# All Over Over-Unders!

## Addressing I/I, Water Quality, and CSO Abatement with an Over-Under Manhole Program


**Shawn T. Syde, P.E.**

**Karilyn Heisen, P.E.**

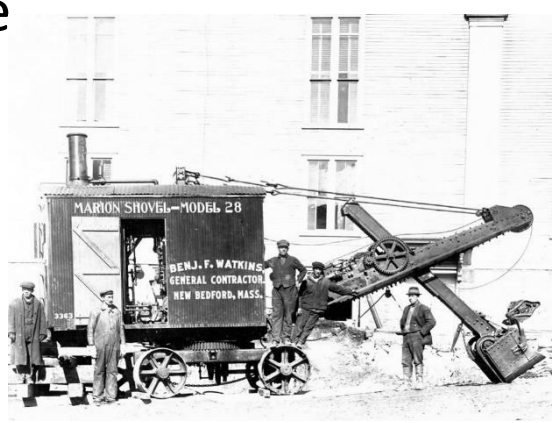
January 27, 2020

# Presentation Outline

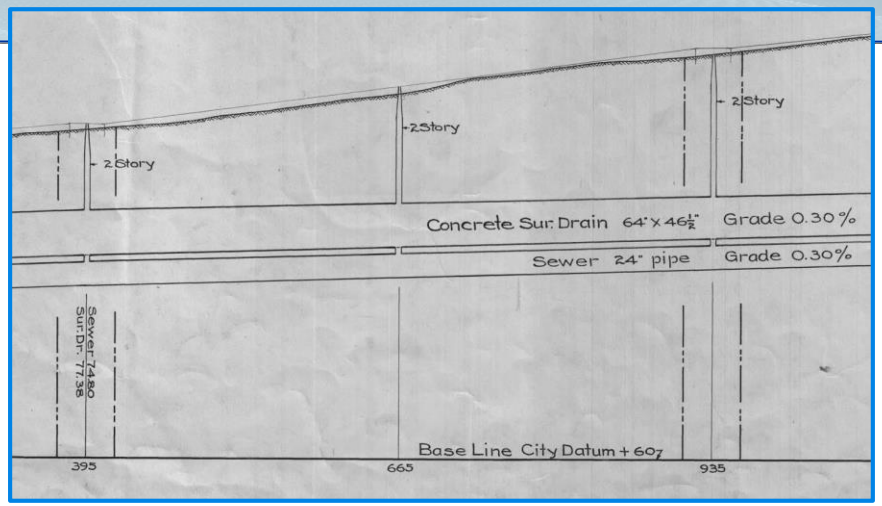
- Overview of City System
- Over-Under Manhole Types
- Study Overview
- Example Area – Outfall 026
- Next Steps

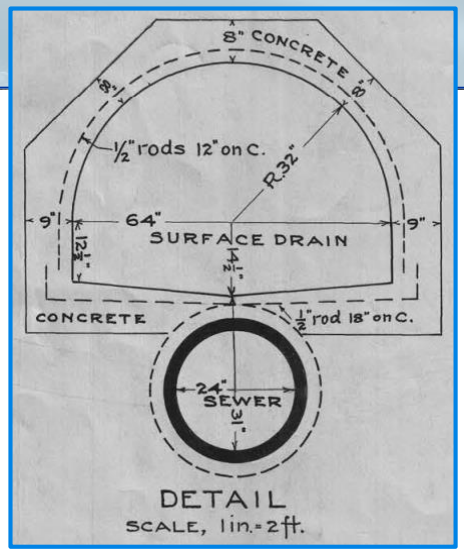
# New Bedford Collection System 101

- System constructed primarily between 1880s and 1960s
- 350 miles of pipe ranging in size from 6-in to 96-in serving approximately 100,000 people in three communities
- 29 pumping stations
- 11.5 miles of force/pressure mains
- 71 regulators flowing to 27 outfalls
- Intertwined network of interceptors, weirs, and pumping stations configured to maximize flow capture and conveyance to City's WWTP



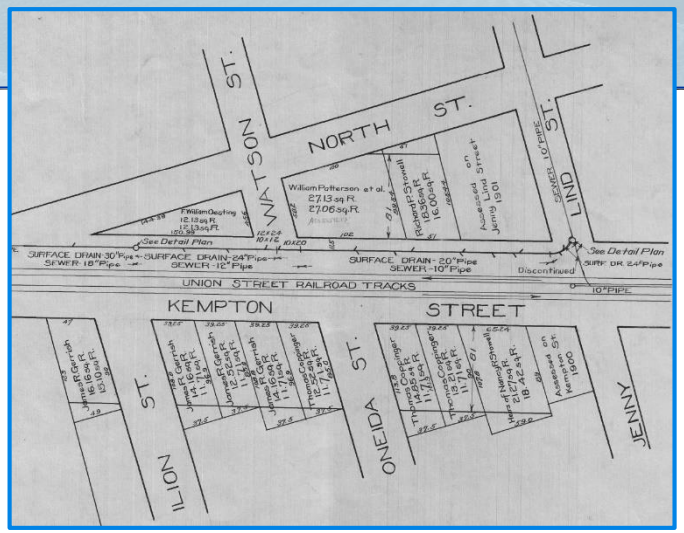
# What is an Over-Under Manhole?



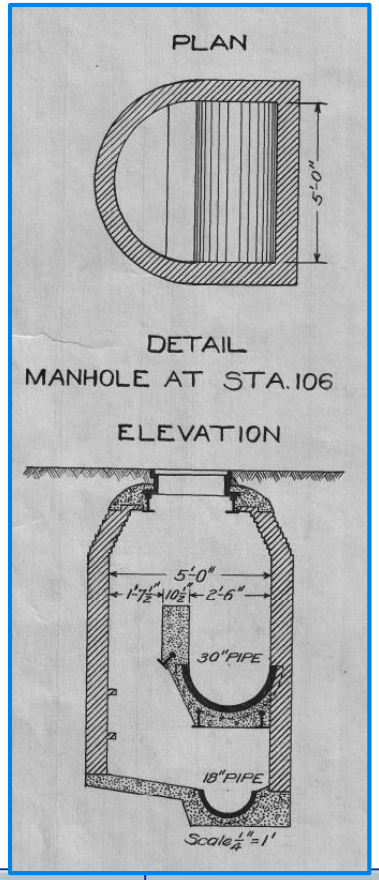



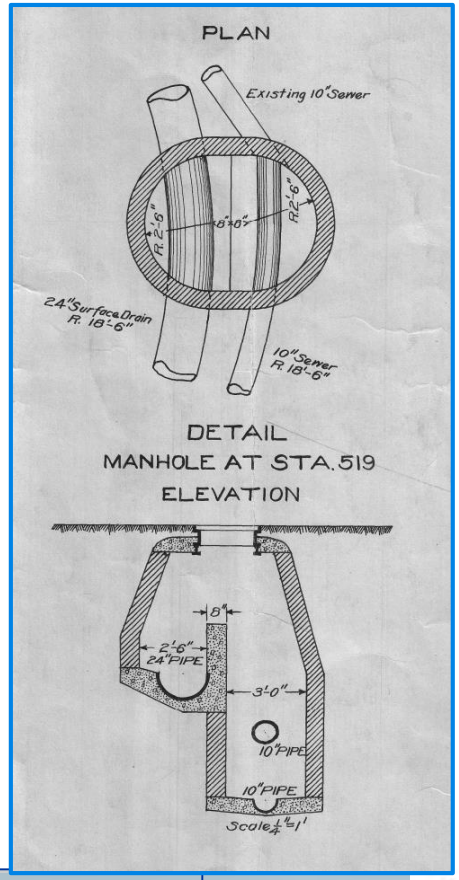


# What is an Over-Under Manhole?

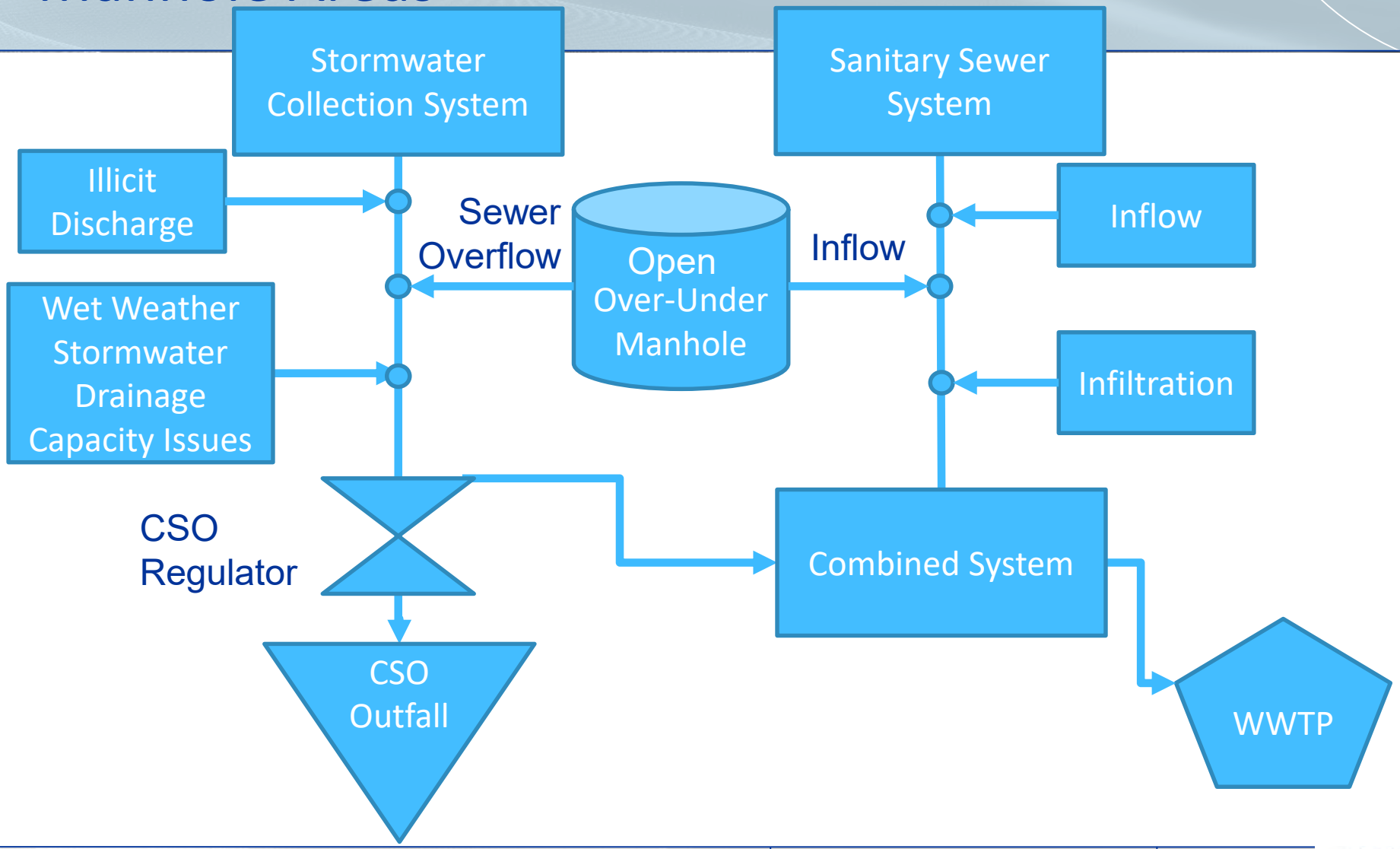






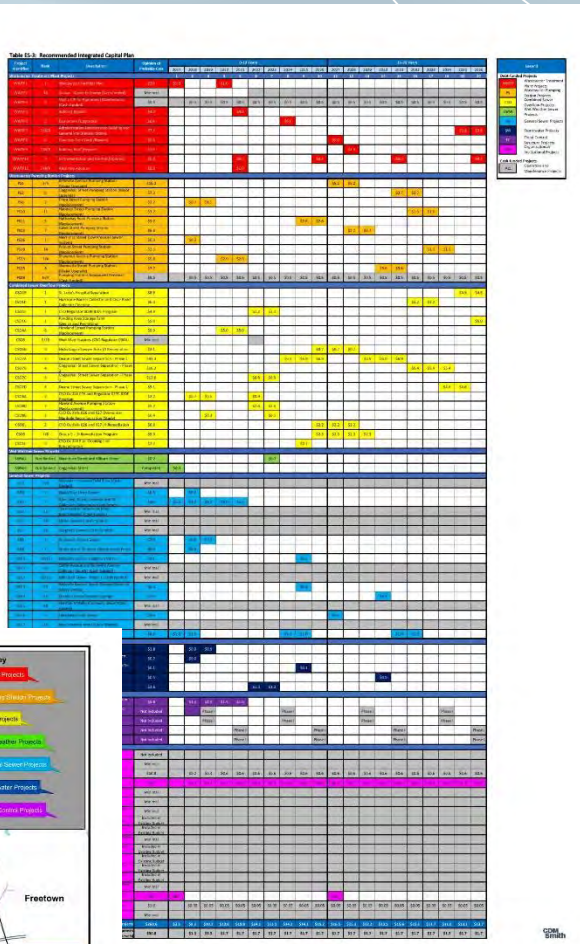



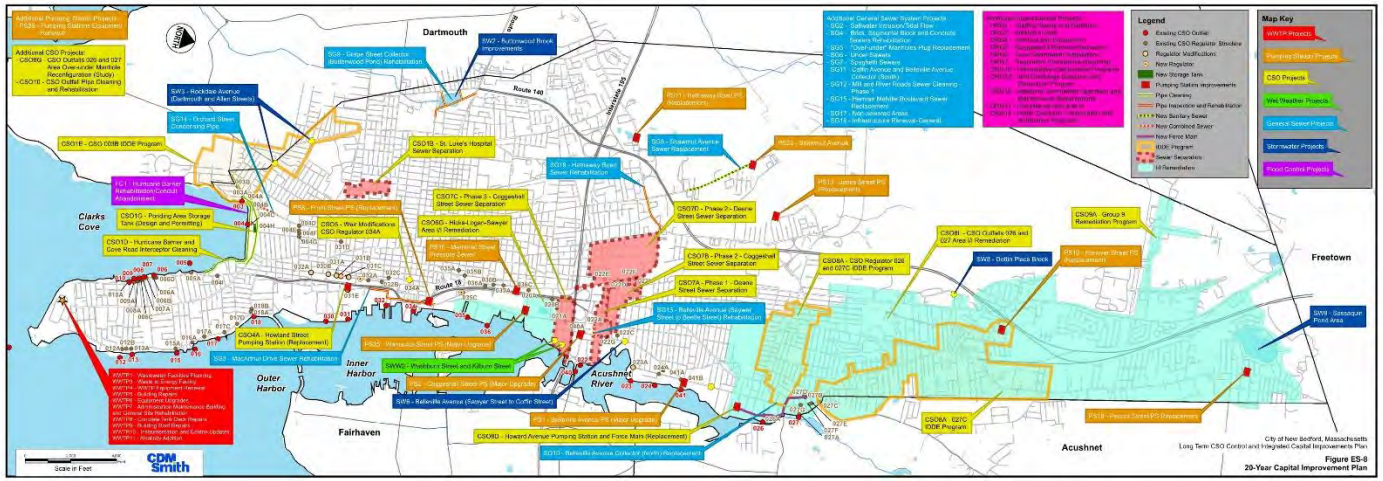
# General Collection System Layout for Over-Under Manhole Areas



# Why is New Bedford "All Over" Over Unders?

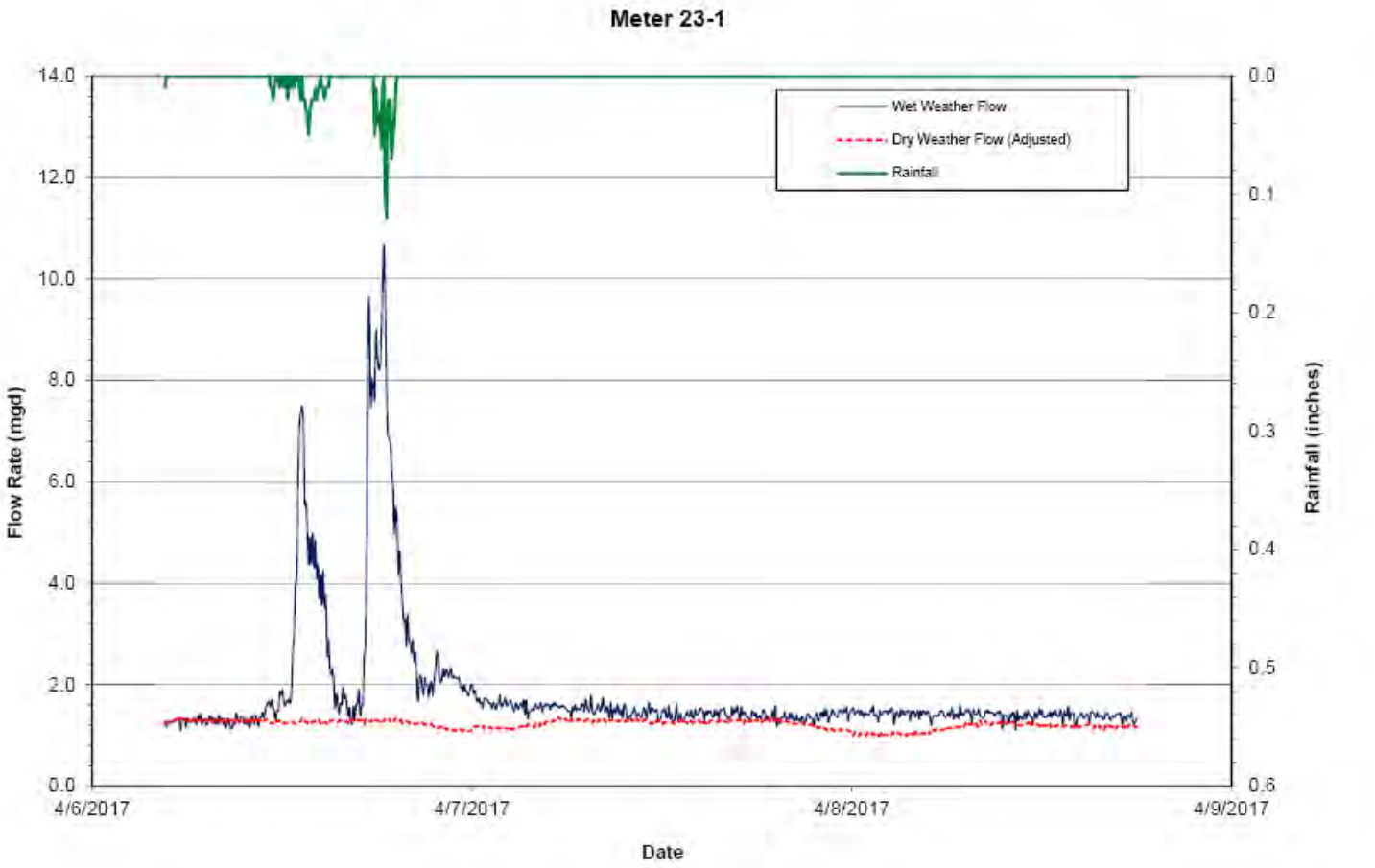
- CSO Abatement
  - Long Term CSO Control and Integrated Capital Improvements Plan – 2017
  - Recommended 20-year Plan
  - 17 MG from CSO 026 alone!!





# Why is New Bedford "All Over" Over Unders? (Cont.)

- Significant Source of Inflow



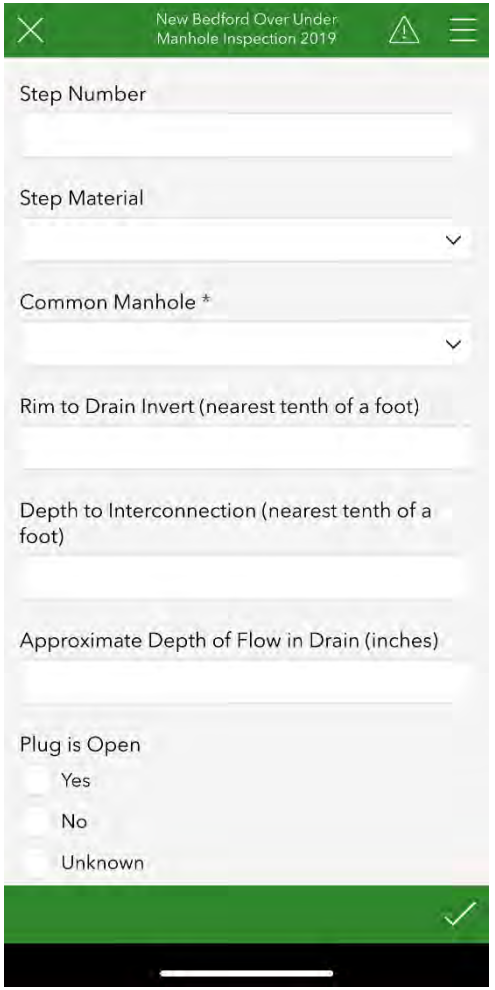
# Why is New Bedford "All Over" Over Unders? (Cont.)

- Maintenance Issues
  - Lack of access for cleaning and inspection
  - Broken pipes
  - Prone to blockages


# OVER-UNDER MANHOLE STUDY

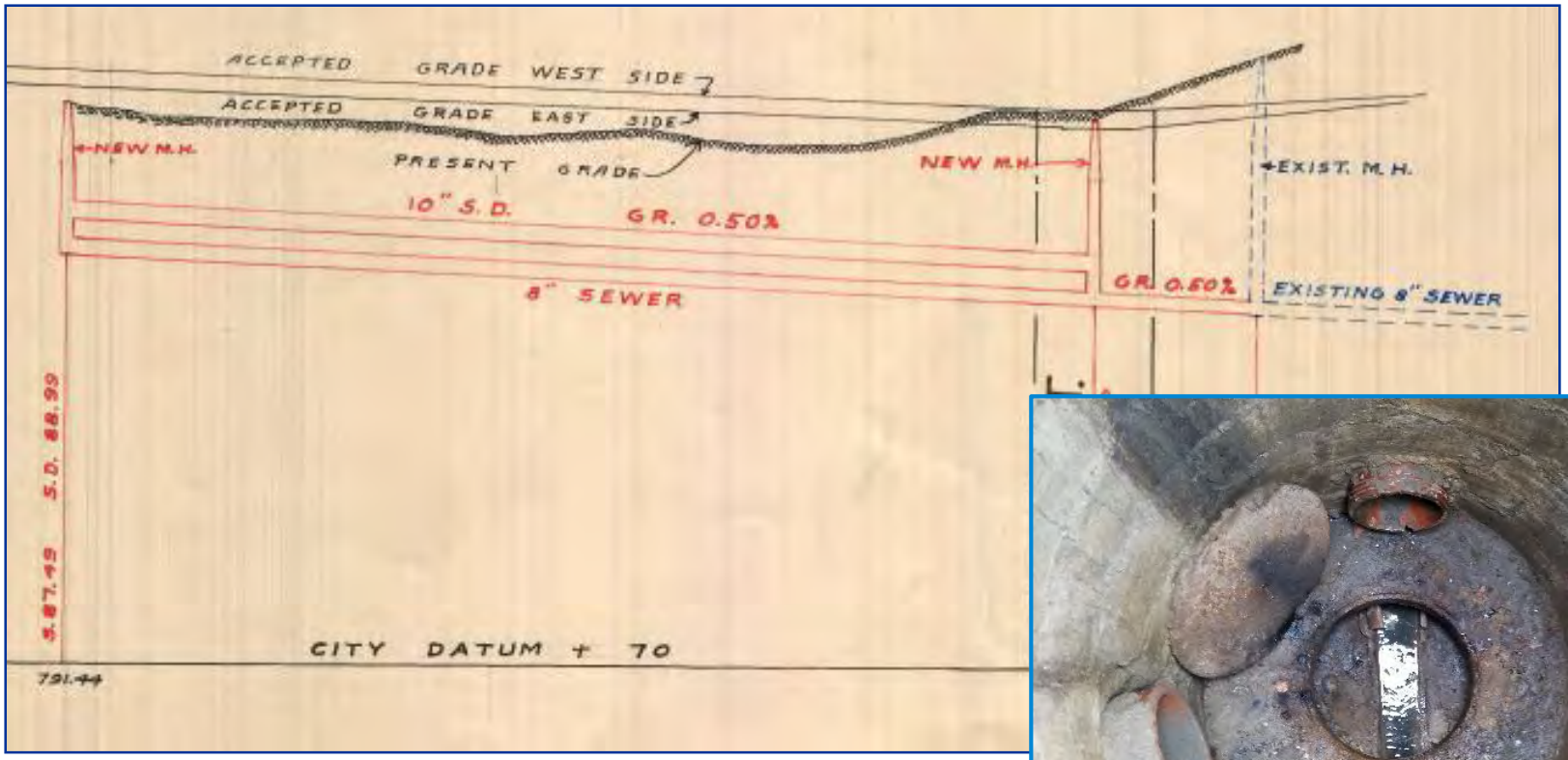
# Manhole Inspection Program

- 596 manholes identified in six areas of the City's sewer system
- NASSCO MACP Version 7.0
- Level 1 inspection of 596 manholes with 24 partial inspections
- Three months of field work



# Interesting Finds – Incorrect Connections


# Interesting Finds - Unconnected Drains



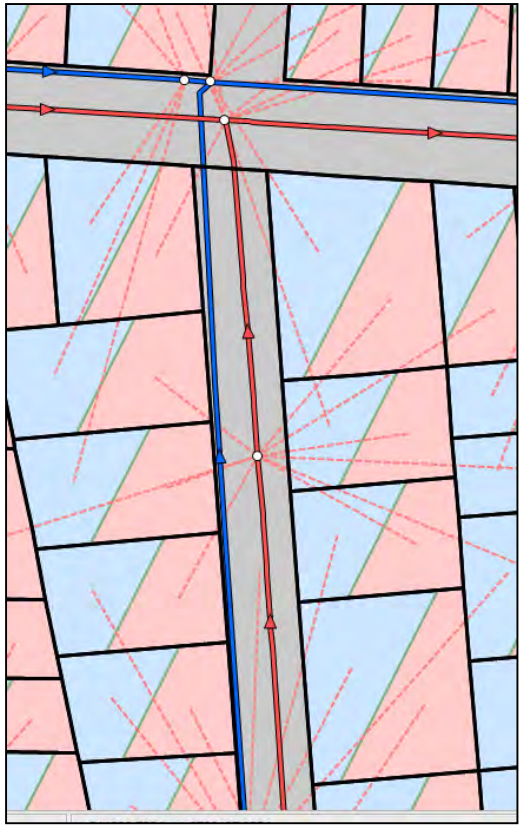

# Interesting Finds – Missing Covers/Broken Pipes

# Metering

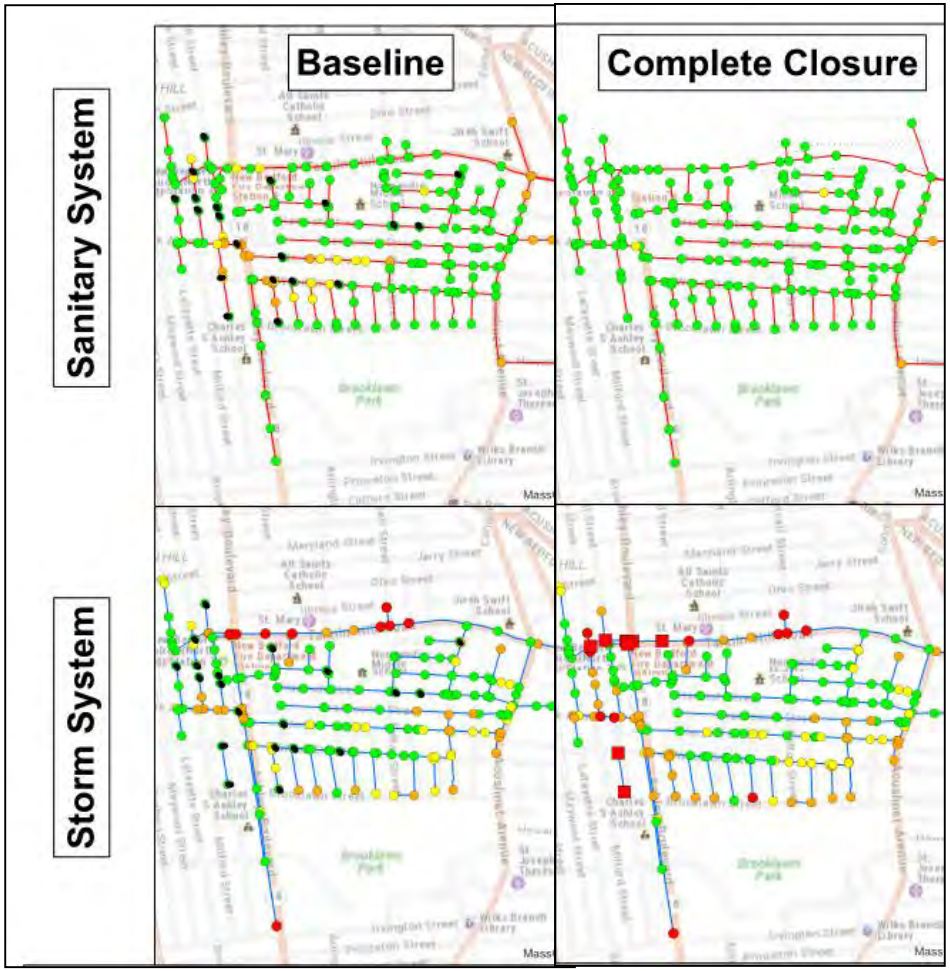
- Pairs of meters in the sanitary and storm system
- Area-velocity measurements
- Spring 2019
  - March to May
- No direct evidence of cross-flow

# SWMM Model Development

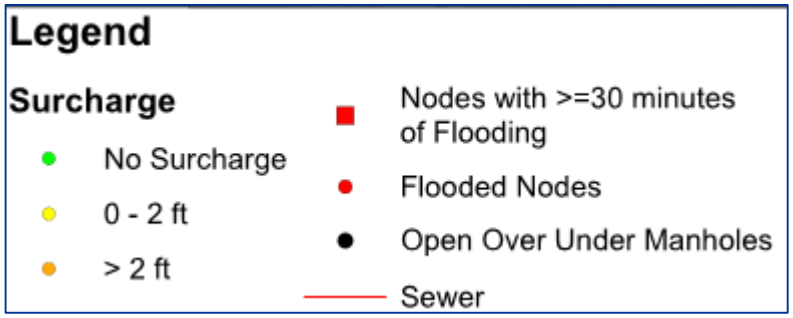
- Detailed GIS System data
- Catchments from city parcels
- Impervious coverage
- Six local models
  - 3 models calibrated to meter data
  - Extrapolated input parameters to other models
- City-wide SWMM model used for downstream boundary conditions



# Model Simulations and Findings




- Design Storms
  - 2-year
  - 6-month
  - 3-month
- Stormwater Flooding and Surcharge
- Sanitary System Capacity



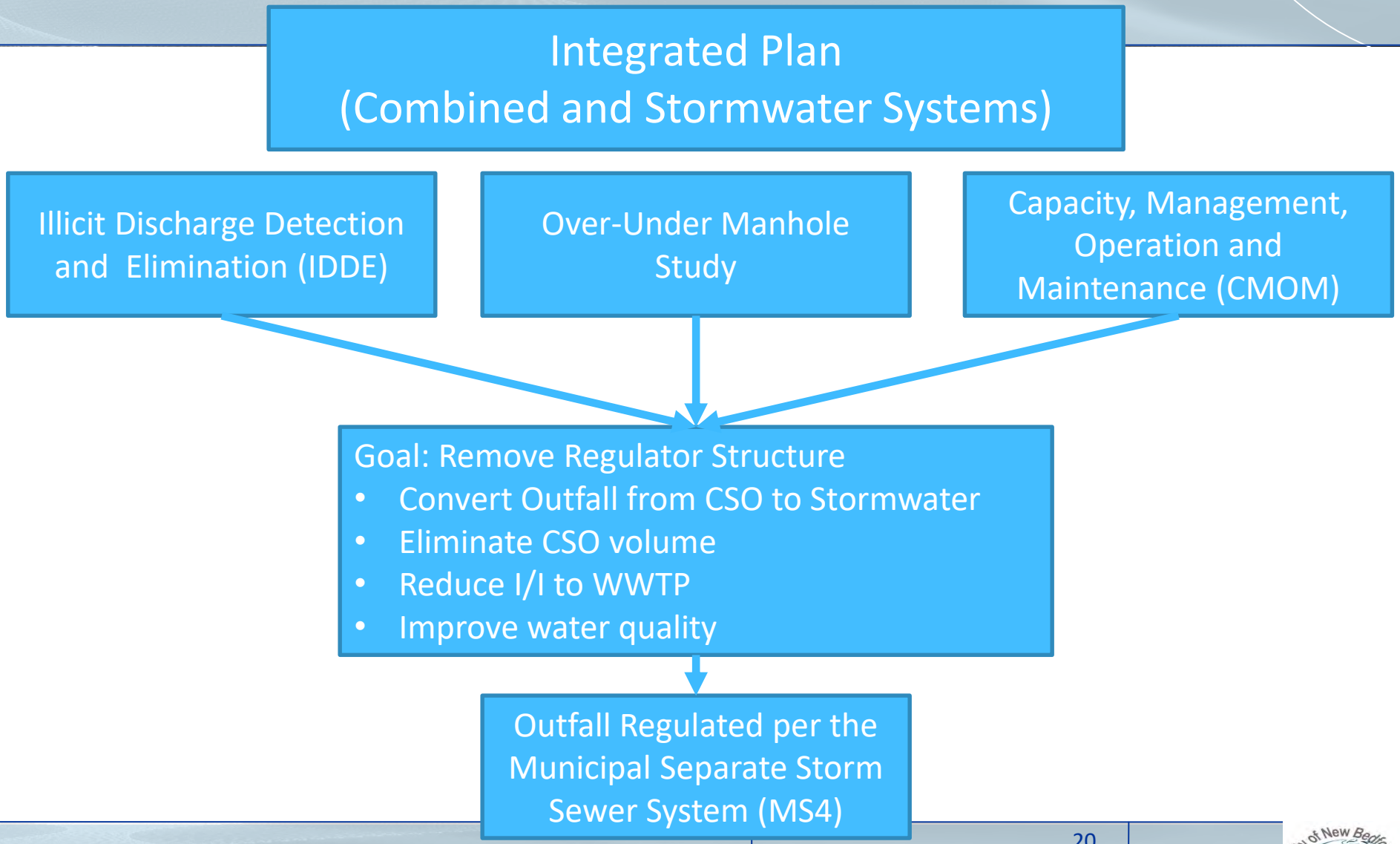

# EXAMPLE AREA – OUTFALL 026

# Goals and Issues in Outfall 026

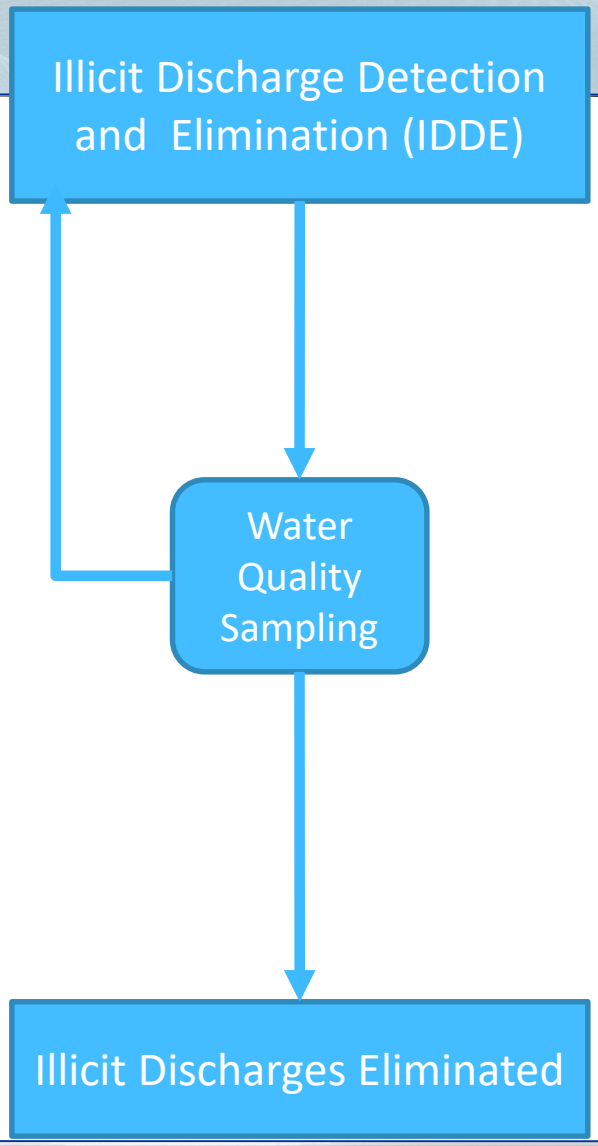
- Goal: Convert 026 CSO outfall into MS4 outfall
  - Will reduce CSO by at least 17 MG in a typical year


- Issues
  - Illicit Connections
  - 20 Open over-under manholes
  - Storm drain capacity

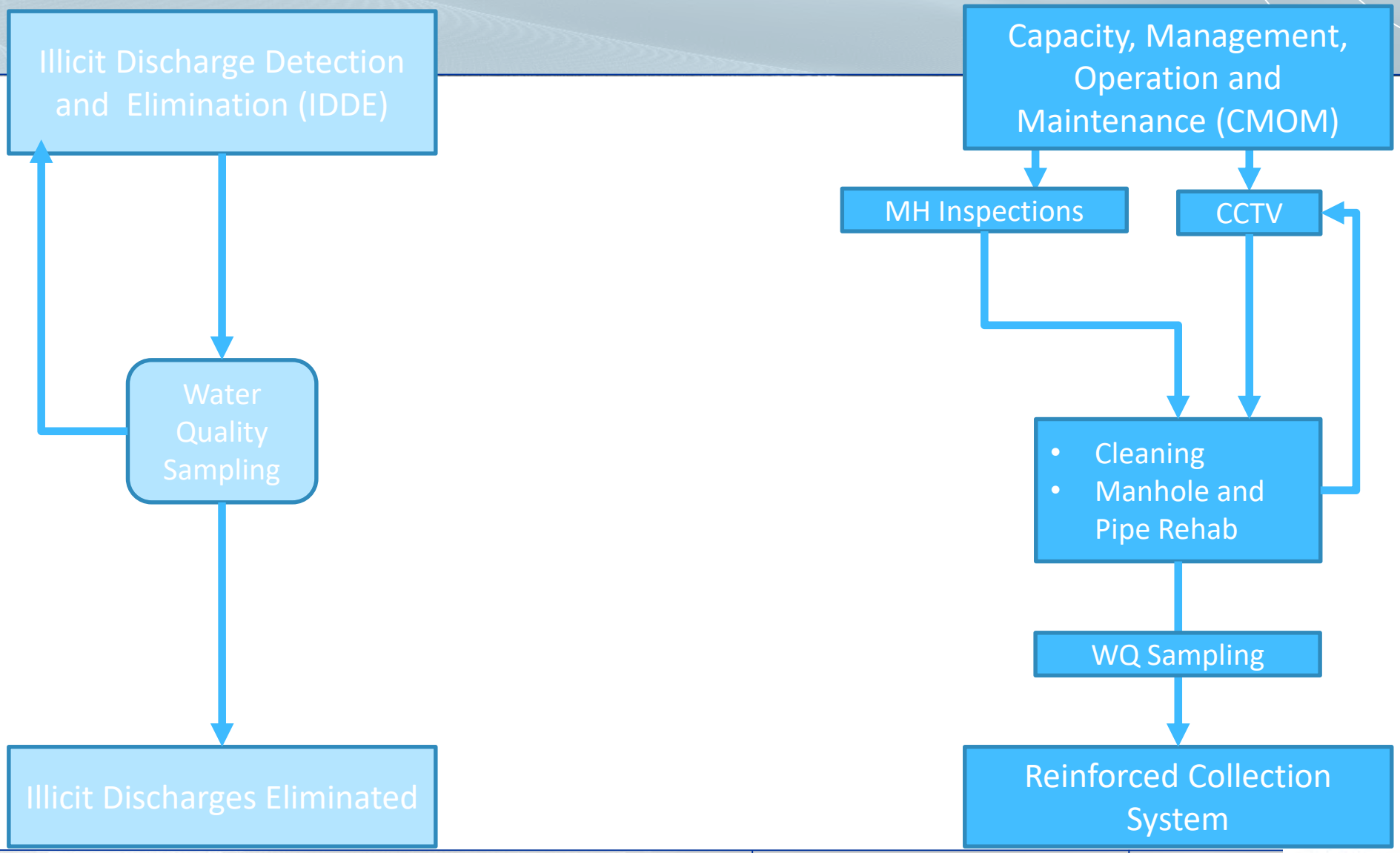
# Steps to Conversion to MS4 Outfall



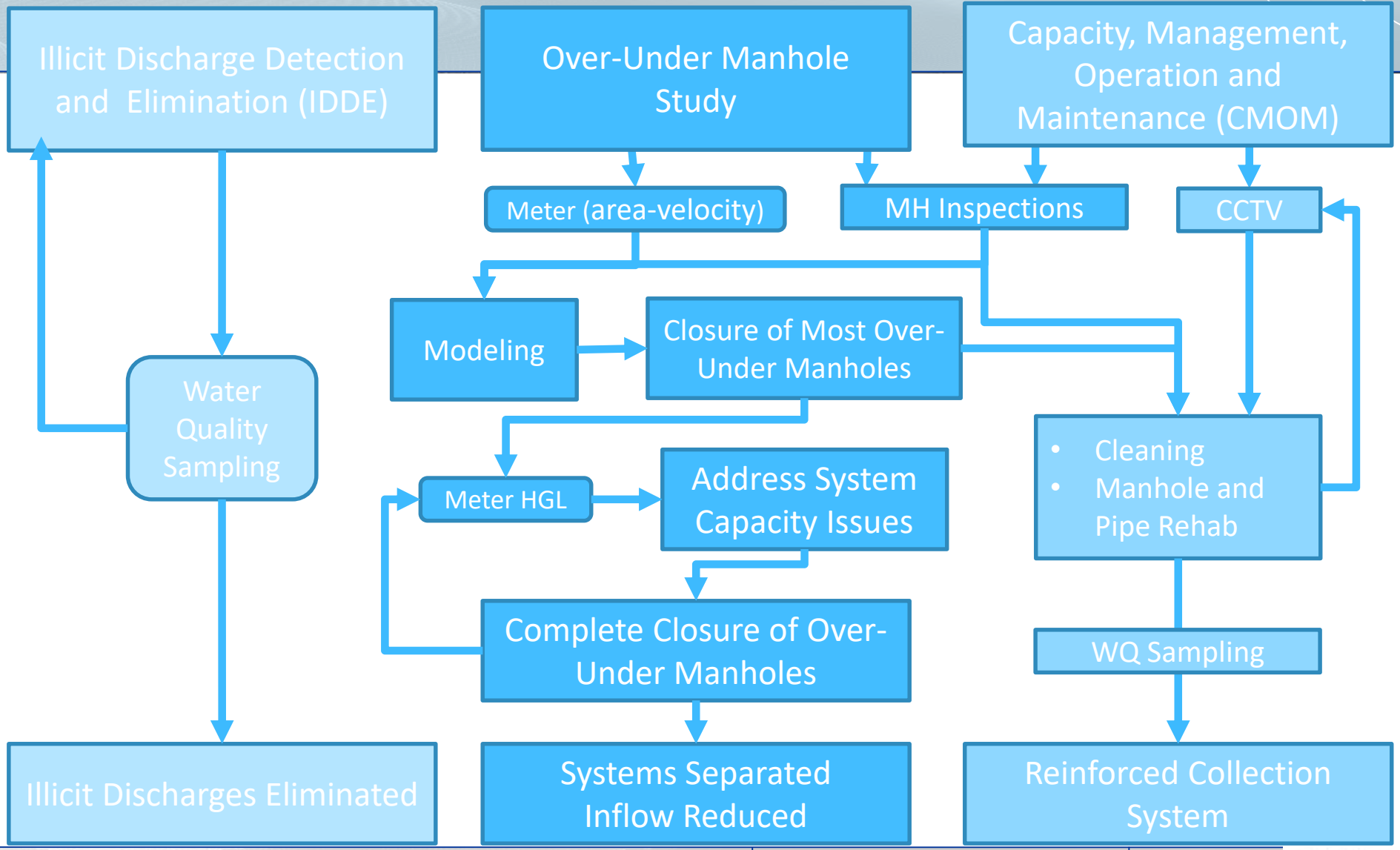
# Steps to Conversion to MS4 Outfall



# Steps to Conversion to MS4 Outfall



# Steps to Conversion to MS4 Outfall



# Validation and Final Conversion

- ✓ No Illicit Connections
- ✓ Sufficient Stormwater Capacity (Green Infrastructure?)
- ✓ Over-Under Manholes Closed
- ✓ All Manholes Inspected
- ✓ Repairs made to prevent future issues
- ✓ Validation through Water Quality Sampling

- ❖ Remove Regulator/Convert to MS4 Outfall
  - ❖ Eliminate CSO
  - ❖ Reduce I/I to WWTP
  - ❖ Improve Water Quality

# Next Steps

- Evaluate impacts to the entire system
- Complete IDDE inspections
- Begin CCTV inspections
- Stormwater capacity analysis
- Clean, repair and close open over-under manholes
- Assess maintenance access needs and construct improvements




# Acknowledgements

Shawn T. Syde, P.E.
City Engineer
shawn.syde@newbedford-ma.gov

Karilyn Heisen, P.E.
Senior Water Resources Engineer
heisenkj@cdmsmith.com

**Team Members**

- Jamie Ponte, Commissioner
- Justin Chicca, Superintendent of Wastewater
- Jesse Herman, CDM Smith

# Questions?