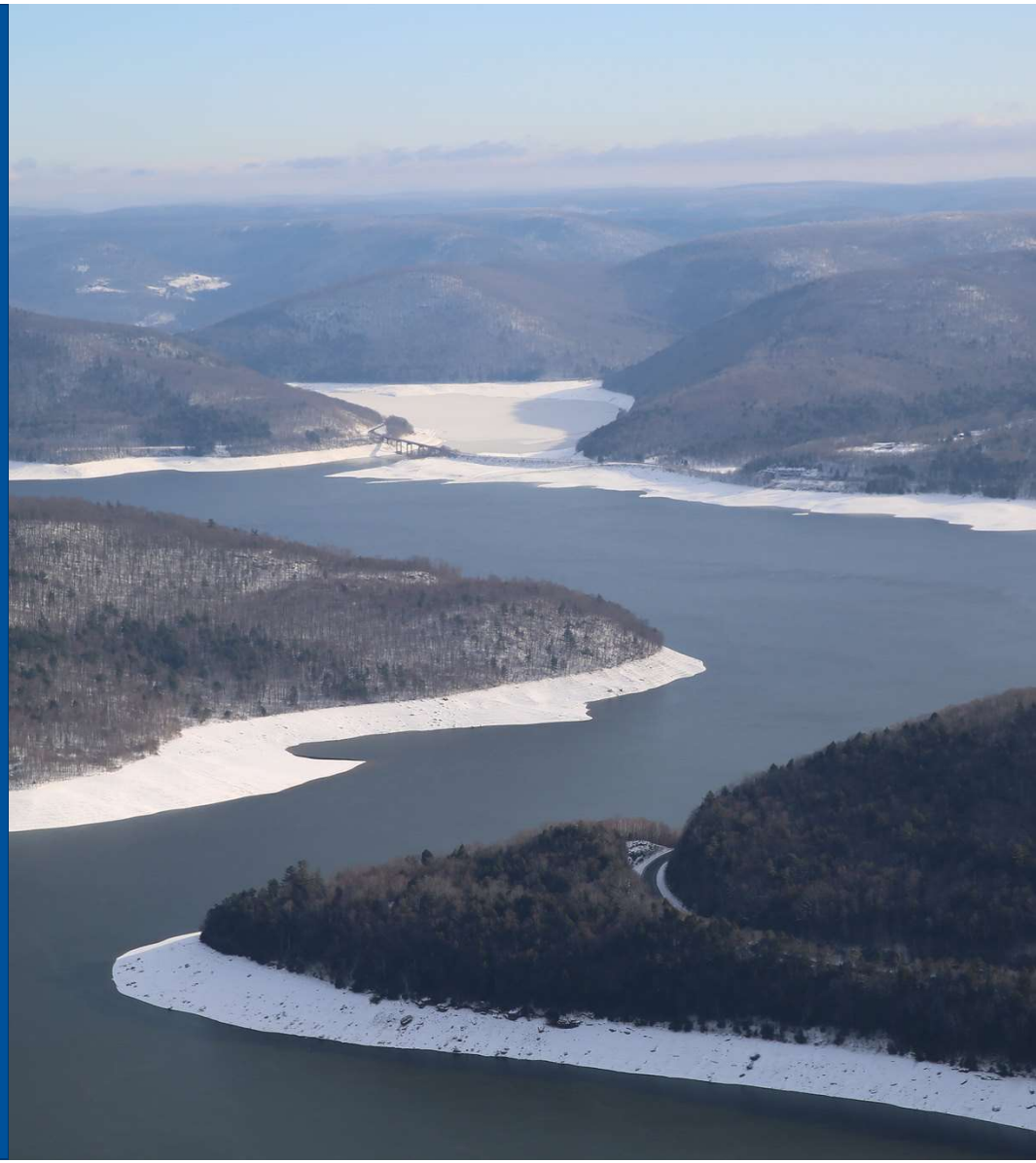
Delaware Aqueduct Repairs

Water Water Everywhere Conference

Friends of the Upper Delaware

October 25, 2023

NYC Environmental Protection



Agenda

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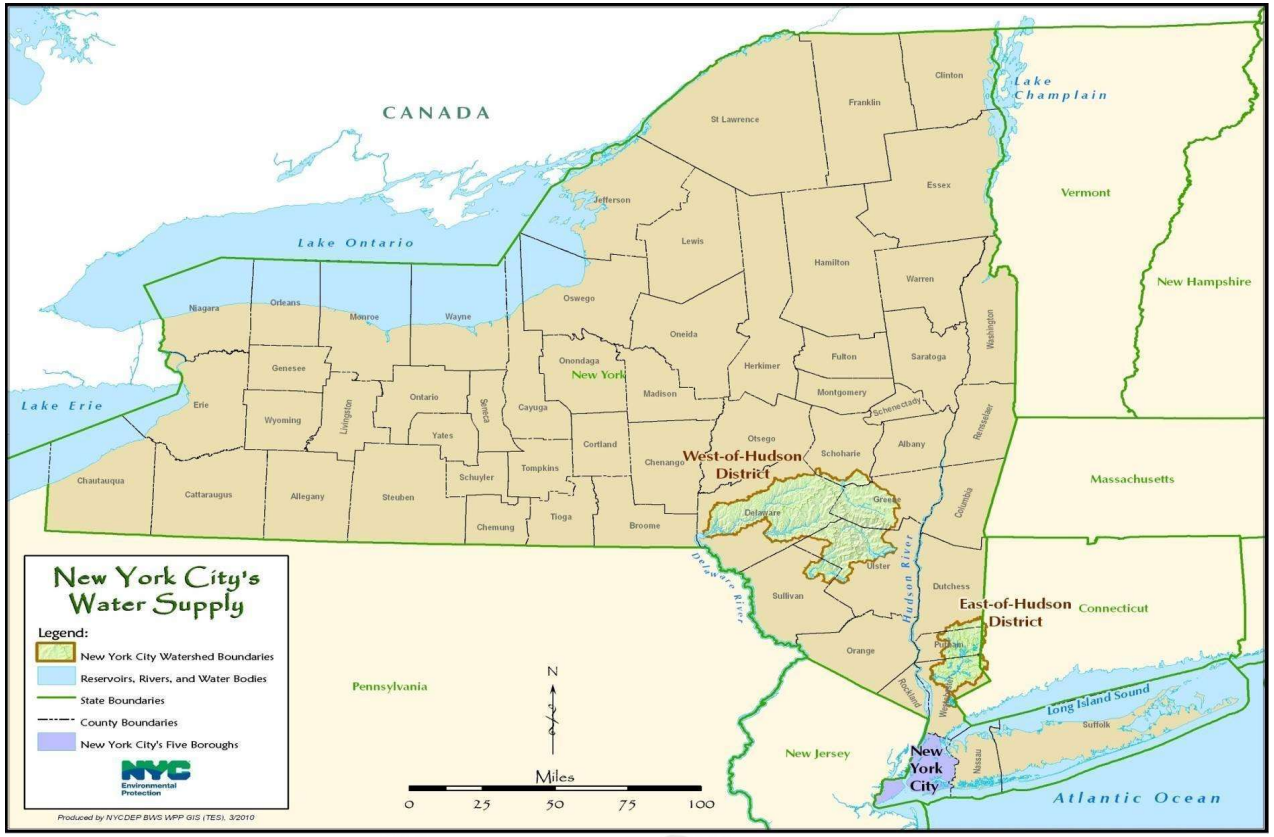
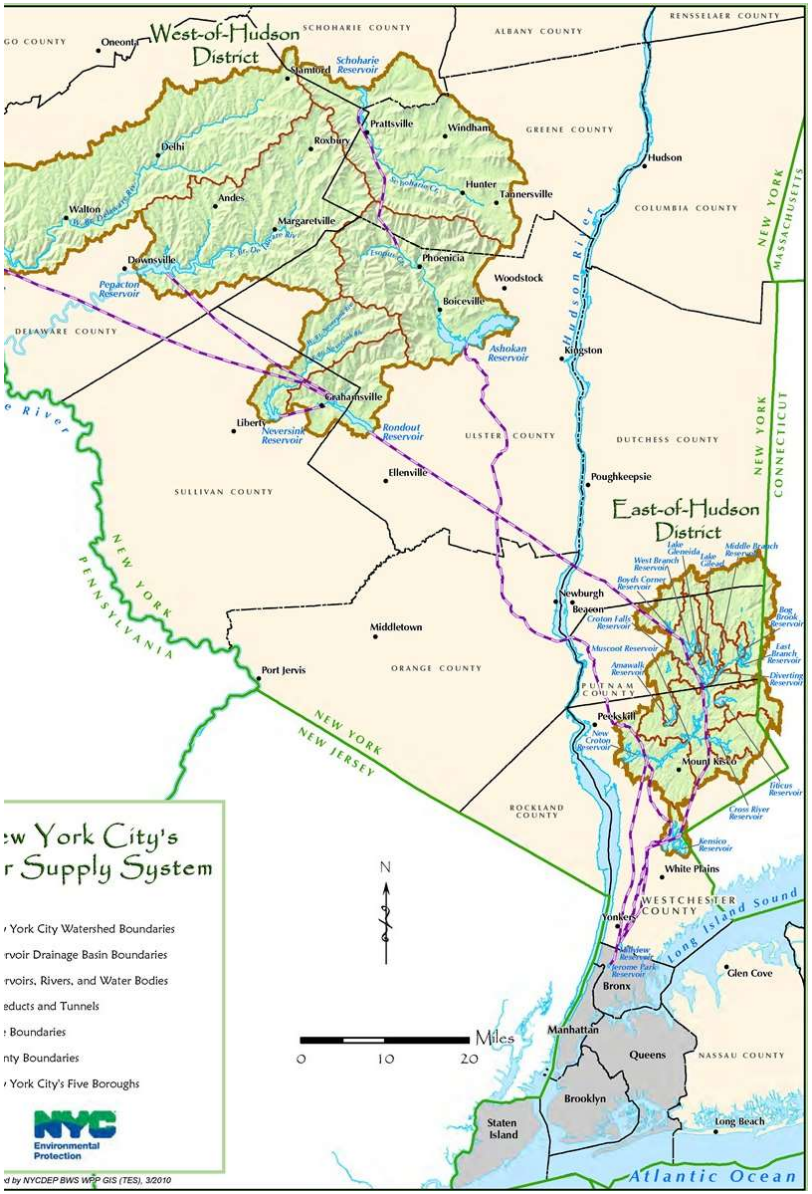
BUREAU OF WATER SUPPLY

NYC Environmental Protection

- System Overview
- Leak Overview
- Project Overview
- Supply Augmentation
- Shutdown Management Plan
- Operational Challenges
- Common Questions & Concerns
- Q&A



New York City Water Supply



Water Supply Overview

- Surface water system
- 19 reservoirs + 3 lakes (Croton, Catskill, and Delaware Systems)
- 570 billion gallon total reservoir storage capacity
- 9.8 million consumers (~1/2 New York State population)
- Delivers more than 1.1 billion gallons of water each day
- Watershed = 1,969 square miles (~1.2 million acres)
- Watershed covers parts of 8 upstate counties in NY plus a small portion of CT
- Nation's largest municipal water supply – 90% unfiltered
- Conveyed by gravity alone

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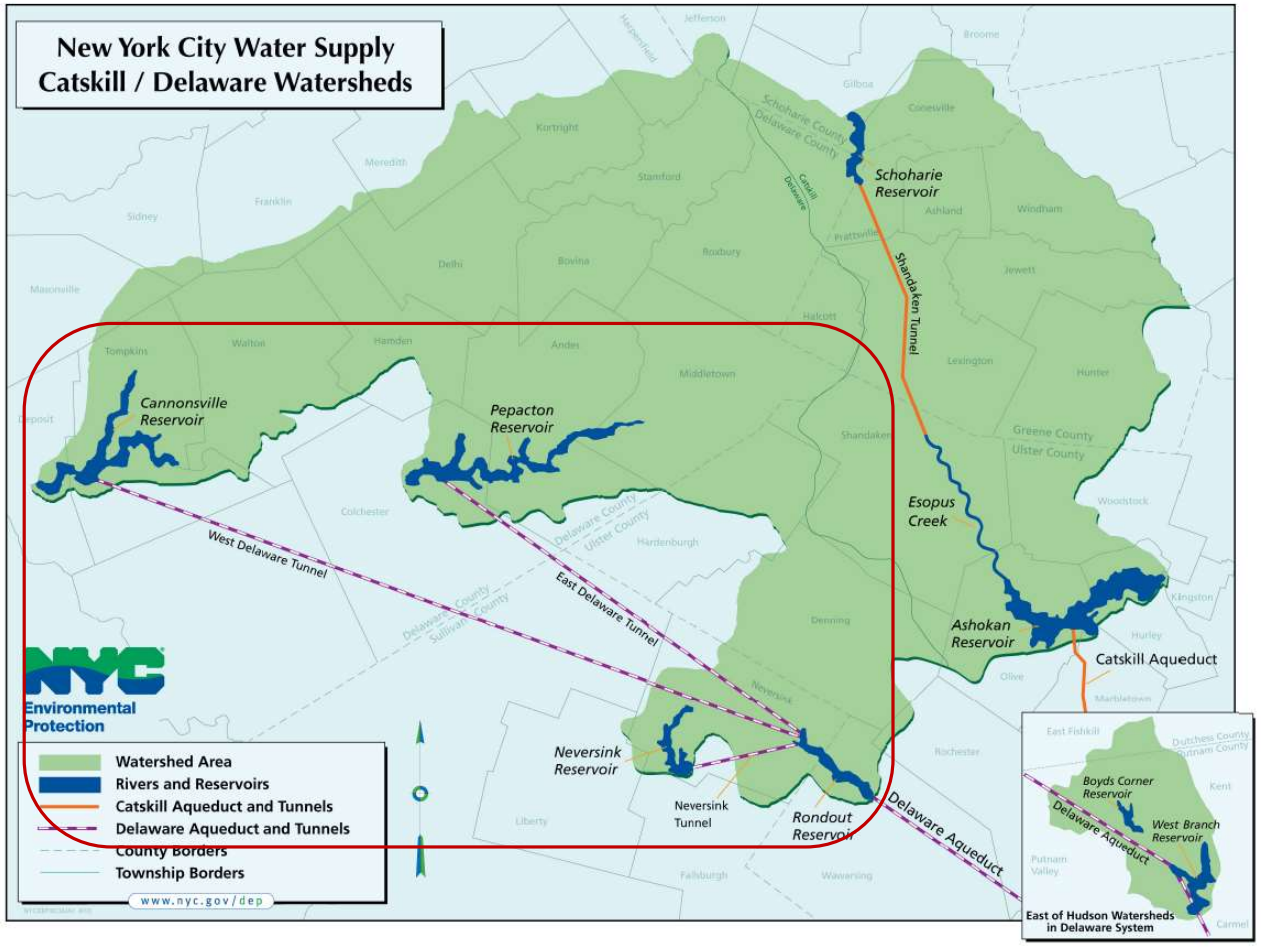
Delaware System Overview

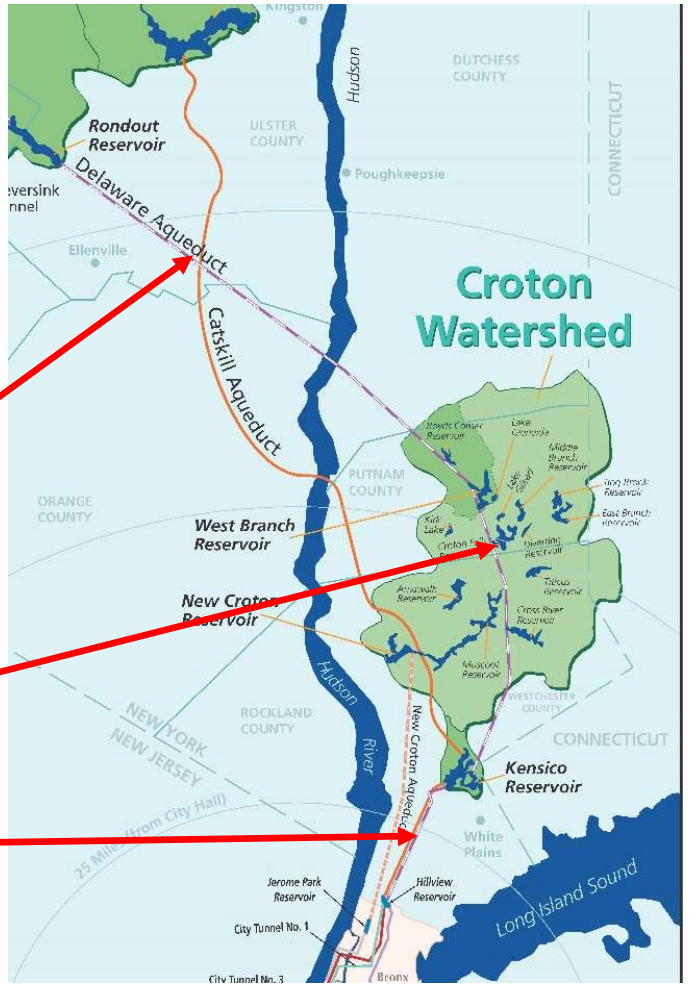
Delaware System was completed in several stages:

- Delaware Aqueduct-1944
- Rondout Reservoir-1950
- Neversink Reservoir-1954
- Pepacton Reservoir-1955
- Cannonsville Reservoir-1964



Delaware Aqueduct

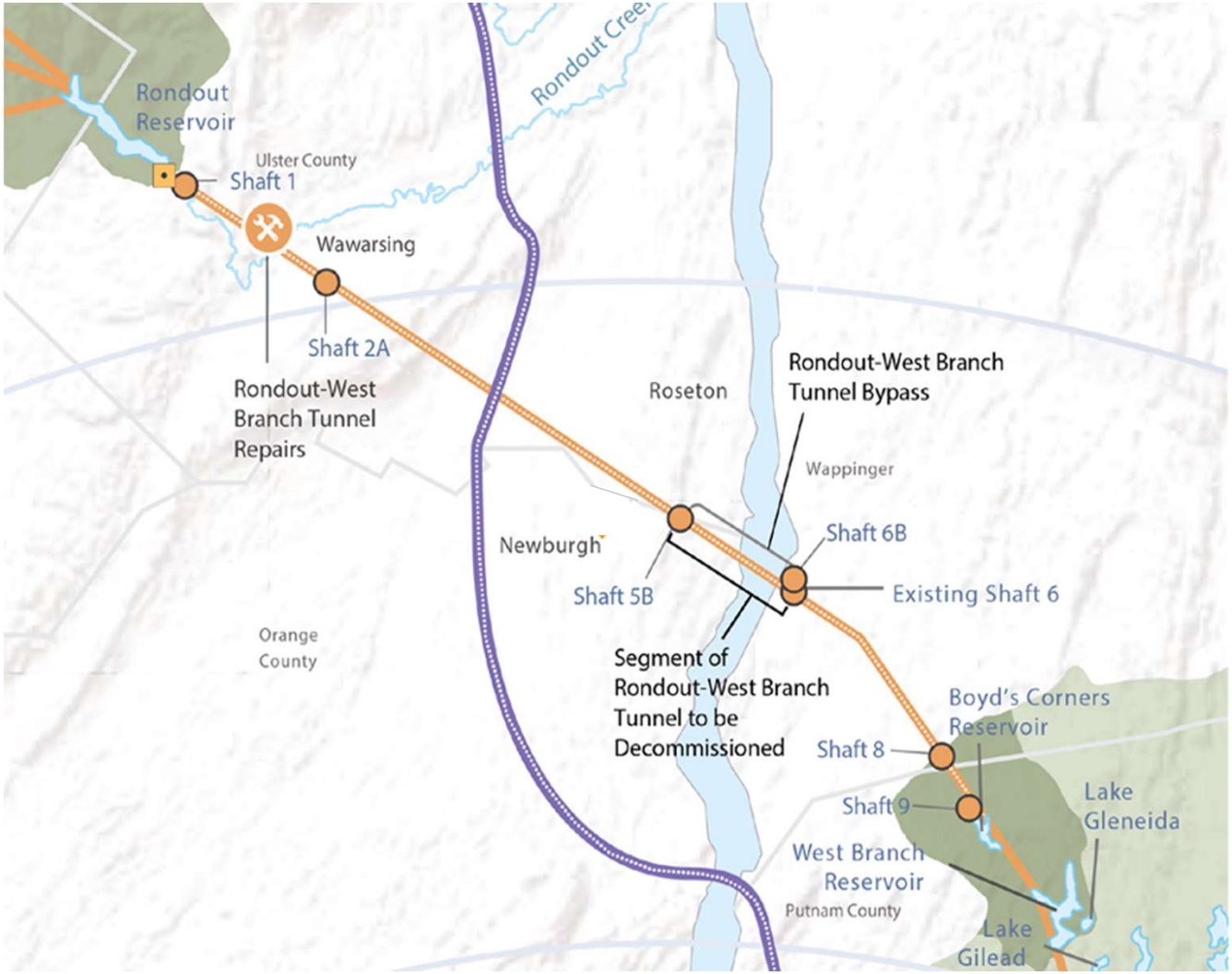
- 85 miles long from Rondout to Hillview Reservoir
- Longest tunnel in the world
- Conveys about 50-60 percent of NYC drinking water
- Put in service in 1944
- Last drained for inspection 1957-1958
- Critical system component
- Aqueduct consists of three segments
  - Rondout to West Branch (44 mi.)
  - West Branch to Kensico (27 mi.)
  - Kensico to Hillview (14 mi.)



Leaks Discovered

- Leak identified in late 1990 at CHG&E Roseton generating station north of Newburgh
- Leak identified in 1992 in the Ulster County Town of Wawarsing
- Total leakage rate estimated at more than 30 million gallons per day
- About 95 percent of the leakage is from the area at Roseton near Newburgh
- Difficult conditions encountered during aqueduct construction – faulted limestone
- Steel inter-lining installed through these sections to provide support for the tunnel

Primary Areas of Concern



Delaware Aqueduct Repair Project

- Largest and most complex repair project in the 180-year history of NYC's municipal water supply
- Total program cost $1 billion
- Fixing or eliminating leaks in the Delaware Aqueduct

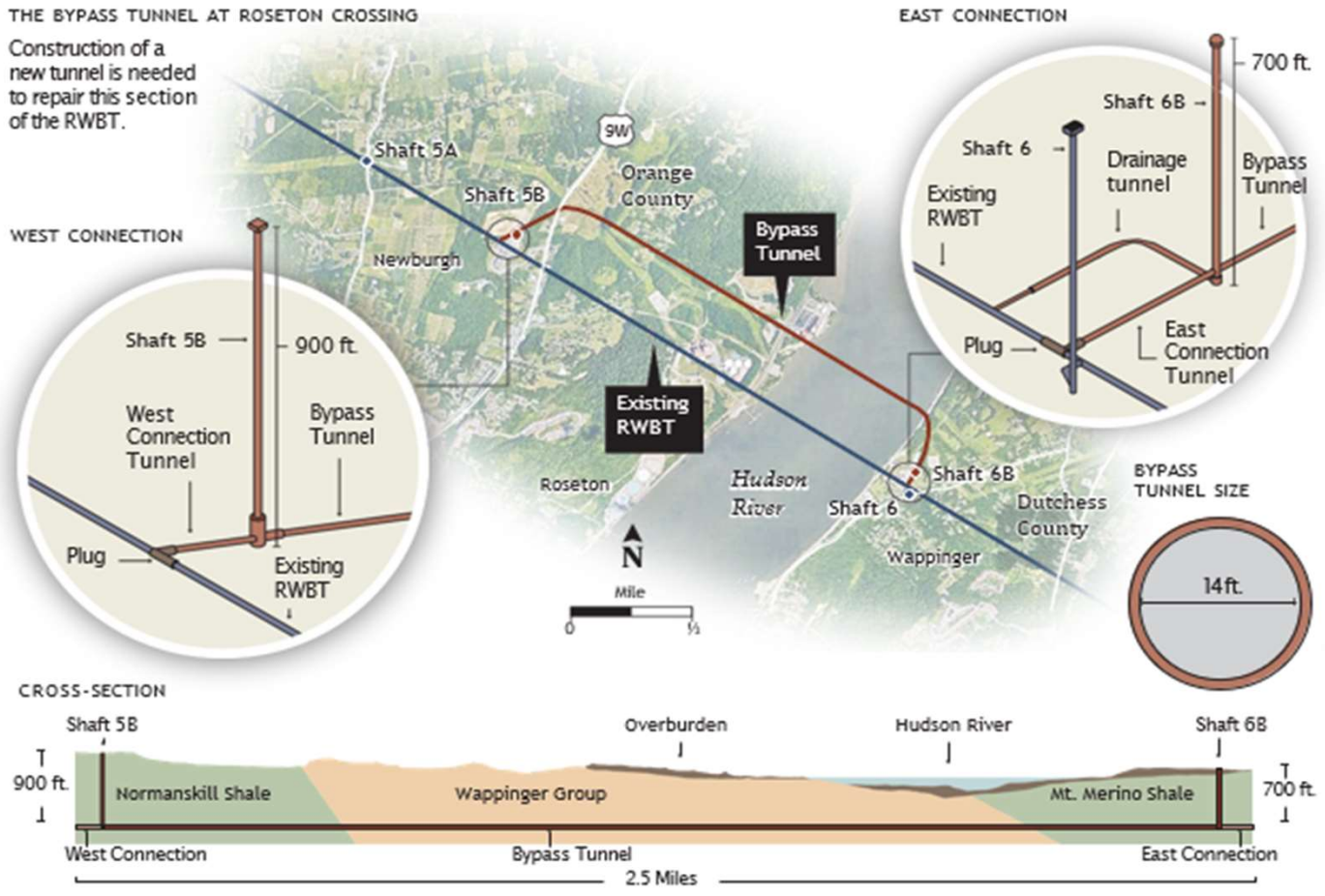
DELAWARE
Aqueduct Bypass

The Water for the Future program has been initiated to address leaks in one of the two main aqueducts that supplies drinking water to New York City and other upstate communities, the Delaware Aqueduct. Together, through engineering repairs and innovative conservation, we will enjoy the safe, clean, reliable drinking water for generations to come.

NYC Water for the Future
Environmental Protection

New York City's Water Supply System

Bypass Tunnel to Connect at Both Ends Under Hudson

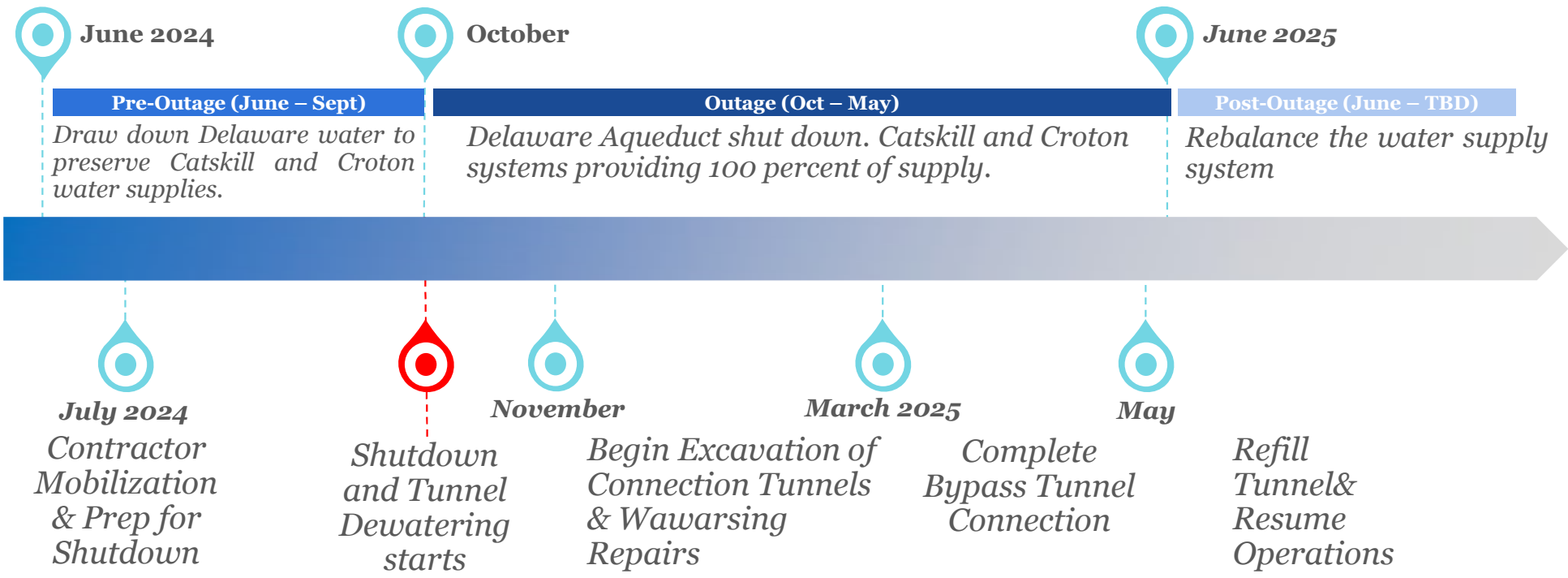


Water Supply Augmentation

During the 5-8 month shutdown how will NYC meet demand?

Source	Max Capacity
Catskill System	600 MGD
Croton Pump Stations	240 MGD
Croton System	290 MGD

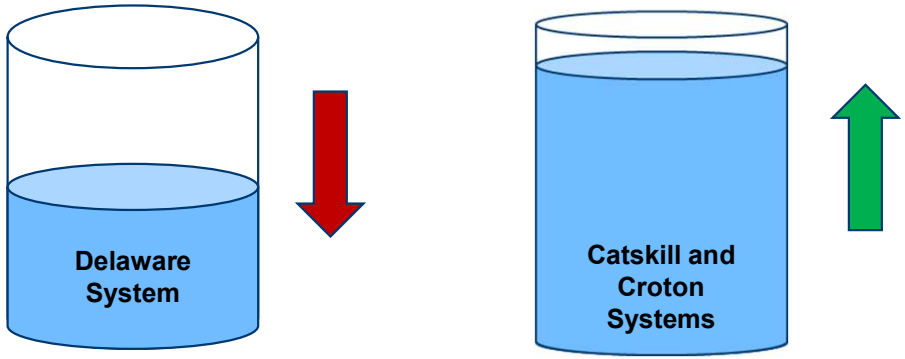
Shutdown Operations and Tunnel Connection Timeline



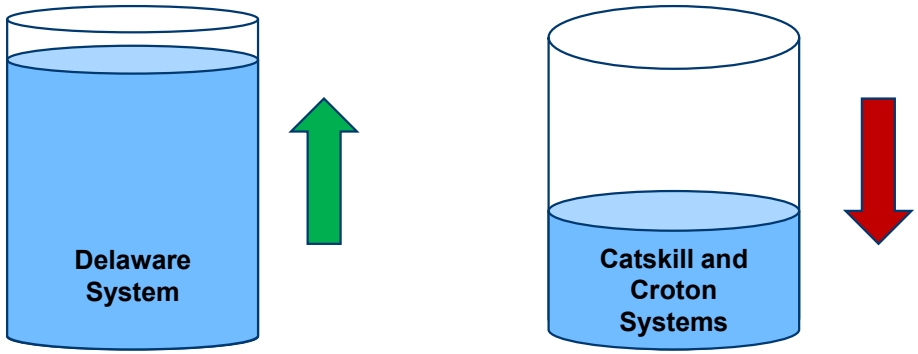
All “go” / “no-go” and potential project bailout decisions are made in real time based on precision data and in coordination with expert and regulatory partners. Bailout return-to-service during shutdown can take between 1 and 9 weeks.

Shutdown Operations

Before the aqueduct shutdown



During the aqueduct shutdown



BWS Operational Challenges

Dewatering Exercise

- On March 6, 2023, DEP shut down the Delaware Aqueduct and began the process of dewatering the tunnel to an elevation of –90 feet below sea level, the first such draining in nearly 70 years
- The two-week shutdown enabled DEP to perform critical infrastructure and hydrological tests before beginning the final connection phase
- An engineering analysis of the new data obtained from the March shutdown concluded that the level of groundwater infiltration potentially exceeded the capacity of tunnel dewatering systems
- Safety of the workers 700 feet below ground is paramount

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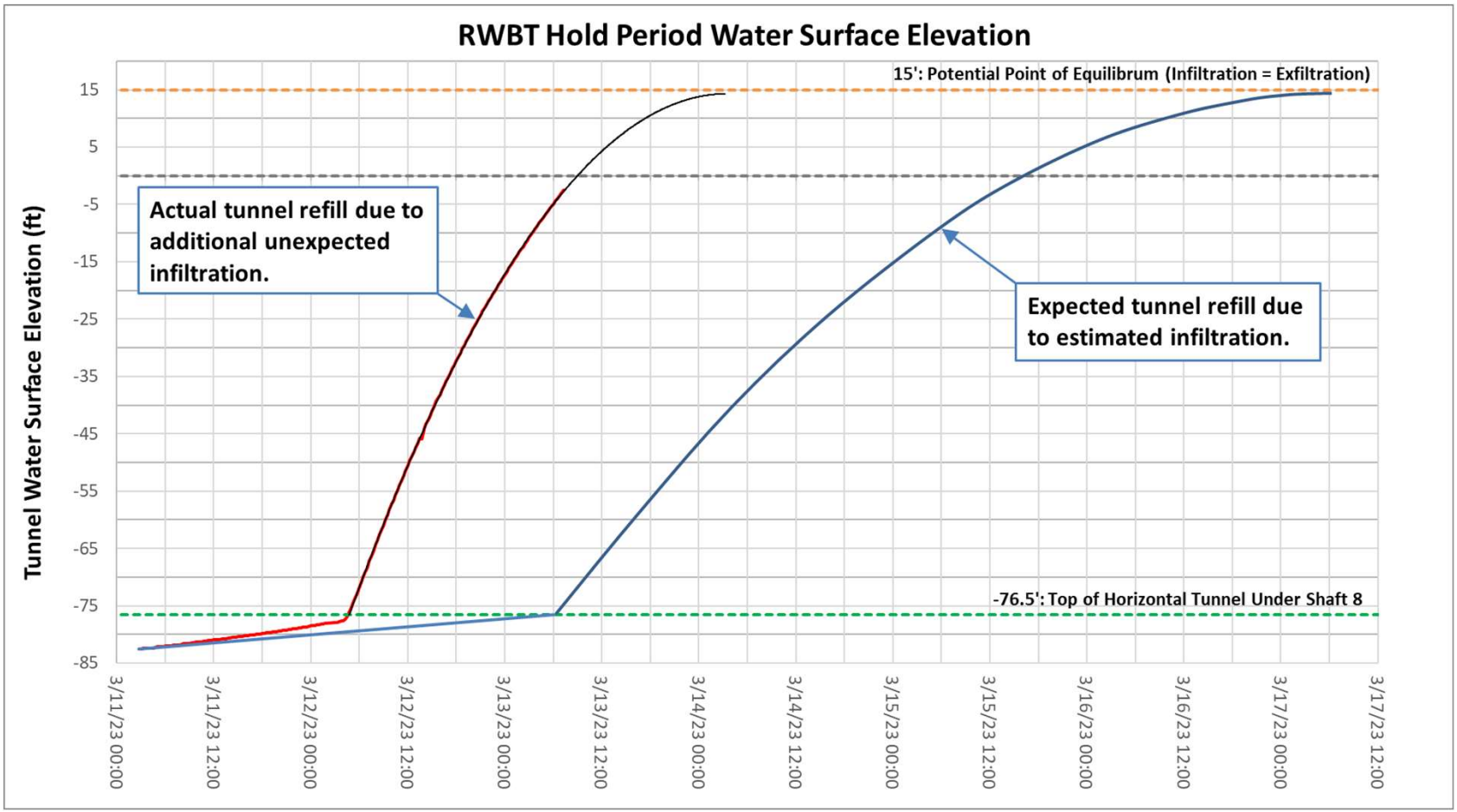
Higher than Anticipated Tunnel Infiltration Rates

Current dewatering pump design capacity is insufficient, which would cause infiltration water to flood the connection worksite



Current Path Forward

Conducting an additional dewatering exercise in Fall 2023 (October 16 – November 11) to gather additional data on infiltration, with full shutdown in October 2024

- Continue with Shaft 6B pump augmentation work
- Fall 2023 exercise will provide additional data points, to further reduce uncertainty of actual infiltration when fully dewatered
  - Exercise will dewater the RWBT
  - Estimate 2-3-week exercise duration

Tunnel Boring Machine “Nora” at Shaft 6B

Croton Filtration Plant

Cross River Pump Station

Croton Falls Pump Station

Questions and Concerns We've Heard

- **Will there be more water released downstream of Delaware System Reservoirs during the shutdown or in the lead-up to it?**
  - It depends on conditions. If it's an especially wet year, then there may be more water. If it's dry, then it'll likely be a bit less.
- **What impact will shutdown have on fisheries?**
  - Not expecting any impact. Delaware System Reservoirs will continue to operate under rules of 2017 Flexible Flow Management Program throughout shutdown period.
- **Will there be a greater risk of flooding?**
  - Delaware System of Reservoirs will continue to operate under rules of 2017 Flexible Flow Management Program and follow the Conditional Seasonal Storage Objective (CSSO) for each reservoir.
  - Even when full reservoirs attenuate flood risk downstream.

Steel liners for the Delaware Aqueduct Bypass Tunnel with Freedom Tower in background

More info in "*Water for the Future Shutdown System Operations EIS.*" 429-page document with in-depth analysis on impacts of shutdown.

Questions

1949

1957