

Catskill Aqueduct: Rondout Pressure Tunnel Town of Marbletown Board Update

November 15, 2022

Agenda

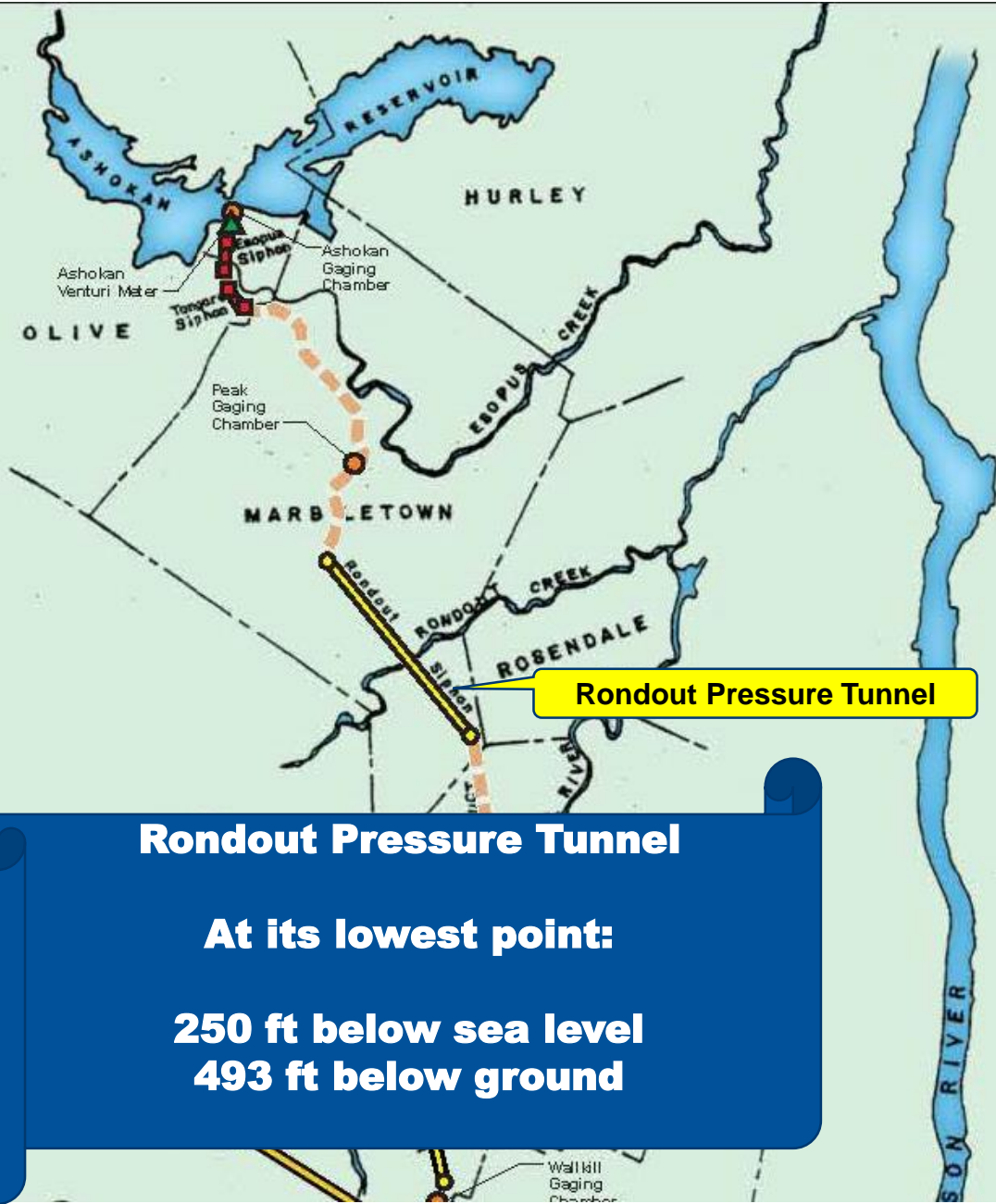
- History of Catskill Aqueduct's Rondout Pressure Tunnel
- Catskill Aqueduct Repair and Rehabilitation (CAT-RR) Project
- Existing DEP Projects
 - Catskill Aqueduct Pressure Tunnels Program
 - USGS Study
 - Well Monitoring for Catskill Aqueduct Chemical Addition
- Future DEP Neighborhood Support

History of Rondout Pressure Tunnel

- 54-month construction contract awarded in June of 1908
 - ~4.5 miles of pressure tunnel under Rondout Creek
 - >500 ft deep downtake/uptake shafts,
 - 5 additional construction shafts
 - Drainage shaft and chamber
- At its time, this contract had the largest scope of the Catskill Aqueduct construction contracts and contained the most difficult work.
- Initial construction was completed and testing commenced in 1912.



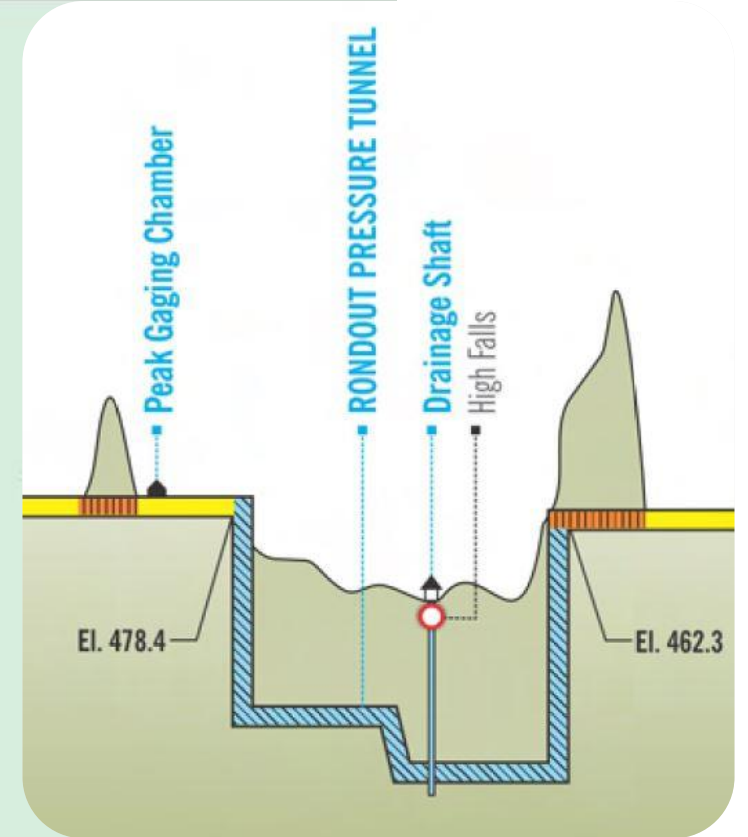
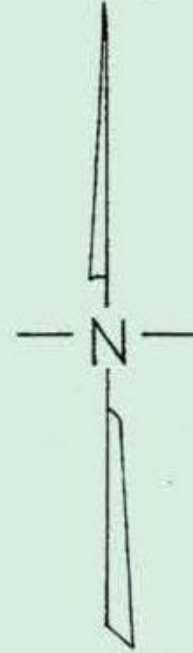
Rondout Pressure Tunnel



Rondout Pressure Tunnel

At its lowest point:

250 ft below sea level
493 ft below ground



Construction Difficulties

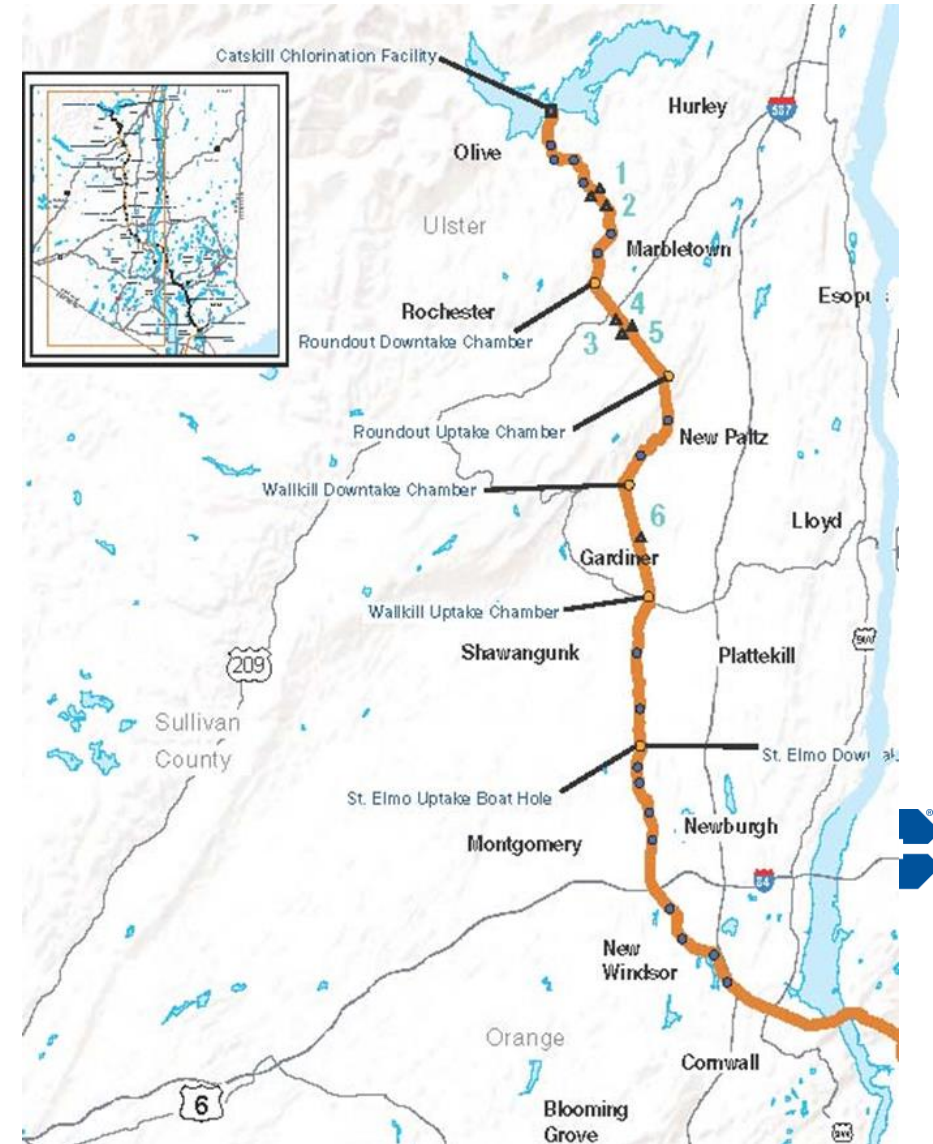
- **Mud Seams:** A horizontal mud seam approximately 110 feet long located above the tunnel was removed when the tunnel was driven and the area was backfilled with 6 - 8 feet of concrete in the crown of the finished tunnel.
- **Groundwater:** Significant quantities of groundwater, reportedly running as high as 2,000 gallons per minute (gpm), were encountered when driving the tunnel.
- **Hydrostatic Testing:**
 - During a test in 1912-1913, the RPT was found to be leaking and, subsequent to unwatering, cracks were discovered. The cracks were believed to be due to movement of limestone and compression of sandstone and were not deemed a threat to the integrity of the tunnel.
 - Rings of 15-inch steel channels encased in concrete were electrically welded in place and the tunnel diameter was reduced from 14.5 ft to 12.75 ft over a section approximately 1,100 feet in length.
 - Subsequent testing indicated tunnel leakage had been reduced from 2,600 gpm to 850 gpm.

Current Conditions

- Since the early 1990's DEP has monitored suspected surface expressions along the Rondout Pressure Tunnel
- Monitoring frequency has increased in the last five years
 - Routine monthly monitoring
 - Additional monitoring during operational changes for the Catskill Aqueduct
- Use of LiDAR and thermal imaging to determine if other potential expressions exist

Catskill Aqueduct Repair and Rehabilitation (CAT-RR)

- Goal: to ensure the structural integrity, extend the useful life, and restore transmission capacity of the Catskill Aqueduct.
 - 74 miles between two raw water reservoirs, mostly open channel flow
- Scope
 - Leak Mitigation
 - Mechanical Repair
 - Biofilm Removal and Condition Assessment
- Construction 2018 to 2022
- Project did not include unwatering of pressure tunnels



CAT-RR Project

- Fall 2018 – 56 Days (October 2018 – January 2019)
 - Inspections, internal crack repair, ladder removal, biofilm removal pilot test.
- Fall 2019 – 74 days (November 2019 – January 2020)
 - Culvert drain sluice gate closure/replacement, biofilm removal, abandoned community tap removal, defect repairs.
- Spring 2020 - 20 days (April 2020)
 - Poor Farm Arch structural repairs.
- Fall 2020 – 75 Days (November 2020 – February 2021)
 - Valve leak repairs at Rondout and Wallkill Pressure Tunnel drainage chambers.
- Fall 2021 - 73 days (10/2/21 to 12/14/21)
 - Biofilm removal at steel pipe siphons.
 - Catskill Influent Wier repairs and flashboard installation.
 - Siphon valve replacement.
 - Reinforced concrete cap at select aqueduct locations, EOR inspection and repair.
 - Carbon fiber reinforced polymer wall and invert repairs at select locations.
 - Defect repairs at steel pipe siphons.



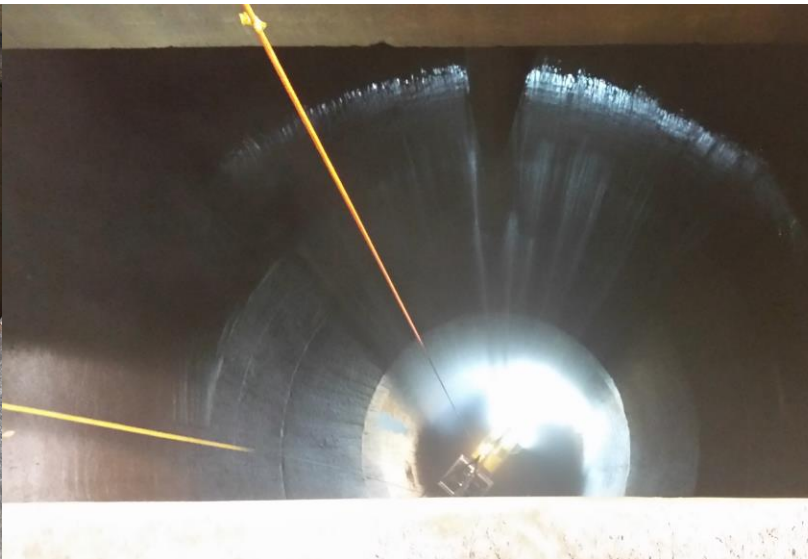
RPT Repair Project

Catskill Aqueduct Pressure Tunnels (CAPT)

- Conditions Assessment and Investigations- UNDERWAY
 - Investigate conditions of pressure tunnel and identify risks and repairs required to maintain operation.
 - Monthly monitoring of surface expressions and monitoring during operational changes.
 - Thermal Imaging and LiDAR conducted in November 2019 to find potential surface expressions.
- ROV- UNDERWAY
 - Use of remote operated vehicle to inspect the tunnel for leaks
 - Currently scheduled for December 2022
- Design- To commence late 2024
 - Designing structural repairs of the Rondout Pressure Tunnel
- Construction-
 - Construction to commence no earlier than 2027

Rondout Pressure Tunnel ROV

- October 2016 – Remote Operated Vehicle (ROV) inspection.
 - Acoustic surveys to identify locations of suspect tunnel defects.
 - Targeted, detailed inspection of suspect defect locations using dye tests, cameras, hydrophone and tell tails.
 - Identified 11 confirmed leak locations; liner cracks and two small debris piles
- December 2022 – Next ROV inspection planned under CAPT project to assess current tunnel conditions and compare to the 2016 inspection results.



Other DEP Projects

United States Geological Survey

- Characterize the hydrogeology and geochemistry of the bedrock and unconsolidated aquifer systems and delineate the magnitude and extent of influence of the leaking aqueduct on the aquifer systems.
 - 48 wells monitored: 34 bedrock and 14 overburden
 - 3 surface water sites monitored
 - Report anticipated July 2023

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- Well monitoring program to detect the presence of chlorine dioxide in drinking water wells located in close proximity to known leaks in the Rondout Pressure Tunnel.
- Baseline well monitoring initiated in 2019
- Chlorination of Catskill Aqueduct anticipated to commence in late December 2022.



Future DEP Contract

Contemplated Inter-governmental Agreement with Town of Marbletown

- DEP has proposed a Neighborhood Support Program that will be managed by Town of Marbletown:
 - Private drinking water well needs:
 - Relocation, replacement or improvement of wells
 - Engineering or water treatment services
 - Other potential issues confirmed to be caused by elevated groundwater connected to leaks from the Rondout Pressure Tunnel, such as:
 - Damage to surficial grading/pavement, utilities, drainage systems
 - Settlement/movement of existing structures
- Funded by DEP
- Eligibility contingent upon USGS study findings



Thank You!

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Questions?