preferred</p>
	Disruption to redevelopment of Arsenal Lands and Marie Curtis Park	Nature of disruption to redevelopment activities	<ul style="list-style-type: none"> no disruption <p>Most Preferred</p>	<ul style="list-style-type: none"> impacts limited to trails adjacent to rifle baffles <p>Moderately Preferred</p>	<ul style="list-style-type: none"> impacts limited to the Small Arms Building area and trails adjacent to rifle baffles <p>Moderately Preferred</p>	<ul style="list-style-type: none"> impacts Arsenal Lands as route occupies majority of site prevents Marie Curtis Park reforestation works in 2013 <p>Least Preferred</p>	<ul style="list-style-type: none"> impacts Arsenal Lands as route occupies majority of site <p>Least Preferred</p>
	Potential to disrupt traffic on Lakeshore Boulevard	Potential for truck traffic to affect the flow of traffic on Lakeshore Boulevard	<ul style="list-style-type: none"> may require a new temporary signal light off of Lakeshore causing some traffic disruption trucks delivering fill from Hanlan water main site will need to enter back onto Lakeshore to access route <p>Least Preferred</p>	<ul style="list-style-type: none"> may require a new temporary signal light off of Lakeshore causing some traffic disruption trucks delivering fill from Hanlan water main site will need to enter back onto Lakeshore to access route <p>Least Preferred</p>	<ul style="list-style-type: none"> existing signal light at Lakeshore so no new disruption shared access with Hanlan water main site removes some trucks from Lakeshore. <p>Most Preferred</p>	<ul style="list-style-type: none"> may require a new temporary signal light off of Lakeshore causing some traffic disruption trucks delivering fill from Hanlan water main site will need to enter back onto Lakeshore to access route <p>Least Preferred</p>	<ul style="list-style-type: none"> may require a new temporary signal light off of Lakeshore causing some traffic disruption trucks delivering fill from Hanlan water main site will need to enter back onto Lakeshore to access route <p>Least Preferred</p>
SUMMARY			MOST PREFERRED	LEAST PREFERRED	MOST PREFERRED	LEAST PREFERRED	LEAST PREFERRED
Cultural Environment	Proximity to heritage features	Distance between road and heritage features	<ul style="list-style-type: none"> nearest feature is ~70m <p>Most Preferred</p>	<ul style="list-style-type: none"> nearest feature is ~5m <p>Least Preferred</p>	<ul style="list-style-type: none"> nearest feature is ~5m <p>Least Preferred</p>	<ul style="list-style-type: none"> nearest feature is ~115m <p>Most Preferred</p>	<ul style="list-style-type: none"> nearest feature is ~5m <p>Least Preferred</p>
	Potential for Archaeology Resources	Potential for unearthing archaeological resources as part of access road construction.	<ul style="list-style-type: none"> some potential triggering Stage 2 archaeological assessments (~475 m) <p>Moderately Preferred</p>	<ul style="list-style-type: none"> some potential triggering Stage 2 archaeological assessments (~1120 m) <p>Least Preferred</p>	<ul style="list-style-type: none"> some potential triggering Stage 2 archaeological assessments (~1185 m) <p>Least Preferred</p>	<ul style="list-style-type: none"> some potential triggering Stage 2 archaeological assessments (~140 m) <p>Most Preferred</p>	<ul style="list-style-type: none"> some potential triggering Stage 2 archaeological assessments (~1260 m) <p>Least Preferred</p>
SUMMARY			MOST PREFERRED	LEAST PREFERRED	LEAST PREFERRED	MOST PREFERRED	LEAST PREFERRED

Table 6.2 Alternative Construction Site Access Route Evaluation (Cont'd)

Environmental Component	Criteria	Indicator	Alternative Route				
			Route 1	Route 1B	Route 2	Route 3	Route 3B
Technical/Engineering	Ease of construction	Issues which will complicate construction	<ul style="list-style-type: none"> significant tree removal required narrow work area with steep slopes bordered by a watercourse requires relocation of the watercourse, and stabilization of the valley wall <p>Least Preferred</p>	<ul style="list-style-type: none"> bridge required to cross stream ~25 full mature trees removed longest section of road to create new trail along Lakeshore required for construction period <p>Least Preferred</p>	<ul style="list-style-type: none"> 1 or 2 mature trees removed moderate length of Waterfront Trail will be destroyed new trail along Lakeshore required for construction period <p>Moderately Preferred</p>	<ul style="list-style-type: none"> relocation of 2 young butternuts and removal of 1 mature tree root protection in forest required short section of Waterfront Trail will be destroyed. <p>Most Preferred</p>	<ul style="list-style-type: none"> 1 or 2 mature trees removed moderate length of Waterfront Trail will be destroyed new trail along Lakeshore required for construction period <p>Moderately Preferred</p>
	Ease of decommissioning	List of issues which will complicate decommissioning	<ul style="list-style-type: none"> Longest section of floodplain and forest to restore following road decommissioning <p>Least Preferred</p>	<ul style="list-style-type: none"> Longest section of Waterfront Trail to restore following road decommissioning <p>Least Preferred</p>	<ul style="list-style-type: none"> Moderate length of waterfront trail to restore following road decommissioning <p>Moderately Preferred</p>	<ul style="list-style-type: none"> Least complex decommissioning and restoration <p>Most Preferred</p>	<ul style="list-style-type: none"> Moderate length of waterfront trail to restore following road decommissioning <p>Moderately Preferred</p>
	Potential to disturb contaminated soils	Area of contaminated soils crossed	<ul style="list-style-type: none"> potential for contamination from spent bullets - some testing required <p>Most Preferred</p>	<ul style="list-style-type: none"> potential for contamination from spent bullets - some testing required <p>Most Preferred</p>	<ul style="list-style-type: none"> potential for contamination from spent bullets - some testing required <p>Most Preferred</p>	<ul style="list-style-type: none"> portions overlie an old municipal landfill where additional protective measures may be required to prevent disturbance of the underlying soils. <p>Least Preferred</p>	<ul style="list-style-type: none"> potential for contamination from spent bullets - some testing required <p>Most Preferred</p>
SUMMARY			LEAST PREFERRED	LEAST PREFERRED	MOST PREFERRED	MODERATELY PREFERRED	MOST PREFERRED
Cost	Cost of construction, operations and decommissioning	Order of magnitude costs	<ul style="list-style-type: none"> Base Cost - \$341,000 Contingencies - \$89,000 Total - \$430,000 <p>Moderately Preferred</p>	<ul style="list-style-type: none"> Base Cost - \$380,000 Contingencies - \$99,000 Total - \$479,000 <p>Least Preferred</p>	<ul style="list-style-type: none"> Base Cost - \$317,000 Contingencies - \$82,000 Total - \$399,000 <p>Moderately Preferred</p>	<ul style="list-style-type: none"> Base Cost - \$221,000 Contingencies - \$57,000 Total - \$278,000 <p>Most Preferred</p>	<ul style="list-style-type: none"> Base Cost - \$319,000 Contingencies - \$83,000 Total - \$402,000 <p>Moderately Preferred</p>
SUMMARY			MODERATELY PREFERRED	LEAST PREFERRED	MODERATELY PREFERRED	MOST PREFERRED	MODERATELY PREFERRED

6.3.3.1 Natural Environment

Three criteria were used to evaluate the alternative access routes for the natural environment component including:

1. Vegetation/habitat removed or disturbed during construction of site access road and laydown area;
2. Disruption to Applewood or Serson Creek; and
3. Disruption related to natural hazards (floodplain, erosion).

Criteria: Vegetation/habitat removed or disturbed during construction of site access road and laydown area

For the criteria “vegetation/habitat removed or disturbed during construction of site access road and laydown area” there were two indicators used to evaluate each alternative access route:

1. Area and significance of vegetation removed; and
2. Potential for forest habitat fragmentation.

Indicator: Area and significance of vegetation removed or altered

Site preparation and the creation of roads will require the removal of vegetation, and therefore a reduction in the amount of natural habitat within the LWC Project Study Area. This reduction in natural habitat impacts biodiversity and the resilience of the remnant communities. Some areas, such as grasslands, provide breeding bird habitat for open country and early successional breeding birds. The impacted area and vegetation removal were considered during the evaluation. Routes that resulted in the least amount of vegetation removal or habitat alteration are preferred.

The relative regional significance (i.e. L-Rank) of the affected terrestrial communities was also considered in the evaluation. Routes that avoid impacts on communities of concern are preferred. GIS mapping of ELC communities was overlain on the route alternatives and the linear distance of routes through specific communities was measured using GIS tools. This allowed for an analysis of the relative significance of the terrestrial communities affected.

The new road may also provide new routes for invasive species and human encroachment. Disturbance in natural communities can provide pathways for invasive species, pets, and human activity causing impacts to native flora, fauna and soil (e.g., erosion, compaction). Routes that utilize existing trails or infrastructure are preferred as they result in fewer new disturbances that would allow invasive species establishment and encroachment. Potential impacts related to

invasive species and human encroachment were determined by professional judgment through qualitative analysis of the ELC and route mapping.

Route 1 crosses approximately 475 m of forest along the west side of Applewood Creek and another 200 m of forest would need to be removed to realign the river channel away from the valley wall. Tree removal for this route would occur in a L5 vegetation community. This route requires the most tree removal and is ranked least preferred.

Route 1B requires the removal of at least 25 mature trees along the Waterfront Trail. While these trees are not Species of Concern and the majority of the trees are located within L5 and L+ communities, they do provide ecological function for birds and wildlife. Route 1B is ranked moderately preferred due to fewer tree removal requirements than Route 1.

Route 3 cuts through the middle of an L3 woodlot community. The proposed route aligns with an existing break in the woodlot which minimizes tree removal or relocation to only a few mature trees. While the total number of trees requiring removal in Route 3 were low (less than Route 1B), the tree removal occurs in a community of higher significance. Due to tradeoffs between the number of trees removed and the significance of the vegetation community, Route 3 is also ranked moderately preferred.

Routes 2 and 3B involve removal of only a few trees along the route. The majority of these routes are located through L+ communities. No Species of Concern are affected. Routes 2 and 3B are considered most preferred.

All routes discharge out onto the beach through the L2 and L3 beach communities and as such, each route has the same relative effects in that area.

Indicator: Potential for forest habitat fragmentation

Larger, contiguous habitat blocks allow fauna and flora communities to be more resilient to development and increased user pressure. Although there are no ‘interior’ forest conditions present at Marie Curtis Park, the current forest patches are not bisected by roads or other infrastructure, and this condition should be maintained to the extent possible. The Marie Curtis Terrestrial Biological Inventory and Assessment (2012) recommends that recreation or other activities should be directed away from the main forest as much as possible. The assessment also indicates that the majority of habitat patches within the LWC Project Study Area are of poor quality, with the exception of a small meadow patch in the middle of the Arsenal Lands that is considered to have fair habitat quality. Routes that do not bisect contiguous forest blocks are preferred.

Forest habitat fragmentation was determined by professional judgment through qualitative analysis of the ELC and route mapping. Further ground-truthing with TRCA's forester was undertaken for each route to identify the specific trees that would need to be removed to accommodate a 12 m wide road way. Analysis of the significance of those tree removals were undertaken based on professional judgment.

Route 1 requires the removal of a large swath of forest along the western end of a woodlot and requires the removal of an additional 200 m swath within a woodlot to realign Applewood Creek. Additional fluvial geomorphologic studies would be required to clearly delineate the location and length of that additional fragmentation of the woodlot. Given these fragmentation impacts, Route 1 is ranked least preferred.

The effects on habitat fragmentation for Route 3 are somewhat mitigated by the fact that there is an existing gap in the woodlot that could accommodate much of the proposed access road. The proximity of an access route to the remaining mature woodlot would require extensive root protection works to ensure that further fragmentation of the woodlot (through mature tree die-off) does not occur. Given the potential impacts to the remaining woodlot from root damage, Route 3 is also ranked least preferred.

Route 1B requires removal of approximately 25 mature trees immediately east of Applewood Creek along the Waterfront Trail. This is a section of Waterfront Trail where tree canopy cover is nearly complete, despite the presence of the trail. Less tree removal is required for this route compared to Route 1 so this route is ranked moderately preferred.

Routes 2 and 3B require the least amount of tree removal to accommodate the proposed access routes. No significant increase in habitat fragmentation would occur as a result of these two routes so these routes are ranked most preferred.

Criteria: Disruption to Applewood or Serson Creek

For the criteria "disruption to Applewood or Serson Creek" there were two indicators used to evaluate each alternative access route:

1. Length and nature of disruption to Applewood or Serson Creek; and
2. Potential to impair water quality in off-line wetland areas.

Indicator: Length and nature of disruption to waterbodies (including Applewood, Serson and Etobicoke Creeks, and wetlands)

Disruption to creeks can result in alteration to creek function, fish habitat, changes to water quality, and changes to riparian vegetation. Routes that require creek alterations, or disturbance to riparian vegetation were evaluated for potential impacts to fish and fish habitat. Routes that minimally alter or disrupt ecological function in Applewood, Serson or Etobicoke Creek are preferred.

Mapping of fish habitat and fish communities, water flow and the route alternatives were examined through GIS and the relative impacts of each route was evaluated based on the professional judgment of an aquatic ecologist.

Route 1 requires the realignment of approximately 200 m of stream channel in Applewood Creek. This will have direct and significant impacts on fish habitat, water quality and riparian vegetation. Given these impacts, Route 1 is ranked least preferred.

Route 1B requires the construction of a temporary bridge crossing over Applewood Creek which should not impact fish habitat quality substantially. However, the crossing does increase the potential for direct discharges from vehicles and debris into the stream as thousands of trucks would cross directly over the water course to access the LWC Project. In addition, in the event of large flood events, the bridge structure may be designed to “fail” to ensure that the structure does not increase flood risk upstream. The failure of this structure could impact fish habitat quality downstream during the flood and during the process of retrieving the structure after the event. As a result, Route 1B is ranked moderately preferred.

Routes 2, 3 and 3B do not come within the regulated flood plain for Applewood, Serson or Etobicoke Creek. As such, these routes will not impact the creeks and are all ranked most preferred.

Indicator: Potential to impair water quality in Arsenal Lands wetland areas

Site preparation activities such as grading and filling may increase the risk of erosion and sedimentation in nearby wetlands. Other contaminants (oil, dust, salt, sand and debris) may also impact the water quality, which can negatively impact the success of amphibian breeding. Roads may impact the hydrology of wetlands and watercourses by creating barriers to overland flow, thereby restricting inputs to nearby wetlands or watercourses, and by creating increased run off from paved areas. Routes that avoid impacts to off-line wetland areas are preferred.

GIS was used to examine ELC, Arsenal Lands' wetlands and amphibian breeding survey data overlaid with the route alternatives. The relative impacts to the off-line wetlands were determined through professional judgment of an ecologist.

Three small wetland ponds are located within the LWC Project Study Area. These wetlands are known to contain breeding populations of amphibians. Routes 1 and 1B do not come near any of these ponds. As such, Routes 1 and 1B are ranked most preferred for this indicator.

Routes 2 and 3B both come within approximately 50 m of one of these ponds. Given the distances and ability to avoid these ponds with the construction access routes, Routes 2 and 3B are both ranked moderately preferred.

Route 3 is within 25 m of one pond and 50 m of another pond. The road runs along the entire length of the amphibian breeding area of the pond that is within 25 m. Given the increased exposure and risk to these wetlands, Route 3 is ranked least preferred.

Criteria: Disruption related to natural hazards (floodplain, erosion)

For the criteria “disruption related to natural hazards (floodplain, erosion)” only one indicator was used to evaluate each alternative access route: “nature of change on flood capacity and exposure to natural hazards”.

Indicator: Nature of change on flood capacity and exposure to natural hazards

Road construction has the potential to interfere with existing runoff patterns by creating barriers and altering drainage within hazard lands. These impacts may result in restrictions in surface flow, thereby increasing flood risk upstream. It can also create risks to people, equipment and infrastructure from potential flooding of roads within the flood plain and potentially unstable valley slopes. Analysis was undertaken by professionals to assess the potential natural hazards to which each route is exposed. Routes deemed to have less impact on natural hazards are preferred.

In the case of Route 1, the access road descends a steep valley wall and requires 475 m of road construction within the flood plain. This represents a significant safety risk for people and infrastructure. It could also potentially increase flooding upstream due to infill within the flood plain. As a result, Route 1 is ranked least preferred.

Route 1B involves a single crossing of Applewood Creek. This crossing is approximately 18 m long, and would result in the approaches remaining within the regulatory flood plain of Applewood Creek. Under an extreme flood event, there is the potential that the approaches

would increase flood levels upstream. To mitigate these effects, a longer span bridge could be constructed at greater cost, or the bridge could be designed to fail. The latter would effectively shut the construction site down until the bridge could be restored. As a result of these issues, Route 1B is ranked moderately preferred.

Route 3 is in close proximity to two wetland ponds and would require crossings to be established over an unnamed ephemeral stream. Route 3 was not located within the regulatory flood plain for Etobicoke Creek. Given the proximity to these natural hazards, Route 3 is ranked moderately preferred.

Routes 2 and 3B are not in proximity to Applewood Creek, the unnamed ephemeral creek or Etobicoke Creek. They are approximately 50 m from one wetland pond. Given their limited exposure to natural hazards, Routes 2 and 3B are ranked most preferred.

Summary of Access Route Evaluation for Natural Environment Criteria and Indicators

Table 6.3 summarizes the access route evaluation for the natural environment. Routes 1 and 3 are ranked the lowest with Route 1 ranked least preferred for all three criteria and Route 3 ranked least preferred for two out of the three criteria. Route 1B is ranked as moderately preferred based on moderately preferred ranking in two out of three criteria. Both Route 2 and Route 3B are ranked most preferred for all three criteria and are, therefore, each ranked most preferred from the natural environment perspective.

Table 6.3 Summary Access Route Evaluation for Natural Environment

Environmental Component	Criteria	Route 1	Route 1B	Route 2	Route 3	Route 3B
Natural Environment	Vegetation/habitat removed or disturbed during construction of site access road and laydown area	Least Preferred	Moderately Preferred	Most Preferred	Least Preferred	Most Preferred
	Disruption to Applewood or Serson Creek	Least Preferred	Most Preferred	Most Preferred	Least Preferred	Most Preferred
	Disruption related to natural hazards (floodplain, erosion)	Least Preferred	Moderately Preferred	Most Preferred	Moderately Preferred	Most Preferred
SUMMARY		LEAST PREFERRED	MODERATELY PREFERRED	MOST PREFERRED	LEAST PREFERRED	MOST PREFERRED

6.3.3.2 Social Environment

Four criteria are used to evaluate the alternative access routes from the perspective of the social environment:

1. Disruption to use and enjoyment of Waterfront Trail;
2. Disruption to use and enjoyment of Marie Curtis Park;
3. Disruption to redevelopment of Arsenal Lands and Marie Curtis Park; and
4. Potential to disrupt traffic on Lakeshore Boulevard.

Criteria: Disruption to use and enjoyment of Waterfront Trail

For the criteria “disruption to use and enjoyment of Waterfront Trail” only one indicator was used to evaluate each alternative access route: “length of trail disrupted”.

Indicator: Length of trail disrupted

Access road construction has the potential to disrupt the use and enjoyment of the Waterfront Trail in areas where the road is in proximity to or directly on the trail. Some sections of trail could be completely closed to users while construction is occurring. Routes that result in less disruption to trail users are preferred.

Route 1 crosses the Waterfront Trail at the entrance to the WWTF immediately south of Lakeshore Road. Since this is only a crossing of the trail, it will not result in a significant disruption to trail users. Thus, Route 1 is ranked most preferred for this indicator.

Routes 1B, 2 and 3B all follow considerable portions of the Waterfront Trail through the Arsenal Lands. The disrupted portion of Waterfront Trail within the City of Toronto will be limited. Effects to the trails within TRCA/City of Toronto limits should be minimized to within approximately 5 m of the boundary area. Any effects beyond this will be discussed with City of Toronto staff. These routes would require the closure of the trail through the Arsenal Lands which would dead-end the trail in Marie Curtis Park. To create a viable connection to the two ends of the trail, a temporary connection would need to be established along the south side of Lakeshore Road to allow trail users to bypass the access road during construction. Due to the significant length of trail that would be altered for these three alternative routes, they are ranked least preferred.

Route 3 requires a crossing of the trail near the beach volleyball courts in Marie Curtis Park. This option results in substantially less trail disruption than Routes 1B, 2 and 3B, but does impact a higher use portion of the trail than Route 1 so it is ranked moderately preferred.

Criteria: Disruption to use and enjoyment of Marie Curtis Park

For the criteria “disruption to use and enjoyment of Marie Curtis Park” only one indicator was used to evaluate each alternative access route: “area of Marie Curtis Park disrupted”.

Indicator: Area of Marie Curtis Park disrupted

Access road construction has the potential to disrupt the use and enjoyment of Marie Curtis Park in areas where the road is in proximity to or directly within high use areas of the park. Some sections of the park could be closed to users while construction is occurring. Routes that result in less disruption to trail users are preferred.

Routes 1, 1B, 2 and 3B are all located away from the high use areas in Marie Curtis Park. There are no direct impacts to users of the park with any of these routes. These routes are all ranked most preferred.

Route 3 crosses the southernmost section of Marie Curtis Park resulting in disruption to park beach users in this area for the duration of the LWC Project. The affected area includes the portion of the park where beach volleyball courts have been installed by the City of Toronto. Based on this disruption, Route 3 is ranked least preferred.

Criteria: Disruption to redevelopment of Arsenal Lands and Marie Curtis Park

For the criteria “disruption to redevelopment of Arsenal Lands and Marie Curtis Park” only one indicator was used to evaluate each alternative access route: “nature of disruption to redevelopment activities”.

Indicator: Nature of disruption to redevelopment activities

Plans have been developed by TRCA and the City of Toronto to redevelop Marie Curtis Park. Many of those works have been completed or are currently underway and include: dog off leash area (2011), parking lot decommissioning near beach (2012), beach volleyball courts (2012), Waterfront Trail upgrades (underway Spring 2013); and reforestation of woodlots (underway Spring 2013).

Furthermore, the City of Mississauga and TRCA were planning to proceed with a Parks Master Plan process for the Arsenal Lands in 2012 with implementation to proceed over the next several years. Those plans were put on hold to allow a temporary stockpile of clean fill within the Arsenal Lands for the LWC Project. The stockpile initiative was subsequently put on hold in the summer of 2012 which could allow the Parks Master Plan process for the Arsenal Lands to proceed. Resumption of the Parks Master Plan process would be complicated by a construction access route that bisects the plan area. Thus, the placement of site access routes has the potential

to disrupt works currently underway or recently completed in Marie Curtis Park, or to prevent the implementation of plans for the Arsenal Lands over the course of the LWC Project construction. Routes that result in less disruption of these plans are preferred.

Route 1 does not have any impact on the implementation of either plan. It allows the implementation of an Arsenal Lands Master Plan to proceed uninterrupted and avoids all enhancement activities in Marie Curtis Park. Route 1 is ranked most preferred for this indicator.

Routes 1, 2 and 3B each require some crossing of the Arsenal Lands redevelopment areas but allow for the majority of plans associated with the large meadow at 1400 Lakeshore Road to be implemented concurrently with construction of the LWC Project. These routes also avoid all enhancement activities in Marie Curtis Park (though the construction access route comes within a few metres of the terminus of trail upgrades). For these reasons, Routes 1, 2 and 3B are ranked moderately preferred for this indicator.

Route 3 bisects through the middle of the large meadow for the Arsenal Lands (at 1400 Lakeshore Road) which would result in delays in implementing the majority of plans for the Arsenal Lands. This route bisects areas where tree planting is planned in Marie Curtis Park and would cross the upgraded Waterfront Trail and run the length of the upgraded trail areas and cross the beach volleyball courts towards the LWC Project site. Route 3 is ranked least preferred for this indicator.

Criteria: Potential to disrupt traffic on Lakeshore Road

For the criteria “potential to disrupt traffic on Lakeshore Road” only one indicator was used to evaluate each alternative access route: “potential for truck traffic to affect the flow of traffic on Lakeshore Road”.

Indicator: Potential for truck traffic to affect the flow of traffic on Lakeshore Boulevard

Trucks entering the LWC Project site from Lakeshore Road could disrupt traffic on Lakeshore Road due to the volume of daily construction traffic anticipated for the project. Truck traffic into the site is estimated to be between 200-250 trucks per day. Trucks entering the site from Lakeshore Road will be turning either right or left into the preferred access route depending on access from east or the west of the LWC Project. Traffic lights may be required at uncontrolled intersections due to the volume of daily truck trips to and from the site. Some fill is anticipated to come from the Hanlan water main site which may or may not require trucks to access the LWC Project via Lakeshore Road depending on the preferred route. Routes with existing traffic lights on Lakeshore Road and routes that can provide fill from the Hanlan water main site without using Lakeshore Road are preferred.

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Routes 1, 1B, 3 and 3B are at uncontrolled intersections that may require traffic lights to be installed. Additional traffic lights on Lakeshore will further impede traffic flow. If it is determined that traffic lights are not required at these uncontrolled intersections, traffic would be impeded by trucks arriving from the east that would be turning left into the site. In addition, all four of these routes would require trucks delivering fill from the Hanlan water main site to enter back onto Lakeshore Road before accessing the LWC Project site. This would have further traffic implications on Lakeshore Road. For these reasons, Routes 1, 1B, 3 and 3B are all ranked least preferred for this indicator.

Route 2 has an existing traffic light at Lakeshore Road which would help to reduce traffic disruptions from LWC Project related traffic. This route also has a shared access with the Hanlan water main project which means that the LWC Project site can be accessed directly by trucks delivering fill from the Hanlan water main project without going back out to Lakeshore Road. For these reasons, Route 2 is ranked most preferred for this indicator.

Summary of Access Route Evaluation for Social Environment Criteria and Indicators

Table 6.4 summarizes the access route evaluation for the social environment. Routes 1B, 3 and 3B are ranked the lowest with route 3 and 3B ranked least preferred for all three out of four criteria and Route 1B ranked least preferred for two out of the four criteria. Routes 1 and 2 are ranked most preferred for social environment criteria with route 1 ranked most preferred for three out of four criteria and route 2 ranked most preferred for two out of four criteria.

Table 6.4 Summary Access Route Evaluation for Social Environment

Environmental Component	Criteria	Route 1	Route 1B	Route 2	Route 3	Route 3B
Social Environment	Disruption to use and enjoyment of Waterfront Trail	Most Preferred	Least Preferred	Least Preferred	Moderately Preferred	Least Preferred
	Disruption to use and enjoyment of Marie Curtis Park	Most Preferred	Most Preferred	Most Preferred	Least Preferred	Most Preferred
	Disruption to redevelopment of Arsenal Lands and Marie Curtis Park	Most Preferred	Moderately Preferred	Moderately Preferred	Least Preferred	Least Preferred
	Potential to disrupt traffic on Lakeshore Boulevard	Least Preferred	Least Preferred	Most Preferred	Least Preferred	Least Preferred
SUMMARY		MOST PREFERRED	MODERATELY PREFERRED	MOST PREFERRED	LEAST PREFERRED	LEAST PREFERRED

6.3.3.3 Cultural Environment

Four criteria were initially considered under the Cultural Environment:

1. Removal of designated heritage properties or attributes;
2. Disruption to designated heritage properties or attributes;
3. Proximity to heritage properties or attributes; and
4. Potential for archaeological resources.

Upon review of the proposed access routes, and a review of the available information, it was determined that none of the routes would involve direct removal or disruption to designated heritage properties or attributes. As such, all proposed access routes were considered most preferred. Only “proximity to heritage properties or attributes” and “potential for archaeological resources” were considered further in the analysis.

Criteria: Proximity to heritage properties or attributes

For the criteria “proximity to heritage properties or attributes” only one indicator was used to evaluate each alternative access route: “distance between road and heritage properties or attributes”.

Indicator: Distance between road and heritage properties or attributes

While not designated under the *Ontario Heritage Act*, the Arsenal Lands (TRCA-owned property), located at 1400 Lakeshore Road in Mississauga, is identified as a Cultural Landscape (Site No. L-IND-3) for its direct association with Canadian wartime history. In order to reach the project site at the water’s edge, a number of proposed access routes were identified through the Arsenal Lands.

Routes 1 and 1b do not travel any distance through the Arsenal Lands. Routes 2 and 3b travel along existing paved surfaces for approximately 245-m, before travelling along a new temporary road for approximately 85-m, and entering Region of Peel property where it connects with the existing Waterfront Trail. Route 3 travels primarily along existing paved surfaces for 390-m, bisecting the middle of the Arsenal Lands meadow, before entering Marie Curtis Park West. It should be noted that the potential impact of the proposed access routes on the future Master Planning process and implementation of the Arsenal Lands is assessed in Section 6.3.3.2 (Disruption to redevelopment of Arsenal Lands and Marie Curtis Park).

Visible remnants of the former uses of the Arsenal Lands include the water tower, outdoor firing range, and Long Branch Rifle Range. These features are independently designated as heritage properties, and are assessed below.

A number of heritage designations have been identified within the LWC Project Study Area, including:

- The Small Arms Building and Water Tower (By-law No. 0258-2009), located at 1400 Lakeshore Road East on TRCA-owned property. Key heritage attributes of the Small Arms Building which have the potential to be impacted by the access routes include the row of deciduous trees to the west, and a woodlot composed of 5-6 trees located to the southwest of the Small Arms Building;
- The Long Branch Indoor Rifle Range (By-law No. 0170-2012), located at 1300 Lakeshore Road on Region of Peel property; and
- A Notice of Intention to Designate has been issued for the Outdoor Firing Range, located at 1300 Lakeshore Road East on Region of Peel property. Key heritage attributes of the Outdoor Firing Range which have the potential to be impacted by the access routes include the 16 wooden baffles and concrete backstop.

Proposed routes that are further from designated heritage properties or attributes are preferred given the large number of vehicles anticipated to access the site over the years. Routes 1 and 3 avoid all designated heritage properties and attributes along their lengths. The closest heritage property to Route 1 is the down-range end of the Outdoor Rifle Range, which is approximately 70 m away. The closest heritage property to Route 3 is the Water Tower, which is approximately 115 m away. Routes 1 and 3 are ranked most preferred.

Routes 1B, 2 and 3B cross the eastern extent of the Outdoor Firing Range, along the existing Waterfront Trail, and are within 5 m of one of the baffles. The Outdoor Firing Range heritage designation includes a 30-m buffer on either side of the identified heritage attributes; however, with the use of construction fencing to separate the road from the baffles, it is not anticipated that these baffles will be impacted by construction access. Route 2 comes within 25 m of the northeast corner of the Small Arms Building. Each route moves southeast away from the Small Arms Building so for the majority of the length, the construction access route is over 65 m away from the building. There are no impacts anticipated on the Small Arms Building as a result of the Route 2 construction access. Routes 1B, 2 and 3B are ranked moderately preferred.

Criteria: Potential for archaeological resources

For the criteria “potential for archaeological resources” only one indicator was used to evaluate each alternative access route: “potential for unearthing archaeological resources as part of the access road creation”.

Indicator: Potential for unearthing archaeological resources as part of access road creation

A Stage 1 Archaeological Assessment was completed by TRCA archaeologists (2013) in support of the LWC Project. This study consolidated the results of a number of studies completed in the area over the last several years and included additional archival research. Conclusions for the Stage 1 Assessment indicated that:

- extensive areas within the LWC Project Study Area have potential for intact cultural heritage resources;
- proposed access routes located on lands identified as having potential for intact cultural heritage resources should be subject to a Stage 2 archaeological assessment;
- archaeological monitoring, followed by a Stage 3 and 4 archaeological assessment if necessary, is required for removal of parking lots as they may have capped existing archaeological heritage resources; and
- all areas deemed as disturbed require no further archaeological assessment.

Thus, alternative access routes with shorter lengths that avoid areas having potential for intact cultural heritage resources are preferred.

Route 3 has a 410 m section that crosses a large meadow within the Arsenal Lands that has been extensively disturbed (thus no additional assessments are required along this portion of the route). Furthermore, this route only requires a single crossing of the Waterfront Trail so the Waterfront Trail does not need to be temporarily relocated. There is approximately 140 m of proposed road length that would require a Stage 2 Assessment through the woodlot south of the large meadow, and an additional 265 m of road overlying the municipal landfill south of the woodlot. Route 3 is ranked most preferred.

Route 1 requires a single crossing of the Waterfront Trail near Lakeshore Road so the Waterfront Trail does not need to be temporarily relocated. However, a Stage 2 Assessment would be required for the 475 m of access road required east of the WWTF access road, and for approximately 200 m of channel realignment required for Applewood Creek. Since the length of required Stage 2 Assessment is longer than Route 3, Route 1 is ranked moderately preferred.

Routes 1B, 2 and 3B require a temporary relocation of the Waterfront Trail to the south side of Lakeshore Road for a distance of 420 m. The Stage 1 Assessment concluded that intact cultural heritage resources may be found along the south side of Lakeshore Road so Stage 2 Assessment is required. In addition, each of these routes has additional areas that would be subject to Stage 2 Assessments:

- Route 1B follows the Waterfront Trail for a distance of 700 m. The road will be several metres wider than the existing Waterfront Trail so there is the potential for intact archaeological resources along its length.
- Route 2 follows the Waterfront Trail for a distance of ~500 m, plus an additional 265 m of land was deemed as having potential for intact archaeological resources between Lakeshore Road and the Waterfront Trail.
- Route 3B follows the Waterfront Trail for a distance of ~500 m, plus an additional 340 m of land was deemed as having potential for intact archaeological resources between Lakeshore Road (at 1400 Lakeshore entrance) and the Waterfront Trail.

Since Routes 1B, 2 and 3B require substantially greater lengths of Stage 2 Archaeological Assessment compared to Routes 1 and 3 they are ranked least preferred.

Summary of Access Route Evaluation for Cultural Environment Criteria and Indicators

Table 6.5 summarizes the access route evaluation for the cultural environment. Of the two criteria which showed a difference between access route alternatives, Route 1 was ranked as having the most preferred (with one most and one moderately preferred). The remaining routes – 1B, 2, 3 and 3B – all had at least one criteria that was ranked least preferred and were therefore summary ranked as least preferred.

Table 6.5 Summary Access Route Evaluation for Cultural Environment

Environmental Component	Criteria	Route 1	Route 1B	Route 2	Route 3	Route 3B
Cultural Environment	Proximity to heritage properties or attributes	Most Preferred	Moderately Preferred	Moderately Preferred	Most Preferred	Moderately Preferred
	Potential for Archaeology Resources	Moderately Preferred	Least Preferred	Least Preferred	Most Preferred	Least Preferred
SUMMARY		MOST PREFERRED	LEAST PREFERRED	LEAST PREFERRED	MOST PREFERRED	LEAST PREFERRED

6.3.3.4 Technical/Engineering

Three criteria were considered for Technical/Engineering:

1. Ease of construction;
2. Ease of decommissioning; and
3. Potential to disturb contaminated soils.

Criteria: Ease of construction

For the criteria “ease of construction” only one indicator was used to evaluate each alternative access route: “issues which will complicate construction”.

Indicator: Issues which will complicate construction

Construction access routes involve a number of standard “road construction” techniques that are systematic and applicable for a given unit length of road. However, variables such as (but not limited to) differences in topography, soils and hazards can produce substantive additional engineering challenges when developing a new construction access route. These additional engineering considerations are also usually associated with increased project risk and often cost. Construction access routes that require less “route specific” engineering solutions and as a result, are subject to less project risk are preferred.

Route 3 requires the least amount of additional engineering beyond standard road building techniques. This route involves some additional root protection measures where the road bisects the woodlot south of the large meadow, and involves some additional planning efforts to relocate or remove two large butternut trees within the proposed ROW. Route 3 was ranked most preferred.

Routes 2 and 3B require the removal of a couple mature trees and the creation of a temporary trail realignment along the south side of Lakeshore Road, in addition to the creation of the new access roads. Route 2 also involves minor separation works at the entrance to the Small Arms Building to prevent having Hanlan water main construction traffic from accessing the LWC Project access road. Routes 2 and 3B are ranked moderately preferred.

Route 1 involves substantive geotechnical works to create a sloped roadway into the Applewood floodplain. Large numbers of trees require removal, and approximately 200 m of Applewood Creek requires realignment. The majority of the access road would likely remain at risk due to flooding as it is located within the Applewood Creek floodplain. Route 1B requires the establishment of a temporary bridge crossing over Applewood Creek. Furthermore, this route involves the removal of more than 25 mature trees along the Waterfront Trail, and the creation of a temporary trail realignment along the south side of Lakeshore. Routes 1 and 1B are ranked least preferred.

Criteria: Ease of decommissioning

For the criteria “ease of decommissioning” only one indicator was used to evaluate each alternative access route: “issues which will complicate decommissioning”.

Indicator: Issues which will complicate decommissioning

Construction access routes involve a number of standard “road decommissioning and restoration” techniques that are systematic and applicable for a given unit length of road. However, variables such as (but not limited to) differences in topography, soils and hazards, can produce substantive additional engineering challenges when decommissioning/restoring a route to its original conditions.

Construction access routes that require less “route specific” engineering solutions and as a result, are subject to less project risk are preferred.

Route 3 requires the least amount of decommissioning and restoration within the woodlot and south of the woodlot and is ranked most preferred.

Routes 2 and 3B require substantive trail reestablishment as part of the access road decommissioning, and reforestation along the Waterfront Trail and are ranked moderately preferred.

Route 1 involves substantial removals of the access road and extensive reestablishment of the forest cover along Applewood Creek. There may be a need to for further channel realignment works in Applewood Creek. Route 1B requires the longest stretch of Waterfront Trail to be reestablished as part of the road decommissioning. A substantial amount of reforestation will be required along the Waterfront Trail and some period of time will pass before the “character” of the enclosed mature canopy over the Trail will be reestablished. This route requires the proper decommissioning of the temporary bridge and approaches. Both routes 1 and 1B are ranked least preferred.

Criteria: Potential to disturb contaminated soils

For the criteria “potential to disturb contaminated soils” only one indicator was used to evaluate each alternative access route: “area of contaminated soils crossed”.

Indicator: Area of contaminated soils crossed

Estimated costs for each access route do not take into account remediation costs to deal with potential soil contamination issues. Routes with higher potential to disturb contaminated soils will require additional remediation and costs associated with them.

Routes 1, 1B, 2, and 3B have some potential for spent lead bullets given their proximity to the rifle shooting range. Each of the routes may cross over potential municipal landfill for the last 50 to 60 m before reaching the lake edge. Thus, issues pertaining to potential soil contamination are deemed to be of equal concern between these four routes. Routes 1, 1B, 2, and 3B are all ranked most preferred.

Route 3 is ranked least preferred, largely due to the fact that for the final 265m, the proposed route will travel over a former municipal landfill area.

Summary of Access Route Evaluation for Technical/Engineering Criteria and Indicators

Table 6.6 summarizes the access route evaluation for technical/engineering. Routes 1 and 1B are both summary ranked as least preferred with each ranked least preferred for two out of the three criteria. Route 3 is summary ranked as moderately preferred based on most preferred ranking in two out of three criteria but least preferred for one criterion. Both Route 2 and route 3B are summary ranked as most preferred with each ranked moderately preferred for two out of three criteria and most preferred for one criterion.

Table 6.6 Summary Access Route Evaluation for Technical/Engineering

Environmental Component	Criteria	Route 1	Route 1B	Route 2	Route 3	Route 3B
Technical/ Engineering	Ease of construction	Least Preferred	Least Preferred	Moderately Preferred	Most Preferred	Moderately Preferred
	Ease of decommissioning	Least Preferred	Least Preferred	Moderately Preferred	Most Preferred	Moderately Preferred
	Potential to disturb contaminated soils	Most Preferred	Most Preferred	Most Preferred	Least Preferred	Most Preferred
SUMMARY		LEAST PREFERRED	LEAST PREFERRED	MOST PREFERRED	MODERATELY PREFERRED	MOST PREFERRED

6.3.3.5 Cost

Only one criterion was considered for Cost: Cost of construction, operations and decommissioning.

Criteria: Cost of construction, operations and decommissioning

For the criteria “cost of construction, operations and decommissioning” only one indicator was used to evaluate each alternative access route: “order of magnitude costs”.

Indicator: Order of magnitude costs

Cost is an important measure when evaluating the viability of a construction access route. The cost breakdown is considered in three parts: upfront construction costs; operation costs; and decommissioning costs.

For the LWC Project, costs were established on the basis that a heavy duty industrial road will be established with a 9 m wide roadbed and an additional 3 m in the ROW to accommodate necessary fencing and protections. Differences in costs between routes are based on the specific technical challenges identified previously, such as bridge installations, geotechnical works, river realignments, and trail realignments. These costs do not include substantive soil remediation costs or archaeology, in the event that “significant heritage resources” are identified in the Stage 2 Assessments. Access routes that cost more are deemed less preferred.

At an estimated cost of approximately \$278,000 including contingencies, Route 3 is ranked most preferred. Costs may increase substantively, depending on any site specific remediation required for construction and decommissioning given the length of road overlying the municipal landfill soils.

At an estimated cost of approximately \$430,000, \$399,000, and \$402,000 including contingencies, respectively, routes 1, 2 and 3B are ranked moderately preferred.

- Route 1 involves substantive additional costs associated with geotechnical works, channel realignment works, and decommissioning costs.
- Route 2 and route 3 are essentially the same with substantive additional costs associated with the temporary realignment of the Waterfront Trail, and reestablishment of the Waterfront Trail following decommissioning of the access roads.

At an estimated cost of approximately \$479,000 including contingencies, Route 1B is ranked least preferred. This route has more of the substantive additional costs associated with the temporary Waterfront Trail realignment, and reestablishment of the Waterfront Trail as Routes 2 and 3B, but it also has the added costs associated with the need for a bridge crossing over Applewood Creek.

Summary of Access Route Evaluation for Cost Criterion and Indicator

Table 6.7 summarizes the access route evaluation for cost. Route 1B, with the highest combined construction and contingency cost is ranked as least preferred. Routes 1, 2 and 3B are ranked as moderately preferred. Route 3 is ranked as most preferred as the least cost route.

Table 6.7 Summary Access Route Evaluation for Cost

Environmental Component	Criteria	Route 1	Route 1B	Route 2	Route 3	Route 3B
Cost	Cost of construction, operations and decommissioning	Moderately Preferred	Least Preferred	Moderately Preferred	Most Preferred	Moderately Preferred
SUMMARY		MODERATELY PREFERRED	LEAST PREFERRED	MODERATELY PREFERRED	MOST PREFERRED	MODERATELY PREFERRED

6.3.3.6 Summary of Access Route Evaluation

Based on the summary rankings for natural environment, social environment, cultural environment, technical/engineering and cost, route 2 of the alternative routes is deemed the most preferred access route for the LWC Project (see Table 6.8). Route 2 is the only option that is only ranked least preferred for one component (cultural environment) and most preferred for three components (natural environment, social environment and technical/engineering). Route 2 also represents a middle value for cost.

Table 6.8 Overall Summary of Access Route Evaluation by Component

Environmental Component	Route 1	Route 1B	Route 2	Route 3	Route 3B
Natural Environment	Least Preferred	Moderately Preferred	Most Preferred	Least Preferred	Most Preferred
Social Environment	Most Preferred	Moderately Preferred	Most Preferred	Least Preferred	Least Preferred
Cultural Environment	Most Preferred	Least Preferred	Least Preferred	Most Preferred	Least Preferred
Technical/Engineering	Least Preferred	Least Preferred	Most Preferred	Moderately Preferred	Most Preferred
Cost	Moderately Preferred	Least Preferred	Moderately Preferred	Most Preferred	Moderately Preferred
SUMMARY	MODERATELY PREFERRED	LEAST PREFERRED	MOST PREFERRED	MODERATELY PREFERRED	MODERATELY PREFERRED

6.4 PHASING PLAN AND CONSTRUCTION STEPS

The phasing plan for constructing the Preferred Alternative consists of two build-out scenarios as identified below. If the OPG waterlots are available at the commencement of construction, the entire footprint would be developed according to Build-out Scenario 1. If the OPG waterlots are not available at the commencement of construction, Build-out Scenario 2 would be implemented. Stages 3 and 4 in Build-out Scenario 2 would only commence if OPG waterlots became available

following Stages 1 and 2. There would be no difference in potential effects with either build-out scenario. The two build-out scenarios are outlined below:

Build-out Scenario 1 – OPG Waterlot Available at Commencement of Construction

Stage 1 – Land creation through establishment of 5 construction cells (depending on fill supply) filled sequentially connecting to the OPG pier.

Stage 2 – Park development on entire footprint connecting to the OPG pier.

Build-out Scenario 2 – OPG Waterlot not Available at Commencement of Construction

Stage 1 – Land creation through establishment of 4 construction cells filled sequentially connecting to the existing shoreline north of the OPG waterlots.

Stage 2 – Park development tie off to existing shoreline north of the OPG waterlots.

Stage 3 – Land creation of the final cell connecting to the OPG pier (if the waterlot becomes available at a later date).

Stage 4 – Park development to the OPG pier.

Stage 1 for both phasing options will include the acquisition of the unpatented waterlots on the bed of Lake Ontario (Crown Land) or Crown Land Use Permits to access such lands. These permits are required to implement the construction of the land base and associated shoreline protection. Timing for this stage is dependent upon the availability of appropriate fill material, funding and approvals. Since it is anticipated that construction will occur over a period of 7-10 years, it is anticipated that shore protection works and subsequent filling activity would be done as a series of cells where a temporary berm would be installed for a cell and tied off to the existing shoreline. Filling and grading activity could occur within a completed cell concurrently with shore protection works for the next cell. It is likely that the entire footprint would involve construction of 4-5 individual cells constructed one after the other. Stage 2 will include park development, including trail construction, creek crossings, signage and landscaping.

Sections 6.4.1 and 6.4.2 below provide a detailed description of the Phasing Plan, including the relative timing of construction activities. Appendix C details standard construction techniques and associated mitigation measures. It should be noted that the actual construction of the LWC Project components may rely on different construction techniques and phasing than those described in the subsequent sections, provided that the effects on the environment are not worse than described.

6.4.1 Stage 1 – Land Creation

Upon receipt of all required approvals, construction access will be via proposed Route 2 described in Section 6.3 and shown on Figure 6.16. Temporary construction access will include

the installation of temporary granular base, perimeter fencing, tree protection, site drainage improvements and removal of select vegetation as required.

A laydown area will be constructed at the site entrance near Lakeshore Road and will include a site trailer and appropriate parking for site workers and visitors.

Heavy construction equipment such as track loaders, dozers loaders, dozers and excavators will be left on site on site in their respective work locations at the end of each working day. Equipment will be fuelled on-site. Setbacks from sensitive habitats and natural hazard areas will be implemented. Appropriate setbacks will be determined through discussion with applicable agencies at detailed design. An emergency spill response plan will be developed and spill kits will be available on-site in case of any spills or leaks.

A portion of the existing shoreline protection will be removed to facilitate site filling activities. The bulk of the majority of material removed will be re-used in construction of the final shoreline protection. The lakefill process will begin with the construction of a confining dyke, progressing in a westerly direction from the construction access road on the east side of Applewood Creek towards the Ontario Power Generation's Lakeview piers.

Applewood Creek will be extended out into Lake Ontario by creating a temporary channel and lining both sides with inert material such as brick rubble, concrete or purchased aggregate. Appropriate sized culverts will be installed in the confining dyke structure in order to accommodate flows from Applewood Creek into Lake Ontario for the duration of the project. As the project nears completion, the final configuration for Applewood Creek will be constructed within the new lakefill and the temporary channel and culverts removed. If possible, the final configuration for Applewood Creek may be established prior to the end of construction; options will be explored during detailed design.

A laydown area will be constructed west of the temporary Applewood Creek channel and will accommodate trailers, staff and visitor parking.

The confining dyke may be made up of both purchased aggregate and/or clean, large broken concrete, brick and block rubble. As portions of the confining dyke are completed, and closed off to the open water, suitable earth fill material will be placed inside the dyke or cell to allow the operation to continue year round.

As the outer dyke nears both the Serson Creek baseflow culvert outlet and the Serson Creek overflow channel, a confining structure made up of inert material (brick rubble, concrete and rip rap) will be used to create a channel to extend flows out to Lake Ontario. Appropriate sized

culverts will be used to convey flows through the dyke and allow vehicles to cross and continue the outer core construction.

Interim drainage controls will be implemented as the lakefill progresses, which will include extending existing outfall and culvert pipes where necessary. Sediment control measures will be implemented as required to prevent overflows from eroding the newly filled areas. Final armouring of the shoreline will be completed in phases while lakefilling occurs within the confined portions of the dyke. The islands will be constructed after the initial land base is created. All in-water work will be completed between July 1st and March 31st in order to comply with outside the warm water fisheries regulations.

As the availability of suitable concrete rubble is often difficult to predict, construction phasing options allows some flexibility. The general economic climate, competition from concrete recycling operations, hauling distances and lack of road construction during the winter months all impact the potential supply of suitable concrete rubble and earth fill.

All disturbed areas will be temporarily stabilized as is feasible during on-going construction activities until final site restoration can be completed. Where possible, during detailed design opportunities for progressive rehabilitation will be explored. In addition, all construction debris, mud tracking etc. will be collected and removed from the site and adjacent roadways on an on-going basis and in a timely fashion.

It is anticipated that the majority of the fill volumes will be obtained from various Region of Peel, City of Mississauga and other public agency infrastructure projects and local private sources.

Equipment to be utilized for construction includes; track-mounted backhoe, loader, crane, dozer and off road trucks. All fuelling and equipment maintenance will be done at a safe distance from the water course to ensure that no deleterious substances enter the waterway.

6.4.2 Stage 2 – Park Development

This phase of the LWC Project will include the construction of park features. This includes a waterfront trail, landscaping, interpretive sign installation, pedestrian bridges, wetland feature and forest buffer.