



## **INTRODUCTION**

*The City of Toronto has undertaken to develop a master plan for the management of wet weather flows. This will be an action plan to address stormwater management, combined sewer overflow, infiltration and inflow, and funding challenges currently facing the city. This process was initiated in the fall of 1997 and comprises the following four steps:*

**Step 1** involves the data gathering, background review and scoping phase for the Master Plan. It also involves development of a Policy Paper and Step 2 Terms of Reference.

**Step 2** will focus on development of the Wet Weather Flow Management Master Plan. It will involve filling data and information gaps, evaluating and selecting preferred strategies (including funding) to deal with the wet weather flow problems, and preparing an implementation plan for the strategies.

**Step 3** includes the implementation of the Master Plan recommendations.

**Step 4** is the final step and will involve monitoring the success of the plan and revising as necessary according to the results of the monitoring.

Step 1 work has been completed and is documented in the following reports:

- *Toronto Master Plan For Wet Weather Flow Management, Draft Step 1 Report (including Appendices under separate cover), August 1998, Dillon Consulting Limited.*
- *Toronto Master Plan For Wet Weather Flow Management, Draft Step 2 Terms of Reference, August 1998, Dillon Consulting Limited.*

*This Executive Summary has been prepared as a summary of the above-noted documents. It is intended to provide the reader with an overview of work done to-date, including background, approach, findings and direction for Step 2 work.*

*This document contains:*

- *Section 1: Overview*
- *Section 2: Background*
- *Section 3: Step 1 Approach*
- *Section 4: Step 1 Findings*
- *Section 5: Step 2 Terms of Reference*

***‘This will be an action plan to address stormwater management, combined sewer overflow, infiltration and inflow, and funding challenges.’***

## **1.0 OVERVIEW**

“Wet Weather Flow” (WWF) refers to stormwater runoff resulting from a rainfall or snowmelt event that discharges into the City’s surface waters. In undeveloped areas, this stormwater runoff seeps into the ground or drains slowly over pervious surfaces into local watercourses. In developed areas, this runoff is prevented from seeping into the ground by roads, driveways and other impervious areas. It is accumulated and discharged quickly into receiving watercourses by sewers and man-made drainage systems.

Urban development has contributed to increased runoff volumes and peak flows resulting in flooding, erosion, and physical destruction of fisheries habitat. It has also contributed to degraded water quality resulting in beach closures, as well as adverse effects on human health, on fish and wildlife and on the aesthetics of the overall environment.

To address the problems caused by uncontrolled discharge of wet weather flows to the City’s surface waters, a number of initiatives have been pursued by individual agencies and the local municipalities over the past fifteen years. Many of these prior initiatives have suffered from lack of a holistic, watershed-based approach to solving the problems. When the Ministry of the Environment approved Phase 1 of the Western Beaches Storage tunnel, it did so on the condition that a comprehensive wet weather flow management master plan be developed for the entire Toronto area, on a watershed basis. This approach would ensure that individual projects proposed by the various agencies and municipalities could be evaluated in the context of the larger plan. The complexity of the wet weather flow problem and the different individual management strategies taken within Toronto and the upstream municipalities supported the need for this comprehensive master plan.

***A key finding that arose out of the Step 1 work is the need to adopt the prevailing philosophy that source control solutions should be considered first.”***

In 1997, a decision was made to initiate a Wet Weather Flow Management Master Plan process for Toronto. A Steering Committee was struck to guide this process and included representatives from the Toronto Region Conservation Authority (TRCA), the Ministry of the Environment (MOE), the Waterfront Regeneration Trust, the former Toronto municipalities, various citizens groups and members of the public. The Goal and Objectives of this Master Plan have been defined as follows:

**Goal** - *To reduce and ultimately eliminate the adverse impacts of wet weather flow on the built and natural environment within the City of Toronto, and to achieve a measurable improvement in water quality in the City’s water bodies over the next 20 years in a timely and sustainable manner that balances environmental, social and economic considerations.*

### **Objectives:**

- *Develop an integrated work plan for wet weather flow management that is based on a holistic/ecosystem-based approach;*

- *Establish strong linkages and cohesiveness among Toronto and neighbouring municipalities and agencies for the management of wet weather flows;*
- *Develop procedures, policies and by-laws to direct municipal action to deliver the wet weather flow management goal; and,*
- *Establish priorities for improvement works and other action to be undertaken on a City-wide basis.*

This document outlines the findings of Step 1 of the four step master planning process. Step 1 involved: the collection and analysis of information about the current situation; development of policies to guide the City; and, identification of gaps where further data needs to be collected. This “fact finding” step has shown that a great deal of work has been done by a large number of stakeholders. It is critical to have a solid understanding of all of this work before developing the Master Plan in Step 2.

A key finding that arose out of the Step 1 work is the need to adopt the prevailing philosophy that source control solutions should be considered first, followed by conveyance, then by end-of-pipe solutions. Work needs to be done to determine how far source control methods can go towards dealing with the wet weather flow problem. It is likely that the Master Plan will propose a combination of all three approaches to address the City’s wet weather flow problems.

***“It is critical to have a solid understanding of all of this work before developing the Master Plan in Step 2.”***

## **2.0 BACKGROUND**

In this section, background information is provided which includes a summary of the adverse effects of uncontrolled wet weather discharges, a description of the major wet weather flow components, and a summary of Toronto area wet weather flow control initiatives which have been undertaken in the recent past.

### ***What is the effect of urban development on Wet Weather Flows?***

Urban development has two major adverse effects on wet weather flows, including an increase in stormwater quantity, and degradation of stormwater quality. The increased percentage of impervious area, the improved surface grading and the improved drainage systems associated with urban development all act to reduce the occurrence of stormwater infiltrating into the ground, and hence increase the volume of runoff to receiving waters. This has the effect of reducing baseflows in local creeks and rivers (i.e. groundwater contributions). In addition, this runoff is conveyed more quickly away from the developed areas, resulting in increased peak flows to the watercourses. Stormwater quality degradation occurs as a result of contaminants being pick-up by the runoff as it travels over land and through the sewer systems. Over the past twenty years, it has been consistently demonstrated that stormwater runoff contains elevated levels of suspended solids, metals, pesticides, herbicides, nutrients, bacteria and other contaminants which are harmful to the environment.

***Over the past twenty years, it has been consistently demonstrated that stormwater runoff contains elements which are harmful to the environment.”***

### ***What are the major components of Wet Weather Flow?***

The major components of wet weather flow include:

- **Combined Sewer Overflows (CSO)** - A combined sewer is a pipe that is used to convey both domestic wastewater and stormwater runoff to a treatment plant. Combined sewers are prevalent in areas developed prior to the 1950's. Toronto's combined sewers and treatment facilities were designed with a capacity to handle sewage flows during dry-weather

periods, plus some limited amount of wet weather flow. They do not have the capacity to handle higher flows during wet weather. Instead, by-passes and overflows are built into the sewer at strategic locations to remove excess flows from the system. This means that sanitary sewage is discharged directly into Lake Ontario and several of Toronto's rivers during periods when it rains. While this method of operation was considered acceptable at the time these systems were developed, this is no longer the case. Sewer separation since the mid-1960's has alleviated the problem to a significant degree, but 30 % of the former City of Toronto, over 50 % of the former York and East York and a portion of the former City of Scarborough still rely on combined sewer systems. The separation of the remaining combined sewers in the City can contribute to resolving the WWF problem, although it would be extremely costly and disruptive to undertake in downtown areas.

- **Stormwater** - A storm sewer is a pipe that conveys only stormwater runoff from the source to the receiving stream. A stormwater outfall denotes the end of the pipe where stormwater is discharged in to the receiving stream. While the impacts of urban development on water quantity have long been recognized, the impacts on water quality have only really been acknowledged over the past ten to fifteen years. Recent studies have illustrated that discharges from stormwater outfalls have significant adverse impacts on receiving waters, and that mitigation measures are required for both stormwater discharges and CSO discharges, to achieve a measurable gain in the quality of the receiving water. The emerging trend is to recognize stormwater as a resource to be put to beneficial use such as groundwater replenishment, recreation, and aesthetic purposes.
- **Inflow and Infiltration (I/I)** - I/I represents the extraneous flow in a sanitary or combined sewer system that uses up capacity which would otherwise be available for conveyance of dry-weather flow. Inflow occurs when stormwater is purposely directed into the system via roof downspouts, foundation drains, illegal connections to the system or cross-connections between the storm and sanitary systems. Infiltration occurs when old or damaged pipes an/or high groundwater table allows groundwater to leak in to the system. Excessive I/I in a sewer system results in basement flooding , CSOs, and treatment plant by-passes.

***What has been done in the past to deal with the adverse effects of Wet Weather Flows?***

Since the early 80's, the need to reduce the environmental impacts of past practices with respect to wet weather flows has become a major focus of the public, government agencies and elected officials. To address this need, several major initiatives have been undertaken locally. These include:

***“Since the early 80’s, the need to reduce the environmental impacts of past Wet Weather Flow practices has become a major focus.”***

- initiation of multi-stakeholder Toronto Area Watershed Management Strategy (TAWMS) and Remedial Action Plan (RAP) studies, both of which had the ultimate objective of improving the quality of Toronto-area surface waters;
- the preparation of comprehensive basin management plans for the Rouge River, Don River, and Humber River by the Toronto and Region Conservation Authority;
- the formation of the Toronto Stormwater Group to advise on the application of non-structural techniques for stormwater control in the city;
- the initiation of three Stormwater Demonstration Projects in the City to test the feasibility and public acceptance of broad scale implementation of various source control measures (i.e. lot level controls);
- the development of a comprehensive Sewer System Master Plan by the former City of Toronto to virtually eliminate CSOs and to effectively control the discharge from all

- stormwater outfalls;
- the enactment of policies and by-laws requiring new development to incorporate water quality and quantity control facilities;
  - the completion of the Main Treatment Plant Environmental Assessment which reviewed and developed preliminary recommendations for control of CSO and I/I within the Main Treatment Plant sewershed; and,
  - the implementation of pollution control projects such as the Western Beaches Tunnel (under construction), the two Eastern Beaches Storage Tanks, the Grenadier Pond Sedimentation Facility, the Scarborough Dunkers Flow Balancing System, and the High Rate CSO Treatment Demonstration Project.

Most of the above initiatives were prompted by concern over the generally degraded state of Toronto's surface waters, and in particular, by the frequency of beach closings. Although improvements in the way we manage wet weather flows are underway, there is still more that needs to be done. The Master Plan is intended to define the required additional level of effort.

### **3.0 STEP 1 APPROACH**

The Step 1 work involved the following major tasks:

- Data Collection and Review
- Description of Existing Conditions
- Data Analysis and Assessment
- Policy Paper Preparation
- Step 2 Terms of Reference Preparation

Each of these tasks is briefly described below.

#### ***Collection and Review of Background Data***

The background data collection and review was conducted with input from City staff, the Ministry of the Environment, TRCA, the Steering Committee and numerous watershed-based groups. Numerous reports, drawings, plans, maps, etc. were collected and reviewed. Input obtained through previous public consultation activities related to WWF was reviewed, as well as the input obtained through the Step 1 consultation activities. Also undertaken was a review of WWF management practices in other jurisdictions within North America and in Europe.

#### ***Description of Existing Conditions***

Existing conditions representing the “way it is today” were documented and included a description of the following:

- **WWF Problem** - “*The WWF problem is defined as a degraded environment in the City’s watersheds and near shore zone of Lake Ontario as a result of a number of WWF management barriers*”. This problem statement is supported by a number of WWF impacts or environmental consequences of the problem. Three WWF management categories were identified, forming the overall framework for Master Plan development, including:
  - i) **Technical** (i.e. what projects and programs would need to be implemented?);
  - ii) **Institutional** (i.e. what administrative mechanisms will need to be put in place to implement the projects and programs?); and,
  - iii) **Funding** (i.e. how will the WWF programs and projects be paid for?).
- **Existing Projects and Programs** - Existing wet weather flow programs and projects were identified based on the review of previous reports and on discussions with City of Toronto and Review Agency staff. An extensive review of national and international wet weather flow practices was also undertaken. The main purpose of the review was to examine the general approaches around the world to WWF management and to compare them to current practices in Toronto.

- **WWF Regulations, Policies and Guidelines** - To better understand the roles and responsibilities of the various government organizations and agencies with respect to the management of WWF in the City, current WWF related regulations, policies and guidelines were identified and described. The results of this review helped to establish the City's mandate with respect to WWF, and provided background information for WWF policy development.
- **Funding Mechanisms Review** - Funding mechanisms for WWF management were identified and described. This included a review of the current funding mechanisms used in Toronto as well as the WWF management funding experience in other parts of Canada and the United States.

*“The Wet Weather Flow problem is defined as a degraded environment in the City’s watersheds and near shore zone of Lake Ontario.”*

### **Data Analysis and Assessment**

An analysis and assessment of the background information/data and the existing conditions was then undertaken resulting in the identification of :

- **Data gaps to be filled for the Master Plan** - Step 1 work identified data that will likely be required to prepare the Master Plan. There is also a need to harmonize the GIS databases that currently exist between TRCA and the former municipalities. These data gaps should be filled in Step 2.
- **Strategic issues to be addressed in the Master Plan** - These strategic issues represent the fundamental WWF management “barriers” that must be overcome to resolve the WWF problem. Step 2 of the Master Plan is to focus on addressing these barriers. Many of these strategic issues relate to the need to better understand the potential effectiveness/appropriateness of alternative technical, institutional and/or funding WWF solutions.
- **Committed/Parallel projects and programs to continue during Master Plan development** - Recognizing that the WWF Master Plan will take many months to develop, it is important that WWF management initiatives continue to be pursued. Based on the Step 1 work, recommendations for the continuation of several WWF management initiatives have been made. This includes WWF pilot/demonstration projects.

### **Policy Paper Preparation**

A WWF Policy Paper was prepared that includes a goal statement and specific objectives for the Master Plan. From the goal and objectives, a set of policy statements were formulated. These policy statements conceptually define how, and the extent to which the WWF problem will be solved. These policies will be submitted to City Council for adoption and may also feed into the preparation of a new Official Plan for the City.

## ***Step 2 Terms of Reference Preparation***

The Step 1 work resulted in the preparation of a Terms of Reference that serves as a “road map” for the Step 2 work. This Terms of Reference is described further in Section 5.0 of this executive summary.

## **4.0 STEP 1 FINDINGS**

The following highlights the key findings of the Step 1 work.

### ***How big is the problem?***

There are 71 CSO outfalls in Toronto that discharge into the Humber River, Lower Don River and the lakefront area, and approximately 2,300 stormwater outfalls throughout the City. CSOs are aggravated by excessive I/I which occurs in the Don, the Humber and the Etobicoke Sewersheds. Numerous impacts result from the uncontrolled discharge of CSOs and stormwater to the City's sewers and surface waters, including degraded water quality, basement flooding, surface flooding, stream erosion, reduced ground water infiltration, and aquatic habitat degradation. These impacts reduce the use and enjoyment of our watersheds, restrict swimming opportunities in Lake Ontario and threaten public health and safety.

### ***How well do we understand the impacts of WWF?***

The extent to which we understand the impacts of WWF vary. Through prior study and monitoring activities, impacts on water quality are well understood. In addition, TRCA has identified high risk erosion and flood areas, and past watershed studies have identified the impacts on natural habitats. There is not however, a comprehensive understanding of the extent of the basement flooding problem or the impacts of reduced groundwater infiltration. These impacts need to be examined in more detail in Step 2 of the Master Plan.

### ***How valuable is the work that has been done in the past?***

Numerous wet weather flow studies have been undertaken over the past fifteen years that have examined impacts and possible solutions. These include the TAWMS and RAP initiatives, the Toronto Stormwater Group initiatives, the former City of Toronto Sewer System Master Plan, the Don, Humber and Rouge watershed strategies, and many others. These studies have provided an enormous amount of technical data, and have also served as a rallying point for individuals and citizen groups to get involved at the community level. These prior initiatives provide the basis from which to launch the development of a comprehensive WWF Master Plan which will guide future actions.

***There are 71 CSO outfalls in Toronto that discharge into the Humber River, Lower Don River and the lakefront area throughout the City."***

### ***Can the problem be completely solved?***

It is not feasible to analyze and develop solutions for every catchment/outfall in the City within the time allotted for development of the Master Plan.

In general, CSO outfalls are relatively few in number, they are confined to the south-central portion of the city, they have been studied extensively in the past, and proposals exist for elimination of most of them. While these prior proposals must be assessed to determine whether or not they will satisfy the criteria and targets to be developed in Step 2, it is reasonable to suggest that an objective of the Master Plan should be to have a plan in place for virtual elimination of all of the CSOs (i.e. there is no need to prioritize among them).

By contrast, the stormwater outfalls are large in number, they are dispersed throughout the City, there has been limited prior assessment and relatively few solutions proposed. Therefore, a sound approach to stormwater outfall prioritization must be developed for detailed assessment.

***“Numerous impacts result from the uncontrolled discharge of CSOs and stormwater to the City’s sewers and surface waters.”***

***How does the built-up nature of the City influence possible solutions?***

The built-up nature of the City presents a challenge for WWF management. There is limited space for WWF management facilities and the implementation of certain source control measures could result in problems being created (i.e. the disconnection of roof leaders and foundation drains could cause basement flooding, surface flooding etc.). As well, the majority of our

conveyance infrastructure (i.e. pipes) is located beneath roadways, and its replacement is an expensive undertaking. Thus, we must distinguish between approaches and solutions which apply to retrofit (Toronto) versus greenfield situations.

***Are there lessons to be learned from other jurisdictions?***

We learned the following from a review of U.S. and European practices:

- for the most part, the U.S. stormwater and CSO control methods reviewed have been considered and/or implemented in Toronto;
- the CSO control criteria established by MOE (Procedure F-5-5) is more stringent than the criteria used in the U.S. and Europe;
- more intensive use of sewer flushing and Real Time Control techniques should be examined further for application in the City;
- combined sewers (rather than sewer separation) are considered to be a more environmentally friendly option in parts of Europe, due to the water quality concerns associated with untreated stormwater discharges to surface waters; and
- infiltration-based practices for new development tend to have more widespread application in the U.S. although this may be due to local conditions.

***Is there a best way to solve the problem?***

There is no single correct way of dealing with wet weather flow problems. However, it has become quite clear through input from the public, the local municipalities, and the review agencies, and through the review of national and international trends, that the preferred approach to dealing with wet weather flow problems is through a hierarchy of source, conveyance and end-of-pipe control measures. It is anticipated that a combination of all three measures will play a role in the overall solution. Step 2 work will determine the extent to which each of these control measures can or should be applied.

***Are the necessary policies/guidelines in place for WWF management?***

As a result of the Step 1 work, a set of WWF policies were developed and are recommended for adoption by the City. These policies are articulated in the *WWF Policy Paper*. A review of existing WWF/development guidelines of the former municipalities was also undertaken and are presented in the Step 1 Report. The significant variation in these guidelines suggests there is a need for guideline harmonization.

***Is there agreement on Wet Weather Flow targets?***

Targets are important as they define the extent to which the WWF problems are to be solved, and provide a benchmark to judge the success of the WWF management solutions. In the past, the TRCA, MOE and various former municipalities have all developed targets. Unfortunately, there is no clear agreement as to how the targets should be set (i.e. outfall or receiving stream based) and how stringent they should be. Agreement on these targets by other stakeholders has yet to be reached. Further work is required in Step 2 to develop a consistent set of targets.

***What institutional challenges are we facing?***

The technical solutions to WWF need to be supported by various administrative and management tools, referred to as institutional mechanisms. Key challenges to be overcome in creating the appropriate mechanisms include:

- the need to develop the WWF Master Plan in a watershed context;
- the coordination of WWF Master Plan initiatives with upstream municipalities;
- identifying the right mix of regulations and incentives for WWF initiatives;
- utilizing land use planning as a means to manage WWF;
- securing a commitment from the City to solving the problem;
- setting an appropriate time frame for addressing the problem;
- making the public aware of the need for and value of WWF management (to support City and household level initiatives).

***‘As a result of Step 1 work, a set of WWF policies were developed, and are recommended for adoption by the City of Toronto.’***



### ***What WWF projects and programs should continue?***

While the Master Plan will provide the blueprint for all future wet weather flow management activities, it may take several years for completion and approval. In the mean time, positive wet weather flow initiatives should not be abandoned. An approach was developed in Step 1 for assessing which initiatives should continue in parallel with development of the Master Plan. The over-riding criterion was that there should be minimal conflict with the ultimate direction to be provided by the Master Plan.

Wet weather flow initiatives were categorized as Management Activities, Stormwater Management Activities (source and conveyance controls) and Structural Alternatives (end-of-pipe). It was determined that Management Activities (street sweeping, catch basin cleaning, system rehabilitation, chemical use control, sewer use by-law review and enforcement, water conservation, public education, etc.) and at-source stormwater management activities (downspout disconnection, inlet controls, lot level infiltration, porous pavements, etc.) should continue.

It was also determined that some structural projects should continue to be pursued, provided they yield immediate local benefit, they do not conflict with or adversely affect other proposed measures, and they are relatively low cost. These projects include the Emery Creek Stormwater Management Pond, Etobicoke Flow Balancing System, Humber Wetlands, Spring Creek Sedimentation Facility, etc. These projects represent smaller, more local naturalization approaches and are unlikely to conflict with the ultimate direction provided by the Master Plan.

Pilot/demonstration projects to examine the feasibility and effectiveness of porous pavement, pervious catch basins and sand filters are recommended.

### ***Are current funding practices for WWF management appropriate?***

The Step 1 work identified a number of problems with the way in which WWF management activities are funded including:

- insufficient annual operating and capital budgets;
- budget setting process that is removed from front line managers;
- lack of harmonization between the former area municipalities;
- no incentives for on-site management; and,
- no stream of revenue dedicated to WWF management.

As part of the Step 2 work, a WWF management funding strategy to address these and other issues will be developed.

## **5.0 STEP 2 TERMS OF REFERENCE**

One of the outputs of the Step 1 work was a draft Step 2 Terms of Reference document (August 1998). This document provides the basis and direction for Step 2 activities (Master Plan development).

### ***How is the Terms of Reference to be used?***

The Step 2 Terms of Reference provides the framework for developing the Master Plan. Rather than being prescriptive in nature, the Terms of Reference exposes the significant issues that must be considered in developing the Master Plan. It is intended that the Terms of Reference be used to assist in scoping and developing work plans.

### ***What are the major Step 2 activities as defined by the Terms of Reference?***

The Terms of Reference has identified several activities to be pursued in Step 2. A brief discussion of each of these activities is provided below:

- **Data and Information Gaps** - The most significant GIS-based data gaps include storm sewer outfalls, foundation drain connections, downspout connections, soil types and basement flooding locations. While the level of detail required to make Master Planning level decisions may not be that extensive, eventually, detailed lot level information will be required prior to implementation of initiatives. It is also suggested that in Step 2, the various GIS data bases which currently exist, be harmonized into one single accessible system, and a single agency should maintain and support the system.

***“Rather than being prescriptive the Terms of Reference exposes the the significant issues that must be considered in developing the Master Plan.”***

- **Target Setting** - Wet weather flow targets are required to help develop and evaluate the level of control required by the various alternative solutions. Targets and criteria can be developed at many levels (receiving water quality, outfall discharges, facility performance criteria, watershed targets/indicators etc.). To reach agreement on what Toronto and other agencies with an interest in the City’s watercourses should strive for in managing wet weather flows will be a challenge. There is , however, consensus that improvement of

our watercourses is necessary and this improvement must be measurable. In Step 2, targets must be established, up-front and in a reasonable length of time; flexibility must be retained to alter the targets over time; and a decision is required on the presumptive (outfall-based targets) versus the demonstration (receiving water-based targets) type approach. The approaches used in developing the targets and indicators in the Don Report Card (completed) and Humber Report Card (underway) should be considered in Step 2 for developing wet weather flow targets.

- **Problem Prioritization** - In Step 2, an approach to prioritizing from among the 2300+ stormwater outfalls/catchments is required. Selection criteria are suggested in the Terms of Reference.
- **Technical Solutions** - Technical solutions refer to the potential structural and non-structural means available to manage WWF. In the past, the approach has generally been to develop structural/end-of-pipe solutions first (and in detail), and then to determine whether or not source controls could be used to reduce the size of the structural solution (after-the-fact source control assessment). It has become quite clear through a review of both stakeholder input and national/international trends, that the preferred approach to dealing with wet weather flow problems is through the Source/Conveyance/End-of-Pipe control hierarchy. An array of solutions following this hierarchy is provided in the National/International practices review.

This approach requires that detailed analyses be carried out to illustrate that pre-defined targets can be met with this proposed treatment-train approach. The ‘source control-first’ approach is fundamentally different than the approach used in the past, and we must make sure that emphasis truly remains on this hierarchical approach during Step 2. Without this emphasis, the approach is sure to drift back to the structural/end-of-pipe approach.

It must be noted that: the effectiveness of source controls are not well known; experience with widespread application of source controls is quite limited; and extremely detailed information as well as micro-scale (lot level) analyses are required to fully establish the effectiveness of source controls. In general, retaining water in the system (infiltration) is not compatible with urban development. Thus, a number of important questions need to be addressed: i.e. Where does infiltrated water go? Is groundwater mounding likely to cause a problem? Is there potential for groundwater contamination? and Will I/I increase with increased infiltration?. These issues must be assessed carefully in Step 2 as part of the source control first approach.

- **Institutional Mechanisms** - Institutional mechanisms are the administrative/management processes and tools required for WWF Master Plan implementation. The Terms of Reference has identified and discussed the significance of:

- ⇒ coordination with other municipalities;
- ⇒ choosing the right mix of regulations and incentives;
- ⇒ the role of land use planning;
- ⇒ selection of an appropriate time frame for Master Plan implementation; and
- ⇒ involving the public in both Master Plan development and implementation.

***“Some major issues to be considered in developing the implementation plan include clear delineation of responsibilities, costs, affordability and timelines.”***

- **Funding Mechanisms** - The output of Step 2 will be a plan of sufficient detail to allow the implementation of an equitable and flexible funding mechanism, that achieves the environmental and financial requirements, and addresses the strategic issues and major concerns/criticisms of stakeholders. This will be done by evaluating all potential funding

mechanisms according to pre-defined criteria. Upon evaluation and short-listing, two mechanisms will be selected for more detailed design and assessment. Design principles, financing strategies, modeling and assessment will be used to help identify the preferred mechanism. Administrative strategies will then be developed for the preferred mechanism, including preparation of spending strategies, preparation of billing and collection strategies, development of by-law structures and consultation with stakeholders.

- **Master Plan Implementation/Phasing Plan** - The cost and magnitude of works required to deal with the wet weather flow problem will make immediate implementation of the entire plan impractical. The plan will have to be phased in over many years. Priorities must be developed on an impact and cost-effectiveness basis. In addition, phasing may be required between watersheds or within watersheds. Major issues to be considered in developing the implementation plan include clear delineation of responsibilities, costs, available resources and affordability, implementation timelines and monitoring results.
- **Stakeholder Consultation** - The Step 2 work should focus on priority problem areas allowing for more direct interaction with groups and individuals with an interest in these areas. Depending on the nature of the issues to be discussed, more local community/watershed- based meetings may be appropriate in Step 2 in addition to , or instead of, City-wide public forums. Other creative consultation approaches should be examined as well.

The full documents for this project will elaborate, in detail, on these findings. Step 1 work forms the base on which to build a Wet Weather Flow Master Plan for the City of Toronto.