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5. Description, Evaluation and Rationale for 'Alternative Methods' of Carrying Out the Undertaking

'Alternative Methods' are different ways of doing the same activity or, in other words, functionally similar ways of implementing or designing the river mouth or discharge points described at the end of **Chapter 4**.

For the purposes of the EA, the 'Alternative Methods' were identified by layering different forms and features required to create the functions of a natural river mouth for each of the discharge points identified in **Chapter 4** (alternative discharge points 2, 3 and 4). The identification of different 'Alternative Methods' gave prime consideration to the characteristics of the river and the ability to fulfill the naturalization and flood protection objectives in the context of the river conditions. Other project objectives were addressed as subsequent refinements or layers applied to the 'Alternative Methods'. Additionally, the 'Alternative Methods' took into account the design elements from the winning Design Competition team.

Scenarios for the naturalization of the Don River mouth could be endlessly diverse. All scenarios are a combination of river mouth forms and features to create river mouth functions.

- ***Forms*** refer to the shape, size, and physical setting (in terms of soils, physiography, subsurface geology, topography, river channel width, and water depth).
- ***Features*** refer to components that are characteristic of a natural area (e.g., species of wildlife, plants and vegetation communities, etc.).
- ***Functions*** are processes, products or services that are created by combining forms and features (e.g., wildlife habitat, sediment storage, flood conveyance). The upstream reaches of the river and the watershed, the shoreline uses, and the lake also influence the river mouth and its functions. Some desirable river mouth functions are:
    a) Sediment storage / transport;
    b) Linkages with upstream / downstream;
    c) Flood conveyance;
    d) Aquatic / terrestrial habitat (reproduction, nursery, feeding, refuge);
    e) Nutrient / energy storage and export;
    f) Biomass export (forage fish, sport fish, birds); and,
    g) Debris capture.

The identification and evaluation of the different 'Alternative Methods' was carried out in a five-step process illustrated and described in **Figure 5-1**. This process can be thought of as layering of information to develop a comprehensive alternative method. As the identification and evaluation progressed, the level of detail in the data used increased proportionally.

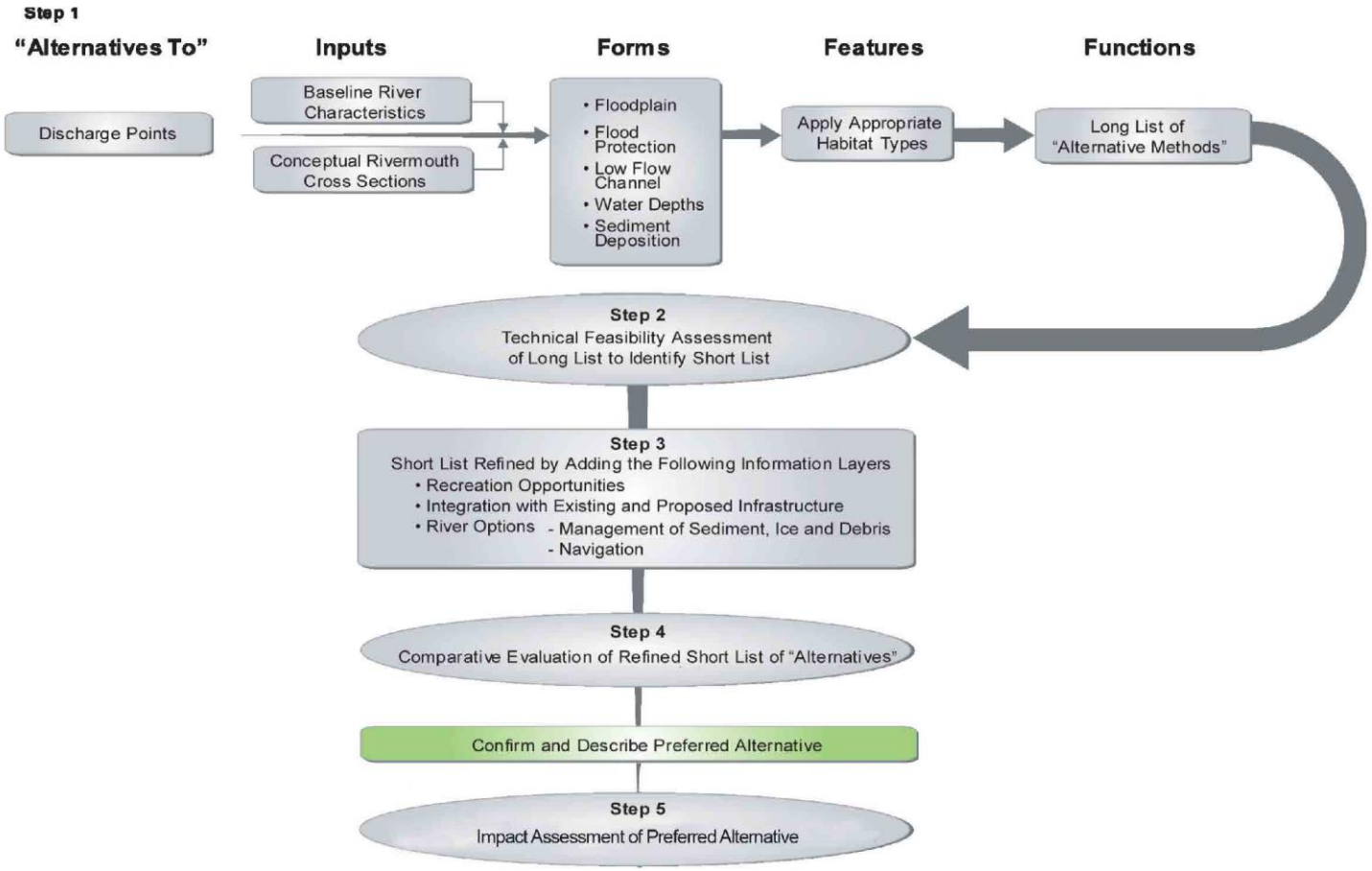


Figure 5-1 The Identification and Evaluation of 'Alternative Methods'

The results of the Design Competition (see **Section 2.2.3.2**) were made known before Step 4 was completed. This necessitated a re-evaluation of Steps 1 to 4 in order to incorporate the competition results into the assessment including the addition of a new alternative. These changes are summarized below, and described in more detail in **Section 5.3.2**.

The following sections provide a general description of the five-step process used for evaluating the 'Alternative Methods', followed by the results of this evaluation (Steps 1 to 4, **Sections 5.1** to **5.4**), culminating in a final, Preferred Alternative for the DMNP. This Preferred Alternative is then refined and evaluated in Step 5 (**Chapters 6** and **7**).

Following direction from Toronto City Council, a number of the short-listed alternatives were re-examined as part of the PLAI process (see **Section 2.2.3.3**). The findings from the PLAI were incorporated into the design of the preferred alternative that resulted from Step 4. This is further described in **Section 5.5**.

Step 1: Development of Long List of Alternatives

This step involved identifying forms and features which combine to deliver individual functions that meet the naturalization and flood protection objectives for the DMNP. For the purposes of the assessment, each alternative method generally consisted of three elements:

- A discharge point (**form**), as defined in **Chapter 4**;
- A cross-section (**form**); and,
- A habitat or vegetation community (**feature**).

The methodology to determine these elements and establish the long list of 'Alternative Methods' involved:

1. Defining the characteristics of the river mouth;
2. Identifying generic cross-sections and vegetation communities using forms and features from reference sites;
3. Determining the conditions of survival for the vegetation communities; and,
4. Combining the cross-sections and vegetation communities with the discharge points to create 'Alternative Methods'.

No revision of Step 1 was necessary following the Design Competition.

The long list of 'Alternative Methods' thus included all combinations of discharge points, cross-sections and vegetation communities, with the hydraulic characteristics determined through modelling scenarios. These 'Alternative Methods' were advanced to Step 2.

Step 2: Technical Feasibility Assessment of Long List

This long list of different 'Alternative Methods' was subjected to a technical feasibility assessment to identify the alternatives that had the greatest ability to meet the naturalization and flood protection objectives of the project. This ensured that the project planning was focused on the alternatives with the highest potential to meet the project goal and objectives.

Feasibility assessment criteria were developed to address the ability of each alternative to achieve the naturalization and flood protection objectives given the existing and future river characteristics. Following the Design Competition, these criteria were revisited and revised which is discussed in greater detail in **Section 5.3.2**.

The 'Alternative Methods' that remained following this step formed the short list and were subject to further refinement in Step 3.

Step 3: Refinement of Short List

The remaining short list of 'Alternative Methods' was refined and developed in more detail in order to address the other project objectives. The short list of 'Alternative Methods' developed in Step 2:

a) Was refined based on the results of the technical feasibility assessment;
b) Addressed issues related to operational management;
c) Addressed issues related to existing infrastructure replacement, relocation or abandonment;
d) Addressed opportunities to influence planned infrastructure and uses through other EAs/ planning processes underway such that the DMNP is improved to the extent possible;
e) Identified opportunities for recreation; and,
f) Identified opportunities to enhance cultural and heritage resources.

Key issues that were revised based on the Design Competition concepts and are expanded upon in **Section 5.3.2** include:

- Area available for naturalization;
- Composition and optimization of naturalized areas;
- Area available for development and parkland;
- Location of infrastructure; and,
- Location of flood protection features.

The output of Step 3 was a revised and refined set of alternatives to be assessed as part of Step 4. These alternatives reflected the original objectives of the DMNP, as well as the changes brought to the EA process as a result of the Design Competition.

Step 4: Evaluation of Short List Alternatives

A formal evaluation method was used to establish an order of preference between alternatives. The method used evaluation criteria and indicators to structure information and facilitate the comparison of alternatives against each other. The evaluation criteria and indicators were developed to reflect project objectives and refined through public and agency consultation.

Following the results of the Design Competition, the evaluation criteria previously developed for this Step were simplified and revised. Key changes to the evaluation criteria reflected the following issues:

- Revised study area and alternatives;
- Greater integration with built form;
- Incorporation of active recreation components formerly associated with Commissioners Park[1];
- Revised approach to consideration of effects on infrastructure; and,
- Naturalization optimization including both wetland and terrestrial opportunities.

Further, the Study Team recommended that the width of the floodplain for all alternatives be further refined during this Step by accounting for the roughness coefficient of the proposed vegetation communities. Similarly, it was pointed out that there might be opportunities during this Step to examine whether adding fill to the developable area for the remaining original EA alternatives would reduce the width of the floodplain further. These changes are further described in **Section 5.4**.

The outcome of Step 4 was the identification and selection of a preferred alternative.

1. The park was envisioned to include active recreation components such as four regional sports fields, and bike/pedestrian paths.

Step 5: Evaluation and Refinement of Preferred Alternative

The final step of the evaluation of alternatives involved five distinct tasks:

1. The identification and resolution of stakeholder issues associated with the Step 4 analysis;
2. Confirmatory studies with respect to hydraulics and sediment management through the river, management of contaminated soil and groundwater, and risk analysis of encroachment on the shipping lane in the Inner Harbour;
3. Development of a conceptual design to refine the preferred alternative (see **Section 5.4**) and add detail to the design;
4. Detailed effects assessment and identification of mitigative measures; and,
5. Development of the Monitoring and Impact Management Plan.

The results of Steps 1 to 4 of the five-step process to determine a preferred alternative are presented in the following sections. Step 5 is presented in **Chapters 6** and **7**.

5.1 Step 1: Develop Long List of Alternatives

The methodology for developing a long list of 'Alternative Methods' involved:

1. Defining the characteristics of the river mouth;
2. Identifying generic cross-sections and vegetation communities using forms and features from reference sites;
3. Determining the conditions of survival for the vegetation communities; and,
4. Combining the cross-sections and vegetation communities with the discharge points to create 'Alternative Methods'.

These tasks are described in detail below.

5.1.1 *What are the Characteristics of the River Mouth?*

The starting point for the development of different conceptual alternatives is an understanding of the characteristics of the river and its sediment transport regime (i.e., the quantity of sediment being transported). This section builds on the baseline characteristics of the river described in **Section 3.1** to show how that information influenced the development of alternatives. The characteristics described here include the:

- Flow rate during normal conditions and flood conditions for frequencies up to and including the regional storm events;
- Water quality; and,
- Sediment quantity.

These river characteristics were the basis or first layer on which the 'Alternative Methods' were created. These river characteristics experience a normal range of fluctuation due to weather and seasonal variations. However, they are also subject to change over time in response to changes in the watershed and changes to the environment, such as climate change.

River characteristics are considered from two different perspectives. First, alternatives must be designed for extreme conditions, being the conveyance of the regulatory flood (1,700 cubic metres per second). Second, there must be an understanding of day-to-day conditions and how those conditions influence the ability of ecological communities to get established and thrive. Thus, river characteristics are described with respect to extreme flooding events and day-to-day conditions, as well as their ability to adapt and function sustainably to changes within the watershed and climate.

5.1.1.1 Flow Rate

Intense, widespread precipitation can produce sudden and drastic changes in discharge, particularly in a watershed as urbanized as the Don River. In fact, even relative minor rainfall events can result in significant and rapid changes in discharge throughout the Don River. As can been seen from **Figure 5-2**, any particular alternative at the mouth of the Don River must be able to accommodate a wide range of discharges within a relatively narrow area, while at the same time providing for naturalized, functional and sustainable habitat. The normal flow conditions at the mouth of the Don ranges from 3 to 5 cubic metres per second and represents the flow condition that occurs the majority of time throughout the year.

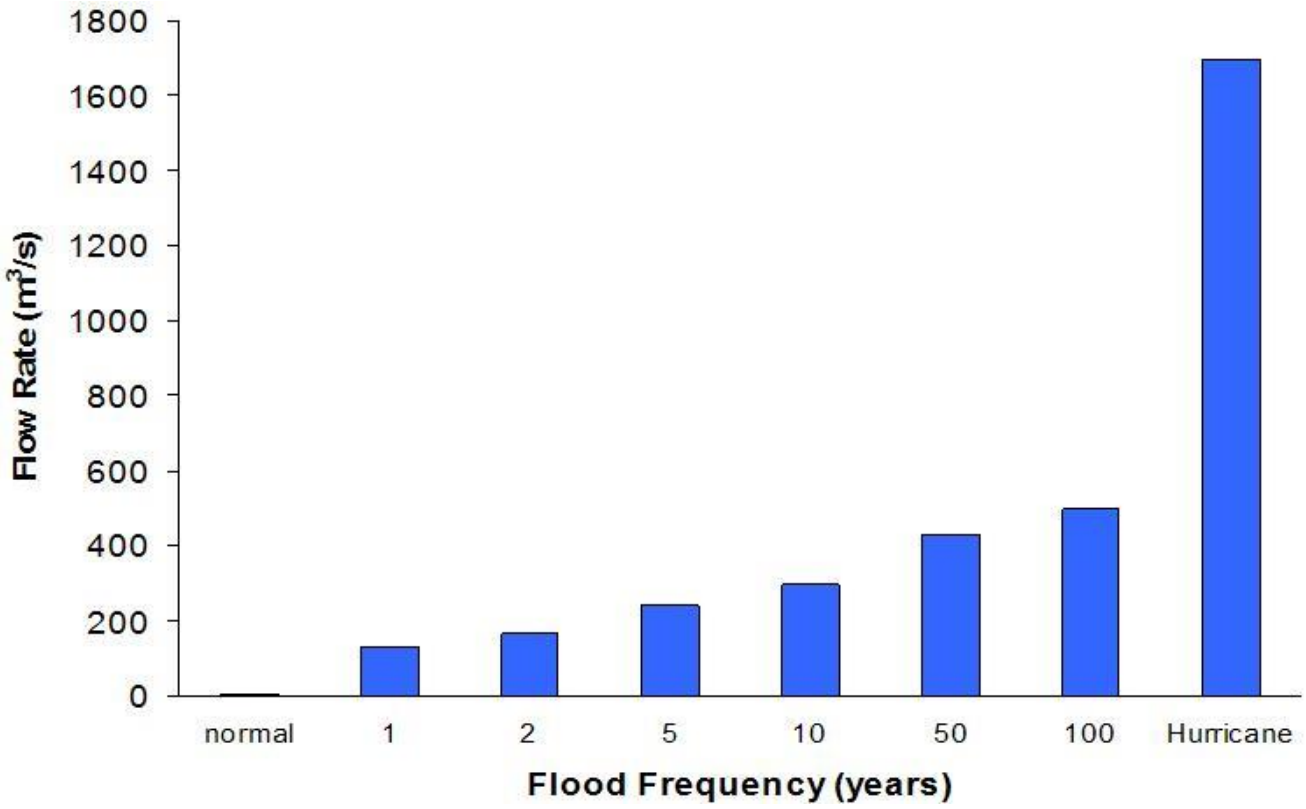


Figure 5-2 Flow Rates during Flood Events

The naturalized mouth of the Don must be designed such that the ecological conditions are sustainable under the normal range of flow conditions, and be able to survive flood events up to the 25 to 50 year event, and ultimately, be able to convey very large floods safely into the Inner Harbour up to Regulatory storm (i.e., 1,700 cubic metres per second).

Equally important to the characteristics of the river mouth is an understanding of the fixed constraints in the Project Study Area. At this stage of the analysis, there is one critical constraint that must be addressed: the flood elevation on the downstream side of the CN Rail bridge which cannot be exceeded (78.7 metres above sea level (mASL)). This elevation is set to ensure the function of upstream flood protection works and the permanent nature of the CN Rail bridge (see **Figure 5-3**). Flood protection south of the elevated railway bridge cannot be provided simply by raising the grades around the existing river. Raising the grades would cause water levels to rise upstream, potentially overtopping of the Flood Protection Landform in the West Don lands and / or the CN railway embankment. Given these constraints, solutions south of the elevated tracks must work to lower upstream water levels. This would likely require a combination of lowering and widening the valley in addition to potentially adding some minor fill to create the new containing valley feature.

Figure 5-3 Location of CN Rail Bridge in the Project Study Area

5.1.1.2 Water Quality

For the purpose of screening alternatives, the Study Team examined water quality from the perspective of its effect on naturalization. Light availability has the greatest influence on the establishment, maintenance and diversity of aquatic vegetation (both floating and submerged) (Hudon *et al.,* 2000). Light availability varies with total suspended solids (TSS), water colour (which can vary independently of TSS), and water depth. Based on data collected by Gartner Lee Limited (GLL) in 2006 and secondary data from the Ministry of the Environment (MOE) from 2000 (GLL and SENES, 2007), light availability and turbidity in the Don River will limit the vegetation communities to those that can survive in shallow water (less than 0.5 metres depth) as there is too little light reaching greater depths.

The concentration of suspended sediment can affect plant growth by inhibiting light penetration through the water column, limiting seed germination in the river bed and inhibiting submergent plants from photosynthesizing. Concentrations of suspended sediment above 20 milligrams per litre impede plant growth.

Above baseflow conditions exist on average approximately 100 days a year in the Project Study Area. As discharge increases above baseflow conditions, so does the capacity of the water to transport suspended sediments and as such, concentrations of suspended sediments increase (50 to 500 milligrams per litre). As the overall suspended sediment load increases, the proportion of clay relative to sand and silt decreases. The 90-degree corner at the mouth of the Keating Channel, combined with the significant increase in depth and width of the Channel, results in an immediate and significant decrease in sediment transport capacity that settles out the sand and coarser silts in the Keating Channel. As a result of this self-sorting process, the constituent sediment grain sizes at the mouth of the Keating Channel are the fine silts and clays. It is estimated that approximately 5,000 tonnes per year of clay and 1,000 tonnes per year of fine silt are not currently trapped in the Keating Channel and remain in suspension. The Keating Channel is a very efficient sediment trap for coarse silt and sands. It is anticipated that any sediment management solution will not be as effective as the Keating Channel, and as such, any naturalization solution must be sustainable given the residual suspended sediment loads.

5.1.2 *What Generic Cross-sections (Forms) and Vegetation Communities (Features) are Appropriate for the DMNP?*

5.1.2.1 Description of Generic Cross-Sections

Forms and features were identified that could work with the river characteristics to create river mouth functions. Given the diversity of river mouth forms and features, 'reference sites' for river mouth and near shore river environments in the Great Lakes-St. Lawrence basin, south of the Canadian Shield, were identified to provide inspiration for naturalizing the Don Mouth. These reference sites represented broadly defined assemblages of forms and features which create functioning river mouths.

As shown in **Table 5-1**, this methodology led to the development of three different generic cross-sections for the ToR that could be considered individually throughout the length of the river mouth or in combination with other concepts in different reaches of the river mouth. The three cross-sections are:

1. A natural river channel (R);
2. A created wetland river channel / floodplain with riparian vegetation (CW); and,
3. A lacustrine environment with associated wetland (L).

Table 5-1 Generic Cross-Sections

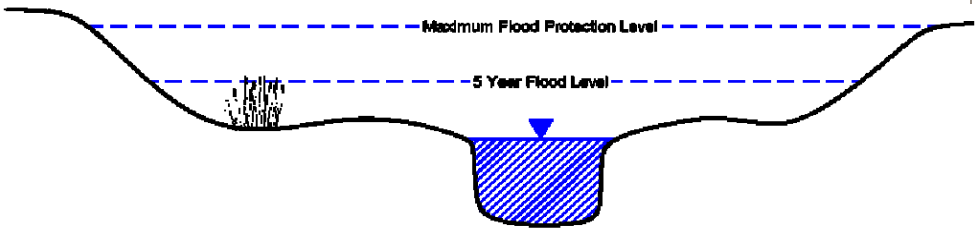
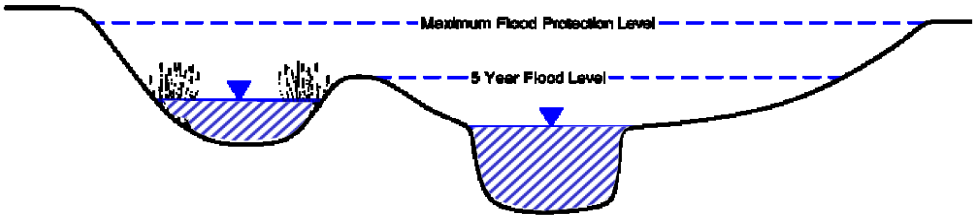
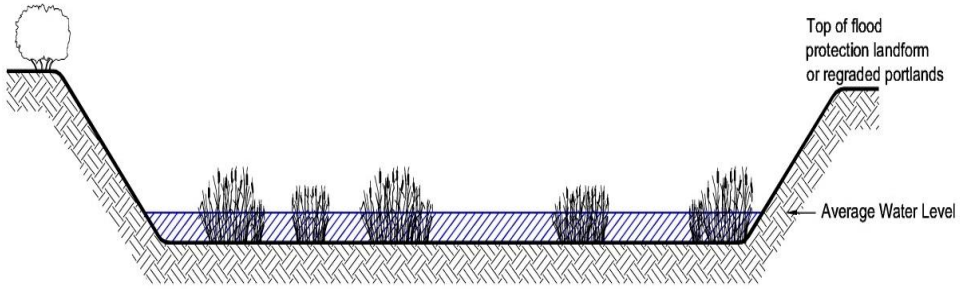
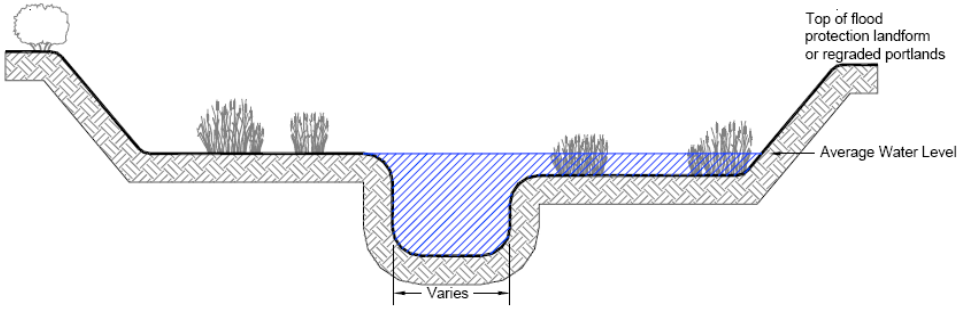
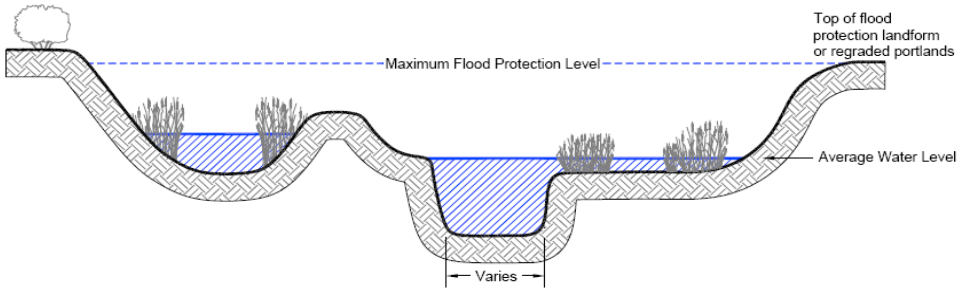
Name and Description	Illustration
Natural River Channel (R) • The ***natural river channel (R) concept form*** allows riparian vegetation to be fully exposed and connected to the water and sediment load from the Don River depending on flow and lake level. The channel will flood periodically, resulting in water within the floodplain at or below the soil surface, providing for both aerobic and anaerobic conditions. • Based on preliminary hydraulic modelling for Alternatives 2 and 3, a natural river channel configuration would require a channel approximately 80 metre wide and a total floodplain width of 300 metres (including the river channel) to be able to convey the Regulatory Flood. Under such a scenario, the channel would be required to be several metres deep and flooding would not overtop the riverbank until approximately the 10-year flood event. • The preliminary hydraulic modelling for Alternatives 4S and 4W suggest that such a natural river channel configuration would only require a channel approximately 30 metres wide combined with up to a 300 metre wide primary floodplain and 300 metre wide spillway to convey the Regulatory Flood. Modelling suggests that waters would overtop the low flow channel banks under this scenario with a frequency of approximately once every two to five years.	
Created Wetland (CW) • The ***created wetland (CW) concept form*** builds upon the ***natural river channel (R) concept form.*** In addition to a river channel, it provides a wetland that is separated from the main flow of the river much of the time. The natural river channel carries all of the flow during low flow conditions. The wetland is designed so that it is flooded periodically, thereby allowing certain plant species to grow. This concept provides the ability to manage carp and other invasive species from the wetland as desired. • The width of the natural river channel within the CW cross-section is identical to the R cross-section.	

Table 5-1 Generic Cross-Sections

Name and Description	Illustration
Lacustrine Environment (L) • The ***lacustrine environment (L) concept form*** is like a lake in its shape, thereby allowing the flow to spread across the entire channel. The depth of water level will vary based on lake levels. The channel will always be flooded because the bottom of the channel will remain lower than the anticipated low lake level conditions. Thus, vegetation will be dependent on the average water level in Lake Ontario (the Keating Channel, which is too deep for vegetation, is an extreme example of this concept). Sediment deposition will diffuse throughout the channel. This environment only promotes anaerobic conditions.	
Lacustrine / Natural River (L/R) • The combination of a ***lacustrine environment (L) concept form*** with a ***natural river (R) channel*** provides a section of the floodplain (river channel and lacustrine areas) that is always flooded while the remainder of the floodplain will flood with a frequency dependent on the hydraulic capacity of the river and lacustrine sections. Like the natural river channel, this cross-section provides for both aerobic and anaerobic conditions.	
Lacustrine / Created Wetland (L/CW) • The combination of ***lacustrine environment (L)*** and ***created wetland (CW)*** concept forms separates the created wetland from the main flow in the lacustrine channel section much of the time. The lacustrine channel carries all of the flow during low flow conditions. Conditions can vary from primarily anaerobic to a combination of aerobic and anaerobic, depending on the type of offline wetlands that are created.	

The Study Team determined that two other cross-sections should be considered based on the combination of the generic cross-sections. These new cross-sections represent river mouth forms not captured by the three original cross-sections which may provide advantages particularly in meeting the naturalization objective. Two hybrid cross-sections were created:

1. Lacustrine and natural river (L/R); and,
2. Lacustrine and created wetland (L/CW).

More detailed descriptions of the five cross-sections are provided in **Table 5-1**.

As depicted in **Figure 5-4**, there is no combination of the created wetland and natural river forms because the created wetland cross-section already includes a river channel.

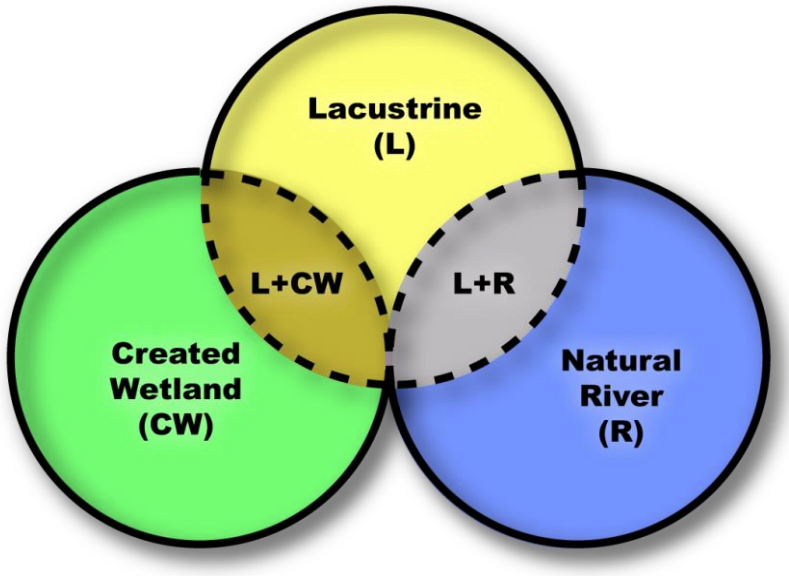


Figure 5-4 Venn Diagram Showing Combinations of Cross-sections

The shape or geometry of the river mouth cross-section greatly influences the velocities that are experienced, which in turn influences erosion (areas of high flow velocity), deposition (areas of low flow velocity) and the establishment and maintenance of particular plant communities. For the same volume, very wide, flat cross-sections (i.e., lacustrine) will produce relatively uniform shallow depths with low to moderate flow velocities. A cross-section with increased topographic and bathymetric complexity and significant planform variation will have a much more complex depth and flow velocity distribution.

The difference between these cross-section geometries becomes most noticeable when comparing day-to-day flow conditions (five cubic metres per second) to Regulatory Flood conditions (1,700 cubic metres per second). Day-to-day flows in the lacustrine channel will have a very wide water surface with very shallow depths whereas the same flows will be contained within the main channel of the natural river cross-section. Backwater effects produced by Lake Ontario will produce significant impacts on the depth and flow velocity conditions and sustainability of desired vegetation communities for each of the alternatives.

Typically, natural river systems are defined by two physical components. First, a low flow channel with a defined bed and banks conveys the normal low flows and contains runoff from the more frequent runoff events with return

frequencies typically in the range of 1.5 to 2 years or a 50 to 70 percent risk of occurrence in any given year. Second, an overbank area with confining valley walls allows for higher flows that limit the extent of flooding below the top of the river valley. In low-lying non-confined areas which lack a valley feature, the floodplain may be very extensive (such as is currently experienced at the mouth of the Don). Since the second project objective requires the project to greatly reduce the extent of flooding in the area surrounding the mouth of the Don, each viable alternative must have a channel and floodplain system that can contain floods up to and including the Regulatory Flood.

5.1.2.2 Description of Habitat (Vegetation Communities)

Vegetation communities that were considered based on reference sites typical to natural river mouths along the north shore of Lake Ontario are: upland forest and / or thicket; treed swamp; thicket swamp; meadow marsh; emergent marsh; and submergent marsh. A generic description of these vegetation communities, along with the corresponding Ecological Land Classification and photographs, is provided in **Table 5-2.**

Table 5-2 Vegetation Communities

Name and Description	Photograph
Submergent Marsh (SAS) *A wetland that is permanently flooded and dominated by herbaceous aquatic plants that are rooted or free floating or a combination of the two*	
Emergent Marsh (MAS) *A wetland that is permanently flooded and dominated by grasses and broadleaved flowering plants with less than 25% woody species*	

Table 5-2 Vegetation Communities

Name and Description	Photograph
Meadow Marsh (MAM) *A wetland that is seasonally flooded and dominated by grasses and broadleaved flowering plants with less than 25% woody species*	
Thicket Swamp (SWT) *Wetlands that are flooded in the spring and dry out by August but are dominated by shrubby species with tree cover absent or up to 60% closure*	
Treed Swamp (SWD / SWC / SWM) *Treed areas of wetland (more than 60% canopy closure) that are flooded in the spring and dry out by August*	

Table 5-2 Vegetation Communities

Name and Description	Photograph
Upland Forest (FOD / FOC / FOM) *Trees with shrubby understorey which are typical of the Great Lakes-St. Lawrence Forest Region*	

5.1.3 *What are the Conditions for Survival of the Vegetation Communities?*

Wetland and aquatic vegetation communities vary in composition and productivity given differences in hydrology (e.g., mean water depth in mid-summer, number of days flooded during the growing season), light and nutrient availability and disturbance (e.g., wave action, currents, ice scour, sediments, dredging, debris, deposition), which in turn reflect elevation, topography, water sources and soils. Differences in the amount and timing of flooding, nutrients, and physical disturbances produce different assemblages of plants. The most diverse wetland and aquatic ecosystems occur where these conditions vary greatly. For example:

- *Hydraulically stable, nutrient-rich and undisturbed conditions favour the establishment of highly productive, low diversity communities, dominated by a few species of highly competitive, perennial plants.*
- *Areas with moderate levels of water level fluctuations, nutrients and disturbance tend to produce communities with lower levels of productivity, but the highest levels of biodiversity.*
- *Areas with either low levels of fertility or high levels of disturbance and water level fluctuations generally support sparse vegetation communities, although paradoxically, they often provide refuge from competition for uncommon or rare species.*
- *Areas with both low levels of fertility and high levels of disturbance tend to remain un-vegetated, except by the hardiest plants.*

In the context of the DMNP, the following guidelines provide an ecologically sound basis for an initial screening of naturalization options. These guidelines are based primarily on research studies conducted on wetland and aquatic communities in the Great Lakes-St. Lawrence basin, in both degraded and relatively undisturbed communities.

Water Depth

Mean water depth in mid-summer and the number of days flooded during the growing season have the greatest influence on the establishment, maintenance and diversity of emergent vegetation (marsh and wetland meadow communities). Emergent vegetation (marsh or wet meadow communities) in the Great Lakes-St. Lawrence region generally occurs between an elevation of 40 centimetres above average mid-summer water levels and 100 centimetres below mid-summer water levels. The diversity of emergent vegetation communities will increase as the available range of elevation between plus (+) 40 centimetres and minus (-) 100 centimetres increases. At the mouth of the Don River, high turbidity and the resultant low light penetration will generally prevent the establishment and maintenance of vegetation communities lower than 50 centimetres below mid-summer water levels.

Exclusion of Woody Vegetation

Woody vegetation within the floodplain tends to interfere with flood conveyance. In flood modelling, this interference is represented by the roughness coefficient. Preliminary modelling suggests that the roughness coefficient for woody vegetation exceeds the maximum thresholds allowable in the flood conveyance channels under some of the naturalization and flood control alternatives. Woody emergent vegetation (trees and shrubs) typically does not tolerate flooding as well as non-woody vegetation. A study of river based wetlands along the Ottawa and St. Lawrence Rivers established a reliable threshold of 80 days or 45 percent of the growing season for flooding as the maximum tolerance level for woody vegetation.

Light Availability

As described in **Section 5.1.1.2**, light availability has the greatest influence on the establishment, maintenance and diversity of aquatic vegetation (both floating and submerged). Research in the Great Lakes-St. Lawrence basin has demonstrated that the maximum depth for aquatic vegetation depends upon the availability of light which, in turn, depends to a large extent on total suspended solids (TSS). Sampling showed that TSS levels at the upper end of the Keating Channel range between approximately 20 milligrams per litre and 80 milligrams per litre depending on the season and weather conditions. Preliminary modelling of suspended solids in the Don River and Keating Channel suggests that a TSS target of less than 20 milligrams per litre is probably unrealistic for the DMNP.

Disturbance

Exposure to disturbance (wave action, current, ice scour and ice plucking[2], sediments, dredging, debris, deposition) affects both emergent and aquatic vegetation. Wave action and water currents can disturb vegetation by:

- Causing physical destruction of plant tissue;
- Removing or depositing materials around plant roots; and,
- Altering the composition, texture and nutrient capacity of soils.

The impacts of wave action depend upon wave size and energy, which in turn depend upon the exposure of a site to the waves and the *fetch* (the total distance over which a wave can build in size and energy in response to wind). The impacts of water current depend upon water velocity and water depth. For the DMNP, it is not expected that wave action will play a significant role in determining the structure of wetland and aquatic communities because of the sheltered location of the river mouth within the Inner Harbour. Nonetheless, alternatives that discharge directly into the Inner Harbour will experience some wave action, as compared to those that discharge directly into the Ship Channel and are further sheltered.

Flow

Under most flow conditions, flows in the Don River are not expected to play a defining role in the day-to-day functioning of wetland or aquatic plant community occurrence or structure. The Don River has a very low gradient, and under most conditions the influence of Lake Ontario extends far up the system resulting in very low water velocities in the Lower Don River and the Keating Channel. Some of the alternatives for naturalization of the Don River could increase average water flow velocities. If so, an upper average water velocity limit of one metre per second for the establishment and maintenance of submerged aquatic vegetation is suggested. Flows above one metre per second tend to reduce plant growth and community productivity through direct damage to plant tissue, stimulation of plants to reallocate resources to root growth, and flattening of plant leaves to the bottom of the

2. *Where plants become imbedded in ice as water freezes, then water levels rise, lifting the ice and embedded plants from the ground.*

channel where they receive less light energy. Low water velocities generally do not provide a direct challenge to wetland and aquatic vegetation. However, for the DMNP, the potential exists for low water velocities to result in the deposition of fine sediments in sufficient quantities to bury or suffocate wetland and aquatic plants.

Dredging and Scouring by Debris and Ice

Dredging, scouring and plucking (by debris or ice) disturb vegetation by the direct destruction of plants and the removal of soil. In general, such disturbances prevent the establishment of perennial plants, but may permit the establishment of annual or biennial plants, depending upon the frequency and severity of disturbance. Some areas may not support any vegetation. Areas exposed to the main channel of the river will normally suffer the greatest frequency and severity of disturbance while more sheltered areas may suffer little or none.

The following table outlines the conditions under which the six vegetation communities under consideration can survive.

Table 5-3 Summary Table of Survival Conditions for Vegetation Communities

Habitat Types (ELC Vegetation Communities)	Secchi Depth	Depth of Water to Permit Plant Growth (50% Coverage)	Flooding Frequency Required	Roughness (Manning's) Coefficient	Susceptibility to Siltation
SAS Submergent Marsh	0.5	-40 to -20 cm	Permanent	0.04	High
MAS Emergent Marsh	0.5	-20 to 0 cm	Permanent to semi-permanent	0.04	Moderate
MAM Meadow Marsh	N/A	-10 to 10 cm	Seasonal	0.06	Moderate
SWT Thicket Swamp	N/A	-20 to 20 cm	Seasonal	0.06	Low
SW Treed Swamp	N/A	-50 to 40 cm	Annual	0.08	Low
FO Upland Forest	N/A	0 to 50 cm	Infrequent	0.12	Low

5.1.4 *What 'Alternative Methods' are Possible?*

5.1.4.1 Identifying 'Alternative Methods'

'Alternative Methods' were derived by combining discharge points (2, 3 and 4; **Table 4-5**) with cross-sections (L, CW, R, L/CW, L/R; **Section 5.1.2.1**) and then identifying compatible habitat types (SAS, MAS, MAM, SWT, SW, and FO; **Table 5-2**). Alternative 4 (two discharge points) was divided into two different alternatives, based on differing low flow locations. These were:

1. ***Alternative 4W:***
   Primary discharge to the Keating Channel and secondary discharge through the Port Lands to the Ship Channel

2. ***Alternative 4S:***
   Primary discharge through the Port Lands to the Ship Channel and secondary discharge to the Keating Channel

The framework for combining discharge points with cross-sections and habitat types is illustrated in **Figure 5-5**.

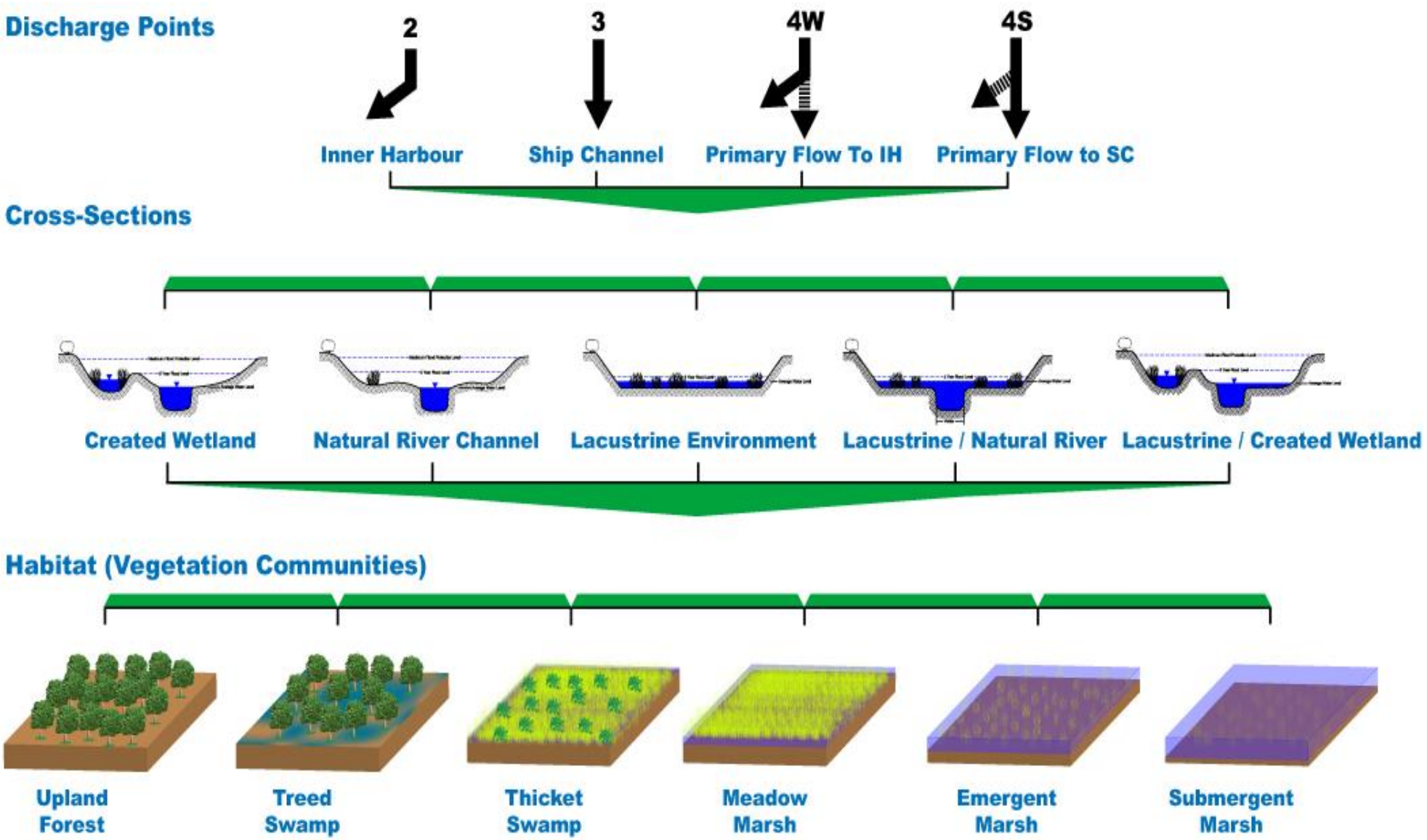


Figure 5-5 Framework for Developing the Long List of 'Alternative Methods'

The presence of an overflow spillway for discharge points 4W and 4S eliminates the need to design the primary channel for conveyance of the Regulatory Flood, which means that the primary channel can be designed for typical fluctuations rather than significant storm events. Conversely, 'Alternative Methods' for discharge points 2 and 3 must be designed to address both typical fluctuations and significant storm events.

For all of the 'Alternative Methods' associated with 4W and 4S, the overflow spillway will be designed to convey a minimum of a 10-year storm. To effectively convey the flood, the spillway will have a trapezoidal shape akin to the lacustrine cross-section. In order to optimize the use of land in the Port Lands, it has been indicated that the land associated with the overflow spillway could be available for a variety of upland habitat types (e.g., upland forest), along with other compatible uses (i.e., passive recreation) between flood events. There will be opportunities for additional naturalization closer to the lake based on lake levels.

Thus, the long list of 'Alternative Methods' includes all combinations of discharge points, cross-sections, and vegetation communities discussed in the sections above, with the hydraulic characteristics presented in **Table 5-3**. These 'Alternative Methods' are advanced to Step 2 for a screening of their technical feasibility with regards to the primary project objectives of flood protection and naturalization.

5.1.4.2 Modelling the 'Alternative Methods'

To determine the dimensions of each cross section, and the water elevation and water depth associated with the long list of 'Alternative Methods', a series of modelling scenarios were completed using Hydrologic Engineering Centres River Analysis System (HEC-RAS) software.

A number of assumptions were used during the modelling, which are listed below:

- All cross-sections, regardless of discharge point, are influenced by the average water elevation of Lake Ontario at the Inner Harbour (i.e., Cherry Street), which is 75.2 mASL (as of 2010). Thus, under low flow conditions, the average water level of the Don River for all cross-sections is equal to 75.2 mASL. This level can fluctuate by approximately one metre in either direction due to lake levels.
- The width of the low flow channel for the lacustrine (L) cross-section is equal to the width of the entire floodplain (i.e., 300 to 500 metres); therefore, any vegetation will be permanently submerged in water. Given that the overflow spillway associated with discharge points 4W and 4S is essentially lacustrine in cross-section, it has a width of 300 metres.
- The natural river (R) cross-section has a low flow channel with a width that ranges between 30 metres and 80 metres, depending on whether there is only one discharge point (2 and 3) or a primary channel and an overflow spillway (4W and 4S). The remainder of the cross-section width exists as floodplain.
- All remaining cross-sections have a low flow channel width identical to that of the natural river cross-section.
- The water depth of the wetland within the CW and L/CW cross-sections is independent of the water level associated with the primary channel and the remainder of the floodplain; therefore, the wetland can contain water during non-flooding conditions.
- The lacustrine portion of the L/R and L/CW cross-sections can be designed such that the water depth is suitable for vegetation other than the treed communities (i.e., SAS, MAS, MAM, SWT).

The results of the modelling are presented in **Table 5-4**, which includes the channel invert (the elevation of the channel bed), the average level water elevation, and frequency of overflow in the floodplain for the four discharge points.

Table 5-4 Hydraulic Modelling Results for the Discharge Points

Discharge Point	Location of Primary Channel	Channel Invert	Average Water Level[a]	Frequency of Overflow in Floodplain[b]
2	Cherry Street	71.2 mASL	4.0 m	Regulatory Flood
	Lake Shore Boulevard E.	72.2 mASL	3.0 m	Regulatory Flood
3	Lake Shore Boulevard E.	72.2 mASL	3.0 m	Regulatory Flood
	Commissioners Street	72.0 mASL	3.2 m	Regulatory Flood
4W	Cherry Street	71.2 mASL	4.0 m	100-year flood
	Lake Shore Boulevard E.	72.0 mASL	3.2 m	100-year flood
4S	Lake Shore Boulevard E.	72.8 mASL	2.4 m	100 year flood
	Commissioners Street	72.1 mASL	3.1 m	Between 10- and 100-year flood

Notes: a. Based on average lake levels of 75.2 mASL
b. Does not apply to L cross-section, which constantly has water within the floodplain

The results in Table 5.4 indicate that the average water depth within the primary channel would be too deep to support some of the submergent and emergent vegetation communities (which require a maximum of 0.5 m to permit plant growth; see **Table 5-3**). Furthermore, the floodplain floods too infrequently to support vegetation other than the treed communities for any cross-section that does not contain a hydraulically controlled wetland (e.g., created wetland).

5.1.4.3 Summary of Long List of Alternatives

The long list of 'Alternative Methods' thus includes all combinations of discharge points, cross-sections, and vegetation communities summarized in **Figure 5-5 and Table 5-3**, with the hydraulic characteristics presented in **Table 5-4**. These discharge point specific cross-sections ('Alternative Methods') include the widths and depths of the channels, water levels for various return storms, location of sediment deposition and maximum flood protection levels. These cross-sections are advanced to Step 2 for a screening of their technical feasibility with regards to the primary project objectives of flood protection and naturalization.

5.2 Step 2: Technical Feasibility Assessment of Long List

Following the development of the long list of 'Alternative Methods', each alternative was subjected to a technical feasibility assessment to identify the alternatives that had the greatest ability to meet the naturalization and flood protection objectives of the DMNP.

Feasibility assessment criteria were developed to address the ability of each alternative to achieve the naturalization and flood protection objectives given the existing and future river characteristics. Following the Design Competition, these criteria were revisited and revised in two areas (width of floodplain and width and shape of overflow spillway), as discussed in greater detail below.

The 'Alternative Methods' that remained following this step formed the short list and were subject to further refinement in Step 3.

5.2.1 *What are the Screening Criteria?*

Two screening criteria for the technical feasibility assessment were developed. These criteria reflect the primary project objectives of flood protection and naturalization.

Regarding flood protection, the criterion is: *Do the cross-sections contain and convey water volumes associated with the Regulatory Flood?* For naturalization, the criterion is: *Do the cross-sections meet requirements for plant growth?*

These are described in **Table 5-5** in greater detail below.

Table 5-5 Screening Criteria

Screening Criteria	Indicators	Measures	Rationale
Do the cross-sections contain and convey water volumes associated with Regulatory Flood?	Can the cross-section convey a flow rate of 1,700 m^3/s at a water elevation of 78.7 m downstream of the CN Rail bridge within the dimensions of the Project Study Area?	Regulatory Flood elevation of less than 78.7 m	Water elevations exceeding 78.7 m (Regulatory Flood) will not be contained, and water levels upstream of the bridge may overtop the Flood Protection Landform in the West Don Lands and railway embankment
		Width and depth of channel	Channel must fit within the dimensions of the Project Study Area
	Will the proposed vegetation communities impede the flow of water and raise the elevation above 78.7 m?	Roughness coefficient of less than 0.08 for the vegetation communities	Roughness coefficient equal to or greater than 0.08 will impede flow
Do the cross-sections meet requirements for plant growth?	Is the water elevation under low flow conditions too deep to support vegetation communities?	Water elevation / water depth less than 0.5 m (i.e., how far light will travel into the water column)	0.5 m is the maximum depth at which plants are likely to grow at the Don Mouth
	Does the cross-section expose sensitive vegetation communities (**Table 5-3**) to excessive siltation?	Vegetation communities are exposed to sediment deposition for the full growing season	The Don River carries high volumes of silt, clays and other sediments. Siltation effects will limit photosynthesis, impede germination and reduce rigour of the vegetation type

5.2.2 *What 'Alternative Methods' are Technically Feasible?*

Each alternative method, which is comprised of a discharge point, a cross-section, and a vegetation community, was assessed against the screening criteria above to determine its technical feasibility. The alternative methods that passed the screening were carried forward to Step 3 of the analysis (**Section 5.3**).

5.2.2.1 "Do Nothing" Alternative

As noted in **Section 2.1**, the "Do Nothing" alternative is not technically feasible since it does not provide for flood protection from the Regulatory Flood and the existing configuration of the Keating Channel does not permit the establishment of the naturalized community. Therefore, the "Do Nothing" alternative was not considered further.

5.2.2.2 Discharge Points 2 and 3

Flood Protection Screening Indicators

1. *Can the cross-section convey a flow rate of 1,700 cubic metres per second at a water elevation of 78.7 metres downstream of the CN Rail bridge within the dimensions of the Project Study Area?*

   All of the cross-sections for discharge points 2 and 3 can be designed to convey the Regulatory Flood at an elevation of 78.7 metres downstream of the CN Rail bridge within the dimensions of the Project Study Area. **Therefore, none of the alternatives are eliminated based on their inability to convey the Regulatory Flood.**

2. *Will the proposed vegetation communities impede the flow of water and raise the elevation above 78.7 metres?*

   The second indicator of flood protection is the roughness coefficient, or the measure of the roughness of a surface over which a liquid is flowing. All of the vegetation communities have a roughness coefficient of less than 0.08, except for treed swamp (SW) and upland forest (FO). The treed communities have a higher roughness coefficient compared to the other vegetation communities because of their larger surface area and rigidity, thereby impeding the flow of water. **Therefore, SW and FO are eliminated for all the cross-sections for discharge points 2 and 3 because they would not effectively convey water at the Regulatory Flood Event, based on the amount of available land for these alternatives**.

Naturalization Screening Indicators

1. *Is the water elevation under low flow conditions too deep to support vegetation communities?*

   The water depth of the lacustrine (L) cross-section during low flow conditions for all discharge points is between 2.4 and 4.0 metres. Because the low flow channel occupies the entire floodplain, all opportunities for naturalization must occur within the floodplain. At a water depth greater than 0.5 metres, plant growth will be highly impaired due to the turbidity of the water that inhibits light penetration. Therefore, **all the remaining vegetation communities associated with the L cross-section are eliminated for discharge points 2 and 3.**

   Similarly, the water depths within the primary channel of the natural river (R) cross-section for all discharge points are too deep to support wetland plant growth during low flow conditions. Conversely, the floodplain associated with the R cross-section is inundated with water only during the flood events greater than the 10-year flood, which occurs too infrequently to allow for the establishment of vegetation communities other than upland forests and carries too large a volume of water to maintain any vegetation communities. **Therefore**, **all the remaining vegetation communities associated with the R cross-section are eliminated for discharge points 2 and 3**.

   For the created wetlands (CW) cross-section, the frequency and extent of flooding will be managed for the offline wetlands to best suit the desired wetland communities (i.e., SAS, MAS, MAM and SW). Conversely, in order to convey the Regulatory Flood, treed swamp or upland forest cannot be viable alternatives for discharge points 2 and 3. **Therefore, the SW and FO vegetation communities are eliminated for the CW cross-section for discharge points 2 and 3.**

For the L/R cross-section, the lacustrine portion will have a water depth under low flow conditions that is shallow enough (i.e., less than 0.5 metres) to permit growth of wetland communities. However, it will be inundated with water during low flow conditions, thereby preventing growth of the treed communities. **Therefore, SW and FO are eliminated for the L/R cross-section for discharge points 2 and 3.** The same rationale applies to the L/CW cross-section. **Therefore, SW and FO are eliminated for the L/CW section for discharge points 2 and 3.**

2. *Does the cross-section expose sensitive vegetation communities to excessive siltation?*

As described above, all the vegetation communities associated with the L and R cross-section have been screened out for discharge points 2 and 3 through the application of the previous indicators; therefore, they are not considered further.

With regards to the CW and L/CW cross-sections, both contain a section of the floodplain (i.e., the created wetland feature) that is isolated from the low flow channel. As a result, during normal conditions, the vegetation communities within the created wetland will not be exposed to any siltation.

Similarly, the LR cross-section contains a section of the floodplain where the water depth is quite shallow compared to the low flow channel. It is anticipated that most of the silts will remain within the low flow channel under normal conditions, thereby minimizing the exposure of sensitive vegetation communities to excessive siltation. **Therefore, no vegetation communities associated with CW, L/CW, or L/R are eliminated due to excessive siltation.**

A summary of the application of screening criteria for discharge points 2 and 3 is shown in **Figure 5-6**.

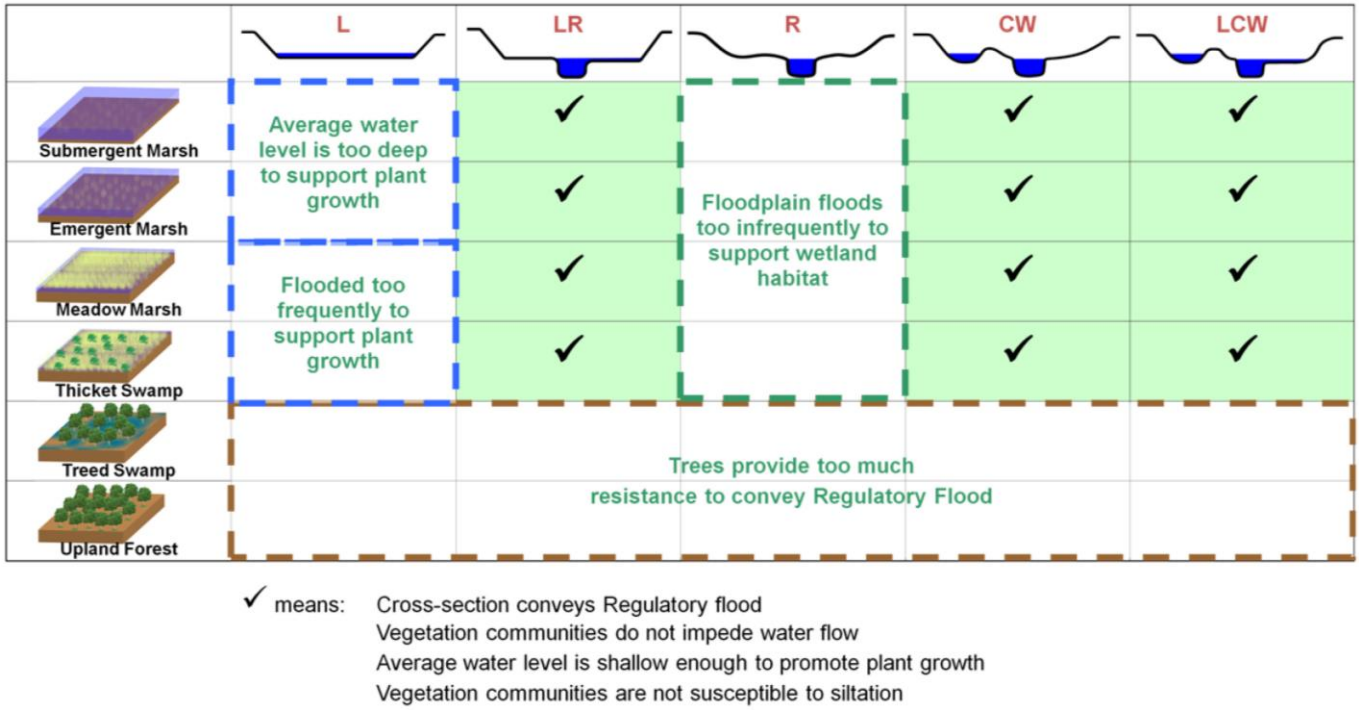


Figure 5-6 Screening of Cross-sections and Habitats for Discharge Points 2 and 3

5.2.2.3 Discharge Points 4W and 4S

Flood Protection Screening Indicators

1. *Can the cross-section convey a flow rate of 1,700 cubic metres per second at a water elevation of 78.7 metres downstream of the CN Rail bridge within the dimensions of the Project Study Area?*

   All of the cross-sections for discharge points 4W and 4S can be designed to convey the Regulatory Flood at an elevation of 78.7 metres downstream of the CN Rail bridge within the dimensions of the Project Study Area. As described previously, for discharge points 4W and 4S the flow during the Regulatory Flood would be conveyed through both the main river valley system and the overflow spillway. **Therefore, none of the alternatives associated with discharge points 4W and 4S are eliminated based on their inability to convey the Regulatory Flood.**

   Regarding the overflow spillway, only the lacustrine (L) cross-section is able to convey the Regulatory Flood while providing for other compatible uses (i.e., recreation opportunities) that could optimize the use of land in the Port Lands between flood events. **Therefore, all of the cross-sections except L are eliminated for the overflow spillway of discharge points 4W and 4S.**

2. *Will the proposed vegetation communities impede the flow of water and raise the elevation above 78.7 m*etres*?*

   The roughness coefficient associated with SW and FO is not relevant in the screening of discharge points 4W and 4S because the trees will not impede the flow of water in the primary channel. **Therefore, the roughness coefficient does not eliminate any habitat types associated with discharge points 4W and 4S.**

Naturalization Screening Indicators

1. *Is the water elevation under low flow conditions too deep to support vegetation communities?*

   For the primary channel associated with discharge points 4W and 4S, the depth of water and permanent inundation associated with the L cross-section do not support any of the vegetation communities except for submergent marsh (SAS). **Therefore, all the vegetation communities associated with L except for SAS are eliminated for the primary channel of 4W and 4S as they would not survive under low flow conditions.**

   For the remaining cross-sections, water levels under low flow conditions in areas outside the low flow channel will be sufficient to support all vegetation communities.

   Conversely, regarding the overflow spillway, there is too little water under normal conditions to support communities other than upland forest (FO). **Therefore, all of the vegetation communities except FO are eliminated for the overflow spillway associated with discharge points 4W and 4S.**

2. *Does the cross-section expose sensitive vegetation communities to excessive siltation?*

   The low flow rate and velocity under normal conditions associated with the L cross-section will result in the deposition of sediment. SAS is screened out due to siltation effects that will limit photosynthesis and reduce vigour of the vegetation type. **Therefore, all the vegetation communities associated with L are eliminated for the primary channel of 4W and 4S.**

   For the remaining cross-sections, vegetation communities outside the low flow channel will not be exposed to excessive siltation, as described above.

A summary of the application of screening criteria for the primary channel associated with 4W and 4S is shown in **Figure 5-7**. A summary of the screening criteria for the overflow channel is shown in **Figure 5-8.**

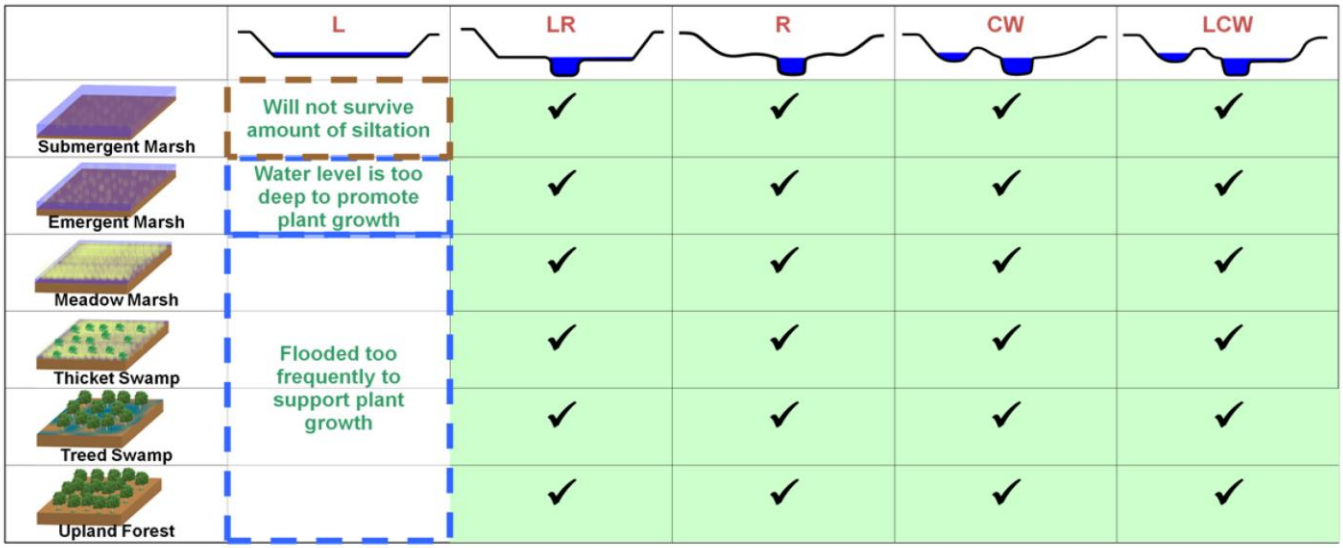


Figure 5-7 Screening of Cross-sections and Habitats for Discharge Points 4W and 4S (Primary Channel)

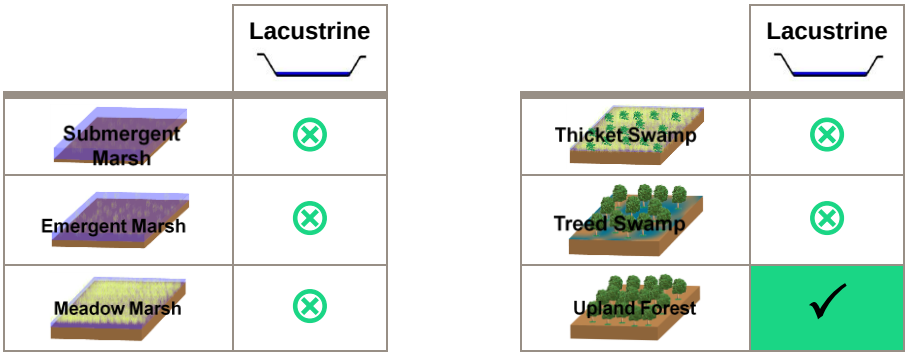


Figure 5-8. Screening of Cross-sections and Habitats for Discharge Points 4W and 4S (Overflow Spillway)

5.2.2.4 Dealing with Sedimentation

All combinations of discharge points 2, 3 and 4 with the L, L/R, R, CW and L/CW cross-sections were also evaluated in terms of sedimentation potential. Specifically, the evaluation examined whether sedimentation hindered the ability of the cross-sections to provide for flood protection (i.e., can the Regulatory Flood be conveyed given annual sedimentation?).

Based on modelling that simulated sedimentation, all of the combinations suffered the same sedimentation fate as the existing conditions. In other words, all of the sand and most of the silt carried by the Don River would be deposited within the channel, primarily in the upstream part of the channel. As presently occurs with the existing condition (i.e., the Keating Channel), the deposition of approximately 30,000 to 32,000 cubic metres of silt and sand each year (see **Table 3-5**) compromises the ability of the river valley system to convey flows associated with small and frequent flood events. In comparison, sedimentation would not pose a conveyance issue for the Regulatory Flood, as the force associated with this flood event is expected to move the sediment through the river valley system and out to the Inner Harbour.

Conveying the Regulatory Flood does, however, require widening the channel south of the CN bridge, which causes the velocities to slow and sediments to drop. Thus, a natural deposition area is created to manage sediment upstream of the naturalized area. Creation of a sediment trap has the advantages of: 1) focusing the sedimentation in one area so that maintenance dredging does not cause widespread damage to naturalization efforts; and 2) reducing the suspended sediment load downstream, thereby improving conditions for survivorship of aquatic vegetation.

A sediment trap has been included at the upstream end of all the 'Alternative Methods' in order to pass the screening criterion for sediment. Each of the 'Alternative Methods' also contains a lacustrine form immediately downstream of the CN Rail bridge to accommodate the sediment trap, as per existing conditions.

5.2.2.5 Summary of Short List of 'Alternative Methods'

In summary, the L cross-section is eliminated for all discharge points because it cannot meet the naturalization screening criterion. The R cross-section does not meet the naturalization screening criterion for discharge points 2 and 3 and these combinations are thus eliminated from further consideration. The treed swamp (SW) and upland forest (FO) are eliminated for all cross-sections for discharge points 2 and 3 as these habitats interfere with the conveyance of the Regulatory Flood.

Figure 5-9 is a summary of the discharge points, cross-sections, and vegetation communities being carried forward to Step 3.

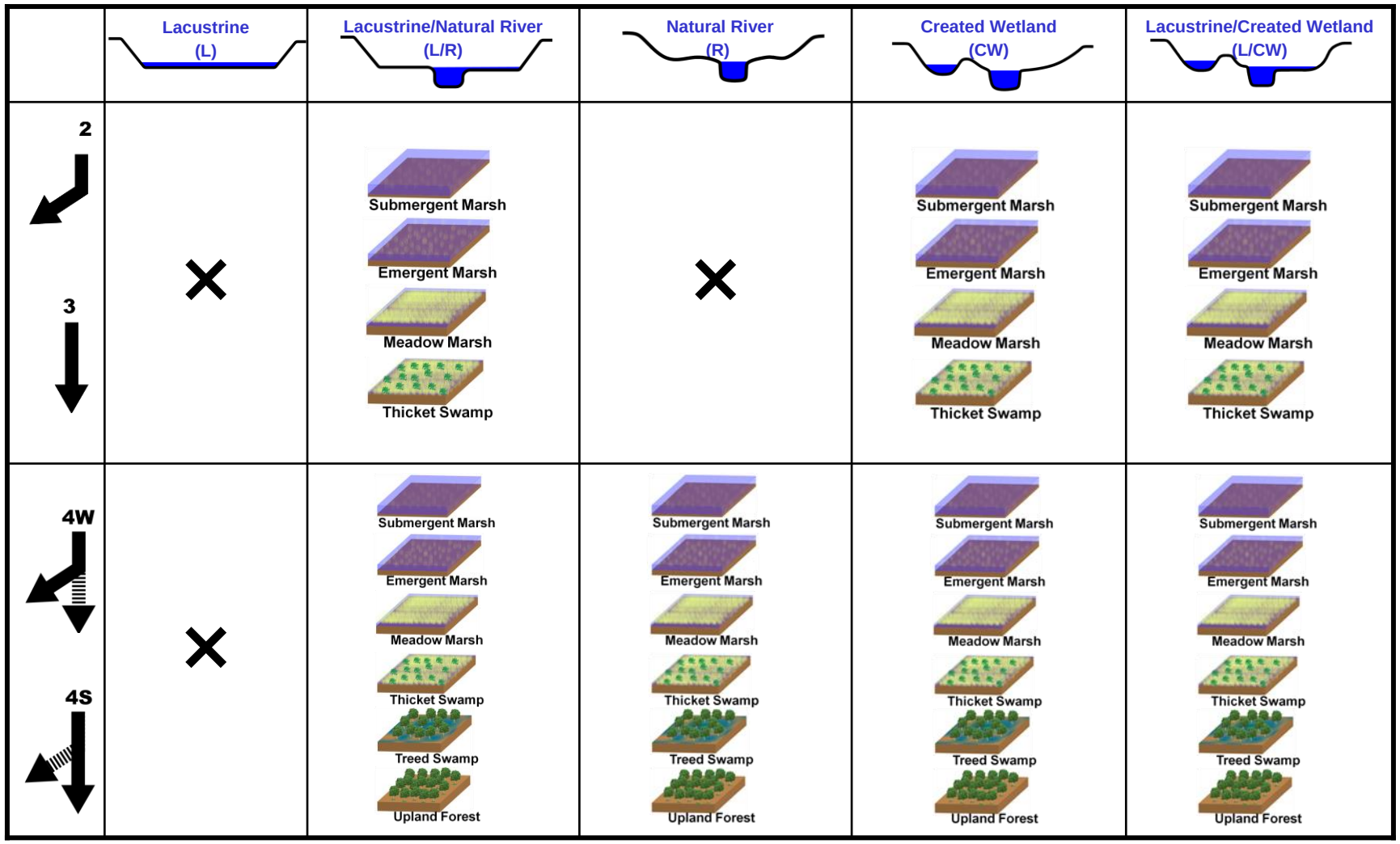


Figure 5-9 Summary of 'Alternative Methods' for Primary Channel that Pass the Screening Criteria

5.3 Step 3: Refinement of Short List

Step 3 was the 'refinement of the short list' of alternatives, which involved developing the 'Alternative Methods' in more detail by addressing the other project objectives related to operational management, integration with infrastructure, and recreation and cultural opportunities. The ToR specifies that the short list of 'Alternative Methods' will:

a) Be refined based on the results of the technical feasibility assessment;
b) Address issues related to operational management;
c) Address issues related to existing infrastructure replacement, relocation or abandonment;
d) Address opportunities to influence planned infrastructure and uses through other EAs / planning processes underway such that the DMNP is improved to the extent possible;
e) Identify opportunities for recreation; and,
f) Identify opportunities to enhance cultural and heritage resources.

During Step 3, the Study Team developed a preliminary design for each alternative which incorporated information to address all of the project objectives discussed above. The output of Step 3 was a revised and refined set of alternatives to be assessed as part of Step 4.

5.3.1 *Step 3 Refinement Attributes*

The attributes that were used to refine the 'Alternative Methods' in Step 3 are described in detail below.

5.3.1.1 Optimize Habitat

One of the objectives of the DMNP EA is the creation of aquatic and terrestrial habitat as part of the project objective for naturalization. The ToR explains:

> *Naturalization of the Don Mouth will not only improve the aquatic and terrestrial habitat conditions at the mouth of the river, but will provide for the creation of a more natural form of river mouth which will over the long-term do the following:*
>
> a) *Improve aquatic and terrestrial habitat;*
> b) *Improve linkages between habitats;*
> c) *Enhance biodiversity of aquatic and terrestrial species;*
> d) *Accommodate future changes in the environment;*
> e) *Enhance, to the extent possible, the low flow habitat conditions within the Don Narrows (the Don Narrows extends from Riverdale Park to the north side of the CN Railway); and,*
> f) *Address the public's risk of exposure to West Nile Virus.*

During Step 3, the Study Team completed an optimization exercise that combined the cross-sections and the habitat types identified in Step 2 for each of the discharge points. The intent of optimization was to identify the combinations that would be most effective in providing a diverse range of habitat that can be established quickly and is sustainable over the long-term. The objectives used to identify these combinations are described below.

Objectives for Habitat Optimization

Based on research from reference wetlands along the north shore of Lake Ontario, it was determined that providing habitat that can be established quickly and is sustainable over the long-term would require designing a system that meets the following objectives.

Table 5-6 Objectives for Habitation Optimization

Habitat Optimization Objective	Rationale
Provides a Core, Contiguous Area of Wetland Habitat	The target of 10 ha was developed based on a review of Habitat Suitability Indices (USGS, 2008) for wetland species and field data collected by TRCA staff from coastal wetlands within their jurisdiction. A core contiguous area of wetland habitat, which has been defined as being equal to approximately 10 ha, is expected to provide enhanced ecological function and support species such as the Least Bittern, Sora, Marsh Wren, Muskrat and Snapping Turtles. In addition, the shape of the core area of wetland habitat must be designed to minimize external edge effect, thereby maximizing the amount of habitat that is unaffected by surrounding uses. To provide enhanced ecological function, the wetland habitat must also be isolated from river-related effects, such as turbidity and the flashiness associated with flood events. This wetland is anticipated to provide a diverse mosaic of wetland habitat types with highly variable internal bathymetry, topography, and edges within the contiguous wetland habitat, and would likely be connected hydraulically with lake sourced water.
Provides Control of Invasive Species	The core wetland area to be included in each EA alternative must also be sustainable in the sense that it is not susceptible to invasive aquatic species (e.g., carp) that uproot vegetation and remove plant communities. This can be accomplished by creating barriers to fish passage through the use of berms (artificial levees), strategic placement of emergent vegetation, water level controls, and other means. Control of invasives also applies to introduced plant species that can outcompete native plants. By establishing some control over the frequency and duration of inundation through microtopography and other means, native plants have a much better chance of surviving and ultimately thriving. An adaptive management approach will be built into the design to allow for the possible removal of barriers and need for active management in the future if desired, once the various wetland communities have become established.
Provides Aquatic Habitat Outside of the Low Flow Channel	In addition to the aquatic habitat (primarily submergent and emergent marsh) associated with the low flow channel, wetlands comprised of submergent, emergent, and meadow marsh are intended to provide habitat for aquatic species by retaining standing water or by maintaining connections to the lake / river for most of the year. Turbidity of the Don River water remains a substantial impediment to the provision of aquatic habitat and controlling this constraint by creating habitat outside of the channel is important.
Provides Open Space / Terrestrial Habitat Outside of the Core, Contiguous Wetland	Where possible, the EA alternatives are intended to provide open space / terrestrial habitat as a means of supporting terrestrial species and migrating birds, and providing a variety of 'natural' experiences for park users. These areas of open space / terrestrial habitat are provided in addition to the core, contiguous wetland areas. It is noted that parklands and non-manicured upland areas will provide habitat value for wildlife while also supporting recreational uses.
Designed to be Self-Sustaining with Minimal Adaptive Management	The naturalized component of the river mouth must be designed for minimal maintenance as another element of sustainability. This involves assessing sediment deposition (at a coarse level of detail) to determine whether wetland areas within or adjacent to the low flow channel or spillways will be susceptible to excessive sedimentation, and will ultimately require dredging to maintain habitat and hydraulic function. This objective for naturalization is addressed during Step 5 of the EA (**Chapter 6**) as part of the three-dimensional sediment modelling.

Approach to Habitat Optimization

For Step 3, habitat optimization was intended to produce a generic template of habitat types for comparative purposes (i.e., the Step 4 evaluation). Thus, the alternatives developed in Step 3 do not show the location of any vegetation communities; instead, the vegetation communities described in the ToR and in Steps 1 and 2 were combined to form the habitat types shown in **Table 5-7**.

Table 5-7 Association between Vegetation Communities and Habitat Types

Habitat Type	Description	Associated Vegetation Communities
Aquatic	The diversity of ecosystem types found within and adjacent to the river channel and Lake.	• Submergent marsh • Emergent marsh
Wetland	Wetland communities whose hydrologic regime does not rely on permanent inundation from the river. This is intended to refer to 'created wetlands' that are hydraulically separated from the river, perched wetlands that are elevated above the river, or wetlands that are inundated by the Lake. However, it is not intended to preclude other types of wetland.	• Submergent marsh • Emergent marsh • Meadow marsh • Thicket swamp • Treed swamp
Open Space / Terrestrial	Non-manicured upland, parkland, and recreational fields.[a]	• Treed swamp (in the case of side slope groundwater seepage areas) • Upland forest

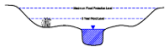
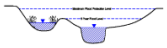
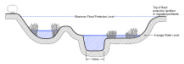
Note: a. It is noted that non-manicured upland and parkland will provide considerably higher value for wildlife than recreational fields. However, it was assumed that any non-developed area provides some value for wildlife.

The Study Team also identified cross-sections that were best able to meet the objectives for optimizing the naturalized component of the floodplain. The rationale for favouring certain cross-sections is described in **Table 5-8**, using the objectives described in **Section 1.2**.

Based on this comparison, the Study Team concluded that the created wetland (CW) and lacustrine/created wetland (L/CW) cross-sections were best suited to achieving the objectives for optimization. Nonetheless, it was agreed that any of the alternatives could be comprised of multiple cross-sections (i.e., created wetland, natural river) along the floodplain and still achieve these objectives.

This conclusion is advanced to the more detailed habitat optimization step undertaken as part of Step 5 for the preferred alternative (**Chapter 6**).

Table 5-8 Ability of Cross-sections to Achieve Naturalization Objectives

Objective	Lacustrine (L)	Natural River (R)	Created Wetland (CW)	Lacustrine / Natural River (L/R)	Lacustrine / Created Wetland (L/CW)	Rationale
						
Provides a core, contiguous area of wetland habitat			✓		✓	The created wetland (CW) and L/CW cross-sections are best able to provide high functioning wetland habitat of at least 10 ha because the wetland areas can be isolated from the low flow channel and therefore from the turbidity and velocities associated with high frequency, low magnitude storm events that are detrimental to vegetation growth. In comparison, the other three cross-sections do not separate wetland habitat from the channel and the habitat is therefore exposed to turbid and flashy water levels.
Provides control of invasive species			✓		✓	Only those cross-sections that isolate wetland habitat, including CW and L/CW, from the low flow channel are able to control invasive species such as carp. They also provide opportunities for control of invasive plant species through water level controls, if required. Again, because the other three cross-sections do not separate wetland habitat from the channel, they are more susceptible to invasive species and the managers have no control of hydrology to adapting management.
Provides aquatic habitat outside of the low flow channel			✓	✓	✓	Cross-sections that maintain a shallow water depth in the areas outside of the low flow channel are able to provide aquatic habitat within the remainder of the floodplain. These include the CW, L/CW, and L/R cross-sections. In comparison, the floodplain associated with the L cross-section is comprised entirely of the low flow channel and therefore there is no potential to accommodate aquatic habitat outside of this area. Regarding the R cross-section, the floodplains are inundated too infrequently to sustain any kind of aquatic habitat.
Provides open space / terrestrial habitat outside of the core, contiguous wetland	✓	✓	✓	✓	✓	Any of the cross-sections are able to provide open space / terrestrial habitat, as these areas are typically at the edges of or beyond the floodplain.
Is designed to be self-sustaining			✓		✓	Cross-sections that separate the wetland areas from the low flow channel, including CW and L/CW, and are therefore less susceptible to sediment deposition require less maintenance than the other cross-sections. These cross-sections also lend themselves to control of hydrology if warranted based on adaptive management.

5.3.1.2 Identify Flood Protection Features

During Step 2, the Study Team confirmed that the low flow channel and associated floodplain would be of sufficient width and depth to convey the Regulatory Flood (see **Section 5.2.2**). In Step 3, the dimensions of the low flow channel were refined based on additional hydraulic modelling (Aquafor Beech, 2006). The modelling confirmed that alternatives with only one discharge point would need a low flow channel of 80 metres in width and approximately three to four metres in depth. In comparison, alternatives with multiple discharge points (i.e., a primary channel and overflow spillway(s)) would need a low flow channel with a width varying from 15 to 30 metres and a depth of one to two metres.

Conveyance of the flood still requires constructing flood protection features, such as berms, or building up the adjacent topography above the height of the floodplain. Specifically, given the constraints at the upper limit of the study area, it may be necessary to construct flood protection measures on the east side of the Don River north of Lake Shore Boulevard to contain flooding.

In addition, for alternatives with an overflow spillway(s), a weir would be designed or grades set at a certain height so that the spillway would be activated only once water levels at a certain threshold (i.e., storm event) has been reached.

5.3.1.3 Provide for Sediment, Ice and Debris Management

A third objective is the management of sediment, debris and ice to ensure that the DMNP supports required navigation, natural function, and existing or future flood protection works within the Lower Don River. Sediment and debris may be managed through project design to a certain degree, while some form of active management such as dredging and debris removal will be necessary given the significant quantities of sediment and debris that are delivered to the Don Mouth.

A sediment trap will be established in the Don Narrows immediately downstream of the CN Rail bridge for all the alternatives. As mentioned previously, widening the channel at the CN Rail bridge creates a natural deposition area for sediment. As a result, the sediment trap allows deposition of larger materials (sands and some clays) in a deepened area that can accommodate sedimentation without encroaching on the channel cross-sectional area required to convey flood flows. The sediment trap will likely require regular dredging. The dredged material is not hazardous but exceeds international open water disposal guidelines. Therefore this material must be removed to a confined disposal facility or otherwise disposed of.

The EA alternatives provide for a sediment and debris management area adjacent to the channel somewhere in between the CN Rail bridge and Lake Shore Boulevard. The exact size and shape of the drying area requires further design during Step 5. There are a number of options that will be considered which will remove sediment at the management area or transport it away from the management area. These options are investigated as part of Step 5.

Debris and ice management options are common to all the alternatives and will be further refined in later steps of the EA.

5.3.1.4 Address Existing and Planned Infrastructure

Given the industrial legacy of the Project Study Area, there is considerable infrastructure within the Lower Don Lands. These features include roads and rail spurs within the new floodplain, and bridges crossing the existing channel and the new floodplain. It should be noted that for the purpose of the Step 4 evaluation, Lake Shore

Boulevard is assumed to be moved to the north along the southern edge of the rail lands in order to facilitate both development activities and the naturalization of the Don Mouth (with the exception of Alternative 3, which does not require the relocation of Lake Shore Boulevard to provide for naturalization).

5.3.1.5 Provide Recreational Features

The fifth objective recognizes that the DMNP can encourage and contribute to the development of compatible recreation, cultural, and heritage opportunities as well as providing public access to the Don Mouth, including for persons with disabilities. Recreation opportunities include walking and cycling trails, sports fields, and water-based recreation including boating and fishing. In particular, the DMNP should improve pedestrian and bicycle trail linkages between Lake Ontario and the Don watershed.

For the refinement of alternatives during Step 3, the locations of the Water's Edge Promenade and pedestrian and bicycle trails were assumed. Specifically, a secondary trail system was added to each alternative in order to ensure that fundamental connections to the Martin Goodman Trail, Water's Edge Promenade and Don River Bikeway were considered in the Step 4 evaluation.

As a result of the Design Competition, it became necessary to incorporate the green space and recreational amenities originally associated with Commissioners Park into the DMNP alternatives; however, it was recognized that the park might not be incorporated in its originally proposed location or configuration. At the time of the Design Competition, the City of Toronto Parks Department envisioned that the Lower Don Lands would provide for up to four regional-sized sports fields, which would be supported by indoor facilities including change rooms, washrooms, meeting rooms, concession stands, etc. It has been assumed that parking would be provided within the adjacent development blocks in underground or above-ground structures.

Approximately 17 hectares of open space / terrestrial habitat, which includes parkland and recreational fields, is provided for in each alternative. This is equivalent to the land that would have been put aside for Commissioners Park. While the park facilities may be programmed for regulation playing field space, the City would like to see opportunities for flexible and informal use of the recreational space.

5.3.1.6 Identify Opportunities to Enhance Cultural and Heritage Resources

As identified above, the fifth objective also refers to enhancing cultural and heritage resources. Built heritage features within the Project Study Area include the dockwalls of the Keating Channel, bridges such as the Cherry Street bascule bridge, and heritage buildings, such as the Toronto Harbour Commission storage buildings at 62 Villiers Street, the Victory Soya Mills Silos at 351-369 Lake Shore Boulevard East, and the former Bank of Montreal building at 309 Cherry Street. There is limited potential to discover archaeological sites within the Project Study Area due to extensive disturbance to the area from the late 1800s to the mid-1900s. The only areas with some potential are along the original sand spit underlying the current Cherry Street alignment. It was determined that this objective of the EA would be better addressed during Step 5 (conceptual design and impact assessment). Thus, the identification of opportunities to enhance cultural and heritage resources was deferred to Step 5.

5.3.2 *Re-evaluation Based on International Design Competition Results*

As described in the introduction to this chapter, the results of the Design Competition were made known following the completion of Steps 1 to 3 and before the completion of Step 4. This necessitated a review of the assumptions and criteria employed in Steps 1 to 4, and resulted in a new alternative (known as **4WS**). This 're-evaluation' is

described below. The distinguishing factors among the alternatives and their comparison to design elements from the Design Competition are described in **Appendix E-3**.

5.3.2.1 Re-evaluation of Steps 1 and 2

The re-evaluation of Steps 1 and 2 is focused on two key issues: the width of floodplain and the width and shape of the overflow spillway.

During Step 2, the Study Team assumed that the width of the floodplain for all the alternatives is equal to a minimum of 300 metres based on the modelling described in **Section 5.2.3.1.1**. This assumption was based on a roughness coefficient of 0.08 which would permit all vegetation communities except for treed swamp and upland forest.

The MVVA team proposed that a narrower floodplain be considered. The narrower floodplain was considered in response to the explicit consideration of raising the topography above the floodplain as part of the hydraulic modelling and the use of secondary overflow channels for some of the alternatives. Hydraulic modelling runs were completed to determine the width of the floodplain for the new Alternative 4WS (see **Section 5.3.2.2** below) based on two spillways and to confirm that the alternative passes the following screening indicator from **Table 5-5**: *Can the cross-section convey a flow rate of 1,700 cubic metres per second at a water elevation of 78.7 metres downstream of the CN Rail bridge within the dimensions of the Project Study Area?*

Additional hydraulic modelling runs were recommended to determine whether the width of the floodplain for the existing EA alternatives could be reduced by reducing the roughness coefficient used in the modelling. Based on the vegetation communities identified during the Step 3 habitat optimization, the Study Team proposed using a roughness coefficient of 0.05 to calculate the floodplain width which would allow for all the vegetation communities except for the upland forest within the floodplain.

Additional hydraulic modelling was undertaken to determine whether the width of the overflow spillway could be reduced by changing the frequency of storm events conveyed by the spillway, by increasing the depth of the spillway, or by increasing the width of the low flow channel. The intent of this exercise was to optimize the land required for flood conveyance and protection, the land available for naturalization, and the land available for development.

As a result, the minimum width of the floodplain was adjusted to 150 metres, and the width of the overflow spillway was decreased by deepening the spillway for all alternatives.

5.3.2.2 A New Alternative and Refinement of Step 3

The discharge channel morphology suggested in the MVVA design prompted the development of new **Alternative 4WS**, **which is a refinement to Alternative 4W**.

Alternative 4WS possesses a low flow channel that discharges to the Inner Harbour, located between Polson Quay and Cousins Quay, south of the Keating Channel. Alternative 4WS also has two overflow spillways: one to the west through the Keating Channel, and the other to the south to the west of the Don Greenway discharging to the Ship Channel. The specific characteristics of this alternative are described in full in **Section 5.3.3.5**.

While Alternative 4WS is similar in configuration to Alternative 5 (combination of Alternatives 2 and 3 with a third discharge point midway between creating a wide delta), Alternative 5 included naturalization between the three permanent discharge points, creating a naturalized delta. This was a major drawback of Alternative 5. In comparison, Alternative 4WS includes only one permanent discharge point with two spillways and allows for the development of lands between the discharge points and the spillways.

Refinement of Step 3

Table 5-9 below outlines the key issues that were revised during Step 3 in response to the Design Competition and then reflected in the alternatives considered in Step 4.

Table 5-9 Key Issues Revised During Step 3 in Response to the Design Competition

Issue	Refinement
Area Available for Naturalization	• As noted in **Section 5.3.1.1**, there was a need to optimize habitat and the extent and type of naturalized areas considered in the short-listed alternatives. In this way the alternatives were all considering the nature and extent of naturalized area in a consistent manner. • It was noted that the MVVA design incorporated an opportunity for lake filling as a design element while the EA alternatives did not consider this possibility. Lake filling might also provide additional land area available for naturalization, parkland or development. For the purposes of revising the EA alternatives, lake filling was not to be explicitly considered; however, it was recognized that it could be added to any of the alternatives as a design element or to increase the available land area.
Composition and Optimization of Naturalized Areas	• For each alternative, the habitat types were optimized by maximizing the area proposed as 'created wetland' in lieu of other habitat types. This decision was based on the preference for a core area that was sufficiently sized to provide interior habitat – this area was defined as 10 hectares. As a result, the EA alternatives offered minimal terrestrial habitat. • The MVVA design proposed a set of habitat types that was neither entirely consistent with the vegetation communities identified for the EA alternatives, nor with the assumptions made regarding roughness coefficient. The MVVA design was thus modified to include the same vegetation communities that were proposed for the original EA alternatives while providing for a core area of wetland habitat of at least 9 hectares. The EA alternatives were also refined to include other vegetation communities, especially for terrestrial habitat.
Area Available for Development and Parkland	• The MVVA design proposed a reconfigured river mouth with a fully integrated community, including parkland. In comparison, the EA alternatives did not consider the location and form of development within the Port Lands. Regarding parkland, the Study Team assumed that green space and associated recreational amenities originally associated with Commissioners Park could be maintained in their entirety for alternatives that discharge into the Inner Harbour (i.e., 2 and 4W); however, alternatives that discharge into the Ship Channel reduced the amount of land available for the sports fields and other recreational features proposed. Thus, an assumption was made to ensure that a minimum of 17 ha of active and passive recreational space be included in each alternative being carried forward to the Step 4 evaluation. • To ensure a direct comparison of the alternatives with respect to built form, it was necessary to make the developable area explicit in the presentation of the original EA alternatives. Therefore, the EA alternatives were refined to include built form attributes, and criteria were considered in the Step 4 evaluation to assess the approximate value of the development area that would be added. For each of the alternatives, the land identified as 'development area' was assumed to provide for approximately 8,700 residential units and 97,000 m^2 of non-residential development. The density of residential and non-residential development varied depending on the development area available for each alternative.
Location of Infrastructure	• The original EA alternatives and the MVVA design made assumptions regarding the location of key pieces of infrastructure, such as Lake Shore Boulevard. Based on discussions with Waterfront Toronto, an understanding emerged that for the purpose of Step 3 some of the infrastructure in the Project Study Area would be moved or modified as a result of any of the development activities and that some would remain in place. Therefore, as part of the EA only the infrastructure that will be modified or relocated solely as a result of the DMNP project will be considered in the assessment of effects. This decision was reflected in the descriptions of each alternative and the Step 4 evaluation criteria.

5.3.3 *Description of the Refined Short List of Alternatives*

As described above, an alternative method was developed for each discharge point based on the following components of a revitalized river mouth as part of Step 3:

a) Floodplain and low flow channel;
b) Optimized habitat;
c) Sediment, debris, and ice management;
d) Infrastructure;
e) Flood protection / containment features;
f) Recreational features;
g) Opportunities to enhance cultural and heritage resources; and,
h) Area available for development.

The alternatives are described below according to these components.

5.3.3.1 Alternative 2: River with discharge to the Inner Harbour

Alternative 2 is based on discharge point 2, which discharges to the Inner Harbour (refer to **Figure 5-10**). The floodplain is 300 metres wide and encompasses the area south from the Wilson Railyard to the south side of Villiers Street and west from the western side of the Don Roadway to Cherry Street. The low flow channel is approximately 80 metres wide where it crosses under Lake Shore Boulevard and maintains that width as it turns west and follows the alignment of the existing Keating Channel. The channel jogs north in the vicinity of Munition Street and widens to approximately 200 metres as it crosses under Cherry Street. Throughout its length, the low flow channel has a depth of three to four metres. This wide and deep channel configuration is required to be able to convey the Regulatory Flood through a single outlet to the lake.

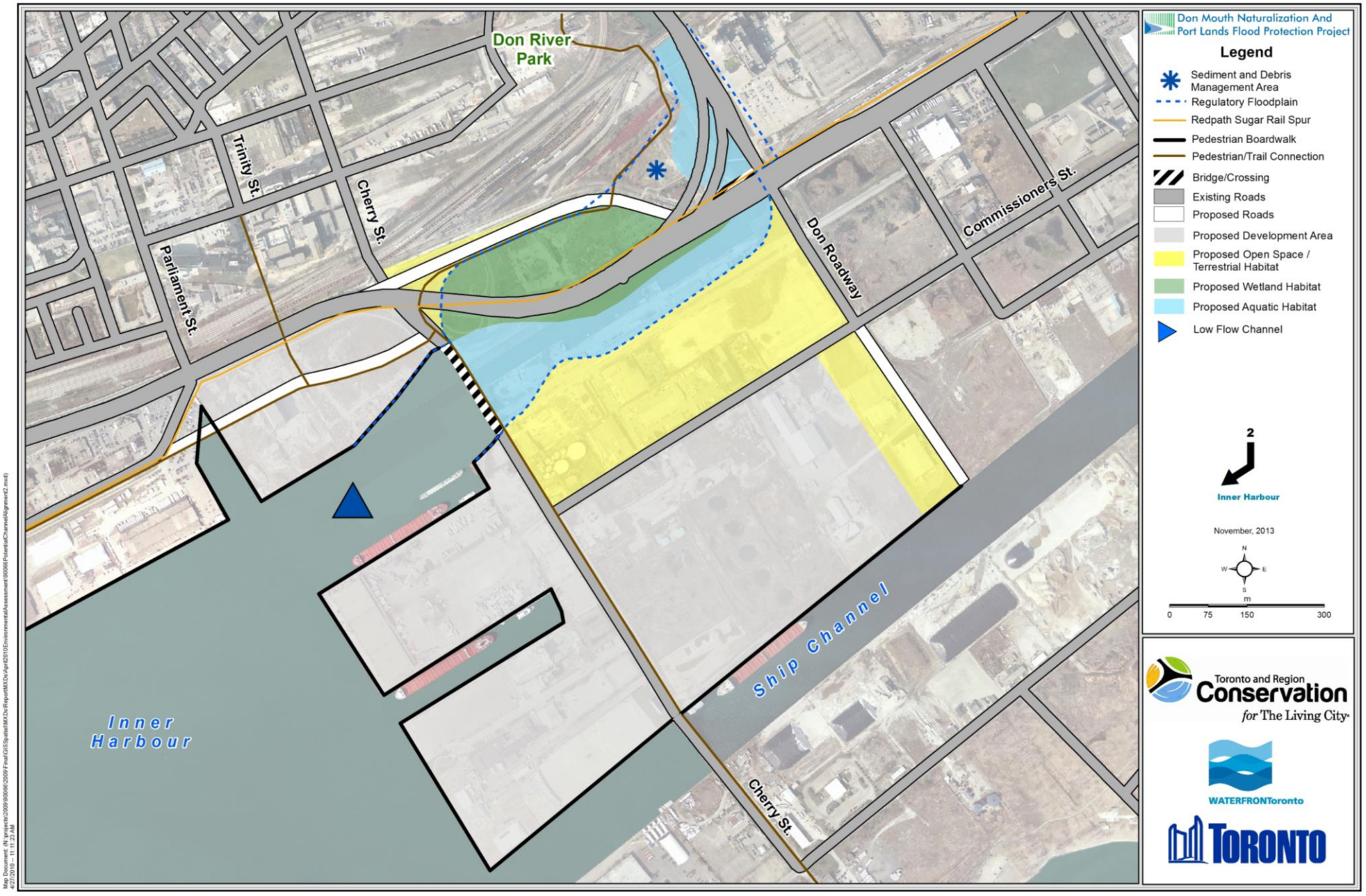


Figure 5-10 Alternative 2

Due to the width of the low flow channel, Alternative 2 provides over 12 hectares of aquatic habitat. Over eight hectares of wetland habitat abuts the low flow channel to the north, and is traversed by the Gardiner Expressway. The majority of open space / terrestrial habitat is to the south of the channel and extends southward to Commissioners Street in the same general location as the proposed green space and associated recreational amenities originally associated with Commissioners Park, encompassing an area equal to 14 hectares. This alternative preserves the Don Greenway as envisaged in the City of Toronto Central Waterfront Secondary Plan, travelling south along the west side of the Don Roadway and providing an additional three hectares of open space / terrestrial habitat. A small portion of open space / terrestrial habitat is located outside the floodplain to the east of the Cherry Street and Lake Shore Boulevard intersection.

In terms of additional recreation features, pedestrian and trail connections are provided from Queens Quay Boulevard in the west, Trinity Street in the north, and Cherry Street in the south. An additional connection is provided between the Don Valley Trail and the intersection of Cherry and Queens Quay trail along the south side of the realigned Lake Shore Boulevard.

As a result of naturalization and flood protection, a number of changes to infrastructure are required for Alternative 2. To minimize disturbance to the wetland, Lake Shore Boulevard is shifted north to parallel the Don Yard to the west of the Don River. In addition, a new crossing for Lake Shore Boulevard and for the Harbour Track Lead must be constructed to span the floodplain. Similarly, the Cherry Street bridge will be replaced with a new structure to span the floodplain and low flow channel. A number of streets will also be closed to provide for terrestrial habitat and open space, including Villiers Street to the west of the Don Roadway and Munition Street in its entirety.

Dockwall reconstruction will be required along both sides of the Keating Channel to create the low flow channel and associated floodplain. This alternative will also require the removal of the Essroc pier and a small triangular portion of the Home Depot lands to the west of Cherry Street.

5.3.3.2 Alternative 3: River with discharge through the Port Lands to the Ship Channel

The floodplain in Alternative 3 encompasses the area south from the Wilson Railyard to the Ship Channel and west for 300 metres from the western side of the Don Roadway (refer to **Figure 5-11**). Like Alternative 2, the low flow channel is approximately 80 metres wide where it crosses Lake Shore Boulevard. It meanders to the west side of the floodplain where it crosses under Commissioners Street and widens to approximately 200 metres where it enters the Ship Channel. Throughout its length, the low flow channel has a depth of three to four metres.

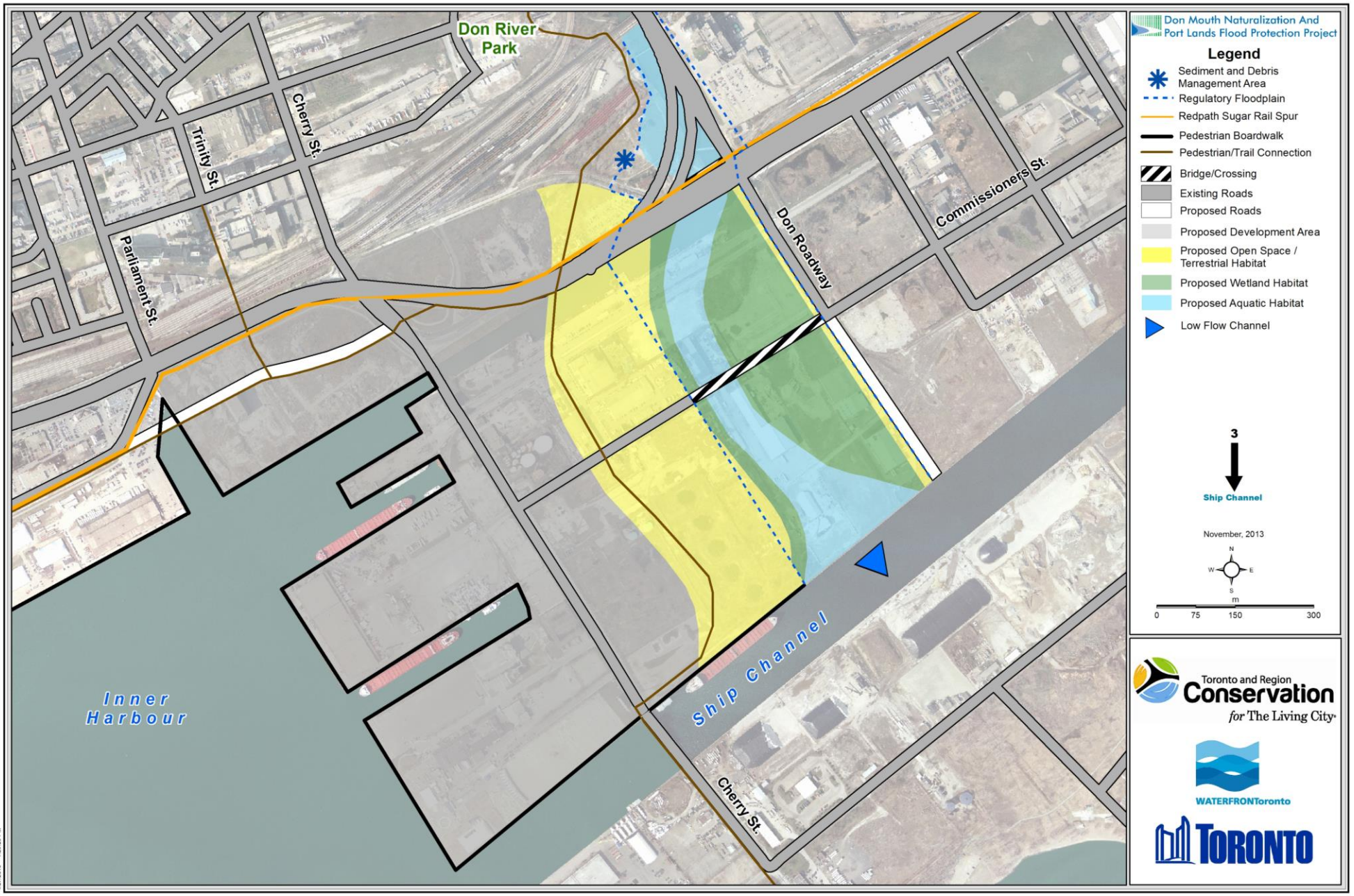


Figure 5-11 Alternative 3

Alternative 3 provides over ten hectares of aquatic habitat within the low flow channel. The majority of wetland habitat, approximately nine hectares, is located between the low flow channel to the west and the Don Roadway to the east. A narrow strip of wetland habitat totalling just over two hectares borders the low flow channel to the west. Approximately three hectares of open space / terrestrial habitat is located within the remainder of floodplain, primarily in the vicinity of Lake Shore Boulevard and the Ship Channel. The majority of open space / terrestrial habitat is located to the west of the floodplain, totalling over 17 hectares. This area is intersected by Commissioners Street and by Lake Shore Boulevard / Gardiner Expressway and is intended to replace the green space and associated recreational amenities originally associated with Commissioners Park. The Keating Channel will be filled in to the west of the floodplain to maximize the amount of land available for open space / terrestrial habitat and urban development.

Additional recreational features include the pedestrian trail connections from Queens Quay Boulevard in the west, and Trinity Street and the Don Valley Trail in the north. Regarding the latter, this connection extends south under the Gardiner Expressway and along the western edge of the open space / terrestrial habitat feature to the Ship Channel where it connects to Cherry Street.

A number of infrastructure changes are necessitated by Alternative 3. Most notably, a crossing will be required for Commissioners Street to span the wetland and the low flow channel. Upstream, two crossings will need to be constructed for Lake Shore Boulevard and the Harbour Lead Track. Unlike the other alternatives, however, the remainder of Lake Shore Boulevard will remain in its current alignment. Due to the filling in of the Keating Channel, the Cherry Street bridge will be replaced with a road over the filled-in channel. In addition, Villiers Street will be closed to the west of the Don Roadway, and Munition Street will be closed in its entirety.

Modifications to the dockwall will occur along the former Keating Channel and at the interface between the river mouth and Ship Channel.

5.3.3.3 Alternative 4W: Combination of discharge points to the Inner Harbour and Ship Channel (Primary discharge to the Inner Harbour)

In many ways, Alternative 4W is similar to Alternative 2 (refer to **Figure 5-12**). Alternative 4W's floodplain encompasses the same footprint as Alternative 2 with the addition of an overflow spillway that extends 200 metres west from the Don Roadway and south to the Ship Channel from the south end of Villiers Street. The low flow channel follows the same general alignment as Alternative 2 but is approximately 80 metres wide where it crosses under Lake Shore Boulevard. Unlike Alternative 2, the channel narrows to between 15 and 30 metres (with a depth of approximately 1.5 metres) as it turns west from Lake Shore Boulevard to help convey suspended sediment and to maximize wetland habitat diversity within the floodplain.

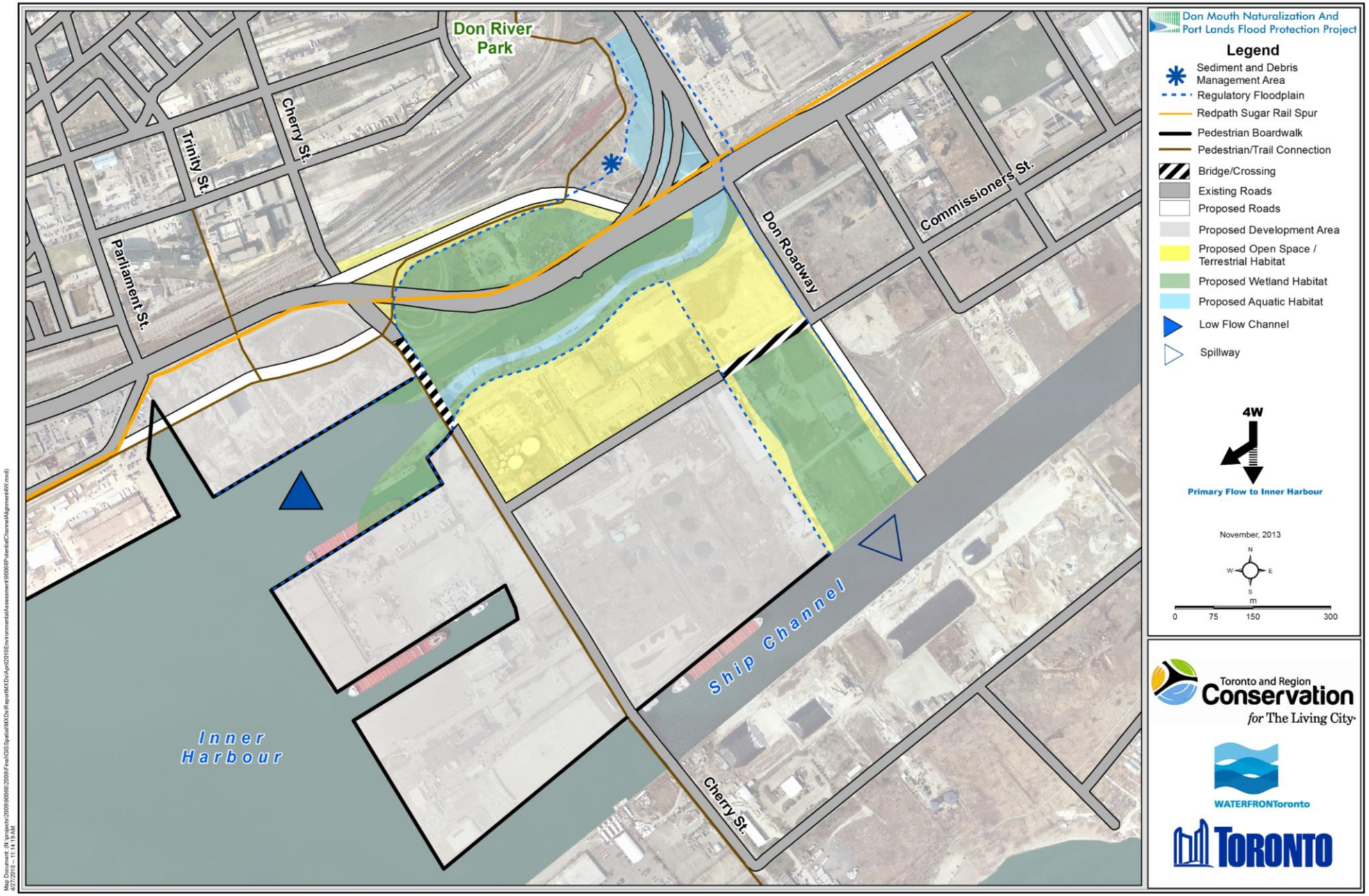


Figure 5-12 Alternative 4W

Alternative 4W's channel provides nearly six hectares of aquatic habitat. Like Alternative 2, the majority of wetland habitat, nearly 14 hectares, is located to the north of the channel and is traversed by the Gardiner Expressway. An additional 6.5 hectares occupies the overflow spillway adjacent to the Don Roadway. Within the remainder of the floodplain is nearly six hectares of open space / terrestrial habitat, the majority of which is located to the north of Commissioners Street. Another 10 hectares of open space / terrestrial habitat is located to the south of the low flow channel and to the north of Commissioners Street.

Similar to Alternative 2, pedestrian and trail connections are provided from Queens Quay Boulevard in the west, Trinity Street in the north, and Cherry Street in the south. An additional connection is provided between the Don Valley Trail and the intersection of Cherry Street and Queens Quay trail along the south side of the realigned Lake Shore Boulevard.

The infrastructure changes required for Alternative 4W are similar to those required for Alternative 2, with the exception of an additional crossing at Commissioners Street where the spillway is located. Dockwall modifications are also required where the spillway enters the Ship Channel. Like Alternative 2, the Essroc pier will be removed to facilitate the river mouth and associated wetland habitat.

5.3.3.4 Alternative 4S: Combination of discharge points to the Inner Harbour and Ship Channel (Primary discharge to the Ship Channel)

The floodplain for Alternative 4S is similar to what is proposed for Alternative 3 with the addition of an overflow spillway that follows the alignment of the Keating Channel to the Inner Harbour (refer to **Figure 5-13**). The spillway is approximately 250 metres wide where it diverges from the low flow channel, tapering by nearly 100 metres as it enters the lake. The low flow channel follows the same general alignment as Alternative 3 but is approximately 80 metres wide where it crosses under Lake Shore Boulevard and narrows to between 15 and 30 metres as it heads south. Like Alternative 4W, the low flow channel has a depth of approximately 1.5 metres.

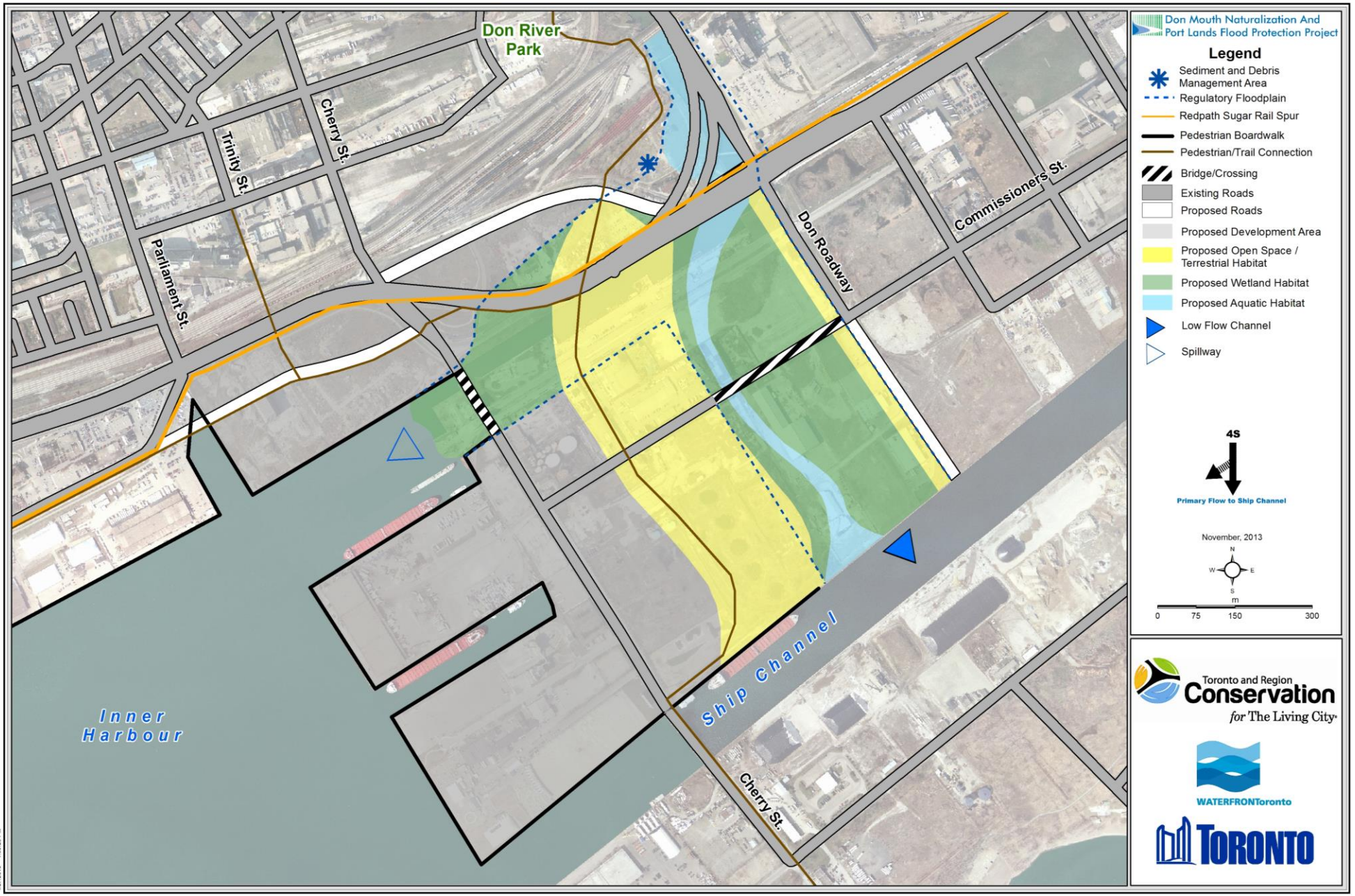


Figure 5-13 Alternative 4S

Alternative 4S provides seven hectares of aquatic habitat within its low flow channel. Nearly 12 hectares of wetland abuts the low flow channel, primarily to the east of the channel, and an additional 6.5 hectares occupies the western portion of the overflow spillway. Nearly nine hectares of open space / terrestrial habitat are also located within the floodplain, including close to two hectares along the western portion of the Don Roadway and the remainder within the overflow spillway. Another ten hectares of open space / terrestrial habitat is located to the west of the low flow channel outside of the floodplain.

Similar to Alternative 3, additional recreational features include the pedestrian trail connections from Queens Quay Boulevard in the west, and Trinity Street and the Don Valley Trail in the north. Regarding the latter, this connection extends south under the Gardiner Expressway and along the western edge of the open space / terrestrial habitat feature to the Ship Channel where it connects to Cherry Street.

Infrastructure modifications are similar to Alternative 3, with several notable exceptions. First, Lake Shore Boulevard is realigned to the north along the Don Yard. Second, a new crossing is required at Cherry Street as the Keating Channel is not filled in. In addition, Alternative 4S requires the removal of the Essroc pier. Dockwalls will need to be modified along the Keating Channel to accommodate the overflow spillway and associated recreation areas, and additional modifications will take place at the interface between the river mouth and the Ship Channel.

5.3.3.5 Alternative 4WS: River with discharge to the Inner Harbour and two overflow spillways

Alternative 4WS is a variation on Alternative 4W in that the low flow channel discharges to the Inner Harbour, although the discharge location is located further south between Polson Quay and Cousins Quay (refer to **Figure 5-14**). A large promontory has been constructed in this location and extends out approximately 150 metres into the Inner Harbour from Cousins Quay. The low flow channel is approximately 15 metres wide and 1.5 metres deep, with an associated floodplain of 150 to 200 metres wide.

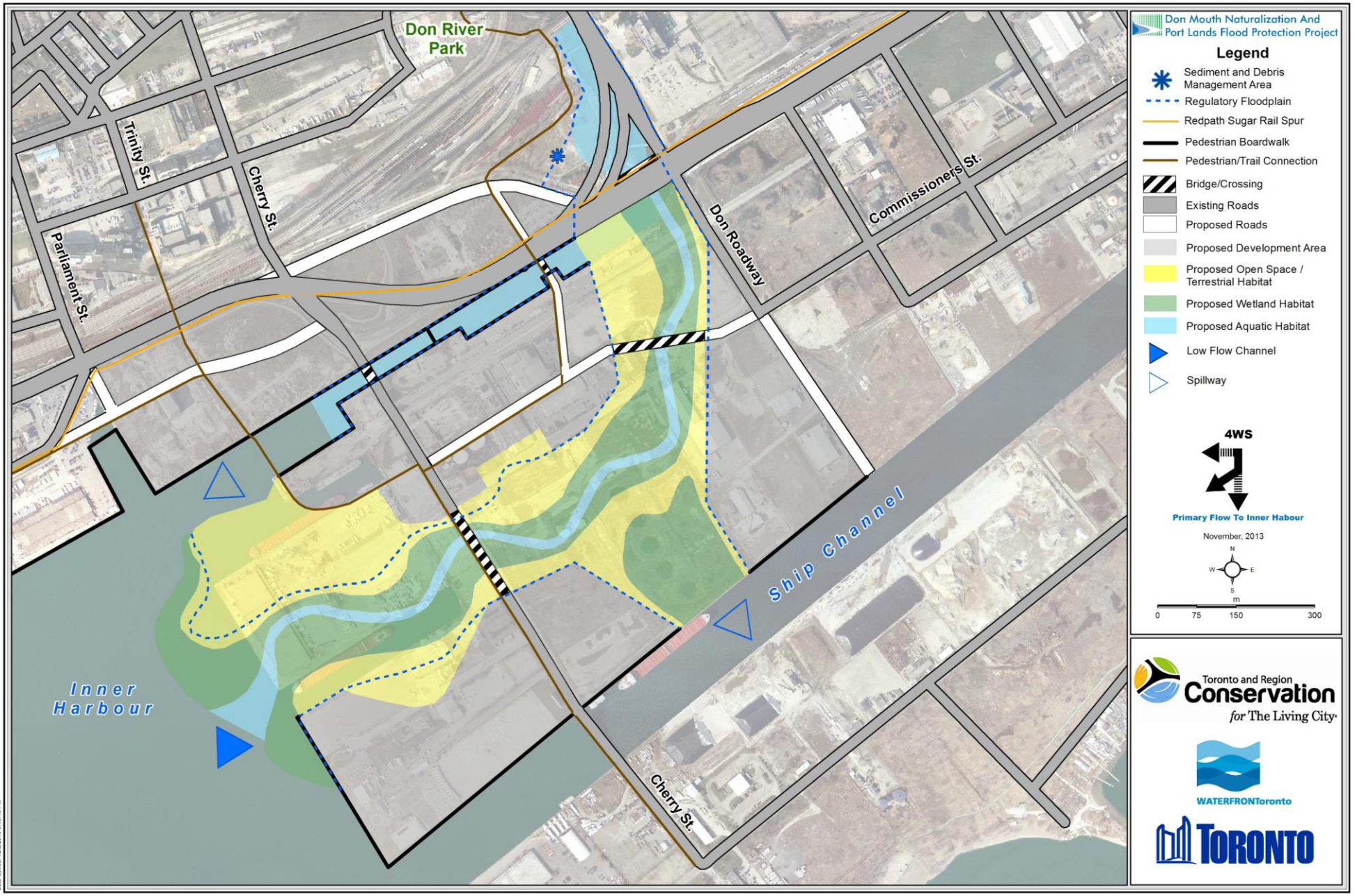


Figure 5-14 Alternative 4WS

Alternative 4WS has two overflow spillways: one to the west through the Keating Channel, which will be separated from the low flow channel by a set of weirs; and the second to the south through a version of the Don Greenway that has been shifted west by approximately 300 metres. The spillway through the Keating Channel will retain the existing planform dimensions though the channel depths may be modified pending hydraulic designs aimed at enhancing the quality of aquatic habitat and reinforcing the aging dockwalls. The spillway to the south is also between 150 to 200 metres wide and will discharge to the Ship Channel. To complete the requirements for flood protection, the topography surrounding the floodplain will be built up by approximately 1.5 metres over existing grade. In addition, an area of approximately two hectares along the east of the Don River from the CN Rail tracks south to Lake Shore Boulevard will need to be modified to increase flood conveyance.

Based on the dimensions of the low flow channel, Alternative 4WS provides approximately six hectares of aquatic habitat. Over 15 hectares of wetland habitat abuts the low flow channel and an additional 3.5 hectares occupies the southern overflow spillway as a core wetland area. There are nearly 13 hectares of open space / terrestrial habitat located within the remainder of floodplain, and approximately eight hectares located adjacent to the floodplain, primarily within the promontory to the north of the channel west of Cherry Street.

Pedestrian and trail connections are provided from Queens Quay to the west, and Trinity Street and the Don Valley Trail to the north. Both the Trinity and Don Valley Trail connections propose to cross the Keating Channel, and will therefore require the provision of pedestrian bridges. These trails meet up at the intersection of Cherry Street and the realigned Commissioners Street (as discussed below) and then continue south along Cherry Street.

Implementing Alternative 4WS will require a number of modifications to existing infrastructure. Two new water crossings will have to be built where the floodplain intersects Commissioners Street and Cherry Street. The existing crossing at Lake Shore Boulevard will need to be widened to accommodate the floodplain. Another infrastructure change that is reflected in Alternative 4WS is a realignment of Commissioners Street to the north by approximately 90 metres starting at the Don Roadway to the west of the floodplain, along with a shift of Lake Shore Boulevard to the north to parallel the Don Yard. Finally, Villiers Street will be closed, decommissioned and removed west of the Don Roadway.

Alternative 4WS will also require modifications to dockwall along the Ship Channel to create the overflow spillway, and along Cousins Quay and Polson Quay to create the promontory and the river mouth.

5.4 Step 4: Evaluation of Short List Alternatives

The purpose of Step 4 was to evaluate the alternatives and identify one alternative to be carried forward for more detailed technical analysis as part of Step 5. This evaluation of alternatives was accomplished by establishing an order of preference between the revised and refined alternatives developed in Step 3 (Alternatives 2, 3, 4W, 4S, and 4WS). The evaluation method used criteria and indicators to structure information and facilitate the comparison of alternatives against each other. The evaluation criteria and indicators were developed to reflect project objectives through consultation with a wide range of regulators, stakeholders and members of the public.

Before Step 4 was completed, the results of the Design Competition were made known. In response, the evaluation criteria as originally envisioned were simplified and revised. Key changes to the evaluation criteria reflect the following issues:

- Revised Project Study Area and alternatives;
- Greater integration with built form;
- Incorporation of active recreation components originally proposed for Commissioners Park;

- Revised approach to consideration of effects on infrastructure;
- Naturalization optimization including both wetland and terrestrial opportunities; and,
- Ensuring alternatives can accommodate planned infrastructure (e.g., grading of bridges to accommodate proposed transit).

The comparison of alternatives required the explicit consideration of trade-offs thereby keeping more desirable attributes over those less desirable. The alternative identified as preferred at the end of Step 4 has the greatest potential to meet all of the DMNP objectives. The detailed assessment of the preferred alternative is presented in **Chapter 7**.

It should be noted that the comparison of alternatives was undertaken prior to the PLAI (see **Section 2.2.3.3**) and the data presented is accurate as of the time of the evaluation.

5.4.1 *Assumptions*

Critical assumptions are characteristics associated with the alternatives that the Study Team took into account to complete the Step 4 effects assessment and evaluation of alternatives. For Step 4 of the EA, certain assumptions were developed that apply to all of the alternatives. These are discussed in Section 1 of **Appendix F-1**.

5.4.2 *Evaluation Methodology*

The Step 4 evaluation involved three tasks as detailed below:

1. Development of comparative evaluation criteria and indicators;
2. Assessment of effects; and,
3. Comparative evaluation to identify the alternative(s) with the highest potential to meet project objectives.

5.4.2.1 Criteria and Indicators

The evaluation criteria and indicators used for the Step 4 evaluation were developed by the technical team and reviewed by a number of stakeholders including:

a) TRCA, MVVA team and Waterfront Toronto;
b) City of Toronto staff;
c) The public;
d) Interest groups; and,
e) Federal and Provincial regulatory agencies.

The criteria and indicators measured the relative ability of each alternative to achieve the seven project objectives in comparison to the other alternatives. **Appendix F-2** provides a list of the project objectives, criteria and indicators used in the assessment and the rationale for why each indicator was used. This list was originally developed prior to the Design Competition. It was refined after the Design Competition to include criteria that better addressed the expanded Project Study Area, and the added details of each alternative related to their ability to integrate with infrastructure and the future urban form. The Design Competition resulted in an evaluation of alternatives that was more robust pertaining to each alternative's ability to integrate within the revitalized waterfront.

As the work on Step 4 progressed it became apparent that information was not available for some of the criteria and indicators; therefore the assessment of these criteria and indicators was deferred to Step 5. **Appendix F-3** provides a list of the criteria and indicators deferred to Step 5.

5.4.2.2 Effects Assessment

The data for the Step 4 effects assessment were collected as part of baseline studies. Baseline data were used with the descriptions of the alternatives and the critical assumptions to determine how the construction and operation of each alternative would affect the environment. For many of the indicators, the data were collected by measuring areas or linear distances using GIS, or maps of each alternative were overlain on baseline conditions maps to identify features that may be displaced or disrupted. **Appendix F-4** details how the effects assessment was carried out for each criterion included in the evaluation. The indicators for each criterion are presented in **Appendix F-2**.

A number of objective specific assumptions were used to facilitate the effects assessment in addition to the assumptions mentioned in **Section 5.4.1**. These assumptions are described in detail in Section 2 of **Appendix F-1**.

The DMNP, as articulated by the project objectives, is about taking an ecologically dysfunctional, flood prone derelict area and turning it into a new river mouth for flood conveyance and naturalization. As such, the evaluation of 'Alternative Methods' was structured to assess the ability of each alternative method to meet these project objectives. The underlying assumption was that construction activities would displace and disrupt some existing land uses and resources but that what was put in place would be an overall net benefit and TRCA was interested in assessing how large that benefit might be.

This benefit is assessed in the tables and as part of the trade-offs. Given the conceptual level of detail associated with the 'Alternative Methods' and the lack of information about construction phasing, it was not possible at the time of the assessment to address the indicators related to nuisance effects associated with construction (see **Appendix F-3**). Therefore, it was assumed at that time that the nuisance effects associated with construction were common to all alternatives, easily mitigated using standard construction practices (see **Appendix G**) and thus, did not help distinguish between the alternatives. Based on a request from stakeholders, construction-related effects were revised using information available from the Step 5 assessment (see **Chapter 7**). A description of these effects is summarized in **Section 5.4.3.8**.

Once the assessment of effects was completed, the alternatives were rated for each indicator as most preferred, moderately preferred and least preferred. In general, this was done by looking at the differences between the alternatives vis-à-vis the confidence level of the assessment methods. If the differences were very small, the alternatives were rated the same; only major differences were reflected in the ratings. The alternative that measured best against the indicator was rated as *most preferred*, the alternative that measured worst against the indicator was rated as *least preferred*, and the remainder were rated as *moderately preferred*. A rating of least preferred does not mean that the effects are unacceptable, only that the alternative is less likely to meet that project objective, criterion, or indicator compared to other alternatives.

The results of the effects assessment and summary of criteria ratings are reported in **Tables 5-10** to **5-23** below (complete evaluation matrix minus criteria that are screened and deferred to Step 5).

5.4.2.3 Comparative Evaluation

The comparative evaluation combined the information presented by indicator to reflect a preference by criterion and then combined the information presented by criterion to reflect a preference for each objective. For example, if an objective had three criteria for which an alternative was ranked 'most preferred' for all criteria, the alternative would be most preferred for that objective. Finally, the preferences by objective were combined to present the preferred alternative, in effect rolling up the detailed information into a decision. At each point any trade-offs between alternatives are identified and discussed in the following sections with the intent of providing the reader with a traceable decision-making process. At no point was weighting applied to the ratings of alternatives by indicator, criterion or objective.

5.4.3 *Results of Comparative Evaluation*

The following sections detail the comparative evaluation of alternatives by objective to identify trade-offs and create a reasoned argument as to which alternative(s) are most preferred for each objective. Each section states what the objective is intended to measure followed by a discussion of trade-offs (i.e., advantages versus disadvantages) within criteria, a discussion of trade-offs (i.e., advantages versus disadvantages) between criteria and the determination of the rating of alternatives for the objective. The discussion of effects assumes that mitigation measures as detailed in **Appendix G** have been applied to address any potential effects. As noted above, the DMNP is about taking an ecologically dysfunctional, derelict brownfield site at risk of flooding and creating an ecologically functional river mouth and a flood protected site that will permit the development envisioned by the Secondary Plan. As such, there are very few negative net effects associated with the project. It was also assumed that as discussed in **Chapter 6**, construction of the low flow channel and river valley system will precede the construction of the adjacent communities.

5.4.3.1 Naturalization

The naturalization objective measures the ability of each alternative to create functional wetland, aquatic and terrestrial habitat. It also measures the potential to create linkages between these new habitat areas and existing naturalized areas such as Environmentally Significant Area (ESA) 130 and Tommy Thompson Park. Refer to **Table 5-10** below for the details of the comparative evaluation.

Table 5-10 Step 4 Comparative Evaluation Table – Naturalization

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
1. Naturalization	Total naturalized area		35.5 ha	38.6 ha	40.3 ha	45.8 ha	47.8 ha
			Least preferred	**Moderately preferred**	**Moderately preferred**	**Most preferred**	**Most preferred**
	Area of wetland habitat types created (designed to respond to ecosystem constraints)	Total area of wetland within the Alternative	8.1 ha	11.5 ha	20.5 ha	20.0 ha	19.1 ha
			Least preferred	**Moderately preferred**	**Most preferred**	**Most preferred**	**Most preferred**
		Largest single patch size of wetland	4.3 ha	9.0 ha	4.8 ha	7.0 ha	4.7 ha
			Least preferred	**Most preferred**	**Least preferred**	**Moderately preferred**	**Least preferred**
	Area of open space / terrestrial habitat	Total area of potential open space / terrestrial within the Alternative (measured as total of non-manicured upland and parkland)	15.3	17.0 ha	14.0 ha	18.8 ha	18.3 ha
			Least preferred	**Moderately preferred**	**Least preferred**	**Most preferred**	**Most preferred**
	Potential for negative and / or beneficial effect on wildlife species or communities (i.e., minimizing disturbance and connecting habitat)	Ratio of perimeter to area of the largest contiguous wetland habitat patch (measure of largest circle within patch)	1.3 ha	2.7 ha	3.1 ha	2.5 ha	2.7 ha
			Least preferred	**Most preferred**	**Most preferred**	**Most preferred**	**Most preferred**
		Ratio of perimeter to area of the largest contiguous open space / terrestrial patch (measure of largest circle within patch)	3.2 ha	3.8 ha	4.1 ha	3.5 ha	3.4 ha
			Same	**Same**	**Same**	**Same**	**Same**
	Potential for negative and / or beneficial effects on native fish habitat or aquatic communities	Total area of aquatic habitat	12.1 ha	10.1 ha	5.8 ha	7.0 ha	• Keating channel 4.1 ha • Main channel 6.3 ha • Total = 10.4 ha
			Most preferred	**Moderately preferred**	**Least preferred**	**Least preferred**	**Moderately preferred**
		Length of channel	1,300 m	1,140 m	1,310 m	1,165 m	• Keating channel 740 m • Main channel 2,000 m • Total = 2,740 m
			Least preferred	**Least preferred**	**Least preferred**	**Least preferred**	**Most preferred**
	Potential for hydraulics and hydrology to affect sustainability of vegetation communities and associated fauna	Flexibility in design to allow management of full range of flows without adverse impact on vegetative communities (high erosional stress, sediment deposits)	• Single corridor conveys flood but difficult to manage high flood events (i.e., vegetation subject to high shear stress during flood events).	• Single corridor conveys flood but difficult to manage high flood events (i.e., vegetation subject to high shear stress during high flood events).	• Two corridors. • Spillway diverts flood events from main corridor thereby reducing shear stress on floodplain vegetation.	• Two corridors. • Spillway diverts flood events from main corridor thereby reducing shear stress on floodplain vegetation.	• Three corridors. • Two spillways provide more control of flow diversion of flood events. Access to 'hard' Keating Channel for flood events.
			Least preferred	**Least preferred**	**Moderately preferred**	**Moderately preferred**	**Most preferred**
	Potential to maintain and improve connection for aquatic species	Orientation of the connection to the Inner Harbour that encourages fish access	• Directly into the Inner Harbour.	• Indirectly into the Inner Harbour through the Ship channel.	• Directly into the Inner Harbour.	• Indirectly into the Inner Harbour through the Ship channel.	• Directly into the Inner Harbour.
			Most preferred	**Least preferred**	**Most preferred**	**Least preferred**	**Most preferred**
	Quality of habitat types created	Density of infrastructure within or adjacent to habitat measured as a ratio of length of crossing to area of habitat patch.	• 64 m of crossing / ha of wetland.	• 21 m of crossing / ha of wetland.	• 27 m of crossing / ha of wetland.	• 28 m of crossing / ha of wetland.	• 11 m of crossing / ha of wetland.
			Least preferred	**Moderately preferred**	**Moderately preferred**	**Moderately preferred**	**Most preferred**
	Potential for negative and / or beneficial effect on wildlife species or communities (i.e., minimizing disturbance and connecting habitat)	Potential for enhancement for migratory bird habitat (internal linkages as well as links external to the project to both existing and planned habitat)	• Least potential for enhancement based on linear distance of 675 m of naturalized area.	• Moderate potential for enhancement based on linear distance of 915 m of naturalized area.	• Least potential for enhancement based on linear distance of 675 m of naturalized area.	• Moderate potential for enhancement based on linear distance of 860 m of naturalized area.	• Greatest potential for enhancement based on linear distance of 1,250 m of naturalized area.
			Least preferred	**Moderately preferred**	**Least preferred**	**Moderately preferred**	**Most preferred**

Within the naturalization objective there are a number of trade-offs identified within the criteria. For the criterion *area of wetland habitat types created*, there is a trade-off between the total area of wetland created and the largest single patch size. While it is desirable to create a large total area of wetland, it is also desirable that the individual patch size be large enough to provide functional habitat, which is generally accepted by ecologists to be four hectares. As described previously, TRCA data indicate that, within its jurisdiction, patches approaching 10 hectares may provide an enhanced level of habitat quality in terms of biodiversity.

Alternative 4S creates the best combination of total area created and patch size, and is therefore considered to be most preferred. Alternative 2, which has the least total area created and the smallest patch size, is least preferred. Alternatives 4W and 4WS create some of the largest total area of wetland but have patch sizes of less than five hectares and are thus moderately preferred. Alternative 3 creates a relatively small total area of wetland but the largest single patch size and is thus moderately preferred for this indicator.

For the criterion *potential for negative and / or beneficial effect on native fish habitat or aquatic communities*, there is a trade-off between the total area of aquatic habitat created and the length of the channel where length is a surrogate for sinuosity or the potential to create shallow productive zones at the shoreline / river interface. Alternatives 4W and 4S are rated as least preferred with respect to both the area of habitat created and the length of the channel and thus are least preferred for this criterion. Alternative 4WS creates a moderate area of aquatic habitat and by far the longest length of channel, thus it is the most preferred alternative. Alternatives 2 and 3 create relatively large areas of aquatic habitat but have the shortest channel lengths and thus are moderately preferred.

For all other criteria only one indicator is used, so no trade-offs are identified within each remaining criterion.

Alternative 4WS is most preferred for all of the naturalization criteria except the *area of wetland habitat*, for which it is moderately preferred, as it creates a large total area of habitat but provides relatively small individual wetland patches compared to Alternatives 3 and 4S. It is recognized that these disadvantages may be overcome during the Step 5 design refinement and analysis by increasing the sizes of individual patches.

Alternative 4WS scores well for the size of the overall naturalized footprint, total area of wetland and upland habitat created and for providing the greatest potential to limit disturbance to wildlife and connect through to the Project and Impact Assessment Study Areas. It is well connected to the Inner Harbour and has the longest channel length. However, the Keating Channel is not connected to the low flow channel, and therefore provides less value in terms of aquatic habitat. The small individual patch size of wetland is overcome by the low potential impact to wetlands from infrastructure.

Alternative 4W scores well for the size of the overall naturalized footprint, area of wetland, wetland patch size, potential to limit disturbance to wildlife and connectivity to the Inner Harbour. It provides moderate upland habitat and scores poorly for the amount of aquatic habitat. It is subject to moderate effects from infrastructure crossings.

Alternative 4S provides the highest area of overall naturalized footprint, total upland and wetland habitat created and has a high potential to limit disturbance to wildlife. It is subject to moderate effects from infrastructure crossings. It scores low for the area of aquatic habitat created and for the length of the river.

Alternative 2 scores well for the size of the upland and aquatic habitat created and connectivity to the Inner Harbour. However, it provides the smallest footprint of naturalized area and the least wetland. Potential for enhanced wildlife function is poor and impacts from infrastructure crossings are high. The single outlet restricts design potential to enhance habitat.

Alternative 3 scores well for creating the largest single patch of wetland such that potential interior habitat may be created. It is subject to moderate effects from infrastructure crossings, provides the second lowest overall naturalized footprint, with only moderate amounts of total wetland, upland and aquatic habitat. The single outlet restricts design potential to enhance habitat.

Therefore, for the naturalization objective Alternative 4WS is most preferred followed by Alternatives 4W and 4S as moderately preferred and Alternative 2 and 3 as least preferred.

Table 5-11 presents a summary of the criteria ratings for the naturalization objective.

Table 5-11 Summary of Criteria Ratings for the Naturalization Objective

Objective	Criteria	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
Naturalization	Total naturalized area	Least preferred	Moderately preferred	Most preferred	Most preferred	Most preferred
	Area of wetland habitat types created	Least preferred	Moderately preferred	Moderately preferred	Most preferred	Moderately preferred
	Area of open space / terrestrial habitat	Least preferred	Moderately preferred	Least preferred	Most preferred	Most preferred
	Potential for negative and / or beneficial effect on wildlife species or communities	Least preferred	Most preferred	Most preferred	Most preferred	Most preferred
	Potential for negative and / or beneficial effects on native fish habitat or aquatic communities	Moderately preferred	Moderately preferred	Least preferred	Least preferred	Most preferred
	Potential for hydraulics and hydrology to affect sustainability of vegetation communities and associated fauna	Least preferred	Least preferred	Moderately preferred	Moderately preferred	Most preferred
	Potential to maintain and improve connection for aquatic species	Most preferred	Least preferred	Most preferred	Least preferred	Most preferred
	Quality of habitat types created	Least preferred	Moderately preferred	Moderately preferred	Moderately preferred	Most preferred
	Potential for negative and / or beneficial effect on wildlife species or communities (i.e., minimizing disturbance and connecting habitat)	Least preferred	Moderately preferred	Least preferred	Moderately preferred	Most preferred
Objective Summary		***Least preferred***	***Least preferred***	***Moderately preferred***	***Moderately preferred***	***Most preferred***

5.4.3.2 Flood Protection

The flood protection objective measures the ability of each alternative to remove regulatory flood risk from Spill Zones 1 and 2 by containing storm events. Refer to **Table 5-12** below for the details of the comparative evaluation.

Table 5-12 Step 4 Comparative Evaluation Table – Flood Protection

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
2. Flood Protection	Potential to impact flooding conditions elsewhere	Extent of flooding that will continue to occur in developed areas or beyond the Project Study Area	• No flooding in developed areas or beyond Project Study Area except for Unilever and east of Don River upstream of CN Rail bridge.	• No flooding in developed areas or beyond Project Study Area except for Unilever and east of Don River upstream of CN Rail bridge.	• No flooding in developed areas or beyond Project Study Area except for Unilever and east of Don River upstream of CN Rail bridge.	• No flooding in developed areas or beyond Project Study Area except for Unilever and east of Don River upstream of CN Rail bridge.	• No flooding in developed areas or beyond Project Study Area except for Unilever and east of Don River upstream of CN Rail bridge.
			Same	**Same**	**Same**	**Same**	**Same**
		Need for additional flood protection or flood proofing works to eliminate flood risks	• Additional flood protection works required east of Don River upstream of CN Rail bridge at Eastern Avenue.	• Additional flood protection works required east of Don River upstream of CN Rail bridge at Eastern Avenue.	• Additional flood protection works required east of Don River upstream of CN Rail bridge at Eastern Avenue.	• Additional flood protection works required east of Don River upstream of CN Rail bridge at Eastern Avenue.	• Additional flood protection works required east of Don River upstream of CN Rail bridge at Eastern Avenue.
			Same	**Same**	**Same**	**Same**	**Same**
		Need for erosion protection to eliminate flood risks	• More extensive erosion protection (due to high shear stresses).	• More extensive erosion protection (due to high shear stresses).	• Less extensive erosion protection (due to moderate shear stresses).	• Less extensive erosion protection (due to moderate shear stresses).	• Less extensive erosion protection (due to lower shear stresses).
			Least preferred	**Least preferred**	**Most preferred**	**Most preferred**	**Most preferred**
	Potential for sediment to affect flooding and conveyance of flow	Adaptability of design to allow conveyance of sediments under low flow and range of flood conditions	• Limited adaptability because wide base flow channel impedes sediment conveyance under low flow conditions. • Alternative can be designed to convey sediments under flood conditions.	• Limited adaptability because wide base flow channel impedes sediment conveyance under low flow conditions. • Alternative can be designed to convey sediments under flood conditions.	• Greater adaptability because narrower base flow channel allows more sediment conveyance under low flow conditions. • Alternative can be designed to convey sediments under flood conditions. Minimal accumulation of sediment on spillway – unlikely to impact flooding or flow conveyance – may require limited park maintenance.	• Greater adaptability because narrower base flow channel allows more sediment conveyance under low flow conditions. • Alternative can be designed to convey sediments under flood conditions. Minimal accumulation of sediment on spillway – unlikely to impact flooding or flow conveyance – may require limited park maintenance.	• Greater adaptability because narrower base flow channel allows more sediment conveyance under low flow conditions. • Alternative can be designed to convey sediments under flood conditions. Minimal accumulation of sediment on spillway – unlikely to impact flooding or flow conveyance – may require limited park maintenance.
			Least preferred	**Least preferred**	**Most preferred**	**Most preferred**	**Most preferred**
	Land area removed from flood risk	Property area removed from flood risk within Port Lands	• All property area (approximately 240 ha) removed from flood risk.	• All property area (approximately 240 ha) removed from flood risk.	• All property area (approximately 240 ha) removed from flood risk.	• All property area (approximately 240 ha) removed from flood risk.	• All property area (approximately 240 ha) removed from flood risk.
			Same	**Same**	**Same**	**Same**	**Same**
	Ability to accommodate potential changes in extreme precipitation and water flows resulting from climate change	Capacity for future modification to the design to respond to trends toward substantial increases in water volumes due to climate change	• Earthworks required to modify capacity.	• Earthworks required to modify capacity.	• Weir modification possible to account for change in lake levels or river flow regime. Possibility for detailed design to include adjustable flow control.	• Weir modification possible to account for change in lake levels or river flow regime. Possibility for detailed design to include adjustable flow control.	• Weir modification possible to account for change in lake levels or river flow regime. Possibility for detailed design to include adjustable flow control.
			Least preferred	**Least preferred**	**Most preferred**	**Most preferred**	**Most preferred**

While all options can provide Regulatory Flood protection, Alternatives 4W, 4S and 4WS do so with the greatest degree of flexibility and potential to manage impacts related to future flood damages to the conveyance system. This is accomplished by distributing flows within multiple outlets and reducing overall flood velocities. Accordingly, Alternatives 4W, 4S, and 4WS are most preferred for all flood protection criteria and are therefore most preferred for the flood protection objective. Alternatives 2 and 3 are least preferred overall as they are least preferred for all of the flood protection criteria.

Table 5-13 presents a summary of the criteria ratings for the flood protection objective.

Table 5-13 Summary of Criteria Ratings for the Flood Protection Objective

Objective	Criteria	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
Flood Protection	Potential to impact flooding conditions elsewhere	Least preferred	Least preferred	Most preferred	Most preferred	Most preferred
	Potential for sediment to affect flooding and conveyance of flow	Least preferred	Least preferred	Most preferred	Most preferred	Most preferred
	Ability to accommodate potential changes in extreme precipitation and water flow resulting from climate change	Least preferred	Least preferred	Most preferred	Most preferred	Most preferred
Objective Summary		***Least preferred***	***Least preferred***	***Most preferred***	***Most preferred***	***Most preferred***

5.4.3.3 Operational Management and Constructability

The operational management and constructability objective measures the ease or difficulty with which the project can be constructed, operated, and maintained and the effects on port operations and shipping. Operational issues include the management of sediment and debris. Refer to **Table 5-14** below for the details of the comparative evaluation.

Table 5-14 Step 4 Comparative Evaluation Table – Operational Management and Constructability

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
3. Operational Management and Constructability	Potential to phase implementation of river modifications	Ease of construction	• River construction and remedial action along the alignment of Keating Channel cannot be phased in as much as the proposed Don River remains unchanged from the existing condition. Construction of the new river alignment will be intricate because of the need to allow continuing river flow past abutting construction and remediation zones. • Higher complexity in construction of roads anticipated due to the proposed realignment of Lake Shore Boulevard right under DVP NB/SB ramps.	• River construction can be phased in as much as Keating Channel can remain in service while the new riverbed and adjacent wetlands are excavated in the dry. Once river alignment and associated excavation is complete, Keating channel can be cut off, subject to any necessary remedial work and backfilled. • Least complexity in road construction anticipated.	• River construction and remedial action along the alignment of Keating Channel cannot be phased inasmuch as the proposed Don River remains unchanged from the existing condition. Construction of the new river alignment will be intricate because of the need to allow continuing river flow past abutting construction and remediation zones. • Higher complexity in construction of roads anticipated due to the proposed realignment of Lake Shore Boulevard right under DVP NB/SB ramps.	• River construction can be phased inasmuch as Keating Channel can remain in service while the new riverbed and adjacent wetlands are excavated in the dry. Once river alignment and associated excavation is complete, Keating channel can be cut off, subject to any necessary remedial work and backfilled. • Higher complexity in construction of roads anticipated due to the proposed realignment of Lake Shore Boulevard right under DVP NB/SB ramps.	• River construction can be phased inasmuch as Keating Channel can remain in service while the new riverbed and adjacent wetlands are excavated in the dry. Once river alignment and associated excavation is complete, Keating channel can be cut off, subject to any necessary remedial work and backfilled. • Higher complexity in construction of roads anticipated due to the proposed realignment of Lake Shore Boulevard right under DVP NB/SB ramps.
			Least preferred	**Most preferred**	**Least preferred**	**Moderately preferred**	**Moderately preferred**
		Ability to divert roads and maintain access during construction	• Reconstruction of Lake Shore Boulevard crossing will require lane closures for each direction (two lanes at a time), and detours along Cherry Street and Villiers / Commissioners Streets. • New Cherry Street bridge spanning low flow channel will require detours along Lake Shore Boulevard.	• Reconstruction of Lake Shore Boulevard crossing will require lane closures for each direction (two lanes at a time), and detours along Cherry Street and Villiers / Commissioners Streets. • New road overtop filled in Keating Channel can be constructed, while existing Cherry Street bridge is operational.	• Reconstruction of Lake Shore Boulevard crossing will require lane closures for each direction (two lanes at a time), and detours along Cherry Street and Villiers / Commissioners Streets. • New Cherry Street bridge spanning low flow channel will require detours along Lake Shore Boulevard.	• Reconstruction of Lake Shore Boulevard crossing will require lane closures for each direction (two lanes at a time), and detours along Cherry Street and Villiers / Commissioners Streets. • New Cherry Street crossing spanning overflow spillway will require detours along Lake Shore Boulevard.	• Reconstruction of Lake Shore Boulevard crossing will require lane closures for each direction (two lanes at a time), and detours along Cherry Street and Villiers / Commissioners Streets. • New Cherry Street bridge spanning low flow channel will require detours along Lake Shore Boulevard.
			Same	**Same**	**Same**	**Same**	**Same**
		Ability to manage 5-year flood events during construction	• Build in 'wet' or requires extensive temporary diversion.	• Build in 'dry' with Keating as 'flow diversion'.	• Build in 'dry' using spillway as temporary flow diversion.	• Main channel built in dry – spillway subject to flooding during construction.	• Build in 'dry' with Keating as 'flow diversion'.
			Least preferred	**Most preferred**	**Most preferred**	**Moderately preferred**	**Most preferred**
	Accessibility of river mouth for operational management (i.e., dredge, barge, etc.)	Accessibility to sediment trap location and low flow channel to facilitate operational management related to sediment, debris and ice	• Primary sediment and debris management is the same for all alternatives. • Trap access impeded by crossings. • Operational management of residual sediment and debris easier in single wide channel downstream from trap.	• Primary sediment and debris management is the same for all alternatives. • Trap access impeded by crossings. • Operational management of residual sediment and debris easier in single wide channel downstream from trap.	• Primary sediment and debris management is the same for all alternatives. • Trap access impeded by crossings. • Less residual sediment and debris management required in main channel due to better conveyance during low flow conditions. • Residual sediment and debris management required on spillway after large flood event. • Smaller low flow channel may impede barge access.	• Primary sediment and debris management is the same for all alternatives. • Trap access impeded by crossings. • Less residual sediment and debris management required in main channel due to better conveyance during low flow conditions. • Residual sediment and debris management required on spillway after large flood event. • Smaller low flow channel may impede barge access.	• Primary sediment and debris management is the same for all alternatives. • Trap access impeded by crossings. • Less residual sediment and debris management required in main channel due to better conveyance during low flow conditions. Periodic dredging of residual sediment in Keating Channel may be required. Minimal sediment load to Ship Channel is anticipated. Residual sediment and debris management required on spillway after large flood event. • Smaller low flow channel may impede barge access.
			Most preferred	**Most preferred**	**Least preferred**	**Least preferred**	**Least preferred**
		Need for access roads to sediment and debris management areas	• Same for all.	• Same for all.	• Same for all.	• Same for all.	• Same for all.
			Same	**Same**	**Same**	**Same**	**Same**

Table 5-14 Step 4 Comparative Evaluation Table – Operational Management and Constructability

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
	Potential for adverse effects/ improvements to Port operations	Displacement / disruption of yards operations	• Loss of works yard adjacent to Keating Channel due to widened low flow channel and creation of an aquatic habitat.	• Loss of works yard adjacent to Keating Channel due to infilling of channel and creation of terrestrial habitat / open space.	• Loss of works yard adjacent to Keating Channel due to creation of naturalized area.	• Loss of works yard adjacent to Keating Channel due to creation of terrestrial and wetland habitat.	• Loss of works yard adjacent to Keating Channel due to development.
			Same	**Same**	**Same**	**Same**	**Same**
		Length of dockwall modified or buried	• 2,500 m of dockwall will be modified along Keating Channel.	• Total of 1,965 m of dockwall modified or buried including 1,665 m buried along Keating Channel and 300 m modified at interface between river mouth and Ship Channel.	• Total of 2,550 m of dockwall modified or buried including 2,250 m modified along Keating Channel and 300 m modified at interface between overflow spillway and Ship Channel.	• Total of 2,550 m of dockwall modified or buried including 2,250 m modified along Keating Channel and 300 m modified at interface between river mouth and Ship Channel.	• Total of 2,745 m of dockwall modified or buried including 1,900 m modified along Cousins Quay and Polson Quay, 170 m modified along the Ship Channel, and 675 m buried along eastern end of Keating Channel.
			Moderately preferred	**Most preferred**	**Moderately preferred**	**Moderately preferred**	**Least preferred**
		Disruption to Port operations	• Any loss of dockwall is not desirable as it limits options for future shipping prospects.	• Any loss of dockwall is not desirable as it limits options for future shipping prospects.	• Any loss of dockwall is not desirable as it limits options for future shipping prospects.	• Any loss of dockwall is not desirable as it limits options for future shipping prospects.	• Any loss of dockwall is not desirable as it limits options for future shipping prospects.
			Same	**Same**	**Same**	**Same**	**Same**
		Qualitative assessment of effects on shipping activities	• Similar to existing condition – negligible effect on shipping activities.	• Discharge of river to Ship Channel will create a hazard for moving vessels into Ship Channel during storm events. Perpendicular river currents will impact large vessels in Ship Channel.	• Periodic discharge of river water into Ship Channel is not anticipated to impact shipping operations.	• Discharge of river to Ship Channel will create a hazard for moving vessels into Ship Channel during storm events. Perpendicular river currents will impact large vessels in Ship Channel.	• Proposed promontory into the Inner Harbour sits on shipping lane for Redpath Sugar and occupies a number of anchorages. Risk assessment will be required to identify a new shipping lane and relocate anchorages. • Periodic discharge of river water into Ship Channel is not anticipated to impact shipping operations.
			Most preferred	**Least preferred**	**Most preferred**	**Least preferred**	**Moderately preferred**
	Annual operations and maintenance costs	Annual cost of sediment and debris management activities	• Less costly.	• Less costly.	• More costly as residual sediment and debris management required on spillway after large flood event and smaller low flow channel may impede access.	• More costly as residual sediment and debris management required on spillway after large flood event and smaller low flow channel may impede access.	• More costly as residual sediment and debris management required on spillway after large flood event and smaller low flow channel may impede access.
			Most preferred	**Most preferred**	**Least preferred**	**Least preferred**	**Least preferred**

Alternative 2 is most preferred for all but one of the operational management and constructability criteria. Alternative 2 has advantages related to accessibility for operational management, the effects on shipping and the Ship Channel, and operation and maintenance costs. Alternative 2 has disadvantages related to the potential to phase implementation of the project. This relates to the need to make modifications to the Keating Channel while maintaining river flows, the ability to divert roads and maintain access, and the ability to manage flood events during construction.

Alternative 3 is most preferred for all but one of the operational management and constructability criteria as well. The disadvantages of Alternative 3 relate to the effects on the Ship Channel from the permanent discharge of the river and the effects on moored ships from strong perpendicular currents during storm events. This alternative has advantages over the other alternatives related to the phasing of implementation, the accessibility of the river mouth for operational management, and annual operation and maintenance costs.

Despite these disadvantages, Alternatives 2 and 3 are considered most preferred for the operational management and constructability objective.

Alternative 4W is moderately preferred as it has advantages related to effects on Port operations and shipping but is least preferred for the potential to phase implementation, the accessibility of the river mouth for operational management and annual operation and maintenance costs. Both Alternatives 4S and 4WS are least preferred overall as they are least preferred for all of the criteria with the exception of the potential to phase implementation of the alternative, for which they are moderately preferred.

Table 5-15 presents a summary of the criteria ratings for the operational management and constructability objective.

Table 5-15 Summary of Criteria Ratings for the Operational Management and Constructability Objective

Objective	Criteria	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
Operational Management and Constructability	Potential to phase implementation of river modifications	Least preferred	Most preferred	Least preferred	Moderately preferred	Moderately preferred
	Accessibility of river mouth for operational management (i.e., dredge, barge, etc.)	Most preferred	Most preferred	Least preferred	Least preferred	Least preferred
	Potential for adverse effects / improvements to Port operations and shipping	Most preferred	Least preferred	Most preferred	Least preferred	Least preferred
	Annual operation and maintenance costs	Most preferred	Most preferred	Least preferred	Least preferred	Least preferred
Objective Summary		***Most preferred***	***Most preferred***	***Moderately preferred***	***Least preferred***	***Least preferred***

5.4.3.4 Integration with Infrastructure

The integration with the infrastructure objective measures the extent of modifications to existing infrastructure required to implement each alternative. Infrastructure considered includes roads, rail, the ability to accommodate future planned transit, underground utilities, dockwalls, and above-ground utilities. Only infrastructure which is to be modified as a result of the implementation of an alternative was considered. Infrastructure modifications may also be required to facilitate proposed development but were not assessed as part of this evaluation. It should be noted that some of the infrastructure modifications will create benefits by facilitating the planning of development areas or the servicing of the proposed development. While the effects of the modifications have been included in the evaluation, the benefits have not. Refer to **Table 5-16** below for the details of the comparative evaluation.

Table 5-16 Step 4 Comparative Evaluation Table – Integration with Infrastructure

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
4. Integration with Infrastructure	Potential for changes to existing, planned and proposed roads solely due to DMNP	Potential modifications to Lake Shore Boulevard at the Don Roadway, Cherry Street, Commissioners Street, and / or Gardiner Expressway substructure to accommodate alternatives	• ***Lake Shore Boulevard*** will be realigned / 700 m will be affected. • ***Cherry Street:*** 200 m will be affected. • ***Commissioners Street:*** will not be affected. • ***Gardiner Expressway:*** 700 m will be affected.	• ***Lake Shore Boulevard***: 300 m will be affected. • ***Cherry Street:*** will not be affected. • ***Commissioners Street:*** 300 m will be affected. • ***Gardiner Expressway:*** 300 m will be affected.	• ***Lake Shore Boulevard***: will be realigned / 700 m will be affected. • ***Cherry Street:*** 200 m will be affected. • ***Commissioners Street:*** 200 m will be affected. • ***Gardiner Expressway:*** 700 m will be affected.	• ***Lake Shore Boulevard:*** will be realigned / 600 m will be affected. • ***Cherry Street:*** 150 m will be affected. • ***Commissioners Street:*** 300 m will be affected. • ***Gardiner Expressway:*** 600 m will be affected.	• ***Lake Shore Boulevard:*** will be realigned / 700 m will be affected. • ***Cherry Street:*** 200 m will be affected. • ***Commissioners Street:*** will be realigned / 700 m will be affected. • ***Gardiner Expressway:*** 170 m will be affected.
			Moderately preferred	**Most preferred**	**Least preferred**	**Least preferred**	**Least preferred**
		Long-term maintenance implications for Gardiner Expressway substructure	• 700 m of the Gardiner Expressway structure will be within the floodplain, will potentially be prone to erosion/scour and will require long-term maintenance.	• 300 m of the Gardiner Expressway structure will be within the floodplain, will potentially be prone to erosion/scour and will require long-term maintenance.	• 700 m of the Gardiner Expressway structure will be within the floodplain, will potentially be prone to erosion / scour and will require long-term maintenance.	• 600 m of the Gardiner Expressway structure will be within the floodplain, will potentially be prone to erosion / scour and will require long-term maintenance.	• 170 m of the Gardiner Expressway structure will be within the floodplain, will potentially be prone to erosion / scour and will require long-term maintenance.
			Least preferred	**Moderately preferred**	**Least preferred**	**Least preferred**	**Most preferred**
	Potential need for new bridges	Length of new vehicular bridges by location Length of new pedestrian bridges by location	• ***Lake Shore Boulevard***: Requires a 350 m structure on Don River. • ***Cherry Street:*** Requires a 200 m structure along the floodplain. • No new pedestrian bridges are required - pedestrian circulation is accommodated on vehicular bridges.	• ***Lake Shore Boulevard***: Structure on Don River requires widening to 300 m within the floodplain. • ***Commissioners Street***: Requires a 300 m structure along the floodplain. • One new pedestrian bridge desirable at north side of Ship Channel to enhance connectivity (Length approximately 200 m).	• ***Lake Shore Boulevard***: Requires a 320 m structure on Don River. • ***Cherry Street:*** Requires a 200 m structure along the floodplain. • ***Commissioners Street:*** Requires a 200 m structure. • One new pedestrian bridge desirable at north side of Ship Channel to enhance connectivity (Length approximately 200 m).	• ***Lake Shore Boulevard*** Requires a 320 m structure on Don River. • ***Cherry Street:*** Requires a 150 m structure along the floodplain. • ***Commissioners Street:*** Requires a 300 m structure. • One new pedestrian bridge desirable at north side of Ship Channel to enhance connectivity (Length approximately 100 m).	• ***Lake Shore Boulevard***: Structure on Don River requires widening to 170 m within the floodplain. • ***Cherry Street:*** Requires a 200 m structure along the floodplain. • ***Commissioners Street:*** Requires a 185 m structure. • One new pedestrian bridge desirable at west end of river to enhance connectivity (Length approximately 80 m).
			Most preferred	**Moderately preferred**	**Least preferred**	**Least preferred**	**Moderately preferred**
	Modifications required to accommodate surface transit	Cherry Street Commissioners Street	• Needs to be widened to the TTC / City of Toronto's requirement to accommodate two traffic lanes as well as street cars with sidewalks/ landscape / utility strips on both sides including 200 m of bridge structure.	• Needs to be widened to the TTC / City of Toronto's requirement to accommodate two traffic lanes as well as street cars with sidewalks/ landscape / utility strips on both sides including 300 m of bridge structure.	• Needs to be widened to the TTC / City of Toronto's requirement to accommodate two traffic lanes as well as street cars with sidewalks/ landscape / utility strips on both sides including 400 m of bridge structure.	• Needs to be widened to the TTC / City of Toronto's requirement to accommodate two traffic lanes as well as street cars with sidewalks/ landscape / utility strips on both sides including 450 m of bridge structure.	• Needs to be widened to the TTC / City of Toronto's requirement to accommodate two traffic lanes as well as street cars with sidewalks / landscape utility strips on both sides including 385 m of bridge structure.
			Most preferred	**Moderately preferred**	**Least preferred**	**Least preferred**	**Least preferred**
	Potential for changes to existing rail lines or yards or access roads leading to rail yards	Potential for modifications to the Keating Yard and rail connection to mainline/Don Yard	• Modifications to the Keating Yard and rail connection to mainline / Don Yard will be required including a 310 m structure on Don River within the flood plain.	• Modifications to the Keating Yard and rail connection to mainline / Don Yard will be required including a 260 m structure on Don River within the flood plain.	• Modifications to the Keating Yard and rail connection to mainline / Don Yard will be required including a 280 m structure on Don River within the flood plain.	• Modifications to the Keating Yard and rail connection to mainline / Don Yard will be required including a 280 m structure on Don River within the flood plain.	• Modifications to the Keating Yard and rail connection to mainline / Don Yard will be required including a 130 m structure on Don River within the flood plain.
			Least preferred	**Least preferred**	**Least preferred**	**Least preferred**	**Most preferred**
		Redpath Sugar spur, and Don Yard access road	• Redpath Sugar spur will be affected within the flood plain (700 m). • Don Yard access road will require minor modifications.	• Redpath Sugar spur will be affected within the flood plain (300 m). • Don Yard access road will not be affected.	• Redpath Sugar spur will be affected within the flood plain (700 m). • Don Yard access road will not be affected.	• Redpath Sugar spur will be affected within the flood plain (600 m). • Don Yard access road will require minor modifications.	• Redpath Sugar spur will be affected within the flood plain (200 m). • Don Yard access road will not be affected.
			Least preferred	**Moderately preferred**	**Least preferred**	**Least preferred**	**Most preferred**

	Potential for changes to existing, planned and proposed underground utilities	Potential for modifications to:
		• Enbridge gas pipeline
		• water and wastewater utilities
		• other underground utilities
			• A total of 4,200 m of existing utilities will need relocation which includes:
			  • Gas pipeline along Lake Shore Boulevard;
			  • Watermain and the Sanitary sewer;
			  • Conduit lines and oil lines.
				• A total of 3,230 m of existing utilities will need relocation. which includes:
				  • Gas pipeline along Lake Shore Boulevard and Commissioners Street;
				  • Watermain and Sanitary sewer;
				  • Conduit lines and the oil lines.
					• A total of 5,450 m of existing utilities will need relocation which includes:
					  • Gas pipeline along Lake Shore Boulevard, Cherry Street and Commissioners Street;
					  • Watermain and Sanitary sewer;
					  • Conduit lines and oil lines.
						• A total of 5,630 m of existing utilities will need relocation which includes:
						  • Gas pipeline along Lake Shore Boulevard, Cherry Street and Commissioners Street;
						  • Watermain and Sanitary sewer;
						  • Conduit lines and oil lines.
							• A total of 5,550 m of existing utilities will need relocation which includes:
							  • Gas pipeline along Lake Shore Boulevard;
							  • Watermain and Sanitary sewer;
							  • Conduit lines and oil lines.

			Moderately preferred	**Most preferred**	**Least preferred**	**Least preferred**	**Least preferred**

Table 5-16 Step 4 Comparative Evaluation Table – Integration with Infrastructure

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
	Potential for modifications to dockwalls	Potential need for dockwall reinforcement to prevent undermining from flood events	• Undermining should not constitute the principal concern in relation to new dockwalls in the Toronto Port Authority (TPA).	• Undermining should not constitute the principal concern in relation to new dockwalls in the TPA. Dockwall reinforcement (comprising the installation of new tiebacks and deadmen and modifications to coping walls will be required where existing walls are shortened to permit the construction of new river mouths or wetlands. • Sections of timber Wakefield walls scheduled for modification (i.e., along the Ship Channel) will have to be replaced.	• Undermining should not constitute the principal concern in relation to new dockwalls in the TPA. Dockwall reinforcement (comprising the installation of new tiebacks and deadmen and modifications to coping walls will be required where existing walls are shortened to permit the construction of new river mouths or wetlands such as at the wetland zones at the Ship Channel west of the Don Roadway Extension. • Sections of timber Wakefield walls scheduled for modification (i.e., along the Ship Channel) will have to be replaced.	• Undermining should not constitute the principal concern in relation to new dockwalls in the TPA. Dockwall reinforcement (comprising the installation of new tiebacks and deadmen and modifications to coping walls will be required where existing walls are shortened to permit the construction of new river mouths or wetlands such as at the discharge of the re-routed Don River and its adjacent wetland zones at the Ship Channel west of the Don Roadway Extension. • Sections of timber Wakefield walls scheduled for modification (i.e., along the Ship Channel) will have to be replaced.	• Undermining should not constitute the principal concern in relation to new dockwalls in the TPA. Dockwall reinforcement (comprising the installation of new tiebacks and deadmen and modifications to coping walls will be required where existing walls are shortened to permit the construction of new river mouths or wetlands such as at the discharge of the re-routed Don River and its adjacent wetland zones on the west face of Cousins Quay in Toronto Harbour and at the Ship Channel west at the east end of the former IOL B&G site. • Sections of timber Wakefield walls scheduled for modification (i.e., along the Ship Channel) will have to be replaced.
			Most preferred	**Least preferred**	**Least preferred**	**Least preferred**	**Least preferred**
		Maintenance implications for dockwalls	• No significant maintenance requirements are considered necessary unless insufficient care is taken in relation to dockwall design or during construction.	• No significant maintenance options are considered necessary unless insufficient care is taken in relation to dockwall design or during construction or where new river mouths or wetlands cross existing walls. The structural components for the new river mouths will have to be designed in such a way as to avoid damage to docking or transiting vessels.	• No significant maintenance options are considered necessary unless insufficient care is taken in relation to dockwall design or during construction or where new river mouths or wetlands cross existing walls. The structural components for the new river mouths and wetlands will have to be designed in such a way as to avoid damage to docking or transiting vessels.	• No significant maintenance options are considered necessary unless insufficient care is taken in relation to dockwall design or during construction or where new river mouths or wetlands cross existing walls. The structural components for the new river mouths and wetlands will have to be designed in such a way as to avoid damage to docking or transiting vessels.	• No significant maintenance options are considered necessary unless insufficient care is taken in relation to dockwall design or during construction or where new river mouths or wetlands cross existing walls. The structural components for the new river mouths will have to be designed in such a way as to avoid damage to docking or transiting vessels.
			Most preferred	**Least preferred**	**Least preferred**	**Least preferred**	**Least preferred**

	Potential for changes to existing above ground utilities	Length of above ground utilities to be modified	• Overhead Bell Canada and overhead power lines will be affected / removed within the following sections:
			  • The entire length of Villiers Street (700 m) as part of the roadway removal.
				• Overhead Bell Canada and overhead power lines will be affected / removed within the following sections:
				  • The entire length of Villiers Street (700 m) as part of the roadway removal;
				  • Commissioners Street for a length of 300 m located within the floodplain.
					• Overhead Bell Canada and overhead power lines will be affected / removed within the following sections:
					  • The entire length of Villiers Street (700 m) as part of the roadway removal;
					  • Commissioners Street for a length of 200 m located within the floodplain.
						• Overhead Bell Canada and overhead power lines will be affected / removed within the following sections:
						  • The entire length of Villiers Street (700 m) as part of the roadway removal;
						  • Commissioners Street for a length of 300 m located within the floodplain.
							• Overhead Bell Canada and overhead power lines will be affected / removed within the following sections:
							  • The entire length of Villiers Street (700 m) as part of the roadway removal;
							  • Commissioners Street for the entire length (700) as a result of the road realignment;
							  • Cherry Street for a length of 200 m located within the floodplain.

			Most preferred	**Moderately preferred**	**Moderately preferred**	**Moderately preferred**	**Least preferred**
		Potential for modifications to the hydro bridge and substation	• Potential for impacts on the hydro bridges and substation may be present.	• Potential for impacts on the hydro bridges and substation may be present.	• Potential for impacts on the hydro bridges and substation may be present.	• Potential for impacts on the hydro bridges and substation may be present.	• Potential for impacts on the hydro bridges and substation may be present.
			Same	**Same**	**Same**	**Same**	**Same**

All of the alternatives have significant effects on infrastructure. The ability to distinguish between the alternatives is focused on the issue that those alternatives with more than one discharge point generally require more significant modifications to infrastructure than those with only one discharge point. For this reason, Alternatives 2 and 3 are most preferred for the integration with infrastructure objective. Alternative 2 generally minimizes the modifications to bridges, underground and above ground utilities and dockwalls and roads. However, disadvantages relate to the changes required for rail lines, rail yards and access roads to rail yards. Alternative 3 generally minimizes the modifications to roads, bridges, rail lines, and underground and above ground utilities, but has the potential to create maintenance issues for dockwalls.

Alternatives 4W and 4S have disadvantages for all criteria except changes to above-ground utilities and are thus least preferred for the integration with infrastructure objective. Alternative 4WS is moderately preferred for this objective. It has the least impact to rail lines, yards and access roads and only moderate impact to roads and bridges. For all other criteria it is least preferred.

Table 5-17 presents a summary of the criteria ratings for the integration with infrastructure objective.

Table 5-17 Summary of Criteria Ratings for the Integration with Infrastructure Objective

Objective	Criteria	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
Integration with Infrastructure	Potential for changes to existing, planned and proposed roads solely due to DMNP	Moderately preferred	Most preferred	Least preferred	Least preferred	Moderately preferred
	Potential need for new bridges	Most preferred	Moderately preferred	Least preferred	Least preferred	Moderately preferred
	Modifications required to accommodate surface transit	Most preferred	Moderately preferred	Least preferred	Least preferred	Least preferred
	Potential for changes to existing rail lines or yards or access roads leading to rail yards	Least preferred	Moderately preferred	Least preferred	Least preferred	Most preferred
	Potential for changes to existing, planned and proposed underground utilities	Moderately preferred	Most preferred	Least preferred	Least preferred	Least preferred
	Potential for modifications to dockwalls	Most preferred	Least preferred	Least preferred	Least preferred	Least preferred
	Potential for changes to existing above ground utilities	Most preferred	Moderately preferred	Moderately preferred	Moderately preferred	Least preferred
Objective Summary		***Most preferred***	***Most preferred***	***Least preferred***	***Least preferred***	***Moderately preferred***

5.4.3.5 Recreational and Cultural Opportunities

The recreational and cultural opportunities objective measures changes to existing recreational and cultural resources and the potential to create new recreational opportunities and conserve heritage resources. Refer to **Table 5-18** below for the details of the comparative evaluation.

Table 5-18 Step 4 Comparative Evaluation Table – Recreational and Cultural Opportunities

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
5. Recreational and Cultural Opportunities	Potential for effect from construction on traditional uses of lands by Aboriginal peoples	Extent of traditional uses of lands within footprint of river mouth	• No Impact: Previous 19th and 20th century developments have already impacted traditional uses of lands by Aboriginal peoples.	• No Impact: Previous 19th and 20th century developments have already impacted traditional uses of lands by Aboriginal peoples.	• No Impact: Previous 19th and 20th century developments have already impacted traditional uses of lands by Aboriginal peoples.	• No Impact: Previous 19th and 20th century developments have already impacted traditional uses of lands by Aboriginal peoples.	• No Impact: Previous 19th and 20th century developments have already impacted traditional uses of lands by Aboriginal peoples.
			Same	**Same**	**Same**	**Same**	**Same**
	Potential for effect from construction on archaeological resources	Significance of archaeological resources within footprint of river mouth	• 7 inventoried archaeological resources impacted (Inventory No. LDP-2, LDP-3. LDP-4, LDP-5, LDP-9, LDP-10, LDP-11).	• 5 inventoried archaeological resources impacted (Inventory No. LDP-2, LDP-4, LDP-8, LDP-9, LDP-10).	• 8 inventoried archaeological resources impacted (Inventory No. LDP-2, LDP-3, LDP-4, LDP-5, LDP-9, LDP-10, LDP-11, LDP-12).	• 7 inventoried archaeological resources impacted (Inventory No. LDP-2, LDP-4. LDP-5, LDP-8, LDP-9, LDP-10, LDP-12).	• 3 inventoried archaeological resources impacted (Inventory No. LDP-2, LDP-4, LDP-8).
			Least preferred	**Moderately preferred**	**Least preferred**	**Least preferred**	**Most preferred**
	Sustainability of active and informal park spaces	Qualitative assessment of maintenance requirements of 'park' space	• Alternative to be designed to minimize maintenance. Further assessment required in Step 5.	• Alternative to be designed to minimize maintenance. Further assessment required in Step 5.	• Alternative to be designed to minimize maintenance. Further assessment required in Step 5.	• Alternative to be designed to minimize maintenance. Further assessment required in Step 5.	• Alternative to be designed to minimize maintenance. Further assessment required in Step 5.
			Same	**Same**	**Same**	**Same**	**Same**
	Potential for changes to use of river mouth for boating	Compatibility of recreational boating with naturalization	• Can be designed to be compatible.	• Can be designed to be compatible.	• Can be designed to be compatible.	• Can be designed to be compatible.	• Can be designed to be compatible.
			Same	**Same**	**Same**	**Same**	**Same**
		Dimensions (depth, length, and width) of river mouth in context of navigable waterway	• Low flow channel will be navigable by motorized boats.	• Low flow channel will be navigable by motorized boats.	• Low flow channel will be navigable by canoe or kayak.	• Low flow channel will be navigable by canoe or kayak.	• Low flow channel will be navigable by canoe or kayak.
			Most preferred	**Most preferred**	**Least preferred**	**Least preferred**	**Least preferred**
	Potential to negatively or positively affect recreational boating in the Inner Harbour	Qualitative assessment of effects on recreational boating	• Similar to existing condition but river mouth will be more attractive to recreational boaters and may attract more use than what currently occurs with the Keating Channel.	• Not desirable to attract recreational boating activity to Ship Channel. Small craft cannot be seen from wheel house of freighter in Ship Channel greatly increasing risk of collisions with larger vessels.	• Similar to existing condition but river mouth will be more attractive to recreational boaters and may attract more use than what currently occurs with the Keating Channel.	• Not desirable to attract recreational boating activity to Ship Channel. Small craft cannot be seen from wheel house of freighter in Ship Channel greatly increasing risk of collisions with larger vessels.	• River mouth will be more attractive to recreational boaters and may attract more use than what currently occurs with the Keating Channel. Keating Channel may continue to provide opportunities for recreational boating. Promontory into Inner Harbour may encroach on available navigable space, affecting recreational boating.
			Most preferred	**Least preferred**	**Most preferred**	**Least preferred**	**Moderately preferred**
	Opportunity to enhance / degrade existing and proposed pedestrian/ cycling linkages with and between waterfront areas and the rest of the city	Length of existing and potential pedestrian / cycling trails	• 3,664 m of primary trails provided. Potential for 600 m of secondary trails.	• 3,270 m of primary trails provided. Potential for 600 m of secondary trails.	• 3,270 m of primary trails provided. Potential for 600 m of secondary trails.	• 3,631 m of primary trails provided. Potential for 950 m of secondary trails.	• 3,700 m of primary trails provided. Potential for 1,800 m of secondary trails.
			Least preferred	**Least preferred**	**Least preferred**	**Moderately preferred**	**Most preferred**
		Extent of linkages to parks within East Bayfront Precinct Plan, Distillery District, Lake Ontario Park, etc.	• Open space linkages to Lake Ontario Park, Don River Park, Distillery District and East Bayfront provided.	• Open space connections to Lake Ontario Park and Don River Park provided. Connections to East Bayfront and Distillery District not provided.	• Open space linkages to Lake Ontario Park, Don River Park, Distillery District and East Bayfront provided.	• Open space linkages to Lake Ontario Park and Don River Park. Limited linkages to Distillery District and East Bayfront.	• Open space linkages to Don River Park, Lake Ontario Park, Distillery District and East Bayfront provided.
			Most preferred	**Least preferred**	**Most preferred**	**Least preferred**	**Most preferred**

Table 5-18 Step 4 Comparative Evaluation Table – Recreational and Cultural Opportunities

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
	Potential to provide functional linkages to Martin Goodman Trail	Number of linkages	• 4 potential linkages provided.	• 3 potential linkages provided.	• 4 potential linkages provided.	• 4 potential linkages provided.	• 4 potential linkages provided.
			Same	**Same**	**Same**	**Same**	**Same**
		Strategic location of linkages to achieve connectivity	• 4 linkages provided at strategic locations.	• 2 linkages provided at strategic locations.	• 3 linkages provided at strategic locations.	• 2 linkages provided at strategic locations.	• 4 linkages provided at strategic locations.
			Most preferred	**Least preferred**	**Moderately preferred**	**Least preferred**	**Most preferred**
	Potential for displacement from construction of naturalized area on built heritage resources	Cultural heritage value of built heritage resources and cultural heritage landscapes within low flow channel[3]	• 9 resources or landscapes: Port Lands Industrial District (CHL1), railway lines and spurs (CHL2), THC Storage Buildings at 62 Villiers Street (BHR16), Villiers Street (CHL17), two one-storey frame warehouses on the north side of Villiers Street (BHR18 and BHR19), one-storey warehouse on Villiers Street (BHR20), Essroc silos (BHR26), and the Keating Channel (CHL28).	• 7 resources or landscapes: Port Lands Industrial District (CHL1), railway lines and spurs (CHL2), Commissioners Street (CHL 9), Villiers Street (CHL17), two one-storey frame warehouses on the north side of Villiers Street (BHR18 and BHR19), and the Keating Channel (CHL28).	• 9 resources or landscapes: Port Lands Industrial District (CHL1), railway lines and spurs (CHL2), Villiers Street (CHL17), THC Storage Buildings at 62 Villiers Street (BHR16), two one-storey frame warehouses on the north side of Villiers Street (BHR18 and BHR19), and one-storey warehouse on Villiers Street (BHR20), BHR27, CHL28.	• 8 resources or landscapes: Port Lands Industrial District (CHL1), railway lines and spurs (CHL2), CHL9, Villiers Street (CHL17), two one-storey frame warehouses on the north side of Villiers Street (BHR18 and BHR19), one-storey warehouse on Villiers Street (BHR20), and the Keating Channel (CHL28).	• 7 resources or landscapes: Port Lands Industrial District (CHL1), railway lines and spurs (CHL2), Polson dockwall (BHR3), Commissioners Street (CHL 9), Villiers Street (CHL17), Marine Terminal 35 and Atlas Crane site at 242-292 Cherry Street (BHR21), and the Keating Channel (CHL28).
			Same	**Same**	**Same**	**Same**	**Same**

3. *For this indicator, all of the alternatives were deemed to have similar effects (see Appendix B).*

Alternatives 2 and 4WS are the most preferred for this objective. Alternative 2 provides considerable opportunities with respect to recreational boating and linkages to the existing and proposed trail system. The greatest disadvantages of this alternative relate to the potential to affect archaeological resources. Alternative 4WS is most preferred with respect to minimizing the potential effects to archaeological resources, while increasing the opportunity to provide linkages to existing and proposed trail system and to the Martin Goodman Trail. The greatest disadvantage relates to changes to use of the river mouth for boating. Alternatives 3 and 4W are both moderately preferred. Alternative 3 is least preferred with respect to the ability to enhance the trail system and provide linkages to existing trails and for its effect on boating in the Inner Harbour; however, it is most preferred for changes to the use of the river mouth for boating and moderately preferred for potential effects on archaeological resources. Alternative 4S is least preferred as it is least preferred for all criteria except the potential to enhance pedestrian / cycling trail linkages between existing and proposed trails and effects on cultural heritage resources.

Table 5-19 presents a summary of the criteria ratings for the recreation and cultural opportunities objective.

Table 5-19 Summary of Criteria Ratings for the Recreation and Cultural Opportunities Objective

Objective	Criteria	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
Recreational and Cultural Opportunities	Potential for effect from construction on archaeological resources	Least preferred	Moderately preferred	Least preferred	Least preferred	Most preferred
	Potential for changes to use of river mouth for boating	Most preferred	Most preferred	Least preferred	Least preferred	Least preferred
	Potential to negatively or positively affect recreational boating in the Inner Harbour	Most preferred	Least preferred	Most preferred	Least preferred	Moderately preferred
	Opportunity to enhance/degrade existing and proposed pedestrian/cycling linkages with and between waterfront areas and the rest of the city	Moderately preferred	Least preferred	Moderately preferred	Moderately preferred	Most preferred
	Potential to provide functional linkages to Martin Goodman Trail	Most preferred	Least preferred	Moderately preferred	Least preferred	Most preferred
	Potential for displacement from construction of naturalized area on built heritage resources	Same	Same	Same	Same	Same
Objective Summary		***Most preferred***	***Moderately preferred***	***Moderately preferred***	***Least preferred***	***Most preferred***

5.4.3.6 Co-ordination with Other Planning Efforts

The co-ordination with other planning efforts objective recognizes that there are a number of planning efforts underway within the waterfront and that the DMNP must co-ordinate with these other planning efforts and support the establishment of sustainable communities in this area. This objective measures consistency with the intent of the current City of Toronto Central Waterfront Secondary Plan, the displacement of existing uses, the potential for nuisance effects, the land area available for development, the amenity value created by the naturalized area, the ability to support transit utilization, walkability and the potential to create vistas to the Toronto skyline. Refer to **Table 5-20** below for the details of the comparative evaluation.

Table 5-20 Step 4 Comparative Evaluation Table – Co-ordination with Other Planning Efforts

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
6. Co-ordination with Other Planning Efforts	Consistency with the intent of the City of Toronto Central Waterfront Secondary Plan	Consistency of project with objectives of City of Toronto Central Waterfront Secondary Plan (cross referenced to other indicators as appropriate)	• Alternative is consistent with Secondary plan; however, it does not provide the best opportunities to achieve the objectives of the Secondary Plan. The alternative does not facilitate the creation of a network of waterfront parks however it facilitates the removal of barriers and the creation of connections in terms of creating transit supportive development and creating walkable neighbourhoods.	• Alternative is not consistent with Secondary plan; however, it does not provide the best opportunities to achieve the objectives of the Secondary Plan. The alternative does not facilitate the creation of a network of waterfront parks nor does it facilitate the removal of barriers and the creation of connections only creating a moderate amount of transit supportive development and having one of the lowest numbers of walkability linkages.	• Alternative is consistent with Secondary plan; however, it does not provide the best opportunities to achieve the objectives of the Secondary Plan. The Alternative facilitates the creation of a network of waterfront parks however, the river mouth remains intertwined with the road network at the north end of the project study area and the Alternative does not facilitate the connections necessary to create dynamic communities or to promote transit only creating a moderate amount of transit supportive development and having one of the lowest number of walkability linkages.	• Alternative is consistent with Secondary plan; however, it does not provide the best opportunities to achieve the objectives of the Secondary Plan. The Alternative facilitates the creation of a network of waterfront parks however, the river mouth is not central and integral to redevelopment and the Alternative does not facilitate the connections necessary to create dynamic communities or to promote transit creating the lowest amount of transit supportive development and having one of the lowest numbers of walkability linkages.	• Alternative is not consistent with Secondary plan; however, it does provide the best opportunities to achieve the objectives of the Secondary Plan. The Alternative facilitates the creation of a network of waterfront parks with the river mouth central and integral to redevelopment and the Alternative does facilitate the connections necessary to create dynamic communities and to promote transit creating the a moderate amount of transit supportive development and having one the highest number of walkability linkages.
			Moderately preferred	**Least preferred**	**Moderately preferred**	**Moderately preferred**	**Most preferred**
	Potential for removal of, or changes to, existing land use	Number and type of displaced land uses	• Displacement of • Coopers Iron and Metal • Production Services Ltd. • Villiers Parkette • Humipan's • Port of Toronto Works Department • Abitibi Consolidate Recycling Division • NR Industries Inc. • Cherry Beach Sound • Toromont Cimco • Galaxy Truck & Trailer Repair • Star Coach Services • Magic Bus Company • Essroc Italcementi Group • Quantex Technologies • The Keating Channel Pub & Grill. • All alternatives are considered to have large negative impacts with respect to the displacement of existing uses. However, uses in the Cousins Quay area are on short term leases and likely to be gone before construction begins. Existing uses in the central area of the Port Lands are in the last years of leases and / or leases have relocation provisions thus these uses may be gone or easily relocated prior to the start of construction. The Commissioners Park area is characterized by 30-40% private land ownership and Polson Quay is 90% private	• Displacement of • Coopers Iron and Metal • Production Services Ltd. • Villiers Parkette • Humipan's • Port of Toronto Works Department • Abitibi Consolidate Recycling Division • NR Industries Inc. • Cherry Beach Sound • Toromont Cimco • Galaxy Truck & Trailer Repair • Star Coach Services • Magic Bus Company • Harbour Remediation and Transfer Inc. • Toronto Fire Fighters Association Building • TPLC (formerly TEDCO) Portlands Office • United Rentals. • All alternatives are considered to have large negative impacts with respect to the displacement of existing uses. However, uses in the Cousins Quay area are on short term leases and likely to be gone before construction begins. Existing uses in the central area of the Port Lands are in the last years of leases and / or leases have relocation provisions thus these uses may be gone or easily relocated prior to the start of	• Displacement of • PS Production Services Ltd. • Villiers Parkette • TPA Works Yard National Rubber Technologies • Cherry Beach Sound • Galaxy Truck & Trailer Repair • Essroc Italcementi Group • Quantex Technologies • The Keating Channel Pub & Grill • Harbour Remediation and Transfer Inc. • United Rentals. • All alternatives are considered to have large negative impacts with respect to the displacement of existing uses. However, uses in the Cousins Quay area are on short term leases and likely to be gone before construction begins. Existing uses in the central area of the Port Lands are in the last years of leases and / or leases have relocation provisions thus these uses may be gone or easily relocated prior to the start of construction. The Commissioners Park area is characterized by 30-40% private land ownership and Polson Quay is 90% private ownership or long term leases. Removal or relocation of existing uses in these areas may create negative impacts.	• Displacement of • PS Production Services Ltd. • Villiers Parkette • TPA Works Yard National Rubber Technologies • Cherry Beach Sound • Galaxy Truck & Trailer Repair • Essroc Italcementi Group • Quantex Technologies • The Keating Channel Pub & Grill • Harbour Remediation and Transfer Inc. • TPLC Port Lands Office • United Rentals. • All alternatives are considered to have large negative impacts with respect to the displacement of existing uses. However, uses in the Cousins Quay area are on short term leases and likely to be gone before construction begins. Existing uses in the central area of the Port Lands are in the last years of leases and / or leases have relocation provisions thus these uses may be gone or easily relocated prior to the start of construction. The Commissioners Park area is characterized by 30-40% private land ownership and Polson Quay is 90% private ownership or long term leases. Removal or relocation of existing uses in these areas may create negative impacts.	• Displacement of • Coopers Iron and Metal • Production Services Ltd. • Villiers Parkette • Humipan's • Port of Toronto Works Department • Harbour Remediation and Transfer Inc. • Toronto Fire Fighters Association Building • TEDCO Port Lands Office • United Rentals • Enterprise 2005 Cruise Lines • Turtle Island Recycling • ILA Local 1842 • Lafarge Canada Inc. • T&T Supermarket • 'The Docks' Parking Lot. • All alternatives are considered to have large negative impacts with respect to the displacement of existing uses. However, uses in the Cousins Quay area are on short term leases and likely to be gone before construction begins. Existing uses in the central area of the Port Lands are in the last years of leases and / or leases have relocation provisions thus these uses may be gone or easily relocated prior to the start of construction. The Commissioners Park area is characterized by 30-40% private land ownership and

Table 5-20 Step 4 Comparative Evaluation Table – Co-ordination with Other Planning Efforts

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
			ownership or long term leases. Removal or relocation of existing uses in these areas may create negative impacts.	construction. The Commissioners Park area is characterized by 30-40% private land ownership and Polson Quay is 90% private ownership or long term leases. Removal or relocation of existing uses in these areas may create negative impacts.			Polson Quay is 90% private ownership or long term leases. Removal or relocation of existing uses in these areas may create negative impacts.
			Same	**Same**	**Same**	**Same**	**Same**
	Potential for nuisance effects on the planned and proposed surrounding community	Location of operational management areas in relation to planned and proposed land uses	• Low potential for nuisance effects on the planned and proposed land uses as operational management area surrounded by wetlands, roads and railways.	• Moderate potential for nuisance effects on the planned and proposed land uses as operational management area near terrestrial/open space area. Also surrounded by wetlands, roads and railways.	• Moderate / high potential for nuisance effects on the planned and proposed land uses as operational management area beside terrestrial / open space area. Also surrounded by wetlands, roads and railways.	• Moderate potential for nuisance effects on the planned and proposed land uses as operational management area near terrestrial / open space area. Also surrounded by wetlands, roads and railways.	• Moderate potential for nuisance effects on the planned and proposed land uses as operational management area near terrestrial / open space area. Also surrounded by wetlands, roads and railways.
			Most preferred	**Moderately preferred**	**Least preferred**	**Moderately preferred**	**Moderately preferred**
	Land outside of regulatory floodplain available for development	Total land area available for development or development related amenities	• 58.4 ha.	• 56.3 ha.	• 54.9 ha.	• 47.7 ha.	• 54.0 ha.
			Most preferred	**Moderately preferred**	**Moderately preferred**	**Least preferred**	**Moderately preferred**
	Amenity value created by river and naturalized areas	Length of naturalized edge adjacent to terrestrial areas	• 200 m of naturalized area abutting the terrestrial area.	• 1,560 m of naturalized area abutting the terrestrial area.	• 2,710 m of naturalized area abutting the terrestrial area.	• 2,600 m of naturalized area abutting the terrestrial area.	• 4,084 m of naturalized area abutting the terrestrial area.
			Least preferred	**Moderately preferred**	**Moderately preferred**	**Moderately preferred**	**Most preferred**
		Length of open space / terrestrial	• 1,610 m of terrestrial area abutting the development area.	• 1,010 m of terrestrial area abutting the development area.	• 1,565 m of terrestrial area abutting the development area.	• 700 m of terrestrial area abutting the development area.	• 2,710 m of terrestrial area abutting the development area.
			Moderately preferred	**Moderately preferred**	**Moderately preferred**	**Least preferred**	**Most preferred**
		Accessibility to naturalized edge – development area within 200 m of naturalized edge	• 2.1 ha of development area within 200 m of wetland.	• 1.3 ha of development area within 200 m of wetland.	• 20.9 ha of development area within 200 m of wetland.	• 13.9 ha of development area within 200 m of wetland.	• 31.4 ha of development area within 200 m of wetland.
			Least preferred	**Least preferred**	**Moderately preferred**	**Moderately preferred**	**Most preferred**
		Accessibility to open space / terrestrial area – development area within 200 m of open space / terrestrial area	• 22.4 ha of developable area within 200 m of terrestrial area.	• 17.2 ha of developable area within 200 m of terrestrial area.	• 21.4 ha of developable area within 200 m of terrestrial area.	• 23.1 ha of developable area within 200 m of terrestrial area.	• 47.5 ha of developable area within 200 m of terrestrial area.
			Moderately preferred	**Least preferred**	**Moderately preferred**	**Moderately preferred**	**Most preferred**
	Ability of location of river to support transit utilization	Development area within 400 m of potential transit routes	• 55.9 ha of development area within 400 m of potential transit routes.	• 53.8 ha of development area within 400 m of potential transit routes.	• 52.4 ha of development area within 400 m of potential transit routes.	• 45.1 ha of development area within 400 m of potential transit routes.	• 52.5 ha of development area within 400 m of potential transit routes.
			Most preferred	**Moderately preferred**	**Moderately preferred**	**Least preferred**	**Moderately preferred**
	Walkability - ability to create pedestrian connectivity between and within neighbourhoods	Number of linkages among neighbourhoods across park and naturalized areas less than 200 m	• A total of 5 linkages between developable lands, which presents the ability to create connectivity between these areas.	• A total of 3 linkages between developable lands, which presents the ability to create connectivity between these areas.	• A total of 5 linkages between developable lands, which presents the ability to create connectivity between these areas.	• A total of 4 linkages between developable lands, which presents the ability to create connectivity between these areas.	• A total of 11 linkages between developable lands, which presents the ability to create connectivity between these areas.
			Least preferred	**Least preferred**	**Least preferred**	**Least preferred**	**Most preferred**
	Potential to provide vistas to the downtown skyline	Extent of open space / terrestrial afforded with views of the skyline	• Limited views afforded from approximately 200 m segment of open space frontage.	• No unobstructed views to skyline afforded.	• Limited views afforded from approximately 400 m of open space frontage.	• Limited views from approximately 130 m of open space frontage.	• Unobstructed views from 850 m of open space frontage.
			Least preferred	**Least preferred**	**Moderately preferred**	**Least preferred**	**Most preferred**

Alternative 4WS is most preferred for the co-ordination with other planning efforts objective. It is most preferred or moderately preferred for all of the criteria. In general, effects to existing uses from displacement and / or construction nuisances are minimized while the potential to create sustainable communities with amenity created by the river and floodplain system, walkability and created vistas are maximized.

Alternatives 2 and 4W are moderately preferred for this objective. Alternative 2 has advantages related to the potential of nuisance effects, land available for development and ability to support transit utilization but disadvantages related to the amenity value created by the river and naturalized areas, walkability, and the potential to provide vistas to the downtown skyline.

Alternative 4W is moderately preferred for all criteria except the potential for nuisance effects from operational management areas and walkability for which it is least preferred. These disadvantages may be mitigated through the design and location of pedestrian trails and mitigating nuisance effects associated with the operational management area.

Alternatives 3 and 4S are least preferred for this objective, but only slightly. These alternatives are not preferred for any of the criteria and their most significant disadvantages relate to walkability and the creation of vistas.

Table 5-21 presents a summary of the criteria ratings for the co-ordination with other planning efforts objective.

Table 5-21 Summary of Criteria Ratings for the Co-ordination with Other Planning Efforts Objective

Objective	Criteria	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
Co-ordination with Other Planning Efforts	Consistency with the intent of the City of Toronto Central Waterfront Secondary Plan	Moderately preferred	Least preferred	Moderately preferred	Moderately preferred	Most preferred
	Potential for nuisance effects on the planned and proposed surrounding community	Most preferred	Moderately preferred	Least preferred	Moderately preferred	Moderately preferred
	Land outside of regulatory floodplain available for development	Most preferred	Moderately preferred	Moderately preferred	Least preferred	Moderately preferred
	Amenity value created by river and naturalized areas	Least preferred	Least preferred	Moderately preferred	Moderately preferred	Most preferred
	Ability of location of river to support transit utilization	Most preferred	Moderately preferred	Moderately preferred	Least preferred	Moderately preferred
	Walkability - ability to create pedestrian connectivity between and within neighbourhoods	Least preferred	Least preferred	Least preferred	Least preferred	Most preferred
	Potential to provide vistas to the downtown skyline	Least preferred	Least preferred	Moderately preferred	Least preferred	Most preferred
Objective Summary		***Moderately preferred***	***Least preferred***	***Moderately preferred***	***Least preferred***	***Most preferred***

5.4.3.7 Consistency with Waterfront Toronto Sustainability Framework

The consistency with the Waterfront Toronto Sustainability Framework addresses the issues associated with the management of contaminated soils and the construction costs of each alternative. This assessment was focused on soils because many of the other sustainability elements outlined in the Sustainability Framework were effectively dealt with in design and did not aid in distinguishing between the alternatives. Refer to **Table 5-22** below for the details of the comparative evaluation.

Table 5-22 Step 4 Comparative Evaluation Table – Consistency with Waterfront Toronto Sustainability Framework

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
7. Consistency with Waterfront Toronto Sustainability Framework	Potential for disturbance of contaminated soils	Area of contaminated soils to be managed / remediated for the project	• Wetlands and river channel footprints occur within areas containing likely hazardous soils to depths of at least 5.0 m. • Proposed terrestrial environments occur with areas exhibiting soil impacts to at least 4.0 m. • Possibility of localized areas of light non-aqueous phase liquids (LNAPL) anticipated to be encountered south of Commissioners Street and east of Cherry Street. • Groundwater contamination associated with inorganic and organic parameters anticipated. • The riverbed will be realigned 10 to 20 m to the south of the existing north bank of Keating Channel, requiring demolition of a significant portion of that wall to allow for reclaiming of the part of the channel as wetland and demolition of the entire TPA Marine Works Yard dock and all existing facilities. River construction will require excavation to 4 to 4.5 m below existing grade to provide a 3 m draft and 1 to 1.5 m of subgrade excavation for installation of scour resistant bedding.	• No anticipated disturbance of hazardous soils. • Proposed river channel, as well as adjacent wetlands and terrestrial environments occur within areas containing contaminated soils to depths of at least 3.0 m and locally 5.0 m. • Localized areas of light non-aqueous phase liquids (LNAPL) and dense non-aqueous phase liquids (DNAPL) anticipated to be encountered within river channel and wetlands footprints. • Groundwater contamination associated with inorganic and organic parameters anticipated. • The redirection of the Don River across the north area of the Port Lands will require demolition of the easternmost end of the north wall of the Keating Channel, the east end of the TPA Marine Works Yard dockwall and 300 m of the north wall of the Ship Channel west of the extension of the Don Roadway and the backfilling of the Keating Channel. River construction will require excavation to 4 to 4.5 m below existing grade to provide a 3 m draft and 1 to 1.5 m of subgrade excavation for installation of scour resistant bedding.	• Wetlands and river channel footprints north of Gardner Expressway occur within areas containing likely hazardous soils to depths of at least 5.0 m. • Adjacent terrestrial environment north of Commissioners Street underlain by contaminated soils to a depth of approximately 4 m. • Wetlands footprint south of Commissioners Street requires management of contaminated soil to locally 5. 0 m as well as localized areas of light non-aqueous phase liquids (LNAPL) and dense non-aqueous phase liquids (DNAPL). • Groundwater contamination associated with inorganic and organic parameters anticipated. • The realigned river will be cut parallel and to the south of the existing alignment of Keating Channel through what is now the TPA Marine Works yard. This will involve filling the old channel. Pulling out the entire existing dockwall supporting structure (coping walls and supports, tiebacks, deadmen, etc.), excavating the new riverbed to 3 to 3.5 m to provide a 2 m draft and 1 to 1.5 m of subgrade excavation for installation of scour resistant bedding, as well as filling in existing Keating channel for a change in alignment of approximately 5 m.	• Partial wetlands and river channel footprints north of Gardner Expressway occur within areas containing likely hazardous soils to depths of at least 5.0 m. • Balance of river channel, wetlands and terrestrial environments occur within lands containing contaminated soils to anticipated depths of at least 3.0 m and locally extending to depths of at least 5.0 m. Localized areas of light non-aqueous phase liquids (LNAPL) and dense non-aqueous phase liquids (DNAPL) anticipated to be encountered south of Commissioners Street and east of Cherry Street. • Groundwater contamination associated with inorganic and organic parameters anticipated. • The redirection of the Don River across the north area of the Port Lands will require demolition of the entire Keating Channel dockwall structure including the TPA Marine Works Yard dockwall and the Cement Dock as well as 300 m of the north wall of the Ship Channel west of the extension of the Don Roadway and the backfilling of the Keating Channel. River construction will require excavation to 3 to 3.5 m below existing grade to provide a 2 m draft and 1 to 1.5 m of subgrade excavation for installation of scour resistant bedding.	• No anticipated disturbance of hazardous soils. • Alignment of river channel and adjacent wetlands and terrestrial areas located within lands containing contaminated soils to depths of at least 4.0 m below surface grade including Localized areas of light non-aqueous phase liquids (LNAPL) and dense non-aqueous phase liquids (DNAPL). • Lakebed sediments exhibited organic and inorganic contamination and will have to be removed or controlled during reclamation. • Groundwater contamination associated with inorganic and organic parameters anticipated. • The redirection of the Don River and west across the Port Lands south to Commissioners Street and then west to discharge across Cousins Quay to the Harbour will require demolition of the easternmost end of the north wall of the Keating Channel, the east end of the TPA Marine Works Yard dockwall, 800 m of Cousins Quay dockwall and 200 m of the north wall of the Ship Channel west of the extension of the Don Roadway. Much of the demolition will be to marginally below grade for wetland construction other than for the outlet of the rerouted Don River which will require demolition down to river bed depth. River construction will require excavation to 3 to 3.5 m below existing grade to provide a 2 m draft and 1 to 1.5 m of subgrade excavation for installation of scour resistant bedding. Demolition or reconstruction of 200 m of the north Ship Channel dockwall at will also be required to permit wetlands to become established.
			Least preferred	**Most preferred**	**Least preferred**	**Least preferred**	**Moderately preferred**
		Nature of contamination	• Soils impacted with heavy metal and petroleum hydrocarbon compounds (PHCs) anticipated occurring to depths of at least 5.0 m below existing grade in areas beneath and north of Gardner Expressway (where wetlands development most prominent).	• North of Commissioners Street and east of Cherry Street, soils are impacted by heavy metals, PHCs, PAHs to anticipated depths of at least 3.0 m and locally extending to depths of at least 5.0 m. • Groundwater contamination is identified discontinuously across the	• Soils impacted with heavy metal and petroleum hydrocarbon compounds (PHCs) anticipated occurring to depths of at least 5.0 m below existing grade in areas beneath and north of Gardner Expressway (where wetlands development most prominent).	• Soils impacted with heavy metal and petroleum hydrocarbon compounds (PHCs) anticipated occurring to depths of at least 5.0 m below existing grade in areas north of Gardner Expressway where a combination of terrestrial and wetlands environment planned.	• South of the Keating Channel and east of Cherry Street, the soils are anticipated to be impacted to depths of at least 4.0 m below surface grade with a combination of heavy metals, PHCs and PAHs. • South of the Keating Channel and west of Cherry Street, the soils are

Table 5-22 Step 4 Comparative Evaluation Table – Consistency with Waterfront Toronto Sustainability Framework

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
			• Leachate toxic soils are encountered below proposed wetlands area north of Keating Channel. • Soils within areas of proposed river channel and terrestrial environments north of Commissioners Street impacted by heavy metals, PHCs as well as light fraction volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) anticipated to depths of at least 4 m below existing grade. • Soils underlying proposed terrestrial lands south of Commissioners Street impacted by heavy metals, PHCs, PAHs to anticipated depths of at least 3.0 m and locally extending to depths of at least 5.0 m. • Groundwater contamination is identified discontinuously across the entire river mouth relocation zone and includes petroleum hydrocarbons and chlorinated solvent impacts and, to a lesser extent, inorganic compounds (principally metals, pH and EC / SAR) and PAHs. • Localized zones of LNAPL and DNAPL.	entire river mouth relocation zone and includes petroleum hydrocarbons and chlorinated solvent impacts and, to a lesser extent, inorganic compounds (principally metals, pH and EC / SAR) and PAHs. • Localized zones of LNAPL and DNAPL.	• Leachate toxic soils are encountered below proposed wetlands area north of Keating Channel. • Soils within areas of proposed river channel and adjacent wetlands and terrestrial environments north of Commissioners Street impacted by heavy metals, PHCs as well as VOCs and PAHs anticipated to depths of at least 4 m below existing grade. • Soils underlying proposed wetland environment bordered by proposed terrestrial lands south of Commissioners Street impacted by heavy metals, PHCs, PAHs to anticipated depths of at least 3.0 m and locally extending to depths of at least 5.0 m. • Soil contamination comprising metals and PAHs anticipated south of the Keating Channel and west of Cherry Street to depths of 2.5 m. • Groundwater contamination is identified discontinuously across the entire river mouth relocation zone and includes petroleum hydrocarbons and chlorinated solvent impacts and, to a lesser extent, inorganic compounds (principally metals, pH and EC / SAR) and PAHs. • Localized zones of LNAPL & DNAPL.	• Leachate toxic soils are encountered below proposed wetlands and terrestrial areas north of Keating Channel. • South of the Gardner Expressway and east of Cherry Street, terrestrial and wetlands areas dominate with some residential development aligned along Cherry Street. Soils within these proposed areas impacted by heavy metals, PHCs and PAHs to anticipated depths of at least 3.0 m and locally extending to depths of at least 5.0 m. • Soil contamination comprising metals and PAHs anticipated south of the Keating Channel and west of Cherry Street to depths of 2.5 m. • Groundwater contamination is identified discontinuously across the entire river mouth relocation zone and includes petroleum hydrocarbons and chlorinated solvent impacts and, to a lesser extent, inorganic compounds (principally metals, pH and EC / SAR) and PAHs. • Localized zones of LNAPL and DNAPL.	anticipated to be impacted to depths of at least 2.5 m below surface grade with a combination of heavy metals, PHCs and PAHs. • Groundwater contamination is identified discontinuously across the entire river mouth relocation zone and includes petroleum hydrocarbons and chlorinated solvent impacts and, to a lesser extent, inorganic compounds (principally metals, pH and EC / SAR) and PAHs. • Localized zones of LNAPL and DNAPL are anticipated east of Cherry Street.
			Least preferred	**Most preferred**	**Least preferred**	**Least preferred**	**Most preferred**
	Ability to manage contaminated soils and groundwater	Ease of remediation / risk management	• Full scale cleanup of the site will require removal of contaminated soil and groundwater from the vicinity of existing dockwalls in Keating Channel with significant attendant water management requirements. Remedial action will have to be co-ordinated with reconstruction to ensure that a spillway is maintained and that ingress by water from the Don River and harbour areas is eliminated so that remedial work can be safely and fully completed. Contaminated Keating Channel bed materials will have to be removed before filling. • Proximity of large portions of the site to the river alignment, river mouth and the Ship Channel and the inclusion of a large wetland	• Full scale cleanup of the site will require removal of contaminated soil and groundwater from the vicinity of the existing dockwall at the east end of Keating Channel and on the north side of the Ship Channel with significant attendant water management requirements as well as at the south side of the existing mouth of Keating Channel. The Channel can remain open during remedial action and river reconstruction to eliminate significant water management requirements. Contaminated Keating Channel bed materials will have to be removed before filling. • Proximity of large portions of the site to the proposed river alignment and along the dockwall of the Ship	• Full scale cleanup of the site will require removal of contaminated soil and groundwater from the vicinity of existing dockwalls in Keating Channel and on the north side of the Ship Channel with significant attendant water management requirements. Remedial action will have to be co-ordinated with reconstruction to ensure that a spillway is maintained and that ingress by water from the Don River and harbour areas is eliminated so that remedial work can be safely and fully completed. Contaminated Keating Channel bed materials will have to be removed before filling. • Proximity of large portions of the site to the river alignment, river mouth and along the dockwall of the Ship	• Full scale cleanup of the site will require removal of contaminated soil and groundwater from the vicinity of the existing dockwall at the east end of Keating Channel and on the north side of the Ship Channel with significant attendant water management requirements. Keating Channel can remain open during remedial action and river reconstruction to eliminate significant water management requirements. Contaminated Keating Channel bed materials will have to be removed before filling. • Proximity of large portions of the site to the proposed river alignment and along the dockwall of the Ship Channel and the inclusion of a large wetland component on the former	• Full scale cleanup of the site will require removal of contaminated soil and groundwater from the vicinity of existing dockwalls at the east end of Keating Channel, on the north side of the Ship Channel and along the south half of Cousins Quay and a small portion of the north side of Polson Quay with significant attendant water management requirements. Keating Channel can remain open during remedial action and river reconstruction to eliminate significant water management requirements. Contaminated Keating Channel bed materials will have to be removed before filling. • Proximity of large portions of the site to the river alignment and along the dockwall of the Ship Channel and

Table 5-22 Step 4 Comparative Evaluation Table – Consistency with Waterfront Toronto Sustainability Framework

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
			component on the former BA refinery site north of existing Lake Shore Boulevard will result in designation of approximately 30% of the area to be redeveloped as sensitive, resulting in the application of the most stringent cleanup standards to depth and the requirement to remove large quantities of soil if generic cleanup standards are applied. • Risk assessment can readily be applied and will reduce the majority of contaminated soil removal. It will, however, require incorporation of clean growing media beneath wetland zones and protective fill and geomembrane caps beneath new river alignments. This alternative includes a limited number of zones exhibiting soil and groundwater containing phase separated (liquid) hydrocarbons, all requiring removal to meet Provincial regulatory requirements.	Channel and the inclusion of a large wetland component between Keating Channel and the Ship Channel will result in designation of approximately 50% of the area to be redeveloped as sensitive, resulting in the application of the most stringent cleanup standards to depth and the requirement to remove large quantities of soil if generic cleanup standards are applied. • Risk assessment can readily be applied and will reduce the majority of contaminated soil removal. It will, however, require incorporation of clean growing media beneath wetland zones and protective fill and geomembrane caps beneath new river alignments. This alternative includes a number of zones exhibiting soil and groundwater containing phase separated (liquid) hydrocarbons, all requiring removal to meet Provincial regulatory requirements.	Channel and the inclusion of a large wetland component on the former BA refinery site north of existing Lake Shore Boulevard and between Commissioners Street and the Ship Channel will result in designation of approximately 75% of the area to be redeveloped as sensitive, resulting in the application of the most stringent cleanup standards to depth and the requirement to remove large quantities of soil if generic cleanup standards are applied. • Risk assessment can readily be applied and will reduce the majority of contaminated soil removal. It will, however, require incorporation of clean growing media beneath wetland zones and protective fill and geomembrane caps beneath new river alignments. This Alternative includes a limited number of zones exhibiting soil and groundwater containing phase separated (liquid) hydrocarbons, all requiring removal to meet Provincial regulatory requirements.	BA refinery site north of existing Lake Shore Boulevard and between Keating Channel and the Ship Channel will result in designation of approximately 60% of the area to be redeveloped as sensitive, resulting in the application of the most stringent cleanup standards to depth and the requirement to remove large quantities of soil if generic cleanup standards are applied. • Risk assessment can readily be applied and will reduce the majority of contaminated soil removal. It will, however, require incorporation of clean growing media beneath wetland zones and protective fill and geomembrane caps beneath new river alignments. This Alternative includes a number of zones exhibiting soil and groundwater containing phase separated (liquid) hydrocarbons, all requiring removal to meet Provincial regulatory requirements.	the inclusion of large wetland components along the retrained alignment of the Don River and at the south end of the former Texaco Fuel Terminal adjacent to the Ship Channel will result in designation of approximately 60% of the area to be redeveloped as sensitive, resulting in the application of the most stringent cleanup standards to depth and the requirement to remove large quantities of soil if generic cleanup standards are applied. • Risk assessment can readily be applied and will reduce the majority of contaminated soil removal. It will, however, require incorporation of clean growing media beneath wetland zones and protective fill and geomembrane caps beneath new river alignments. This Alternative includes a number of zones exhibiting soil and groundwater containing phase separated (liquid) hydrocarbons, all requiring removal to meet Provincial regulatory requirements. This Alternative is the only design that includes for the placement of significant quantities of fill above existing grade and that will thus permit contaminated and clean soil to be retained on site and still meet net fill balance objectives without importing significant quantities of fill. Extensive new dockwall construction will however, be required to support fill placement in the Inner Harbour.
			Least preferred	**Most preferred**	**Least preferred**	**Least preferred**	**Least preferred**

Table 5-22 Step 4 Comparative Evaluation Table – Consistency with Waterfront Toronto Sustainability Framework

Objective	Criteria	Indicator(s)	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
	Physical constraints imposed by existing soil and ground-water contamination	Extent of areas where remediation or risk management is not feasible	• No areas exist where remedial (full-scale) or mitigative (risk management) measures are impossible or unfeasible.	• No areas exist where remedial (full-scale) or mitigative (risk management) measures are impossible or unfeasible.	• No areas exist where remedial (full-scale) or mitigative (risk management) measures are impossible or unfeasible.	• No areas exist where remedial (full-scale) or mitigative (risk management) measures are impossible or unfeasible.	• No areas exist where remedial (full-scale) or mitigative (risk management) measures are impossible or unfeasible.
			Most preferred	**Most preferred**	**Most preferred**	**Most preferred**	**Most preferred**
		Proximity to footprint of river mouth	• Realignment of the river mouth will result in the removal of contaminated soil from the vicinity of the existing mouth of Keating Channel. • Demolition of the cement dock and northern Keating Channel wall will result in mobilization of contaminants into the harbour over the short term during cleanup. Relocation of the northern bank of the Keating Channel mouth will bring the new replacement dockwall into contact with soil that has been found to be leachate toxic for lead and that may include PCB wastes west of Cherry Street and PHCs, PAHs and metals east of Cherry Street. • If a full scale cleanup approach is adopted, a 30 m wide buffer zone of fill meeting Table 1 background Standards will have to be established adjacent to the dockwall. If risk management measures are to be applied, localized soil replacement and engineered controls such as reactive barriers or low permeability cut-off walls would have to be implemented.	• A new river course to be constructed south from Keating Channel will open out to discharge into the Ship Channel. • Soil contamination across the majority of this land is generally moderate, comprising metals and other inorganics, heavier fraction PHCs and PAHs associated with coal and residual fuels. NAPL is present along the dockwall bordering the north side of the Ship Channel within the area of proposed terrestrial environment. Excavation for river construction purposes will remove soil to depths of up to 4.0 to 4.5 m to reach design draft and for installation of scour resistant bedding. • As with Alternative 2, full scale cleanup will require excavation to 10 m or more below existing surface for a distance of 30 m from the dockwall and from the design alignment of the river banks to ensure that soil within that zone meets Table 1 background Standards for sensitive sites or, alternatively, risk management measures including engineered controls to eliminate the possibility of migration of free phase or dissolved contamination into the new river and Ship Channel.	• The realignment of the river mouth will involve demolition of the Cement Dock only which will result in removal of moderate levels of generally immobile inorganic, PHC and PAH contaminants in soil along the south side of the existing opening of Keating Channel to the Inner Harbour. • Fill brought in to construct the wetlands at the mouth will have to meet Table 1 background Standards and will provide an extra protective burden against the existing dockwalls. • Demolition of the upper portion of the Ship Channel wall expose NAPL as was the case with Alternative 2 and excavation of the wetland will require subgrade excavation to at least the original lake bed if full scale cleanup to Table 1 Background conditions is to be adopted.	• Exposure to contaminants at the River mouth at the Ship Channel will be similar to the situation for Alternative 2. • Removal of the Cement Dock will result in excavation of relatively immobile soil contamination while construction of the wetland at the mouth of Keating channel will provide a significant barrier to migration into the Inner Harbour from the east.	• The new river mouth at the face of Cousins Quay will involve the placement of a significant quantity of new fill to the west of existing lands, thus providing protection from migration. • Construction of the wetlands and river channel will require excavation to clean native soil to ensure that Table 1 background Standards are met under the full scale scenario which will remove the majority of contaminated soil from the vicinity of the river mouth. This would also result in removal of a significant proportion of LNAPL. • The wetland area at the Ship Channel is located in potential areas of LNAPL which would be removed under both full scale cleanup or risk management procedures.
			Least preferred	**Moderately preferred**	**Moderately preferred**	**Most preferred**	**Most preferred**
	Cost of management of groundwater and soil contamination	Total cost associated with remediation or risk management	• Construction: 60% of highest. • Risk Management: 85% of highest.	• Construction: Highest. • Risk Management: Highest.	• Construction: 90% of highest. • Risk Management: 95% of highest.	• Construction: 55% of highest. • Risk Management: 85% of highest.	• Construction: 80% of highest. • Risk Management: 60% of highest.
			Most preferred	**Least preferred**	**Least preferred**	**Most preferred**	**Most preferred**

All of the alternatives will require a substantive amount of soil remediation / risk management in order to construct the new river mouth and wetlands. The management of any soil contamination will be an integral part of the construction of any one of the alternatives and thus a key determinant of the overall preliminary construction costs. The alternatives differ with respect to the location and volume of soil to be managed, the nature of any contamination likely to be encountered, the ease with which it may be managed, and total project cost.

Alternatives 3, 4S and 4WS are most preferred for this objective as they are all most preferred for two of the four criteria. Alternative 3 has the lowest potential to disturb contaminated soils and the best ability to manage contaminated soils and groundwater largely as a result of the short length of the alternative and its relative location. Alternatives 4S and 4WS exhibit the least potential for physical constraints imposed by existing soil and groundwater contamination and the lowest costs associated with the management of soil and groundwater contamination compared to Alternatives 3 and 4W. Alternative 2 is moderately preferred as it is least preferred for all criteria except cost and Alternative 4W is least preferred as it is least preferred for all criteria except the physical constraints imposed by existing soil and groundwater contamination for which it is moderately preferred. Based on the level of project design and the soil information available, Alternatives 3 and 4W are anticipated to be the most expensive, while Alternatives 2, 4S and 4WS are the least expensive.

Table 5-23 presents a summary of the criteria ratings for the consistency with the Waterfront Toronto Sustainability Framework objective.

Table 5-23 Summary of Criteria Ratings for the Consistency with Waterfront Toronto Sustainability Framework Objective

Objective	Criteria	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
Consistency with Waterfront Toronto Sustainability Framework	Potential for disturbance of contaminated soils	Least preferred	Most preferred	Least preferred	Least preferred	Moderately preferred
	Ability to manage contaminated soils and groundwater	Least preferred	Most preferred	Least preferred	Least preferred	Least preferred
	Physical constraints imposed by existing soil and groundwater contamination	Least preferred	Moderately preferred	Moderately preferred	Most preferred	Most preferred
	Cost of management of ground-water and soil contamination	Most preferred	Least preferred	Least preferred	Most preferred	Most preferred
Objective Summary		***Moderately preferred***	***Most preferred***	***Least preferred***	***Most preferred***	***Most preferred***

5.4.3.8 Confirmation of Construction-Related Effects Associated with the Short List Alternatives

As mentioned previously, based on a request from stakeholders, construction-related effects were revised using information available from the Step 5 assessment (see **Chapter 7**). As described in **Section 5.4**, the purpose of the Step 4 Comparative Evaluation of the short-listed alternatives was to choose the alternative best able to meet project objectives. The project objectives were developed to seek an ultimate solution to naturalization, flood protection and city building that maximized the benefits achieved. The comparative evaluation was objective-based

rather than based around project components in order to measure how well each alternative achieved these benefits. The criteria and indicators measured the relative ability of each alternative to achieve the seven project objectives. Thus, the evaluation sought to choose the alternative that provided the most benefit.

Furthermore, the short-listed alternatives are very conceptual in nature and little was known about how they would be constructed; therefore, the criteria and indicators used for the evaluation reflected the type of information that was available at that time, such as modifications to dockwalls, roads, rail lines, utilities, disturbance to archaeological and heritage resources, disturbance and displacement of existing land uses, changes to navigation / shipping, effects to recreational users, etc. From a decision-making perspective construction cost is often an important factor. As noted above, based on the level of project design and the soil information available, Alternatives 3 and 4W are anticipated to be the most expensive and Alternatives 2, 4S and 4WS are the least expensive. As part of the Step 4 assumptions, it was recognized that existing low quality habitat would in all cases be replaced with a larger area of better quality habitat; therefore, only the created habitat was measured.

With regards to nuisance effects associated with construction (noise, dust, access, etc.), it was assumed that these effects were common to all alternatives, effectively mitigated using standard construction techniques, and thus did not help distinguish between the alternatives. Although limited construction-related information and assumptions were developed for the preferred alternative as part of Step 5 (**Chapter 6**), the same information was not available for the other short-listed alternatives. Hence, there is limited usefulness to extrapolating this construction-related information to the other short-listed alternatives. Furthermore, Alternative 4WS underwent considerable refinement before the detailed assessment, which makes the information less applicable to the short-listed alternatives. Thus, the mitigation measures described in this section reflect what was developed for the preferred alternative and have been assumed to apply to the other alternatives based on the information available, keeping in mind the above noted limitations.

The remainder of this section details (in **Table 5-24**):

- Criteria and indicators that were used during the Step 4 Comparative Evaluation to assess construction-related differences between the alternatives, plus any additional criteria and indicators originally deferred to Step 5 or used in Step 5 that deal with effects from construction;
- Effects related to those criteria and indicators; and,
- Mitigation measures, assumed from the effects assessment undertaken during Step 5 and documented in **Chapter 7**, to address the effects.

Where effects are already documented in this chapter, a brief summary is provided and reference is made to the applicable tables. Otherwise, a more fulsome discussion of the effects, along with the mitigation measures, is included in the table below.

Table 5-24 Construction-Related Effects and Mitigation by Objective

Criteria / Environmental Component	Indicator(s)	Effects	Mitigation
Objective 1: Naturalization			
Aquatic Environment			

Potential for negative effects on native fish habitat or aquatic communities	Disruption, destruction, and alteration of aquatic habitat / nuisance effects on aquatic habitat from construction (noise, dust, vibration, sediment release, etc.)	**Common to all Alternatives**
		• Loss of and disturbance to low quality aquatic habitat within the Keating Channel and upstream of Lake Shore Boulevard due to lake filling and in-water works
		• Degradation of water quality during widening of channel upstream of Lake Shore Boulevard as a result of contaminated material (soils / groundwater) accidentally entering the watercourse
		
		Unique to Alternative 4WS
		• Loss of and disruption to low quality habitat within the Inner Harbour due to construction of the promontories
		• Lake filling activities during construction may release or mobilize sediment within the Inner Harbour, which may affect fish species
			For all Alternatives
			• Create new high quality habitat of a larger area and greater complexity to compensate for permanent loss of low quality habitat during construction
			• Adhere to Best Management Practices (BMPs) to reduce likelihood of contaminated material entering the existing channel / watercourse
			• Prepare and follow a spill response plan, including immediately reporting and managing any leakage or spillage
			• Limit in-channel construction to specific times of year to avoid adverse flow conditions and avoid critical fish spawning and migration periods
			• Use appropriate isolation of excavated area at north end of upstream of Lake Shore Boulevard during construction to minimize impact to downstream water quality
			
			Additional Mitigation for Alternative 4WS:
			• Should the work area of the promontory be enclosed, the following measures will be employed to minimize or eliminate effects to fish:
			  • Salvage fish once area has been enclosed
			  • Avoid lake filling activities during windy days when possible to minimize dispersion of sediment
			  • Use an excavator or a backhoe located on a barge, or a bottom dump scow to methodically place fill material on top of sediments within the containment berms for the promontories

Terrestrial Environment			
Potential for negative effect / changes on wildlife species or communities (i.e., minimizing disturbance and connecting habitat)	Removal or disturbance of terrestrial habitat / nuisance effects on terrestrial species from construction (noise, dust, vibration, sediment release, etc.) during construction	**Common to all Alternatives** • Removal of low quality terrestrial habitat composed of cultural communities including Cultural Meadows, Cultural Woodlands, and Meadow Marsh within the footprint of proposed river valley system • Temporary displacement of a few species of urban tolerant wildlife (e.g., birds, coyote) due to nuisance effects • Minimal effects on behaviour of terrestrial species as existing terrestrial habitat is limited and poor quality; species will likely relocate to other nearby naturalized areas	**For all Alternatives** • Create new higher quality terrestrial habitat to compensate for loss of low quality habitat as part of naturalization • Salvage plants where appropriate for replanting • Phase disturbance to existing vegetation during construction • Sequential restoration of habitat
Objective 2 : Flood Protection			
Flooding			
Potential to impact flooding conditions elsewhere	Extent of flooded areas during flood events within the construction area	**Common to all Alternatives** • Construction activities will not exacerbate existing flood risk within the construction area	**For all Alternatives** • Include construction sites on TRCA flood warning system to prepare site in advance of possible flood events.
Objective 3 : Operational Management & Constructability			
Traffic, Road Infrastructure and Emergency Services			
Potential to phase implementation of river modifications	Ability to divert roads and maintain access during construction	**Common to all Alternatives** • Potential for lane / road closures and road detours (refer to **Table 5-14**)	**For all Alternatives** • Utilize a traffic management plan and standard traffic control measures to safely co-ordinate traffic flow • Provide alternate / temporary access and appropriate re-routing signage to businesses along temporary lane closures
Economic Base			
Potential to phase implementation of river modifications	Length of dockwall modified or buried / disruption to Port operations	**Common to all Alternatives** • Dockwall removal / modification will result in a loss of potential mooring revenue for TPA, and may affect industrial users who moor their vessels along the dockwalls • Relocation of TPA yard (refer to **Table 5-14**)	**For all Alternatives** • Arrangements will be made with TPA for lost mooring revenue (i.e., negotiations regarding compensation) • Enter into discussions with TPA to understand available remaining dockwall and identify alternative mooring locations for vessels • Provide advance notice to TPA in order to inform users of potential dockwall removal / modification • Enter into discussions with TPA to ensure that the new location for the works yard addresses their requirements

Table 5-24 Construction-Related Effects and Mitigation by Objective

Criteria / Environmental Component	Indicator(s)	Effects	Mitigation
Existing Land Use			
Potential to phase implementation of river modifications	Qualitative assessment of effects on shipping activities	**Unique to Alternative 4WS** • Potential effects to manoeuvring for larger vessels (refer to **Table 5-14**)	**For Alternatives 2, 3, 4W and 4S** • No mitigation required, since shipping activities will remain similar to existing conditions **For Alternative 4WS** • Establish clearly marked navigation aids as directed by the TPA in applicable locations regarding construction of the promontories • Provide advance notice to TPA in order to inform users of duration and spatial extents of the potential disruption to Port operations
Lake / River Water Quality			
Potential effects from construction on lake and river water quality	Effects of in-water and near shore works on water quality	**Common to all Alternatives** • Potential for release of sediment plume during 'in-channel' construction activity upstream of Lake Shore Boulevard associated with creation of sediment trap, which may result in increased turbidity upstream of Lake Shore Boulevard and downstream within the Keating Channel and Inner Harbour • Potential degradation of water quality during widening of channel upstream of Lake Shore Boulevard as a result of contaminated material (soils / groundwater) accidentally entering the watercourse **Unique to Alternative 4WS** • Potential for release of sediment plume during filling of promontories, which may result in increased turbidity in the Inner Harbour	**For all Alternatives** • Use appropriate isolation of excavated area at north end of the area upstream of Lake Shore Boulevard during construction to minimize impact to downstream water quality • Limit in-channel construction to specific times of year to avoid adverse flow conditions and avoid critical fish spawning and migration periods • Use BMPs to prevent contaminated material from entering the watercourse and prepare and follow a spill response plan, including immediately reporting and managing any leakage or spillage **Additional Mitigation for Alternative 4WS** • Use an excavator or a backhoe located on a barge, or a bottom dump scow to methodically place fill material on top of sediments within the containment berms for the promontories
Objective 4 : Integration with Infrastructure			
Traffic, Road Infrastructure and Emergency Services			
Potential for changes to existing, planned and proposed roads solely due to DMNP	Potential modifications to Lake Shore Boulevard at the Don Roadway, Cherry Street, Commissioners Street, and / or Gardiner Expressway substructure to accommodate alternatives	**Common to all Alternatives** • Potential realignment / modifications to sections of Lake Shore Boulevard, Cherry Street, Commissioners Street and / or Gardiner Expressway substructure (refer to **Table 5-16**)	**For all Alternatives** • Utilize a traffic management plan and standard traffic control measures to safely co-ordinate traffic flow • Provide alternate / temporary access and appropriate re-routing signage to businesses along temporary lane closures
Existing Land Use			
Potential for changes to existing rail lines or yards or access roads leading to rail yards	Potential modifications to the Keating Yard and rail connection to mainline / Don Yard, Redpath Sugar spur, and Don Yard access road	**Common to all Alternatives** • Potential modifications to Keating Yard and rail connection to mainline / Don Yard / potential effects to Redpath Sugar and modifications to Don Yard access road (refer to **Table 5-16**)	**For all Alternatives** • Utilize a traffic management plan and standard traffic control measures to safely co-ordinate traffic flow • Provide alternate / temporary access and appropriate re-routing signage to businesses along temporary road closures • Provide advance notice to TPLC and its users such as Toronto Terminals Railway and GO Transit regarding service disruption
Potential for changes to existing, planned and proposed underground utilities	Potential modifications to Enbridge gas pipeline, water and wastewater utilities and other underground utilities	**Common to all Alternatives** • Potential relocation of existing underground utilities (refer to **Table 5-16**)[4]	**For all Alternatives** *Water Supply and Wastewater System* • No mitigation required for water and wastewater • Install backflow prevention devices or reroute to continue operation of any existing SSOs that will continue to discharge directly to the Don River *Stormwater* • No mitigation required for storm water *Other Utilities* • Meet with utility providers, including Hydro One Networks Inc. (HONI), to confirm that these utilities may be removed or relocated and to develop an approach to maintain servicing during construction
Potential for changes to existing above ground utilities	Length of above ground utilities to be modified / Potential for modifications to the hydro bridge and substation	**Common to all Alternatives** • Potential removal of above-ground utilities (refer to **Table 5-16**)	**For all Alternatives** • Meet with utility providers, including HONI, to confirm how these utilities may be removed or relocated and to develop an approach to maintain servicing during construction

4. *Construction-related effects related to underground and above-ground utilities are primarily associated with the Lower Don Lands Environmental Assessment Master Plan (LDL EAMP). New servicing will be provided as part of implementation of the LDL EAMP and the associated precinct plans.*

Table 5-24 Construction-Related Effects and Mitigation by Objective

Criteria / Environmental Component	Indicator(s)	Effects	Mitigation
Objective 5 : Recreational and Cultural Opportunities			
Aboriginal Interests			
Potential for effect from construction on traditional uses of lands by Aboriginal peoples	Extent of traditional uses of lands within footprint of river mouth	**Common to all Alternatives** • No effect to traditional uses as they have been disturbed due to previous development (refer to **Table 5-18**)	**For all Alternatives** • Incorporate heritage aspects into the design of the DMNP where feasible as an enhancement measure • Continue to engage the Mississaugas of the New Credit First Nation, the Métis Nation of Ontario, and other Aboriginal groups as requested, in the DMNP
Archaeological Resources			
Potential effect from construction on Archaeological resources	Significance of archaeological resources within footprint of river mouth	**Common to all Alternatives** • Potential disruption to inventoried archaeological resources for all alternatives(refer to **Table 5-18**)	**For all Alternatives** • A professional archaeologist will be on site to monitor excavation in areas of archaeological potential (i.e., where there are known archaeological resources) • If artifacts are found, the Ministry of Culture will be notified and construction in the area of the find will cease until the value of the find can be ascertained • If Aboriginal artifacts are discovered, the Ministry of Culture will provide guidance on which Aboriginal groups would likely be interested in the finds, and these groups will be notified
Land-Based and Marine Recreation			
Potential to negatively or positively affect recreational boating in the Inner Harbour	Qualitative assessment of effects on recreational boating	**Common to all Alternatives** • Potential nuisance effects for recreational boaters within the Keating Channel (refer to **Table 5-18**) **Unique to Alternative 4WS** • Potential nuisance effects for recreational boaters within the Inner Harbour due to construction of the promontories (refer to **Table 5-18**)	**For all Alternatives** • Areas of in-water works will be appropriately marked for navigation • Proper signage will signal where recreational boaters may go • No mitigation required for construction upstream of Lake Shore Boulevard due to infrequent use
Built Heritage and Cultural Landscape Resources			
Potential for displacement from construction of naturalized area on built heritage resources	Cultural heritage value of built heritage resources and cultural heritage landscapes within low flow channel	**Common to all Alternatives** • Disruption to built heritage resources and cultural heritage landscapes (refer to **Table 5-18**)	**For all Alternatives** • Recognize heritage value of displaced cultural heritage landscapes through signage or other interpretive material or programs • Undertake a cultural heritage assessment to determine the feasibility of relocating built heritage resources (i.e., if the heritage integrity of the structure is intact) in collaboration with the City's Heritage Preservation Services unit and other heritage stakeholders • Relocate potentially displaced built heritage resources (i.e., structures) on or off-site where possible or incorporate resource into the design of the new river mouth; where relocation is not possible, recognize heritage value of displaced resources through signage or other interpretive material or programs • Mitigate construction-related disturbance to built heritage resources and cultural heritage landscapes through landscaped buffering, stabilization, and maintenance of vehicular access as required
Objective 6 : Co-ordination with Other Planning Initiatives			
Existing Land Use			
Potential for removal of, or changes to, existing land use	Number and type of displaced land uses	**Common to all Alternatives** • Potential removal and relocation of existing land uses (privately and publicly owned) (refer to **Table 5-20**)	**For all Alternatives** • Where property is under ownership by the City of Toronto or its agents (i.e., TPLC), lessees will be given proper notice and leases will be terminated or not renewed prior to construction as per the terms of the leases • Where property is privately held, is subject to longer-term leases, or is owned by the TPA, arrangements will be made for loss of property and / or activity (i.e., negotiations for potential relocation and / or compensation)
Implications of construction activities on business operations, residential uses, and recreational users (deferred from Step 4 to Step 5)	Nuisance effects (dust, combustion emissions) as a result of construction activities	**Common to All Alternatives** • Limited potential for nuisance effects associated with dust, as majority of earthworks will require movement of wet or damp soils, which will minimize the amount of airborne dust • Dust and combustion emissions associated with earthworks will be short-term, infrequent (at certain times of the day), and will have no effects outside of Project Study Area • No sensitive receptors (e.g., residents) will exist at the start of construction	**For all Alternatives** • Implement BMPs for dust suppression (on-site watering, gravel aggregate on roads and limiting the speed of vehicles on roads) • Use well-maintained equipment to minimize combustion emissions • Use real-time monitoring systems to measure dust levels

Table 5-24 Construction-Related Effects and Mitigation by Objective

Criteria / Environmental Component	Indicator(s)	Effects	Mitigation
Implications of construction activities on business operations, residential uses, and recreational users (deferred from Step 4 to Step 5)	Nuisance effects (noise) as a result of construction activities	**Common to All Alternatives** • Limited potential for nuisance effects associated with noise, as there are anticipated to be few sensitive receptors in the vicinity of construction • Noise emissions will be short-term and infrequent, and localized to the construction areas • Potential for recreational users to experience nuisance effects associated with noise levels typical of conventional construction methods • No sensitive receptors (e.g., residents) will exist at the start of construction	**For all Alternatives** • Implement BMPs for noise reduction (alerting residents, notifying businesses and recreational users of planned events that may cause disturbance, and scheduling these activities to avoid sensitive time periods if necessary) • Use well-maintained equipment to minimize combustion emissions and noise • Adhere to City of Toronto's Noise By-Law (No. 111-2003)
Objective 7 : Consistency with Waterfront Toronto Sustainability Framework			
Geology and Soils			
Potential for disturbance of contaminated soils	Area of contaminated soils to be managed / remediated for the project	**Common to All Alternatives** • Potential disturbance of contaminated soils within footprint of wetlands, river channel, and terrestrial habitat (refer to **Table 5-22**)	**For all Alternatives** • Implement BMPs for dust suppression • Use real-time monitoring systems to measure dust levels • Minimize the exposure time of contaminated soils prior to conversion to control odours and ensure ongoing odour management during construction. • Remove oil, cut and cap all uncovered abandoned pipelines • Prepare and follow a spill response plan, including immediately reporting and managing any leakage or spillage • Implement full-time groundwater control (which will involve dewatering), treatment and disposal. • Install sheet piles at approximately 5 metres below depth of excavation to prevent groundwater migration during earthworks or well point dewatering network to suppress water table during construction, or combination of the two • Treat groundwater on-site or at some off-site licensed receiver • Remove LNAPL to facilitate Risk Assessment / Risk Management
Groundwater Quality			
Environmental implications of groundwater management activities during construction	Contaminated groundwater requiring treatment / management	**Common to all Alternatives** • Potential groundwater seepage within excavated areas, which may result in contamination of soils or storm water if there is contact • Potentially significant volumes of groundwater will require control to permit development work **Unique to Alternative 4WS** • Potential disturbance of the active product control / recovery pumping system that operates in the vicinity of southwest corner of Commissioners Street and Cherry Street	**For all Alternatives** • Implement full-time groundwater control (which will involve dewatering), treatment and disposal • Install sheet piles at approximately 5 m below depth of excavation to prevent groundwater migration during earthworks or well point dewatering network to suppress water table during construction, or combination of the two • Treat groundwater on-site or at some off-site licensed receiver **Additional Mitigation for Alternative 4WS** • Remove all associated LNAPL and decommission active product control / recovery pumping system to facilitate Risk Assessment / Risk Management

In summary, many of the construction-related effects and the associated mitigation measures are common to all of the alternatives assessed during Step 4, and thus do not help to distinguish between alternatives. The effects that do distinguish between alternatives were assessed in the original Step 4 evaluation, with the exception of "Potential for negative effects on native fish habitat or aquatic communities" and "Potential effects from construction on lake and river water quality", which were deferred to Step 5 due to a lack of information at the time of the assessment, as stated previously.

For those two criteria, Alternative 4WS is unique in that there are effects associated with lake filling during construction of the promontories in the Inner Harbour. In the context of effects on fish habitat, the loss of a small amount of low quality habitat is mitigated by the creation of a much larger amount of high quality habitat. With regards to effects on water quality, the potential increase in turbidity during filling of the promontories can be mitigated using standard construction techniques. Therefore, the net effects associated with these two criteria are similar for all alternatives.

Thus, the construction-related effects and mitigation measures documented in this section do not change the results of the comparative evaluation completed as part of Step 4.

5.4.3.9 Summary of Step 4 Comparative Evaluation of Alternatives

Table 5-25 summarizes the Step 4 evaluation of alternatives by objective and is a summary of **Tables 5-11** through **5-23**. The write-up that follows identifies the advantages and disadvantages of each alternative.

Table 5-25 Summary of Step 4 Evaluation by Objective

Objective	Alternative 2	Alternative 3	Alternative 4W	Alternative 4S	Alternative 4WS
1. **Naturalization**	Least preferred	Least preferred	Moderately preferred	Moderately preferred	Most preferred
2. **Flood Protection**	Least preferred	Least preferred	Most preferred	Most preferred	Most preferred
3. **Operational Management and Constructability**	Most preferred	Most preferred	Moderately preferred	Least preferred	Least preferred
4. **Integration with Infrastructure**	Most preferred	Most preferred	Least preferred	Least preferred	Moderately preferred
5. **Recreational and Cultural Opportunities**	Most preferred	Moderately preferred	Moderately preferred	Least preferred	Most preferred
6. **Co-ordination with Other Planning Efforts**	Moderately preferred	Least preferred	Moderately preferred	Least preferred	Most preferred
7. **Consistency with Waterfront Toronto Sustainability Framework**	Moderately preferred	Most preferred	Least preferred	Most preferred	Most preferred
Summary	***Moderately preferred***	***Moderately preferred***	***Moderately preferred***	***Least preferred***	***Most preferred***

As shown in **Table 5-25,** Alternative 4WS is most preferred overall. It is most preferred for all of the objectives except operational management and constructability, and integration with infrastructure. The disadvantages of this alternative for these two objectives relate to the potential for secondary management of sediment and debris, the effect on port operations including the removal of dockwall, and the need for a moderate amount of modifications to existing infrastructure. It should be noted that these disadvantages are relative to the other alternatives and in no way suggest that there are deficiencies with Alternative 4WS that cannot be addressed either through design refinement or mitigation. During Step 5, opportunities to minimize and mitigate these effects through the use of new technologies or the refinement of the design were investigated.

Alternatives 2, 3 and 4W are moderately preferred overall. Alternatives 2 and 3, while being most preferred for three of the objectives, are least preferred or moderately preferred for the naturalization, flood protection and co-ordination with other planning efforts objectives. It was felt that the advantages these alternatives had with respect to the remaining objectives did not outweigh the disadvantages these alternatives presented with respect to naturalization, flood protection and co-ordination with other planning efforts. Alternative 4W is most preferred for the flood protection objective, least preferred for integration with infrastructure and consistency with Waterfront Toronto Sustainability Framework and moderately preferred for the four remaining objectives. The moderate showing of Alternative 4W for most of the objectives renders it moderately preferred overall.

Alternative 4S is least preferred overall. This alternative is least preferred for four of the seven objectives, moderately preferred for the naturalization objective, and most preferred for the flood protection and consistency with Waterfront Toronto Sustainability Framework objectives. The disadvantages associated with this alternative will be difficult to overcome with design refinements and mitigation.

5.4.4 *Description of the Preliminary Preferred Alternative and Confirmatory Studies*

As described in **Section 5.3.3.5**, Alternative 4WS (the preliminary preferred alternative) includes a low-flow channel to the Inner Harbour, with two overflow spillways (to the Keating Channel and Ship Channel). This Alternative also includes the construction of promontories which could restrict ship navigation in the Inner Harbour.

Alternative 4WS has the potential to provide approximately six hectares of aquatic habitat, over 15 hectares of wetland habitat abutting the low flow channel and an additional 3.5 hectares occupying the southern overflow spillway as a core wetland area. It includes nearly 13 hectares of parkland / terrestrial habitat located within the remainder of floodplain, and approximately eight hectares located adjacent to the floodplain, primarily within the promontory to the north of the channel west of Cherry Street.

Pedestrian and trail connections, requiring some pedestrian bridges, are provided from Queens Quay to the west, and Trinity Street and the Don Valley Trail to the north. A number of modifications to existing infrastructure will also be required, including new water crossings, realignment of Commissioners Street, a shift of Lake Shore Boulevard to the north and the closing and decommissioning of Villiers Street. Alternative 4WS will also require modifications to the dockwall along the Ship Channel to create the overflow spillway, and along Cousins Quay and Polson Quay to create the promontory and the river mouth.

Soil contamination studies were undertaken to indicate where soil remediation is required (see **Section 6.5.1**) and confirm the design features of the preliminary preferred alternative.

5.5 Port Lands Acceleration Initiative (PLAI) and Refinements to the Preliminary Preferred Alternative

As discussed in **Section 2.2.3.3**, in 2011 Toronto City Council approved a protocol, known as the PLAI, directing City staff, Waterfront Toronto and the TRCA to examine whether the Lower Don Lands could be developed more affordably and sooner than previously anticipated. The PLAI planning process put the DMNP EA on hold and a short list of 'Alternative Methods' identified during the initial DMNP EA process was re-examined within the context of City Council's direction. Extensive public consultation was undertaken as part of the PLAI process to help guide and critique the review process (refer to **Section 10.2**).

The PLAI investigates the phased implementation of flood protection and infrastructure improvements required to support revitalization of the Port Lands as a means of expediting development, and consequently, contributing to the costs of the required flood protection and infrastructure works. A number of the short-listed alternatives from the DMNP EA were re-examined with respect to flood protection, naturalization, cost, contribution to city building, and the ability to phase development. The effects of the project on existing land uses and industrial operations (e.g., 54 Polson Street (Lafarge Canada Inc.), Redpath Sugar and TPA operations) were considered so that the design of the new river valley system would accommodate existing shipping and port operations, where appropriate.

The results of the PLAI confirmed that the optimal design for flood protection was a refinement of the DMNP Preferred Alternative (Alternative 4WS). The refined design for Alternative 4WS (identified as Alternative 4WS Amended) is described in more detail below.

5.5.1 *Alternative 4WS Amended – River with Discharge to the Inner Harbour and an Overflow Greenway*[5]

The following describes the design of Alternative 4WS Amended as per the PLAI Final Report approved by Toronto City Council in October 2012. The design of Alternative 4WS Amended achieves the objectives for flood protection and the revitalization of the Port Lands identified in the DMNP EA. It maintains a low flow channel that discharges into the Inner Harbour utilizing the existing slip between Polson and Cousins Quays. The amended design also has an overflow greenway to the south along the Don Roadway which discharges into the Ship Channel and a spillway in the existing Keating Channel that will be separated from the low flow channel by a set of weirs. Alternative 4WS Amended differs from the original Alternative 4WS since the river outlet has been shifted slightly north and the overflow greenway has been shifted east to align with the planned Don Roadway extension. Further, there is no filling within the Inner Harbour to create promontories at the two quays.

Figure 5-15 below provides an illustration of the design of Alternative 4WS Amended.

5. *When the DMNP EA was re-started after input from the PLAI, the term 'greenway' was adopted to refer to the Ship Channel spillway.*

Figure 5-15 Design of Alternative 4WS Amended from the PLAI Final Report, 2012

The low flow channel of Alternative 4WS Amended is approximately 15 metres wide and 1.5 metres deep, with an associated river valley width of approximately 150 metres wide. The spillway through the Keating Channel retains the existing planform dimensions of Alternative 4WS, although the channel depths may be modified pending hydraulic designs aimed at enhancing the quality of aquatic habitat and reinforcing the aging dockwalls. The final greenway to the south is also 150 metres wide and will discharge to the Ship Channel. To complete the

requirements for flood protection, the topography surrounding the floodplain will be raised. It is estimated that the grades will have to be raised by approximately 1.5 to 2 metres above existing grade. In addition, an area of approximately two hectares along the east bank of the Don River from the CN Rail tracks south to Lake Shore Boulevard and an area east along the Don Roadway from Lake Shore Boulevard south to the Ship Channel will need to be modified to contain flooding.

Implementing Alternative 4WS Amended will require the accommodation of new infrastructure and a number of modifications to existing infrastructure to ensure that the Lower Don Lands are protected from flooding. These plans are discussed further and evaluated within the LDL EAMP. For example, new bridge crossings are required where Cherry Street crosses the Keating Channel and where the floodplain intersects Commissioners Street and Cherry Street. The existing crossing at Lake Shore Boulevard will also need to be lengthened to accommodate the floodplain. Alternative 4WS Amended will require modifications to the dockwall along the Ship Channel to create the greenway, and along Cousins Quay and Polson Quay. A more detailed description of the flood protection and infrastructure work required as part of the design for Alternative 4WS Amended can be found in **Chapter 6**.

5.5.1.1 Comparison between Alternative 4WS and Alternative 4WS Amended

Alternative 4WS and Alternative 4WS Amended were compared against each other using the criteria developed in Step 4 to confirm that Alternative 4WS Amended is more preferred than, or equally preferred as, Alternative 4WS. The alternatives were also compared to ensure that the refinements to the design meet the DMNP EA objectives. As mentioned in **Section 5.4.2.3**, at no point was weighting applied to the rankings of alternatives by indicator, criterion or objective.

The following sub-sections describe in greater detail how Alternative 4WS Amended compares with Alternative 4WS as well as how it compares with the other short-listed alternatives (refer to **Appendix G** for a comparison of the two alternatives by environmental component).

Naturalization Objective

In comparison with Alternative 4WS, Alternative 4WS Amended has a slightly shorter length of river channel and provides a smaller naturalized area due to a narrower Ship Channel Wetland in the Alternative 4WS Amended design. Alternative 4WS Amended also has a greater amount of wetland habitat fragmentation than Alternative 4WS as more infrastructure passes through the naturalized areas created. The smaller naturalized area afforded by Alternative 4WS Amended results in lower capital costs associated with the naturalization of the mouth of the Don River. Both alternatives provide similar benefits according to all other naturalization criteria (i.e., potential for hydraulics and hydrology to affect vegetation communities, potential to maintain and improves connection for aquatic species, and potential to affect wildlife species or communities).

Compared to the other short-listed alternatives identified in **Section 5.4**, Alternative 4WS Amended does not have the largest total naturalized area, although it provides more benefits than the other short-listed alternatives with regards to all other remaining naturalization criteria.

Flood Protection Objective

Both Alternatives provide similar flood protection benefits in terms of the final design for the flood protection objective. However, the capital costs associated with armouring the river and valley system are lower for Alternative 4WS Amended than Alternative 4WS. In addition, Alternative 4WS Amended provides the benefit of flood protection for parts of the Port Lands sooner than Alternative 4WS through the phased implementation approach.

Given that Alternative 4WS was most preferred compared to the other short-listed alternatives, Alternative 4WS Amended is also the most preferred overall for this objective.

Operational Management and Constructability Objective

Alternative 4WS Amended is preferred over Alternative 4WS in terms of the operational management and constructability objective because it requires fewer modifications to dockwalls than Alternative 4WS and shipping operations will not be restricted by promontories.

When compared with the other short-listed alternatives, both Alternative 4WS and Alternative 4WS Amended are the least preferred because they provide less accessibility to the river mouth for operational management and have higher annual operation and maintenance costs associated with their design. These costs are due to the residual debris and sediment management required in the Keating Channel and Ship Channel, as well as on the greenway after large flood events. Both alternatives result in adverse effects to shipping and existing land uses, although the design of Alternative 4WS Amended has less impacts when compared with Alternative 4WS. Both Alternative 4WS and Alternative 4WS Amended offer advantages for phasing implementation of river modifications as a result of their dual spillway design when compared to the other alternatives.

Integration with Infrastructure Objective

Alternative 4WS Amended is preferred over Alternative 4WS for most of the criteria associated with the integration with infrastructure objective. The amended Alternative requires fewer modifications to existing infrastructure (e.g., changes to existing, planned and proposed roads and bridges; modifications required to accommodate surface transit; and, changes to existing, planned and proposed underground utilities). Additionally, Alternative 4WS Amended allows for industrial facilities such as Lafarge and Redpath Sugar to continue shipping activities in the Lower Don Lands as fewer dockwalls are removed as part of the design.

Compared to the other short-listed alternatives, Alternative 4WS Amended ranks as moderately preferred. Alternatives 2 and 3 are most preferred because the design of these alternatives results in fewer impacts to existing infrastructure when compared to the other alternatives.

Recreational and Cultural Opportunities Objective

Alternative 4WS is slightly preferred over Alternative 4WS Amended for providing recreational and cultural opportunities. Both Alternative 4WS and Alternative 4WS Amended result in similar impacts to archaeological resources and create similar functional linkages to the Martin Goodman Trail. In addition, consultation with Aboriginal communities has confirmed that neither Alternative is anticipated to have impacts on traditional uses of lands by Aboriginal communities. The promontories and wider floodplain in the design of Alternative 4WS provide a greater area for parkland[6] than Alternative 4WS Amended. Further, Alternative 4WS Amended has the potential to displace more built heritage resources than Alternative 4WS. On the other hand, the design of Alternative 4WS Amended results in fewer impacts to existing recreational boating in the Inner Harbour when compared to Alternative 4WS.

6. *Following the PLAI process terrestrial habitat and parkland were assessed separately as it was determined that the DMNP design should provide opportunities for programmed space in addition to wildlife habitat. Parkland consists of open space outside of the floodplain that may be used for recreational purposes.*

Despite the drawbacks of Alternative 4WS Amended mentioned above, it is considered more preferred than the other short-listed alternatives as it has the lowest potential to affect archaeological resources, provides the greatest opportunity to enhance existing pedestrian and cycling linkages as well as functional linkages with the Martin Goodman Trail.

Co-ordination with Other Planning Efforts Objective

For the co-ordination with other planning efforts objective, Alternative 4WS Amended is preferred over Alternative 4WS as it provides more developable area, displaces fewer existing land uses, creates greater amenity value, and better supports transit utilization since a larger area of development area is within 400 metres of potential transit routes.

Alternative 4WS Amended is ranked higher than the other short-listed alternatives given that Alternative 4WS was previously most preferred.

Consistency with Waterfront Toronto Sustainability Framework Objective

When assessing the consistency of the designs with the Waterfront Toronto Sustainability Framework, both Alternative 4WS and Alternative 4WS Amended require similar amounts of soil remediation / risk management and are therefore ranked the same.

Given that Alternative 4WS was previously tied as most preferred with Alternative 4S and Alternative 3, Alternative 4WS Amended is also most preferred when compared with the other short-listed alternatives.

5.5.1.2 Confirmation of Construction-Related Effects Associated with Alternative 4WS and Alternative 4WS Amended

To ensure that the construction-related effects associated with Alternative 4WS Amended are similar to Alternative 4WS, potential effects and mitigation measures for these two alternatives are compared in **Table 5-26** below. **Section 5.4.3.8** identifies that construction-related effects for Alternative 4WS and Alternative 4WS Amended were based on information available from the Step 5 assessment (see **Chapter 7**). The assumptions used to evaluate these alternatives based on their construction-related effects were the same as those used to evaluate the short-listed alternatives. As it was previously determined that many of the construction-related effects and the associated mitigation measures are common to all of the short-listed alternatives assessed during Step 4, only those criteria unique to Alternative 4WS and Alternative 4WS Amended were evaluated further.

Table 5-26 Construction-Related Effects and Mitigation by Objective for Alternative 4WS and Alternative 4WS Realigned

Criteria / Environmental Component	Indicator(s)	Effects	Mitigation
Objective 1: Naturalization			
Aquatic Environment			

Potential for negative effects on native fish habitat or aquatic communities	Disruption, destruction, and alteration of aquatic habitat / nuisance effects on aquatic habitat from construction (noise, dust, vibration, sediment release, etc.)	**Alternative 4WS**
		• Loss of and disruption to low quality habitat within the Inner Harbour due to the construction of the promontories
		• Lake filling activities during construction may release or mobilize sediment within the Inner Harbour, which may affect fish species
		Alternative 4WS Amended
		• Loss of and disruption to low quality habitat within the Inner Harbour due to lake filling activities at Essroc Quay
		• Lake filling activities at Essroc Quay during construction may release or mobilize sediment within the Inner Harbour, which may affect fish species
			For both Alternatives
			• Create new high quality habitat of a larger area and greater complexity to compensate for permanent loss of low quality habitat during construction
			• Prepare and follow a spill response plan, including immediately reporting and managing any leakage or spillage
			• The following measures will be employed during lake filling activities to minimize or eliminate effects to fish:
			  • Salvage fish once the area has been enclosed
			  • When possible, avoid lake filling activities during windy days to minimize dispersion of sediment
			• Adhere to BMPs to reduce the likelihood of contaminated material entering the existing channel, minimize dust, sedimentation and noise as a result of construction activities
			• Use an excavator, a backhoe located on a barge, a bottom dump scow, or end dumping with a truck to place fill material on top of sediments within the containment berms during in-water works
			• Limit in-channel construction and conform to fish timing window guidelines to avoid adverse flow conditions and avoid fish spawning and migration periods

Objective 3 : Operational Management & Constructability			
Existing Land Use			
Potential to phase implementation of river modifications	Qualitative assessment of effects on shipping activities	**Alternative 4WS** • Potential effects to manoeuvring for larger vessels (refer to **Table 5-14**) **Alternative 4WS Amended** • None	**Alternative 4WS** • Establish clearly marked navigation aids as directed by the TPA in applicable locations regarding construction of the promontories • Provide advance notice to TPA in order to inform users of duration and spatial extents of the potential disruption to Port operations **Alternative 4WS Amended** • No mitigation required, since shipping activities will remain similar to existing conditions
Lake / River Water Quality			
Potential effects from construction on lake and river water quality	Effects of in-water and near shore works on water quality	**Alternative 4WS** • Potential for release of sediment plume during filling of promontories, which may result in increased turbidity in the Inner Harbour **Alternative 4WS Amended** • Potential for release of a sediment plume during the filling of Essroc Quay, which may result in increased turbidity in the Inner Harbour	**For both Alternatives** • Use an excavator, a backhoe located on a barge, a bottom dump scow, or end dumping with a truck to place fill material on top of sediments within the containment berms during in-water works • Limit in-channel construction and conform to fish timing window guidelines to avoid adverse flow conditions and avoid fish spawning and migration periods • Adhere to BMPs to reduce likelihood of contaminated material entering the existing channel • Prepare and follow a spill response plan, including immediately reporting and managing any leakage or spillage
Objective 5 : Recreational and Cultural Opportunities			
Land-Based and Marine Recreation			
Potential to negatively or positively affect recreational boating in the Inner Harbour	Qualitative assessment of effects on recreational boating	**Alternative 4WS** • Potential nuisance effects for recreational boaters within the Inner Harbour due to the construction of the promontories (refer to **Table 5-18**) **Alternative 4WS Amended** • Potential nuisance effects for recreational boaters within the Inner Harbour due to the filling of Essroc Quay	**For both Alternatives** • Areas of in-water works will be appropriately marked for navigation • Proper signage will signal where recreational marine users may go
Objective 7 : Consistency with Waterfront Toronto Sustainability Framework			
Groundwater Quality			
Environmental implications of groundwater management activities during construction	Contaminated groundwater requiring treatment / management	**Common to both Alternative 4WS and Alternative 4WS Amended** • The active product control / recovery pumping system that operates in the vicinity of southwest corner of Commissioners Street and Cherry Street could be potentially disturbed during construction activities as soils are excavated	**For both Alternatives** • Remove all associated LNAPL and decommission active product control / recovery pumping system to facilitate Risk Assessment/Risk Management

The table above indicates that Alternative 4WS and Alternative 4WS Amended share common construction-related effects and mitigation measures. While the effects associated with lake filling are common to both alternatives, the magnitude of the effects is considerably less for Alternative 4WS Amended since the lake filling area is smaller and in a less prominent area within the Inner Harbour.

Thus, the construction-related effects and mitigation measures documented in this section do not change the results of the comparison documented in **Section 5.5.1.1**.

5.5.1.3 Summary of the Comparative Evaluation of Alternative 4WS and Alternative 4WS Amended

Table 5-27 below provides a summary of the evaluation of the alternatives by objective.

Table 5-27 Summary of the Comparative Evaluation of Alternative 4WS and Alternative 4WS Amended by Objective

Objective	Alternative 4WS	Alternative 4WS Amended
1. Naturalization	**Preferred**	**Not preferred**
2. Flood Protection	**Not preferred**	**Preferred**
3. Operational Management and Constructability	**Not preferred**	**Preferred**
4. Integration with Infrastructure	**Not preferred**	**Preferred**
5. Recreational and Cultural Opportunities	**Preferred**	**Not preferred**
6. Co-ordination with Other Planning Efforts	**Not preferred**	**Preferred**
7. Consistency with Waterfront Toronto Sustainability Framework	**Same**	**Same**
Summary	***Not preferred***	***Preferred***

Table 5-27 *identifies that Alternative 4WS Amended is more preferred than Alternative 4WS overall. It is the preferred design for all of the EA objectives except naturalization (Objective 1) and recreational and cultural opportunities (Objective 5). When compared to the other short-listed alternatives, the differences between Alternative 4WS and Alternative 4WS Amended are minor. The refinements to the design of Alternative 4WS are consistent with the original design objectives for the DMNP.*

The disadvantages of Alternative 4WS Amended are that it creates slightly less naturalized area and parkland, and displaces more built heritage resources compared to Alternative 4WS. These deficiencies, however, are minor and can be addressed either through design refinement or mitigation. During Step 5, opportunities to minimize and mitigate these effects through the use of new technologies or the refinement of the design were investigated.

The advantages of Alternative 4WS Amended are that it reduces potential impacts to navigation by removing promontories within the Inner Harbour and accommodates the continued operation of several industrial facilities within the Lower Don Lands (i.e., Lafarge and Redpath Sugar) during construction. There are also reduced effects on mooring and continued use of a larger area of the port. Alternative 4WS Amended can be constructed at a lower capital cost than Alternative 4WS as costs to establish vegetation, modify existing infrastructure, and armour the river valley are less than Alternative 4WS. Alternative 4WS Amended requires fewer modifications to existing infrastructure, is better integrated with surrounding land use than Alternative 4WS and is able to maximize developable land while creating high functioning naturalized habitats.