

**FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE
CATSKILL/DELAWARE UV FACILITY**

4.	ULTRAVIOLET LIGHT DISINFECTION FACILITY	1
4.1.	INTRODUCTION AND PROJECT DESCRIPTION	1
4.1.1.	Site Description	2
4.1.1.1.	Topography	4
4.1.1.2.	Surface Water	7
4.1.1.2.1.	Off-Site	7
4.1.1.2.2.	On-Site	7
4.1.1.3.	General Geology	7
4.1.1.4.	Seismicity	7
4.1.1.5.	Subsurface Conditions	8
4.1.1.5.1.	Fill Material	8
4.1.1.5.2.	Glacial Till	8
4.1.1.5.3.	Glacial-Fluvial Material	8
4.1.1.5.4.	Decomposed Rock	8
4.1.1.5.5.	Bedrock	9
4.1.1.5.6.	Groundwater	9
4.1.2.	Ultraviolet Light Disinfection Facility	9
4.1.2.1.	Raw Water Supply	10
4.1.2.1.1.	Catskill Water Supply System	10
4.1.2.1.2.	Delaware Water Supply System	10
4.1.2.1.3.	Catskill/Delaware System	10
4.1.2.2.	Raw Water Conveyances	11
4.1.2.2.1.	Delaware Aqueduct	11
4.1.2.2.2.	Catskill Aqueduct	12
4.1.2.2.3.	Emergency Raw Water Bypass	18
4.1.2.3.	Emergency Overflow	19
4.1.2.4.	Treated Water Conveyances	19
4.1.2.4.1.	Delaware Aqueduct	19
4.1.2.4.2.	Catskill Aqueduct	20
4.1.2.4.3.	Treated Water for the Town of Mount Pleasant	20
4.1.2.4.4.	Eastview Overflow	21
4.1.3.	Project Site Overview	21
4.1.3.1.	UV Facility Description	25
4.1.3.1.1.	Cleaning Systems	26
4.1.3.1.2.	Process Laboratory	26
4.1.3.1.3.	Electrical Power	27
4.1.3.1.4.	UV System Uninterruptible Power	28
4.1.3.1.5.	Fuel Demand	28
4.1.3.1.6.	Traffic Circulation	29
4.1.3.1.7.	Architectural Considerations	29
4.1.3.1.8.	Stormwater Management Design Considerations	30
4.1.4.	UV Disinfection Process Goals	30
4.1.4.1.	Design Criteria	31
4.1.4.1.1.	UV Transmittance	32
4.1.4.1.2.	System Redundancy	32
4.1.4.1.3.	UV Dose	32

**FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE
CATSKILL/DELAWARE UV FACILITY**

4.1.4.1.4. UV Evaluation	32
4.1.4.2. Disinfection Process.....	33
4.1.5. Construction Schedule	33
4.1.5.1. Phase I.....	33
4.1.5.2. Phase II.....	34
4.1.5.3. Phase III	35
4.1.5.4. Erosion and Sediment Control Measures.....	35
4.1.5.4.1. Phase I.....	35
4.1.5.4.2. Phase II.....	36
4.1.6. Capital and O&M Costs.....	36
FIGURE 4.1-1. EASTVIEW SITE LOCATION MAP.....	3
FIGURE 4.1-2. EASTVIEW SITE AERIAL VIEW.....	5
FIGURE 4.1-3. SITE TOPOGRAPHY PROPOSED FACILITY AT THE EASTVIEW SITE WITH WETLANDS	6
FIGURE 4.1-4. TOWN OF MOUNT PLEASANT PROPOSED RAW WATER CONNECTION TO PUMPING STATION	16
FIGURE 4.1-5. SEPARATE UV TREATMENT SYSTEM FOR MOUNT PLEASANT AND 20-INCH GRAVITY FEED CONNECTION TO DELAWARE SHAFT NO. 18	22
FIGURE 4.1-6. AERIAL VIEW OF PROPOSED UV FACILITY	23
FIGURE 4.1-7. UV FACILITY GENERAL SITE PLAN	24
TABLE 4.1-1. PROPOSED UV FACILITY STATISTICS.....	25
TABLE 4.1-2. UV FACILITY ESTIMATED ELECTRICAL POWER DEMANDS	27
TABLE 4.1-3. SUMMARY OF DESIGN CRITERIA	31
TABLE 4.1-4. UV FACILITY: ESTIMATED CAPITAL AND OPERATION & MAINTENANCE (O & M) COSTS.....	37

4. ULTRAVIOLET LIGHT DISINFECTION FACILITY

4.1. INTRODUCTION AND PROJECT DESCRIPTION

The New York City Department of Environmental Protection (NYCDEP) is proposing to design, construct, and place into operation by 2009 an Ultraviolet Light Disinfection Facility (UV Facility) for the Catskill and Delaware (Catskill/Delaware) Water Supply System. The proposed project would be constructed on City-owned property (Eastview Site) within the Towns of Mount Pleasant and Greenburgh, in Westchester County, New York (Figure 4.1-1). The property was purchased by the City of New York in the early 1900s and the site was equipped with connections to the Catskill and Delaware Aqueducts in anticipation of the potential future need for water treatment. Additional work related to the project would occur at the Kensico Reservoir and along the Catskill Aqueduct (see Section 5, Off-Site Facilities). The Eastview Site has been chosen for the location of the proposed UV Facility due to the role of the Eastview Site with respect to the long-term goals for the City's water supply.

The proposed project would be in accordance with the terms of the 2002 Filtration Avoidance Determination (FAD) issued by the United States Environmental Protection Agency (USEPA). The Final EIS is being presented in accordance with the construction schedule in place under the FAD. However, NYCDEP is currently in discussion with USEPA to extend the FAD schedule. This extension is being requested to enable NYCDEP to better meet the construction requirements, and NYCDEP's commitment to perform full-scale validation testing of the UV units.

The New York City Water Supply System is comprised of the Catskill, Delaware, and the Croton Systems, which provides approximately 1.4 billion gallons per day (bgd) to approximately eight million New York City residents and approximately one million upstate consumers.¹ The proposed UV Facility would be capable of disinfecting a maximum flow of 2,020 million gallons per day (mgd), with an average flow of 1,310 mgd.

The proposed UV Facility is being introduced to meet the water supply needs of the City of New York (City) and lower Westchester County and to safeguard the City's compliance with state and federal drinking water standards. Currently, the Catskill/Delaware Water Supply System is treated by chlorination, fluoridation, and with the addition of corrosion control chemicals. The introduction of this additional disinfection "barrier" against viruses and protozoa such as *Giardia* and *Cryptosporidium* would significantly enhance the City's water supply protection program.

UV disinfection is a treatment process in which water passes in close proximity to a network of lamps that emit ultraviolet light. The UV lamps that would be put into this facility are similar to the fluorescent lights that may be found in many businesses and households; however, they would not have the fluorescent coating that is applied to fluorescent lights. When passing

¹ Under the Water Supply Act of 1905, which allowed the City of New York to expand its water supply system west of the Hudson River, the City is obligated to supply water to Greene, Delaware, Schoharie, Sullivan, Ulster, Orange, Putnam and Westchester Counties upon request.

through a UV disinfection unit (which house the lamps), the DNA of microorganisms (such as *Giardia* and *Cryptosporidium*) in the water are altered in such a way that the microorganisms are no longer able to replicate and therefore are rendered non-infective. Without the ability to replicate, the organisms are shed from the host's digestive tract without causing illness.

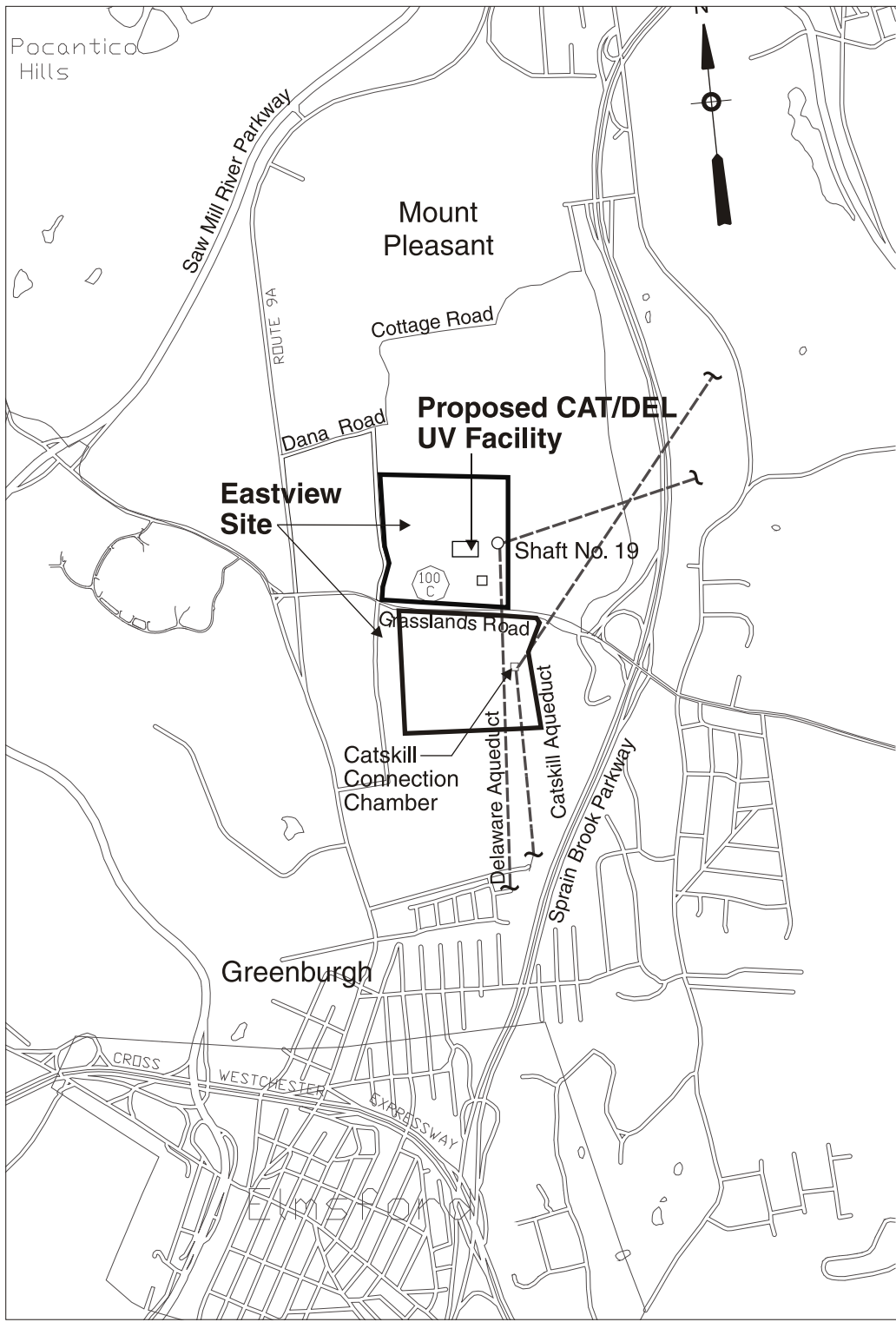
The proposed UV Facility would be subdivided into four equally sized banks or modules. Each module would be equipped with 14 process trains (13 duty and 1 standby) along with the associated electrical panels, UV sleeve cleaning system and appurtenances. A "process train" is a descriptor for the overall equipment and transmission path that water passes through the UV Facility. The primary components of a process train include two isolation valves, a flow control valve, a flow meter, and a UV unit along with the necessary fittings and appurtenances.

Each disinfection unit could contain fourteen rows of twelve lamps, for a total of 168 low-pressure high output (LPHO) lamps to achieve the design dose of 40 millijoules per square centimeter (mJ/cm²). Each of the lamps would be situated within a quartz sleeve that is inserted into the disinfection unit. The quartz sleeve surrounds the lamp to protect the lamps from the water passing through the unit. Following the disinfection process, treated water would be conveyed from the disinfection units into common treated water conveyances and distributed to the treated water conveyance systems.

4.1.1. Site Description

The City-owned Eastview Site contains approximately 149 acres of largely undeveloped land located within central Westchester County, New York. The property is bisected by Grasslands Road (Route 100C), which serves as the border between the Town of Mount Pleasant and the Town of Greenburgh. The north parcel within the Town of Mount Pleasant (north of Route 100C) contains about 83² acres or 56 percent of the total acreage. The south parcel within the Town of Greenburgh (south of Route 100C) contains about 66 acres or 44 percent of the total acreage. An additional eight acres of land sits to the east of the Eastview Site in the Town of Greenburgh and runs along the Catskill Aqueduct corridor. This parcel of land, which contains the Catskill Aqueduct Connection Chamber (CCC) and is under a permanent easement with Consolidated Edison Company of New York (Con Edison), is included as part of this analysis.

² A four-acre easement was provided to Westchester County for the extension of Walker Road along the western boundary of the site; this reduced the acreage from the 87 acres that has been formerly reported in other documents.



Not to Scale

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The north parcel is identified by Town of Mount Pleasant Assessor's Office as Section 116-16, Tax Block 1, Lot 2 and Section 116-20, tax Block 1 Lot 1 and is currently zoned OB-2 (Office/Business). The south parcel is identified by Town of Greenburgh Assessor's Office as Section 20, Tax Block 20,000, Lots 19, 20, and 21 and is currently zoned R-20 (Single Family Residential). Currently, the City-owned property is undeveloped, with the exception of: 1) Delaware Aqueduct Shaft No. 19, situated on the eastern side of the north parcel with an access road off Route 100C; 2) the CCC and the Eastview Overflow, situated on the eastern side of the south parcel with an access road off Route 100C; 3) an electrical substation (owned and maintained by Con Edison), situated on the eastern side of the south parcel with an access road off Route 100C; 4) Con Edison's electrical transmission lines that run alongside the eastern edge of the south parcel; and 6) the historic Hammond House, a private residence situated in the middle of the north parcel along Route 100C. This residence has been on site since 1719; however, the City retains ownership of the land on which the house is situated. NYCDEP may choose in the future to relocate the Hammond House from the Eastview Site to another location as part of the proposed UV Facility project due to security concerns associated with a private residence being located on the same site as critical components of the City's water system. For a more detailed discussion, please see [Section 4.12, Historic and Archaeological Resources](#).

The proposed UV Facility would be located on the north parcel in the Town of Mount Pleasant, in the vicinity of Delaware Aqueduct Shaft No. 19, with water conveyance systems extending into the south parcel in the Town of Greenburgh. A location map is provided in [Figure 4.1-1](#) and an aerial view of the proposed UV Facility is provided in [Figure 4.1-2](#). A description of why this site was chosen for the UV Facility is contained in [Section 1, Introduction and Project Background](#), and [Section 7, Alternatives](#).

4.1.1.1. Topography

The Eastview Site is primarily characterized by successional field and woodland communities, including mature upland woods and successional woods and fields. Mine Brook, a tributary to the Saw Mill River, flows through the central portion of the Eastview Site from north to south, creating various wetland communities ([Figure 4.1-3](#)).

The topography of the Eastview Site consists of varied slopes, low-lying areas adjacent to small streams, and gently sloping uplands. Elevations on the north parcel range from a low of 298 feet above mean sea level (MSL) along the stream corridor, to 334 ft MSL and 364 ft MSL at the western and eastern portions of the north parcel, respectively. The western portion of the north parcel is the most level area, while the eastern portion slopes downward towards Mine Brook. Elevations on the south parcel range from 260 feet MSL near the stream corridor to 372 feet MSL on the eastern border. The elevation range is less on the western side of the stream corridor, rising only 60 feet with a maximum elevation of 320 feet.

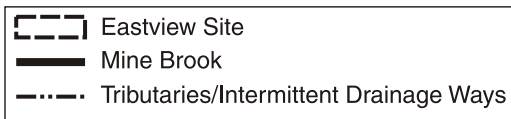
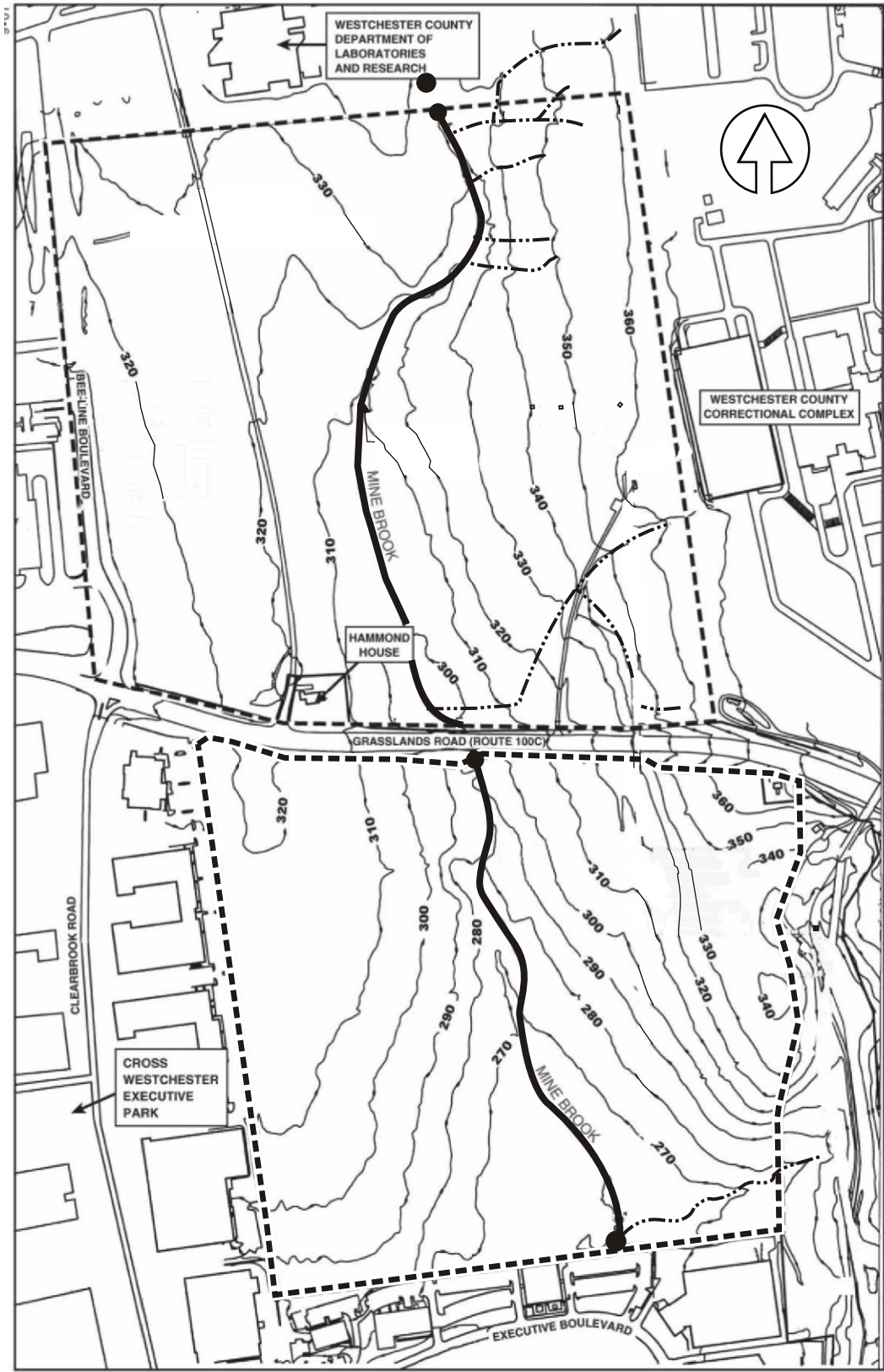


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Aerial View Eastview Site

Catskill/Delaware UV Facility

Figure 4.1-2



Site Topography Eastview Site

Figure 4.1-3

4.1.1.2. Surface Water

Surface water on the property is characterized primarily by the north/south flowing stream, Mine Brook, and numerous smaller intermittent tributaries that contribute flows to Mine Brook. Mine Brook is classified by New York State Department of Environmental Conservation (NYSDEC) as a Class C stream, indicating that the NYSDEC has determined that its best use is for fishing, and other uses except primary contact recreation and shell fishing for market purposes. Wetland areas are located adjacent to Mine Brook and in isolated areas on the property, where the poorly drained soils allow water to collect near the surface.

4.1.1.2.1. Off-Site

Mine Brook enters the property at the northern boundary through four closely spaced culverts and one principal tributary that convey flow from developed land on the Grasslands Reservation, Westchester County's property located north, west, and east of the north parcel.

Surface water that enters the property from the north via the culverts is currently uncontrolled. Westchester County may choose to reduce these flows in the future as part of a stormwater control plan for the Grasslands Reservation.

4.1.1.2.2. On-Site

As Mine Brook flows through the property, it picks up groundwater and surface water from surface flow and intermittent tributaries. During dry flow periods, the average base flow of Mine Brook is approximately 118 gallons per minute (gpm) at the point where it exits the north parcel under Route 100C.

4.1.1.3. General Geology

Two distinct geologic sequences underlie the property: Inwood Marble and the Manhattan Formation. The Manhattan Formation is the more predominant rock formation and consists of metamorphic rock types dominated by garnetiferous quartz-biotite-plagioclase gneiss with abundant sillimanite. These rock types are of Ordovician age and are often found folded with metamorphosed schists that are accentuated by alternating thin layers of light and dark gray. The western portion of the property includes bedrock from the Inwood Marble Formation. The Inwood Marble, of Cambro-Ordovician age, is a medium to coarse-grained marble ranging in composition from calcite to pure dolomite. The property subsurface deposits consist of glacial till. Till is composed of unsorted deposits of debris varying in composition from rocks and boulders to clay-sized particles.

4.1.1.4. Seismicity

The property is located in the general seismic Zone 2A, which implies a maximum horizontal ground acceleration of 0.15g for a 500-year return period earthquake. Design of

foundations for buildings on the property would be made in accordance with the requirements of the New York State Building Code.

4.1.1.5. Subsurface Conditions

The different strata identified through subsurface investigations are described below.

4.1.1.5.1. Fill Material

The soil profile developed by test borings drilled on the property indicates that soil conditions at the Eastview Site are typically characterized by 3 to 8 inches of topsoil, followed by an upper layer of naturally deposited inorganic soil. This layer of soil ranges in classification from a brown to yellow brown, sandy silt to silty sand with various amounts of gravel. The upper layer was found to have densities ranging from loose to dense; however, it was typically found to be medium dense. This layer was found to range in thickness from about 5 feet to 20 feet across the property.

A possible fill or a modified till layer, consisting of dense dark brown to gray-brown silty sand with gravel, approximately 8 to 20 feet thick (approximately between Elevations 360 and 340 MSL) was encountered immediately to the east of Shaft No. 19 as well as west of the existing CCC at approximately ground Elevation 320. The presence of this material is likely related to backfilling around the shafts during construction.

4.1.1.5.2. Glacial Till

With the exception of the area described above, the rest of the property is underlain by a thick layer of glacial till, which can be generally classified as brown to gray fine sand to silty fine sand with occasional cobbles and boulders. Its thickness, starting from ground surface, varies between 18 and 120 feet or approximately between Elevations 340 and 200 MSL. The upper 10 feet of the till deposit are generally loose to medium dense throughout the property overlying medium dense to very dense material.

4.1.1.5.3. Glacial-Fluvial Material

This layer is discontinuous and consists of dense, brown silty fine sand with sub-rounded quartz gravel, or of fine sand with no gravel. This layer occurs at depths varying between 53 and 113 feet or approximately between Elevations 280 and 217 feet MSL, mainly along the eastern portion of the property surrounding Mine Brook.

4.1.1.5.4. Decomposed Rock

In boreholes drilled to bedrock, a relatively thin layer (6 to 18 feet) of totally decomposed rock was encountered overlying the bedrock. This material is a very dense silty sand soil and is anticipated to be continuous throughout the property between Elevations 200 and 330 MSL.

4.1.1.5.5. *Bedrock*

The bedrock consists of subcropping schist (Manhattan Formation) below most of the Eastview Site, as well as limestone (Inwood Formation) on the western portion of the property. Gneiss or schist belonging to the Manhattan Formation was encountered at depths ranging from 34 feet (northern portion of the north parcel) to 135 feet (western portion of the north parcel) or approximately between Elevations 327 and 185 feet MSL. The bedrock is generally moderately weathered in the top 10 feet. The bedrock encountered in the vicinity of Shaft No. 19 appears to be a local rise in the bedrock surface, which is generally at a depth greater than 80 feet. At least one bedrock fracture zone was identified during drilling of the shafts and tunnels for the Catskill and Delaware Aqueducts. These fracture zones were thought to coincide with fractures, but were found to be related somewhat to contacts between formations as well. One such fracture zone was found about 2,000 feet to the south of Shaft No. 19, within the south parcel of the Eastview Site.

Based on a seismic refraction study conducted by NYCDEP, the depth to the bedrock based on the standard penetration resistance and grain size distribution of the subgrade soils, neither fill material nor natural soils are considered susceptible to liquefaction during a seismic event.

4.1.1.5.6. *Groundwater*

The direction of groundwater flow below the property and surrounding area is from east to west toward the Saw Mill River. The highest groundwater elevation (354 feet, referred to the MSL at Sandy Hook, New Jersey) occurs near Shaft No. 19. The lowest groundwater elevation (305 feet MSL) occurs on the western edge of the north parcel.

Groundwater in the overburden west of Mine Brook consists of direct infiltration of precipitation and infiltration of surface water from Mine Brook. Mine Brook is in turn recharged by groundwater and precipitation infiltration from the east. Groundwater levels at the property generally range from 0.5 to more than 40 feet below existing grade, with most of the levels at an average depth of 10 feet.

4.1.2. *Ultraviolet Light Disinfection Facility*

The proposed project includes the construction of a UV Facility for treatment of the Catskill and Delaware Water Supplies; an electrical substation and emergency generator building for supplying power and emergency standby power to the UV Facility; various raw and treated water piping, valves and appurtenances; and forebay structures to connect the raw and treated water piping to the existing Catskill and Delaware aqueducts. The UV Facility equipment would be housed within a main UV Building. This building would also contain an administrative area, operations control room, laboratory facilities, heating ventilation and air conditioning (HVAC) equipment, electrical equipment, a maintenance area, and chemical storage tanks (for storage of UV cleaning acid solution).

The proposed UV Facility is being designed to minimize space requirements. This design practice involves using appropriate loading rates and common wall construction. Since the

proposed UV Facility would contain both below-grade and water-containing structures, the main structural system would be constructed of cast-in-place reinforced concrete. Cast-in-place concrete provides the durability, water-tightness, and structural integrity needed for large underground water-containing structures. All structural components would be designed in accordance with state and local codes to accommodate normal and seismic forces. The design would incorporate levels of redundancy, at a minimum, to satisfy the requirements of *Recommended Standards for Water Works*, also referred to as the *Ten State Standards*. Although these design levels of redundancy are not considered mandatory, they would be used in the process design and by the New York State Department of Health (NYSDOH) as a guideline for approval of the proposed facility. Therefore, the proposed action would incorporate an “n+1”³ redundancy for the critical equipment within each treatment module.

4.1.2.1. Raw Water Supply

4.1.2.1.1. Catskill Water Supply System

The Catskill System is located approximately 100 to 125 miles north of lower Manhattan. With a total storage capacity of 178 billion gallons and a safe yield of 470 mgd, the Catskill System accommodates approximately 35 percent of the City’s average daily demand for drinking water. See [Section 1, Introduction and Project Background](#), for further details on the Catskill Water Supply System.

4.1.2.1.2. Delaware Water Supply System

Planned in the 1920s and constructed between 1936 and 1964, the Delaware System extends between 85 and 125 miles northwest of lower Manhattan. The 1,010 square mile Delaware watershed is located west of the Catskill watershed. With a total storage capacity of 326 billion gallons and a safe yield of about 580 mgd, the Delaware System accommodates approximately 55 percent of the City’s average day demand for drinking water. See [Section 1, Introduction and Project Background](#), for further details on the Delaware Water Supply System.

4.1.2.1.3. Catskill/Delaware System

The Kensico and Hillview Reservoirs, the sections of the Catskill and Delaware Aqueducts between the two Reservoirs, and the three water tunnels that extend from the Hillview Reservoir into the City of New York are generally referred to as the “Catskill/Delaware System.” Although the Kensico and Hillview Reservoirs were constructed as part of the Catskill System, they also serve as balancing and distribution reservoirs, respectively, for the Delaware System. Water from both the Catskill and Delaware Aqueducts is normally discharged into the Kensico Reservoir before being conveyed through the Delaware and Catskill Aqueducts to the Hillview Reservoir.

Currently, after passing through the Kensico Reservoir, water reenters the Aqueducts at the southern end of the reservoir; at this location, chlorine and fluoride are added for primary

³ n+1 means that a process or piece of equipment has one full standby or backup unit so that it can be taken out of service for maintenance and a backup can take over the process.

disinfection and dental hygiene. Adding chlorine at this location ensures that adequate disinfection contact time (CT) is provided prior to reaching Hillview Reservoir.

Aluminum sulfate (alum) facilities on the Catskill and Delaware water supplies are used to reduce turbidity spikes in the water. These facilities are located prior to the Aqueducts' discharge into Kensico Reservoir. These facilities are used intermittently.

Additional chlorine, as well as sodium hydroxide and phosphoric acid are added at Hillview Reservoir. Sodium hydroxide and phosphoric acid are added to the water supply for pH adjustment and corrosion control, while chlorine is added for disinfection within the distribution piping.

4.1.2.2. Raw Water Conveyances

This section discusses the raw water conveyance and necessary modifications to existing facilities. Similar to current practices, raw water would be conveyed from the Kensico Reservoir, in the Town of Mount Pleasant, New York, through the Delaware and Catskill Aqueducts to the Eastview Site. At the Eastview Site, modifications to the existing connection chambers would be necessary to permit raw water from the aqueducts to flow to the proposed UV Facility.

The proposed UV Facility would provide treatment for the City and Westchester County Maximum Day demands for a total of 2,020 mgd initially and up to 2,400 mgd in the future. This potential increase in capacity would be required if the City were to decide to build the Kensico-City Tunnel, which could have a capacity of up to 2,400 mgd. The proposed UV Facility, as currently designed, would have an average flow of 1,310 mgd to meet the average day demands.

Although the City is currently planning for the construction and operation of the Croton Water Treatment Plant (Croton project), the 290 mgd plant would not contain emergency back-up power sufficient to continue full operation of the Croton plant in the event of electrical power failure. For this reason the capacity of the proposed UV Facility has been established to meet the maximum day demands.

4.1.2.2.1. Delaware Aqueduct

Currently, water from the Delaware Aqueduct can either be routed through or around Kensico Reservoir through Delaware Shaft No. 18. Under the proposed project, operation of the Delaware Aqueduct either through or around the Kensico Reservoir would remain unchanged. Water exiting Delaware Shaft No. 18 continues down the Delaware Aqueduct to the Hillview Reservoir in the City of Yonkers. Delaware Shaft No. 19 is located on the Eastview Site. Water from the Delaware Aqueduct would be conveyed to the proposed UV Facility through a connection from Delaware Shaft No. 19.

The Shaft No. 19 facility is a diversion structure housing two shafts along the Delaware Aqueduct, an Uptake shaft and Downtake shaft. The Uptake shaft conveys water from the

aqueduct to the surface and the Downtake shaft carries water back to the aqueduct. Atop the two shafts is a diversion structure. Currently, water flows directly from the Uptake shaft to the Downtake shaft. The structure was designed to deliver water to a future water treatment plant at Eastview. In order to be used with a treatment plant, the direct connection between the Uptake and Downtake shafts would be sealed and the Aqueduct water arriving at the Uptake would be directed through currently bulkheaded openings to a treatment plant. Treated water would then be directed back to the Aqueduct via the Downtake through another set of currently bulkheaded openings.

As part of the proposed project, an inlet structure (the North Forebay) would be constructed to the UV Facility. The North Forebay would be connected to the Aqueducts supplying water to be treated by the UV Facility. The Delaware Aqueduct would be connected to the North Forebay through the existing provisions within the Delaware Shaft No. 19 diversion structure. Water entering the North Forebay would be directed to the UV Facility through underground conduits.

4.1.2.2.2. Catskill Aqueduct

Under normal conditions, water from the Catskill System enters the Kensico Reservoir through the Catskill Influent Chamber. Water is withdrawn from the reservoir through the Catskill Upper Effluent Chamber. Between Kensico Reservoir and the Eastview Site, water flows through the Catskill Aqueduct via gravity, and as currently exists would not be able to convey water to the proposed UV Facility because it enters the Eastview Site at too low of a hydraulic elevation. At present, the Catskill Aqueduct is typically operated at approximately 600 mgd, while its maximum design capacity is approximately 800 mgd; however, current estimates of its actual design capacity vary between 700 and 750 mgd. As part of the proposed project, the Catskill Aqueduct would be pressurized between the Kensico Reservoir and the Eastview Site to allow the hydraulic elevation to be increased such that supply to the UV Facility would be possible without the need to construct a pumping station for this supply. This pressurization work would also enable the aqueduct to achieve a capacity of 800 mgd, or greater.

Two alternative means are currently being contemplated for delivering Catskill Aqueduct water to the proposed UV Facility. These alternative means include: (1) a new, pressurized CCC on the Catskill Aqueduct just north of the existing CCC, with two 12-foot diameter conduits routed along the east property line to the North Forebay, or (2) a pressure tunnel to the North Forebay from the Catskill Aqueduct, with an aqueduct connection in the vicinity of the Sprain Brook Parkway east of the Eastview Site.

During the Catskill Aqueduct Pressurization, the Catskill Aqueduct would need to be refurbished and along certain segments reconstructed. To accomplish this, a series of seasonal shutdowns (September to May) of the Aqueduct are planned. To allow for prolonged shutdowns (i.e., dewatering) of the Catskill Aqueduct, NYCDEP would provide one of two options for users between Kensico Reservoir and the Eastview Site: (1) a water connection from the Eastview Site to the existing Mount Pleasant Commerce Street Pumping Station located in the Town of Mount Pleasant; or (2) a gravity feed connection from the Delaware Shaft No. 18 Flow Control Structure to the Town's existing Commerce Street Pumping Station. NYCDEP would also

provide temporary water to users of the Catskill Aqueduct water supply south of the rehabilitation work (between the Eastview Site and Hillview Reservoir).

Catskill Aqueduct Users between the Kensico Reservoir and the Eastview Site.

The NYCDEP committed to UV disinfection in the Filtration Avoidance Determination and prefers siting the facility at the Eastview Site in order to optimize the system's hydrology. The result of NYCDEP's decision to site the UV Facility at the Eastview Site and the Catskill Aqueduct pressurization work would require periodic shutdowns of the Catskill Aqueduct. These periodic shutdowns would interrupt the water supply to the Town of Mount Pleasant. Unlike the short-term shutdowns of 24 – 36 hours that were implemented earlier this year to facilitate inspection of the Aqueduct, the proposed shutdowns would need to be substantially longer to support demolition and construction activities within the Aqueduct and its ancillary facilities. Since the Catskill Aqueduct is currently the sole source for water within the Town of Mount Pleasant and the existing water supply infrastructure within the Town can only accommodate 1 to 2 day disruptions in service, it would be impractical to attempt the necessary Aqueduct modifications in the absence of an alternate water source or delivery conduit for the Town. Therefore, NYCDEP would provide a water source for the Town in order to facilitate the proposed Catskill Aqueduct Pressurization work and enable NYCDEP to shut down the Aqueduct for extended periods of time. The Town of Mount Pleasant currently has available two connections to the City's Catskill Aqueduct: 1) near the Catskill Venturi Meter off of Columbus Avenue (Valhalla Pumping Station), and 2) a tap on the Kensico Siphon (Hawthorne Pumping Station) adjacent to the Taconic State Parkway. The Town is currently in the process of commissioning its new Commerce Street Pumping Station, which will replace both the existing Valhalla and Hawthorne Pumping Stations. The Commerce Street Pumping Station is supplied by a tap on the Kensico Siphon of the Catskill Aqueduct. As described above, during the refurbishment/reconstruction of the Catskill Aqueduct, the Aqueduct would be shut down and dewatered, so these connections would not be available. Therefore, two options are being considered for providing Delaware Aqueduct water to the Town during extended shutdowns of the Catskill Aqueduct required for the pressurization work.

The first option is a 30-inch diameter gravity feed connection that could be installed from the Delaware Shaft No. 18 Flow Control Structure to the existing Commerce Street Pumping Station (Figure 4.1-4). The gravity feed connection from the Delaware Shaft No. 18 Flow Control Structure would be routed from the Kensico Reservoir campus heading west along Lakeview Avenue and Wall Street before intersecting Commerce Street. This route consists of public roads and a Mount Pleasant Right-of-Way, which is adjacent to an industrial park (Farrand Controls Division, Ruhle Companies, Inc.) prior to intersecting Commerce Street. Construction would commence in late 2006. See [Section 5.1, Kensico Reservoir Work Sites](#), for further discussion of this option. The second possible option could include the construction of a temporary booster pumping station at the Eastview Site and installation of a 24-inch diameter force main to convey water from a temporary bypass pumping station on Delaware Shaft No. 19 to a connection at Mount Pleasant's Commerce Street Pumping Station. See [Section 7, Alternatives](#), for further discussion of this option. Westchester County Water District No. 3 would continue receiving water from its connections to the Towns of Mount Pleasant and Greenburgh.

The pumped supply from the Delaware Shaft No. 19 could be routed from the Eastview Site to Commerce Street following one of two routes:

- One route alternative would exit the Eastview Site to the east along Grasslands Road (Route 100C), and follow Route 100C east to Woods Road (Penitentiary Road), west of the Sprain Brook Parkway. The piping would continue north along Woods Road onto Westchester County property; then east through the County property; then east across the Sprain Brook Parkway; then east through County property to Route 100; then north along Route 100 to Lakeview Avenue (Old Tarrytown Road). The piping would continue down Lakeview Avenue; north on Commerce Street; under Davis Brook (Davis Brook is currently piped in this location); continue east along Commerce Street; east under the Metro North Railroad tracks and the Taconic State Parkway; and connect to the Commerce Street Pumping Station.
- The other route alternative would follow the same path as the first alternative up to the intersection with Route 100. At this point, the paths deviate. The piping would continue north along Route 100 to the Catskill Aqueduct Easement into the Gate of Heaven Cemetery to the east; then east within the City property through Gate of Heaven Cemetery; under Davis Brook (Davis Brook is currently piped in this location); east under the Metro North Railroad tracks; east under the Taconic State Parkway; and connect to the Commerce Street Pumping Station.

The installation of a water main to Mount Pleasant's Commerce Street Pumping Station would be similar to a typical utility installation, and would cover approximately 100 linear feet per day.

Catskill Aqueduct Users Between the Eastview Site and the Hillview Reservoir.

Two options are being considered for providing temporary water to affected consumers of the Catskill Aqueduct water supply during extended shutdowns to be conducted during the pressurization work. These options include:

- Option 1 – At the Eastview Site, establish a temporary pumping station at Delaware Shaft No. 19; install a bypass water main under 100C to the Catskill Aqueduct downstream of the CCC, and an emergency generator; or
- Option 2 – Backfeed water by gravity from the Hillview Reservoir. Possibly install a temporary pumping station at the Hillview Reservoir if required for the affected users.

Work required to complete Option 1 would occur at the Eastview Site. Option 2 would involve work at the Hillview Reservoir.

Option 1 - Temporary Pumping Station/Bypass Main.

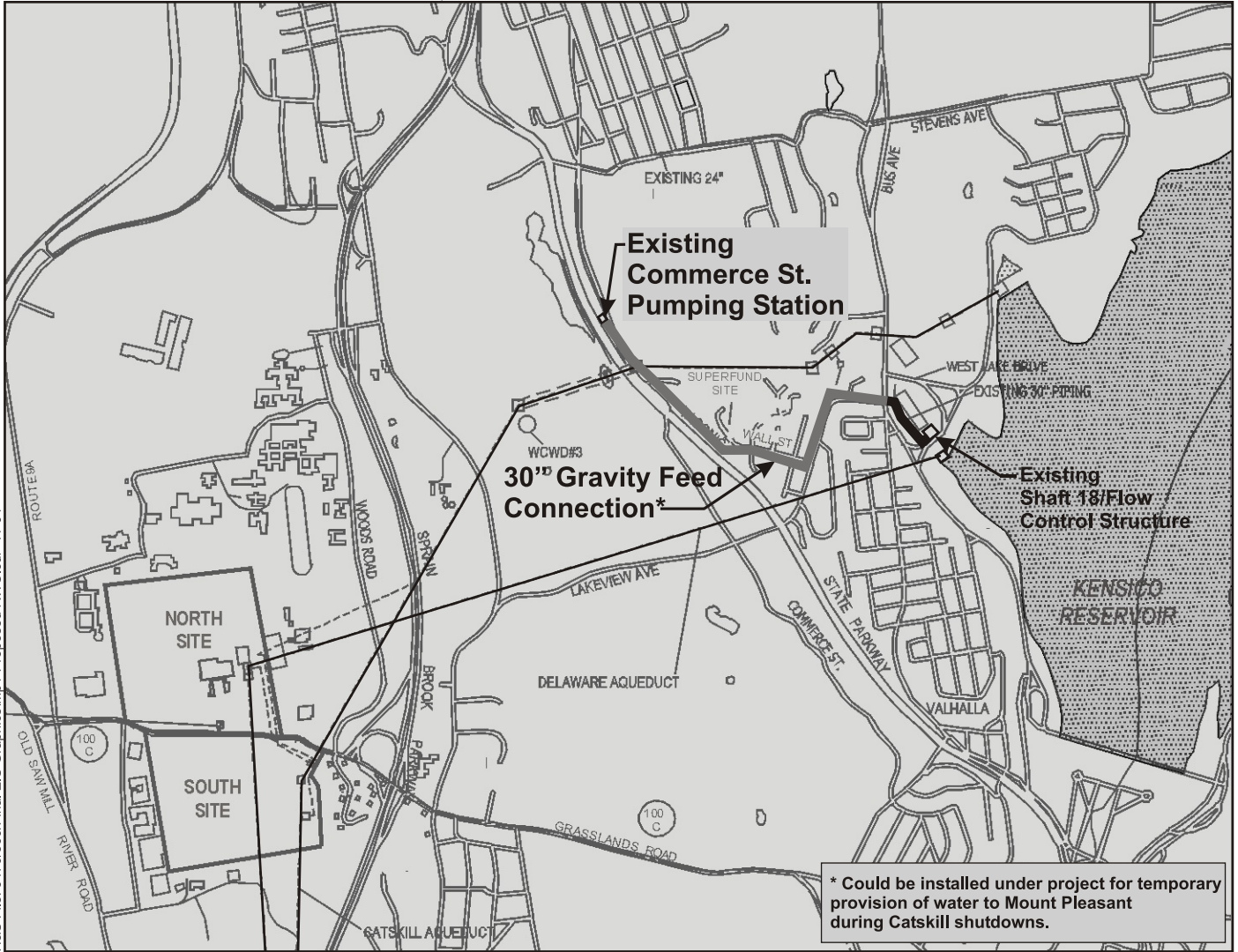
A temporary Delaware Shaft No. 19 Pumping Station would be established at the Eastview Site to convey Delaware Aqueduct water to the Catskill Aqueduct downstream of the existing CCC. The estimated capacity of the station would be 50 mgd, based upon historic demand data. Three pumps (2 duty, 1 standby) would be located on existing Shaft No. 19. The pumps and valves would be enclosed in a temporary housing. Roof openings could be provided in the structure to allow for pump access by mobile crane.

Electrical Power. Electrical power would be supplied to the site from two 4160-volt feeds (double-ended), installed in a concrete encased ductbank.

Emergency Generator. An emergency diesel generator would be located to the north of Shaft No. 19, in the vicinity of the proposed UV Facility construction trailer offices. The estimated capacity of the emergency diesel generator would be about 1,500 kW.

Catskill Bypass Pipeline. A 42-inch diameter bypass main would be constructed to convey water from Shaft No. 19 to the Catskill Aqueduct. The design capacity of the bypass main would be 50 mgd. Approximately 2,800 linear feet of main would be required for the bypass. The bypass main would run south along the east property line, passing under Route 100C. Upon crossing Route 100C, the transmission line would be routed further to the east, across the Catskill Aqueduct and would continue south along the east side of the Catskill Aqueduct. The “tap” or aqueduct connection would be located downstream of the CCC. The 42-inch bypass main would be installed using traditional open cut soil/rock excavation, with exception of the section required to traverse Route 100C. This segment would be jacked/bored in order to minimize traffic impacts.

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Town of Mount Pleasant Proposed Raw Water Connection to Pumping Station

Catskill/Delaware UV Facility

Figure 4.1-4

Option 2 - Backfeed Alternative at Hillview Reservoir.

Under this option, Delaware Aqueduct water could be supplied to Uptake Chamber #1, located at the Hillview Reservoir, during Catskill Aqueduct shutdowns and allowed to backfeed into the Catskill Aqueduct to supply affected users. Water would flow up the Catskill Aqueduct without pumping if the water level within Hillview Reservoir is maintained above a minimum water level; otherwise pumping could be required. The City of Yonkers and Mt. Vernon draw water directly from the forebay of Uptake Chamber #1.

If required to maintain a minimum water level in Uptake #1, temporary pumping equipment could be installed to feed water into Uptake #1. Due to limited space inside the Uptake Chamber, the pumps would likely be installed in the reservoir, adjacent to Uptake Chamber #1. The discharge from the pumps would either penetrate the exterior wall of existing Uptake #1 superstructure or, if possible, a sub-aqueous discharge could be provided through the existing waterways on the east or west side of the Uptake #1 Chamber.

Three submersible pumps would lift water from the Reservoir and discharge into the uptake shaft. Pumping would only be required when the water elevation in the shaft was less than a minimum level required to feed affected users. Power for the pumps would be supplied by existing infrastructure. Since the normal operating range for the Hillview Reservoir satisfies the minimum required water level for users operating on backfeed from Hillview Reservoir, pumping would only be required on an as-needed basis.

A new emergency generator would be located in the vicinity of the Uptake #1 Chamber on the north end of the Hillview Reservoir to power the pumps in the event of a power failure.

Construction of either of these water supply options would commence in late 2006.

Coordination of the Shutdowns of the Catskill and New Croton Aqueducts. The Catskill Aqueduct shutdown periods are anticipated to occur during three of the four available shutdown seasons (from September through May) from 2007 to 2011. In addition, if the Croton project were located on the Eastview Site, it would require shutdowns of the New Croton Aqueduct (NCA). NYCDEP policy is to coordinate the shutdowns of the Catskill and NCA so that they do not occur at the same time.

While the use of the NCA is necessary for any of the three sites being considered for the Croton project, the work required and ultimate use of each segment of the NCA and associated facilities varies according to the site selection for the Croton project. The work on the NCA involves two major components; general repairs to the NCA and the connection of the NCA to the Croton project. NYCDEP currently anticipates that the majority of the NCA baseline rehabilitation work would be performed over the three available shutdown seasons between October 2004 and April 2007 (2004 to 2005, 2005 to 2006, and 2006 to 2007). For the Croton project at the Eastview Site, the 2008 to 2009 shutdown season would be used for connecting the Croton project to the NCA. For the Croton project located at Mosholu, the 2009 to 2010 shutdown

season would be used for the needed connections between the NCA and the Croton project. The final work to complete the NCA rehabilitation would be performed during the same shutdown season that is needed for the Croton project connections to the NCA, if necessary. If this additional rehabilitation work is needed and cannot be completed during this season, this work would take place after the Croton project is placed on-line. If the Croton project is located at the Eastview Site and the NCA is chosen as the means to convey treated water, the NCA south of the Croton project would have to be pressurized. This pressurization work would take place from 2011 to 2015, after the Croton project is placed in service.

During these shutdowns, NYCDEP would work with the upstate suppliers to meet their water supply needs. Many of these suppliers currently have alternative connections to the City's supply that would be used during certain periods during these shutdowns. The NYCDEP has already initiated coordination with the towns and water utilities served by the NCA and the Catskill Aqueduct to plan for the upcoming out of service periods of each aqueduct for inspection and rehabilitation. Based on this coordination, the City and upstate suppliers would continue to receive water during construction of the Croton project and the proposed UV Facility.

4.1.2.2.3. Emergency Raw Water Bypass

In the event that operations at the proposed UV Facility would have to be shut down, service were to be severely disrupted for an extended period of time, or the facilities were unable to provide adequate treatment capacity, the ability to bypass the proposed UV Facility would be required to ensure supply of water to the City and Westchester County customers via the Delaware and Catskill Aqueducts. Therefore, an emergency raw water bypass would be constructed to allow for the delivery of Catskill and Delaware Aqueduct water to the City and Westchester County customers.

When the proposed UV Facility is in operation, the bypass structure would be closed to isolate the raw water supply from the treated water supply. The NYSDOH requires that an air gap must be provided to protect the treated water supply from cross contamination with the raw water supply. An air gap is a physical separation of the two supplies, eliminating the potential for equipment failure and/or leakage.

Delaware Aqueduct Emergency Raw Water Bypass.

Under the proposed project, an emergency raw water bypass would be constructed to ensure that an air gap is provided during operation of the proposed UV Facility. Sluice gates would be installed in the five existing interconnecting waterways that connect the Uptake and Downtake shafts within Shaft No. 19. The sluice gates would provide isolation between the raw and treated water supplies. In addition to the sluice gates, each waterway would be equipped with a sump and a pumped drain line to ensure that any incidental leakage of raw water past the sluice gates that occurs would be conveyed away from the treated water. In the event of an emergency, the drain would be isolated and the sluice gates would be opened to allow raw water to enter the Downtake shaft where it would be conveyed to the City.

Catskill Aqueduct Emergency Raw Water Bypass.

Under the proposed project, an emergency raw water bypass would be constructed to bridge the air gap between the pressurized (raw) and gravity (treated) water conduits, which would be maintained during operation of the proposed UV Facility. An air gap would be provided between the pressurized and gravity segments of the Catskill Aqueduct. This provision would include either isolation valves or isolation gates that could be opened during an emergency to convey water to the City.

4.1.2.3. Emergency Overflow

In addition to the facility foundation drain, an emergency overflow would be present at the UV Facility to provide a means of alleviating flood conditions that could result from catastrophic failure of process piping or UV equipment inside the building. While the potential for an overflow condition at the proposed UV Facility is considered extremely remote, provision to reduce flooding within the proposed facility would be included as a safety measure for employees working at the facility and as a preventative measure to reduce potential damage to UV equipment. This emergency overflow from the UV Facility would be discharged to Mine Brook just upstream of Route 100C on the Eastview Site. In an emergency scenario due to the catastrophic failure of a process train, a total volume of approximately 1.5 acre-ft with a maximum flow rate of 50,000 gpm (112 cfs) could occur. This instantaneous discharge would equate to a peak flow rate generated at the culvert crossing on Route 100C from a 1 to 2 year storm. The total volume discharged (1.5 acre-ft) is 15 percent of the runoff generated at the culvert crossing on Route 100C from a 3-month storm. These peak flows and volumes, which could be discharged in an emergency condition, would not have a significant impact on the existing stream corridor of Mine Brook.

4.1.2.4. Treated Water Conveyances

4.1.2.4.1. Delaware Aqueduct

As mentioned above, the Delaware Shaft No. 19 facility houses a Downtake shaft which carries water back to the aqueduct. Connections are provided on the south side of the Downtake shaft to allow treated water to be returned to the shaft.

A new South Forebay would provide a means of transferring treated water from the UV Facility back into the Delaware Aqueduct via the Delaware Shaft No. 19 Downtake. The structure would be located on the south face of the existing Delaware Shaft No. 19 structure. Bulkheads inside the south connecting waterways would be removed upon construction of the South Forebay structure and would hydraulically couple the two structures. The South Forebay would include four inlet waterways or pipes equipped with isolation gates that would allow treated water to flow into a bay area. Upon leaving the bay, treated water would spill over a control weir and enter the five south connecting waterways to the Delaware Shaft No. 19 Downtake. Treated water would then re-enter the Delaware Aqueduct.

4.1.2.4.2. Catskill Aqueduct

Treated water would be returned to the Catskill Aqueduct through a new treated water pipeline to the existing CCC. A small surface access structure may be associated with the existing CCC. The treated water pipeline is a deep (30 to 40 foot depth) trench installation, approximately 1,900 feet long that would require excavation. The excavation for the treated water pipeline would be open cut and would be located east of Mine Brook. Treated water piping would approach the existing CCC from the west. The estimated disturbed area for this alternative is 3.5 acres. The treated water pipeline would run from the UV Facility under Route 100C, and then to the existing CCC. The existing CCC would be modified to accept this connection. The Chamber would still be a relatively simple below-grade structure, containing a control weir. Modification of the existing CCC would require some demolition work of the aqueduct at the connection site, to allow water to enter the aqueduct at reasonable velocities.

4.1.2.4.3. Treated Water for the Town of Mount Pleasant.

When the proposed UV Facility is placed into operation, the Town of Mount Pleasant would be provided access to UV treated water either through the NYCDEP UV Facility or through a UV building at Mount Pleasant's Stevens Avenue Storage Tanks provided by the NYCDEP. Although NYCDEP does not have an obligation to provide alternative water supply connections, NYCDEP is committing to providing the Town of Mount Pleasant with facilities for UV treated water to ameliorate the consequences of electing to site the UV Facility at the Eastview Site. The siting of the UV Facility at the Eastview Site would potentially impact the community with several lengthy construction projects (e.g., the Catskill Aqueduct Pressurization, the Kensico Dam Reconstruction, and the UV Facility construction), which would result in inconvenience from traffic congestion and other potentially adverse impacts from major construction activities. Two options are being considered for providing a permanent UV treated water supply to the Town.

One option is to construct a separate UV Facility in the Town of Mount Pleasant at the existing Stevens Avenue Storage Tanks, which are supplied from the existing Commerce Street Pumping Station. The UV units would be installed within a new stand-alone building located on Town property, to the southeast of the existing water storage tanks (Figure 4.1-5). The footprint of the Mount Pleasant UV building would be approximately 30 feet by 40 feet. The building would be located on a cleared area that is part of the Town's property. The Town would have the ability to draw from either the Catskill or Delaware Aqueducts through the existing Commerce Street Pumping Station from either: the Delaware Aqueduct via a 30-inch gravity feed connection from Shaft No. 18 installed for supplying Delaware Aqueduct water during extended shutdowns of the Catskill Aqueduct for pressurization work, or from the Town's existing connection to the Kensico Siphon of the Catskill Aqueduct. For further details regarding this option, see [Section 5.1, Kensico Reservoir Work Sites](#).

A second option is to construct a permanent pumping station, located at the Eastview Site, which would convey water from the proposed UV Facility to a connection at Mount Pleasant's Commerce Street Pumping Station (see [Section 4.16, Infrastructure and Energy](#), and [Section 7,](#)

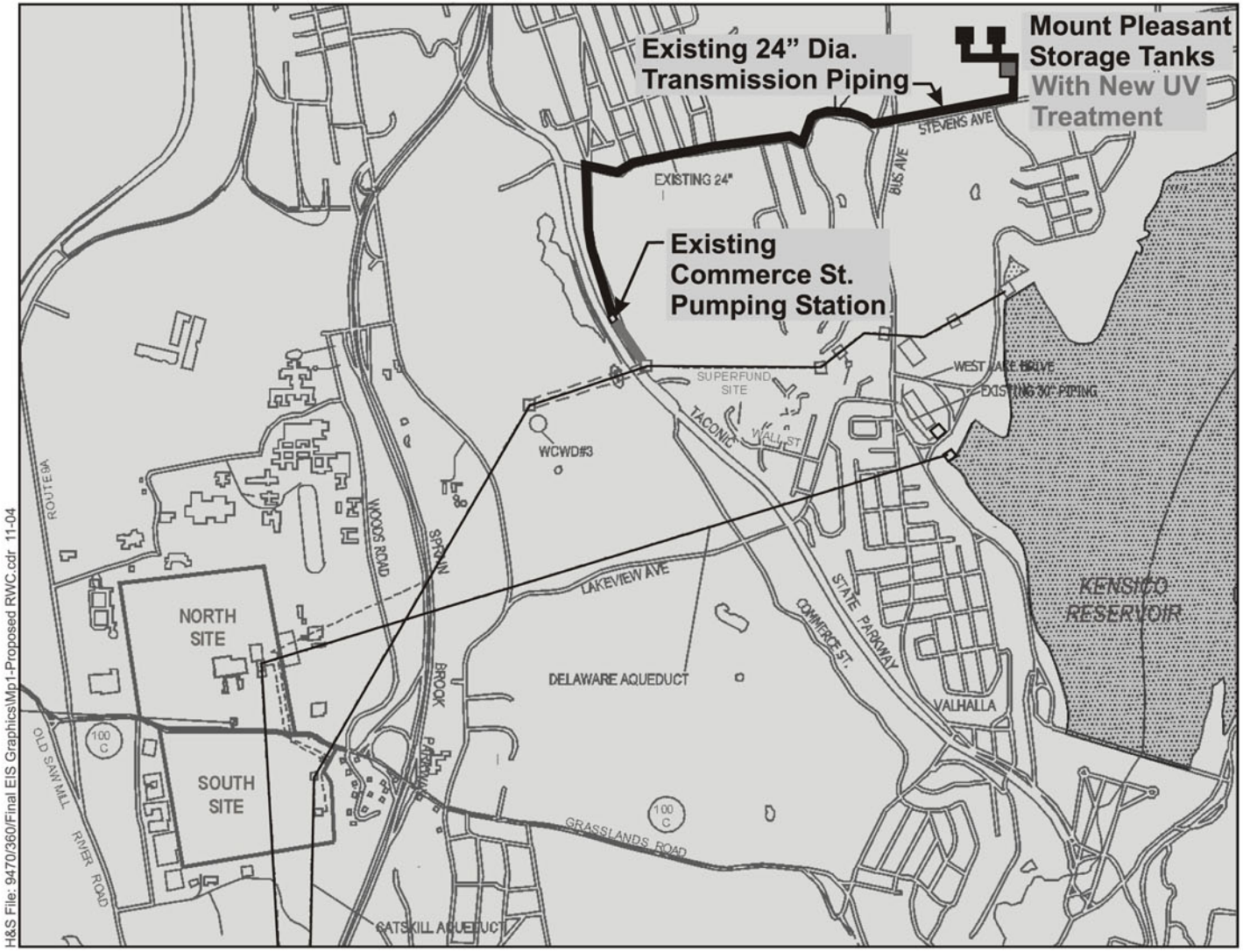
Alternatives, for further discussion of these options). This permanent pumping station would be constructed on the edge of the NYCDEP's property (southern edge of the north parcel, east of Mine Brook) to allow easy access by the Town from Route 100C to enable this flow to enter the Town's distribution system. This permanent pumping station would be located on land already disturbed as part of the proposed UV Facility project, allowing easy access by the Town from Route 100C to enable this flow to enter the Town's distribution system. Therefore, no additional impacts are anticipated with the construction of this permanent pumping station.

4.1.2.4.4. Eastview Overflow

As part of the proposed project, the Eastview Overflow structure on the Catskill Aqueduct would be inspected to ascertain its condition. The Eastview Overflow is located downstream of the CCC; the function of the overflow is to preserve open channel flow conditions in the Catskill Aqueduct and prevent pressurization of the downstream segment of the Aqueduct between the Eastview Site and Hillview Reservoir. The function of the overflow structure would remain unchanged after construction of the UV Facility. The overflow would continue to protect the Catskill Aqueduct from surcharging, should the flow directed to it exceed its carrying capacity south of Eastview. Work at the overflow could include patching deteriorated concrete; replacing old manhole covers and hatches; and clearing any vegetation that has grown within the concrete portion of the overflow spillway channel.

4.1.3. Project Site Overview

The proposed UV Facility would include a main disinfection building; water conveyance systems (for both the Catskill and Delaware supplies); two forebay structures to house the conveyance systems from and to the Delaware Aqueduct; a connection chamber to convey treated water into the Catskill Aqueduct, a guard house, an electrical generator building, and a possible pumping station. The disinfection units would be housed within a main disinfection building that would be accompanied by administrative offices, lamp storage, a process laboratory, security and maintenance, and the HVAC system. [Figure 4.1-6](#) presents an aerial view of the proposed UV Facility, and [Figure 4.1-7](#) presents a general site plan. A summary of the proposed UV Facility is presented in [Table 4.1-1](#) below.



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Separate UV Treatment System for Mount Pleasant

Catskill/Delaware UV Facility

Figure 4.1-5

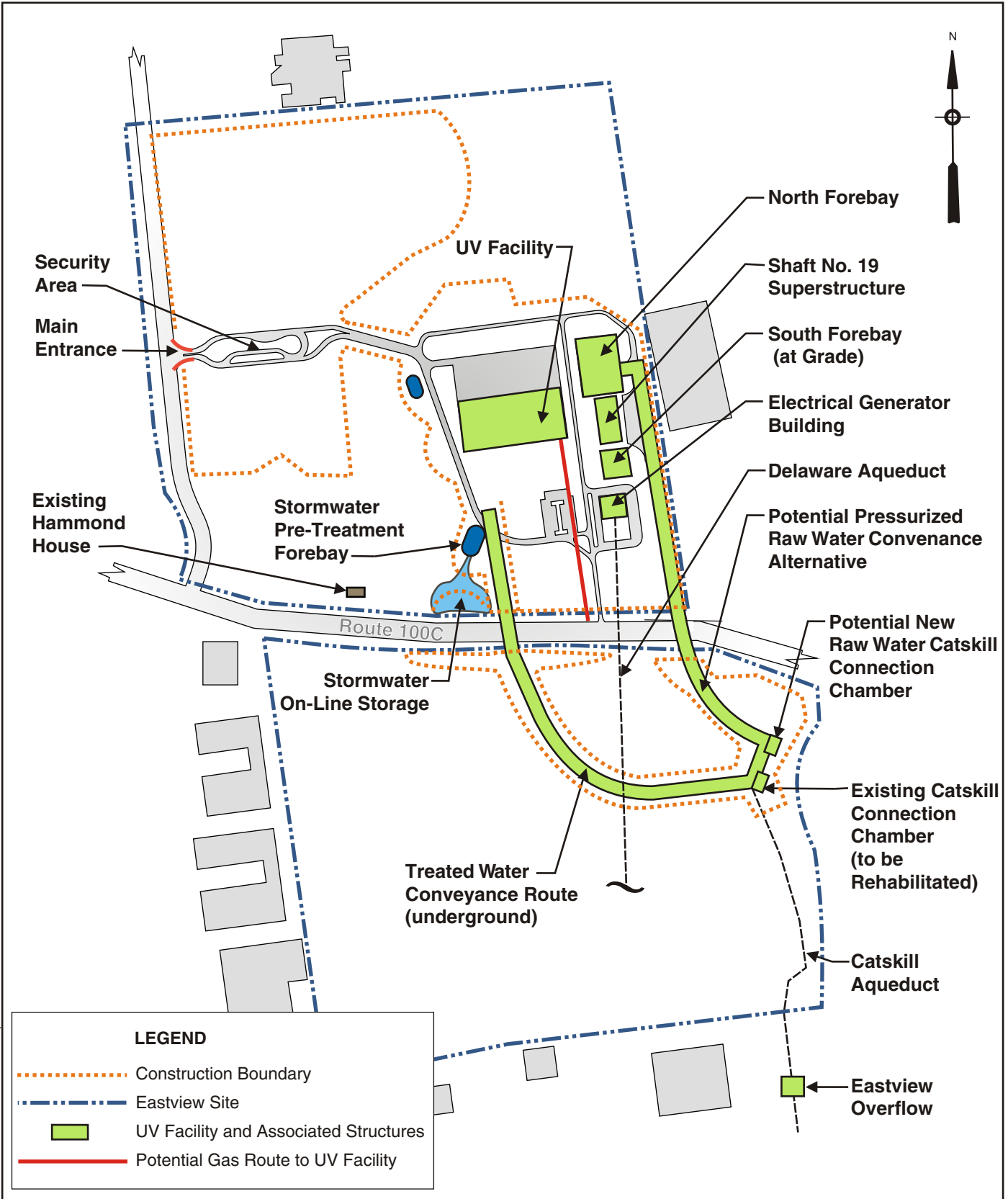


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Aerial View of Proposed UV Facility

Catskill/Delaware UV Facility

Figure 4.1-6



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NOT TO SCALE

UV Facility General Site Plan

Catskill/Delaware UV Facility

Figure 4.1-7

TABLE 4.1-1. PROPOSED UV FACILITY STATISTICS

Approximate Eastview Site Acreage	149 acres
In the Town of Mount Pleasant	83 acres
In the Town of Greenburgh	66 acres
Approximate existing grade	EL 346 MSL (Average)
Main UV Disinfection Facility:	
Approximate dimensions	410 ft. X 200 ft.
Maximum Height above final grade	35 ft. (avg.)
Approximate footprint area	82,000 sq. ft.
Forebay Structures:	
Approximate dimensions:	
North Forebay (raw water)	210 ft. x 147 ft.
Approximate footprint area	30,870 sq. ft.
South Forebay (treated water)	80 ft. x 93 ft.
Approximate footprint area	7,440 sq. ft.
Delaware Shaft No. 19	147 ft. x 91 ft.
Approximate footprint area	13,377 sq. ft.
Maximum Height above final grade (North Forebay and Shaft No. 19)	20 ft. (avg.)
Generator Building:	
Approximate dimensions	100ft x 110ft.
Maximum Height above final grade	25 ft.
Approximate footprint area	11,000 sq. ft.
Approximate final grade	340 MSL (avg.)
Approximate area affected during construction	66 acres (61 on the north parcel and 5 on the south parcel)
Approximate finished area	9 acres

4.1.3.1. UV Facility Description

The proposed UV Facility would be located to the east of Mine Brook on the north parcel of the Eastview Site. The proposed facility would include a process floor at the lower level and an area for administrative, operations, and laboratory functions as well as utility systems (i.e. HVAC, UPS) located on the upper level. In keeping with the natural topography and drainage of the site, roadways and walkways around the proposed facility would provide at-grade access to the upper level on the south side of the proposed facility and directly to the lower level on the north and west sides of the proposed facility. A maintenance bay and loading area would provide additional access on the southwest corner of the proposed facility for servicing and receiving large equipment. A police access road would be established on the west side of Mine Brook for secure internal access to that part of the site by NYCDEP Police.

The lower level would be subdivided into four equally sized banks or modules. Each module would be equipped with 14 process trains (13 duty and 1 standby), along with the associated electrical panels, UV sleeve cleaning system and appurtenances. The primary components of a process train would include two valves, a flow meter, and a UV unit along with the necessary fittings and appurtenances.

Each disinfection unit could contain approximately 168 LPHO lamps to achieve the design dose of 40 mJ/cm². Each of the lamps would be situated within a quartz sleeve that is inserted into the disinfection unit. The quartz sleeve surrounds the lamp to protect the lamps from the water passing through the unit. Following the disinfection process, treated water would be conveyed from the disinfection units into common treated water conduits and distributed to the treated water conveyance systems.

Four cleaning system storage tanks (one per module) would be equipped with secondary containment to prevent incidental spills and leaks from contaminating the floor and adjacent surfaces. Passageways and flat surfaces that can be traversed at this level would include a central walkway (Elevation 315) and steel platform systems located between each UV process train to accommodate inspection and maintenance of the UV trains.

4.1.3.1.1. Cleaning Systems

Cleaning of UV lamps is a significant operation and maintenance procedure, and is dependent on the rate that the quartz sleeves accumulate a film of organic and inorganic material that inhibits the passage of UV light into the water, referred to as sleeve fouling. The fouling of the sleeves is a result of water-quality effects such as precipitation of iron, calcium, aluminum, and manganese salts along with other inorganic and organic constituents. The cleaning procedure would consist of cleaning the quartz sleeves with a chemical solution. This procedure must be performed as a routine maintenance operation. Upon isolating and draining the disinfection unit, chemicals are sprayed or soaked on the quartz sleeves. The sleeves are then cleaned manually or by spraying/rinsing.

Access to the lamp sleeves within the disinfection unit for cleaning purposes would be provided via access ports built into the wall of the UV unit. Each individual lamp is accessible by an exterior connection.

4.1.3.1.2. Process Laboratory

The proposed UV Facility would include a process laboratory for monitoring and controlling the disinfection process. The laboratory would be equipped to conduct both wet chemistry and microbiological testing. The laboratory would also process other samples for shipment to off-site laboratories for analysis. Several of these analyses use bench top analyzers, which would require a minimal amount of chemicals for sample preparation and instrument maintenance and calibration: the other analyses would be preformed using colorimetric processes with commercially-prepared reagent packets.

4.1.3.1.3. Electrical Power

Energy conservation would be universally implemented in the design and operation of the proposed facility. Premium efficiency motors, transformers, lighting and energy-consuming appliances would be specified as much as possible. Electric power for the proposed facility would be furnished by the New York Power Authority (NYPA), which has a contract to supply electricity to New York City government facilities. NYPA generates, buys, and transmits electrical power on a wholesale basis, but does not have its own distribution system. NYPA would supply electrical power through Con Edison. The distribution of electricity to the Eastview Site containing the proposed UV Facility would be the responsibility of Con Edison. The electric supply for the proposed UV Facility would be provided from the Grasslands Reservation Substation located adjacent to the eastern edge of the Eastview Site via two underground feeders using tri-plex shield cables. For further information regarding the electric supply for the proposed UV Facility, refer to **Section 4.16, Infrastructure and Energy**.

Determination of the electrical power demands was estimated based on four scenarios: connected load, maximum demand, average demand, and emergency load. The connected load is the sum total electrical load of all equipment installed in the facilities, including standby units that normally would not be operating. This amount is not used for supply capacity. Maximum demand is the total maximum demand of all electrical loads when the proposed UV Facility is operating at its maximum flow capacity (2,020 mgd). Average demand is the total maximum demand of all electrical loads when the proposed UV Facility is operating at its average flow capacity (1,310 mgd). Emergency load is equal to the maximum load, since the proposed facility would be designed to be able to operate at full power even without an external power source. **Table 4.1-2** presents the estimated electrical power demands for these four scenarios.

TABLE 4.1-2. UV FACILITY ESTIMATED ELECTRICAL POWER DEMANDS

Total Demand	Estimated Load	
	KW	kVA ¹
Connected Load	6,800	9,450
Maximum Operating Load (2400 mgd)	6,400	8,900
Average Operating Load (1310 mgd)	4,450	6,150
Emergency Load (2400 mgd)	6,400	8,900

Note:

1. kW = kVA x pf, where pf is the power factor (a measure of electrical efficiency)

The proposed UV Facility would require two underground service feeders, each at 13.8-kV. Westchester County, where the site is located, is designated by Con Edison as a “single contingency” area, meaning that any one feeder may be taken out of service anytime and the remaining feeder should be able to carry the maximum load.

Electrical Design Considerations. The basic electrical design considerations would be safety, reliability, flexibility, energy conservation, ease of operation and maintenance, and life cycle costs. The electrical design would comply with Federal, State, City, and local codes and

other applicable codes and standards. All major electrical equipment would be located indoors in dedicated electrical rooms. The underground and indoor installation of electrical facilities and the state of the art design, including shielding, would reduce electromagnetic fields and extremely low frequency emissions (EMF/ELF) to background levels in areas where the public would have access.

Emergency Power. In case all Con Edison feeders are out of service (and during one-hour monthly exercising), four emergency standby diesel generators, each rated 1,750 kW would provide emergency power for full Facility capacity. The generators would provide power to run all necessary UV disinfection equipment. In addition, the generators would power fire pumps, fire alarm, fire protection, smoke-purging exhaust fans, emergency elevators, and other emergency equipment in case of fire or other emergency conditions within 10 seconds of a power failure as required by the National Electric Code. Emergency power for the security system, communication systems, lightning protection system, plant control system and other safety equipment would also be provided. Four hours of fuel storage in a day tank adjacent to the emergency generator would be provided to allow for exercising the unit. Two 20,000-gallon tanks would be installed underground in a vault, at least 20 feet away from any means of egress.

4.1.3.1.4. UV System Uninterruptible Power

All process controls, and computer and communications systems would have individual uninterruptible power supplies (UPS). With the sensitivity of the UV system to power disturbances, UPS systems would be provided (Batteries and UPS systems would be provided to sustain the process until the back-up generators pick up the loads). The proposed UV Facility would also contain dedicated rooms for the UPS and their associated battery systems. The UPS are being supplied to provide continuous, uninterrupted power to the UV modules. They would enable the UV lamps to operate uninterrupted during utility system disturbances, and would maintain the UV lamps during the time it takes for the standby generators to automatically start and power the distribution system in the event of a utility failure. All of the electrical equipment in the proposed UV Facility would be installed in dedicated electrical or UPS/battery rooms within the facility.

It is not anticipated that other potential NYCDEP projects would have significant adverse impacts on the surrounding community power systems.

4.1.3.1.5. Fuel Demand

Con Edison would deliver natural gas to the gas meter room within the proposed UV Facility. Gas supply to the proposed UV Facility would be supplied through a 6-inch main connecting from the gas main on Route 100C near the proposed emergency entrance.

The proposed UV Facility heating system would be provided by three 400 hp dual fuel (natural gas/fuel oil) hot water boilers. The three boilers would be provided to meet the heating requirements (two operating and one standby). Each boiler would be provided with a flue gas reclamation system to reduce NO_x emissions. Natural gas would be used to fuel the boilers with the exception of limited days of extreme cold weather, when fuel oil would be used. As stated above, a fuel storage design would include two 20,000 gallon tanks underground in a vault.

These tanks would contain No. 2 fuel oil and would be used for both emergency generators and as a back-up source of fuel for the boilers. The exact location of the fuel oil storage tank would be determined in the final design. The capacity of the fuel storage is equivalent to a 15-day supply. Fuel oil would only potentially be utilized during the months of December through March (heating season).

4.1.3.1.6. Traffic Circulation

The main access to the proposed UV Facility would be from Walker Road, which is located to the west of the north parcel in the Town of Mount Pleasant. All vehicular traffic would enter the site via a secured entry road and would be required to pass through a security screening area, which would be located several hundred feet west of the proposed facility, adjacent to the Walker Road entrance. Separate screening areas would be provided for cars and trucks. Interior road access would be provided around all buildings and structures located adjacent to the proposed facility. Additionally, a gated emergency access road to Route 100C would be provided.

Employee and visitor parking facilities (approximately 54 spaces) would be located to the south of the proposed UV Facility. A shipping/receiving area would be located at the northern end of the proposed facility.

4.1.3.1.7. Architectural Considerations

The main UV Facility would be configured in an east-west orientation. Much of the structure would be below grade. The greatest extent of above grade structure would be located in the west end of the structure. To the east, the building would be almost entirely below grade.

A superstructure above the main structure would house personnel areas, laboratory, control room, electrical distribution and HVAC equipment areas. The superstructure roof would be constructed of metal and have a barreled configuration interrupted by skylight or louver structures to admit natural light and provide for ventilation requirements. A similar roof would be used for the generator building and the superstructure to be constructed over the existing Shaft No. 19 (and for a potential structure over the North Forebay) to provide a consistent architectural treatment and to integrate the structures. The personnel area, on the south side of the UV Facility, would have a flat roof, with consideration given to including photovoltaic panels and skylights. The walls of the building would be constructed of reinforced concrete and pre-cast concrete panels or masonry with aluminum windows and curtain wall segments for glazed areas. Landscaping would be provided to reinforce the natural qualities of the site and as screening where appropriate. The portion of the roof over the structure where no superstructure is present would be covered with earth and blend in with the surrounding vegetation, or have a “green roof” with selected vegetation.

As part of the facility’s security measures, a number of exterior roadway lighting and other outdoor area lighting would be provided. To maintain the visual comfort of the surrounding area, extra care would be taken and downcast lighting would be utilized to prevent glare and minimize light seen from the surrounding area.

The landscaping plan's design features would include site perimeter barriers at the Eastview Site. These include cable barriers to be installed along the northern perimeter from Mine Brook to the Walker Road property boundary and then south along the western perimeter of the project site. Additionally, along the perimeter where cable barriers would be installed, 30 foot wide ditches would also be constructed between the cable barriers and roadways. The roadway side of the ditches would be lined with rip rap. The only break in the cable barriers would be at the Walker Road entrance and the emergency exit in the vicinity of the existing Delaware Shaft No. 19. The main entrance would be surrounded by Jersey barriers. Along a portion of the eastern perimeter, cable barriers would also be installed. Due to security concerns, vegetative buffering such as thick foliage around the north and west boundaries of the Eastview Site would not be introduced.

4.1.3.1.8. Stormwater Management Design Considerations

The stormwater controls for operation of the proposed facility would incorporate measures specified by Westchester County, New York State Department of Conservation, NYCDEP, Town of Mount Pleasant, and USEPA. Stabilization and best management practices (BMPs) would be included in the project design to ensure that peak flows would be dissipated to avoid on-site erosion.

The sedimentation and erosion controls and stormwater management practices would be employed to minimize erosion and prevent sedimentation of Mine Brook and adjacent wetlands. Control measures would include stabilization of disturbed areas and structural controls to divert runoff and remove sediment. In addition to managing stormwater runoff and erosion, BMPs would help to ensure that measures are taken to prevent accidental releases of fuels, lubricating fluids, or other hazardous materials.

4.1.4. UV Disinfection Process Goals

The NYCDEP has extensive records documenting the quality of its Catskill and Delaware water supply systems. The water supplied by the Catskill and Delaware systems is generally of high quality and is characterized by low turbidity, alkalinity, organic content, and mineral concentrations. While turbidity is generally low, infrequent turbidity spikes have been observed during storm events. NYCDEP currently has several measures in place to control these turbidity events to ensure that turbidity standards are met, including a turbidity curtain, and an Alum Addition Facility at Kensico Reservoir. Continued maintenance of these facilities would be required, even after the proposed UV Facility has been placed in operation.

The general trend in the Catskill and Delaware system from the farthest watersheds to the Kensico Reservoir is one of improving quality (i.e., lower turbidity) due to increased settling time as the water in the Catskill and Delaware systems travels downstream from upstream reservoirs and eventually mixes in Kensico Reservoir.

The primary goals of the proposed UV Facility are to meet the public water supply and public health needs of the City and to comply with State and Federal drinking water standards and regulations. The USEPA has determined that the City has an adequate long-term watershed

protection program for its Catskill/Delaware water supply that meets the requirements of the Surface Water Treatment Rule (SWTR) and the Interim Enhanced Surface Water Treatment Rule (IESWTR) for unfiltered water supply systems. The Long Term 2 Enhanced Surface Water Treatment Rule (LT2SWTR) negotiations are leading towards supplementing and, in some cases, superceding the IESWTR requirements. Under the LT2SWTR, unfiltered systems would be required to continue to meet filtration avoidance criteria and provide treatment to achieve 4-log virus, 3-log *Giardia*, and 2-log *Cryptosporidium* inactivation using a minimum of two disinfectants or be required to filter their supply systems. To meet the USEPA requirements, the NYCDEP has elected to implement Ultraviolet Light Disinfection as part of its water supply protection strategy, in addition to the current practices of adding chlorine and fluoride, to serve as the treatment for the unfiltered Catskill/Delaware System. The addition of the UV Facility would work with the City's current treatment practices and watershed protection program and allow the City's System to meet the upcoming water supply requirements.

4.1.4.1. Design Criteria

The design criteria utilized in the planning for a UV system considers the following components: UV transmittance, system redundancy, and UV dose. Table 4.1-3 presents a summary of the proposed UV Facility design criteria.

TABLE 4.1-3. SUMMARY OF DESIGN CRITERIA

Log Inactivation: <i>Cryptosporidium</i>	2 ⁽¹⁾
<i>Giardia</i>	3 ⁽¹⁾
Viruses	4 ⁽¹⁾
Disinfection Unit Flow Capacity	40 mgd
UV Dose	40 mJ/cm ² ⁽²⁾
UV Transmittance	87% ⁽³⁾
Disinfection Unit Redundancy Requirements	4 units (10%)
Lamp Type	Low-Pressure High Output (LPHO)
Lamp Intensity Degradation Factor	70% to 80%
Maximum Allowable Head Loss	18 inches
Cleaning System	Chemical Cleaning ⁽⁴⁾
Monitoring Requirements	Flow rate (mgd) UV Intensity (mW/cm ²) UV Transmittance (% T) Turbidity (NTU) UV Dose (mJ/cm ²)

Notes:

- (1) *Giardia* and virus inactivation would be achieved through a combination of UV and chlorine disinfection, 2-log inactivation of *Cryptosporidium* regulatory for unfiltered water supplied.
- (2) Conservative UV Dose of 40 mJ/cm² to achieve a 3-log inactivation of *Cryptosporidium*.
- (3) Represents 95th percentile value of 1998 pilot data.
- (4) For LPHO systems.

4.1.4.1.1. UV Transmittance

UV transmittance of water is a measure of the clarity of the water, and is inhibited by color, turbidity, organics, iron and other interferences. The UV transmittance of the water impacts the size and lamp number/intensity associated with the UV unit required to deliver the target UV dose. UV transmittance is calculated using the measurements of UV absorbance (A) at a specified wavelength.⁴

4.1.4.1.2. System Redundancy

To ensure continuous service while UV units are taken out of service for maintenance and cleaning, additional disinfection units should be incorporated. The proposed UV Facility is designed to have one redundant unit for each of the four treatment modules.

4.1.4.1.3. UV Dose

Disinfection requirements were first established in the SWTR. The “CT” concept was established by this rule. The product of a disinfectant residual concentration, C and effective contact time, T, is compared to published CT values to determine the effectiveness of a disinfectant. Given that UV does not have a concentration, the CT concept has been altered and replaced with “UV dose”. The term “UV dose” represents a microbe’s exposure to UV energy, and is defined as the product of UV intensity (mW/cm²), and exposure time of the fluid or particle to be treated (sec). UV dose is expressed as (mW-sec)/cm² or mJ/cm². UV dose is dependent on flow rate, water quality and UV intensity. Some factors affecting UV intensity are power input, lamp age, and sleeve cleanliness.

4.1.4.1.4. UV Evaluation

NYCDEP is currently preparing for two evaluation programs with respect to UV design criteria. The first program involves the construction of a small scale “pilot” facility that will evaluate low pressure high output (LPHO) and medium pressure UV units to look at the impact of “fouling”⁵ on the lamps. The results of these studies would assist in the evaluation of how fouling would affect operation of the proposed UV Facility. The second program is an evaluation and validation of the full-scale UV system. NYCDEP has contracted to have an existing validation facility expanded to be able to test the UV units at flows up to 60 mgd. From the evaluation, the optimal unit for would be selected for inclusion in the proposed UV Facility. From this testing, the units would also be validated to meet the requirements of State and Federal regulations.

⁴ $A = (UV_{254}, \text{cm}^{-1}) * (\text{cell length}, \text{cm})$
UV Transmittance = 100×10^{-A}

⁵ Fouling is a result of water-quality effects such as precipitation of iron, calcium, aluminum, and manganese salts along with other organic and inorganic constituents. Fouling is also depending on the type of lamp used.

4.1.4.2. Disinfection Process

UV disinfection is a treatment process in which water passes in close proximity to a network of lamps that emit ultraviolet light. When passing through a UV disinfection unit (which house the lamps), the DNA of microorganisms in the water are altered in such a way that the microorganisms are no longer able to replicate and therefore are rendered non-infective. Without the ability to replicate, the organisms are shed from the host's digestive tract without causing illness.

UV light is defined as the electromagnetic spectrum between visible light and X-Rays, with wavelengths roughly between 100 and 400 nanometers (nm). A nanometer is a unit of spatial measurement that is equal to one billionth of a meter. For disinfection purposes, the most useful region is the germicidal range generally between approximately 230 and 300 nm. Below 230 nm, water molecules absorb much of the energy, leaving little for disinfection.

4.1.5. Construction Schedule

The anticipated construction period for the proposed project would be a five-year period from 2005 through the start of operations by 2009. Excavation, building construction, stormwater management, and erosion and sedimentation control measures would be implemented in a phased approach during construction. Phase I of construction would include mobilization, clearing and grading of the contractor's staging area and stockpile area, site clearing and grubbing, installation of sheeting, mass site excavation, construction of site access roads, installation of erosion and sedimentation controls, and construction of a series of small detention basins on the site. Filling and landscaping of the Delaware Aerator would also occur during this phase. Phase II would include final foundation excavation and preparation for structures, piping, and buildings; construction of the facility buildings and structures; excavation for treated water piping to the Catskill Aqueduct and Catskill Connection Chamber; and construction of the permanent stormwater detention pond/enhanced wetland. Phase III would involve completion of site roadways, grading and landscaping; and restoration of the site in addition to the filling and landscaping of the Catskill Aerator. For each phase of construction, the following topics are described: the sequence of construction and a summary of work to be conducted; erosion and sediment control measures to be implemented; and a description of on-site activities.

4.1.5.1. Phase I

Most of this phase of the work would be conducted under a separate site preparation contract between May 2005 and July 2006. Prior to the start of significant construction activities at the Eastview Site, an entrance to the project area from Walker Road for construction equipment and personnel would be established, and security features around the site would also be installed. The construction area would be fenced to clearly demarcate the limits of construction. A silt fence and double row of hay bales would be installed inside the fencing to assist in erosion and sedimentation control. Temporary utilities, parking, and site offices would be installed in anticipation of the site clearing and excavation work.

Before the excavation process begins, a series of small stormwater detention basins would be constructed on site. The detention basins would be an integral component of stormwater management for the construction phase of the proposed project. The detention basins would ensure that the flow in Mine Brook during construction, resulting from storm events, does not exceed the existing conditions.

The excavation process would begin with the clearing and grubbing of vegetation within the construction and lay down areas. This would be followed by the installation of soldier piles and lagging around the perimeter of the excavation area on three sides (north, east and south) and the excavation of the buildings' footprints on the north parcel to an approximate elevation of 260 to 290 feet, or an average of some 40 feet below the existing grade. Approximately 900,000 cubic yards (cy) of soil and rock would be excavated from the site. Approximately 400,000 cy of excavated materials would be stored on site in a designated stockpile area for use as fill around the buildings and final grading. Up to 290,000 cy could be used for filling the Kensico Aerators, with up to 175,000 cy to fill the Delaware Aerator. The amount of fill in the Catskill Aerator would be limited to minimize interference with the planned later construction of a new Screen Chamber associated with the Catskill Aqueduct rehabilitation program (see [Section 5, Off-Site Facilities](#)). Stabilization of open soil surfaces would be done immediately after clearing; seeding, mulch, or synthetic mesh/fabric materials applications would be effective in stabilizing slopes. Stabilization of exposed areas and stockpiled soils would consist of hydroseeding, or straw or grass mulch. Portable sump pumps would be used to manage groundwater and stormwater inside the excavation. These pumps would convey water to the detention basins; the water would eventually be discharged to Mine Brook. Storm flows into the excavation would comprise the largest quantity source of water to be discharged to the detention basins during construction.

Other Phase I features include rough grading, construction of the site roadways, storm drainage, other yard piping and the contractor laydown and storage areas. These areas would be covered with porous pavement. During this initial construction phase of the proposed project, structural best management practices (BMPs), such as oil/water separators and sediment removal devices, would be installed. All existing and/or proposed catch basin inlets would be protected with hay bales and/or a sediment filter over the inlet. Dust generation would be minimized by the use of water trucks.

4.1.5.2. Phase II

Once the main site excavation is completed, final preparation of subgrades for the building footprints, construction of the UV building and related structures and buildings, raw and treated water conveyances, and connections to the existing aqueducts would occur between August 2006 and September 2009. The installation of the treated water conveyance to the Catskill Aqueduct would occur over approximately a one year period between 2007 through 2008. If Catskill Aqueduct raw water is delivered to the proposed facility from the south parcel, the installation of this pressurized raw water conveyance would occur during 2010. If Catskill Aqueduct raw water is delivered to the proposed facility from a new tunnel connecting to the Catskill Aqueduct in the vicinity of the Sprain Brook Parkway, the tunneling for and installation of this pressurized tunnel conveyance would occur during 2010. Portable sump pumps would be

used to manage groundwater and stormwater inside the locally excavated areas. These pumps would discharge water to the adjacent woodland where it would be absorbed.

After the subgrade preparation is completed, the building construction would proceed, with underdrain installation and initial concrete construction. This would include foundations for the UV building and the connection structures to Shaft No. 19, with formwork for concrete and placement of reinforcing steel at the foundation level. In general, building construction would proceed both horizontally and vertically, moving from east to west. After the outer structure walls of the UV building and Shaft No. 19 connection structures (north and south forebays) are constructed, backfill alongside these walls would be placed using the excavated material stockpiled on site.

Construction of the new CCC on the south parcel would take approximately one year. A CCC would be constructed to the north of the existing CCC structure to allow for the connection of the pressurized raw water conveyance to the Catskill Aqueduct. Connection of the treated water conveyance to the existing CCC would occur in 2007 and 2008; if needed, the raw water CCC would be constructed between 2010-2011 seasonal shutdown of the Catskill Aqueduct.

4.1.5.3. Phase III

Final site grading and filling of the Catskill Aerator and construction of the new Screen Chamber at the Kensico Reservoir campus would occur during this phase. Filling of the Catskill aerator would likely occur after 2008.

4.1.5.4. Erosion and Sediment Control Measures

During construction, sedimentation and erosion controls and stormwater management practices would be employed to minimize erosion, and prevent sedimentation of Mine Brook and adjacent wetlands. However, the final design of the erosion and sedimentation control measures during construction of the proposed plant would be the responsibility of the contractor. Control measures would include stabilization for disturbed areas, and structural controls to divert runoff and remove sediment. In addition to managing stormwater runoff and erosion, BMPs would help to ensure that measures are taken to prevent accidental releases of fuels, lubricating fluids, or other hazardous materials.

4.1.5.4.1. Phase I

The proposed erosion and sedimentation control plan would be developed to prevent waterborne sediment from entering surface water and wetland resource areas adjacent to the site during Phase I of construction. Before Phase I of construction is initiated, BMPs would be installed at locations around the perimeter of the site to control sedimentation and erosion associated with stormwater runoff, as well as maintain flow to Mine Brook. The location of erosion and sedimentation control measures would serve as an absolute limit of work. Under no circumstances would any work occur on the resource side of the erosion control barriers.

During this phase of construction, control of stormwater runoff to Mine Brook would be provided primarily using hay bales, sediment fences, and temporary sedimentation basins/rock filters. A line of toed-in and staked silt fences and hay bales would define the limits of work. Runoff from cleared areas would be collected via diversion berms and drainage swales, each leading to filtration devices such as check dams, hay bales or washed stone, placed in drainage swales to reduce stormwater runoff velocity. These check dams would be placed within the gutter of roadways where slopes are greater than five percent.

Construction laydown and staging, and truck queuing/turn around areas, would be surfaced with porous pavement where possible. All catch basins within the drainage system would be equipped with inlet protection. Structural BMPs would provide treatment of runoff from these impervious areas (access roadways, parking area). These pollution prevention devices are designed to remove oil and sediment from stormwater during all wet weather events.

4.1.5.4.2. Phase II

The main activity during this phase of construction, building and conduit construction, would result in an increase in on-site traffic. The erosion and sediment control devices established in Phase I would remain in place. Stormwater flows, in addition to any groundwater contribution, would be pumped to the small detention basins located along the down slope areas of the site. A regular program of inspections and maintenance would be conducted.

During building construction, the site would be stabilized. As noted above, after the outer structure of the building is erected, backfilling would occur using the excavated material stockpiled on site. The emphasis of stormwater management at this stage of the work would be on operation and maintenance of structural BMPs, and control of runoff from on-site activities. Most activity during the later stages of building construction would occur within the building interior (i.e., installation of UV equipment, piping, valves, electrical and HVAC equipment, conduits, ducts, architectural finishes, etc.).

The stormwater runoff and quality from the proposed construction areas to Mine Brook would be controlled so as not to exceed the pre-construction levels. The surface runoff from the areas to be occupied by the proposed facility currently flows to Mine Brook under existing conditions. No potentially significant adverse impacts are anticipated to the natural and surrounding resources from the quality and quantity of stormwater runoff due to the construction activities at the proposed site.

4.1.6. Capital and O&M Costs

Since the Draft EIS, the design of the proposed facility has progressed; the Final EIS carries the current costs of the project as contained in the June 2004 Capital Improvement Plan (CIP). The estimated total capital and construction cost for the proposed project is estimated at \$597,000,000, in 2004 dollars. Annual operation and maintenance costs are estimated at \$6,690,984. The operation and maintenance cost includes the estimated property taxes/PILOTs. In addition, there would be a patent fee of approximately \$7 million per year for the UV technology for the first nine years of operation.

Table 4.1-4 shows the anticipated capital and O&M costs for the proposed UV Facility. As discussed in Section 3.7, Data Collection and Impact Methodologies, Socioeconomic Conditions, there are two types of financing that would be available to fund the construction of the proposed facility: (1) bonds issued by the New York City Municipal Water Finance Authority; and (2) bonds issued through the State Revolving Fund (SRF).

Operating & maintenance costs include the labor required to operate and maintain the systems, as well as such expenses as electricity, chemicals, spare parts, and property taxes. Labor costs are escalated from 2010 at the rate of 2.5 percent per year and costs other than labor are escalated at the rate of three percent per year. These escalations are consistent with the rates used in the financial forecast prepared in connection with the issuance of the bonds.

TABLE 4.1-4. UV FACILITY: ESTIMATED CAPITAL AND OPERATION & MAINTENANCE (O & M) COSTS

	Capital Cost	Annual O&M Cost
UV Facility at Eastview Site	\$597,000,000	\$6,690,984

Note: Capital costs in this table reflect total costs for all components of the project expressed in 2004 dollars. Annual property taxes/ PILOTs are included in the O&M costs. Potential patent fees are not included in the O&M costs.