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## Department of Environmental Protection Joins Local Officials from the Hudson Valley to Mark Important Progress on the Delaware Aqueduct Bypass Tunnel

### Bedrock Excavation at Shaft 6B in Dutchess County Begins with Ceremonial First Blast

### Work is part of \$1 Billion Project to Fix Leaks in Delaware Aqueduct

Department of Environmental Protection (DEP) Commissioner Emily Lloyd on Friday joined town, county and state officials in Wappinger, N.Y. to mark the next phase of construction at Shaft 6B, a key component of the \$1 billion bypass tunnel project that will address leaks in the Delaware Aqueduct. Commissioner Lloyd was joined by Dutchess County Executive Marcus Molinaro, Town of Wappinger Supervisor Barbara Gutzler, State Sen. Terry Gipson, State Assemblyman Kieran Michael Lalor, and Town of Newburgh Supervisor Gil Piaquadio for a ceremonial first blast at the construction site, which marked the beginning of bedrock excavation to build a 700-foot-deep shaft on the east side of the Hudson River.

The Delaware Aqueduct conveys more than half of New York City's high-quality drinking water every day from reservoirs in the Catskill Mountains. DEP has been monitoring two leaks in the aqueduct since the 1990s. The leaks—located in Newburgh and Wawarsing—release a combined 15-35 million gallons a day, depending on the rate of flow inside the aqueduct. To address the leaks, DEP has begun construction of a 2.5-mile bypass tunnel that will run 600 feet below the Hudson River, from Newburgh to Wappinger. The bypass tunnel, which is scheduled to be complete in 2021, will convey water around the leaking portion of the Delaware Aqueduct in Newburgh. That existing part of the aqueduct will be taken out of service once the bypass tunnel is finished. The smaller leak in Wawarsing will be sealed shut by grouting from inside the aqueduct.

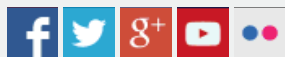
The bypass tunnel is the central component of DEP's \$1.5 billion Water for the Future program, which aims to ensure clean, safe and reliable drinking water for future generations of New Yorkers. Water for the Future also includes structural upgrades to the Catskill Aqueduct, rehabilitation of the Queens Groundwater System to supplement upstate supplies, and water conservation initiatives in the City.

"Repairing the Delaware Aqueduct is among the highest priorities for DEP because the aqueduct supplies more than half the drinking water to 8.4 million people in New York City and another million residents upstate," **DEP Commissioner Emily Lloyd** said. "That is why I'd like to thank the elected leaders here in the Hudson Valley for working with DEP to help this vital infrastructure project get started."

**More Information**

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“The bypass tunnel project is one of the most significant projects in Dutchess County in years, creating employment opportunities with a positive multiplier impact for the local economy,” **Dutchess County Executive Marcus J. Molinaro** said. “The New York City DEP has worked to mitigate any adverse impact and provide favorable benefits for the community.”

“The partnership between the Town of Wappinger and DEP shows how two diverse groups can come together to find a creative solution to each other’s needs,” **Town of Wappinger Supervisor Barbara Gutzler** said. “Through joint meetings early in the planning process, along with close coordination of activities by the Town and DEP, and above all cooperation and respect from both parties, we are able to provide fresh drinking water for New York City’s and Wappinger’s future generations of residents. As a native of Queens and now the Supervisor of this great Town of Wappinger, I cannot express adequately my thanks to DEP for funding this water line through the southwestern quadrant of Wappinger. Not only will DEP benefit, but residents of the Chelsea Hamlet will finally have a solution for their failing wells. I am proud of our partnership with DEP, and honored to have played a role in this historic event.”

The Delaware water supply system originates more than 120 miles north of New York City and comprises four reservoirs: Cannonsville, Neversink, Pepacton and Rondout. The 85-mile long Delaware Aqueduct conveys drinking water from these reservoirs to the City’s distribution system. On average, the Delaware Aqueduct provides more than half of the approximately 1 billion gallons of clean drinking water required to meet the City’s demands every day. The aqueduct, the world’s longest continuous tunnel, was constructed between 1939 and 1944 and crosses Ulster, Orange, Dutchess, Putnam and Westchester counties. The aqueduct runs as deep as 1,500 feet below ground, varies in diameter from 13.5 to 19.5 feet, and was constructed by drilling and blasting.

In most areas, the Delaware Aqueduct is lined only with reinforced concrete. However, two sections of the tunnel that run through limestone formations were lined with steel because limestone is more likely to cause wear and tear on the aqueduct. The ongoing investigation of the structural integrity of the aqueduct has found that small cracks formed where this steel lining ended.

DEP has continuously tested and monitored the leaks by using dye, backflow, and hydrostatic tests, and hourly flow monitors provide near real-time data on the location and volume of the leaks. In 2003 and 2009, DEP used an Autonomous Underwater Vehicle (AUV)—a cutting-edge, self-propelled submarine-shaped vehicle built in partnership with engineers at Woods Hole Oceanographic Institution in Massachusetts—to conduct a detailed survey of the entire 45-mile length of tunnel between Rondout Reservoir and West Branch Reservoir. The AUV took 360-degree photographs while gathering sonar, velocity, and pressure data to assist in determining the location, size and characteristics of the leaks. The AUV is scheduled to launch again in fall 2014 to update that data. All the data gathered thus far clearly show that the rate of water leaking from the tunnel has remained constant and the cracks have not worsened since DEP began monitoring them in 1992.

#### **Repairing Leaks in the Delaware Aqueduct**

In 2010, the City announced a plan to address the leaks by building a bypass tunnel around the portion of the aqueduct in Newburgh with significant leaks, and also grouting closed the smaller leaks in Wawarsing. Site work for this complex project began in January 2013 and construction is expected to continue through the year 2021.

The project commenced with the excavation of two vertical shafts that will provide access for construction workers to build the bypass tunnel. The shafts in Newburgh and Wappinger will be 900 and 700 feet below surface level respectively and will measure roughly 30 feet in diameter. Blasting for the shaft in Newburgh began in October 2013. Work in Wappinger began last year with the excavation of roughly 65 feet of topsoil, which allowed construction crews to

begin the blasting and excavation of bedrock in late March. Both shafts are expected to be complete by 2016. An underground chamber at the bottom of the Newburgh shaft will serve as the staging area for the bypass tunnel. DEP expects to use a tunnel boring machine to drill the 22-foot-diameter bypass tunnel, progressing at roughly 50 feet a day. The tunnel will be roughly 14.5 feet in diameter once it is lined with concrete and steel and will stretch 2.5 miles—including beneath the entire width of the Hudson River.

The existing Delaware Aqueduct will stay in service while the bypass tunnel is under construction. Once the bypass tunnel is nearly complete and water supply augmentation and conservation measures are in place, the existing tunnel will be taken out of service and excavation will begin to connect the bypass tunnel to structurally sound portions of the existing aqueduct. This work is anticipated to happen late in the year 2021. Engineers expect it will take roughly eight months to connect the bypass tunnel. While the Delaware Aqueduct is shut down, work crews will also fix cracks at three segments in Wawarsing, roughly 35 miles northwest of the bypass tunnel. These segments, totaling roughly 500 feet, will be sealed by injecting grout into them.

The project will mark the first time that the Delaware Aqueduct will be drained since 1958. In June, City employees installed new pumps inside Shaft 6, also in Wappinger, at the lowest point of the Delaware Aqueduct to eventually dewater the tunnel. Those pumps will be tested several times before the tunnel is drained in 2021. The nine pumps are capable of removing a maximum of 80 million gallons of water a day from the tunnel—more than quadruple the capacity of the original pumps they replaced from the 1940s. The largest of the pumps are three vertical turbine pumps that each measure 23 feet tall and weigh 9 tons.

The bypass tunnel project is expected to create nearly 200 jobs over the next seven years. In 2012, DEP signed a project labor agreement (PLA) with the Hudson Valley Building and Construction Trade Council that ensured the vast majority of those jobs would be filled by local workers. Also, the PLA is expected to save the City up to \$23 million over the life of the project. With 18 different local labor agreements that could potentially apply to the project, the PLA provides for a unified approach to shifts and time off, and the increased coordination under one agreement allows for more cost-effective scheduling and increased flexibility.

Because the Shaft 6B worksite in Wappinger is located near a residential neighborhood, DEP has taken several steps, with guidance from the town, to ensure minimal disruption to local residents. The City has installed noise barriers around the perimeter of the construction site, and contractors are adhering to a schedule that does not allow blasting after 3 p.m. DEP also conducted pre-blast surveys of nearby homes and will perform seismic monitoring throughout the project to ensure compliance with vibration thresholds. Vibration from blasting should not be felt by local residents because of the depth and relatively small size of the charges.

The City has also agreed to fund an \$11 million extension of Wappinger's existing water district—a project that is mutually beneficial to DEP and the town. The extension will provide water to the Shaft 6B construction site, which ultimately saved DEP the cost of potentially more expensive options for getting water. New York City will pay Wappinger for the water that it uses at Shaft 6B, which will come from preexisting well fields that are owned and operated by the town. The district extension will also provide connections to 150 homes in the surrounding hamlet of Chelsea. Homeowners who connect to the extended system are expected to see a decrease in their home insurance rates because the water lines will include fire hydrants every 500 feet. Phase I of the extension, which extended water lines south from Route 9, down River Road to the construction site, has already been completed. Phase II is expected to begin this year. DEP also reached an agreement to provide Dutchess County with \$800,000 for the maintenance and post-construction repair of Chelsea Road, which serves as the main access road to the construction site.

## Ensuring Reliable Water Supply During Construction

The Delaware Aqueduct bypass project has required years of preparation and planning that led to the Water for the Future program, a portfolio of related projects that will ensure New York City has high-quality and reliable drinking water while the aqueduct is out of service.

- **Catskill Aqueduct Repair and Rehabilitation:** The 74-mile-long Catskill Aqueduct, which conveys water from the Ashokan and Schoharie reservoirs, will undergo a repair and rehabilitation project starting in 2016. Along with replacing more than 30 valves that are decades old, the interior lining of the tunnel will be scrubbed to decrease friction, which will increase the tunnel's capacity by approximately 30-40 million gallons of water each day.
- **Queens Groundwater:** To augment the City's upstate water supplies, DEP will also rehabilitate the Queens Groundwater System, formerly the Jamaica Water Supply, which will sustainably provide more than 33 million gallons of water a day in southeast Queens. DEP has committed to using proven technologies to ensure these wells produce high-quality water that meets or exceeds all water quality standards. The Queens Groundwater System comprises 68 wells at 48 separate well stations.
- **Water Conservation:** Between now and the Delaware Aqueduct shutdown in 2021, DEP will implement a number of initiatives to reduce water consumption in the City by as much as 50 million gallons a day. As part of the Municipal Water Efficiency Program, DEP is identifying opportunities to conserve water at City-owned properties and facilities. Thus far, DEP has partnered with the New York City Department of Parks and Recreation to install activation buttons on spray showers in 400 playgrounds around the city that will save 1.5 million gallons of water a day. DEP has also begun updating bathroom fixtures in 500 city schools that will save an additional 4 million gallons of water each day. To help encourage water conservation in private residences, DEP will sponsor a voucher program that aims to replace up to 800,000 inefficient toilets with high efficiency models that will save up to 30 million gallons of water a day by 2018. The City is also working with private businesses to reduce demand for water and, over the summer, announced that 11 premier hotels have agreed to cut their water use by 5 percent, saving roughly 13 million gallons annually.
- **Croton System:** The Croton Water Filtration Plant is entering its final stage of construction in the north Bronx, and testing of the filtration system and water lines is nearly complete. Once online, the filtration plant will allow the City to once again use water from the reservoirs in Putnam and Westchester counties that comprise the Croton System. DEP expects this will provide nearly 300 million gallons of high-quality water each day.

Updates on construction, milestones and other information related to Water for the Future will be posted at: [nyc.gov/waterforthefuture](http://nyc.gov/waterforthefuture). The website includes a clear explanation of the projects, a timeline, and information about how the program will improve and secure the delivery of clean drinking water to 8.4 million residents of New York City and roughly a million additional residents in Orange, Putnam, Ulster and Westchester counties who also use water from the City's supply.

DEP manages New York City's water supply, providing more than one billion gallons of high quality water each day to more than 9 million residents, including 8.4 million in New York City, and residents of Ulster, Orange, Putnam, and Westchester counties. This water comes from the Catskill, Delaware, and Croton watersheds that extend more than 125 miles from the City, and the system comprises 19 reservoirs, three controlled lakes, and numerous tunnels and aqueducts. DEP employs nearly 6,000 employees, including almost 1,000 scientists, engineers, surveyors, watershed maintainers and others professionals in the upstate watershed. In addition to its \$68 million payroll and \$157 million in annual taxes paid in upstate counties, DEP has invested more than \$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. In addition, DEP has a robust capital program with over \$14 billion in investments planned over the next 10 years that will create up to 3,000 construction-related jobs per year. For more information, visit [nyc.gov/dep](http://nyc.gov/dep), like us on Facebook at [facebook.com/nycwater](https://facebook.com/nycwater), or follow us on Twitter at [twitter.com/nycwater](https://twitter.com/nycwater).

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