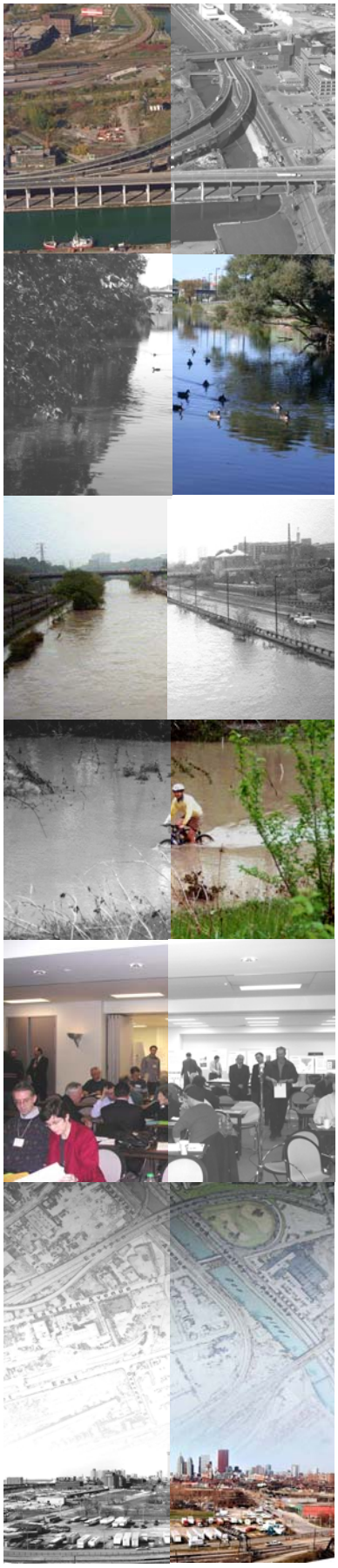


TORONTO WATERFRONT REVITALIZATION CORPORATION

Lower Don River West

Remedial Flood Protection Project

Class Environmental Assessment

Environmental Study Report

Prepared For

Toronto and Region Conservation Authority

Funded By

Toronto Waterfront Revitalization Corporation

Government of Canada

Province of Ontario

City of Toronto

DILLON CONSULTING

In partnership with

Acres International

URS Canada

Envision – the Hough Group

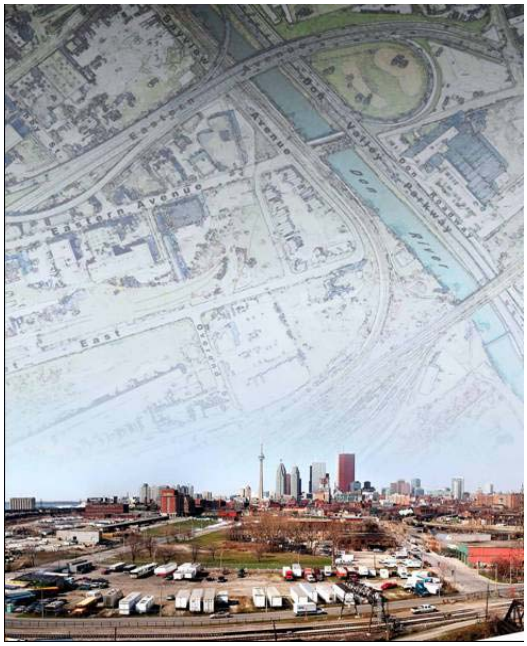
Greenberg Consultants

PARISH Geomorphic

FIScH Engineering

TORONTO AND REGION Conservation for The Living City

EXECUTIVE SUMMARY



View of Spill Zone 3 from the Don River

The Regulatory Floodplain

This Class Environmental Assessment (Class EA) was undertaken to examine alternative flood protection systems, and their environmental effects, for the elimination of the flood risk on 210 hectares of land west of the Lower Don River that are now located within the Regulatory Floodplain. This study was conducted in accordance with the *Conservation Authority Class EA for Remedial Flood and Erosion Control Projects (Conservation Ontario, 2002)* and the *Canadian Environmental Assessment Act.*

Flooding along the Lower Don River has a written history dating back to the mid-1870s, beginning with ice jams and late fall flooding. As recently as May 2000, flooding occurred within this area due to a series of severe thunderstorms. While most of the storm events over the past few decades have resulted mainly in nuisance type flooding, the area is subject to extensive flooding under a tropical storm similar to Hurricane Hazel, which occurred on October 15 and 16, 1954. Since the early 1980s, the Lower Don River floodplain has been identified by the TRCA as the highest priority flood prone area within its jurisdiction.

The Province of Ontario currently uses the rainfall from Hurricane Hazel centered over the Don watershed to define the limits of flooding during saturated soil antecedent conditions. With this amount of rainfall, the river is anticipated to rise to levels that exceed the channel of the river and begin to spill to the extent that the valley allows.

Currently, there are approximately 440 hectares of land within the Regulatory Floodplain along the Lower Don River, near its outlet to Lake Ontario. There are three identified flood zones within the Regulatory Floodplain.

Toronto's Waterfront

Lower Don River North of Queen Street

The general Study Area for this Class EA includes the 210 hectares of land that comprise Spill Zone 3 of the Regulatory Floodplain along the Lower Don River. This includes the areas between the Don River and the CN Tower to the west, and extending from Lake Ontario to as far north as Queen Street. Areas immediately north of the CN Rail line and west of the Don River would experience the most severe flooding, with flood depths in some locations exceeding 3 metres under Regulatory Flood conditions. During Regulatory Flood levels, the CN Rail crossing does not provide sufficient capacity to pass all of the floodwaters flowing downstream. As a result, the embankment acts as a dam at these flood levels which increases the degree of flooding upstream in Spill Zone 3.

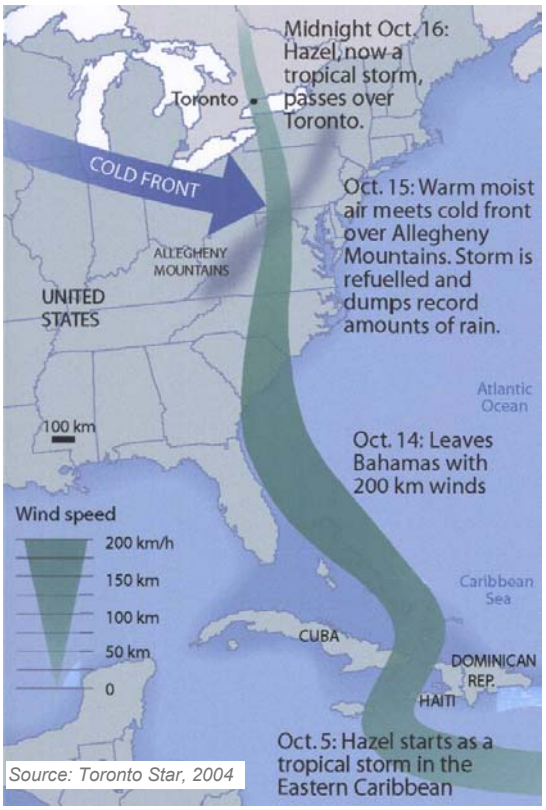
The floodplain extends south of the railway embankment as floodwaters would flow south to Lake Ontario through underpasses at Cherry, Parliament, Sherbourne, Jarvis, Yonge, Bay and York Streets.

To protect the lands susceptible to flooding in Spill Zone 3, the flood waters must be contained upstream of the CN Rail crossing. Accordingly, the flood waters that currently would flow westerly, across the West Don Lands, will need to be restricted and conveyed under the CN Rail bridge over the Don River. A fundamental consideration is to achieve the stated objective without creating additional flooding upstream, downstream or on lands to the east.

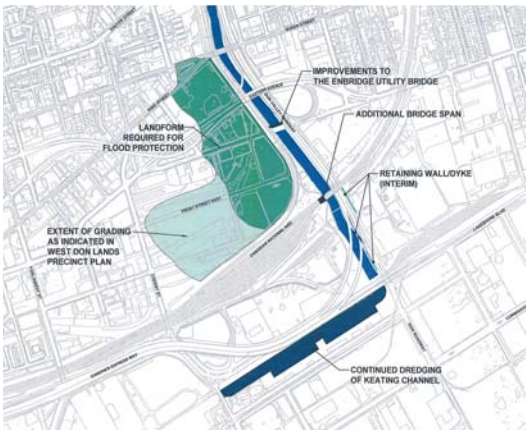
DESCRIPTION OF THE UNDERTAKING

The preferred undertaking to accomplish the above was selected through a comparison of several flood control alternatives. The proposed undertaking involves:

- A flood protection landform on the west side of the Don River;



Path of Hurricane Hazel



Elements of Flood Protection Project

- Interim flood protection works on the east bank of the Don River (retaining wall/dykes);
- An additional span (21.3 m) attached to the west abutment of the existing CN Rail bridge over the Don River;
- Continued dredging of the Keating Channel as per the Keating Channel Environmental Assessment (Acres, 1983); and,
- Modifications to the Enbridge Utility Bridge that crosses the Don River.

Although modifications to the Enbridge Utility Bridge are not critical to overall flood protection, it would be beneficial to deal with local impacts. The construction of the Flood Protection Landform will also require the relocation of infrastructure including Bayview Ave and other utilities. The relocation of this infrastructure has been addressed in a separate EA (under the Municipal Class EA) as part of the West Don Lands Precinct Plan. To facilitate the construction of the flood protection landform, the TWRC has initiated the West Don Land (WDL) Soil and Groundwater Management Strategy (SGMS) to address the management of subsurface environmental conditions.

The estimated costs associated with the remedial flood protection project are $5.6 M for the flood protection landform, $14.6 M for the bridge extension, $0.5 M for the East Bank works, and $0.3 M for the modifications to Enbridge Utility Bridge for a total of $21 M.

CONCURRENT AND RELATED STUDIES

The *Lower Don West Remedial Flood Protection Project* forms part of the overall vision for the Lower Don River. The elimination of the floodplain and the naturalization of the mouth of the Don River is one of

West Don Lands & East Bayfront Precinct Plans

The Portlands

the four priority projects being undertaken and/or funded by the Toronto Waterfront Revitalization Corporation (TWRC) aimed at the revitalization of the City's waterfront.

The *Don Mouth Naturalization and Port Lands Flood Protection Project*, which is being initiated by TRCA as an Individual Environmental Assessment undertaking will address the floodplain areas in Spill Zones I and 2 and the naturalization of the mouth of river.

While the *Lower Don River West - Remedial Flood Protection Project* will function independently of any other naturalization and flood protection works, it must be compatible with the *Don Mouth Naturalization and Port Lands Flood Protection Project* and not impose any constraints.

As part of the initial planning activities by TWRC, precinct plans are being prepared for the West Don Lands and the East Bayfront.

The West Don Lands occupy a 32 hectare area between the Don River and Parliament Street to the west, and from the CN Rail line to Queen Street to the north. The West Don Lands precinct plan indicates a mixed residential and commercial land use, with provision for affordable housing and recreational opportunities.

The East Bayfront precinct plan is a 36 hectare waterfront area that extends south of the CN Rail line between Jarvis and Cherry Street. It is expected to become a community with 6-8,000 units of housing, including affordable housing and related commercial spaces.

Both precinct plan lands are situated within the Regulatory Floodplain of the Lower Don River, and are reliant on the construction of the *Lower Don River West - Remedial Flood Protection Project* for their viability and implementation.

West Don Lands Precinct Plan Concept

The West Don Lands precinct plan, in particular, is highly integrated with the *Lower Don River West - Remedial Flood Protection Project*. A centrepiece of this plan is the proposed 7.2 hectare Don River Park; the flood protection landform would establish a large component of the land base which will form the Don River Park. This green space will extend westward well into the community and form part of a boulevard along Front Street leading towards the downtown Toronto.

The infrastructure servicing strategy including water, storm sewers, wastewater sewers, and roadways for the West Don Lands precinct plan has been developed through the *Class Environmental Assessment Master Plan*. The servicing concepts developed as part of the *Master Plan* have been incorporated into the design of the remedial flood protection works. Of particular importance is the relocation and realignment of Bayview Ave, and the redirection of all storm runoff from the precinct plan area westerly toward Cherry Street, where it will be intercepted and conveyed to Lake Ontario. The integrity of the flood protection landform must be maintained by ensuring that no buried servicing (sewers) is allowed within the fill to protect against failure via saturation or boils.

Members of the Public at the Open House

Another local project is Commissioners Park, a 16.6 ha waterfront greenspace that is being developed by TWRC. The facility will be located in the Portlands, and extend from the south side of the Keating Channel to Commissioners Street. The park is intended to be a waterfront landmark, as well as providing active recreational facilities and helping to meet the future needs of the communities in the West Don Lands, the East Bayfront and the Port Lands.

PUBLIC AND AGENCY CONSULTATION

A number of consultation activities were held throughout the duration of the Class EA study including:

Geo-Environmental Assessment

Aquatic & Fish Habitat Assessment

- Project initiation and open house advertisements in the local media;
- Three newsletters (*LDRW News*) were sent to those on the mailing list and made available at various events;
- Three Public Open Houses/Workshops;
- Four Community Liaison Committee Meetings;
- Five Technical Advisory Committee Meetings;
- Meeting with the band council of the Mississaugas of the New Credit to provide an opportunity to accommodate their concerns and ideas, as well as to provide background information on the project and the preferred alternative;
- West Don Lands Precinct Plan public events; and,
- A project website was maintained on TRCA's main website.

Comments and input received from the public at these events were considered by the project Team in the selection, assessment and design of the preferred flood remediation project.

BASELINE INVENTORIES

Baseline conditions in the study area were inventoried for a number of environmental components including:

- Aquatic Habitat and Fish;
- Terrestrial Natural Heritage;
- Built Heritage and Archaeological Resources;
- Socio-economic and Land Use;
- Hydrology/Hydraulics of the Lower Don River;
- Rail Corridor Impact Assessment;
- Geo-Environmental Assessment; and,
- West Nile Virus Assessment.

These inventories facilitated the identification of constraint areas and formed the basis for the assessment of the potential for effects of the project.

LONG LIST OF ALTERNATIVES

- Do Nothing;
- Floodplain Policy Revision;
- Flood Protection Landform (with and without culvert and east bank retaining wall/dykes);
- Wedge (with and without culvert and east bank retaining wall/dykes);
- CN Rail Bridge and Channel Widening;
- Secondary Channel with Flood Protection Landform;
- Floodwall/Dyke;
- Upstream Storage;
- Flood Proofing of Individual Structures;
- River Dredging; and,
- Watershed Conservation Measures.

EVALUATION OF ALTERNATIVES

A long list of flood control/remediation alternatives to address the flood risk problem was identified and then screened against three criteria including:

- Does the alternative achieve flood protection to the Regulatory Flood level for the Lower Don River West Lands?

- Does the alternative comply with current provincial floodplain policies, including the technical requirements associated with a permanent solution?

- Is the alternative technically feasible/proven?

The alternatives that did not meet all three criteria, and therefore were screened from further consideration included: Do Nothing, Floodplain Policy revision, Floodwalls/Dykes, Upstream Storage, Flood Proofing of Structures, and Watershed Conservation Measures. Notwithstanding that Watershed Conservation Measures alone cannot address the flooding associated with the Regulatory Storm, such measures form a significant component of other TRCA/City initiatives aimed at improving the overall health of the local steams, rivers and the waterfront. As such, they were assumed to be in place in conjunction with the other alternatives.

The remaining five alternatives were then assessed and evaluated on the basis of 35 evaluation criteria organized under six study assessment groups: Physical, Biological, Cultural, Socio-economic, Engineering/Technical, and Cost.

Basic requirements for permanent flood control solution as stipulated by the various levels of government.

… minimum required width of flood protection landform berm is 120 m;

… toe of flood protection landform must be set a minimum of 40 m from the west bank of the Don River;

… buried utilities (i.e.; storm and sanitary sewers) longitudinally within the flood protection landform is prohibited;

… flood protection landform to account for potential effects of future climate change;

… fill slopes on the wet side of flood protection landform - 5-10 %; on the dry side - 1.5-2.5 % typical, with a maximum of 5 % in localized areas;

… structures foundations should not encroach onto the 120 metre footprint; and,

… recreational uses and limited ancillary structures (no foundations) may be permitted in keeping with the allowable uses as per the *TRCA Valley and Stream Corridor Management Guidelines*.

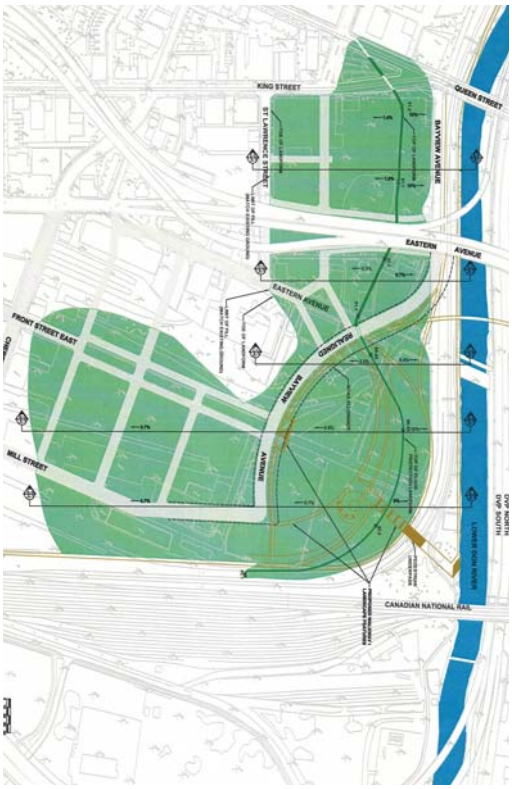
… planting restrictions as per the preliminary Flood Protection Landform vegetation zones.

Through the assessment and evaluation process, the Flood Protection Landform (with the culvert and east bank retaining wall/dykes) was considered preferred over all other alternatives. Key advantages of this alternative, as compared to the others, include:

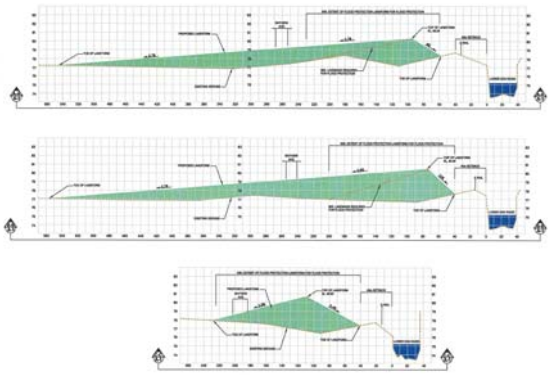
- Minimal noise and air quality effects during the operation period;
- Allows for advance opportunities for clean-up of contaminated lands in the Lower Don River West lands;
- Will enhance sediment transport in the Lower Don River;
- Will facilitate the creation of new habitat and linkages;
- Will result in limited effects to aquatic habitat;
- Will create an opportunity to enhance the landscape/views;
- Will allow opportunities to enhance greenspace/recreation areas;
- Creates no constraints on future efforts to naturalize the Lower Don River;
- High flexibility to address future changes in river flows;
- Low complexity and high ease of implementation;
- Minimal risk of failure;
- Limited need to relocate utilities; and
- Low cost.

REFINEMENT OF THE PREFERRED ALTERNATIVE

The multi-cell culvert, which provides additional capacity through the CN Rail embankment, allows the Hydro One Networks ducts in the vicinity of the embankment to remain in place without any realignment of the electrical cables/ducts. Previous studies indicated that this realignment would be prohibitively costly; however, discussions with Hydro One Networks revealed a significant cost reduction for the relocation works. Geo-environmental and geotechnical investigations at the proposed location of the culvert were also conducted



Flood Protection Landform - Plan View



Flood Protection Landform - Section View

to establish the subsurface conditions and to assess their effects on the design and construction of the proposed culvert works with regards to soil disposal, foundation requirements, temporary track protection requirements, and methods to control dewatering.

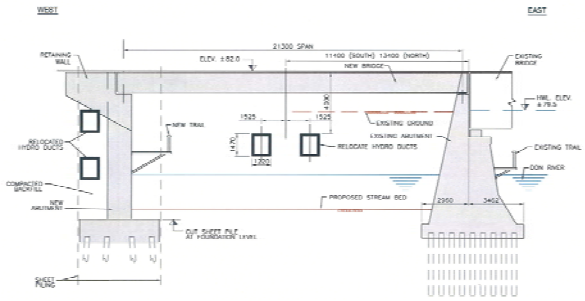
Given the considerable reduction in the cost estimate of relocating the Hydro One Networks underground plant, and the relatively unfavourable geotechnical conditions that were revealed by the geotechnical investigation, the bridge extension option (identified in initial stages of developing alternatives for the project whereby the waterway opening is augmented through the provision of an additional bridge span at the existing CN Rail bridge) was revisited as a viable method of providing additional hydraulic capacity. Based on a comparative evaluation between the bridge extension and culvert options, the bridge extension option emerged as the preferred method for providing additional hydraulic capacity through the CN Rail embankment and was adopted as a component of the overall remedial flood protection project.

CONFIGURATION OF THE PREFERRED ALTERNATIVE

The preferred flood remediation project includes: a flood protection landform; an extension to the existing CN Rail bridge to facilitate flows, and retaining wall/dykes on the east bank of the Don River so as to not further impact Spill Zones 1 and 2.

The following describes the details of the key elements of the preferred flood control alternative:

- The average height of the flood protection landform at its crest ranges from 2.8 to 3.8 m and the crest elevation ranges from 81.5 m at its northern edge at King Street to 80.0 m at the CNR embankment;



Bridge Extension at CN Rail Embankment

Ongoing Dredging the Keating Channel

- The proposed limit of fill for the preferred alternative covers an area of approximately 20 ha (of which approximately 12 ha is required for flood protection);

The width of the proposed flood protection landform and floodway extends from the river to approximately 200m to the west;

The slope from the top of the flood protection landform to meet the existing ground will vary from 5 to 10%, on its east (wet side). On the west (dry) side, typical slopes will range from 1 to 2.5%;

- In its final form, the flood protection landform will contain a variety of plantings, pedestrian/ bike pathways, recreation grounds and ancillary buildings associated with the park setting, however, these features are not the subject of this Environmental Assessment. To the west of the flood protection landform, land use is unrestricted;

- The flood protection landform will be designed with sufficient flexibility to accommodate a range of remedial approaches to address contaminated soil and ground-water. The contamination clean-up strategy and implementation plan associated with the flood protection landform will be conducted jointly by the TWRC and ORC, as part of the overall strategy for the West Don Lands;

- The additional span attached to the west abutment of the existing CN Rail bridge over the Don River will be 21.3 m in length to provide additional hydraulic capacity through the CN Rail embankment. The existing pedestrian underpass will be replaced;

- The east bank retaining wall/dykes will be approximately 1 to 1.5 m in height. The northern most dyke extends from the CNR embankment on

privately-owned land and connects with the Don Valley Parkway north-bound off-ramp of the Gardner Expressway.

Enbridge Utility Bridge

Further south, a retaining wall extends from the Don Valley Parkway southbound onramp to the Gardner Expressway and extends along the east bank of the Don River. From this point, the retaining wall is transformed into a 1 to 1.5 m high dyke and connects to the roadbed of Lake Shore Boulevard. The retaining wall/dykes will be located on City-owned land;

- Continued dredging of the Keating Channel as per the Keating Channel Environmental Assessment (Acres, 1983); and,

- Modifications to the Enbridge Utility Bridge that crosses the Don River.

ENVIRONMENTAL EFFECTS OF THE FLOOD REMEDIATION PROJECT

As part of this Class EA, an effects assessment of the proposed project was undertaken. A summary of these effects (negative and positive), are as follows:

Existing Pathway under CN Rail Embankment

- Some noise and dust disturbance effects can be expected in the area during the construction period. The absence of residents in the immediate vicinity of the project area reduces the significance of these effects, nonetheless, standard controls for dust and noise at construction site will be incorporated where appropriate during the implementation of the flood control components;

- There is some potential for increased sediment loads to enter the Don River during construction. Sediment controls will be put in place to minimize these effects;

- The West Don Lands Soil and Groundwater Management Strategy (SGMS) will allow for management of subsurface environmental conditions in the area;

- There are no sensitive natural heritage features in the project study area;

- Approximately 0.5 ha of poor quality vegetation will be removed. Plantings/landscaping of the landform will increase the amount of vegetation as well as wildlife habitat opportunities;

- There will be no loss of fish habitat: additional habitat will likely result due to the natural river bottom at the bridge extension;

- Some minor disturbance to the aquatic habitat is possible during the construction of the bridge extension. Measures will be put in place to minimize sedimentation, and the bridge extension will be designed to ensure that no impediment to fish passage is created;

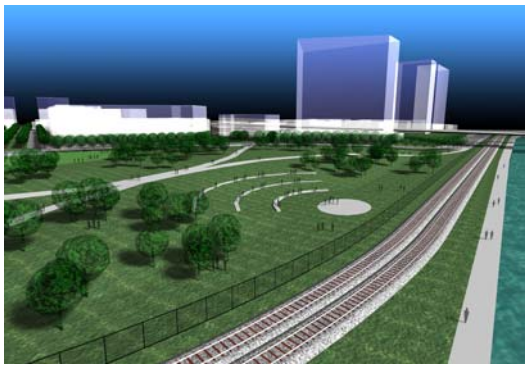
- Approximately 20 businesses that lease property from the Ontario Realty Corporation (on a monthly renewal basis) will be displaced;

- The project will effectively eliminate the flood risk in Spill Zone 3. The bridge extension will likely result in the reduction of sediment transport through the area, however, continued dredging of the Keating Channel will aid in improving sediment conveyance in the area;

- The recreation pathway along the west side of the Lower Don River will be improved. The existing underpass through the CN Rail embankment which is prone to flooding) will be replaced;

- Construction of the bridge extension will have impacts on railway infrastructure and operations during the construction period. Coordination

with CN Rail, GO Transit, CP Rail, VIA Rail and Toronto Terminals Railway is ongoing to minimize these impacts; and,



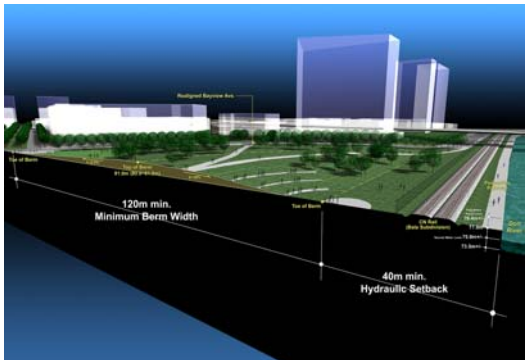
Flood Protection Landform Conceptualization

- Construction of the bridge extension will require the relocation of Hydro One Networks underground cables. Coordination with Hydro One is also ongoing to minimize any impacts during construction.

The results of this Class EA study have concluded that the construction and operation of this project will result in few negative environmental effects. The project will result in a number of positive effects including the elimination of the flood risk west of the river. Landscaping efforts associated with the project will increase greenspace, recreation and natural habitat opportunities in the area as well.

MITIGATION PLAN

The following summarizes the mitigation measures recommended to offset the few negative environmental effects that will result from the construction and operation of the flood protection landform and associated works:



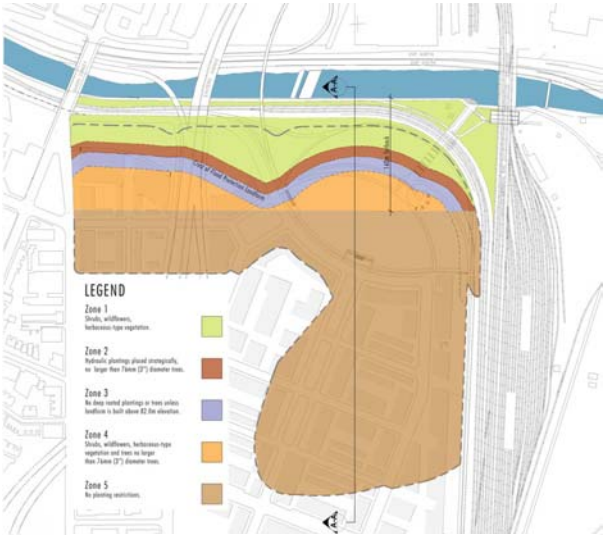
Flood Protection Landform Conceptualization Section View

- Dust suppression on roadways during construction, and a vegetated covering for the flood protection landform will eliminate dust effect after construction;

- Temporary noise barriers will be installed and night time construction limited to the extent possible during construction;

- East bank works (retaining wall/dykes) will mitigate increased flooding on the east side of the river;

- Swales will be incorporated into the design to enhance water quality;



Landscaping Plan

- Best Management Practices will minimize sediment runoff, and plantings on the flood protection landform will minimize erosion and sediment potential after construction, as well as provide/improve wildlife habitat and increase shading (microclimate benefit);
- Construction of the bridge extension will not take place during fish spawning seasons;
- The creation of new recreation trails and underpass improvements will enhance pedestrian pathways;
- Where archaeologically significant features are discovered, the features will be excavated and preserved;
- All businesses that will require relocation will be notified, by TWRC and/or ORC, well in advance of construction and access to businesses to be maintained during construction, with detours to be provided if required;
- Mitigation measures required for the relocation of roads and utilities will be defined during the detailed design phase; and,
- Record of site conditions under Ontario Regulation 153-04 will be completed once contaminated soil/groundwater remedial approaches are implemented/completed to allow for land use changes and building permit issues.

1

Planting Zone 1: Grasses, wildflowers and other herbaceous vegetation; limited number of woody shrubs.

LANDSCAPING CONSIDERATIONS AND CONCEPTS

Based on flood protection and long-term stability considerations, preliminary concepts for the landscape treatment of the flood protection landform were defined on the basis of five zones relative to the distance from the river's edge. The type of

vegetation that can occur within each of the zones is prescribed by the flood control measures as is summarized as follows:

- Zone 1 (River's edge to within 15 m of crest of landform on wet side): Grasses, herbaceous vegetation. Limited numbers of woody shrubs;
- Zone 2 (Edge of Zone 1 to crest of landform on wet side): Hydraulic plantings with woody shrubs and tress no larger than 75 mm diameter;
- Zone 3 (Crest of landform to 20 m east on dry side): Shrubs, wildflowers and herbaceous vegetation, no deep rooted plantings or trees unless landform is over 82.0 m;
- Zone 4 (20 m east of the crest of the landform to 160 m development setback): Shrubs, wildflowers and herbaceous vegetation and trees no larger than 75 mm diameter; and,
- Zone 5 (Beyond 160 m development setback from edge of the river): No restrictions.

The development of the preliminary planting zones is in draft form and the final planting strategy will be developed in consultation through the park design and precinct landscaping plan.

CONCLUSIONS

The *Lower Don River West Remedial Flood Protection Project* has been carried out under the Class EA process. The main objective of this undertaking is to permanently remove 210 ha of land in downtown Toronto from the Regulatory Floodplain. It is recommended to eliminate the flooding risk via the construction of a flood protection landform on the west side of the river, flood protection works on the east side of the river, a bridge extension at the CN Rail embankment, continued dredging of the Keating

Channel (as per the requirements under the previous Keating Channel Environmental Assessment), and modifications to the Enbridge Utility Bridge.

The preferred solution was selected among several alternatives via a comparative evaluation. Ample public consultation activities were conducted throughout the Class EA study, whereby public comments and concerns were received and considered by the Study Team in the selection, assessment and functional design of the preferred solution.

Demonstration Plan

An analysis of the potential environmental effects indicate that the construction and operation of the remedial flood protection project would result in a few negative environmental effects that are readily mitigable, and several positive effects, the foremost being the elimination of the flood risk to 210 ha of downtown Toronto.

This Environmental Assessment also covers the requirements of the Ontario Realty Corporation Class EA process for land transfers, with the exception of providing an individual strategy for relocating existing businesses and for soil/groundwater remediation. These strategies will be developed by the Ontario Realty Corporation and the Toronto Waterfront Revitalization Corporation within the coming months, and will be submitted to the Ministry of the Environment for review prior to implementation of the preferred alternative.

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1.0 INTRODUCTION

1.1 Purpose of the Undertaking

A Class Environmental Assessment (Class EA) has been undertaken to examine flood protection alternatives, and their environmental effects, to eliminate the flood risk on 210 hectares of land located west of the Lower Don River. These lands are currently located within the Regulatory Floodplain. This study is being conducted in accordance with the *Conservation Authority Class EA for Remedial Flood and Erosion Control Projects (Conservation Ontario, 2002)* and the *Canadian Environmental Assessment Act.*

1.2 Study Area Description

The Study Area is located along the lower reach of the Don River in the City of Toronto, and encompasses the area within Spill Zone 3 of the Regulatory Floodplain as shown in ***Figure 1.1***.

Within this spill zone, the Regulatory Floodplain extends to the west of the Lower Don River to York Street, and south of Queen Street to the waterfront, as floodwaters can move southward under the embankments at roadway underpasses at Cherry, Parliament, Jarvis, Yonge and Bay Streets. The study area also includes land to the east of the Lower Don River, south of the CN Rail bridge to Lakeshore Blvd.

1.3 Description of the Undertaking

The undertaking was selected through a comparison of several flood control alternatives as documented in this Class Environmental Assessment Report. The proposed undertaking involves the following:

- a *flood protection landform* on the west side of the Don River;
- interim flood protection works south of the CN Rail Kingston Line on the east bank of the

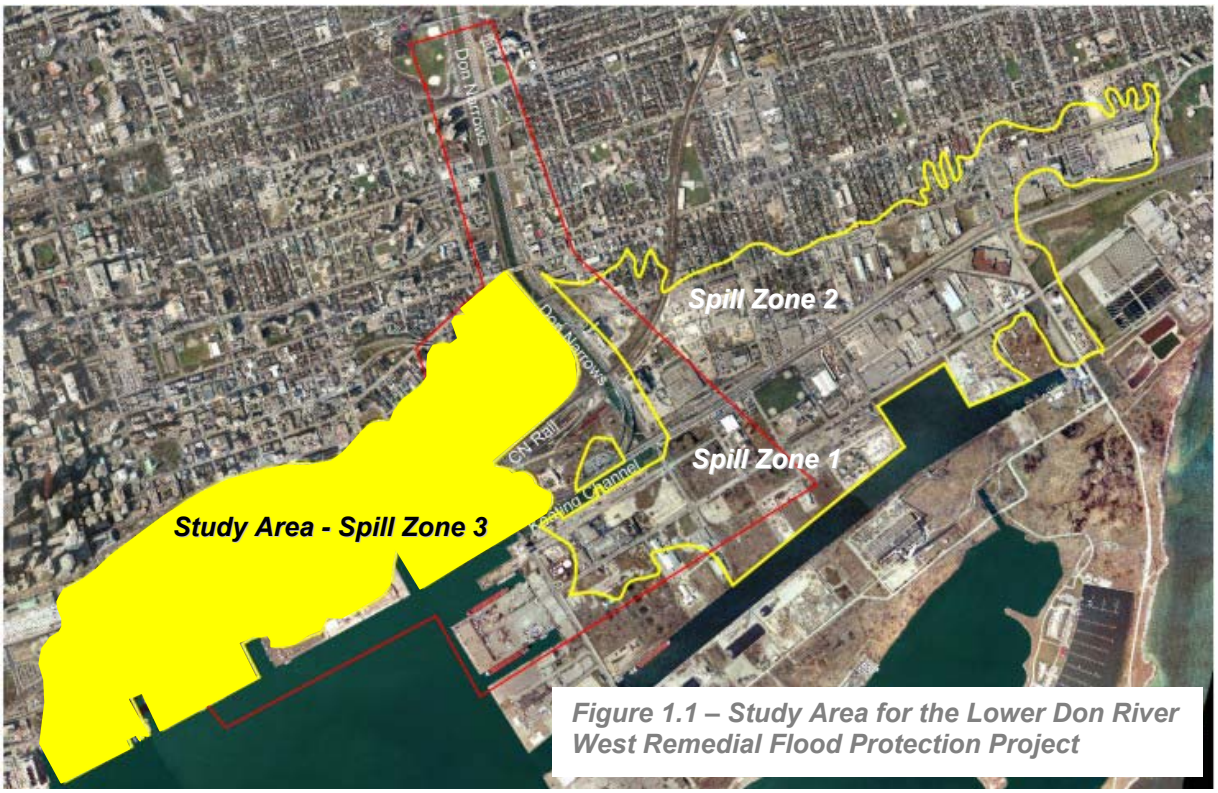


Figure 1.1 – Study Area for the Lower Don River West Remedial Flood Protection Project

Don River, consisting of a combination of a retaining wall and dykes;

- an additional span attached to the west abutment of the existing CN Rail bridge over the Don River;
- continued dredging of the Keating Channel as per the Keating Channel Environmental Assessment (Acres, 1983) ; and,
- modifications to the existing utility bridge that is located immediately downstream of the Eastern Ave. crossing of the river.

The components of the undertaking are identified in ***Figure 1.2.***

The construction of the Landform will also require the management of contaminated soils and groundwater, and the relocation of infrastructure, including Bayview Avenue and other utilities, and existing businesses in the area. These issues will be addressed in a separate Class EA (under the *Municipal Class EA*) as part of the *West Don Lands Precinct Plan* and through ORC's and TWRC's West Don Lands (WDL) Soil and Groundwater Management Strategy (SGMS).

1.4 Rationale for the Undertaking

The *Lower Don West - Remedial Flood Protection Project* is one of the four priority projects of the Toronto Waterfront Revitalization Corporation (TWRC), and is aimed at assisting with the revitalization of the Toronto Waterfront.

Currently, there are approximately 440 hectares of land within the Regulatory Floodplain along the Lower Don River, near its outlet to Lake Ontario.

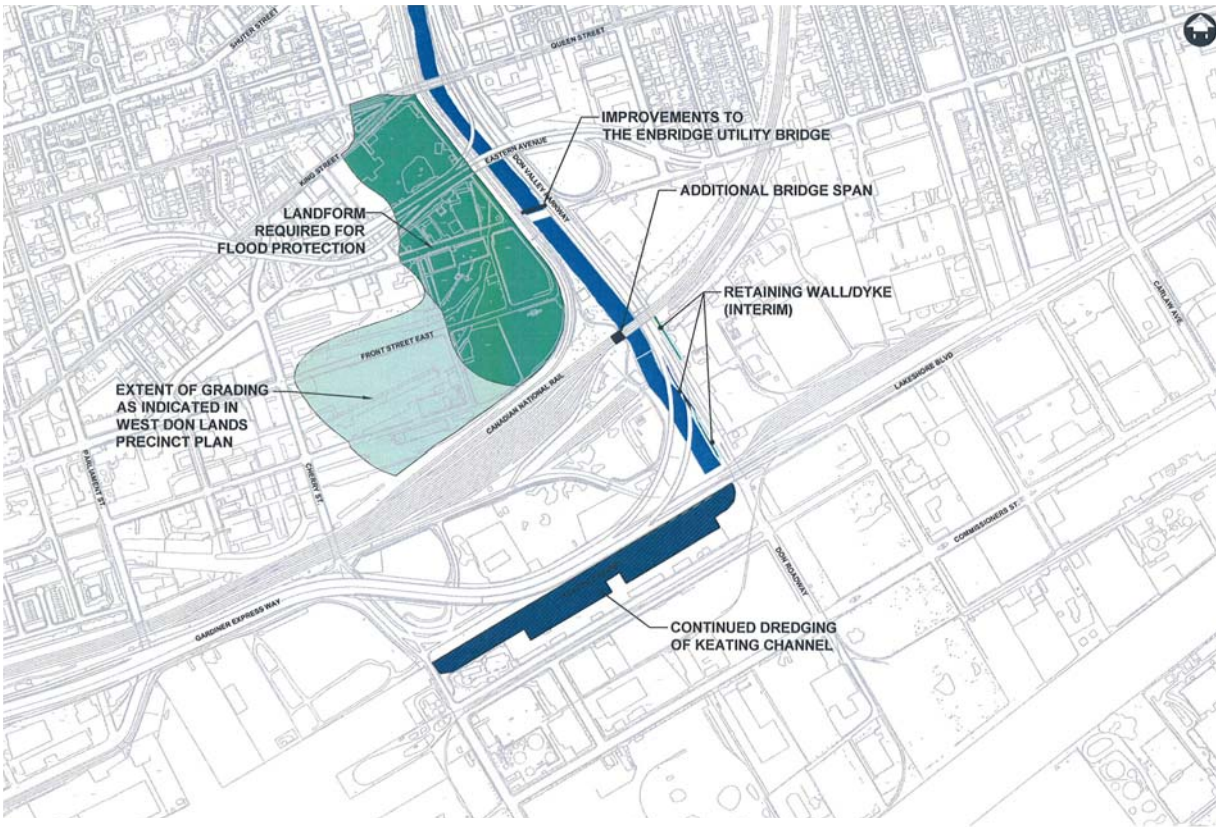


Figure 1.2 – Remedial Flood Protection Project - Component Works

Since the early 1980s, the Lower Don River floodplain has been identified by the Toronto and Region Conservation Authority (TRCA) as the highest priority flood prone area within its jurisdiction.

The objective of this project is to develop the functional design of a remedial flood protection scheme that will provide permanent protection for Spill Zone 3 (to the west of the Don River), thereby removing the associated 210 hectares of downtown Toronto from the Regulatory Floodplain.

2.0 BACKGROUND

2.1 History of the Problem

The establishment of Toronto as a major economic centre in Canada and North America is linked to the early influx of industry, shipping and railroads to the Central Harbour and along the Lower Don River. In the 1830s, virtually all of the Central Waterfront was located along Front Street. Concern over the loss of public access to the waterfront eventually led to extensive lakefilling in 1854 to establish The Esplanade. Two years later, the City granted the Grand Trunk Railway (now CN) the southern 12 metres of the Esplanade for the railway, which essentially cut off public access to the waterfront once again.

In 1924, the Grand Trunk Railway raised the track six metres above grade along a berm to improve pedestrian and vehicle access to the waterfront through underpasses at York, Bay, Yonge, Jarvis, Parliament and Cherry Streets (*Royal Commission on the Future of the Toronto Waterfront, 1989*).

A railway bridge to span the Lower Don River and connect to an elevated berm on the east side of the river was also constructed. To this day, the elevated berm and bridge provides a major link into the Downtown Toronto core for CN Rail, GO Transit, and Via Rail.

A renewed influx of industrial activity to the Toronto Waterfront emerged through the implementation of the 1912 Waterfront Plan, which called for the reclamation of the 520 ha Ashbridge's Bay Marsh into an industrial port. A combination of hydraulic fill (littoral sediments) and trucked fill (construction, demolition and other solid waste) were used to create the land base of the Port Lands. Two other components of this transformation called for the straightening of the Don River, which shaped the Don Narrows (located from present-day Riverdale Park to the crossing of Lakeshore Boulevard) and the establishment of the Keating Channel that

redirected the Don River into the Central Harbour from Ashbridge's Bay. The Don Narrows possesses a low gradient, rectangular-shaped channel with vertical sheet-pile retaining walls, and a largely featureless bed.

South of the CN Rail bridge, the Don River turns 90 degrees to the west as it enters the Keating Channel, also consisting of vertical sheet-pile walls, and a deeper uniform bed. Trucked fill was primarily used to create the land base connecting the north side of the Keating Channel to the south side of the Grand Trunk (CN) Railway. Construction of the Keating Channel and Port Lands was completed in 1922.

Given the Don River's high sediment loads, which originally contributed to the establishment of the extensive delta marsh of Ashbridge's Bay, it quickly became apparent that regular dredging would be required to maintain shipping activities within the Keating Channel. Sedimentation rates and dredging volumes were fairly consistent from 1922 until 1950, ranging from 40,000 to 50,000 m^3 per year *(Acres, 1983)*. Widespread development within the Don River Watershed during the post-war boom resulted in significant increases in sedimentation and dredging at the mouth of the Don River from 1950 until 1970. Peak sedimentation rates, coinciding with the construction of the Don Valley Parkway, reached up to four times the average pre-war era sedimentation rate. After 1970, decreases in the

number of new watershed disturbances and improved sediment control structures likely contributed to the decline in sedimentation in the Keating Channel to levels similar to the pre-war era.

A reduction in shipping activities within the Keating Channel, combined with restrictions on the open water disposal of dredgate imposed by the International Joint Commission (IJC) in 1974, resulted in a cessation of dredging in the Keating Channel. In the following five to six years, the Keating channel filled with sediment and debris to the point where it became visible under all but high lake levels, resulting in increased flood risk along the Lower Don River. By 1983, it was estimated that 300,000 m^3 of sediment had accumulated in the Keating Channel.

Prior to approval of the *Keating Channel Environmental Assessment (Acres, 1983),* emergency measures were taken to remove 150,000 m^3 of this material to reduce the flood hazard. Annual dredging and the deposit of dredgate in containment cells at the Leslie Street Spit was initiated in 1987 as part of the Keating Channel Environmental Assessment. From 1987 to 1991, large-scale dredging activities were conducted to remove new and older sediment deposits from the channel. Since 1992, regular dredging has been conducted to remove new sediment deposits in order to maintain the design flood risk stipulated in the *Keating Channel Environmental Assessment Study*. Sediment deposition rates in the Keating Channel are now similar in magnitude to those prior to the pre-war development boom at approximately 35,000 m^3 per year.

As part of the Watershed Planning process in 1980, the Lower Don River floodplain was identified by Toronto and Region Conservation Authority (TRCA) as the highest priority flood prone area within its jurisdiction. This ranking was based upon an assessment of the extent of area flooded under the Regulatory Flood, and the risk to life and property that it represents. The *Keating Channel Environmental Assessment* Study identified three different Spill Zones for the Lower Don River (Refer to ***Figure 2.1***). These zones are: Zone 1 - The Port Lands, Zone 2 - east of the Don River north of Lake Shore, and Zone 3 - the lands west of the Don River.

This *Lower Don River West - Remedial Flood Protection Project* pertains to Spill Zone 3, which includes the West Don Lands and part of the downtown core of the City. The area at risk due to flooding in Spill Zone 3 includes the 172 hectares of land under the Special Policy Area designation (SPA), and an additional 38 hectares of land that are currently under a Holding Symbol (H) designation (West Don Lands) in the City of Toronto Official Plan.

A number of factors contribute to the extent of flooding through Spill Zone 3:

- the Lower Don, north of the CN Railway, flows through a low-lying, non-confining floodplain consisting of deltaic sediments and lakefill; and,

- backwater effects are produced by:
  - the CN Rail embankment;
  - water levels in Lake Ontario;
  - potential ice jams; and,
  - low-lying utility and transportation bridges.

In addition to flooding, the soils and groundwater associated with Spill Zone 3 are contaminated by past lakefilling and industrial land use activities. All lands within and adjacent to the potential flood protection works area will first need to be assessed and remediated as required. This component of the project is discussed in ***Section 5.2.3*** of this Report.

Figure 2.1 – Regulatory Floodplain along the Lower Don River

2.2 Overview of Previous Studies

The following provides a brief overview of the major studies that were previously conducted relating to the flood protection project for the Lower Don River West, and form the basis for the current study.

i) *Keating Channel Environmental Assessment, prepared for the Metropolitan Toronto and Region Conservation Authority. Acres Consulting Services Ltd., March 1983.*

This environmental assessment relates to the needs and consequences of dredging the Keating Channel. The study concludes that with regular maintenance dredging activities, the full hydraulic capacity of the channel would be restored. In combination with a dyking program, this would facilitate the achievement of the flood protection objectives, as well as, a reduction in the contaminated sediment in the channel.

ii) *Flood Protection Options for the Ataratiri Development, prepared for Department of Public Works, City of Toronto. MMM Ltd., January 1991.*

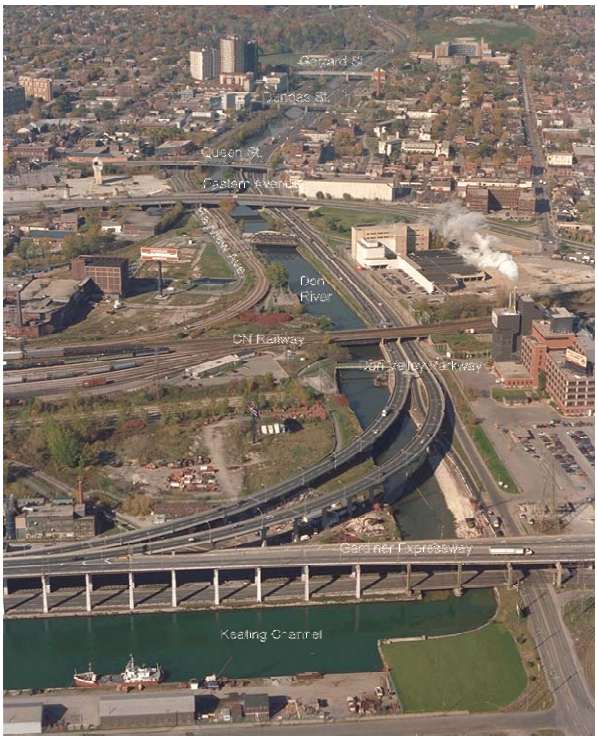
This study describes flood protection alternatives for the formerly proposed Ataratiri Development and addresses conditions to which a Special Policy Area (SPA) designation was granted to allow development to proceed. Due to the flow patterns in the spill zones of the Lower Don River, a two-dimensional model, specific to urban floodplain analysis was used.

Various flood protection schemes were considered in developing a strategy for protecting the entire Lower Don River floodplain area. The

study recommends filling and regrading the study area to drain to Lake Ontario via Cherry Street, in combination with continued full dredging of the Keating Channel. The solution increases residual flood depths east of the Don River and therefore the study recommends the implementation of a Master Plan for the protection of the entire Lower Don River floodplain lands.

iii) *Lower Don Lands Strategy Flood Protection and River Regeneration Concepts, Prepared for the Waterfront Regeneration Trust. MMM Ltd., July 1994.*

This study describes the integration of flood protection works and river regeneration concepts and recommends an action plan incorporating wetland habitat, naturalization of the Lower Don River and realignment of the mouth, fill on the former Ataratiri lands, and additional flow capacity under the CN Rail embankment. The report recommends that the 'minimum' flood protection package be implemented as a first phase of an overall strategy for flood control for the Lower Don Lands, when development on the former Ataratiri lands proceeds. The 'minimum' flood protection package contrasts the 'ultimate' flood control package which involves complete implementation of the realignment of the mouth of the Don River.



iv) *Scoping and Sensitivity Analysis on Flood Protection Options for West Don Lands Site, Report Prepared for Ontario Realty Corporation. Acres & Associated, July 1996.*

This report summarizes a peer review conducted for Ontario Realty Corporation (ORC), evaluating previously proposed flood protection alternatives for the West Don Lands. The primary objective of the study was to ensure that all reasonable alternatives to a berm had been sufficiently considered. The results of this analysis indicated that a berm alternative is the most feasible method of achieving flood protection consistent with the planning objectives, providing sufficient hydraulic capacity in the floodway, and facilitating the creation of open space.

v) *West Don Lands Flood Protection and Related Issues Study, prepared for City of Toronto, Ontario Realty Corporation, Toronto and Region Conservation Authority. MMM Ltd., May 2000.*

The purpose of this study was to outline flood protection requirements for the West Don Lands in order to facilitate the removal of the Holding designation for the area in the City's Official Plan. The study advances the proposed flood protection measure to a functional design stage, based on the recommendation from the Acres (1996) report that a berm is the preferred flood protection solution (this study did not consider additional alternatives, but rather focused on addressing outstanding design issues associated with the berm). The study also develops an integrated package of flood protection and river regeneration measures for the area south of the CN tracks that would provide flood protection for the remaining portion of the lands affected by the Regulatory Flood.

vi) *Don River Hydrology Update Final Report, prepared for Toronto and Region Conservation Authority. MMM Ltd, June 2004.*

This report documents the refinements made to the hydrologic model for the Don River Watershed. The model, updated from the 1990s, incorporates the following changes:

- the use of the Visual OTTHYMO Version 2.0 (VO2) hydrologic model which replaced the outdated HYMO model;
- updated development condition and land use data for the Don Watershed; and,
- calibration and validation of the updated model to an actual event in May 2000.

The calibrated model was used to establish the current design flows for the Don River Watershed that have been adopted for the development of the flood protection alternatives for the *Lower Don River West - Remedial Flood Protection Project*.

Calculated flows are provided for a range from the 2 to 100-year design events, and the Regulatory Flood.

The results indicate that the existing 100-year peak flows near the mouth of the Don River have increased by approximately 3% from past modelling of the watershed.

For the Regulatory Flood (Hurricane Hazel), the simulations indicate significant increases in flows at several locations throughout the watershed due to recently urbanized catchments in the upper regions of the watershed and updated areal reduction factors, which differ significantly from the reduction factors applied in the previous model update (in the 1990s).

A description of the potential impacts of climate change on the hydrology of the Don River watershed was also documented in the report. A thorough discussion of the hydrologic and hydraulic characteristics of the Lower Don River is provided in ***Section 4.5*** of this Report.

2.3 Conservation Authority Involvement Justification

In 1979, floodplain mapping was completed for the Lower Don River and Keating Channel on behalf of the Toronto and Region Conservation Authority. At that time, the modeling results depicted significant flooding under the Regulatory Flood with depths between 3 and 4 metres higher than the ground elevations surrounding the Lower Don River. As previously noted, on the basis of the results, the floodplain of the Lower Don River became recognized as the highest priority flood risk area within the jurisdiction of TRCA.

Numerous attempts to address flooding in this area have been made between 1980 and 2000 as components of the following projects: the Keating Channel EA (1983) for TRCA, the 1988 flood study by TRCA, the Ataratiri Project by the City of Toronto, and the *West Don Lands Flood Protection and Related Issues Study (2000)*.
Additional hydraulic studies undertaken in relation to these projects have further refined the extent and depth of the floodplain under the Regulatory Flood. However, other than the continued implementation of the Keating Channel EA since the late 1980s (eg. dredging of the Keating Channel and disposal in the Tommy Thompson Park containment cells), each reincarnation of the project has not been carried forward to functional design due to varying economic and political conditions, thereby leaving the 210 hectares of land west of the Lower Don River at risk to flooding.

In 2001, the TRCA was identified by the three levels of government as the recipient agency to naturalize the mouth of the Don River and provide flood protection for the entire 440 hectare floodplain (210 hectares to the west and 230 hectares to the east and south) surrounding the Lower Don River and Keating Channel.

Figure 2.2 – Floodwater Depths along the Lower Don River for the Regulatory Flood

This project was to be undertaken as a component of the Toronto Waterfront Revitalization initiative. In 2003, the TRCA initiated an environmental assessment to develop a functional design for the *Lower Don River West Remedial Flood Protection Project* (LDRW Project), with the goal of removing the 210 hectares of land west of the Don River from the Regulatory Floodplain.

The TRCA is conducting the LDRW Project under the auspices of the *Valley and Stream Corridor Management Program (MTRCA, 1994)*. The goal of this Program is *to undertake an integrated valley and stream corridor management program with one objective being to prevent, eliminate or reduce the risk to life and property from flooding.*

The Plan also has a goal to protect and regenerate the ecological health and integrity of these systems; and to provide opportunities for compatible public use and enjoyment. To facilitate the planning and implementation of flood control projects related to the *Valley and Stream Corridor Management Program*, the *Conservation Authority Class Environmental Assessment for Remedial Flood and Erosion Control Projects (March 2002)* was selected to direct this study and was triggered with the submission of a Notice of Intent, which was filed by the TRCA in March 2003. The Conservation Authority Class EA can be used for "*those projects undertaken by Conservation Authorities, which are required to protect human life and property, in previously developed areas, from an impending flood or erosion area*".

In 1994, *Forty Steps to a New Don* - the Report of the *Don Watershed Task Force* recommended three general principles to help guide the vision of a revitalized urban river:

i) Protect those components of the watershed that are healthy;

ii) Regenerate those components of the watershed that are degraded; and,

iii) Promote community responsibility and ownership for a healthy Don River.

Forty specific steps are outlined in the document in order to achieve this vision. The LDRW Project will help address a number of these steps as follows:

Step 5: Keep sewage out of the Don: The long-term plans for CSOs and SSOs that currently flow into the Don River through the proposed area for flood protection works, will be redirected westward to Cherry Street for treatment before being released into Lake Ontario. Servicing relocations and treatment of effluent, however, are beyond the scope of this Environmental Assessment.

Step 10: Keep old landfill sites from leaching into groundwater and streams: The entire floodplain surrounding the Don River in this area is composed of landfill materials, some of which is contaminated by past land uses. As part of the design, the LDRW Project will ensure that existing contaminated soils and groundwater do not enter the Don River or get released into air, soils or vegetation.

Step 13: Identify the natural ecosystems and species in the watershed: As part of the environmental assessment process, detailed baseline studies have been undertaken to identify the conditions of local ecosystem health and to identify those species that utilize the local habitats.

Step 14: Protect and regenerate the natural form and function of the Don's valley and stream corridors: The LDRW Project will re-establish a confining valley system for the Don River as is found immediately upstream in order to regenerate the hydraulic and ecological function along the Don River corridor.

Step 17: Protect and regenerate lowland forests, meadows and streamside vegetation: As a component of the flood protection components of the LDRW Project, improvements in the quality and function of streamside vegetation communities will be made within this area.

Step 21: Enhance the network of green corridors that link natural areas, on the tableland as well as in valley and stream corridors: The LDRW Project will greatly improve the quality of stream corridor habitat, thereby improving the migration of wildlife from Lake Ontario and Tommy Thompson Park, to the headwaters of the Don River.

Step 22: Improve the aesthetics of the Don's natural areas: Landscape design will play a large role in the final park design for the flood protection works to ensure that opportunities to improve the ecological, visual, and recreational components of the environment are maximized. These final park designs are beyond the scope of the Environmental Assessment.

Steps 24&25: Provide safe pedestrian access into the Don's public natural areas & create continuous watershed trails between Lake Ontario and the Oak Ridges Moraine: Trail linkages between neighbouring communities, the waterfront and the Don Watershed will be improved to ensure safe and informative recreation opportunities for the public.

Step 26: Accept flooding as a natural process and respect its dangers: The floodplain surrounding the mouth of the Don River has long been recognized as the TRCA's highest priority area for flood protection. The fundamental objective for this project is to remove the risk of flooding to this large area of Toronto by mitigating the impacts of past development practices (eg. lakefilling, transportation and utility infrastructure, etc) that have increased the extent and degree of flooding.

Step 28: Honour our cultural heritage throughout the watershed: Landscape design will play a large role in the final park design for the flood protection works to ensure that the industrial and archaeological history of the area is recognized through art, design features, park programming, and displays. These final park designs are beyond the scope of the Environmental Assessment.

As is apparent, implementation of the LDRW Project will help meet many of the targets set out in *Forty Steps to a New Don (1994).* These improvements will likely be documented in the 2006 and 2009 editions of the *Don Watershed Report Card*, a document released every three years that depicts the state of the environment, and marks and celebrates the progress in the regeneration of the Don Watershed.

The *Task Force to Bring Back the Don* published a report entitled *Bringing Back the Don* in 1991 that lists numerous targets and goals that would improve the ecological health and public accessibility throughout the Don River at a sub-watershed level. Three of the objectives for the lower Don River included *restoring terrestrial habitats*, *establishing appropriate uses of valleylands* and *improving access to the valley*. Specific recommendations for these two objectives include: replanting valley slopes with native woodlands and meadow species, improvement of access to and along the Don River for cyclists and walkers, and improving connections between the waterfront and the Don River. Flood protection components of the LDRW Project will be evaluated as to their ability to meet these objectives

2.4 Concurrent and Related Studies

The *Lower Don West-Remedial Flood Protection Project* forms part of the overall vision for the Lower Don River. The elimination of the floodplain and the naturalization of the mouth of the Don River is one of the four priority projects being undertaken and/or funded by the Toronto Waterfront Revitalization Corporation (TWRC) aimed at the revitalization of the City's waterfront.

The *Don Mouth Naturalization and Port Lands Flood Protection Project*, which is being initiated by TRCA as an Individual Environmental Assessment undertaking will address the floodplain areas in Spill Zones I and 2 and the naturalization of the mouth of river.

While the *Lower Don River West - Remedial Flood Protection Project* will function independently of any other naturalization and flood protection works, it must be compatible with the *Don Mouth Naturalization and Port Lands Flood Protection Project* and not impose any constraints. For the purposes of discussion, hereinafter these two undertakings will be referred to as the *Lower Don Environmental Projects.*

As part of the initial planning activities by TWRC, precinct plans are being prepared for the West Don Lands and the East Bayfront.

The West Don Lands occupy a 32 hectare area between the Don River and Parliament Street to the west, and from the CN Rail line to King Street to the north. The West Don Lands Precinct Plan indicates a mixed residential and commercial land use, with provision for affordable housing and recreational opportunities.

The East Bayfront Precinct Plan is a 36 hectare waterfront area that extends south of the CN Rail line between Jarvis and Cherry Street. It is expected to become a community with 6-8,000 units of housing, including affordable housing and related commercial spaces.

Both precinct plan lands are situated within the Regulatory Floodplain of the Lower Don River, and are reliant on the construction of the Lower *Don River West - Remedial Flood Protection Project* for their viability and implementation.

The West Don Lands Precinct Plan, in particular, is much more integrated with the *Lower Don River West - Remedial Flood Protection Project*. A centerpiece of this plan is the proposed 7.2 hectare Don River Park, which will be created by the construction of the *flood protection landform* along the west bank of the river. This green space will extend westward well into the community and form part of a boulevard along Front Street towards the downtown Toronto.

The infrastructure servicing strategy (including water, storm sewer, wastewater sewer utilities and roadways) for the West Don Lands Precinct Plan has been developed through the *Class Environmental Assessment Master Plan.* The servicing concepts developed as part of the Master Plan have been incorporated into the design of the remedial flood protection works. Of particular importance is the relocation and realignment of Bayview Ave, and the redirection of all storm runoff from the precinct plan area westerly toward Cherry Street, where it will be intercepted and conveyed to Lake Ontario.

The remaining undertaking in the area is Commissioners Park, which involves the creation of an approximate 16.6 hectare waterfront park that has been developed by TWRC. The facility will be located in the Portlands, and extend from the south side of the Keating Channel to Commissioners Street. The park is intended as a waterfront landmark, as well as providing active recreational facilities and helping to meet the future needs of the communities in the West Don Lands, the East Bayfront and the Portlands.

3.0 PUBLIC AND AGENCY CONSULTATION

3.1 Consultation History

There have been significant and on-going consultation activities conducted in relation to the Lower Don River and its environs. These past consultation activities are summarized briefly below:

i) ***Ataratiri*** (West Don Lands) (1991) – In the planning of the Ataratiri lands, a Neighbourhood Advisory Council (NAC) was established that included a variety of public interests. The role of NAC was to provide advice to City staff. A NAC environmental sub-committee was also created that examined flood risk issue.

ii) ***Task Force to Bring back the Don*** (1991) – As part of this work, ten focus group discussions were held with members of the public. The West Don Lands were examined as part of the Task Force.

iii) ***Forty Steps to a New Don*** (1992-1994) – Extensive consultation was undertaken in the preparation of this Report including public meetings and circulation of the report for comment.

iv) ***Unlocking Toronto's Port Lands*** (Sept. – Dec. 1999) – This public consultation forum dealt with a variety of issues including the naturalization of the mouth of the Don River and flood protection.

v) ***Obstacles and Opportunities: Realizing the Potential for the West Don Lands*** (Nov 1999) – This workshop with local residents, businesses, government agencies and other stakeholders was undertaken to generate ideas and create interest in the redevelopment of the West Don Lands.

vi) ***Olympic Bid Neighbourhood Working Group*** – Consultations were held with various stakeholders regarding potential developments associated with the Olympic bid.

vii) ***Wet Weather Flow Master Plan*** (2000 - 2002) – Consultation activities were held regarding this study that examined a number of wet weather/environmental related issues.

viii) ***Toronto's Central Waterfront Secondary Plan*** (2002) – A multitude of meetings and other consultation events were held with various communities regarding the Secondary Plan and the TWRC's Development Plan and Business Strategy.

ix) ***West Don Lands Precinct Plan*** (2003 - 2004) – A series of consultation events have been held in the development of the West Don Lands Precinct Plan.

x) ***East Bayfront Precinct Plan*** (2003 - 2004) – A series of consultation events have been held in the development of the East Bayfront Precinct Plan.

3.2 Public & Agency Notifications

A number of public notices were published in support of this undertaking, including:

i) A Notice of Intent was sent to the MOE Environmental Assessment Branch and Conservation Ontario on March 24, 2003;

ii) A Notice of Intent was published in the Beaches South Riverdale Mirror on March 28, 2003, the Toronto Star on March 29, 2003 and in the St Lawrence Bulletin in April 2003;

iii) The TRCA website provided project and public consultation opportunity and updates throughout the study period;

iv) The Public Information Centre (PIC) #1 advertisement was published around January 15, 2004 (depending on the publication) in: The Voice, ETC…News, North York Mirror, Now Magazine;

v) The PIC #1 Notification flyer was available on January 8, 2004 on the TRCA web site and mailed to 120 people on the mailing list, the *Technical Advisory Committee* members (60 individuals), local councillors, the local MP and MPP;

vi) The Public Information Centre (PIC) #2 advertisements were published in mid April in: Eye Weekly, Beaches South Riverdale Mirror and Now Magazine;

vii) The PIC #2 Notification flyer was available on April 20, 2004 on the TRCA web site, was mailed to 140 individuals, emailed to 120 individuals, and sent to *Community Liaison Committee* members, *Technical Advisory Committee* members, local councillors, the local MP and MPP;

viii) The PIC #3 advertisement was published between August 27 and September 10, 2004 in Now Magazine, Eye Weekly, ETC News, Beaches/South Riverdale Mirror, St. Lawrence Community Neighbourhood Bulletin;

ix) The PIC #3 advertisement was available on August 17, 2004 on the TRCA web site and mailed to 136 people on the mailing list, and sent to Community Liaison Committee members, Technical Advisory Committee members, local councillors, the local MP and MPP; and,

x) Notification on the availability of the Draft Environmental Study Report for review purposes was provided to the members of the TAC and CLC on December 13, 2004. At that time the members of both committees were also advised that the bridge extension option at the CN Rail crossing was emerging as the preferred option.

A notice was send out to all participants at the PICs on January 17, 2005, advising of the availability of this report for review and comment, and also pointing out that the bridge extension option has been adopted.

Appropriate notices were also placed in local print media, including: NOW Magazine, ETC….News, The Voice, North York Mirror etc.

The document is also available to the public through its posting on the TRCA's website.

3.3 Information Releases

As part of the consultation program, *LDRW News* publications were released in January 2004, April 2004 and July/August 2004. These newsletters provided basic information about the study, including data updates, and progress to-date and the study schedule. The newsletters were distributed to those on the mailing list (about 120 people), sent to local councillors,

distributed at the PICs, given to CLC and TAC members, sent to First Nation Groups (Mississaugas of New Credit, Ashinabek Nation, Nation of Iroquois and Allied Indians representatives), placed on the TRCA website, and made available at *the Paddle the Don* event (Newsletter #1). Copies of the newsletters are available in ***Appendix A.***

A press release for the third PIC was sent to all media outlets.

3.4 Open Houses/Workshops

Three Public Information Centres (PICs) were held as part of this Class Environmental Assessment Study. The first was held on January 19, 2004 at Metro Hall in Toronto. The PIC was advertised as outlined in ***Section 3.2***. Approximately 85 people attended the first PIC.

At this event 32 display boards were set up providing information about the study. Copies of the display boards are included in ***Appendix A.*** Staff of the TRCA and the Consultant Team were available to answer questions at the PIC. A presentation was given at 7 pm by the TRCA, the Chair of the West Don Lands Committee, and Dillon Consulting, which provided an overview of the project and introduced the proposed flood protection alternatives to be evaluated against the proposed criteria. A copy of the presentation is available in ***Appendix A***.

Following the presentation, questions from the group were addressed, and then breakout groups were formed. Within the breakout groups, the participants addressed several questions that were contained in a workbook. Summary notes from all three PICs are also included in ***Appendix A***. Key issues/comments raised by the participants are summarized in ***Section 3.7.***

The second PIC was held on April 29, 2004 and was advertised as outlined in ***Section 3.3.*** Approximately 25 people attended the second PIC. The event was structured in the same manner as the first PIC, and included some 25 display boards, and a presentation followed by a question/discussion period. This PIC presented preliminary results of the alternatives evaluation and identified the *flood protection landform* (initially identified as a "berm") with culvert and east bank works as the preferred alternative. The focus of the discussion was on this option. ***Appendix A*** contains the display boards for the PIC together with the presentation material, the workbook and a summary of the event/ discussions.

The third PIC was held on September 21, 2004 and was advertised in a similar manner as the previous two events. Approximately 20 people attended the event and 25 information boards were displayed. The focus of the PIC was on presenting the functional design for the proposed flood protection works. A presentation was made and an opportunity provided for the public to ask questions. Staff of TRCA and the Consulting Study Team were available to answer questions. Participants were provided with a workbook that described the process to date and included several questions intended to prompt comments from the participants.

3.5 Community Liaison Committee

A *Community Liaison Committee* (CLC) was also formed as part of the consultation program. The committee was composed of 19 members of the public representing a variety of resident associations and interest groups. The committee met on four occasions: November 26, 2003, January 5, 2004, April 20, 2004 and September 07, 2004. The purpose of the committee was to help obtain input from public representatives on all aspects of the study including: options to be considered, evaluation criteria and input on the public consultation materials.

An additional meeting was held on November 10, 2004 with community representatives from both the CLC and the TAC that had expressed concerns regarding the re-vegetation and landscaping of the flood protection landform.

The CLC was formed in accordance with the Conservation Authority Class EA requirements and has assisted throughout the process, in

particular, by providing feedback on design issues and advice in structuring the Public Information Centre. The *Community Liaison Committee* included representatives from the following groups:

- Citizens for the Old Town;
- Cityscape;
- Corktown Residents & Business Association;
- Don Watershed Regeneration Council;
- Food Share;
- Gooderham & Worts Neighbourhood Association;
- Mississaugas of the New Credit First Nation;
- Port Lands Partnership;
- Queen-Broadview BIA;
- South East Downtown Economic Redevelopment Initiative (SEDERI);
- South Riverdale Revitalization Project;
- St. Lawrence Neighbourhood Association;
- Taddle Creek Watershed Initiative;
- Task Force to Bring Back the Don;
- Toronto Cycling Committee; and,
- West Don Lands Committee.

Minutes from the *Community Liaison Committee* meetings are available in ***Appendix A.***

3.6 Technical Advisory Committee

An additional component of the consultation program was the *Technical Advisory Committee*, which was established to provide technical review assistance as the project progressed. The role of the *Technical Advisory Committee* included streamlining agency involvement by providing quick access to key individuals and information; assisting in responding to issues raised during the public consultation process; and assisting in the coordination of the Lower Don flood protection project with other projects and initiations in the study area. The *Technical Advisory Committee* was convened on a total of five occasions, on the following dates: April 8, 2003, August 29, 2003, November 18, 2003, April 13, 2004, and August 5, 2004.

The Committee consisted of stakeholders, representatives from various organizations, key community leaders and technical representatives of all pertinent regulating agencies. Participating agencies and organizations included:

- Canada Lands Company;
- Canadian Environmental Assessment Agency;
- Canadian National Railway;
- City of Toronto;
  - City Planning;
  - Commissioner's Office;
  - Economic Development, Culture & Tourism;
  - Parks and Recreation;
  - Public Health;
  - Technical Services;
  - Transportation Services;
  - Water and Wastewater Services;
  - Toronto Police (Marine Unit);
  - Toronto Waterfront Secretariat;
  - Toronto Economic and Development Corporation;
- Environment Canada;
- Fisheries and Oceans Canada;
- GO Transit;
- Home Depot Canada;
- Korex Don Valley Canada;
- Ministry of Culture;
- Ministry of Environment;
- Ministry of Natural Resources;
- Ontario Realty Corporation;
- Ontario SuperBuild Corporation;
- Hydro One (subsequent addition to the TAC);
- Public Works and Government Services Canada;
- National Energy Board of Canada;
- Toronto Port Authority;
- Canadian Pacific Railway;
- Toronto Terminus Railway;
- Via Rail;
- Toronto Waterfront Revitalization Corporation;
- Unilever Canada;
- Cityscape;
- South Riverdale Community Association;
- West Don Lands Committee; and,
- Task Force to Bring Back the Don.

Minutes from the *Technical Advisory Committee* meetings are available in ***Appendix A.***

3.7 Summary of Issues and Concerns

3.7.1 Public Information Centre No. 1 January 19, 2004

Both the written and verbal concerns raised by the public were summarized by TRCA staff. The summary is included in ***Appendix A,*** together with the responses that were provided. The authors of more comprehensive letters submitted by the public were invited to meet and discuss their concerns in person.

In general, the feedback pertaining to the first PIC was positive. The main recurring themes of concerns/comments of the public were:

- the desire to maximize naturalization, trail linkages and recreation opportunities with the project;
- the preference for the use of more holistic approaches that do not require hard engineering (i.e., upstream storage, Wet Weather Flow Management Master Plan solutions, and wetland creation);
- concern that the project activities will increase flood risk elsewhere;
- questions related to transportation and railways; and,
- clarification was requested on the difference in scope between the *Don Mouth Naturalization and Port Lands Flood Protection Project* and the current study.

3.7.2 Public Information Centre No. 2 April 29, 2004

The written and verbal comments received from the public were also summarized by TRCA staff for the second Public Open House and the summary is included in ***Appendix A***.
In general, positive comments were again received. The main themes of discussions at the second PIC were:

- questions asking to clarify the flood protection landform and culvert specifications;
- potential increased flood risk to the Bala subdivision railbed;
- the need to maximize recreation opportunities on the flood protection landform;
- concern that the property belonging to Home Depot may be subject to increased flooding following the implementation of this project (Correspondence with Home Depot in this regard is attached in ***Appendix C***);
- clarification regarding flood impacts once the *flood protection landform* and culverts are in place and the synergy with the naturalization project;
- concerns of climate change increasing the Regulatory Floodplain; and,
- questions regarding the state of the groundwater/soils investigation in the *flood protection landform* area.

3.7.3 Public Information Centre No. 3 September 21, 2004

The comments and concerns raised by the public were again summarized by TRCA staff for the third Public Open House and are included in ***Appendix A***. After a review of the project components and the Class Environmental Assessment process that was followed, details of the functional design were presented. The following items of discussion followed:

- questions to distinguish this undertaking from the *Mouth of the Don Naturalization and Portlands Protection Project*;
- questions to explain the hydraulic modelling undertaken and a description of the Regulatory Flood;
- questions regarding the estimated costs and funding sources for construction and soil management work;
- concerns regarding ownership of the flood protection works and the need for a suitable landscaping/planting plan; and,
- concerns regarding how to make the pedestrian underpass friendly to the public.

Members of the public, through personal communication to TRCA staff, advised as to their strong preference to have an extension to the existing bridge, as opposed to the culvert structure for access purposes, however, at the time of the public information centres, culverts appeared to be the optimal method for providing additional hydraulic capacity through the CN Railway embankment.

3.7.4 Mississaugas of New Credit First Nation

The Mississaugas resided along the north shore of Lake Ontario, including the Toronto area, prior to colonization by the European settlers.

Given their historical ties to the area, the Mississaugas were extended an invitation to actively participate as a member of the Community Liaison Committee, at the onset of the project. Invitations to join the Community Liaison Committee and all meeting agendas and minutes were also sent to the Ashinabek Nation and the Nation of Iroquois and Allied Nations. No response was ever received from representatives of these two nations.

During the initial discussions, the Mississaugas advised of their continuing interest in the area through the Toronto Purchase Specific Claim, which calls for appropriate compensation for the loss of their ancestral lands. The process and steps that the Mississaugas are following in this regard to secure a fair and just settlement is provided in a document entitled *Toronto Purchase Specific Claim – Arriving at an Agreement*, which is provided in ***Appendix B.***

On July 5, 2004, a meeting was held with the Mississaugas' Band Council to discuss the particulars of the *Lower Don River West Remedial Flood Protection Project.* The meeting was started with a presentation that covered:

- an overview of the need for the project;
- the status of the technical and public evaluation of alternatives;
- components of the preliminary preferred alternative; and,
- the anticipated timelines to complete the Class EA component of the overall project.

The key issues raised by the Mississaugas during the ensuing discussions included:

- the need to incorporate a recognition of the ongoing status of the Toronto Purchase Specific Claim into the Environmental Assessment process; and,

- that sufficient information is provided to allow for meaningful discourse from the Band Council in determining the final preferred alternative, and resulting land uses for the preferred alternative.

The Band Council was advised that the land use planning for the preferred alternative was being determined through the West Don Lands Precinct Planning process with the understanding that specific criteria, to be determined by TRCA and Dillon Consulting, be maintained to ensure that the primary flood protection role is not undermined.

3.7.5 Ontario Mile Corporation Raceway

The Ontario Mile Corporation Raceway (OMCR) expressed their long-standing interest to use the West Don Lands to develop a tourist attraction featuring an inexpensive adult leisure destination - a Raceway, Water Show and Slots Project. The flood protection scheme proposed by the OMCR is a series of dykes and retaining walls and a retention basin and concrete spillways. The retention basin would also encompass a music/fountain tourist attraction. The flood protection works would offer protection up to the 100-year level.

The OMCR describes the benefits of the proposed entertainment use of land as follows:

- no soil penetration, slab on grade which encapsulates and seals contaminated soil and groundwater;
- employment creation during construction and operation of the raceway;
- year-round tourist attraction and tax revenue to the City due to public/private partnership;
- government regulation of gambling;
- minimal infrastructure required;
- flood storage offered on site; and,
- land can be leased under current legislation without the need to purchase.

The OMCR expressed concerns regarding the flood protection landform as follows:

- open space park lands attract undesirable behaviour, not acceptable to the surrounding community;
- all costs are borne by taxes, no private input, concerns regarding funding;
- soil contamination may result due to leeching;
- possibility of failure exists for storm events in the 100 to 300-year range, and flash flood conditions can still occur; and,
- few developers, private stakeholders or academics were in attendance at January 19, 2004 Public Information Centre.

TRCA responses to comments/concerns raised were provided in a series of correspondence.

A letter dated August 26, 2004 outlined the reasons why the construction of a concrete channel to contain the Regulatory Flood is an inappropriate method for protecting the City of Toronto from flooding.

In a letter dated September 14, 2004, TRCA responded to a number of the issues raised. OMCR's land use planning concerns were forwarded to Urban Strategies, the project manager for the West Don Lands Precinct Plan.

A copy of the correspondence with OMCR is provided in ***Appendix C.***

4.0 DESCRIPTION OF LOWER DON

4.1 The Don River Watershed

The Don River is one of more than sixty rivers and streams flowing south from the Oak Ridges Moraine. The River is approximately 38 km long and outlets into the Keating Channel, which then conveys the flows into Toronto Harbour and Lake Ontario. The entire drainage basin of the Don River is 360 km^2. ***Figure 4.1*** and ***Figure 4.2,*** on the following pages, describe the existing and future land use conditions within the Don River Watershed.

For 200 years, the Don Watershed has been subject to intense pressures from human settlement. These have fragmented the river valley's natural branching pattern; degraded and often destroyed its once rich aquatic and terrestrial wildlife habitat; and polluted its waters with raw sewage, industrial/agricultural chemicals, metals and other assorted contaminants.

Land clearing, settlement, and urbanization have proceeded in three waves in the Don River Watershed, beginning in the late 18th century with the City of Toronto in the Lower Don and scattered villages in the upper watershed. Next came the urbanization of the middle watershed, mainly in North York, after World War II. Rapid

Toronto's Waterfront

Historic Watershed

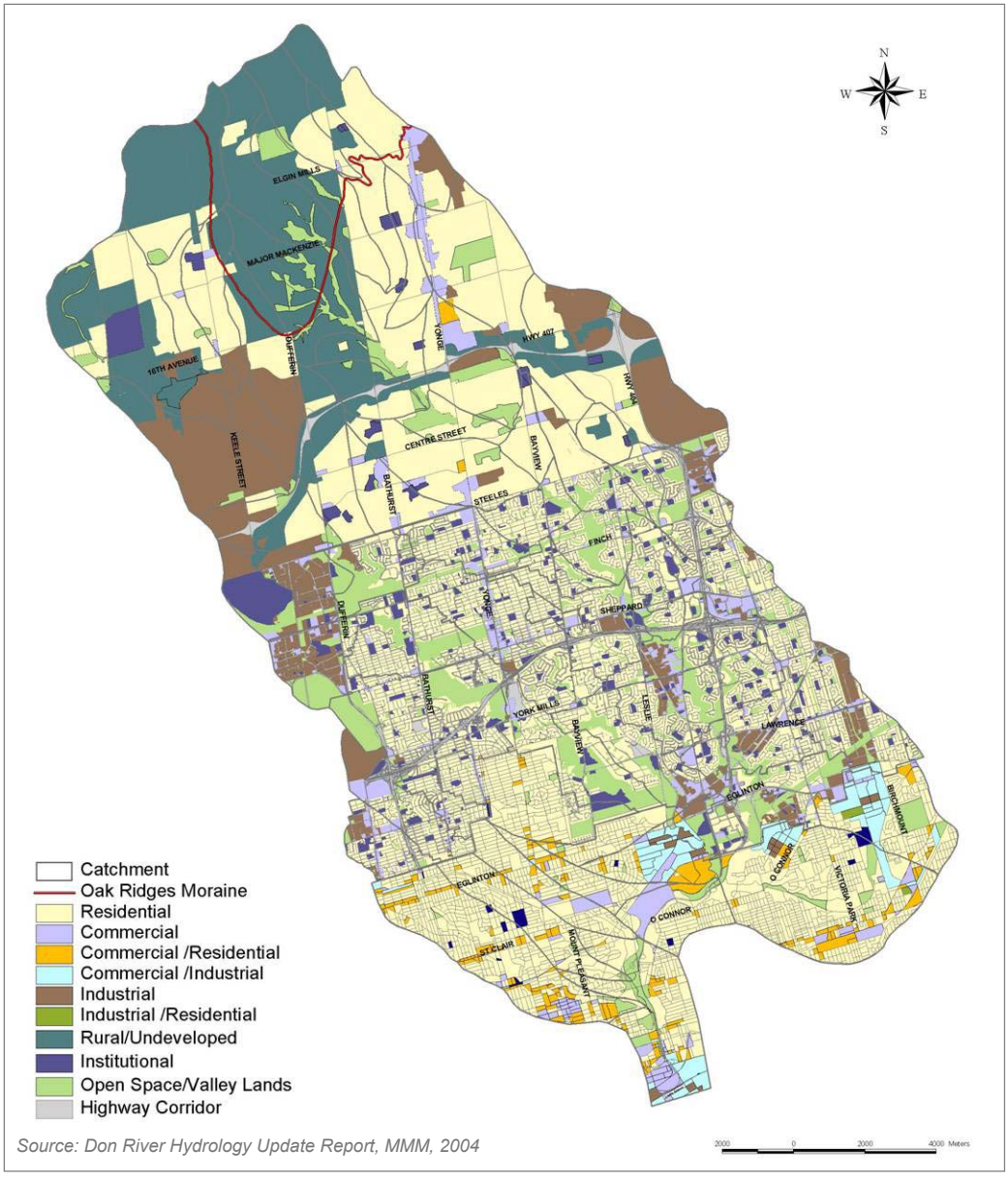
urbanization of the river's headwaters in York Region began in the early 1980s and continues today.

Hydrologic changes in the watershed began when settlers converted the forests to agricultural fields; many streams were denuded even of bank side vegetation. Urban development then intensified the problems of warmer water temperatures, erosion, and water pollution. Over the years during the three waves of urban expansion, the Don River mouth, originally an extensive delta marsh, was filled in and the lower portion of the river was straightened.

Small Don River tributaries were piped and buried, wetlands were "reclaimed," and springs were lost. The middle and lower valley became a transportation corridor. The hydrologic cycle was severely altered by the expanses of urban and suburban pavements, rooftops, roads, parking lots, and gutters: water that had once soaked into the ground and had run slowly through grassy fields was now collected in a network of underground sewers, bringing stormwater quickly and efficiently to the river and carrying many pollutants with it.

While sewage contamination is less prevalent today than it once was, sewage continues to reach the Don River through combined sewers in older neighbourhoods and illegal cross connections between the sanitary and storm sewers throughout the watershed.

Increasing flood peaks are also creating more of a problem. As well, following many changes to the Don River channel and valley, flooding remains a problem - the Don Valley Parkway and the Bayview Extension are frequently closed for short periods in the aftermath of a heavy rain storm. Flooding in the Lower Don River is in large part due to its broad and unconfined floodplain and the intensity of development within the entire watershed. Projects are being implemented to help ameliorate the problem: natural landscapes absorb, collect, filter and release stormwater gradually and collection ponds hold back runoff. But these projects typically only affect medium to small stormwater (rainfall) events. They are not large enough in scale to significantly reduce the peak runoff from a severe event like Hurricane Hazel.



Source: Don River Hydrology Update Report, MMM, 2004

Figure 4.1 - Existing Land Use in the Don River Watershed

Along with this legacy of hydrologic changes, water pollution, and degraded habitats, there are encouraging signs for regeneration. Eighteen species of fish still live in the river system, though brook trout and Atlantic salmon are no longer part of this community. Pacific salmon are now using the Don watershed for spawning. There are almost twenty designated natural areas (Environmentally Significant Areas (ESAs), Areas of Natural or Scientific Interest (ANSIs), and Ministry of Natural Resources designated wetlands) within the watershed. Trails are being

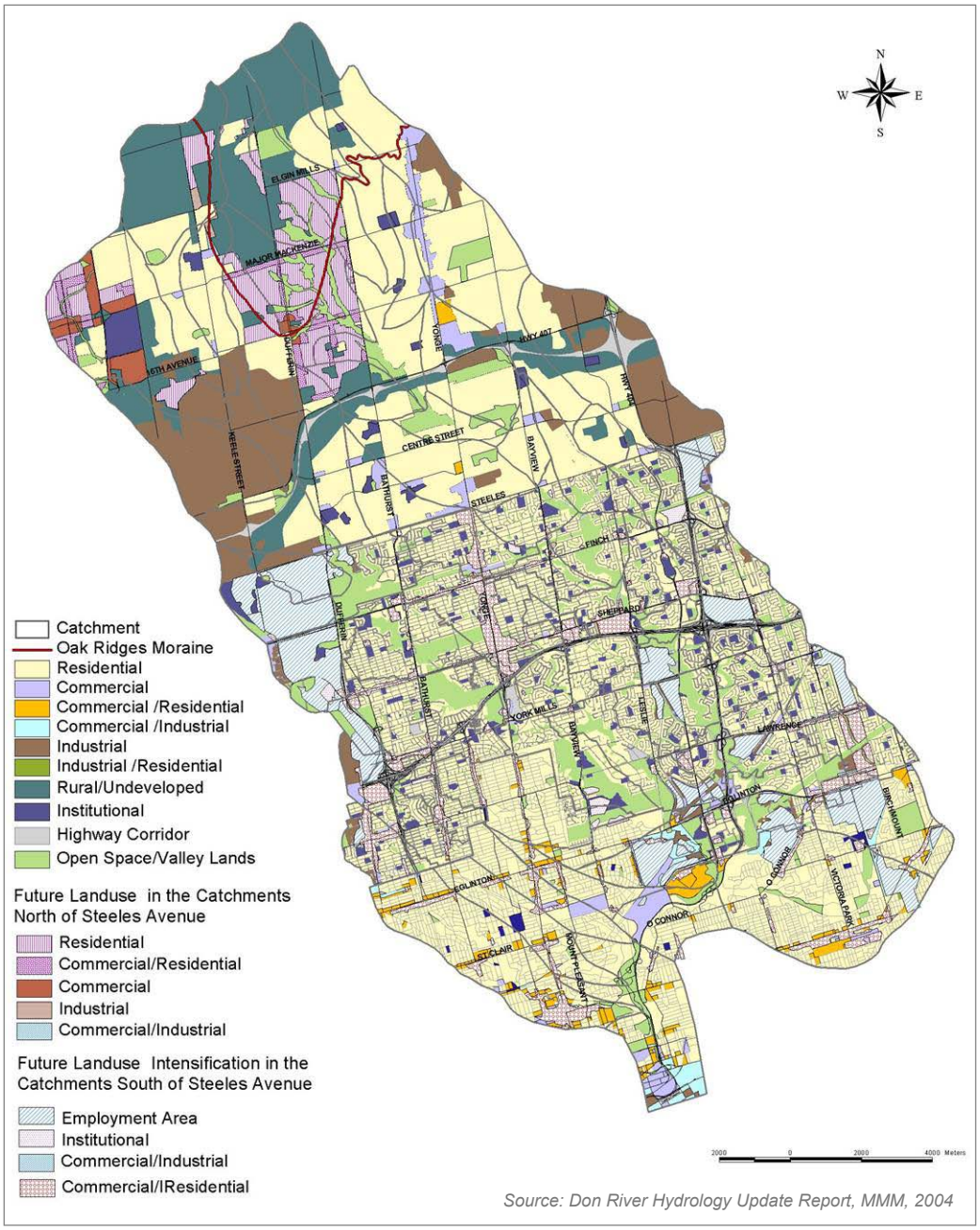


Figure 4.2 - Future Land Use in the Don River Watershed

built in many areas. Old combined sewers are being remediated in the Lower Don River to reduce sewage contamination in the river.

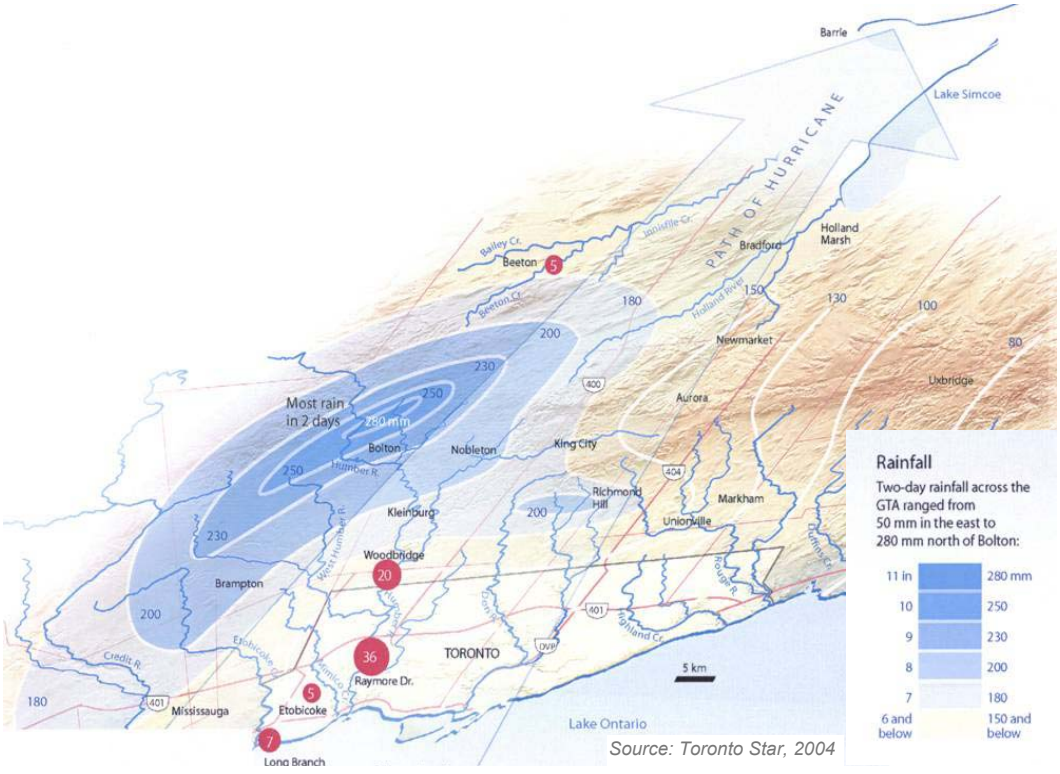
Since Hurricane Hazel in 1954, a large part of the Don River valley and stream corridors have been brought into public ownership, resulting in a better starting point for regeneration than many other urban rivers enjoy. Most importantly, throughout the watershed residents and businesses are taking responsibility for the Don River in many types of volunteer activities, and governments are coming to share accountability, planning, and funding for regeneration.

4.2 Lower Don River Flooding – A Historical Perspective

Flooding along the Lower Don River has a written history dating back to the mid-1870s, beginning with ice jams and late fall flooding. As recently as May 2000, flooding occurred within this area due to a series of severe thunderstorms. While most of the flooding over the past few decades has resulted mainly in nuisance type flooding, the area would be subject to extensive flooding under a tropical storm similar to Hurricane Hazel, which occurred on October 15 and 16, 1954 over the Humber River.

The Province of Ontario currently requires the application of the rainfall from Hurricane Hazel centered over the Don River Watershed to define the limits of flooding. Given antecedent saturated soil conditions, with this amount of rainfall, the river is anticipated to rise to levels that exceed the banks of the river and begin to spill to the extent that the valley allows.

Upstream of Queen Street, the valley feature is narrow and will contain the flood, although depths and velocities of flow will be extremely



Rainfall Depths Deposited by Hurricane Hazel in the GTA during October 1954.

high. South of Queen Street, the valley expands laterally to form the historical Lake Ontario shoreline, which enables the flood to also travel outwards, spilling south and west into the downtown core of the City and eastward towards the beaches area.

The CN Rail's Kingston line runs west to east across the area and is on an elevated fill embankment that would impede flows under the Regulatory Flood and increase upstream flooding to the west through Spill Zone 3. Water depths over the surrounding floodplain are estimated to be in the 3 m range immediately upstream of the tracks during the peak of the flood. These overbank flood waters would find southern release through the rail embankment at underpasses for Cherry, Parliament, Sherbourne, Jarvis, Yonge, Bay and York Streets, causing flooding south of the rail line in what is know as the East Bayfront Precinct.

To protect the lands west of the river within Spill Zone 3, Regulatory Flood water will be contained within the channel of the Don River and a new floodway. To prevent against increased flooding upstream and to the east of the Don River, flood conveyance under the CN Rails' Kingston line must be increased to accommodate water that would have flowed over the floodplain through Spill Zone 3.

4.3 Physiographic Description

When the ice fronts of the last Ice Age retreated 11,000 to 13,000 years ago, the Don River flowed out of the long glacial deposit north of Toronto, the Oak Ridges Moraine. At first, the river's two main branches, the West Don and the East Don, flowed as separate rivers south into Lake Iroquois. When the shores of that ancestral lake fell to become Lake Ontario about 9,000 years ago, the two rivers joined at the huge sandbar they had formed on the old shoreline - along with a third stream, Taylor/Massey Creek - to become one river at what is now the Forks of the Don. The new, united Lower Don then flowed in a westerly

View of the Don River below Queen Street during May 2000 flood event. Note closure of Don Valley Parkway to the right.

and then southerly direction across the old lakebed, carving out a broad deep valley through the lacustrine sediments and glacial deposits. Subsequent rising of Lake Ontario's waters through rebound of the land following the disappearance of the glacier formed marshes in the lower reaches of the broad valley.

The Don River Watershed was a network of branching tributaries and wetlands connecting the Oak Ridges Moraine with Lake Ontario 38 kilometres to the south. Originally, the river was sustained by underground aquifers of glacial water in its headwaters, as well as by rainfall and snowmelt that infiltrated the soils of the region's vast forests. The forests, streams, ponds, and marshes of the watershed provided varied habitats for fish, birds, and other animals, and a branching, natural corridor for migratory species to travel from the lake at the south to the headwaters and deep upland forests in the north.

Today the terrain of the Don's valley and stream corridors still varies considerably. There are small streams that flow across level fields; there are steep sided, wooded ravines, and broad, deep floodplain meadows. But what has changed dramatically through the last 200 years of settlement is the rich, branching pattern of the pristine Don's tributaries and associated wetlands. A great many streams have been truncated,

buried, dammed, rerouted, straightened, and lined with wood, steel, rock, or concrete in the process of building the city and suburbs. Ponds and marshes have also been filled; the widespread removal of vegetation and the disturbance and compaction of soils have also occurred. These actions have severely altered the character, habitats, and hydrogeological functioning of the natural watershed.

Four decades ago, in 1950, only 15 percent of the Don Watershed was urbanized. Most of the land was rural, with active farms and some natural areas. In 1994, the watershed was 80 percent urbanized, and home to more than 800,000 residents. It is estimated that by the year 2021, when the population of the Greater Toronto Area will be 6.7 million (compared to 4.4 million today), the Don River Watershed will become over 91 percent urbanized.

4.4 Baseline Studies

A series of baseline studies were undertaken to characterize the natural and human environment along the Lower Don River and generate data for use in the development and assessment of flood protection alternatives.

The specific studies that were undertaken, together with the organization responsible for the work are listed below:

- *Hydraulic Analyses – Marshall, Macklin, Monahan Ltd;*
- *Aquatic Investigations – TRCA;*
- *Terrestrial Natural Heritage – TRCA;*
- *Cultural Heritage – TRCA;*
- *Geo-environmental Considerations; - Consultant Project Team;*
- *Rail Transportation Baseline Study - Consultant Project Team;*
- *Socio-economic Assessment – Consultant Project Team; and,*
- *West Nile Virus Study - Consultant Project Team.*

The results of the above investigations and associated technical analyses are documented in six individual Study Reports that were prepared, and which are contained in ***Appendix D*** through ***Appendix I***. The findings for the Socio-economic assessment are contained in the ***Section 4.9 of*** this Report.

An overview of the investigations and findings of the above studies is provided in the following sections.

4.5 Hydrologic/Hydraulic Characterization

4.5.1 Hydrologic Analyses

The hydrologic characterization of the existing conditions, and the development of alternative remedial works was based on the report *Don River Hydrology Update (MMM, June 2004)* and hydraulic modelling performed by MMM for this Class Environmental Assessment Study. The hydrology update was conducted for TRCA to develop current estimates of potential floods throughout the Don River Basin. The update incorporated the most recent data available for re-calibration of the hydrologic model; and determined estimates of flood discharges for both existing and for future conditions, taking into account urban developments and storm water management plans.

The update involved the conversion of the previous hydrologic model (HYMO) to Visual OTTHYMO Version 2.0 (V02). Given the significant development in the Don watershed over the last 10 years, it was necessary to update the model to reflect the current and planned development conditions in the watershed.

The City of Toronto recently completed their *Wet Weather Flow Management Master Plan*, during which, current land use data and statistics were collected for the Don River watershed. This data was used to update the new hydrologic model.

A summary of the calculated flows, for a range of storm events, at several locations along the lower part of the Don River watershed, is presented in ***Table 4.1.*** The flow values shown reflect the anticipated future land uses within the watershed. ***Table 4.2*** indicates the increase in the flows associated with a Hurricane Hazel type event that can be expected as the Don River watershed is fully urbanized, as per current land use plans.

Comparing the estimates for current and future land use conditions the Hurricane Hazel flows are expected to increase from 1655 m^3/s to 1694 m^3/s, at the mouth of the Don River (i.e., Lake Ontario). This represents an increase of 2.4% in peak flow, which can be attributed to the predicted increase in impermeable areas in the basin.

calculated for future land use conditions (1694 m^3/s) were applied in the hydraulic assessment alternatives.

The documentation contained in the *Don River Hydrology Update Study*, attributes this increase to two factors: an increase in the impermeable area in the basin, and a change in the reduction factor that is applied to establish the design rainfall depths associated with Hurricane Hazel. For the previous estimates, a reduction factor of 82.4%, based on the *equivalent circular area* upstream of the Lake Ontario location was used throughout the watershed. As part of the *Don River Hydrology Update Study*, an individual reduction factor for each flow node was calculated based on the recommendations of the *Technical Guidelines for Flood Plain Management in Ontario.*

Consequently the input rainfall depths that were applied at locations with smaller upstream drainage areas are greater than the input rainfall originally used as part of the previous hydrologic analyses.

Table 4.1 - Summary of Calculated Peak Flows (Future land Use)

Location	Flow Node No.	Drainage Area (km^2)	Peak Flow (m^3/s)					
			2-year	5-year	10-year	50-year	100-year	H. Hazel
South of Bloor St.	48.3	334.0	150.1	224.3	278.2	356.1	479.3	1728.3
North of Gerrard Ave.	48.2	348.8	172.4	255.4	313.4	463.8	531.6	1807.0
Lake Ontario	48.1	360.8	164.0	239.6	295.4	430.5	496.3	1694.3

Table 4.2 also compares present estimates with previous estimates of the peak flows associated with the planned future land use conditions within the watershed. The peak flows presented in the table indicate that the future conditions peak flow at Lake Ontario has increased from, 1548 m^3/s to 1694 m^3/s, which constitutes an increase of 9.4%. It is noted that the flow values

The analyses for the *Don River Hydrology Update Study* also include a sensitivity study to predict potential impacts of climate change based on the assumption that climate change will cause an increase in the amount of rainfall. The study shows that there is a non-linear effect on the peak flows: an increase of 9% in rainfall causes a 17% increase in peak flow for future conditions.

Table 4.2 - Comparison of Calculated Flows (m^3/s) - Hurricane Hazel

Location	Land Use		Previous Studies
	Existing	Future	
South of Bloor Street	1685	1728	1535
North Of Gerrard St.	1767	1807	1590
Lake Ont.	1655	1694	1548

Note: Flow values indicated for Previous Studies were based on the anticipated Future Land Uses at the time. These values were also applied in for the purposes of the West Don Lands and Related Issues Study (2000).

However, with the current technology, climatologists are not yet able to provide predictions of changes in rainfall on a local scale, thus the results are only intended as very preliminary estimates.

Based on the results of the *Don River Hydrology Update*, it can be concluded that flood flows have increased in the Don River over the past 10 years and that the future may bring marginally higher flows. Thus there is a potential for higher flood levels at the West Don Lands. Accordingly, this consideration was included in the evaluation of the various flood protection alternatives.

4.5.2 Hydraulic Analysis

As discussed, the area adjacent to the Lower Don River has been subject to flooding since the development began in the Toronto area. In the past, numerous hydrologic and hydraulic studies have been completed in order to provide technical insights for this area.

Since 1988, several studies have been completed to investigate flood protection alternatives. These were based on the one-dimensional HEC-2 computer model, physical models, and the two dimensional Dynamic Hydro-diffusion Model (DHM). The HEC-2 and DHM models for the existing land use scenario for areas near the Lower Don River were obtained from on-going and previous studies, and adjusted to incorporate the updated peak flows.

The two-dimensional hydraulic model has been used to establish hydraulic conditions for the Lower Don River because of the extensive floodplain under the Regulatory Flood, whereby flow moves perpendicular to the river channel, rather than in a linear fashion assumed by original floodplain mapping completed for the TRCA in 1979, for which the HEC-2 model was used.

The DHM was employed because of its ability to model the effect of structures in an urban floodplain area. The model discretizes the floodplain into grids, whereby flow moves between the grids in all four directions depending on flood conditions. As previously discussed, under existing conditions (before the construction of flood control works), the Regulatory Floodplain extends to York Street in the west, Woodbine Avenue in the east and as far north as Queen Street.

The modelling was based on the higher Regulatory Flood values that were calculated as part of the *Don River Hydrology Update Study*, which calculated a flow of 1695 m^3/s at the mouth of the river – the previous value for this event was 1450 m^3/s.

A summary of the calculated Regulatory Flood levels, under existing conditions, for each of the

individual grids employed for the analyses is presented in ***Appendix D.***

A tabular summary of the calculated levels along the river channel is provided in ***Table 4.3***, and the resulting flooding depths that occur are shown graphically in ***Figure 4.3.*** A profile of along the river from Lake Shore Blvd to upstream of Queen Street, together with the surface water profile produced by the Regulatory Flood is shown in ***Figure 4.4.***

The results of the hydraulic analyses lead to the following conclusions:

- slightly higher flood levels for existing conditions (i.e., prior to the implementation of any flood protection works) are associated with the updated flow values; along the river channel, the increase is generally limited to less than 0.1 m, with a maximum value of 0.14 m noted at Queen Street;
- within the Don River channel, the flooding depth ranges from approximately 5.5 m at Lake Shore Road, to approximately 7 m at Queen Street;
- within Spill Zone 3 (the floodplain on the west bank), the flooding depth is generally less than 1 m, with the exceptions noted below;
- flood depths greater than 1m would be expected within the area immediately adjacent to the river, and immediately north of the CN Rail line – refer to ***Figure 4.3;***
- the lands approximately bounded by the Don River, to the east, Cherry Street to the west, the CN Rail line to the north, and Lake Shore Blvd to the south (i.e., 480 Lake Shore Blvd) remains generally unaffected by the Regulatory Flood levels;

Table 4.3 – Regulatory Flood Levels Along the Lower Don River

Location (DHM Grid No)	Flood Level (m) Existing Conditions
Queen Street Bridge (#1)	80.48
Upstream CN Bridge (#7)	79.68
Downstream CN Bridge (#8)	78.65
Gardiner Expressway Ramp (#9))	78.29
Upstream Lake Shore Road Bridge (#10)	78.21
Downstream Lake Shore Road Bridge (#11)	77.30

- under the Regulatory Flood conditions, approximately, 1/3 of the total flow would overtop the west bank of the river and travel westerly towards downtown Toronto and southerly through the roadway underpasses toward Lake Ontario;
- under existing conditions, none of the roadway crossings are overtopped, with the exception of Lake Shore Blvd.

4.6 Aquatic Investigations

4.6.1 General

The aquatic investigations and related work conducted by the TRCA are described in the Report entitled *Lower Don River Environmental Assessment – Aquatic Investigations*, which forms ***Appendix E*** of this Report.

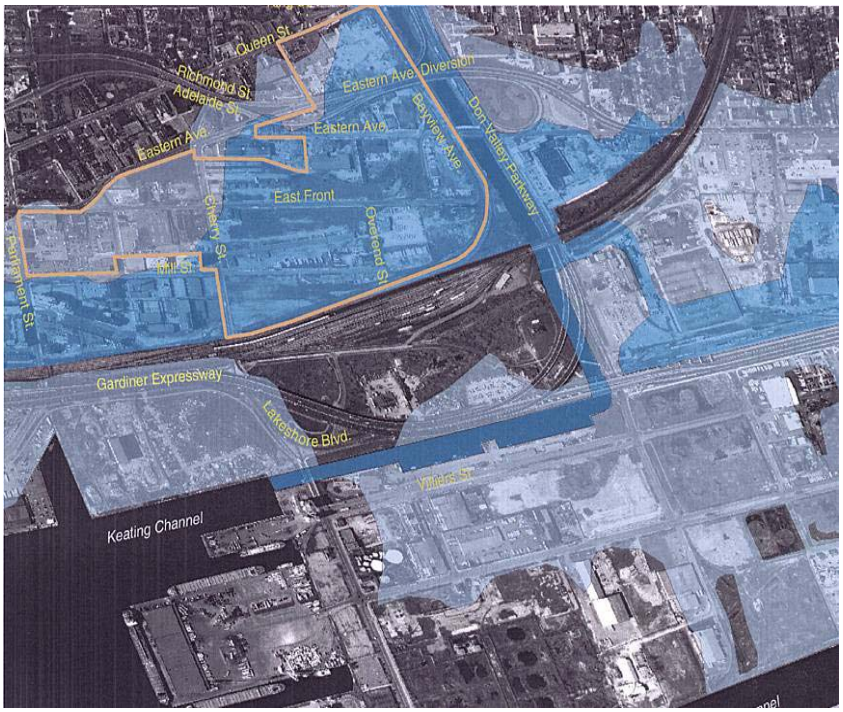
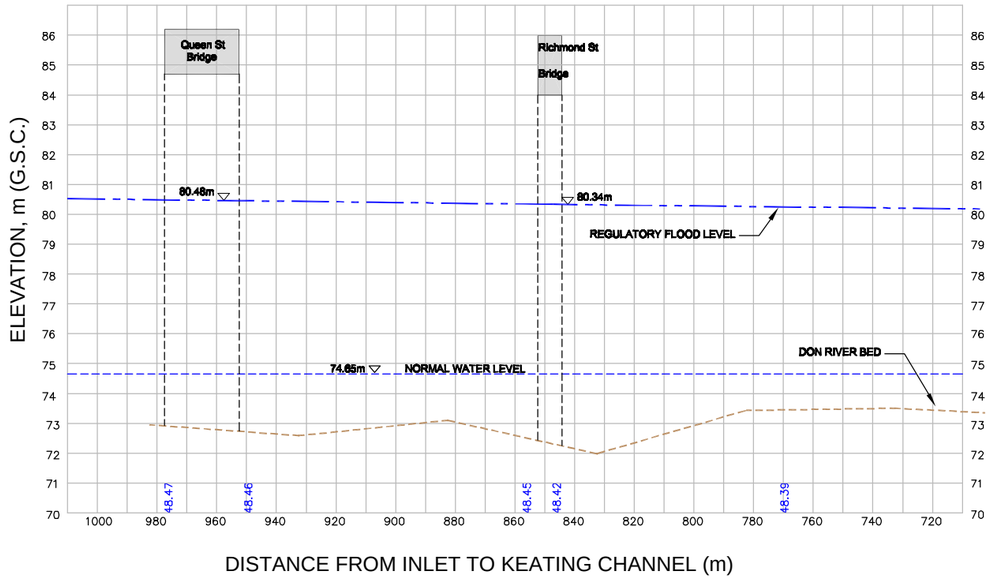
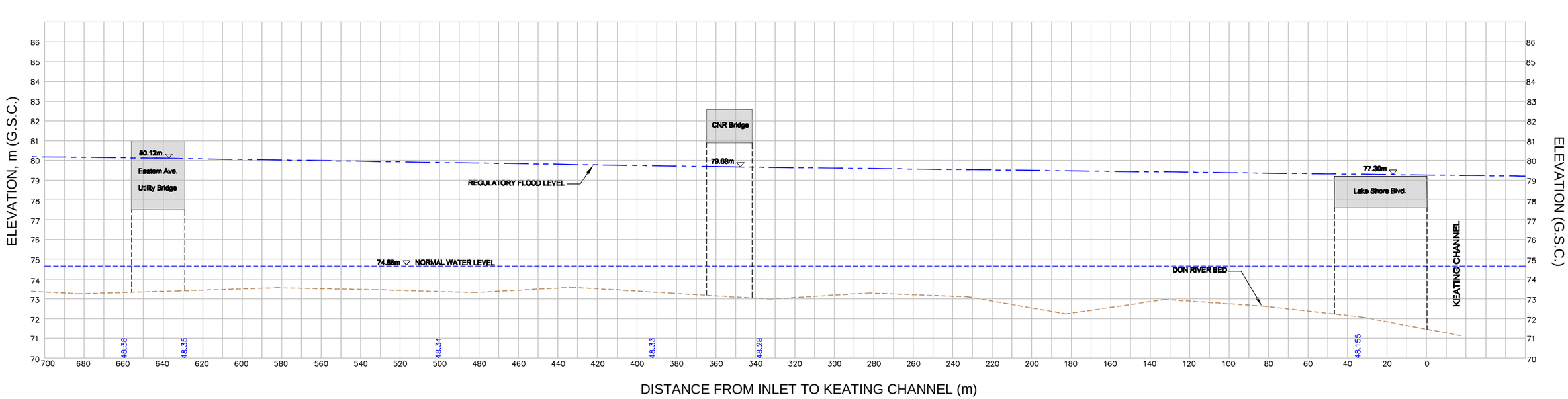


Figure 4.3 – Extent of Flooding along the Lower Don River During a Hurricane Hazel Event.

The investigation and assessment of the Lower Don River aquatic system was carried out with the objective of ensuring the requirements of both Environmental Assessment studies being carried out by TRCA are satisfied, i.e., both of *the Lower Don River Environmental Studies*.

Accordingly, the general study area for the aquatic investigations included the river channel and all top of bank lands within the Port Lands and along the Lower Don River, and ecologically significant areas that will be connected to the Don River Watershed as a result of channel naturalization. The specific study area includes all lands where flood protection, channel naturalization and soil management will be conducted to meet Project objectives. The geographic extent includes the Don Narrows, all of the West Don Lands, and follows the mouth of the Keating Channel at Parliament Street in the west and Villiers Street to the south.





DILLON CONSULTING

Lower Don River West
Remedial Flood Protection Project

WATER SURFACE PROFILE
EXISTING CONDITIONS

48.47 – HEC CROSS-SECTION LABEL

DATE: **NOVEMBER 2004** | DRAWN BY: **TJH** | CHECKED BY: **HCD**

PROJECT NO. **03-2658-5000**

FIGURE NO. **4.4**

The data gathered during this study can be used to evaluate alternatives for the Environmental Assessment, assist in the future to monitor the effectiveness of mitigation measures, as well as any impacts resulting from modifications to the river.

Existing conditions were first documented through a review of historical documents as well as fieldwork.

To determine the baseline environmental conditions for the aquatic environment, multiple inventory methods were used, including water temperature surveys, fish community assessment, water chemistry and bio-monitoring studies as well as wildlife studies.

4.6.2 Fish Community Assessment

The fish community assessment was conducted using an electrofishing boat. The lower reaches of the Lower Don River were sampled once in the Spring, once in the Summer and once in the Fall of 2003. Historical data from the TRCA database was also utilized. All fish were identified, enumerated, batch weighed, measured and released. Where appropriate, fish tags were applied to certain species and tag return information was used to provide migration data.

The results of the fish community assessment showed that at least 14 species of fish exist in the Study Area (Refer to ***Table 4.4***).

Over 88% of the fish community composition consists of white sucker, emerald shiner and spottail shiners. Other species present include northern pike, walleye, white bass, carp, Chinook salmon, gizzard shad, bluntnose minnow, Johnny darter, rainbow smelt and alewife. The low species diversity found in the Don River indicates a typical degraded system dominated by generalist species such as white suckers and shiners. Biomass results support the observation that white suckers are the dominant species in the Study Area. This species can withstand a wide variety of conditions. The presence of carp in the study area is also an indication that the system is degraded.

Fish catches conducted in the spring, summer and fall suggest that the Don River is capable of supporting a walleye population, but limiting

Table 4.4 - Classification of Fish Captured in the Lower Don River Spring, Summer, Fall 2003

Top Piscivore	Specialist/Insectivore/Planktivores	Generalists
Walleye – *Stizostedion vitreum*	Emerald Shiner – *Notropis atherinoides*	Bluntnose Minnow – *Pimephales promelas*
Chinook Salmon – *Oncorhynchus tshawytscha*	Gizzard Shad - *Dorosoma cepedianum*	Carp – *Cyprinidae carpio*
Northern Pike – *Esox lucius*	Spottail Shiner – *Notropis hudsonius*	Grass Carp – *Ctenopharyngodon idella*
	Johnny Darter – *Etheostoma nigrum Rafinesque*	White Sucker – *Catostomus commersoni*
	White Bass – *Morone chrysops*	Alewife – *Alosa pseudoharengus*
	Pumpkinseed – *Lepomis macrohirus*	

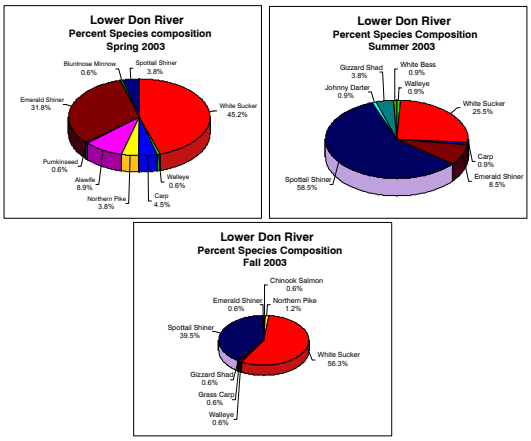


Figure 4.5 – Seasonal Distribution of Fish Species

factors, such as water quality and lack of habitat components, could produce a population that may never develop beyond isolated incidences. Refer to ***Figure 4.5*** for a seasonal composition of fish species.

The presence of northern pike is likely due to favourable water temperatures, as well as the presence of high populations of forage fish such as white suckers and shiners.

In historical documents, the Lower Don River has been classified as a warmwater fishery; however the 2003 fish survey indicates significantly low biomass and/or absence of warm water species in the system. This is probably due to a lack of instream cover, the uniformity of the river channel, the lack of riffles and pools as well as shallow depths and silty substrates.

4.6.3 Water Temperature Survey

To assess the water temperature in the Lower Don River a number of temperature recorders were placed in the river. It was important to determine the water temperature at different locations in the river because water temperature influences the species composition within the river. Water temperature is directly related to solar radiation and is influenced by stormwater discharge, weather, as well as riparian and aquatic vegetation.

Water temperatures in the Study Area were relatively uniform throughout the eight recording stations. Temperatures fluctuated according to weather patterns and in general there were not major differences from one station to the next throughout the reach. Average temperatures in the river were compared against ideal temperature ranges for fish spawning. The average temperature during spawning was within the required range for most species.

4.6.4 Benthic Invertebrate Sampling

Benthic invertebrates are useful indicators of environmental conditions as they are generally less mobile than other organisms and integrate all the physical parameters of their environment. In addition, many species have a narrow range of environmental requirements. As a result, the health of the benthic community can be correlated with the river conditions.

Because the benthic communities of the Lower Don River had already been studied extensively by the TRCA for previous studies, this background data was used and no further surveys were conducted. A copy of this report is included in ***Appendix E***. Poor water quality and sediment conditions upstream of the study area are likely having a negative effect on the benthic community downstream within the Study Area.

4.6.5 Water Chemistry Monitoring

Water chemistry affects aquatic life in both the water column and in the sediment. Biomonitoring was conducted to determine the bioavailability of contaminants in the river. Filter feeders such as bivalves (clams and mussels) are used as a method to determine levels of water contamination. Clams were placed in wire cages in the Study Area, as well as at another location used as a control site. Clams were removed from the cages at regular intervals and analyzed for the presence of contaminants such as zinc, copper, arsenic, mercury, lead, PCB/Pesticides and PAHs. Only zinc was observed to be above the maximum recommended 'no effect' level of 30 µg/g at many of the sampling stations. Hexachlorobenzene and Heptachlor were the only parameters that registered measurable levels within any part of the Study Area but were less than the Provincial Water Quality Objectives (note that there are no direct tissue contaminant guidelines to compare the data against). In terms of PAHs, Fluoranthene was the only parameter that measured detectable levels within any of the study sites. There are also no direct guidelines for comparison for this data.

4.7 Terrestrial Natural Heritage

4.7.1 Terrestrial Attributes

The terrestrial natural heritage conditions of the study area are fully documented in the report entitled *Lower Don Valley – Biological Inventory,* which forms ***Appendix F*** of this document.

The Study Area (Refer to ***Figure 4.6***) for the natural heritage work includes most of the open space in and associated with the Don River south of Bloor Street. It does not include the areas east of the Don valley Parkway south of Gerrard Street, nor does it include the Necropolis Cemetery lands. Similar to the aquatic investigations, the Study Area limits were selected with due consideration for the data requirements of both

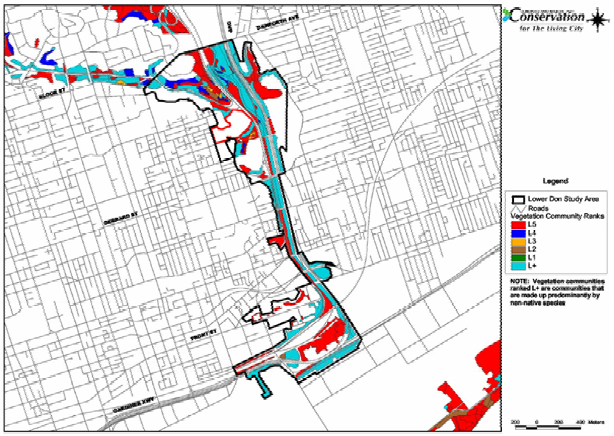


Figure 4.6 – Terrestrial Natural Heritage Study Area and Community Ranks

Environmental Assessment undertakings dealing with the Lower Don River.

The approach adopted for this component takes into account the site within the context of the region and regional pressures. A key component of the approach is the scoring and ranking of natural cover at three scales of detail: the landscape, the vegetation communities and the flora and fauna species.

The total amount of natural cover or abundance of particular vegetation communities or species was determined. The amount of natural cover is important because species and community abundance are dependent on it. A ranking was applied to determine the function of habitats and the positive or negative influences on them. Similarly, all vegetation communities and flora and fauna species have been ranked according to their overall resilience. Several factors influence this resilience and these factors have been used as scoring criteria that are then summed to produce the final rank. In this way, a species rarity is not the only factor influencing the rank, in fact, the majority of criteria are based on the species ecology. Species and communities that rank as L1 - L3 are considered to be of regional concern, while those that rank L4 are considered to be of concern within the urban areas. These species are not necessarily rate, but rather are considered

likely to decline if further alterations continue to happen to the natural system.

A comprehensive list of the vegetation communities, flora and fauna species within the Study Area is provided in ***Appendix F.***

Within the Lower Don River Study Area, approximately 19% of the land is forested (almost all of which are located along the valley slopes of the Don River, north of Gerrard Street) and 0.7% is wetland. Approximately 1% of the area is successional and approximately 11% is meadow. The remaining land (68%) is manicured or developed land. From a natural heritage perspective, the areas of manicured land represent potential restoration sites or provide opportunities to direct future development away from natural features. In the Study Area, 41 vegetation communities have been identified.

The study area includes five vegetation communities of regional concern (L1 - L3): three remnant oak communities on the "Hogsback" ridge near Castle Frank ranging from forest through woodland to savannah, a Duckweed Mixed Shallow Aquatic community resulting from successful restoration at the Riverdale Farm, and a Flat-Stemmed Bluegrass - Forb Sand Barren that developed on Gravelly fill northwest of the Keating Channel. In addition, nine other communities are of concern in the urban context (L4). These include upland forests, wetlands, and a riverbank sand bar. The ranks for communities are derived from a combination of rarity and sensitivity with respect to site conditions.

In the Lower Don study area, 324 established vascular plant species have been identified, of which 56 are of concern either region wide (L1 - L3) or within the urban context (L4). Eighteen of the 56 are regionally rare, so factors such as habitat dependence and sensitivity to land use impacts are of paramount importance in the status of a species.

Within the study area, there are 16 species that are considered to be of concern (L1 - L4). Only two of these 16 species are demonstrably rare within the TRCA jurisdiction but the other 14 are species that are expected to decline both locally and regionally if their natural habitat is impacted by development. The 16 species of concern include the beaver, spotted sandpiper, great-crested flycatcher, green frog and midland painted turtle. Concentrating concern just on species that are known to be regionally rate, in the case northern rough-winged swallow, northern mockingbird and the L5 species, orchard oriole, would jeopardize the remaining 14 species whose populations are currently secure but are considered to be at risk of decline if conditions change.

The benefits associated with natural cover, including the support of biodiversity as well as recreational and aesthetic opportunities, are dependent on the distribution of the natural cover. If natural cover is distributed evenly then the benefits are also distributed evenly. In the Lower Don Study Area, it is suggested that the amount of natural cover in the TRCA jurisdiction is low. This is particularly the case within the Don River watershed, in general and especially the Lower Don area, where almost no natural cover remains. Given this condition, all habitats are therefore considered important as part of the remnant regional natural system.

The Terrestrial Natural Heritage Approach also considers the matrix influence which refers to the effects of surrounding land uses on habitat patches, flora and fauna. The patches of natural cover in the Lower Don Study Area face impacts from the surrounding matrix of primarily urban lands. The adjacent urban areas are having negative impacts on the natural system. Even if higher quality patches are left intact, increasing the proportion of adjacent urban areas through the conversion of natural cover to urban land use will further degrade the matrix influence.

A habitat patch score analysis that was conducted within the Study Area resulted in a very low value. If one of the three landscape measures (size, shape or matrix) were reduced, the total habitat patch score would further decrease and would reflect a decline in the quality of the natural system. Therefore, the study results recommend focusing restoration efforts to improve the Habitat Patch Total Score by improving poor functioning patches.

It should be noted that because the vegetation communities, as well as the flora and fauna in the Study Area are subject to very high pressures resulting from the surrounding urban matrix, it is unlikely that the full complement of biodiversity associated with forest habitat could be ever restored or maintained. However, one way of mitigating against the matrix influence is to increase the amount of natural cover, effectively diluting the negative influence over a wider area. Currently, although breeding bird diversity is low, the natural cover in the Lower Don provides foraging and resting opportunities for thousands of migratory songbirds. The habitat patches in the Lower Don are important to this north-south movement because they provide a link between the Leslie Street Spit and the natural areas north of the city.

4.7.2 Avian Migratory Stopover and Corridor Evaluation

The Lower Don River, as well as the Keating Channel, represents a link between the Tommy Thompson Park Important Bird Area (IBA) to the south and the continuous Don Valley Corridor to the north. The migratory and stopover utilization data developed as part of the *Biological Inventory Study* is a part of the newly developed and larger migratory bird banding project titled Tommy Thompson Park Oakridges Moraine migratory bird project (refer to ***Figure 4.7***). Permanent bird monitoring stations throughout the Don River corridor have been established. These stations monitor migratory bird abundance and richness by point count observations, and corridor usage

Figure 4.7 – Avian Migratory Stopover Evaluations Stations

by recording the occurrence of colour leg banded birds. Data from the spring shows sharper peaks of diversity and abundance due to the rushed nature of migration then whereas in the fall there is a more gradual increase in numbers. Point count data from the Lower Don sites reveal that species abundance and diversity are positively correlated to habitat size and density in both spring and fall migration windows.

4.8 Cultural Resources

4.8.1 Built Heritage

A Cultural Heritage Study, including an historical review and a resulting data base of identified cultural heritage resources, was conducted by the TRCA to support both the *Lower Don River Environmental Studies*. The nature of the work that was completed and the findings of the investigations were documented in the *Environmental Assessment for the Naturalization and Flood Protection for the Lower Don River: Cultural Heritage Study*, which is attached in ***Appendix G***.

The study provides an archaeological and historical review of the locations most likely to be affected by future naturalization and flood protection activities.

The analyses and assessments were conducted on the basis of a General Study Area and a Specific

Study Area (refer to ***Figure 4.8***). The General Study Area is based on:

- the area of flood prone lands, following zones that are considered Special Policy Areas within the Port Lands and along the Lower Don River; and,

- all culturally and ecologically significant areas that may be connected to the Don Watershed as a result of river channel naturalizations.

This area stretches north from the existing edge of Toronto's Inner Harbour to the Queen Street bridge on the west side of the Don River; the north side of Eastern Avenue on the east side of the river; and from the York Street Slip on the west end, to Ashbridge's Bay on the east end.

The Specific Study Area includes all lands where flood protection, river channel naturalization, and management of subsurface environmental conditions works may be conducted throughout the course of the two projects. This area encompasses the Don River from its mouth at the Keating Channel to Winchester Street, and is contained within Broadview Avenue to the east, and River Street to the west. Additionally, the proposed areas to be naturalized at 480 Lake Shore Blvd., the National Iron Works property and the West Don Lands are considered in some detail. The specific Study Area is focused on:

- natural history, especially the late 19th Century modifications which dramatically altered the original bed and flow of the Don River;

- the extant built heritage found adjacent to and within its banks; and,

- some 'lost sites' with archaeological potential.

A total of sixty-one (61) individual human heritage features were defined during the Resource Definition component of the study, two (2) for the Specific Study Area, and fifty-nine (59) for the General Study Area. Two (2)

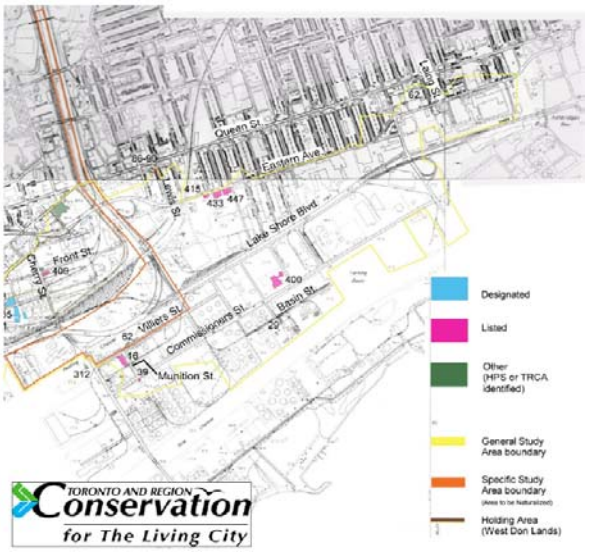


Figure 4.8 – Heritage Resources South & East of the Lower Don River

archaeological sites have been registered with the Ontario Ministry of Culture, both within the Special Policy Area of the General Study Area – the Parliament site of the 1797 to 1824 first and second parliament buildings of Upper Canada, and the Gooderham and Worts Windmill site. Both locations are west of any proposed flood protection works for the Lower Don River West Project area. The City of Toronto's current Inventory of Heritage Properties identified a total of 31 designated properties and 21 listed structures or landscapes within the study area. None of these 52 structures will be impacted by the proposed flood protection works for the Lower Don River West project. Additionally, four properties in the Study Area are being considered by the City in 2003 for inclusion in the Inventory. Two additional properties with the potential for historical significance were identified by TRCA archaeologists as being within the northwestern most part of the flood protection landform at 605 and 611 King Street East.

The Lower Don Valley has a long history which dates from the time of the Aboriginal Mississauga peoples and continued through the French and British regimes with extensive documentation and

maps dating from the 18th Century onwards. Human use and intervention of the Don River began almost immediately once the lands in the Township were taken up, with infilling, tree removal, farming, and the establishment of mills and industry significantly altering the flow of the Don early in the 19th Century. By the second quarter of the 19th Century, the Don was being used as an open sewer, a practice which continued into the early 20th Century. The late 19th Century saw the land use become almost entirely industrial, and after the extensive flooding which occurred in the second half of the 19th Century that destroyed businesses and bridges, lobbying began for improvements to the Don Valley. Improvements cost far more in time and money than anticipated and neither attracted further business, nor stopped the periodic flooding. Historic remnants of industrial sites, military installations homes and tavern stands have largely been destroyed due to the construction of roads and the Don Improvements of the 1880s-1890s. However, any excavation for the flood protection landform may unearth evidence of a buried stream and the footings of a breakwork and blockhouse near the King and Queen Street intersection. Other features that have the potential for being unearthed as part of the construction of the flood protection landform include possible bridge abutments formerly located along Front Street (formerly Palace Street), and Tate street (which was located between Front and Mill Streets). It is unknown whether these abutments were destroyed or only buried as part of the creation of the Don Narrows. An old bridge abutment was observed along the banks of the Don River immediately north of the CN Rail's Kingston line which appears to be within what would have been the alignment of Tate Street before it was decommissioned.

4.8.2 Archaeology

Cultural heritage forms one component of the *Lower Don River West - Remedial Flood Protection Project*, with archaeology forming one part of that component. The archaeological study was conducted by the TRCA and D. R. Poulton & Associates Inc. (DPA).

TRCA staff conducted a background study as an initial step in the cultural heritage component of the Lower Don Projects. The Study was informed by several past heritage studies, including the 2003 *Archaeological Master Plan of the Central Waterfront* which was prepared by Archaeological Services Inc. (ASI). The Report included a review of the historic development of the study area and provided data on known and potential archaeological resources. It also included a recommendation that more detailed Stage 1 archaeological background studies should be carried out for any areas that were subject to possible future impact from the construction of landform, wetlands or other developments associated with the flood protection and naturalization projects.

Concurrent with the TRCA background study, an independent Stage 1 archaeological background study was conducted that overlapped part of the study area for the Don Mouth Project. It was carried out on behalf of the Toronto Waterfront Revitalization Corporation (TWRC) by Historical Research Limited and ASI. The TWRC study focused on the East Bayfront, West Don Lands and Portlands Areas of the City of Toronto. The report on that study was finalized in April 2004. As with the TRCA study, it included a review of the historic development of the study area as well as data on known and potential archaeological resources. It also included recommendations concerning the need for more intensive documentary research and for Stage 2 survey to confirm the presence or absence of archaeological remains.

The vicinity of the Lower Don River has undergone enormous changes over the past 150 years, since the first European settlement began in earnest in the 1790s. Portions of this area would originally have had a very high potential for Aboriginal sites of the pre-contact and post-contact periods. However, it is the consensus of both previous and current studies that there is

little or no potential for such sites to survive owing to the extent of 19th Century and later landscaping and construction impacts.

The TRCA and TWRC studies both determined that the study area for the Don Mouth Naturalization and Flood Protection Project has a relatively high inherent archaeological potential for remains relating to the late 18th and 19th Century historic evolution of York, later Toronto. The documented sites range in type from military to residential, institutional, commercial and industrial. For example, the lands of concern to this study include a substantial portion of the Eastern Liberties that lay directly east of the eastern limits of the City of Toronto as incorporated in 1834. Those lands included a wide range of historic structures. Similarly, the Naturalization Study Area for the Lower Don extends north to Riverdale Park. The upper reaches of that part of the river valley area include the locations of early historic wharves and factories. The key question for any such sites will be the extent to which the archaeological remains survived subsequent development impacts.

4.9 Socio-Economic & Land Use

4.9.1 Existing Land Use

As shown in ***Figure 4.9***, Spill Zone 3 contains a variety of land uses including: residential properties, retail and office space, vacant land and parking lots, and industrial and warehouse/storage businesses. In total, there are approximately 280 properties within Spill Zone 3, and the breakdown of the existing land uses are summarized in ***Table 4.5***.

Table 4.5 - Existing Land Use in Spill Zone 3

Land Use	Number of Properties
Residential	164
Retail	38
Warehouse/Storage	36
Vacant Land	31
Industrial	20
Office	20
Parking	17
Utility/Transportation	14
Open/Miscellaneous	8
Institutional	1

The West Don Lands, which occupy the eastern portion of Spill Zone 3, is the area most likely to be affected by the flood protection alternatives. The West Don Lands are bounded by the Don Valley Parkway/Don Roadway on the east, the CN Rail tracks to the south, Parliament Street to the west and Queen Street to the north. Historically this land has been used for a variety of uses from residential to industrial. Previous industries have included, tannery, metal processing, asphalt paving, scrap metal yard, waste paper processing, meat packing, soap manufacturing, resin storage, dye chemicals, oil company and fertilizer plant. Given the previous industrial nature of the study area, the soil and groundwater is likely contaminated.

Much of the existing land area is currently vacant and or underutilized, and the lands are largely owned by the Ontario Realty Corporation (ORC).

Current lands uses are summarized as follows:

- Within the West Don Lands, there are about 10 buildings in the block of ORC owned land bounded by: the proposed Bayview Avenue Extension, King Street, the CNR tracks and the Don River. This is the area to be covered by the proposed landform that is required for flood protection. All buildings are occupied and these buildings/properties are leased from the ORC and are used for a variety of commercial uses including storage, film industry, a network installation business and Foodshare Toronto. Large vacant areas of the ORC lands are used for miscellaneous storage of vehicles and containers;

- On the east side of the Don River, there is a car dealership (BMW) located south of Queen Street. The Unilever owned property/ industrial plant is located south of the CN Rail tracks and leased by Korex;

- Although there are no residents within the block of land potentially affected by the flood control works, there are residences along, and to the north, of Queen and King Street. The closest of these residences is about 350 to 400 m away from the northern point of the proposed landform. Larger residential areas are located north of King Street (Corktown) and South Riverdale on the east side of the Don River. There are also new condominium developments to the west of the site associated with the Gooderham & Worts redevelopment area;

Figure 4.9 – Existing Land Use

Figure 4.10 – Official Plan Land Use Designation in Spill Zone 3.

- A paved walkway/bicycle path extends along the east side of the West Don Lands. It is located along the west side of the Don River (between the Don River and rail tracks). The walkway/path connects the upper reaches of the Don River to the waterfront trails system. The walkway/pathway crosses under the CN Rail tracks on a hanging bridge adjacent to the west bank of the river. During flooding events the culvert floods and the pathway is closed; and,

- The West Don Lands are included in the City's Part II Official Plan for the King-Parliament area. Key objectives for this revitalization area involve a mix of uses including the retention of existing commercial/light industrial activity. The plan also includes the provision for a Don River open space district for various uses including regeneration of the Don River. ***Figure 4.10*** shows the land use designations for Spill Zone 3. The Plan also provides for the enactment of a hold-bylaw for the area. The lands are currently zoned 'Reinvestment Area (hold) District'. The removal of the holding status is subject to the provision of several studies including an Environmental Management Plan to address the land/groundwater contamination issue.

The area has also been incorporated into the redevelopment plans of the Toronto Waterfront Revitalization Corporation (TWRC). As outlined in the TWRC Development Plan and Business Strategy, the West Don Lands are to be a mixed use area including a variety of building types for

commercial, institutional, and residential uses. A large portion of the area is also to provide open space opportunities.

4.9.2 Methodology

A component of the Environmental Assessment involved the determination of the flood protection benefits that would be derived through the implementation of the proposed undertaking. This was achieved through the calculation of the flood damages associated with the occurrence of a Hurricane Hazel flood over the Don River Watershed. Through the implementation of the proposed works these damages would be prevented and accordingly, represent the benefits that would be realized.

To undertake this determination, the following procedure was adopted:

- Spill Zone 3 was divided into two areas: those that would be subject to flood depth of less than 1 m during a Regulatory Storm and those where the flood depth would be greater than 1m (Refer to ***Figure 4.11*** on the following page). For the purposes of estimating damages, an average depth of 0.6 m and 1.5m was considered for these areas, respectively.

- The residential structures in Spill Zone 3, are generally townhomes or multi-rise apartment buildings. The potential flood damages for such structures were obtained from a previous residential depth-damage study (*Paragon Engineering Limited (1985)*). Based on the information contained in the above-noted study, the damages associated with townhomes were estimated at: $13,500/townhome for a flood depth of 0.6 m and $18,500/townhome for a depth of 1.5 m.

- Flood damage data is not readily available for multi-rise residential buildings, and accordingly, the damages associated with this type of structure were assumed to be similar to

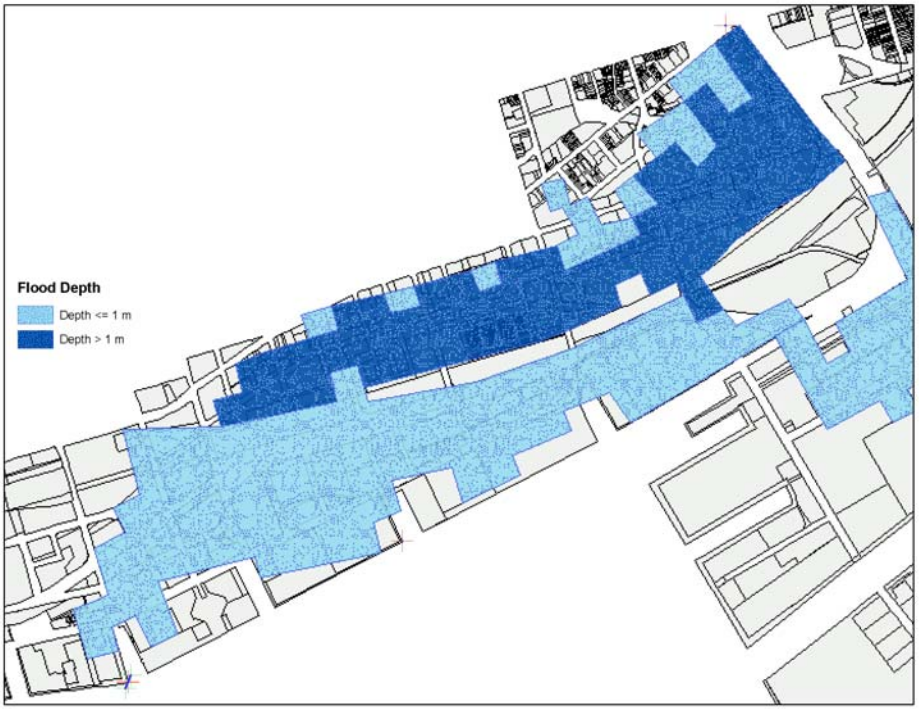


Figure 4.11 – Flood Depth under the Regulatory Flood – Spill Zone 3

that of hotels (given the similarity in contents and structure).

On the basis of the above, the damage rate on a unit area basis was assumed to be $95/m² for a flood depth of 0.6 m and $170/m² for a depth 1.5 m.

- For the industrial/commercial/institutional (ICI) properties (with the exception of Vacant Land, Parking and Open/Miscellaneous land uses whose damages were assumed to be negligible), the depth-damage data in shown in ***Table 4.6*** was used for estimating flood damages (from *Flood Estimation Guide*, Ministry of Natural Resources, 1990).

- The ICI sector depth-damage data is based on a previous study for the Fort McMurray area, in Alberta; flood damage in Toronto is assumed to be consistent with that of Fort McMurray for the purposes of this study.

- Depth-damage data was available in 1984 dollars. Estimates of damage were converted to present value using the consumer price index (CPI) that measures the inflation of prices over time. The all-items CPI for 1984 is 72.1 and is 123.9 currently. The all-items CPI has been identified as suitable for estimating residential damages (MNR, 1990) and was assumed to be appropriate for ICI sector properties for the purposes of this study.

4.9.3 Flood Damage Assessment

Based on existing land use in Spill Zone 3, the total value of flood damages (structural and contents) from the Regulatory Storm was estimated to be $162.5 million. This estimate is based upon the flood depths resulting from a single occurrence of the Regulatory Storm at existing conditions (i.e., existing land use with no flood protection works in place). As shown in ***Table 4.7*** retail space and warehouse/storage industries account for the majority of the damages at $69 million and $44 million, respectively. Industrial, residential and office space also contribute significantly to the total flood damage value with values of $20 million, $14 million and $13 million, respectively. Damages to vacant Land, parking and open/miscellaneous land uses were assumed to be negligible.

Table 4.7 - Flood Damages by Primary Land Use

Primary Land Use	Damage Costs
Retail	$69 M
Warehouse/Storage	$44 M
Industrial	$20 M
Residential	$14 M
Office	$13 M
Utility/Transportation	$1.4 M
Institutional	$0.9 M
TOTAL	$162.5 M

Table 4.6 – Industrial/Commercial/Industrial Flood Damages Values

Primary Land Use	Flood Depth of 0.6 m	Flood Depth of 1.5 m	Primary Land Use	Flood Depth of 0.6 m	Flood Depth of 1.5 m
Retail	$617/m²	$1204/m²	Office	$188/m²	$337/m²
Warehouse/Storage	$263/m²	$509/m²	Utility/Transportation	$263/m²	$509/m²
Industrial	$263/m²	$509/m²	Institutional	$320/m²	$365/m²

With future development in the West Don Lands and the East Bayfront area, flood damages are likely to increase without the flood protection works in place, with the introduction of mixed-use areas where currently much of the land is vacant or used for parking.

4.10 Topography, Soils, Groundwater and Soil Contamination

The average elevation of the West Don Lands is about 2 m above Lake Ontario Levels. There is little ground surface relief change in the area. The West Don Lands are underlain by Upper Ordovician bedrock consisting of dark grey shale of the Georgian Bay Formation. Although it varies by location, bedrock (sometimes shale) has been encountered between 7 to 26 m below ground surface. Subsurface investigations to-date indicate that the lands are underlain by very loose to dense fill up to 6 m thick. Depending on the location, the fill is underlain by either peat, organic silt, loose to compact grey sand, silty sand, or brown silt till. The fill materials consist predominately of dredged lake sediments and construction debris or waste debris that includes metal fragments, fly ash and incinerated municipal waste.

The shallow groundwater table is within the fill and varies between 78.1 and 74.2 m above sea level (about 1 to 3 m below ground surface). In general, east of Cherry Street, the shallow groundwater flows are to the southeast into the Don River. West of Cherry Street the shallow groundwater flow direction is to the southwest into the Inner Harbour. The shallow horizontal groundwater flow velocity was estimated to be in the order of several mm/yr, based on an estimated hydraulic conductivity of 10^{-7} cm/s and a porosity of 0.45. The bedrock flow regime was investigated by a series of six wells installed by Trow, Dames and Moore (TDM). There appears to be a downward hydraulic gradient from the fill through the native till to the bedrock. The bedrock horizontal groundwater flow velocity was estimated to be in the order of 100 m/yr, using an estimated hydraulic conductivity of 10^{-2} cm/s for fractured shale and a porosity of 0.05.

The following provides comments with respect to the extent of soil and groundwater contamination in the area. Further details are presented in ***Appendix H***.

Based on reported soil sample chemical analyses, there are metals and polynuclear aromatic hydrocarbon (PAH) impacted soils across the flood protection landform area. A large portion of the metals and PAHs impacts occur within 1.5 m of ground surface. Depending on the soil sample location, there are some areas where the PAH and arsenic concentrations are more than 7 times greater than the current Part XV.1 EPA Table 3 generic full depth standards for Residential/ Parkland/Institutional property use in a non potable groundwater condition (Table 3). The extent and nature of soil contamination in the Lower Don Lands is to be confirmed through the West Don Lands (WDL) Soil and Groundwater Management Strategy (SGMS) that is to be undertaken by the TWRC.

With respect to groundwater impacts, the limited groundwater quality data indicate some lead, cyanide and PAH concentrations greater than current generic standards. At some soil sample borehole locations, there were reports of petroleum hydrocarbon-like odours, but groundwater monitoring wells were not installed at these investigation locations. The extent and nature of the groundwater contamination in the Lower Don Land area is to be confirmed through the West Don Lands (WDL) Soil and Groundwater Management Strategy (SGMS) that is being undertaken by the Ontario Realty Corporation (ORC).

4.11 Existing Infrastructure

4.11.1 Utility Lines

A summary of the existing utilities located within the area that will affected by the flood protection works is presented in ***Table 4.8***.

Regarding the east side of the Don River, it is noted that there is a steel 10" NEB regulated Trans-northern gas line located within the area of the 'northern' wall/dyke that may be affected by the construction of a dyke south of the CN Rail line. There are also a 200 mm and 250 mm oil pipelines parallel to the TNP pipeline. There are other utilities that include 300 mm and 375 mm storm sewers, THES conduit, and a 500 mm gas main located between the Don Roadway and the Don River. The existing storm system outlets to the Don River via a 450 mm sewer and the 525 mm outlets in this area also.

4.11.2 Rail Infrastructure

The CN Rail bridge over the Don River carries two mainline tracks for the Kingston Subdivision, two service tracks and one pullback track. The pullback track will be converted into a mainline in 2006. Two tracks from the Bala Subdivision run along the west bank of the Don River and, just west of the CN Rail bridge over the Don River, turn almost 90°, then parallel to the Kingston Subdivision tracks towards Union Station. A number of tracks for the Don Yard are located at the southwest corner of the bridge. The Wilson Yard is located just south of the Don Yard. Mill Street Junction hydro substation is located about 85 m north of the northwest side of the bridge. Don Fleet Junction hydro substation is located about 67 m south of the southwest side of bridge. Underground hydro ducts run between the two hydro substations, and cross the two Kingston Subdivision mainline tracks, two service tracks and one pullback track. The bicycle and walking trail that extends along the west bank of Don River is suspended on the side of the west abutment through the bridge structure.

CN Rail, GO Transit and VIA Rail require two live tracks on the CN Rail bridge over the Don River at all times.

The bridge was originally built in 1928 and had two spans. In 1949, the east span was demolished, and three spans were added on the same side to accommodate the Don Valley Parkway. The superstructure consists of five individual deck plate girders (DPGs) with concrete decks, each carrying a track. Underground Hydro One Networks ducts were constructed in 1964. The ducts run parallel to the Don River on the west side of the bridge, and cross the Rail tracks almost perpendicularly. A summary of the rail transportation study is included in ***Appendix G***.

Table 4.8 – Study Area Utilities

Street/Location	List of Utilities
Front Street	• 150mm, 200mm, and 400mm diameter water mains • 300mm and 375mm diameter sanitary sewers. • 600mm by 900mm and 300mm diameter storm sewer • Bell conduit • 100mm diameter steel high-pressure gas line
Eastern Avenue	• 1500mm diameter sanitary trunk sewer (Low Level Interceptor (LLI)) • 675mm and 750mm diameter storm sewer • 300mm diameter sanitary sewer • 300mm diameter water main • 600mm diameter gas line • Bell conduit • THES duct bank
Cypress Street	• 375mm diameter sanitary sewer • 300mm diameter storm sewer • 300mm diameter water main • Bell conduit • 300mm diameter gas line
Queen Street/King Street Area	• 1650mm diameter storm sewer • T.H.E.S. cable • 300mm, 375mm, 450mm diameter and 600mm by 900mm combined sewer • 150mm and 400mm diameter water main • 100mm intermediate pressure gas line
Bayview Avenue	• 300mm and 400mm diameter sanitary sewer • 525mm, 675mm,and 750mm diameter storm sewers • 150mm diameter watermain • 30" Enbridge gas main • Ontario Duct bank • TELUS Fibre Optic Cable
Overland Street	• 150mm diameter water main • 375mm diameter storm sewer • 300mm diameter sanitary sewer • THES conduit • 100mm diameter high-pressure gas line
Mill Street	• 300mm diameter storm sewer. • 300mm diameter sanitary sewer. • 100mm diameter high-pressure gas line. • 150mm diameter water main.

5.0 EXAMINATION OF ALTERNATIVES

5.1 Approach Overview

The process to select a preferred flood control alternative included a number of steps that involved:

- the identification of a long list of alternatives;
- the application of a set of screening criteria to form a short list of feasible alternatives;
- the development of a set of evaluation criteria;
- the assessment of effects for each of the alternatives on the short list; and,
- the comparative evaluation of the alternatives and selection of the preferred alternative.

5.2 Description of Long List of Alternatives

The following presents the long list of flood remediation alternatives that were initially identified and considered in this Class Environmental Assessment Study.

5.2.1 Do Nothing

All Provincial Environmental Assessments require the consideration of the *do nothing* alternative. The *do nothing* would mean that existing conditions would remain with the Spill Zone 3 Lands subject to potential flooding. This would result in a continued risk to property damage and risks to human health and safety. Redevelopment within floodplain lands would continue to be discouraged under the Planning Act.

5.2.2 Flood Policy Revision

Development within a flood prone area is under the authority of various governmental agencies including: Toronto and Region Conservation Authority, the Ministry of Natural Resources (responsible for provincial floodplain policy) and the Ministry of Municipal Affairs (responsible for the Planning Act). It is generally recognized that urban development within a floodplain is an inappropriate use of land from a public safety standpoint. To prevent flood damages to property, under the Planning Act, via Natural Hazards Policies (***Section 3.1***), the TRCA on behalf of the Ministry of Natural Resources *discourages redevelopment and/or new development within a floodplain*.

Within areas that would be adversely affected economically and/or socially by the prevention of infilling or redevelopment, such as is the case for most of the lands within Spill Zone 3, a need has been recognized for greater flexibility from a floodplain policy perspective. For this reason, a Special Policy Area (SPA) designation has been granted for approximately 172 ha of the 210 ha of the Spill Zone 3 floodplain area. For existing or proposed development within the SPA area, flood protection measures must be carried out to acceptable standards. Individual floodproofing mechanisms can be implemented to protect structures from flooding during Regulatory Flood conditions.

The remaining 38 ha of Spill Zone 3 are associated with the West Don Lands. Given the depth of flooding created by the regulatory storm in the West Don Lands, individual floodproofing is not sufficient to allow for urban renewal. As such, the West Don Lands have been zoned with a Holding Symbol that prevents any urban renewal, unless the flood risk is completely and permanently eliminated.

Under the SPA designation, severe limitations on the type of development may be imposed within the Spill Zone 3 Lands through floodproofing requirements for individual structures. Under consideration in this Environmental Assessment is the option to lower the level of protection

required by the floodplain policy. With flood protection measures in place against the 150-year or the 350-year storm, rather than the regulatory storm, Hurricane Hazel, floodproofing measures would not be required or would be less stringent with a lower policy standard, thereby eliminating and/or minimizing potential limitations on future development.

5.2.3 Flood Protection Landform with East Bank Works & Culvert

As shown in ***Figure 5.1***, this alternative includes a flood protection landform on the west bank, running parallel to the Don River which will provide permanent flood protection for the Spill Zone 3 Lands, a flood conveyance structure (culvert or bridge) under the CN Rail embankment, and a retaining wall/dyke system along the east side of the river. The flood conveyance structure and east bank works are required to mitigate the impacts of increased flood levels upstream and to the east resulting from the construction of the western flood protection landform.

This set of structures will protect the Spill Zone 3 Lands from flooding under the Regulatory Flood. The individual components are described below:

Flood Protection Landform: The landform extends along the eastern boundary of the West Don Lands, from the Queen Street crossing of the Don River to the CN Rail crossing, and ranges in height from 0.60 m at the King Street Embankment to 3.5 m at the south end. In order to provide permanent flood protection, the required landform width is 120 m, however, given the topography at the northern site boundary a reduction in landform width is possible. For hydraulic conveyance considerations, the toe of the fill embankment must be set 40 m from the west edge of the Don River (refer to ***Section 6.4.2*** for further details regarding the flood protection landform). It will be necessary to relocate Bayview Avenue in order to maintain traffic flows

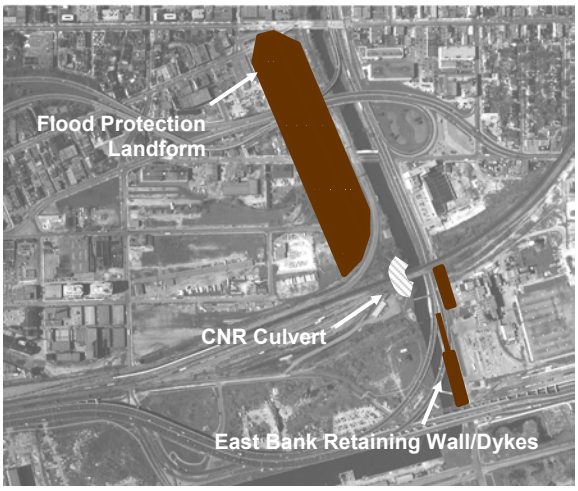


Figure 5.1 - Flood Protection Landform with Culvert & East Bank Works

over the flood protection landform. Details of the Bayview Avenue relocation are being considered under the *West Don Lands Master Plan*. Construction would not involve any in-water construction activities.

As the flood protection landform is located on impacted subsurface soil and groundwater requiring management, subsurface soil and groundwater management issues will be addressed by the West Don Lands (WDL) Soil and Groundwater Management Strategy (SGMS). The intent of the SGMS is to implement a subsurface environmental condition management program that minimizes human and ecological risk, and optimizes the applications of sustainability practices. The SGMS will include, but is not limited to:

- A summary of subsurface environmental conditions across the West Don Lands, inclusive of the initiation and completion of supplemental subsurface environmental investigation activities;

- Completion of a risk assessment program meeting provincial and federal government requirements to establish subsurface environmental conditions management options in support of the proposed West Don Lands development;

- Use of built form where possible, for example, the construction of a flood protection landform in the Lower Don River area to cover impacted near ground surface soils, to manage subsurface environmental conditions of concern; and,

- Implementation of physical subsurface environmental remedial measures where necessary, for example, the collection of any free-phase petroleum-like product that exists on the groundwater surface beneath the area that presents a human or ecological health risk.

East Bank Works: Interim mitigation measures are required to protect against the small increase in flood levels that would result to the east of the Lower Don River following the construction of the upstream conveyance structure and the flood protection landform on the west bank. The east bank works will consist of a retaining wall/dyke system, approximately 1 to 1.5 m in height. The northern most dyke would extend southerly from the CN Rail embankment on privately-owned property (Unilever) for a distance of approximately 80 m before tying off into the Gardiner Expressway off-ramp. Further south, a retaining wall extends from the Don Valley Parkway south-bound on-ramp to the Gardner Expressway and runs along the east bank of the Don River. From this point, the retaining wall is transformed into a 1 to 1.5 m high dyke and connects to the road bed of Lakeshore Boulevard.

The construction of the east bank works would require no in-water construction activities. Some subsurface environmental management activities may be associated with the construction of the eastern dyke, similar to those required for the flood protection landform. Alternatively, the Don Roadway could be raised to function as a permanent flood control berm.

CN Rail Culvert*:** The new culvert(s) would be located under the CN Rail embankment, immediately to the west of the existing bridge over the Don River (Refer to ***Figure 5.1). The reinforced concrete culvert system consists of multiple cells to convey the Don River flows, and also to allow pedestrians to pass through the CN Rail right-of-way. The culvert is required to increase the hydraulic capacity of the existing crossing in order to accommodate the floodwaters that currently would flow westerly across the Spill Zone 3 Lands.

It is expected that some contaminated soils would be encountered during construction of the culverts. While this area falls outside West Don Lands, it is expected that subsurface environmental management activities may be undertaken, similar to those required for the flood protection landform.

Groundwater will need to be controlled by pumping during construction of the culvert. Treatment of the groundwater prior to discharge should be addressed by approaches to be outlined by the West Don Lands SGMS.

5.2.4 Flood Protection Landform with East Bank Works (No Culvert)

This alternative includes a flood protection landform along the western bank of the Don River and the retaining wall/dykes on the East Bank, as previously described above. Although the physical area taken up by the flood protection landform is the same as described above, there is no culvert associated with this alternative (refer to ***Figure 5.2***), and therefore, the flood protection landform height would need to be several metres higher. This option by itself may not achieve the intended objectives of protecting the Spill Zone 3 Lands, as flood levels could exceed the elevation of the CN Rail lines, which would significantly increase flooding upstream and to the east of the river.

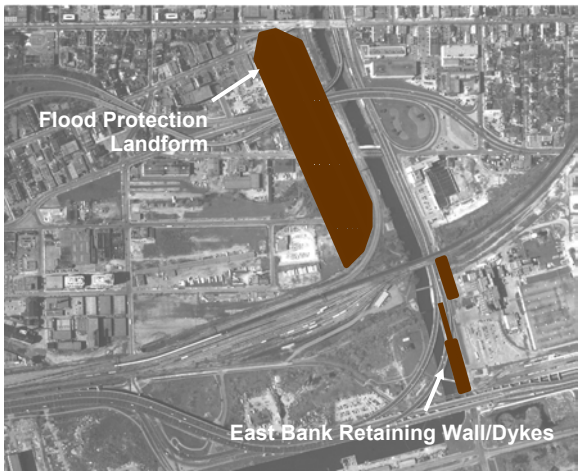


Figure 5.2 - Flood Protection Landform & East Bank Works

5.2.5 Wedge with East Bank Works &Culvert

As shown in ***Figure 5.3***, the wedge alternative requires substantial fill. The extent of the fill area is irregular in shape and bounded by King Street to the north, and the CN Rail tracks to the south. The eastern boundary of the wedge would be the same as the flood protection landform, while the western limit of the wedge will taper off to Cherry Street due to the existing heritage structures. Again, the eastern edge of the wedge would be located 40 m from the west bank of the Don River to maintain the hydraulic requirements for the passage of the flood flows.

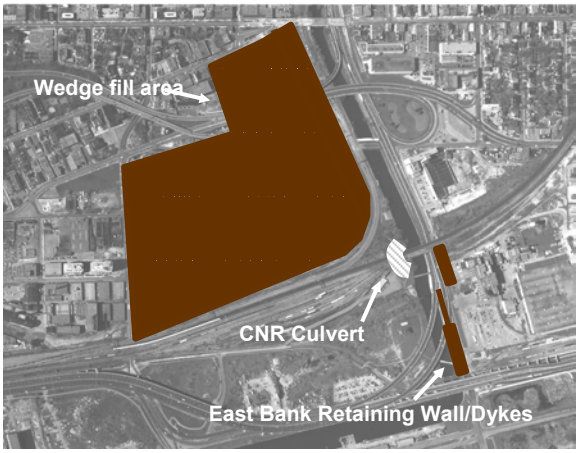


Figure 5.3 - Wedge with Culvert & East Bank Works

The height of the wedge along the west side of the Don River would be the same as for the flood protection and form, previously described.

A significant amount of additional fill is required for this alternative that would be trucked in from an off-site location. To accommodate the wedge option, it would be necessary to remove all existing buildings in the West Don Lands (though it may be possible to preserve or relocate identified heritage features and buildings), and reconstruct existing roadways and utilities. The same options exist for the management of contaminated soils under the SGMS as for the flood protection landform option previously described. The construction of the wedge would require no in-water construction activities.

This option would also include the construction of a culvert under the CN Rail embankment and the East Bank works as previously described for the flood protection landform option.

5.2.6 Wedge & East Bank Works (No Culvert)

This alternative would involve the construction of the Wedge option and the East Bank retaining wall /dykes as previously described. As there is no culvert associated with this option (Refer to ***Figure 5.4***), the height of the wedge would need to be several metres higher along its eastern edge (west bank of the Don River). This option by itself may not achieve the intended objectives of protecting the Spill Zone 3 Lands, because flood water elevations could exceed the top elevation of the CN Rail lines and would significantly increase flooding upstream and to the east of the river.

5.2.7 CN Rail Bridge & Channel Widening

This alternative involves major channelization of the Lower Don River and the widening of the CN Rail bridge over the river.

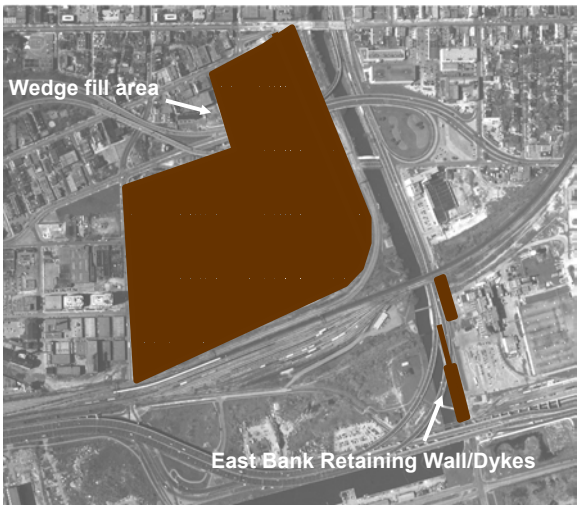


Figure 5.4 - Wedge & East Bank Works

To accommodate the Regulatory Flood, the Lower Don River channel, downstream of the Queen Street crossing, would require significant widening over its present 40 m width. This would also involve the widening of the existing CN Rail and Lake Shore Blvd bridges over the Don River. This alternative would still require a low flood protection landform along the eastern boundary of the West Don Lands to fully achieve flood protection to the Regulatory Flood level.

It is expected that some contaminated soils would be encountered as part of this alternative. While this area falls outside the West Don Lands, it is expected that the West Don Lands SGMS would be utilized, as well as additional geotechnical and geoenvironmental studies that will likely be required. Similar subsurface environmental management activities would be undertaken as for the flood protection landform alternative.

The river would be widened through excavation of the existing banks. There would likely be a need to relocate the CN Rail tracks (Bala Subdivision) and the recreation pathway on the west bank of the river further to the west and/or use a trestle system to elevate the rail line. Alteration to the Don Valley Parkway is also expected as well as the relocation of two hydro substations. In-stream works would be required for this option.

5.2.8 Secondary Channel with Flood Protection Landform

This alternative would involve the creation of a second river channel through the Spill Zone 3 Lands as shown in ***Figure 5.5***. The existing Don River channel would be maintained. A portion of the river flow volumes would be diverted to this new channel, which would outlet into the Keating Channel/Inner Harbour. In essence this alternative creates a braided channel and would require a flood protection landform to protect the remaining Spill Zone 3 Lands from inundation during the Regulatory Flood.

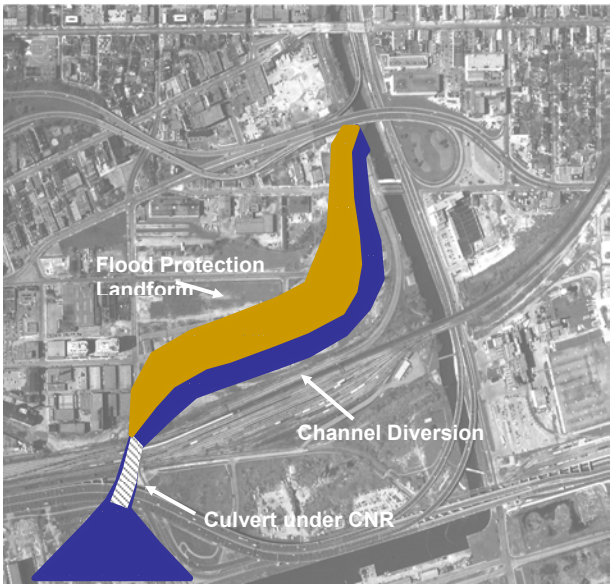


Figure 5.5 - Secondary Channel with Flood Protection Landform

The new river channel would be approximately 40 m in width and culverts would be constructed to facilitate passage under the CN Rail tracks. It is expected that this channel would be developed in a naturalized manner.

The creation of the river channel would involve significant excavation. Management of soil and groundwater would be addressed by the West

Don Lands Soil and Groundwater Management Strategy (SGMS). It is expected that some contaminated soils would be encountered as part of this alternative. Similar subsurface environmental management activities would be undertaken as for the flood protection landform alternative.

The project would require the relocation of infrastructure and the construction of several bridges over the new river channel including: Bayview Ave, Eastern Ave and Lakeshore Blvd.

5.2.9 Floodwall/Dyke

This alternative would involve the construction of a floodwall or dyke along both sides of the Lower Don River. The flood wall would likely require the similar subsurface environmental management activities as for the flood protection landform option previously described.

To meet Regulatory Flood requirements, the floodwall would be a minimum of 5-6 m in height along the west bank, would be set back 40 m from the water's edge, and would extend from the CN Rail crossing to Queen Street.

If combined with culverts at the CN Rail crossing, the floodwall would be a minimum of 3.5 m in height along the west bank, set back approximately 40 m from the water's edge, and would extend from the CN Rail crossing to Queen Street. As an individual measure, without additional capacity at the CN Rail crossing, the floodwall would have to be increased in height by 0.5 to 1.0 m

5.2.10 Upstream Storage

This alternative would involve the implementation of multiple flood control reservoirs on the upper reaches of the Don River to reduce downstream peak flows to levels that can be safely conveyed without inundating the Spill Zone 3 Lands. There is already one such reservoir in place, the G. Ross Lord Dam on the Upper West Don, located near the intersection of Dufferin Street and Finch Avenue. The proposed detention facilities would involve the temporary storage of floodwaters during storm events and their subsequent slow release to prevent downstream flooding.

One potential storage reservoir site is the Willowdale Dam on the Upper East Don River, located near the intersection of Finch Avenue and Leslie Street. This reservoir would cover about 150 ha of land, most of which is currently recreational land owned by the Toronto and Region Conservation Authority (Refer to ***Figure 5.6)***.

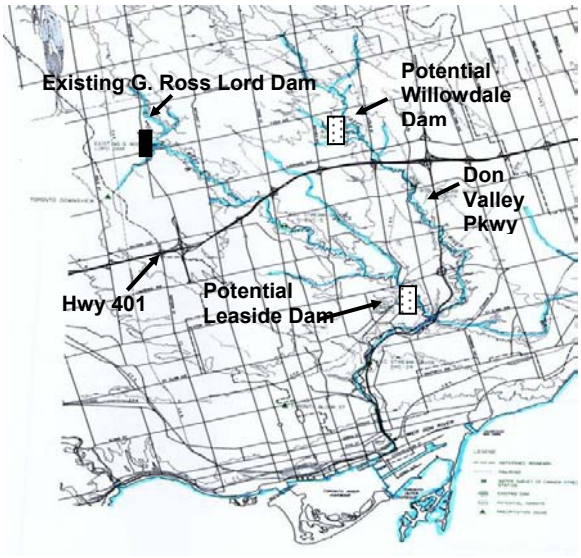


Figure 5.6 – Existing & Potential Storage Sites

Another potential storage reservoir site is the Leaside Dam on the West Branch of the Don River, downstream of the G Ross Lord Dam, located near the intersection of Don Valley Parkway and Eglinton Avenue or 600 m upstream of the Forks of the Don River. This site would provide a relatively small storage reservoir and would cover an area of about 30 ha of parkland, requiring dykes to protect portions of the Ontario Science Centre.

The three reservoirs acting together have been estimated to produce a 20 percent reduction in flood peaks at the river mouth for a major flood (return period exceeding the 50-year level). For the Regulatory Flood, the reduction may be somewhat less.

Given the limited flow attenuation that would be achieved by the reservoirs, the flood protection landform and culvert works would still be required on the West Don Lands to meet the flood protection objectives of this project.

5.2.11 Floodproofing of Individual Structures

Flood proofing is a process generally required when new development/redevelopment is permitted within a Regulatory Floodplain.

Through the application of structural changes and/or adjustments in the design and construction of individual structures, or by retrofitting existing buildings to isolate flood-prone facilities with protective dykes or sandbagging during floods, flood damages can be prevented and/or minimized.

Flood proofing is most effective in short duration flood flow conditions with low velocities and flood depths of less than or equal to one metre.

This alternative consists of structural alterations to protect individual facilities in the Spill Zone 3 Lands.

The level of protection provided will be up to the Regulatory Flood.

Most of the buildings located within Spill Zone 3 have brick walls with limited integrity and windows and other openings near ground level, therefore the protection for existing structures will have to be in the form of dykes around buildings. However, land available to build dykes is limited. In addition, due to the excessive flooding depths that would be experienced within the West Don Lands under the Holding designation, individual flood proofing is not a feasible solution.

5.2.12 River Dredging

The Keating Channel at the mouth of the Don River is currently dredged on an annual basis. This alternative would expand upon these existing dredging activities from the Keating Channel upstream to a point mid-way between Queen Street and Dundas Street (Refer to ***Figure 5.7***). the objective would be to increase the hydraulic capacity of the Don River by increasing the available flow area. A review of available engineering and utility drawings for the area indicate that the maximum depth to which the river bed can be consistently deepened is limited by the presence of existing sanitary trunks or watermain crossings. For example, the Low Level Interceptor crosses the Don River via a pair of inverted siphons just north of Eastern Avenue.

Figure 5.7 - Extent of River Dredging

These crossings are located at or below an elevation of approximately 70 m, which is some 5 m below the existing river bed. The dredging of the river bed to a depth of 5 m will generate in the order of 250,000 m^3 of material that would require disposal.

Dredged material from the Keating Channel is currently taken to the Leslie Street Spit containment facility. It is understood that the Leslie Spit CDF has about 2,000,000 m^3 of remaining capacity and therefore should be able to accommodate the dredge material assuming, it meets quality criteria. This of course would greatly reduce the life-expectancy of the Leslie Street Spit containment cells.

To support this option it would be necessary to extend the existing sheet pile walls along both banks of the river. Currently, a sheet pile wall extends along the west bank of the river from the Lake to above Gerrard Street and along its west bank discontinuously to Queen Street. It is anticipated that a replacement sheet pile wall to a greater depth would be needed to accommodate the river deepening.

This option would also involve the dredging of the river on an annual basis to maintain the required river depth to accommodate flood flows. With the regular removal of material in the Don River, it is anticipated that less frequent dredging of the Keating Channel would be necessary in the future. The current dredging barge owned and operated by the Toronto Port Authority cannot access the Lower Don River due to the low clearance under Lake Shore Road. As a result, other equipment or means would be required to dredge the lower river channel.

5.2.13 Watershed Conservation Measures

This alternative involves adopting watershed conservation measures that would help attenuate the increase in stormwater runoff to the Don River that has resulted due to urban development in the Don River Watershed. The conservation measures will include a combination of source, conveyance system, and end-of pipe controls. Source controls include: the use of rain barrels, roof leader disconnection, and rooftop gardens. Conveyance system controls include: exfiltration /filtration systems and enhanced ditches/swales for enhanced infiltration.

5.3 Screening of Alternatives

The next step in the process to select a preferred flood protection solution was to confirm whether each of the alternatives on the long list meets minimum criteria. Only those alternatives that met the minimum criteria were carried forward for further consideration. The following screening criteria were utilized:

- ***Criterion 1 - Does the alternative achieve flood protection to the Regulatory Flood level for Spill Zone 3 Lands?*** The alternative either on its own or combined with other works needs to be able to eliminate the flood risk in Spill Zone 3.

- ***Criterion 2 - Does the alternative comply with current provincial floodplain policies, including the technical requirements associated with a permanent solution?*** To conform to this objective, the alternative must meet the provincial requirements by ensuring that there are no off-site impacts that cannot be mitigated, and that the proposed works comprise a permanent solution, such that no additional protection measures (i.e., individual floodproofing) are needed for re-development. For example, as per *MNR Rivers and Stream Performance Standards and Technical Guidelines* (April 2001), if a dyke were implemented as the preferred flood protection alternative, floodproofing of re-development proposals would still be required as dykes are not regarded as permanent flood control structures based on the risk related to failure modes that exist within a typical dyke design.

- ***Criterion 3 - Is the alternative technically feasible/proven?*** For a flood remediation alternative to pass this screening criterion, it needs to have been constructed in the past and have a history of success in eliminating flood risk. For example, with a flood protection dyke, three principle modes of failure exist:

  i) dyke overtopping (flood waters overtop the dyke and erode the dry side of the dyke resulting in failure of the fill);

  ii) dyke saturation (the movement of water through or under the dyke can result in the saturation of the dyke and failure); and,

  iii) boils (the movement of water through or under the dyke can produce what are termed boils which develop at the toe of the dry side of the dyke where water resurfaces creating an ever increasing flow of water as fines beneath the dyke are removed, finally resulting in failure of the fill).

Table 5.1 presents the results of the screening exercise.

Table 5.1 - Screening the Long List of Alternatives

Criterion 1 - Does the alternative achieve flood protection to the Regulatory Flood level for the Spill Zone 3 Lands?
Criterion 2 - Does the alternative comply with current provincial floodplain policies, including the technical requirements associated with a permanent solution?
Criterion 3 - Is the alternative technically feasible/proven?
Note - Alternatives that meet the above screening criteria, and which were carried forward for detailed assessment are highlighted.

Flood Protection Alternatives	Screening Criteria			Comments/Conclusions
	Criterion 1	*Criterion 2*	*Criterion 3*	
Do Nothing	NA	No	NA	Option does not meet objective of removing flood risk from the Regulatory Flood. Screened from further consideration.
Floodplain Policy Revision.	Would require a change to the floodplain standard for the area, which will not occur for a number of reasons; refer to Comments /Conclusions.	No – area floods under more frequent flows and would still require remedial works.	NA	The Ministry of Natural resources has indicated that this alternative is unacceptable unless it can be demonstrated that: i) flood protection measures to the Regulatory Flood level are not feasible; ii) loss of life would not be expected under the Regulatory Flood; and, iii) there are no adverse flood impacts on existing development. Given the feasible alternatives that are available and the risk to public safety associated with the Regulatory Flood, this alternative was considered inappropriate and screened from further consideration.
Flood Protection Landform with East Bank Works & Culvert.	Yes, with sufficient hydraulic capacity at the CN Rail crossing to ensure no increase in upstream flood levels.	Yes	Yes	This alternative meets all screening criteria requirements, and accordingly, was carried forward for further evaluation.

Table 5.1 - Screening the Long List of Alternatives

Criterion 1 - Does the alternative achieve flood protection to the Regulatory Flood level for the Spill Zone 3 Lands?
Criterion 2 - Does the alternative comply with current provincial floodplain policies, including the technical requirements associated with a permanent solution?
Criterion 3 - Is the alternative technically feasible/proven?
Note - Alternatives that meet the above screening criteria, and which were carried forward for detailed assessment are highlighted.

Flood Protection Alternatives	Screening Criteria			Comments/Conclusions
	Criterion 1	*Criterion 2*	*Criterion 3*	
Flood Protection Landform with East Bank Works (No culvert).	Yes, with the berm constructed to a higher elevation than above alternative.	No, as significantly higher flood levels would be produced upstream of the CN Rail crossing that would affect offsite areas.	Yes	Without the additional hydraulic capacity provided by the culverts and/or similar structures, at the CN Rail crossing, this alternative would create significantly higher flood levels upstream of the crossing. Under the Regulatory Flood conditions, the higher flood levels would affect the railway lines on the west bank, the existing development on the east side of the Don River and the existing development areas upstream of Queen Street. The effects associated with the higher flood levels cannot easily and/or reasonably be mitigated and would involve prohibitive costs. Accordingly, this alternative was screened from further consideration.
Wedge with East Bank Works & Culvert.	Yes	Yes	Yes	For hydraulic considerations, this alternative is very similar to the Flood protection landform/East Bank Works/Culvert alternative. It meets all screening criteria and was carried forward for further evaluation.

Table 5.1 - Screening the Long List of Alternatives

Criterion 1 - Does the alternative achieve flood protection to the Regulatory Flood level for the Spill Zone 3 Lands?
Criterion 2 - Does the alternative comply with current provincial floodplain policies, including the technical requirements associated with a permanent solution?
Criterion 3 - Is the alternative technically feasible/proven?
Note - Alternatives that meet the above screening criteria, and which were carried forward for detailed assessment are highlighted.

Flood Protection Alternatives	Screening Criteria			Comments/Conclusions
	Criterion 1	*Criterion 2*	*Criterion 3*	
Wedge & East Bank Works (No Culvert).	Yes, with the height of fill along its west limit (near the Don River) constructed to a higher elevation than the above alternative.	No, as significantly higher flood levels would be produced upstream of the CN Rail crossing that would affect offsite areas.	Yes	This alternative would produce the same hydraulic conditions as the Flood Protection Landform & East Bank Works (No Culvert) alternative, which is unacceptable. As a result this alternative was screened from further consideration.
CN Rail Bridge & Channel Widening	Yes	Yes	Yes	The widening of the CN Rail bridge and channel meets all criteria, and this alternative was carried forward for further evaluation.
Secondary Channel & Flood Protection Landform	Yes	Yes	Yes	This alternative satisfies the screening criteria, and was therefore carried forwarded for further evaluation.
Floodwall/Dykes	No	No	Yes	Floodwalls/Dykes can reduce flood risk to areas behind them, but not to an acceptable level. The area behind the floodwall/dyke is to be considered as a *flood fringe* area. As such, based on MNR policy, redevelopment proposals would still be required to be floodproofed to the flood standard. Therefore, this alternative was screened from further consideration as floodwalls/dykes are not considered permanent flood control structures.

Table 5.1 - Screening the Long List of Alternatives

Criterion 1 - Does the alternative achieve flood protection to the Regulatory Flood level for the Spill Zone 3 Lands?
Criterion 2 - Does the alternative comply with current provincial floodplain policies, including the technical requirements associated with a permanent solution?
Criterion 3 - Is the alternative technically feasible/proven?
Note - Alternatives that meet the above screening criteria, and which were carried forward for detailed assessment are highlighted.

Flood Protection Alternatives	Screening Criteria			Comments/Conclusions
	Criterion 1	*Criterion 2*	*Criterion 3*	
Upstream Storage - Structural	Yes	No	Yes	*Structural* - Upstream storage facilities will provide marginal benefit to controlling downstream flooding. Modelling results indicate that 20-30 dam/reservoir facilities, similar in size to the existing G. Ross Lord facility would be required to achieve the required level of flow reduction in the Regulatory Flood. The construction of dams and reservoirs create significant adverse ecological impacts. *Non-structural* - Given the volume of storage required, non-structural increased valley storage would not be effective and would also result in significant ecological impacts to a large portion of the existing valley system. Therefore this alternative was screened from further consideration.
Upstream Storage – Non-Structural	No	No	Yes	
Floodproofing of Individual Structures	No	No	Yes	Floodproofing of individual structures does not achieve the objective of a permanent and comprehensive solution to the flooding problem. While structures can be floodproofed, this alternative does not address the concerns associated with the flooding of roadways, ingress/egress from buildings, the attendant risks to public safety, and the associated socio-economic impacts. In addition, individual floodproofing is not considered to be a feasible solution for the areas assigned the *Holding* designation within the West Don Lands. Therefore, this alternative was screened from further consideration.

Table 5.1 - Screening the Long List of Alternatives

Criterion 1 - Does the alternative achieve flood protection to the Regulatory Flood level for the Spill Zone 3 Lands?
Criterion 2 - Does the alternative comply with current provincial floodplain policies, including the technical requirements associated with a permanent solution?
Criterion 3 - Is the alternative technically feasible/proven?
Note - Alternatives that meet the above screening criteria, and which were carried forward for detailed assessment are highlighted.

Flood Protection Alternatives	Screening Criteria			Comments/Conclusions
	Criterion 1	*Criterion 2*	*Criterion 3*	
River Dredging	Yes	Yes	Yes	River dredging meets all criteria, and therefore was carried forward for further evaluation.
Watershed Conservation Measures	No	Yes	Vary	Watershed conservation measures offer significant benefits for wet weather flow management and flood management for more frequent storm events, but they are not capable of providing flood protection for the Regulatory Flood. It is expected that source control measures will continue to be implemented by the City of Toronto as part of its Wet Weather Flow management program and, as a result, are assumed to be included with all alternatives. However, for the purposes of achieving flood protection, this alternative was not carried forward for further consideration.

5.4 Evaluation of Alternatives and Selection of Preferred Alternative

Upon completing the screening of the long list of alternatives, a short-list of five alternatives was carried forward for more detailed evaluation. These alternatives included:

- ***Alternative 1*** – Flood Protection Landform with East Bank Works and Culvert;
- ***Alternative 2*** – Wedge with East Bank Works & Culverts;
- ***Alternative 3*** – CN Rail Bridge & Channel Widening;
- ***Alternative 4*** – Secondary Channel with Berm; and,
- ***Alternative 5*** – River Dredging.

These alternatives were evaluated against a set of 35 evaluation criteria organized on the basis of the following six Study Assessment Groups:

- Physical;
- Biological;
- Cultural;
- Socio-economic;
- Engineering/Technical; and
- Cost.

On the basis of the above criteria, each of the five alternatives were evaluated comparatively, and ranked in order of preference. ***Table 5.2*** presents the results of the comparative evaluation, and ***Table 5.3*** presents the summarized ranking scores.

In conducting the comparative evaluation, the evaluation criteria were considered of equal importance. The alternatives were ranked in order of preference with a ranking score of ***1*** assigned to the preferred alternative. These scores have no numerical value and simply identify the relative difference among options.

Based on the assessment/rankings for each criterion, the preference rankings of the alternatives were then determined within each of the six Study Assessment Groups. The following discussion presents and explains the results of the comparative evaluation on an individual Assessment Group basis, which should be read in conjunction with ***Tables 5.2*** and ***5.3.***

5.4.1 Physical Assessment Group

A total of 11 evaluation criteria were considered in the Physical Assessment Group. As the alternatives were equally ranked for two of the criteria, nine criteria were considered in the evaluation under this group. The criteria addressed a number of issues including: air/noise emissions during construction; effects on surface water flow and baseflow; effects on surface water quality; effects on contaminated soil; and river geomorphologic considerations.

There was no single alternative that was clearly preferred over the others with respect to this group of criteria. All options had a number of advantages and disadvantages. The only option that appears to be less preferred than the others is Alternative 5 – River Dredging, as it provides no opportunity for improvements to surface water quality and to contaminated soil/groundwater. As the other options have a mixture of advantages and disadvantages with no clear preference among them, Alternatives 1 to 4 were considered to be equally ranked and preferred over Alternative 5 for this group.

Table 5.2 – Comparative Evaluation of Alternatives

Evaluation Criteria*	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Physical Assessment Group						
Potential for change to environmentally significant land forms	**Construction**	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		No environmentally significant physical landforms of note are affected by the project.				
Potential for air emissions to affect air quality	**Construction**	Ranked: 2	Ranked: 2	Ranked: 2	Ranked: 2	Ranked: 1 Given that the construction activities involve work below the water line in the Don River, there will be minimal potential for dust to be generated.
		Alternatives 1 to 4 are expected to result in substantial dust effects in the local area during construction. Potential receptors include local trail users, area businesses, and commuters/passengers traveling through the Lower Don River area. No residents are expected to be affected. Area businesses will be removed for the wedge and secondary channel alternatives, thereby potentially reducing the number of receptors.				
	Operation	Ranked: 1 No air emissions are expected during the operation period for this alternative.	Ranked: 1 No air emissions are expected during the operation period for this alternative.	Ranked: 1 Dredging & associated sediment transportation activities would result in the release of fossil fuel emissions.	Ranked: 4 Dredging & associated sediment transportation activities would result in the release of fossil fuel emissions.	Ranked: 5 Dredging & associated sediment transportation activities would result in the release of fossil fuel emissions.
Potential for noise effects on the community and wildlife populations	**Construction**	Ranked: 2	Ranked: 2	Ranked: 2	Ranked: 2	Ranked: 1 Some noise effects expected from dredging activities. Noise effects considered to be less than other alternatives.
		Alternatives 1 to 4 are expected to result in substantial noise effects in the local area during construction. Potential receptors include local trail users, area businesses, the surrounding habitat and wildlife, and commuters/passengers traveling through the Lower Don River area. No residents are expected to be affected. Area businesses will be removed for the wedge and secondary channel alternatives, thereby potentially reducing the number of receptors.				
Potential for effect on storm water flow/ drainage regime	**Construction /Operation**	Ranked: 3 This alternative will have some effect on the existing storm drainage pattern locally, within the Spill Zone 3 Lands. Within the context of the Spill Zone 3 Lands, the overall effect will be minimal.	Ranked: 5 Significant alteration to the drainage pattern locally within the Spill Zone 3 Lands is expected from the Wedge alternative. Within the context of the Spill Zone 3 Lands, the overall effect will be minimal.	Ranked: 2 This alternative would have minimal if any affect on the existing drainage pattern within the Spill Zone 3 Lands.	Rank: 3 This alternative will have some effect on the existing storm drainage pattern locally, within the Spill Zone 3 Lands. Within the context of the Spill Zone 3 Lands, the overall effect will be minimal.	Ranked: 1 This alternative would not create any changes to the existing drainage pattern within the Spill Zone 3 Lands. Therefore, no potential for effect on stormwater/ drainage conditions.

* Note: the Do Nothing alternative was screened from further consideration due to its inability to provide permanent flood protection for the Spill Zone 3 Lands
Note: Ranking of 1 indicates the Most Preferred option; Ranking of 5 indicates the Least Preferred option.

Table 5.2 – Comparative Evaluation of Alternatives

Evaluation Criteria*	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Potential for effect on base water flow regime and groundwater recharge/discharge	**Construction**	Ranked: 3 Dewatering for culvert construction will lower groundwater baseflows with the potential for damaging rail links.	Ranked: 3 Dewatering for culvert construction will lower groundwater baseflows with the potential for damaging rail links.	Ranked: 2 Widening of the CN Rail bridge is likely not as serious an issue regarding dewatering as compared to the culverts.	Ranked: 5 Dewatering will be required for the construction of the culvert under the rail line to the west, as well as the large area of dewatering to excavate the channel through the West Don Lands.	Ranked: 1 This alternative would not require dewatering activities.
	Operation	Ranked: 3 No significant change expected to groundwater base flow. ***Flood Protection Landform-*** groundwater recharge/ discharge may be affected depending on foundation treatment & seepage cut-off required. ***East Bank Works*** - groundwater recharge/discharge may be affected depending on foundation treatment & seepage cut-off required. ***Culvert*** - negligible effect on groundwater flow & no effect on recharge/discharge.	Ranked: 5 Significant change expected to groundwater baseflow due to the wedge construction. Groundwater recharge through the wedge could be reduced depending on surface treatment of wedge ground level. East Berm - groundwater recharge/ discharge may be affected depending on foundation treatment and seepage cut-off required. Culvert has negligible effect on groundwater flow and no effect on recharge/discharge.	Ranked: 1 Channel widening/bridge construction not expected to alter base flow. No effect to recharge/discharge expected.	Ranked: 3 Baseflow alterations expected through creation of a new secondary channel. Changes to recharge are expected due to alterations in ground level, slopes & surface treatments. Changes to discharge may occur based on the geometry of channel with respect to the change in recharge and baseflow.	Ranked: 1 No change to base flows. No change to recharge.
Potential for adverse effect/ improvement on surface water quality due to sediment discharges	**Construction**	Ranked: 1 Some potential for sedimentation of the Lower Don River during construction of the culvert.	Ranked: 1 Some potential for sedimentation of the Lower Don River during construction of the culvert.	Ranked: 4 Widening of the channel has the potential to increase sediment loads in the Lower Don River.	Ranked: 3 Construction of the secondary channel has potential to result in some increased sediment loads during construction, but only when the secondary channel is being connected to the Don River.	Ranked: 5 Dredging activities will significantly increase sediment loadings in the river.
	Operation	Ranked: 3 The flood protection landform is not expected to adversely affect surface water quality. May be opportunities for improved storm water control measures.	Ranked: 3 The wedge is not expected to adversely affect surface water quality. May be opportunities for improved storm water control measures.	Ranked: 1 The widening of the channel may offer opportunities to improve surface water quality through naturalization efforts.	Ranked: 1 The secondary channel may offer opportunities to improve surface water quality through naturalization efforts.	Ranked: 5 No opportunity to enhance surface water quality. Potential effects on water quality during maintenance dredging.

Table 5.2 – Comparative Evaluation of Alternatives

Evaluation Criteria*	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Potential for adverse effect/ improvement on surface water quality due to release of petroleum products	**Construction**	Ranked: 4 This alternative would require working around the Hydro One underground cables while keeping the lines filled with oil (4 hour turn around time to re-energize if needed, preclude opportunity to empty cables in advance of construction). This places the lines at a greater risk for accidental damage and release into the river.	Ranked: 4 This alternative would require working around the Hydro One underground cables while keeping the lines filled with oil (4 hour turn around time to re-energize if needed, preclude opportunity to empty cables in advance of construction). This places the lines at a greater risk for accidental damage and release into the river.	Ranked: 2 This alternative would require the relocation of the Hydro One underground cable which requires emptying oil from the cables in advance of the works. This would reduce the chance for accidental discharge of petroleum products into the river.	Ranked: 2 This alternative would require the relocation of the Hydro One underground cable which requires emptying oil from the cables in advance of the works. This would reduce the chance for accidental discharge of petroleum products into the river.	Ranked: 1 No impacts due to such deleterious releases into the river.
Potential for effect on/from contaminated soils and groundwater	**Construction**	Ranked: 2 Opportunity to remove contaminant sources and hotspots. Potential use of treated impacted soils from West Don Lands by using the West Don Lands Soil and Groundwater Management Strategy (SGMS). Groundwater also to be addressed by the SGMS. Potential for worker exposure to contaminants during excavation and remedial activities. Potential for release of dust and vapours to the environment.	Ranked: 1 Opportunity to remove contaminant sources and hotspots. Potential use of treated impacted soils from West Don Lands by using SGMS. Groundwater also to be addressed by SGMS. Potential for worker exposure to contaminants during excavation and remedial activities. Potential for release of dust and vapours to the environment. The wedge is considered to offer the opportunity for a more comprehensive solution to contaminant management in the study area.	Ranked: 3 Excavation for bridge and widened channel will require ex-situ management of contaminated soils. Contaminated groundwater would need to be managed during excavation with treatment as required prior to discharge. Contaminated soil and groundwater to be managed using SGMS approach. Potential for worker exposure to contaminants during excavation and remedial activities. Potential for release of dust and vapours to the environment.	Ranked: 3 Excavation of diverted channel will result in large volume of contaminated soil which will require offsite disposal with or without ex-situ remediation. Groundwater will need to be controlled during excavation and may require treatment prior to discharge. Contaminated soil and groundwater to be managed using SGMS. Potential for worker exposure to contaminants during excavation and remedial activities. Potential for release of dust and vapours to the environment.	Ranked: 5 Dredging of potentially contaminated sediments along the 1.2 km length of the Lower Don River. Transportation of these sediments to a Confined Disposal Facility with treatment and/or stabilization of the sediment and treatment of the decanted water. Potential for worker exposure to contaminants during dredging.
	Operation	Ranked: 1 Flood protection landform provides cover to prevent remaining soil contamination from being exposed to human receptors. Long term contaminated groundwater management from/to flood protection landform should be addressed by SGMS.	Ranked: 1 Wedge provides cover to prevent remaining soil contamination from being exposed to human receptors. Long term contaminated groundwater management from/to flood protection landform should be addressed by SGMS.	Ranked: 1 Long term contaminated groundwater management should be addressed by SGMS to deal with discharge to widened channel.	Ranked: 1 Long term contaminated groundwater management should be addressed by SGMS to deal with discharge to the secondary channel.	Ranked: 5 Long term maintenance dredging to maintain channel depth will require sediment management for perpetuity.
Extent to which alternative allows for use of alternative stormwater management techniques	**Operation**	Rank: 3 This alternative presents minimal constraints to the implementation of appropriate stormwater management measures.	Rank: 5 This alternative presents some limitation to the options available for the implementation of appropriate stormwater management measures. Site servicing dictates that all drainage will flow in an east- west direction.	Rank: 2 This alternative will produce a lowering of flood levels in the Don River, which may provide increased flexibility for the design of stormwater management measures.	Rank: 3 This alternative presents minimal constraints to the implementation of appropriate stormwater management measures.	Rank: 1 The lowering of flood levels in the Don River may provide increased flexibility for the design of appropriate stormwater management measures.

Table 5.2 – Comparative Evaluation of Alternatives

Evaluation Criteria*	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Potential for change in sediment transport in the river	**Operation**	Ranked: 1 Due to confinement of flood flows, sediment transport would be enhanced during high flow events. Some potential for sedimentation of the Lower Don River during culvert construction. Culvert may result in local accumulations on upstream side, & slight increase in transport downstream.	Ranked: 1 Due to confinement of flood flows, sediment transport would be enhanced during high flow events. Some potential for sedimentation of the Lower Don River during culvert construction. Culvert may result in local accumulations on upstream side, & slight increase in transport downstream.	Ranked: 4 Channel widening will result in greater deposition, thereby adversely affecting sediment transport.	Ranked: 3 The addition of the secondary channel would in result in greater deposition.	Ranked: 5 Channel dredging will result in the greatest deposition, thereby adversely affecting sediment transport.
Potential for increase in the in-stream erosion potential	**Operation**	Ranked: 4 Any increase in erosion potential from confinement of flood flows is alleviated by the culvert. Some erosion downstream of the culvert in the confluence zone maybe possible.	Ranked: 4 Any increase in erosion potential from confinement of flood flows is alleviated by the culvert. Some erosion downstream of the culvert in the confluence zone maybe possible.	Ranked: 2 Channel widening will result in a noticeable decrease in channel erosion and erosion potential.	Ranked: 2 Secondary channel would decrease the erosion potential along the existing channel, although the new channel may increase erosion potential in floodplain areas and at confluence zones.	Ranked: 1 Channel dredging will result in a decrease in instream erosion and erosion potential.
Potential for change in local microclimate as a result of the alternative	**Operation**	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		There is no predicted change in the microclimate associated with any of the alternatives under consideration. Opportunity to naturalize the area could increase amount of shading in the area and thus affect temperatures at a micro level that could be beneficial to wildlife in the area.				
Potential physical effects from climate change	**Operation**	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		Anticipated reduction in Lake Ontario water levels would increase effectiveness of flood conveyance for all alternatives. Culvert may become perched due to lower water levels and if not installed with sound foundations, possible downcutting of the river channel, exposing a way for people to enter the lower culverts . In each scenario, CSO contaminants would have less resident time in the Lower Don River, and sediment deposition would be reduced.				
PHYSICAL CRITERIA GROUP SUMMARY		***1***	***1***	***1***	***1***	***5***
Biological Assessment Group						
Potential for loss/improvement on terrestrial wildlife habitat function, linkages and populations (including diversity and productivity)	**Construction**	Ranked: 1 Potential for loss of minimal (<0.5 ha) poor quality habitat along the west side of the Lower Don River. Construction of the flood protection landform could allow for improved natural habitat on top of the berm along the Lower Don River corridor to allow linkages with upstream habitat areas.	Ranked: 2 Potential for loss of minimal (<1.5 ha) poor quality habitat along the west side of the Lower Don River. Natural habitat could be created on top of the eastern edge of the wedge alternative along the Lower Don River corridor to allow linkages with upstream habitat areas.	Ranked: 2 Potential for loss of minimal (<1.5 ha) poor quality habitat along the west side of the Lower Don River. In widening the channel there is expected to be an opportunity to naturalize the channel sides to result in improved natural habitat. Less potential to improve terrestrial linkages than with the berm/wedge alternative.	Ranked: 2 No notable loss of existing habitat expected. The creation of a new channel would provide an opportunity to increase natural habitat through channel naturalization.	Ranked: 5 No terrestrial habitat loss will result. No potential for improved terrestrial habitat.

Table 5.2 – Comparative Evaluation of Alternatives

Evaluation Criteria*	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Potential for negative and /or beneficial effect on species of federal, provincial and local concern, and on their critical habitat	**Construction**	Ranked: 2 No species of federal, provincial or regional concern have been identified in the study area but at least 3 species have been recorded in the area that are ranked as L4 by TRCA, which indicates that they are considered species of concern in the urban area.	Ranked: 5 No species of federal, provincial or regional concern have been identified in the study area but approximately 10 species of fauna & flora have been recorded in the area that are ranked as L4 by TRCA, which indicates that they are considered species of concern in the urban area.	Ranked: 2 No species of federal, provincial or regional concern have been identified in the study area but at least 3 species have been recorded in the area that are ranked as L4 by TRCA, which indicates that they are considered species of concern in the urban area.	Ranked: 2 No species of federal, provincial or regional concern have been identified in the study area but at least 3 species have been recorded in the area that are ranked as L4 by TRCA, which indicates that they are considered species of concern in the urban area.	Ranked: 1 No species of concern have been identified in the study area.
Potential for effect on fish habitat, passage and fish populations	**Construction**	Ranked: 1 Construction of the flood protection landform will not result in aquatic habitat effects. The construction of the culvert has some potential to result in temporary disturbance effects (e.g. from sedimentation).	Ranked: 1 Construction of the wedge will not result in aquatic habitat effects. The construction of the culvert has some potential to result in temporary disturbance effects (e.g. from sedimentation).	Ranked: 4 Although the aquatic habitat quality in the Lower Don River is considered to be poor, the widening of the channel has the potential to result in the temporary loss of habitat and short-term disturbance effects.	Ranked: 3 The creation of a secondary channel is expected to result in minimal disruption effects to the existing fish habitat/populations; however construction of culvert crossings at two locations has the potential to result in temporary disturbances.	Ranked: 4 Channel dredging activities will result in impacts on aquatic habitat due to removal of shallow littoral habitat, potential spawning habitat, and increased suspended sediment as well as disruption of migratory patterns.
	Operation	Ranked: 1 Potential effect on fish migration due to the construction of the culvert can be mitigated by incorporating measures to allow fish passage. Surface water runoff will be managed through a storm water management system to minimize effects of water quality.	Ranked: 1 Potential effect on fish migration due to the construction of the culvert and be mitigated by incorporating measures to allow fish passage. Surface water runoff from the berm will be managed through a storm water management system to minimize effects of water quality. Some habitat improvement through use of baffles and granular substrate through lower cells of culvert.	Ranked: 3 The widened river channel will likely promote sedimentation to occur, and therefore continued dredging activities will be required that could have an adverse effect on the aquatic habitat.	Ranked: 3 Dredging activities will have a continual adverse effect on the aquatic habitat.	Ranked: 5 Annual dredging activities will continue to have an affect on aquatic habitat in the Lower Don River.
Potential biological effects from climate change	**Operation**	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		Climate change may result in an increase in channel morphology formation, and higher slopes (due to the anticipated lowering of Lake Ontario water levels) which may result in a gravity-fed hydraulic system, rather than a backwater system. A defined point bar, riffle-pool morphology may form within the sheetpile wall channel that would provide improved habitat conditions for fish.				

Table 5.2 – Comparative Evaluation of Alternatives

Evaluation Criteria*	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Effects of aquatic habitat on West Nile Virus transmission	**Operation**	Ranked: 1 The construction of the flood protection landform will not increase the cross sectional area of the channel meaning the flow velocities will remain as is during dry weather. Mosquitoes are dependent on stagnant water, without the presence of any predators.	Ranked: 1 The construction of the wedge will not increase the cross sectional area of the channel meaning the flow velocities would remain as is during dry weather. Mosquitoes are dependent on stagnant water, without the presence of any predators.	Ranked: 4 Mosquitoes are dependent on stagnant, water, and the absence of predators. Channel widening provides an increased flow area, thus reducing the flow velocities during dry weather and would be conducive to providing breeding opportunities for mosquitoes.	Ranked: 3 Mosquitoes frequently breed along the edges of slow-flowing rivers where there is plenty of emergent vegetation. Formation of the secondary channel could increase the extent of the naturalized banks of the river and provide conditions that would be suitable breeding areas for mosquitoes.	Ranked: 4 Mosquitoes are dependent on stagnant water and the absence of predators. Channel dredging provides an increased flow area, thus reducing the flow velocities during dry weather and provide conditions that may be more conducive as breeding opportunities for mosquitoes.
Effects of microclimate change on West Nile Virus transmission	**Operation**	Ranked: 2 The extrinsic incubation period of WNV amplification decreases with increased temperature. The construction of the flood protection landform would allow for ample greenspace and shaded areas which provide opportunity to decrease the microclimate temperature and thus lengthen the incubation period of mosquitoes.	Ranked: 2 The extrinsic incubation period of WNV amplification decreases with increased temperature. The construction of the wedge would allow for ample greenspace and shaded areas which provide opportunity to decrease the microclimate temperature and thus lengthen the incubation period of mosquitoes.	Ranked: 5 The extrinsic incubation period of WNV amplification decreases with increased temperature. Channel widening decreases the opportunity for greenspace and shaded areas and may increase the microclimate temperature thus shortening incubation periods for mosquitoes.	Ranked: 1 The extrinsic incubation period of WNV amplification decreases with increased temperature. The secondary channel will create the most greenspace and shaded areas and provides the best opportunity to decrease the microclimate temperature.	Ranked: 4 The extrinsic incubation period of WNV amplification decreases with increased temperature. Channel dredging decreases the opportunity for greenspace and shaded areas and may increase the microclimate temperature thus shortening incubation periods for mosquitoes.
BIOLOGICAL ASSESSMENT GROUP SUMMARY		***1***	***3***	***3***	***1***	***5***
Cultural Assessment Group						
Potential for effect on current and traditional uses of lands by Aboriginal peoples.	**Operations**	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		Lands are not currently used by aboriginal peoples. Local aboriginal groups have stated an interest to participate in the naturalization of the Lower Don River. The Mississaugas of the New Credit First Nation is in ongoing discussions with the federal government regarding the Toronto Purchase Specific Claim.				
Potential for effect on archaeological resources	**Construction**	Ranked: 2 The north limit of flood protection landform abuts King Street/Queen Street Gore (site of 1838 Battery).	Ranked: 5 The north limit of the wedge and East Berm abut King Street/Queen Street Gore (site of 1838 Battery). The wedge also abuts eastern edge of historic limits of original Town of York.	Ranked: 3 Potential archaeological concerns apply to possible sites oriented along the original channel of the Don River, and along eastern boundary of West Don Lands.	Ranked: 4 Potential archaeological concerns apply to possible sites within alignment of new channel through the west Don Lands.	Ranked: 1 Potential archaeological concerns apply to possible sites oriented the original channel of the Don River, and along eastern boundary of West Don Lands.

Table 5.2 – Comparative Evaluation of Alternatives

Evaluation Criteria*	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Potential for effect on built heritage resources	**Construction**	Ranked 2: No built heritage resources have been identified within the construction area of the flood protection landform. Channel improvements may impact remains of original wood pilings still seen in the Lower Don River, or other remnant channel features.	Ranked 5: Proposed filling will remove most buildings and streets within the West Don Lands, including potential industrial heritage landscapes. Potential visual impacts to heritage resources west of the proposed fill area will need to be assessed, in conjunction with proposed land development of West Don Lands.	Ranked 3: Channel widening and bridge improvements may impact remains of original wood pilings still seen in the Lower Don River, and other remnant channel features.	Ranked : 4 Keating Channel and its floodwall have been identified as a potential cultural heritage landscape and/or historic structure, which may be impacted by this alternative.	Ranked: 1 Extension of sheetpiling and increased dredging operations may impact remains of original wood pilings still seen in the Lower Don, and other remnant channel features.
CULTURAL CRITERIA GROUP SUMMARY		*2*	*5*	*3*	*4*	*1*
Socio-Economic Assessment Group						
Potential for change in landscape or views	**Operation**	Ranked: 1 Current landscape is significantly degraded. Some potential for changes in views/landscapes. It is expected that views can be improved through naturalization efforts associated with this alternative.	Ranked: 1 Current landscape is significantly degraded. The wedge alternative (in association with land development and potential naturalization activities) is expected to alter (improve) the views/ landscape character of the area.	Ranked: 4 Current landscape is significantly degraded. Some expected changes to views/landscape associated with the Lower Don River area. Assumed naturalization efforts associated with the alternative are expected to improve the character of the area.	Ranked: 1 Current landscape is significantly degraded. The area in which the channel will be diverted through will experience landscape character changes. Potential naturalization efforts associated are expected to improve the character of the area.	Ranked: 4 Current landscape is significantly degraded. No changes/ improvements in views will result.
Opportunity for visual integration with future development plans for the area	**Operation**	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		All alternatives expected to have an equal opportunity for visual integration with future development plans.				
Potential for removal of, or changes to, existing land use	**Construction**	Ranked: 2 Land is largely vacant with exception of bike trail and Bayview Ave. which would require relocation.	Ranked: 4 The wedge will affect most of the West Don Lands. Although most of these lands are vacant, some existing buildings are used for commercial purposes. The tenants of these buildings would need to relocate.	Ranked: 2 This alternative is expected to result in minimal impact on existing land use. The bike path may need to be relocated in sections.	Ranked: 4 The creation of a new channel through the West Don Lands will displace some existing land uses, although as most of the lands in this area are vacant, and effects would likely be minimal.	Ranked: 1 No removal of land
Potential for disruption effects on the existing surrounding community	**Construction**	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		There are no residences in the vicinity of the project site that are likely to be affected.				
	Operation	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		There are no residences in the vicinity of the project site that are likely to be affected.				

Table 5.2 – Comparative Evaluation of Alternatives

Evaluation Criteria*	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Potential for disruption effect on existing business enterprises	**Construction**	Ranked: 2 Some potential for disruption during construction to businesses located along Eastern Ave., if they remain in place. The relocation of Bayview Ave. will also result in the removal of some businesses. Some disruption to the railway operations will occur to facilitate the culvert construction.	Ranked: 2 The existing businesses located along Eastern Ave. would need to be relocated with the wedge alternative. Some disruption to the railway operations will occur to facilitate the culvert construction.	Ranked: 5 Potential for disruption to the Rail companies that use the tracks/ bridge. Limited potential for disruption to other businesses.	Ranked: 4 Depending on the location of the secondary channel, there exists the potential for disruption to businesses located along Eastern Ave.	Ranked: 1 Disruption to businesses not expected.
	Operation	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		No effect on businesses is expected during the operation period.				
Potential for disruption effects on existing recreation features and users	**Construction**	Ranked: 3 Need to divert/relocate the bike pathway along the Lower Don River.	Ranked: 3 Need to divert/relocate the bike pathway along the Lower Don River.	Ranked: 3 Need to temporarily divert the bike pathway during construction.	Ranked: 2 Bike path can likely remain in current location. Need to bridge secondary channel.	Ranked: 1 Bike path will not be affected.
	Operation	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		No external effects during the operation period are to occur.				
Potential to enhance active and passive recreation and greenspace in the area	**Operation**	Ranked: 1 It is expected that the berm can be naturalized to enhance the Lower Don River bike path and provide opportunity for new active recreation features.	Ranked: 1 It is expected that the eastern edge of the wedge can be naturalized to enhance the Lower Don River bike path and provide opportunity for new active recreation features.	Ranked: 4 Limited opportunity to enhance recreation opportunities through this alternative.	Ranked: 3 Some opportunity to enhance passive recreation opportunities through this alternative.	Ranked: 5 No opportunities to enhance recreation opportunities
Opportunity to integrate with planned land uses in the surrounding area; allow for a balance of development/open space	**Operation**	Ranked: 3 High likelihood that the flood protection landform can be integrated with future development plans and provides an opportunity for open space.	Ranked: 4 The wedge provides greater challenges for future development integration.	Ranked: 2 Limited effects on the West Don Lands redevelopment plans.	Ranked: 5 The secondary channel would create the greatest challenges for integration with future development plans and consume land intended for development.	Ranked: 1 No effect on/opportunity for integration with future development plans in the West Don Lands
Compatibility and opportunities for synergy with Don Mouth Naturalization and Port Lands Flood Protection project	**Operation**	Ranked: 1 This alternative does not place any constraints or requirements on any future works along the mouth of the Don River. As such it is considered to be fully compatible with any future efforts.	Ranked: 1 This alternative does or place any constraints or requirements on any future works along the mouth of the Don River. As such it is considered to be fully compatible with any future efforts.	Ranked: 3 The widening of the Lower Don River would limit the alternatives available for naturalization of the Don River mouth given that the widened cross section and identified alignment be in place.	Ranked: 4 A new channel would provide opportunities for enhanced naturalization efforts. The alternative would place some restrictions on the alternatives available for the naturalization efforts, as the water volume that would be transported to the mouth would be significantly reduced.	Ranked: 5 Not compatible with efforts to naturalize the Lower Don River. The nature of the mouth of the Don River would essentially be fixed by this alternative to deepened section extending down to the Keating Channel. The range of naturalization options would therefore be severely restricted.

Table 5.2 – Comparative Evaluation of Alternatives

Evaluation Criteria*	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Opportunity to enhance pedestrian/cycling linkages	**Operation**	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		Good opportunity to enhance pedestrian linkages, and potentially improve bikeway connection.				
Potential for change in property values /ownership	**Operation**	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		Ranked Equally. All of the alternatives are expected to reduce the flood risk potential in the area. As a result, property values would be expected to benefit from all of the alternatives. All the options are considered to be similar in this regard.				
SOCIO-ECONOMIC CRITERIA GROUP SUMMARY		***1***	***2***	***2***	***2***	***2***
Engineering/Technical Assessment Group						
Extent to which solution addresses current and anticipated flood control problem	**Operation**	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1	Ranked: 1
		Ranked Equally: All alternatives have been conceptualized to address the flooding problem – comprehensive flood control for both current and anticipated flooding is achieved. No significance difference among these alternatives from this perspective.				
Flexibility of alternative to address future changes in flows as a result of climate change	**Operation**	Ranked: 1 Providing flood protection to a higher flow level can be readily achieved by raising the top elevation of the flood protection landform, when required.	Ranked: 2 Increasing the level of protection can be achieved by raising crest elevation of the wedge. Adequate provisions to be included in the design to ensure buffers are provided that would enable the raising in grade.	Ranked: 4 Increasing the level of flood protection would likely require additional works in the form of a small berm on both the east and west side. Accordingly, adequate buffers must be identified during the design process.	Ranked: 3 Providing flood protection to a higher flow level can be readily achieved by raising the top of berm elevation when required.	Ranked: 4 Increasing the level of flood protection would likely require additional works in the form of a small berm on both the east and west side. Accordingly, adequate buffers must be identified during the design process.
Ease/ complexity of implementation	**Construction**	Ranked: 1 The most straightforward alternative to construct, essentially consisting of earth works to construct the flood protection landform, with the added complexity of installing culverts under the CN Rail crossing of the Don River.	Ranked: 2 Similar to Alternative 1 except larger in scope. Furthermore, implementation is more complex and time consuming. The removal of all existing structures within the West Don Lands would be necessary for completion of this option.	Ranked: 3 This alternative involves the widening of the Don River, the installation of sheetpile walls to protect the banks, and widening of the CN and Lake Shore Blvd crossings of the river. Comparatively, this involves fairly complex and extensive works. DFO timing constraints for conducting work in the Don River would pose significant constraints.	Ranked: 3 Very involved construction including the construction of the secondary channel and a channel crossing under the Bala Subdivision rail line. All work would be constructed in the dry, including the culvert under the CN lines.	Ranked: 3 This alternative involves extensive dredging of the Don River bed to significant depths, and the installation of sheet pile walls to maintain and protect the sides of the deepened channel. Working in and around the bridge structures would require particular attention. Comparatively, this involves fairly complex and extensive works. DFO timing constraints for conducting work in the Don River would pose significant constraints.

Table 5.2 – Comparative Evaluation of Alternatives

Evaluation Criteria*	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Potential for risk of failure	**Operation**	Ranked: 2 Although this alternative is virtually risk free from failure, it is considered to have a slightly higher failure risk that the wedge alternative. This option functions passively, without reliance on any significant operation and/or maintenance requirements. (Locating buried utilities (i.e.; storm and sanitary sewers) and deep rooted vegetation shall be avoided). Culvert may plug or fill with sediment or become blocked by debris.	Ranked: 1 Once the works associated with this alternative are implemented, the west bank of the Don River will be comparable to a natural section of a high valley wall for flood protection considerations. For all intents and purposes the potential for failure would be considered as negligible. Culvert may plug or fill with sediment or become blocked by debris.	Ranked: 4 With the widened channel for the Don River, increased sedimentation will be likely, and dredging of the Don River will be necessary to ensure the design capacity for the river is maintained. Accordingly, this alternative will be dependant on continuous maintenance to ensure proper operation. This need for regular maintenance is considered to represent a higher risk of failure.	Ranked: 3 Similar to Alternative 1, with a slightly increased potential for sedimentation to occur along the secondary channel and the resultant need for dredging. However, it would be in a much more localized and shorter area than either Alternatives 3 or 5.	Ranked: 5 Given the slower flow velocities associated with this alternative, significantly increased sedimentation would be anticipated along the lower reach of the Don River. Accordingly, regular dredging operations would be necessary to maintain the required capacity of Don River channel. This need for regular maintenance is considered to represent a higher risk of failure.
Potential for effect on existing and planned utilities/transportation infrastructure (including Go Transit and CN Rail facilities)	**Construction**	Ranked: 1 The implementation of this alternative would require the relocation of Bayview Ave. In addition, some effects on rail operations would occur during the construction phase in order to facilitate the installation of the culvert.	Ranked: 1 The implementation of this alternative would require the relocation of Bayview Ave. In addition, some effects on rail operations would occur during the construction phase in order to facilitate the installation of the culvert.	Ranked: 5 This alternative would involve the need to relocate rail tracks (Bala Line) and other utilities that parallel the LDR. Also need to relocate Hydro One line, transformer stations, utility ducts (Old Eastern bridge), and utilities under Kingston Line Bridge.	Ranked: 3 Implementation of this alternative would necessitate the installation of new structures across the new channel. The construction of culverts under the CN Rail lines would affect transportation infrastructure at Cherry Street, Lake Shore Road, and possibly the Gardiner Expressway.	Ranked: 3 Removal of old buried oil pipelines that cross the Don River upstream of Lake Shore Road. Hydro One also has a live cable crossing of the Don River at Queen Street, and there would be a high potential for conflicts with other utilities.
ENGINEERING/ TECHNICAL CRITERIA GROUP SUMMARY		***1***	***2***	***4***	***3***	***4***
Cost Assessment Group						
Cost to implement the alternative	**Construction**	Ranked: 1 Moderate Cost[1]	Ranked: 2 High Cost	Ranked: 2 High Cost	Ranked: 2 High Cost	Ranked: 2 High Cost
Annual operations and maintenance costs	**Operation**	Ranked : 1 Moderate Cost[2]	Ranked:1 Moderate Cost	Ranked 3: High Cost	Ranked: 3 High Cost	Ranked: 3 High Cost
COST ASSESSMENT GROUP SUMMARY		**1**	**2**	**3**	**3**	**3**

[1] Low Cost: $0-10M; Moderate Cost: $10-20; and High Cost: >$20M
[2] Low Cost: <$0.5M; Moderate Cost: $0.5 - $1M; and High Cost: >$1M. Cost includes dredging considerations.

Table 5.3 – Ranking of Alternatives

Evaluation Criteria	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Physical Assessment Group						
Potential for change to physical landform	**Construction**	1	1	1	1	1
Potential for air emissions to affect air quality	**Construction**	2	2	2	2	1
	Operation	1	1	1	4	5
Potential for noise effects on the community and wildlife populations	**Construction**	2	2	2	2	1
Potential for effect on storm water flow/ drainage regime	**Construction/ Operation**	3	5	2	3	1
Potential for effect on base water flow regime and groundwater recharge/ discharge	**Construction**	3	3	2	5	1
	Operation	3	5	1	3	1
Potential for adverse effect/ improvement on surface water quality	**Construction**	1	1	4	3	5
	Operation	3	3	1	1	5
Potential for effect on/from contaminated soils and groundwater due to sediment discharges	**Construction**	2	1	3	3	5
	Operation	1	1	1	1	5
Potential for effect on/from contaminated soils and groundwater due to release of petroleum products	**Construction**	4	4	2	2	1
Extent to which alternative allows for use of alternative stormwater management techniques	**Operation**	3	5	2	3	1
Potential for change in sediment transport in the river	**Operation**	1	1	4	3	5
Potential for increase in the in-stream erosion potential	**Operation**	4	4	2	2	1
Potential for change in local microclimate as a result of the alternative	**Operation**	1	1	1	1	1
Potential physical effects from climate change	**Operation**	1	1	1	1	1
PHYSICAL CRITERIA GROUP RANKING SUMMARY		**1**	**1**	**1**	**1**	**5**
Biological Assessment Group						
Potential for loss/improvement on terrestrial wildlife habitat function, linkages and populations (including diversity and productivity)	**Construction**	1	2	2	2	5

Table 5.3 – Ranking of Alternatives

Evaluation Criteria	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Potential for negative and/or beneficial effect on species of federal, provincial and local concern, and on their critical habitat	**Construction**	2	5	2	2	1
Potential for effect on fish habitat, passage and fish populations	**Construction**	1	1	4	3	4
	Operation	1	1	3	3	5
Potential biological effects from climate change	**Operation**	1	1	1	1	1
Effects of aquatic habitat on West Nile Virus transmission	**Operation**	1	1	4	3	4
Effects of microclimate change on West Nile Virus transmission	**Operation**	2	2	5	1	4
BIOLOGICAL CRITERIA GROUP RANKING SUMMARY		**1**	**3**	**3**	**1**	**5**
Cultural Assessment Group						
Potential for effect on current and traditional uses of lands by Aboriginal peoples.	**Operation**	1	1	1	1	1
Potential for effect on archaeological resources	**Construction**	2	5	3	4	1
Potential for effect on built heritage resources	**Construction**	2	5	3	4	1
CULTURAL CRITERIA GROUP RANKING SUMMARY		2	5	3	4	1
Socio-Economic Assessment Group						
Potential for change in landscape or views	**Operation**	1	1	4	1	4
Opportunity for visual integration with future development plans for the area	**Operation**	1	1	1	1	1
Potential for removal of or changes to existing land use	**Construction**	2	4	2	4	1
Potential for disruption effects on the existing surrounding community	**Construction**	1	1	1	1	1
	Operation	1	1	1	1	1
Potential for disruption effect on existing business enterprises	**Construction**	2	2	5	4	1
	Operation	1	1	1	1	1
Potential for disruption effects on existing recreation features and users	**Construction**	3	3	3	2	1
	Operation	1	1	1	1	1
Potential to enhance active and passive recreation and greenspace in the area	**Operation**	1	1	4	3	5

Table 5.3 – Ranking of Alternatives

Evaluation Criteria	Period of Effect	Alternative 1 Flood Protection Landform with East Bank Works & Culvert	Alternative 2 Wedge with East Bank Works & Culvert	Alternative 3 CN Rail Bridge & Channel Widening	Alternative 4 Secondary Channel with Flood Protection Landform	Alternative 5 River Dredging
Opportunity to integrate with planned land uses in the surrounding area; allow for a balance of development/open space	**Operation**	3	4	2	5	1
Compatibility and opportunities for synergy with Don Mouth Naturalization and Port Lands Flood Protection project	**Operation**	1	1	3	4	5
Opportunity to enhance pedestrian / cycling linkages	**Operation**	1	1	1	1	1
Potential for change in property values /ownership	**Operation**	1	1	1	1	1
SOCIO-ECONOMIC CRITERIA GROUP RANKING SUMMARY		**1**	**2**	**2**	**2**	**2**
Engineering/Technical Assessment Group						
Extent to which solution addresses current and anticipated flood control problem	**Operation**	1	1	1	1	1
Flexibility of alternative to address future changes in flows as a result of climate change	**Operation**	1	2	4	3	4
Ease/complexity of implementation	**Construction**	1	2	3	3	3
Potential for risk of failure	**Operation**	2	1	4	3	5
Potential for effect on existing and planned utilities/ transportation infrastructure (including Go Transit and CN Rail facilities)	**Construction**	1	2	5	3	3
ENGINEERING/ TECHNICAL CRITERIA GROUP SUMMARY		**1**	**2**	**5**	**3**	**5**
Cost Assessment Group						
Cost to implement the alternative	**Construction**	1	2	2	2	2
Annual operation & maintenance cost	**Operation**	1	1	3	3	3
COST ASSESSMENT GROUP SUMMARY		**1**	**2**	**3**	**3**	**3**

5.4.2 Biological Assessment Group

There were seven evaluation criteria considered in this assessment group. All alternatives were equally ranked for one criterion, thus six criteria were considered in the evaluation. As both terrestrial and aquatic habitat in the study area is of comparatively low quality/degraded nature, alternatives that have the potential to improve/increase habitat were generally considered as preferred. The following summarizes the results for the remaining four criteria (from most preferred to least preferred).

i) *Ranked 1st (Tie) – Alternative 4 - Secondary Channel with Flood Protection Landform & Alternative 1 – Flood Protection Landform with East Bank Works and Culvert*

Alternative 4 will not remove any terrestrial habitat and the new river channel is expected to offer an opportunity to create new habitat along its banks. From an aquatics perspective, the creation of the new channel is expected to result in the least amount of disruption to the existing Don River, and will result in the creation of new aquatic habitat. West Nile Virus transmission is likely to be minimized by both these alternatives.

Alternative 1 would cause the loss of approximately 0.5 ha of habitat, affects only three species of concern in an urban area, and will allow for the creation of new terrestrial habitat through the formation of the flood protection landform.

Alternative 1 differs from Alternative 4 in that it will provide a more limited opportunity for the improvement of the aquatic habitat.

Alternative 4 would cause a more pronounced and prolonged impact on the aquatic environment during the construction phase of the project.

ii) *Ranked 3rd (Tie) – Alternative 2 - Wedge with East Bank Works and Culvert & Alternative 3 - CN Rail Bridge& River Widening*

Alternative 3 will result in the loss of less than 1 ha of habitat. Only three species of potential concern in an urban area may be affected by this option. The alternative is considered favourable from an aquatics perspective as it will create new habitat through river widening. It is assumed that the widened river will be created in a more naturalized manner than the existing Don River channel.

Alternative 2 will result in the loss of less than 1.5 ha of terrestrial habitat and have the potential to affect up to ten species of concern in an urban area. It also offers no opportunity to increase aquatic habitat and will result in some aquatic effects during installation of the culvert.

Alternative 2 would produce a significantly more adverse effect on the aquatic environment during the construction phase of the project, but would provide a far greater opportunity for permanent and long-term enhancement.

iii) *Ranked 5th – Alternative 5 - River Dredging*

The river dredging option was considered to be least preferred as it provides no opportunity for improvement of either terrestrial or aquatic habitat and will regularly disrupt aquatic habitat during annual dredging activities.

5.4.3 Cultural Assessment Group

There were three evaluation criteria considered in this assessment group. All options were equally ranked for one criterion – the effect on Aboriginal peoples, thus only two criteria were considered in the evaluation. Alternatives that minimize effects on archaeologically significant resources or built heritage resources were considered preferred.

With the exception of Alternative 4, all alternatives will potentially impact an old bridge abutment in the location of the proposed culverts that may be of some cultural significance. The dredging activities would impact this abutment if it is not supported to below the proposed dredging depth. The following summarizes the results for the remaining two criteria (from most preferred to least preferred):

i) *Ranked 1st – Alternative 5 River Dredging*

This alternative minimizes the potential effect on archaeological and built heritage resources.

ii) *Ranked 2nd – Alternative 1 - Flood Protection Landform with East Bank Works & Culvert*

No archaeological or built heritage resources exist within the location of the flood protection landform with the exception of the King Street/Queen Street Gore (site of 1838 battery).

iii) *Ranked 3rd – Alternative 3 CN Rail Bridge & River Widening*

River widening may impact remnant river features such as the original wood pilings in the Lower Don River. Potential archaeological concerns apply to possible sites oriented to the original river channel and along the eastern boundary of the West Don Lands.

iv) *Ranked 4th – Alternative 4 - Secondary Channel with Flood Protection Landform*

A potential cultural heritage landscape may be impacted by this alternative: the Keating Channel and its floodwall. Potential archaeological concerns apply to possible sites oriented to the original river channel and along the Eastern Boundary of the West Don Lands.

v) *Ranked 5th – Alternative 2 Wedge with East Bank Works & Culvert and*

The wedge will remove most buildings and streets within the West Don Lands including potential industrial heritage landscapes. The retaining wall/dykes would abut the King Street/Queen Street Gore (site of 1838 battery) and historic limits of the original Town of York.

5.4.4 Socio-Economic Assessment Group

This assessment group considered the potential impacts on businesses, recreation features, viewscapes, and land use. The affected lands are generally underutilized and degraded. Most of the existing buildings are expected to be replaced in the future through redevelopment activity. It was assumed that there are no existing residents in the immediate area.

Similar to the biological assessment group, a focus of this assessment group was on the ability of the option to enhance recreation/greenspace lands and integrate with future development plans. A total of 14 evaluation criteria were considered, for which the alternatives were ranked equally for six. The results of the evaluation on the basis of the remaining eight criteria are described below:

i) *Ranked 1st – Alternative 1 - Flood Protection Landform with East Bank Work & Culvert*

This alternative was ranked first or second for six of the eight criteria (Refer to ***Table 5.2*** and ***5.3***). Advantages include: the greatest opportunity to enhance views; limited removal of existing land use; limited removal of existing businesses; highest compatibility/opportunity to integrate with naturalization efforts along the Lower Don River; and good opportunity to enhance pedestrian, cycling, and wildlife linkages. Disadvantages of this alternative would be relatively minor, and limited to a greater potential

for disruption to trail users during the construction period, and potentially greater challenges with future land use integration than the river widening/dredging options.

ii) Ranked 2nd (tie) – Alternatives 2, 3, 4 & 5

The remaining options were all considered to be equal and less preferred than Alternative 1. It was not possible to further distinguish among these remaining options. The wedge option has the potential for greatest effect on existing land use, yet offers opportunities to enhance green space and is considered compatible with naturalization efforts along the Lower Don River. Alternatively, the river widening and secondary channel options have less impact on existing land use but offer limited opportunity to enhance green space.

5.4.5 Engineering/Technical Assessment Group

A total of five evaluation criteria were considered in this assessment group, which addresses such issues as the ability to accommodate changes in flows due to climate change, ease of implementation, risk of failure, and effects on utilities/infrastructure. The alternatives were all ranked the same with respect to the criteria that addressed their ability to address the flood control problem. The following provides the justification for the rankings:

i) Ranked 1st – Alternative 1 - Flood Protection Landform with East Bank Works and Culvert

Alternative 1 was ranked first for three criteria and ranked second for one criterion (marginally higher risk to failure than the wedge option although both are considered to be permanent and with minimal risk up to the Regulatory Flood level).

ii) Ranked 2nd – Alternative 2 Wedge with East Bank Work and Culvert

Alternative 2 was considered to be less preferred than Alternative 1 as it was considered to be less flexible, more complex to build and has the potential for greater effect on utilities.

iii) Ranked 3rd – Alternative 4 River Dredging

Alternative 4 is considered to have low flexibility to accommodate changes in future flows; a higher risk of failure and is considered to have a high effect on utilities/infrastructure.

iv) Ranked 5th (Tie) – Alternative 3 - CN Rail Bridge & River Widening & Alternative 5 - River Dredging

Both these options were considered either least preferred or second least preferred for all criteria, and were therefore ranked last. Both alternatives are relatively complex and involve extensive works and are dependent on continuous maintenance. Additional works are likely required in the form of a small berm on either side of the river to ensure a high level of flood protection.

5.4.6 Cost Assessment Group

A planning level cost was determined for each alternative, which allowed an assessment to be made on a relative cost scale of high, medium and low. The following ranking of the alternatives result:

- Alternative 1 – least cost; and,
- Alternatives 2, 3, 4 and 5 – high cost.

The explanation for this cost ranking is discussed below.

i) Alternative 1 – Flood Protection Landform with East Bank Works & Culvert

The total cost of the component works for this alternative is estimated at $16.5 M. This cost includes allowances for the items listed below:

- the fill required to create the flood protection landform;
- utility relocation works;
- some soil management works;
- the construction of the 6 cell culvert;
- the implementation of the East Bank Works; and,
- 25% for engineering and contingencies.

Excluded from the $16.5 M is any cost allowance for:

- the removal of any existing buildings;
- relocation of Bayview Avenue;
- any associated utilities with the roadway; and,
- the preparation of a landscape plan for the flood protection landform.

ii) Alternative 2 – Wedge with East Bank Works & Culvert

The works associated with this alternative is essentially the same in scope and extent as those identified for Alternative 1, with the exception of the additional fill required to create the wedge landform. The quantity of earth fill required to construct the wedge is estimated at approximately 500,000 m^3, which is approximately 150% greater than the quantity needed for Alternative 1. Accounting for the additional earth fill, the total cost of this option is estimated at $20.5 million, including a 25% allowance for engineering and contingencies.

iii) Alternative 3 – CN Rail Bridge & Channel Widening

A series of hydraulic computer simulations were undertaken to provide a preliminary assessment on the extent of channel/bridge widening that would be required to achieve a significant lowering of the Regulatory Flood levels along the Lower Don River upstream of the CN Rail crossing.

The results of the analyses indicate that a Regulatory Flood level of approximately 79 m could be achieved through major widening of the river channel and the CN Rail and Lake Shore Avenue bridges to 90 m (approximately 2.5 times the width of the existing channel and bridge structures).

The cost of this alternative is estimated at $28.5 M, including engineering and contingencies.

The cost estimate does not include any allowance for other works that would be required to accommodate relocation/realignment of hydro facilities, the CN Rail Bala Subdivision, and possibility the Don Valley Parkway.

iv) Alternative 4 – Secondary Channel with Flood Protection Landform

The total cost of the component works for this alternative is estimated at $30 M. This cost includes allowances for the works noted below:

- the excavation of a secondary channel that would be approximately 1200 m in length, 40 m in width and 4 m in depth (excavation volume of approximately 220,000 m^3);

- the earth fill required to create a flood protection landform to the west of the secondary channel;

- a culvert under the CN Rail Bala Subdivision line, immediately south of Eastern Avenue, at the inlet to the Secondary Channel;
- utility relocation works;
- some soil management works;
- the construction of a large culvert under the railway embankment under the Don Yard;
- the implementation of the East Bank Works; and,
- 25% for engineering and contingencies.

The above cost estimate does not include any cost allowance for:

- the removal of any existing buildings;
- culvert crossings under Bala Subdivision and Bayview Avenue;
- any associated utilities with the roadway; and,
- the preparation of a landscape plan for the flood protection landform.

v) Alternative 5 – River Dredging

The total cost for this option is estimated at $22.5 M, and the associated component works would include the following:

- the lowering of the existing channel bed elevation by approximately 5m from Lake Shore Road to upstream of Queen Street, a distance of approximately 1200 m;
- the installation of a sheet pile wall along both sides of the river between the two locations noted above;
- the earth fill required to create a flood protection landform similar to that described for Alternative 1; however, this feature would lower in elevation, but longer than that associated with Alternative 1;
- utility relocation works;
- some soil management works;
- the implementation of the East Bank Works; and,
- 25% for engineering and contingencies.

No cost allowance has been included for the following works which may/will be required:

- any reinforcement or strengthening works that may be required at the existing bridges;
- relocation of Bayview Avenue;
- any associated utilities with the roadway; and,
- the preparation of a landscape plan for the flood protection landform.

5.4.7 Comparative Evaluation

Table 5.4 summarizes the rankings of the alternatives by criteria group (a ranking of 1 indicates the most preferred).

The identification of the preferred alternative was established based on an evaluation process that involved comparing each of the options in pairs. The details of this comparative evaluation process and the resulting outcome are discussed below.

i) Alternative 1 (Flood Protection Landform) vs. Alternative 2 (Wedge)

With reference to ***Table 5.4***, Alternative 1 was considered equal to, or preferred over, Alternative 2 for all 6 criteria.

As the flood protection landform is physically smaller, it is expected to have less environmental effect. From an engineering perspective, the flood protection landform is considered to be more flexible, is less complex, and would have less effect on existing infrastructure/utilities.

Table 5.4 - Summary of Alternatives Ranking by Criteria Group

Assessment Group	Alternative 1 Landform	Alternative 2 Wedge	Alternative 3 River Widening	Alternative 4 Secondary Channel	Alternative 5 River Dredging
Physical	1	1	1	1	5
Biological	1	3	3	1	5
Cultural	2	5	3	4	1
Socio-economic	1	2	2	2	2
Engineering	1	2	4	3	4
Cost	1	2	3	3	3

While the wedge option was considered to have the lowest risk of failure (essentially none), the flood protection landform is also considered virtually risk free. From a cost perspective, the flood protection landform is significantly less expensive.

From the foregoing, on an overall basis, Alternative 1 (Flood Protection Landform) is considered preferred over the Alternative 2 (Wedge).

ii) Alternative 1 (Flood Protection Landform) vs. Alternative 3 (River Widening)

Alternative 1 was considered equal to, or preferred over, Alternative 3 for all 6 criteria (Refer to ***Table 5.4***). Alternative 3 (River Widening) is expected to result in substantial effects to the natural environmental, social environment and infrastructure in the area as a significant amount of the existing bank area would need to be removed. Existing infrastructure such as the CN Rail tracks, the Don Valley Parkway, electrical substation, as well as crossing structures could be affected by this option due to the proximity of these features to the Lower Don River.

The river widening option is also considered to be more technically challenging and is expected to involve significantly higher costs.

Accordingly, Alternative 1 is considered preferred over Alternative 2.

iii) Alternative 1 (Flood Protection Landform) vs. Alternative 4 (Secondary Channel with Flood Protection Landform)

Alternative 1 was considered equal or preferred over the secondary channel option for all 6 criteria.

The key disadvantages of the secondary channel option include the potential for impact on archaeological features as well as the Keating Channel, which has been identified as a historic landscape/historic structure. Other disadvantages of the secondary channel option include its limiting effect on the creation of open space lands in the West Don Lands and the naturalization options for the Don River Mouth. The secondary

channel alternative is also considered more complex to build and would require the new channel to cross under the Bala Subdivision rail line. It is also considered to have a higher risk of failure due to the potential for sedimentation in the channel that could require future dredging.

Based on the above, Alternative 1 is considered preferred by a significant margin over Alternative 4.

iv) Alternative 1 Flood Protection Landform) vs. Alternative 5 (River Dredging)

As can be noted from ***Table 5.4***, Alternative 1 was preferred over, Alternative 5 for 5 of the 6 criteria.

The dredging/deepening of the Lower Don River channel would have greater biophysical/ environmental impacts due to increased sediment loads that would affect aquatic habitat. The option also provides no opportunity for enhancement of terrestrial habitat and recreation opportunities along the banks of the river. Dredging activity would also need to be carried out over the long term, causing disruption to the aquatic environment and users of the area on a continual basis. The option may not be compatible with the long term intentions to naturalize the mouth of the Don River, and would impose serious restrictions on the range of options that could be pursued.

From a technical perspective, the dredging option is considered to have a higher risk of failure due to the long term maintenance that is required to ensure its hydraulic capacity is not compromised. The need for new sheet piling along the banks also increases the complexity to implement this alternative.

In addition to the higher capital costs, the long term maintenance requirements will further increase the cost disadvantage associated with Alternative 5.

The only advantage offered by Alternative 5 over Alternative 1 is the low potential it would have in regard to disrupting cultural heritage features. This was not considered to be an overwhelming advantage, as the effect to cultural resources from the Alternative 1 is quite minor and can be readily mitigated.

For these reasons, Alternative 1 is considered to be significantly preferred over Alternative 5.

5.4.8 Summary of Evaluation

Based on the comparative analysis that was conducted, Alternative 1 (Flood Protection Landform with East Bank Works and Culvert) emerged as the preferred solution for achieving the flood protection to the Regulatory Flood standard for the 210 hectares of land that comprise Spill Zone 3. Key advantages of this alternative include:

- minimal noise and air quality effects during the operation period;
- allows for opportunities for clean-up of contaminated lands in the West Don Lands;
- enhances sediment transport in the Lower Don River;
- results in limited loss of vegetation and will facilitate the creation of new habitat and linkages;
- produces only limited effects on the aquatic habitat;
- limited effects on archaeological features;
- creates an opportunity to enhance the landscape/views;
- minimal effect on existing land use;

- allows opportunities to enhance greenspace/ recreation areas;
- poses no constraints on future efforts to natural the Lower Don River;
- highly adaptive and can readily be modified to respond to future changes in river flows that may arise due to climate change;
- is of comparatively low complexity and can be readily implemented;
- the associated risk of failure is assessed as being low;
- the associated extent of utility relocation is limited; and,
- it has the lowest capital and maintenance costs of all alternatives considered.

As a result of the above advantages, and the absence of any significant off-setting disadvantages, Alternative 1 (Flood Protection Landform with East Bank Works and Culvert) is considered preferred.

In presenting this option as the preferred alternative to the public (Open House #3 and on the TRCA web site), there was general support for the option with no comments received suggesting that it should not be pursued.

6.0 FUNCTIONAL DESIGN & ENVIRONMENTAL ASSESSMENT

6.1 Introduction

A key element of the environmental assessment process is the assessment of the potential for negative and positive effects on the natural and human environment, and the identification of suitable mitigation measures.

As the initial step in this regard, the functional design of the preferred alternative was undertaken to establish and define the details of each component of the overall flood remedial project.

This section begins with a description of the functional design of the component works that comprise the remedial flood protection project. Included in the discussion is a detailed account of a refinement that was undertaken to the preferred alternative, and the technical and field investigations that have been carried out in support of the undertaking. As a result of these activities, a ***bridge extension option*** was ultimately selected as the preferred method for providing the needed hydraulic capacity through the CN Rail embankment.

Following the above is a description of the specific elements of the proposed works and the results of the environmental assessment of the undertaking, which was based on the criteria contained within the *Conservation Ontario Class Environmental Assessment*, and included physical, biological, cultural, socio-economic, and engineering/ technical considerations.

A discussion is then provided on the recommended mitigation approaches and measures that should be incorporated into both the construction and operation phase of the remedial flood protection project.

6.2 Refinement of the Preferred Alternative

As part of the preliminary development of the conceptual design for the remedial flood protection project, a re-assessment was carried out for all individual component works to confirm constraints and details.

A significant outcome of this project review was the need to confirm a major constraint affecting the opportunities available for providing additional capacity through the CN Rail embankment. Previous studies indicate that the presence of Hydro One Networks ducts at this location significantly constrain the type of structure that is feasible due to the prohibitive cost associated with any realignment of the electrical cables/ducts.

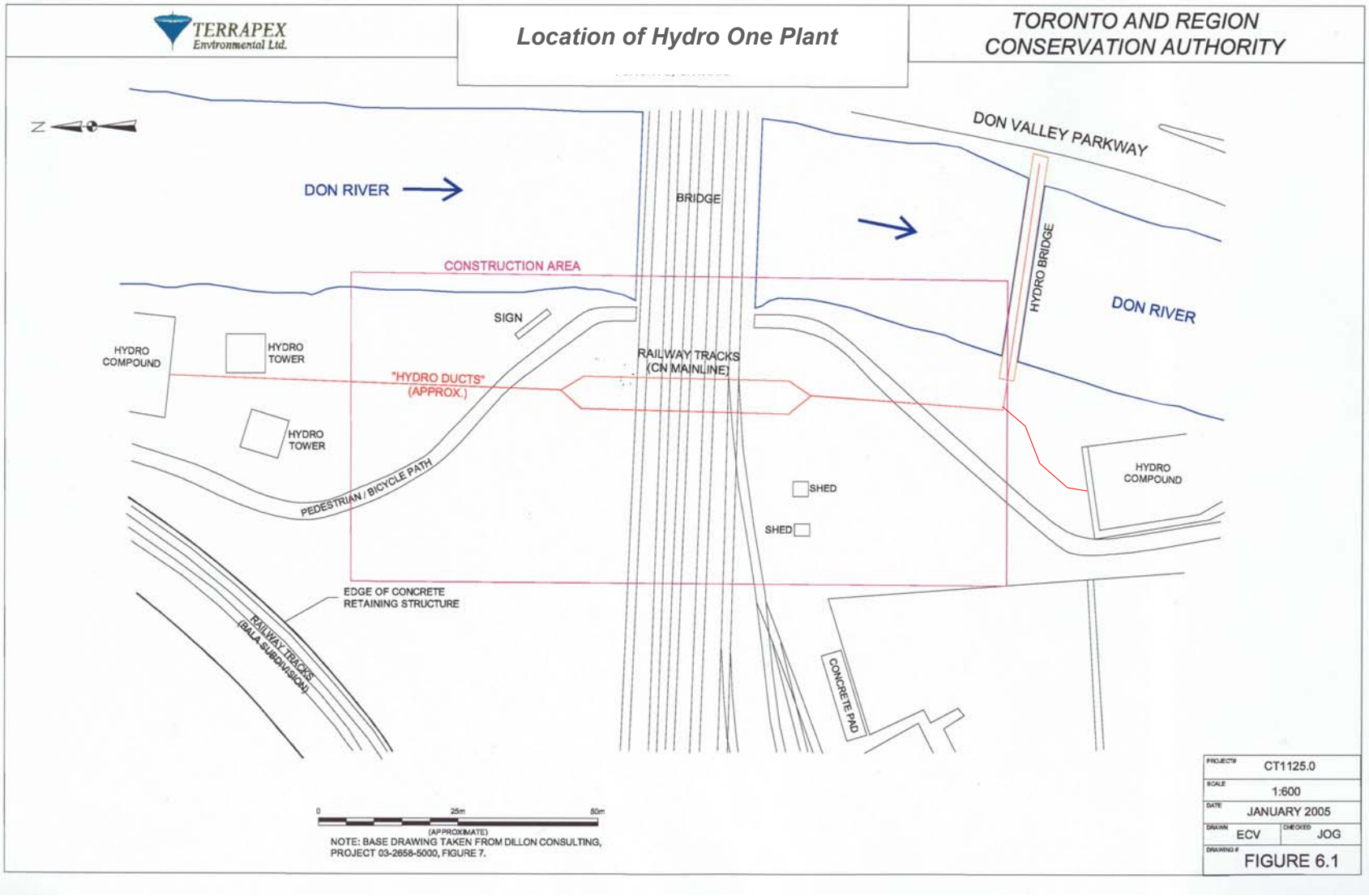
Discussions were pursued with Hydro One Networks regarding this item, and subsequent investigations by Hydro One resulted in a significant reduction in the original cost estimate for the relocation works.

Through the on-going consultations that were held with CN Rail, it become apparent that field work was needed to establish the geo-environmental and geotechnical characteristics of the subsurface conditions at the proposed location for the culvert.

A detailed discussion of the efforts associated with the above activities and the results are described in the following sections of this report.

6.2.1 Hydro One Networks Plant

Underground Hydro One Networks cables and ducts were constructed in 1964 between the Mill Street Junction hydro substation located north of the CN Rail line, and the Don River Junction hydro substation located to the south. As shown on ***Figure 6.1***, the underground cables extend parallel to, and along the west bank of the Don River, and cross the CN Rail embankment almost perpendicularly (90° 42').


TERRAPEX
Environmental Ltd.
Location of Hydro One Plant
TORONTO AND REGION
CONSERVATION AUTHORITY
N
DON RIVER
BRIDGE
DON VALLEY PARKWAY
HYDRO BRIDGE
DON RIVER
CONSTRUCTION AREA
SIGN
HYDRO
COMPOUND
HYDRO
TOWER
"HYDRO DUCTS"
(APPROX.)
RAILWAY TRACKS
(CN MAINLINE)
HYDRO
TOWER
PEDESTRIAN / BICYCLE PATH
SHED
SHED
HYDRO
COMPOUND
EDGE OF CONCRETE
RETAINING STRUCTURE
RAILWAY TRACKS
(BALA SUBDIVISION)
CONCRETE PAD
0
25m
50m
(APPROXIMATE)
NOTE: BASE DRAWING TAKEN FROM DILLON CONSULTING,
PROJECT 03-2658-5000, FIGURE 7.
PROJECT# CT1125.0
SCALE 1:600
DATE JANUARY 2005
DRAWN ECV
CHECKED JOG
DRAWING # FIGURE 6.1

This high voltage plant was laid in two groups of three cables. On the north side of the embankment, both cable groups are protected by concrete tiles. On the south side, protection is provided by encasement in a concrete envelop. The ground cover over both groups is in the order of 1.1 m.

In the immediate vicinity of, and through the CN Rail embankment, the cables are located in two timber boxes that are spaced 3.5 m apart (centre to centre), and have dimensions of 1.22 m wide by 1.47 m high by approximately 45 m long. Additional information on this electrical plant can be found in ***Appendix J***.

During the initial stages of developing alternatives for the project, two methods for increasing the hydraulic capacity through the CN Rail embankment emerged as the most likely solutions: the installation of a multi-cell culvert structure; or augmenting the waterway opening of the existing bridge through the provision of an additional bridge span, hereinafter referred to as the ***bridge extension option***. Due to the prohibitive constraints on the east bank (i.e., Don Valley Parkway etc.), regardless of which structure was considered, the structure would need to be located on the west bank of the Don River.

The technical analyses for the bridge extension option (i.e., the provision of an additional span) confirmed the results of previous studies. To achieve the needed hydraulic capacity with this option, the relocation of the Hydro One Networks cables and ducts would be necessary. Information presented in the *West Don Lands Flood Protection and Related Issues Study (MMM, 2000)* indicates that the relocation of the electrical plant would be in the order of $10 M, which rendered the bridge extension option prohibitively costly (the cost estimate was provided to MMM by Hydro One in 1991 and reconfirmed in 1994). The most significant component of the high cost ($8 M) was the need to install and maintain a back-up power supply system while the plant relocation was being carried out (personal communication – MMM).

During the latter stages of this Environmental Assessment, additional discussions were held with Hydro One Networks to reconfirm their requirements and anticipated costs in regard to the plant relocation. Hydro One Networks reviewed and investigated the details and issues associated with the relocation and established a Class C (planning level) cost estimate of $2.2M for completing the works. This information is outlined in their letter of November 17, 2004, which is attached in ***Appendix C*** of this document.

Overhead cables in this area extend above the CN Rail Kingston Subdivision and Bala Subdivision lines from existing towers located on the south and north side of embankment.

A request was made of Hydro One Networks to assess the need for any temporary and/or permanent relocation of this plant to facilitate works (for both the culvert and bridge extension options) at the CN Rail embankment, and determine a preliminary cost estimate. As noted in their response letter, there is inadequate information available in regard to the exact location of the overhead cables, and as such a determination of the scope of works and costs was not available at the time of submission. Hydro One Networks indicated that field survey work should be conducted to establish the position of the overhead cables.

6.2.2 Geo-Environmental/Geotechnical Investigations

Given the complexity of the staging sequence for construction of the culvert, the potential effects on scheduling, and concerns expressed by CN Rail, GO Transit and Toronto Terminals Railway (TTR), detailed foundation investigations were initiated as part of this Environmental Assessment. The concerns expressed by the rail transportation agencies related to constructability

issues included construction methods, the geotechnical characteristics of the native materials, potential dewatering requirements and the nature of the geo-environmental conditions at the site. All of these factors could affect the construction scheduling and ultimately lead to service delays during the construction period.

Accordingly, Terrapex Environmental Ltd. and Terraprobe Ltd. were retained to undertake the geo-environmental/geotechnical investigations and analyses. The objectives of the investigations were to establish the subsurface conditions at the site, and assess their effects on the design and construction of the proposed culvert or bridge extension work with regards to soil disposal, foundation requirements, temporary track protection requirements and methods to control dewatering.

A detailed account of the investigations that were conducted, the results of the technical analyses and the associated conclusions and recommendations are documented in individual reports for each component of the work. A copy of each document is attached in ***Appendix J***.

An overview summary of each component is provided in the following discussion.

i) Geo-Environmental Site Assessment

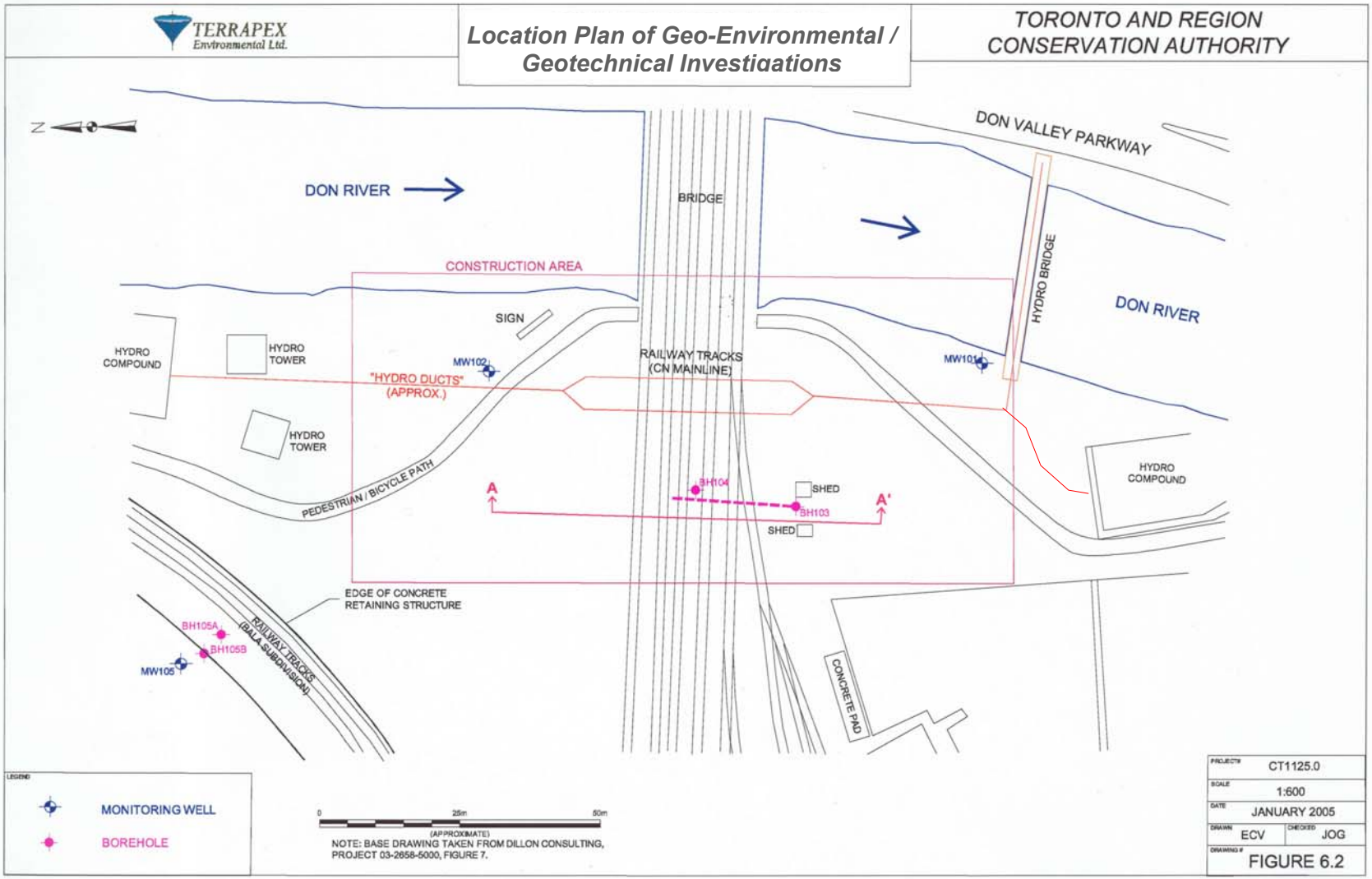
The study area for both components comprised an area adjacent to the Don River, approximately 160 m long and 80 m wide, as shown on ***Figure 6.2***. Boreholes and investigations were also carried out in the vicinity of the CN Bala Subdivision in anticipation that a pedestrian underpass will be installed, as per the recommendations of the West Don Lands Precinct Plan. While field information was collected that will assist in the planning and design of the underpass, it does not form part of the undertaking that is the subject of this Environmental Assessment.

The scope of work related to the hydraulic structure included:

- the drilling of four boreholes in the area, two of which were instrumented as monitoring wells;
- coring of bedrock to a depth of 3 m in one borehole;
- sampling soil and groundwater; and,
- conducting field hydraulic conductivity tests on one of the monitoring wells.

The results of the investigations revealed the following site characteristics and conditions.

- Fill, consisting predominantly of loose sand and gravel, with some cinders and organic material, was encountered at all borehole locations to depths varying from 2.2 m to 9.8 m below grade. A cross section through the site is presented on ***Figure 6.3.***
- The native soil beneath and on the north side of the CN Rail line generally ranges from loose sand to loose silty fine sand.
- The native soil on the south side of the CN Rail line generally consists of silty clay to clayey silt. Auger refusal or confirmed bedrock was encountered at depths of between 11.1 m and 25.0 m. Based on this field data, and available bedrock mapping, it is apparent that the site is located at the edge of a bedrock valley.
- The depth to groundwater in the two installed monitoring wells ranged from 1.8 to 3.5 m below grade.


TERRAPEX
Environmental Ltd.
Location Plan of Geo-Environmental / Geotechnical Investigations
TORONTO AND REGION CONSERVATION AUTHORITY
N
DON RIVER
BRIDGE
DON VALLEY PARKWAY
HYDRO BRIDGE
DON RIVER
CONSTRUCTION AREA
SIGN
HYDRO COMPOUND
HYDRO TOWER
HYDRO TOWER
MW102
"HYDRO DUCTS" (APPROX.)
RAILWAY TRACKS (CN MAINLINE)
MW101
HYDRO COMPOUND
PEDESTRIAN / BICYCLE PATH
A
BH104
SHED
A'
BH103
SHED
EDGE OF CONCRETE RETAINING STRUCTURE
BH105A
BH105B
MW105
RAILWAY TRACKS (BALA SUBDIVISION)
CONCRETE PAD
LEGEND
MONITORING WELL
BOREHOLE
0
25m
50m
(APPROXIMATE)
NOTE: BASE DRAWING TAKEN FROM DILLON CONSULTING, PROJECT 03-2658-5000, FIGURE 7.
PROJECT# CT1125.0
SCALE 1:600
DATE JANUARY 2005
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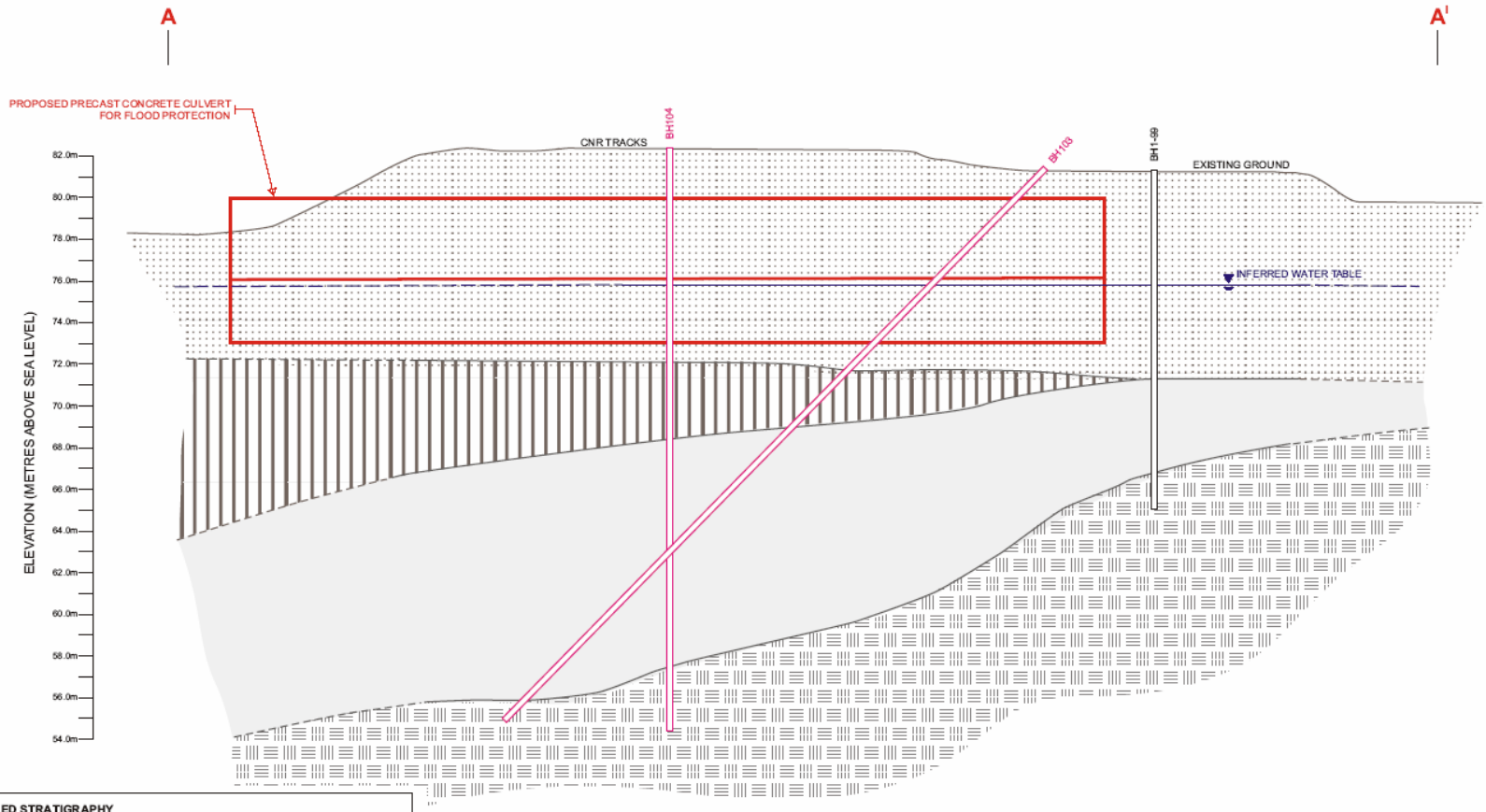
DRAWING # FIGURE 6.2

TERRAPEX Environmental Ltd.

Generalized Stratigraphy

CLIENT: TORONTO AND REGION CONSERVATION AUTHORITY



NOTE: GROUND ELEVATION AND PROPOSED CULVERT DETAILS TAKEN FROM FIGURE 3, LOWER DON RIVER WEST REMEDIAL FLOOD PROTECTION PROJECT, CULVERT CONSTRUCTABILITY REPORT, DRAFT3, SEPTEMBER 13, 2004, URS.

PROJECT #	CT1125.0
SCALE	1:200
DATE	JANUARY 2005
DRAWN	ECV
CHECKED	JOG
DRAWING #	FIGURE 6.3

- As requested by TRCA, the results of the laboratory analyses were compared to the Ministry of the Environment generic standards for parkland use in a potable groundwater situation, as applicable, found in Table 2 of the Soil, Groundwater and Sediment Standards for Use Under Part XV.1 of the Ontario Environmental Protection Act (O. Reg. 153/04).

- Due to the proximity of the site to the Don River (i.e., within 30 m), a risk assessment may be required to demonstrate that the generic criteria are sufficiently protective.

- The MOE standards for parkland use were exceeded for the following parameters for at least one sample: antimony, copper, lead, zinc, several PAHs and petroleum hydrocarbons.

- The concentrations of all VOCs, including BTEX and PCBs, in all soil samples analyzed were well below the applicable standards.

- Based on the results of a TCLP analysis, soil at the site would be classified as non-hazardous for disposal purposes.

The concentrations of all parameters in both groundwater samples analyzed were well below the MOE Table 2 criteria.

The proposed hydraulic structure through the CN Rail embankment would be located within the fill layer, and on a preliminary basis, it is estimated that approximately half of the soil in the embankment which would require excavation consists of cinder-containing fill. If consideration is given to the reuse of this material, thorough testing would be recommended to confirm that it meets applicable standards.

The hydraulic conductivity of the subsurface soil suggests that dewatering of the excavation areas will be required. The groundwater analysis results indicate that groundwater in the vicinity of the proposed culvert is not impacted to a degree exceeding the generic standards for potable groundwater use. The water would be suitable for discharge to a municipal sanitary sewer, provided other parameters meet the City Sewer Use By-Law. All groundwater discharges should be monitored for concentrations of petroleum hydrocarbons as petroleum impacted groundwater is known to be present in the vicinity.

ii) Foundation Considerations

The borehole information indicates that fill would be encountered, and that peat was noted in one borehole between an elevation of approximately 71.3 and 70.4 m. In addition, the presence of debris and organic materials were noted sporadically within the fill. The peat is a relatively highly compressible organic material and is not considered to be suitable for foundation support.

Therefore, due to the presence of peat, organics, debris and inconsistent nature, the fill materials are not considered suitable to support the structure, and should be fully excavated to a design foundation subgrade, or underlying native alluvial soil deposit.

With a wet cohesionless fine and silty sand foundation, and a groundwater level of approximately 2 m below grade or higher than the foundation subgrade, significant dewatering of the excavation area prior to construction will be required to facilitate construction by lowering the static groundwater table by about 1.2 m below the foundation elevation. Unsupported excavation sides will be unstable and experience sloughing and flowing. Further, common dewatering of the entire area, without cut-off sheeting or cofferdams, would likely result in settlement and instability of the rail track embankment.

The proposed culvert would have a closed flat base, and therefore, individual or strip footings

are not required to support the structure. The installation of the closed based concrete culvert will likely not result in a net load increase on the subgrade, and therefore, total and differential settlements should not exceed tolerable limits.

The additional span would be 21.3 m wide and could be supported on deep foundations. Options for deep foundations include caissons and driven piles. It is understood that the existing bridge is supported on driven piles and this is likely to be the most economical and workable solution for an extension of the structure.

iii) Excavation and Groundwater Control

As discussed above, extensive groundwater seepage is expected into the excavations. The volume of water seepage will likely increase with the depth of excavation. This is based on the relatively moderate permeability of the soils, in the order of 10^{-3} to 10^{-4} cm/sec, based on the results of the permeability test.

For excavations extending into the underlying wet soils, or below the water table, it would be necessary to lower the groundwater level below the excavation bases prior to construction, and to maintain that level during the construction period. Accordingly, a more rigorous dewatering (i.e., deep well points) would be required. Additionally, excavations carried out below the water table in cohesionless soil (silt, sand, etc) will experience loosening and sloughing of the base and sides.

Uncontrolled dewatering of the overall area may result in settlement of the existing embankment and adjacent areas, which could compromise the serviceability of the tracks underground utilities and other structures. Due to the proximity of the proposed culvert to the existing CN Rail embankment, river and existing bridge abutment, consideration should be given to conducting dewatering in stages within isolated units in conjunction with appropriate support/shoring systems. This approach would control and mitigate potential off-site effects and adjacent settlement. The pumping requirements would be limited and confined. The support system must be structurally stable to withstand unbalanced earth and hydrostatic pressures (depending on the type of support system), minimize lateral soil movement and not have adverse impacts on the stability of the embankment slope and bridge abutments.

Due to the presence of a relatively high groundwater level, moderately permeable subsurface soils and the close proximity of the river, consideration should be given to erect the structure within a cofferdam. The support system should be extended into the bedrock to facilitate sequential dewatering and construction in stages. Typical temporary support systems consist of soldier piles and logging, caisson walls or sheet walls. It should be noted that caisson walls provide more rigid lateral support for the ground, and may be considered in settlement or stability-sensitive areas. The design and installation of tieback/anchors for the shoring system will be difficult due to loose sand/silt overburden materials and a relatively high water table, and would have to be anchored into the underlying bedrock. The installation of the tiebacks will require casing extending to the bedrock. Shoring could be supported by internal bracing.

The required excavation area and depth, in the case of a bridge abutment supported on driven piles/caissons could be significantly less and be comparatively more manageable than for the culvert option.

iv) Sheetpile Wall Deficiency Report

Terrapex Environmental Ltd. and Terraprobe Ltd. were also retained to undertake a preliminary deficiency report for the sheet pile wall on the east and west banks of the Lower Don River between Queen Street and Lakeshore Boulevard in

Toronto. Results of the deficiency report are included in ***Appendix J***.

In general, the existing sheet pile wall is in moderate condition. There is heavy rusting, especially at the water line, but the wall has maintained most of its structural integrity and is generally plumb. The concrete top of the sheet pile has occasional cracks and exposed rebar. The existing concrete retaining wall is also in moderate condition with occasional cracks and some exposed rebar. Based on the above, the following areas require further assessment and potential remediation:

- A section of the wall consists of gabion baskets over a concrete structure just north of the Enbridge Utility Bridge; and,
- Localized areas of the sheetpile wall have holes at the water line where complete degradation of the steel had occurred. These holes should be repaired to eliminate the potential for a sinkhole and ground loss behind these holes.

6.2.3 Bridge Extension Option for Additional Hydraulic Capacity (Selected as Preferred Option)

Given the considerable reduction in the cost of relocating the Hydro One Networks underground plant, and the relatively unfavourable geotechnical conditions, the bridge extension option was revisited as a potential solution for providing the additional hydraulic capacity.

Accordingly, conceptual designs were prepared for both the multi-cell culvert and bridge extension options. This was followed by a detailed comparative evaluation of both options (refer to ***Section 6.5.4***), which ultimately resulted in the selection of ***bridge extension option*** as the preferred solution.

The design concepts that were developed for both options (multi-cell culvert and bridge), together with the detailed assessment, and the rationale for adopting the bridge extension option, are presented and thoroughly discussed in Section 6.5 of this report.

6.3 Project Description

The preferred flood protection alternative is comprised of the following five elements, which are presented in ***Figure 6.4***.

- A flood protection landform on the west side of the Lower Don River;
- Flood protection works on the east bank of the Lower Don River;
- An additional span (21.3 m) attached to the west abutment of the existing CN Rail bridge over the Don River (bridge extension option);
- Continued dredging of the Keating Channel as per the requirements of the Keating Channel Environmental Assessment (*Acres, 1983*); and,
- Modifications to the Enbridge Utility Bridge.

6.4 Design Requirements for the Flood Protection Landform

6.4.1 Provincial Context

The concept of implementing a dyke or earth fill structure to eliminate the risk of flooding to the lands along the west bank of the Don River south of Queen Street was originally identified within studies associated with the former Ataratiri project.

The Ataratiri project was an initiative of the Province of Ontario and the City of Toronto beginning in 1989, and continuing through 1991, to develop a site for affordable housing. The chosen location was west of the Lower Don River, and north of the CN Rail line, on 38 ha of land now known as the West Don Lands.

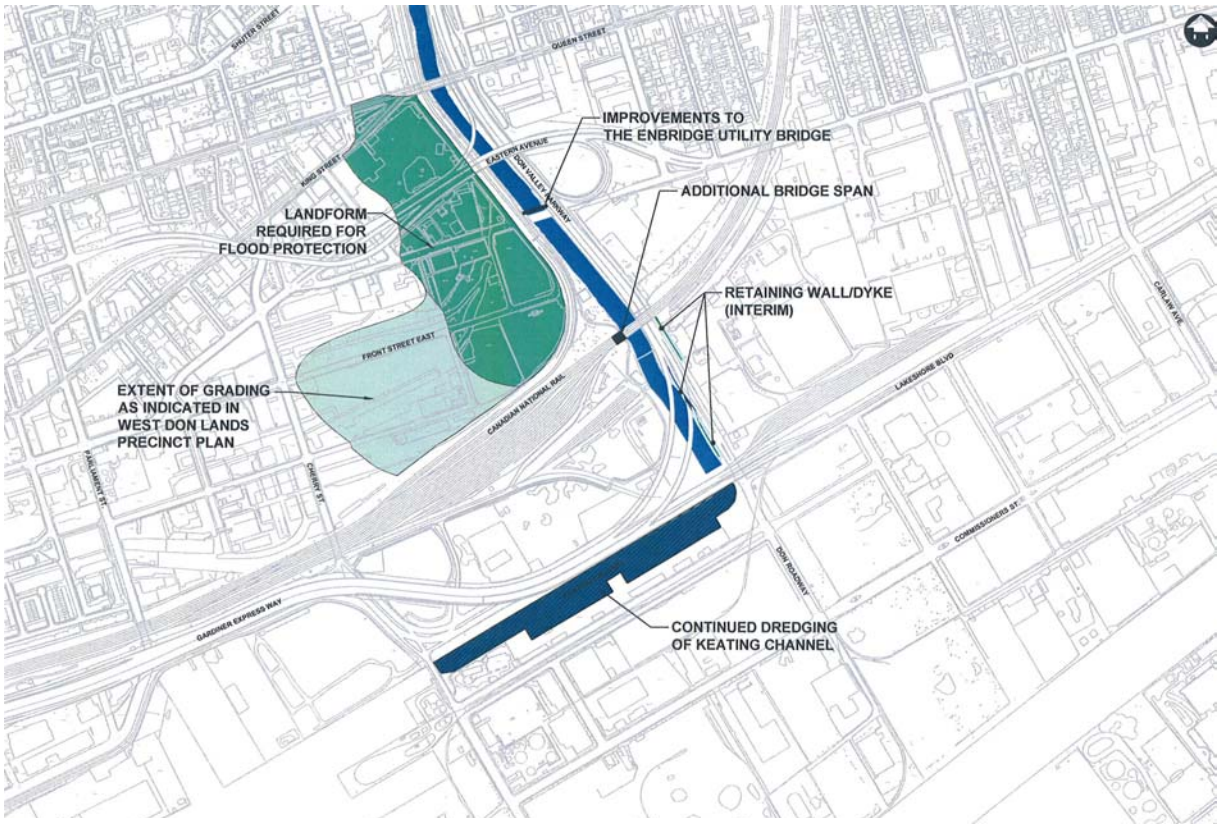


Figure 6.4 – Remedial Flood Protection Project, Component Works

The Province of Ontario, through the Ministry of Natural Resources, indicated that to develop the site for affordable housing, it would be necessary to completely and permanently eliminate the risk of flooding. To accomplish this objective, any proposed remedial works would need to be designed to remove all flood risk.

The *Provincial Natural Hazards Policy* which includes flooding is implemented using the *Rivers and Streams Performance Standards and Technical Guidelines*, published by the Ministry of Natural Resources in April of 2001. This guideline document clearly states that an earth fill dyke, or similar structure, is not considered as a form of permanent flood control and that if used, additional flood protection, such as floodproofing of individual structures, would be necessary behind the dyke. This position is based on the risk related to the failure modes that are inherent in the typical design of a dyke structure.

With a dyke, three principal modes of failure exist:

i) *Dyke overtopping* - floodwaters can overtop the structure and erode its dry side, leading to the potential failure of the fill;

ii) *Dyke saturation* - the movement of water through or under the dyke can result in the saturation of the dyke and failure; or,

iii) *Boils* - the movement of water through or under the dyke can produce what are termed boils, which develop at the toe of the dry side of the dyke as water re-surfaces, creating an ever increasing flow as fines beneath the

dyke are removed, and finally resulting in failure of the fill.

The risk of failure due to the modes described in *ii)* and *iii)* above can be aggravated by either man made or natural intrusions into the earth fill, by burrowing animals, deep rooted vegetation, buried servicing (sewers) and building foundations.

As part of the Ataratiri design, to address each of these risks of failure, the earth dyke was modified to minimize each element of risk to the degree that was technically feasible. The height of the fill was raised and the slope on the east, or wet side, was set at gradients between 3- 10%. The width of the top of the earth fill was widened to include a provision for construction access (3-5m), and also to accommodate potential surface transportation requirements (15 - 20m), if and where Bayview Avenue would need to pass over the fill.

On the west, or dry side of the earth fill, gradients were set to meet the technical needs of eliminating the erosive potential should an overtopping occur. These ranged from 1.5 - 2.5% on average, with up to a 5% grade in some localized areas to accommodate site specific requirements, should the need arise.

To address the potential failure due to overtopping, along the north site boundary, where the earth fill would be shallower, along King Street, the base width would range from approximately 70m to 120m prior to the inclusion of factor of safety. At the southern end of the site, where the height of the earth fill would be over 3m, the base width would range from approximately 100 - 300m to address the risk of failure associated with overtopping - with no factor of safety applied.

The second and third mode of failure, i.e., saturation of the fill embankment, and the creation of boils can be readily managed through the selection of suitable construction material for the fill and by achieving proper compaction. In addition, the integrity of the fill must be maintained by ensuring that no buried servicing is allowed within the fill and landscaping features are limited to shallow rooted materials to avoid the creation of deep fractures.

The concern of water traveling beneath the fill is a more complex issue. Short of removing all materials to bedrock and having this replaced with impermeable material, the rate of water movement through the underlying soils is somewhat difficult to assess with accuracy. The area is composed of fill, placed historically to extend the existing landform, and there is essentially no information available regarding its' permeability to subsurface flows under different hydraulic conditions in the Don River.

In addition to these unknowns, existing stormwater outfalls pass under the area where the flood protection landform was envisioned, which create additional challenges. While primary and back-up flow control gates can be placed to minimize the risk of floodwaters backing up through these sewers and flooding the area west of the flood protection landform, a threat of groundwater moving along the outside of these conduits in a form of piping creates a more complicated design issue.

To determine the extent of movement both under and along any existing infrastructure, a review of the hydraulic conditions was undertaken. Flooding is anticipated to occur along the wet (east) side of an earth fill dyke starting at flood frequencies between the 50 to 100-year event. A review of the hydrograph for the Regulatory Flood reveals that floodwaters could be in contact with the wet side of the of the dyke for up to 20-25 hours based an uninterrupted passage of floodwaters. Assuming a relatively permeable and unconsolidated material beneath the dyke, and a head of 3m on the wet side, the application of Darcy's equation suggests rather moderate

penetration by floodwaters would be anticipated, i.e., in the range of several metres.

As such, this mode of failure would reflect a minor overall risk, given the widths of fill necessary to meet the needs established for the risk of overtopping. In regard to the threat of a piping occurrence, again, the initial penetration that would be anticipated would be in the range of only several metres resulting in similar risks as the floodwaters travel under the flood protection landform.

Given the range in design width related to minimizing the risk of floodwaters both overtopping and undermining an earth fill dyke, a design criteria was jointly established by all levels of Government that would allow an earth fill embankment to be considered as a permanent flood protection measure for the Ataratiri project. With a footprint that could potentially range from between 100 to 300m, a reasonable footprint width of 120m was adopted for the purpose of identifying and protecting a minimum land base for any future flood remedial works. This would be in addition to that required for the implementation of the hydraulic floodway.

The dimensions required for the earth fill landform to protect against the three modes of failure are significant such that it no longer resembles a typical dyke structure, and hereinafter will be referred to as a ***flood protection landform***.

In summary, the following outlines the design criteria/principles associated with the flood protection landform alternative that would ensure a permanent solution is achieved in accordance with the requirements agreed upon by the various levels of government.

- In order to permanently protect against the three potential modes of failure, the minimum required flood protection landform width is 120m. Given the topography at the northern site boundary, a more detailed review of the area may indicate that a reduced width is acceptable.

- For hydraulic conveyance considerations, the toe of the flood protection landform must be set a minimum of 40m from the west bank edge of the Don River. To improve the overall design and aesthetics of the area, some variation in the setback may be considered, however, hydraulic calculations will be necessary as part of the final engineering work to finalize this detail.

- To ensure the integrity of the earth fill, locating buried utilities (e.g., storm and sanitary sewers) on the flood protection landform should be restricted and regulated. In addition, the placement of deep-rooted vegetation should also be avoided. Any proposed works within the footprint of the flood protection landform should be subject to the approval of the Toronto and Region Conservation Authority.

- Climate change may result in changes within the hydrologic response of the watershed. In order to accommodate these potential changes, the flood protection landform should be constructed in a manner that will allow for it to be adapted to any changes in flow. Current indications related to a changing climate tend to reflect the potential for a higher Regulatory Flood. As such, the land use of the flood protection landform should be flexible in allowing for adaptation through an increase in its height, if required at some time in the future. Some tolerance to climate change has been incorporated into the proposed design concept.

- Fill slopes on the wet (east) side of the flood protection landform should be designed with fill slopes of 3-10%. The dry side fill slopes should be designed with gradients of 1.5-2.5% with a maximum of 5% in localized areas.

- Structure foundations should not encroach onto the 120m footprint.

- Active recreational uses and limited ancillary structures (no foundations) may be permitted on the flood protection landform beyond the 100-year flood line in keeping with the allowable uses as defined within the TRCA *Valley and Stream Corridor Management Guidelines*.

6.4.2 Details of the Flood Protection Landform

Based on the above criteria, the existing topography and the required crest (top of the flood protection landform) elevations, the minimum flood protection landform would have a cross section consisting of approximately a 30m wide eastern slope (on the wet side), a 3 to 5 m wide crest and a 120 m wide western slope (on the dry side). However, this basic configuration has been modified beyond the minimum requirement to meet the needs of other interests in the area.

Through cooperative efforts with the Consultant Team preparing the West Don Lands Precinct Plan, the configuration, dimensions and elevations of the flood protection landform were adjusted and refined to ensure compatibility with the needs for the future redevelopment of the area. The resulting layout of the flood protection landform is shown in ***Figure 6.5***, and typical cross-sections are presented in ***Figures 6.6A*** and ***6.6B***.

The specific elements that have been incorporated into the design are identified below:

- The relocation of Bayview Avenue from the east side of the flood protection landform to the west side in order to remain as a through street by connection to Front Street. The layout of the relocated Bayview Avenue was developed as part of the West Don Lands Precinct Plan.

- The servicing aspects for the water, storm and sanitary sewers, stormwater management and the roadway network are described in the report entitled *West Don Lands, Class Environmental Assessment – Master Plan, March 2004*. The preferred alternative as identified in the Master Plan document was incorporated into the functional design of the flood protection landform.

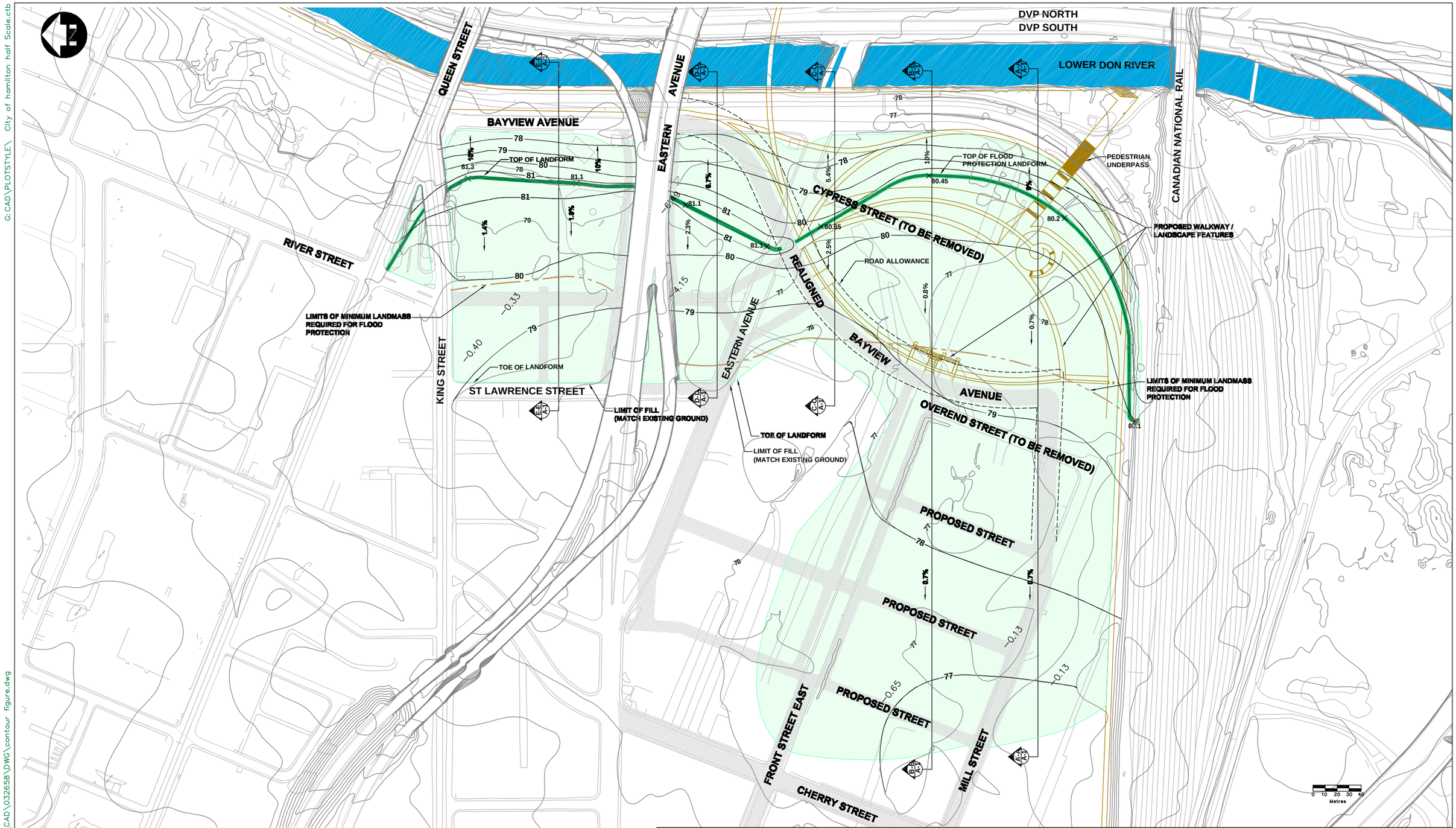
- The proposed landscape concept and features for the parkland block between the relocated Bayview Avenue and the Don River as presented in the West Don Lands Precinct plan have been included in ***Figure 6.5*** to provide a complete representation of the landscape following the implementation, and to illustrate the integration of the flood protection landform with the Precinct Plan.

- For the same reasons as discussed above, the proposed redevelopment of lands west of the realigned Bayview Avenue and at the south end of the flood protection landform are reflected in ***Figure 6.5***, together with the proposed layout of the future redevelopment of this area.

- It is noted that the elements of the West Don Lands Precinct Plan are shown on the ***Figures 6.5, 6.6A*** and ***6.6B*** for completeness, but do not form part of this Class Environmental Assessment (e.g., the additional fill required in conjunction with servicing of the southern part of the Precinct Plan area. A separate EA or Class EA will be undertaken by the TWRC to address these items:

  – the pedestrian bridge over the Don River south of Eastern Avenue; and,

  – the pedestrian underpass through the CN Rail Bala Subdivision.



NOTES:

1. PROPOSED WALKWAY/LANDSCAPE FEATURES AS PRESENTED IN WEST DON LANDS PRECINCT PLAN.
2. REALIGNED BAYVIEW AVE AS PRESENTED IN WEST DON LANDS CLASS ENVIRONMENTAL ASSESSMENT MASTER PLAN.
3. AREA EXTENT OF FLOOD PROTECTION LANDFORM WEST OF REALIGNED BAYVIEW AVE AS PRESENTED IN WEST DON LANDS PRECINCT PLAN.

DILLON CONSULTING

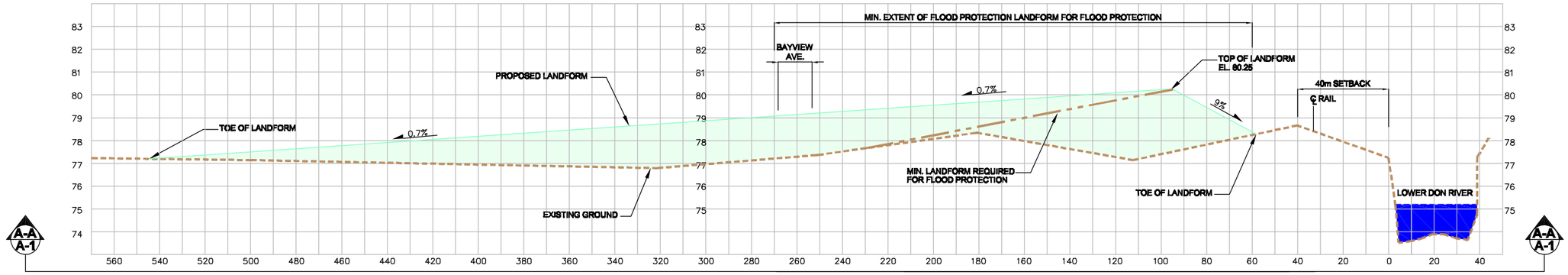
Lower Don River West
Remedial Flood Protection Project

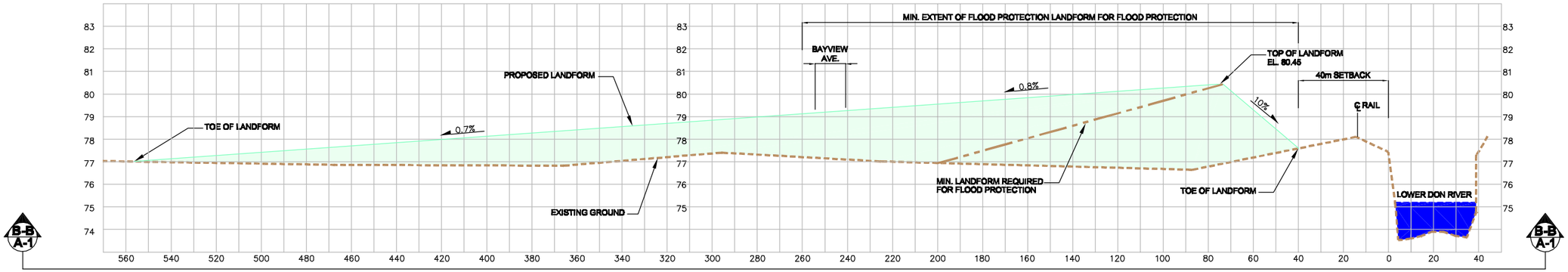
FLOOD PROTECTION LANDFORM PLAN

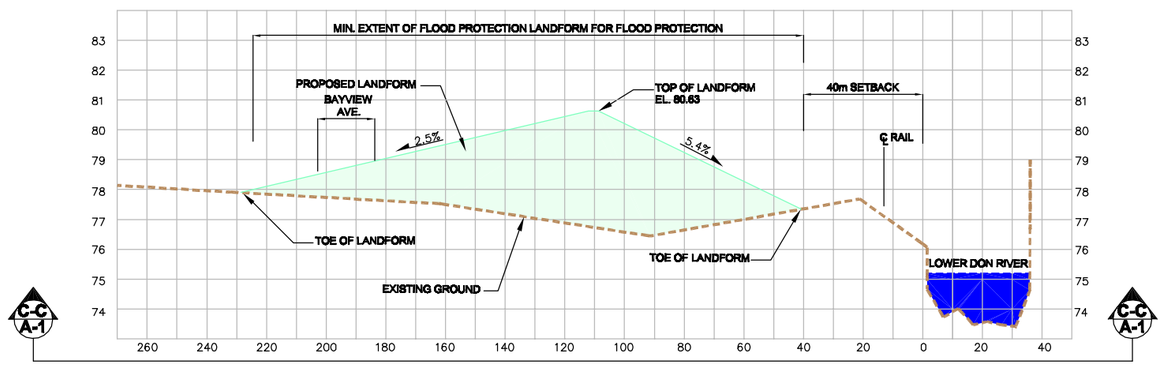
PROJECT NO. **03-2658-5000**

FIGURE NO. **6.5**

DATE: **NOVEMBER 2004** | DRAWN BY: **TJH** | CHECKED BY: **HCD**







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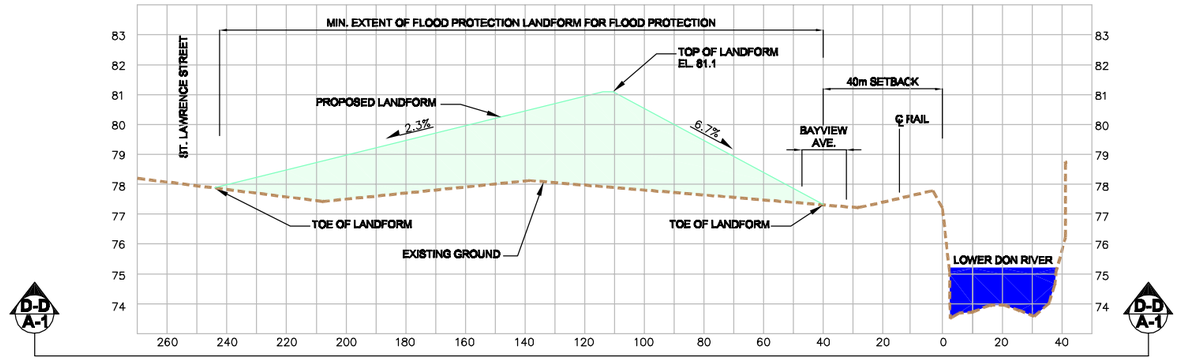
Lower Don River West
Remedial Flood Protection Project

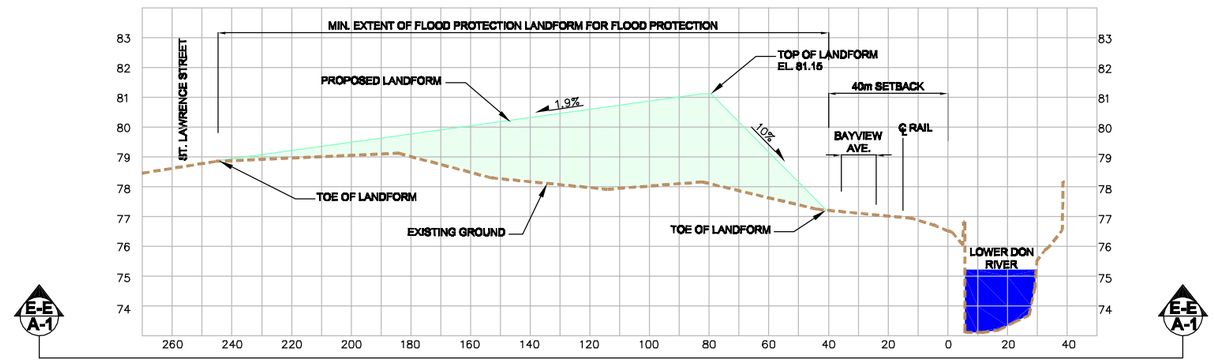
FLOOD PROTECTION LANDFORM CROSS SECTION (SOUTH END)

PROJECT NO. **03-2658-5000**

FIGURE NO. **6.6A**

DATE: **NOVEMBER 2004** | DRAWN BY: **TJH** | CHECKED BY: **HCD**





DILLON CONSULTING

Lower Don River West
Remedial Flood Protection Project

FLOOD PROTECTION LANDFORM CROSS SECTION (NORTH END)

PROJECT NO. **03-2658-5000**

FIGURE NO. **6.6B**

DATE: **NOVEMBER 2004** | DRAWN BY: **TJH** | CHECKED BY: **HCD**

The inclusion of the additional earth fill for servicing purposes has affected the flood protection landform by making it larger than the minimum required meeting the design standards for flood protection considerations. In the area between King Street and just south of Eastern Avenue the western slope of the flood protection landform has been reduced to incorporate the reconstruction of the area to St. Lawrence Street as per the West Don Lands Precinct Plan.

South of Eastern Avenue, the crest of the flood protection landform has been shifted west to allow for a suitable slope on the east side of the landform where the relocated Bayview Avenue crosses over the flood protection landform. Bayview Avenue has been relocated further west once it crosses the crest of the landform to accommodate the proposed park and landscaping features.

6.4.3 Grading Considerations

The final configuration of the flood protection landform has a crest elevation of 81.5 m at the northern limit where the proposed crest would tie into the existing grade near the southeast corner of Queen Street and River Street. The crest will then angle southeast to King Street at which point it will head south. At this location the flood protection landform is designed to be offset from the existing Bayview Avenue which would remain at its current location.

The wet (east) side of the flood protection landform is designed to be at a 3 to 10% slope from the existing ground to its crest elevation, which would vary in elevation from approximately 81.3 to 81.1 m north of Eastern Avenue. The slope on the dry side will vary from approximately 1.5 to 2.5%. The flood protection landform will meet the existing Eastern Avenue embankment on the north and south sides.

South of Eastern Avenue, the crest of the flood protection landform shifts to the southwest to allow for more moderate road grades for the relocated Bayview Avenue which will cross the flood protection landform in this area. Slopes of the flood protection landform vary from 5.4 to 8.7% in this area on the wet side and approximately 2.5% on the dry side. South of the Bayview Avenue crossing, the crest would swing back to the west. The crest elevations in this area range from 81.1 m at Eastern Avenue to 80.5 m.

The wet side of the flood protection landform is designed to continue at the maximum design slope of 10% on the wet side; however it would be flatter on the dry side in order to match the layout of the West Don Lands Precinct Plan. The crest elevations would vary from approximately 80.5 m at Eastern Avenue to 80.1 m where the crest would meet the existing embankment of the CN Rail line.

The height of the flood protection landform, from existing ground to the crest, is generally in the range of 3.0 to 3.5 m. And, throughout its length the toe of the flood protection landform is set back a minimum of 40 m from the west bank of the Don River.

The earth fill for both the flood protection landform and to accommodate the servicing requirements for the West Don Lands would occupy an area of 20 ha. (Refer to ***Figure 6.5***).

The land area required solely for the flood protection aspects would cover approximately 15 ha. North of Eastern Avenue, the flood protection landform would have a typical width of some 180 m. South of the roadway, its western boundary would expand to incorporate the realigned Bayview Avenue and the parkland (Don Park) by the West Don Lands Precinct Plan.

The additional fill area needed to accommodate the servicing requirements is located primarily between Front Street and the CN Rail property, and extends over a 5 ha site. At this location, the total fill area has an overall width that exceeds 500 m. As previously noted, the additional earth fill is not required for achieving the flood

protection objectives.
The total earth fill required to construct the flood protection landform is estimated to be approximately 170,000 m^3, and an additional 30,000 m^3 of fill material would be needed in the West Don Lands Precinct Plan to achieve the required grading for servicing purposes.

6.4.4 Landform Composition

The final composition of the flood protection landform will be determined during the detailed engineering phase based on the findings and recommendations of the following investigations:

- geotechnical investigations that should be undertaken to support the final engineering work; and,
- the West Don Lands (WDL) Soil and Groundwater Management Strategy (SGMS).

To facilitate the implementation of the West Don Lands Precinct Plan and the construction of the flood control landform, the TWRC has initiated the West Don Lands Soil and Groundwater Management Strategy (SGMS) to address the management of subsurface environmental conditions. It is expected that the SGMS will implement a network of groundwater monitoring wells to quantify and delineate the extent of groundwater contamination. With this information, groundwater remedial solutions will be developed to address contaminant sources and remaining groundwater contamination. These approaches could include source removal, in-situ bioremediation or chemical oxidation/reduction, permeable reactive barriers, and monitored natural attenuation.

The SGMS will focus on the development of affordable management solutions of subsurface environmental conditions. The first stage will involve the compilation of all available West Don Lands soil and other environmental information into a database to identify data gaps.

Additional data to overcome critical data gaps will be collected. It is envisioned that solutions will include development of site-specific criteria to reduce soil volumes, on-site soil management and possible reuse. In addition anticipated in-situ /ex-situ remedial approaches, to manage contaminated soils left in place and allow the reuse of excavated soils, include bioremediation, chemical oxidation/reduction, and stabilization. It is expected that the SGMS can be developed to be compatible with the currently proposed design for the flood remediation works and not result in significant alteration to this design.

Considering that a majority of the area is to be converted into parkland, the flood protection landform would need a topsoil layer. The composition beneath the topsoil layer could use clay or another low permeability layer (or cap) across the flood protection landform, which would prevent the seepage of water during storm events. The core of the flood protection landform, beneath the cover of the clay layer, would consist of suitable material that meets the identified engineered needs. The alternative would be a clay or other low permeability material core keyed into the existing soil and fill, and supported on the wet and dry sides by suitably graded and compacted material. This second alternative would use a smaller volume low permeability material and may cost less than the capping approach.

Due to the amount of material necessary for the construction of the flood protection landform, it is anticipated that the majority of it will need to be imported. Onsite material may be used if it fits the necessary criteria however little cut is proposed so this volume would be minimal.

Some excavation would likely be needed in order to key the flood protection landform into the existing subgrade for stability purposes and also to help prevent the seepage of groundwater.

The specific depth and location of any excavation will depend on the final design and recommendations of the geotechnical studies and results arising from the SGMS investigations.

It is expected that the final flood protection landform will contain a variety of plantings, pedestrian/bike pathways, recreation grounds and ancillary buildings associated with the park setting.

6.4.5 Construction Considerations

Following site preparation of the area (i.e., the management of subsurface environmental and cultural heritage conditions, removal of existing buildings and structures, etc.), the work to remove existing roads, abandon and relocate utilities and construct the flood protection landform and new streets, should take approximately 18 to 24 months subject to availability of suitable fill material, receipt of all necessary approvals and utility coordination.

For construction runoff, silt fences, straw bales and other stormwater measures would be needed. Depending on the local requirements, temporary detention ponds may also be needed. Staging of stormwater measures (i.e., drainage of localized low areas that may be created during construction) would also be required.

During detailed design, permanent drainage facilities should be included to enable suitable long term storm servicing. To the east of the landform crest, the associated works are anticipated to be minimal, and would be limited to the placement of catch basins in key locations. This work may also involve the placement of check valves on outlets into the Don River on a temporary basis until the full drainage system for the West Don Lands is in place. To the west of the landform the storm servicing system would form part of the proposed works for the West Don Lands Precinct Plan.

Currently available plans indicate that storm drainage would be directed towards Cherry Street and then southerly to Lake Ontario. There will be no in-stream works associated with the construction of the flood protection landform.

6.4.6 Traffic Effects

The construction of the flood protection landform would necessitate changes to the current roadway layout and traffic patterns. The evaluation and selection of the preferred alignments, roadway widths, and associated details was carried out as part of the *West Don Lands, Class Environmental Assessment – Master Plan*. The following description of the preferred arrangement of the roadway network was taken from the above-noted study report.

As mentioned previously, a portion of Bayview Avenue would be relocated, south of Eastern Avenue such that it would pass over the crest of the flood protection landform. Once on the west side, the relocated Bayview Avenue would be extended to connect to Front Street and Mill Street. Front Street and Mill Street would be shortened and revised to connect and end at the relocated Bayview Avenue. Front Street is also proposed to be modified to a boulevard section. Eastern Avenue would also be shortened to end at the realigned Bayview Avenue (Refer to ***Figure 6.5***).

The flood protection landform would include the placement of fill on the River Street road allowance between Queen Street and King Street. The construction of the landform on River Street would require its abandonment west of Bayview Avenue where it runs parallel to Queen Street.

In addition to the reconstruction of existing roads in the area to meet new alignments and grades, new roadways are proposed to be constructed within the project area. As indicated in the West Don Lands Precinct Plan, new roadways would be established between Eastern Avenue and Mill

Street east of Cherry Street and between King Street and Eastern Avenue east of St. Lawrence Street.

In addition to the construction of the new roadways, the following roadway segments would be eliminated (Refer to ***Figure 6.5***):

- Cypress Street between Front Street and Eastern Avenue; and,
- Overend Street between Front Street and Mill Street will be removed.

6.4.7 Stormwater Management

Stormwater management controls will be put in place for both the temporary construction period and permanent measures for after construction. For construction runoff, control silt fences, straw bales and other stormwater measures may be needed. Depending on the local requirements, temporary detention ponds may also be needed. Staging of stormwater measures (i.e., drainage of localized low areas that may be created during construction) may also be needed. Stormwater runoff from the flood protection landform should be minimized to the extent possible and

Surface water will be drain westerly into the City's storm system as well as into the Don River through existing culverts (under the tracks) and outfalls to the River. There will be no new storm outfalls to the Don River. This work is anticipated to be minimal and will most likely be limited to placement of catch basins in key locations. Stormwater runoff from the flood protection landform should be minimized to the extent possible and on-site stormwater management measures may be required which could include infiltration or the reuse of stormwater for irrigation. The exact measures to be implemented will be identified as part of the design phase of the parkland concept.

6.4.8 Utility Relocation

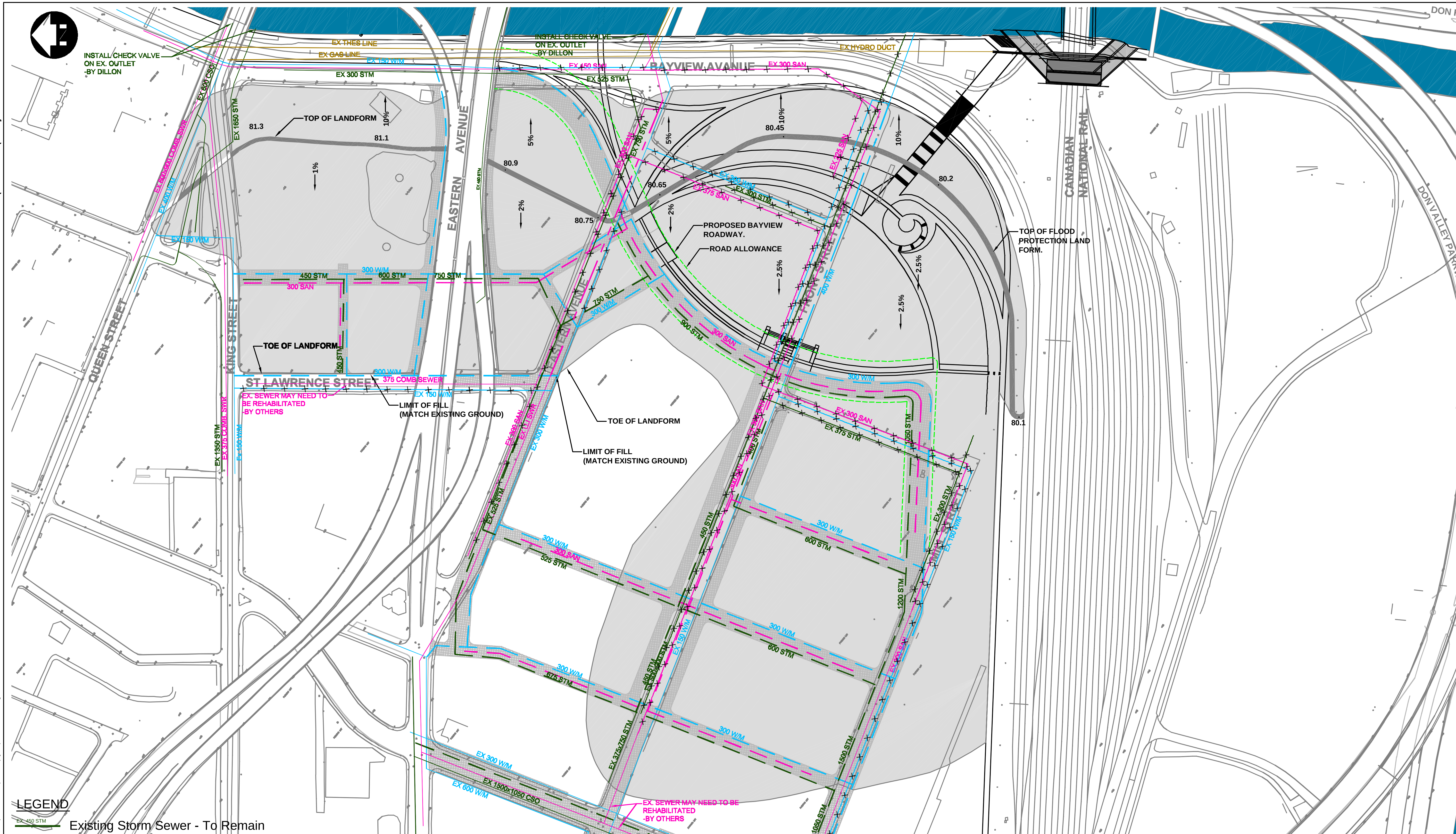
The following section summaries the modifications required to the existing sanitary, storm, and water utilities in order to facilitate the construction of the flood protection landform. The summary includes references to proposed modifications of existing infrastructure to accommodate the servicing of the West Don Lands Precinct Plan; however for a detailed account of these works, reference should be made to *West Don Lands, Class Environmental Assessment – Master Plan*.

A schematic of the servicing layout for the utilities based on the West Don Lands Precinct Plan is shown in ***Figure 6.7***. This figure shows the existing watermain, sanitary and storm sewer that are to remain as well as those lines that are proposed as part of flood protection landform work and the proposed West Don Lands Precinct Plan development.

In all cases, any underground pipes that are to be abandoned should be removed or filled to reduce the risk of pipe collapses, and the loss of material into the pipe that would result due to surface settlements.

i) Front Street

The existing 400mm diameter watermain that is located on Front Street within the proposed location of the flood protection landform would require replacement for an estimated 90m length where the placement of 2 to 3 meters of fill is proposed. In addition a local distribution 200mm diameter watermain should be abandoned east of the new alignment of Bayview Avenue.



LEGEND

- Existing Storm Sewer - To Remain
- Proposed Storm Sewer - By Others
- Existing Sanitary/Combined Sewer - To Remain
- Proposed Sanitary Sewer - By Others
- Proposed Sanitary Sewer - Part of Flood Protection Project
- Existing Watermain - To Remain
- Proposed Watermain - By Others
- Proposed Watermain - Part of Flood Protection Project
- Existing Gas, THES, and Hydro Services - To Remain
- ×××× Existing Utilities To Be Removed

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DATE: **NOVEMBER 2004**

Lower Don River West
Remedial Flood Protection Project

**FLOOD PROTECTION LANDFORM
UTILITY PLAN**

PROJECT NO.
03-2658-5000

FIGURE NO.
6.7

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The existing 300mm diameter sanitary sewer on Front Street, east of the realigned Bayview Avenue should be abandoned, and the sanitary flows redirected through a new sanitary sewer. It is estimated that approximately 200m of this existing sewer would need to be removed or abandoned. In addition to the 300mm diameter sanitary sewer a 225mm diameter sanitary sewer that services the east end of Front Street and a portion of Bayview Avenue should be abandoned.

The storm sewer servicing associated with future development proposes that storm flow be redirected south on Cherry Street. Existing storm sewers east of the landform crest and the existing outlet to the Don River will be removed and/or abandoned.

Private utility modifications include the abandonment or relocation of a Bell plant and a 100mm diameter gas main that would need to be abandoned and replaced to suit proposed road alignments.

ii) Eastern Avenue

The existing Low Level Interceptor (LLI) is a 1500mm diameter sanitary trunk sewer that extends easterly along Eastern Avenue, and crosses the Don River. This existing sewer would require structural reinforcement or replacement due to the proposed placement of fill associated with the flood protection landform. It is estimated that approximately 150 m of this trunk sewer would either need reinforcement or replacement.

A section of the 300 mm diameter local sanitary sewer will need condition assessment to determine whether replacement is required due to the placement of fill. Approximately 120 m of this sewer from the aligned Bayview Avenue easterly to the existing alignment of Bayview Avenue can be abandoned.

The *West Don Lands Precinct Plan* indicates that Eastern Avenue will be removed within the limits of the proposed flood protection landform. The existing 750mm diameter storm sewer and the outlet in the Don River that is located in this area may be abandoned. Storm flows associated with future development will be directed south along the relocated Bayview Avenue to Front Street and eventually west to Cherry Street. The existing 600mm outlet that services the Eastern Avenue Diversion will need to be retrofitted with a backflow prevention device.

The existing 150mm diameter local distribution watermain east of the new alignment of Bayview Avenue may be abandoned as servicing for future development is proposed to be replaced by a new 300mm diameter watermain. Alternately the 150mm diameter watermain may be reconstructed to standard depth within the limits of the landform.

An existing 600mm diameter gas main located on Eastern Avenue that provided local service to the area can be abandoned and removed at the easterly end of Eastern Avenue. Where the gas main is to be maintained, confirmation will be needed to determine if modifications are required to that length of gas main.

iii) Cypress Street

The plan for the Don Lands Precinct indicates that Cypress Street, between Front Street and Eastern Avenue, would not been maintained as part of the future road alignments, and therefore the existing 375mm diameter sanitary sewer, 300mm diameter storm sewer and 300mm diameter watermain along this road allowance may be abandoned. Consideration for any flows through these utilities, which originate from areas west of the flood protection landform, may be directed to the new Bayview Avenue alignment.

Private utilities that would be abandoned as a result of the abandonment of the Cypress Street road allowance would include a Bell conduit and a 300mm diameter gas main.

iv) Queen Street / King Street / River Street

The flood protection landform would include the placement of fill on the River Street road allowance between Queen Street and King Street. The construction of the landform on River Street would require the abandonment of River Street west of Bayview Avenue, where it runs parallel to Queen Street. The existing 300mm combined sewer and 1650 mm storm sewers which outlet into the Don River in this area would need to be fitted with check valves or a similar backflow prevention device. Existing infrastructure and private utilities would need to be reviewed further to determine the need for modifications although due to the minor amounts of fill and small impact area in this location, modifications are expected to be minor.

v) Bayview Avenue

Bayview Avenue, north of Eastern Avenue, would remain along its existing alignment and as the flood protection landform would be located west of this street; impacts to existing utilities would be limited.

The 300mm diameter sanitary sewer from Front Street that continues along Bayview Avenue may be abandoned. The flows in this sewer would be redirected to the 300mm diameter sanitary sewer that is proposed for the new Bayview Avenue alignment to facilitate future development. A 450mm diameter sanitary sewer on Bayview Avenue will need to remain to provide servicing to the area north of Queen Street.

Modifications to the catch basins located along Bayview Avenue would be required to ensure drainage is maintained following construction of the flood protection landform. Existing storm sewers along Bayview Avenue, north of Eastern Avenue, would remain in place to maintain storm flows north of Eastern Avenue. The storm sewer outlet to the Don River would require retrofitting with a backflow prevention device.

The existing watermains, whose condition meets acceptable municipal standards, could remain and be connected to the relocated 400mm diameter watermain. Future servicing needs for any passive park development within the landform limits would need to be determined.

6.4.9 Integration with West Don Lands Precinct Plan

The grading of the flood protection landform west of the Don River is influenced by both flooding and aesthetic design. The flooding is controlled by the flood protection landform height which links the river bank at the Queen Street Bridge to the rail embankment at the south end. The crest of the flood protection landform falls gently from north to south accounting for the higher flooding level just below Queen Street. The profile of the flood protection landform for flood control responds to the need for flood volume containment adjacent to the river, then rising to the required height at a slope of approximately 5 to 10%. The crest of the flood protection landform is located as far east as possible to maximize the dry side to the west. The dry side then falls at a gentle rate to create space for typical recreation and open space uses. The aesthetic or non-flood control character feature is then essentially added on top of this flood protection landform to create a unique park character and recreational features for this site (Don Park). The primary feature would be a raised recreational path which links River Street square with a track level path alignment at the south end of the site. The additional landform of this path is located just west of the flood crest and rises as an embankment shape to the path level. This sculpted landform sweeps across the site in a manner which recalls the unique landforms of the waterfront rail embankments.

This focal landform is similarly steeper providing a unique park feature and viewing opportunity of both the river valley to the east and the mouth of the Don to the South. The remaining park landform to the west is essentially flatter providing opportunities for sports field, gardens or other recreational features.

The overall intent of the landform features, beyond flood control, is to create unique walking, riding and viewing opportunities while expressing the particular natural and cultural qualities of Toronto's waterfront.

6.5 Details of the Remedial Works at the CN Rail Embankment

6.5.1 General

The existing CN Rail bridge over the Don River was originally built in 1928 and had two spans, a main span over the river, and a short span on the east side. In 1949, the east span was demolished, and three spans were added on the same side to accommodate the Don Valley Parkway. The general arrangement of the existing structure and the location of the proposed remedial works are shown in ***Figure 6.8***.

Originally, the west abutment was supported on wooden piles, which were driven to bedrock. The bedrock elevation is almost constant from the south to the middle of the abutment, but slopes down at an angle of almost 45° to the north end of the abutment. In 1941, the west abutment was partially underpinned by concrete pilasters to prevent any further movement towards the Don River.

The CN Rail bridge has a span of about 39.5 m over the Don River. The superstructure consists of five individual deck plate girders (DPGs) with concrete decks, each carrying a track. The west abutment is a concrete structure, which supports all the DPGs. The gravity type abutment is about 6.9 m wide at the bottom, and about 10.4 m high at the top of the backwall. The length of the west abutment is about 30 m, excluding the north wingwall. A copy of the design drawings for the CN Rail bridge drawings are provided in ***Appendix I***.

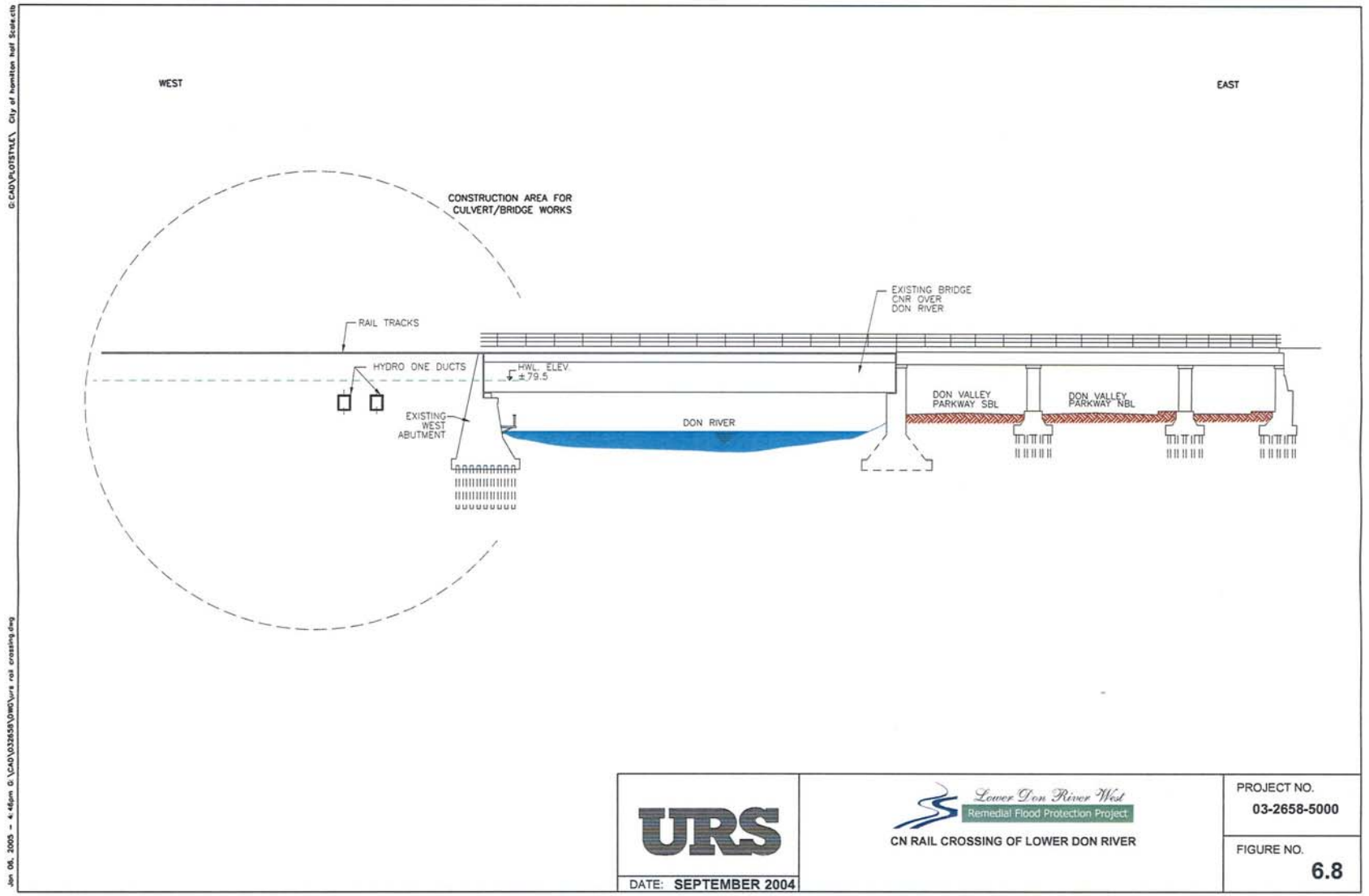
Two feasible methods of providing the needed additional hydraulic capacity through the CN Rail embankment materialized as warranting a detailed assessment.

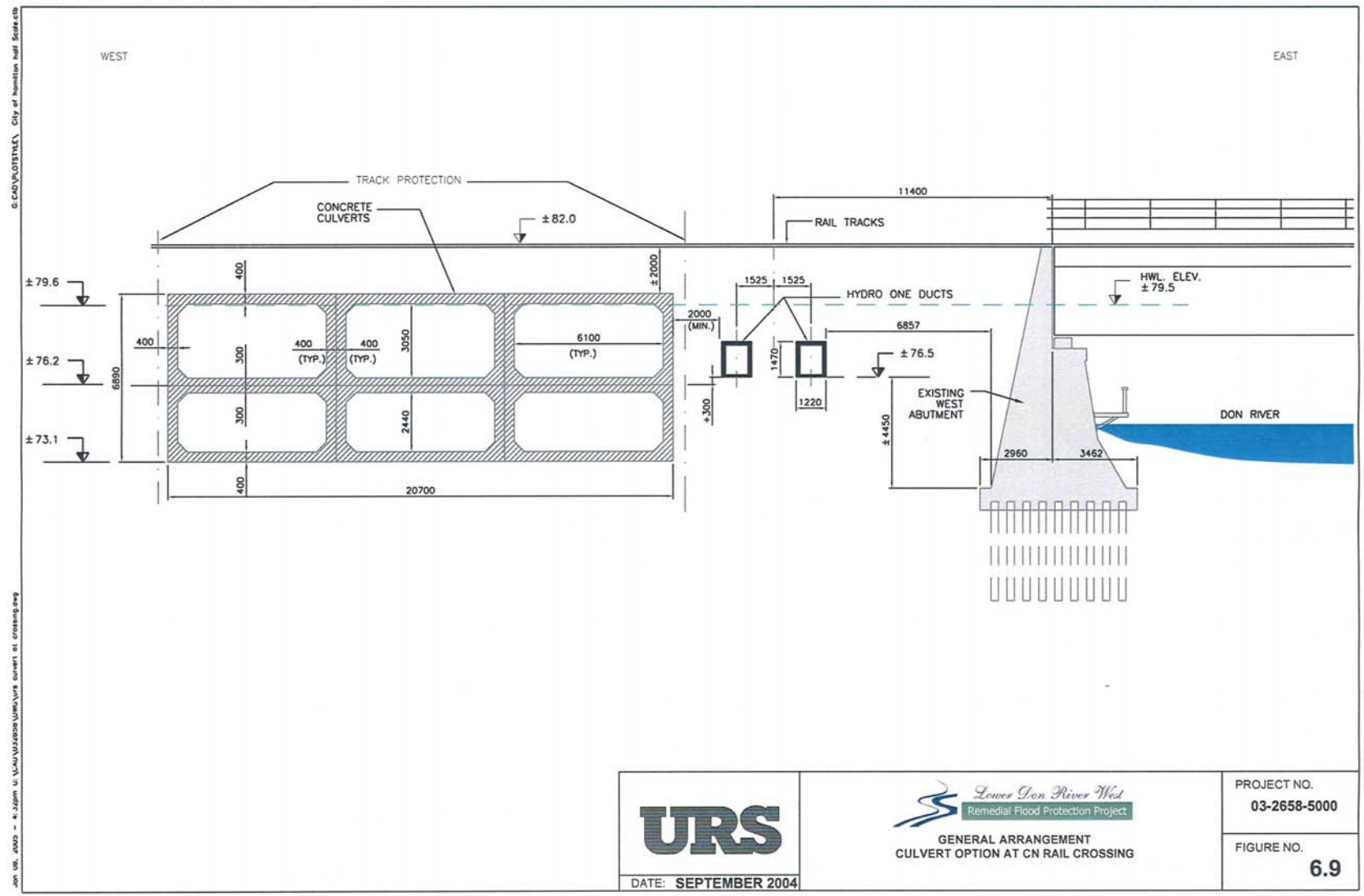
Detailed design concepts were developed for the implementation of both a multi-cell culvert structure, and a new bridge span on the west bank of the Don River. A comparative evaluation of the two options was then completed, which led to the selection of the preferred solution.

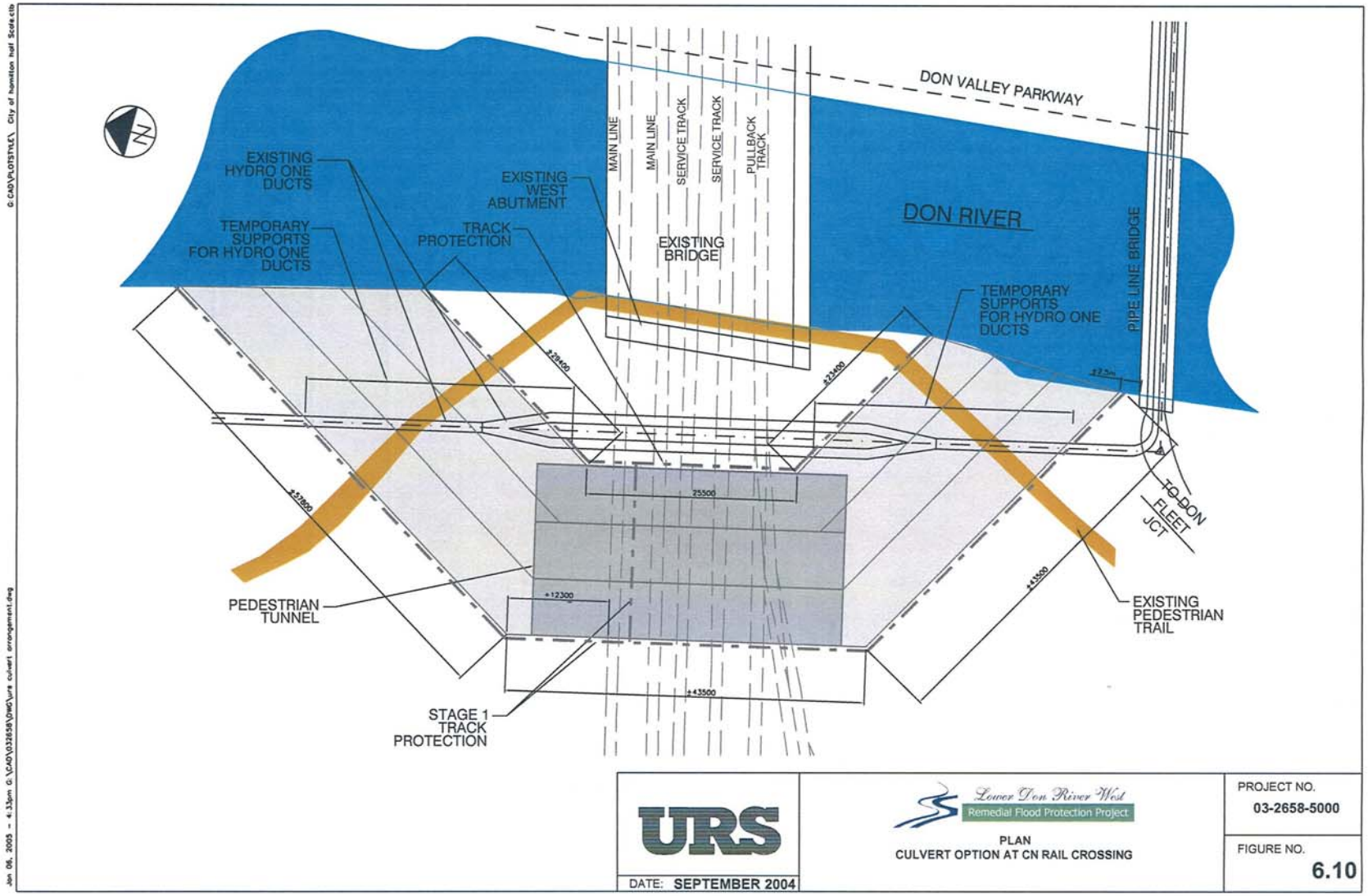
6.5.2 Multi-Cell Culvert Option

This option would involve the installation of a six cell culvert under the CN Rail embankment to augment the hydraulic capacity of the existing CN Rail bridge. The overall layout and elevations of the proposed culvert are depicted in section and plan view in ***Figures 6.9*** and ***6.10***, respectively. The additional capacity is required to pass the increased peak flows that would be conveyed to the crossing due to the confining nature of the flood protection landform. Under current conditions, approximately one third of the flow associated with the total Regulatory Flood spills in a westerly, and then southerly direction, immediately north of the CN Rail crossing. This diversion of floodwaters reduces the flow that must be passed through the existing bridge structure from 1690 m^3/s to approximately 1190 m^3/s.

With the implementation of the flood protection landform, the full 1690 m^3/s will reach the CN Rail crossing. Unless additional capacity is provided, the increased flows would cause higher upstream flood levels, and increased flood risk to existing development.


WEST
EAST
CONSTRUCTION AREA FOR CULVERT/BRIDGE WORKS
RAIL TRACKS
HYDRO ONE DUCTS
HWL ELEV. ±79.5
EXISTING WEST ABUTMENT
EXISTING BRIDGE CNR OVER DON RIVER
DON RIVER
DON VALLEY PARKWAY SBL
DON VALLEY PARKWAY NBL
URS
DATE: SEPTEMBER 2004
Lower Don River West
Remedial Flood Protection Project
CN RAIL CROSSING OF LOWER DON RIVER
PROJECT NO.
03-2658-5000
FIGURE NO.
6.8


WEST
EAST
TRACK PROTECTION
CONCRETE CULVERTS
±82.0
11400
RAIL TRACKS
±79.6
±76.2
±73.1
400
2000
±2000
1525
1525
HYDRO ONE DUCTS
HWL. ELEV. ±79.5
2000 (MIN.)
6857
6100 (TYP.)
400 (TYP.)
400 (TYP.)
3050
300
300
2440
6890
1470
1220
±76.5
±300
EXISTING WEST ABUTMENT
±4450
DON RIVER
2960
3462
20700
URS
DATE: SEPTEMBER 2004
Lower Don River West
Remedial Flood Protection Project
GENERAL ARRANGEMENT
CULVERT OPTION AT CN RAIL CROSSING
PROJECT NO.
03-2658-5000
FIGURE NO.
6.9


DON VALLEY PARKWAY
DON RIVER
PIPE LINE BRIDGE
MAIN LINE
MAIN LINE
SERVICE TRACK
SERVICE TRACK
PULLBACK TRACK
EXISTING HYDRO ONE DUCTS
EXISTING WEST ABUTMENT
TEMPORARY SUPPORTS FOR HYDRO ONE DUCTS
TRACK PROTECTION
EXISTING BRIDGE
TEMPORARY SUPPORTS FOR HYDRO ONE DUCTS
TO DON FLEET JCT
PEDESTRIAN TUNNEL
EXISTING PEDESTRIAN TRAIL
STAGE 1 TRACK PROTECTION
+29400
+23400
+37800
25500
+12300
+43500
+43500
N
URS
DATE: SEPTEMBER 2004
Lower Don River West
Remedial Flood Protection Project
PLAN
CULVERT OPTION AT CN RAIL CROSSING
PROJECT NO.
03-2658-5000
FIGURE NO.
6.10

In addition to providing flow capacity, one of the upper culvert cells would be utilized as a pedestrian passage under the CN Rail embankment to create linkages to the area recreational trails – the Don River Trail and the Martin Goodman Trail.

The culvert would consist of three cells below grade and three cells above grade located on top. The upper culverts would be 6.1 x 3.0 m and the lower culverts would be 6.1 x 2.4 m.

6.5.2.1 Hydraulic Analyses

The determination of the appropriate culvert dimensions to be constructed under the CN Rail embankment and the associated upstream flood levels for the preferred option was undertaken using both the Dynamic Hydrodiffusion Model (DHM) and the HEC-2 computer models. The former is a two-dimensional model that was originally developed under grant by the US Geological Service. It is particularly well suited to account for effects of structures in an urban floodplain by representing the flow path as a series of grid squares rather than as cross sections at discrete locations as is the case for the HEC-2 model. The simulations consider the movement of flow between grids in all four directions depending on flow conditions at a particular time. The model also accounts for dynamic flow conditions, incorporating the effects of storage in the floodplain areas, which leads to more realistic flows and flood levels.

The HEC-2 model is a well known computer tool developed by the US Army Corps of Engineers, and is widely used for the determination of floodplain limits and assessing hydraulic conditions in watercourses.

The initial analyses contained in the *West Don Lands Flood Protection and Related Issues Study (MMM, 2000)* were based on the DHM model, and on a preliminary basis, the modelling identified a three cell culvert arrangement under the CN Rail embankment. The DHM model was applied due to its capability to assess two dimensional flow conditions, which would occur along the Lower Don River during the Regulatory Flood as floodwaters spill westerly towards the downtown core.

During the course of this Environmental Assessment, it was recognized that, with the installation of the culverts under the CN Rail embankment, and the construction of the flood protection landform, flow conditions upstream and through the CN Rail crossing would more closely resemble a one dimensional condition, as compared to the two dimensional situation that would be the case with the current arrangement along the Lower Don River.

As the HEC-2 hydraulic model can more accurately simulate one dimensional flow conditions compared to DHM, it was decided to analyze the reach of the Don River, from the CN Rail to Queen Street, using HEC-2. The model was developed for the Don River reach from immediately south of the CN Rail crossing, upstream to just north of the Queen Street crossing. The starting water level (i.e., downstream of the CN Rail crossing) was taken from the results of the DHM model.

The initial results of the HEC-2 analysis of the three cell culvert arrangement indicated higher Regulatory Flood levels upstream of the CN Rail crossing than the corresponding levels determined using DHM. A review of the reason for this difference between the model types revealed an underestimation of water levels by the DHM model, which relates to how it defines channel shape and capacity. Ultimately, it was determined that a six cell arrangement was required in order to achieve acceptable Regulatory Flood levels along the Don River upstream of the crossing.

The main factors contributing to the need for a larger culvert are as follows.

- The Regulatory Flood flow has increased to a value of 1690 m^3/s, based on recent work by Marshall Macklin Monaghan Limited on behalf of the TRCA, from the 1460 m^3/s that was used in the *West Don Lands Flood Protection and Related Issues Study (MMM, 2000)*.

- A detailed assessment of the modelling results suggests that the DHM model underestimated the flood level assigned by the rating curve provided at the CN Rail crossing.

- As part of the current HEC-2 analysis, an increased freeboard was adopted immediately upstream of the CN Rail crossing by considering the potential increase in flood level at the outer edges of the floodplain, where the flow velocity is low. The energy grade line elevation was considered rather than the hydraulic grade line elevation to assess the adequacy of the alternative culvert arrangements.

- The number of cells required for the multi-cell culvert is also influenced by the maximum size (approximately 6 m wide) of structure available in precast form.

The hydraulic analyses were conducted for a range of storm events; the flood levels associated with the Regulatory Flood conditions are presented in ***Table 6.1***. Also shown in the table are the existing condition flood levels at several cross section locations for comparison purposes. The locations of the HEC-2 cross sections of the Don River that were incorporated into the modelling are illustrated on ***Figure 6.11***, (the resulting surface water profile is plotted on ***Figure 4.4***).

The details of the hydraulic modelling and analyses for all storm events form ***Appendix G*** of this report; a summary of the conclusions drawn

Table 6.1 – Calculated Hydraulic Conditions for the Regulatory Flood

HEC Cross Sect. No.	Description (Refer to Figure 6.11)	Distance from CN Rail (m)	Water Level (m)	EGL (m)	Velocity (m/s)	Existing Water Level (m)
48.28	Starting water level		79.0	79.48	4.39	
48.33	Upstream of CN Rail	22	79.42	80.03	3.46	79.79
48.34		148	79.92	80.20	3.3	
48.35		281	80.14	80.80	4.43	
48.37		309	80.77	80.90	2.21	
48.38	Upstream of Old Eastern Ave	310	80.63	80.96	3.43	80.29
48.39	Downstream face of Eastern Ave. Flyover	425	80.54	81.16	3.77	
48.42		496	80.59	81.31	5.06	
48.45	Richmond St Ramp from DVP	506	80.79	81.38	4.68	80.46
48.46		610	80.62	81.67	5.38	
48.47	Upstream face of Queen St	632	80.75	81.71	5.2	80.56

Figure 6.11 - HEC-2 Cross Section Number & Location

from the results are presented in the following:

- The implementation of the remedial flood protection project will prevent any floodwaters from spilling westerly, and confine them to the east of the flood protection landform. This would eliminate the current flood risk associated with Spill Zone 3, for all events up to and including the Regulatory Flood.

- The design of the flood protection landform addresses the three modes of potential failure for earth fill structures, and as such, it would satisfy the Provincial standard established for classification as a permanent flood protection measure. The proposed undertaking, therefore, represents a comprehensive long-term flood protection solution.

- The implementation of the remedial flood protection project will not adversely affect the Regulatory Flood conditions on adjacent lands.

- A minor increase in the flood level of 0.19m is noted upstream of the Queen Street crossing. During the detailed design phase, minor refinements to the alignment of the flood protection can be examined to reduce this effect if deemed necessary.

- Velocities are such that sediments deposits will be eroded and general bed transport will occur in the river during the Regulatory Flood. The sediments would be deposited downstream of the CN Rail crossing, if velocities fall below the threshold for transport. This will likely occur in the floodplain areas where the river overtops its banks.

- This would not increase the sediment loads in the Keating Channel, but it does indicate that the present dredging will need to be continued as long as the existing influx of sediments to the Don River continues.

- The Enbridge utility bridge (Cross section 48.35 on ***Figure 6.11***) creates a region where the HEC-2 model suggests that the flow will pass through critical depth. The removal of the concrete panels from the utility bridge and their replacement with a wire mesh arrangement would provide additional flow capacity and improve overall flow conditions at this location.

- The flood protection landform will alter the existing overland flow pattern, and eliminate the flow route for part of the West Don Lands. However, the proposed stormwater management system for the West Don Lands will collect and convey the drainage from these lands westward to Cherry Street.

- The containment of the flow that would normally spill to the west would raise water levels on the east bank of the river, downstream of the CN Rail bridge. These increases in water level would be mitigated through the construction of a retaining wall and dykes to ensure that these areas would not experience increased flooding. It is noted that these structures are limited in size, are temporary works, and will not be subject to frequent flooding. The detailed design of these works should include measures to ensure their stability (i.e., provision of rip rap core for the dykes).

6.5.2.2 Construction Considerations

Construction of the mutli-cell culvert would require coordination with CN Rail and consideration of the needs of the other various users of the rail facilities. Throughout the Environmental Assessment process, numerous discussions were held with CN Rail, GO Transit and Toronto Terminals Railway (TTR) regarding impacts on their rail operations that would occur during the installation of the culvert.

The CN Rail bridge carries five existing tracks over the Don River. The track arrangement being:

the two most northerly are mainline tracks, adjoined by two service tracks, and the most southerly being a pullback track for the Don Yard. Train operations over the Don River bridge involve four rail services:

i) *Through freight services* - generally high priority or intermodal freight trains on routes such as Montreal - Chicago or Oshawa – US, which do not need to call at the CN Toronto area Yards at Concord and Bramport. These trains may operate at any time on weekdays or weekends.

ii) *Local freight services* - based at the Don Yard to serve local industries. Switching cars for delivery to local industries is carried out in the Don Yard, which is adjacent to the Don River bridge using a pullback track that crosses the bridge. Local freight trains normally operate Monday to Friday and generally during daylight hours.

iii) *GO Transit* – provide an intensive passenger train service during morning and evening peak hours, with an hourly service in each direction between peak services, in the evenings, and on weekends.

iv) *VIA Rail* - operates inter-city services from Toronto to Ottawa and Montreal. These operate from early morning to late evening seven days per week, although there are slightly fewer trains at weekends.

Construction of the multi-cell concrete culvert could be carried out in six stages (Refer to ***Figure 6.12***), as described below:

i) *Stage 1 – Track Protection and/or Cofferdam.* In Stage 1 track protection and/or cofferdams would be installed over a number of 5.5 hour weekday overnight work blocks. Track protection/cofferdam may consist of sheet piles, H piles or concrete caissons depending on soil conditions and the level of the water table. If extensive dewatering is required the culvert would be installed within a cofferdam.

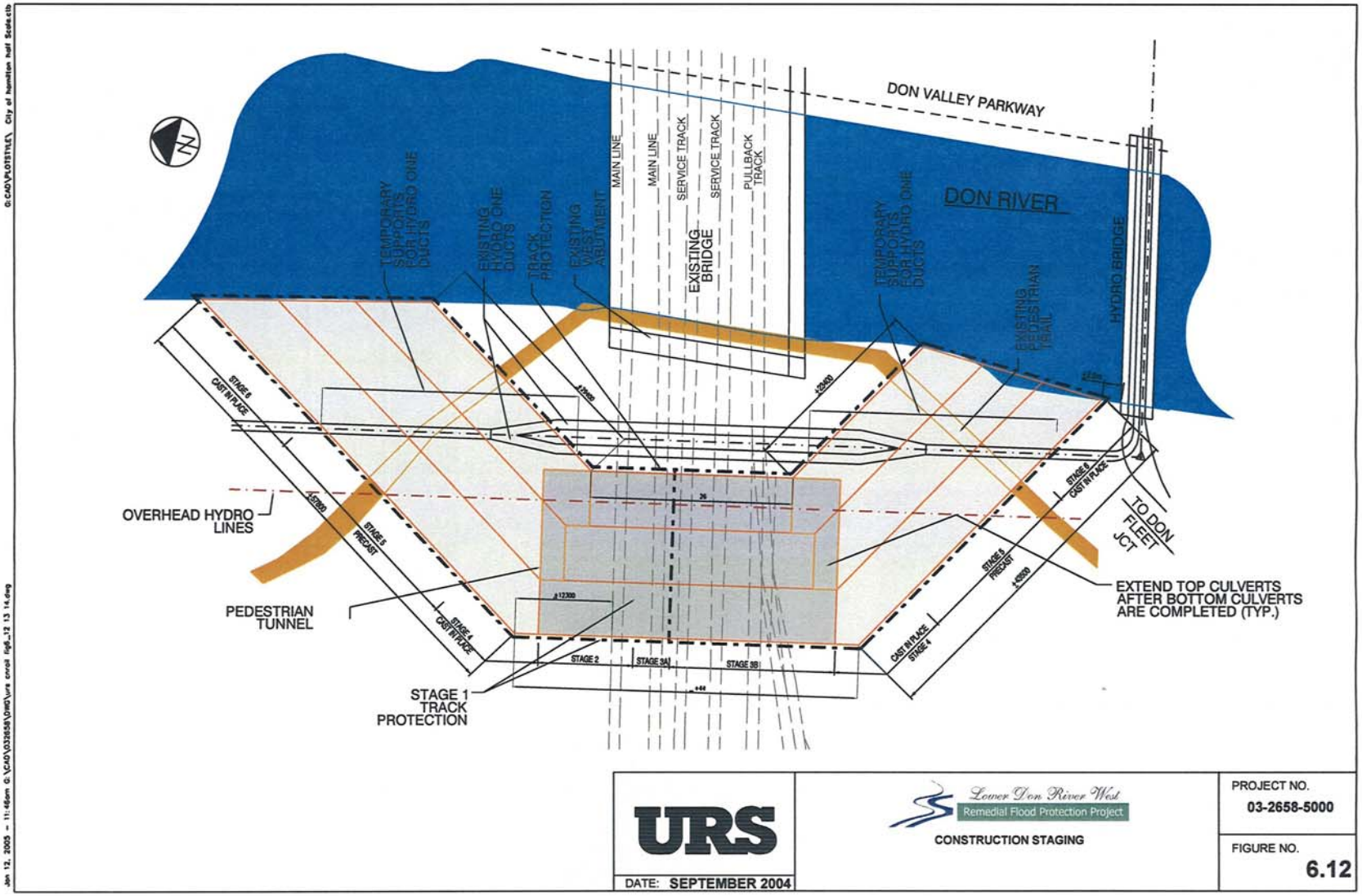
ii) *Stage 2 – North Mainline Track* - In Stage 2 the north mainline train traffic is diverted to the south mainline track. Precast culvert cells would be installed under the north mainline track over a 56-hour weekend work block. The north track would then be reopened to train traffic.

iii) *Stage 3A – South Mainline Track, Service Tracks and Pullback Track* - In Stage 3A the south mainline train traffic is diverted to the north mainline track. Service tracks and pullback track are closed to train traffic. Precast culvert cells would be installed under the south mainline track, service tracks and pullback track over a 56 hour weekend work block. The south mainline track would then be reopened to mainline train traffic.

In Stage 3B, work that is not completed in stage 3A on the service tracks and pullback track is completed over three 12 hour weekday work blocks on Monday, Tuesday, and Wednesday following Stage 3A. The Don Yard would be switched from the west end during this stage.

iv) *Stage 4 – North and South Sides of CN Rail Tracks* - In Stage 4 the cast-in-place sections of the culvert would be constructed on the north and south sides of the CN Rail tracks. This work does not impact CN Rail tracks and therefore can be carried out following the completion of Stages 3A and 3B.

v) *Stage 5 – Construction Under Hydro One Ducts* - In Stage 5 cast-in-place culvert cells would be installed under the Hydro One ducts on the north and south sides of the railway tracks. This work does not impact CN Rail tracks and therefore can be carried out at any time after Stage 4 is completed. Temporary support


DON VALLEY PARKWAY
DON RIVER
TEMPORARY SUPPORTS FOR HYDRO ONE DUCTS
EXISTING HYDRO ONE DUCTS
TRACK PROTECTION
EXISTING WEST ABUTMENT
MAIN LINE
MAIN LINE
SERVICE TRACK
SERVICE TRACK
PULLBACK TRACK
EXISTING BRIDGE
TEMPORARY SUPPORTS FOR HYDRO ONE DUCTS
EXISTING PEDESTRIAN TRAIL
HYDRO BRIDGE
STAGE 6 CAST IN PLACE
STAGE 5 PRECAST
STAGE 4 CAST IN PLACE
STAGE 2
STAGE 3A
STAGE 3B
STAGE 4 CAST IN PLACE
STAGE 5 PRECAST
STAGE 6 CAST IN PLACE
OVERHEAD HYDRO LINES
PEDESTRIAN TUNNEL
STAGE 1 TRACK PROTECTION
TO DON FLEET JCT
EXTEND TOP CULVERTS AFTER BOTTOM CULVERTS ARE COMPLETED (TYP.)
URS
DATE: SEPTEMBER 2004
Lower Don River West
Remedial Flood Protection Project
CONSTRUCTION STAGING
PROJECT NO.
03-2658-5000
FIGURE NO.
6.12

systems for Hydro One ducts would be designed during detailed design.

vi) *Stage 6 – Adjacent to the Don River* - In Stage 6 the cast-in-place sections of the culvert are constructed adjacent to the Don River on the north and south sides of the CN Rail tracks. This work does not impact CN Rail tracks and therefore can be carried out following the completion of Stages 3A and 3B.

6.5.2.3 Effect on Rail Service

The staging of the construction of the multi-cell culvert was developed with the intent of minimizing the impact on rail service; however some limited *work blocks* would be unavoidable. *Work blocks* are time periods during which one or more tracks are taken out of service for maintenance or construction purposes.

The construction works involving the two mainline tracks have been scheduled for night time and weekend periods to avoid delays to GO Transit service, and to minimize, to the extent possible, the impacts on the VIA Rail operations. Freight trains operate on a more flexible schedule, and can more readily accommodate some short term changes.

i) *Work Blocks – Overnight* - The last VIA Rail train movement on weekdays is at 23:30; GO Trains cease operating at 00:37 and start again about 06:00. This provides a 5.5 hours period for an overnight work block on both main tracks during which construction activities would have no effect on passenger rail service. During this period some delay to freight trains may become necessary if any are in operation. (A single main track could be available from 22.10 hours, if a 19 minute delay to the VIA Rail 23:23 arrival and a 12 minute delay to the VIA Rail 23:30 departure are tolerable.)

ii) *Work Blocks – Weekend* - During Saturdays and Sundays, GO trains operate on an hourly basis in both eastbound and westbound directions.

Table 6.2 - Weekend Delays to Via Rail Service (No Track Diversion)

Saturday	
Departure Time Union Station	**Approximate delay**
23:30	12 minutes (assuming 22.23 arrival occupies single track first)
Arrival Time Union Station	**Approximate delay**
08:20	22 minutes
11:17	25 minutes
22:23	19 minutes
Sunday	
Departure Time Union Station	**Approximate Delay**
09:30	5 minutes
11:30	5 minutes
15:20	15 minutes
15:35	5 minutes
23:30	12 minutes (assuming 22.23 arrival occupies single track first)
Arrival Time Union Station	**Approximate Delay**
23:23	19 minutes

During Saturdays VIA Rail trains depart at 07:45, 11:05, 15:35, 18:10, 21:35 & 23:30, and arrive at 08:20, 11:17, 15:09, 16:43, 22:02 & 22:23. During Sundays VIA Rail departures are at 07:45, 09:30, 11:05, 11:30, 12:35, 15:20, 15:35, 17:00 18:10, 21:35 & 23:30 and arrivals at 12:49, 15:09, 16:11 16:43, 20:02, 20:44, 20:59 & 23:23.

The delays that VIA Rail trains would experience in order to obtain a one main track work block throughout the weekend are summarized in ***Table 6.2;*** the GO Transit service schedule would remain unaffected.

iii) *Work Blocks - Service and Pullback Tracks* - If the placement of culvert segments beneath the southern main track, two service tracks and the pull-back track during one work block from, for example, 22.10 Friday to 06.00 Monday and restoration of all tracks is not feasible, then switching Don Yard from the west on Fridays and Mondays of the weekend work blocks could be considered. This would provide two extra days for service and pullback track removals and restoration, however, some interference with the Scott Street interlocking may occur, which will require further approval from CN Rail.

The interrelationship between the construction stages and the work block requirements, together with a description of the impacts on rail operations is summarized in ***Table 6.3***.

Reference can also be made to ***Appendix I***, which contains the *Rail Transportation Report* and the *Culvert Constructability Report,* for further explanation on the implications of the culvert construction on rail service.

During the discussions with CN Rail, GO Transit, and TTR, consideration was given to the concept of implementing a track diversion to facilitate the

Table 6.3 – Summary of Construction Work Blocks & Associated Impacts on Train Operations for Multi-cell Culvert Option (No Track Diversion)

Construction Stages	Days	Work Block	Work Block Hours	Impacts on Train Operations
Stage 1 – Install railway track protection.	Weekdays: Overnight.	00.37 to 06.00	5 hrs 20 min.	• All tracks in operation; • Possible disruption for freight trains during the night;
Stage 2 - All work under north mainline track.	First Weekend.	Friday 22:10 to Monday 6:00.	55 hrs 50 min.	• South mainline, service tracks and pullback track in operation • North mainline traffic diverted to south main line track; • Delays as per ***Table 6.2.***
Stage 3A • All work under south mainline track; • Partial work under service tracks and pullback track.	Second Weekend.	Friday 22:10 to Monday 6:00.	55 hrs 50 min.	• North mainline in operation. • South mainline traffic diverted to north main line track • Service tracks and pullback track out of operation; • Delays as per ***Table 6.2***.
Stage 3B - Remaining work under service tracks and pullback track.	Following second weekend.	Monday &Tuesday.	12 hours each day.	• Mainline tracks in operation • Service tracks and pullback track out of operation. • Delays as per ***Table 6.2***.
Stages 4 - Cast-in-place sections north and south of the railway tracks.		Not Required.	Not Required.	• No impact.
Stage 5 - Precast Sections under Hydro One Networks ducts.		Not Required.	Not Required.	• No impact.
Stage 6 - Cast-in-sections adjacent to the Don River.		Not Required.	Not Required.	• No impact.

construction of the six cell culvert. The works would involve the temporary diversion of the two mainline tracks to the two most southerly tracks (i.e., a service and the pullback track). The track diversion would significantly expand the time frame that would be available for the installation of the multi-cell culvert under the five tracks. At the very minimum, the work block on the mainline tracks could be prolonged from the weekend period to an extended period of time.

Following the completion of the geotechnical investigations, and the unfavorable conditions that were observed, it became apparent, that weekend work blocks would likely not permit sufficient time for the installation of the culvert under the mainline tracks.

CN Rail staff conducted the necessary field surveys and technical analyses regarding track geometry and the potential restrictions on train speeds and reported that a track diversion would be feasible and highly preferred by CN Rail.

Based on the above factors, track diversion was adopted as part of the overall works associated with the multi-cell culvert option.

6.5.2.4 Preliminary Construction Cost Estimate for Multi-Cell Culvert Option

A detailed breakdown of the preliminary costs that were determined for the construction of the six-cell culvert structure is provided in ***Table 6.4***. As can be noted from the table, the preliminary cost estimate totals $14.2 M. This figure is based on the best available estimates for all components necessary to construct the culvert, including an allowance for the track diversion and engineering work on the part of CN Rail.

The estimate does not include an allowance for the possible costs that may be involved for the relocation of the Hydro One Networks overhead plant on the west bank of the Don River. As previously noted, a field survey of the wires is necessary in order to establish if relocation is required, the scope of work involved, and the associated costs. The cost also does not include the gratings required at the entrance and exit of the underground culverts, as well as any entrance shaping requirements to increase the hydraulic efficiency of the inlet.

6.5.3 Bridge Extension Option

The increased hydraulic capacity that is required at the CN Rail embankment can also be achieved by widening the waterway opening of the existing bridge. This would be accomplished by converting the existing west abutment to a bridge pier, and constructing an adjoining span and abutment. The configuration and details of this option are shown in ***Figures 6.13*** and ***6.14.***

The existing west abutment is supported on wooden piles and concrete pilasters, which are spread under the footing evenly. Because the excavation for the new span would remove the lateral earth pressure from the earth behind the abutment, the existing footing may have sufficient capacity to support the new span without additional piles in the footing; this would be confirmed during the detailed design process. If it is found that the existing abutment footing and stem requires strengthening, this would be achieved by adding temporary spans under each track. Additional piles and a pile-cap would be installed and connected to the existing footing.

The proposed new spans are deck plate girders (DPG) with a precast concrete deck containing ballast, similar to the existing spans over the Don River. Each track would be supported on an individual DPG span. The most southern span would be wider, in order to accommodate the switching to the Don Yard.

Table 6.4 – Preliminary Cost Estimate for Multi-Cell Culvert Option

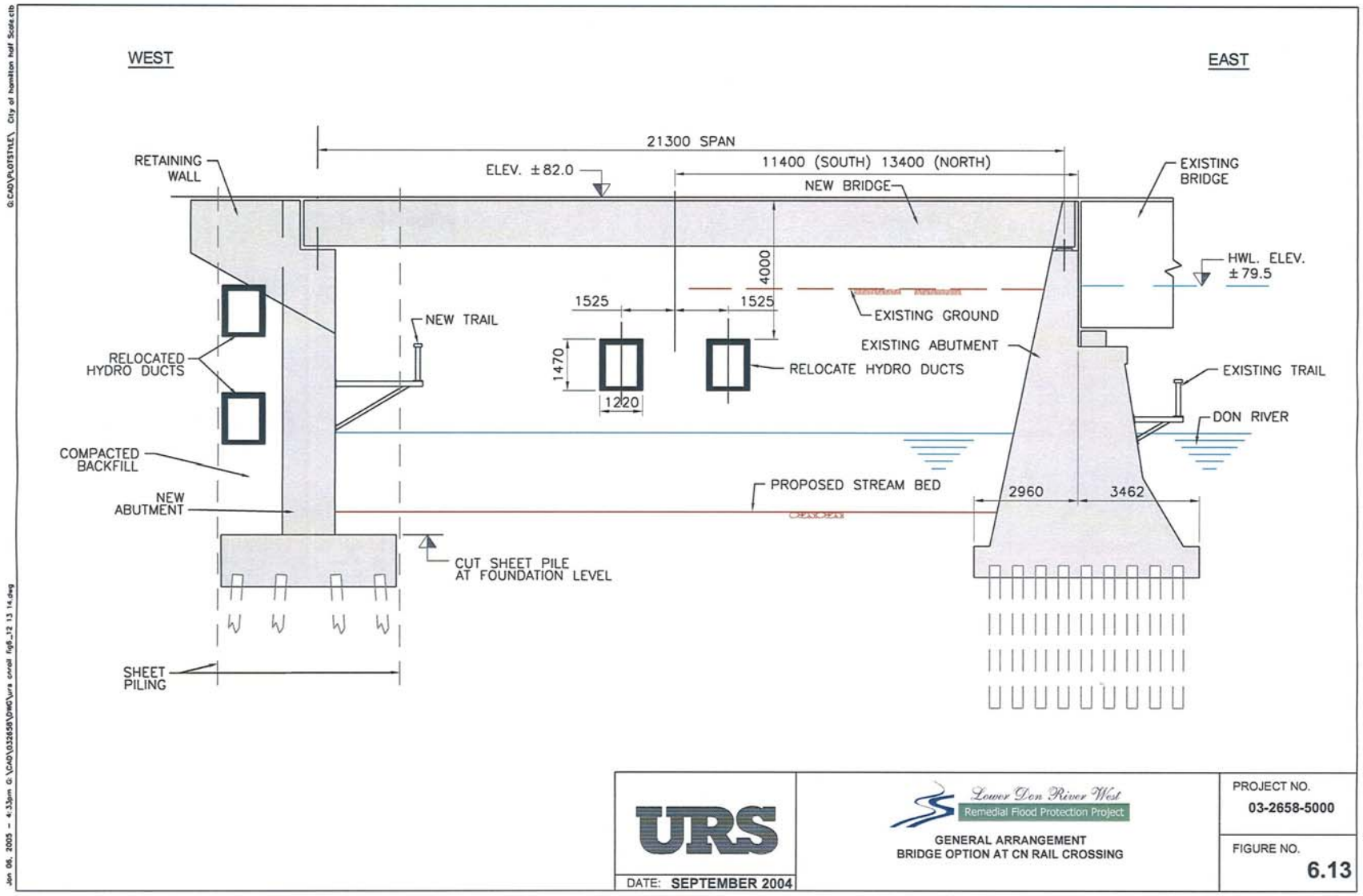
Item	Units	Quantity	Unit Price	Item Cost
Track Protection	m^2	2,120	$ 1,000	$ 2,120,000
Track Protection (live)	m^2	200	$ 1,500	$ 300,000
Dewatering	L.S.	1	$ 500,000	$ 500,000
Excavation	m^3	22,000	$ 40	$ 880,000
Retain Utility Ducts	L.S.	1	$ 100,000	$ 100,000
Pre-cast Culvert Fabrication	m	190	$ 4,800	$ 912,000
Pre-cast Culvert Transportation	m	190	$ 300	$ 57,000
Pre-cast Culvert Erection	m	190	$ 500	$ 95,000
Bedding	m^2	800	$ 500	$ 400,000
Post-tensioning	each	24	$ 1,000	$ 24,000
Cast-in-place Concrete	m^3	2,400	$ 800	$ 2,160,000
Flag Man	day	40	$ 1,000	$ 40,000
Mass Concrete	m^3	250	$ 300	$ 75,000
Illumination	L.S.	1	$ 25,000	$ 25,000
CN Rail Track Work and Diversion	L.S.	1	$ 2,500,000	$ 2,500,000
Grating	each	7	$ 50,000	$ 350,000
Encasing Hydro Ducts	L.S.	1	$ 200,000	$ 200,000
Retaining Wall	m^2	200	$ 800	$ 160,000
			Sub-total	***$ 10,898,000***
			15% Contingency & 15% Engineering	$ 3,302,000
			Total	***$ 14.2 M***

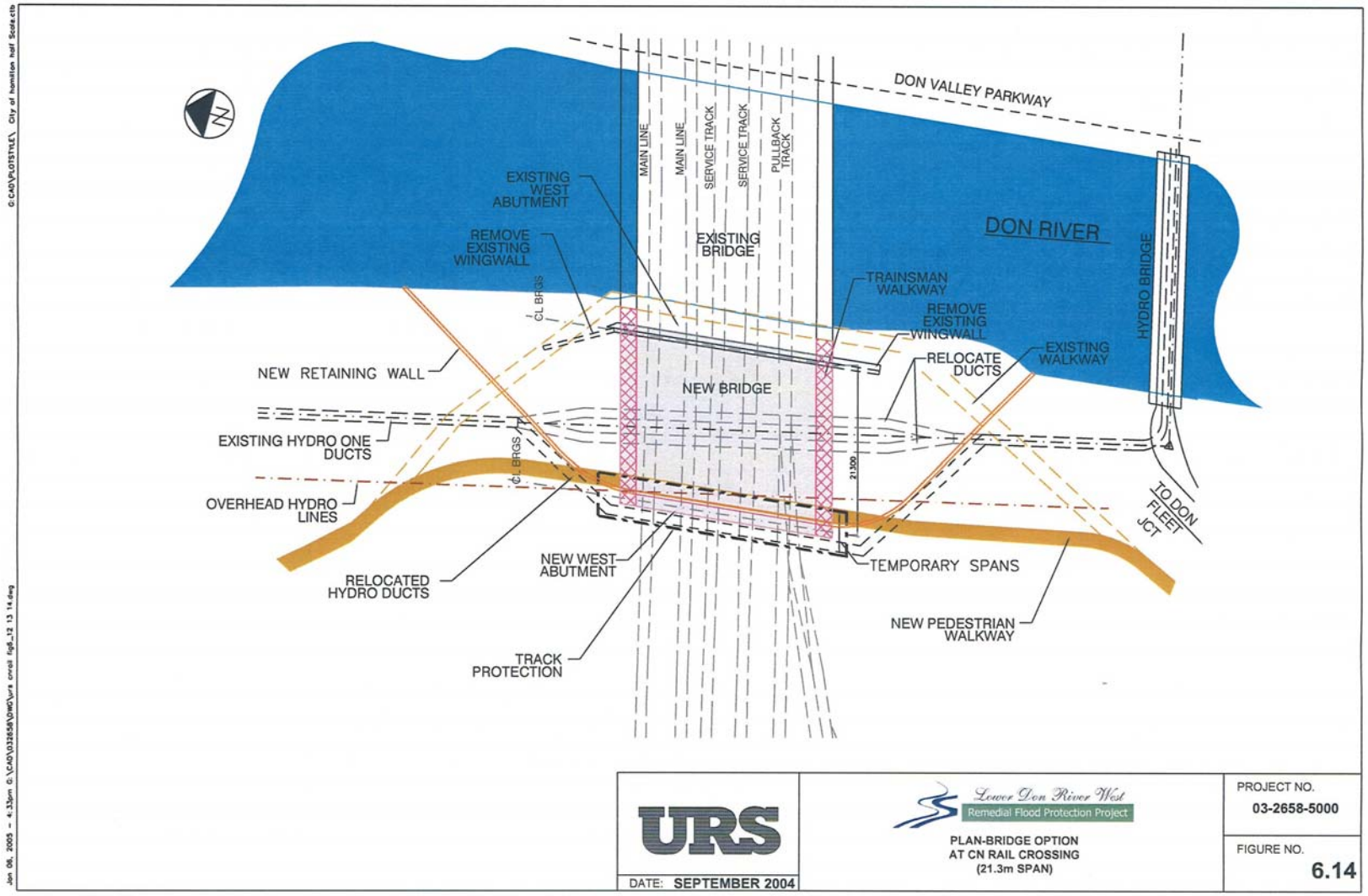
The required works also included two concrete ducts on the west side of the proposed abutment to carry the Hydro One Networks cables that are currently contained in the two ducts that extend through the embankment.

The required width of the additional span was determined to be 21.3 m, with the determining factor being the location of the Hydro One Networks cables/ducts, and the approach for the relocation of this plant.

A shorter span could be suitable for satisfying solely the hydraulic considerations. However, through the discussions with Hydro One Networks staff it was established that the preferred timing for the relocation of the cables/ducts would be during the Spring (May) or the Fall (October) seasons, when demand is typical at the annual lows.

Given that the construction of the additional span may not coincide with the optimum time for the relocation of the Hydro One Networks ducts, an approach was adopted that provides for maximum construction flexibility. With a 21.3 m span, the construction of the bridge works (abutment and deck) could be completed with the existing ducts remaining in their current locations. Following completion of the bridge and duct work, the cables would be relocated by Hydro One Networks forces at the appropriate time. This would then be followed by the excavation works and final grading of the waterway opening under the newly constructed span.


WEST
EAST
21300 SPAN
11400 (SOUTH) 13400 (NORTH)
NEW BRIDGE
ELEV. ±82.0
RETAINING WALL
EXISTING BRIDGE
HWL. ELEV. ±79.5
4000
1525
1525
NEW TRAIL
EXISTING GROUND
EXISTING ABUTMENT
RELOCATED HYDRO DUCTS
1470
1220
RELOCATE HYDRO DUCTS
EXISTING TRAIL
DON RIVER
COMPACTED BACKFILL
PROPOSED STREAM BED
2960
3462
NEW ABUTMENT
CUT SHEET PILE AT FOUNDATION LEVEL
SHEET PILING
URS
DATE: SEPTEMBER 2004
Lower Don River West
Remedial Flood Protection Project
GENERAL ARRANGEMENT
BRIDGE OPTION AT CN RAIL CROSSING
PROJECT NO.
03-2658-5000
FIGURE NO.
6.13


DON VALLEY PARKWAY
DON RIVER
HYDRO BRIDGE
MAIN LINE
MAIN LINE
SERVICE TRACK
SERVICE TRACK
PULLBACK TRACK
EXISTING WEST ABUTMENT
REMOVE EXISTING WINGWALL
EXISTING BRIDGE
TRAINSMAN WALKWAY
REMOVE EXISTING WINGWALL
RELOCATE DUCTS
EXISTING WALKWAY
NEW RETAINING WALL
NEW BRIDGE
EXISTING HYDRO ONE DUCTS
OVERHEAD HYDRO LINES
TO DON FLEET JCT
NEW WEST ABUTMENT
TEMPORARY SPANS
RELOCATED HYDRO DUCTS
NEW PEDESTRIAN WALKWAY
TRACK PROTECTION
URS
DATE: SEPTEMBER 2004
Lower Don River West
Remedial Flood Protection Project
PLAN-BRIDGE OPTION
AT CN RAIL CROSSING
(21.3m SPAN)
PROJECT NO.
03-2658-5000
FIGURE NO.
6.14

Utilizing a shorter bridge span would require the relocation of the ducts/cables in advance of the construction of the proposed abutment in order to provide adequate working space. It is also noted that relocating the ducts in advance of the bridge works would necessitate the tunnelling through the CN Rail embankment to install the culverts required to house the Hydro One Networks ducts/cables.

6.5.3.1 Hydraulic Considerations

The proposed span for the bridge extension option would provide a waterway opening of over 127 m^2, which is approximately 25% greater than that afforded by the culvert option.

Together with its significantly shorter wetted perimeter as compared to the culvert option, the bridge extension option becomes a much more efficient structure. Overall, the capacity of the bridge extension option significantly exceeds the capacity of the culvert structure.

Accordingly, the Regulatory Flood Levels produced by the bridge extension option will be equal to or slightly lower than the values associated with the culvert option, as summarized in ***Table 6.1***.

6.5.3.2 Construction Sequencing & Effects on Rail Service

The steps that would be followed for the construction of the bridge extension option, together with the effects on the work block requirements are summarized in ***Table 6.5.***

Due to the smaller work area associated with the construction of the proposed abutment, the track diversion is not needed for the construction of the bridge extension option. However, to facilitate the installation of temporary, and subsequently, the permanent spans, weekend work blocks would be unavoidable. The total construction time required for the implementation of this option is estimated at 6 months.

The use of the weekend work blocks would not effect the schedule of GO Transit service, but would result in the same delays to the VIA Rail trains as for the culvert option described in ***Table 6.3***. A maximum delay to service of approximately 25 minutes is anticipated.

6.5.3.3 Preliminary Construction Cost Estimate for Bridge Extension Option

A detailed breakdown of the preliminary costs that were determined for the construction of the bridge extension option is provided in ***Table 6.6***. As can be noted from the table, the preliminary cost estimate totals $14.6 M. This figure is based on the best available estimates for all components necessary to construct the bridge, including an allowance for the temporary spans and for engineering work on the part of CN Rail.

As previously noted, the possible costs that may be involved for the relocation of the Hydro One Networks overhead plant on the west bank of the Don River are not currently known, and therefore are not reflected in the costs for this option.

6.5.4 Identification of Preferred Option (Bridge Extension) for the CN Rail Embankment

The selection of the preferred method of providing additional hydraulic capacity through the CN Rail embankment was based on the same approach as that used for determining the preferred alternative for the overall project (Refer to ***Section 5.4***).

The six Study Assessment Groups and the associated 35 evaluation criteria were applied to both the culvert and bridge extension option to determine the more appropriate solution.

Table 6.5 – Construction Sequencing & Time Requirements For Installation of the Bridge Extension Option

Construction Sequence	Weekend Work Blocks	Night Time Work	Regular Time
Un-stressing of the CWR and provide joints, by CN Rail crew.			
Drive soldier piles and installation of top tiebacks, on and adjacent to mainline tracks (within 6m of mainline tracks).		5.5 hrs/night over 2 weeks	
Drive soldier piles and installation of top tiebacks on service and pullback tracks.			1 week
Installation of temporary spans at location of proposed abutment (and at west abutment of existing structure, if required), on the two mainline tracks.	55 hours over 1st weekend		
Installation of temporary spans at location of proposed abutment (and at west abutment of existing structure, if required), on the service/pullback tracks.			1 week
Drive footing piles on, and adjacent to, the mainline tracks.		5.5 hrs/night over 2 weeks	
Drive footing piles on the service and pullback tracks.			1 week
Excavation and construction of the abutment footing and stem, (proposed abutment), and installation of the conduits for the relocation of the hydro ducts adjacent to the proposed abutment wall.			3 months
Modification of the back-wall of the west abutment of the existing bridge, and the installation of the permanent spans, on the two mainline tracks.	55 hrs over 2nd weekend		
Modification of the back-wall of the west abutment of the existing bridge, and the installation of the permanent spans, on the service and pullback tracks.			2 weeks
Relocation of hydro ducts behind the new abutment.			1 week
Excavations of the earth fill under the bridge deck to achieve the required hydraulic waterway opening.			1 month

Notes: Work Block - time period during which track closure would be in effect (applies to one mainline track closure at a time).
Night Time - night time period during which no VIA Rail and GO trains are in operation, and only a maximum of 2 freight trains may pass.
Regular Time - regular working hours with no constraints on service.

Table 6.6 – Preliminary Cost Estimate for the Bridge Extension Option

Item	Units	Quantity	Unit Cost	Item Cost
Track Protection	L.S.	1	$ 400,000	$ 400,000
Excavation	m^3	20,000	$ 40	$ 800,000
Dewatering	L.S.	1	$ 50,000	$ 50,000
H-piles – HP310x110	m	700	$ 300	$ 210,000
Rock Points	each	70	$ 350	$ 24,500
Mass Concrete in Footings	m^3	64	$ 300	$ 19,200
Concrete in Footings	m^3	520	$ 500	$ 260,000
Concrete in Abutment	m^3	470	$ 750	$ 352,500
Concrete Deck	m^3	450	$ 1,000	$ 450,000
Concrete in Wingwall	m^3	460	$ 750	$ 345,000
Bearings	each	20	$ 10,000	$ 200,000
Waterproofing	m^2	640	$ 30	$ 19,200
Backfill	m^3	4000	$ 25	$ 100,000
Hand Rail & Train's Man Walkway	m	48	$ 1,000	$ 48,000
Trail Path	m	30	$ 1,500	$ 45,000
Flag Man	day	120	$ 1,000	$ 120,000
Hydro Ducts Culvert	m	60	$ 1,000	$ 60,000
Steel Structure	tonne	315	$ 4,500	$ 1,417,500
CN Rail Track Work & Temp. Spans	L.S.	1	$ 2,000,000	$ 2,000,000
Retaining Wall	m^2	400	$ 800	$ 320,000
Temporary Span	L.S.	5	$ 250,000	$ 1,250,000
Strengthening Existing Abutment	L.S.	1	$ 500,000	$ 500,000
Relocate Hydro One Networks Ducts (Class C cost estimate provided by Hydro One Networks (± 50 %))	L.S.	1	$ 2,200,000	$ 2,200,000
			Sub-total	***$ 11,190,900***
			15% Contingency & 15% Engineering	$ 3,357,270
			Total	***$ 14.6 M***

The initial step in the process indicated that for two of the six Study Assessment Groups, and 29 of the evaluation criteria, the two options were considered equal, and/or could not be meaningfully differentiated. This left the following four Study Assessment Groups and associated evaluation criteria as the relevant factors for identifying the preferred option:

i) Biological Assessment Group
- Potential for effect on fish habitat, passage and fish populations.

ii) Socio-Economic Assessment Group
- Opportunity to integrate with planned land uses in the surrounding area; allow for a balance of development/open space.

iii) Engineering/Technical Assessment Group
- Ease/complexity of implementation; and,
- Potential for risk of failure.

iv) Cost Assessment Group
- Cost to implement the option.

A comparison of the two options based on the above evaluation criteria determined that the bridge extension option is preferred over the multi-cell culvert structure. An explanation of the underlying rationale is provided below.

i) Biological Assessment Group

Both options can be designed with appropriate mitigation measures to avoid or minimize adverse effects on fish habitat and passage. Instream and/or riparian restoration alternatives could be designed with the intent of promoting viable fish habitat in association with these structures. The culvert option could also include the use of natural substrates in the culvert bottom.

However, the bridge extension option would create a more natural river bed, as opposed to the concrete bottom of the culvert. Overall the bridge option would provide conditions that are more conducive to the establishment of higher quality fish habitat.

Given the above, the Biological Assessment Group has a strong preference for the bridge extension option.

ii) Socio-economic Assessment Group

The West Don Lands Precinct Plan depicts a bridge structure through the CN Rail embankment as a means of integrating the flood protection requirements, with the need for pedestrian access and circulation through the area. Access through the embankment is viewed as a key component of the linkage network that will join the future Don River Park (on the flood protection landform), the Don River Valley, and the Lakeshore Trail systems. The structure is also viewed as a civic design feature of the new waterfront and functional connections.

During the interaction with the public, several comments were received indicating a strong preference for a bridge extension structure. Due to its length and more confined nature, the culvert was perceived as an imposing structure, and concerns were expressed regarding personal safety while accessing the culvert. The bridge extension option provides an open access route, with improved sightlines and pedestrian visibility.

On a comparative basis, the above factors lead to preference for the bridge extension option for this assessment group.

iii) Engineering/Technical Assessment Group

In general, there is more engineering confidence associated with the construction of an additional bridge span than for the construction of the culverts. Construction (including excavation, shoring, and dewatering) of the bridge extension option would be confined to a relatively small area compared to the culvert option, as the culvert cells intersect the rail lines to the west side of the hydro ducts, resulting in a longer hydraulic path.

The construction of both options would require the excavation of the site area, the installation of

shoring/cofferdams and dewatering of the excavations. For the culvert option, the excavation would extend for the full width of the three culvert cells, a distance of some 21 m. By comparison, for the bridge extension option, the work area would be limited, providing a width of approximately 5 m to permit the construction of the new abutment.

While inside bracing of the shoring/cofferdam is feasible for the bridge extension option, the same is not the case for the culvert structure. To construct the culvert, tiebacks would be necessary to support the shoring, but given the unfavourable site conditions, this may be difficult to implement. The poor soil conditions dictate that the tiebacks must be anchored into bedrock, and liners would be necessary in all the holes to prevent the collapse of the surrounding soil.

The anchoring of the tiebacks into bedrock would necessitate the angling of the tiebacks, and since the sheet pile cannot resist the vertical component of the tension exerted by the tiebacks, a soldier piles and waler system would be required.

Finally, the bedrock is 25 m deep on the north side of the CN Rail embankment, and given the required angling of the tiebacks that is required, and the needed embedment length into sound bedrock, the resultant drilling length may exceed the reach of readily available equipment.

Given the above complexities, it is unlikely that installation of the culvert option could be achieved during weekend work blocks, and track diversion would be deemed necessary. An allowance for the track diversion has been included in the construction costs for the culvert option.

However, there are also a number of risk factors and constraints associated with the culvert option that could lead to increased costs, which are difficult to quantify at this time, and for which a specific allowance has not been included.

These risks and constraints include: the poor soil conditions combined with high groundwater levels; the potential time constraints for installing the culvert cells under the CN Rail embankment; and the need to construct the lower three cells of the culvert under and in the vicinity of the electrical ducts, which will be subject to strict requirements by Hydro One Networks. A review of the inherent uncertainties, potential difficulties and/or unfavourable conditions that could be encountered suggests a higher contingency allowance in the construction cost for the culvert option would be appropriate.

By contrast, it is anticipated that construction of the bridge extension option would be a relatively straightforward undertaking. The construction technique makes use of temporary spans, which is a commonly used approach by CN Rail, and the work area is fairly limited in size.

In regard to risk of failure, both options can provide the required hydraulic capacity to achieve flood protection to the Regulatory Flood level. The culvert structure, however, by virtue of the numerous cell side-walls would be more susceptible to blockage by large floating debris. This condition would be more likely to occur during major storm events, when the effect of blockage could be more severe.

The results of the above comparative analyses indicate that the bridge extension option is preferred based on engineering/technical considerations.

iv) Cost Assessment Group

The cost of the culvert option is estimated at $14.2 M, and the cost of the bridge extension option is $14.6 M. For practical considerations, the cost differential is considered negligible, and the options were considered equal for this assessment group.

However, it should be noted that given the risk factors associated with the construction of the culvert option, the cost of this option can easily increase.

6.5.4.1 Evaluation Results

Based on the above discussion, the bridge extension option emerged as the preferred method for providing additional hydraulic capacity through the CN Rail embankment, and was adopted as a component of the overall remedial flood protection project. A summary of the outcome of the comparative analysis is presented in ***Table 6.7***.

6.6 East Bank Retaining Wall/Dykes

Interim flood protection works are required for the east bank of the Lower Don River to prevent an increase in the water level downstream of the railway when the flood protection landform is constructed. The east bank works consist of two 1.0 to 1.5 m retaining wall/dykes. The first extends from the CN Rail line to the east of the Don Roadway on private property and a retaining wall and dyke system west of the Don Roadway on City-owned property. The second dyke extends between the Don Roadway and the Don River from the Don Valley Parkway (where it begins to cross the Don River) and Lakeshore Blvd. The dyke will be approximately 4 to 8 meters from the east bank of the Don River. The east bank works are depicted in ***Figure 6.15***.

The construction of the northerly dyke will involve construction on lands under the ownership of Unilever, and a tie into the CN Rail embankment (which is presently owned by GO Transit) in the north and the Don Valley Parkway on-ramp to the south. In addition, it will involve the elimination of an abandoned access right-of way that originally connected the lands south of the CN Rail with the lands to the north.

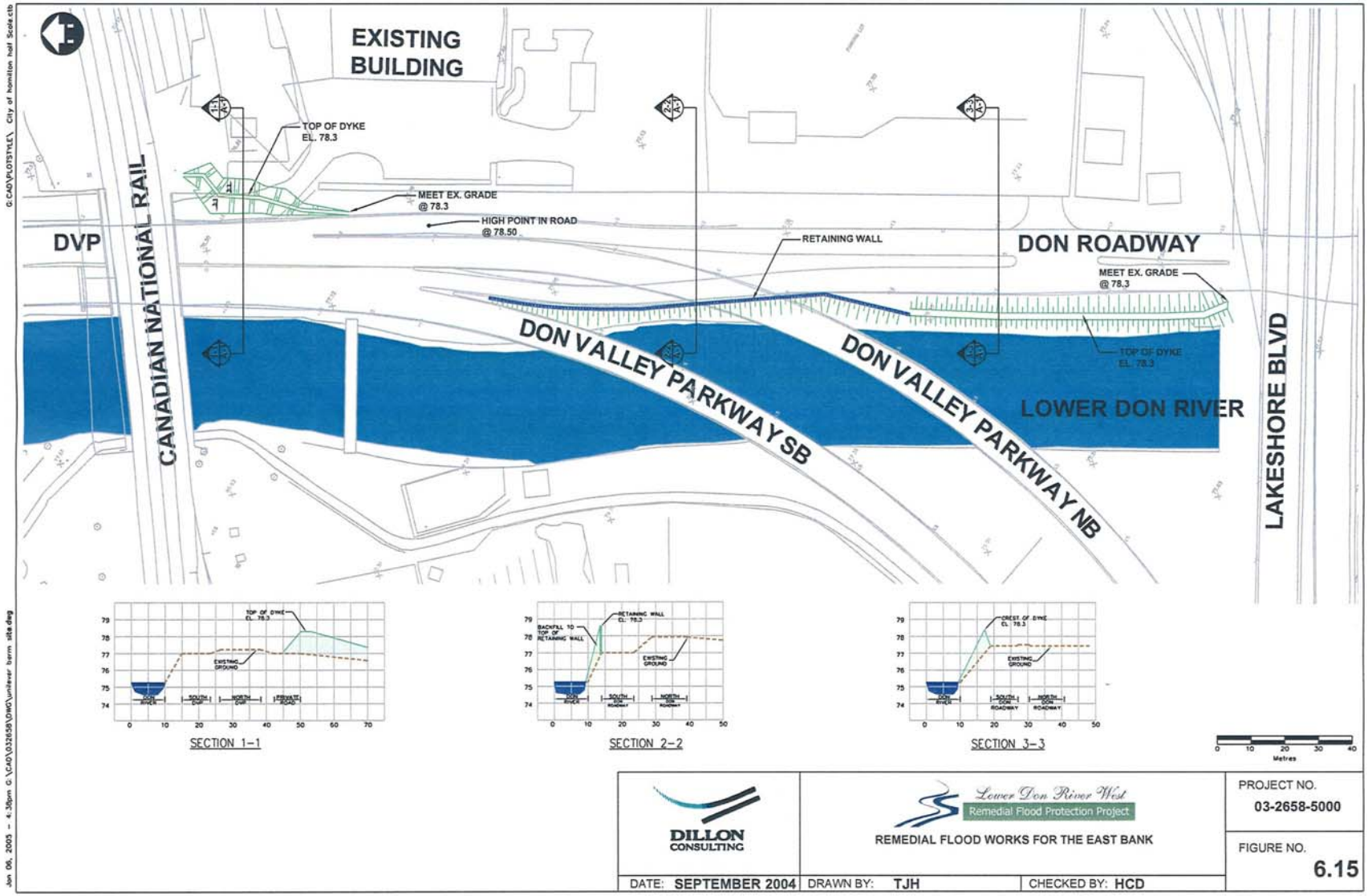
Recent redevelopment of the lands to the north, associated with the BMW dealership, has altered the topography, and together with the construction of a stormwater management facility, has rendered the former access route unusable.

As noted above, the implementation of remedial works on the east bank to address the flooding issue requires works to be carried out on the Unilever property. This was first acknowledged in the *West Don Lands Flood Protection and Related Issues Study (MMM 2000)*. During the course of this Environmental Assessment, discussions were held with Unilever to obtain their agreement with the proposed works and to ensure that their concerns would be adequately addressed.

A number of alternatives were developed, which range from interim to permanent options, and

Table 6.7 – Summary of Option Evaluation

Evaluation Criteria	Culvert Option	Bridge Option
Biological Assessment Group • Potential for effect on fish habitat, passage and fish populations.		preferred
Socio-Economic Assessment Group • Opportunity to integrate with planned land uses in the surrounding area; allow for a balance of development/open space.		preferred
Engineering/Technical Assessment Group • Ease/complexity of implementation; and, • Potential for risk of failure.		preferred preferred
Cost Assessment Group • Cost to implement the option.	equal	equal


EXISTING BUILDING
TOP OF DYKE EL. 78.3
MEET EX. GRADE @ 78.3
HIGH POINT IN ROAD @ 78.50
RETAINING WALL
DVP
CANADIAN NATIONAL RAIL
DON ROADWAY
MEET EX. GRADE @ 78.3
TOP OF DYKE EL. 78.3
DON VALLEY PARKWAY SB
DON VALLEY PARKWAY NB
LOWER DON RIVER
LAKESHORE BLVD
SECTION 1-1
SECTION 2-2
SECTION 3-3
Metres
DILLON CONSULTING
Lower Don River West
Remedial Flood Protection Project
REMEDIAL FLOOD WORKS FOR THE EAST BANK
PROJECT NO. 03-2658-5000
FIGURE NO. 6.15
DATE: SEPTEMBER 2004
DRAWN BY: TJH
CHECKED BY: HCD

p

submitted to Unilever and Korex staff for review and comment. The details of the alternatives considered, together with a discussion of the associated benefits/disbenefits, are contained in a document entitled *Discussion Paper on The Review of Alternatives for the East Bank*. A copy of the document is provided in ***Appendix K***.

Following their review, agreement was reached on the following points:

- the works as shown on ***Figure 6.15*** represent the preferred alternative for the east bank, and are considered as an interim measure; and,

- Unilever would undertake the design and construction of the proposed works on their property, on behalf of TRCA; the design and construction of all works must conform to the appropriate design standards to ensure the long-term stability of the dyke.

Initially, the Toronto Fire Department indicated that the access right-of-way would be required as a fire route. Following further investigations, it was determined that a fire route at this location was not required; correspondence to this effect from the Toronto Fire Department is included in ***Appendix C***. Unilever has indicated that they have no need for the access route.

Excavation will be required to construct the footings for the wall/dykes. In the event that contaminated soils are encountered, they would be managed in a manner similar to that outlined for the west flood protection landform noted above.

In the area of the northern dyke immediately south of the CN Rail, there is a steel 250mm gas line that falls under the regulatory mandate of the National Energy Board (NEB). Exact modifications, if any, to this main would be finalized as the detailed design progresses. Also located in this area is a 200 mm oil line owned by Sun Oil Company and a 250 mm diameter oil pipeline, which is owned by Imperial Oil Company. Discussions have been held with these companies to determine how these lines could be affected, and all have agreed in principle to the proposed concept. A copy of the correspondence with the three companies is included in ***Appendix C***. Considering that the proposed fill required to create the retaining wall/dyke is less than 2 m in depth, it is expected that the effects will be minimal, if any.

In the area of the retaining wall to be located along the west edge of the Don Roadway, there is a 525 mm and 600 mm diameter storm outlet. These outlets may need to be modified to accommodate the proposed wall and check valves would be installed on the existing outlets to the Don River.

Along the southern retaining wall/dyke located just north of Lake Shore Boulevard west of the Don Roadway, there is an existing THES conduit, a 500 mm diameter gas main and a 525 mm diameter storm sewer outlet. The effect of the 1.5 meters of fill needed to create the dyke is expected to be minimal, if any. A check valve would be constructed on the existing storm outlet.

6.7 Keating Channel Dredging

The continued dredging of the Keating Channel as per the dictates of the Keating Channel Environmental Assessment (Acres, 1983) is necessary to reduce potential flood depths along the Lower Don River. Currently dredging activities are carried out on an annual basis and remove approximately 35,000m^3 of material yearly. This ensures that water levels in the lower Don River are 0.3 to 0.7m lower than with no dredging activities. The dredged material is disposed of at a contained disposal facility at the Leslie Street Spit.

6.8 Modifications to the Enbridge Utility Bridge

Minor modifications to the Enbridge Utility Bridge are required to reduce the local flow disruptions.

The structure is a concrete bow-swing arch bridge. The bridge is completely enclosed, and the closure is extended to the approaches. The doors at the two ends of the bridge are locked, and at the time of site visit, the inside of the bridge was not accessible. There are panels between the hangers, extending from the deck to the roof. There is no opening on the upstream (north) side of the bridge. On the downstream (south) side, a few openings have been provided in the panels, and several vents have been provided in the roof. The bridge is narrow, about 5 m wide, with Bell Canada and TV cable ducts attached to the deck on the outside fascia.

The proposed retrofitting work on this structure includes: removal of the vertical panels between the hangers, encasing the utility pipes, and installing railings on both sides of the bridge. The proposed work is based on a preliminary visual inspection of the structure.

Additional investigation would be required during the detailed design phase to confirm the scope of work.

It is important to note that the bridge is substantially submerged under the Regulatory Flood conditions, and does not affect the governing flood levels in the area. Accordingly, while the identified modifications are definitely preferred, they are not essential to the functionality of the remedial flood protection project.

6.9 Remedial Flood Protection Project Cost

A breakdown of the costs associated with the flood remedial project is provided in ***Table 6.8.*** This summary incorporates the works necessary to construct all components, including the flood protection landform as shown in ***Figure 6.5,*** the bridge extension, the works on the east bank, the Enbridge utility bridge, and the related utility relocation, road work, etc., to facilitate construction.

The cost does not include items that are not directly necessary for the project, and other items that may be required for the construction of the utilities and road works associated with the redevelopment of any adjacent lands in Spill Zone 3. This would include: the relocation or the new construction of roadways (i.e., Bayview Ave.) or utilities, the landscaping works for the end use of the flood protection landform, and other

Table 6.8 – Summary of Preliminary Costs
Remedial Flood Protection Project

Flood Protection Component	Item	Estimated Cost
Flood Protection Landform	Site Preparation (including stripping and stockpiling of soil, removing	$ 675,000
	Supply and Place Landform Fill Material	$ 2,000,000
	Utility work (including abandonment of appropriate utilities,	$ 490,000
	Soil Management (including risk assessment, SSRA remediation)	$ 800,000
	Basic Restoration (hydroseeding, etc.)	$ 500,000
	Landform Sub-Total (including 25% engineering & contingency)	***$ 5,581,250***
Bridge Extension Option (21.3m span)	***Bridge Extension Option Sub-Total, as per Table 6.6 (including (30% engineering & contingency)***	***$ 14,600,000***
East Bank Works	Site Preparation (including stripping and stockpiling of soil)	$ 6,000
	Supply and Place Dyke Fill Material	$ 28,000
	Installation of Check Valves on Existing Storm Outlets	$ 150,000
	Protection of Existing Storm Outlets and Three Pipelines	$ 40,000
	Construction of Retaining Wall/Connection to Concrete Pier	$ 140,000
	Basic Restoration (hydroseeding, etc.)	$ 35,000
	East Bank Sub-Total (including 25% engineering & contingency)	***$ 498,750***
Enbridge Utility Bridge	Removal of vertical panels, encasement of utility pipes and provision of hand railings. (including 25% engineering & contingency)	***$ 320,000***
	Total Cost of Remedial Flood Protection Project	***$ 21 M***

Notes:

i) The cost for the Soil management component was taken from the *West Don Lands Flood Protection and Related Study Report (MMM 2000)*, and adjusted for inflation, as additional investigations in this regard are currently been undertaken by ORC.

ii) Additional costs would be incurred for the temporary re-location of the Hydro One overhead lines to facilitate construction of the bridge extension, which are not included in the above.

servicing works, as may be required.

The cost for the continued dredging of Keating Channel is not included, as dredging activities are currently ongoing and additional costs would not be incurred as a result of this project

Total costs may be revised depending on staging and coordination of the project components in the area (i.e. additional utility or roadwork may be added to the landform work in order provide temporary services or for cost effective reasons).

6.10 Assessment of Effects and Benefits

This section describes the potential for environmental effects of the project. ***Table 6.9*** summarizes these positive and negative effects.

The following is a description of the effects by environmental component for the remedial flood protection project. Both construction and operation phases are considered. Following this description, ***Table 6.10*** summarizes the nature of the expected effects and the mitigation measures that would be implemented to reduce negative effects, together with expected residual effects.

6.10.1 Physical Environment

6.10.1.1 Terrain, Landforms and Topography

i) *Terrain Construction Effects* - The project will result in the modification of the existing terrain through the creation of the flood protection landform. The existing terrain is relatively flat and there are no unique landforms in the general area.

ii) *Terrain Operation Effects* - There will be no operation effects to terrain/topography.

iii) *Terrain Effects Significance* - Although the project will result in some terrain alteration through construction excavation activities, the existing terrain/topography of the study area is not considered to be significant from a natural heritage or human interest perspective. The area is highly urbanized and has been significantly altered in the past and the creation of the flood protection landform is expected to greatly improve the aesthetics of the area.

6.10.1.2 Air Quality

i) *Air Quality Construction Effects* - During excavation and grading activities, increases in particulate matter (dust) could result in the local area. There would also be emissions from the diesel engines of construction machinery, however there are no residents in the West Don Lands. Residents north of Queen Street are located approximately 100 m from the northern end of the flood protection landform (at Queen Street). These residents might experience some short-term dust effects during the construction phase, although most of the construction activity would be in excess of 300 m from these residential areas.

Users of the recreation pathway may notice increased dust on occasion, but these effects would be short term.

Some of the remaining businesses in the Lower Don River West Lands that are not displaced by the flood protection landform could experience increased dust levels. Many of the businesses on ORC property may be removed as part of the initial site preparation efforts associated with the construction of the flood protection landform.

Businesses along Queen/King Street, as well as the BMW car dealership and the Korex plant on the east side of the Don River could also experience some limited dust effects temporarily.

Table 6.9 – Remedial Flood Protection Project
Summary of Effects

Screening Criteria	Rating of Potential Effect							
	-H*	-M	-L	NIL	+L	+M	+H	NA
Physical								
Unique Landforms								X
Existing Mineral / Aggregate Resources Extraction Industries								X
Earth Sciences – Areas of Natural and Scientific Interest								X
Specialty Crop Areas								X
Agricultural Lands or Production								X
Niagara Escarpment								X
Oak Ridges Moraine								X
Environmentally Sensitive/Significant Areas (physical)				X				
Air Quality			X[1]	X				
Agricultural Tile or Surface Drains								X
Noise Levels and Vibration			X[1]	X[2]				
High/Stormwater Flow Regime							X[2]	
Low/Base Water Flow Regime				X[2]				
Existing Surface Drainage and Groundwater Seepage				X[1,2]				
Groundwater Recharge/Discharge Zones				X[1,2]				
Littoral Drift								X
Other Coastal Processes								X
Water Quality			X[1]		X[2]			
Soil/Fill Quality							X[2]	
Contaminated Soils/Sediments/Seeps							X[2]	
Existing Transportation Routes		X[1]		X[2]				
Constructed Crossings (e.g. bridges, culverts)				X[2]				
Geomorphology			X[1.2]					

Table 6.9 – Remedial Flood Protection Project
Summary of Effects

Screening Criteria	Rating of Potential Effect							
	-H*	-M	-L	NIL	+L	+M	+H	NA
Biological								
Wildlife Habitat			X[1]		X[2]			
Habitat Linkages or Corridors			X[1]		X[2]			
Significant Vegetation Communities				X[1]	X[2]			
Environmental Sensitive/Significant Areas (biological)								X
Fish Habitat/Populations/Migration			X[1]		X[2]			
Species of Concern (e.g. species at risk, vulnerable/threatened/endangered species, conservation priorities – either flora or fauna)								X
Exotic/Alien and Invasive Species					X[2]			
Wildlife/Bird Migration Patterns			X[1]		X[2]			
Wildlife Population			X[1]		X[2]			
Wetlands					X[2]			
Microclimate					X[2]			
Life Science ANSI's								X
Unique Habitats								X
Cultural								
Traditional Land Uses								X
Aboriginal Reserve or Community								X
Outstanding Native Land Claim					X[2]			
Trans-boundary Water Management Issues								X
Riparian Uses								X
Recreational or Tourist Uses of a Water Body and/or Adjacent Lands			X[1]		X[2]			
Recreational or Tourist Uses of Existing Shoreline Access Locations								X
Aesthetic or Scenic Landscapes or Views			X[1]		X[2]			
Archaeological Resources, Built Heritage Resources & Cultural Heritage				X[2]	X[1]			

Table 6.9 – Remedial Flood Protection Project
Summary of Effects

Screening Criteria	Rating of Potential Effect							
	-H*	-M	-L	NIL	+L	+M	+H	NA
Landscapes								
Historic Canals								X
Federal Property								X
Heritage River System								X
Socio-Economic								
Surrounding Neighbourhood or Community			X[1]		X[2]			
Surrounding Land Uses or Growth Pressure							X[2]	
Business Operations			X[1]	X[2]				
Existing Infrastructure, Support Services, Facilities		X[1]						
Pedestrian Traffic Routes			X[1]			X[2]		
Property Values or Ownership							X[2]	
West Nile Virus				X[2]				
Existing Tourism Operations								X
Property/Farm Accessibility								X
Engineering/Technical								
Rate of Erosion in Ecosystem				X[1,2]				
Sediment Deposition Zones in Ecosystem				X[1,2]				
Flood Risk in Ecosystem							X[2]	
Slope Stability				X[1,2]				
Existing Structures			X[1]	X[2]				
Hazardous Lands							X[2]	
Hazardous Sites							X[2]	

Notes: * ± H, ± M, ± L indicates high, moderate and low positive/negative effect, respectively;
NIL indicates no effect;
NA indicates not applicable;
X[1] indicates construction period; and,
X[2] indicates operation period.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Physical				
Air Quality	Construction	Increase of local airborne particulate matter and diesel fumes during construction. Effects are predicted to be temporary and localized. There are few receptors in the area, the closest of which are businesses/residents along and to the north of Queen Street. Also, people who may pass through the area on the recreation pathways could notice increased dust levels.	Dust suppression on roadways; flushing/or wet sweeping of paved surfaces; properly construct road bases on unpaved construction roads; minimize time exposure of unvegetated soil stockpiles; maximize separation distance of diesel generators from receptors. A Dust Monitoring program to evaluate the extent of dust impact will be implemented.	A limited number of people/businesses in the area may perceive higher levels of dust. These effects will be temporary, localized and are typical for a construction site.
	Operation	No dust effects during the operation period.	The flood protection landform will be vegetated so there will be no dust effects.	No residual effect expected.
Noise Levels and Vibration	Construction	Noise from construction activity, such as back-up beepers, pneumatic drills and diesel engines, has the potential to be noticeable, particularly if construction occurs outside of weekday daytime periods. Traffic on the Don Valley parkway and other roadways result in high ambient sounds levels, which will mask some of the construction noise effects.	Work will be undertaken in accordance with City noise by-laws. Various mitigation measures are available to minimize construction noise including maintenance of mufflers and other noise reduction devices on heavy equipment, and installation of temporary noise barriers around stationary noise sources. Night-time construction activity should be minimized. Noise complaints are to be followed-up by the contractor.	Noise and vibration effects from the project are not expected to be of concern given the temporary nature of the effect, the high ambient noise levels in the area and large separation distances between residents and the construction site.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Noise Levels and Vibration	Construction	Noticeable noise effects from heavy equipment are typically limited to within 200 m of the construction site. Although residents along and to the north of Queen Street are approximately 100 m from the northern limit of the landform, these residents will be at least 300 m from the most extensive construction areas which are located south of Eastern Avenue. Given the separation distance, significant noise effects are not expected. If the businesses along Eastern Avenue are still occupied during construction, some temporary noise effects could be experience by the employees. Businesses along east bank of the Don River could experience some noise effects as well. Vibration effects are largely expected to remain within the project area.	Noise effects should be monitored particularly if a number of construction projects are being conducted in the area simultaneously.	
	Operation	No noise or vibration effects during the operation period.	No mitigation required.	No residual effect expected.
High/Stormwater Flow Regime	Construction	No effect on stormwater flows during construction.	No mitigation required.	No residual effect expected.
	Operation	The construction of the flood protection landform/bridge extension/east bank works will reduce flooding in the Lower Don West lands as a result of the Regulatory storm. This is a positive effect.	Retaining wall/dykes will be required to mitigate increased flooding	Reduced potential of flooding in the Lower West Don lands as a result of the Regulatory storm.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
High/Stormwater Flow Regime	Operation	There will be an increased risk of flooding downstream of the CN Rail bridge, and flows and water levels will increase.		
Low/Base Water Flow Regime	Construction	No effect to baseflows since the flood protection landform construction is primarily a filling exercise. A limited number of deep (below groundwater level) excavations may be required during implementation of the SGMS, with limited dewatering as required.	No mitigation required.	No residual effect expected.
	Operation	Although the flood protection landform will reduce infiltration, given its relatively small area and location at the downstream end of the watershed, effects on baseflow are not expected.	No mitigation required.	No residual effect expected.
Existing Surface Drainage and Groundwater Seepage	Construction	Surface water drainage patterns will be altered during construction. Flows on the west side of flood protection landform to be directed to Cherry Street collectors. Only localized drainage from the flood protection landform will flow to the river. See water quality component regarding sediment loadings. Groundwater seepage is expected to be unchanged during construction	Storm sewers will be installed to collect surface water runoff and connect to the City storm system.	No residual effect expected.
	Operation	The flood protection landform will alter surface drainage patterns in the local area. Storm sewers will be put in place to drain the flood protection	Storm sewers will be installed to collect surface water runoff and connected to the City storm system.	No residual effect expected.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Existing Surface Drainage and Groundwater Seepage	Operation	landform dry side (west side) towards Cherry Street. Flows from the wet side (east side) of the flood protection landform will drain towards the Don River. Groundwater seepage expected to be unchanged. To be confirmed after the development of the West Don Lands Soil and Groundwater Management Strategy (SGMS).		
Groundwater Recharge/ Discharge Zones	Construction	No appreciable effect to groundwater recharge/discharge.	No mitigation required.	No residual effect expected.
	Operation	Although the flood protection landform may reduce the area of infiltration depending on landform construction materials and changes to surface imperviousness, given its relatively minimal size, reduction in groundwater levels are not expected. Infiltration along top of flood protection landform and its wet side (east) may increase due to change from an impervious to vegetated ground surface. To be confirmed after the development of the SGMS.	Where possible, stormwater infiltration opportunities will be maximized (e.g. swales).	No residual effect expected.
Water Quality	Construction	During the construction period, there is potential for increases in sediments loads to the Don River, particularly for the construction of the additional span at the CN Rail bridge.	Best Management Practices (e.g., silt curtains, rock checks dams, erosion blanket, rip rap, straw bale, and vegetated buffers) will be put in place to minimize the potential for sediment runoff from the construction site and from spills (e.g., grease, hydraulic fluid, fuel, etc).	Any potential negative water quality effects from the project would be short term in duration and likely focused on a localized area (e.g., near the CN Rail embankment). Effects are expected to be minimal.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Water Quality	Operation	No negative effects expected. Potential for improvement through expected soil clean-up efforts and plantings on the flood protection landform to reduce overland sediment transport.	Plantings on the flood protection landform.	No negative effects anticipated. Potential for improvement in runoff quality.
Fill Quality/ Contaminated Soils	Construction	Clean fill and/or soils located on-site will be utilized for flood protection landform construction	Contaminated soils used in the landform construction may require some level of remediation depending on the nature of the contamination.	Flood protection landform construction and the associated West Don Lands Soil and Groundwater Management Strategy (SGMS) expected to improve soil conditions in the study area.
Existing Transportation Routes	Construction	Construction equipment may use local roads to access the site. This could lead to temporary traffic delays. If the relocated roadway can be constructed with the existing roadway in place, traffic disruption effects are expected to be minimal; alternatively, some short-term disruptions to the lower part of Bayview Avenue would be necessary.	If traffic can be maintained along the existing Bayview Avenue during construction, effects to traffic will be minimal and no mitigation will be required beyond for example, signage regarding the operation of construction equipment in the area.	Some temporary delays to local traffic are possible during the construction period.
	Operation	The project will require the relocation of Bayview Avenue. The relocated Bayview Ave is not expected to affect traffic movement in the larger area. The relocation of Bayview Ave is addressed under a separate Class EA entitled *West Don Lands, Class Environmental Assessment – Master Plan, March 2004.*	No mitigation required beyond the relocation of Bayview Avenue.	No residual effect expected.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Constructed Crossings	Construction	No crossings will need to be constructed for this project.	No mitigation required.	No residual effect expected.
Geomorphology	Construction	Construction of the additional bridge span could have a detrimental effect through the introduction of sediments in the Don River.	Appropriate erosion and sediment control measures need to be implemented (as previously described).	Any sedimentation effects will be temporary and of limited magnitude. Mitigation measures are expected to be effective. Residual effects are expected to be minimal.
	Operation	Sediment transport would be negatively affected via the bridge extension. This structure would effectively increase the channel width at the local scale. While providing flood relief, it would tend to lower channel velocities at lower stages, which would increase the deposition of sediment, although, continued dredging of the Keating Channel would improve sediment conveyance through the area. With respect to erosion potential, little change is anticipated at the bridge extension and in downstream areas.	No specific mitigation required.	The bridge extension is expected to result in a slight negative effect through the reduction of sediment transport through the area. Continued dredging of the Keating channel will aid in improving sediment conveyance in the area.
Biological				
Wildlife Habitat	Construction	The flood protection landform/bridge extension will result in the loss of less than 0.5 ha of poor wildlife habitat along the west side of the Lower Don River.	Loss of this poor quality habitat is not of concern.	Minimal effect.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Wildlife Habitat	Operation	Through construction of the flood protection landform, new habitat will be created which will result in a net improvement of habitat.	Plantings on the flood protection landform to provide/improve wildlife habitat.	Net improvement to wildlife habitat in the area.
Habitat Linkages or Corridors	Construction	The area offers limited opportunity for the movement of wildlife in the area. Construction activities will result in disturbance effects that could scare wildlife from the area	No mitigation required.	The disturbance effects to wildlife in the area due to construction will be temporary and generally considered to be minimal.
	Operation	The area currently provides poor/limited linkages for the movement of wildlife through the area and to the upper reaches of the Don River. The construction of the flood protection landform and associated plantings would improve habitat linkages.	No mitigation required.	Net improvement to wildlife movement expected through the flood protection landform.
Significant Vegetation Communities	Construction/ Operation	No significant vegetation communities present. New plantings with native species will help to reduce the number of invasive/exotic species in the area.	No mitigation required.	Neutral to positive effect through new plantings of native species associated with the landscaping plan.
Fish habitat/ populations	Construction	The construction of the flood protection landform/bridge extension will not result in the removal of fish habitat. There is some potential for temporary disturbance effects during construction, particularly from the bridge extension (e.g. through the release of sediments during runoff periods).	BMPs will be put in place to reduce sediments from entering the Don River (as previously described).	Any sedimentation effects from construction activity will be localized and temporary.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Fish habitat/ populations	Operation	The bridge extension is not expected to have a negative effect on fish habitat in the Lower Don. Instream and/or riparian restoration measures could be designed to promote new fish habitat in the area of the widened channel.	Implementation of instream fish habitat restoration measures.	Net improvement to fish habitat in the study area.
Fish Migration/ Movements	Construction	Construction of the bridge extension may interfere with normal fish movements under the CN Rail bridge.	Construction of the bridge extension will not take place during fish spawning seasons.	No effect on spawning movements. Slight, temporary effect on non-spawning fish movement
	Operation	The bridge extension is not expected to impede upstream and downstream fish movements	The additional span will be designed to allow for the easy passage of fish.	No residual effect expected.
Exotic/Alien and Invasive Species	Construction/ Operation	There is potential that invasive plant species could take hold on the flood protection landform.	Plantings of native species and vegetation management activities will reduce the potential for invasive species.	Slight positive effect through the planting of native species as part of the landscaping efforts.
Wildlife/Bird Migration Patterns	Construction	Although the natural cover is of rather poor quality, migrant birds utilize the riparian corridor as migratory pathways.	The construction of the flood protection works will unavoidablely interfere with this migrant route, however, efforts should be made to reinstate the continuity of habitat as soon as possible, by avoiding a delay in initiating the planting program, thus minimizing the number of seasons over which migrant birds are affected.	Disturbance effects to wildlife in the area would be temporary and generally considered minimal.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Wildlife/Bird Migration Patterns	Operation	The flood protection landform/bridge extension will not affect wildlife/bird migration patterns in the area.	No mitigation required.	Improvements in habitat through plantings on the flood protection landform may improve wildlife movement through the area. This will be a net benefit.
Wildlife Population	Construction	There is limited wildlife in the area. No species of federal, provincial or regional concern have been identified in the study area but at least 5 species have been recorded in the area that are ranked as L4 by the TRCA in the urban matrix flora and fauna species of concern. These species include the eastern garter snake, wood chuck, red-eyed vireo, northern rough winged swallow (however, this species will not likely be threatened by the construction), and northern mockingbird. These species are found within the footprint of the study area.	No mitigation available during construction. Plantings on the flood protection landform to provide/improve wildlife habitat.	Potential for future disturbance effects to the limited species that might inhabit the area. These species are expected to migrate to other nearby areas during construction.
	Operation	The creation of the flood protection landform and associated plantings will improve wildlife habitat and potentially lead to increased wildlife populations in the area.	Plantings on the flood protection landform to provide/improve wildlife habitat.	Improvements in habitat through plantings on the flood protection landform may improve wildlife populations in the area. This will be a net benefit.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Microclimate	Operation	There is no predicted change in micro-climate associated with the project. Opportunities to naturalize the area could increase the amount of shading in the area and thus affect temperatures at a micro level that could be beneficial to wildlife in the area.	Encourage plantings to increase shading.	Potential net benefit to wildlife through increased shading from plantings.
Cultural				
Outstanding Native Land Claims	Construction/ Operation	Lands to be affected by the project are not currently used by First Nations. The area is included as part of a larger land claim by the Mississaugas of the New Credit First Nation. The Band has indicated an interest in the project, particularly in regards to facility design.	Consider the incorporation of an Aboriginal cultural feature into the facility. In preparing the detail design, opportunities for such a feature will be investigated.	Potential for positive effects should an Aboriginal cultural feature be incorporated into the design of the facility.
Recreation Uses of Lands Adjacent to a Water Body	Construction	There will be some disturbance effects to users of the pathway (west side of Don River) during construction.	Detours will be provided if required through the area.	Minimal short term disturbance, effects/inconveniences during construction.
	Operation	The pathway will be improved with a new pedestrian underpass at the CN Rail embankment that will not be as prone to flooding as is the existing pathway. Proposed landscaping will improve aesthetics through the area.	Plantings, creation of new trail connections and underpass improvements	Net improvement to the pathway adjacent to the Lower Don River. Plantings/ naturalization efforts will improve the aesthetics for pathway users. Linkages between the waterfront and the upper reaches of the Don River will be improved.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Landscape/Views	Construction/ Operation	The current landscape is significantly degraded. There is some potential for change in views and in the landscape character through construction of the flood protection landform/bridge extension. Through the naturalization efforts associated with the landform, the views/landscape of the area will be improved.	No mitigation required.	Net improvement to views/landscape in the area with proposed planting/ naturalization and landscaped open space.
Archaeological/ Built Heritage	Construction	Only one built heritage resource has been identified. It is the Palace Street School (1859), now the Canary Restaurant, on the west edge of proposed berm. The flood protection landform will not affect this feature. Background research indicates there is little or no potential for Aboriginal sites. The flood protection landform footprint also includes the original (pre-1887) alignment of the Don River channel.	As a rule, any lands where soils have not been removed or regraded to a depth of 3 m or more have archaeological potential. More detailed archaeological assessment will confirm the presence or absence of archaeological remains in any lands where construction will require cutting rather than, or in addition to, filling. There are two basic options for mitigating significant archaeological resources: salvage excavation and preservation by avoidance. Archaeological monitoring of bore hole testing would provide key information on the potential for underlying archaeological remains in any given area.	Assuming that any archaeological features in the area can be recovered and preserved, the net residual effect is expected to be neutral to slightly positive.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Archaeological/ Built Heritage	Operation	No effect.	No mitigation required.	No residual effects expected.
Socio-economic				
Surrounding Neighbourhood	Construction	Residences in the vicinity of the project area are located a minimum of 100 m away from the northern end of the flood protection landform. Residents are located in excess of 300 m from the most extensive construction works. Some temporary disruption effects are expected.	Implement noise and air quality related mitigation as previously described.	Minimal and temporary disturbance effects on local residents during construction.
	Operation	The flood protection landform and related open space is expected to increase recreation opportunities in the wider community	No mitigation required.	Through the flood protection, green space and passive recreation opportunities will be improved for the larger community.
Surrounding Land Use/Growth Pressure	Operation	The surrounding lands are largely vacant/underutilized. Through the construction of the flood protection landform and the reduction in flood risk for the Lower Don West lands, there is a greater likelihood that the surrounding lands will be redeveloped.	Detailed design and landscaping efforts should be carried out in a manner that is coordinated with the West Don Lands development initiative.	Net benefit through increased potential for redevelopment in the Lower Don West lands.
Business Operations	Construction	In constructing the flood protection landform, about 20 buildings/businesses in the Lower Don West lands will be displaced. These businesses lease property/buildings from the ORC that are	Businesses that will be displaced are to be notified by ORC well in advance. ORC is to assist in the relocating of businesses where possible.	Up to 20 businesses in the West Don Lands will be displaced. This will affect the operation to these businesses although as

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Business Operations	Construction	renewed on a monthly basis. Other businesses in the area (e.g., along the east side of the Don River and along King/Queen Street) could experience some disruption effects in the form of dust/noise and access restrictions. As the most extensive construction works are south of Eastern Avenue and in excess of 300 m away, disruption effects to the Queen/King Street businesses are expected to be minimal. One access point to the Korex Plant will be blocked as a result of the project. Discussions have occurred with Unilever who is the property owner. This access point is not currently used and the blocking of it will not affect business operations. The property is accessed through another access route. The extension of the CN Rail bridge will require the closure of one mainline track during each construction period. Alteration to CN Rail schedule will be required during these periods.	Dust and noise effects will be mitigated through measures previously described. Access will be maintained to area businesses during construction. The bridge extension will be installed and CN rail crossing reduced to one track during weekend periods (likely long weekends) so as to minimize effects to rail traffic. Discussions have occurred with CN Rail regarding the project. CN Rail has defined when the construction can occur (over two weekend work blocks).	lease arrangement is on a one-month basis, the temporary nature of these locations should be well-known to these businesses. Some temporary disruption effects could also occur to area businesses during construction. Mitigation is expected to be effective. The separation distance and temporary nature of the construction, reduces the significance of these effects. By limiting the impact on rail operation to weekend periods only, effects will be minimized.
	Operation	No operation effects to businesses will result. New commercial development opportunities are expected as a result of reducing the flood risk in the West Don Lands.	No mitigation required.	No residual effect expected.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Existing Infrastructure	Construction	The installation of the flood protection landform will require the relocation of Bayview Ave that is assessed under a separate EA process in a report entitled *West Don Lands, Class Environmental Assessment – Master Plan, March 2004*. Although not part of the flood control works, the TWRC West Don Lands Precinct Plan proposed the realignment of Mill, Front and Eastern Avenues and the abandonment of Cypress Ave. The installation of the flood protection landform will require the relocation/ replacement of water mains and storm sewers in the area as previously outlined in the "Project Description" of this EA report. Works on the east bank of the Don River could affect natural gas lines in the area. The bridge extension requires the relocation of Hydro One Networks underground ducts and may require the temporary relocation of overhead cables in the area.	Utility relocations to be defined in the detailed design stage. Discussions are ongoing with oil/gas companies regarding the potential (if any) for effects on the natural gas lines along the east bank of the Don River. By building a larger span (21.3 m), the construction of the bridge works could be completed with the underground Hydro One ducts remaining in their present location, until such time as Hydro One is able to relocate the cables. Two concrete culverts will be attached to the outside of the new abutment to accommodate the realignment of the cables (refer to ***Figure 6.13***). A determination of the scope of work for relocating the overhead cables is currently being established in cooperation with Hydro One Networks.	Although the project will require changes to existing infrastructure, service levels will not be altered.
Pedestrian Traffic Routes	Construction	There will be some disturbance effects to users of the pathway (west side of Don River) during construction.	Detours will be provided if required through the area.	Minimal short term disturbance effects/inconveniences during construction

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
	Operation	The recreation pathway along the west side of the Lower Don River will be improved. The existing underpass at the CN Rail embankment (which is prone to flooding) will be replaced.	No mitigation required.	Net benefit to pedestrian linkages.
Property Values/ownership	Operation	Through the construction of the flood protection landform/bridge extension and reduction in flood risk, it is expected that property values in the West Don Lands could increase.	No mitigation required.	Potential for increase in property values.
West Nile Virus	Operation	The construction of the remedial flood protection project would not create any stagnate flow areas, and will maintain low flow velocities similar to current conditions. Mosquitoes are dependent on stagnant water, without the presence of any predators. The project therefore is not expected to result in an increase in mosquito populations.	No mitigation required.	No increase in mosquito populations.
Engineering/Technical				
Rate of Erosion/ Sediment Deposition	Operation	As the flood protection landform will have a limited slope and will be planted primarily with grasses and some trees/shrubs, the project is not likely to increase erosion rates. (In-stream erosion has been addressed under the geomorphology criterion).	Maximize use of plantings on the flood protection landform	No residual effect expected.
Flood Risk	Operation	The project will be designed to the Regulatory storm level and will reduce the flood risk in the Spill Zone 3 Lands.	East bank works will be required to address increased flood levels downstream of the CN Rail bridge to	Reduction in flood risk in the Spill Zone 3 Lands which is a project benefit.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Flood Risk	Operation	The flood protection landform will increase flood levels in Spill Zones 1 and 2, downstream of the CN Rail bridge.	protect Spill Zones 1 and 2. The works are considered temporary and will likely be replaced through other measures to be identified in the naturalization study.	
Slope Stability	Operation	Given the relatively mild slope of the flood protection landform, slope stability is not considered to be an issue	Sodding/seeding of the flood protection landform will minimize erosion and help to maintain slope stability.	No residual effect expected.
Existing Structures	Construction	1. CN Rail tracks/structure: Construction of the bridge extension at the existing west abutment will be carried out during nightly and weekend work blocks, as well as regular time. One mainline track at a time will be taken out of service for a weekend during the construction. The construction procedures are repeated under the other mainline track and then under the service tracks in subsequent weekends. 2. Enbridge Utility Bridge No changes to the concrete bow string arch utility bridge, owned by Enbridge Gas are planned. Panels on the utility bridge crossing the Don River will be removed and replaced with open mesh to allow water to flow through the bridge during high flow events.	No delays to GO Transit trains are planned during the work blocks. Delays to some of the VIA Rail trains are not expected to be longer than 25 minutes. Some delays to CN Rail freight trains are expected, depending on their timetables during the construction period. At high flood levels, parts of the bridge will be submerged under water. No mitigation measures are required.	No residual effects expected. Submersion of parts of the utility bridge during the Regulatory Storm.

Table 6.10 – Remedial Flood Protection Project
Description of Potential Effects

Environmental Components	Effect Period	Nature of Effect	Mitigation	Residual Effect
Hazardous Lands/Sites	Construction	Potential for worker exposure to contaminants during excavation and remedial activities. Potential for release of dust and vapours to the environment.	Soil and groundwater management plans to prevent exposure to workers.	No residual effects expected.
Hazardous Lands/Sites	Operation	Through the construction of the flood protection landform there is an opportunity to remove contaminant sources and hotspots. Management of subsurface environmental conditions to be addressed by the SGMS.	Record or site condition (RSC) under O. Reg. 153-04 to be completed once remedial approaches implemented/ completed to allow for land use changes and building permit issue.	Project will result in the management of subsurface environmental conditions which is a net benefit.

The following mitigation measures will be used to reduce impacts on air quality:

- use new or well-maintained heavy equipment and machinery, preferably fitted with muffler/exhaust system baffles, engine covers;
- comply with operating specifications for heavy equipment and machinery;
- minimize operation and idling of gas-powered equipment and vehicles, in particular, during smog advisories;
- minimize vehicular traffic on exposed soils and stabilize high traffic areas with clean gravel surface layer or other suitable cover material;
- avoid excavation and other construction activities with potential to release airborne particulates during windy and prolonged dry periods;
- stabilize stockpiled excavated soils in areas that are upwind of sensitive receptors;
- cover or otherwise contain loose construction materials that have potential to release airborne particulates during transport, installation or removal;
- spray water to minimize the release of dust from gravel, paved areas and exposed soils; apply chemical dust suppressants only where necessary on problem areas; and,
- restore disturbed areas as soon as possible to minimize the duration of soil exposure.

ii) *Air Quality Operation Effects* - As the flood protection landform will be covered in plantings once constructed, dust/air quality effects are not expected during operations.

iii) *Air Quality Effects Significance* - Air quality effects (dust & exhaust) during the construction period will be temporary and mitigation measures to reduce dust levels are expected to be effective in minimizing the frequency and magnitude of dust effects. As a result, the effects are not expected to be significant. A dust monitoring program would be put in place in conjunction with a complaints monitoring program during the construction period to detect and respond to dust effects. During the operations period, no change in air quality is expected.

6.10.1.3 Noise and Vibration

i) *Noise and Vibration Construction Effects* - The use of heavy equipment during all phases of construction activity will result in noise effects that could affect people passing through the area (on the recreation trail) and some local businesses. The proximity of the Don Valley Parkway, Gardner Expressway and other roadways result in a high ambient sound levels, which is expected to "mask" some of the construction noise. Sensitive receptors such as residents along and to the north of Queen Street are approximately 100 m from the northern limit of the construction area and in excess of 300 m for most of the areas to be affected by the project.

During the construction period, the contractor would be required to abide by City of Toronto noise by-laws. The contractor would be required to keep the idling of construction equipment to a minimum and maintain equipment in good working order, with effective muffling devices to reduce noise from construction activities. Night-time construction activity would be minimized. Noise complaints are to be followed-up by the contractor.

The use of construction equipment is expected to generate vibration effects in the immediate area. Any residents along or immediately north of Queen Street may experience some vibration effects from construction activities associated with the northern section of the flood protection landform. As the most extensive construction activities are south of Eastern Avenue (at least 300 m away), effects to residents should be minimal.

ii) *Noise and Vibration Operation Effects* - Noise and vibration effects during the operations period would not occur.

iii) *Noise and Vibration Effects Significance* - Noise effects from construction activities would be temporary. There are few residential receptors in the area that could experience these effects (possibly some businesses in the area). Receptors are a minimum of 100 m from the construction areas (and for most construction activities, residents will be at least 300 m away). The frequency and magnitude of noise effects will differ throughout the construction period. Through adherence to City noise by-laws and the suggested mitigation measures, noise effects are not expected to be significant.

iv) Construction vibration effects are not expected to be significant due to the separation distance from receptors (the closest residents are about 100 m away and at least 300 m from the most extensive construction activities).

v) There would be no noise/vibration effects during the operation period.

6.10.1.4 Surface Water

i) *Surface Water Construction Effects* - Surface water drainage patterns would be altered through the construction of the flood protection landform. Storm flows on the west side would be directed to the Cherry Street collectors. Runoff on the east (wet) side of the flood protection landform would still be directed to the Don River via existing storm sewers and/or appropriate overland flow routes.

Potential water quality impacts from the construction of the project relate primarily to the potential for sediment transport/deposit into local watercourses (Don River) and the City's storm sewer system, as a result of runoff/erosion during construction.

In advance of the release of the contract tender package an Environmental/ Stormwater Management Report would be prepared that would summarize the drainage design, concept (including drainage area plan, design flow rates, pump capacity, water quality management measures (e.g., a settling tank before the pump), and sediment and erosion control practices which would include relevant drawings such as a plan of Best Management Practices (BMPs) (silt fences, mud mats, etc.).

In preparing the Environmental/Stormwater Management Report, consideration will be given to the following standards and guideline documents: the *Ontario MOE Stormwater Management Planning and Design Manual (2003); the Ontario Provincial Standards and Specifications (OPSS 518 & 577); the Ontario MOE Stormwater Pollution Prevention Handbook (Part I) and the Part II – Pollution Prevention and Flow Reduction Measures Fact Sheets; the Ontario MNR Guidelines on Erosion Control for Urban Construction Sites (1989)* and *the MNR Technical Guidelines- Erosion and Sediment Control (1989).*

To provide source controls and minimize adverse impacts on adjacent lands and watercourses, the following drainage

mitigation measures would be incorporated into the design:

- minimize disturbance of existing vegetation outside ditching and grassed slopes where regrading is required;
- minimize time exposure of unvegetated soils;
- maximize length of overland flow through to points where stormwater leaves the right-of-way;
- complete an erosion assessment on all new and existing ditches to determine the need for additional erosion protection;
- where ditch regrading is required, consider utilization of flat bottom ditches in lieu of v-shaped ditches to reduce velocities and erosion potential, promote peak flow attenuation and provide short-term stormwater storage;
- use of in-line erosion control measures such as erosion blanket, rip rap, straw bale, rock flow checks and vegetated buffers, thereby mitigating high flow velocities and excessive erosion/sedimentation;
- any stockpiled materials would be stored and stabilized away from the water;
- refuelling and handling of potentially hazardous substances is to be undertaken away from watercourses;
- sediment and erosion control measures would be left in place until all disturbed areas have been stabilized;
- the sediment control plan would be designed and implemented to mitigate impacts associated with construction of the project to prevent suspended sediment, mud, debris, fill, rock dust, etc. from entering the river (overland or via storm sewers). Areas disturbed by work would be minimized. Silt fences/curtains, sediment traps, check dams would be installed as appropriate;
- measures would be in place to minimize mud tracking by construction vehicles, and to ensure timely cleanup of any tracked mud, dirt and debris along access routes and areas outside of the immediate work area where the above sediment controls would not be in place;
- work would be suspended if excessive flows of sediment discharges occur and any appropriate action would be taken immediately to reduce sediment loading;
- based on the geo-environmental investigations groundwater from foundation excavations would be tested and discharged into the City's sanitary sewer system;
- temporary mitigation measures should be installed prior to commencement of any site clearing, grubbing, excavation, filling or grading works and maintained on a regular basis, prior to and after runoff events. Any accumulated materials would be cleaned out during maintenance and prior to their removal. All disturbed areas on land to be restored to natural conditions should be re-vegetated as soon as conditions allow preventing erosion and restoring habitat functions. Land based measures would not be removed until vegetation has been re-established to a sufficient degree (or surface soils stabilized using other measures) so as to provide adequate erosion protection to disturbed work areas; and,

- in constructing the CN Rail bridge extension, some works along the riverbank will be required and could include the installation of new sheet piling. Special consideration will need to be given to avoid the release of sediments into the Don River during the construction period. BMPs such as silt curtains shall be considered. Water pumped from the area of excavation will flow through a filter bag and then overland prior to discharge into the Don River to allow for the removal of sediments.

ii) *Surface Water Operation Effects* - The flood protection landform would alter surface drainage patterns in the local area. Storm sewers will be put in place to drain most of the area towards Cherry Street. Storm runoff from the east (wet) side of the flood protection landform will drain towards the Don River through existing storm collectors/outlets to the Don River, or appropriate overland flow routes. There will be no new storm outlets to the Don River.

Once constructed, it is expected that the flood remedial works would have limited effect on surface water quality. Through the clean-up of contaminated soils and the increase in vegetation in the area (plantings on the flood protection landform), stormwater runoff quality may improve. This would be a net improvement. Although changes in runoff volumes will depend on infiltration rates of the flood protection landform, significant volume changes are not expected.

iii) *Surface Water Effects Significance* - The implementation of the above mitigation measures is expected to be effective and would minimize effects on surface water quality during the construction and operation periods. Construction effects would be short term and of relatively low magnitude. During the operations period, although there is potential for an increase in surface water flow volumes (due to changes in infiltration rates), however, the increase would be minimal. Based on the deficiency report for the sheetpile and concrete walls along the banks of the Lower Don River (included in ***Appendix J***), the existing walls are in moderate conditions with heavy rusting along the water line. The wall has maintained most of its structural integrity and is not expected to be impacted by the nominal increase in flows in the Lower Don River. Based on this discussion, insignificant residual surface water effects are expected to occur as a result of the project.

6.10.1.5 Hydraulics

i) *Hydraulics Construction Effects* - Regarding geomorphology effects on the Don River, the installation of an additional span to the CN Rail bridge could have a detrimental effect through the introduction of sediments. Any sedimentation effects will be temporary and of limited magnitude. Mitigation measures to reduce sedimentation are expected to be effective. Residual effects are expected to be minimal, if any.

ii) *Hydraulics Operation Effects* - The construction of the remedial flood protection project would reduce flooding in the Spill Zone 3 Lands as a result of the Regulatory Flood. This is a key benefit of the project. ***Figure 6.16*** shows the revised aerial extent and flood depths in the Lower Don area as a result of the remedial flood protection project. This compares to the flooding depths under current conditions that are indicated in ***Figure 4.3***.

To avoid flooding levels from increasing in Spill Zones 1 and 2, south of the CN Rail crossing, it would be necessary to install works on the east side of the Don River consisting of a retaining wall and dykes. The retaining wall/dykes are considered temporary pending the outcome of the planned *Don Mouth Naturalization and Port Lands Flood Protection Project*.

Sediment transport would be negatively affected through the added span. This structure effectively increases the channel width at the local scale. While this may provide flood relief, it would also tend to lower channel velocities at lower stages, which would in turn lead to increased deposition of sediment. However, with continued dredging of the Keating Channel, sediment conveyance through the area would be improved. With respect to erosion potential, little change is anticipated both at the bridge extension and in downstream areas.

iii) *Hydraulics Effect Significance* - The additional span is expected to result in a slight negative effect through the reduction of sediment transport competency and anticipation deposition of material.

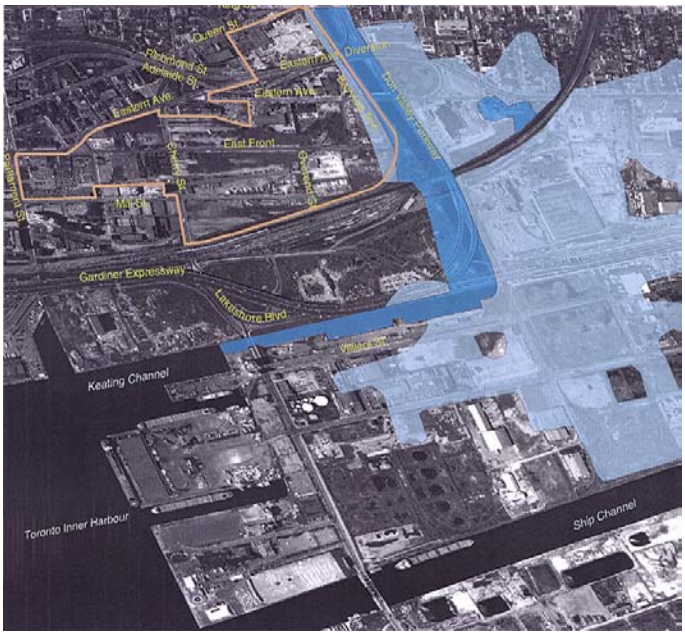


Figure 6.16 – Flooding Depths with Remedial Flood Protection Project in Place

6.10.1.6 Groundwater

i) *Groundwater Construction Effects* - Clean-up activities through the West Don Lands (WDL) Soil and Groundwater Management Strategy (SGMS), that would be associated with the remedial flood protection project, are expected to result in improved groundwater quality in the area.

Groundwater supplies could be affected by spills of hazardous material (e.g. fuels, lubricants) during construction. The handling of these materials would conform with provincial protocols and in the event of a spill, cleanup procedures would follow standard construction practices to be defined in the facility design/contractor documentation. Measures to minimize impacts of accidental spills would be put in place including, secondary containment of any onsite ASTs, an adequate supply of clean-up materials and appropriate training of the construction crew to manage spills. In the event of a spill, the MOE would be notified, the spill should be contained, free phase liquids recovered, and impacted soil excavated and stockpiled upon

impermeable membranes to prevent additional impact to soil and groundwater.

ii) *Groundwater Operation Effects* - Although the flood protection landform is expected to marginally reduce water infiltration (as the area will no longer be flat and greater amounts of stormwater will flow overland and the aquatard created by the flood protection landform clay layer will further decrease infiltration), given the relatively small area of the flood protection landform in the context of the watershed, and its location at the bottom of the watershed, effects on baseflows are not expected.

As the increase in paved (impervious) area is minimal, if any, in the context of this urban environment, effects on groundwater supply through the reduction in infiltration rates is expected to be minor.

iii) *Groundwater Effects Significance* - Groundwater supplies are not expected to be significantly affected given the relatively minor increase in the impervious area in the context of this urban area (low magnitude of effect). The significance of the groundwater supply in the study area is not high, as groundwater is not used as a potable supply because the area is serviced by municipal water. It is assumed that spills contingency measures will be effectively implemented by the contractor in the event of groundwater contamination through spills to avoid further contamination. It is expected that there will be a net improvement in groundwater quality as a result of the SGMS to be undertaken by the ORC in association with the construction of the flood control works.

6.10.1.7 Soils and Contaminated Lands

i) *Soils and Sediments Construction Effects* - During construction activities, particularly grading and excavation, there is the potential for increased surface erosion and sedimentation in the Don River. The potential for effect and possible mitigation has been addressed within the Surface Water sub-section. These include a variety of measures such as erosion control blanket, rip rap, straw bales and rock check flows.

Soils could also be contaminated through spills in the handling of fuels and oils for construction equipment.

Fuel management/clean-up procedures as described under the Groundwater environmental component would be followed.

Excavated soils would either be used in constructing the flood protection landform, infill grading for the West Don Lands precinct area (west of the flood protection landform) or at the Port Lands, or disposed off-site at an appropriate location/facility (e.g., for another construction project). The West Don Lands Soil and Groundwater Management Strategy (SGMS) will delineate extents of contaminated soils, and may provide site specific criteria to screen soils prior to offsite disposal, reuse as part of the flood protection landform, or exsitu treatment prior to offsite disposal or onsite reuse. The SGMS would be guided by the new Record of Site Condition (RSC) regulation (O. Reg. 153-04) and the updated standards for soil, sediment, and groundwater under Part XV.1 of the EPA. It is expected that an RSC would be required for implementation of the flood protection landform since changing the property use to a more sensitive use, in this case from commercial/industrial to parkland, triggers the RSC requirements.

ii) *Soils and Sediments Operations Effects* - Soils are not expected to be affected during the operation period of the facility.

iii) *Soils and Sediments Effects Significance* - With the implementation of the mitigation measures as previously outlined in the Surface Water subsection, effects on soils and sediments are not expected to be significant during the construction period. The effects to soils would be temporary, are expected to be of low magnitude and readily mitigatable.

6.10.1.8 Transportation

i) *Transportation Construction Effects* - Construction equipment may use local roads to access the site. This could lead to temporary delays; however, disruptions are expected to be minimal if the relocated Bayview Avenue can be constructed with the existing roadway in place. If traffic can be maintained along the existing Bayview Avenue during construction, effects to traffic would be minimal and no mitigation would be required beyond signage regarding the operation of construction equipment in the area. Alternatively, some short-term disruptions to the lower part of Bayview Avenue would be necessary. Relatively minor disruptions would be experienced to Via Rail during the construction of the bridge extension which will result in two weekend work blocks.

ii) *Transportation Operation Effects* - No effects to transportation routes during the construction period are anticipated.

iii) *Transportation Effects Significance* - Some temporary delays to local traffic and rail transportation is possible during the construction period.

6.10.2 Biological

6.10.2.1 Vegetation

i) *Vegetation Construction Effects* - Some clearing of the existing vegetation would be required in constructing the flood protection landform and other associated works. Most of the vegetation to be removed is of low quality. The total area of vegetation to be removed is less than 0.5 ha. The lands to be affected are largely designated for commercial/industrial development. No natural protection areas are to be affected. The removal of trees would be minimized. A landscape plan to involve the sodding of excavated/disturbed areas and the planting of trees and shrubs would be developed as part of the detailed design. Through the use of native species in the landscaping plan, a reduction in exotic/invasive species in the area can be expected.

ii) *Vegetation Operation Effects* - Vegetation is not to be affected during the operations phase.

iii) *Vegetation Effects Significance* - Recognizing that the vegetation to be removed is limited in area, is of low quality, and is affected by exiting urban activities and not designated for protection, vegetation effects are not considered to be significant. Landscaping/ planting activities are expected to result in a net increase in the amount of native vegetation in the area (and possibly a reduction in exotic/invasive species). This is a net improvement of the project.

6.10.2.2 Fish and Fish Habitat

i) *Fish and Fish Habitat Construction Effects* - The lower reaches of the Don River provide limited fish habitat as described in ***Section 4.1*** of this Report (existing aquatic conditions). The banks of the river have been protected with vertical sheet pile walls. The construction of the remedial flood protection project will not result in the removal of fish habitat. There is some potential for temporary sedimentation effects during construction, particularly from the construction of the additional bridge span

and from grading works along the river bank in the vicinity of the CN Rail crossing).

Some effects could also occur from works associated with the existing sheet piling that may be required as part of the bridge extension. BMPs (as previously described in the Surface Water subsection) would be put in place to reduce sediments from entering the Don River during the construction period (e.g., use of a filter bag prior to the discharge of pumped water from the cofferdams). To prevent the potential for effects on fish/fish habitat in the Don River during bridge extension construction, measures shall be implemented to prevent debris from construction activity, including concrete, steel, sawdust, top soil, compost and any chemicals or waste materials from entering the River.

Design details of the project shall be submitted to the Federal Department of Fisheries and Oceans to confirm that the project shall not result in a *Harmful Alteration, Destruction or Disruption* (HADD), and that proposed mitigation measures to minimize effects on fish/fish habitat are acceptable.

ii) *Fish and Fish Habitat Operation Effects* - The bridge extension would be designed to minimize impedance to the movement of fish through the Don River. It is expected that during the operation phase, there would be no negative effects on fish/fish habitat by avoiding the disturbance of the natural river bed, conditions conducive to the establishment of a higher quality fish habitat result.

iii) *Fish and Fish Habitat Effects Significance* – Overall there is the potential for a net benefit in regard to this factor. No fish habitat would be removed, construction disturbance effects would be limited in scale and duration, and some improvement in fish habitat may be realized through a naturalized river bed design.

6.10.2.3 Wildlife and Wildlife Habitat

i) *Wildlife and Wildlife Habitat Construction Effects* - The Lower Don River area is highly urbanized and contains limited natural vegetation that could provide wildlife habitat. It is possible that some small mammals and birds that are sensitized to urban activities could frequent the area, and the area is suspected to provide migrant foraging and sheltering habitat for migratory birds. However, based on the natural heritage inventory work that was undertaken as part of this Environmental Assessment, there are no known Species at Risk in the general area.

ii) *Wildlife and Wildlife Habitat Operation Effects* - Wildlife and wildlife habitat would not be negatively affected during operations. The area currently provides poor/limited linkages for the movement of wildlife through the area and to the upper reaches of the Don River. The construction of the flood protection landform and associated plantings will improve habitat linkages.

iii) *Wildlife and Wildlife Habitat Effects Significance* - Although the project would result in the loss of some vegetation through excavation, rail & drain relocation and road widening activities, due to the limited value of this area as wildlife habitat, significant negative effects are not expected. Plantings association with landscaping could lead to a net improvement to wildlife habitat.

6.10.3 Cultural

6.10.3.1 Heritage and Archaeological

i) *Heritage and Archaeological Construction Effects* – Background research indicates there is little

or no potential for Aboriginal sites in the affected areas.

The footprint of the flood protection landform includes the original (pre-1887) channel of the Don River. During construction excavation, it may be possible to identify and uncover or demarcate the pre-improvement course(s) of the river. Only one built heritage resource has been identified in the general area. It is the Palace Street School (1859), now the Canary Restaurant, located at 409 Front Street East (south-east corner of Front Street and Cherry Street). The building would not be affected by the flood protection landform. It is possible that the western edge of the additional fill material as required for the West Don Lands Precinct Plan could implicate the property/building. Grade changes at the far west end of the flood protection landform are likely to be minimal. The building is acknowledged as a historical structure in the West Don Lands Precinct Report, and is recommended for preservation.

Other features that have the potential for being unearthed as part of the construction of the flood protection landform include possible bridge abutments formerly located along Front Street (formerly Palace Street) and Tate Street (which was located between Front and Mill Streets). It is unknown whether these abutments were destroyed or simply buried as part of the creation of the Don Narrows. An old bridge abutment was observed along the banks of the Lower Don River immediately north of CN Rail's Kingston line which appears to be within what would have been the alignment of Tate Street before it was decommissioned.

Generally, any lands where soils have not been removed or regraded to a depth of 3 metres or more have archaeological potential. More detailed archaeological assessment (i.e. Stage 2 Assessment) would be needed to confirm the presence or absence of archaeological remains in any lands where engineering and construction would require cutting rather than or in addition to filling. There are two basic options for mitigating significant archaeological resources; salvage excavation, and preservation by avoidance. Archaeological monitoring of bore hole testing would provide key information on the potential for underlying archaeological remains in any given area.

ii) *Heritage & Archaeological Operational Effects* - No effects on heritage and archaeological features are anticipated during operations.

iii) *Heritage and Archaeological Effects Significance* - Through additional archaeological investigations to be conducted prior to the initiation of construction activity, it is expected that the presence of features will be confirmed and the need for resource recovery determined. During the construction period, should archaeological resources be encountered, work shall cease immediately in that area and the Ministry of Culture will be contacted.

6.10.3.2 Land Use by First Nations

Although the lands to be affected by the remedial flood protection project are not currently used by First Nations, the area is included as part of a larger land claim (Toronto Purchase) by the Mississaugas of the New Credit First Nation. As part of the consultation program for this project, a meeting was held with the New Credit First Nation. The Band indicated an interest in the project, particularly with respect to the design of the facility and questioned whether some form of Aboriginal cultural feature could be incorporated into the facility. In preparing the detail design, opportunities for such a feature would be investigated.

6.10.4 Land Use/Socio-Economic

6.10.4.1 Land Use/Social

i) *Land Use/Social Construction Effects* - Lands to be affected by the project are largely designated for commercial/industrial purposes. No residential property or agricultural lands would be affected.

As previously described in the Air Quality/ Noise sub-sections of this report, the closest residents to the construction areas (at the northern limit) are approximately 100 m away. Residents will be approximately 300 m from the most extensive construction works which are located south of Eastern Avenue. Disturbance effects to residents are expected to be limited in magnitude and duration. .

There is expected to be some disturbance effects to users of the recreation pathway (west side of Don River) during construction. Detours would be provided if required to maintain access through the area.

ii) *Land Use/Social Operation Effects* - No negative effects to land use/socio-economics are expected during the operations period.

The surrounding lands are largely vacant/ underutilized. Through the construction of the flood protection landform and the reduction in flood risk for the Lower Don West lands, there is a greater likelihood that the surrounding lands would be redeveloped.

The current landscape is significantly degraded. There is some potential for change in views and in the landscape character through construction of the remedial flood protection project. Through the naturalization efforts associated with the flood protection landform, the views/ landscape of the area will be improved.

The pathway would be improved with a new pedestrian underpass at the CN Rail embankment (as a result of the bridge extension) that would not be prone to flooding as is the existing pathway. Proposed landscaping will improve aesthetics through the area. A pedestrian underpass would also be constructed under the Bala Rail Subdivision, as part of the West Don Lands Precinct Plan, which will facilitate access from the pathway along the Don River.

iii) *Land Use/Social Effect Significance* - Land use/socio-economic effects expected as a result of the project include some construction disturbances to residents and users of recreation pathways. Noise and dust mitigation measures previously described are expected to minimize these effects. Mitigation to reduce noise and dust effects is expected to be effective. Separation distances between construction activity and residents will minimize effects. As these effects will be temporary and infrequent, they are not considered to be significant.

6.10.4.2 Economic Effects

i) *Economic Construction Effects* - In constructing the flood protection landform, about 10 commercial buildings in the West Don West Lands would be displaced (the 10 properties are included on the land covered by the flood protection component of the landform; most businesses in the ORC owned lands are expected to be displaced from long term development plans for the area). The businesses to be displaced from the flood protection landform have short-term leases for their property/buildings from the ORC that are renewed on a monthly basis. To minimize the displacement effects to these businesses, ORC and/or TWRC should give these operations as much advance notice as possible. As well, if possible, the ORC/TWRC/City of Toronto should offer

alternate properties/buildings from which they can relocate to continue their operations.

Businesses along the east side of the Don River (e.g. BMW dealership) could experience some disruption effects in the form of dust/noise and access restrictions although this business is at least 500m away from construction areas, and disturbance effects are expected to be minimal.

The abandoned access right-of-way to the Unilever property would be eliminated as a result of the east bank works. Discussions in this regard have occurred with Unilever. Since this access right-of-way is not currently in use, and is not functional due to grading constraints, its removal would not affect business operations. Unilever has indicated their agreement with its permanent removal. The property is accessed through the driveway off of the Don Roadway, near the south limit of the site.

Given the industrial nature of the Unilever site (leased by Korex), minimal nuisance-type disruption effects to this business are expected during the construction period. Korex has expressed concerns regarding truck movement on the site and, in response, the TRCA has committed to ensuring that truck access to the loading bay will take priority over the construction. Construction equipment will be required to clear the area when trucks require access. Active traffic management will be required on site to guarantee the free flow of delivery trucks to the loading bays. (The minutes of a meeting in this regard with Korex are included in ***Appendix C***.)

In the construction of an additional span at the CN Rail bridge, it would be necessary to close the rail tracks for short periods. This would occur during long weekend periods when rail traffic is lighter. Some disruption to CN Rail operations would result and changes to their schedule would be involved. In conducting this Environmental Assessment, a number of discussions have occurred with CN Rail. CN Rail would continue to be consulted during detailed design and construction periods so as to limit effects on their operations.

ii) *Economic Operation Effects* - Business operations are not expected to be affected during the operations period.

iii) *Economic Effect Significance* - Up to 10 businesses that lease property from the ORC would be displaced from the flood protection landform. As these businesses renew their leases on a monthly basis with the ORC, their operations in the Don West Lands are to be considered as temporary. The effect to the ending of these short-term leases is not considered to be significant.

There could on occasion be access restrictions to businesses during the construction period. This will be minimized as much as possible. Businesses along King St/Queen St and the BMW car dealership on the east side of the Don River could experience some disruption effects during the construction period. Recognizing the separation distance between construction areas (at least 350m), these effects would be temporary and the high ambient noise levels in the area, these disturbance effects are not expected to be significant.

The installation of the flood protection works will provide flood protection to businesses in the area, which is considered to be a positive effect.

6.10.4.3 Health Effects

i) *West Nile Virus* - Mosquitoes are absolutely dependent on stagnant, non-flowing water or

slow-flowing water. If water is constantly flowing there is little possibility of breeding mosquitoes.

A combination of slow-flowing water and naturalized banks can be undesirable in terms of breeding mosquito species such as *Coquillettidia perturbans* (an inefficient vector of WNV, but known to be infected quite frequently with WNV; the actual risk to human remains uncertain.). These mosquitoes breed along the edges of ponds, lakes and slow-flowing rivers wherever there are plenty of cattails and other emergent vegetation. (The larvae actually attach themselves to the submerged roots and shoots of the vegetation and tap into the plants' oxygen supply.) Thus, an increase "naturalized" shores (especially if this includes emergent vegetation) are less favoured that those that restrict the amount of vegetation and slow-flowing portions.

The construction of the remedial flood protection project would not create any stagnate flow areas, and will maintain low flow velocities similar to current conditions. Mosquitoes are dependent on stagnant water, without the presence of any predators. The project therefore is not expected to result in an increase in mosquito populations.

Flooded ditches breed *Culex restuans* (a major enzootic vector) and flooded depressions on land will breed *Aedes vexans* (a potential bridge vector of WNV). *Aedes vexans* larval development can be very rapid with increased temperatures and thus, any grassy areas that are flooded for a week or two in warm weather will produce large numbers of *Aedes vexans* mosquitoes. The flood protection landform would be designed in such as manner as to not include depression areas that would contain ponded water.

ii) *Noise/Air Quality* - Given that there are no residents in the immediate project area, health effects from noise and dust generated during construction is not likely.

iii) *Soil Contamination* - Recognizing that there is a high potential that the soils to be excavated are contaminated, there is a potential for worker exposure to contaminants during construction and remedial activities. Appropriate health and safety measures will need to be followed which will be dictated in the West Don Lands (WDL) Soil and Groundwater Management Strategy (SGMS) for management of subsurface environmental conditions.

6.10.5 Engineering/Technical

The flood protection landform has been designed to eliminate the flood risk in Spill Zone 3 from the Regulatory Storm, but could potentially could increase flood levels, along the east bank downstream of the CN Rail bridge. Therefore, a retaining wall and dykes will be required to mitigate high flood levels downstream of the CN Rail bridge to protect Spill Zone 1 and 2. The retaining wall/dykes are considered temporary and are expected to be replaced through other measures to be identified in the *Don Mouth Naturalization and Port Lands Flood Protection Project*.

Given the relatively gentle slope (up to 10% on the east side and, typically, 1.5 to 2.5% on the west), slope stability is not considered to be an issue. Sodding/seeding of the flood protection landform would minimize erosion and help to maintain slope stability.

6.11 Mitigation Strategy

Table 6.11 summarizes the mitigation strategies that have been developed to prevent, minimize and manage the potential effects on the human and natural environment due to the implementation of the remedial flood protection project.

6.12 Project Monitoring

It is recommended that project monitoring be undertaken during construction and post construction periods. Details of the monitoring program are to be developed as part of the detailed design phase of the project. The following sections outline monitoring activities that are recommended.

6.12.1 Construction Monitoring

- Residents complaints program to monitor and resolve noise and air quality effects on surrounding residents and businesses;
- Monitoring of storm water runoff from the construction site during rainfall events;
- Monitoring of excavation areas to ensure that the length of time that soils are exposed are minimized so as to reduce erosion and sedimentation effects;
- Groundwater monitoring is to be undertaken as part of soil remediation efforts that are to be defined through the groundwater and soil clean-up efforts in the Lower Don West Lands to be undertaken by the TWRC;
- Monitoring/testing of on-site soils for contamination prior to their use in the construction of the landform;
- Monitoring of project activities in the construction of the CNR bridge extension to ensure that there is no release of deleterious materials into the Don River that could affect fish populations. Monitoring activities regarding potential effects on fish habitat/fish populations to be detailed in the fish compensation package to be developed in anticipation of needed DFO authorization;
- Monitoring of pedestrian pathway detours through the area to ensure that users are provided with safe passage during the construction period; and,
- Monitoring of local transportation routes to ensure that truck cleaning efforts are effective to reduce the accumulation of soil/mud along these roadways.

6.12.2 Operation Monitoring

- Monitoring of vegetative plantings to ensure that they are surviving and that invasive species are not taking hold. Monitoring and maintenance activities will also be required to ensure that trees do not grow on the critical portions of the landform that could compromise its integrity;
- Monitoring of the Lower Don River to ensure that there are no significant sedimentation deposits as a result of the widened channel through the CNR bridge extension;
- Long term ground water monitoring is expected by the TWRC to determine the effectiveness of contaminated soil/ groundwater clean-up activities in the study area; and,
- Periodic monitoring of the structural soundness of landform.

Table 6.11 – Summary of Mitigation Strategies

Environmental Component	Mitigation Strategies
Air Quality	Dust suppression on roadways; flushing/or wet sweeping of paved surfaces; properly constructed road bases on unpaved construction roads; minimize time exposure of unvegetated soil stockpiles; maximize separation distance of diesel generators from receptors. If dust suppressants are necessary, non-chloride based agents should be used, particularly near the Don River. The flood protection landform will be vegetated so there will be no dust effects from it once constructed.
Noise Levels and Vibration	Construction work will be undertaken in accordance with City noise by-laws. Various mitigation measures are available to minimize construction noise including maintenance of mufflers and other noise reduction devices on heavy equipment, and installation of temporary noise barriers around stationary noise sources. These measures are to be implemented as required. Construction activity during the nighttime should be minimized. Noise complaints are to be followed-up by the contractor. Noise effects should be monitored particularly if a number of construction projects are being conducted in the area simultaneously.
High/Stormwater Flow Regime	Retaining Wall/Dykes will be required to mitigate increased flooding in Spill Zones 1 & 2 (east side of Don River)
Existing Surface Drainage & Groundwater Seepage	Storm sewers will be installed to collect surface water runoff and connected to the City storm system. Runoff on the "wet side" (east) of the flood protection landform will be directed to the Don River through existing culverts/outlets.
Groundwater Recharge/ Discharge Zones	Where possible, stormwater infiltration opportunities will be maximized (e.g. swales) to promote groundwater recharge.
Water Quality	A sediment and erosion control plan based on Best Management Practices consistent with MOE's *Stormwater Management Design Manual (2003)* (e.g. silt curtains, rock checks dams, erosion blanket, rip rap, straw bale, and vegetated buffers) will be put in place to minimize the potential for sediment runoff from the construction site and from spills (e.g. grease, hydraulic fluid, fuel, etc). Plantings on the Landform will minimize erosion and sediment runoff once constructed.
Existing Transportation Routes	If traffic can be maintained along the existing Bayview Avenue during the construction period, effects to traffic will be minimal and no mitigation will be required beyond for example, signage regarding the operation of construction equipment in the area.
Geomorphology	Erosion and sediment control measures as described for Water Quality to be implemented and maintained to minimize sediment deposition in area watercourses.
Wildlife Habitat	Plantings on the flood protection landform to provide/improve wildlife habitat.
Fish habitat/ Populations	BMPs will be put in place to reduce sediments from entering the Don River. Instream and/or riparian restoration measures could be designed to promote new fish habitat

Table 6.11 – Summary of Mitigation Strategies

Environmental Component	Mitigation Strategies
	in the area of the widened channel.
Fish Migration/ Movements	Placement of the bridge will not take place during fish spawning seasons. The bridge would be designed to allow easy passage of fish, and incorporate measures that promote the creation of fish habitat.
Exotic/Alien and Invasive Species	Planting of native species and vegetation management activities will reduce the potential for invasive species.
Wildlife Population	Encourage continuous plantings along the landform to encourage the movement of wildlife up the valley.
Microclimate	Encourage plantings to increase shading.
Outstanding Aboriginal Land Claims	Consider the incorporation of an Aboriginal cultural feature into the facility.
Recreation Uses of Lands Adjacent to a Water Body	Detours will be provided if required through the area. Plantings, creation of new trail connections and underpass improvements to enhance pathways through the area.
Archaeological/ Built Heritage	Undertake a further assessment as required to better assess the presence of features. Excavate and preserve encountered features where possible.
Surrounding Land Use/Growth Pressure	Detailed design and landscaping efforts should be carried out in a manner that is coordinated with the West Don Lands development initiative.
Surrounding Neighbourhood	Implement noise and air quality related measures.
Business Operations	Businesses that will be displaced to be notified well in advance by the ORC. Dust and noise effects to area businesses will be mitigated through measures previously described. All construction and demolition wastes will be disposed of in accordance with MOE guidelines. Maintain access to area businesses during construction.
Existing Infrastructure	Roads and utilities to be relocated as to be defined in the detailed design phase. Continue discussion with utility companies regarding affects on these infrastructure.
Pedestrian Traffic Routes	Detours will be provided if required through the area.
Rate of Erosion	Maximize use of plantings on the Landform to minimize erosion
Flood Risk	Retaining Wall/Dykes will be required to address high flood levels downstream of the CN Rail bridge to protect Spill Zone 1 and 2. The retaining wall/dykes are considered temporary and are expected to be replaced through other measures to be identified in the *Don Mouth Naturalization and Port Lands Flood Protection Project.*

Table 6.11 – Summary of Mitigation Strategies

Environmental Component	Mitigation Strategies
Slope Stability	Sodding/seeding of the flood protection landform will minimize erosion and help to maintain slope stability.
Existing Structures	Modifications are expected to the utility bridge (panel replacement) and to the CN Rail bridge over the Don River. Changes to these structures will be defined in the preparation of the detailed design.
Hazardous Lands/Sites	Record of site condition (RSC) under O. Reg. 153-04 to be completed once remedial approaches implemented/completed to allow for land use changes and building permit issue.

6.13 Landscape Plan

6.13.1 Planting Zones

Within the West Don Lands Precinct Plan, the area occupied by the flood protection landform is proposed to be the principal parkland for the new West Don Lands community. Suggested facilities for the Don River Park include walking paths and lookout areas, a riverside promenade, horticultural gardens and naturalized habitat areas, a multi-purpose sportsfield, and space for play areas. Landscaping for the flood protection landform would be finalized in conjunction with detailed design for the park. However, to achieve the stated goal of the undertaking, i.e., to maintain the structural stability of the flood protection landform and to minimize surface roughness in the floodway which maintains hydraulic capacity, there are specifications on the type and location of vegetation that can be located on the flood protection landform, particularly on the wet side.

At its crest, the flood protection landform would range in height from 2.8 to 3.8m, with the crest elevation ranging from 81.5 m at its northern edge at King Street, to 80.0 m at the CN Rail embankment. On the east side, the toe of the flood protection landform would be set 40 m from the bank of the Don River. On the east side, the proposed slope of the landform ranges from 3 to 10%. On its west side, the flood protection landform is integrated with the fill and grading that is proposed to accommodate the West Don Lands, with shallow slopes of 1.5-2.5%. The minimum width of the flood protection landform would vary from approximately 200 m at the north limit to 220 m at the south limit, in the vicinity of the CN Rail embankment. With the inclusion of the fill area for the West Don lands, its width in the vicinity of Front and Mill streets increases to some 530m.

The landscape treatment of the landform is defined by a series of zones that are summarized in ***Table 6.12***. The type of vegetation that can occur within each of the zones integrates the flood protection objectives with aesthetic and environmental considerations. These zones are described in ***Table 6.12*** and illustrated in ***Figures 6.17*** and ***6.18***.

Table 6.12 – Flood Protection Landform Vegetation Zones

Zone	Location (Refer to Figure 6.15)	Type of Vegetation
Zone 1	River's edge to within 15 metres of crest of landform (wet side)	Grasses, wildflowers and other herbaceous vegetation. Limited numbers of woody shrubs.
Zone 2	From edge of Zone 1 to crest of landform	Hydraulic plantings strategically located and designed to disrupt flow of water under flood conditions, with woody shrubs, and trees no larger than 76mm (3") in diameter.
Zone 3	From crest of landform to 20 metres east (dry side)	Shrubs, wildflowers and herbaceous vegetation. No deep rooted plantings or trees unless landform is over the 82.0 m elevation.
Zone 4	From 20 metres east of the crest of the landform to the 160 metre development setback	Shrubs, wildflowers and herbaceous vegetation, and trees no larger than 76mm (3") in diameter.
Zone 5	Beyond the 160 m development setback from edge of the river	No planting restrictions.

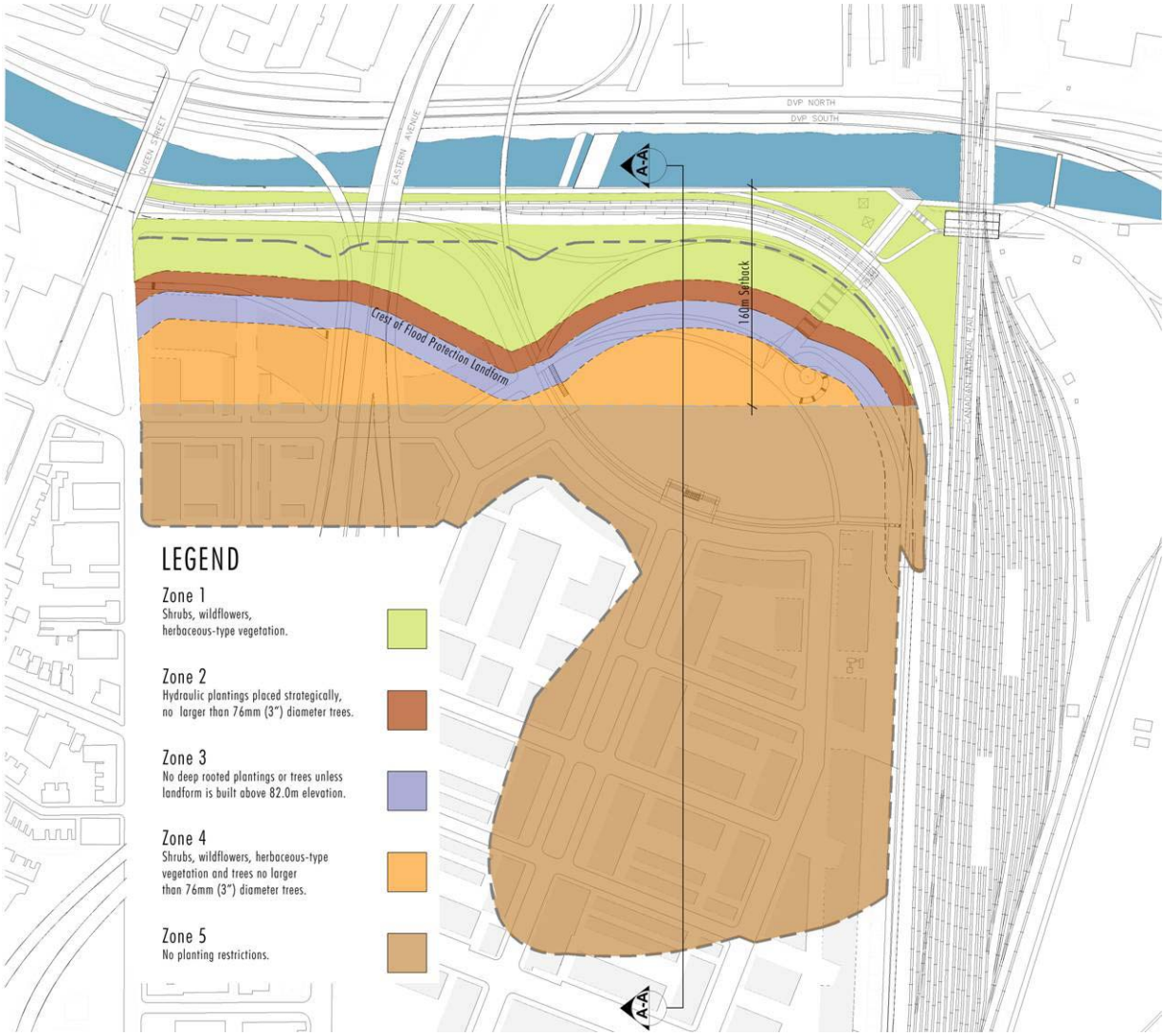


Figure 6.17 – Flood Protection Landform Vegetation Zones

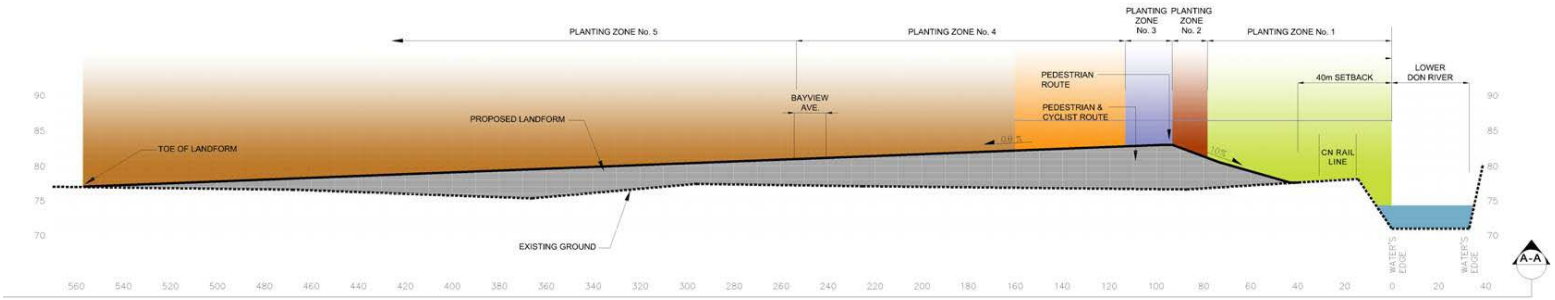


Figure 6.18 – Flood Protection Landform Vegetation Zones (Section View)

The flood protection considerations in regard to the final landscape treatment of the landform relate to ensuring that a permanent structure is achieved and maintained, which is virtually risk free of failure. As described previously, there are three principle modes of failure associated with an earth fill structure: overtopping by floodwaters; saturation by the movement of water through or under the structure; and boils, also caused by the movement of water through or under the earth fill.

The risk of failure due to each of these modes can be aggravated due to either man-made or natural intrusions into the fill such as by burrowing animals, vegetation rooting systems, servicing (sewers), building foundations or vegetative changes that would increase flood levels due to an increase in floodplain roughness.

In the case of the floodway, which is being created in the zone on the east side of the flood protection landform, the feasibility of implementing significant naturalized riparian plantings was initially investigated, and then further reviewed in response to comments received at the public information sessions. The results of hydraulic analyses that were conducted to assess this issue indicate that the added roughness (flow resistance) that would accompany an enhanced level of planting would produce a significant increase in flood levels that would not be contained within the existing floodplain.

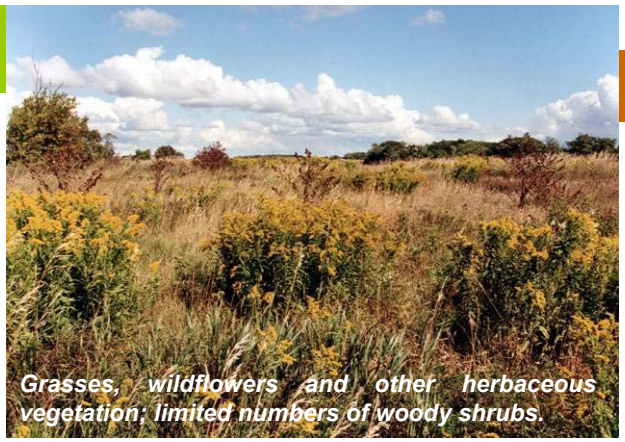
An increase in flood levels would be created, with increased flooding of lands adjacent to, and upstream, of the remedial flood protection project. In addition, the flood protection landform itself would be subject to overtopping during the Regulatory Flood conditions. Any opportunities to offset the hydraulic impacts are limited due to the physical tie off points available for the flood protection landform and the limited benefits that can be achieved through additional hydraulic improvements at the CN Rail crossing. A sensitivity analysis was undertaken to determine the maximum level of roughness that could be considered to this area and still maintain the permanency of the flood protection was also undertaken, and this analysis revealed that only limited planting of this area is possible without compromising the hydraulic capacity required to meet the flood protection goals.

Also, restrictions on the landscaping of the restrictions are required to ensure that its structural integrity is permanently maintained. Deep rooted plantings can increase water penetration and potentially weaken the overall structure. In addition, failure of large trees along the wet side of the feature can lead to slope failure and surface erosion issues, which during a large flood could increase the risk of structural failure. The collection of local woody debris within the increased hydraulic openings within the CN Rail could also lead to increased water levels and overtopping of the flood protection landform. Through the park design process, opportunities should be sought to create knolls or other features which can be planted with trees that will reach a larger size without jeopardizing the structural integrity of the flood protection landform.

On the west side of the flood protection landform, the planting constraints to maintain the feature and minimize any of the failure risks dissipate, such that beyond the primary areas of the flood protection landform, no restrictions are necessary.

Given the restrictions that exist in terms of creating the flood protection landform and associated works to achieve a permanent removal of the Provincial floodplain designation can occur, a strategic review of re-naturalization for this area is vital.

1



Grasses, wildflowers and other herbaceous vegetation; limited numbers of woody shrubs.

ZONE 1

Species	Common Name
Andropogon gerardii	big bluestem
Asclepias syriaca	common milkweed
Aster cordifolius	heart-leaved aster
Aster ericoides	heath aster
Aster lanceolatus	panicled aster
Aster novae-angliae	New England aster
Aster puniceus	swamp aster
Bromus latiglumis	earlyleaf brome
Carex granularis	meadow sedge
Elymus riparius	riverbank wildrye
Eupatorium maculatum	Joe-pye weed
Eupatorium perfoliatum	common boneset
Euthamia graminifolia	grass-leaved goldenrod
Fragaria virginiana	wild strawberry
Juncus dudleyi	Dudley's rush
Lilium michiganense	Michigan lily
Muhlenbergia mexicana	muhly grass
Oenothera biennis	evening-primrose
Panicum acuminatum	hairy panic grass
Panicum virgatum	switch grass
Rudbeckia hirta	black-eyed Susan
Rudbeckia laciniata	cutleaf coneflower
Silphium perfoliatum	cup plant
Sisyrinchium montanum	blue-eyed grass
Solidago altissima	tall goldenrod
Solidago gigantea	late goldenrod
Sorghastrum nutans	Indian grass

2

Hydraulic plantings strategically located and designed to disrupt flow of water under flood conditions, with woody shrubs, and trees no larger than 76mm (3") in diameter.

ZONE 2

Species	Common Name
Asclepias syriaca	common milkweed
Aster cordifolius	heart-leaved aster
Aster ericoides	heath aster
Aster lanceolatus	panicled aster
Aster novae-angliae	New England aster
Aster puniceus	swamp aster
Celastrus scandens	American bittersweet
Cornus foemina	grey dogwood
Cornus rugosa	roundleaf dogwood
Cornus stolonifera	red-osier dogwood
Danthonia spicata	poverty oat grass
Diervilla ionicera	northern bush-honeysuckle
Physalis heterophylla	common ground-cherry
Potentilla anserina	silver-weed
Rosa blanda	smooth wild rose
Solidago juncea	early goldenrod

3

Shrubs, wildflowers & herbaceous vegetation; No deep rooted plantings or trees except where landform is above elevation 82.0m..

ZONES 3 AND 4	
Species	**Common Name**
Amelanchier spp.	serviceberry
Calamagrostis canadensis	blue joint reed grass
Carex lacustris	lake sedge
Carex vulpinoidea	fox sedge
Crataegus spp.	hawthorns
Juniperus communis	common juniper
Juniperus virginiana	red cedar
Malus coronaria	wild crab apple
Prunus pensylvanica	pin cherry
Rhus typhina	staghorn sumac
Rubus allegheniensis	blackberry
Thuja occidentalis	white cedar
Viburnum lentago	Nannyberry

4

Shrubs, wildflowers and herbaceous vegetation, and trees no larger than 76mm (3") in diameter.

5

No planting restrictions.

ZONE 5
Species
Native species are encouraged

6.13.2 Demonstration Plan

The future detailed design process for the Don River Park would need to address the incorporation of the planting strategy set out within the Environmental Assessment for the prescribed setback areas. ***Figures 6.19*** and ***6.20*** following show the application of the different planting zones, overlaid with the proposed concept plan for the Don River Park, as contained within the West Don Lands Precinct Plan.

The proposed plan includes extensive naturalized areas between the river's edge and the crest of the flood protection landform, which would be comprised of meadow with sporadic shrubby vegetation. Reforestation of the wet side is not possible due to flood control requirements. However, the current landscape is significantly degraded, and the riverside planting zones will offer improved natural habitat that supports biodiversity objectives, and linkages to upstream habitat areas. At the crest of the flood protection landform, the concept plan proposes grading that will support shrub thickets and tree planting through some areas (above 82.0 metres). There are no restrictions on the type of vegetation that can be planted beyond the relocated Bayview Ave. The opportunity exists to develop a park plan that is sympathetic to the Don River context, and which provides additional natural areas such as meadows and woodlands in addition to more formalized landscapes and structured activity areas.

Figure 6.19 – Demonstration Plan

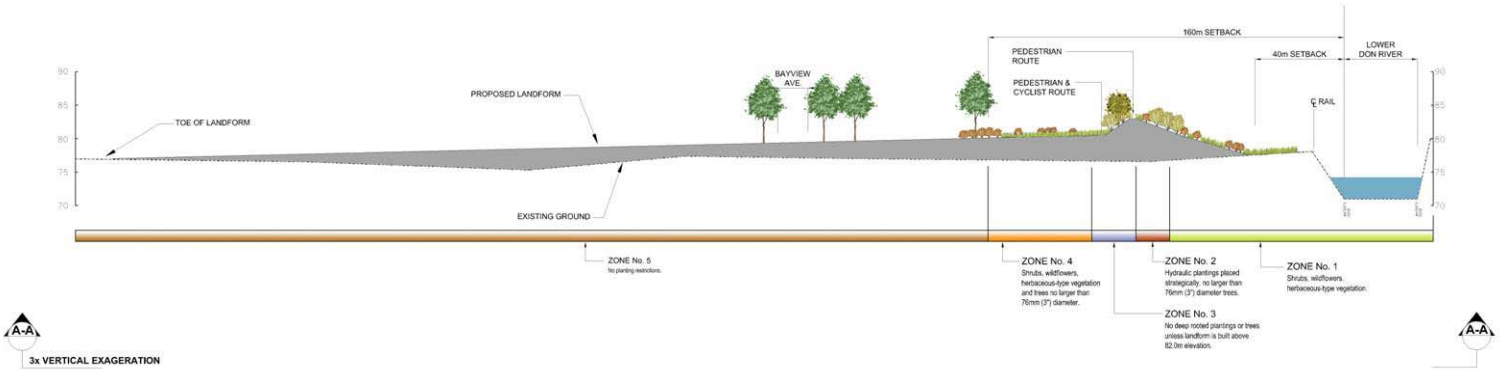


Figure 6.20 – Demonstration Plan (section view)

6.14 Pedestrian Circulation and Access

The proposed bridge structure at the CN Rail embankment would include a trail connection. This will improve pedestrian and bicycle access for the Don River Trail, creating linkages to the Martin Goodman Trail, and the future Portlands community. The Don River Trail would be linked to the West Don Lands community via an underpass at the CN Rail Bala Subdivision within the Don River Park. Other internal park

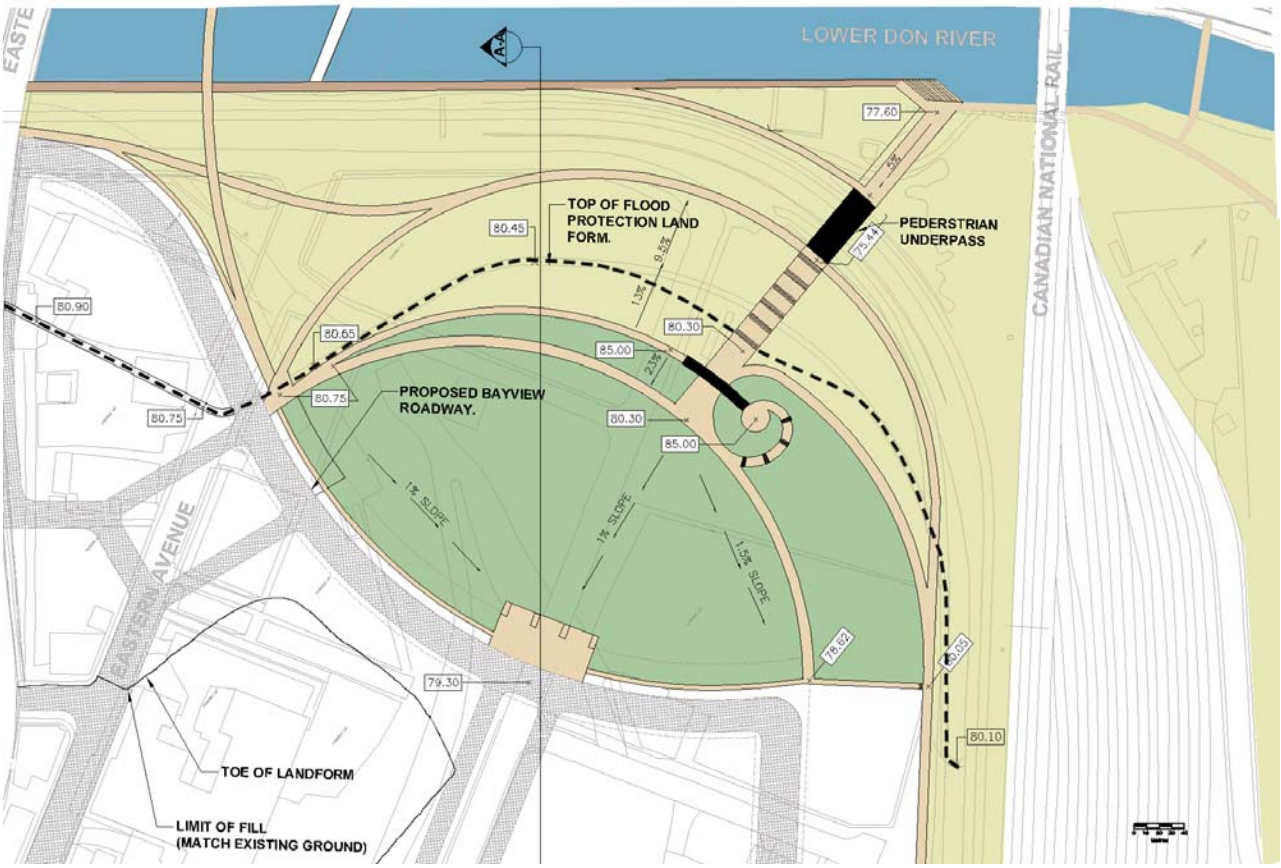


Figure 6.21 – Potential Trail Concept Plan

Lands community will be connected to the Don River corridor.

The design of the pedestrian trail, its approaches and landscaping are outside the scope of this Environmental Assessment, and will necessitate further detailed design and a public consultation process. However, some design considerations are presented in this report to guide future discussions.

Research on urban trails in other North American cities indicates that pedestrian underpasses need not be intimidating, unsafe, or unsightly places. With appropriate use of landscaping, lighting, and amenities, both perceived and actual safety considerations, can be addressed and visual aesthetics improved.

The following are design parameters that should be considered in the final design of the Don River Trail underpasses:

- Clear sightlines should be established at either end of the underpass for trail safety;
- An amenity area with landscaping, benches and a water fountain should be located at the entrance to the underpass as a rest stop along the trail, and to signal human presence;
- Incorporation of interpretive signs, public art or thematic elements can contribute to making the area a point of interest, and increasing visitorship. Themes for the Don River Trail underpasses might include industrial or railway heritage;

Landscaping and architectural treatment of the bridge underpass create an inviting riverfront trail in Richmond, Virginia.

- The appearance of the underpass should be improved through the use of an architectural façade or wall treatment. This treatment should extend to both the portal area and the walls of the underpass, with the trail access visually highlighted;
- Warm, bright lighting in the underpass should be used to create a welcoming atmosphere and improve visibility;

Amenity area along Richmond riverfront trail

- Walls can be enhanced with textures, bright murals, or ceramic tile to add atmosphere and an element of human interest. Wall treatment should be of a surface that discourages graffiti;

- Recessed areas within the underpass and the approach that might serve as hiding places should be avoided; and,

- The end of the underpass should be visible from the entrance, with the midway point identified with a landmark to minimize the perceived distance.

On November 10, 2004, a meeting with community representatives from the TAC and CLC that had expressed concern regarding the vegetation restrictions was convened to discuss local concerns and preferences in regard to the naturalization and landscaping aspects of the flood protection landform. The objective was to develop some guiding principles towards a vision for the landscape plan.

Arising from the group discussion were the following draft principles that are intended to provide direction to future efforts:

- create places where people can enjoy the valley setting;

- connect the future community of the West Don Lands to the river edge path system;

- create a safe and accessible trail system;

- integrate recreational amenities with the natural environment;

- create habitat that targets specific fauna including birds and insects;

- interpret the natural and cultural heritage of the Don River Valley;

- establish a landscape of native vegetation that supports the valley;
- ecosystem ranging from floodplain grasslands to a wooded slope crest;

- use environmentally sustainable practices; and,

- develop a management strategy to ensure the sustainability of habitat areas.

Coloured ceramic tiles or wall murals add human interest

7.0 SUMMARY OF FINDINGS & CONCLUSIONS

7.1 Preferred Remedial Flood Protection Alternative

The *Lower Don River West Remedial Flood Protection Project* has been carried out under the Class EA process. The main objective of this undertaking is to permanently remove the 210 ha (Spill Zone 3) of downtown Toronto from the Regulatory Floodplain. The Lower Don River floodplain has been identified by the TRCA as the highest priority flood prone area within its jurisdiction since the early 1980s.

The preferred undertaking to eliminate the flood risk in Spill Zone 3 was selected through a screening and comparative evaluation of several flood control alternatives. A long list of alternatives was screened against three criteria, and the alternatives that met all three criteria were carried forward for further evaluation. These remaining alternatives were then assessed and evaluated on the basis of 35 evaluation criteria organized under six study assessment groups: Physical, Biological, Cultural, Socio-economic, Engineering/Technical and Cost.

The identification of the preferred flood protection solution and its refinement was assisted by public consultation activities throughout this Environmental Assessment, including: public open houses/workshops, Community Liaison Committee meetings and Technical Advisory Committee meetings, whereby public comments and input were received. The components of the preferred undertaking consist of:

- A flood protection landform on the west bank of the Don River;
- Interim flood protection works on the east bank of the Don River (retaining wall/dyke);
- An additional bridge span attached to the west abutment of the existing CN Rail bridge over the Don River;
- Continued dredging of the Keating Channel as per the Keating Channel Environmental Assessment (Acres, 1983); and,
- Modifications to the Enbridge Utility Bridge that crosses the Don River.

The construction cost for the preferred alternative is estimated at $21 M.

Initially, the preferred method for providing additional capacity through the existing CN Rail crossing was via a multi-cell culvert (***culvert option***) through the embankment. An additional option was identified in the initial stages of developing alternatives for the project whereby the waterway opening would be augmented through the provision of an additional bridge span (***bridge extension option***).

The culvert option allows the Hydro One Networks ducts in the vicinity of the embankment to remain in place, without any realignment of the electrical cables/ducts. Previous studies indicated that a realignment would be prohibitively costly. However, discussions with Hydro One Networks revealed a significantly lower cost for the relocation works.

Geo-environmental and geotechnical investigations in the vicinity of the CN Rail embankment were conducted to establish the subsurface conditions and to assess their effects on the design and construction of both a culvert and bridge extension option in regard to soil disposal, foundation requirements, temporary track protection requirements, and methods to control dewatering.

Given the considerable reduction in the cost estimate of relocating the Hydro One Networks

underground plant, and the relatively unfavourable geotechnical conditions that were revealed by the geotechnical investigation, the bridge extension option was revisited as a viable method of providing additional hydraulic capacity. Based on a comparative evaluation between the bridge extension and culvert options, the ***bridge extension option*** emerged as the preferred method for providing additional hydraulic capacity through the CN Rail embankment and was adopted as a component of the overall remedial flood protection project.

7.2 Baseline Inventories

Baseline conditions in the study area were inventoried for a number of environmental components to facilitate the identification of constraint areas, and formed the basis for the assessment of the potential for effects of the project. These environmental components included: Aquatic Habitat and Fish; Terrestrial Natural Heritage; Built Heritage and Archaeological Resources; Socio-economic and Land Use; Hydrology/Hydraulics of the Lower Don River; Rail Corridor Impact Assessment; Geo-Environmental Assessment; and West Nile Virus Assessment.

7.3 Environmental Effects of the Remedial Flood Protection Project

An effects assessment (positive and negative) of the proposed undertaking was conducted and resulted in the following conclusions:

- some noise and dust disturbance can be expected during the construction period, however, the absence of residents in the immediate vicinity of the project area reduces the significance of these effects. Nonetheless, standard controls for dust and noise during construction will be incorporated where appropriate;
- some potential exists for increased sediment loads to the Don River during construction;
- the West Don Lands (WDL) Soil and Groundwater Management Strategy (SGMS) will allow for the management of subsurface environmental conditions;
- there are no sensitive natural heritage features in the project area;
- approximately 0.5 ha of poor quality vegetation will be removed; however, plantings/landscaping of the flood protection landform will increase the amount of vegetation as well as wildlife habitat opportunities. Preliminary concepts for the landscaping of the flood have been developed based on flood protection and long-term stability consideration;
- there will be no loss of fish habitat, additional habitat would likely result as part of the bridge extension works;
- minor disturbance to aquatic habitat is possible during the bridge extension construction, however, measures will be put in place to minimize sedimentation and the bridge extension will be constructed to ensure that no impediment to fish passage is created;
- approximately 20 businesses that lease property from the ORC (on a monthly renewal basis) will be displaced;
- the project will completely and permanently eliminate the flood risk in Spill Zone 3 Lands;
- the bridge extension is expected to reduce the sediment transport in the area, however continued dredging of the Keating Channel will aid in improving sediment conveyance through the area;
- the recreation pathway along the west side of the Lower Don River will be improved. The existing pedestrian underpass at the CN Rail embankment (which is prone to flooding) will be replaced;

- construction of the bridge extension will have impacts on railway infrastructure and operation during the construction period. Coordination with CN Rail, GO Transit, CP Rail, VIA Rail and Toronto Terminals Railway is ongoing to minimize these impacts; and,

- construction of the bridge extension will also impact Hydro One Networks. Coordination with Hydro One is ongoing to minimize any impacts during construction.

An analysis of the potential environmental effects deem that the construction and operation of the remedial flood protection project will result in few negative environmental effects that are mitigable, and several positive effects will result from this project including the elimination of the flood risk to 210 ha in downtown Toronto.

7.4 Mitigation Plan

The mitigation measures recommended to offset the few negative environmental effects that will result from the remedial flood protection project are summarized below:

- dust suppression on roadways during construction, and a vegetative covering for the flood protection landform will eliminate any dust effects after construction;

- temporary noise barriers will be installed during construction and night-time construction will be limited to the extent possible;

- east bank works (retaining wall/dykes) will mitigate the potential for increased flooding on the east side of the river as a result of the flood protection landform;

- swales will be incorporated into the design to enhance surface water quality;

- Best Management Practices will minimize sediment runoff, and plantings on the flood protection landform will minimize erosion and sediment potential after construction, while providing/improving wildlife habitat and increase shading (microclimate benefit);

- construction of the bridge extension will not take place during fish spawning seasons;

- the creation of new recreation trails and a new pedestrian underpass at the CN Rail embankment will enhance local pedestrian pathways;

- where archaeologically significant features are discovered, the features will be excavated and preserved;

- all businesses that will require relocation will be notified by TWRC and/or ORC well in advance of construction and access to businesses will be maintained during construction, with detours to be provided, if required;

- mitigation measures required for the relocation of roads and utilities will be defined during the detailed design phase; and,

- record of site conditions under Ontario Regulation 153-04 will be completed once contaminated soil/groundwater remedial approaches are implemented/completed to allow for land use changes and building permit issues.

7.5 Final Design and Implementation Considerations

- During the course of this Environmental Assessment, staff of CN Rail and GO Transit demonstrated a clear willingness to work cooperatively and help to advance the project. CN Rail staff did advise that the most favourable construction window for the remedial flood protection project would be in 2005. Current scheduling by CN Rail indicates that significant in-house track improvement projects are anticipated to begin in 2006. As a result, after 2005 this project would be relegated to a low priority

status, with its implementation likely delayed until 2008.

- Hydro One Networks were also very helpful in responding to information requests and supplying timely input to the process. For the purposes of this Environmental Assessment, Hydro One prepared a planning level cost estimate for relocating the underground plant in the project area. This information proved to be a critical input to the assessment of the identified options for increasing the hydraulic capacity at the CN Rail crossing of the Don River.

  In addition to the underground plant, there are also overhead wires in the project area that will likely require temporary relocation to allow construction of the additional span at the CN Rail crossing.

  The current dialogue with Hydro One Network should be continued to identify funding requirements and implement the necessary agreements to identify and ensure that the field and technical work associated with their plant is undertaken.

- The final composition of the flood protection landform will be determined during the detailed engineering phase. To facilitate the implementation of the West Don Lands Precinct Plan and the construction of the flood protection landform, the TWRC has initiated the *West Don Lands Soil and Groundwater Management Strategy*.

- There are a number of existing utilities in and around the CN Rail line that will need to be relocated in order to enable the construction of the bridge extension. These works can typically require several months from inception to implementation. Accordingly, this work should be initiated as soon as possible.

- There will be the need to undertake a number of field investigations and/or technical analyses as part of the detailed design phase, which include:

  – additional field investigations for the design of the bridge extension foundations;

  – geotechnical foundations to support the detailed design of the flood protection landform;

  – further hydraulic analyses to finalize the details of the bridge opening, the approach and exit channel to the bridge extension, and the final footprint of the flood protection landform;

  – topographic surveys of the area to enable the detailed design work;

  – detailed archaeological field work to assess subsurface cultural heritage conditions; this will entail Level 1, and potentially Level 3 and 4 investigations; and,

  – camera inspection of the Low Level Intercept that extends easterly along Eastern Avenue and crosses the Don River to confirm if any reinforcement and/or replacement works are necessary.

- The development of the concept for the flood protection landform was developed by working closely with the Consultant Team for the West Don Lands Precinct Plan. This ensured that the solution ultimately satisfies both the flood protection requirements and the aesthetic, open space and recreational objectives. This integrated approach should be continued through the detailed design phase to maximize the overall benefits that can be achieved.

- During this Environmental Assessment, the members of the community expressed their interest to be involved in the design phases of the project. Accordingly, it would be beneficial to have the Technical Advisory and Community Liaison committees as active participants during the implementation phase.

7.6 Other Considerations

- The remedial flood protection project incorporates design features aimed at providing flexibility and adaptability such that potential effects of future climate change can be readily accommodated. In this regard, the area along the top of the flood protection landform will be protected from the placement of any man-made features and/or woody vegetation cover. In the event of higher flood flows and levels in the future, the height of the flood protection landform can be readily increased. In addition, should the need arise, the waterway opening through the CN Rail embankment could be further increased to provide additional hydraulic capacity.

- The implementation of the remedial flood protection project will involve the relocation of Bayview Avenue. The layout of the relocated roadway was developed as part of the West Don lands Precinct Plan. The servicing aspects for the water, storm and sanitary sewers, stormwater management and the roadway network are described in the *West Don Lands, Class Environmental Assessment – Master Plan, March 2004.*

- This Environmental Assessment also covers the requirements of the Ontario Realty Corporation Class EA process for land transfers, with the exception of providing an individual strategy for relocating existing businesses and for soil/groundwater remediation. These strategies will be developed by the Ontario Realty Corporation and the Toronto Waterfront Revitalization Corporation within the coming months, and will be submitted to the Ministry of the Environment for review prior to implementation of the preferred alternative.

  However, it is noted that the construction of the bridge extension is not dependent on the completion of the above noted strategies, and can proceed upon approval of the Environmental Assessment contained herein.

- This Environmental Assessment does not include the proposed pedestrian bridge over the Don River, south of Eastern Avenue, and the proposed pedestrian underpass through the CN Rail Bala Subdivision. These two undertakings will be addressed in separate studies to be undertaken by the Toronto Waterfront Revitalization Corporation.

BIBLIOGRAPHY

Acres & Associated-July 1996, *Scoping and Sensitivity Analysis on Flood Protection Options for West Don Lands Site, prepared for ORC.*

Acres Consulting Services Limited, March 1983, *Keating Channel Environmental Assessment, Main Report.*

Acres Consulting, March 1983, *Keating Channel Environmental Assessment Appendix F – Economic Studies.*

Acres International, March 2004, *LDRW Remedial Flood Protection Works Geoenvironmental Information Gap Analysis West Bank – Draft.*

Agra Earth & Environmental, June 10, 1996, *Geotechnical Investigation for Proposed Restoration of the East Bank of the Don River between Lakeshore Boulevard and the CNR Bridge.*

Angus Environmental Ltd., March 1995, *1995 Assessment of the Environmental Data for the Ataratiri Lands prepared for: Waterfront Regeneration Trust.*

Archaeological Resource Management Unit, TRCA, January 2004, *Draft Cultural Heritage Study for the Environmental Assessment for the Naturalization & Flood Protection for the Lower Don River.*

Archaeological Services Inc., April 2004, *Stage 1 Archaeological Assessment of the East Bayfront, West Donlands and Portlands Areas, City of Toronto.*

Barrett, Suzanne, James Flagal, Beth Jefferson, Karlk Konze and Ed Mickiewicz, March 1990, *Environmental Audit of the Port Industrial Lands and East Bayfront, Natural Heritage, Second Draft.*

Beak Consultants Ltd and Raven Beck Environmental Ltd., April 1994, *Lower Don Lands Site Characterization and Remedial Options Study.*

C.K. Hurst, April 1978, *Dredging and Disposal of Dredged Material from the Keating Channel, Toronto.*

CH2M Hill, MacViro, July 2003, *City of Toronto, Wet Weather Flow Management Master Plan, Combine System Sewershed Final Report.*

City of Toronto, *Bring Back the Don, www.toronto.ca/don.*

City of Toronto, Obtained 10/16/03, *Sustainability and Council's Strategic Plan, from: www.city.toronto.on.ca/sustainability/strategic_plan.htm.*

City of Toronto, *Making Waves, Principles for Building Toronto's Waterfront (a summary), Central Waterfront, Part II Plan.*

City of Toronto, October 2002, *Wet Weather Flow Management Policy.*

City of Toronto, Toronto and Region Conservation Authority, December 2001, *City of Toronto Natural Heritage Study: Final Report.*

Conchrane Brook, January 2000, *West Don Lands Redevelopment Framework.*

Conservation Ontario, January 2002, *Class Environmental Assessment for Remedial Flood and Erosion Control Projects.*

Cumming-Cockburn & Associates Ltd., May 1985, *Preliminary Engineering Study Don River at Bayview Extension.*

David Crombie, Commissioner, Royal Commission on the Future of the Toronto Waterfront-1992, *Regeneration: Toronto's Waterfront and the Sustainable City: Final Report.*

Decommissioning Consulting Services Limited, May 28, 2001, *Toronto Port Area Property Ownership.*

Earth Tech Canada Inc., June 2004, *West Don Lands Precinct Plan Municipal Services Engineering, Municipal Services Plan.*

Earth Tech Canada Inc., January 2004, *West Donlands Precinct Plan, Municipal Services Engineering, Working Paper #1, Background Review and Service Provides Requirements.*

EarthTech *et al.*, July 22, 2004, *West Don Lands Class Environmental Assessment Master Plan Draft Report.*

Environmental Assessment for the Naturalization and Flood Protection for the Lower Don River Appendices A to J.

Environmental Task Force, City of Toronto, February 2000, *Clean, Green and Healthy: A Plan for an Environmentally Sustainable Toronto.*

F. Ivan Lorant, Inquiry Officer, July 1981, *Keating Channel Flood Inquiry Report.*

Friends of the Don East, Spring 2003, *"At the Forks".*

Golder Associates, November 1980, *Investigation of Lower Don River Sediments.*

Golder Associates Ltd., September 9, 2004, *Lower Don River West Project - Geotechnical & GeoEnvironmental Investigations & Analysis.*

Jonathan Kauffman Planning Consultant Ltd., Paul Rennick and Associates, Henry Regier, John Holmes, Gordon Wichert, Metropolitan Toronto Planning Department, April 1992, *Metro Waterfront Environmental Study.*

Kleinfeldt Consultants Ltd., April 2000, *West Don Lands Environmental Management Strategy/Action Plan.*

MacLarentech Inc., March 1989, *St. Lawrence Square Redevelopment Project East Station Volume I – Geotechnical Report.*

MacLarentech Inc., March 1989, *St. Lawrence Square Redevelopment Project East Station, Volume II – Boring Logs and Figures.*

MacLarentech Inc., February 1989, *St. Lawrence Square Redevelopment Project East Section, Site and Facility Environmental Investigations, Volume I – Assessment and Volume II – Methods and Results", Prepared for City of Toronto Dept. of Public Health Environmental Protection Office.*

Marshall Macklin and Monaghan Ltd. & MTRCA, Aug. 1987, Feb. 1988, + Nov. 1987, *Lower Don River Flood Protection Meeting Minutes, + Report of Visual Structural Inspection of Steel Sheet Pile Floodwalls, Lower Don River.*

Marshall Macklin and Monaghan Ltd., December 1987, *Flood Protection Dyking Lower Don River, Final Engineering – Phase 1. Appendices I – V.*

Marshall Macklin and Monaghan Ltd., February 1989, *Flood Protection Alternatives for the St. Lawrence Square Development.*

Marshall Macklin and Monaghan Ltd., October 1989, *Flood Protection Alternatives for the Ataratiri Development Report.*

Marshall Macklin and Monaghan Ltd., April 1990, *Flood Protection Alternatives for the Ataratiri Development Addendum.*

Marshall Macklin and Monaghan Ltd., January 1991, *Regional Storm Hydrology Update Lower Don River.*

Marshall Macklin and Monaghan Ltd., January 1991, *Flood Protection Options for the Ataratiri Development.*

Marshall Macklin and Monaghan Ltd., December 1991, *Engineering Feasibility Study Flood Protection – Ataratiri.*

Marshall Macklin and Monaghan Ltd., July 1994, *Lower Don Lands Strategy Flood Protection and River Regeneration Concepts.*

Marshall Macklin and Monaghan Ltd., December 1995, *Further Study of Lower Don Lands Flooding Issues Final Report.*

Marshall Macklin and Monaghan, June 1995, *Further Study of Lower Don Lands Flooding Issues, Draft Report.*

Marshall Macklin and Monaghan Ltd., February 1996, *Conceptual Implementation Plan for Flood Protection Works on the West Don Lands.*

Marshall Macklin and Monaghan, May 2000, *West Don Lands Flood Protection and Related Issues Study.*

Marshall Macklin and Monaghan, Dillon, Unterman McPhail Assoc., Miller Thomson, Envirometrex, May 2001, *Union Station – Second Platform Environmental Assessment.*

Marshall Macklin and Monaghan, January 2001, *Toronto WWF Master Plan, Stage 2 Study Area 4 Don River Watershed DRAFT Existing Conditions Report.*

Marshall Macklin Monaghan, July 2003, *City of Toronto, Wet Weather Flow Management Master Plan – Stage 2 Don River Watershed, Study Area 4.*

Marshall Macklin Monaghan, June 2004, *Don River Hydrology Update Draft Final Report.*

Metro Parks & Culture, December 1995, *Lower Don River: Regeneration Strategy and Naturalization Plan, Pottery Road to the Forks.*

Metropolitan Toronto and Region Conservation Authority, *A History of Flooding in the Metropolitan Toronto and Region Watersheds.*

Metropolitan Toronto and Region Conservation Authority, September, 1984, *Addendum to the Keating Channel Environmental Assessment.*

Metropolitan Toronto and Region Conservation Authority, October 1985, *Project for the Dredging of the Keating Channel – Don River, 1986-1989.*

Metropolitan Toronto and Region Conservation Authority, January 1992, *Keating Channel Environmental Monitoring Program, 1989-1990 Report.*

Metropolitan Toronto and Region Conservation Authority, November 1989, *The 1988 Keating Channel Environmental Monitoring Program.*

Metropolitan Toronto and Region Conservation Authority, May 4, 1994, *Forty Steps to a New Don.*

Metropolitan Toronto Planning Department, February 1994, *Metropolitan Water Plan.*

Metropolitan Toronto Planning Department, Metropolitan Toronto, February 1994, *Metropolitan Waterfront Plan, Metropolitan Waterfront Trail.*

Metropolitan Toronto Planning Department, Metropolitan Toronto, April 1992, *Metropolitan Waterfront Plan, Metro Waterfront Environmental Study.*

Metropolitan Toronto and Region Conservation Authority, *A History of Flooding in the Metropolitan Toronto.*

Ministry of Environment and Energy, April 1988, *Don River Biological Inventory Past, Present and Future Evaluation.*

Mississaugas of the New Credit First Nation, *Toronto Purchase Specific Claim, Arriving at an Agreement.*

Ontario MNR, April 2001, *Rivers and Streams Performance Standards and Technical Guidelines, Lands and Waters Branch, MNR.*

Ontario Ministry of Natural Resources, 1990, *Flood Damage Estimation Guide, Queen's Printer for Ontario.*

November 18-20, 1999, *Obstacles and Opportunities Realizing the Potential of the West Don Lands - Workshop Final Report.*

Paragon Engineering Ltd., December 11, 1985, *Development of Flood Depth-Damage Curves for Residential Homes in Ontario, Volume 1, Technical Report.*

Paragon Engineering Ltd., December 11, 1985, *Development of Flood Depth-Damage Curves for Residential Homes in Ontario, Volume 2, Computer Software Documentation.*

Paragon Engineering Ltd., November 1990, *Ataritiri Hydraulic Model Study.*

Planning and Development, City of Toronto, April 1, 1992, *East and Central Bayfront Principles Report.*

Sarah Kalff, Gord MacPherson and Gavin Miller, April 1991, *Environmental Audit of the East Bayfront/Port Industrial Area Phase II, Natural Heritage.*

SENES Consultants Limited, March 2003, *Waterfront Scan and Environmental Improvement Strategy Study.*

Terrapex Environmental Ltd./Terraprobe, September 2004, *Proposal to Provide Lower Don River West Project Geotechnical / Geo-Environmental Investigations.*

The Don Watershed Regeneration Council, 2000, *A Time for Bold Steps: The Don Watershed Report Card.*

The East Bayfront Working Committee, August 14, 1996, *Report of The East Bayfront Working Committee.*

The Toronto Port Authority, 2001, *Land Use Plan.*

Toronto and Region Conservation Authority, *Toronto Waterfront Revitalization – Hydraulic Modelling Component for the Lower Don River West – Remedial Flood Protection Project.*

Toronto and Region Conservation Authority, October 10, 2003, *Request for Proposals for the Don Mouth Naturalization and Port Lands Flood Protection Plan.*

Toronto and Region Conservation Authority, July 17, 2003, *Request for Proposals for the Lower Don River West – Remedial Flood Protection Project.*

Toronto and Region Conservation Authority, April 18, 2003, *Request for Expressions of Interest for the Lower Don River West - Remedial Flood Protection Project.*

Toronto Waterfront Design Initiative, Fall 2002, *Urban Design Report 1, Report of the Results.*

Toronto Waterfront Revitalization Corporation, November 1999, *Our Toronto Waterfront: Gateway to the new Canada.*

Toronto Waterfront Revitalization Corporation, *Precinct Planning, www.towaterfront.ca.*

Toronto Waterfront Revitalization Corporation, October 17, 2002, *The Development Plan and Business Strategy for the Revitalization of the Toronto Waterfront Summary.*

Toronto Waterfront Revitalization Corporation, *The Development Plan and Business Strategy for the Revitalization of the Toronto Waterfront Appendices.*

TRCA Environmental Services, June 2004, *Lower Don River Environmental Assessment Aquatic Investigations and Data Summary, Draft Report.*

Trow, Dames & Moore, May 1990, *Ataratiri Groundwater Management Report prepared for City of Toronto Housing Department.*

Trow, Dames & Moore, August 1991, *Ataratiri Groundwater Management Report, Volume 1 – Text, prepared for City of Toronto Housing Dept.*

Urban Development Services, City of Toronto, November 2002, *Toronto Official Plan.*

Urban Development Services, City of Toronto, 2001, *Making Waves, Principles for Building Toronto's Waterfront, Central Waterfront Part II Plan.*

Urban Development Services, City of Toronto, 2000, *Toronto Plan Directions Report - Toronto at the Crossroads: Shaping Our Future.*

Urban Strategies Inc. for the TWRC, June 2003, *Central Waterfront Public Space Framework.*

Urban Strategies Inc. *et al.*, June 2004, *West Don Lands Precinct Plan*.

K. Walters, April 1998, *The Don River Ship Channel: Floodproofing for the Lower Don River.*

Waterfront Regeneration Trust, December 1995, *The West Don Lands.*

Waterfront Regeneration Trust, December 1995, *The West Don Lands.*

West Don Lands Committee, November 1999, *Obstacles and Opportunities, Realizing the Potential of the West Don Lands November 18-20, Workshop Final Report.*

West Don Lands Committee, November 18-20, 1999, *Realizing the Potential of the West Don Lands, Workshop Final Report.*

West Don Lands Soil and Groundwater Quality.