



Update on **Lisgar District Basement Water Infiltration Investigation**

April 16, 2013

Council Chamber, Mississauga Civic Centre

Agenda

1. Presentation

- i. History and Background
- ii. Study Findings To-date
- iii. Potential Causes/Factors
- iv. Work Completed To-date by City
- v. Recommendations
- vi. Answers to Questions Received by Ward 10 Office
(Technical Work)
- vii. Status of Claims
- viii. Answers to Questions Received by Ward 10 Office (Claims)
- ix. Next Steps

2. Q & A

HISTORY AND BACKGROUND



LEGEND

Orange	1986 - 1994
Green	1995 - 1999
Blue	2000 - 2004
Pink	2005 - 2011



0 100 200 400

Historic Development of Lisgar Area

i. History and Background

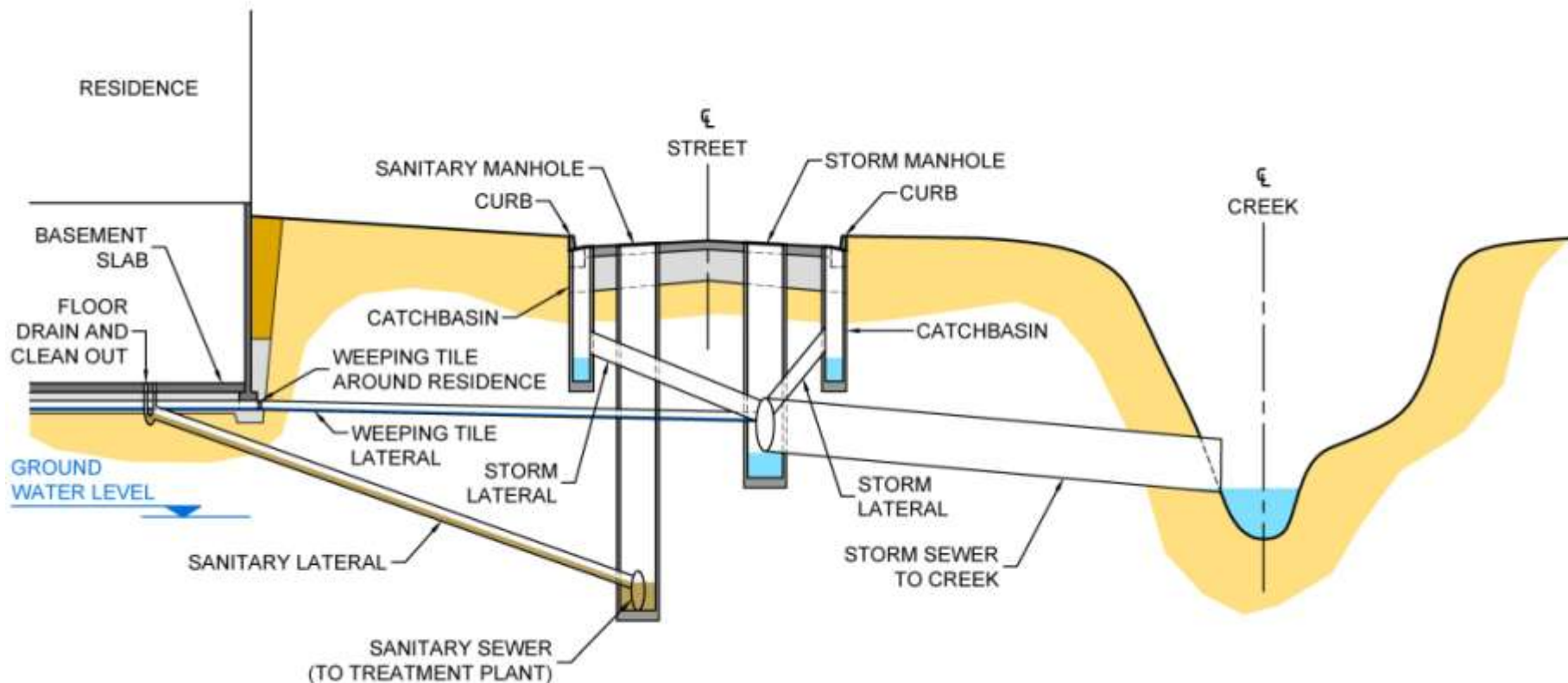
Typical Foundation Drainage Systems for Residential Subdivisions with Basements:

- Gravity Drainage to Storm Sewer
- Sump Pump to Front/Rear Yards or Storm Sewer
- 3-Pipe System – Foundation Drain Collector (FDC)

i. History and Background

Typical Foundation Drainage Systems

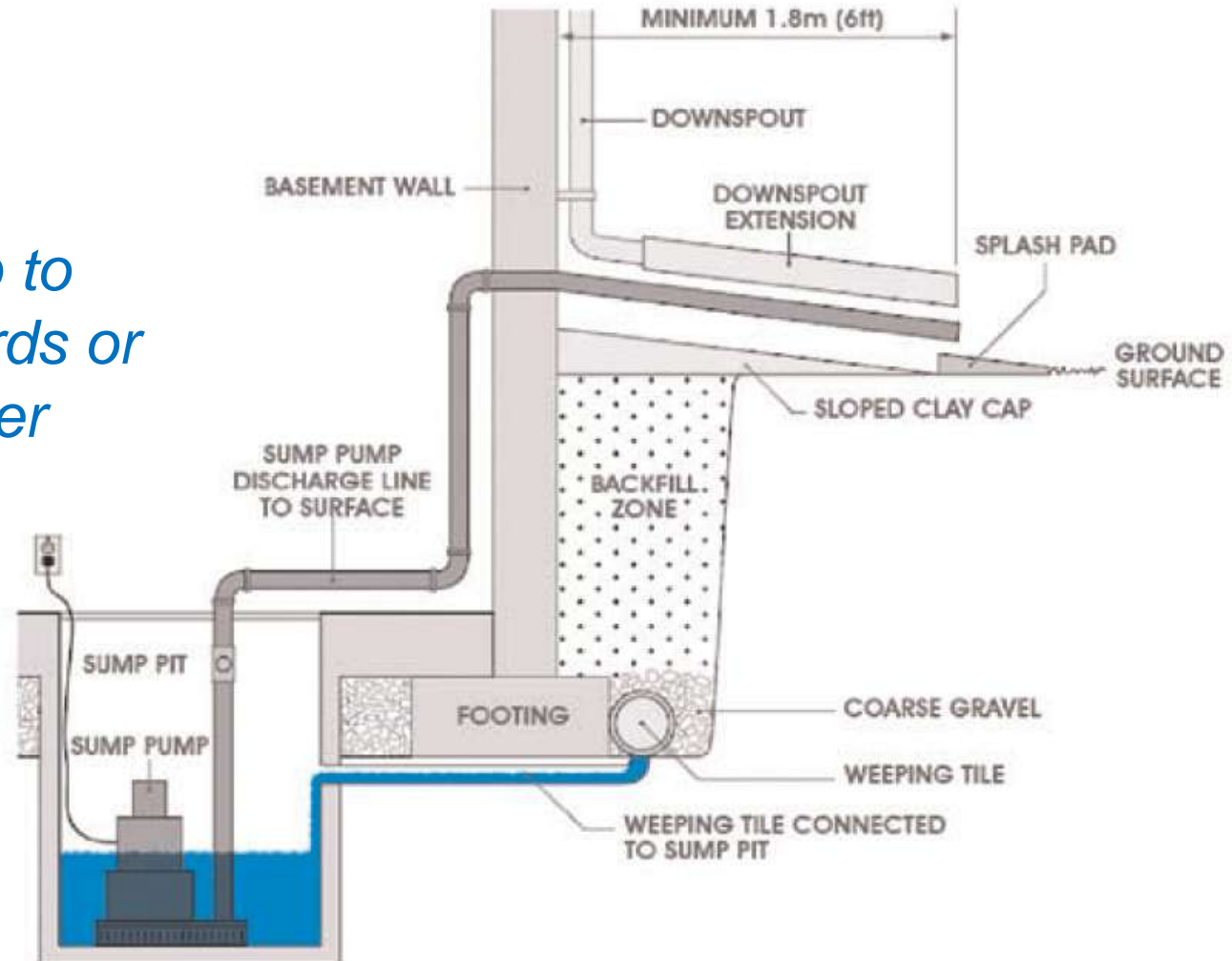
Gravity Drainage to Storm Sewer



i. History and Background

Typical Foundation Drainage Systems

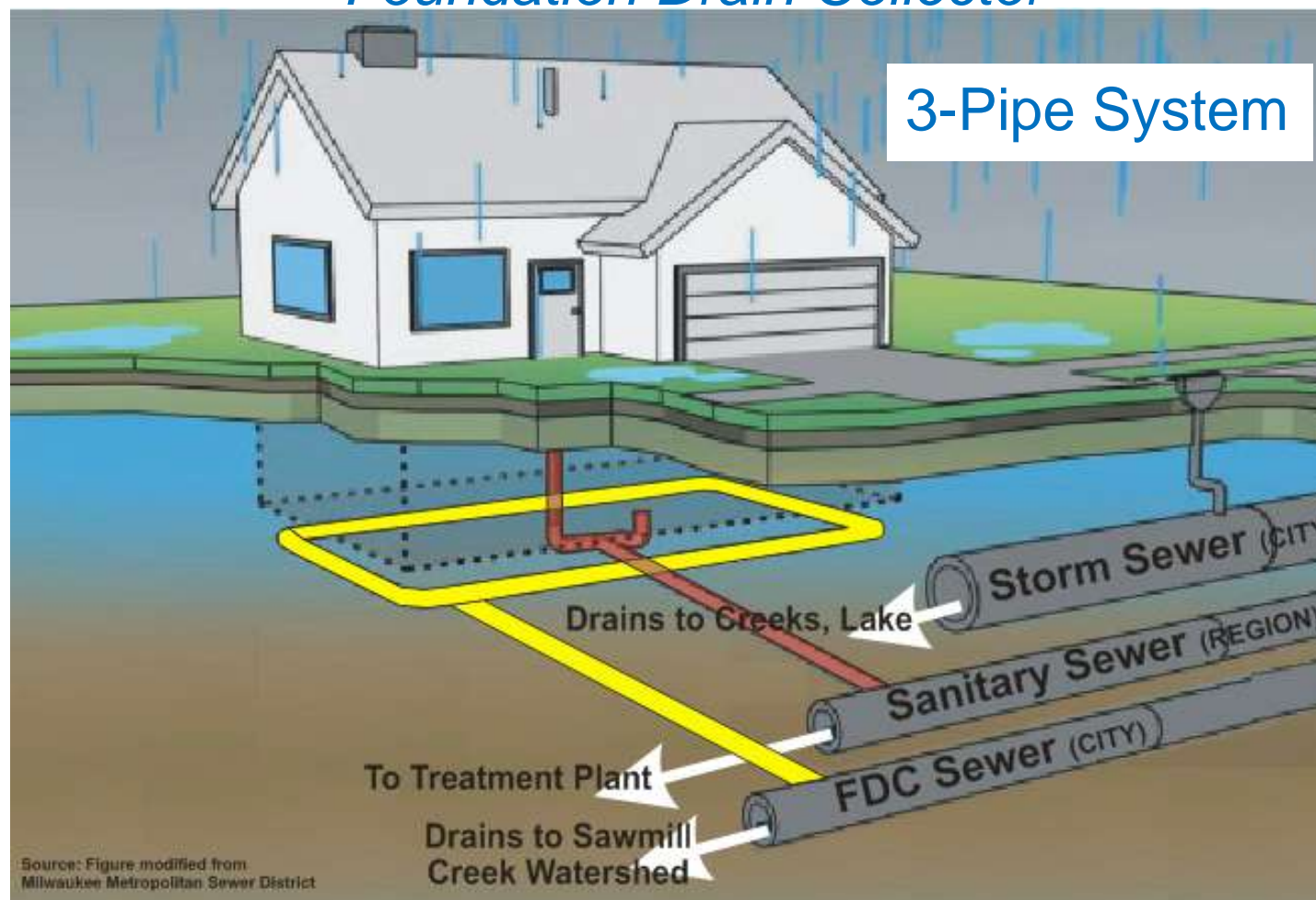
*Sump Pump to
Front/Rear Yards or
Storm Sewer*



i. History and Background

Typical Foundation Drainage Systems

Foundation Drain Collector



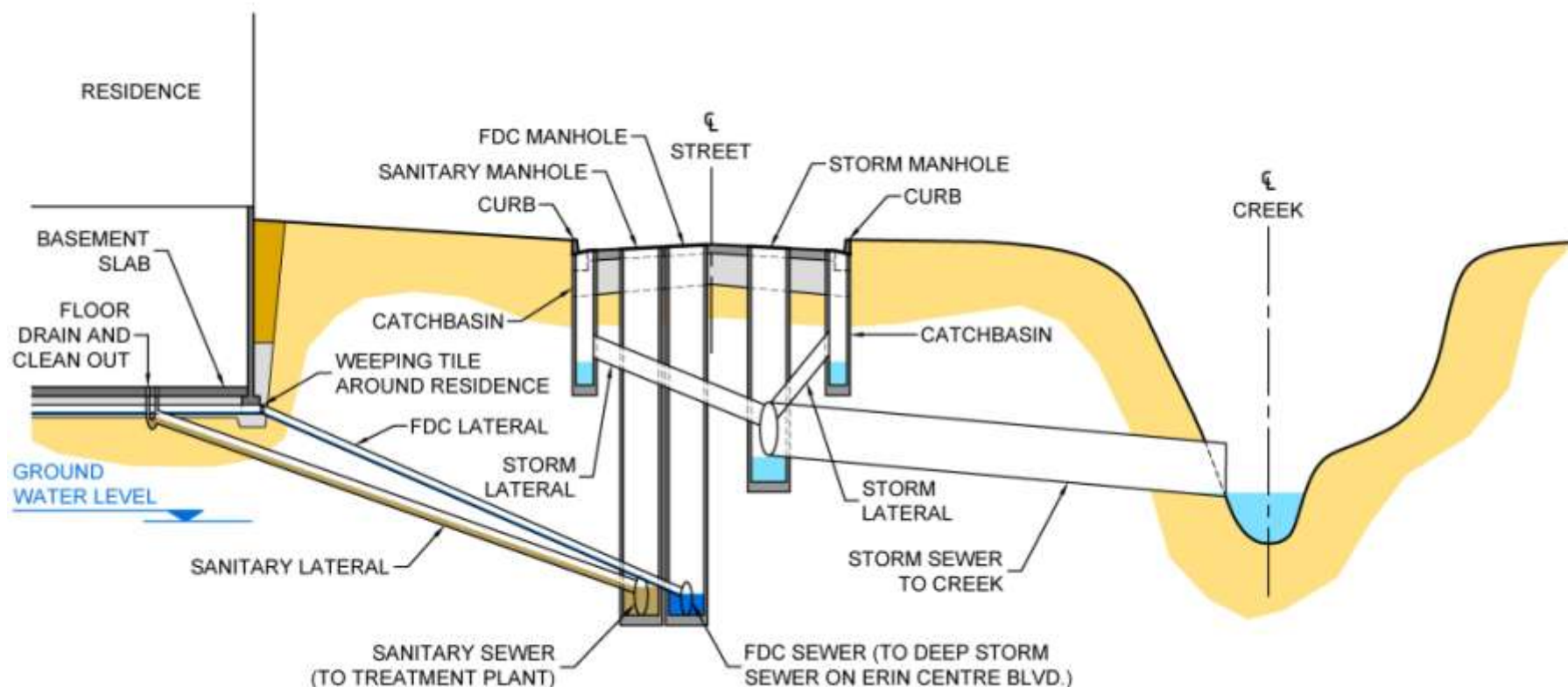
i. History and Background

Why was the 3 Pipe System used in Lisgar?

- Gravity drainage to the Sixteen Mile Creek Tributary not possible since creek is too shallow
- Alternatively, millions of cubic meters of material would have needed to be brought into area to elevate the land on average 1.5 m +/-
- Sump pumps must always be maintained in good operating condition and also require a continuous supply of electricity
- 3-Pipe system has been used in municipalities across Ontario and elsewhere

i. History and Background

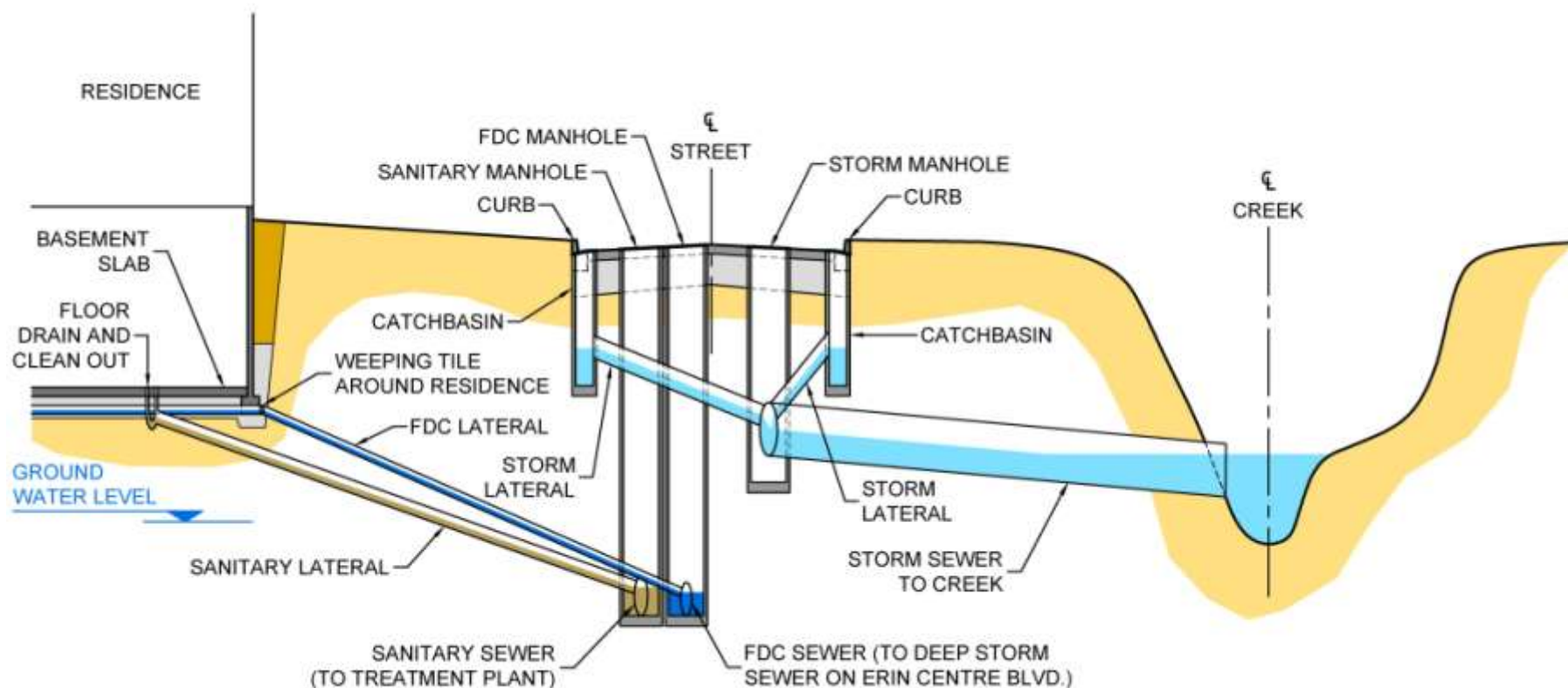
3 Pipe System – *Dry Weather Conditions*



Typical system operation

i. History and Background

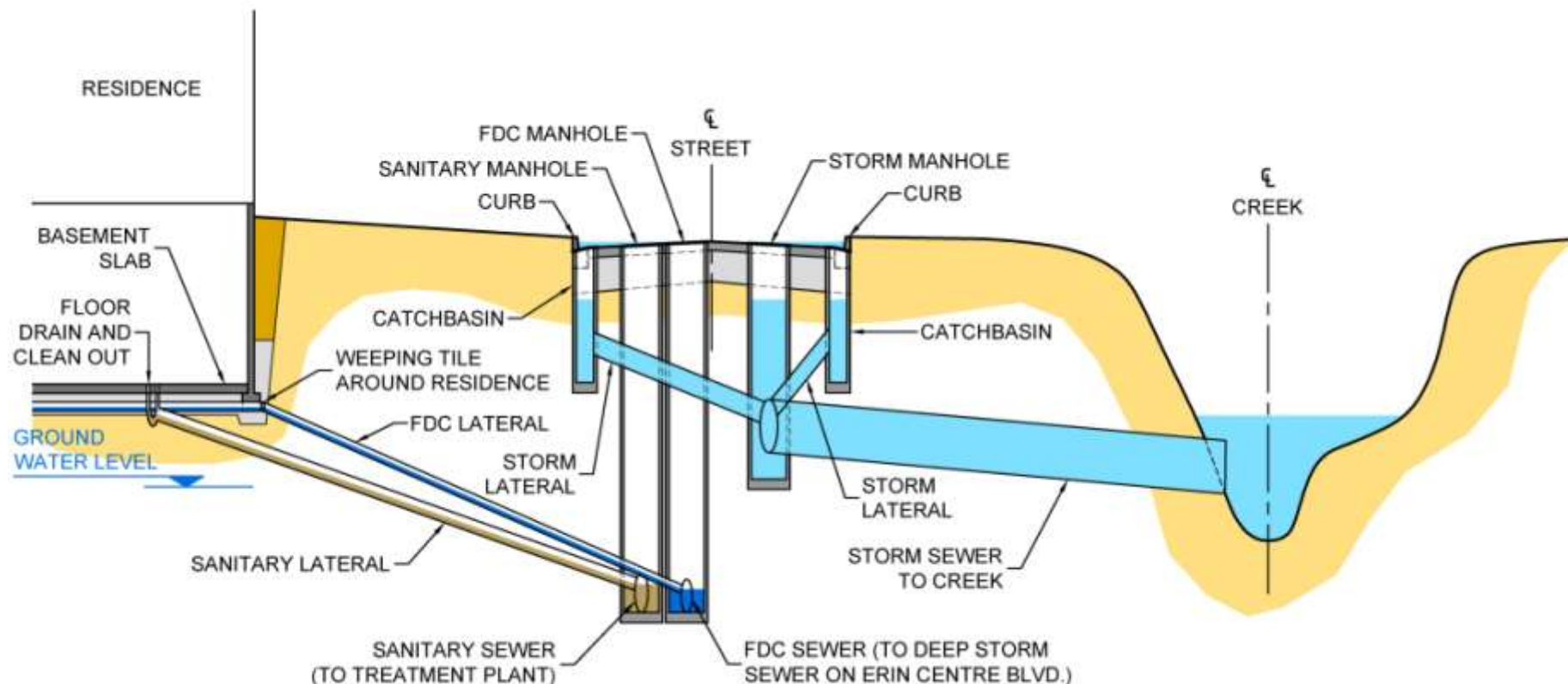
3 Pipe System – “Normal” Storm Event



Typical system operation

i. History and Background

3 Pipe System – *Significant Storm Event*



Typical system operation

i. History and Background

What has Changed?

- Key question is what has changed in the past few years?
- Based on a scan of potential changes the following has been considered:
 - Climate
 - Development
 - Condition of basement foundations
 - Groundwater levels
 - Area infrastructure changes
 - Changes to homes (walkouts; drainage connections)
 - Condition of infrastructure

STUDY FINDINGS TO-DATE

ii. Study Findings To-date

Scope of Engineering Study by Consultant (AMEC)

- Study focused on developing an understanding of the operation of the four (4) separate systems
 1. Roadway Storm Sewer
 2. Overland flow routes
 3. Sixteen Mile Creek Tributary and Osprey Marsh Pond
 4. Foundation Drain Collector (FDC)
- Determine the interaction between the four systems and the potential causes of water infiltration into the basements

ii. Study Findings To-date

Scope of Engineering Study by Consultant (AMEC) (cont'd)

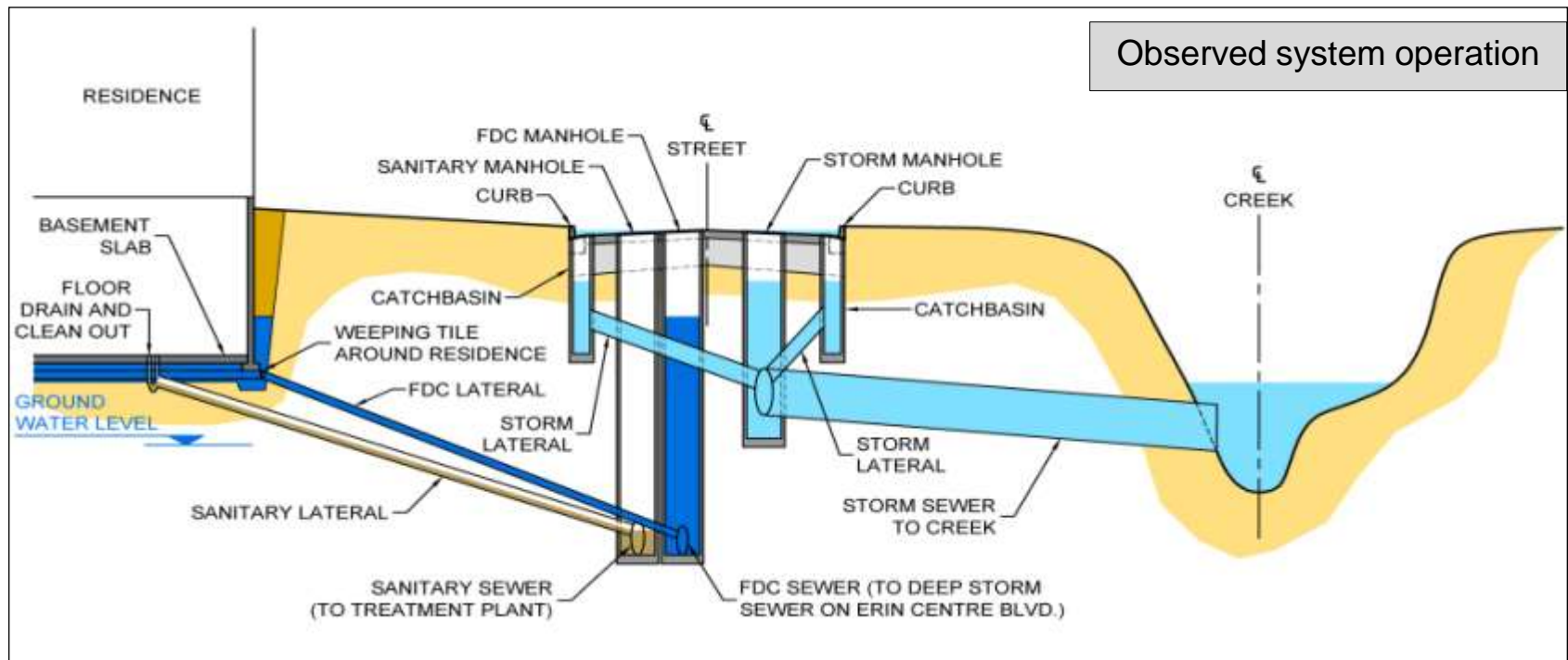
Field Work:

- a) Rainfall
- b) Streamflows in Sixteen Mile Creek
- c) Storm Sewer Water Levels
- d) FDC Water Levels
- e) Groundwater Levels, Temperature and Characteristics

ii. Study Findings To-date

General Overview

- Key finding to date is that water levels have been observed to rise and fall quickly in the FDC system during select storm events, leading to the theory that this could result in an increased amount and duration of water around residential basements



ii. Study Findings To-date

General Overview

- Based on study work to-date, we have been able to:
 - *Eliminate a number of potential causes*
 - *Refine and direct the focus of continuing investigation/study on remaining potential causes*

ii. Study Findings To-date

Weather Conditions during Monitoring (2012)

- The 2012 monitoring year was particularly dry
- Despite best efforts to collect data on system performance during high flow periods, the “right” combination of rainfall and ground saturation did not occur
- In early January (January 11 to 13, 2013), an unusually warm period (melt) combined with long duration rainfall, caused water to infiltrate into home basements primarily on Osprey Boulevard and one home on Alderwood Trail (7 homes total)
- The usefulness of monitoring data is highly dependent on the weather

ii. Study Findings To-date

Relationship: Rainfall ↔ Basement Water Infiltration

- Development occurred largely between 1986 and 2004, with some infill development occurring after this date
- However, water infiltration into basements was not widely reported until 2008 (22 year span in some areas)
- Storm intensity, duration, and soil moisture conditions all play a contributing role
- Rainfall amounts can vary over the Lisgar area depending on the storm
- Large storms do not necessarily correspond to basement water infiltration (Example – No reported basement water infiltration during Hurricane Sandy, Fall 2012)

ii. Study Findings To-date

What has changed?

- Climate Change
- GO Station Development
- Sanitary System Surcharge
- Cross Connections
- Sixteen Mile Creek Water Levels
- City Initiated Improvements

ii. Study Findings To-date

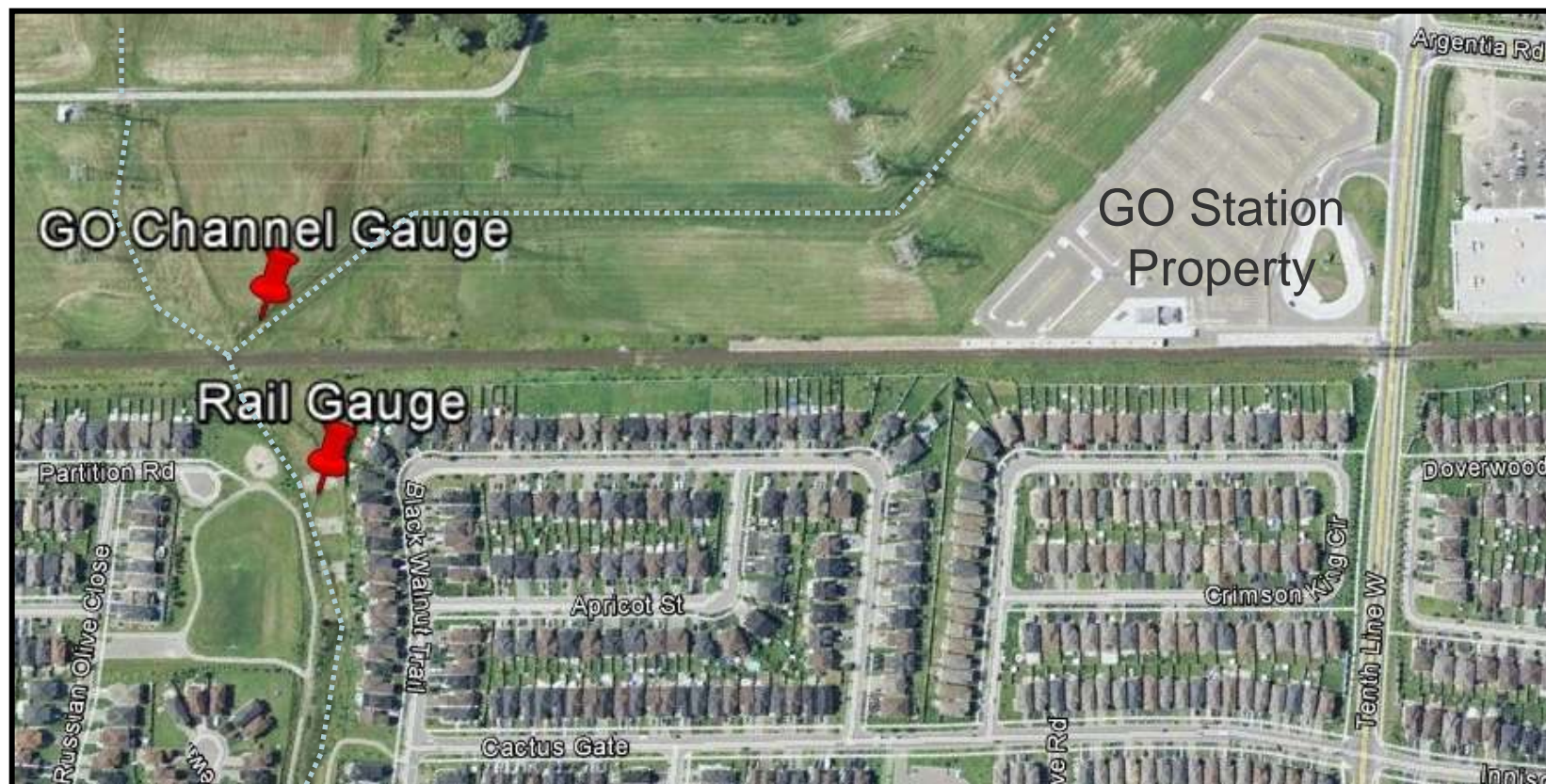
Climate Change

- Not a factor as storms causing basement water infiltration have been moderate in size (i.e. not the largest that caused the problems)
- Comparable storms occurred previously with no issues

ii. Study Findings To-date

GO Station Development

- Monitoring data indicates that this development is not a contributor to area problems



ii. Study Findings To-date

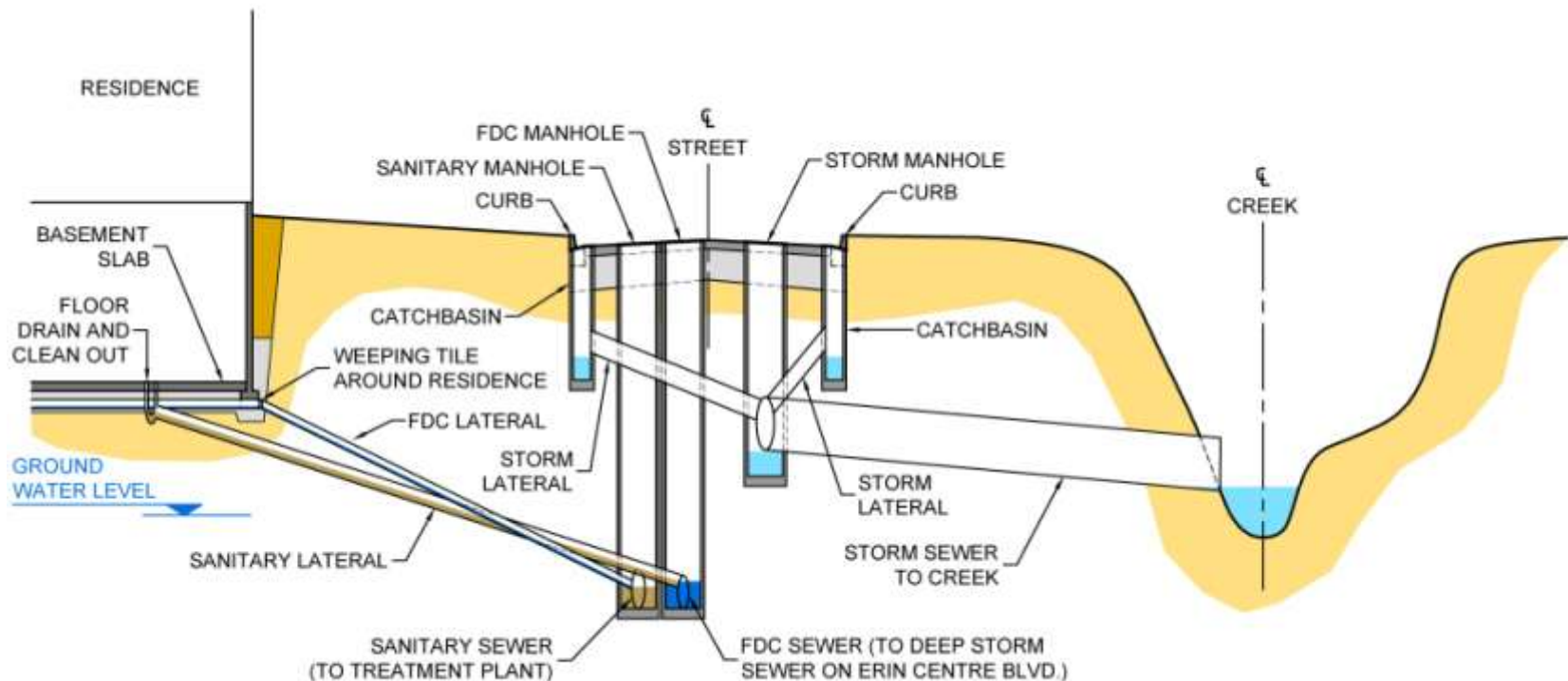
Sanitary System Surcharge

- Surcharge (backflow) from sanitary system is not a direct contributor to basement water infiltration
- The Region of Peel will install monitoring devices within the sanitary sewer system to observe responses to rainfall

ii. Study Findings To-date

Cross Connections (i.e. sanitary system connected to storm or FDC)

- While some cross connections have been found from the smoke & dye tests the number is too few to cause the wide spread problems
- Corrective actions are being undertaken at these locations



ii. Study Findings To-date

Sixteen Mile Creek Water Levels

- The creek cannot be the direct source of basement water infiltration as soils in the area (clay till) move water slowly and the response in the FDC system has been observed to be quick (30 minutes to 3 hours +/-)
- Further investigative work will be necessary to determine if an indirect relationship exists between the creek water levels and water infiltrating into basements

ii. Study Findings To-date

City Work during Investigation Period

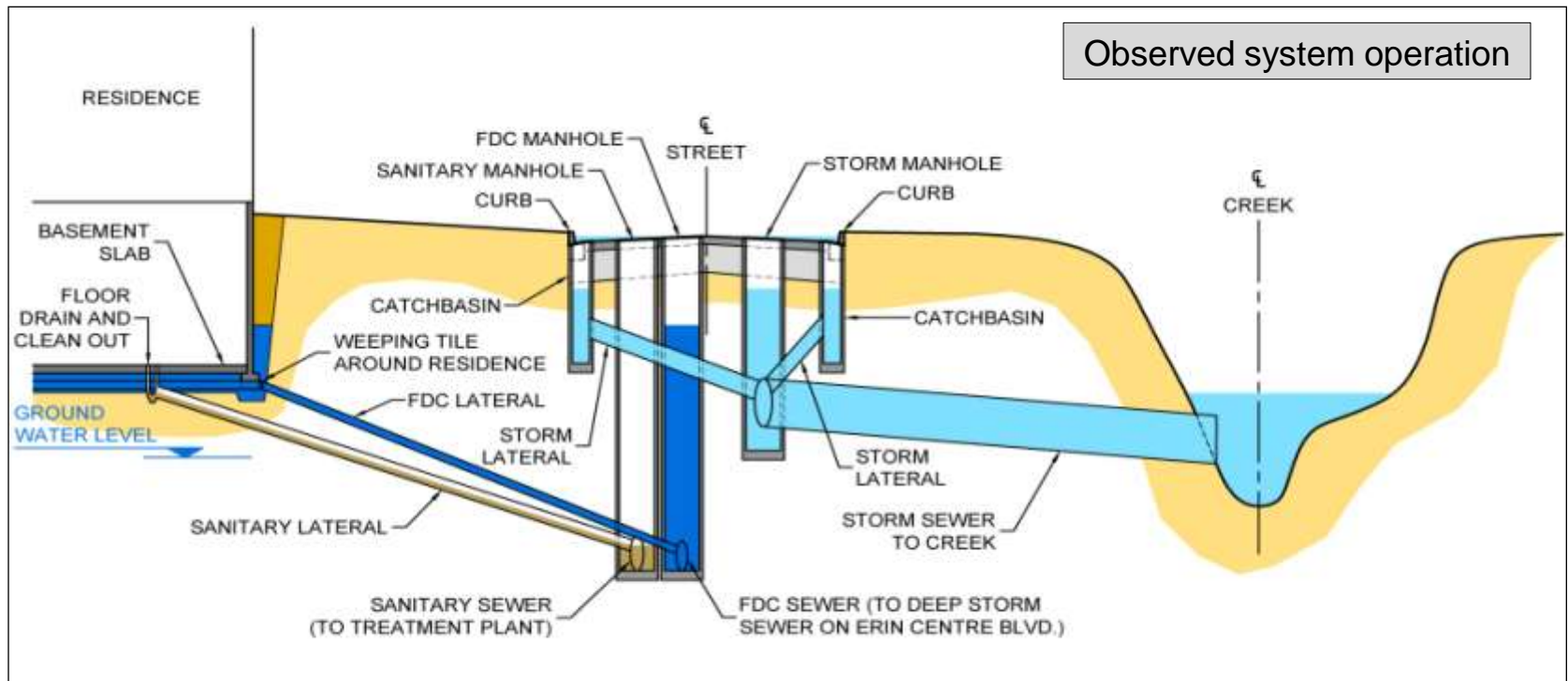
- *Osprey Pond improvements*
- *Cleaning out/flushing of FDC system*
- *Sealing of FDC manhole lids and cracks*
- *Sediment removal from channel*

Potential Causes/Factors

iii. Potential Causes/Factors

Are High Water Levels Connected?

- Do high water levels in Osprey Pond and Sixteen Mile Creek contribute to basement water infiltration?
- If so – how? Since foundation drainage collector system should be isolated from storm system (i.e. separate FDC is deeper than storm)



iii. Potential Causes/Factors

Change to Infrastructure Condition Over Time

- Stormwater related infrastructure has a service life and ages over time
- While Lisgar infrastructure is comparatively young, at less than 25 years, leakage can occur in the storm sewer system due to:
 - cracks in manholes
 - displaced/settled sewers
 - seals and sewer joints breaking down
- If this is occurring, how does the water get into the FDC?

iii. Potential Causes/Factors

Capacity of FDC System?

- Is there a need for additional capacity in the FDC system?
Do the high water levels relate to capacity restrictions?

iii. Potential Causes/Factors

Private Property as a Source?

- Can one of the sources of basement water infiltration be related to private property?

Potential Sources:

- Aging basement foundations (cracking)
 - Changes to building (basement walkouts/pipe connections)
 - Changes to lot grading (flat/reverse sloped towards home)
- Changes may impact neighbouring homes located downstream

iii. Potential Causes/Factors

Private Property as a Source?

Aging Basement Foundations (Cracking)



iii. Potential Causes/Factors

Private Property as a Source?

Changes to Building (Walkouts/Pipe Connections)



iii. Potential Causes/Factors

Private Property as a Source?

Changes to Lot Grading (Flat or Reverse Sloped Towards Home)



iii. Potential Causes/Factors

Summary

Potential Cause / Factor	Influence		
	Low / NA	Contributing	Primary
Groundwater	X		
GO Station	X		
Sanitary System	X		
Cross-Connections	X		
Creek Backwater	<i>Further Assessment Required</i>		
SWM Backwater			
FDC Leakage			
FDC Hydraulics			
FDC Tailwater			
FDC Depths			
Lot Grading			
Basement Construction\Changes			
Stormwater to Utility Trench			

SUMMARY OF WORK COMPLETED TO-DATE BY CITY

iv. Work Completed To-date by City



Maintenance Works Completed on Several Systems:

- FDC and Storm Sewers
- Sixteen Mile Creek
- Osprey Marsh Stormwater Management Pond

iv. Work Completed To-date by City



FDC and Storm Sewers:

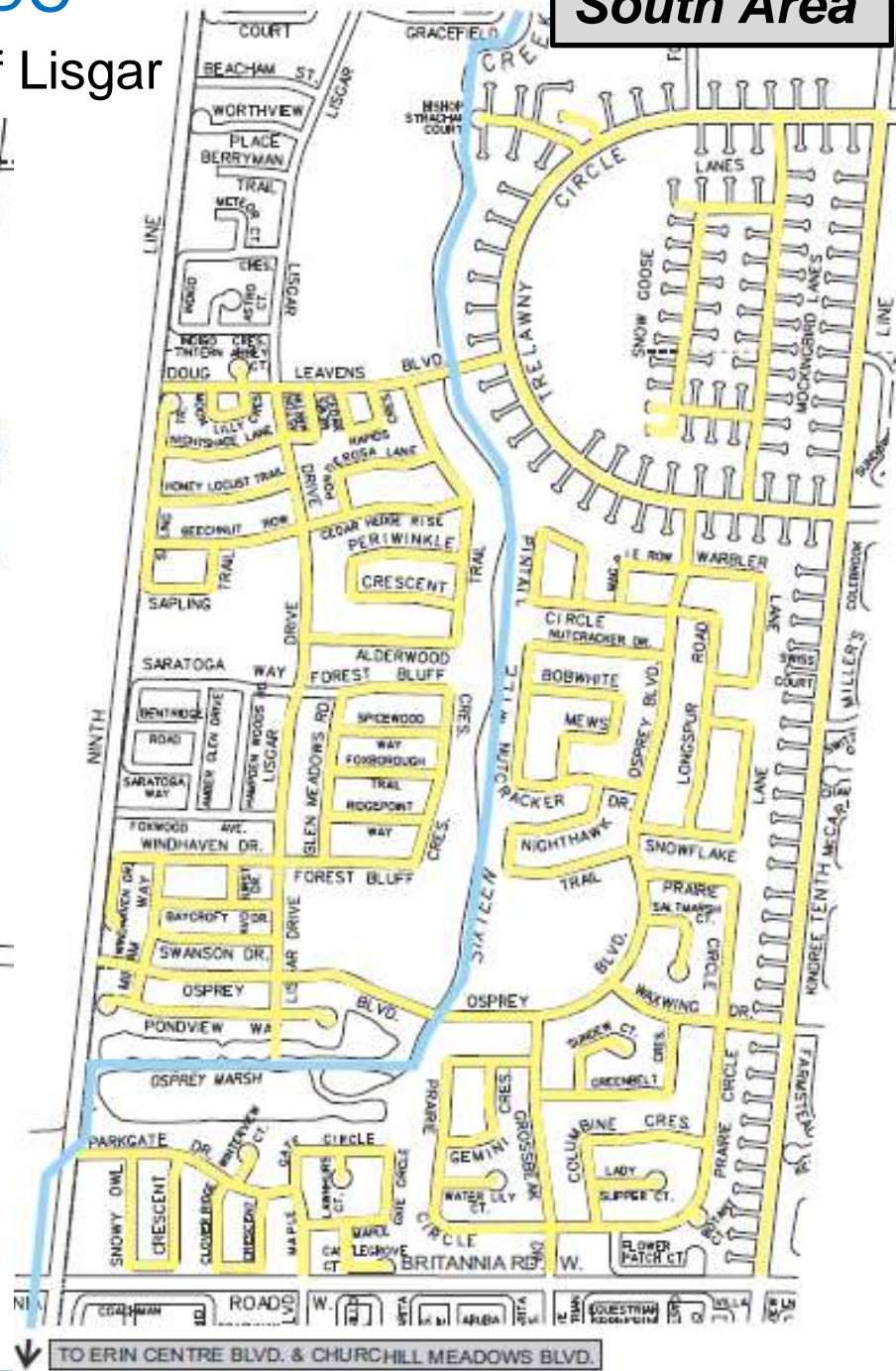
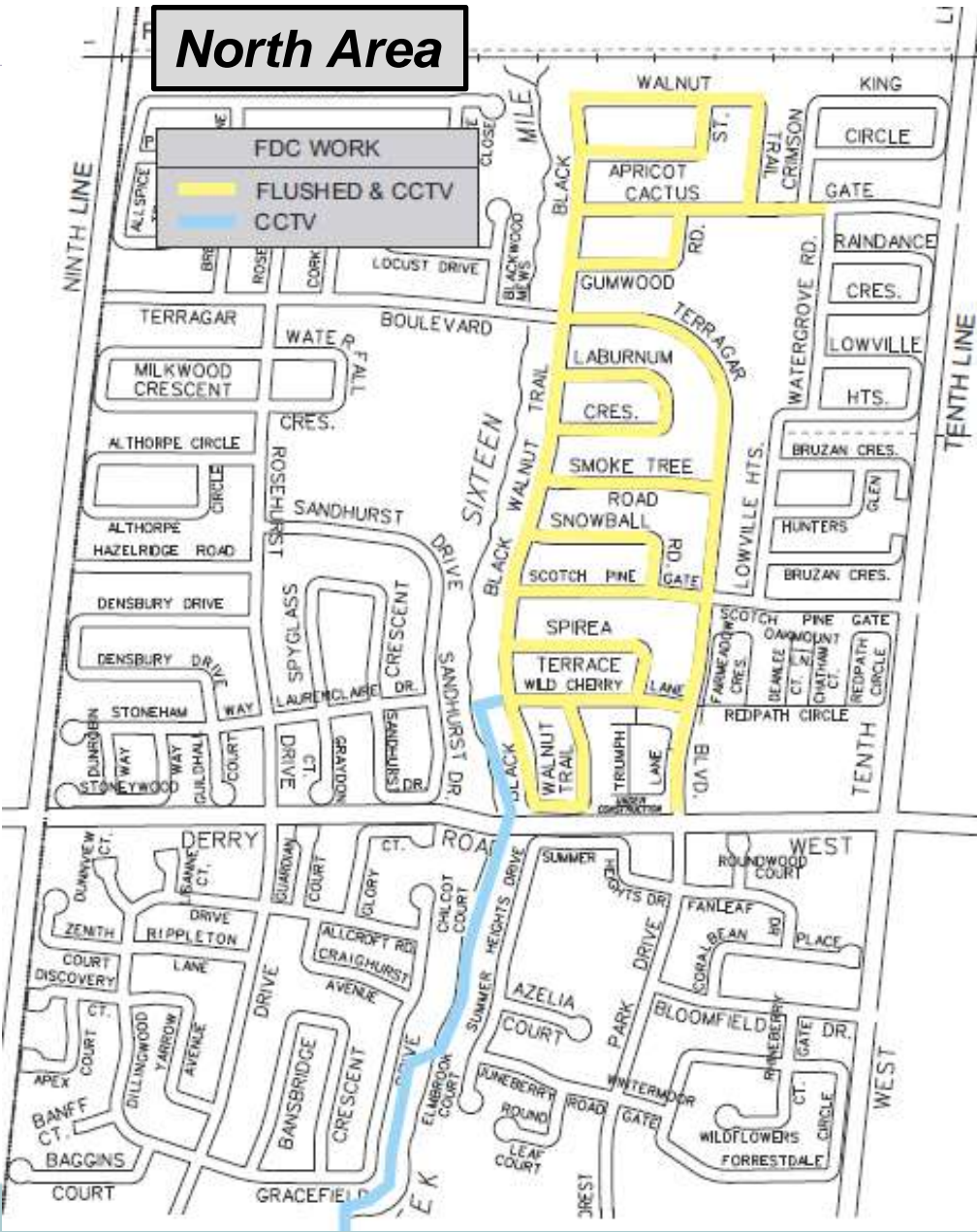
- CCTV (video) inspection of FDC pipes
- Flushing the FDC pipes
- Identifying sanitary-FDC sewer cross connections via smoke and dye testing of FDC system
- Sealing FDC manhole lids and cracks
- Improving overland flow routes
- High Water Protocol

CCTV Inspection & Flushing of FDC

- 100% of affected areas; Over 50% of Lisgar

South Area

North Area



TO ERIN CENTRE BLVD. & CHURCHILL MEADOWS BLVD.

iv. Work Completed To-date by City



Sixteen Mile Creek:

- Vegetation trimming
- Storm outlet channel sediment removal
- Bridges and crossings sediment removal
- Debris/obstruction removals
- Inspection Protocol

iv. Work Completed To-date by City



Osprey Marsh SWM Pond:

- Reconfiguration of the outlet to reduce drain down time
- Inspection and maintenance of FDC manholes
- Maintenance at pond outlet to improve flow

iv. Work Completed To-date by City



Osprey Marsh SWM Pond



RECOMMENDATIONS

v. Recommendations

There are three primary types of actions under consideration:

Physical Improvements

- To address identified areas of concern or potential causes/factors

Further Analysis and Testing

- To answer remaining questions regarding the system to confirm theories on causes

Sump Pump Subsidy

- Consideration for assistance to homeowners to install sump pumps

v. Recommendations

No Further Physical Improvements Recommended At This Time

- Lack of useable data due to 2012 drought
- Need to collect additional information to:
 - i. Validate causes of basement water infiltration
 - ii. Define limits of impacts
 - iii. Develop management strategy
- Similar data shortage may continue in 2013

v. Recommendations

Next Phase of Investigation

FDC System

- Leave FDC monitors in-place
- Install additional FDC level monitors at downstream part of system to assess influence of outlet water levels

Creek/SWM System

- Monitor water levels in Osprey Stormwater Management Facility and Sixteen Mile Creek

v. Recommendations

Next Phase of Investigation (cont'd)

Storm Sewer System

- Additional 'groundwater' monitors
 - *Bedding of FDC/Sanitary sewer laterals*
- Conduct storm sewer leakage tests at strategic locations
- Complete video inspections and Smoke/Dye testing

Private Systems

- Investigate basement walkout drainage systems and lot grading

Sanitary Sewer System

- Region of Peel will install monitoring devices in sanitary sewers

v. Recommendations

Timing/Scheduling of Next Phase of Investigation

- Additional monitoring gauges have been installed with more to come
- Duration uncertain as some work activities are dependent on rainfall
- Estimated duration until Fall 2013 if ideal monitoring conditions occur
- As the results of further investigation become known, further physical works will be considered by the City

v. Recommendations

Preventative measures that homeowners should consider:

Basements/Lots (*Homeowner*)

- Seal cracks and waterproof
- Improve lot grading
- Install sump pumps

v. Recommendations

Preventative measures homeowners should consider:

Seal Cracks and Waterproof



v. Recommendations

Preventative measures homeowners should consider:

Improve Lot Grading



v. Recommendations

Preventative measures homeowners should consider:

Install Sump Pumps



v. Recommendations

Sump Pump Subsidy

- City staff will be recommending a Sump Pump Subsidy Program to assist homeowners who have reported basement water infiltration
 - The program would consist of a subsidy with a maximum allowable amount (cost-shared between City and homeowner) subject to a drainage inspection
 - Subject to Council approval

ANSWERS TO QUESTIONS RECEIVED BY WARD 10 OFFICE (TECHNICAL WORK)

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: There has been a tremendous amount of work done everywhere along the creek. If there was nothing wrong with the system, then why was all this work done?

A:

- Recent work undertaken as a proactive measure
- No evidence to-date to indicate that the creek is the primary or direct cause of basement water infiltration

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: As we know vegetation helps soak up excess water as well as to prevent soil runoff after rainfall. However, with all the tree clearing and bulldozing of the reeds in and around Doug Leavens Blvd., what will be done to restore the cleared vegetation and older growth trees that were removed in order to prevent the creek from filling back up with soil and silt?

A:

- Vegetation management needs to be balanced between encouraging natural growth and ensuring channel flow capacity
- Primary purpose of work at Doug Leavens Blvd. was to improve flow capacity through the channel corridor
- When work is completed and weather/creek conditions allow disturbed areas will be re-established

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: Some measures have been implemented (dredging the creek liners, removing vegetation, etc.) - if these measures are necessary to prevent stormwater surges and flooding, what is the plan for maintaining these measures, or other measures designed to prevent flooding?

A:

- The purpose of the creek work was to improve flow capacity by removing accumulated sediment and vegetation at specific locations
- This creek work is not necessarily “*preventing stormwater surges and flooding*” as there has been no evidence to-date which indicates that the creek is the primary or direct cause of basement water infiltration
- Creek condition will continue to be monitored and re-evaluated to ensure the performance of the creek work is maintained

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: I disagree with removing trees and consider this a window dressing solution. Notably many willows and poplars were removed, which are both water-loving species and should help manage stormwater, not negatively impact it. Please explain the rationale for this action.

A:

- Small number of trees removed where infrastructure was at-risk (i.e. pedestrian pathways, bridge footings, etc.) or where access was required to perform the creek work

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: What is the impact of the 9th Line Lands that are often flooded and is the City monitoring the water levels in this land to optimize their floodplain capacity?

A:

- Water levels within both the Osprey Marsh SWM facility and the receiving watercourse downstream (tributary to the Sixteen Mile Creek main branch) will be monitored to determine if there is any effect upon the performance of the overall storm drainage system

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: What is the original footprint of the 16 Mile Creek transposed over the present residential footprint of Lisgar?

Q: Has the 16 Mile Creek path/route been changed in any way over the years within Lisgar and outside of Lisgar?

A:

- The Sixteen Mile Creek tributary does not follow its original historic alignment
- Assessment to date shows no correlation between the former path of the creek and its tributaries and the homes experiencing basement water infiltration

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: AMEC did a detailed study for the Town of Milton regarding the 16 Mile Creek. Where can this information be accessed?

A:

- Inquiries about AMEC studies relating to Sixteen Mile Creek which were commissioned by the Town of Milton should be directed to the Town of Milton

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: How many "significant rainfalls" have occurred in the Lisgar area since the October 2011 flood of almost 200 homes?

A:

- The October 19-20, 2011 storm event had a total 2-day rainfall of 51 mm (1-day average of 25 mm)
- Six storms since that event have had a 1-day total greater than 25 mm, two of which resulted in reported basement water infiltration (November 29, 2011, and January 13, 2013)

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: What has changed in Lisgar since 2009 to cause the flooding problems?

A:

- The primary source(s) of basement water infiltration have not yet been determined
- City is continuing its efforts to identify potential source(s) through further analysis and testing
- The presentation offers insight into possible changes affecting system performance in Lisgar

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: What connects the streets that have been flooded? Is it the FDC locations? Engineering of the roads? Pathways or the flow of water from the west?

A:

- The connectivity of the different systems as related to surface flooding and/or basement water infiltration continues to be investigated
- Different locations within the Lisgar district have experienced surface flooding and/or basement water infiltration from different storm events

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: What is the current capacity of the system?

Q: What is the capacity of the 3 water/sewer systems that are unique to Lisgar and what was the capacity designed to withstand?

A:

- The FDC sewer system was designed with the typical standard of 0.075 litres/second/unit
- Storm sewers were designed to a 2-year storm event standard. The overland drainage system (in combination with the storm sewer system) was designed to a 100-year storm event standard
- Sanitary sewers were designed based on 302.8 litres/day/person, 0.2 litres/second/hectare for inflow/infiltration plus a peaking factor
- The 3-pipe system is not unique to the Lisgar Area

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: Why was Lisgar developed with the 3 water/sewer systems?

A:

- Gravity drainage (of foundations) to the Sixteen Mile Creek tributary is not possible since the creek is too shallow
- Alternatively sump pumps must always be maintained in good operating condition and also require a continuous supply of electricity
- Alternatively millions of cubic metres of material would need to be brought into area to elevate the land on average 1.5 m +/-, which is not practical

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: If there is no easy/quick resolution to the flooding problems in the area, could the City at least provide a guide to waterproofing your basement (eg, laying down tiles, rubberizing the perimeter or other technical options)? It would help residents to deal with future flooding if it occurs.

A:

- Suggestions for homeowners: sealing cracks, waterproofing, installation of sump pumps and improving lot grading
- Further details on basement flood prevention can be found at the website for the Institute for Catastrophic Loss Reduction (<http://www.basementfloodreduction.com/>) and through private drainage contractors

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: Will there be ongoing (eg forever) maintenance of the creek?

A:

- Monitoring and maintenance of creeks is undertaken by the City on all of its watercourses
- Lisgar creek will continue to be monitored and re-evaluated on an on-going basis
- Regular maintenance within the creek corridor (i.e. wood/urban debris removal, trimming fallen branches, removing obstructions, etc.) will be performed where necessary

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: On a personal note, I back onto the bridge at Doug Leavens and Alderwood. Dredging activities took place a few weeks ago. A small hill of mud was deposited directly behind my property creating a barrier for water run-off from my property.... when will this be removed? I support the dredging but don't want new issues created.

A:

- The excess material has been removed off-site

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: What has been done to ensure stormwater is managed effectively going forward?

A:

- City is continuing efforts to determine the source(s) of water infiltration into basements, and will take the necessary measures to address the issue once this has been determined
- City will continue to monitor water levels in the FDC system, Sixteen Mile Creek system, and Osprey Stormwater Management Facility

Cont'd...

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Cont'd...

- Additional future work:
 - groundwater monitors in the FDC/sanitary sewer lateral bedding
 - storm sewer dye and leakage tests at strategic locations
 - completing CCTV and smoke/dye testing of FDC
- Once the results of the next phase of investigation are known, further physical works will be investigated by the City

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: Now that the Lisgar area has had multiple, widespread flooding incidents, what will be the City response to any flooding, particularly in the Lisgar area?

A:

- City has established a High Water Protocol which includes a Flood Response Team that is placed on stand-by following a High Water Bulletin announcement from the Conservation Authority
- Main objective is to monitor water levels within the Foundation Drain Collector system at key locations and pump if required
- Flood Response Team will also inspect outlets, bridges and catch basins to ensure they are operating properly

vi. Answers to Questions Received by Ward 10 Office (Technical Work)



Q: How many homes participated in the backwater valve program? Were any of the participating homes affected by stormwater after installation?

A:

- Seven backwater valve subsidies were granted by the Region of Peel to homes in the Lisgar/Black Walnut area
- No basement water infiltration issues were reported from the floor drain (which is attached to the sanitary sewer) after backwater valves were installed on the sanitary lateral under the backwater valve subsidy program

STATUS OF CLAIMS

vii. Status of Claims

Until the actual sources of infiltration are found:

- We will continue in our efforts to address potential causes
- Consider additional steps recommended by the Consultant as our investigation continues
- Consideration for assistance to homeowners to install sump pumps

vii. Status of Claims

When the actual sources are found\confirmed:

- The City will implement an action plan based on recommended improvements to address the situation

vii. Status of Claims

Damage Claims Filed with the City

- The City is aware of approximately 185 incidents in the Lisgar Area between 2008 and January 2013; this represents approximately 170 homes that were impacted on one or more occasion; or approximately 2% of all homes in the Lisgar Area
- Many have submitted a claim with the City's Risk Management Section seeking compensation for damages
- In addition, a Class Action lawsuit has been commenced seeking damages in the amount of **\$200 million** on behalf of all residents in the Lisgar Area

vii. Status of Claims

Damage Claims Filed with the City

- Like other municipalities, the City's insurance program does not allow the City to pay any compensation without **evidence of negligence** on behalf of the City
- To date, we have not received any evidence of negligence
- Unless the legal test for liability against the City is met, there is no justification for paying out any claims associated with the basement water infiltration in this area.
- If our continued efforts to find the causes uncover proof of negligence, the City will then be able to address all reported damage claims

ANSWERS TO QUESTIONS RECEIVED BY WARD 10 OFFICE (CLAIMS)

viii. Answers to Questions Received by Ward 10 Office (Claims)



Q: Will we as homeowners be given a copy of all reports from all parties involved with the investigation, recommendations and outcomes?

A:

- Due to on-going legal action against the City in relation to the water infiltration investigation, the City will not be releasing any reports regarding the basement water infiltration investigation
- The public presentation including responses to written questions received from residents will be posted to the City's web page following the public presentation

viii. Answers to Questions Received by Ward 10 Office (Claims)



Q: Obviously, everyone will be asking about our insurance claims - is the City going to address this at the meeting? It is very simple - was the City at fault or not?

A:

- The status of our open claim files was addressed in the presentation and we will continue to search for the cause or causes of the water infiltration in order to determine how best to move forward with these claims

viii. Answers to Questions Received by Ward 10 Office (Claims)



Q: As homeowners, who were affected by the floods, is it guaranteed that this will not happen again and do we need to be concerned about future selling of our homes? Are we obligated to report this/these incidents on a home listing in the City of Mississauga?

A:

- City is continuing efforts to address the issue of basement water infiltration with the intention of minimizing the likelihood of re-occurrence, however, there is no guarantee that incidents such as this will not occur again
- A real estate lawyer should be consulted concerning any potential duties to disclose prior water infiltration events to prospective buyers

viii. Answers to Questions Received by Ward 10 Office (Claims)



Q: I was asked to file a claim for damages as a result of the flood in Oct. 2011 and the response back on 04/25/12 references being patient through the consultants report due to the city.

Q: Will the City compensate homeowners affected by flooding?

A:

- City is continuing to search for the cause or causes of water infiltration into the basements in the Lisgar district
- Unless the legal test for liability against the City is met, there is no justification for paying out any claims associated with the basement water infiltration in the Lisgar district
- If our continued efforts to find the causes uncover proof of negligence, the City will then be able to address all reported damage claims

viii. Answers to Questions Received by Ward 10 Office (Claims)



Q: Will the City cover full costs for sump pumps and installation for homeowners who wish to use such preventive measures?

A:

- As previously indicated, City staff will be recommending a Sump Pump Subsidy Program

viii. Answers to Questions Received by Ward 10 Office (Claims)



Q: What is the City response to the LRA (Lisgar Resident's Association) Deputation?

A:

- Clarification regarding this question was requested through the Councillor's Ward 10 office, but was not received prior to the public meeting

NEXT STEPS

ix. Next Steps

- The City will increase monitoring efforts in the FDC system, storm sewer system, Sixteen Mile Creek, and Osprey SWM Facility
- The City will assess the influence of basement walkout drainage systems and lot grading
- The Region of Peel will install monitoring devices in sanitary sewers
- City staff will bring a Corporate Report to Council by June 2013 with a recommendation for a Sump Pump Subsidy program
- Updates will be provided as the investigation continues

Q & A

This presentation will be posted to the City's website at the following link:

[*www.mississauga.ca/portal/residents/lisgarinvestigation*](http://www.mississauga.ca/portal/residents/lisgarinvestigation)