

ES-1 INTRODUCTION

The vast and complex New York City (City) water supply system was originally developed through the visionary planning of those who understood the importance of delivering an abundant and reliable supply of clean drinking water to the City. Described in greater detail in Chapter 6, “The Water Supply System,” of this Draft Environmental Impact Statement (DEIS), design of the system was initiated in the early 1800s. The City has been able to expand, adapt, and modernize the system to keep pace with a growing population because City leaders have continued to follow the precedent set by early planning pioneers. Today, the City’s Department of Environmental Protection (DEP) is responsible for supplying clean drinking water to more than 8 million City residents and 1 million upstate customers in sufficient quantity to meet present water demands and maintain the water supply system to meet future water demands. This is achieved through careful and coordinated management of the City’s three surface water supply systems: the Catskill, Delaware, and Croton systems, shown on **Figure ES-1**. Currently the Catskill and Delaware water supply systems operate under a Filtration Avoidance Determination (FAD).

Recognizing the need to protect the long-term viability and overall resilience of the water supply system, the City continues to make systematic and sustained investments in the critical infrastructure that provides water to approximately 9 million people each day. DEP developed Water for the Future (WFF) to address significant leakage in one of its most critical pieces of water supply infrastructure, the Delaware Aqueduct. To repair the system and ensure water supply for the next generations of New Yorkers, DEP proposes Upstate Water Supply Resiliency as part of WFF. WFF involves construction of a bypass tunnel around a leaking section of DEP’s Rondout-West Branch Tunnel (RWBT), the upper portion of the City’s Delaware Aqueduct. To support connection of the bypass tunnel to the RWBT, DEP proposes several components of WFF. The proposed components include: the Catskill Aqueduct Repair and Rehabilitation to restore its capacity; a temporary operating protocol for the water supply system; and the RWBT Inspection and Repair, including decommissioning of the bypassed section. These components collectively comprise Upstate Water Supply Resiliency and are proposed to ensure the continued supply of clean drinking water during the RWBT temporary shutdown.

The Delaware Aqueduct has been in operation since the 1940s and transports water a distance of approximately 85 miles through the Delaware water supply system (Delaware System). The Delaware System is the source of approximately 50 percent of the City’s water supply and provides water supply for two upstate municipalities, the Towns of Newburgh and Marlborough. The Delaware System consists of four primary supply reservoirs (Pepacton, Cannonsville, Neversink, and Rondout), two shared reservoirs with the Croton water supply system (Boyd’s Corners and West Branch), and two shared reservoirs with the Catskill water supply system (Kensico and Hillview). The Delaware System is wholly located within New York State.

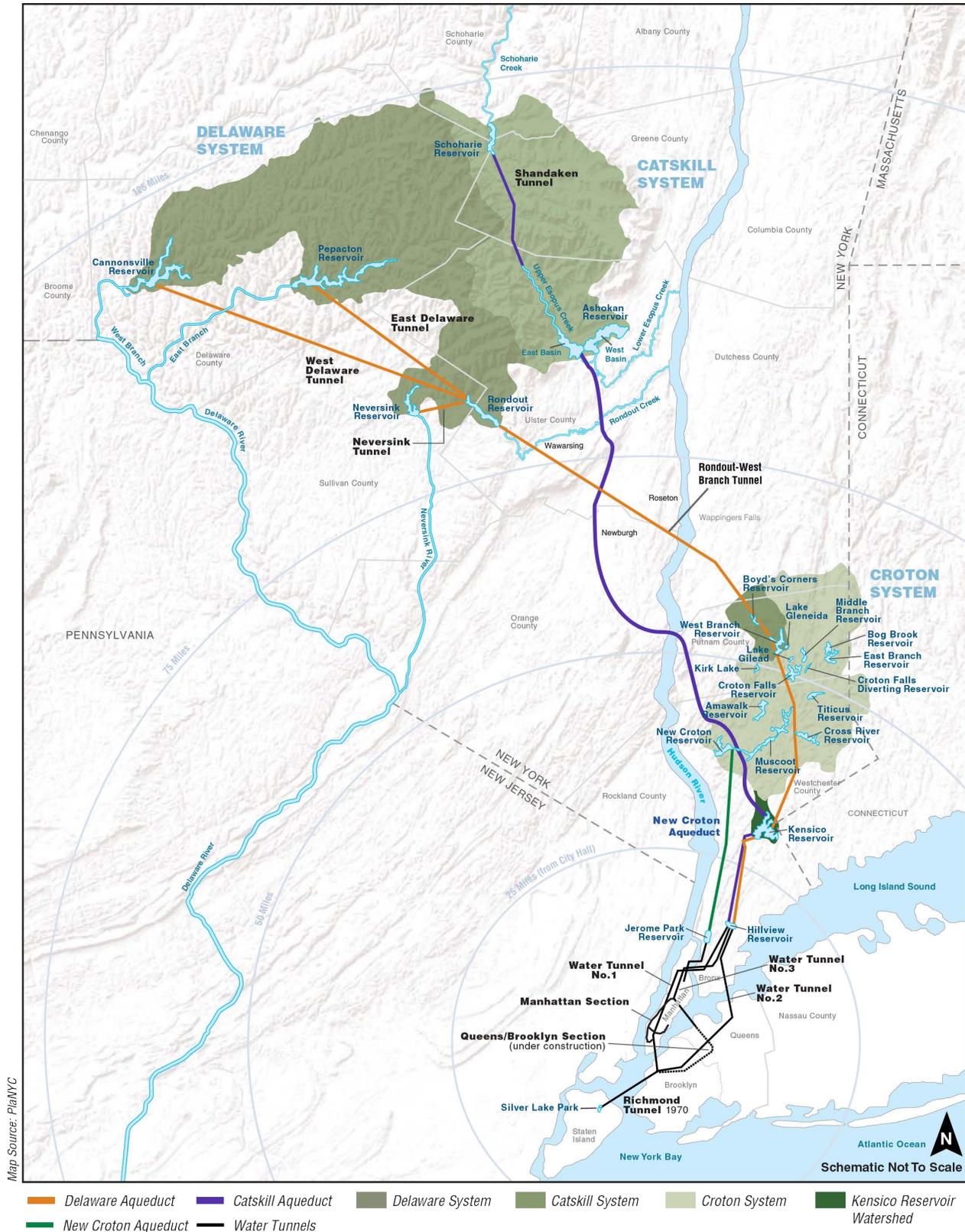


Figure ES-1: New York City Surface Water Supply System Map



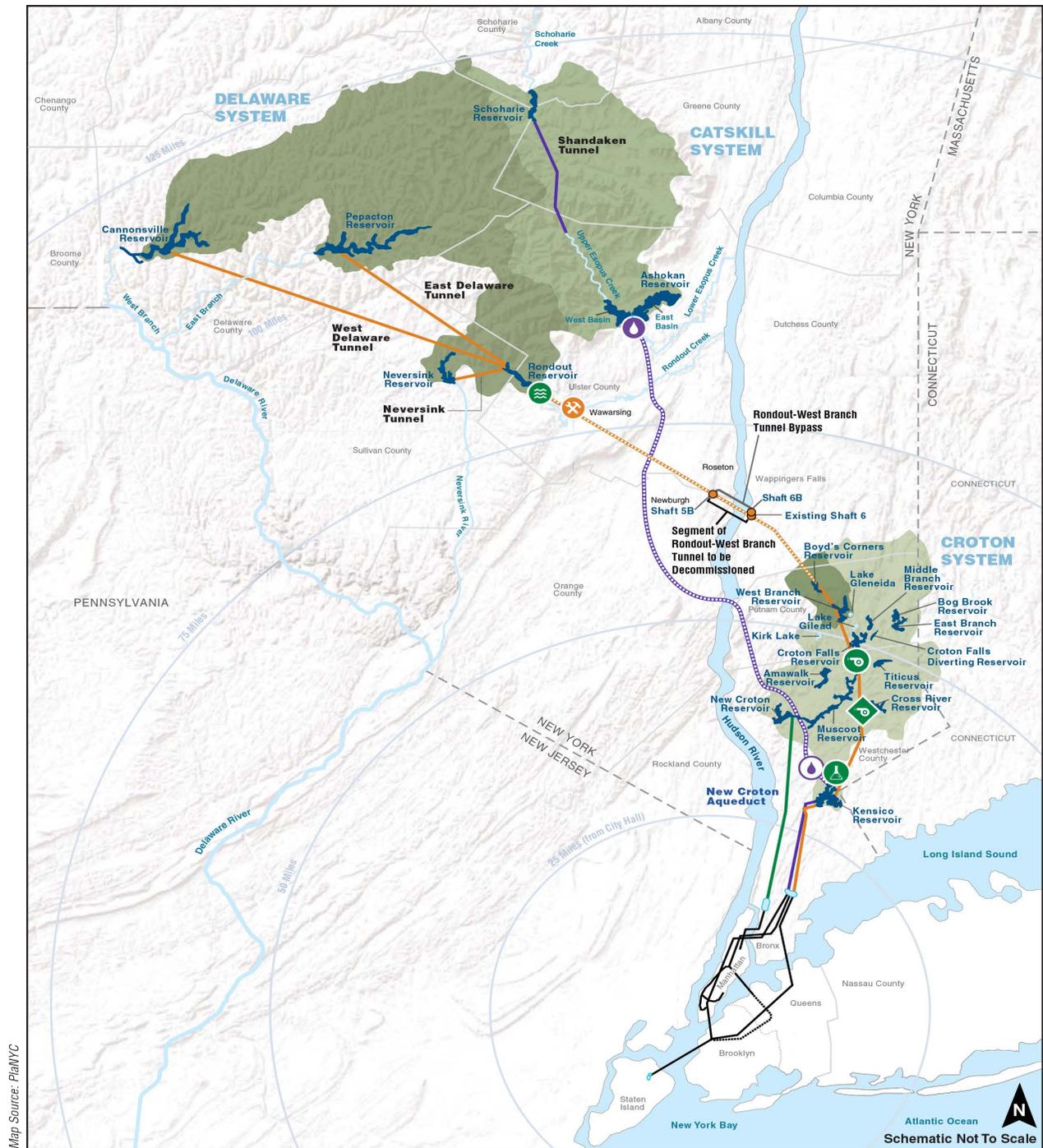
The Delaware Aqueduct is composed of several segments, the longest of which is the RWBT. The RWBT connects the Delaware System's Rondout Reservoir, located in Ulster and Sullivan counties, New York, to West Branch Reservoir in Putnam County, New York. Repairing the RWBT is necessary for the City to continue to meet its water supply obligations, because it is the City's only direct conduit to the source waters of the Delaware System west of the Hudson River.

The RWBT segment of the Delaware Aqueduct is leaking up to 35 million gallons per day (mgd), primarily in the area known as the Roseton crossing under the Town of Newburgh, Orange County, New York. A second leaking section is located near the Town of Wawarsing, Ulster County. To address these leaks, DEP undertook an iterative planning process involving complex modeling and considerations for water supply availability and potential environmental impacts to determine the optimal method of repair. As a result of this planning process, DEP elected to construct a bypass tunnel and two associated shafts to permanently circumvent the leaking section at the Roseton crossing, and to conduct internal repairs to the section near Wawarsing. This project, referred to as RWBT Bypass, was previously evaluated in a Final Environmental Impact Statement issued on May 18, 2012 (previous EIS), and work has commenced.¹

Once the RWBT Bypass is completed in 2022, the RWBT would be temporarily shut down and unwatered to connect the bypass tunnel to the existing RWBT. In addition, DEP would carry out internal repairs to the leaking section of the existing RWBT near Wawarsing. DEP estimates that the maximum temporary shutdown duration would be approximately 8 months. During this temporary shutdown of the RWBT, water from the Delaware System west of the Hudson River would be unavailable to the City and its upstate customers.

DEP has developed Upstate Water Supply Resiliency as part of WFF to ensure the continued supply of clean drinking water during the RWBT temporary shutdown, which comprises three main components: (1) augmentation of available water supply, (2) a temporary operational protocol for the water supply system, and (3) inspection and internal repair of the RWBT. Water supply augmentation includes the repair and rehabilitation of the upper Catskill Aqueduct to restore the capacity of the upper Catskill Aqueduct closer to its historical capacity to support the RWBT temporary shutdown (repair and rehabilitation). The repair and rehabilitation would also extend the useful life of the aqueduct for many years to come. The temporary operational protocol for the City's water supply system is referred to as WFF Shutdown System Operations (WSSO). WSSO would allow DEP to rely more heavily on the Delaware System prior to the temporary shutdown, the Catskill water supply system (Catskill System) and Croton water supply system (Croton System) during the temporary shutdown, and provide for water supply system rebalancing for a short time following the temporary shutdown. To repair the RWBT leaks, during the temporary shutdown, DEP would inspect the RWBT, conduct internal repairs near Wawarsing during connection of the bypass tunnel in Roseton (inspection and repair), and decommission the bypassed section of the RWBT (decommissioning). Each of these components is described in Section ES-2 of this Executive Summary, shown on **Figure ES-2**, and described in further detail in Chapters 9, 10, and 11 of this DEIS.

¹ The previous EIS is available here: http://www.nyc.gov/html/dep/html/environmental_reviews/rwb_tunnel_repair_project.shtml.



Map Source: PlaNYC

- Cross River Pump Station
- Delaware Aqueduct
- New Croton Aqueduct
- Rondout-West Branch Tunnel Inspection and Repair
- Croton Falls Pump Station
- Catskill Aqueduct
- Water Tunnels
- Rondout-West Branch Tunnel Repairs
- Pleasantville Alum Plant
- Chlorination Facility at Ashokan Screen Chamber
- Catskill Aqueduct Repair and Rehabilitation
- Rondout Reservoir Siphons
- Dechlorination Facility at Pleasantville Alum Plant
- Water for the Future Shutdown System Operations Reservoirs

Figure ES-2: Water for the Future Overview



The components of Upstate Water Supply Resiliency are interdependent and the appropriate sequencing of each for implementation is critical. For instance, once repair and rehabilitation is complete, DEP would be ready to implement WSSO. Once WSSO commences and the RWBT is unwatered, DEP would be able to conduct the RWBT inspection and internal repairs near Wawarsing. An overview of Upstate Water Supply Resiliency is described in detail below.

- **Catskill Aqueduct Repair and Rehabilitation:** The original capacity of the upper portion of the Catskill Aqueduct between Ashokan and Kensico reservoirs has been reduced over time, partly because of the accumulation of biofilm (i.e., a naturally occurring layer of microorganisms within a self-produced polymer) along the aqueduct's interior surface. Though relatively thin, the rough surface of this biofilm layer has contributed to slowing the flow of water from a historical maximum of 660 mgd to the current capacity of 590 mgd. The repair and rehabilitation seeks to restore the capacity of the upper segment of the aqueduct closer to its historical capacity during the RWBT temporary shutdown by removing this layer of biofilm. New air vent structures would also be installed at key points along the aqueduct to improve water flow.

Chlorine-based chemicals would be added to the aqueduct to potentially reduce the amount of biofilm prior to conducting biofilm removal, and to help maintain aqueduct capacity for the duration of the RWBT temporary shutdown.² Therefore, a chlorination facility is proposed for construction at DEP's Ashokan Screen Chamber in the Town of Olive, Ulster County, New York, with a dechlorination facility proposed at DEP's Pleasantville Alum Plant in the Village of Pleasantville, Westchester County, New York. In addition, repair and rehabilitation would carry out further repairs necessary to support the aqueduct's capacity enhancements and extend its serviceable life.

In addition to biofilm removal and temporary chlorination and dechlorination, the repair and rehabilitation would include:

- A full inspection of the aqueduct;
- Repair or treatment of minor leaks;
- Replacement of aging mechanical components;
- Rehabilitation of existing aqueduct segments through structural repairs; and
- Removal of sediment within the Catskill Kensico Bypass to restore its capacity for emergency use.

² Chlorination of the Catskill Aqueduct would be achieved through addition of one of two chlorine-based chemicals: chlorine dioxide and sodium hypochlorite. To ensure that water within distribution systems is in compliance with safe drinking water standards as regulated by the State Department of Health (NYSDOH), the chemical added and its corresponding dose would vary depending on seasonal and operating conditions. These doses were selected to achieve the goals of the project, while limiting the potential for effects to the City's water supply (i.e., Kensico Reservoir) and to the Outside Community Connections that rely on the Catskill Aqueduct as a primary or secondary drinking water supply. No more than one chemical would be used at a time.

- **Water for the Future Shutdown System Operations:** Prior to, during, and just following the temporary shutdown, DEP would implement WSSO, a specific and substantially different operating protocol that is designed to maintain reliability of the water supply system during an extended shutdown of the RWBT.³ The purposes of WSSO are to: prepare the water supply for the RWBT temporary shutdown; continue providing water to upstate and in-City customers while the Delaware System is temporarily shut down; and return the system to typical operating conditions once the bypass tunnel connection is complete and the Delaware System is available again.
- **Rondout-West Branch Tunnel Inspection and Repair:** In addition to supporting the connection of the bypass tunnel to the RWBT, WSSO would allow DEP to unwater and inspect the approximately 45-mile length of the RWBT between Rondout and West Branch reservoirs. During the temporary shutdown, DEP would make necessary repairs to the tunnel. Once inspection and repair is completed and the bypass tunnel is connected, decommissioning would occur and the bypassed section of the RWBT that passes under the Hudson River would be taken out of service permanently. As a result, leaks from the RWBT would cease permanently. Once repairs are complete, the water supply system would return to baseline conditions.

The proposed Upstate Water Supply Resiliency is located in the State of New York and is an action to be undertaken by an agency of the City of New York. It is subject to environmental review pursuant to the State Environmental Quality Review Act (SEQRA) and City Environmental Quality Review (CEQR) processes. This DEIS has been prepared in conformance with applicable laws and regulations, including Executive Order No. 91, and follows the guidance of the *CEQR Technical Manual*. DEP is the lead agency in this environmental review process.

This DEIS describes Upstate Water Supply Resiliency including each of its components and the study areas where work is proposed. Across these different study areas, the DEIS:

- Examines the potential environmental effects of each Upstate Water Supply Resiliency component;
- Describes methodologies for and results of impact analyses;
- Discloses short- and long-term potential impacts during construction and operation and commitments to avoid potential impacts to the environment;
- Identifies the potential for significant adverse environmental impacts;

³ DEP frequently modifies its operation of the water supply system for many reasons and in response to a variety of conditions. These operational modifications are considered as routine management activities that would not be subject to environmental review under State Environmental Quality Review Act (SEQRA) or City Environmental Quality Review (CEQR). In contrast, WSSO, as analyzed in this DEIS, refers to a specific and substantially different protocol for operating the system than is currently in place and which is designed solely for the purposes of Upstate Water Supply Resiliency in connection with WFF.

- Describes any commitments by DEP and mitigation measures necessary to minimize or avoid significant adverse environmental impacts that could occur with Upstate Water Supply Resiliency;
- Discusses alternatives to Upstate Water Supply Resiliency; and
- Discusses any irreversible and irretrievable commitments of resources as a result of Upstate Water Supply Resiliency.

As shown on **Figures ES-3** and **ES-4**, Upstate Water Supply Resiliency comprises planning, procurement, and several components that would be constructed and begin operating over different years, culminating in connection of the bypass tunnel to the RWBT beginning in 2022. For the purpose of this DEIS, the following conditions and related analysis years were used to examine the potential environmental effects of each component:

- Baseline Conditions (Existing Conditions) that include observations and assessments collected between late 2012 and early 2016, as applicable.
- Future Conditions without the Proposed Project (No Action Condition) that were based on different years associated with construction and operation of the different components of Upstate Water Supply Resiliency, ranging between 2017 and 2023.
- Probable Impacts with the Proposed Project (With-Action Condition) that were assessed for future conditions for the same analysis years as the Future Conditions without the Proposed Project.

In addition, future conditions associated with construction of Upstate Water Supply Resiliency components were evaluated for peak periods of construction. These represent a “reasonable worst case scenario” of the potential maximum environmental effects. Operation of Upstate Water Supply Resiliency components were evaluated for both temporary operational conditions during the temporary shutdown, and once the water supply system returned to typical operating conditions, where appropriate.

Water for the Future and Upstate Water Supply Resiliency

Planning, Procurement, and Construction

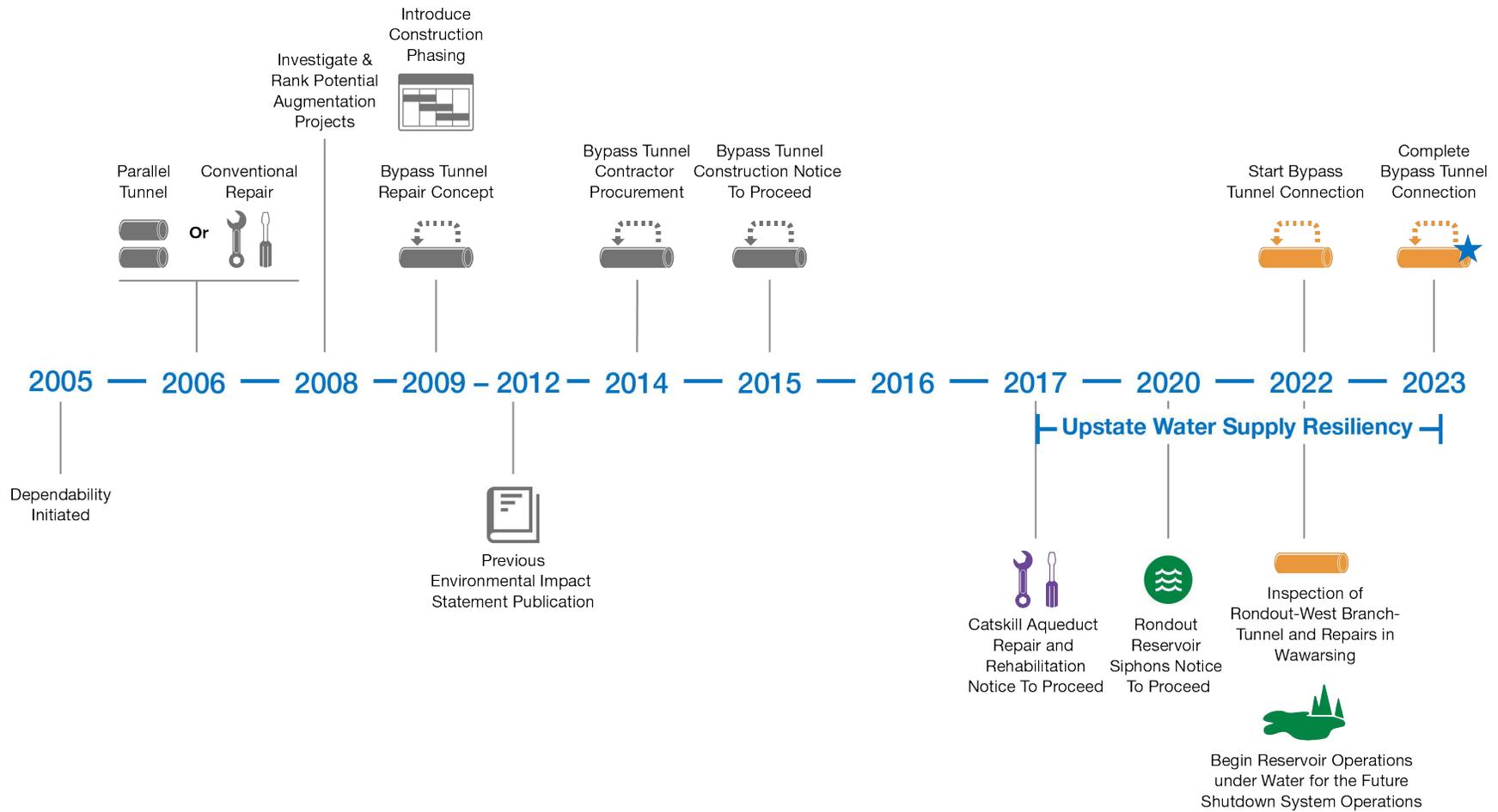


Figure ES-3: Upstate Water Supply Resiliency Overall Timeline

Upstate Water Supply Resiliency

Construction and Implementation

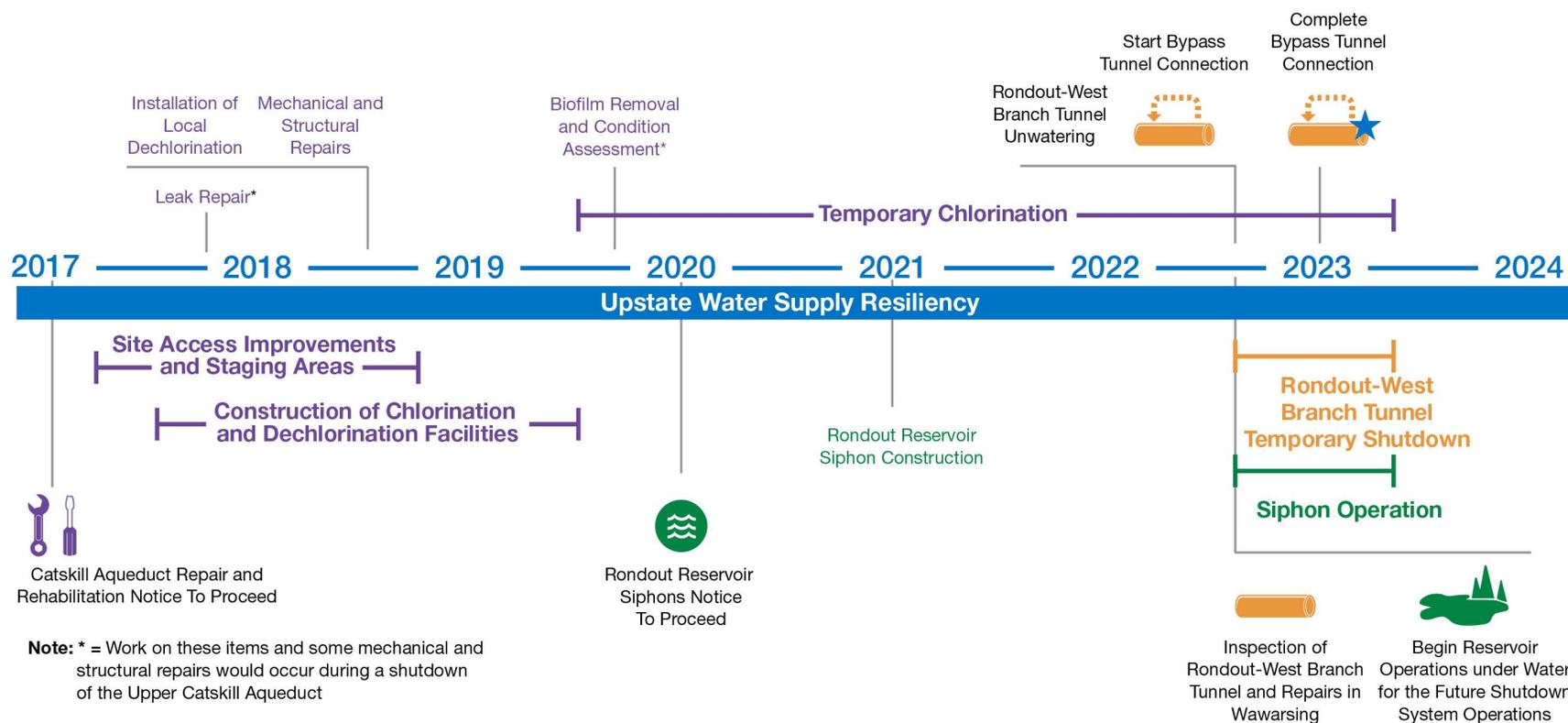


Figure ES-4: Upstate Water Supply Resiliency Detailed Timeline



The remainder of this Executive Summary is organized as follows:

- Section ES-2, “Project Descriptions,” provides a brief description of each Upstate Water Resiliency component, including an overview of the proposed activities.
- Section ES-3, “Potential Major Discretionary Permits, Approvals, and Consultation,” discusses the potential major discretionary permits, approvals, and consultations with regulatory authorities associated with Upstate Water Supply Resiliency.
- Section ES-4, “Probable Impacts of Upstate Water Supply Resiliency,” discusses the potential significant adverse impacts that could result from Upstate Water Resiliency.
- Section ES-5, “Cumulative Impacts,” discusses the potential for Upstate Water Supply Resiliency to result in cumulative impacts from its multiple components, including individually minor but potentially collectively significant effects that would take place over time.
- Section ES-6, “Commitments,” discusses commitments to avoid or reduce potential impacts that could result from the construction and/or operation of Upstate Water Supply Resiliency.
- Section ES-7, “Mitigation,” discusses mitigation measures developed in response to potential significant adverse impacts that could result from the construction and/or operation of Upstate Water Supply Resiliency.
- Section ES-8, “Alternatives,” presents alternatives to Upstate Water Supply Resiliency evaluated as part of this DEIS.
- Section ES-9, “Unavoidable Adverse Impacts,” discusses the potential significant adverse impacts from Upstate Water Supply Resiliency that would not be fully eliminated by the commitments or mitigation measures that would be part of Upstate Water Supply Resiliency.

ES-2 PROJECT DESCRIPTIONS

ES-2.1 Catskill Aqueduct Repair and Rehabilitation

Biofilm removal from the interior surface of the upper Catskill Aqueduct is the primary activity that would restore the aqueduct's capacity to support the RWBT temporary shutdown. As part of the repair and rehabilitation, biofilm would be removed along the unwatered upper Catskill Aqueduct, with the exception of the deep pressure tunnels that have limited accessibility. Access to the aqueduct for biofilm removal would be provided by access manholes, new and existing boatholes, downtake chambers, and other locations that allow entry into the aqueduct. Options for removal of the existing biofilm deposits include manually scraping, vacuuming, or pressure washing.

As biofilm is removed, it would be collected and wash water from the removal process would be treated at specific locations along the Catskill Aqueduct. Treatment would typically occur before the start of a pressure tunnel, directly upstream of Kensico Reservoir, or at steel pipe siphons. In addition to restoring the aqueduct's capacity during the RWBT temporary shutdown, biofilm removal would provide an opportunity to conduct a full condition assessment and, if feasible, conduct repairs that would help ensure the longevity of the aqueduct.

Adequate ventilation is critical to achieve enhanced capacity and flow in the Catskill Aqueduct because water in the aqueduct is driven by gravity. When the aqueduct is at full capacity, trapped air can create pockets that reduce the ability of the aqueduct to convey water. These air pockets reduce the aqueduct's overall flow and capacity. In addition to biofilm removal, new air vent structures would be installed at key points along the aqueduct to promote unobstructed flow within the aqueduct and to further improve the aqueduct's capacity, both during the temporary shutdown and beyond.

The repair and rehabilitation would include temporary chlorination at DEP's Ashokan Screen Chamber, located at the head of the Catskill Aqueduct. Chlorination would help to reduce biofilm and maintain the increased capacity of the aqueduct once the biofilm is removed. A new dechlorination facility would be constructed at the existing Pleasantville Alum Plant, located in the Village of Pleasantville, to remove chlorine prior to discharge into Kensico Reservoir. Site improvements would be undertaken at both the Ashokan Screen Chamber and Pleasantville Alum Plant to facilitate the chlorination and dechlorination operations, respectively. In addition to installation of the dechlorination facility at the Pleasantville Alum Plant, the repair and rehabilitation would include construction of chemical system upgrades within the plant. DEP will work with all water suppliers who receive water from the Catskill System (Outside Community Connections) to implement measures aimed at monitoring and minimizing any potential changes to water supply characteristics as a result of temporary chlorination. These measures may include operational changes by Outside Community Connections to reduce water age⁴ or oxidant use; monitoring of pH, chlorine dioxide, and disinfection by-products (DBPs); and addition of a corrosion inhibitor, as applicable (see Section 9.18.2.5, "Public Health").

⁴ Water age is the term used to describe the amount of time water has been in contact with an oxidant, in this case sodium hypochlorite or chlorine dioxide.

Several leaks would also be repaired along the length of the aqueduct to ensure that chlorine is not introduced into the environment during testing and operation of the chlorination facility. These small leaks in the aqueduct, though substantially smaller in magnitude than the leaks along the RWBT, provide underground pathways for water from the aqueduct to the surrounding environment. These leaks include cracks, joints, or other gaps that have developed over time. At locations where leak repairs are not feasible or prove unsuccessful, local dechlorination systems would be installed.

The temporary chlorination would require a State Pollutant Discharge Elimination System (SPDES) permit for discharges of treated leak water to receiving streams and from the aqueduct into Kensico Reservoir. DBPs would form in the Catskill Aqueduct water as a result of chlorination. Limited concentrations of DBPs could potentially enter the surrounding environment, although natural resources impacts are anticipated to include minor and temporary effects on vegetation at discharge points (see Section 9.18, “Project-wide Impact Analysis”).

In addition, at two leak locations where repair is not possible, the temporary chlorination could potentially affect groundwater along the Catskill Aqueduct. DEP is committed to working with well owners to implement an Action Plan for potentially affected private drinking water supply wells, if required (see Section 9.19, “Commitments”). Temporary dechlorination systems would be put in place to handle leaks at the surface at these locations.

Additional activities to support the aqueduct’s capacity enhancements and extend its serviceable life would include:

- Establishment of temporary staging areas for construction crews and access improvements (rehabilitation or construction of access roads);
- Installation of boatholes (large points of entry) to facilitate biofilm removal and condition assessments;
- Repair of structural components, including rehabilitating the existing steel pipe siphon bridge structures; replacement of valves, sluice gates, and other mechanical equipment used in unwatering the aqueduct; and
- Removal of sediment within the Catskill Kensico Bypass Tunnel, which is located on the western boundary of Kensico Reservoir extending between the Catskill Influent Chamber to the Catskill Upper Effluent Chamber, restoring its capacity for emergency use.

The repair and rehabilitation activities would be conducted in segments along the approximately 74 miles of the upper Catskill Aqueduct between Ashokan and Kensico reservoirs. Due to the geographic span and number of proposed work activities, staging areas would be established at several locations to allow work crews to streamline work activities while reducing temporary environmental effects (e.g., construction traffic) to local communities. To this end, four larger, primary staging areas would serve as the main locations for overseeing construction activities. Given the number of workers needed during the aqueduct shutdown periods, multiple secondary staging areas would be established, often co-located at the work sites. These sites would reduce the

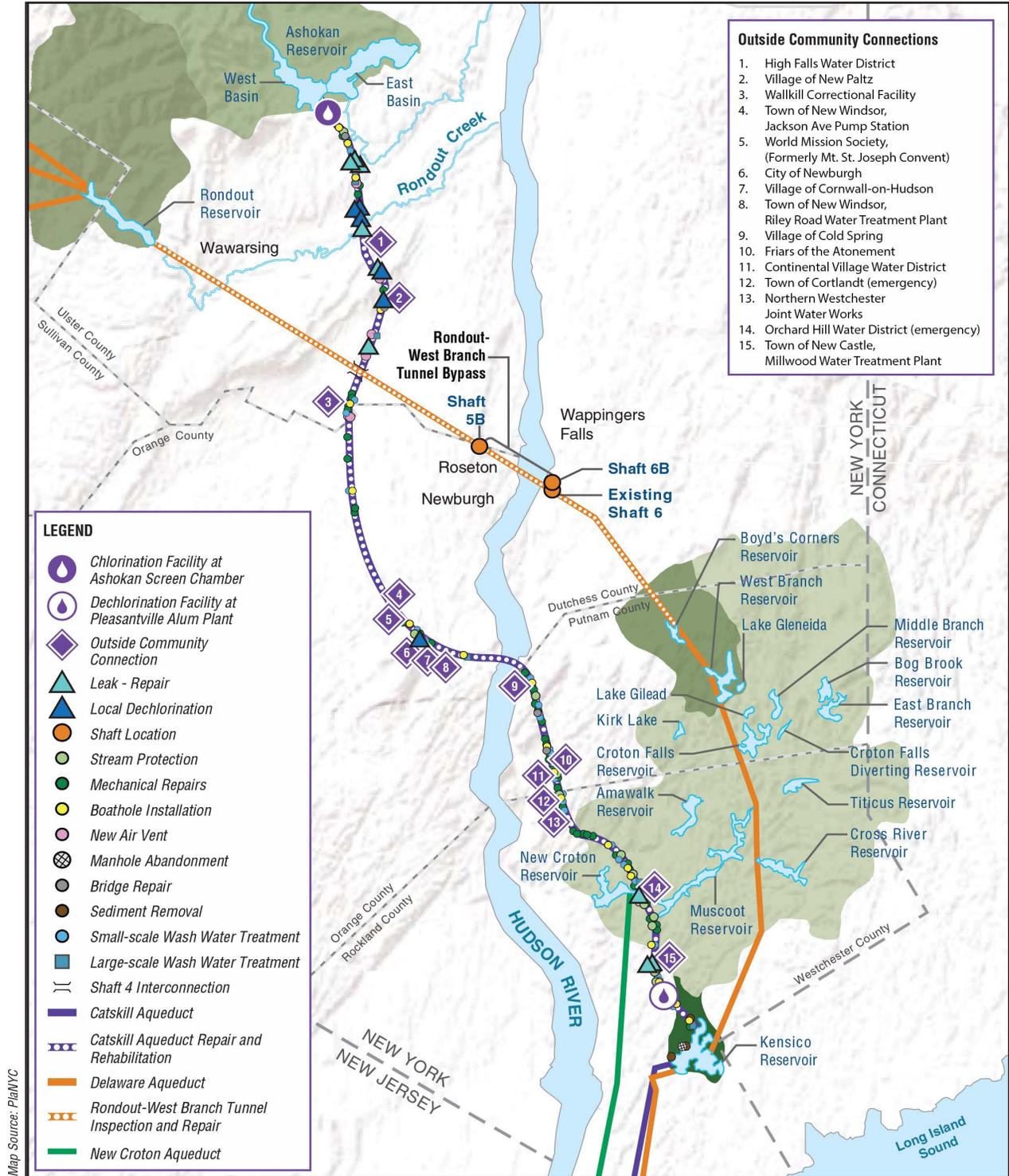
distance workers travel to and from the sites each workday, distribute construction vehicle traffic, and serve as equipment storage and laydown areas to support the work site(s). Additionally, several smaller on-site staging areas would be located near many of the work sites to support activities at those sites. Preparation of these staging areas may consist of: (1) construction of new access roads or rehabilitation of existing access roads, (2) steel pipe siphon bridge inspection and repair, (3) tree and shrub clearing, (4) gravel placement or fill, (5) construction of temporary culverts or stream crossings, and (6) grading.

Repair and rehabilitation requires a phased approach to construction and operation that would span several years. Because biofilm removal would be the key activity that would restore the aqueduct's capacity to support the RWBT temporary shutdown, much of the proposed work would be phased to support this activity. The proposed repair and rehabilitation would begin in 2017 and construction activities are anticipated to be complete in 2019. Temporary chlorination would commence in 2019, in advance of the RWBT temporary shutdown, and, to maintain restored aqueduct capacity, would continue until the bypass tunnel is connected to the RWBT in 2023. However, staging areas used to support the repair and rehabilitation construction activities would be restored to baseline conditions in 2020, because the activities at these locations would be completed by that time.

Leaks would be repaired or local dechlorination systems installed prior to temporary chlorination. To complete the proposed work activities, three shutdowns of the Catskill Aqueduct lasting up to 10 weeks each would be spaced over a period of 3 years from 2017 to 2019. These 10-week shutdowns would allow for access to the interior of the aqueduct to carry out the primary repair and rehabilitation activities, and would generally take place between October and December to coincide with the lowest water demand period of the year. Depending on time constraints and other factors, additional shutdowns may be warranted.

The 10-week shutdown length is governed by the water supply needs of the City and the Outside Community Connections. The planned 10-week shutdowns would temporarily suspend supply to these Outside Community Connections. The Catskill Aqueduct would not be taken out of service unless the City's water supply and these customers are able to sufficiently manage alternative supplies. DEP is working with the affected municipalities to confirm they would have sufficient water supplies in advance of the temporary shutdown, as further described in Chapter 9, "Proposed Catskill Aqueduct Repair and Rehabilitation" of this DEIS.

The potential impacts associated with the repair and rehabilitation activities were evaluated for 37 study areas along the length of the upper Catskill Aqueduct. As shown on **Figure ES-5**, the project would span 14 municipalities in 4 counties: 5 in Ulster County, 2 in Orange County, 2 in Putnam County, and the remaining 5 in Westchester County.



Map Source: PlaNYC

Note: Fourteen identified leaks are located along the upper Catskill Aqueduct. Should any additional leaks be identified along the Catskill Aqueduct, DEP will repair the leak or provide local dechlorination. Biofilm removal is proposed along the interior of the aqueduct within cut-and-cover tunnels, grade tunnels, and steel pipe siphons. Access to the aqueduct would be provided by access manholes, new and existing boatholes, downtake chambers, and other locations that allow entry into the aqueduct. No biofilm removal sites are shown on this figure for clarity.

Not To Scale
For Illustrative Purposes Only



Figure ES-5: Proposed Catskill Aqueduct Repair and Rehabilitation

ES-2.2 Water for the Future Shutdown System Operations

Prior to, during, and just following the RWBT temporary shutdown, DEP would implement WSSO, an operating protocol that modifies the operations typically used to manage the Delaware, Catskill, and Croton water supply systems, shown on **Figure ES-6**. As part of WSSO, DEP would seek exemptions from release requirements set forth in the State regulations (Title 6 of the New York Codes, Rules and Regulations Part. 672.3-3) for West Branch and New Croton reservoirs during October through May, and April and May of the RWBT temporary shutdown, respectively, to maximize retention of water for drinking water supply purposes during this time. DEP would reduce or eliminate all releases with the exception of community releases from the Ashokan Release Channel in accordance with Section 7.c. of the New York State Department of Environmental Conservation (NYSDEC)/DEP Interim Ashokan Release Protocol for Ashokan Reservoir (September 27, 2013).

The potential for impacts associated with WSSO was evaluated for 38 study areas around the 19 reservoirs and 3 controlled lakes in the City's water supply system and their receiving waterbodies. As shown on **Figure ES-6**, the system is located in nine counties: seven counties west of the Hudson River (Broome, Delaware, Green, Sullivan, Ulster, Schoharie, and Orange counties) and two counties east of the Hudson River (Putnam and Westchester counties).

Implementation of WSSO would consist of three phases of the RWBT temporary shutdown with distinct operational protocols, as described in the following, and in detail in Chapter 10, "Proposed Water for the Future Shutdown System Operations" of this DEIS:

- **Pre-shutdown:** The first phase would begin in advance of the RWBT temporary shutdown to prepare the water supply system for heavier reliance on the Catskill and Croton systems, while the Delaware System is temporarily unavailable. To ensure the Catskill and Croton systems are prepared to operate at peak capacity once the shutdown begins, DEP would maximize the Delaware System diversion to the City. During this same period, DEP would reduce flow to the City from the Catskill and Croton systems, thereby increasing the amount of water stored in those systems.⁵ DEP has established real-time parameters (reservoir storage and forecasted inflows from upstream waterways) that would be measured and used in summer and early fall 2022 to indicate whether supply would be adequate to support water supply needs during the temporary shutdown. Once established that sufficient supply exists to support the temporary shutdown, unwatering of the RWBT would begin on October 1, 2022.

⁵ DEP will remain in compliance with all regulations that govern the operation of the water supply system, unless specifically noted in the DEIS that a variance would be requested, as allowed under the Interim Ashokan Release Protocol. Regulations that govern the operation of the water supply system include NYSDEC-regulated minimum conservation releases from most reservoirs; the 1954 U.S. Supreme Court Decree on operations of the Delaware System reservoirs and commitments made by the parties to that Decree and accepted by the Delaware River Basin Commission; the Interim Ashokan Release Protocol at Ashokan Reservoir (or its successor); and State Pollutant Discharge Elimination System (SPDES) permits.

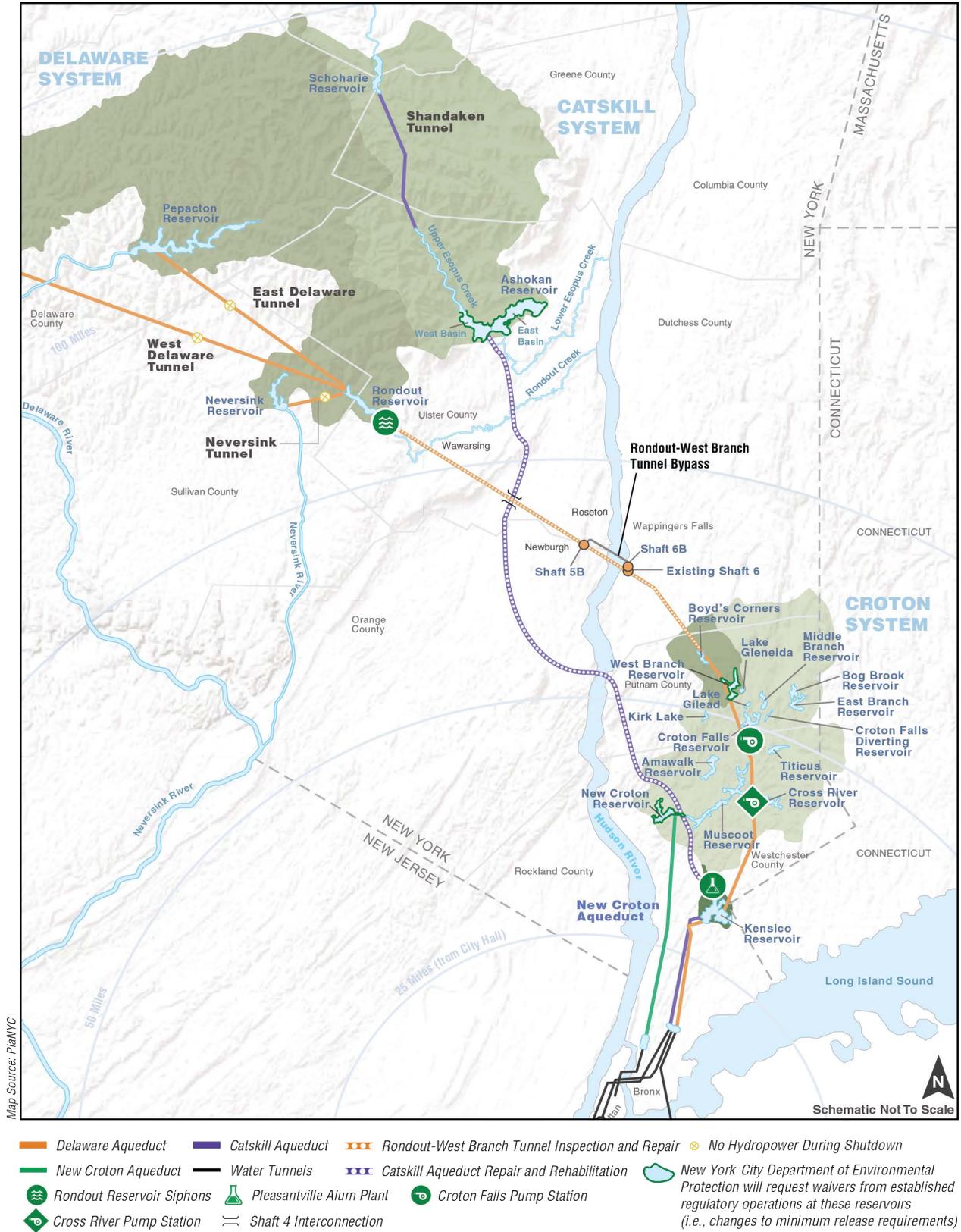


Figure ES-6: Proposed Water for the Future Shutdown System Operations



- **During the temporary shutdown:** Once the temporary shutdown is initiated based on favorable hydrologic conditions, all flow through the RWBT would be stopped and the second phase would commence. The assessments in this DEIS assume a duration for the temporary shutdown of up to eight months. During this time period, WSSO for the Delaware System would focus on management of surface water that would typically be used for drinking water purposes. An increase in releases within the framework of the Flexible Flow Management Plan, or its successor, would be required to maintain reservoir elevations at typical levels and reduce the likelihood of spills from extreme precipitation in three of the four Delaware System reservoirs—Pepacton, Cannonsville, and Neversink. During this time, hydropower facilities installed within the tunnels between these reservoirs and Rondout Reservoir, would be offline. Rondout Reservoir, the fourth Delaware System reservoir, is governed by different regulations and has limited release capacity. Therefore, three temporary siphons would be constructed at the southern end of the reservoir, at Merriman Dam, to release water to Rondout Creek. Use of these siphons would be necessary to manage natural inflows to the reservoir and minimize spills from extreme precipitation. During this second phase, while the Delaware System is temporarily shut down, the Catskill and Croton systems would be the exclusive source of drinking water for the City and its upstate customers. The Catskill and Croton systems would be relied on more heavily, including the use of two pumping stations within the Croton System (Croton Falls and Cross River) that would allow DEP to maximize available water supply within the Croton System.
- **Post-shutdown:** Following the end of the temporary shutdown, the post-shutdown phase would commence with the restarting of the RWBT. This phase of WSSO would continue for a short time period to allow the water supply system to return to typical reservoir conditions.

Throughout the RWBT temporary shutdown, DEP would continuously monitor and evaluate water supply and demand. If, at any given time, system demand exceeds predicted available supply, demobilization from the RWBT bypass tunnel connection would be initiated, the RWBT would be brought back into service and the water supply systems would be allowed to return to typical conditions. The repair would be continued in a subsequent year, when the hydrologic condition of the water supply system allowed.

While natural conditions and DEP's watershed protection programs generally ensure the high quality of the City's water supply, DEP must be prepared to manage turbidity events.⁶ Typically during episodic turbidity events, DEP has been able to temporarily reduce daily flows from the Catskill System to the City and to treat any turbidity in the aqueduct with alum at their

⁶ Turbidity is an optical property of water influenced by the presence of higher concentrations of suspended particles that make water opaque or cloudy. These particles normally consist of suspended clay, silt, organic and inorganic material, and microscopic organisms. Turbidity is of concern primarily due to its potential effects on public health, because the cloudiness could interfere with chlorine and ultraviolet-light disinfection, rendering disinfection less effective. Further, contaminants may adhere to or be encapsulated by the suspended particles. Alum application helps to consolidate suspended particles. These larger, consolidated particles have sufficient mass to settle out of the water, thereby reducing turbidity.

Pleasantville Alum Plant upstream of Kensico Reservoir, until Ashokan Reservoir returns to higher water quality. However, given the need for DEP to rely heavily on the Catskill System during the temporary shutdown, the City would likely be precluded from reducing flows in the Catskill Aqueduct. To manage turbidity during the RWBT temporary shutdown, DEP would need to expand the alum treatment facilities at the Pleasantville Alum Plant to increase the rate of alum treatment during the temporary shutdown to comply with drinking water quality regulations and protect public health.⁷

ES-2.3 Rondout-West Branch Tunnel Inspection and Repair

The inspection and repair would include an initial internal inspection of the sections of the RWBT upstream and downstream of the bypass connection points followed by internal repairs to leaks in the RWBT near the Town of Wawarsing, Ulster County. Inspection and repair would take place during the RWBT temporary shutdown, concurrent with connection of the RWBT bypass tunnel. During this time, internal repairs, including crack repair and contact grouting, would be made to the leaking area near Wawarsing. Should any areas outside of the Wawarsing area be identified during the inspection as requiring repair, that work would be conducted during the RWBT temporary shutdown.

The existing access shafts along the RWBT would be used to facilitate inspection and repair activities. The Rondout Effluent Chamber and Shafts 1, 2A, 8, and 9 of the Delaware Aqueduct would be used during inspection and repair for communication, ventilation, or access to the RWBT (see **Figure ES-7**). During inspection and repair, DEP customers on this segment of the Delaware Aqueduct would be required to temporarily use alternate water supplies. DEP is working with the affected towns to confirm they would have sufficient water supplies in advance of the temporary shutdown, as further described in Chapter 11, “Proposed Rondout-West Branch Tunnel Inspection and Repair” of this DEIS.

Once inspections and repairs to the RWBT are complete and the bypass tunnel is connected to the existing RWBT, the bypass tunnel would become a permanent component of the RWBT. At that time, the leaking segment that was bypassed would be permanently decommissioned. When the connection and repairs are complete, water flow would be restored to the Delaware Aqueduct.

For a short time following the RWBT temporary shutdown, DEP would rely more heavily on the Delaware System to allow the Catskill and Croton systems to rebalance. Once complete, the water supply system would return to typical operating conditions.

The potential for impacts associated with the inspection and repair was evaluated for six study areas around the Rondout Effluent Chamber and shaft sites and study areas in Wawarsing and Roseton that could be affected by the cessation of leaks from the internal repairs and decommissioning, respectively. As shown on **Figure ES-6**, the Rondout Effluent Chamber and shaft sites are located in Ulster and Orange counties, west of the Hudson River, and Putnam County, east of the Hudson River.

⁷ Alum treatment requires approval from NYSDEC and State Department of Health (NYSDOH). During WSSO, DEP will comply with necessary regulatory approvals and notifications for alum treatment and other operations decisions as required under typical operations.

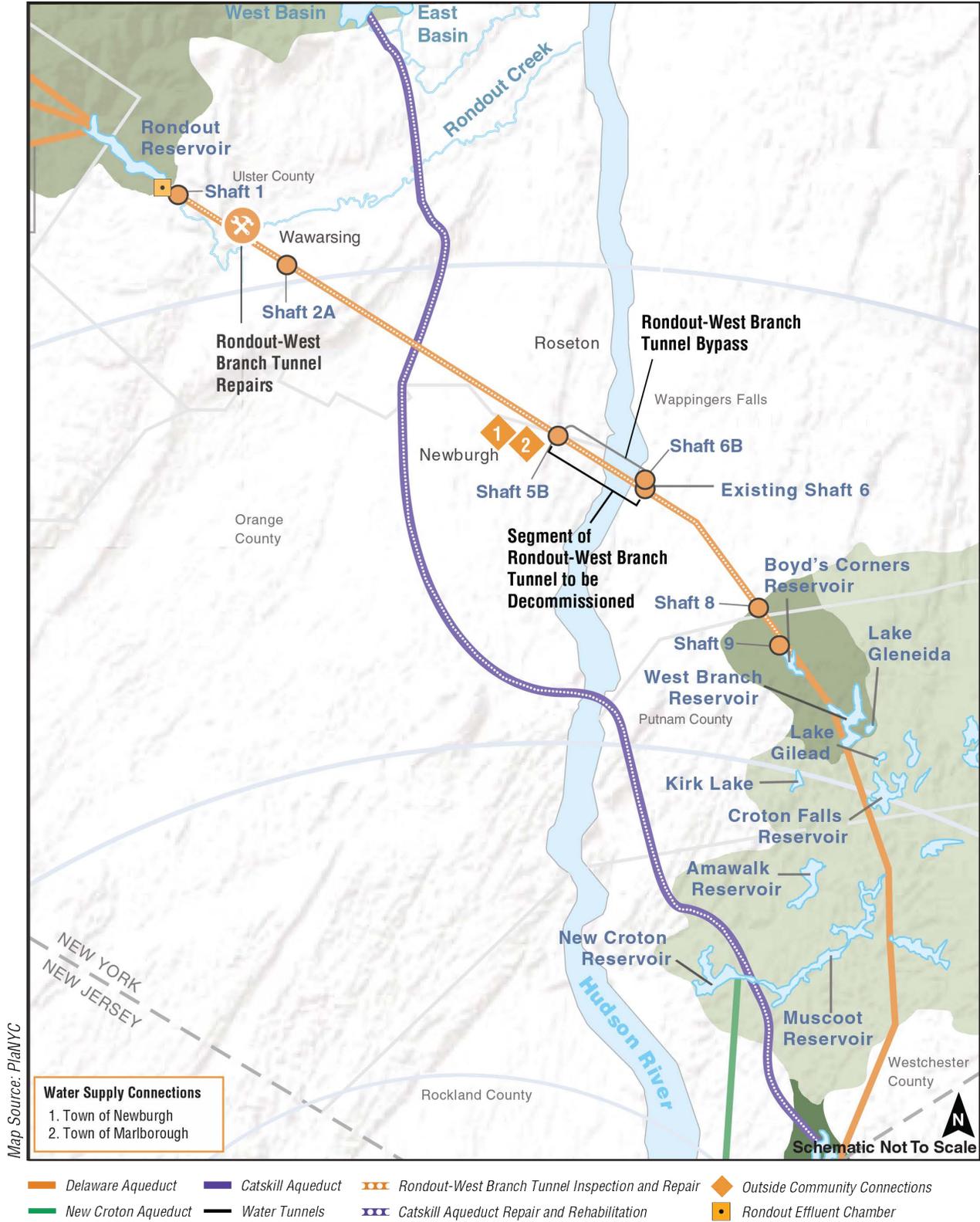


Figure ES-7: Proposed Rondout-West Branch Tunnel Inspection and Repair



ES-2.4 Project Components by Municipality

Table ES-1 identifies the study areas within municipalities throughout Ulster, Orange, Putnam, and Westchester counties where work to support Upstate Water Supply Resiliency would take place for each project component.

Table ES-1: Project Components by Municipality¹

County	Municipality	Proposed Catskill Aqueduct Repair and Rehabilitation Study Areas (Chapter 9)	Proposed WFF Shutdown System Operations Study Areas (Chapter 10)	Proposed RWBT Inspection and Repair Study Areas (Chapter 11)
Ulster	Olive	✓	✓	-
Ulster	Marbletown	✓	✓	-
Ulster	Wawarsing	-	✓	✓
Ulster	New Paltz	✓	-	-
Ulster	Gardiner	✓	-	-
Ulster	Shawangunk	✓	-	-
Orange	Montgomery	✓	-	-
Orange	Newburgh	-	-	✓
Orange	New Windsor	✓	-	-
Putnam	Putnam Valley	-	-	✓
Putnam	Kent	-	✓	✓
Putnam	Nelsonville	✓	-	-
Putnam	Philipstown	✓	-	-
Putnam	Southeast	-	✓	-
Putnam	Carmel	-	✓	-
Westchester	Somers	-	✓	-
Westchester	Bedford	-	✓	-
Westchester	Cortlandt	✓	✓	-
Westchester	Yorktown	✓	✓	-
Westchester	New Castle	✓	✓	-
Westchester	Mount Pleasant	✓	✓	-
Westchester	Pleasantville	✓	-	-

Notes:
 - = Project component does not have a study area in this municipality.
¹ Due to its vast geographic extent, this table does not present all counties and municipalities that surround the City's water supply system, or downstream waterbodies that were reviewed as part of WFF Shutdown System Operations. With the exception of study areas in the towns of Southeast, Carmel, Somers, and Bedford (which contain several study areas each), those municipalities that abut the systems reservoirs and receiving waterbodies, but are not in close proximity to other components of Upstate Water Supply Resiliency are not included.

ES-3 POTENTIAL MAJOR DISCRETIONARY PERMITS, APPROVALS, AND CONSULTATION

A number of major discretionary permits, approvals, and consultations with regulatory authorities would be required for Upstate Water Supply Resiliency.

- U.S. Army Corps of Engineers (USACE)
 - Section 10 of the Rivers and Harbors Act of 1899 permit for in-water construction activities
 - Section 404 of the Clean Water Act permit for in-water construction activities
- NYSDEC
 - Protection of Waters for in- and near-water construction activities
 - Section 401 Water Quality Certifications for in- and near-water construction activities
 - Freshwater Wetlands for activities in regulated wetlands
 - State Pollutant Discharge Elimination System (SPDES) permit for discharges to surface water during implementation of Upstate Water Supply Resiliency
 - Air Emissions Permits and Registrations for generator use during construction
- Consultations and permits, as required, with:
 - U.S. Fish and Wildlife Service (USFWS)
 - National Marine Fisheries Service (NMFS)
 - State Department of State (NYSDOS)
 - State Department of Transportation (NYSDOT)
 - State Department of Health (NYSDOH)
 - State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP)
 - State Natural Heritage Program (NYNHP) under NYSDEC purview; and
 - City Department of Health and Mental Hygiene (NYCDOHMH)
- Additional permits and approvals may include:
 - City Public Design Commission (NYCPDC)
 - Local stormwater permits (including Municipal Separate Storm Sewer System [MS4] approvals); and
 - Additional local permits and approvals

ES-4 PROBABLE IMPACTS OF UPSTATE WATER SUPPLY RESILIENCY

The impact analyses for this DEIS have been tailored to each Upstate Water Supply Resiliency component and are presented separately in their respective chapters (Chapters 9 through 11). Each of the chapters includes a description of the impact analysis methodology, an impact analysis section, and other information necessary to describe the component and its potential to result in significant adverse impacts. The potential for cumulative impacts to occur as a result of implementation of Upstate Water Supply Resiliency as a whole is presented in Chapter 12.

For each component of Upstate Water Supply Resiliency, the impact analysis methodology sections first identify impact categories that do not apply (e.g., shadows, solid waste and sanitation services, and greenhouse gas [GHG] emissions and climate change). For each component of Upstate Water Supply Resiliency, as applicable, a screening assessment was conducted for each impact category that did apply to determine whether *CEQR Technical Manual* thresholds were met, triggering the need to conduct further analysis for a particular impact category. If the screening thresholds were exceeded and an impact analysis was warranted, a description of how the analysis was conducted is provided in each chapter. Where an impact analysis was warranted, impact categories were then evaluated within the appropriate impact analysis section for each study area, based upon the impact analysis years, analysis criteria, *CEQR Technical Manual* thresholds, and applicable town codes.

Based on the analyses conducted and described in Chapters 9, 10 and 11 of this DEIS, Upstate Water Supply Resiliency would not result in significant adverse impacts to: land use, zoning, and public policy; socioeconomic conditions; community facilities and services; open space and recreation; historic and cultural resources; visual resources (an urban design analysis is not warranted because Upstate Water Supply Resiliency is not located in an urban setting); hazardous materials; water and sewer infrastructure; energy; transportation; air quality; noise; public health; and neighborhood character. The potential for significant adverse impacts to natural resources was identified for the inspection and repair, is summarized below, and is described in detail in Chapter 13 of this DEIS.

Many measures incorporated into the design of the proposed project components would avoid or substantially reduce the potential for significant adverse impacts resulting from the construction or temporary operation of Upstate Water Supply Resiliency. These commitments are described in Section ES-6 and described in detail in Chapters 9, 10, 11, and 13 of this DEIS. In addition, specific mitigation measures for each probable impact are described in Section ES-7 and described in detail in Chapters 11 and 13 of this DEIS.

ES-4.1 Catskill Aqueduct Repair and Rehabilitation

During repair and rehabilitation, protective measures would be put in place at all locations that involve proposed in-stream work or work in close proximity to coldwater fisheries. Likewise, partial stream diversions would provide adequate area for both flood flow and fish passage, and would not result in significant adverse impacts to fish. These, and additional protective measures, would be implemented for in-water work and work adjacent to streams supporting coldwater fisheries. This, in conjunction with the flexibility to conduct work during the coldwater fisheries

window where needed, would allow construction of the repair and rehabilitation to avoid or minimize potential impacts to these resources and reduce the overall timeframe for in-water work. In addition, these avoidance and minimization measures have resulted in work plans that would result in relatively minor permanent effects to water resources.

During the period of temporary chlorination, the maximum dose of chlorine dioxide or sodium hypochlorite would be at or below applicable New York State Department of Health requirements. DEP would implement measures aimed at minimizing potential changes to natural resources and water supply as a result of temporary chlorination. In addition, repair and rehabilitation has the potential to affect groundwater quality within two study areas. DEP has proactively developed action plans for private drinking water supply wells within the Lucas Turnpike and Mossybrook Road study areas.

Upon completion of the repair and rehabilitation, temporarily disturbed areas would be restored to baseline conditions. No significant adverse impacts from the repair and rehabilitation are anticipated.

ES-4.2 Water for the Future Shutdown System Operations

While taking the RWBT temporarily offline is an unprecedented operational modification for DEP, the resulting response within the water supply system with respect to reservoir elevations and flows is not anticipated to vary substantially from what occurs under typical operations. This is due in part to annual hydrologic variations that result in wide fluctuations in reservoir water surface elevations, releases, and spills, but also robust planning of modified conditions to maintain delivery of high quality drinking water to DEP's customers. No significant adverse impacts from WSSO are anticipated.

ES-4.3 Rondout-West Branch Tunnel Inspection and Repair

Inspection and repair and decommissioning have the potential to affect groundwater levels near Wawarsing and within Roseton and could have the potential to affect ground elevation (i.e., settlement) in Roseton. In response, DEP has proactively developed action plans for private drinking water supply wells and parcels with the potential for settlement. As a result, no significant adverse impacts are anticipated due to the inspection and repair activities, including repair of the leaks from the RWBT near Wawarsing. Potential significant adverse impacts to wetlands could occur once the RWBT is decommissioned in Roseton. Lowering of groundwater levels as a result of the leak repairs in Roseton could potentially result in the loss of an estimated 1.2 acres of non-regulated wetlands (referred to as Wetlands A, B, C, D, and E). These wetlands are not regulated by USACE or NYSDEC.

ES-5 CUMULATIVE IMPACTS

Cumulative impacts can result from a single action or multiple actions, including individually minor but collectively significant actions that take place over time. They may include indirect or secondary impacts, long-term impacts, and synergistic effects.

In addition to the potential cumulative impacts of Upstate Water Supply Resiliency, this DEIS describes the individual components of Upstate Water Supply Resiliency that overlap in specific municipalities. While each of the proposed activities would be temporary, they were evaluated to identify proposed activities that would occur simultaneously and determine if the combined effects increased their level of significance or changed the potential for impacts within a municipality.

In addition, the previous EIS also assumed that the locations and/or timing of impacts for shaft and bypass tunnel construction would not coincide with what is now referred to as Upstate Water Supply Resiliency. As a result, it was reasonably anticipated that any impacts resulting from Upstate Water Supply Resiliency would also not exacerbate any of the impacts associated with shaft and bypass tunnel construction. Based on the final locations and timing of the proposed activities associated with implementation of Upstate Water Supply Resiliency, there would be no cumulative significant adverse impacts as discussed in Chapter 12 of this DEIS.

The primary purpose of Upstate Water Supply Resiliency is to support the connection of the RWBT bypass tunnel, which would allow DEP to complete unprecedented repair of this critical piece of infrastructure. At the same time, the repair and rehabilitation would improve the capacity and functioning of the upper Catskill Aqueduct. Ultimately, the operation of the bypass tunnel would support public health by enabling DEP to continue to supply clean drinking water to consumers in sufficient quantity to meet future demands. In addition, the repaired RWBT would provide an enhanced aqueduct for supplying additional Delaware System water, as needed, to the Catskill Aqueduct through the Catskill/Delaware Interconnection at Shaft 4 (Shaft 4 Interconnection) during episodes of elevated turbidity in the Catskill System.⁸ This would support DEP's ongoing objectives under its Filtration Avoidance Determination (FAD). In addition to repair and rehabilitation, repair of the RWBT and bypass tunnel connection would support inspections of other tunnel segments, providing greater flexibility to inspect and repair all system components in the future. Therefore, WFF as a whole would provide a cumulative public health benefit.

⁸ DEP would comply with all applicable regulations that govern the operation of the water supply system during future operation of infrastructure improvements implemented under WFF following the completion of WFF.

ES-6 COMMITMENTS

ES-6.1 Upstate Water Supply Resiliency Commitments

DEP has incorporated commitments and protective measures into the project components that would avoid or minimize the potential for significant adverse impacts. Through implementation of these commitments and/or protective measures, no significant adverse impacts would result from the Catskill Aqueduct Repair and Rehabilitation (repair and rehabilitation) and Water for the Future Shutdown System Operations (WSSO). Therefore, mitigation is not required for these components.

In addition, commitments and protective measures are incorporated into the Rondout-West Branch Tunnel Inspection and Repair (inspection and repair) that would also avoid or minimize the potential for significant adverse impacts. Significant adverse impacts associated with inspection and repair that could not be avoided or minimized through incorporation of commitments and protective measures would be mitigated as described in Section ES-7, “Mitigation.”

Upstate Water Supply Resiliency commitments are described below and in greater detail within this DEIS.

ES-6.1.1 CATSKILL REPAIR AND REHABILITATION

As part of the proposed project, DEP identified and incorporated specific commitments within the Catskill Aqueduct Repair and Rehabilitation (repair and rehabilitation) component of Upstate Water Supply Resiliency to avoid and/or minimize the potential for significant adverse impacts to the maximum extent practicable. The commitments and protective measures associated with repair and rehabilitation are summarized below and discussed in further detail within Chapter 9, “Proposed Catskill Aqueduct Repair and Rehabilitation.”

ES-6.1.1.1 Operations

- DEP would only commence aqueduct shutdowns under favorable hydrologic conditions and when the water supply system is entering a period of lower demand.

ES-6.1.1.2 Natural Resources

- Tree removal would be conducted from November 1 through March 31 to avoid impacts to Indiana bats (*Myotis sodalis*) and northern long-eared bats (*Myotis septentrionalis*).
- DEP would inspect structures that would be repaired prior to commencement of work to verify whether there are signs of roosting bats.
- For federal/State Threatened, Endangered Species, and Candidate Species, State Species of Special Concern, protective measures include perimeter fencing and species relocation as discussed in detail in Section 9.4, “Town of Olive Impact Analysis,” through Section 9.18, “Project-wide Impact Analysis.”

- Use of stream diversions for in-water work would be limited to the maximum extent practicable, particularly within those locations where waterbodies are supportive of coldwater fisheries (e.g., trout [T] or trout spawning [TS]). Where temporary diversions are required, DEP would employ partial diversions where feasible that would not restrict more than 40 percent of the stream width in order to maintain stream flow and fish passage throughout the duration of construction. For waterbodies where a full stream diversion may be required, this work would be done outside of any work restrictions associated with coldwater fisheries and would be limited in scope and duration to the maximum extent practicable. Permanent streambank protection measures would be installed along streams in selected areas to prevent erosion and possible scouring within receiving streams.
- Leaks along the aqueduct would be repaired or have local dechlorination systems installed prior to commencing chlorination to prevent chlorinated water from being released into the environment. DEP would conduct a photographic survey of vegetation in proximity to leak flowpaths prior to initiating chlorination and following repair and rehabilitation.

ES-6.1.1.3 Water and Sewer Infrastructure

- Discharges associated with unwatering of the Catskill Aqueduct would be controlled through the use of throttle valves and on-site monitoring to avoid a bankfull event in receiving waterbodies. In addition, for receiving streams that could be inundated during an unwatering event, DEP would avoid discharging at these sites within 24 hours of predicted rain events, during these rain events, and for a period of 48 hours after rain events or after which time streamflow returns to normal.
- DEP would coordinate closely with Outside Community Connections to confirm they have adequate water supply independent of the upper Catskill Aqueduct prior to any temporary shutdown of the aqueduct required for the repair and rehabilitation.

DEP would add sodium hypochlorite or chlorine dioxide as part of the proposed chlorination at doses that would ensure effectiveness of the repair and rehabilitation while maintaining sodium hypochlorite and chlorine dioxide residuals and the associated formation of disinfection by-products (DBPs) below their respective maximum residual disinfection or maximum contaminant levels for all Outside Community Connections, as applicable.⁹

ES-6.1.1.4 Transportation

- Use of the primary staging areas during the 10-week shutdowns would generate higher vehicle trips than during construction when the aqueduct is in service. During these

⁹ DBPs formed as a result of sodium hypochlorite addition include trihalomethanes (THM) and haloacetic acids (HAAs). For chlorine dioxide, DBPs are chlorite and chlorate. Chloride is also formed.

periods, there would be shuttle trips between the primary staging area and study areas to reduce the volume of construction vehicles on local roads.

- To reduce truck trips during the weekend, biofilm removed from the aqueduct would be stockpiled at the Wallkill Downtake Chamber in the New Paltz-Minnewaska Road Study Area and removed from the site Monday through Friday.

ES-6.1.1.5 Noise

- DEP would use generators and fans during construction. Generators would not exceed a maximum noise emission of 75 A-weighted decibels (dBA) equivalent average sound level (Leq) at 50 feet from the generators, and may need to be equipped with protective and sound attenuating enclosures to meet this level. Fans would not exceed a maximum noise emission of 51 dBA Leq at 50 feet from the fans.¹⁰

ES-6.1.1.6 Public Health

- DEP would not dose chlorine dioxide above 0.8 milligrams per liter (mg/L) or sodium hypochlorite above 1.25 mg/L under the proposed chlorination. This would ensure effectiveness of the repair and rehabilitation while maintaining residuals of these chemicals and the associated formation of disinfection by-products (chlorite, chlorate, trihalomethanes [THM], and haloacetic acids [HAAs]) below their respective New York State Department of Health (NYSDOH) maximum residual disinfection or maximum contaminant standards, as applicable.
- DEP would work with Outside Community Connections to implement measures aimed at monitoring and minimizing any potential changes to water supply characteristics as a result of temporary chlorination. These measures may include operational changes to reduce water age or oxidant use; monitoring of pH, chlorine dioxide, and DBPs; and addition of a corrosion inhibitor, as applicable.
- DEP is committed to developing and working with owners to implement an Action Plan for potentially affected private drinking water supply wells within the Lucas Turnpike and Mossybrook Road study areas (see **Figure ES-8** and **Figure ES-9**), if required.

Well Action Plan

For the Lucas Turnpike and Mossybrook Road study areas, DEP would coordinate with landowners of parcels with structures that could contain drinking water supply wells. DEP would also coordinate with current and/or future landowners of vacant parcels that could contain, or be developed to contain, private drinking water supply wells that could be developed before or during the temporary chlorination of the aqueduct. The Action Plan would consist of well monitoring that would occur 12 months before, during, and up to 12 months after the temporary chlorination period. Water levels would be measured and water samples would be collected from each monitored well quarterly, if agreed to by the landowner, to determine the chlorine dioxide,

¹⁰ These reduced noise levels for generators and fans were not used in the impact analyses.

sodium hypochlorite, and/or chlorine residual level in each well. Monitoring results would be compared to the criteria below.

Well Action Plan Criteria

- Point-of-use treatment would be provided to any well that has a documented hydraulic connection to the Catskill Aqueduct and has the potential for detectable levels of chlorine dioxide, sodium hypochlorite, and/or chlorine residual within the areas shown on **Figure ES-8** and **Figure ES-9**.
- Point-of-use treatment would be provided to any well that has a level above the laboratory detection limit for either chlorine dioxide, sodium hypochlorite, and/or chlorine residuals.

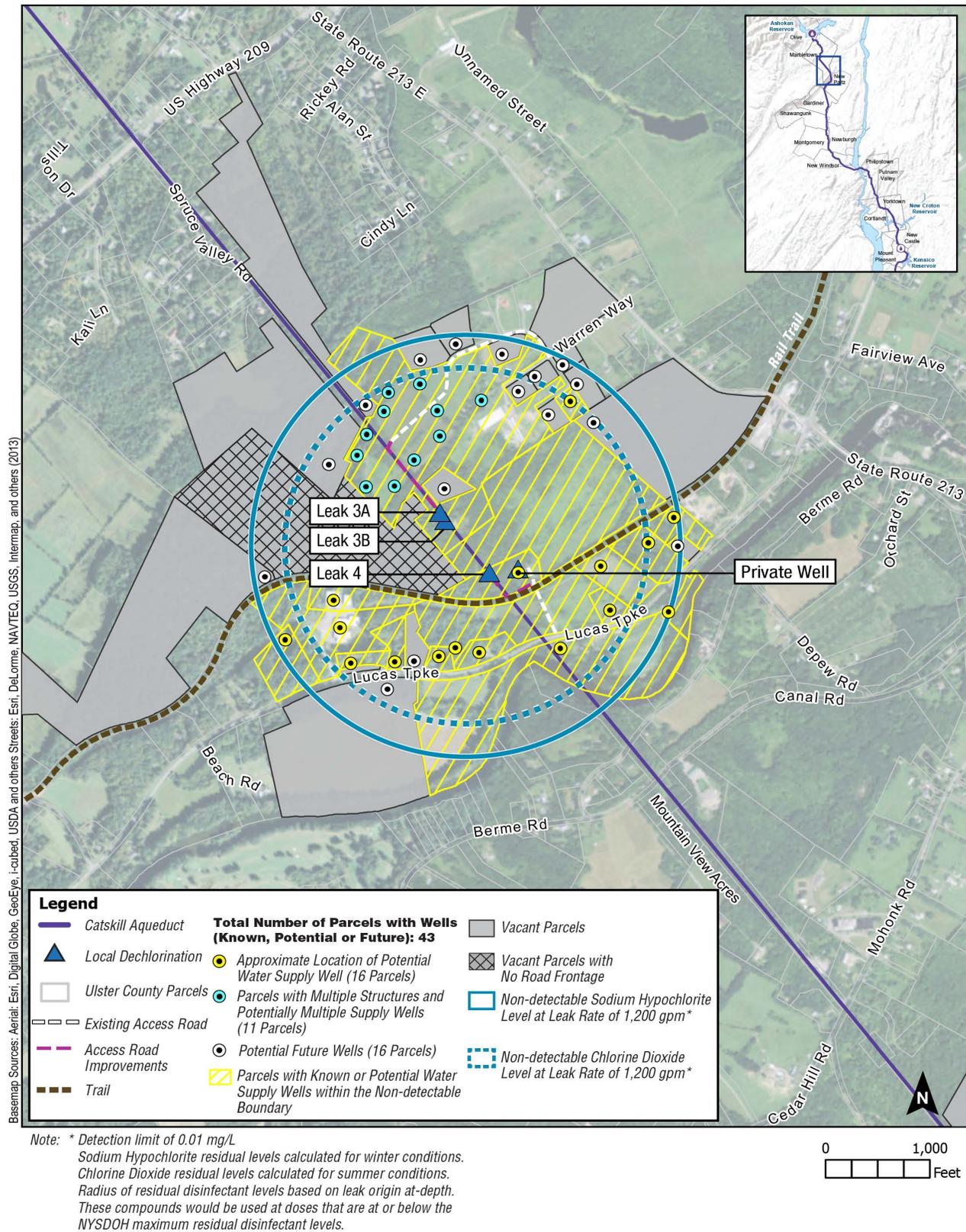
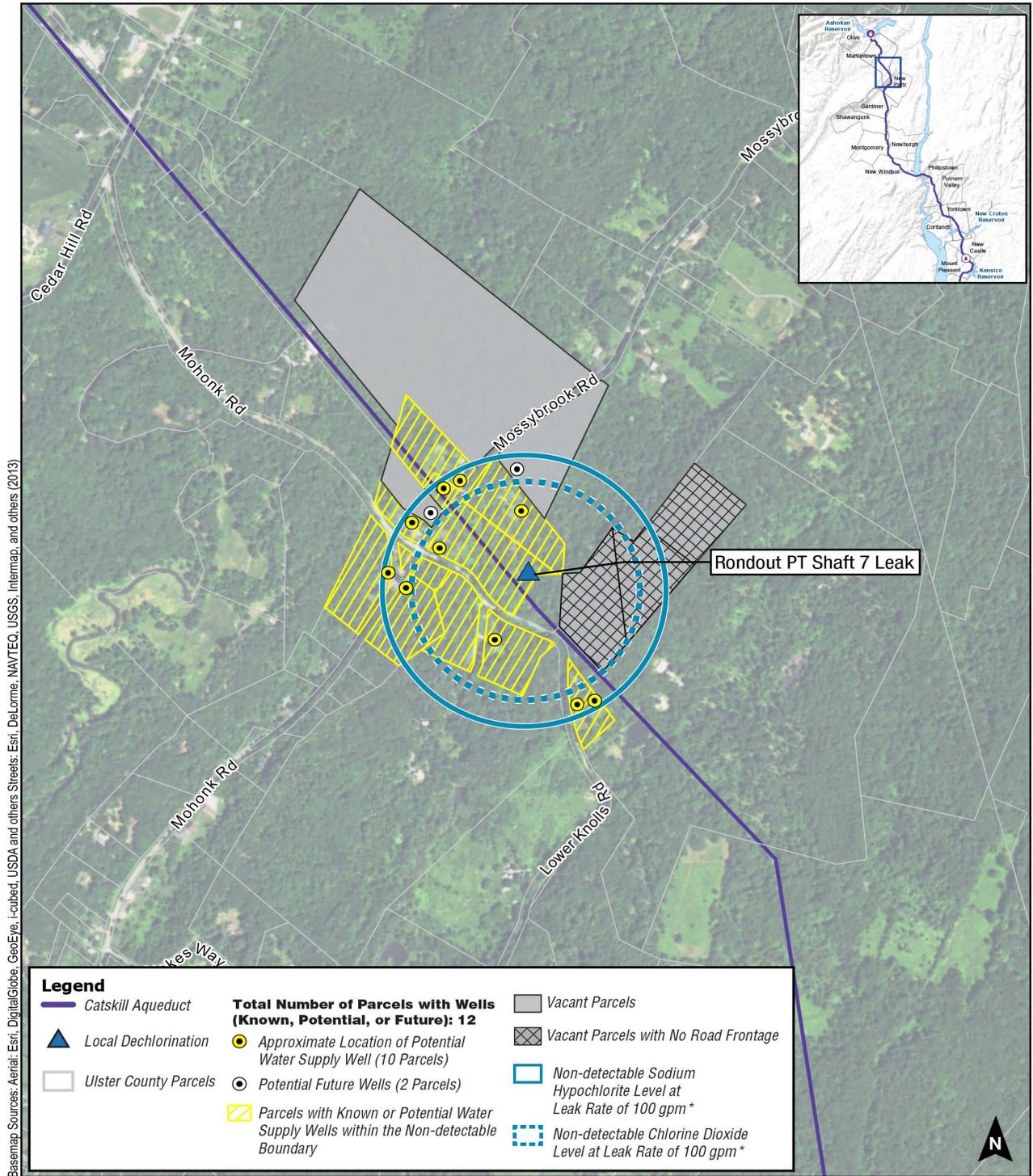


Figure ES-8: Well Action Plan – Lucas Turnpike Study Area, Town of Marletown, Ulster County





Basemap Sources: Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA and others Streets: Esri, DeLorme, NAVTEQ, USGS, Intermap, and others (2013)

Figure ES-9: Well Action Plan – Mossybrook Road Study Area, Town of Marbletown, Ulster County



ES-6.1.2 WATER FOR THE FUTURE SHUTDOWN SYSTEM OPERATIONS

As part of the proposed project, DEP identified and incorporated specific commitments within the Water for the Future Shutdown System Operations (WSSO) component of Upstate Water Supply Resiliency to avoid and/or minimize the potential for significant adverse impacts to the maximum extent practicable. Commitments and protective measures that have been incorporated into WSSO are summarized below and discussed in further detail in Chapter 10, “Proposed Water for the Future Shutdown System Operations.”

ES-6.1.2.1 Operations

- DEP would only commence the RWBT temporary shutdown under favorable hydrologic conditions and when the aqueduct system is entering a period of lower demand.
- While DEP would use the existing exception from the Interim Ashokan Release Protocol in accordance with Section 7.c. of the New York State Department of Environmental Conservation (NYSDEC)/DEP Interim Ashokan Release Protocol for the Ashokan Reservoir (September 27, 2013), DEP would continue to maintain community releases from the Ashokan Release Channel.¹¹

ES-6.1.2.2 Natural Resources

- Siphons at Rondout Reservoir would be available for the duration of the temporary shutdown. Siphons would operate continuously while the reservoir water surface elevation is above the minimum operating level. However, to not contribute to downstream flooding, DEP would temporarily cease operation of the siphons when flows at the U.S. Geological Survey Rosendale Gauge reach within 1 foot of the flood action stage. Following a temporary curtailment of flows, the siphons would be reactivated and flow control valves would be used to ramp flows back up slowly over a number of days.

ES-6.1.2.3 Noise

- DEP would use generators and fans during construction of the siphons at Rondout Reservoir. Generators would not exceed a maximum noise emission of 75 dBA Leq at 50 feet from the generators, and may need to be equipped with protective and sound attenuating enclosures to meet this level. Fans would not exceed a maximum noise emission of 51 dBA Leq at 50 feet from the fans.¹²

ES-6.1.3 RONDOUT-WEST BRANCH TUNNEL INSPECTION AND REPAIR

As part of the proposed project, DEP identified and incorporated specific commitments and protective measures within the Rondout-West Branch Tunnel Inspection and Repair (inspection

¹¹ Section 7 c. of the Interim Ashokan Release Protocol for Ashokan Reservoir states “DEC, or DEP with concurrence by DEC, determines that releases must be changed or interrupted as necessary for inspection, maintenance, testing and repairs (including Delaware Aqueduct repairs).”

¹² These reduced noise levels for generators and fans were not used in the impact analyses.

and repair) component of Upstate Water Supply Resiliency. Commitments and protective measures were incorporated to avoid and/or minimize the potential for significant adverse impacts to the maximum extent practicable. Commitments and protective measures that have been identified are summarized below and discussed in further detail in Chapter 11, “Proposed Rondout-West Branch Tunnel Inspection and Repair.”

ES-6.1.3.1 Natural Resources

- For federal/State Threatened, Endangered Species, and Candidate Species, State Species of Special Concern, protective measures include perimeter fencing and species relocation as discussed in detail in Chapter 11, “Proposed Rondout-West Branch Tunnel Inspection and Repair.”

ES-6.1.3.2 Noise

- Construction associated with the inspection and repair would require operation of fans and generators. Generators would not exceed a maximum noise emission of 75 dBA L_{eq} at 50 feet from the generators, and may need to be equipped with protective and sound attenuating enclosures to meet this level. Fans would not exceed a maximum noise emission of 51 dBA L_{eq} at 50 feet from the fans.

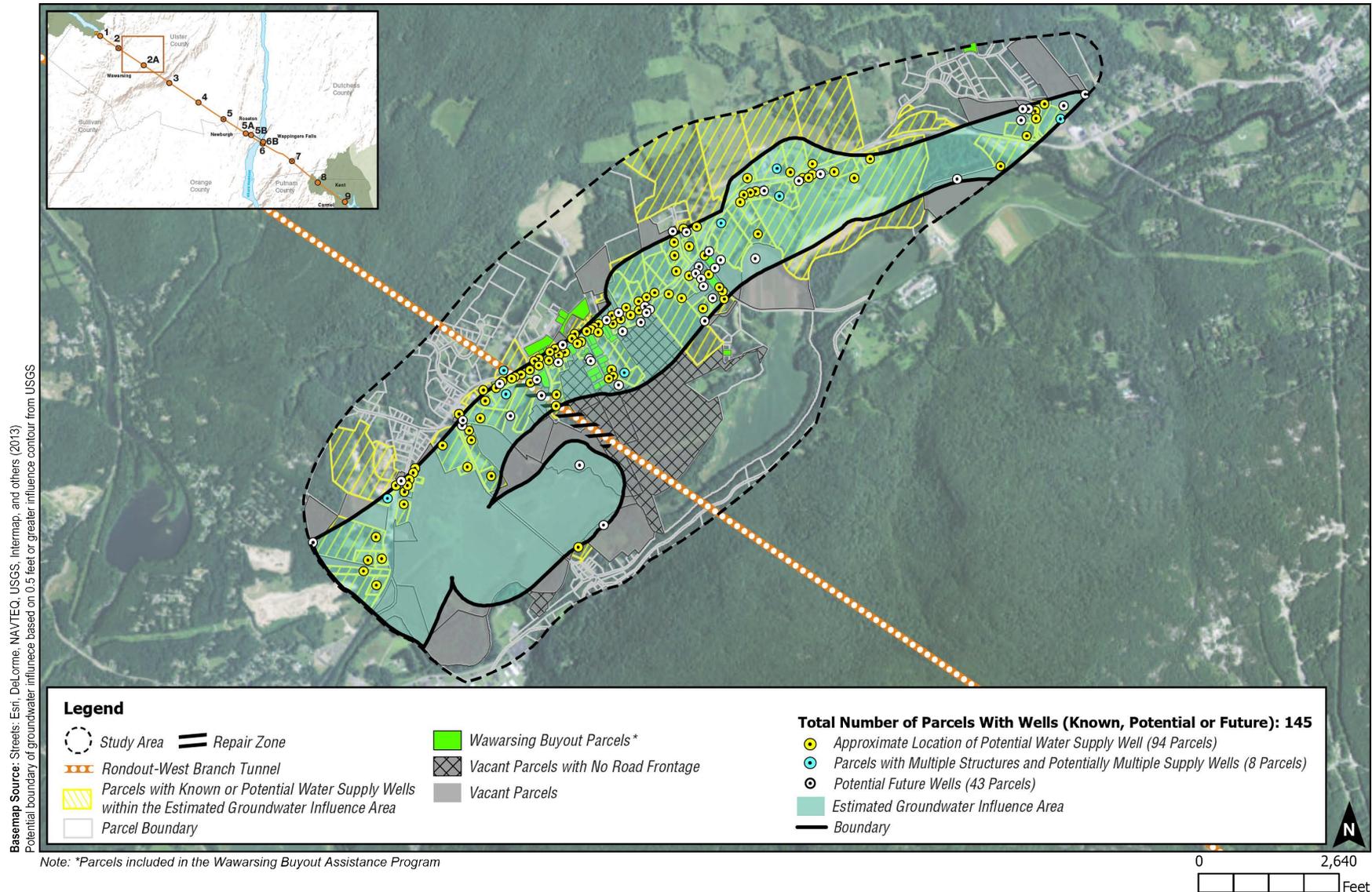
ES-6.1.3.3 Water and Sewer Infrastructure

- DEP would implement a Well Action Plan for potentially affected private drinking water supply wells within the applicable study areas, as described further below.

Well Action Plan

To commence the Well Action Plan, a survey would be prepared and sent to landowners to obtain information on available well construction details, water use, and occupants, for the following parcels:

- Within the Wawarsing Leak Repair Study Area, there are 145 total parcels with known, potential or future private drinking water supply wells identified in the Estimated Bedrock Aquifer Groundwater Influence Area (see **Figure ES-10**). One hundred and two (102) of these parcels currently have structures with potential wells. Forty three (43) of these parcels are vacant parcels that may be developed in the future and could require a private drinking water supply well; and
- Within the Roseton Study Area, there are 27 parcels with known, potential or future potential private drinking water supply wells identified in the Estimated Bedrock Aquifer Groundwater Influence Area (see **Figure ES-11**). Twenty five (25) of these parcels currently have structures with potential wells (one parcel has both a known supply well and a potential drinking water supply well). Two (2) of these parcels are vacant parcels that may be developed in the future and could require a private drinking water supply well. Therefore, in total, there are 28 known, potential, or future wells, as one parcel (Cedar Hill Cemetery) has two existing wells.



Basemap Source: Streets: Esri, DeLorme, NAVTEQ, USGS, Intermap, and others (2013)
 Potential boundary of groundwater influence based on 0.5 feet or greater influence contour from USGS



Figure ES-10: Well Action Plan – Wawarsing Leak Repair Study Area

This page intentionally left blank.

Sources: Figure 9, Roseton Groundwater Flow Model Construction, Calibration and Simulations for Aqueduct Connection Environmental Support, Geopentech, October 2015.
 Basemap Source: Streets: Esri, DeLorme, NAVTEQ, USGS, Intermap, and others (2013), Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, and others

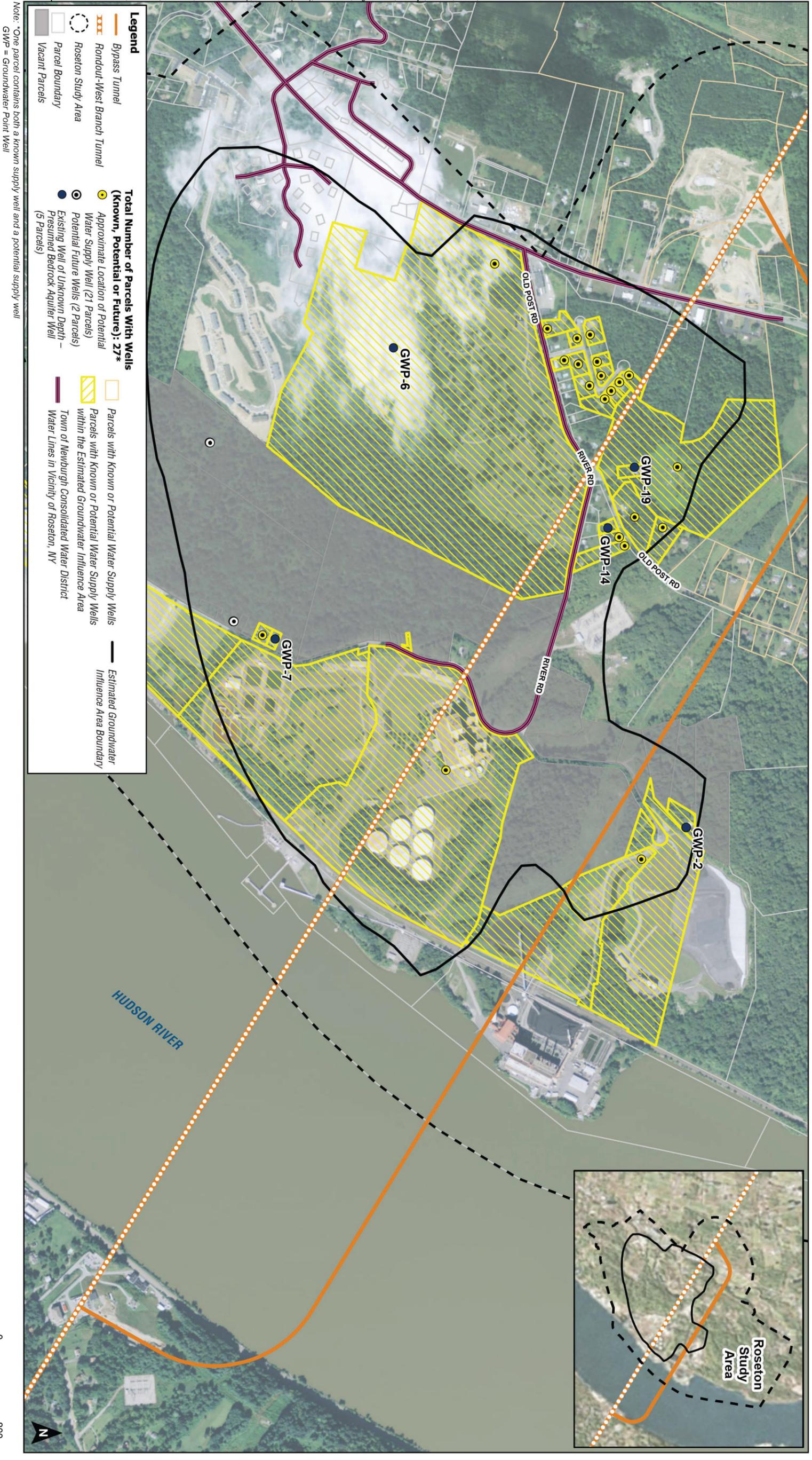


Figure ES-11: Well Action Plan – Roseton Study Area Estimated Groundwater Influence Areas

This page intentionally left blank.

If the landowner provides the applicable well characteristics (e.g., depth and yield), they would be compared to the well monitoring criteria described further below. If a landowner does not have or cannot provide sufficient information for comparison to the well monitoring criteria, DEP would, with their approval, determine the water supply well characteristics (e.g., depth and yield) approximately one year before the RWBT temporary shutdown.

Well Action Plan Criteria

The criteria below were created to identify wells or parcels with future wells that have the potential for water level changes due to the inspection and repair and decommissioning. They were created based on a combination of well characteristics. These include the type of aquifer, well depth, well yield, water usage rates, well storage, and well pump setting, and whether a lower groundwater level could affect the well's ability to meet the water supply needs of its users.

The criteria are based on NYSDOH Individual Water Well recommendations. A well that yields 5 gpm or more is capable of meeting the peak-day demand and the average day demand for a home. For wells that yield less than 5 gpm, it is necessary to store a sufficient volume of water in the well and in the pressure tank for the home to meet peak demands. The NYSDOH recommends a minimum storage volume that ranges from 100 gallons for a two-bedroom home to 300 gallons for a five-bedroom home based on the yield of the well. To put this into perspective, a standard 6-inch drilled bedrock well contains 1.5 gallons per foot, or 150 gallons for every 100 feet of water in the well. These factors were used to create the well monitoring eligibility criteria as described below.

Before the start of the temporary shutdown, the wells would be evaluated to determine if they meet the criteria below. Each well would be evaluated to determine the well yield (in gallons per minute [gpm] over a 4-hour period), depth to water, depth to pump intake, and depth to bottom of well. These data would be used to evaluate the well performance characteristics of each well and would be compared to the criteria below.

- Wells with yield greater than 5 gpm:
 - NOT MONITORED - would not be monitored.
- Well with yield greater than 3 but less than 5 gpm:
 - NOT MONITORED - would not be monitored if well stores greater than 300 gallons;
 - MONITORED - would be monitored if the well stores less than 300 gallons;
 - ALTERNATIVE SUPPLY - would be provided an alternative water supply if the well stores less than 100 gallons.
- Well with yield greater than 1 but less than 3 gpm:
 - NOT MONITORED - would not be monitored if well stores greater than 350 gallons;

- MONITORED - would be monitored if the well stores less than 350 gallons;
- ALTERNATIVE SUPPLY - would be provided an alternative water supply if the well stores less than 200 gallons.
- Well with yield less than 1 gpm:
 - ALTERNATIVE SUPPLY - would be provided an alternative water supply.

These criteria were established by adding 50 gallons to the NYSDOH storage recommendations (Individual Water Supply Wells – Fact Sheet No. 2) for a five-bedroom home for each well yield range (e.g., 1 to 3 gpm and 3 to 5 gpm). Fifty gallons of storage was added to the NYSDOH recommended water storage to account for the water storage that could be lost (e.g., 25 feet of water in a 6-inch diameter well equates to 37.5 gallons) during the temporary shutdown and over the long term from repair of the leaks.

A well that yields 5 gpm or greater would be excluded from the Action Plan. If a water supply well meets the criteria for monitoring and the landowner allows, DEP would conduct well monitoring for groundwater level and groundwater quality 12 months before, during, and up to 12 months after the temporary shutdown. Monitoring would include installing a water level transducer in each well to measure and record the water level fluctuation in each well. Monitoring would also include collecting water samples quarterly and analyzing the water samples for metals and inorganic parameters.

A well in the monitoring program would receive an alternative supply based on the following criteria:

- If the water level in the monitored well is within 20 feet of the pump intake at its typical lowest operating point.
- If a metal or inorganic water quality parameter result exceeds the NYSDOH Part 5 Standards as confirmed by a second sample collected as soon as practical once sampling results indicate a possible exceedance. In the event the baseline water quality monitoring prior to the temporary shutdown demonstrates an existing water quality exceedance, an increase in the concentration of that parameter would also result in alternative supply (see Section ES-6.1.3.4, “Public Health”).

If a water supply well meets the alternative supply criteria, and where the landowner allows, DEP would provide an augmented or alternative water supply. The augmented or alternative supply may include the following options:

- Install an above ground pneumatic storage tank to increase water storage capacity;
- Lower the pump intake in the well to increase water storage capacity in the well;

- Drill the well deeper and lower the pump intake in the well to increase water storage capacity in the well if it is a bedrock well and the well is judged to be suitable to be deepened; or
- Drill a new deeper well and lower the pump intake in the well to increase storage capacity in the well if it is an unconsolidated well.

If the water quality results show that quality exceeds the NYSDOH Part 5 drinking water standards, DEP would provide treatment to treat or remove contaminants to below the NYSDOH Part 5 drinking water standards (see Section ES-6.1.3.4, “Public Health”).

The Town of Wawarsing has initiated the planning studies for the formation of a municipal water supply district that would provide a public water supply for the local residents. For those properties that connect to the water district, this would result in the abandonment of the existing water supply wells, and the need for a Monitoring Action Plan would no longer be necessary. For any additional parcels that may become connected to either a local or municipal water supply district within the study area, well monitoring would no longer be necessary.

ES-6.1.3.4 Public Health

As further described above in “Well Action Plan Criteria,” if the water quality results from the Well Action Plan show that quality exceeds the NYSDOH Part 5 drinking water standards, DEP would provide either an alternate supply or treatment to treat or remove contaminants to below the NYSDOH Part 5 drinking water standards.

ES-6.1.3.5 Geology and Soils

Decommissioning would result in a change of ground water levels, which could result in areas that could be subject to settlement within the Roseton Study Area. DEP is developing and working with owners to implement preventative Action Plans for structures within this area, as described further below.

Action Plans for Structures

DEP is developing, and working with owners to implement, preventative Action Plans for areas within the area that could be subject to settlement during and after the RWBT temporary shutdown (see shaded parcels in **Figure ES-12**). Where structures and infrastructure are located in areas that have the potential to be subject to ground settlement, the specific Action Plans would identify measures that could be implemented prior to, during, and after the temporary shutdown to protect the potentially affected structures or infrastructure based on their type, function, and estimated magnitude of change. These measures could include: additional investigations; development of engineering techniques; and further assessment against structure-specific thresholds to evaluate whether additional engineering techniques are required.

Prior to the temporary shutdown, additional investigations that could be conducted include the following:

- Pre-condition surveys of existing structures and infrastructure within the targeted area of potential settlement to establish structure/infrastructure-specific baseline conditions; and
- Additional structure/infrastructure-specific geotechnical investigations (field explorations and laboratory testing) for specific structure/infrastructure.

Results from these investigations would be used to assess the estimated values for stress, strain, and distortion the structure or infrastructure could experience as a result of the changing physical condition of the ground as settlement occurs. These estimated values would be compared with structural or empirical criteria to further identify the potential response of the structure or identified infrastructure to the estimated ground settlement.

If results from these additional investigations identify potential settlement that could affect the integrity of a structure or infrastructure, DEP would work with owners to provide protective engineering techniques that would be implemented prior to the temporary shutdown. All of the structures and infrastructure in the Estimated Unconsolidated Aquifer Groundwater Influence Area could be stabilized, if necessary, using readily available engineering techniques. For example, structures or infrastructure that could be subject to differential settlement (e.g., rigid structure subjected to bending or tilting) can be stabilized using grouting techniques such as jet, compaction, or compensation grouting. Additional commonly used engineering techniques for stabilization include providing additional structural supports, providing flexible connections for utilities, and rerouting critical infrastructure.



Figure ES-12: Action Plan Parcels in Roseton

This page intentionally left blank.

Some structures or infrastructure could be subject to differential settlement because of differing foundation types used within the same or connected structures (e.g., building founded on piles and soil, or a building founded on piles with utility connections founded on soil). For these, stabilizing techniques that could be applied consist of compaction grouting to prevent ground movements or modification of connections to accommodate potential differential settlement.

Linear structures and infrastructure that could be subject to differential settlement (e.g., railroad tracks, utilities, or pipelines) could be stabilized to stabilize and reinforce the soil.

Prior to the temporary shutdown, a settlement monitoring program would also be developed and implemented during the temporary shutdown as part of the Action Plans. The monitoring program would be specific to the type and function of each potentially impacted structure or infrastructure. It would include monitoring to measure settlement and movements or changes to structures or infrastructure that could be subject to settlement for comparison to estimated changes. The monitoring could include the following measures:

- Surface/subsurface instrumentation such as high-precision settlement survey markers, piezometers, extensometers, and inclinometers; and
- Structural/infrastructure monitoring with instruments such as tiltmeters, crack gauges, and vibration monitors.

In addition to these engineering techniques, the Action Plans could include implementation of similar techniques for specific structures or infrastructure if threshold values of changes associated with estimated settlement or structure/infrastructure distress are exceeded during monitoring (e.g., vibration level, crack size, or new observed distresses). As applicable, the Action Plans would include threshold action values that would be agreed upon with the owners based on the anticipated potential settlement or structure/infrastructure stress levels. For example, for structures or infrastructure that could be subject to differential settlement, compaction grouting or modification of connections would be initiated if the anticipated settlement reaches the agreed-upon threshold action values.

ES-7 MITIGATION

ES-7.1 Upstate Water Supply Resiliency Mitigation

As described above, no potential significant adverse impacts are anticipated from the Catskill Aqueduct Repair and Rehabilitation (repair and rehabilitation) and Water for the Future Shutdown System Operations (WSSO). Therefore, no mitigation is required for those components. There remains the potential for significant adverse impacts to non-regulated (USACE and NYSDEC) wetlands in the Roseton Study Area within inspection and repair. For these potential impacts, mitigation measures would be developed as discussed below.

ES-7.1.1 RONDOUT-WEST BRANCH TUNNEL INSPECTION AND REPAIR

ES-7.1.1.1 Wetlands

A total of approximately 1.2 acres of existing delineated, non-regulated wetlands within the Roseton Study Area are estimated to be lost as a result of the cessation of leaks from decommissioning on surface water and shallow groundwater levels that are the source of water to these wetlands, including Wetlands A, B, D, and E (see **Figure ES-13**).

DEP commits to developing a wetland monitoring program that would be implemented prior to, during, and after the RWBT temporary shutdown to assess the impacts to Wetlands A, B, C, D, and E, and riparian areas adjacent to Stream Segments 3, 3B, and 4. The monitoring program would consist of continuous hydrologic monitoring for up to 5 years following decommissioning, and biennial vegetation monitoring, wetland delineation, wetland functional assessment, and photographic documentation of fixed monitoring plots during the first, third, and fifth years following decommissioning. The objective of the monitoring program would be to document changes to wetland communities and their size and function, and to compare changes to local reference wetlands to determine if significant adverse impacts have occurred as a result of decommissioning. The monitoring of reference wetlands would allow for comparison to determine if any change at the potentially impacted wetland is a result of decommissioning or other source (e.g., climatological). Should permanent impacts to wetland size and/or function be measured, DEP would perform compensatory mitigation.

Compensatory mitigation for permanent impacts to non-regulated wetlands would include wetland creation, restoration, and/or enhancement, with a minimum one to one mitigation ratio (i.e., 1 acre of wetland creation, restoration, or enhancement for every acre of wetland permanently lost as a result of the project). Once the compensatory mitigation site is established, DEP would monitor the site for a minimum of 3 years to confirm that the site meets the objective to compensate for the permanent loss of wetlands in the Roseton Study Area.

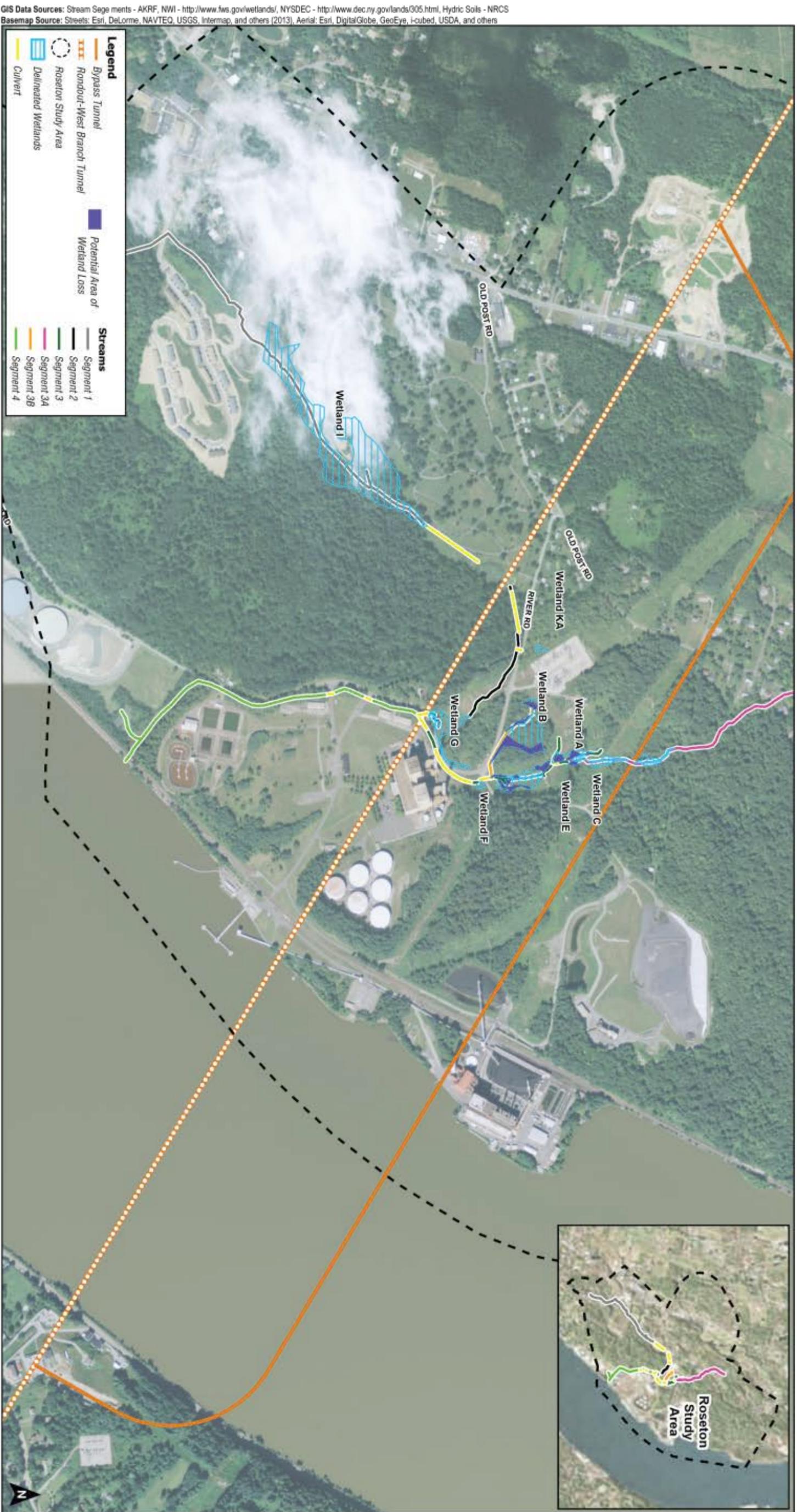


Figure ES-13: Estimated Impacts to Non-regulated Wetlands - Roseton Study Area



This page intentionally left blank.

ES-8 ALTERNATIVES

SEQRA and CEQR require that alternatives to a proposed project or action be identified and evaluated in an EIS, including a No Action Alternative to present environmental conditions that would exist if the proposed project were not implemented. The previous EIS provided a detailed impact analysis of the RWBT shaft and bypass connection, and included a review of several alternatives to WFF (see Section 4.2, “Water Supply Augmentation Planning,” for a description of the alternatives selection process). These are not repeated in this DEIS. The alternatives analysis for this DEIS focused on the potential for impacts associated with three alternatives to Upstate Water Supply Resiliency: (1) the No Action Alternative, (2) Interconnections to Water Supplies in New Jersey, and (3) RWBT Leak Stabilization. The alternatives analysis concluded that the No Action and the RWBT Leak Stabilization alternatives would not be feasible because they would not address the overall WFF goals because they would not adequately address the leaks in the RWBT, and would compromise the City’s water supply. The Interconnections to Water Supplies in New Jersey Alternative was determined to be feasible, however the environmental impacts that would be associated with the alternative would be greater than those of Upstate Water Supply Resiliency.

ES-9 UNAVOIDABLE ADVERSE IMPACTS

Unavoidable significant adverse impacts are defined as those that meet the following two criteria:

- (1) There are no reasonably practicable mitigation measures to eliminate the impacts; and
- (2) There are no reasonable alternatives that would meet the purpose and need of the action, eliminate the impact, and not cause other or similar significant adverse impacts.

For Upstate Water Supply Resiliency, a detailed analysis of potential impacts and description of mitigation measures are presented in this DEIS. As described in Section ES-7, with mitigation measures in place, potential significant adverse impacts as a result of Upstate Water Supply Resiliency would be fully mitigated. Therefore, Upstate Water Supply Resiliency would not result in any unavoidable significant adverse impacts.