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## Fall Foliage

Cannonsville Reservoir - New York City Water Supply System

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## DEP Unveils Next Phase of Cutting-Edge Study to Repair Tunnel Leaks

### Project to Test Strategy for Plugging Leaks with Mix of Lime and Water

Environmental Protection Commissioner Cas Holloway today unveiled the second phase of a ground-breaking study to evaluate the effectiveness of mitigating leaks in the Delaware Aqueduct by adding lime to water in order to seal the cracks from within the tunnel. The \$4 million project, which entails building a small-scale water system that replicates full-scale water supply conditions, will help the city better determine if full-scale application of lime will be successful. The study builds on prior laboratory tests conducted at Syracuse University and funded by DEP that yielded promising results. Upon site approval by the community, DEP will house the experiment in temporary structures adjacent to the Rondout Reservoir in Ulster County. The structures will hold three 2,400-foot pipe loops made of 1.5-inch diameter pipe to mimic the Delaware Aqueduct. Water from the Rondout Reservoir mixed with different chemical combinations of lime will flow at different velocities to simulate different conditions in the aqueduct to study the effectiveness of the pilot. The tests are anticipated to begin in 2012 and would operate for one year. If successful, the technique may be used for applications in the Delaware Aqueduct and elsewhere in the water supply system to repair, mitigate and prevent leaks in New York City's vast 6,600-mile water supply network.

"The repair of the leaks in the Delaware Aqueduct is the biggest infrastructure challenge the city currently faces with respect to our water and wastewater infrastructure," said Commissioner Holloway. "We are already moving forward aggressively with a plan to build a three-mile bypass tunnel around a leaking section of the aqueduct in Roseton, and to repair other leaks in Wawarsing by pressure grouting the tunnel from within. On a parallel track, we are testing cutting-edge technologies to determine what additional options may be viable to address the Delaware Aqueduct leaks — as well as leaks that may arise throughout the water supply system. If the pilot study proves successful, we will determine whether this technology can be used in the Delaware Aqueduct, and other critical infrastructure."

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The one-year study will investigate the crack-sealing characteristics of calcium carbonate, and verify that crack sealing will occur on a larger scale. Results from the study will provide a comparison of each chemical combination's effectiveness to maintain supersaturated conditions, such as in the Delaware Aqueduct, and form calcium carbonate deposits, which reduces the rate of leakage through cracks in concrete.

An expert panel has reviewed the pilot study and confirmed the technical feasibility of leak stabilization for the Delaware Aqueduct. Syracuse University performed lab testing on adding lime to water in 2007. The test successfully reduced the flow rate through the concrete crack test module (a piece of concrete pipe with cracks to simulate a Delaware Aqueduct crack) in times faster than predicted. The next phase of the study is to better mimic actual conditions in the Delaware Aqueduct and to verify the proof of concept study can work on a larger scale. If results are promising, DEP will further study the environmental impacts of the project.

The project will proceed as follows:

- ▶ It will be sited on the east side of the Rondout Reservoir in three standard construction trailers and five shipping containers for laboratory equipment and chemical storage. Each trailer will hold one 2,400-foot pipe loop made of 1.5-inch diameter pipe. Water from the Rondout Reservoir will flow at different velocities to mimic different conditions in the aqueduct.
- ▶ Water will go through the pipe loops using the chemical combinations and pre-determined doses. The proposed chemical combinations include lime, lime with carbon dioxide, and "liquid lime" which uses calcium chloride, sodium hydroxide, and carbon dioxide. Every 800 feet in the pipe loop the water will go through a crack test module which will be monitored to see if flow is reduced through the simulated cracks and to see if the calcium carbonate scale is forming within the cracks. DEP will also be studying various crack sizes in these modules.
- ▶ The water, when exiting the pipe loops, will be treated in an equalization tank to reduce the pH, and then discharged back to Rondout Reservoir. The discharges will be permitted by the New York State Department of Environmental Conservation and all discharge water quality requirements will be met.

The 85-mile aqueduct, completed in 1944, conveys approximately half of the city's drinking water — 500 million gallons per day — from four upstate reservoirs to more than eight million people in New York City, and one million people in Ulster, Orange, Putnam and Westchester counties who also rely on the City's high quality drinking water. The aqueduct is a concrete-lined tunnel that varies in diameter from 13.5 to 19.5 feet and runs as deep as 2,000 feet beneath the ground. It was constructed by drilling and blasting, and, in most areas, lined with unreinforced concrete.

This pilot study is being done in parallel to other efforts to repair leaks in the Delaware Aqueduct. Last November,

Commissioner Holloway outlined a design and timeline to address leaks in the Delaware Aqueduct by building a three-mile bypass tunnel around a portion of the aqueduct that is leaking in Roseton in Orange County, and repairing other leaks in Wawarsing, in Ulster County, from inside the existing tunnel. The construction of the bypass tunnel and the repair of the lining will ensure that DEP can continue to deliver high quality drinking water every day for decades to come. Under the plan, DEP will break ground on the bypass tunnel in 2013, and complete the connection to the Delaware Aqueduct in 2019. The bypass tunnel and internal repairs will cost approximately \$1.2 billion, and water projects to supplement the City's supply during part of the construction period will cost approximately \$900 million. The tunnel repair and project is expected to create between 1,000 and 1,500 jobs.

Preparation for the repair work is currently underway, including: purchasing equipment for the repair; working on the design of the repair; preparing contract documents for the repair, including the bypass tunnel; performing physical investigations of geology at the site of the shafts and bypass tunnel; and assessments of environmental impacts of the project.

The plan to repair the Delaware Aqueduct is part of the Operations section outlined in *Strategy 2011-2014*, a far-reaching strategic plan that lays out 100 distinct initiatives to make DEP the safest, most efficient, cost-effective, and transparent water utility in the nation. The new plan, the product of nearly one year of analysis and outreach, builds on *PlaNYC*, Mayor Bloomberg's sustainability blueprint for New York City. The plan is available on DEP's website at [www.nyc.gov/dep](http://www.nyc.gov/dep).

DEP manages the city's water supply, providing more than 1 billion gallons of water each day to more than 9 million residents, including 8 million in New York City, and residents of Ulster, Orange, Putnam and Westchester counties. Approximately 1,000 DEP employees live and work in the watershed communities as scientists, engineers, surveyors, and administrative professionals, and perform other critical responsibilities. DEP has invested over \$1.5 billion in watershed protection programs — including partnership organizations such as the Catskill Watershed Corporation and the Watershed Agricultural Council — that support sustainable farming practices, environmentally sensitive economic development, and local economic opportunity. New York City's water is delivered from the Catskill, Delaware, and Croton watersheds that extend more than 125 miles from the City, and comprises 19 reservoirs, and three controlled lakes. The DEP police protect the watershed and its facilities, including seven wastewater treatment plants. For more information, visit [www.nyc.gov/dep](http://www.nyc.gov/dep) or follow us on Facebook at [www.facebook.com/nycwater](http://www.facebook.com/nycwater).

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