NJWEA - Fall Tech Transfer 2024 – Infiltration and Inflow

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Agenda

- About New Jersey American Water
- Improving Wastewater System Performance
- First Pilots – Lakewood and Haddonfield
- Accelerating CapEx Investments
- Bound Brook Pilot
- Conclusions

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About New Jersey American Water

- Our approximately 850 employees serve:
  - Approx. 2.8 million people in 18 counties
  - Approx. 662,000 water service customers
  - 58,600 wastewater service customers
- Wastewater system demographics:
  - 21 sewer treatment plants
  - Over 600 miles of sewer main
  - 90 sewer lift stations

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NJ American Water Wastewater Systems

ATLANTIC COUNTY
Egg Harbor City

BERGEN COUNTY
Oakland Twp. – Ramapo River Reserve

BURLINGTON COUNTY
Mansfield Twp. – Homestead; Mapleton

CAMDEN COUNTY
Haddonfield Borough
Mount Ephraim

CAPE MAY COUNTY
Middle Twp. – Avalon Links
Ocean City

GLOUCESTER COUNTY
Elk Township

HUNTERDON COUNTY
Bloomsbury Borough – Fawn Run
Clinton Twp. – Glen Meadows
Tewksbury Twp. – Crossroads at Oldwick; **Pottersville**
Union Twp. – Brass Castle; Lookout Pointe; Village Sq.

MONMOUTH COUNTY
Howell Twp. – Adelphia
Upper Freehold Twp. – Beacon Hill

MORRIS COUNTY
Chester Twp. – Four Seasons at Chester
Jefferson Twp. – Jefferson Peaks
Long Hill Twp.
Mount Olive Twp. – Country Oaks; Morris Chase

OCEAN COUNTY
Lakewood
Plumsted Twp. – Deep Run

SOMERSET COUNTY
Bedminster Twp. – EDC
Bernards Twp. – EDC
Bound Brook
Hillsborough Twp. – Hillsborough Chase
Somerville

WARREN COUNTY
Washington Twp. – Hawk Pointe

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New Jersey Physiographic Regions & Sewer Service Areas

- **Bound Brook:** Lack of historic records
- **Egg Harbor City:** Older system, with flat topography with pump stations and tidal influences (high ground water table)
- **Haddonfield:** Major I&I issues, suburb of an older major New Jersey City (Camden)
- **Lakewood:** First site to deploy sewer monitoring, the system serves a large population area and suffers from undersized pipes
- **Long Hill Township:** Hilly terrain, no additional connections permitted (self-imposed sewer bans), and wet weather flows increase treatment needs from 1 to >4 MGD.
- **Ocean City:** Older system, surrounded by water, and prone to flooding (tidal)
- **Somerville:** A recent acquisition with known SSO issues and a wet weather facility being built downstream by the County

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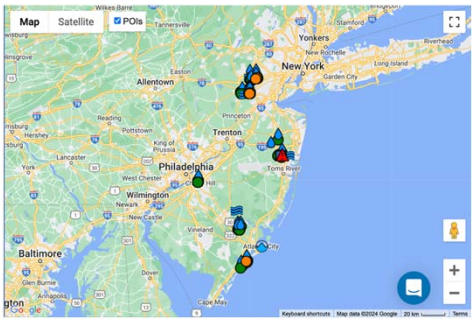
The Lakewood and Haddonfield Pilots



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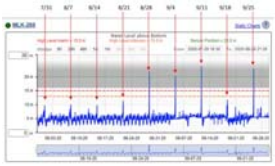
Lakewood and Haddonfield Pilots

- The 35 units were split up into three groups:
  - Group to use on Lakewood's problematic (SSO) or undersized areas
  - Group to monitor I&I hotspots in Lakewood
  - Group to monitor I&I hotspots in Haddonfield
- Data generated enabled:
  - I&I to be estimated in the specified basins
  - Identification of undersized pipes
  - Isolation of critical areas and zones
  - Detection and resolution of blockages in real-time
  - Existing models to be improved with better data



Weekly Friday Surcharge Events in Lakewood

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Improving Cycle Time for Baselining New Acquisitions

- Newly acquired sewer systems have little to no historical data
- Comprehensive Planning Studies (CPS) of a new collection system have required 18 - 24 months of field assessment and analysis before design begins and capital investments are made
- CPS studies focus on Inflow & Infiltration (I&I)
- Avoid using expensive Area Velocity meters within individual basins or small areas of the system
- Incorporate time-consuming and labor-intensive I&I practices, i.e., smoke and dye testing

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New Jersey American Water Innovative Approach to Evaluation

- **Goal:** Reduce the CPS time by up to 12 months
- **ROI:** Secure both financial and operational benefits
  - Financial: Prioritize capital investments sooner to address critical segments of the collection system
  - Operational: Prevent SSO's and optimize maintenance resources, e.g., cleaning frequencies
- **Decision:** Build-out the recent Bound Brook acquisition with advanced sensor technology
  - SmartCover®: Remote sewer (level) monitoring
  - Hazen & Sawyer: Advanced data analytics

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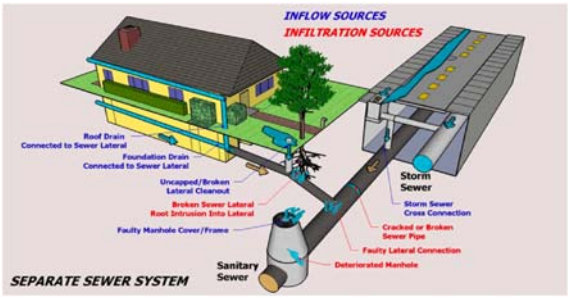
Focusing on Inflow & Infiltration (I&I) in Bound Brook



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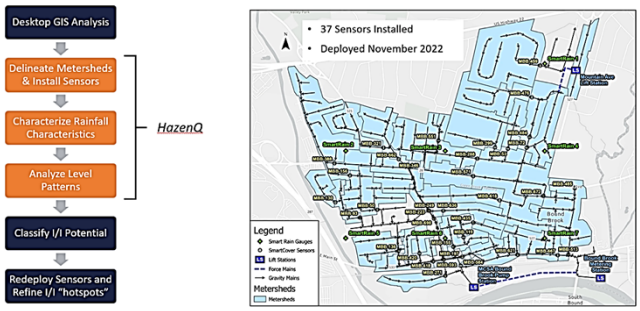
Overview and Preliminary Sensor Deployment



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Rain Events

Start	End	Duration (hours)	Total Depth (in)	Peak Intensity (in/hr)
11/15/2022 21:00	11/16/2022 11:00	14	0.99	0.34
11/27/2022 15:00	11/28/2022 2:00	11	0.51	0.10
11/30/2022 13:00	11/30/2022 22:00	9	0.72	0.16
12/3/2022 11:00	12/3/2022 22:00	11	0.54	0.10
12/6/2022 13:00	12/7/2022 10:00	21	1.12	0.17
12/11/2022 15:00	12/12/2022 3:00	12	0.35	0.06
12/15/2022 16:00	12/16/2022 21:00	29	1.44	0.32
12/22/2022 15:00	12/24/2022 5:00	38	1.57	0.21
12/31/2022 12:00	1/3/2023 18:00	78	0.87	0.25
1/5/2023 21:00	1/6/2023 17:00	20	0.42	0.18
1/19/2023 11:00	1/20/2023 6:00	19	1.13	0.14
1/22/2023 21:00	1/23/2023 21:00	24	0.97	0.18

A wide variety of rain events facilitates different types of I/I responses

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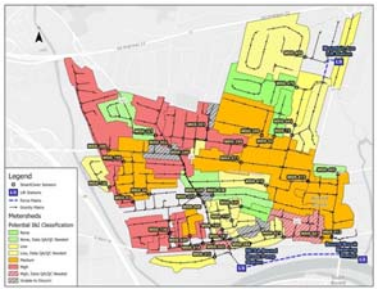
Preliminary Findings

- Red & orange = I/I indicated
- Yellow & green = limited I/I
- QA/QC preliminary data
- Relocate sensors – focus on high and medium I/I area

Potential I&I Classification	Number of Sensors
None	6
Low	10
Medium	8
High	9
Pattern Unclear	4



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HazenQ Data Analysis Facilitates Rapid Level Response Understanding

Collect Flow and Rainfall Data

Use HazenQ to Separate Flow Components

Identify Dominant I/I Source Types

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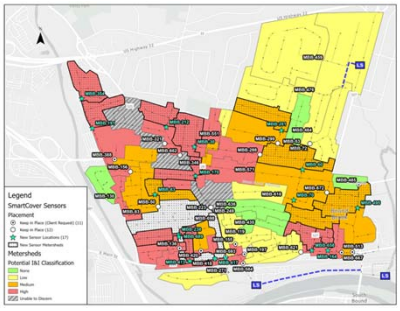
Sensor Redeployment

- 17 sensors were installed in new locations with the following purposes:
  - Break up metersheds with high/medium I&I
  - Capture portions of the system not previously picked up by sensors
- Sensors were in place for ~4 weeks



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Redeployment Example

Initial results indicate high probability of I/I

Two sensors relocated to "break –up" metershed

New data indicate lower probability of I/I in upstream regions

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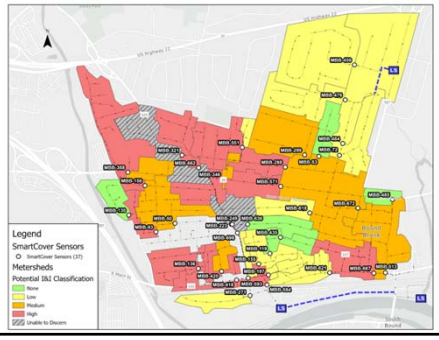
Preliminary I/I "Heatmap"



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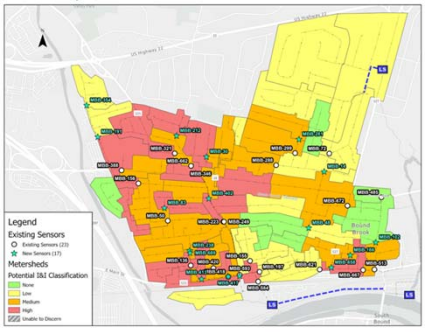
Refined I/I "Heatmap"



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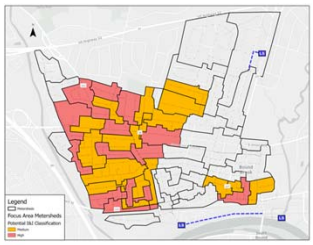
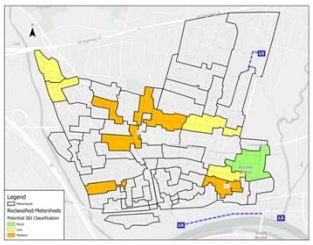
Refined Heat Map Results - Focus

High and Medium Probability I/I Focus Areas



Areas Reclassified to Lower Priority



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Bound Brook I/I Identification – Outcomes

- Reduced 18 - 24 months of traditional field assessment and analysis to 8 months plus 1 month to complete report
  - Rapid targeting of potential "hotspots"
  - Systemwide analysis provides "complete picture" across multiple rain events
  - Analysis supports targeted rehabilitation activities and CCTV without further source identification
    - Identifies prioritized areas of the system requiring capital investments 50% sooner
    - Earlier investments will improve system resiliency and customer satisfaction
- Other benefits
  - Level only data collection cost effective
  - Ability to send report to Board of Public Utilities / NJ DEP sooner and verify improvement results with subsequent monitoring
  - Lower discharge from service area to regional treatment facilities decreases power costs for pumping and associated downstream treatment costs

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Bound Brook: Other Project Outcomes
Operational Benefits

- Visibility to growing blockages due to FROGS (Fats, Roots, Oils, Grease)
  - "Hot spots" were identified, e.g., restaurant row (Route 28)
- Sixteen (16) surcharge events were prevented in the first four (4) months of SmartCover monitoring
  - Cleaning (Jet-Vac) took place only as required based on need versus schedule
  - Preventative maintenance as needed
  - Optimum use of resources and reduced in-field risks
  - Minimize vac-ex fuel costs and associated Green House Gas (GHG) impacts

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Conclusion – Optimized Resource Management

- Continuous monitoring between cleanings enables SSO protection and risk reduction
- Improved visibility allows site cleaning to be performed based on real-time trends, eliminating unnecessary cleanings
  - Fewer cleanings reduces pipe and structural wear to extend asset life
- Personnel and equipment redirected to other projects delivers gains in productivity
- Less time in roadways results in crew safety, reduces Vac-Ex truck fuel costs, and GHG emissions

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Thank you!

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