

Delaware Aqueduct Repair Update

March 23, 2022



Presented to an advisory committee of the DRBC on March 23, 2022.
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Agenda

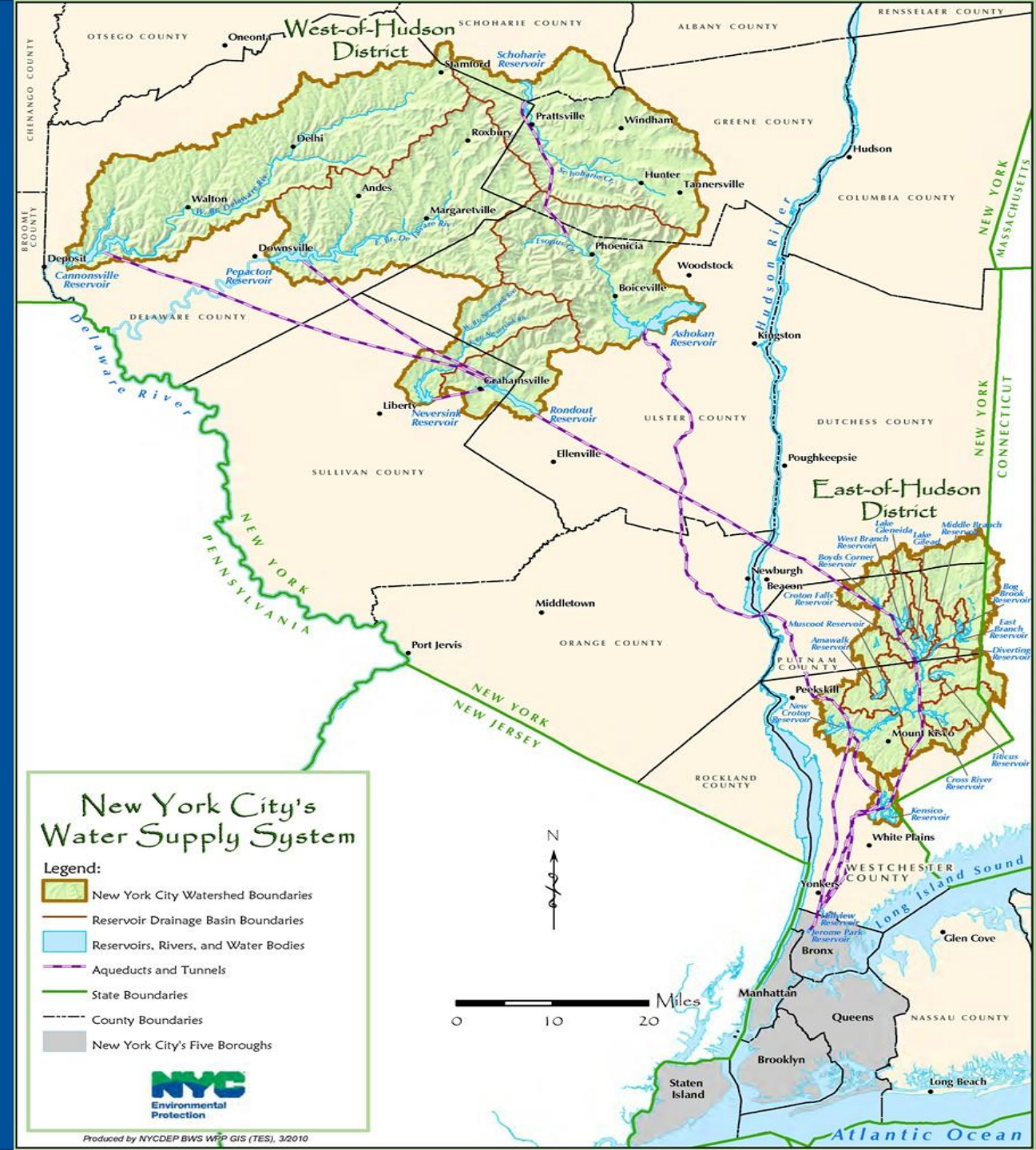
Jennifer Garigliano

CHIEF OF STAFF
BUREAU OF WATER SUPPLY

- System Overview
- Project History
- EIS
- Delaware operations
- Modeling
- Concerns
- Summary
- Questions

System Overview

- Primarily a surface water supply
- 19 reservoirs & 3 controlled lakes
- System Capacity: 570 billion gallons
- Serves 9.8 million people Delivers approx. 1.1 billion gallons per day
- Source of water is a 2,000 square mile watershed in parts of 8 upstate counties



Delaware Aqueduct Bypass Tunnel

- 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
- Building and connecting a new 2.5-mile-long tunnel 600 feet below the Hudson River from Newburgh to Wappinger
- Expected completion in 2023
- Shutdown to connect bypass tunnel begins October 2022



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.)



Leak Discovery

- Leak identified in late 1990 at CHG&E Roseton generating station
- Leak identified in 1992 in Town of Wawarsing
- Total leakage rate estimated at approx. 20 MGD on typical day
- Approximately 95 percent is leaking from Newburgh section
- Difficult conditions encountered during construction – faulted limestone
- Steel lining installed through these sections to provide support for the tunnel



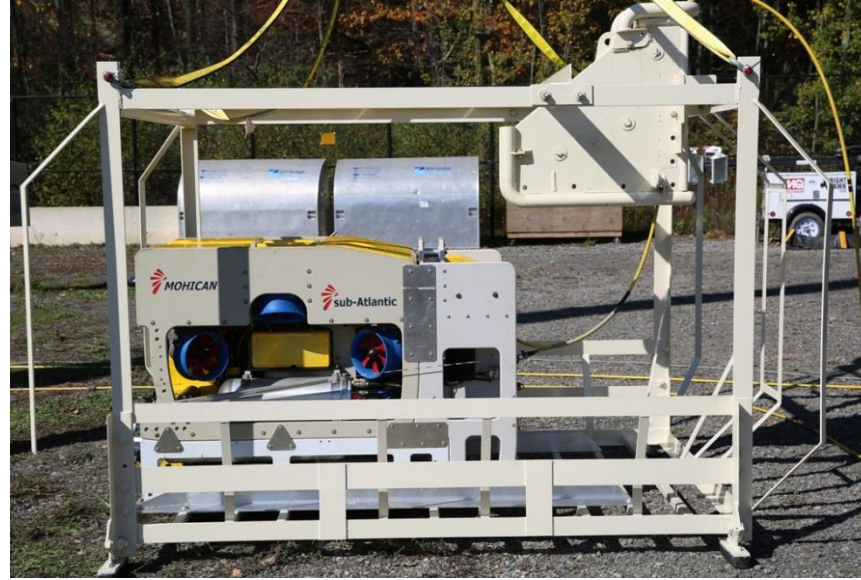
Primary Areas of Concern



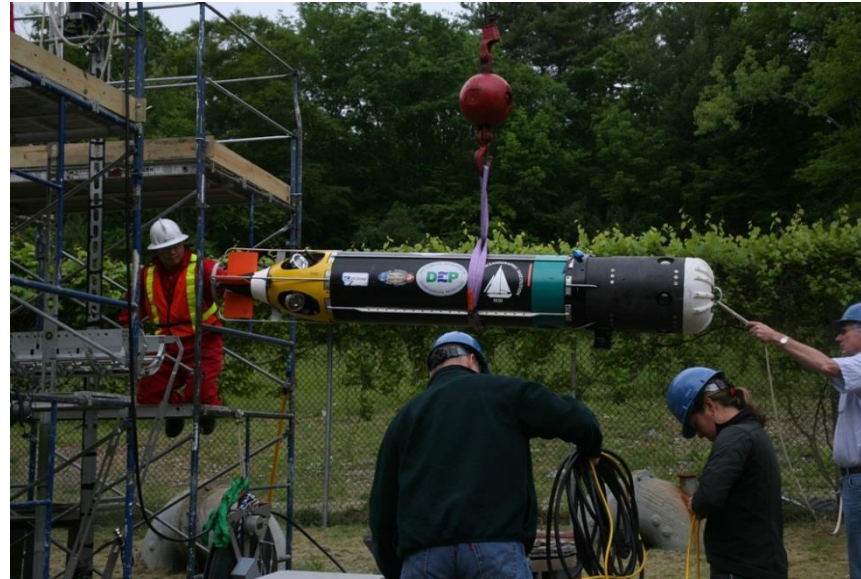
Leak Investigation



Top: ROV used in 2015 to investigate locations in Wawarsing



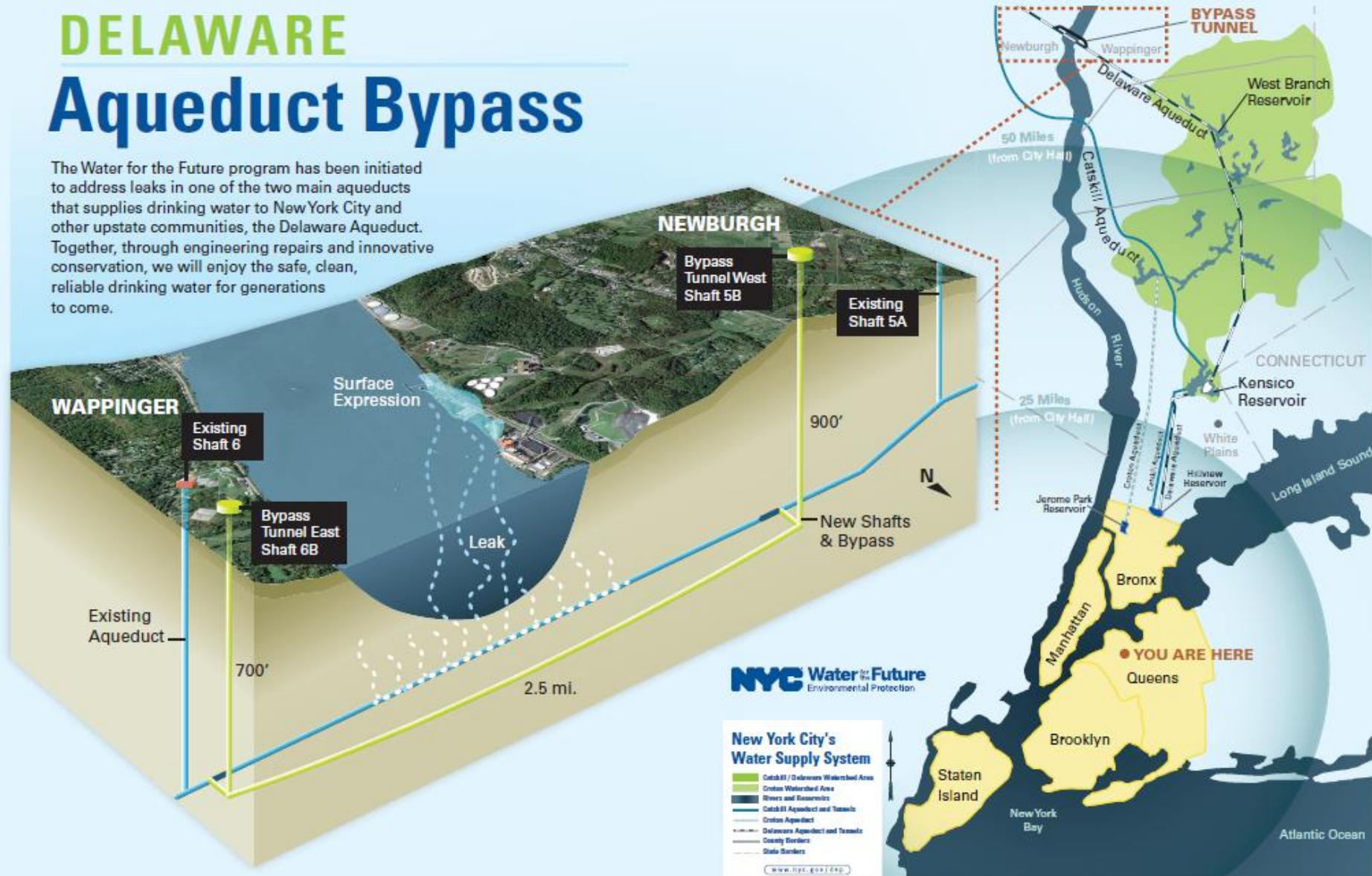
Bottom: AUV used in 2004, 2009, 2014 to investigate the Rondout-West Branch segment



The Solution

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.



Competing Interests in the DRB

- Water Supply
 - Habitat protection
 - Aquatic life
 - Wetlands
 - Flood mitigation
 - Recreation
 - Salinity management
 - Others
- Suggestions we get are in direct conflict with one another
 - It is impossible to create a solution that 100% meets every stakeholder want/concern
 - We do the best we can to find a solution that meets as many wants/needs/desires as possible

Environmental Impact Statement

- This project underwent the NY State Environmental Quality Review Act (SEQR) process
 - Requires an environmental impact statement
 - Public process
- Notice of Completion for the Draft Environmental Impact Statement (DEIS) was issued on September 19, 2016
 - Public hearings were held on October 20, 24, 25, and 28, 2016 in Ellenville; Yorktown Heights; Newburgh; and Loch Sheldrake, NY respectively, to collect public comments
 - The public comment period closed on November 14, 2016
- Notice of Completion of Final Environmental Impact Statement issued on December 15, 2017
- **Chapter 10: Proposed Water for the Future Shutdown System Operations**
 - **10.3: Delaware Water Supply System Assessment and Impact Analysis**
 - **429 Pages**

[chapter-10-wsso.pdf \(nyc.gov\)](#)



Upstate Water Supply Resiliency Project

What's included

- Overview of water supply operations
- OST overview-including the inputs used to make decisions
- Shutdown operations plan
- Hydrologic evaluation and impact analysis methodology
- Land use, zoning and public policy
- Socioeconomic conditions-including recreation
- Natural resources
- Air and noise
- Wildlife and habitat assessment
- Water supply assessment

Tools Used

- OST
- HEC-RAS
- Hundreds of data sets including forecasts
- Maps and plans
- Aerial Imagery
- Field assessments
- Nature Conservancy's Northeast Terrestrial Habitat Maps
- NY Natural Heritage program consultation
- FHWA Traffic Noise model



Water Supply Augmentation

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

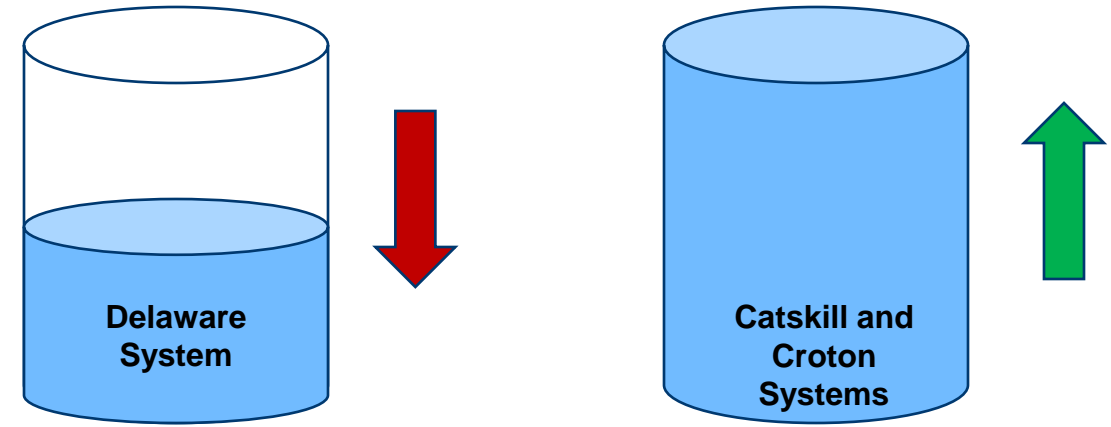
Source	Yield
Catskill System	600 MGD
Croton Pump Stations	240 MGD
Croton System	290 MGD



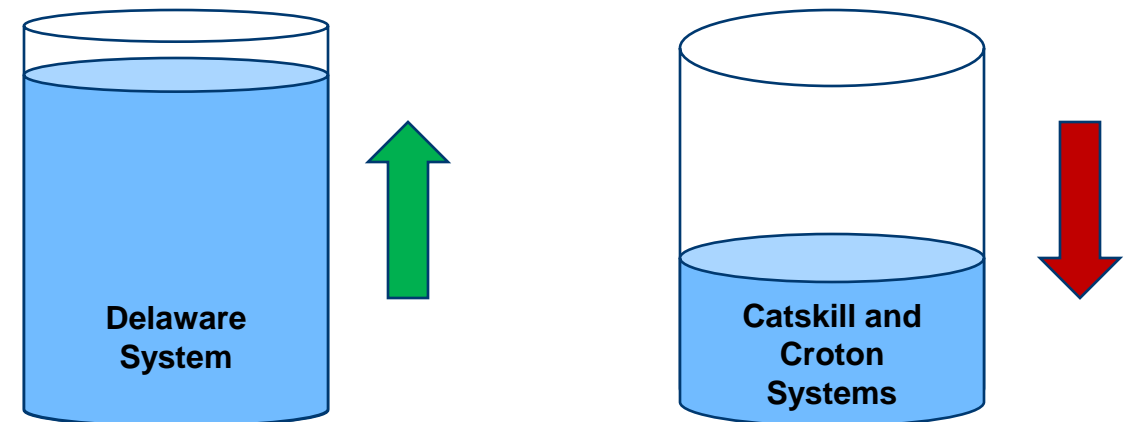
Shutdown Operations

- Water supply system will be operated differently before and during the shutdown
- Usually strive for balance across the three systems
- Preferential use of Delaware System water before the shutdown
 - Draw down the reservoirs to reduce the likelihood they will pass water through spillways
 - Allow Catskill and Croton to stay relatively full
 - Still making downstream releases in accordance with decree and agreements
- Exclusive use of Catskill and Croton water during the shutdown
 - Will draw down those two systems substantially
 - Delaware will begin to refill
- System will be operated after the shutdown to regain “balance”

Before the aqueduct shutdown



During the aqueduct shutdown



OST Modeling

**2015 EIS
2020 Update
Daily Ops**



Getting OST Ready

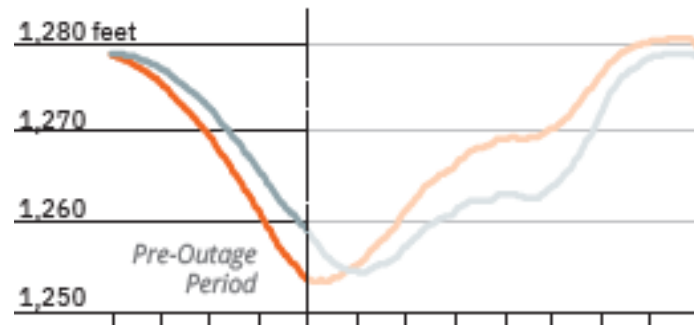
- Updated baseline runs
- Work with the RWBT management team
 - Implement the Management Plan in OST
 - ✓ Account for down basin communities concerns
 - Update Croton operations
 - Set modeling Assumptions
 - Discuss potential adverse conditions
 - Decide about evaluation metrics
 - Decide about outage triggers
- **Important to keep in mind: Model provides Information, management make final decision!**

2015 EIS

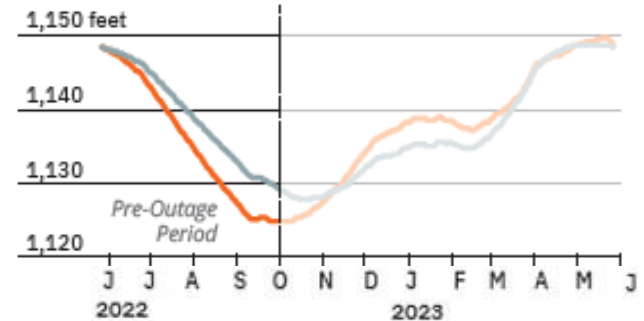
Delaware Basin Reservoirs Management plan

— Typical Operations — Shutdown Operations Average

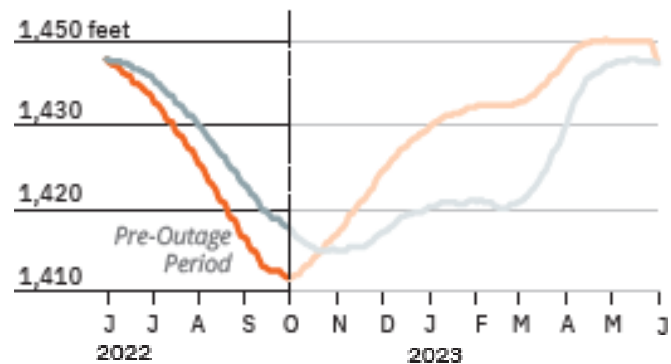
Pepacton Water Surface Elevation



Cannonsville Water Surface Elevation

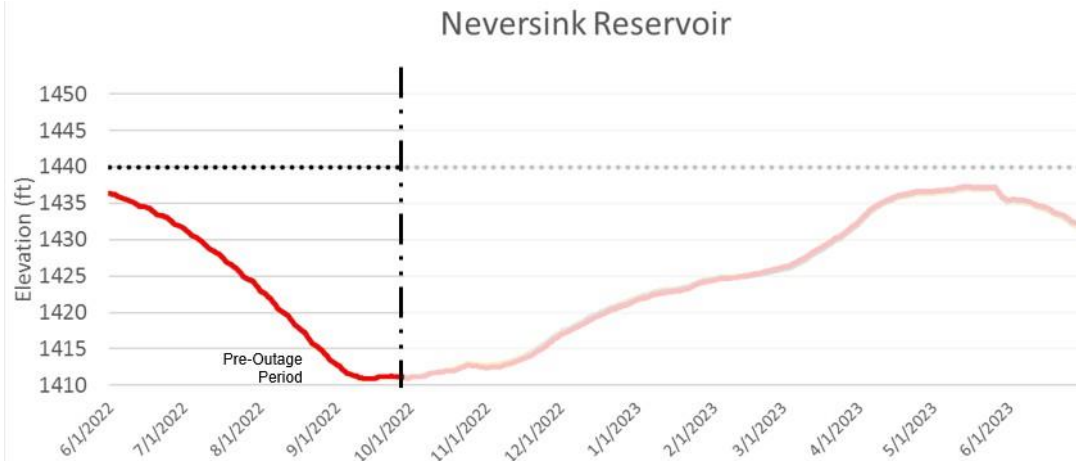
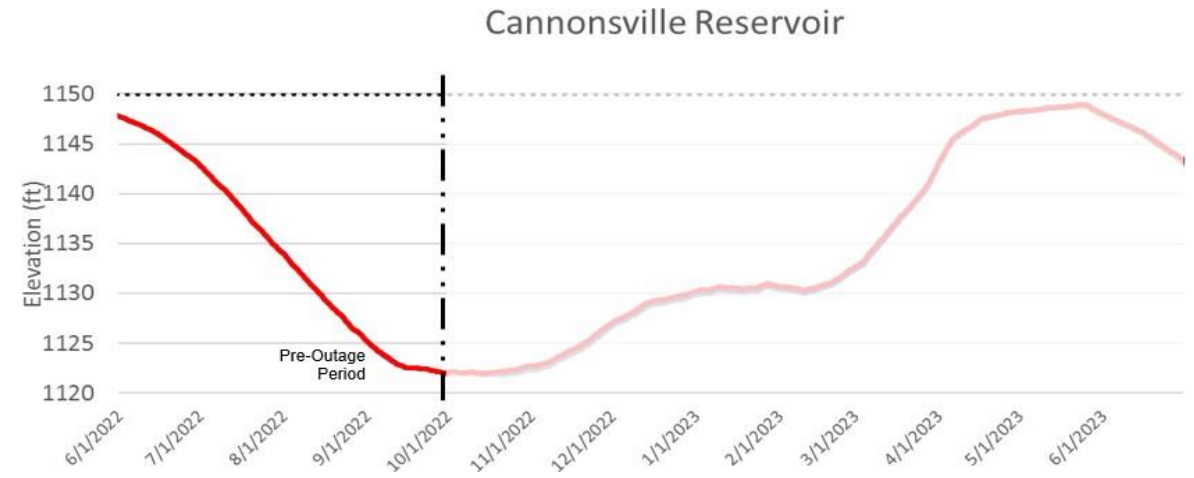
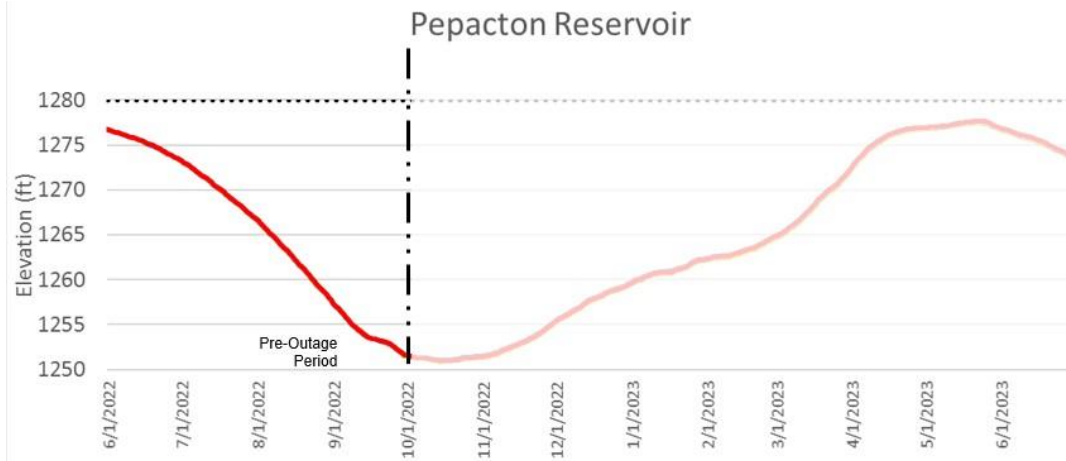


Neversink Water Surface Elevation



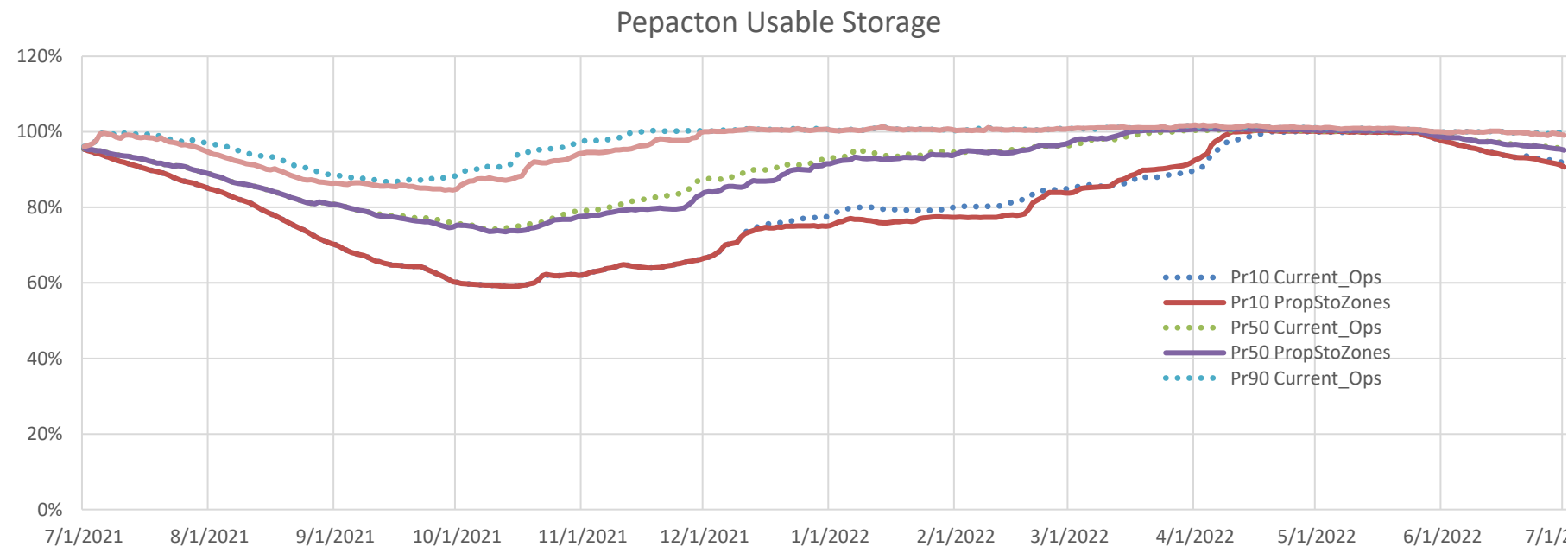
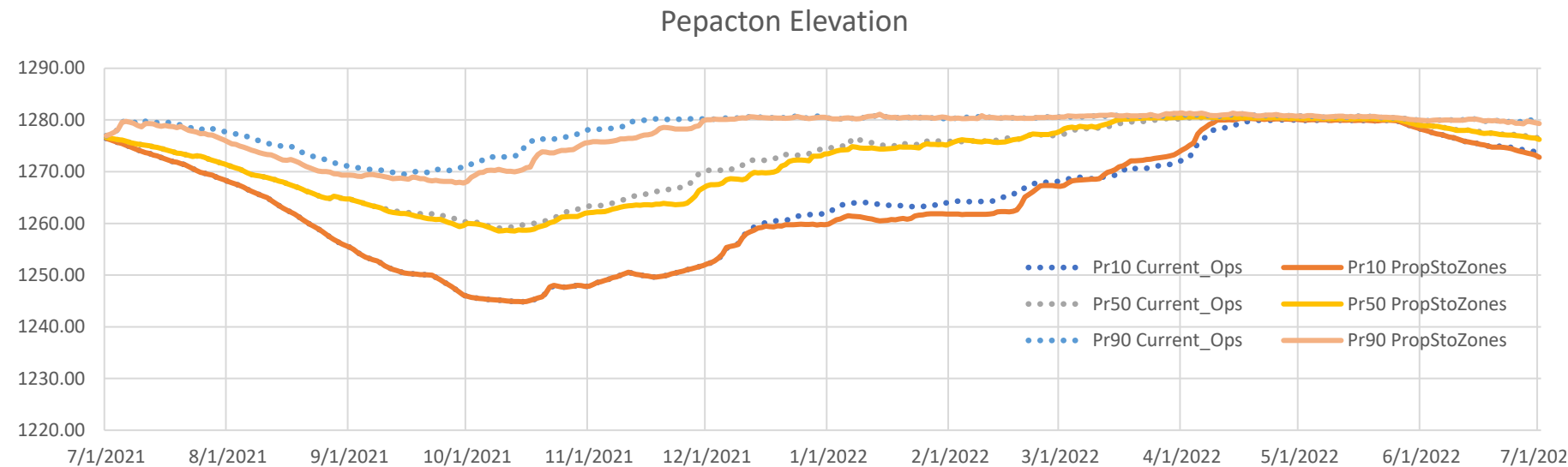
2020 Update

..... Spillway

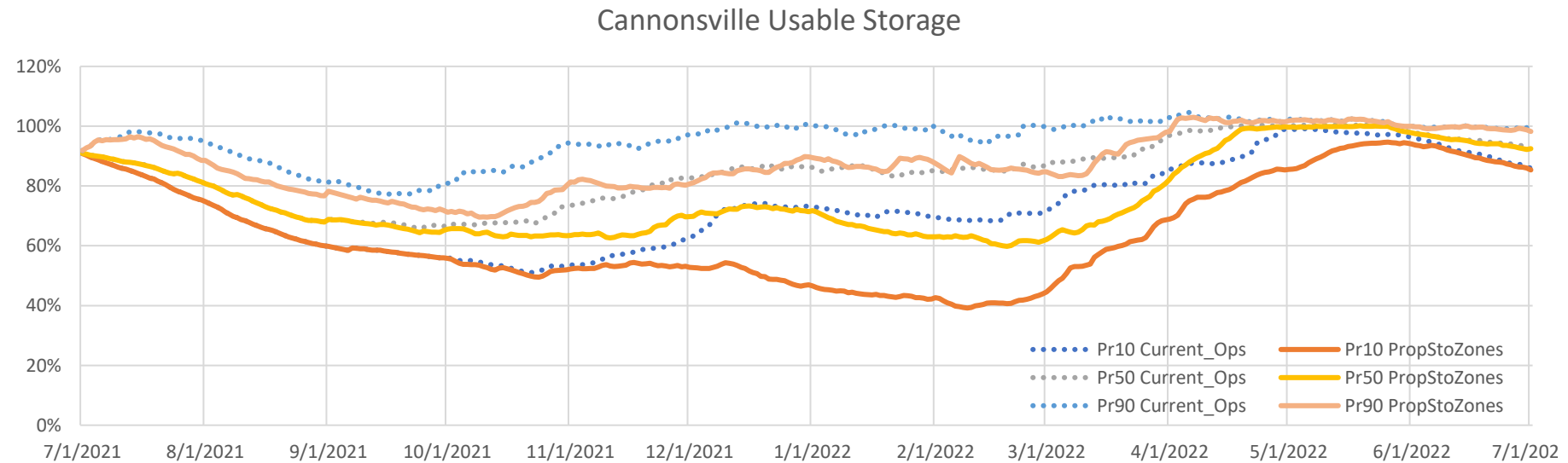
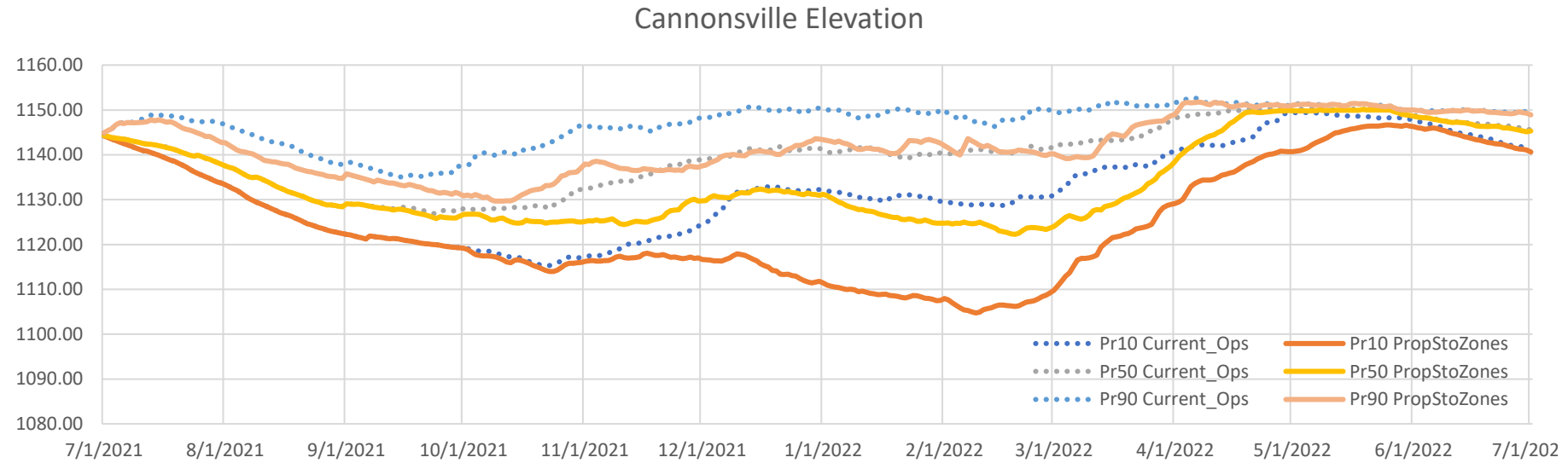


- 2017 FFMP
- Extended Inflow
- New Bathymetry
- Updated Croton Ops
- Updated model assumptions

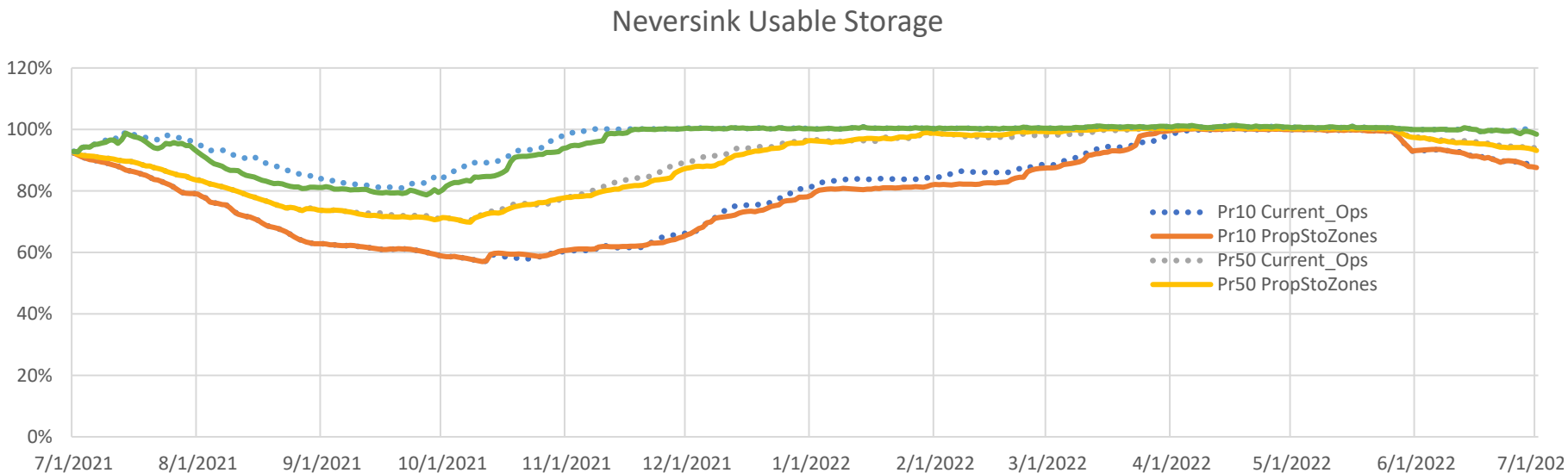
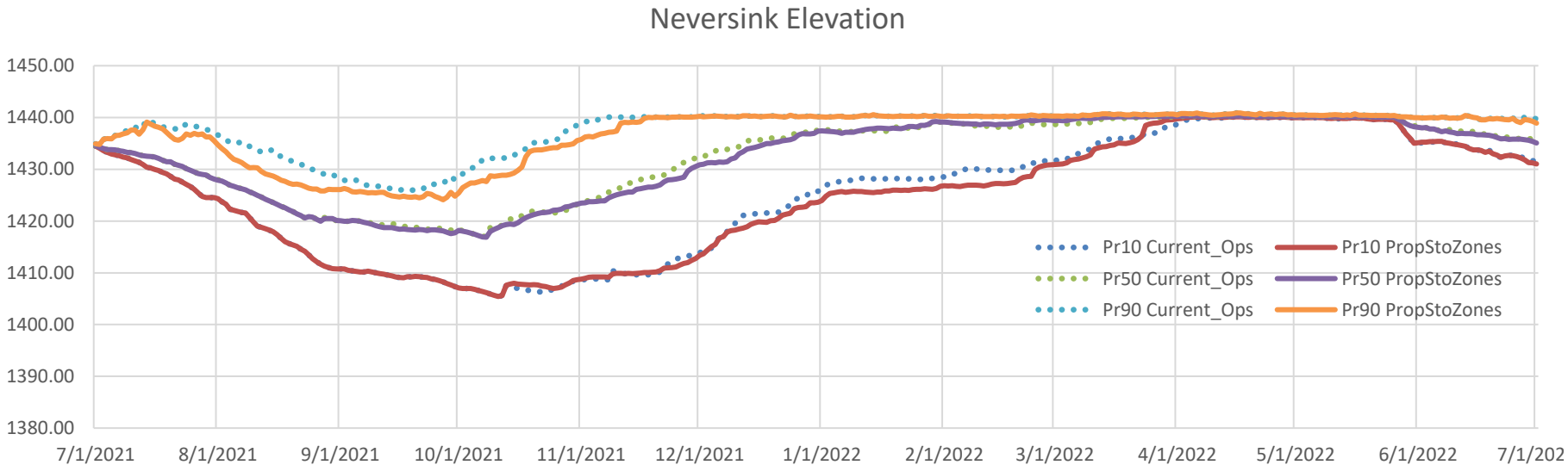
Pepacton Elevation (ft), Pepacton Usable Storage (%)



Cannonsville Elevation (ft), Cannonsville Usable Storage (%)



Neversink Elevation (ft), Neversink Usable Storage (%)



Concerns

- Concerns we've heard:
 - Reservoirs being too full during the shutdown
 - Installing siphons at PCN
- ❑ Extensive planning and public process
- ❑ 20 years in the making
- ❑ Use state of the art models
- ❑ We don't have a crystal ball to predict the weather



WAISGLASS/COULTHART

"...And this is our corporate planning group."

Summary

- The RWBT Shutdown planning started ~20 years ago
- Today OST is used to support shutdown planning and operations
- External drivers can impact the RWBT shutdown
 - Hydrological conditions (Extreme events)
 - Loss of pumping
- OST provide important information to help address communities concerns



Questions

