TOWN OF BELMONT

Presentation to
BOARD OF SELECTMAN
January 11, 2016

SEWER & STORM DRAIN SYSTEM REHABILITATION OVERVIEW

Overview

The Town of Belmont has three types of programs guiding the rehabilitation of the sanitary sewer and storm drain system as part of its overall strategy targeting corrections to these systems.

- EPA/DEP Clean Water Projects
- MWRA Infiltration/Inflow Removal Projects
- Pavement Management Program Repairs

EPA/DEP Clean Water Projects

In 1998 the Town of Belmont was one of six communities contacted by EPA regarding the Clean Water Act.

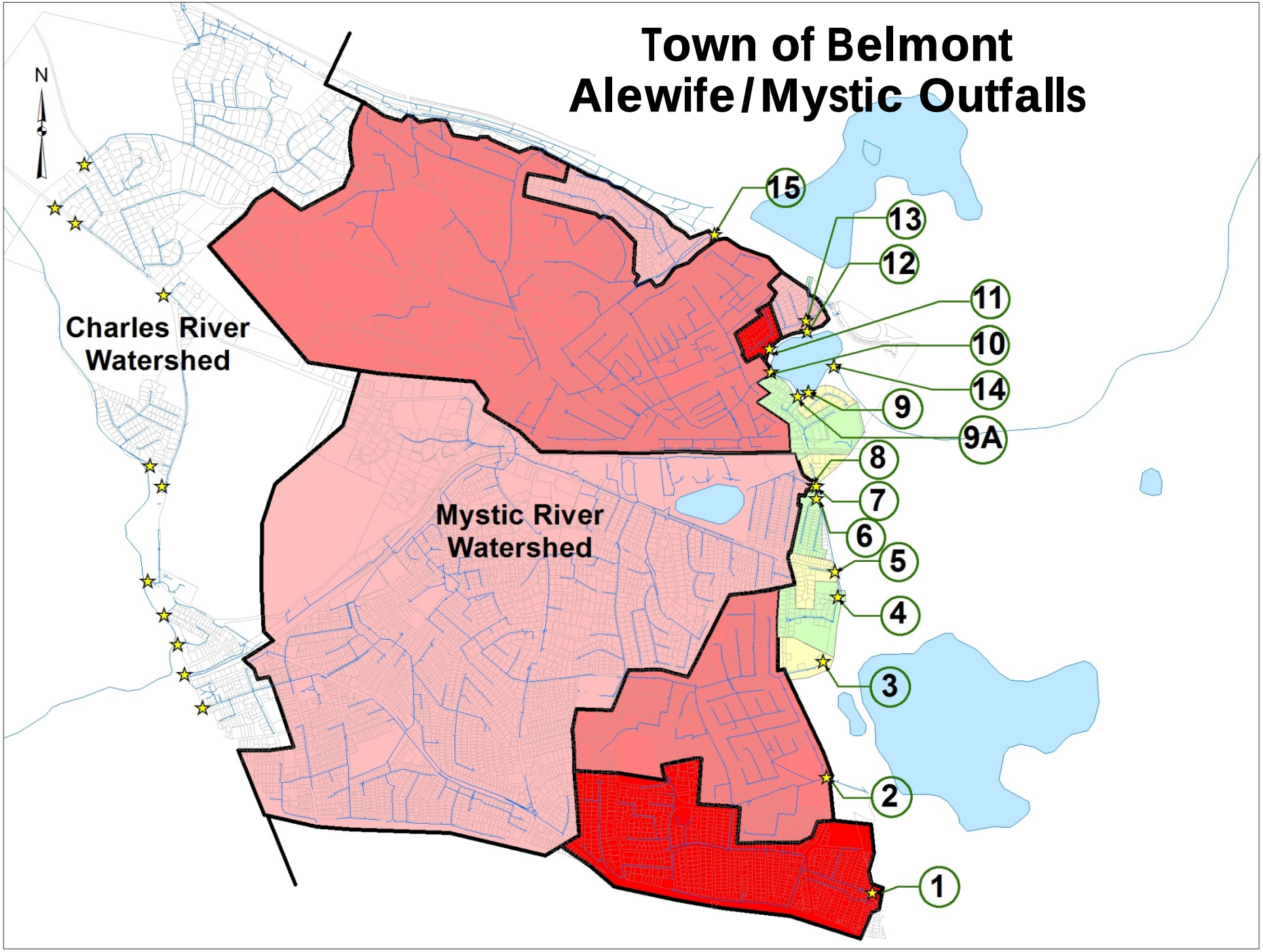
- Goal to address water quality in the Mystic / Alewife Basin.
- Cambridge, Somerville, Arlington, Winchester and Medford

EPA/DEP Clean Water Projects

Belmont was required to investigate all outfalls directly discharging to Little Pond and Alewife Brook and their tributaries

- Identified 15 outfalls
- Performed baseline sampling at each location
- 7 outfalls found to exceed maximum standards

The main purpose of this program is to eliminate illicit connections to the storm water system


Town of Belmont
Alewife / Mystic Outfalls
N
Charles River
Watershed
Mystic River
Watershed
15
13
12
11
10
14
9
9A
8
7
6
5
4
3
2
1

EPA/DEP Clean Water Projects
1999 Sampling Results

Outfall No.	Sample* Result
1	3,300
2	120,000
3	Dry
4	Dry
5	Dry
6	Dry
7	1,100
8	110

Outfall No.	Sample* Result
9	Dry
9A	NS
10	4,000
11	400,000
12	200,000
13	24
14	64
15	600

***E. coli / 100 ml**

Threshold – 235 / 100ml

EPA/DEP Clean Water Projects

Once an outfall was identified, an investigation into the watershed was performed to determine the source of the contamination

- Additional sampling
- CCTV
- Internal property inspections
- Dye water testing

EPA/DEP Clean Water Projects

The main cause of stormwater quality issues in Belmont stems from two conditions

- Deteriorating sanitary sewer mains and service connections
- Direct connections of sanitary sewer services to the storm drain system

To date over $8 Million has been spent addressing the problem.

EPA/DEP Clean Water Projects

- City of Cambridge - $100 Million
  - **Combined sanitary sewer and storm drain system requires separation of these systems**
  - Variance for CSO into Alewife Brook during moderate and heavy rainfall…
- City of Revere - $50 Million
  - **Undersized sanitary sewer system requires new capacity to be created**
  - Forced by a Federal Consent Decree to "implement a comprehensive, system-wide plan" to mitigate impacts associated with insufficient capacity

EPA/DEP Clean Water Projects

Todd Borci – EPA

"EPA's enforcement tools range from Notice of Violations and formal Requests for Information, to Administrative Orders of Consent, Unilateral Administrative Orders (***as were issued over the past several years by EPA to Medford, Malden, Lexington, Everett, Revere, Stoneham in the Mystic watershed***), to Consent Decrees that are Federal Court settlements…"

EPA/DEP Clean Water Projects
October 2015 Sampling Results

Outfall No.	Sample Result	% Decrease
1	ND	Cleared
2	6,800	94.3%
3	NS	Cleared
4	NS	Cleared
5	NS	Cleared
6	NS	Cleared
7	NS	Cleared
8	NS	Cleared

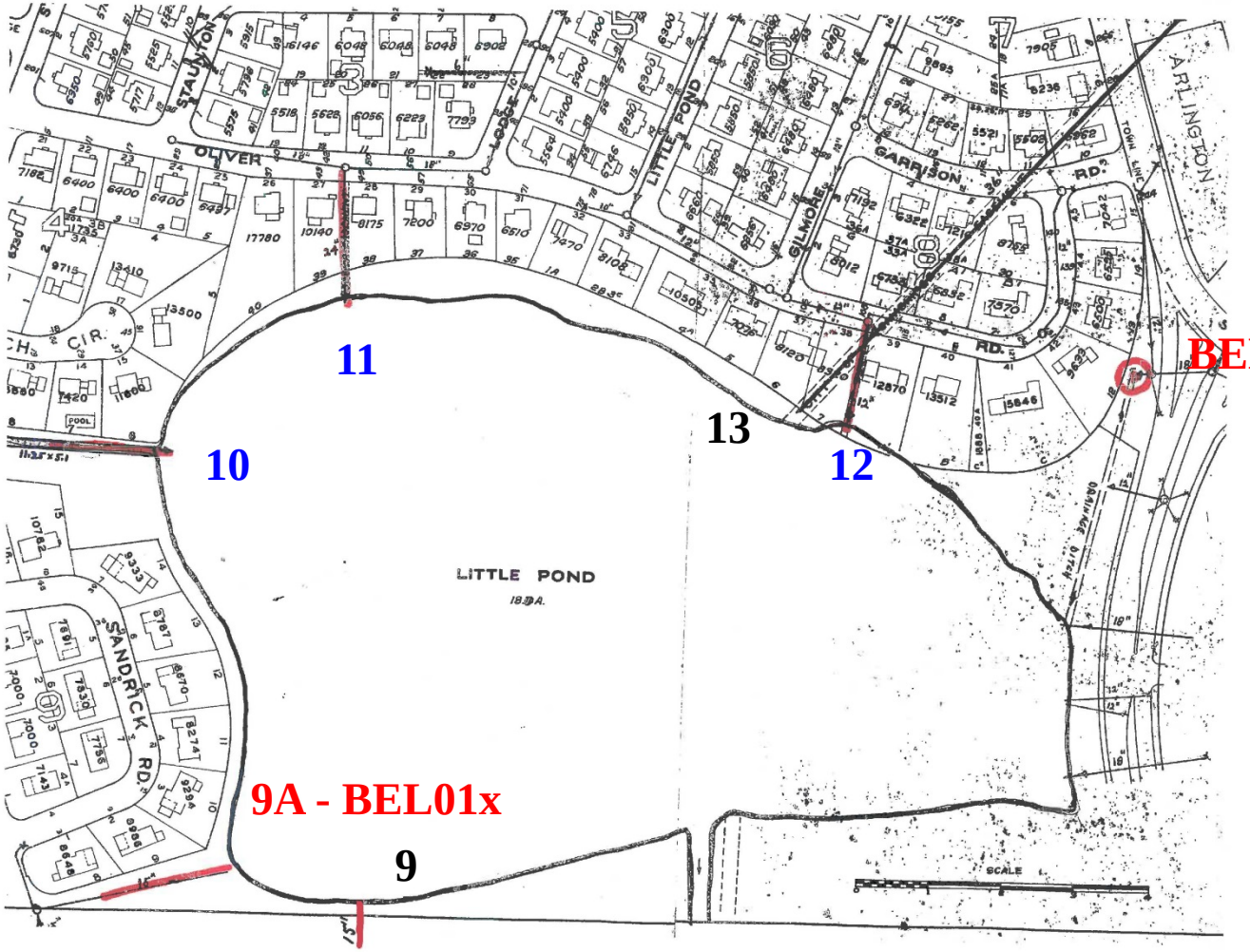
Outfall No.	Sample Result	% Decrease
9	ND	Cleared
9A	Dry	Cleared
10	3,600	10.0%
11	1,950	99.5%
12	2,450	98.8%
13	100	Below
14	NS	Cleared
15	NS	Cleared

***E. coli / 100 ml**

Threshold – 235 / 100ml

NS – Not Sampled
ND – Not Detected

EPA/DEP Clean Water Projects



EPA/DEP Clean Water Projects
October 2015 Sampling Results – 2014 Locations

MyRWA Outfall No.	Location	MyRWA Sample Result 2/26/2014	Stantec Sample Result 10/20/2015 & 10/23/2015
WEB010	Rear Library	2,747	ND
WEB013	Common St	7,945	ND
ATB002	Atkins Brook	54	NS – Below Threshold
BEL01x	Outfall 9A	576	DRY – No Flow
BEL07S	Blanchard Rd	25	NS – Below Threshold
BELOF8	Blanchard Rd	44	NS – Below Threshold
BELHWY001	Rt2 Ditch	2,190	DRY – No Flow
WIBUTB	Clifton St	ND	NS – Below Threshold
BELWEB002	Olmstead Dr	ND	NS – Below Threshold

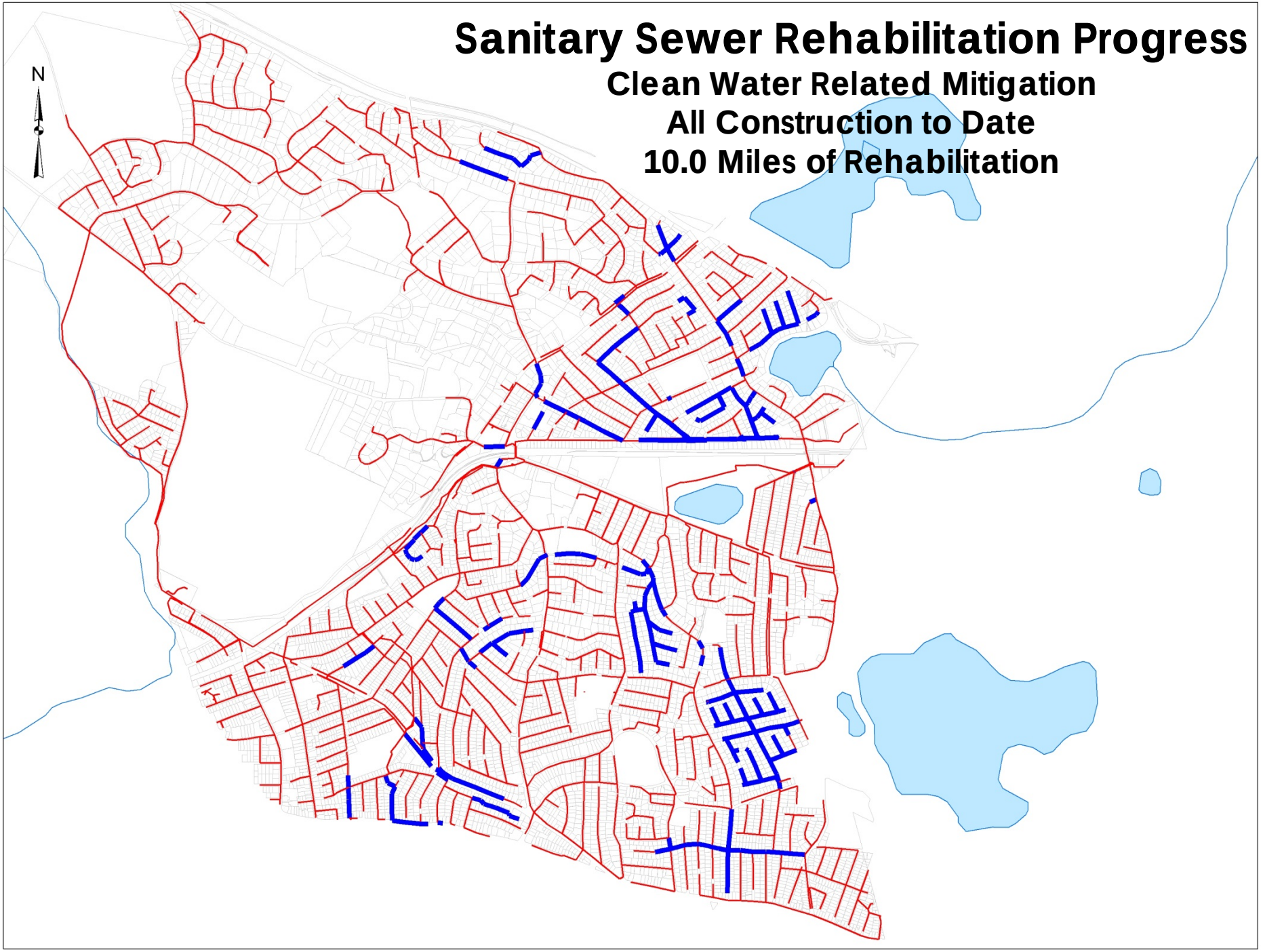
NS – Not Sampled **ND – Not Detected**

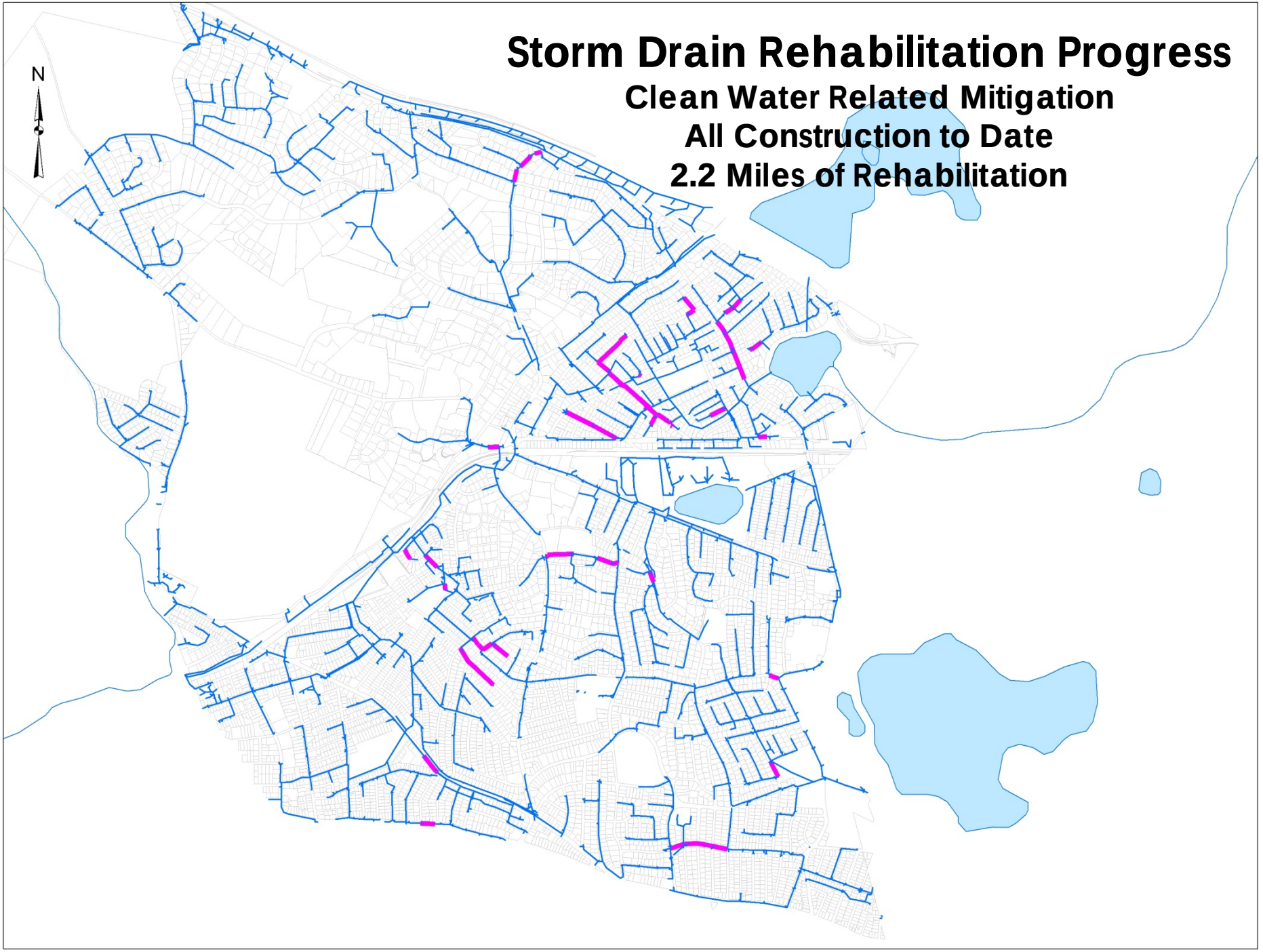
Sanitary Sewer Rehabilitation Progress

Clean Water Related Mitigation

All Construction to Date

10.0 Miles of Rehabilitation




Storm Drain Rehabilitation Progress
Clean Water Related Mitigation
All Construction to Date
2.2 Miles of Rehabilitation
N

EPA/DEP Clean Water Projects

Overall we demonstrate improvement and our work continues

- Sampling is snapshot in time
- Mains and services continue to deteriorate
- It is difficult to identify an illegal connection to the sewer system.

We continue to move forward sampling and investigating

EPA/DEP Clean Water Projects

Next Steps:

- Continue water quality sampling
- Investigate contamination to the source
- Scope a mitigation project
- A five year look out likely includes 2 projects
  - Estimated total cost - $ 4.5 M

- Borrowing from DEP CWSRF at 2% over 20 years
  - Debt service = $275,000 annually

MWRA I/I Grant Loan Program

Funding is for the implementation of an Infiltration and Inflow Removal Program

The MWRA I/I Grant Loan Program

- Funding made in phases
  - 45% grant funding (thru phase 8, 75% phases 9 and 10)
  - 55% 0 interest loan (thru phase 8, 25% phases 9 and 10)

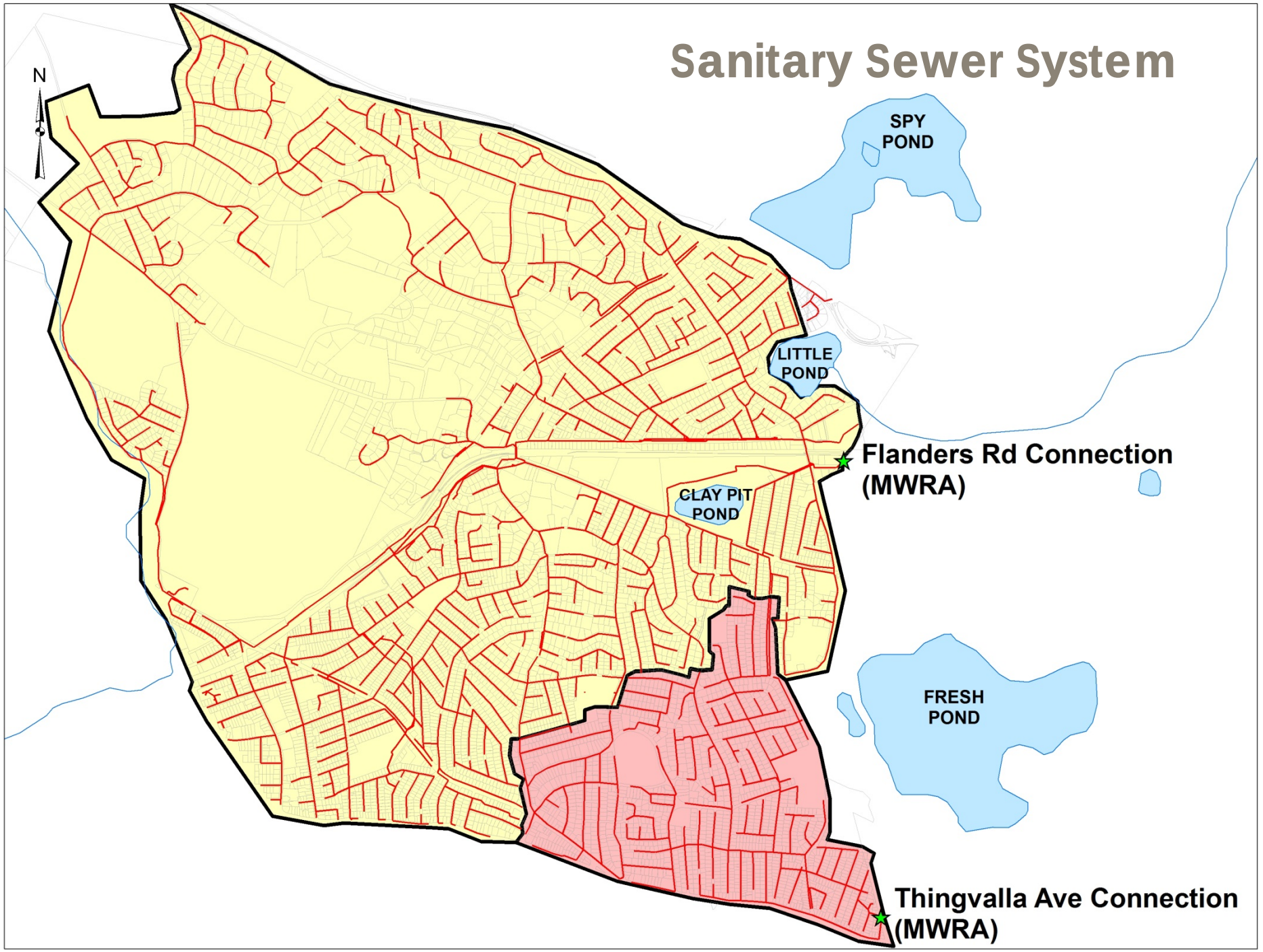
The main purpose of this program is to eliminate infiltration and inflow from the sanitary sewer system

MWRA I/I Grant Loan Program

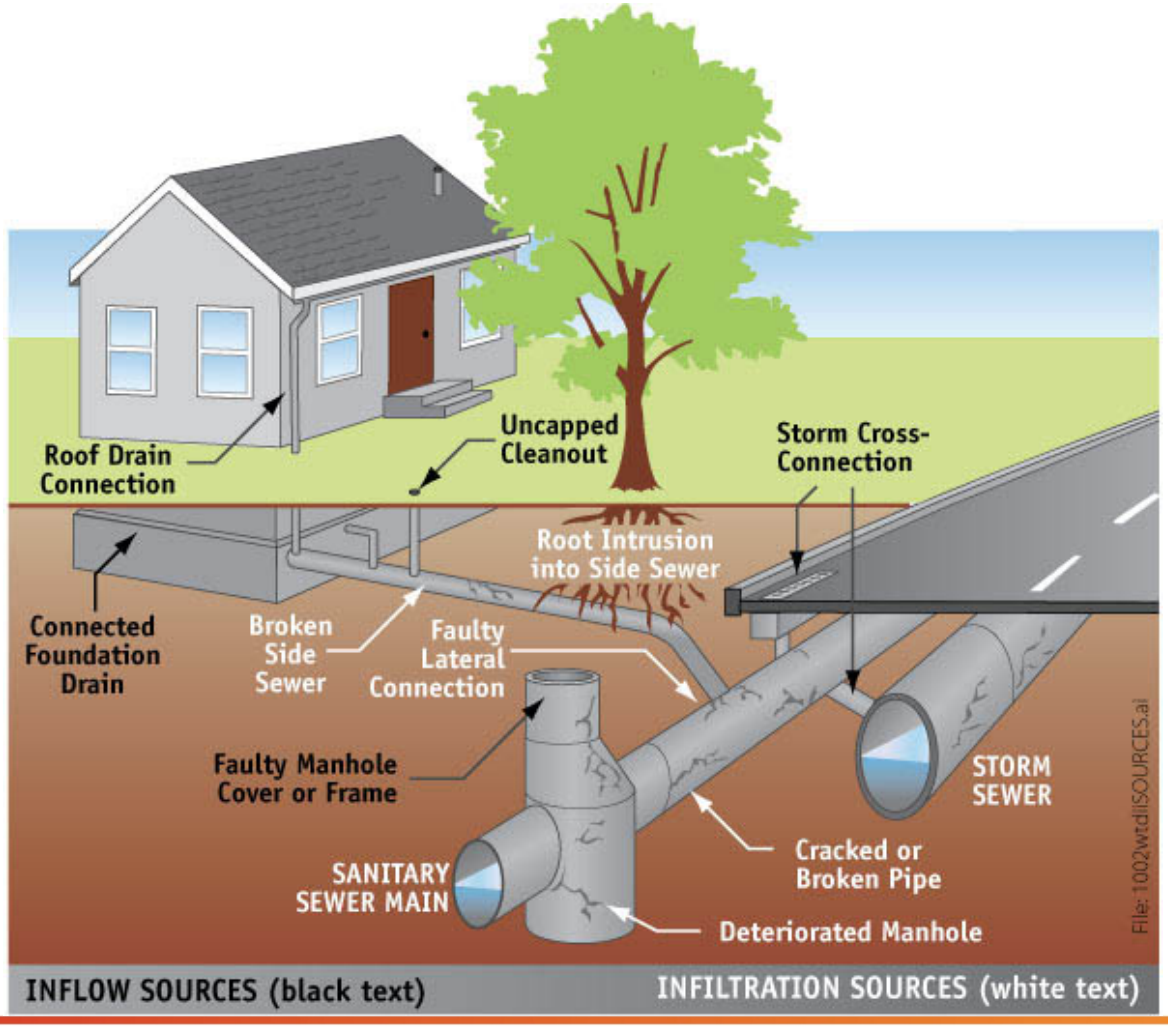
Main causes of I/I in Belmont

- **Infiltration** - groundwater seeping through defects into sanitary sewer pipes and manholes.
- **Inflow** - storm water connections such as roof leaders, sump pumps and catch basins that connect to sanitary sewer system.

To date over $2.9 Million of MWRA funding has been spent on I/I. Additional funds have also been spent.


Sanitary Sewer System
N
SPY POND
LITTLE POND
Flanders Rd Connection (MWRA)
CLAY PIT POND
FRESH POND
Thingvalla Ave Connection (MWRA)

MWRA I/I Grant Loan Program
Sources of I/I



MWRA I/I Grant Loan Program

Why Infiltration / Inflow is a problem

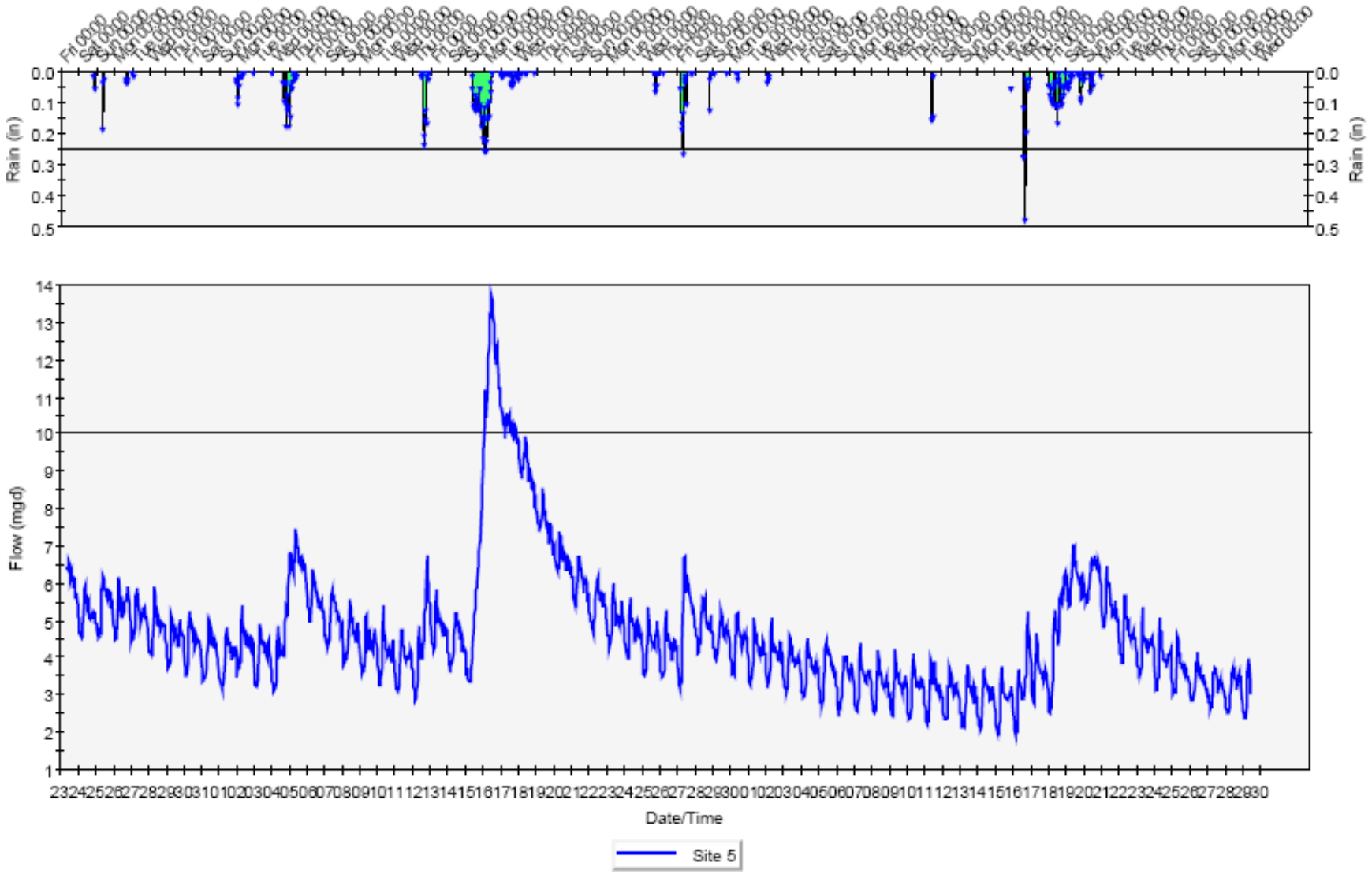
- Sewers are designed for sewage
- I/I takes up capacity in the sewer system
- Can result in sewer system overflows
- Increases treatment costs

Opposite of clean water act problem

MWRA I/I Grant Loan Program

Examples of Town of Belmont I/I related projects

- Sanitary Sewer Evaluation Survey - flow monitoring
- Modeling software
  - Used to troubleshoot system problems
  - Compatible with city of Cambridge and MWRA
- Private inflow sump pump removal
- Sewer and Drain main and service lining and replacement
- Manhole sealing

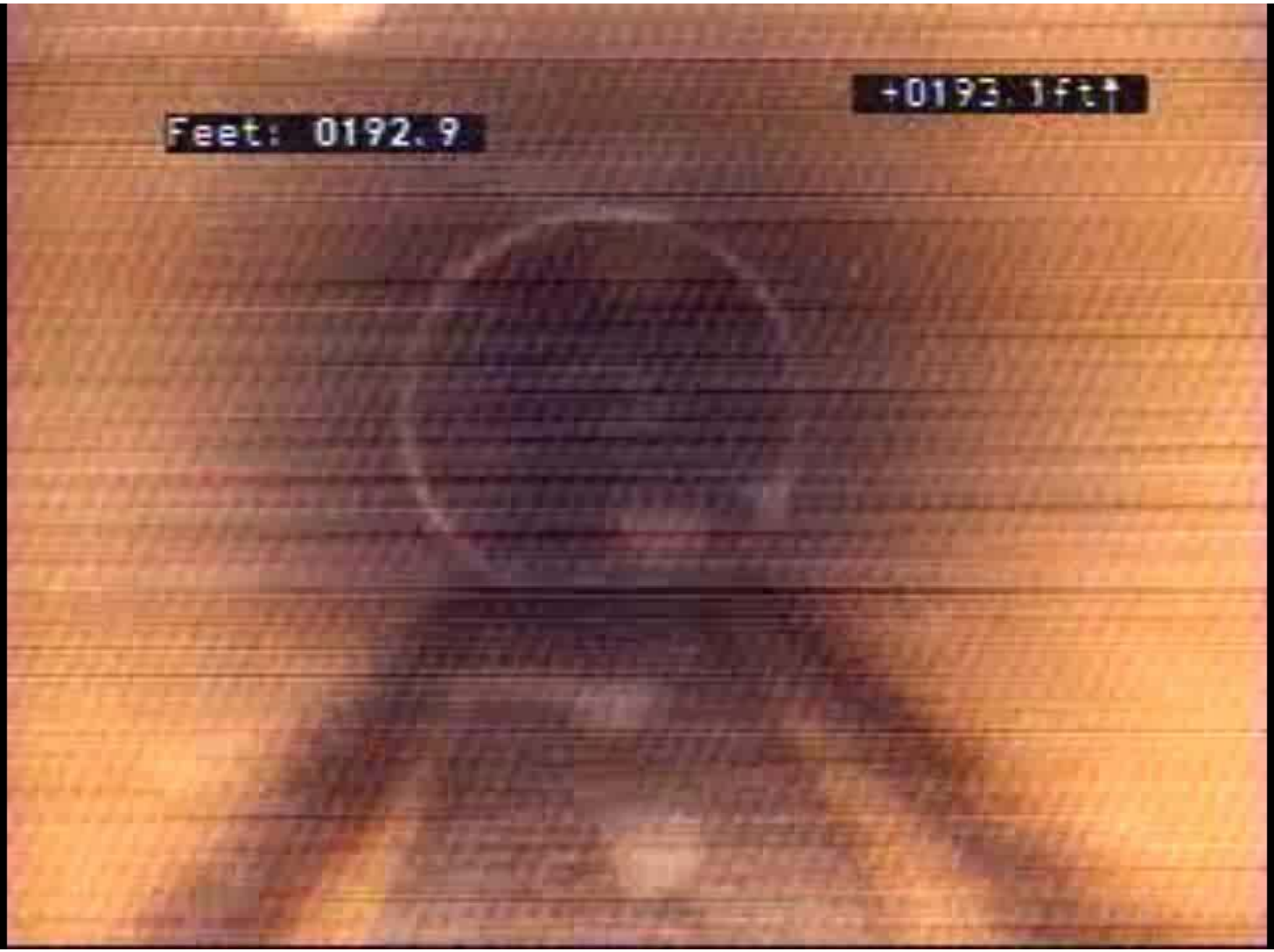

Rain (in)
Flow (mgd)
Date/Time
Site 5

MWRA I/I Grant Loan Program

Once flow monitoring identified the magnitude of I/I in the system an investigation into the watershed was performed to determine the source of the problem

- Dye water testing
- Closed-Circuit Television (CCTV)
- Internal property inspections

This approach is the basis for our ongoing infiltration / inflow investigations


Feet: 0192.9
+0193.1ft

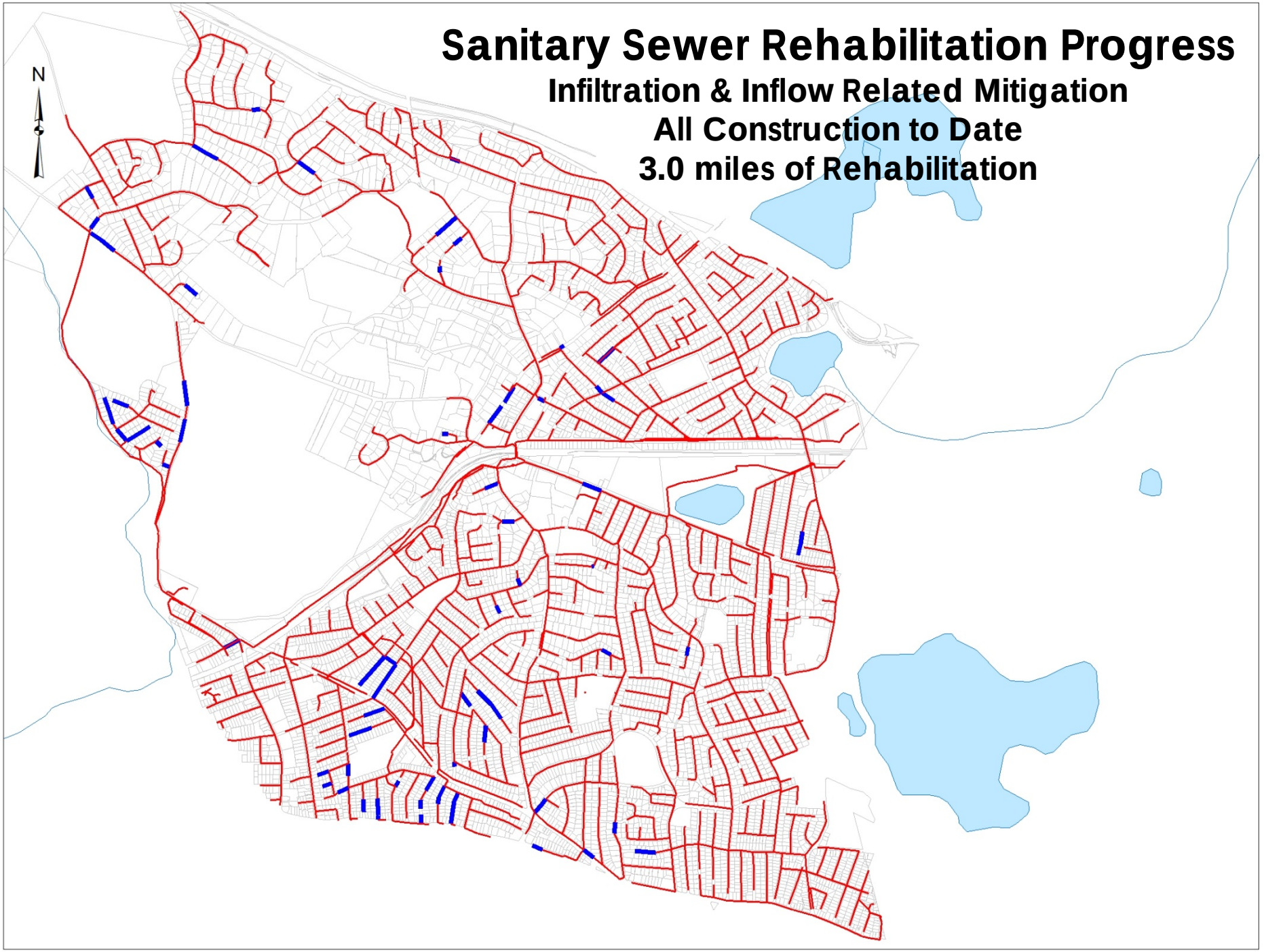

Feet: 0194.0
+0194.0ft

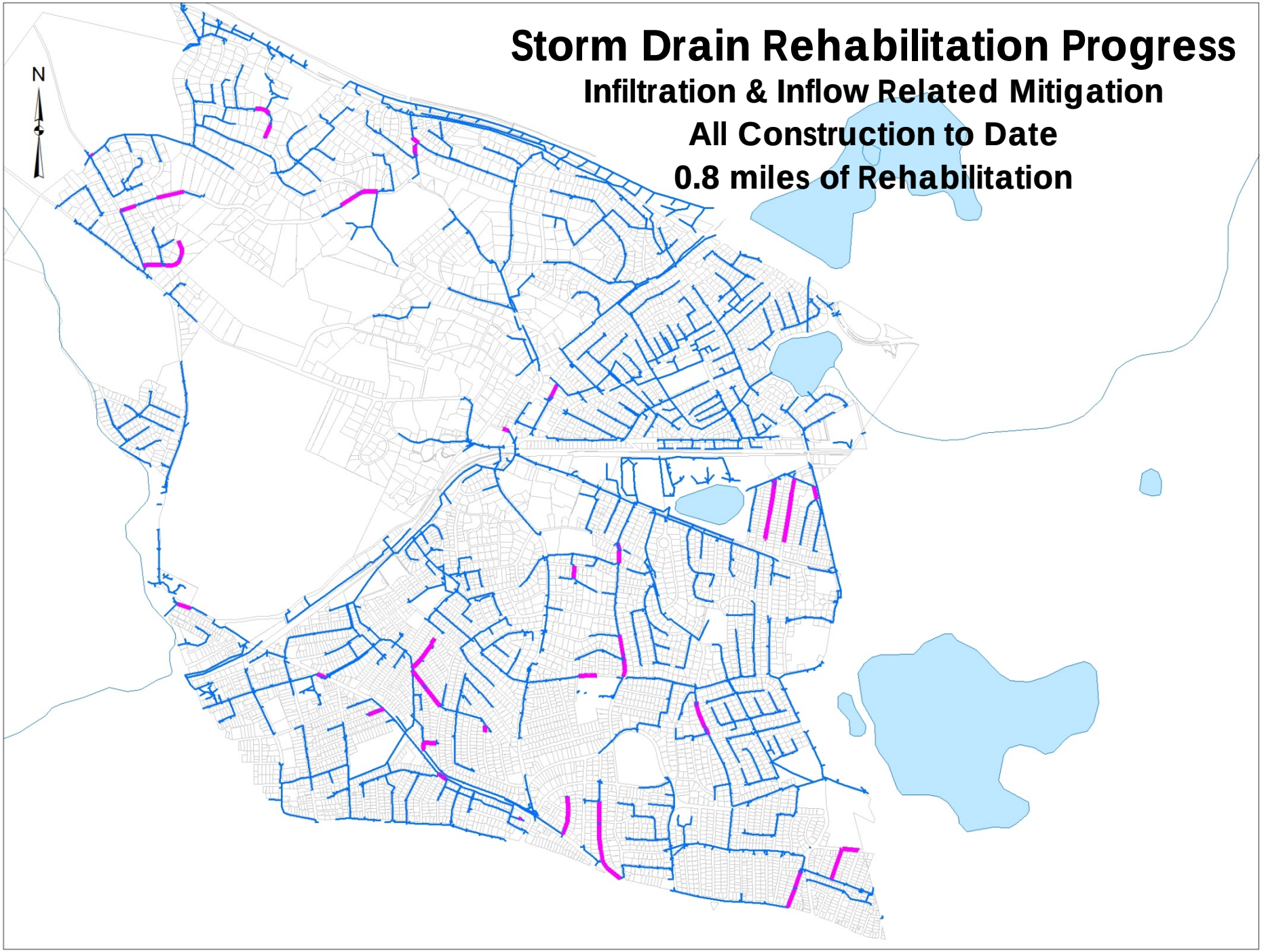
Sanitary Sewer Rehabilitation Progress

Infiltration & Inflow Related Mitigation

All Construction to Date

3.0 miles of Rehabilitation




Storm Drain Rehabilitation Progress
Infiltration & Inflow Related Mitigation
All Construction to Date
0.8 miles of Rehabilitation
N

MWRA I/I Grant Loan Program

Similar to our Clean Water effort we are making improvements and our work continues

- Several private properties are known to have sump pumps directly connected to the sanitary sewer
- Sewer mains and services continue to deteriorate

We continue to scope out new I/I removal projects

MWRA I/I Grant Loan Program

Next Steps:

- Private inflow removal project – sump pumps
- Sewer manhole inflow mitigation
- Potential bylaw requiring inspection of residential property upon transaction
  - Requires Home Rule Petition

Available MWRA funds include

- $447,000 45% grant / 55% loan – 5 year return
  - $49,170 debt service annually
- $1,696,000 75% grant / 25% loan - 10 year return
  - $42,400 debt service annually

Pavement Management Program

Sewers and storm drains are evaluated and repaired as necessary prior to the reconstruction of roads

- Roads are reconstructed based on PCI
- Approximately 1.5 miles per year
- Sewer and drain repairs subject to funding
  - Repairs are addressed immediately (excavation) or deferred if possible (lining)

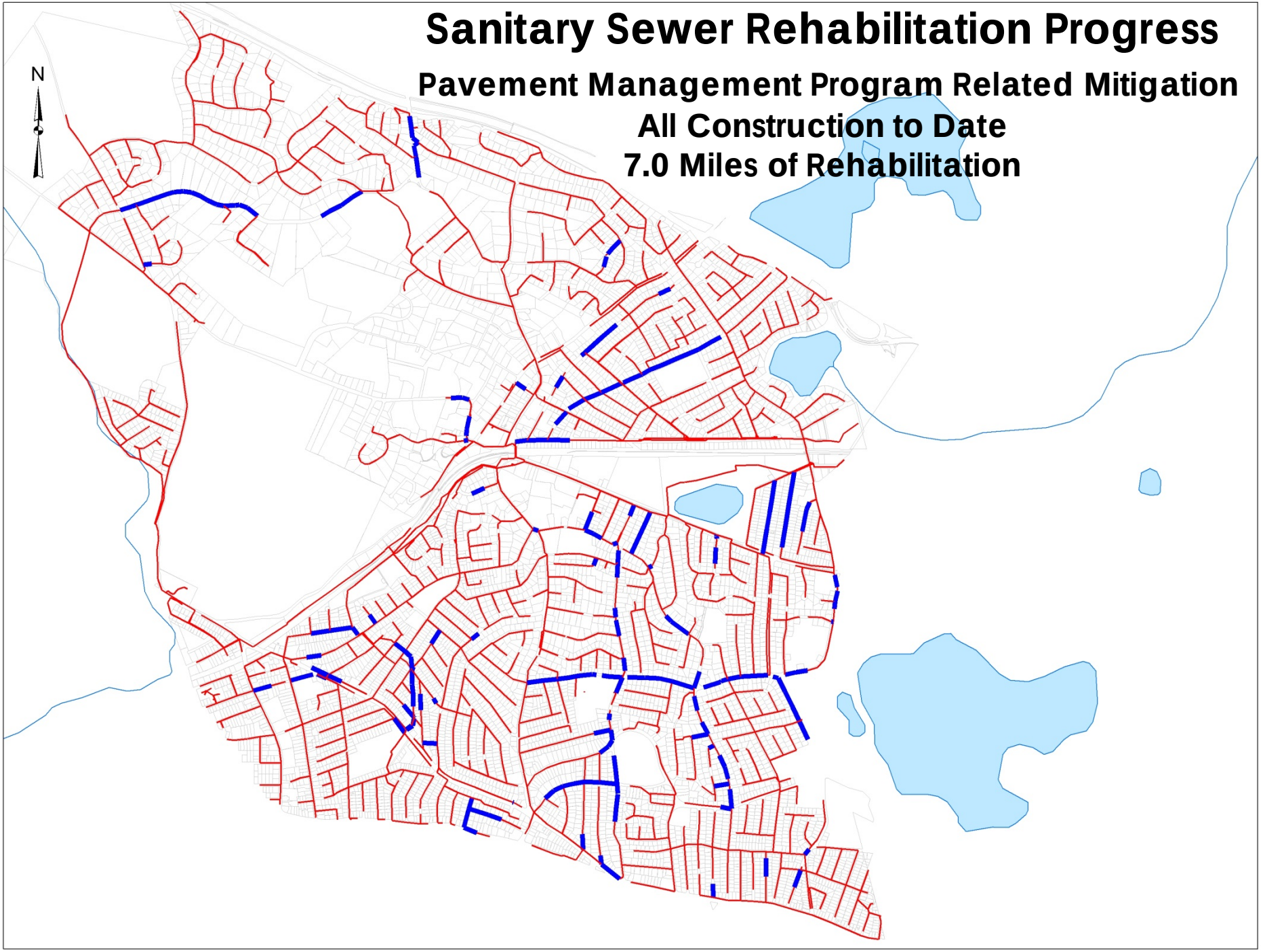
The main purpose of this program is to correct structural deficiencies in the sanitary sewer and storm drain systems

Sanitary Sewer Rehabilitation Progress

Pavement Management Program Related Mitigation

All Construction to Date

7.0 Miles of Rehabilitation

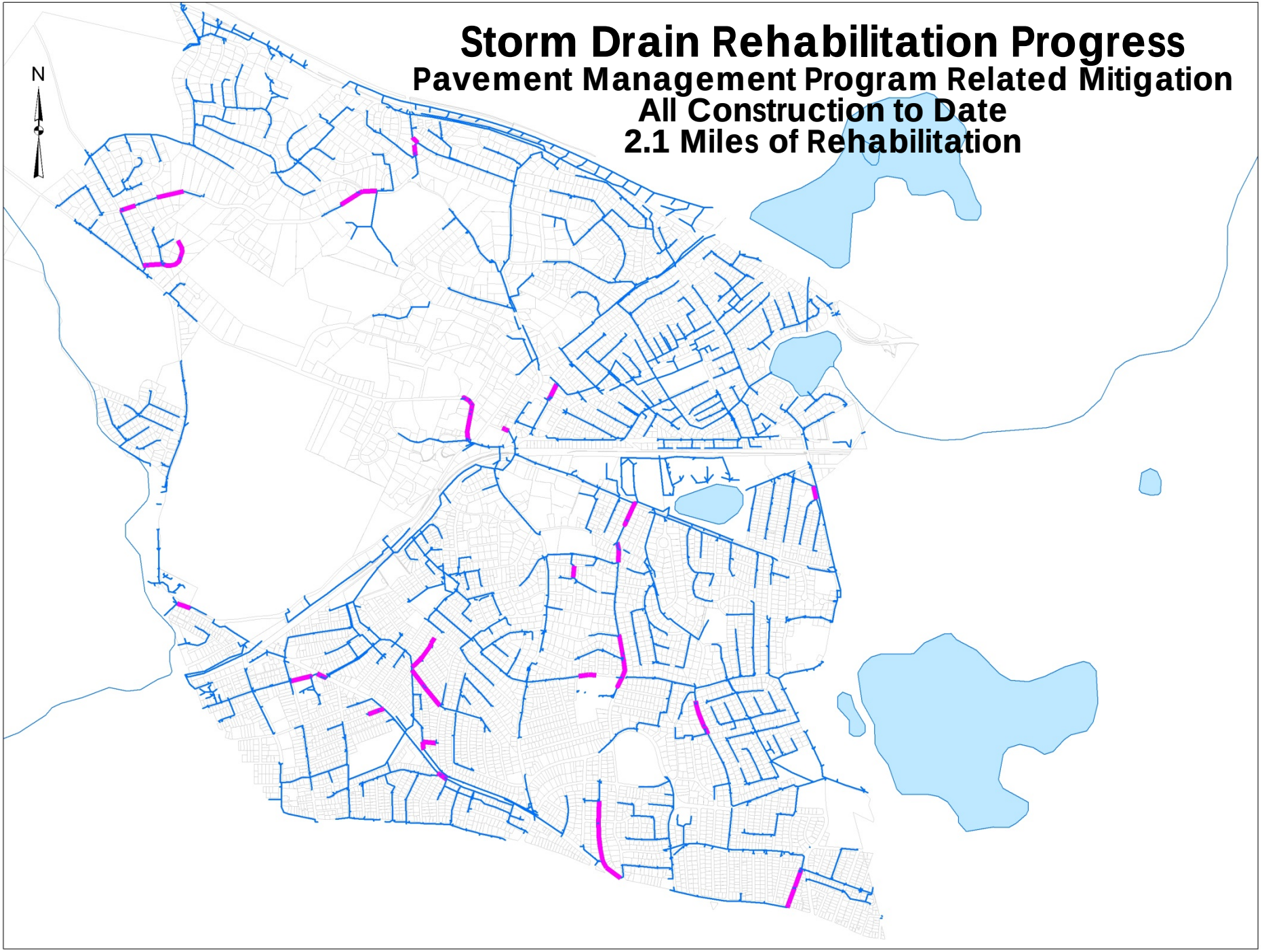


Storm Drain Rehabilitation Progress

Pavement Management Program Related Mitigation

All Construction to Date

2.1 Miles of Rehabilitation



Combined Investigations

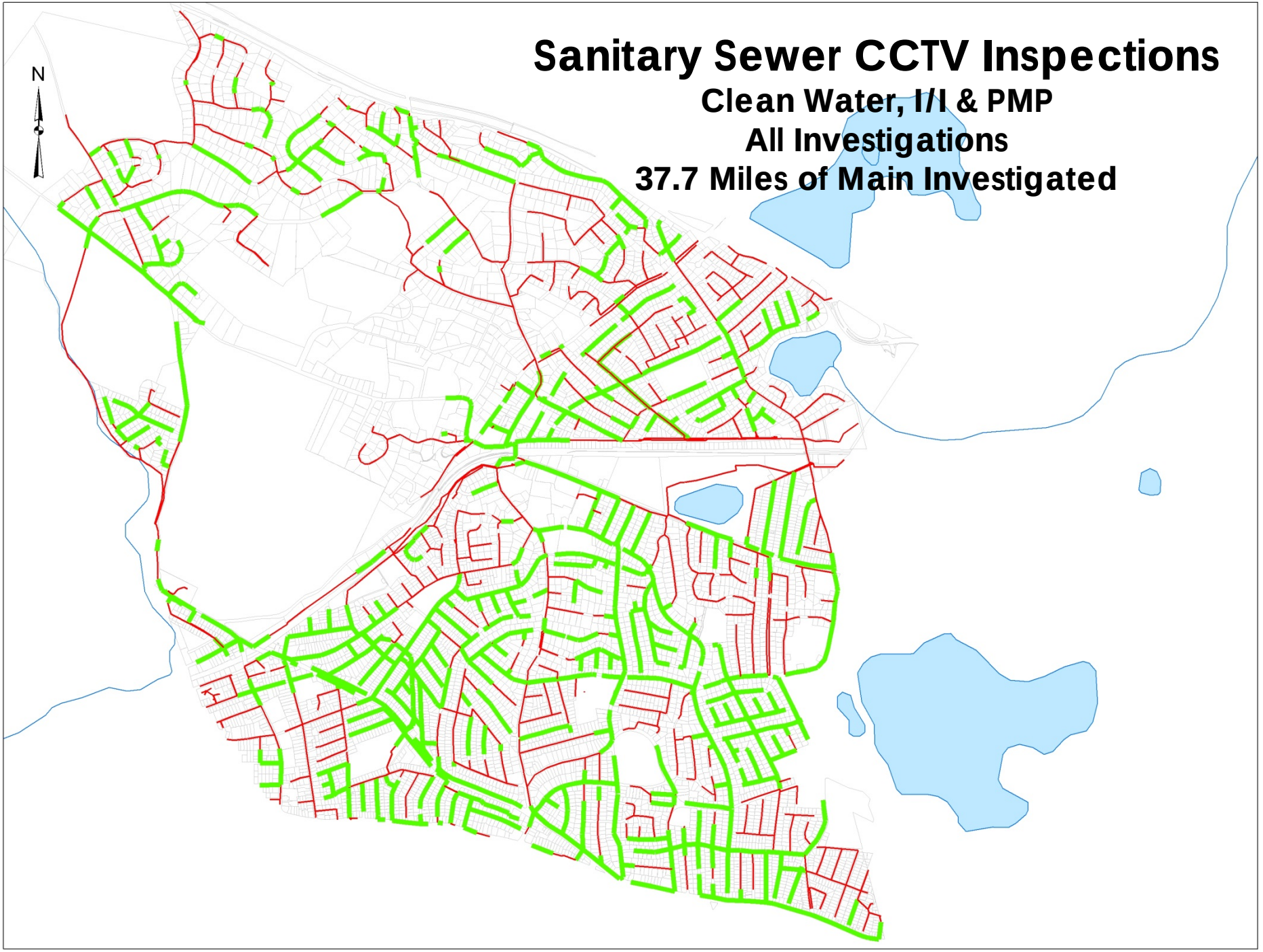
	Sanitary Sewer CCTV Inspected (% of Town)	Storm Drain CCTV Inspected (% of Town)
Clean Water	10.0 miles (13.0%)	8.8 miles (13.1%)
MWRA Inflow & Infiltration	9.2 miles (11.9%)	1.1 miles (1.7%)
Pavement Management Program	18.5 miles (23.9%)	13.7 miles (20.4%)
Total	**37.7 miles (48.8%)**	**23.6 miles (35.1%)**

Sanitary Sewer CCTV Inspections

Clean Water, I/I & PMP

All Investigations

37.7 Miles of Main Investigated

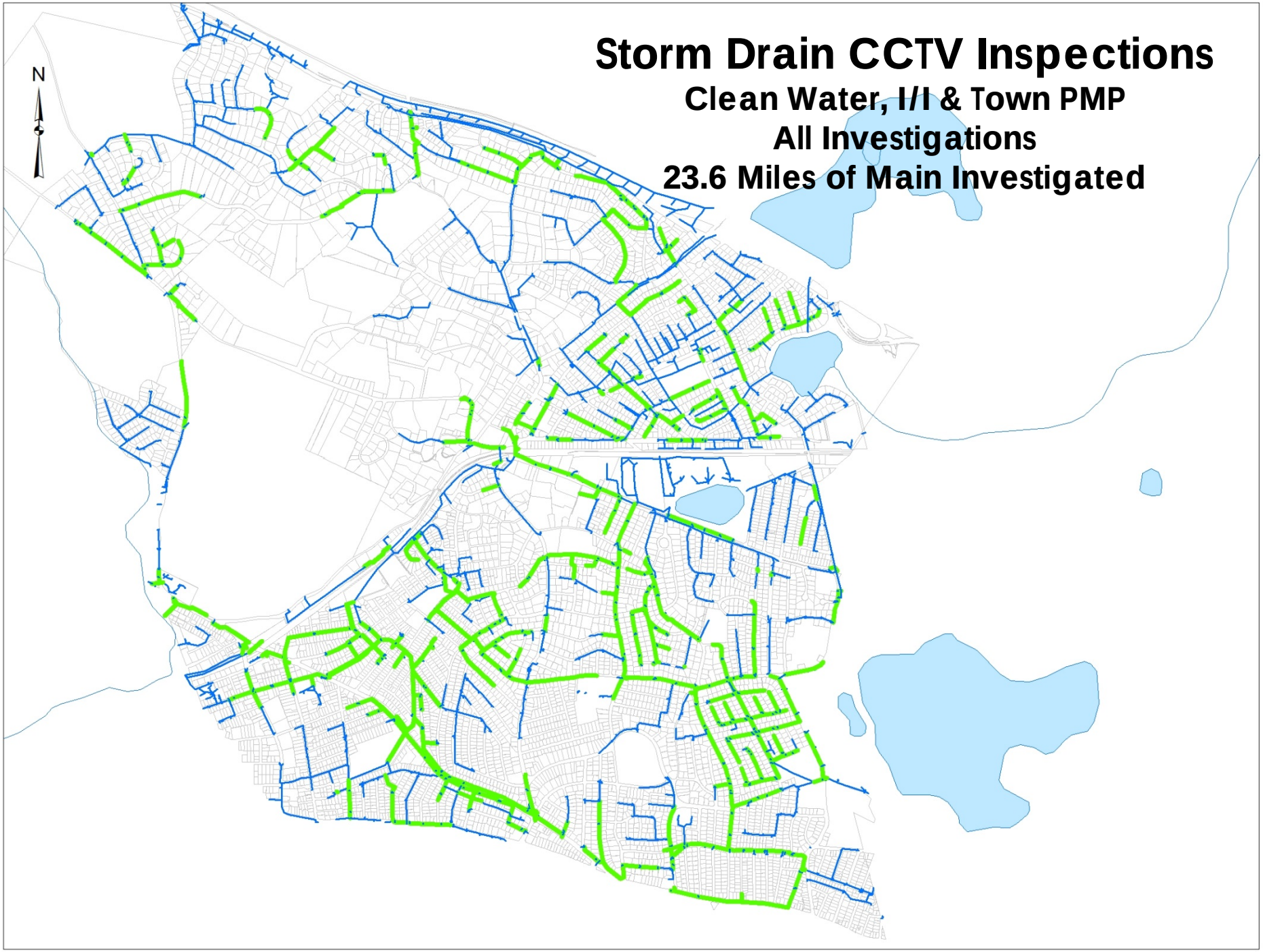


Storm Drain CCTV Inspections

Clean Water, I/I & Town PMP

All Investigations

23.6 Miles of Main Investigated



Combined Rehabilitation

	Sanitary Sewer (% of Town)	Storm Drain (% of Town)
Clean Water	10.0 miles (13.1%)	2.2 miles (3.2%)
MWRA Inflow & Infiltration	3.0 miles (3.9%)	0.8 miles (1.2%)
Pavement Management Program	7.0 miles (9.0%)	2.1 miles (3.1%)
Total	**20.0 miles (26.0%)**	**5.1 miles (7.5%)**

Additional Rehabilitation

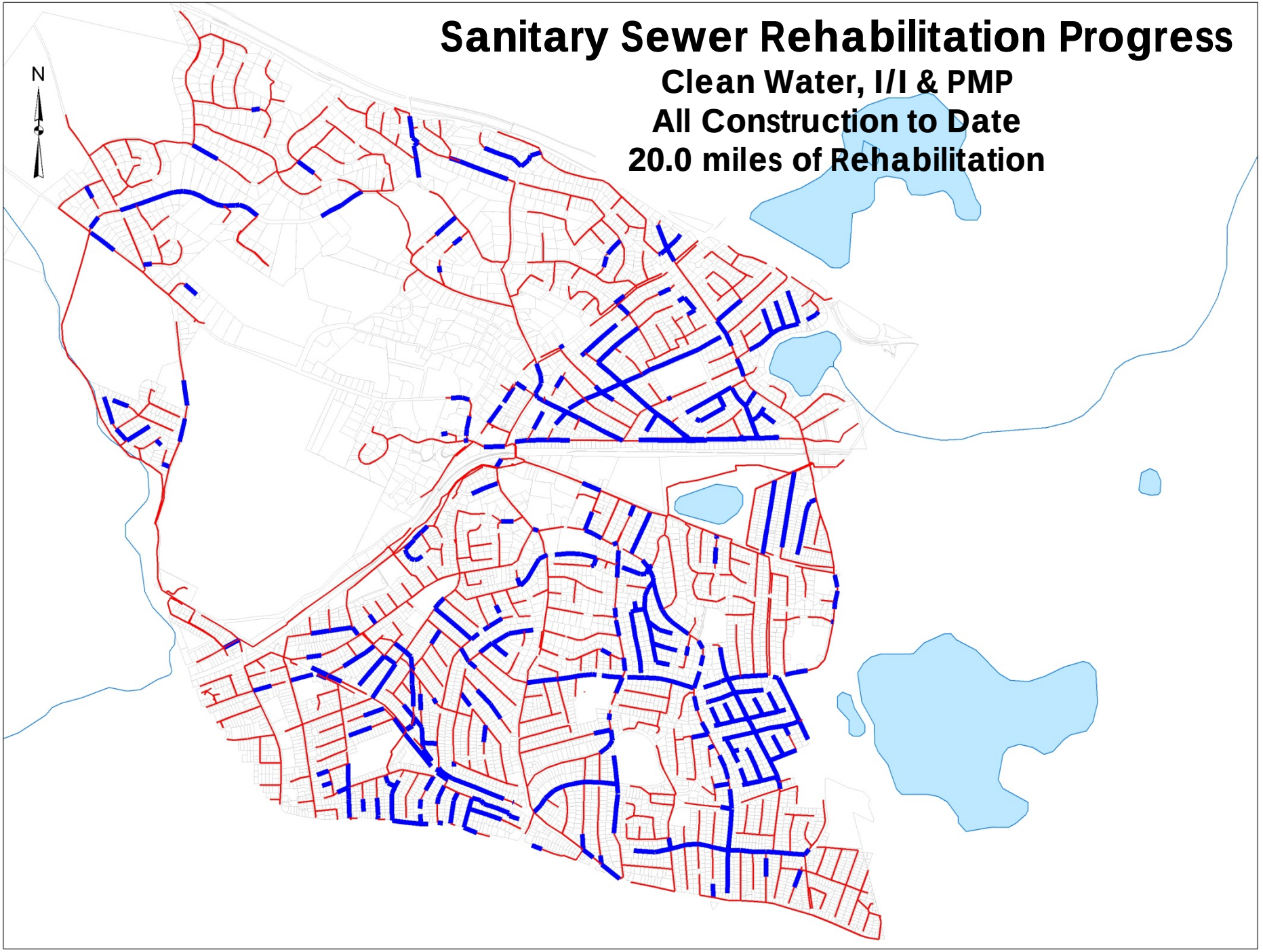
- Services Replaced = 500
- Services Lined = 120
- Manholes Rehabilitated = 150

Sanitary Sewer Rehabilitation Progress

Clean Water, I/I & PMP

All Construction to Date

20.0 miles of Rehabilitation

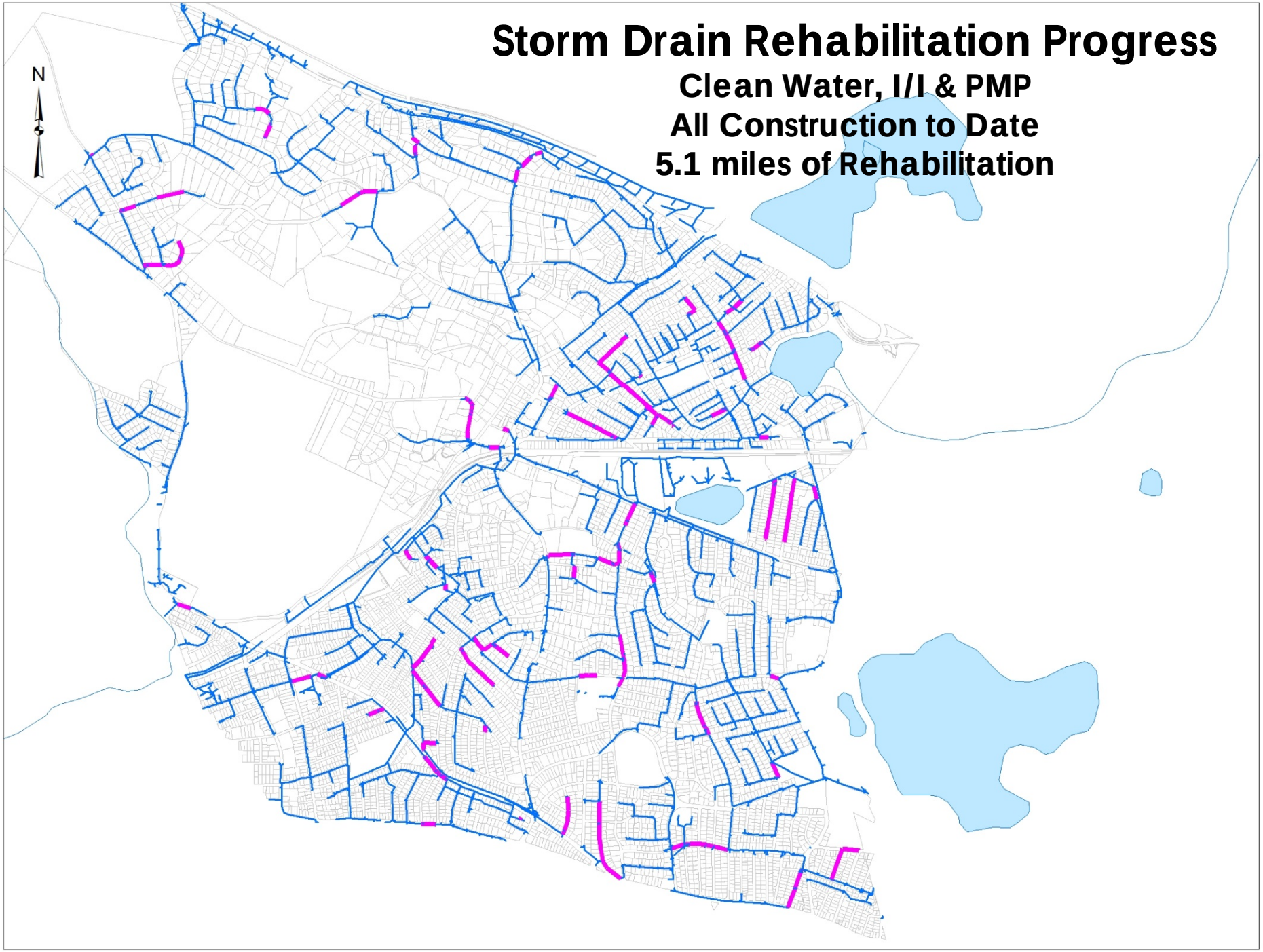


Storm Drain Rehabilitation Progress

Clean Water, I/I & PMP

All Construction to Date

5.1 miles of Rehabilitation



Final Thoughts

Establishing a standardized scope of work for a sewer capital replacement program is difficult

- With drinking water, the Town has used specific parameters for rehabilitation; age, type of pipe material, etc.

A sewer system has different concerns

- The material, vitrified clay, is fairly consistent
- Age is not always a factor; some pipe has held up better than others

Final Thoughts

Investigation based on multiple factors is required before one can say conclusively that a sewer pipe needs replacing

EPA Clean Water issues take priority over a general rehabilitation program.

- Sources are a moving target and require ongoing investigation
- Storm water bylaw addresses illicit connections
  - Replacement of services
  - Enforcement

Final Thoughts

MWRA I/I removal funds are a cost effective source for sewer repairs

Pavement Management Program work would also have priority

All current funding comes from the Sewer Enterprise Fund

- Capital Money - $300,000
- Current Debt Service on DEP and MWRA loans - $1 Million

Balance between rehabilitation efforts and the impact on sewer/water ratepayers

Stormwater Management

This is a program with an entirely different focus than the three sewer and drain rehabilitation programs

- Aimed at mitigating impacts from storm water *before* it enters the storm drain system
- Currently no separate source of funding
  - Funding drives the policy of identifying and implementing projects

Stormwater Management

Some communities have created a stormwater utility to fund projects

Stormwater Management and Erosion Control Bylaw

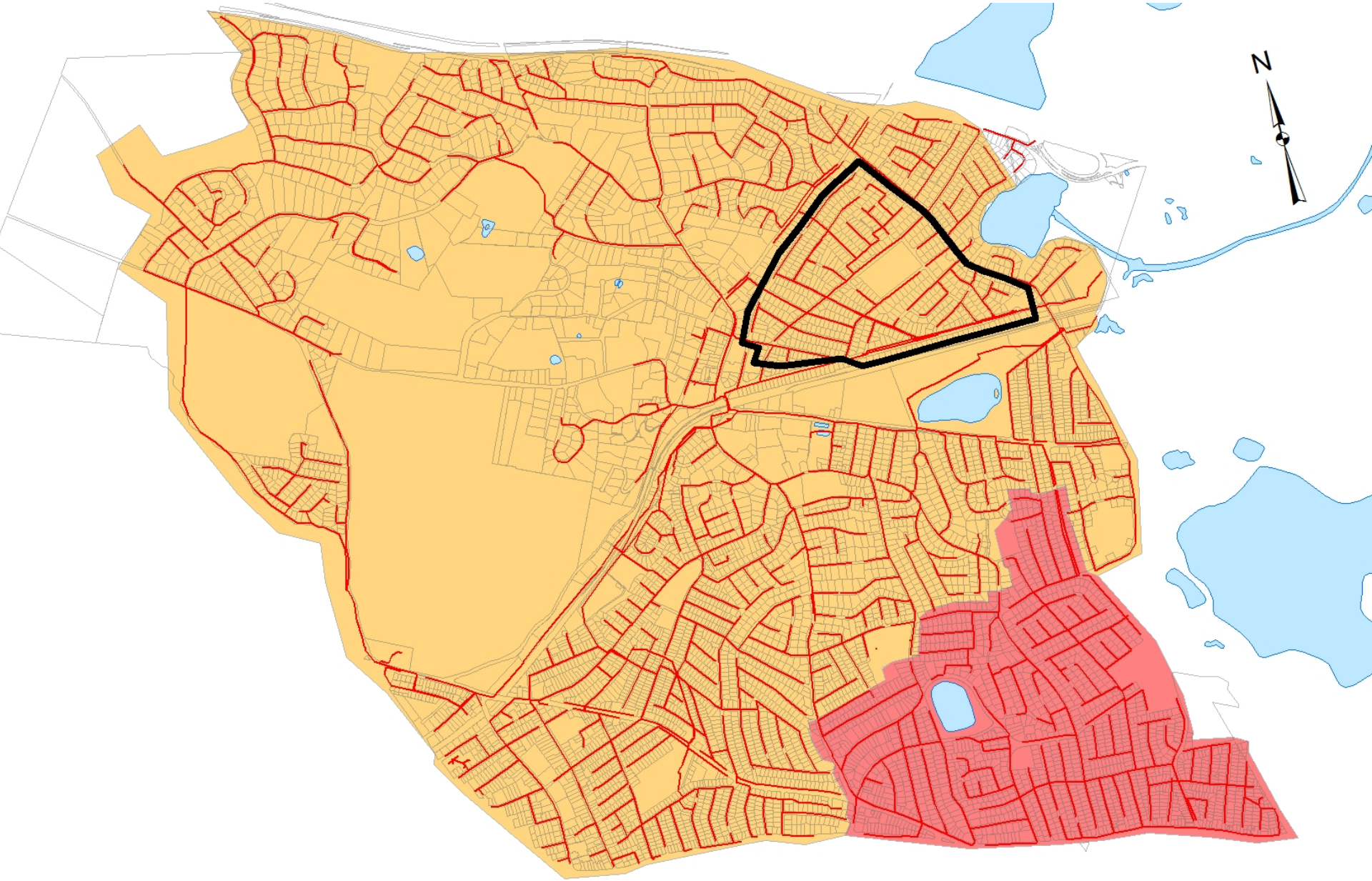
- Adopted by Town Meeting
- Excellent effort to put focus on the issue
- Required by EPA

Winn Brook Area

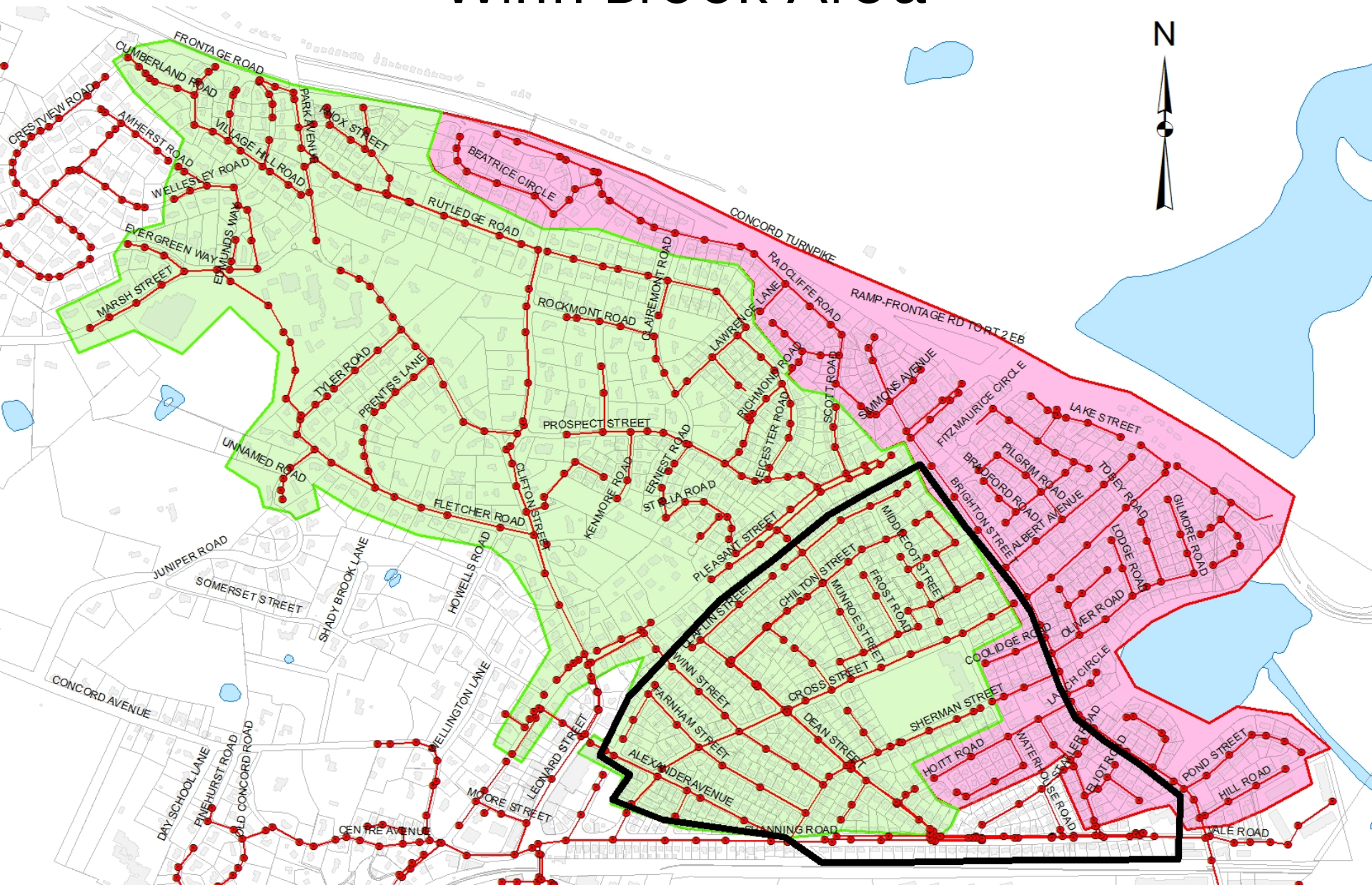
Neighborhood Characteristics

- Low-lying area in Northeast Belmont
- Close proximity to MWRA Flanders Road
- 85% of Belmont tributary to Flanders Road
- Extensive upstream sewer system
- Two different sewer subsystems

Winn Brook Area



Winn Brook Area



Reported Backups

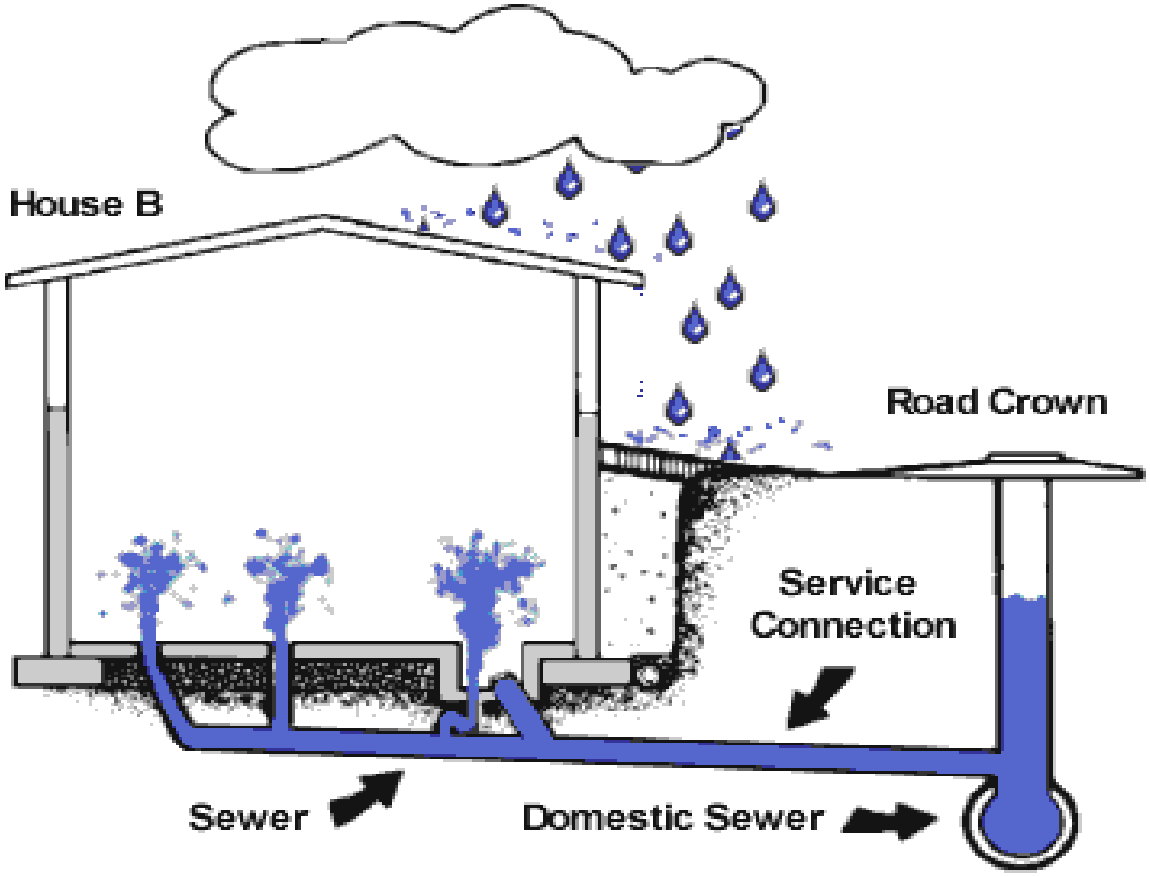
Dates	Number	Rainfall (inches)
October 1996	29	10
June 1998	42	8
March 2001	32	7
May 2006	11	12

Winn Brook Area

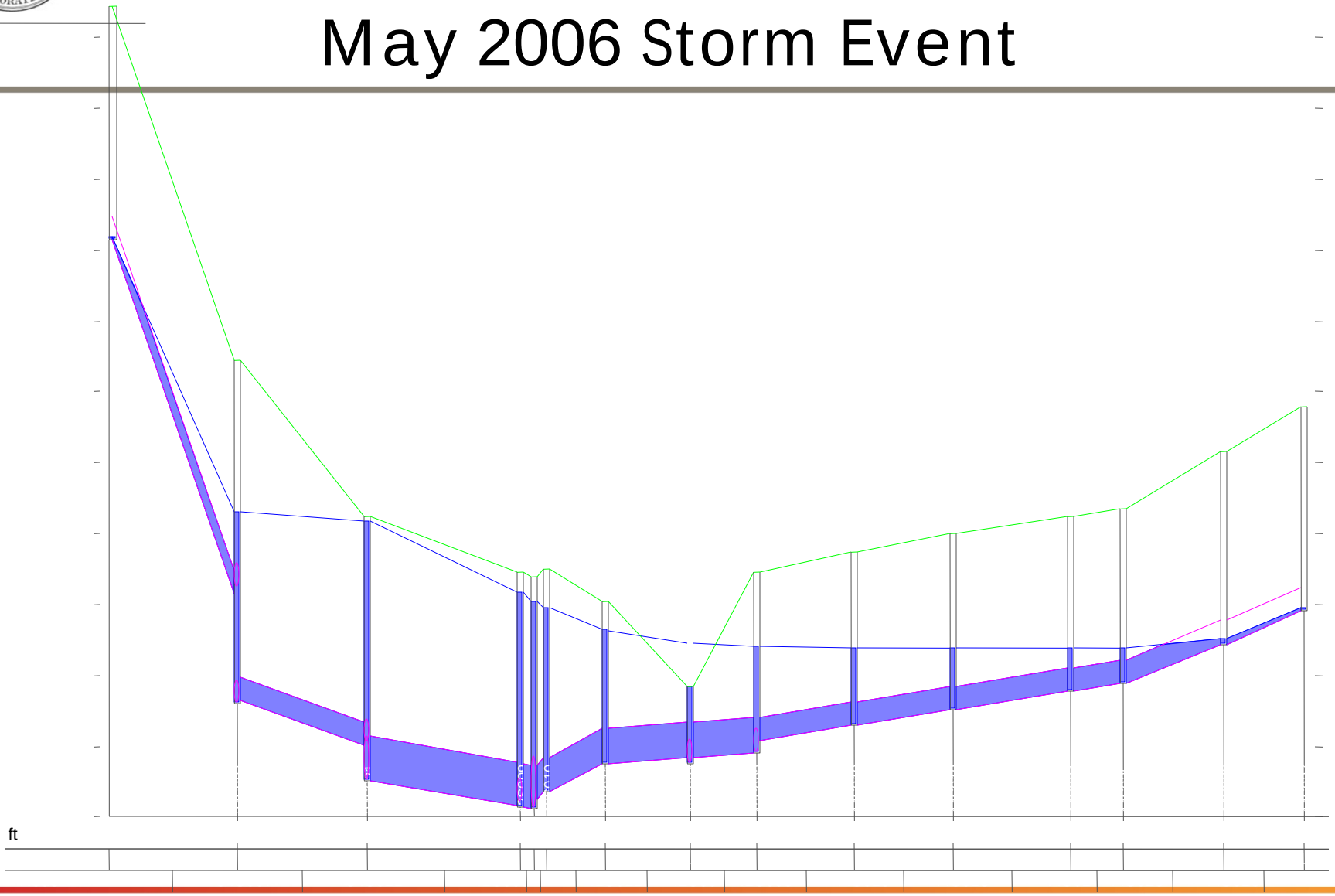
House Inspections

- 95 Houses have reported backups
- 69 Inspections conducted (73%)
- 49 Confirmed sewer overflows

Elevated Hydraulic Grade Line



Cross St. Hydraulic Profile
May 2006 Storm Event



Winn Brook Area

Increased Hydraulic Grade Line Creates Sewer Overflows

- System Capacity Constraints
- Infiltration/Inflow in Belmont
  - 2007 Flow Monitoring Program
- Elevated downstream hydraulic grade line

Winn Brook Area

Solution Constraints

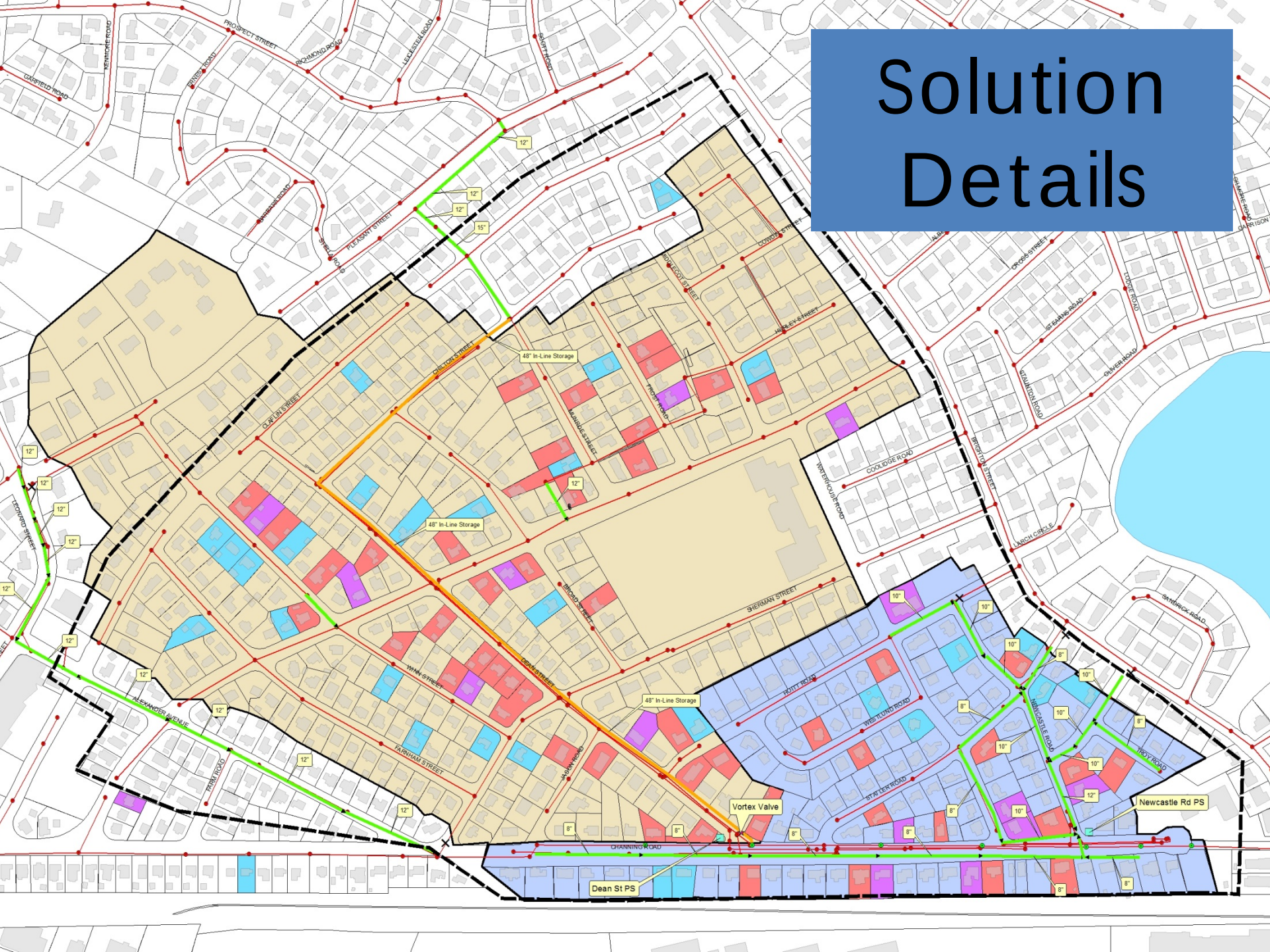
- No significant increase in flow to MWRA interceptor or transference of problem to Cambridge
- No transference of problem within Belmont
- InfoWorks Model

Winn Brook Area

Winning Combination of Mitigation Concepts

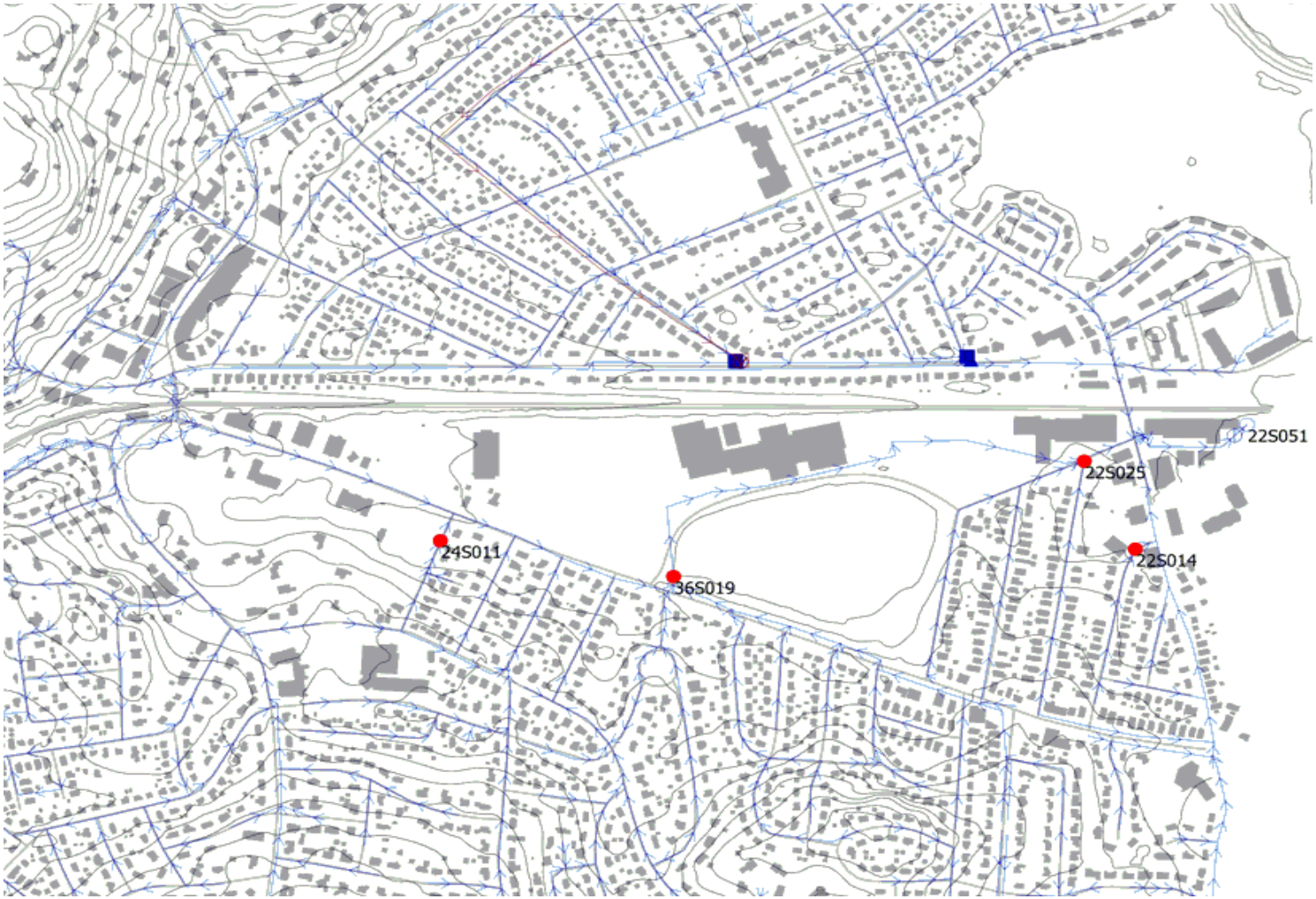
- Flow diversion(Alexander St. & Dean St.)
- Storage (Dean St. Box Culvert)
- Isolation and Pumping (3 Isolation chambers)
- I/I Removal

Solution Details



Baseline Conditions

Early Alternatives Analysis



Final Solution – 15% I/I Reduction

Winn Brook Area

Construction Cost (completed 12/2011)

Winn's Brook Sewer Overflow Mitigation Facilities	$4.9 Million
Town wide I/I Removal	$1.1 Million
TOTAL	$6.0 Million

QUESTIONS?

Glenn Clancy, P.E.
617-993-2659
gclancy@belmont-ma.gov

Justin Gould, P.E.
781-221-1083
Justin.Gould@stantec.com