From a Global to Community Perspective

Deputy Commissioner Paul Rush September 13, 2023



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Agenda

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- 2. Water Research Foundation industry trends
- 3. My water story
- 4. The Delaware Aqueduct

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AWWA's Story

American Water Works Association

Legacy of AWWA

AWWA was founded in 1881 in Engineers' Hall on the campus of Washington University in St. Louis, Missouri. Twenty-two men representing water utilities in Illinois, Indiana, Iowa, Kansas, Kentucky and Tennessee founded the American Water Works Association grounded in a common mission to protect public health.



American Water Works Association

Today

- Offices: Denver, Washington, D.C.
- 50,000+ members globally
- 4,500 active volunteers
- 43 Sections
- Members in 96 countries
- More than 190 Standards

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AWWA Membership











American Water Works Association

The future is bright!

- · Pilot program for YP Liaisons
- Transformative Leadership Academy
- Water Equation scholarships
- Young Professionals and Student Chapters



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11 AWWA Sections represented

In 2022, CE Corps:

Completed 22 water and sanitation projects impacting 1,584 people in 10 underserved communities.

 Massachusetts (x2), New Hampshire, Maryland, Virginia, Tennessee (x2), Colorado, Wyoming, Washington, California, Arizona





HBCU Intern Scholarships to APWA conference

\$15,000 in awards to these STEAM programs:





\$275K in One AWWA Operator Scholarships since 2016

Florida

- Broward County Eco-Challenge
- Pinellas County Water FestivalSeminole HS STEAM Academy
- Virginia
- Rivanna River Conservation
- H2GO2 classroom
- Vector Space
- Arkansas
- Central Arkansas STEM camp Colorado
- Groundwork Denver
- New Jersey
- STEAM Park Alaska
- Stockholm Jr. Water Prize

Water Research Foundation Industry Trends





Industry trends: Per- and Polyfluoroalkyl Substances (PFAS)

- · WRF has numerous resources on PFAS as the regulatory landscape takes shape
- · Resource topics include:
 - · Communication guidance
 - · PFAS Management and prevention Strategies
 - Studying PFAS in Wastewater
 - · So much more!





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PFAS One Water Risk Communications (5124B): UCMR5 Toolkit





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UCMR5 Toolkit Contents

- Brochures for three regulatory-sampling scenarios
 - Sampled in state with • enforceable regs
 - Sampled in state w/o enforceable regs
 - Have not sampled
- Guidance document

Industry trends: Microplastics

- · Microplastics (MPs) are pervasive in lakes, oceans, and drinking water. Microplastics are ingested, inhaled, or absorbed throughout the food chain, from microscopic organisms to humans.
- · Municipal wastewater treatment plants (WWTPs) and water resource recovery facilities (WRRFs) are the largest sources of MPs into aquatic systems in the United States, and likely all developed countries.
 - It is estimated 3 23 billion MPs are released each day by municipal WWTP/WRRFs into U.S. waters.

What research has been completed?

- In 2017, The Water Research Foundation (WRF) published White Paper -Microplastics in Aquatic Systems: An Assessment of Risk
 - · Focused on MPs in the environment and wastewater effluents, explored the risks of MPs to aquatic systems, analyzed peer-reviewed literature, and identified knowledge gaps.
- In 2022, WRF published Determining the Fate and Major Removal Mechanisms of Microplastics in Water and Resource Recovery Facilities
 - The research found that the majority of microplastics are entrained or adsorbed into activated sludge, and developed a standard operating procedure for microplastics sampling and extraction.



The appearance and shape of microplastics vary widely. making it difficult to quantify and separate them from natural particles.



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Industry trends: Disinfection By Products (DBPs)

- · Chlorine interacts with natural organic matter present in water supplies to form regulated and emerging DBPs
- To minimize the formation of regulated DBPs and comply with existing regulations, water utilities have been moving away from chlorine to use alternative disinfectants like chloramine, or installing more advanced and costly treatment processes, such as ozone or granular activated carbon to remove DBP precursors.
- · The goal is to minimize overall risk to the public and find the balance.





Industry trends: Climate Change

Climate Change Project Examples

Climate Adaptation: Adaptation plans, severe weather response, infrastructure improvements

- Incorporating Equity and Social Dimension into Community Climate Adaptation Planning and Watershed Management (<u>5180</u>, \$224K, 2027 completion)
- Climate-Resilient Planning for Urban Stormwater and Wastewater Utilities (Workshop Proceedings 5001 + Project Paper 5058, \$125K). Partnership: WRF, NYCDEP, WUCA, NOAA, Rand Corporation

Climate Mitigation: Energy efficiency and process optimization, renewable energy

- Advancing the Understanding of the Next Largest Source of Utility GHG Emissions through Enhanced Whole-Plant Monitoring and Quantification (5251, RFP pending)
- Developing GHG Emission Library for Unit Processes by Water and Wastewater Utilities and Decentralized Systems (5255, RFP pending)

Climate Risk Assessment: Vulnerabilities in supplies, operations and infrastructure

Webcast available on demand: <u>Multi-faceted Utility Climate Adaptation Strategies</u> and <u>Practices</u> Highlights four WRF climate adaptation projects that feature utility adaptation strategies and practices, with a focus on flooding, wildfire, drought, and risk mapping



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My Water Story

<image>

American Water Works Association



About the Delaware Aqueduct

- Conveys water from the Delaware System to NYC
- Constructed 1939-1945
- Conveys more than <u>50% of total daily supply</u>
- At 85 miles long, it is the longest tunnel in the world
- · Consists of three segments:
 - Rondout-West Branch Tunnel: 44 miles
 - West Branch-Kensico Tunnel: 27 miles
 - Kensico-Hillview Tunnel: 14 miles





The Rondout-West Branch Tunnel (RWBT) is leaking and a repair project is underway

- RWBT supplies Water From Rondout Reservoir to West Branch Reservoir
- 300 to 2,000 Feet Below Ground
- 45 Miles Long; 13.5 Feet Diameter
- 830 MGD Capacity
- Leaks Approximately 15-35 MGD in Wawarsing and Newburgh





Discovering the leak

- 1990 Tunnel Meters show Increase in Flow at Rondout Effluent Chamber (REC)
- 1991 report of spring near Roseton
- 1992 report of suspected tunnel related water issues near Wawarsing
- 1993 Times Herald Record article "Wet Homes Blamed on Leaking Tunnel"
- · 1996 Regular property inspections discontinued
- 1998 September Malcolm Pirnie documents discuss installation of standpipe and dye test at several sites in area.
- 1999 Drought year. Study by Malcolm Pirnie identifies thermal anomalies. DEP dye study is dye positive in 2 separate locations ~10 hrs after injection.
- · 2007 State Comptroller Report on Delaware Aqueduct issued
- · 2008 Rondout- West Branch Tunnel shutdown for 14 days

Understanding the leak

Before planning for the repair, we had to answer some difficult questions:

- · How much is it leaking?
- · Is the leakage rate changing?

Dye tests were performed to help answer these questions.

- Indirect measure of net leakage from tunnel
- Measures flow rate at the end of the tunnel, compares to Venturi meters at beginning of tunnel
- Measures leakage under all flow regimes; it is estimated that Hydrojacking increases leakage at full flow (pressure)

Dye tests revealed that leakage increased as flow increased





Surface expressions were investigated during tunnel depressurization, showing the connection between tunnel pressure and surface flow





Leak investigation results

- Leakage rate: 14 MGD to 36 MGD
- · Leakage rate has not changed
- · Higher leakage at highest flow rates
- · Operational steps taken to reduce leakage



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We needed to know how reliable the tunnel was, so we investigated tunnel conditions

Directional Drilling

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- Horizontal Borehole in Roseton West of the Hudson River
- 40 ft. from the 1100 ft long steel interlined section of tunnel
- Determine Geology in this Fractured Area
- Determine Groundwater Conditions

Autonomous Underwater Vehicle

- · Self Propelled and Navigated Torpedo
- Digital Still Pictures 100% photographic coverage of Tunnel
- · Acoustic Tracking and Communication
- · Developed by Woods Hole Oceanographic Institute



Preparing to repair: how will we meet NYC's demand?

Big questions:

- Is the pumping capacity large enough to dewater tunnel to begin repairs?
- How long will a repair take?
- How are City's supply needs met during a repair?
- How are wholesale customers' needs met?



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Water for the Future

- DEP planned to address the leaks in the RWBT by undertaking the Water for the Future Program, which consists of two main components:
 - Constructing a Bypass Tunnel Around the Leaking Areas in Roseton & Repair of Aqueduct in Wawarsing
 - Developing Water Supply Augmentation Projects and Implementing Demand Management Efforts





Supply Augmentation Efforts: CAT-RR

CAT-RR:

- Rehabilitated 74 miles of the Catskill aqueduct
- Repaired leaks
- · Replaced 36 valves
- Increased capacity from 590 MGD to 630 MGD







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Supply Augmentation: Croton Filtration Plant

- · Capacity: 320 MGD
- In service: 2015
- · GAC installed: 2021





Wholesale Customer Back-Up supplies

Making the fix

- The Bypass Tunnel reached significant completion in October 2021.
- To connect the bypass tunnel, a shutdown of the Rondout West Branch Tunnel (RWBT) is necessary for final connection.
- Work includes:
 - Shutdown and dewatering of the RWBT.
 - Connection of the bypass tunnel to the RWBT.
 - Plugging and abandonment of the leaking section of the RWBT.
 - Grouting of the Wawarsing leaks.
- $\circ~$ Shutdown will begin October 2024.
- Construction will be conducted under 24/7 operations.



Before and during the shutdown, the water supply system will operate outside of normal balance

Normal Operations

- DEP operates the water supply system in a balanced state.
- Supply is typically:
 - Delaware 50%
 - Catskill 40%
 - Croton 10%

Shutdown Operations

- DEP will operate the water supply system outside of normal balance before and during the outage.
- Reliance will be much heavier on the Delaware system beforehand.
- Reliance will be much heavier on the Croton and Catskill systems during.

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DEP will proactively respond to turbidity risks during the shutdown by treating with alum.

- Brief treatment losses during Irene and Lee highlighted the impact of treatment interruptions on turbidity.
- It is imperative to keep the Kensico Reservoir turbidity baseline low during the RWBT shutdown.
- DEP will treat Catskill Aqueduct water with alum when modeling indicates that the Kensico Reservoir effluent could exceed 1.5 NTU.
- In 2018, NYSDOH approved the WFF Alum Treatment Plan to proactively manage turbidity risk.
- Emergency treatment at Shaft 17 if necessary.





Conclusion

- Climate change and the regulatory environment will influence DEP's decision-making during the Delaware Aqueduct shutdown
- DBPs, turbidity, and drought are among the many challenges facing DEP leading up to the 2024 shutdown
- To improve our forecasting capabilities, DEP is working with the Center for Western Weather and Water Extremes (CW3E) which will better enable us to prepare for and respond to drought and extreme rain events

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