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# STORMWATER / CSO ALTERNATIVES DOCUMENT

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## Overview

This document presents a comprehensive list and description of the stormwater management and combined sewer overflow (CSO) control measures that are available for consideration in the development of the Wet Weather Flow Management Master Plan. The contents of this document will be extremely valuable in assessing where and how the measures may be implemented. The information will also be useful in the evaluation of how these measures may achieve the Plan objectives and targets. The document is intended to be a reference document for the Plan development process.

To assist readers, the measures have been divided into a number of categories, depending upon the particular type of application. It should be noted that there are some commonalities and crossovers between categories because some measures can be implemented and used in different applications. The following section provides an example of category crossover.

## Classification of Control Measures

The classification system for control measures is comprised of five (5) categories. The first three categories are classified depending upon where in the drainage system that measure is found. The two additional categories are general watershed wide (management) measures or special enhancement measures. The categories are consistent with MOE categories provided in recent documents. The categories include:

- i) **At source control** measures that are at the beginning of a drainage system or generally at the lot level;
- ii) **Conveyance controls** that are located within the drainage system where flows are concentrated and are being conveyed along a corridor;
- iii) **End-of-pipe controls** that are at the end of a flow conveyance route;
- iv) **Management / operational practices** which are not site specific and are generally “watershed wide” measures;
- v) **Special measures** that are not actual “control works” but provide an enhancement that will provide a watershed or stream improvement.

Stormwater drainage systems are very complex, particularly when links to the sanitary collection system exist. This complexity creates difficulty in developing and applying of any form of uniform classification system without some discrepancies arising. Regardless of the difficulties that may arise, a classification system is needed to facilitate the analysis and comparison of alternative measures.

In describing some of the discrepancies that can arise in the three main controls, it is worthwhile to divide a drainage system into upper (source control), middle (conveyance controls) and lower (end-of-pipe controls) components. In this way the categories describe where the measure is located in the drainage system. However, it is important to remember that the source of pollution can occur anywhere in the system. For example, a cross-connection or overflow from a sanitary sewer to a storm sewer can occur within the conveyance system (ie. at a maintenance hole) and is defined as the source of a particular pollution problem at that point. Similarly, a cross-connection is often located at a house (sanitary or storm), leading to a pollution problem. In this case the source of the problem being considered is at the source of the storm drainage system. Similarly, conditions within treatment plants can be the source of a

particular pollution problem, but these conditions are located in the lower (end-of-pipe) drainage system. Category crossover can also occur in more than two of the alternatives considered, such as that of a wetland system. Wetlands can be located at the source (ie. in backyards of homes), in the conveyance system (adjacent to streams – in the riparian corridor) or at the end-of-pipe as a wetland stormwater management pond. The crossover conditions that exist are illustrated in the matrix (**Table 1.1**) that has been developed.

In the selection and evaluation of CSO alternatives it is important to clearly recognize the categories of the classification system. It is also important to identify the water quality conditions processes and problem sources when analyzing drainage systems and watershed conditions.

It must be recognized that the classification system is intended for use in identifying where the measures are located within the drainage system and not as a means of identifying works that control pollution problems at the source. Information on works that control pollution problems at the source need to be extracted from detailed discussions and requires special measures considerations.

When considering where facilities can be located within a drainage system, some measures can apply to more than one location within that particular drainage system. The desired range of application has been provided in **Table 1.1**, which indicates what measures are normally applied to more than one area. A “P” is used to indicate the Primary area of application and a “✓” is used to indicate where the measures are applied at a secondary level.

## West Nile Virus

Recently, concerns have been expressed over the potential of some measures to increase the possibility of creating mosquito habitat. The mentioned increased mosquito habitat have raised additional concerns towards the possibility of finding the West Nile (WN) virus in and around the City of Toronto.

The West Nile virus is a mosquito-borne virus. Mosquitoes transmit the virus after becoming infected by feeding on the blood of birds, which carry the virus. Many mosquito species can become infected with WN virus, however, *Culex pipiens* and *restuans* are the most common. The WN virus can occasionally cause a serious illness called encephalitis, swelling of the brain. However, the majority of people infected with WN virus show no symptoms or only mild flu-like symptoms, (Health Canada, 2001).

The West Nile virus was first identified in the West Nile District of Uganda in 1937. It is most commonly found in Africa, West Asia, and the Middle East. The virus was found for the first time in North America in the late summer of 1999 in New York City. In 2000, 18 people got sick from the virus and there were two related deaths in the US. Until very recently, there has never been a reported case of the West Nile virus found anywhere in Canada. In late August, 2001, scientists confirmed the first reported case of the West Nile virus in Canada. The virus was discovered in Windsor, Ontario, entering the Country along the Michigan / Ontario border. From this discovery, it is possible that it will find its way further into Canada, including the City of Toronto this year.

The most effective, economical and environmental way to prevent the spread of the West Nile virus is to eliminate mosquito breeding areas. Mosquitoes that transmit the virus breed in small pools of standing water, such as; pot holes, roof gutters, wheelbarrows, flowerpots, pools, birdbaths and any other place that can collect water. To eliminate mosquito breeding areas around the home, special care must be taken to eliminate all standing water.

The City of Toronto has a co-ordinated plan for the prevention and control of the West Nile virus. The City of Toronto’s strategy to prevent and control the West Nile virus focuses on reducing the number of mosquito breeding sites. The new designs, retrofits and technologies adopted by the city will take mosquito breeding into account. For example, in the existing downspout disconnect program residential

homes collect roof leader water in rain barrels for irrigation purposes. The City of Toronto has recommended using a screen mesh over the barrel to eliminate the breeding areas. There does, however, still exist a potential for mosquito breeding in some of the CSO technologies. The potential for mosquito breeding is increased by the existence of standing water. The possibility of surface standing water occurs in the following technologies, which should be considered in the final plan:

- i) Roof Leader Disconnect to Rain Barrels;
- ii) Lot Level Storage/Infiltration Systems (Rear Yard Ponding);
- iii) Rooftop Storage and Rooftop Gardens;
- iv) Roadside Ditches;
- v) Grassed Swales;
- vi) Wetponds/Constructed Wetlands;
- vii) Hybrid Wet Ponds/Wetlands;
- viii) Living Machines/Solar Aquatics.

New designs or minor tweaks will be necessary to avoid standing water.

The City of Toronto has established an Interdepartmental West Nile virus Co-ordinating Committee to prevent the occurrence and/or spread of the West Nile virus through strategies that minimize the use of pesticides in Toronto. There will be communication linkage between the WWFMMP Steering Committee and the Toronto Public Health Department for the sharing of information and strategies.

## Information Sheets

The information sheets on each measure provide the following information. Note that for some measures, certain information categories are not applicable and therefore have not been filled.

**Title** of facility or measure.

**Primary Mechanism** a short description of what the measure does.

**Related WWMPs** outlining what other measures it may be similar to.

**Description** of the measures and what it includes.

**Application Requirements**, or what is required in an application approach. It may include the steps taken and different approaches that are available with this method.

**Proven Effectiveness / Experience Elsewhere** outlines where the measures have been applied and what the measured level of effectiveness is. This may be based on research carried out.

**Cost Considerations** provides information on the cost of application.

**Objectives Addressed** indicates where the measures can assist in meeting the project objectives.

**Opportunities Consideration** provides general information on what opportunities are provided through the application of this measure.

**References** are provided that relates to the measure.

## Conclusion

These measures will be evaluated in the succeeding phases of the development of the master plan. Some measures will be evaluated quantitatively in numerical modelling of the system. In these cases, the performance of the measure will be simulated and the resulting impact on water quality predicted.

This performance, along with the cost of the measure and other factors will be evaluated and compared to other measures. Measures that are not directly assessed quantitatively will be related to those that are, so that all measures will be assessed. The comments in the “opportunities considerations” section indicates how the measure will be assessed.



