

Contents

Letter of Transmittal

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Executive Summary

Purpose and Objectives

The purpose of this study as defined by the Steering Committee is:

- To identify preferred systems for control and use of stormwater from the areas drained by Ellis Avenue and Colborne Lodge Drive storm sewers, with the objectives of minimizing negative environmental effects, and enhancing the beneficial use of stormwater in both natural and built environments.

The Ministry of the Environment (MOE) guidelines were adopted as the stormwater management objectives for the Ellis Avenue and Colborne Lodge Drive drainage area for the purposes of this study. Accordingly, the stormwater management objectives for discharges to the West Pond and Grenadier pond are 70% removal of total suspended solids, and a 2°C increase in thermal regime of the receiving water. The objectives for discharges to the Humber River and Lake Ontario are 80% removal of total suspended solids and a 1°C increase in thermal regime of the receiving water.

The stormwater quantity objective for this study is the maintenance and enhancement of groundwater baseflows throughout the study area. The MOE guideline with respect to quantity control and baseflow maintenance is that no runoff from a 5-mm storm should occur, except from paved surfaces. All of the stormwater from the 5-mm storm event should be infiltrated into the groundwater system, or trapped in depression storage where it can be removed by evaporation.

Study Approach

The project was undertaken in accordance with the planning and design requirements for Schedule C projects outlined in the Municipal Engineers Association *Municipal Class Environmental Assessment*. This required a description of the problem, assessment of alternative solutions and designs, selection of a preferred alternative, and preparation of an Environmental Study Report (ESR), as well as extensive public and agency consultation. In keeping with the EAAC directive and the goals of the Toronto Stormwater Group, the City's preference was that the preferred stormwater management system be a non-structural type of system utilizing source control and natural treatment technologies.

Study Area

To undertake the assessment the Study Area was divided into seven distinct drainage areas based on the existing sewer system. These drainage areas are shown in Figure ES-1. A summary of the characteristics of the drainage areas is provided in Table ES-1.

FIGURE ES-1

TABLE ES-1
DRAINAGE AREA CHARACTERISTICS

Drainage Area Identification	Land Use Description	Drainage Area (ha)	Percent Impervious (Typical)	Percent of Roofs Directly Connected	Soil Type
A	Residential, Detached and Duplex Dwellings	36.0	53%	77%	Sand-Silt
B	Residential, Detached and Multi-Unit Dwellings	8.8	54%	98%	Sand-Silt and Silt-Clay
C	Open Space Parkland, with school and park buildings	15.1	12%	N/A	Silt-Clay
D	Residential, Detached Dwellings	8.9	52%	84%	Silt-Clay
E	Residential, Detached Dwellings	3.6	43%	72%	Silt-Clay
F and G	Commercial, Transportation and Open Space Parkland	17.1	84%	N/A	Fill Material over Beach Sand and Gravel
H	Transportation and Open Space Parkland	13.8	42%	N/A	Fill Material over Beach Sand and Gravel

As part of this project, CH2M HILL completed a survey of the area with respect to downspout disconnection participation. The results of the survey are summarized in Table ES-2 below. As illustrated, only about 21% of buildings in the study area have their downspouts disconnected and directed towards grassed areas or to rain barrels. The remaining are not disconnected or direct the runoff to impervious surfaces such as driveways.

TABLE ES-2
RESULTS OF DOWNSPOUT DISCONNECTION SURVEY

Downspouts	Number of Buildings	Percent
Disconnected to pervious surface	178	20.7%
Disconnected to rain barrel	3	0.3%
Disconnected to impervious surface (i.e. driveway)	98	11.4%
Connected or Not Determined	582	67.6%
Totals	860	100.0%

Description of the Preferred Alternative

The preferred alternative for treatment of stormwater consists of three complementary approaches for achieving the water quality objectives of the EA study. The components of the preferred alternative are:

- Source control to reduce the quantity of runoff and to improve runoff quality.
- Replacement of traditional storm sewers with an exfiltration system on an experimental basis in the future.
- Treatment of storm sewer discharges with treatment wetlands and oil and grit separators.

Source Control – Runoff Quality Improvement

It is recommended that the City continues or enhances all of the existing programs that improve the quality of storm water runoff at the source. These programs are catchbasin cleaning, street cleaning, anti-litter and pet waste control bylaws, the sewer use bylaw, reduction and replacement of road de-icers, and reduction in the use of pesticides/herbicides and fertilizers. Within the study area, problems relating to litter and pet wastes have been noted during site visits. In addition, the sediments and salts that run off from the road network contribute to the degradation of the West Pond and other receiving water bodies. Enhancement of the following programs will help reduce these problems, and opportunities for their enhancement in the study area should be pursued:

- Increased enforcement of anti-litter and pet waste control by laws.
- Replacement of street sweeping equipment with more up-to-date street vacuuming equipment.
- Reductions in the use of road salts as de-icers.

Studies have indicated that source control programs can reduce transported sediment volumes by up to 15%, and improve runoff quality by reducing floatables, fecal coliform contamination, chlorides (salt), nutrients, pesticides and herbicides.

Source Control – Runoff Quantity Reduction

The City also has a number of programs in place aimed at reducing the quantity of runoff, which should be continued. These programs include roof leader disconnection to pervious areas or rain barrels, forestry bylaws and programs aimed at maintaining tree cover, naturalization of public open spaces with native vegetation, experimentation with porous pavement, and green roof initiatives. Within the study area, there are particular opportunities to enhance these programs as well as implement new source control initiatives. These opportunities include:

- Increased property owner participation in roof leader disconnection to pervious areas, rain barrels, ponding areas and/or cisterns/tanks.
- Reduction of impervious surface area on both private and public lots.

- Increased use of landscaping and vegetative techniques aimed at promoting infiltration of rainwater.

A quantitative analysis of these control options was then undertaken. Results indicated that these source control initiatives could achieve 18 to 24% reductions in runoff volumes in the residential areas in the study area. In the transportation corridors, there is less opportunity for source control methods and the expected reduction in runoff is only 1.4%. To implement these controls, it was noted that the City would have to increase public consultation efforts, implement pilot programs, supply financial assistance to landowners, and carry out extensive maintenance and follow-up programs.

Through the Wet Weather Flow Management Master Plan process, the City is increasing their public awareness program regarding source control initiatives. The Master Plan will also help define reasonable landowner uptakes with respect to a variety of source controls. This study and the Wet Weather Flow Management Master Plan are part of the ongoing work to reduce stormwater problems throughout the City.

Conveyance System Improvements

Within the study area, there is potential to reduce the quantity of runoff by replacing existing storm sewers with an exfiltration system using perforated pipe storm sewers. The area north of Rennie Park has sandy soils that are well suited for infiltrating large volumes of stormwater runoff. Retrofitting storm sewers is an expensive and complicated construction task. It is recommended that the City proceed with the modifications only when other major road reconstruction or sewer rehabilitation work is required (i.e. in the next 10 to 15 years).

The long-term reliability of exfiltration systems needs to be assessed in terms of sediment build-up and the ability of the surrounding soils to continually infiltrate large volumes of water. Similarly, the long-term effect on the local water table needs to be determined. The long-term effect on ground water quality from infiltrating large volumes of potentially contaminated runoff must also be determined before moving ahead with this technology on a large scale. The City is currently experimenting with exfiltration sewer systems, with positive results. It is expected that in 10 to 15 years, when sewer rehabilitation and reconstruction work is required in the study area, that exfiltration systems can be applied in areas with suitable site and soils conditions.

Treatment of Storm Sewer Discharges

Storm sewer discharges will continue to have adverse effects on downstream water bodies since the source control efforts will not eliminate the non-point source contribution of contaminants from roads and other surfaces. Similarly, source control measures cannot eliminate stormwater runoff volumes in the study area. Therefore, treatment of stormwater discharge that will remain following the implementation of the recommended source and conveyance controls is required in the study area to meet study objectives. The preferred treatment alternative consists of a combination of treatment wetlands and oil and grit separators, as follows:

- **Drainage Areas A and C, Outfall HP7:** The preferred treatment alternative is a treatment wetland located within the north end of end West Pond. The flows entering

the wetland are pre-treated in a sediment forebay located near outfall HP7 in Rennie Park.

- **Drainage Area B, Outfall HP8:** The preferred treatment alternative for Drainage Area B is the provision of oil and grit separator(s) located at outfall HP8.
- **Drainage Area D, Outfall HP5:** The preferred treatment alternative is a treatment wetland located within at the southwest corner of Grenadier Pond. The flows entering the wetland are pre-treated in a sediment forebay located at outfall HP5.
- **Drainage Areas E, F and G, Outfall H1:** The preferred treatment alternative is a treatment wetland located adjacent to the Humber River south of Lakeshore Boulevard. The flows entering the wetland are pre-treated in a sediment forebay.
- **Drainage Areas E, F and G, Outfall W12:** The preferred treatment alternative for overflows from the Ellis Avenue sewer that discharge at Outfall W12 is a screening device to remove floatables. The screening device would be located near Lakeshore Boulevard, immediately downstream of the diversion weir.
- **Drainage Areas H, Outfall W11:** The preferred treatment alternative is a treatment wetland, located north of Lakeshore Boulevard and situated on west-side of Colborne Lodge Drive. The flows entering the wetland will be pre-treated with oil and grit separators.

The location of the above facilities is illustrated on Figure ES-2. The estimated costs of the treatment alternatives are summarized in the Table ES-3.

FIGURE ES-2

TABLE ES-3:
ESTIMATED COSTS OF PREFERRED TREATMENT ALTERNATIVES

Treatment Facility	Estimated Costs
Treatment wetland and forebay to treat flows from Drainage Areas A and C, Outfall HP7	\$495,000
Oil and grit separator to treat flows from Drainage Area B, Outfall HP8.	\$302,000
Treatment wetland and forebay in Grenadier Pond to treat flows from Drainage Areas D, Outfall HP5	\$380,000
Treatment wetland and forebay near the Humber River to treat flows from Drainage Areas E, F and G, Outfall HP1	\$480,000
Screening device to remove floatables at Outfall W12	\$85,000
Treatment wetland and oil/grit separators located at Colborne Lodge Drive to treat flows from Drainage Area H, Outfall W11	\$432,000
Total	\$2,174,000

Potential Environmental Impacts and Mitigation

Source Control Impacts and Mitigation

The majority of source control initiatives have no adverse environmental impacts. Care must be taken to properly evaluate the effects of roof leader disconnections with respect to local flooding. Roof leaders should not be disconnected such that water is discharged onto adjacent properties where it might cause damage by entering low-lying basement windows or doorways. Sufficient lot grading is necessary to ensure that runoff that is newly introduced to the surface flows away from buildings.

Conveyance System Modifications

Any conveyance system modifications should be undertaken during planned road reconstruction. Short-term impacts associated with construction will include noise, dust, and potential inconveniences to homeowners (e.g. detours). Residences along the proposed construction routes should be notified prior to commencement of construction near their homes and asked for input regarding any potential inconveniences (e.g. specific dates, driveway crossings). The contractor should ensure there is temporary access to their properties if severance of their usual access route is necessary. Construction work and equipment operation should not extend beyond daylight hours. Problems of dust can be alleviated by periodically lightly wetting down the immediate work area. In addition, the contractor should maintain the work area in a neat and orderly fashion and ensure that all persons engaged in the work are informed of the safety regulations and special conditions in the construction area. After completion of construction, properties should be returned to pre-construction conditions (e.g. re-establishing lawns, sidewalks, etc).

Long term monitoring of exfiltration systems is required to determine if ground water contamination is occurring. Long-term monitoring is also required to determine if

groundwater levels are being modified in a way that negatively impacts adjacent buildings (basement flooding) and adjacent vegetation (change in hydrologic conditions). This must be undertaken to fully assess the future continuance of the retrofit program. If negative effects are realized from the program, the City should modify the exfiltration pipes to eliminate further discharge of water into the subsurface soils.

Treatment Systems Construction

Numerous techniques will be employed to mitigate the short-term impacts associated with the construction of wetlands and/or constructed wetlands. Truck traffic to and from the sites will be limited to the extent possible. Working hours will conform to the City's by-law Regulations. Appropriate noise and dust control measures will be applied, and affected property owners will be notified of construction schedules. Construction will be scheduled to minimize the period of disruption. To ensure public safety, construction areas may also be fenced where appropriate. All construction sites will be rehabilitated to pre-construction conditions (or better). Rehabilitation techniques could include landscaping, re-planting areas with native materials, developing educational or trail systems, etc.

Construction of wetlands within West Pond and Grenadier pond may disturb contaminated sediments. Prior to construction, pond sediments will be fully analyzed. A sediment management plan will be prepared that will address the requirement to remove sediments or to cap sediments insitu. As part of the wetland design, it is recommended the capping of the sediments in situ by use of some type of geofabric. The geofabric will contain and separate contaminated sediments at the bottom of the pond from imported soils in which the vegetation will be planted. This should provide adequate protection of downstream water bodies. In addition, siltation control screens will be utilized for all construction undertaken in the water to reduce the downstream movement of disturbed sediments.

Historical information on the area and conversations with City staff suggest that there are numerous areas within and surrounding the study area that were used to receive fill materials from other parts of the City in the early 1900's (possibly up to about 1940). The composition of these fill materials is unknown, but could potentially include garbage, excavation materials and/or coal ashes, from other areas of Toronto. The City of Toronto, Technical Services Department, in consultation with Solid Waste Management Services is currently conducting a preliminary investigation on City property to determine the nature and extent of past landfilling activities in the Swansea area. The program will include an investigation of groundwater quality near the proposed wetland in West Pond. If warranted, the City will undertake a complete site characterization and risk assessment to determine any remediation measures required. If it is discovered that leachate from past landfilling practices is entering the West Pond, the design of the wetland can be modified to treat the leachate¹.

Excavated material at any of the construction sites will be analyzed under MOE material reuse guidelines to determine the appropriate disposal location or method.

¹ Wetlands have been used to treat leachate from landfill sites in Canada, the U.S., and Europe (see "Constructed Wetlands for the Treatment of Landfill Leachates" edited by Mulamootil et. al.). These wetlands are successful at removing a wide range of contaminants from landfills including metals, nutrients, suspended solids, BOD, and organics. A wetland treatment system in the West Pond, therefore, may serve to improve the quality of any potential leachate or runoff from the suspected fill areas.

Vegetation that is removed or disturbed during construction will be replaced with an equivalent mass or area of natural vegetation.

The Ministry of Citizenship, Culture and Recreation (MCCR) has recommended that an archaeological survey of the site around the West Pond be undertaken prior to construction to ensure that there is no disturbance of previously unidentified archaeological and historical sites. As the area has been previously disturbed through infilling activities, it is unlikely that archaeological and historical sites will be discovered. However, prior to construction the City plans to have a registered archaeologist conduct a Stage 1 Archaeological Assessment of the site to identify any potential for resources. If there is potential, further archaeological assessments will be conducted. If any archeological resources are discovered, impacts will be controlled through avoidance or mitigation (e.g. re-designing the shape of the wetland).

Summary of Net Environmental Impacts

The construction of conveyance system modifications, oil and grit separators, and wetlands will cause some nuisance impacts (e.g., truck traffic, noise, and closure of the beach area during construction). However, impacts will be temporary and minor compared with the benefits of the project. The project will improve the water quality, create habitats for wildlife, and offer opportunities to improve natural and recreational systems. The combination of solutions - source control, conveyance system modifications, oil and grit separators, and treatment wetlands - will meet the purpose and stormwater management objectives specified in this study.