# ONTARIO CENTRE FOR MUNICIPAL BEST PRACTICES

200 University Ave., Suite 801, Toronto, Ontario, M5H 3C6

# BEST PRACTICE SUMMARY REPORT

February, 2008

Water and Wastewater

# INFLOW AND INFILTRATION – CUSTOMER OUTREACH

**Abstract:**
The Region of Halton has undertaken an initiative to identify potential sources inflow and infiltration on private property. The Region is surveying customer homes to assess drainage, collect data regarding the home including basement drain elevation, and an assessment of the condition of the lateral which carries wastewater from the home.

Additional information regarding inflow and infiltration management and the OMBI Water and Wastewater Expert Panel 2007 Business question for which this report has been written can be found in the Project Approach and General Inflow and Infiltration Management Practices documents.

**Practice Identification:** Water and Wastewater

**Case Study Municipality:**

- Region of Halton

**Municipal Profile:**

| **Municipality** | **Region of Halton**[1] |
|---|---|
| **Population** | 439,200 |
| **Water Distribution** | 2,051 km of integrated transmission and distribution system with 122,790 service connections, and 24 pump stations |
| **Wastewater Collection** | 1,626 km of sanitary sewers, with a total of 120,498 sewer service connections, and 80 pump stations |

[1] Municipal Profile is based on 2006 Data

| Water Treatment Plant | Population Served | Average Day Demand (ADD) |
|---|---|---|
| Burlington WPP | 164,415 | 107.98 ML/day from Lake Ontario |
| Oakville WPP | 166,613 | 47.56 ML/day from Lake Ontario |
| Wells | 113,700 | 24.63 ML/day |
| **Wastewater Treatment Plants** | **Population Served** | **Annual Average Flow (AAF)** |
| Acton | 10,233 | 4.37 ML/day |
| Georgetown | 33,251 | 16.98 ML/day |
| Milton | 58,755 | 11.68 ML/day |
| Mid Halton | 83,040 | 35.93 ML/day |
| Skyway | 160,303 | 101.92 ML/day |
| South East | 35,312 | 22.16 ML/day |
| South West | 51,592 | 33.92 ML/day |

**Key Words:**

- Inflow and Infiltration (I/I), Basement Flooding, Surcharging, Drainage Survey, Customer Outreach

**Related National Benchmarking Goal(s):**

- Operate a Reliable and Sustainable Sewerage and Drainage Infrastructure
- Sufficient Sewerage & Drainage Infrastructure
- Environmental Protection
- Customer Satisfaction

**Related Performance Measures:**

- # of Reported Overflows due to Capacity / 100 km length
- # of Connections with Sanitary Flooding / 1,000 Service Connections

**Related InfraGuide Best Practices:**

- Infiltration / Inflow Control / Reduction for Wastewater Collection Systems

## Description of Case Study

Recent significant precipitation events between 2006 and 2007 have led the Region to undertake a number of actions to respond to inflow and infiltration (I/I) and the problems that I/I have imposed on the Region's customers, system operations, and the environment. Three significant storms on July 28, 2006, December 2, 2006 and March 26, 2007 resulted in a number of basements in homes in the City of Burlington and Town of Oakville to become flooded due to sanitary sewer backups. The extraneous flow in the sanitary system that caused a number of the basements to flood was a result of inflow and infiltration. To determine the sources of I/I, the method(s) in which excess water was entering the sanitary system, and to identify solutions to help address the issue, Halton initiated a program to conduct Household Drainage Surveys (HHDS). The program assists the Region in determining the causes of the basement flooding events (how stormwater is entering the sanitary system) and in obtaining information required to develop a more comprehensive strategy to address basement flooding across the Region.

**Household Drainage Surveys**

The Household Drainage Surveys are voluntary inspections of homes on the private side that seek to:

- Identify potential sources of stormwater entering the sanitary sewer.
- Assess the site drainage of each home.
- Collect data regarding the home including history and basement drain elevation.
- Assess the condition of the lateral which is the pipe carrying wastewater out of the home.

The Region has been conducting household drainage surveys based on a priority list. Homes within the key flooding areas that have experienced flooding as well as some that have not for comparative purposes have initially been targeted.

The Region is currently conducting the survey on a voluntary basis for homes in the areas hit by the large storm events in July 2006, December 2006, and March 2007. The survey incorporates a review of the lot grading, lateral inspections, roof leader and weeping tile connection assessments, and the determination as to whether homes have backflow prevention devices and sump pumps installed. The second component of the Household Drainage Survey Program is to conduct surveys in a number of homes that have not experienced basement flooding to allow the Region to compare results for similar homes and determine the factors that are leading up to basement flooding.

In addition to the Household Drainage Survey, the Region is also undertaking a *Regional Disconnection and Inflow/Infiltration Monitoring Pilot Program*. The pilot program is serving two purposes:

1. To address homes that have been the most impacted by multiple basement flooding occurrences since July 2006.
2. To gather critical information required to develop a comprehensive strategy to address basement flooding relating to inflow and infiltration across the Region.

As of mid November, 2007, twenty-seven customers qualified for the pilot program. Of these twenty-seven customers it was determined that 12 customers required the installation of sump pumps. Additionally, one lateral has been replaced and one lateral has been relined.

The Region of Halton is a two-tier government structure made up of four municipalities. The Region provides wastewater treatment to the local municipalities and operates and maintains the sanitary collection systems but not the stormwater systems. Committed to reducing inflow and infiltration in the sanitary system, Halton is funding the costs for the pilot program in hopes to have a better idea of the private side costs for rehabilitation and to potentially implement a subsidy program. The information and outcomes of the pilot project will provide valuable information and understanding of the private side issues, which for Halton are the biggest contributor to inflow and infiltration and have always been difficult to address. When the pilot project is complete, Halton intends to work closely with the local municipalities to implement recommendations from the pilot program, including potential cost sharing.

**Customer Outreach**

While the pilot project relating to determining the causes for inflow and infiltration, and the development of strategies to address these causes is ongoing, the Region has also initiated a customer outreach program to inform homeowners of ways to prevent basement flooding. A pamphlet was developed to educate homeowners on inflow and infiltration and the measures they can take to avoid directing excessive stormwater to the sanitary sewer system. The pamphlet will undergo further development over the coming months and will then be available for mass distribution. This information has played an important role in public education meetings held over the last year in educating customers on wastewater collection, how to reduce the risk of basement flooding and how to respond to basement flooding events. The Region's Homeowner's Guide to Flood Prevention has been included at the end of this document.

**Benefits**

- Positive feedback from the customers who see the Region as being proactive.
- Educating customers who did not understand or were not aware of the factors that lead to sanitary backups and potential basement flooding.
- Involvement from local municipalities who are responsible for the stormwater collection to provide seamless services to their customers.
- Increased understanding and valuable information regarding private property issues, which are often the most difficult to address.

**Efficiency**

By implementing the Household Drainage Survey Program, the *Regional Disconnection and Inflow/Infiltration Monitoring Pilot Program*, and Customer Outreach through the *Homeowner's Guide to Flood Prevention*, the Region is addressing customer concerns and obtaining valuable information relating to why and how inflow and infiltration is

occurring. Combined, this information will enable a comprehensive program to address inflow and infiltration to be developed and implemented.

**Effectiveness**
The Region's inflow and infiltration initiatives are educating homeowners on how to reduce the risk of basement flooding. In addition, the Region is positive about the outcomes of the Household Drainage Survey as it is expected to provide valuable information and understanding of the private property side issues which are the biggest contributor to inflow and infiltration and have always been difficult to address.

**Community or Environmental Outcomes**
There has been positive feedback received from customers who see the Region as being proactive. The public is being educated about the reasons for flooding as many customers were not aware of all the causes of basement flooding and the impacts that reducing unnecessary water sent to the sanitary system can have on flood prevention.

**Statutory Requirements**
None

**Replication of the Case Study**
Household Drainage Survey Programs, Stormwater Disconnection and Monitoring Programs, and Customer Outreach Programs can be adopted by municipalities that experience significant inflow and infiltration and have a history of repeat basement flooding occurrences.

**Other OMBI Members that have implemented this practice:**
The City of Toronto has a downspout disconnection program where customers are encouraged to disconnect. The City of Toronto's voluntary program ended November 20, 2008. Approximately 60,000 properties registered for the voluntary program in 2007 and due to the volume, these properties will be addressed over the next few years. In previous years, approximately 5000 to 10,000 properties annually, expressed interest in the voluntary program with approximately 2,000 annually actually agreeing to be disconnected. Participants of the voluntary Downspout Disconnection Program are eligible for one free rain barrel, if it is feasible for installation. Additional rain barrels can be purchased for $60.00.

A mandatory program is being implemented in the core area of the City served by combined sewers. This is a priority area where reducing stormwater from the system would significantly reduce the risk of basement flooding. In this area, it will be the residents' responsibility to pay for the disconnection work. The City is hoping to achieve approximately 80% disconnection through the mandatory program.

Toronto also has a backflow preventor subsidy program and a basement flooding protection subsidy program to prevent reoccurrence of basement flooding. The foundation disconnection and downspout disconnection components of the program can

reduce the inflow and infiltration to sanitary sewers. The total subsidy can be up to $3,200, and can include the following:

- Backflow Valve - In consultation with a licensed plumber, drain contractor, or drainage engineer, if it is determined that a backflow valve is sufficient protection on a storm and/or sanitary sewage connection., the subsidy is 80% of the invoiced cost up to a maximum of $1,000 including eligible labour, materials, permit and taxes.
- Sump Pump (Weeping Tile Drainage) - In consultation with a licensed plumber, drain contractor, or drainage engineer, if it is determined that a sump pump is required to manage the water normally collected by footing weeping tiles (foundation drains) and draining to the sanitary, storm or combined sewer the subsidy is 80% of the invoiced cost up to a maximum of $1,500 including eligible labour, materials, permit and taxes.
- Backflow Valve and Sump Pump - In consultation with a licensed plumber, drain contractor, or drainage engineer, if it is determined that both a backflow valve (called a Mainline Fullport backwater valve) and a sump pump are required the subsidy is 80% of the invoiced cost up to a maximum of $2,300 including eligible labour, materials, permit and taxes.
- Downspout Disconnection - Downspouts must be disconnected, where feasible as determined by the City, to be eligible for any subsidies under this program. If your house downspouts have not been previously disconnected and the homeowner has not participated in the City's past Downspout Disconnection Program, a subsidy is available to complete the disconnection as part of this program. The subsidy is 80% of the invoiced cost up to a maximum of $500 to perform or supervise the disconnection including eligible labour, materials, permits and taxes.
- Pipe Severance and Capping - In consultation with a licensed plumber, drain contractor, or drainage engineer, if it is determined that in addition to other installations (backflow valve and/or sump pump) the severance and capping of the footing weeping tile pipe location outside the foundation walls and storm sewer lateral is required, the subsidy is 80% of the invoiced cost up to a maximum of $400 including eligible labour, materials and taxes.

The difference between submitted costs and the maximum subsidy for any one type of installation cannot be applied in part, or in total, to another type of installation when calculating the total homeowner's subsidy. Homeowners are allowed only one subsidy payment for the appropriate installation or combination of installations per each eligible homeowner in Toronto through this subsidy program.

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## What Can I Do to Reduce the Risk of Basement Flooding?

Every homeowner can do their part to prevent basement flooding for both themselves and their neighbour. Every effort taken to reduce the amount of unnecessary water sent to the sanitary system is a positive step towards flood prevention. Here are some measures to reduce the potential of a flood in and around the home:

- Improve your lot grading, making sure the ground slopes away from the exterior walls of your home.
- Clean eavestroughs on a regular basis.
- Disconnect your downspouts if they are connected to the sanitary system and install downspout extensions two metres (six feet) from the foundation.
- Disconnect your yard drains from the sanitary system.
- Check for leaks in walls, floors, windows or foundations and have them repaired.
- Ensure that your weeping tile drainage is directed to the storm sewer system or to a ditch and not into the sanitary system. If connected to the sanitary system, consider connecting the home's weeping tile system to a sump pump system.
- Consider installing backwater prevention devices on basement plumbing fixtures in combination with disconnecting the weeping tile system from the sanitary system.
- Have a licensed plumber inspect your home's flood-prevention devices such as backwater valves, sump pumps, floor drains and caps to ensure they are working properly.
- Consider installing plastic covers on window wells. Ensure that window wells are raised above ground level to prevent water from flowing into the well from the yard.
- Ensure that outer storm windows, as well as inner windows are closed during rain events.
- Check to make sure that borders around flower and shrub gardens do not create dams that retain water next to the house.
- Conserve water where possible. By conserving water you will reduce the amount of water going into the sanitary system. Consider low-flow fixtures/features for shower heads and toilets, and water-efficient, front load, washing machines.
- Reduce use of plumbing fixtures during major rainfall events.
- Consider the use of rainbarrels to divert stormwater.

## How Halton Region is Helping

In addition to its routine sanitary system maintenance program, Halton Region is continuously assessing and upgrading its infrastructure to minimize the potential for inflow and infiltration of water into the sanitary system from the soil as part of a regular continuous improvement program.

Halton Region provides 24 hours a day, 7 days a week service to homeowners who have been flooded from the sanitary system. There is no charge for clearing a blockage that occurs on the municipal side of the property line. A flat rate is charged for clearing a blockage that occurs on private property.

## Be Safe, Get Help

You may not be comfortable implementing flood-prevention measures without consulting a professional (plumber or landscaper). Remember that a licensed plumber is best qualified to provide advice about your home's drainage system.

## What should I do if my basement floods?

If you experience basement flooding and suspect it is sanitary water, call Halton Region. Regional staff will then inspect the problem, assess the flooding, attempt to determine the source and advise you of what actions you may take. You should also call your insurance company as soon as possible and report any damage caused by the flooding. They will also advise you on how to proceed.

## Visit or Contact Us

For more information please visit our website at www.halton.ca/basementflooding or call us.

Interested in **water conservation within the home?** For more information, or to receive your **FREE** copy of the **Household Guide to Water Efficiency**, please contact us.


### Halton Region

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PW-07001


Halton Region

# Basement Flooding

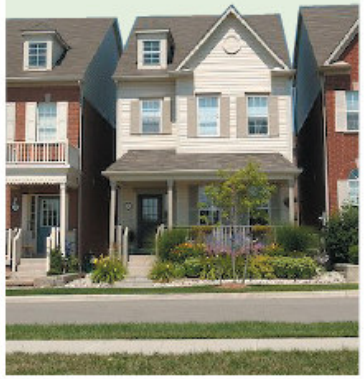
## A HOMEOWNER'S GUIDE TO FLOOD PREVENTION

Halton — a World Class Place To Be.

**Halton Region is committed to providing residents with information on why basements sometimes flood and how to help prevent flooding within the home.**

**A flooded basement is not only a major inconvenience but in many cases is very costly to restore. Insurance premiums may rise as a result of a flood or make it difficult to obtain insurance. Flood waters may be unsanitary and carry waterborne contaminants or irritants.**

**A sewer and drainage system is not a guarantee against basement flooding. Homeowners can help reduce the risk of basement flooding by taking preventive measures. This brochure will help explain how the drainage system works and offer some steps you can take to reduce the risk of basement flooding.**



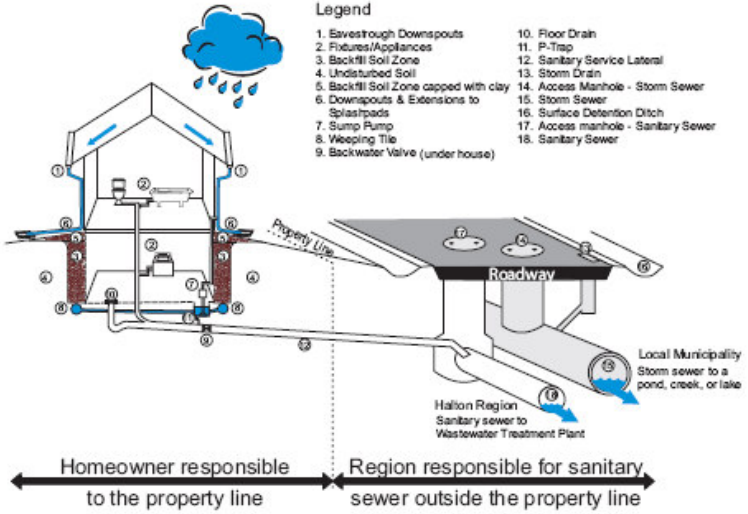
## How Does the Water Collection System Work in My Home?

For your home there is a separate stormwater and sanitary sewer (wastewater) collection system. Responsibility for the sanitary sewer collection system resides with Halton Region and your Local Municipality is responsible for stormwater management.

The stormwater system collects rain and snowmelt (clear water) from streets and properties and directs this flow to a nearby pond, creek or lake. The sanitary system collects water from toilets, sinks, showers and laundry facilities and directs it to sanitary treatment facilities where it receives a high level of treatment prior to being discharged back to the environment.

Clear water from rain and snowmelt penetrates the ground around properties and makes its way into the weeping tile system which surrounds the home's foundation. With newer homes (built within the last 15 years) the weeping tiles direct this clear water to the stormwater system as this water does not require treatment.

In some homes however, the weeping tiles direct this water to the sanitary system. There are several disadvantages to having the weeping tiles (or sump pump discharge) connected to the sanitary system. Taxpayers must pay the cost of treating this high volume of clear water which is unnecessary and expensive. Additionally, this flow can overload the sanitary system during periods of high rainfall contributing to backups within the home.




## How Can My Basement Become Flooded?

Your basement can become flooded due to a number of factors:

- Poor lot drainage resulting in water running towards the home rather than away from it.
- Overflowing eavestroughs.
- Leaking, plugged, or missing downspouts.
- A leak in your home's foundation, basement walls, basement windows or doors.
- Failure (i.e. blockage) of the weeping tile system (foundation drains).
- Blockages due to tree root infiltration in the home service pipe (sanitary service lateral).
- A blocked connection between your home and the sanitary main in the street from paper, grease or other material.
- A back-up in the system caused by a combination of stormwater, sanitary and rainwater from inflow and infiltration.
- Failure of a sump pump used to pump weeping tile water away from the home.