Application of Level Meters at CSO Locations to Provide Real-time Data on System Performance

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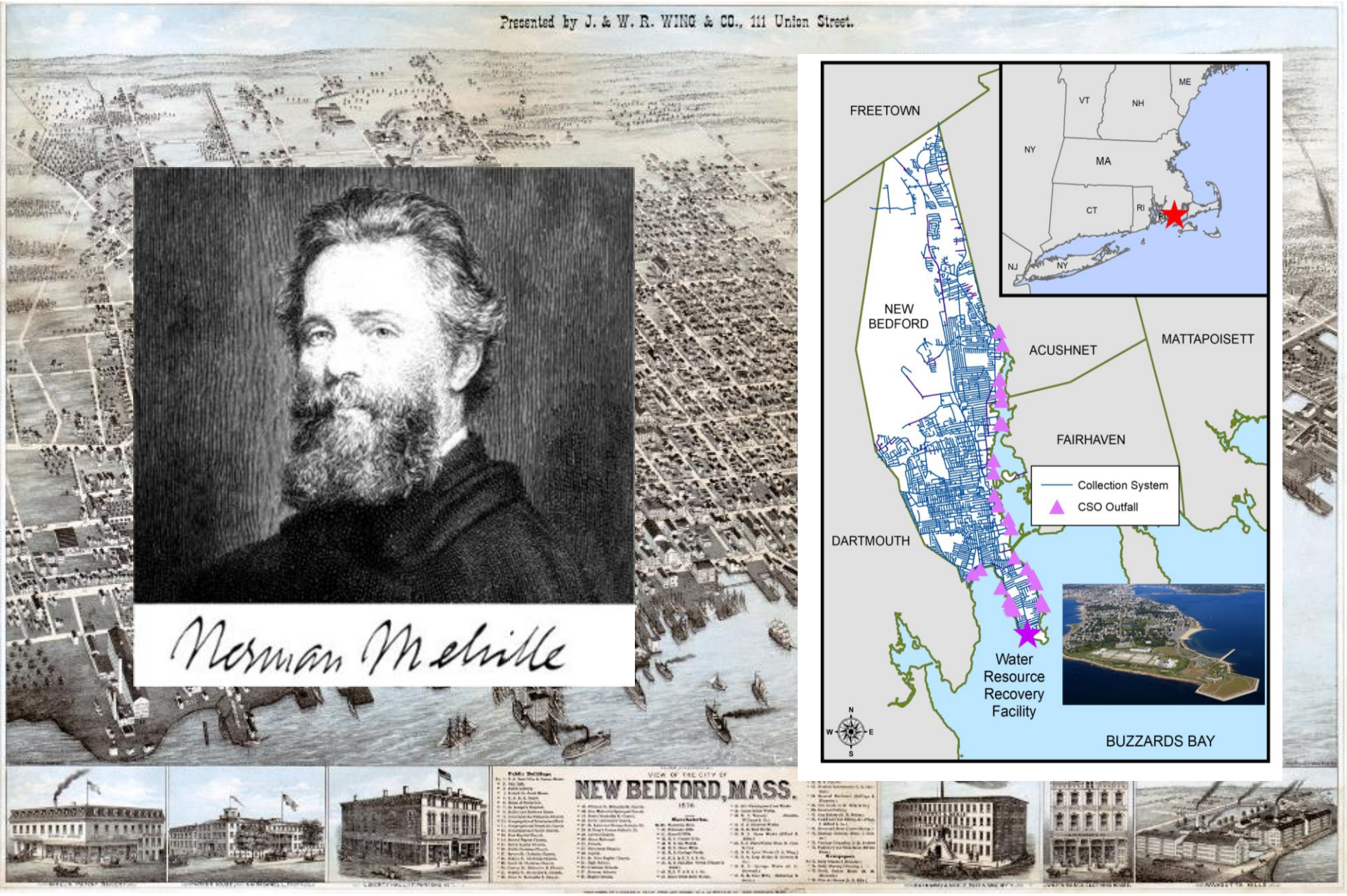

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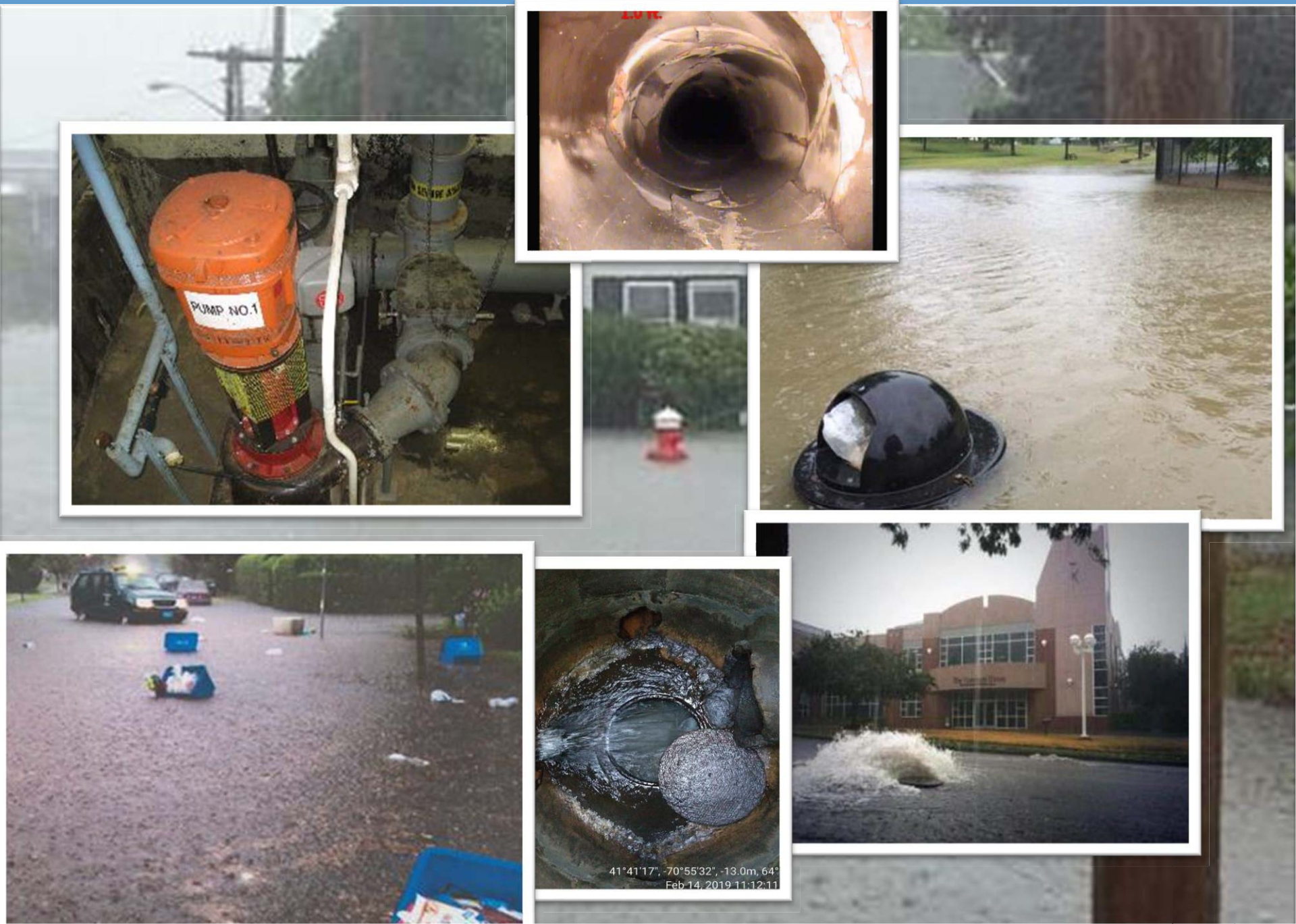
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How are we adapting system monitoring to meet future challenges?

- Background
- Current System Monitoring
- Current and Future Challenges
- Path Forward

New Bedford Collection System Stats

- System constructed between 1850s and 1960s
- Serves 100,000 people in 3 communities
- 75 MGD Wastewater Treatment Plant
- 350 miles of pipe (6-in to 96-in.)
- 29 pumping stations
- 74 regulators flowing to 27 outfalls
- *4 dams and 1 hurricane barrier??!*
- Outfalls susceptible to tidal/tailwater conditions and stormwater flows from partially separated areas

CSO Monitoring Approach

1990s-2018 CSO Block Program

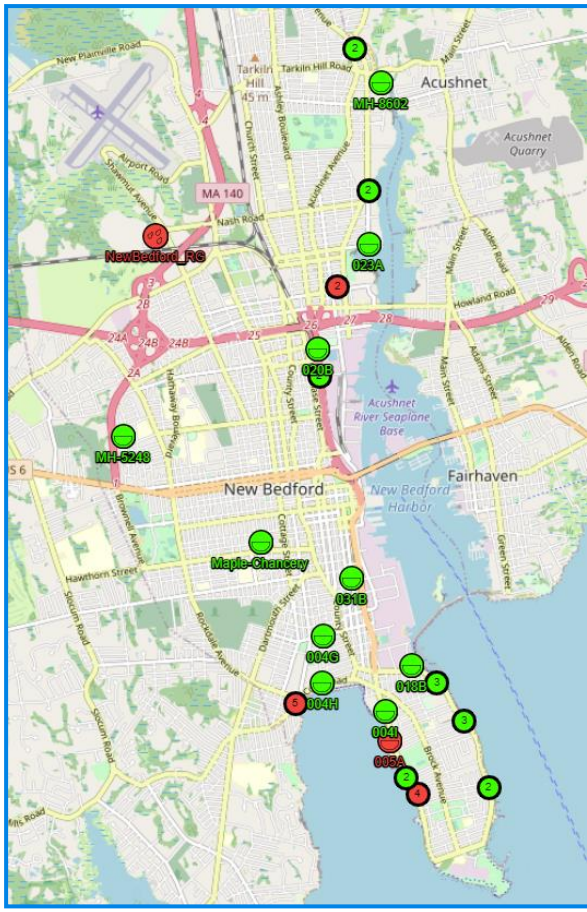
- Blocks used to determine CSO activation

2018-2020 Pilot Study (5 meters)

- Evaluated types of meters
  - Area velocity meters
  - Level meters
- Evaluated meter locations and installation approaches
  - Outfalls
  - Regulators
  - Field conditions
- Study concluded water level meters located at CSO regulators most effective

CSO Monitoring Approach

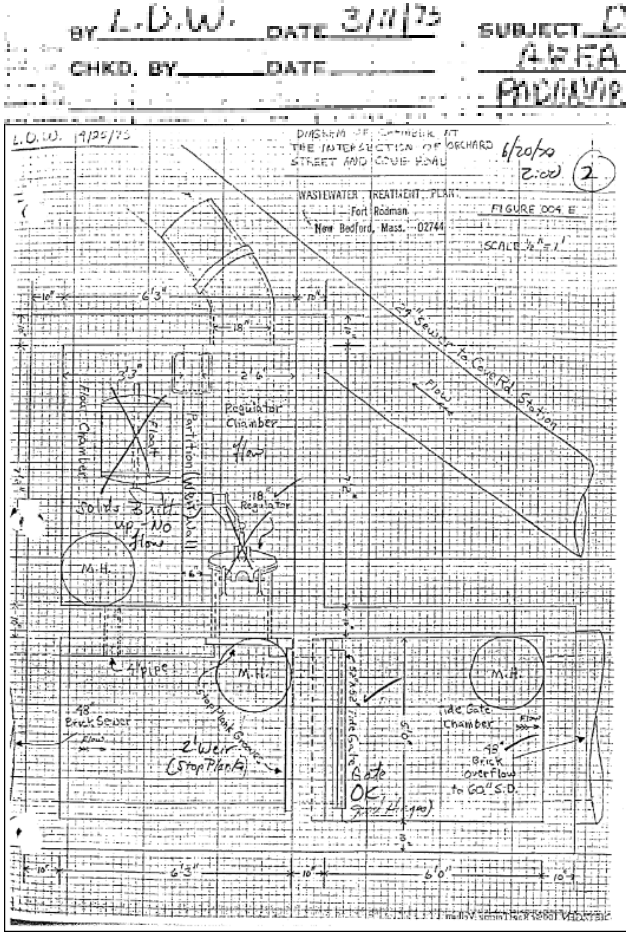
- Since 2020:
  - 37 water level meters
  - 2 rain gauges
- In 2022:
  - 20 additional meters
  - 1 additional rain gauge
- Monitors frequency and magnitude of CSO activation
- Digital Twin for near-real time data analysis

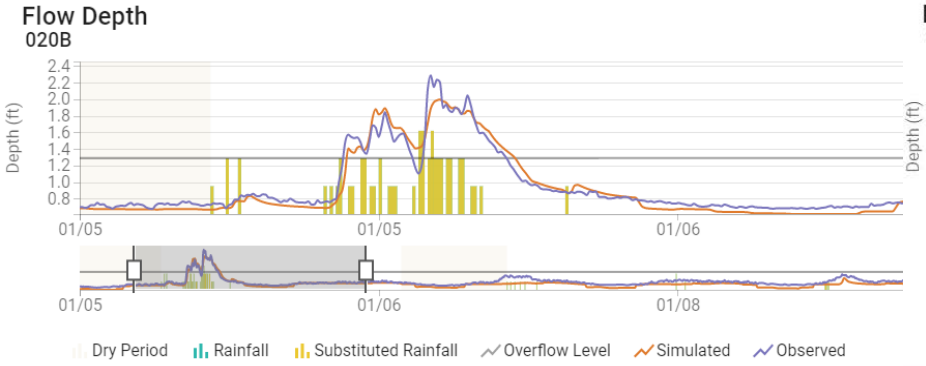


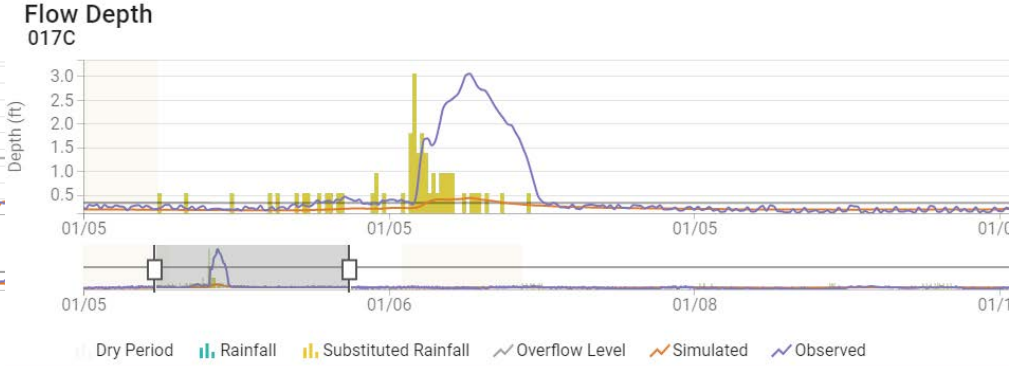
Balanced approach using SWMM model, water level and weir/pipe equations

Where Are We Now?

- Finding issues and challenges!
- Data analysis
  - Weirs equations vs. blocks vs. model
  - Regulator data – old!
- 20 additional meters and a rain gauge planned
- Model Assessment
  - Fine tuning needed to bring it to where we can use it for stuff other than high level planning

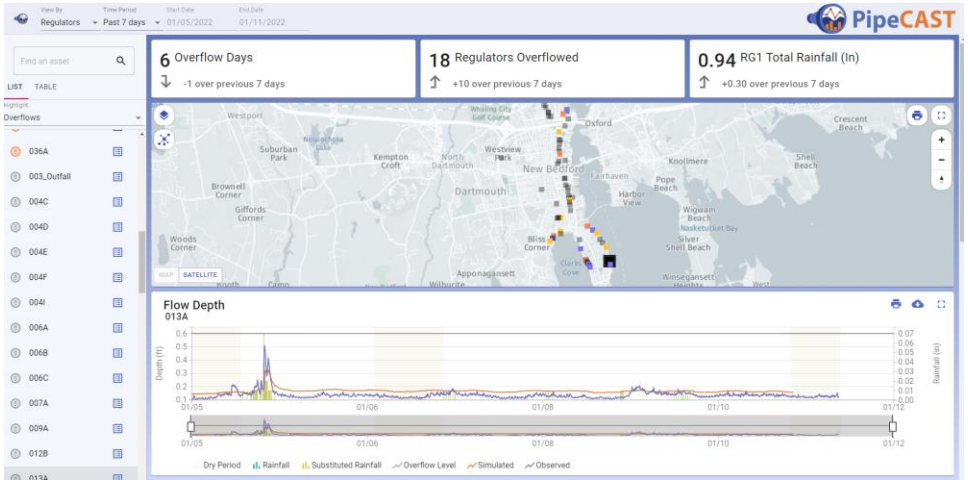


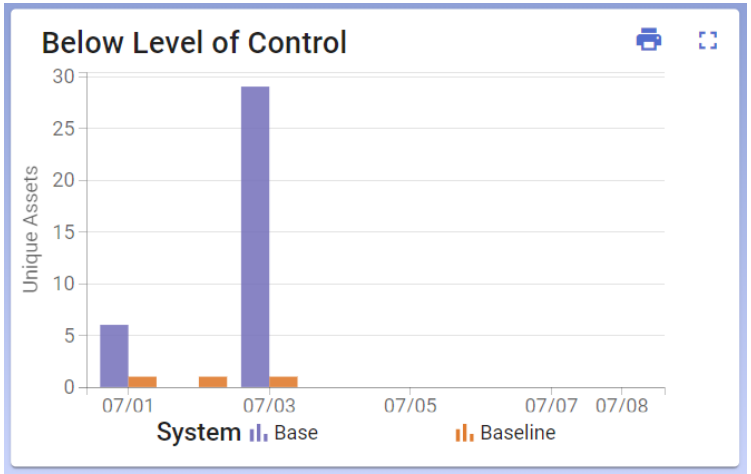




Where Are We Now? (Cont.)

- In the midst of digital twin implementation
  - CMMS integration
  - Reporting
  - Real time comparison
  - Alarms and trending
- Real Time Notifications!!!!!
  - 314 CMR 16
  - Trying to figure out how to navigate this





314 CMR: DIVISION OF WATER POLLUTION CONTROL

314 CMR 16.00: NOTIFICATION REQUIREMENTS TO PROMOTE PUBLIC AWARENESS OF SEWAGE POLLUTION

Section

16.01: Purpose, Authority and Applicability
16.02: Definitions
16.03: Events Requiring Notification
16.04: Public Advisory Notification Requirements
16.05: CSO Permittee Website and Signage Requirements
16.06: CSO Public Notification Plans
16.07: Permittee Reporting Requirements
16.08: Waivers
16.09: Public Health Warnings
16.10: Enforcement, Violations, and Right of Entry

16.01 Purpose, Authority and Applicability

The Massachusetts Department of Environmental Protection promulgates 314 CMR 16.00 pursuant to the authority of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26 through 53 including, but not limited to, §§ 27 and 43A, and St. 2020, c. 322, § 2. 314 CMR 16.00 establishes requirements and procedures for notifying the public of sewage discharges, overflows, and releases of blended wastewater into the surface waters of the Commonwealth to protect and preserve public health. The provisions set forth at 314 CMR 16.04, 16.05, 16.07, and 16.09 are required and enforceable as of July 6, 2022.

16.02: Definition

The following words shall have the following meaning in 314 CMR 16.00, unless the context clearly indicates otherwise:

Blended Wastewater. Wastewater conveyed to a Publicly Owned Treatment Works (POTW) receiving flows from combined sewer systems which is, in part, intentionally diverted around biological or tertiary treatment units during wet weather conditions, and then recombined with flows from the biological or tertiary treatment units, as a measure to minimize and mitigate water quality impacts of discharges of combined sewer overflows, and which when released meets or is predicted to meet NPDES and surface water discharge permit effluent limits based on historic information provided by the permittee through its CSO public notification plan.

Blended Wastewater Public Advisory Notification or Blended Wastewater Notification. The communication a permittee must provide to inform the public of any release of blended wastewater.

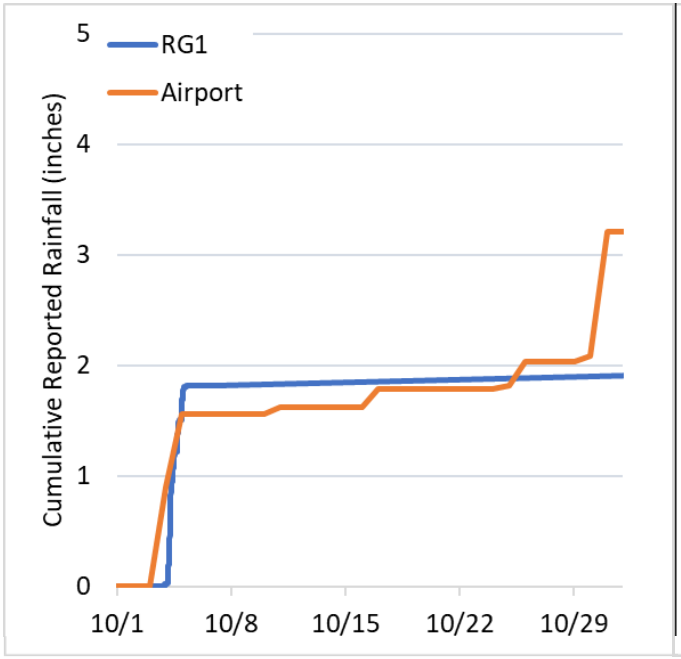
Combined Public Advisory Notification. The issuance of a single communication to inform the public that more than one of a permittee's outfalls are discharging to the same water body or waterway.

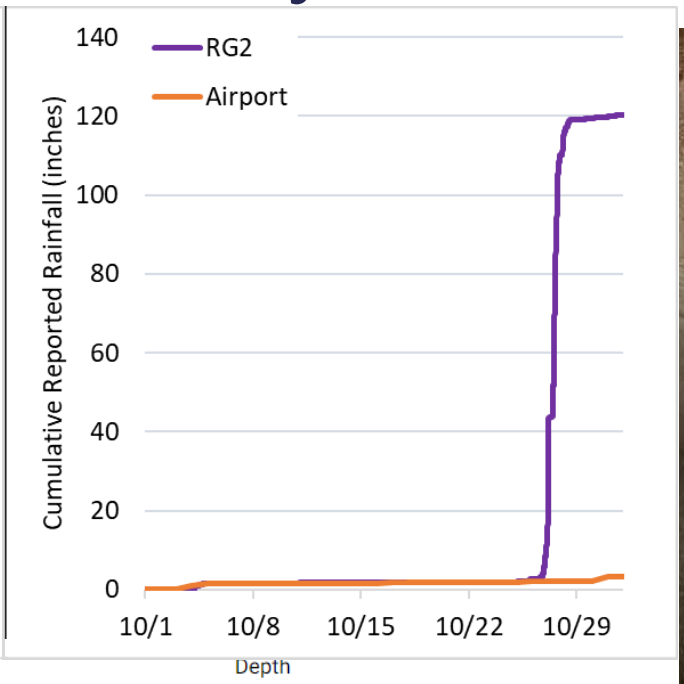
Combined Sewer Overflow or CSO. Any discharge of untreated or partially treated wastewater

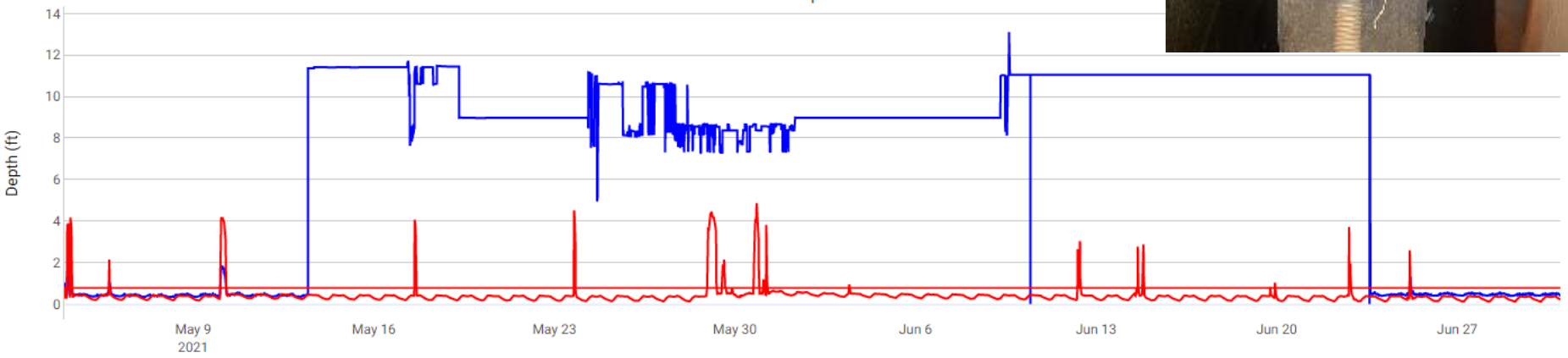
Issues With Remote System Monitoring

- Expensive to implement
- Meter malfunctions and meter communication issues
- Technical staff needed to review data and manage the system
- One size doesn't fit all and not all locations may be able to be metered
- System configuration may impact meter placement

Issues With Remote System Monitoring

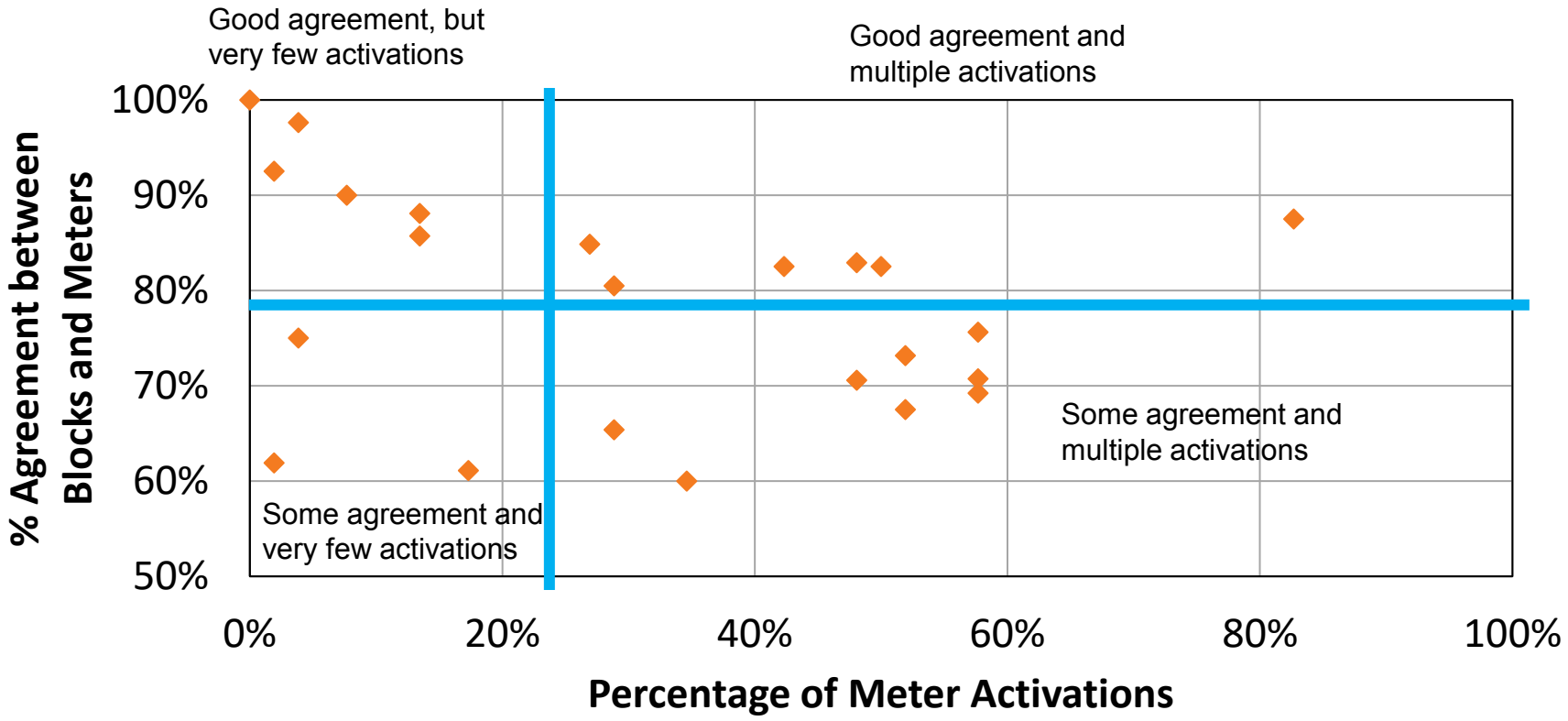






What is the Truth?

- How do we know an overflow actually occurred?
- What is the real overflow duration/volume?
- Answers are: It depends…

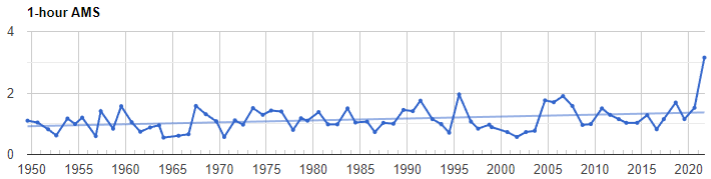


What is this costing?

- Total Current Cost: ~ $200,000 per year
- Is it worth the cost? We think so! Limited staff and more proactive system maintenance allow the City to meet all of its CWA mandates
- Potential for future capital cost savings on larger scale CSO and system improvements projects
- Future Costs: $500,000 to $600,000 annual and upwards of $1M depending on Right to Know law!!

Future Challenges

- Regulatory
- System Information
- Data Quality
- Operations
- Climate Change

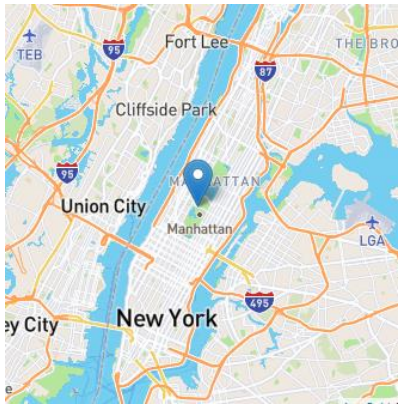


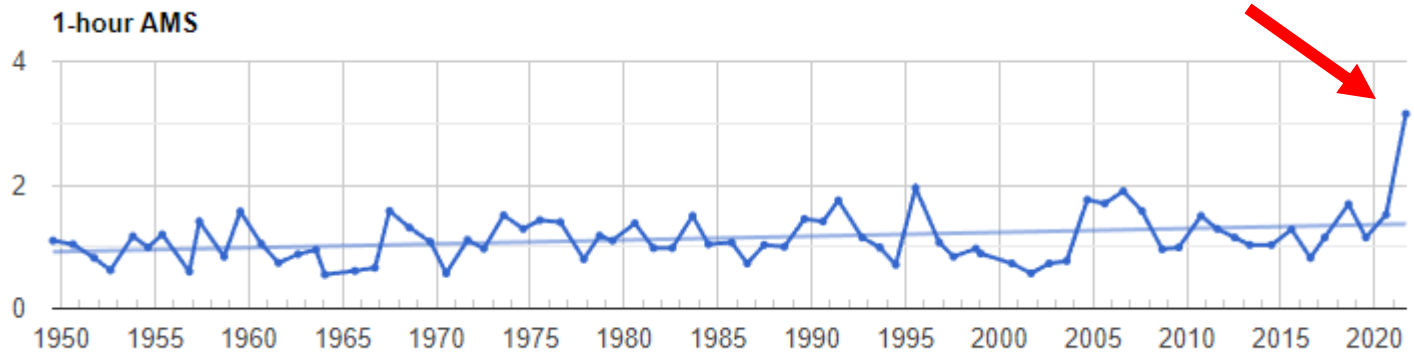
Regulatory Challenges

- Massachusetts Right-to-know Law
  - 314 CMR 16.00: Notification Requirements to Promote Public Awareness of Sewage Pollution
  - Final regulations released January 7, 2022
- Requires (among other things….)
  - Real-time notification and accurate reporting
  - Staffing – need qualified staff to review data at all hours
  - Accurate data and volume estimates
- Division of Marine Fisheries

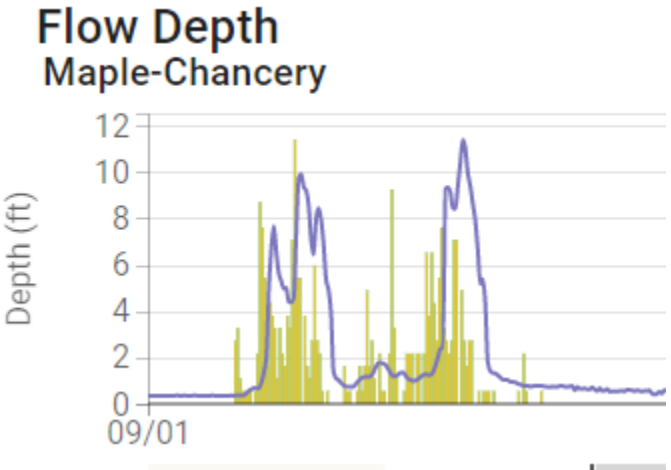
Climate Change and Alerts

- Urban Inland flooding
  - Flooding of basements in New York due to historic 1-hour rainfall total on 9/1/2021



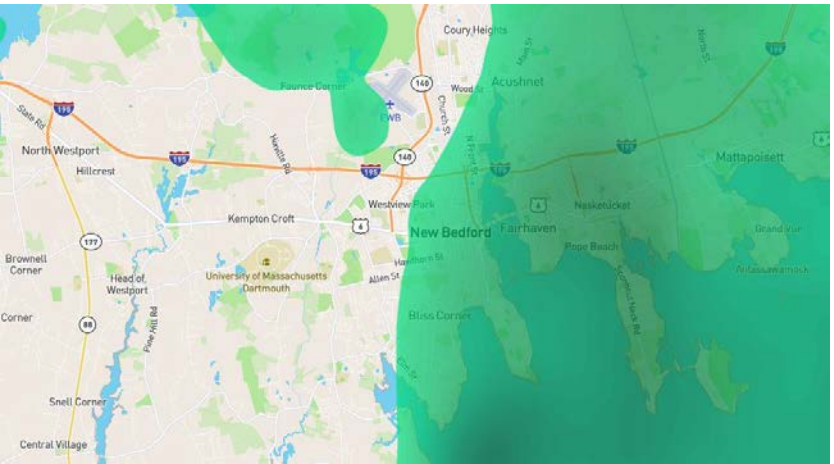


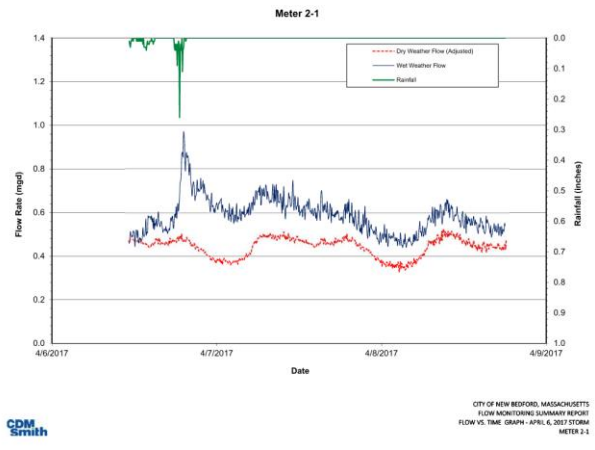
  - Meter in New Bedford showed potential flooding at meter in system
  - Provide alerts for potential basement back-ups and street flooding



Data Analytics

- Predictive analysis with radar analysis
  - Real-time system operations
- Automated Reporting
- Continuous model validation
- Use results document to document system improvements effectiveness – help support rate increases and plan buy-in.





Summary

- Not one size fits all.. Every community is different..
- Not so easy to implement..
- Right to Know – what we want to do vs. what law requires us to do…
- We have a plan that addresses a wide range of issues using a single tool – but be flexible!!
- Mostly cost-effective solution for proactive system management. Right to know burden??
- Regulatory and leadership buy-in is a must – ability to document results and get rate increases
- Development of integrated strategies based on our needs
- Establish strong program management


EPA

Integrated Planning in Action

2017 Long Term CSO Control and Integrated Capital Improvements Plan

New Bedford, Massachusetts

New Bedford's wastewater treatment facility at Fort Rodman.
Photo courtesy of Shoreline Aerial Photography LLC, provided by CDM Smith.

Located on Buzzards Bay in southeastern Massachusetts, New Bedford is a city with a rich maritime history and a population of nearly 100,000. New Bedford owns and operates combined and separate sanitary sewers that transport wastewater to the city's wastewater treatment facility[1], which discharges into Buzzards Bay. The city's storm sewers[2] and combined sewer overflow (CSO) outfalls discharge into the Acushnet River estuary, Clarks Cove, and New Bedford Harbor. Buzzards Bay supports tourism, marinas, and recreational fishing.

lighting the way NB new bedford

EPA Region 1

100,000 population

CSO MS4 SSO WWTF

Challenges

In 1987, New Bedford agreed to reduce CSOs and build a new secondary wastewater treatment facility under a consent decree with the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection. The consent decree was updated in 1990 and 1995 to address cited affordability constraints and allow the city to prioritize wastewater treatment facility improvements and delay CSO abatement activities.

By 2012, New Bedford had reduced CSO volumes by 91 percent since 1990, but it still discharged 284 million gallons of sewage into waterways that year. That same year, EPA issued an administrative order that required the city to address sanitary sewer overflows (SSOs) and develop a scope for updating its long-term control plan (LTCP) for managing CSOs. In addition to these requirements, New Bedford anticipated new nitrogen effluent limits that could require costly upgrades to its wastewater treatment facility. The city also has a stormwater discharge permit that includes a total maximum daily load (TMDL) for pathogens in Buzzards Bay.

Integrated Planning in Action

By 2016, New Bedford met all the deadlines in EPA's 2012 administrative order and submitted a scope of work to integrate the LTCP with a capital improvement plan in lieu of the more traditional LTCP that the order required. The city asked to use the proposed integrated planning approach to prioritize projects that would address overarching issues.

New Bedford staff held meetings with various stakeholders, city departments, and the public and identified more than 150 concerns and impacts. For example, bacteria reduction and system failure prevention were the city's priorities in addition to CSO abatement. The city then distilled this input into six core issues to address through integrated planning (see box at right) and established goals for each. For example, the city set the following six project goals for addressing water quality impairments: 1) address management goals in the TMDL; 2) reduce nitrogen and

Core Issues Addressed Through the Integrated Planning Process

- Water quality impairments
- Public health and safety
- Existing infrastructure reliability
- Climate change
- Sustainability
- Need for economic development

[1] "Wastewater treatment facilities" (WWTFs) is a generic term for facilities that treat or manage wastewater, including publicly owned treatment works.

[2] Storm sewers and storm sewer systems can also be referred to as municipal separate storm sewer systems (MS4s). Stormwater discharge permits can be referred to as MS4 permits.

Contact Us!

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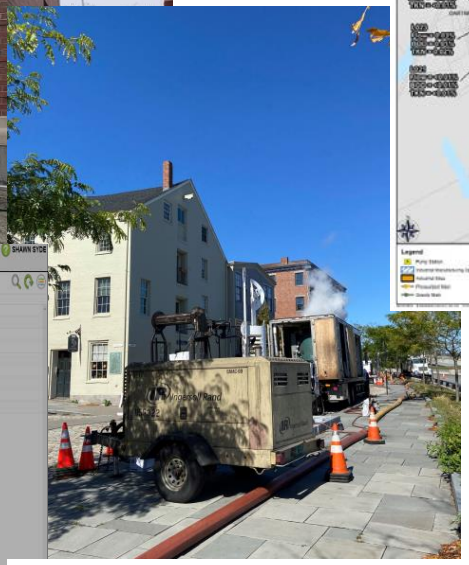
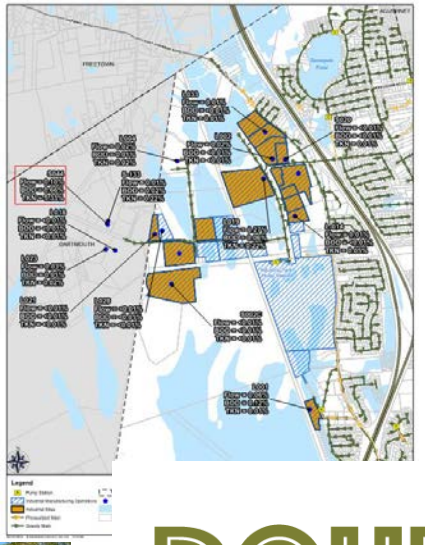
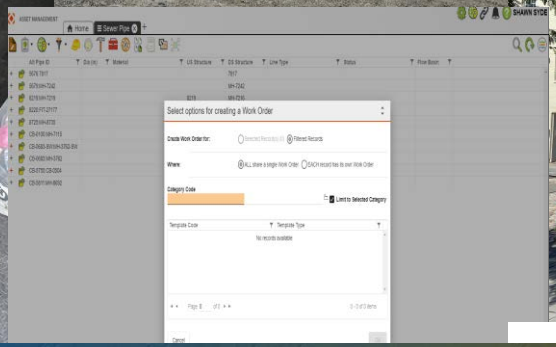
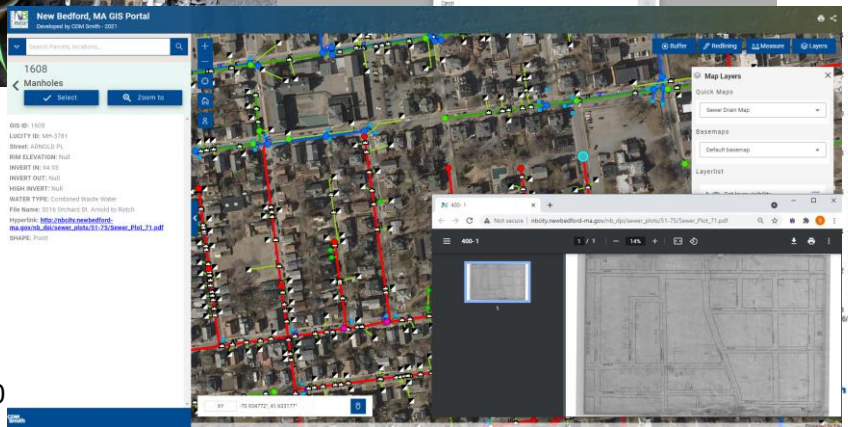
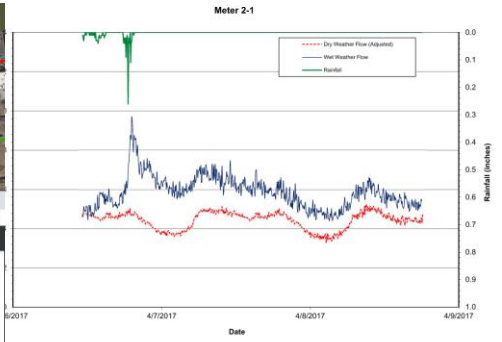
Questions?











DOUBLE VISION

Digital twins facilitate cost-effective CSO monitoring and reporting

Karilyn Heisen, Amy Corriveau, Shawn T. Syde, and Justin A. Chicca

y of New Bedford in Bristol County, Massachusetts, is on Buzzards Bay. Nicknamed "The ng City" during the 19th century, the city was the most important whaling port in the he city's age and development history has resulted in a large and complex combined sewer s. Smart water approaches are proving valuable for managing the system's operations, nance, and regulatory requirements.

d sewer communities across the country, New Bedford is required to monitor and report overflow (CSO) activity through its National Pollution Discharge and Elimination System In addition to reporting under the permit, the city must also report CSOs under an rder (AO) on Consent. The U.S. Environmental Protection Agency (EPA) typically prefers O outfalls with permanent flowmeters to identify the frequency and magnitude of CSOs. generally consistent with proposed "right to know" legislation. These monitoring and ments pose significant burdens to CSO communities. Monitoring costs, meter accuracy, y, system complexities, and other technical issues can limit a community's ability to tive CSOs.

's collection system has unique characteristics and a configuration that complicates CSO allation of permanent meters in the city's 27 outfalls is not an option due to stormwater have a common outfall downstream of CSO regulators, tidal influences, and accessibility manent flowmeters are often considered to provide the best means of reporting overflow are not always the best solution, since meters often have errors associated with them, hey are not installed or maintained properly. Additional challenges include meter calibration ocations, difficulty in measuring sudden and intermittent large flows, and isolating CSOs ormwater discharge to the outfall pipe.