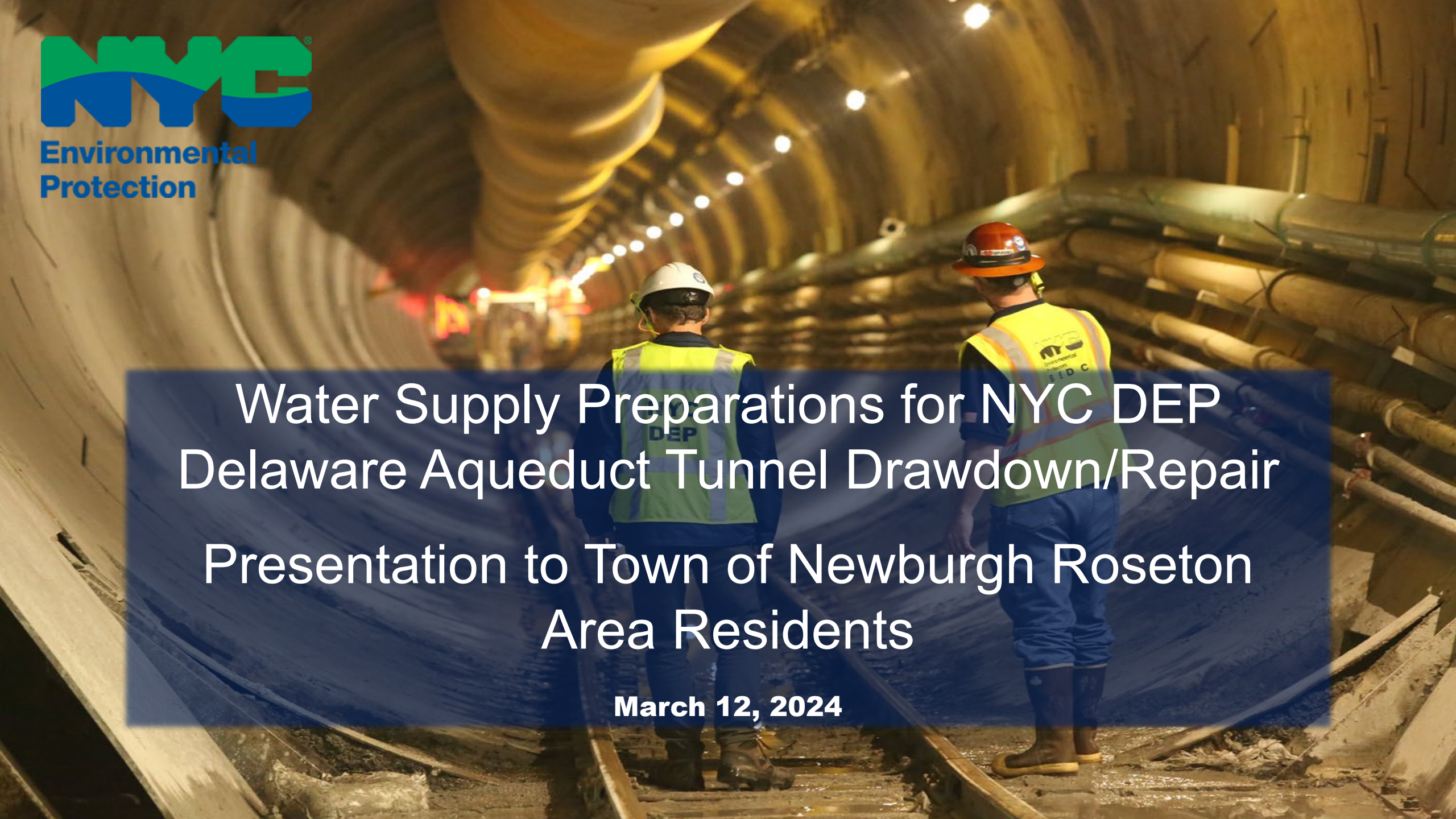


Water Supply Preparations for NYC DEP Delaware Aqueduct Tunnel Drawdown/Repair

Presentation to Town of Newburgh Roseton Area Residents

March 12, 2024

Outline of Discussion

- Project Review, by NYCDEP Representatives
- Aquifer response October RWBT unwatering test, by EISCOM JV
- Prediction for Fall 2024 Connection Period full unwatering
- Alternate water supplies for property owners
  - Municipal water supply extension
  - Interim temporary water arrangements
- Discussion, Questions and Answers, NYCDEP and EISCOM JV

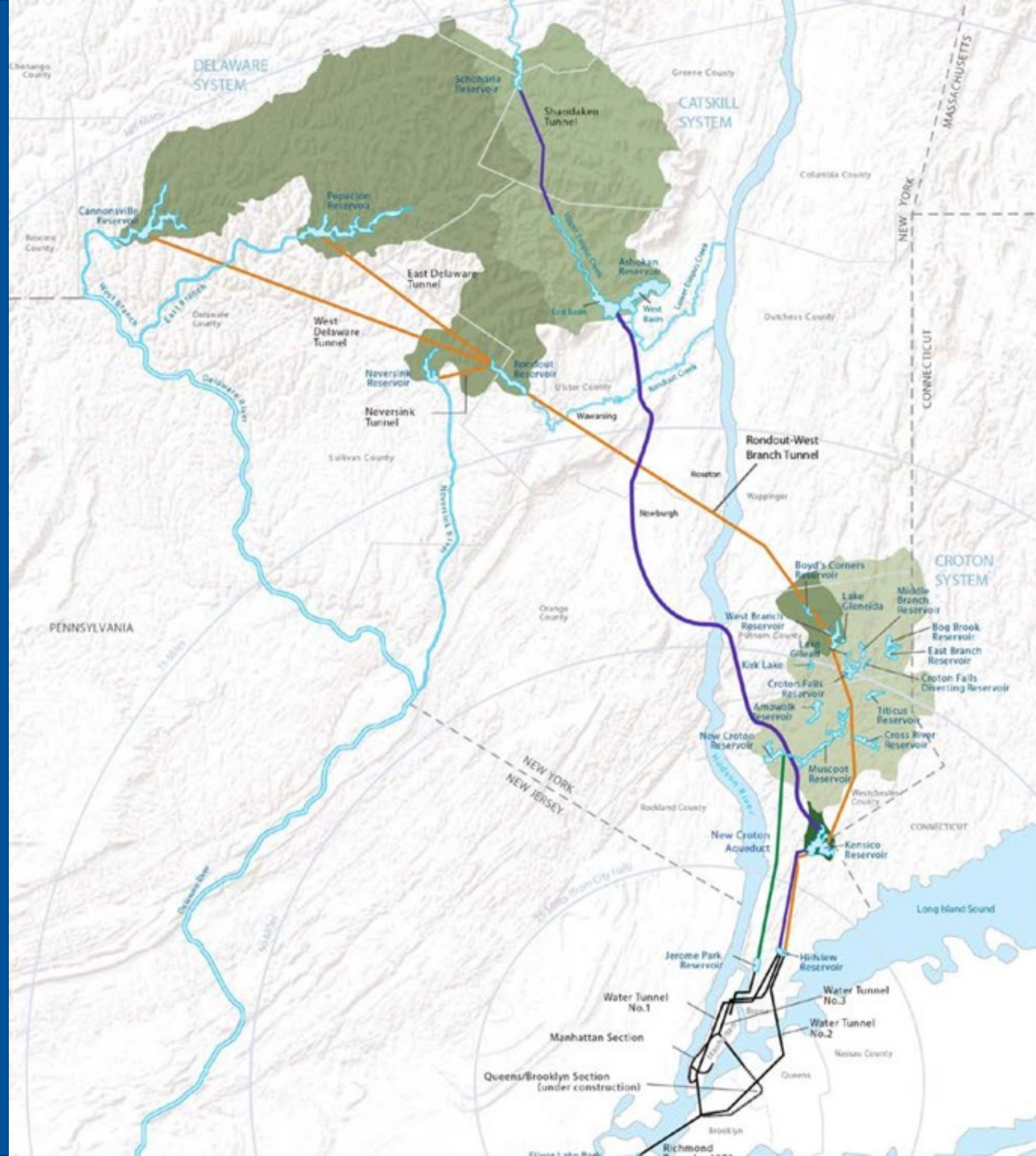
Summary: Significant numbers of wells are expected to be impacted in Roseton. NYCDEP is committed to providing a reliable potable water service for all residents, using municipal water and interim temporary water.

NYC Environmental Protection

System Overview

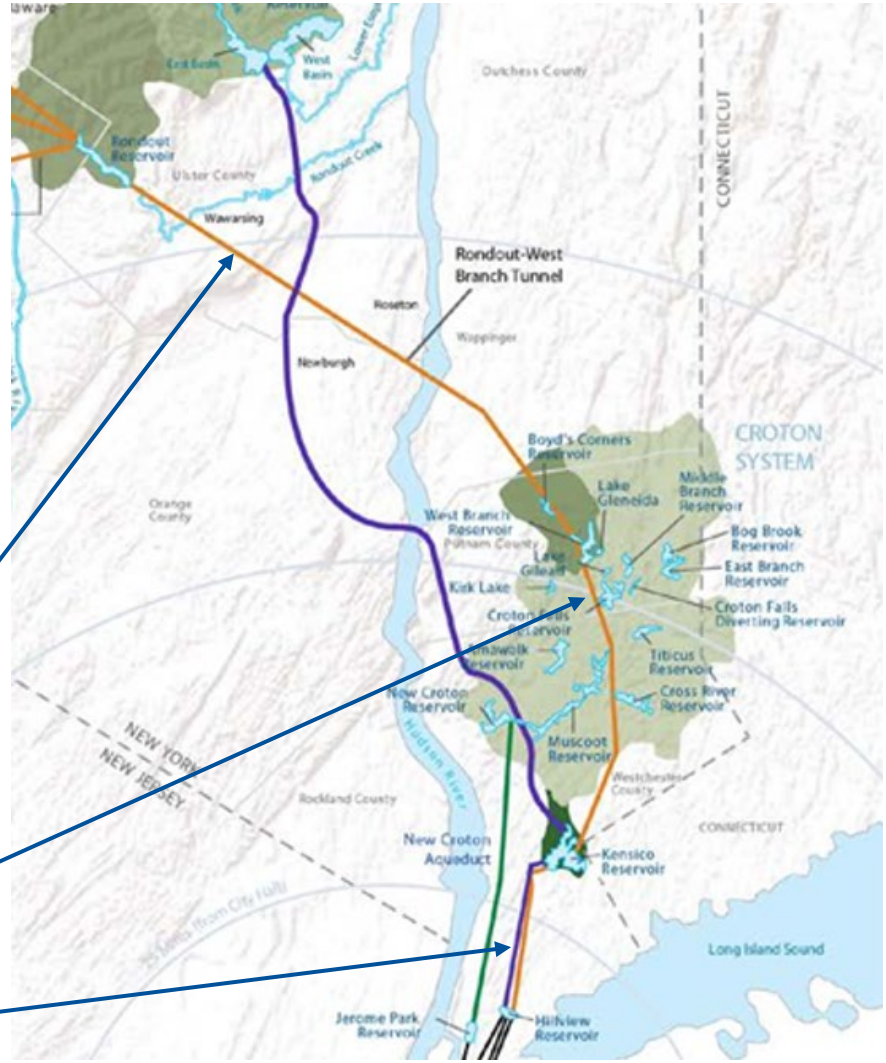
- 19 reservoirs & 3 controlled lakes
- System Capacity: 570 billion gallons
- Delivers approx. 1.1 billion gallons per day to 9.8 million people in New York City and 4 counties north of the City.
- Source of water is a 2,000 square mile watershed (the size of the State of Delaware) spread across 8 upstate counties

NYC Environmental Protection



Delaware Aqueduct

- 85 miles long from Rondout to Hillview Reservoir
- Longest tunnel in the world
- Conveys about 50 percent of NYC drinking water on average
- In service since 1944
- Last fully 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

Delaware Aqueduct Bypass Tunnel

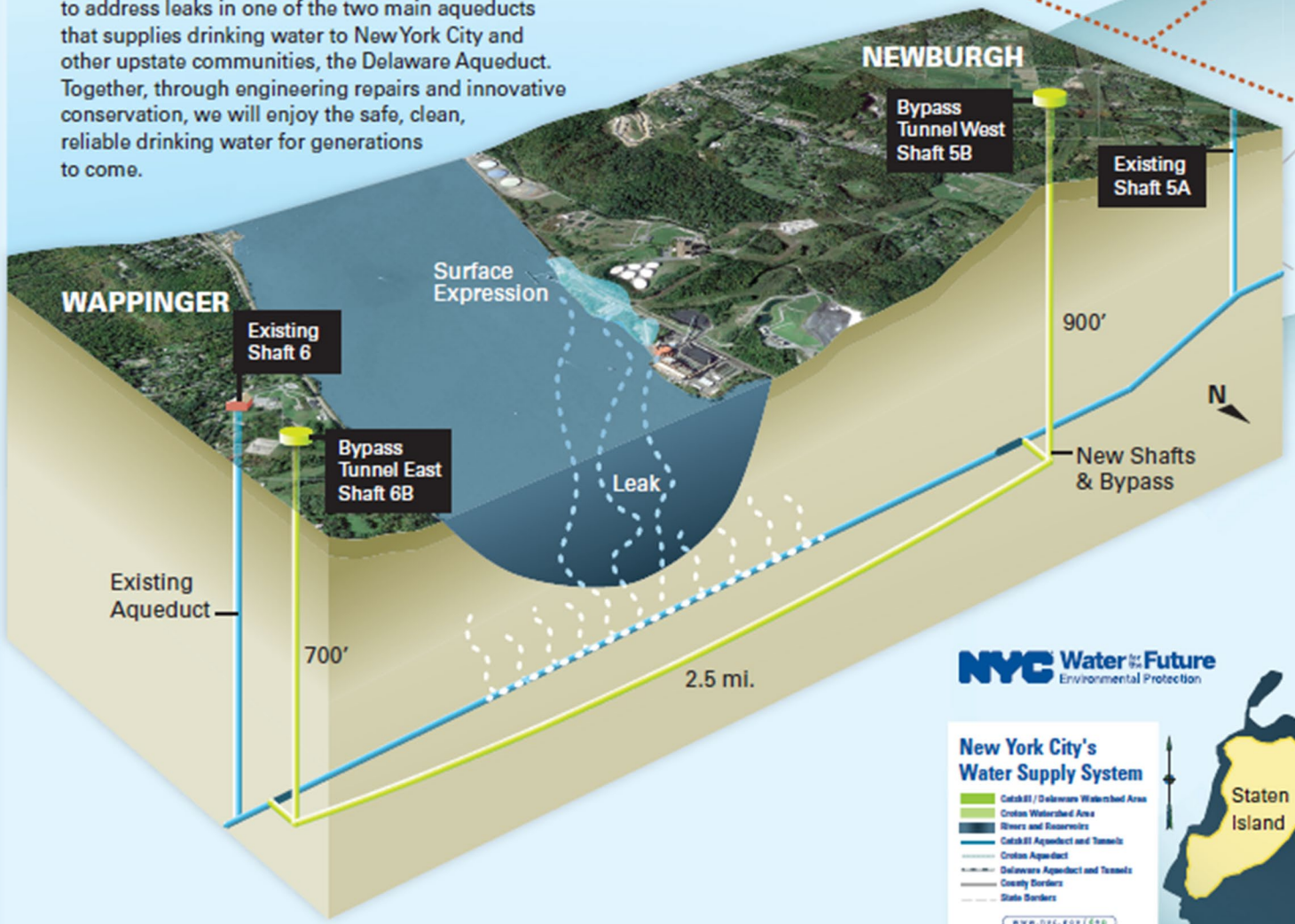
- Largest and most complex repair project in the 180-year history of NYC's municipal water supply
- Tunnel program cost $1+ billion
- Fixing or eliminating leaks in the Delaware Aqueduct
- Building and connecting a new 2.5-mile-long tunnel 600 feet below the Hudson River from Newburgh to Wappinger
- First tunnel under Hudson River since the south tube of the Lincoln Tunnel was completed in 1957

Delaware System Must Shut Down for Final Connection of Bypass Tunnel

- Bypass tunnel section mostly complete in 2021
- Ready to Connect
- Shutdown Delaware System and fully dewater compromised sections of tunnel
- Attach bypass to structurally sound sections and create new route around leak
- Plug and decommission compromised section under the Hudson
- Grout the Wawarsing Leak
- 8 months to complete connection work

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

- Catskill / Delaware Watershed Area
- Croton Watershed Area
- Rivers and Reservoirs
- Catskill Aqueduct and Tunnels
- Croton Aqueduct
- Delaware Aqueduct and Tunnels
- County Borders
- State Borders

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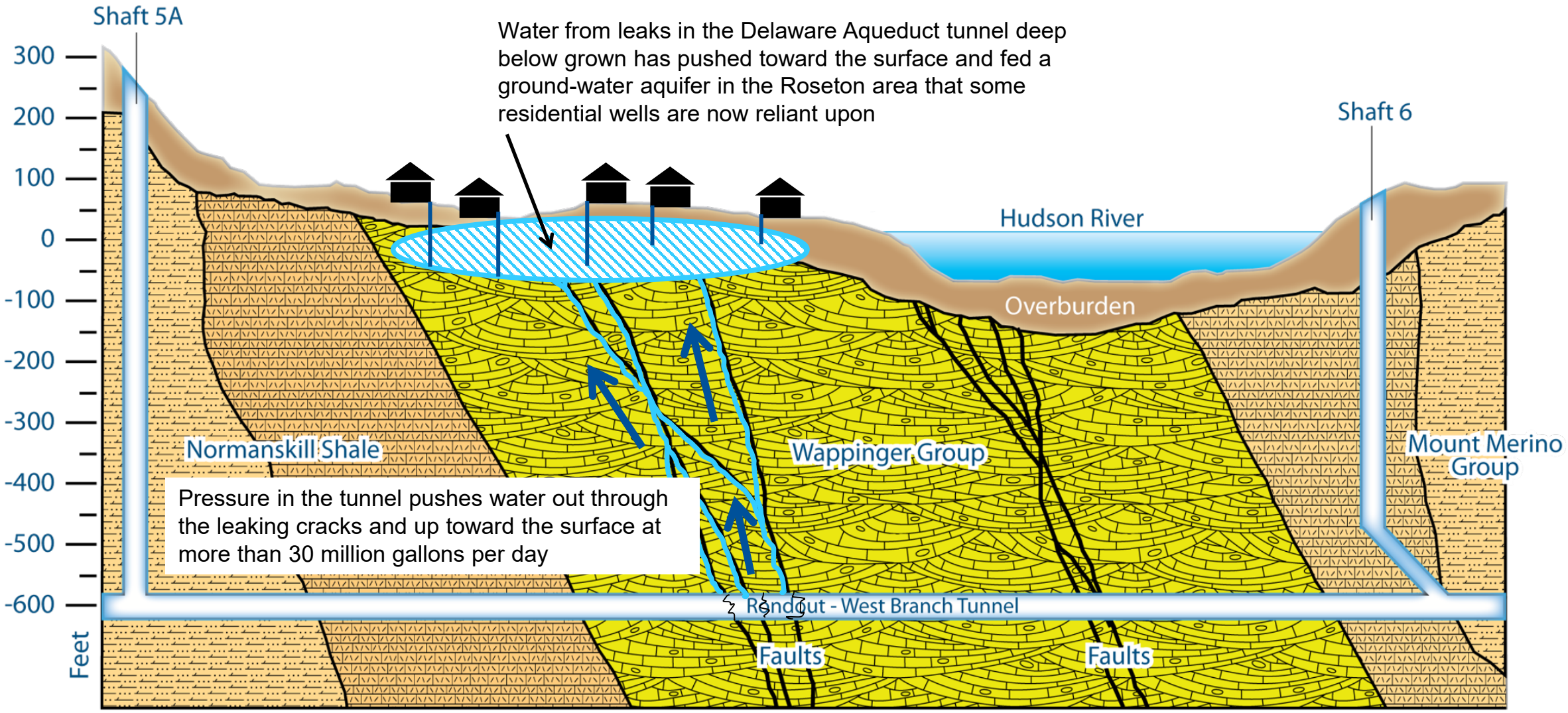
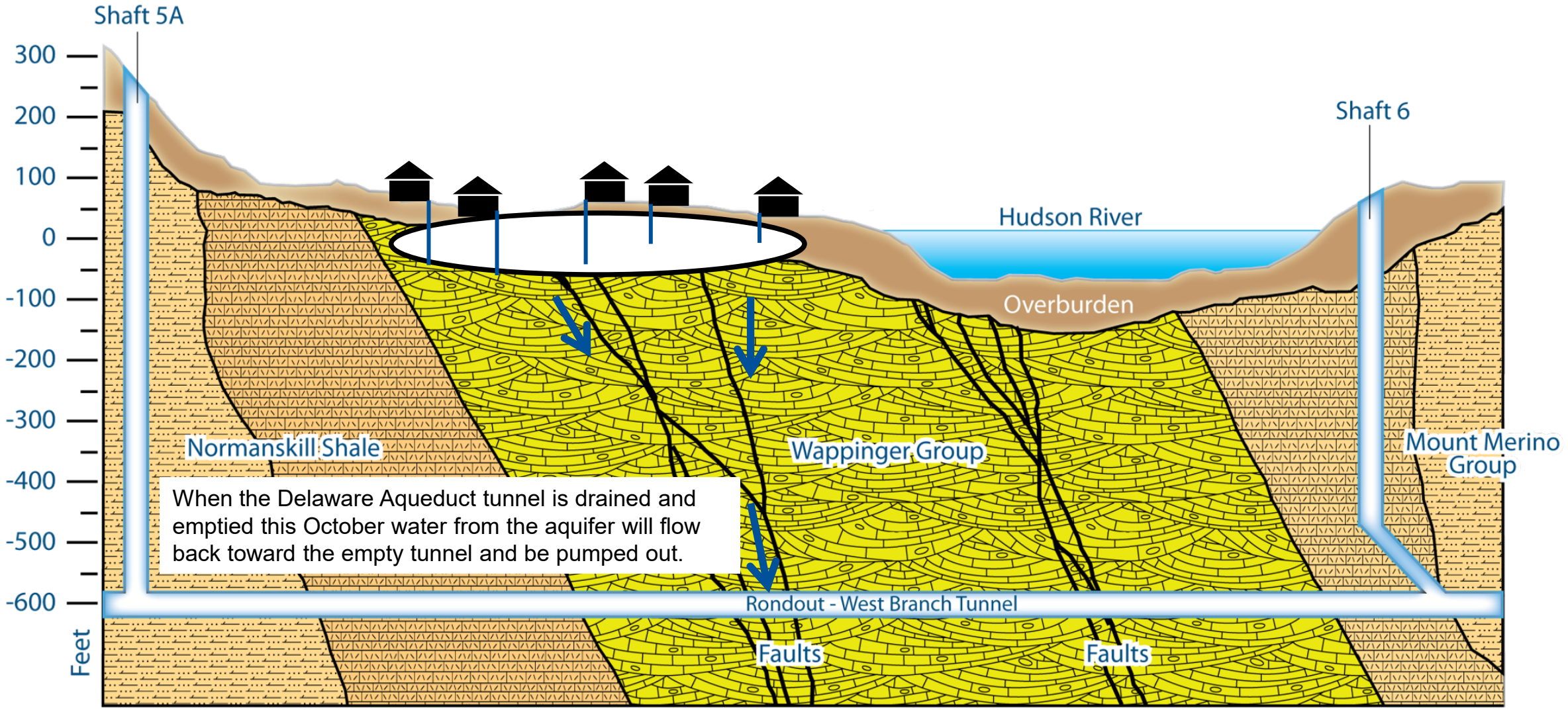
Requisite Dewatering Tests

- In March 2023, DEP shut down the Delaware Aqueduct and lowered the water level in the tunnel to an elevation of –90 feet below sea level to perform critical infrastructure and hydrological tests, the first such draining in nearly 70 years
- An initial analysis from the shutdown showed potential groundwater infiltration into the tunnel at levels higher than originally anticipated
- DEP postponed the final bypass tunnel connection project by 12 months to augment construction site pumping capacity
- Subsequent draining test in October 2023 to -250 feet below sea level found infiltration subsided in longer drawdown with final infiltration rates closer to original design plans
- Both tests also showed potential and actual impacts on residential wells in the Roseton area


Shaft 5A
Water from leaks in the Delaware Aqueduct tunnel deep below grown has pushed toward the surface and fed a ground-water aquifer in the Roseton area that some residential wells are now reliant upon
Shaft 6
300
200
100
0
-100
-200
-300
-400
-500
-600
Feet
Hudson River
Overburden
Normanskill Shale
Wappinger Group
Mount Merino Group
Pressure in the tunnel pushes water out through the leaking cracks and up toward the surface at more than 30 million gallons per day
Rondout - West Branch Tunnel
Faults
Faults


Shaft 5A
300
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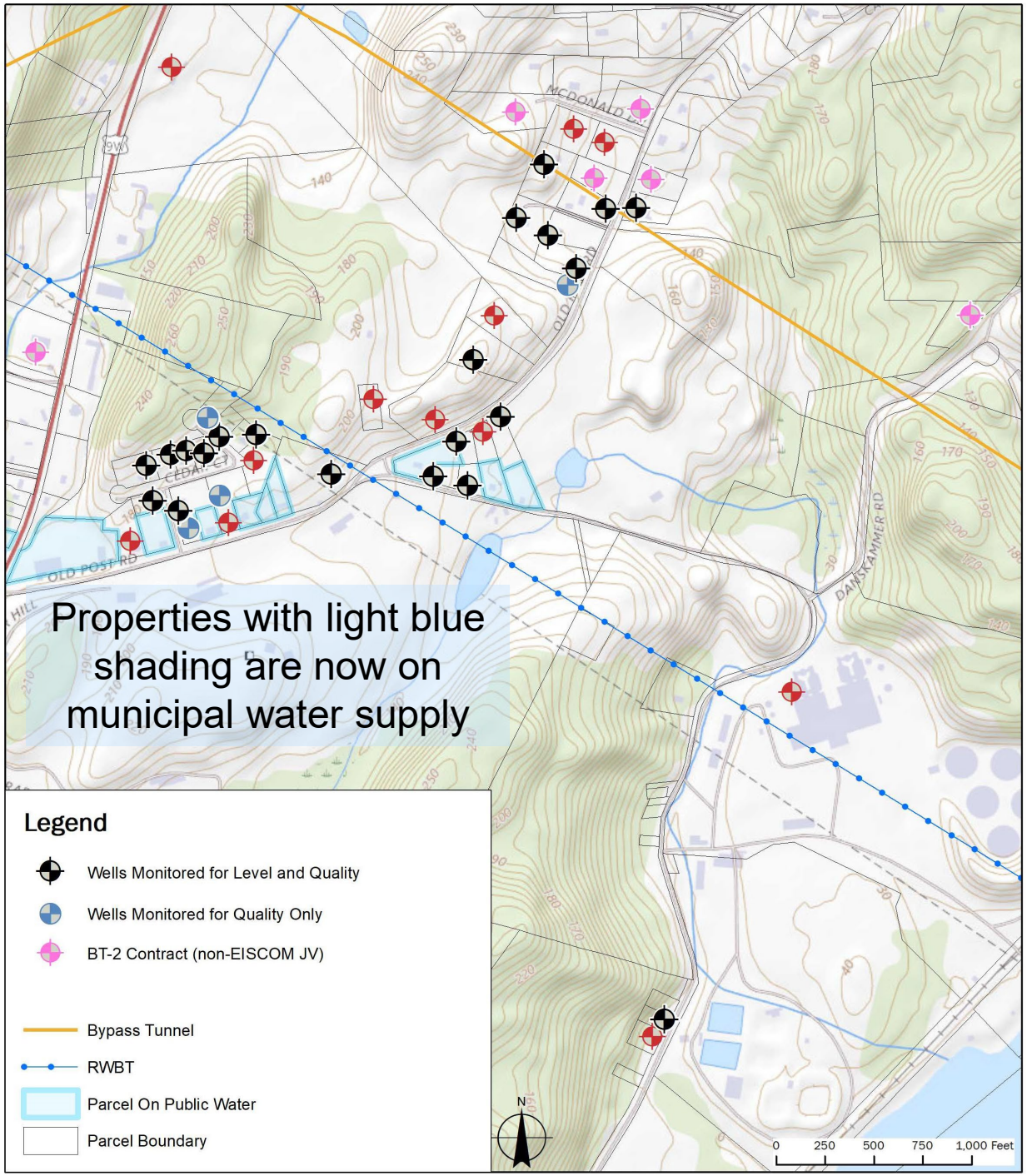
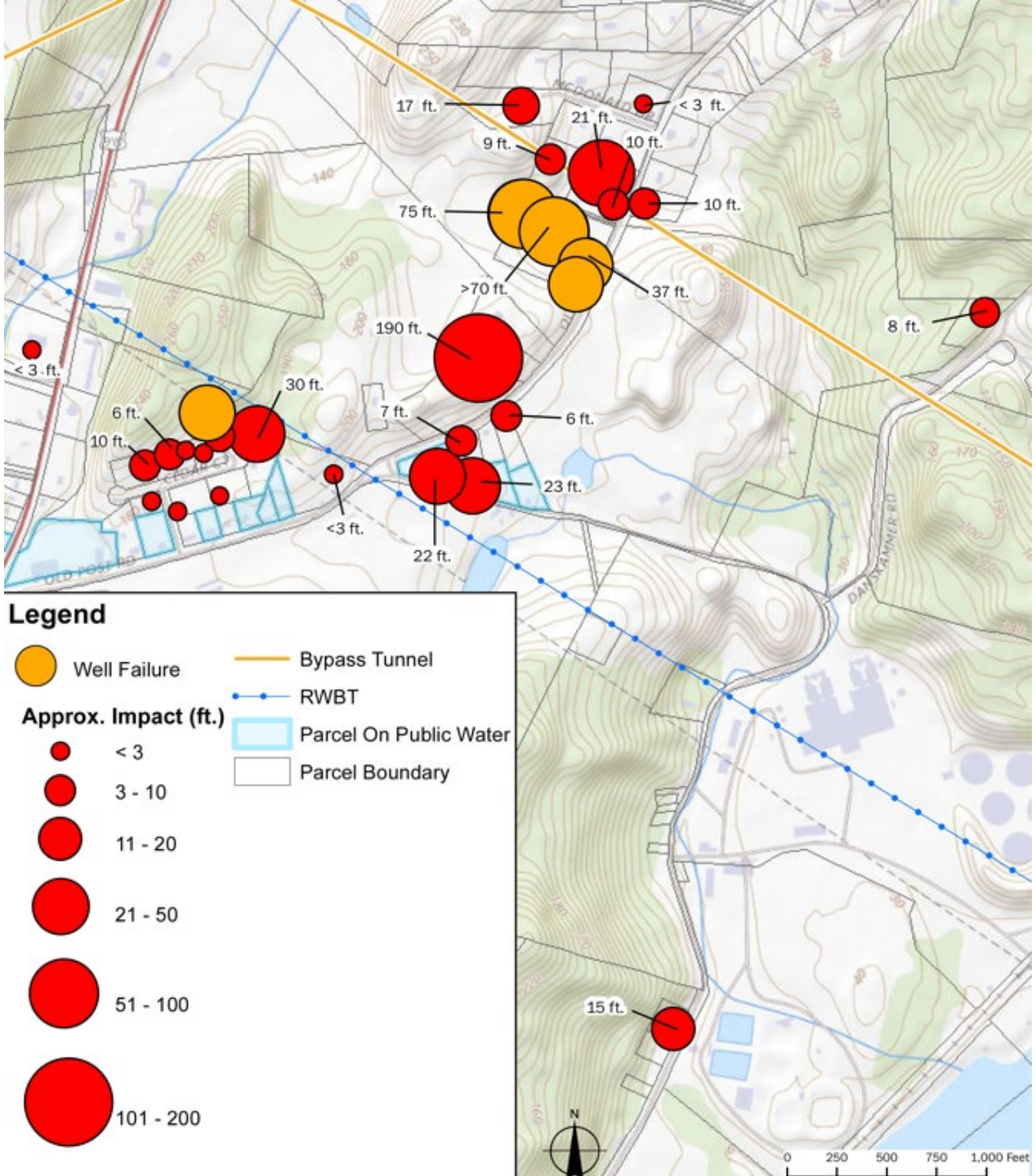
-300
-400
-500
-600
Feet
Shaft 6
Hudson River
Overburden
Normanskill Shale
Wappinger Group
Mount Merino Group
When the Delaware Aqueduct tunnel is drained and emptied this October water from the aquifer will flow back toward the empty tunnel and be pumped out.
Rondout - West Branch Tunnel
Faults
Faults

Well Studies Currently occurring in Roseton



31 residential wells in Roseton area monitored for water supply and water quality.

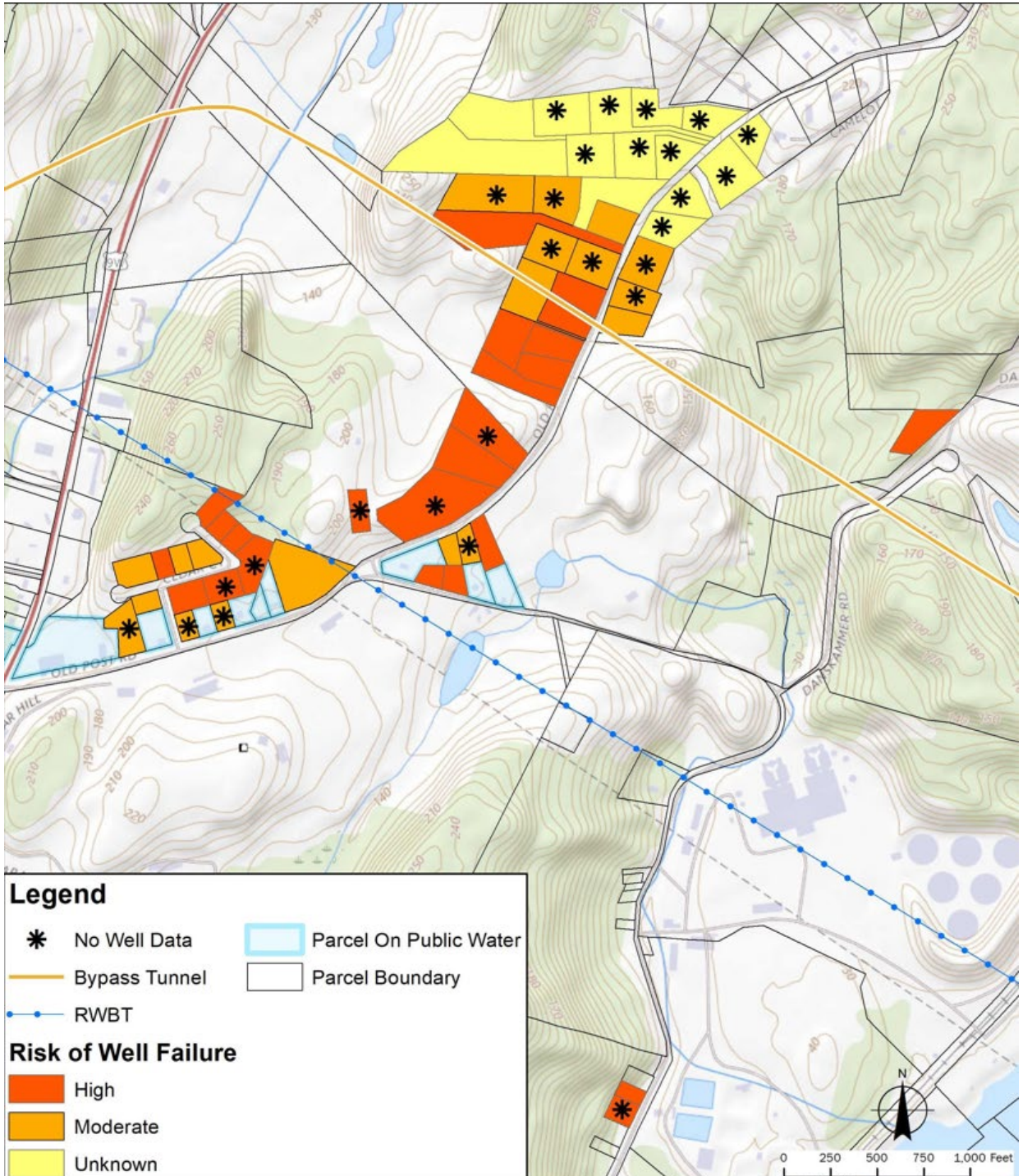
All wells are bedrock wells. Many wells are less than 100 feet deep. Some as deep as 200 feet. A few are deeper. The tunnel is 700 feet below ground surface in the Roseton area.



October 2023 Influence

In October, the water in the tunnel was drawn down to 260 feet below the surface of the Hudson River during a test lasting about 3 weeks. The tunnel in Roseton is about 600 feet below the surface of the Hudson.

- Five wells failed
- To north, 3 to 190 feet of influence
- To south, ~3 to 30 feet
- Almost every monitored well showed a change in water level during that test.



Roseton Well Impact Estimate During 8 Month Shutdown

- 43 wells at medium or high risk.
- Another ~dozen are at an unknown but plausible risk to the north.

RISK values:

HIGH - "quite likely to fail," +75% chance?

MODERATE: "could reasonably fail," +50%?

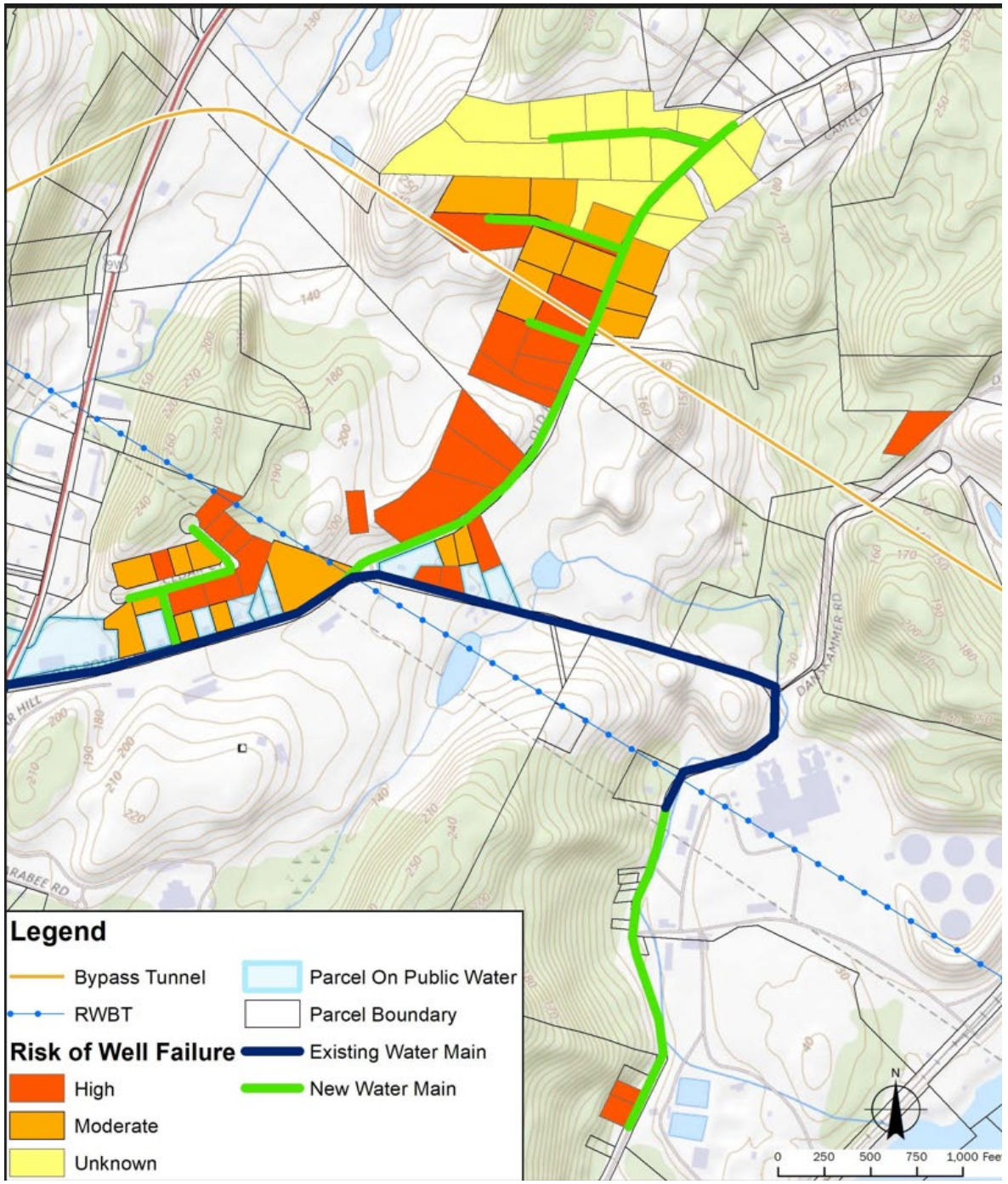
UNKNOWN: Where wells exist, well impacts could occur based on 2023 test projections.

Summary of Observations

- Extensive influence in Roseton
- No wells extend as deep as the Delaware Aqueduct tunnel, so all wells showing steady declines in October could fail as the tunnel is fully drained for many months.
- Aquifer recovery times after bypass tunnel commissioning will also be long, becoming dependent solely on annual natural recharge from precipitation since tunnel leaks will no longer contribute to water levels.
- Where groundwater quality is currently a concern, it may become worse once tunnel leakage is no longer available to provide dilution.

Municipal water for long-term reliability

- NYCDEP and the Town of Newburgh are in discussions to extend municipal water in the Roseton area. The approximate service areas under discussion are shown.
- Benefits:
  - Reliable high-quality water
  - Solves existing and potential well water quality problems into the future
  - Separates residents from aquifer dewatering associated with tunnel activity



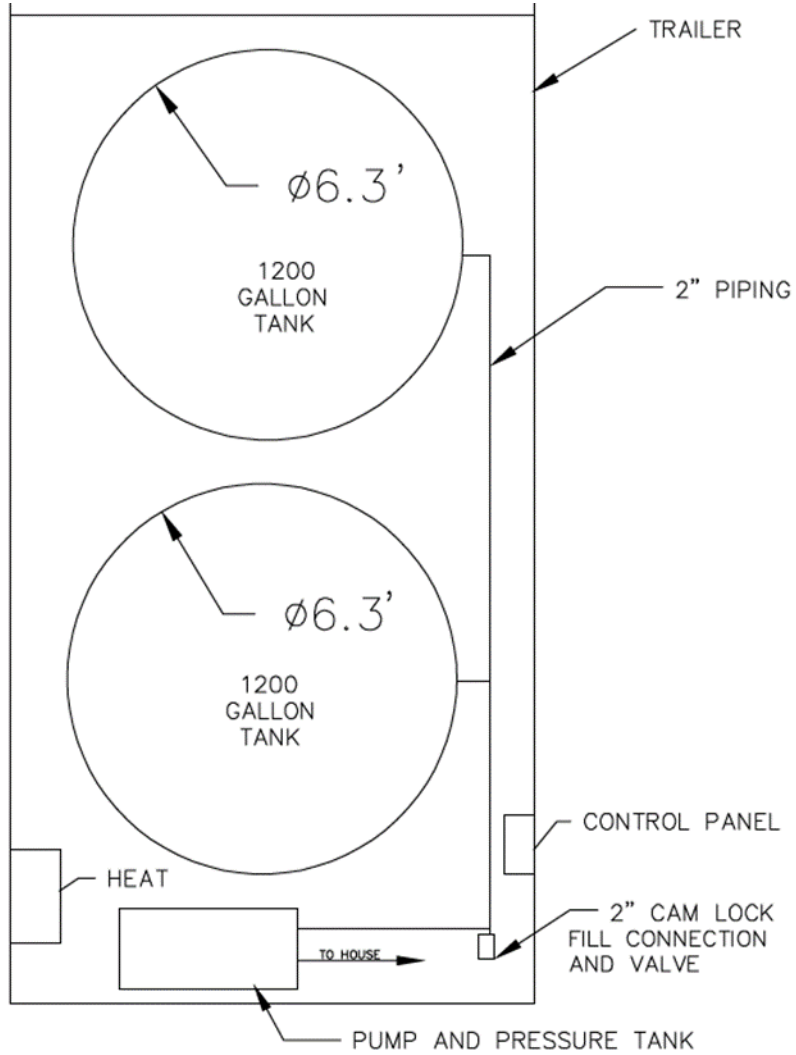
Interim Water Supply

- The proposed water district is unlikely to be completed by October 1, 2024. Portions may not be connected until 2025.
- As an interim program, temporary water will be provided using water tanks. The approach will be enhanced from what was used in 2023.
- Many "lessons learned" were gained by the 2023 experience.
- Individual home water tanks will be used. This gets rid of collective/shared tanks, except in rare instances. It also limits hoses crossing lawns and concerns about electric use sharing.
- Tank capacity has been expanded to provide a week of water (estimate 2,400 gallons). This reduces fill trips and ensures more reliability of constant supply.
- Tanks and pumps will be placed in a heated enclosure, pre-assembled trailers, with only a short insulated/heated hose to the house. This reduces risk of tank or hose freezing.

NYC Environmental Protection

Lessons Learned about Tanks

- Hoses connecting to homes freeze quickly during cold snaps.
- Hoses that cross driveways or other neighbor's yards are a burden.
- Centralized tanks are a burden to the landowner where the tanks are staged, due to servicing visits and tank filling.
- Residents want to know that their electricity is only being used for pumping of their own water.
- Tanks used in 2023 needed to be filled frequently, stressing delivery services and leading to risk of empty tanks.
- Tanks will be housed in pre-assembled trailers. This means that as wells fail, trailer-housed units can be rolled up to the house, connected, and filled as quickly as the bulk water hauler can arrive. This improves likelihood that homes can be provided with backup water very quickly as wells fail.



Inside water tank trailer

More Details

- The proposed heated enclosure is a 8.5 x 16 foot trailer, allowing DEP to pre-construct the trailers off site, to be ready and quickly deployed wherever wells fail.
- DEP will compensate homeowners for electric use to keep tanks from freezing and water delivery service will be free.
- To minimize risk of hose freezing between the trailer and house, trailers need to be positioned on level ground within about 25 feet of a point where water can enter the house.
- A plumber will be on call to help with any fittings needed to connect water to the house.
- Your pump can be taken out of service (shut off breaker) to keep it from burning out during the period when the well is dry. (You may keep your well, if you wish, once municipal water is extended, for irrigation or other uses as long as it is separated from the municipal water supply).

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Summary

- An estimated maximum of 55 wells may fail in Roseton
- Duration of aquifer depletion affecting wells is likely around 2 years, consisting of 6-8 months for connection of the bypass tunnel and up to a year for aquifer recovery. Recovery levels once tunnel leaks are repaired are unknown but presumably lower.
- A water district extension most completely provides secure water service during and following commissioning. It resolves water supply and quality concerns. NYCDEP and the Town of Newburgh are coordinating construction. But it cannot be completed by the time NYCDEP intends to begin tunnel unwatering.
- NYCDEP is preparing to provide interim water using individual domestic water tanks protected inside heated trailers and refilled as needed.

NYC Environmental Protection

Thank you, and Discussion

For general questions about the tunnel project and/or plans for the neighborhood water supply…

John Milgrim
Jmilgrim@dep.nyc.gov
845-334-7868 direct

For property-specific questions about water systems, homeowners may also contact …

Eric J. Orlowski, PG
eorlowski@labellapc.com
845-486-1520 direct
518-928-5823 cell

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