



Rainfall Event of September 29, 2016



Topics to be Discussed

- The Rainfall Event of September 29, 2016
- Effects of Rainfall on Town Sewers and Roads
- Basement Flooding
- How and Why Basements Flood
- Actions by Town to Improve the Storm and Sanitary Sewer Systems
- Actions by Homeowners to Reduce the Risk of Basement Flooding
- Closing Statements



The Rainfall Event



The Rainfall Event

- 220 mm of rain in 24 hours between 6:00 pm September 28th and 6:00 am September 29th
- **195 mm of rain in 12 hours between 12:00 am and 12:00 pm**
- 175 mm of rain in six hours between 6:00 am and 12:00 pm
- 110 mm of rain in two hours between 8:00 am and 10:00 am



The Rainfall Event

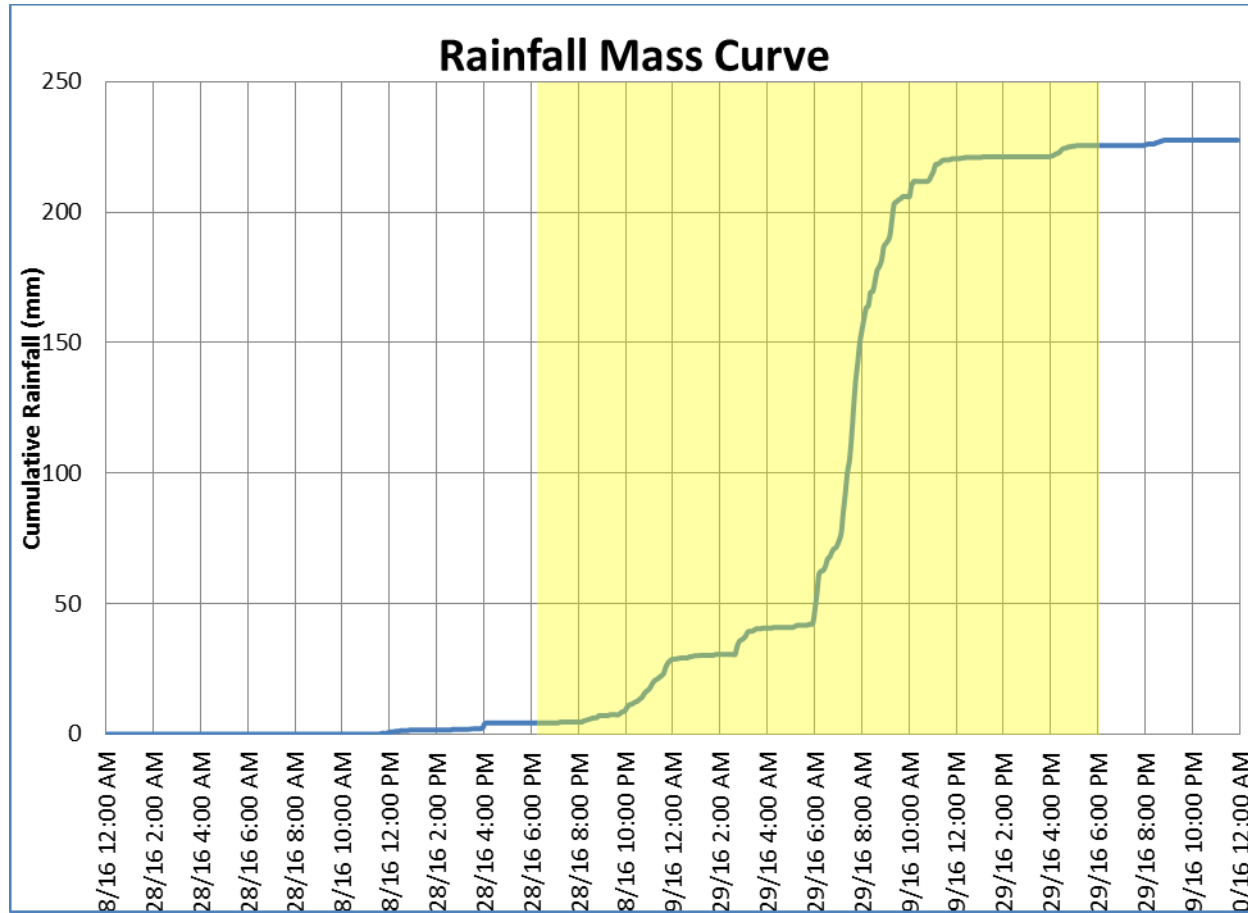
To put into perspective...

- A **1:100 year storm is 108 mm** in 24 hrs (Tecumseh received 220 mm in 24 hrs)
- For comparison, later that week Hurricane Matthew caused similar rainfall (200 mm in 24 hrs) in Daytona Beach, Florida and North Carolina.
- Resulting in massive flooding and property damage.
- These are areas prone to hurricane level rainfalls and they still flooded.



The Rainfall Event

Rainfall Accumulation

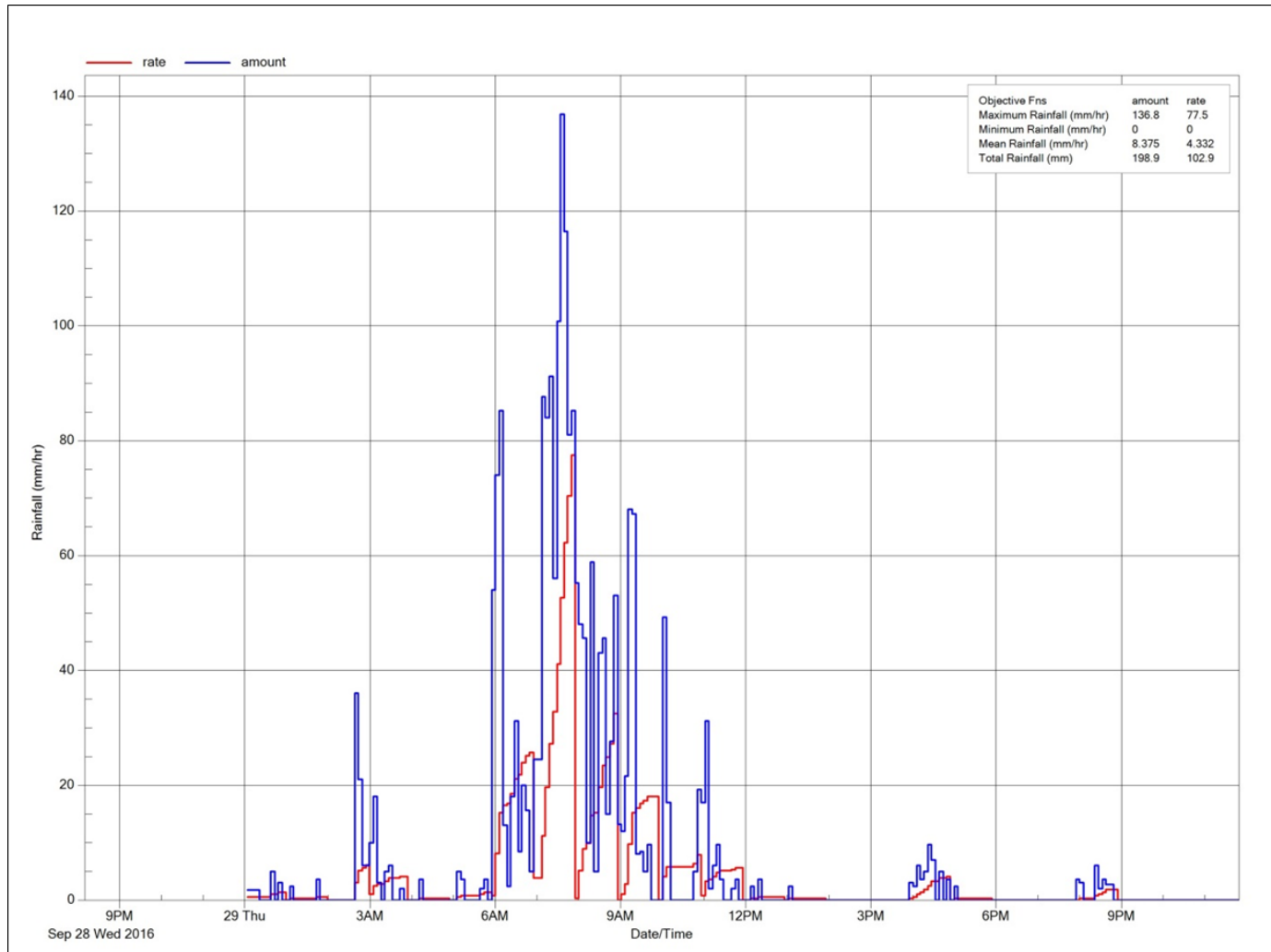


Source: Weather Underground



The Rainfall Event

Rainfall Increment & Intensity



The Effects of Rainfall on Town Sewers and Roads



The Effects on Town Sewers & Roads

- The extraordinarily intense rainfall inundated the storm sewer system because the rainfall event exceeded the design capacity of the storm sewer system
- Almost all North American cities design their storm sewer systems to a 1:2 or 1:5 yr. rainfall
- This rainfall is estimated to be in excess of 1:400 yr. storm



The Effects on Town Sewers & Roads

- Large inflow of storm water overwhelmed both the storm and sanitary sewer systems' normal operating capacities thereby causing the sewers to become **surcharged**
- Storm sewers were full and no more storm water could enter the storm sewers & street flooding resulted
- Excessive storm water entered the sanitary sewers causing them to surcharge



The Effects on Town Sewers & Roads

How does storm water get into the sanitary system?

- Infiltration into sewers on both the public right-of-way & on private properties
- Inflow through cross-connections of roof downspouts & yard drains into sanitary sewers
- Inflow through cross-connections on private properties via floor drains & foundation drains



Lesperance Road



Chene Street at Riverside Drive



Little River Blvd.



Lacasse Park



Public Works & Environmental Services



Effects of the Rainfall on Town Sewers and Roads

Operational Status of Storm & Sanitary Systems during the Rainfall Event

- All storm pump stations were on, operational and pumping at full capacity
- All sanitary pump stations were on, operational and pumping at full capacity
- No blockages in sanitary and storm sewers
- Storm sewers overwhelmed
- Sanitary sewers overwhelmed



Effects of the Rainfall on Town Sewers and Roads

Operational Status of Storm & Sanitary Systems during the Rainfall Event

- Roadways flooded in Wards 1,2 & 3
- No hydro outages reported during the rainfall
- Some transformers failed after the storm had passed



Basement Flooding



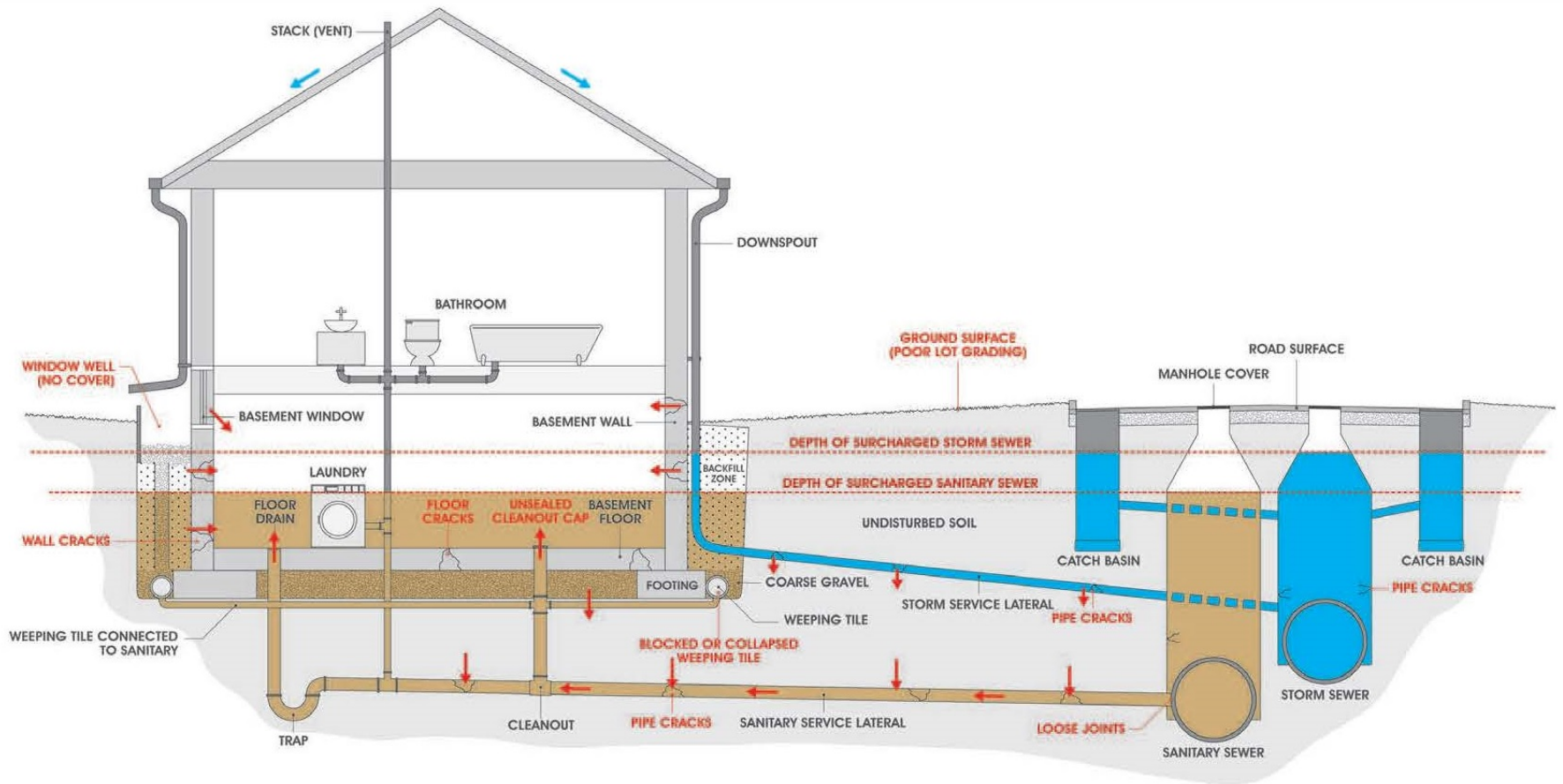
Basement Flooding

Flooded basements occurred due to:

- The combination of:
 - Surcharged sewer systems
 - Failed or overwhelmed sump pumps
 - Lack of backwater valves
 - Water entering through other openings



How Basements Flood



Actions and Improvements to the Town's Storm and Sanitary Sewer Systems



Actions & Improvements to Date

- Over \$20 million in infrastructure improvements were completed since 2010
- Numerous studies & reports were completed on the Town's sewer systems
- In 2011 Council approved a 10-year plan at a cost of \$10 million to implement four main areas of improvements to reduce the risk of basement flooding:
 - Improvements to reduce extraneous flows
 - Assessment & management of public infrastructure
 - Storm drainage improvements
 - Partnering with homeowners to manage risk



Actions & Improvements to Date

- In 2009 the Brighton Storm Water Pumping Station was reconstructed to improve the service level of the storm sewer system in the area
- In 2012 six storm water pumping stations were outfitted with back-up power generation
- In 2013 the East Townline Drain Storm Water Pump Station was reconstructed and improved the capacity from 1.9 to 7.5 cu m / sec
- In 2014 the Town constructed the Lakewood Pump Station and Storage Facility to optimize the sanitary sewer collection system in Wards 1 & 2



Actions & Improvements to Date



Brighton Pump Station



East Townline Drain Pump Station



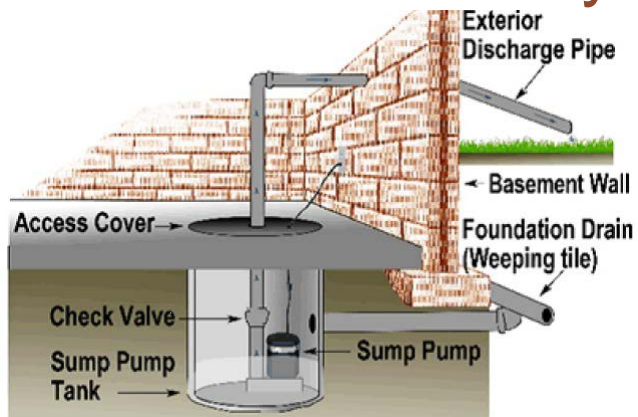
Actions & Improvements to Date

- Relocation of a portion of the East Townline Drain into Lakewood Park to improve the conveyance capacity and storage capacity of the East Townline Drain.
- Town implemented new standard for new subdivisions that all plumbing fixtures in basements must be drained via a sewage ejector pump to the sanitary building sewer.



Actions & Improvements to Date

- Flood prevention by-law making backflow valves and sump pump overflows mandatory for new home construction
- Public information has been provided on the Town's website on how to flood proof a residence.
- Subsidy program to install backwater valves & disconnect foundation drains from sanitary sewers



Proposed Future Actions & Improvements

- Update the Water & Wastewater Master Plan to determine the need, if any, for infrastructure improvements.
- Undertake a Storm Water Master Plan to review storm water system and pumping system.
- Place additional rain shields in all remaining sanitary manhole covers.
- Two applications made for financial assistance from senior levels of government to assist in reducing Inflow & Infiltration from the sanitary system.
- Construction of a second wet weather storage facility along Riverside Drive to temporarily store excess inflow during severe rainfall events.



Proposed Future Actions & Improvements

- Town will continue to offer subsidy programs for backwater valves and the disconnection of foundation drains from the sanitary sewer system.
- Partner with ERCA and surrounding municipalities to update the Intensity-Duration-Frequency curves to deal with climate change.
- Continue to make local improvements to & implement efficiencies to the storm sewer network.
- Continue to provide advice and information to residents on how to flood proof their homes.



Actions by Homeowners to Reduce the Risk of Basement Flooding



Actions by Homeowners to Reduce the Risk of Basement Flooding

- Ensure ground and pavement surfaces around residence slope away from the building
- Properly install & maintain sump pumps
- Remove cross connections between sump pump, sanitary pipes or floor drain
- Install & maintain backwater valve
- Disconnect eaves trough downspouts from storm piping



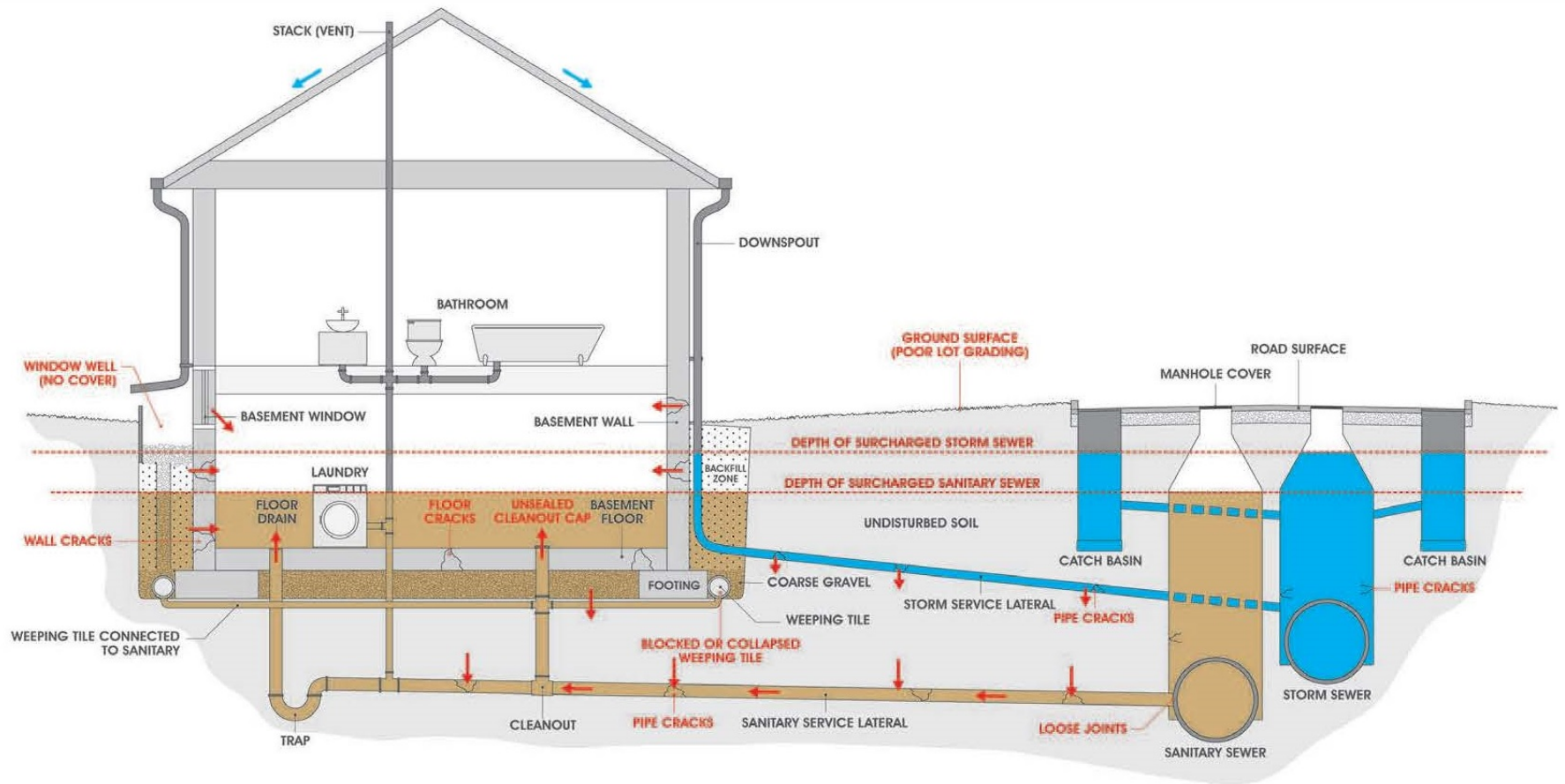
Actions for Homeowners to take to Reduce Risk of Basement Flooding

- Ensure there are no cracks in the storm water piping around the home
- Ensure there are no cracks or holes in the basement walls or floors that may allow water to enter the basement
- Provide backup power supply to the sump pump
- Visit the Town's website for information at:

www.tecumseh.ca



How Basements Flood



Closing Statements

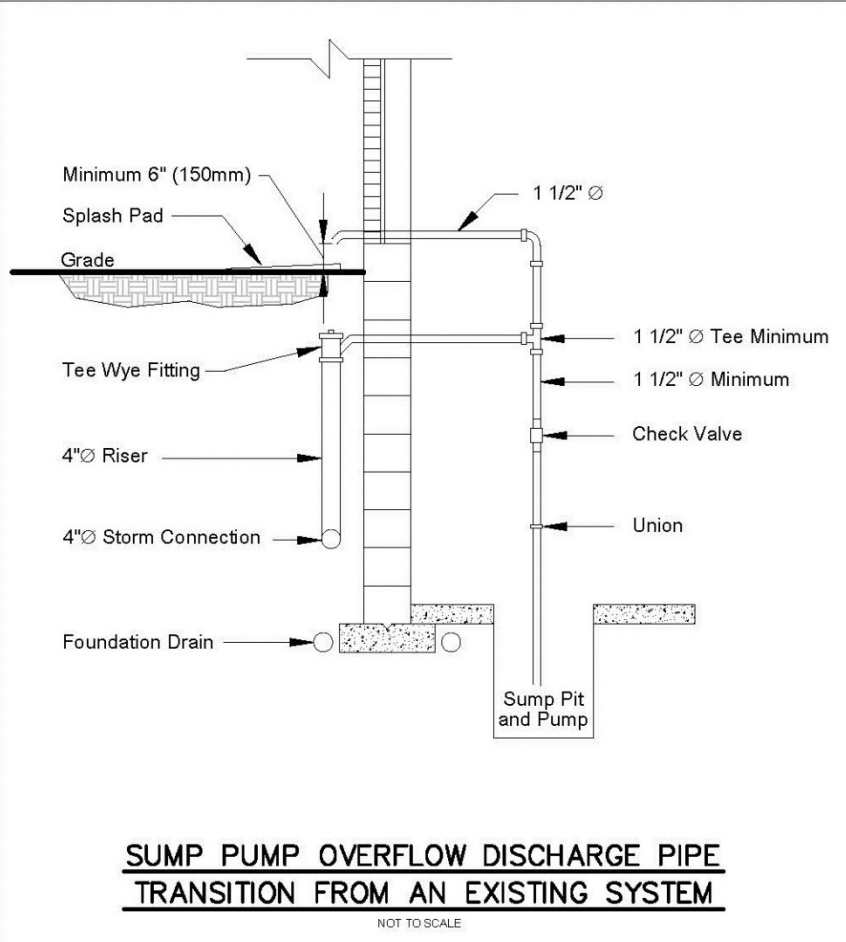
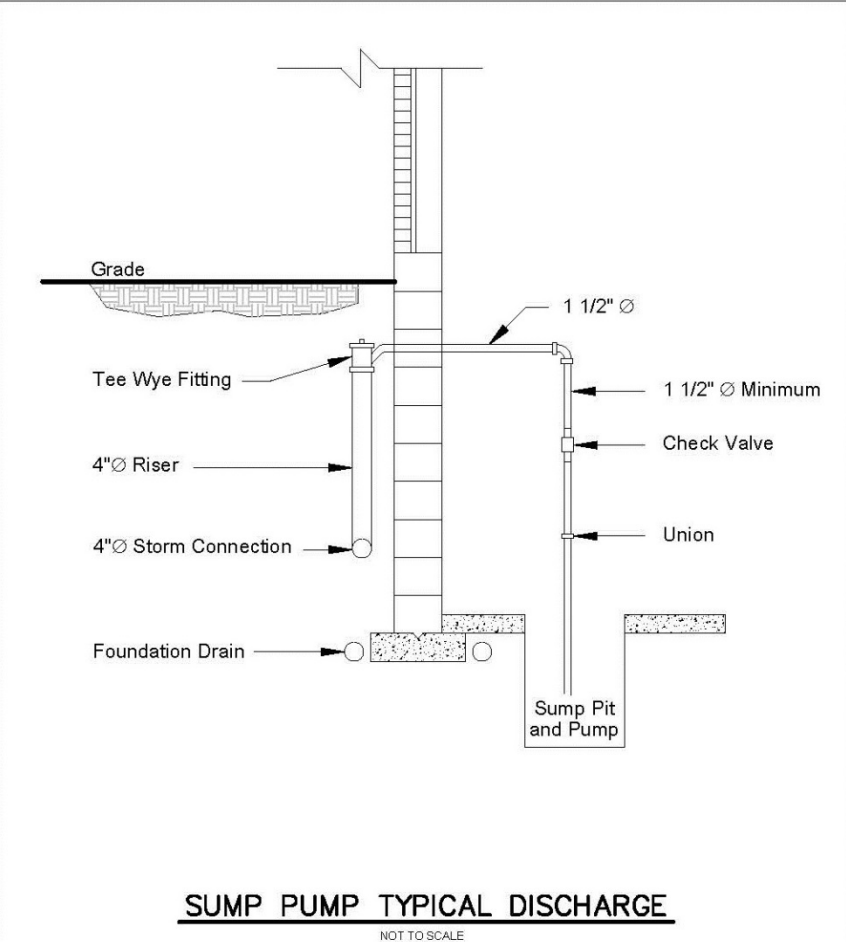
- No level of infrastructure improvements could have prevented the overwhelming of the Town's storm sewers during this severe rainfall.
- The Town's past actions and proposed modifications and infrastructure improvements are significant; however, they alone will not guarantee that a basement flooding event will never occur again.
- The cumulative effect of all Town and resident actions will serve to reduce the impact of severe rainfall events and lessen the extent of basement flooding associated with heavy rainfall events.



CONVERSION OF SUMP PUMP TO DISCHARGE OUTSIDE HOUSE

EXISTING TYPICAL

CONVERSION

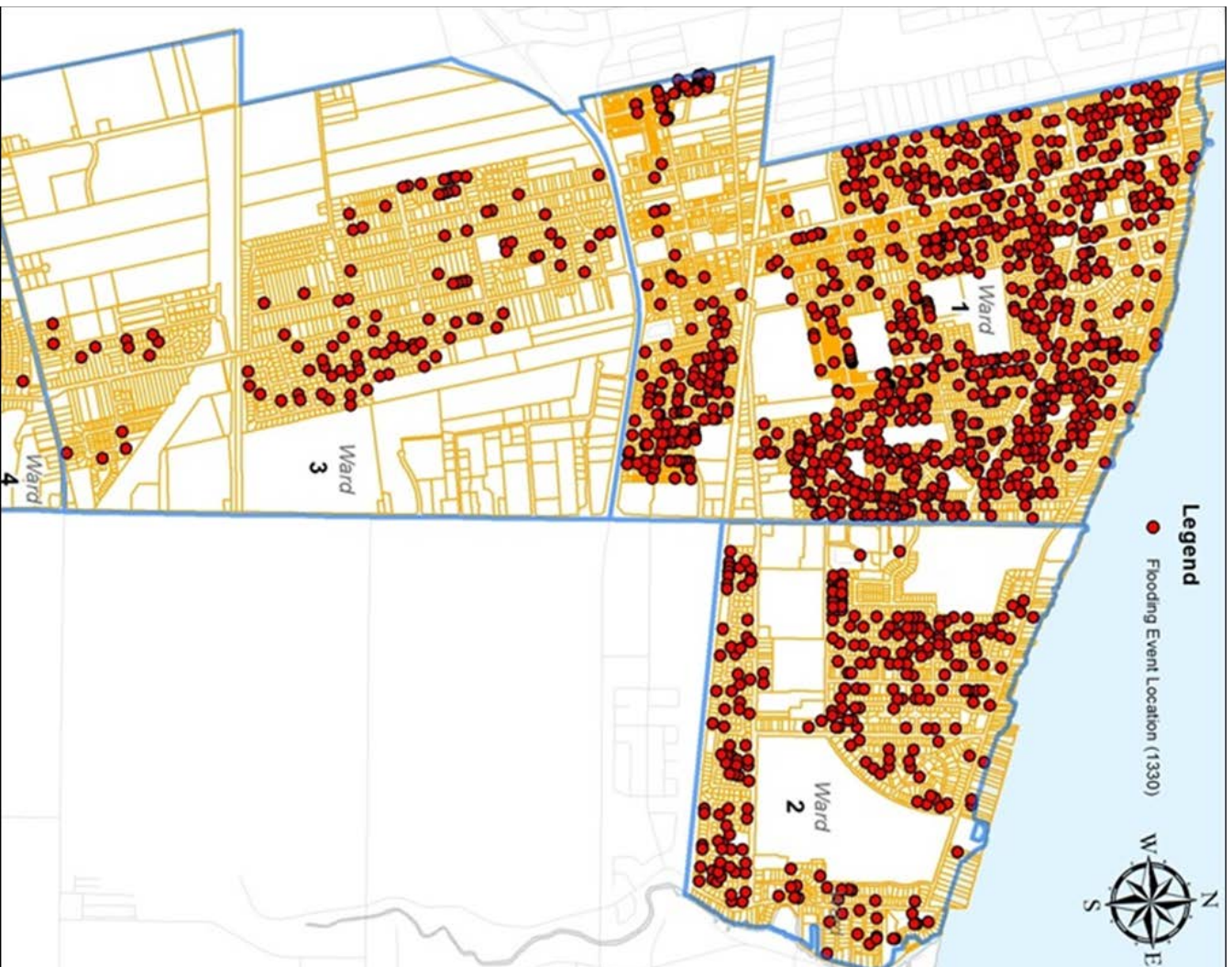


★NOTE : PIPE SIZES SHOWN ARE MINIMUMS

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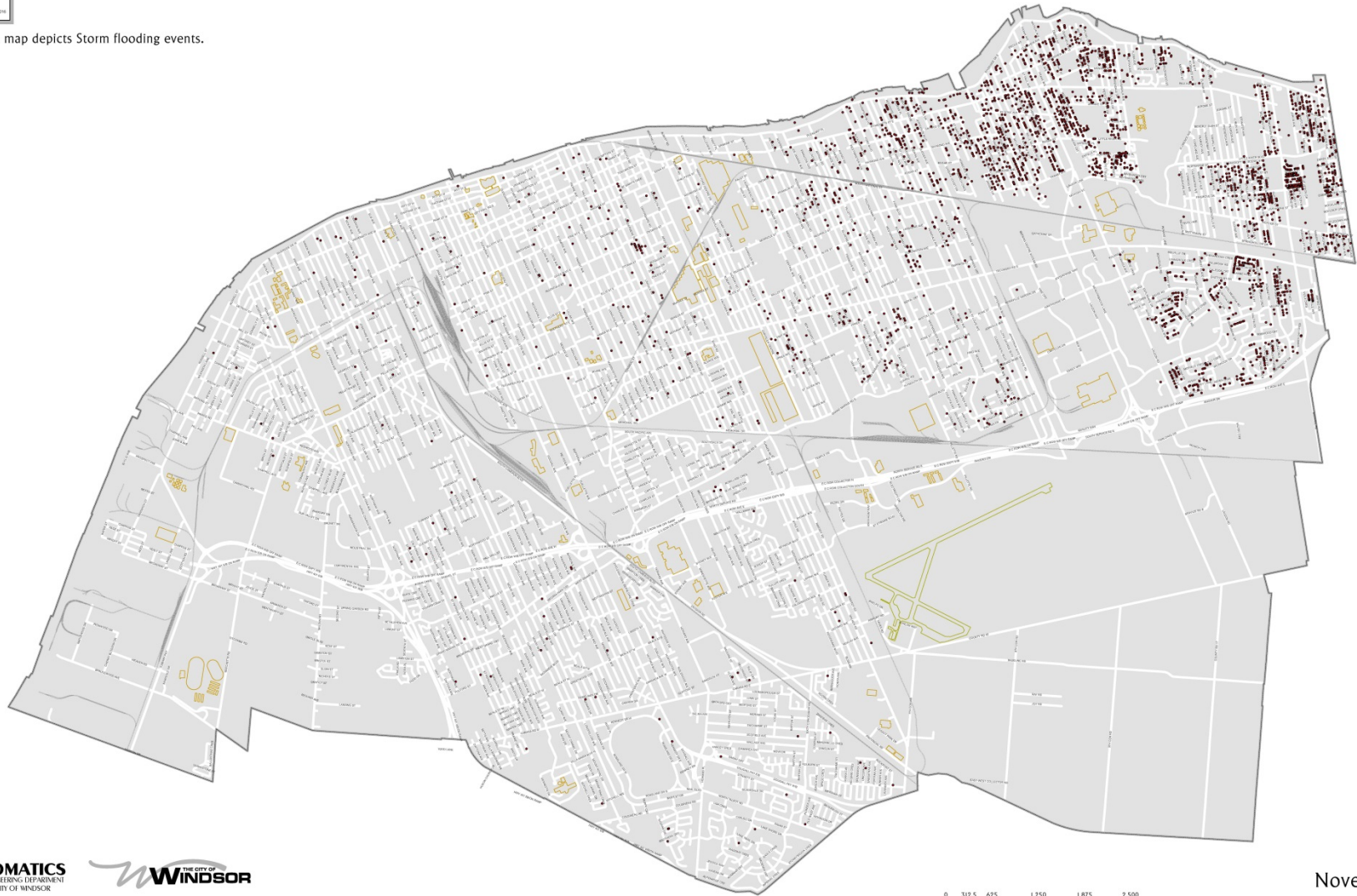
Town of Tecumseh – Location of Flooding



City of Windsor – Location of Flooding

Legend
• Flooding Date: Mar. 20, 2016

NOTE: This map depicts Storm flooding events.



November 2016
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GEOMATICS
ENGINEERING DEPARTMENT
CITY OF WINDSOR

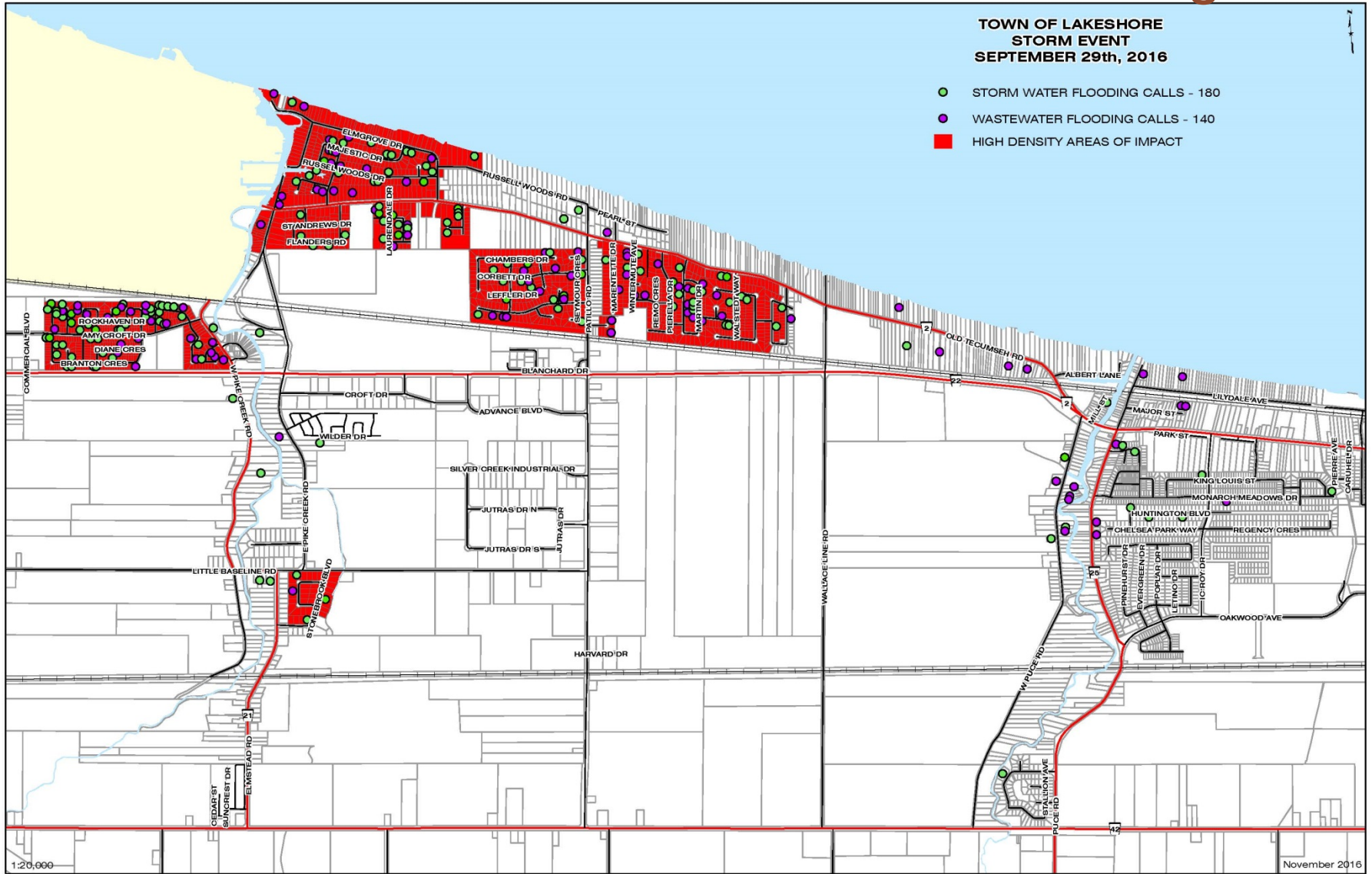
THE CITY OF
WINDSOR

Created by Engineering - Development & Geomatics



Public Works & Environmental Services

Town of Lakeshore – Location of Flooding



Thank-you

