Mandatory Weeping Tile Disconnection to Reduce the Impact of Basement Flooding

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Outline

- Terminology
- Background:
  - Inflow/Infiltration; Basement flooding
- Case Study: Sherwood Forest Subdivision
  - Causes of Basement Flooding
  - Public and Private Side Solutions
  - Next Steps

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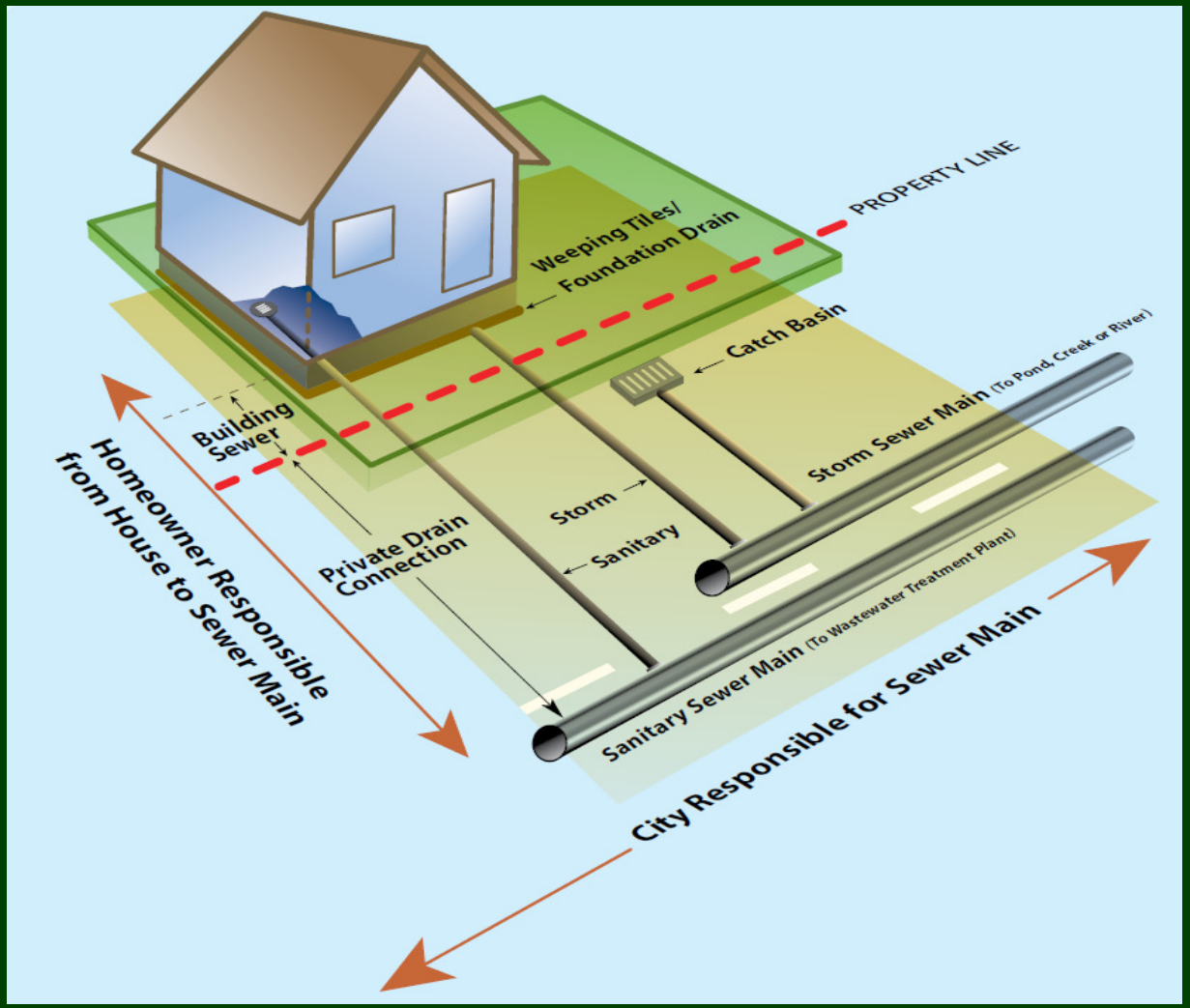
Terminology



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Inflow and Infiltration (I/I)

What is I/I?

- Storm water and/or ground water entering sanitary sewers

Why is it a problem?

- Higher conveyance costs at pumping stations
- Higher treatment costs at pollution control plants
- Combined sewer overflows, bypasses at plants
- Basement flooding

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Where does I/I come from?

- Cracks in pipe
- Combined sewers (catchbasins, cross connections)
- Downspout connections to sanitary
- Weeping tile connections to sanitary

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London's Weeping Tile History

Prior to 1985:

- weeping tile connected to sanitary sewer

1985-1995:

- weeping tile connected to sump pit; sump pump discharge to surface

1995-present:

- weeping tile connected to sump pit; sump pump discharge to storm sewer PDC

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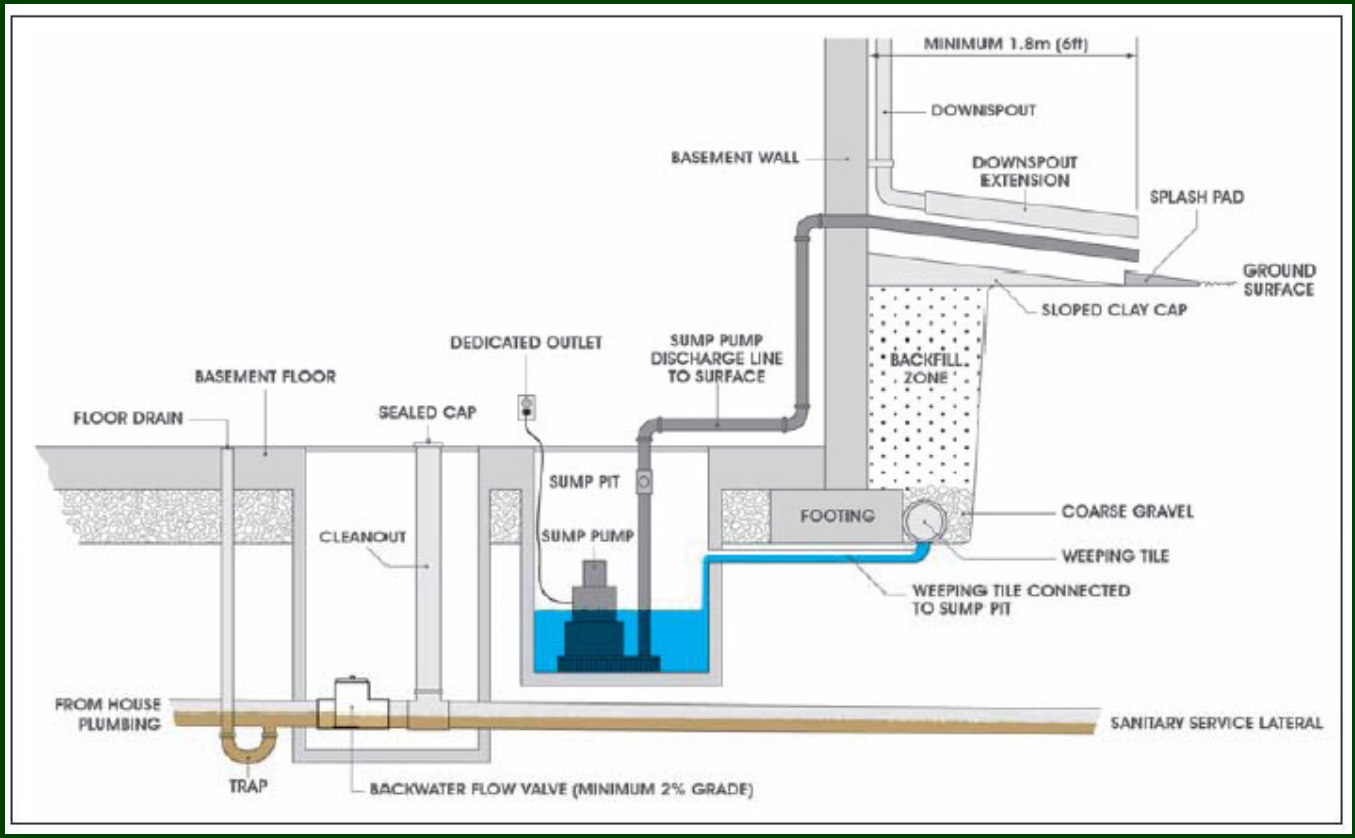
Sump Pump Diagram



Courtesy of ICLR

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Basement Flooding

- Problem within the City of London for many years
- Can be caused by:
  1) Isolated issues leading to **localized** basement flooding
  2) Systemic issues leading to **regional** basement flooding

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Basement Flooding

Isolated issues can include:

- Private Drain Connection (PDC) collapse/blockage
- Weeping tile blockage
- Poor / altered lot grading (sloping towards house)
- Basement wall deterioration (cracks, etc)
- Downspout discharge location (adjacent to building)

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Basement Flooding

Regional issues can include:

- Blocked Sanitary Main
- Surcharged/Overloaded Sanitary Main

Major source of Surcharged Sanitary Main:

- Weeping tile connected to the sanitary sewer, **plus**:
- Lot grading sloped towards house; **and/or,**
- Downspout discharge location (at or near foundation wall).

Leading to: sanitary surcharging from excess stormwater (I/I)

Resulting in: Basement Flooding

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Case Study: Sherwood Forest

- Subdivision developed late 1970s to early 1980s
- Historical basement flooding prone area
- Hit particularly hard May 28, 2009:

  → 83mm of rain in 5 hours

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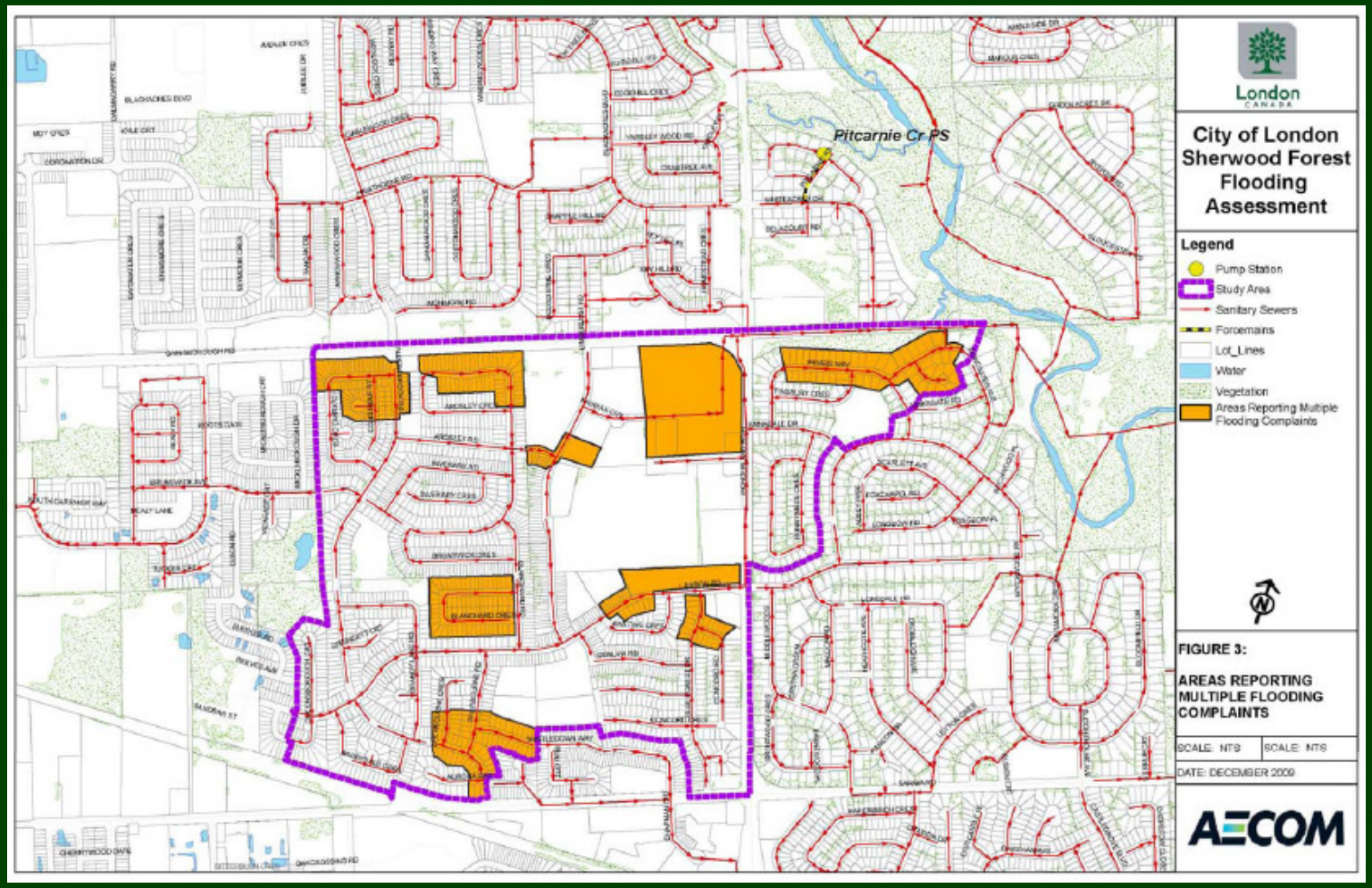
Flooding Areas – May 28/09



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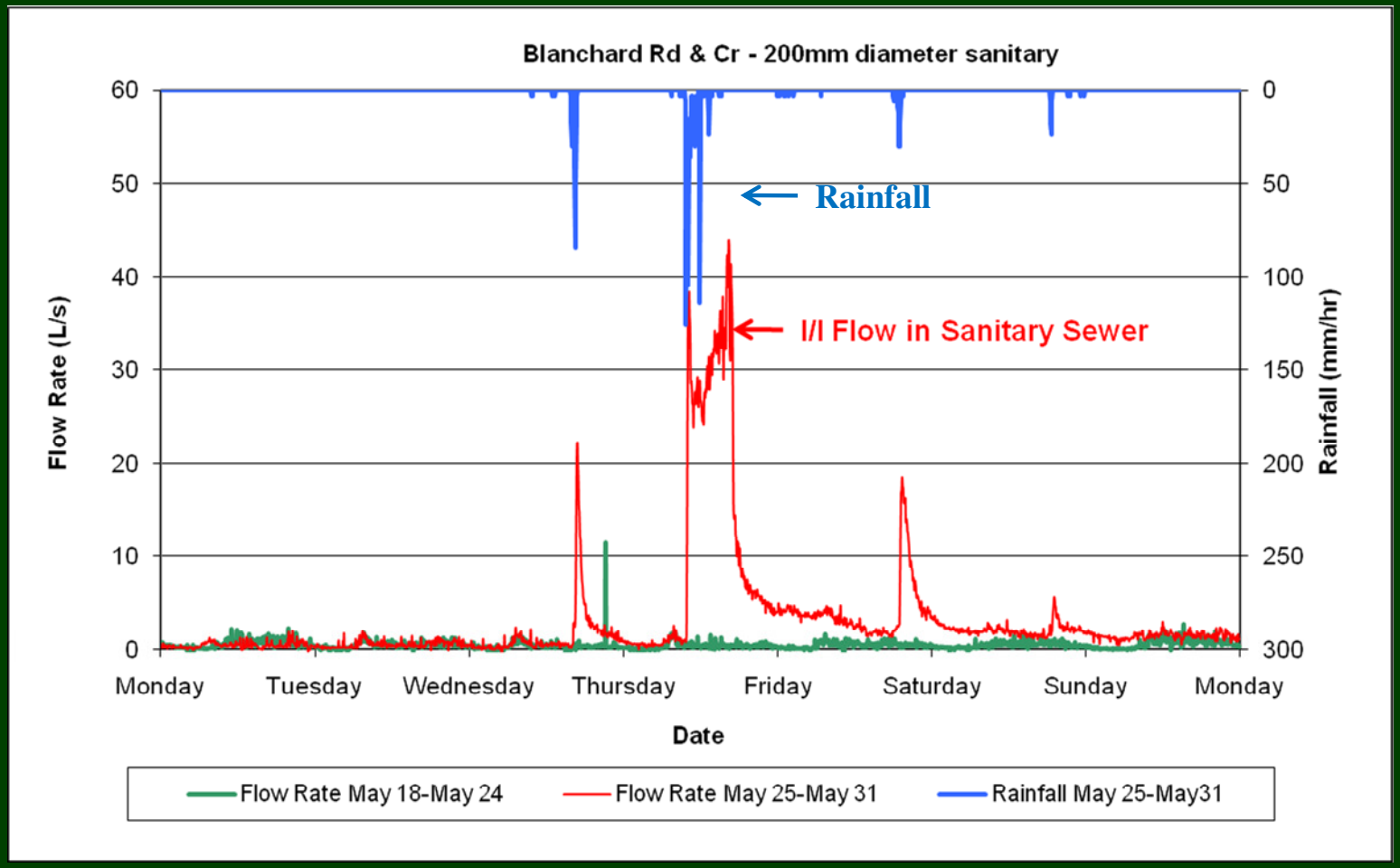
Flow Monitors



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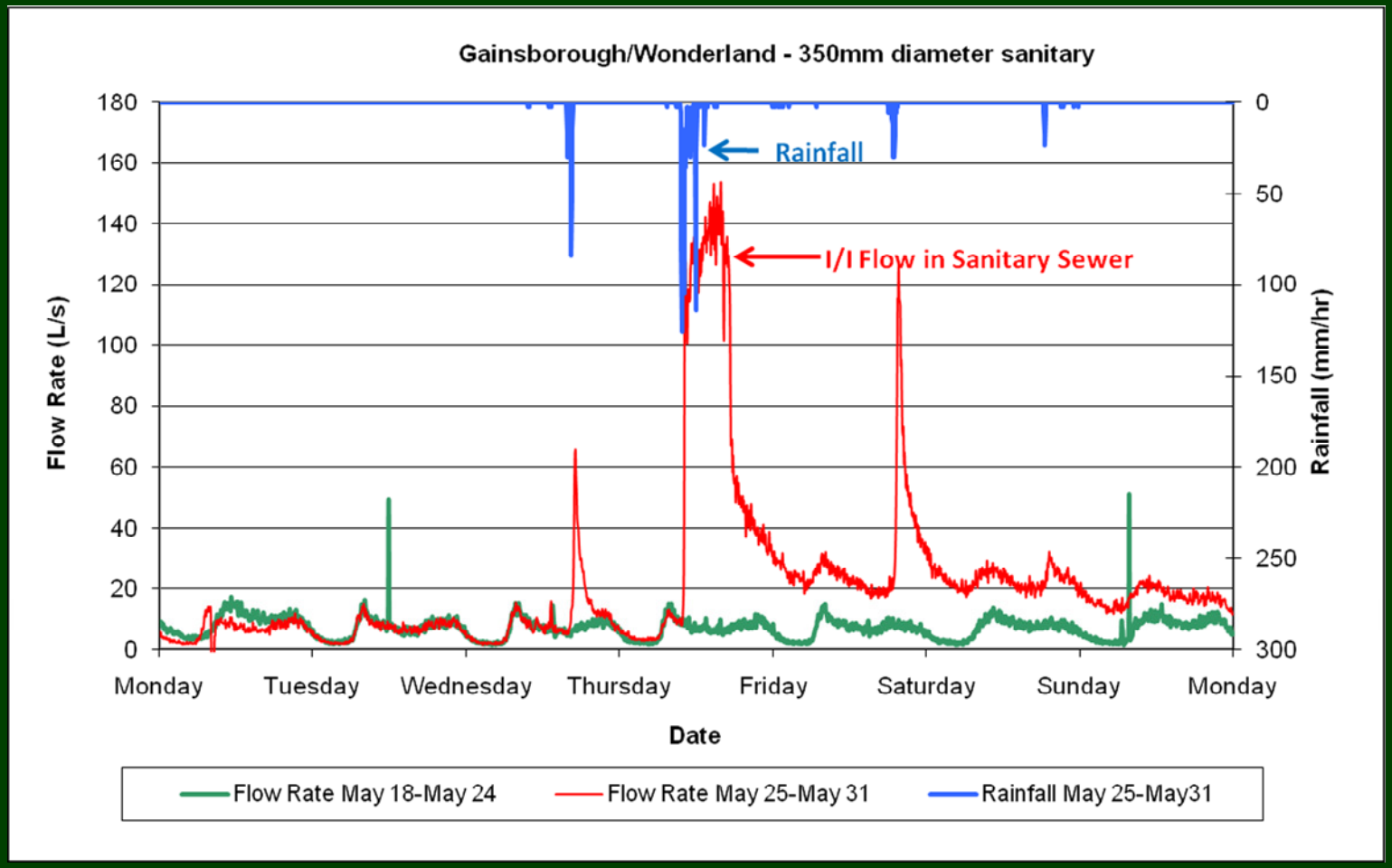
Flow Monitors



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What's Happening?

- Clay soil – does not absorb water
- Lot grading has settled over the years
- Zero lot line homes →
  - Closely spaced together = high % of roof and hard surface
- Poorly placed downspout discharge location

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Downspouts

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Aerial Photos

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Area Study

- City engaged consultant to:
  - Analyze flow monitoring data
  - Build and calibrate computer model
  - Prepare basement flooding mitigation solutions:
    - Public alternative (City infrastructure)
    - Private alternative (Homeowner property)
- Two surveys administered to all 2,000 residences
  - one survey conducted by City of London
  - one survey conducted by ICLR

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Public Side Alternative

City Infrastructure Improvement:

- Pipe upsizing and storage
- Protects basements up to the 25-year design storm event
- Estimated cost: **$10 million** (100% funded by City)
- Risk of larger storm, or back to back storms:
  → overwhelming storage and conveyance
  → more basement flooding

This option only accommodates the I/I

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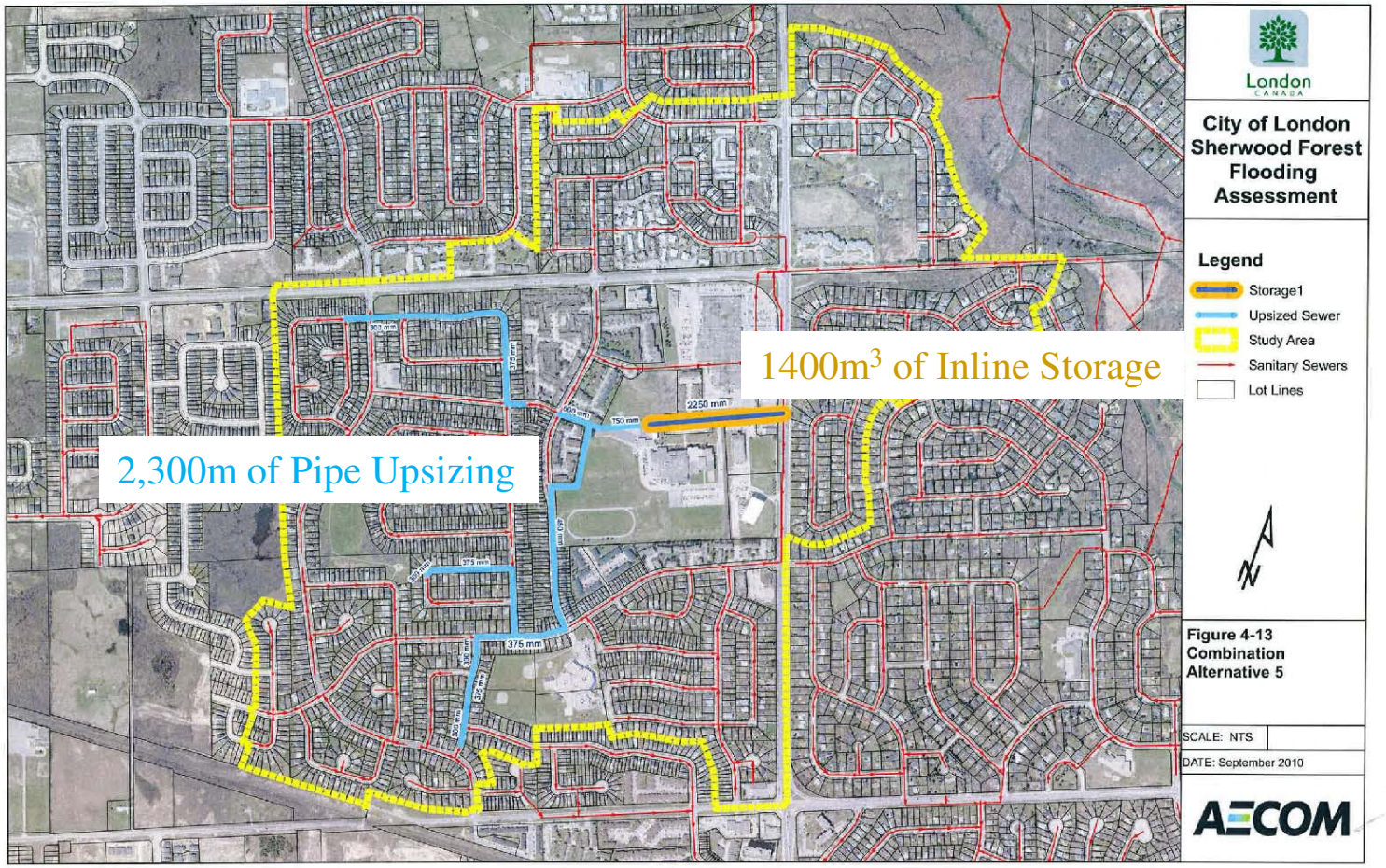
Pipe Upsizing and Storage



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Private Side Alternative

Private Homeowner Improvements:

- Disconnect weeping tile from private sanitary lateral to remove I/I
- Modeling analysis indicates 160 homes required to disconnect
- Protects basements beyond 25-year design storm event
- Estimated cost: **$2 million** (100% funded by City)
  - Includes: weeping tile disconnection, sump pump, backwater valve, dedicated storm PDC for sump pump discharge, and road resurfacing

This option removes the I/I at the source

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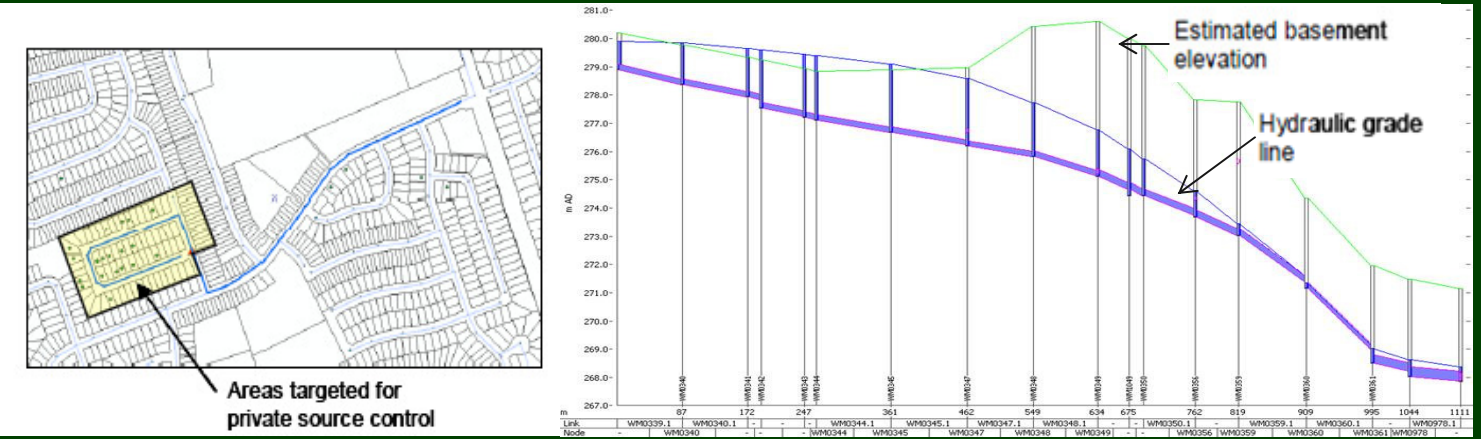
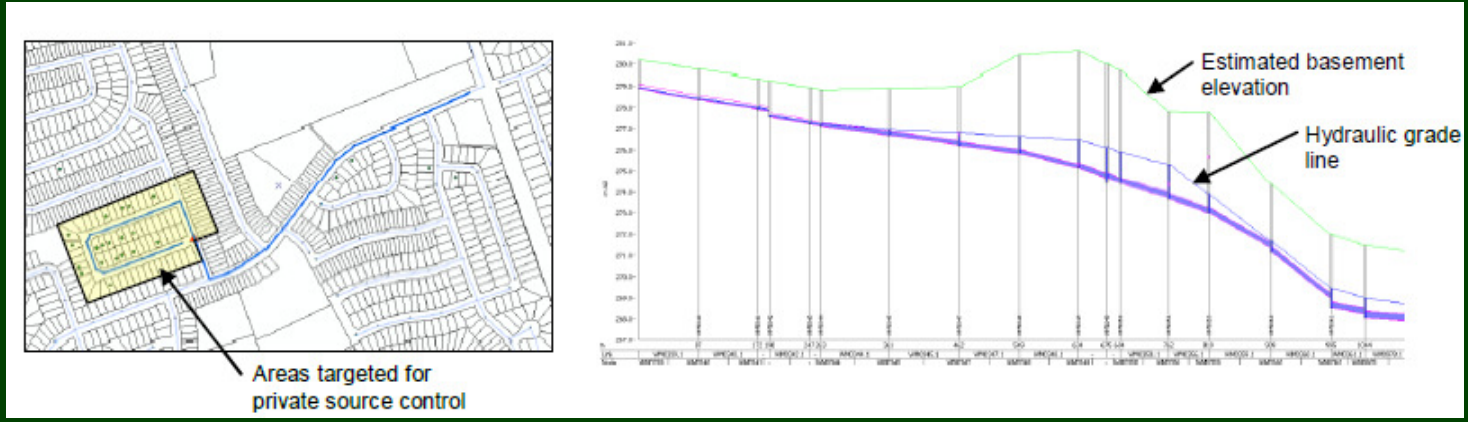
Private Side Alternative

Current State (25-year Storm):



70% Home Disconnection (25-year Storm):



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Private Side Alternative: Advantages

Disconnecting the weeping tile from sanitary:

- Removes I/I at the source
- Saves treatment costs
- Reduces risk of overwhelming system with ‘next big storm’
- Significantly more cost effective:

  → only 20% of public side alternative

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How?

Voluntary (Current Practice):

- 75% Grant Program for Basement Flooding Protection (includes sump pump, backwater valve, weeping tile disconnection, storm PDC)
- Very low uptake; ‘dry basement’ homeowners have no interest, even though they are contributing.

Mandatory (Proposed):

- 100% funded by City
- Focus on problem areas only

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Obstacles

Public Perception:

- City approved original subdivision therefore City responsible to fix
- City sewer pipes are too small
- Nearby development is causing our flooding

Homeowner reluctance to retrofit sump pump:

- Noise, nuisance
- Electricity and maintenance costs

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Next Steps

- Currently preparing Council report which recommends:
  - Focused, mandatory weeping tile disconnections
  - All sump pumps to discharge directly to storm PDCs to prevent icing problems experienced in other areas
- Council acceptance will be key factor

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Thank You

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