BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION
APPLICATION FOR LICENSE FOR MAJOR PROJECT – EXISTING DAM

Cannonsville Hydroelectric Project

FERC Project No. 13287

VOLUME 1
Verification Statement
Initial Statement
Exhibits A – E

City of New York

NYC Environmental Protection

February 2012

VERIFICATION STATEMENT PER 18 CFR § 4.32(a)(4)

New York City Department of Environmental Protection

Application for Original License for Major Project - Existing Dam

Cannonsville Hydroelectric Project

FERC Project No. 13287

STATE OF NEW YORK

COUNTY OF QUEENS

Anthony J. Fiore, who being duly sworn, deposes and says that the contents of this application are ic to the best of his knowledge or belief.

The undersigned Applicant has signed the application this 28th day of February, 2012.

CITY OF NEW YORK, Applicant, acting through the
New York City Department of Environmental Protection

By: _____
Anthony J. Fiore
Chief of Staff - Operations
New York City Department of Environmental Protection

Subscribed and sworn to before me this 28th day of February, 2012.

_____
Notary Public

Seal:

MELISSA S. SIEGEL
Notary Public, State of New York
No. 02SI4832255
Qualified in Queens County
Commission Expires July 31, 2013

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LIST OF ACRONYMS AND ABBREVIATIONS

A	ampere
AC	alternating current
APE	area of potential effect
BG	billion gallons
BOCES	Board of Cooperative Education Services (New York State)
C	Celsius
CEII	Critical Energy Infrastructure Information
CFR	Code of Federal Regulations
cfs	cubic feet per second
Co	County
City	City of New York
CSO	Conditional Storage Objective
CT	current transformer
DC	direct current
DCS	distributed control system
DEP	New York City Department of Environmental Protection
DO	dissolved oxygen
DRBC	Delaware River Basin Commission
EPA	Environmental Protection Agency
ENR	Engineering News Record
F	Fahrenheit
FAW	Forecast-based Available Water
FERC	Federal Energy Regulatory Commission
FFMP	Flexible Flow Management Program
FFMP-OST	Flexible Flow Management Program with the Operations Support Tool
ft	foot/feet
ft/s	feet per second
GIS	geographic information system
HPMP	Historic Properties Management Plan
HPP	Habitat Protection Program
HVAC	heating, ventilation and air conditioning
Hz	hertz
IERQ	Interim Excess Release Quantity
kV	kilovolt
kVa	kilovolt-ampere
kW	kilowatt
kWh	kilowatt-hour
L	liter
m	meter
Means	Means Construction Cost Data
MCC	motor control center
mg	milligram
MG	million gallons
MGD	million gallons per day
mm	millimeter
mi^2	square miles
msl	mean sea level
MVA	megavolt ampere

MW	megawatts
MWh	megawatt-hour
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NPV	net present value
NWI	National Wetlands Inventory
NJ	New Jersey
NY	New York
NYCRR	New York Codes, Rules and Regulations
NYISO	New York Independent System Operator, Inc.
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSEG	New York State Electric & Gas Corporation
NYSM	New York State Museum
O&M	operation and maintenance
OASIS	Operational Analysis Simulation of Integrated Systems
OPCC	Opinion of Probable Construction Costs
OPRHP	Office of Parks, Recreation and Historic Preservation
PA	Pennsylvania
PAA	Public Access Area
PFBC	Pennsylvania Fish and Boat Commission
PEM	palustrine emergent
PLC	programmable logic controller
Project	Cannonsville Hydroelectric Project
PT	potential transformer
PVC	polyvinyl chloride
RCNY	Rules of the City of New York
RGGI	Renewable Greenhouse Gas Initiative
ROW	right-of-way
rpm	revolutions per minute
RTE	rare, threatened and endangered species
SCADA	Supervisory Control and Data Acquisition
SNTEMP	Stream Network Temperature
SPDES	State Pollution Discharge Elimination System
SWCD	Soil and Water Conservation District
SWPPP	Stormwater Pollution Prevention Plan
USC	United States Code
USDA-NRCS	United States Department of Agriculture - Natural Resources Conservation Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
V	volt
WWTP	wastewater treatment plant
WWQO	Watershed Water Quality Operations

INITIAL STATEMENT PER 18 CFR §§ 4.51 and 4.32(a)

Before the Federal Energy Regulatory Commission

New York City Department of Environmental Protection

Application for Original License for Major Project – Existing Dam

Cannonsville Hydroelectric Project

FERC Project No. 13287

(1) The City of New York (the "City"), acting through the New York City Department of Environmental Protection ("DEP"), hereby submits to the Federal Energy Regulatory Commission ("FERC") this application for an original license for the Cannonsville Hydroelectric Project ("Project"), as described in the attached exhibits.

(2) The location of the Project is:

State or territory:	New York
County:	Delaware
Township:	Deposit
Stream or body of water:	West Branch of the Delaware River

(3) The exact name and business address of the applicant are:

City of New York, acting through the
New York City Department of Environmental Protection
59-17 Junction Blvd.
Flushing , NY 11373-5108

The exact name and business address of each person authorized to act as agent for the applicant in this application are:

Carter H. Strickland, Jr.
Commissioner
New York City Department of Environmental Protection
59-17 Junction Blvd.
Flushing, NY 11373-5108
cstrickland@dep.nyc.gov

Anthony J. Fiore
Chief of Staff – Operations
New York City Department of Environmental Protection
59-17 Junction Blvd.
Flushing, NY 11373-5108
afiore@dep.nyc.gov

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540 Broadway
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Albany, NY 12201-2222
klang@couchwhite.com

Garrett E. Bissell, Esq.
Couch White, LLP
540 Broadway
P.O. Box 22222
Albany, NY 12201-2222
gbissell@couchwhite.com

(4) The applicant is a municipality, and is claiming preference under section 7(a) of the Federal Power Act.

(5)(i) The statutory or regulatory requirements of the state(s) in which the project would be located that affect the Project as proposed, with respect to bed and banks and to the appropriation, diversion, and use of water for power purposes, and with respect to the right to engage in the business of developing, transmitting, and distributing power and in any other business necessary to accomplish the purposes of the license under the Federal Power Act, are:

- The City is subject to Water Quality Certification from the New York State Department of Environmental Conservation ("NYSDEC") under 6 NYCRR § 608.9 (2009) and Section 401(a)(1) of the Clean Water Act (33 USC § 1341 (2000)).

- The City is subject to the NYSDEC water quality standards program, specifically 6 NYCRR Part 815, which applies to the Cannonsville Reservoir and West Branch of the Delaware River.

- Diversions, releases, flow objectives and water quality at the Cannonsville Reservoir are subject to the jurisdiction of the Delaware River Basin Commission ("DRBC") and a 1954 Decree from the United State Supreme Court.[1]

- The City is required to comply with the 2007 Filtration Avoidance Determination ("2007 FAD"), issued by the U.S. Environmental Protection Agency ("EPA") in consultation with the New York State Department of Health. The 2007 FAD authorizes the City to continue to supply unfiltered water to City residents from its Catskill and Delaware water supply system until May 2017, as long as the City meets stringent water quality, disinfection, and site-specific avoidance criteria which make filtration unnecessary. Specific filtration avoidance criteria are established by the Surface Water Treatment Rule (40 CFR § 141.71) and the Interim Enhanced Surface Water Treatment Rule (40 CFR § 141.171).

- Part 671 of NYSDEC's regulations (6 NYCRR Part 671) require minimum releases from the Cannonsville Reservoir for conservation purposes.

[1] *New Jersey v. New York*, 347 U.S. 995 (1954). The parties to the decree are the City of New York, the States of Delaware, New Jersey and New York, and the Commonwealth of Pennsylvania (the "Decree Parties").

- New York State water classifications and water quality standards (6 NYCRR Parts 700-706) apply to the Cannonsville Reservoir and the West Branch of the Delaware River.

- The City is a municipality existing under the laws of the State of New York, the New York City Charter, and the New York City Administrative Code. New York City Administrative Code Section 24-364 provides that DEP may utilize such water that it now owns or may acquire for the purpose of generating electric current for use by the municipality. A copy of New York City Administrative Code Section 24-364, which describes the City's authority to engage in developing, transmitting and distributing power is included as Figure IS-1.

(5)(ii) The steps which the Applicant has taken or plans to take to comply with the regulations cited above are:

- The Applicant will request a Water Quality Certification from NYSDEC concurrent with the submittal of the Final License Application for License to FERC.
- The Project will be operated in a manner that will comply with DRBC requirements and the 1954 Supreme Court Decree. A full discussion, including how the Project's operation will comply with these requirements, is included in Exhibit B.
- In March 2011, DEP submitted the "2011 Watershed Protection Program Summary and Assessment," which provided a mid-term assessment of DEP's efforts to maintain compliance with the 2007 FAD. The mid-term assessment highlights several historic and recent activities undertaken by DEP to improve both the water quality and the utilization of the Cannonsville Reservoir, including: (1) the implementation of nearly 2,000 agricultural best management practices since 1996 to reduce agricultural pollution in the Cannonsville watershed; (2) monthly monitoring of pollutants and nutrient loads, including coliform bacteria, dissolved phosphorous, and turbidity; (3) the observation of optimal conditions for benthic communities at the Cannonsville Reservoir; (4) a comprehensive inventory of forest resources for 2,230 plots in the Cannonsville watershed; (5) institution of the Cannonsville Pilot Boating Program (discussed in more detail in Exhibit E); (6) upgrading the Wastewater Treatment Plants near the Cannonsville Reservoir; and (7) funding stormwater retrofit construction projects for eight communities in the Cannonsville watershed.
- The City is in compliance with Part 671 of NYSDEC's regulations. A complete discussion of the conservation releases from the Cannonsville Reservoir, and how the releases comply with NYSDEC's regulations, is included in Exhibits B and E.
- The water quality at the Cannonsville Reservoir meets the highest classifications under New York law. The water quality at the Cannonsville Reservoir is routinely monitored by the City's Watershed Water Quality Operations ("WWQO") group. West of the Hudson River, WWQO has a staff of 62 people, stationed in two laboratories (Grahamsville and Kingston), who are directly responsible for monitoring and maintaining the high water quality in the Cannonsville Reservoir, among other sites. As discussed further in Exhibit E, there are no long term impacts or changes to water quality resulting from the Project.

(6) Name and address of the owner of any existing Project-related facilities.

The dam, spillway, water supply intake chamber, and low-level release works are owned by the City and operated by DEP for purposes of providing water supply to the citizens of New York City.

(7) In accordance with the requirements of 18 C.F.R. § 4.32(a), the City provides the following information:

(a) Identify every person, citizen, association of citizens, domestic corporation, municipality, or state that has or intends to obtain and will maintain any proprietary right necessary to construct, operate, or maintain the project:

As Project proponent, all proprietary rights to construct, operate, and maintain the Project will reside with the City.

(b) Identify (providing names and mailing addresses):

(i) Every county in which any part of the project, and any Federal facilities that would be used by the project, would be located:

Hon. James E. Eisel, Sr.
Chairman, Board of Supervisors
Delaware County
111 Main Street
Delhi, NY 13753

The Project will not use any Federal facilities.

(ii) Every city, town, or similar local political subdivision in which any part of the project would be located or have a population of 5,000 or more people and is located within 15 miles of the project dam:

Hon. Thomas A. Axtell
Supervisor
Town of Deposit
3737 State Highway 8
Deposit, NY 13754

Hon. Robert McCarthy
Supervisor
Town of Sidney
41 Wood Road
Sidney, NY 13838

Hon. Donald M. Smith
Supervisor
Town of Franklin
21 Bartlett Hollow Road
Franklin, NY 13775

Hon. William Layton
Supervisor
Town of Tompkins
P.O. Box 23
Trout Creek, NY 13847

Hon. Craig DuMond
Supervisor
Town of Masonville
Route 206
Masonville, NY 13804

Hon. Bruce E. Dolph
Supervisor
Town of Walton
129 North Street
Walton, NY 13856-1217

(iii) Every irrigation district, drainage district, or similar special purpose political subdivision in which any part of the project would be located or the owns, operates, maintains or uses any project facilities:

There are no irrigation districts, drainage districts, or other similar special purpose political subdivisions in the area where the Project would be located.

(iv) Every other political subdivision in the general area of the project that there is reason to believe would likely be interested in, or affected by, the application:

There are no other political subdivisions in addition to those already identified above in the general area of the Project that there is reason to believe would likely be interested in, or affected by, this Application.

(v) All Indian tribes that may be affected by the project:

Vernon Isaac, Chief
Cayuga Indian Nation
P.O. Box 11
Versailles, NY 14168-0011

Mr. Raymond Halbritter
Oneida Indian Nation of New York
Genesee Street, Ames Plaza
Oneida, NY 13421

Mr. Jesse Bergevin
Oneida Indian Nation
Historic Resource Specialist
2037 Dream Catcher Plaza
Oneida, NY 13421

Leon Shenandoah, Sr., Head Chief
Onondaga Nation
RR 1, Box 270A
Nedrow, NY 13120

Mr. Anthony Gonyea
Onondaga Nation
Historic Preservation Office
716 East Washington Street
Suite 104
Syracuse, NY 13210-1502

Norman Tarbell, Chief
St. Regis Band of Mohawk Indians
412 State Route 37
Akwesasne, NY 13655

Mr. Arnold L. Printup
St. Regis Band of Mohawk Indians
Tribal Historic Preservation Officer
412 State Route 37
Akwesasne, NY 13655

Robert Odawi Porter, President
Seneca Nation of Indians
P.O. Box 231
Salamanca, NY 14779

Ms. Lana Watt
Seneca Nation of Indians
Tribal Historic Preservation Officer
90 O:hi'yoh Way
Salamanca, NY 14779

Robert Chicks, President
Stockbridge-Munsee Band of
Mohican Indians
N8476 Moh-He-Con-Nuck Road
P.O. Box 70
Bowler, WI 54416

Ms. Sherry White
Stockbridge-Munsee Band of
Mohican Indians
Tribal Historic Preservation Officer
W13447 Camp 14 Road
P.O. Box 70
Bowler, WI 54416

Bernie Parker, Chief
Tonawanda Band of Senecas
7027 Meadville Road
Basom, NY 14013

Leo Henry, Chief
Tuscarora Nation
5616 Walmore Road
Lewiston, NY 14092

Figure IS-1: Administrative Code Section 24-364

SUBCHAPTER 4

WATER SUPPLY; MISCELLANEOUS

§ 24–364 Utilization of water to generate electric current.
§ 24–365 Cemetery and burial grounds.

§ 24–364 **Utilization of water to generate electric current.** The commissioner of environmental protection may, subject to the approval of the board of estimate, utilize such water as the department of environmental protection now owns or as it may hereafter acquire, for the purpose of generating electric current for the use of the municipality, or may permit the utilization of such water for the generation and sale of electric current by an electric corporation which was the owner of a developed or undeveloped water power site or sites affected, acquired or damaged by the execution of a plan or project of the city for an additional water supply, and the commissioner of environmental protection, with the approval of the board of estimate, in connection with the settlement of a resultant

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Chap. 3] WATER SUPPLY § 24–365

claim for damage made by such electric corporation, may grant or lease to such electric corporation for periods not to exceed fifty years, rights in, or to use, the lands and waters of the city for the generation of electric current as herein provided, for such consideration and on such terms and conditions as are, in the opinion of the commissioner, in the best interests of the city of New York, including but not limited to a general release of such claim, provided that such grant or lease may be made at the time of settlement of the claim as above provided but the period of use under the terms of the lease or grant, not to exceed fifty years, may commence when generation of electric current thereunder shall begin, provided that no additional water shall be used for such purpose than would otherwise be required by the city.

HISTORICAL NOTE

Section added chap 907/1985 § 1

DERIVATION

Formerly § K51-48.0 added chap 929/1937 § 1
Amended chap 804/1946 § 1
Renumbered chap 100/1963 § 1397
(formerly § K41-48.0)

THE CITY OF NEW YORK
OFFICE OF THE MAYOR
NEW YORK, N.Y. 10007

September 15, 2008

Commissioner Emily Lloyd
Department of Environmental Protection
59-17 Junction Blvd.
Flushing, New York 11373

Dear Commissioner Lloyd:

Section 24-364 of the Administrative Code of the City of New York authorizes the Commissioner of Environmental Protection, subject to the approval of the Board of Estimate, to utilize water that the Department of Environmental Protection (DEP) either owns or may acquire for the purpose of generating electric current for the use of the municipality.

In accordance with section 8 of the Charter, which authorizes the Mayor to "exercise all the powers vested in the city, except as otherwise provided by law," as well as section 24-364 of the Administrative Code, I hereby authorize and direct you or your successor to act as the official representative of the City of New York in all matters related to the utilization of water that DEP owns or may acquire for the purpose of generating electric current.

I further authorize you, as Commissioner of Environmental Protection, or your successor: (1) to act on behalf of the City of New York in all matters related to filing applications with the Federal Energy Regulatory Commission or any other public body for the purpose of generating electric current, including but not limited to ensuring that all procedures required in connection with such applications are followed and providing such certifications and additional information as may be required; and (2) to enter into and execute any agreements necessary to generate such electric current and otherwise to act for the City of New York in all matters related to such generation of electricity.

Sincerely,

Michael R. Bloomberg
Mayor

TOTAL P.02

EXHIBIT A: PROJECT DESCRIPTION AND PROPOSED OPERATION

(1) Description of Existing Project Works and Hydroelectric Project

Existing Project Works

Dam

The Cannonsville Dam was placed into service in 1964 for the purpose of providing water supply to the City of New York. It is located on the West Branch of the Delaware River at 42°03'52.74" North, 75°22'26.26" West in the Town of Deposit, Delaware County, New York ("NY"). The dam is a zoned earthen embankment with a 2,800-foot-long, 45-foot-wide crest rising 175 feet above the valley floor to an elevation of 1175.0 feet above mean sea level ("msl"). The dam is orientated in a north-south direction and is formed by two embankment sections. Figure A-1 is an aerial image showing the main features around the dam and the features associated with the Project.

The ungated spillway, located at the right abutment on the north side of the valley, is a stone masonry side channel spillway. It is a two-section split-level spillway with a total length of 800 feet. The lower section is 240 feet long with a crest elevation of 1150 feet above msl. The upper section is 560 feet long with a crest elevation of 1158.1 feet above msl. The spillway discharges into a channel that was excavated from bedrock and runs parallel to the spillway.

Water Supply Intake

Water supply withdrawals are obtained through a separate intake chamber located on the south shore of the impoundment roughly five miles upstream of the dam. Water drawn from the Cannonsville Reservoir enters the West Delaware Tunnel and travels approximately 44 miles to the upper end of the Rondout Reservoir. From there, it is carried in the 85-mile long Delaware Aqueduct and through other reservoirs before entering the DEP's water supply distribution system.

Low-Level Outlet Release Works

Low-level outlet release works are operated to convey flow to the West Branch of the Delaware River downstream of the dam and are located in a separate chamber at the south end of the dam. Discharges are made through a concrete intake structure at the upstream toe of the dam and then through a 17.5 foot diameter concrete diversion conduit that necks down to a 11.9 foot release water conduit. The invert elevation of the outlet works is at 999 feet above msl. The diversion conduit is located on the south side of the valley under the dam and was utilized to carry the river flow during dam construction. It is 1,280 feet long and terminates in a stilling pool that discharges into the river. A concrete plug was placed toward the end of construction to stop flow through this conduit at the gate tower. At this point, flow is diverted from the 17.5-foot-diameter conduit upward to an 11.9-foot-diameter release water conduit located immediately above it. A concrete gate tower rises above the diversion conduit through the embankment just upstream of the plug and just upstream of the dam centerline. Two Broome-type wheel gates, gate frames and guides were installed in the gate tower. These gates control water entering the release water conduit, which is constructed on top of the abandoned stream diversion conduit from the gate tower to the low-level release works. The release water conduit is an 11.9-foot-diameter cement mortar-lined steel pipe encased in reinforced concrete, which terminates in an 8.8-foot-diameter manifold. The manifold feeds five primary release lines, ranging in size from 54 to 60 inches in diameter and three smaller release lines, ranging in size from 12 to 18 inches in diameter. Flow control is achieved through selectively opening or closing various lines. Three primary release lines are each controlled by two dow-

pivot 60-inch valves. The other two primary release lines are each controlled by a dow-pivot valve and a polyjet valve.

All lines terminate with an orifice plate downstream of the valves. Discharges are directed into a downstream stilling pool. Equipment can be moved into the low-level release works building by removing concrete roof slabs, which are presently covered with sod.

Hydroelectric Project

Background

Several turbine vendors were contacted and provided the appropriate data such that the station hydraulic capacity could be sized accordingly. For purposes of this license application, the City selected the largest station hydraulic capacity of 1,500 cubic feet per second ("cfs"). The 1,500 cfs station hydraulic capacity represents the maximum capacity that the City proposes for this Project; however, once final turbine-generator bids are obtained and the ongoing feasibility analysis relating to the Project is completed based on such final bids, DEP may, subject to FERC review, select a final turbine design with a resulting station capacity less than 1,500 cfs if such a design is determined to be the most economical and feasible for the Project.

The maximum release from Cannonsville, per the operating agreement described below, is 1,500 cfs. The design capacity of the proposed hydropower facility is 1,500 cfs. However, the future maximum discharge from the Project, including the release works and hydropower facility, is not cumulative. The intake pipe leading from the reservoir, through the dam, and feeding the release works was not designed to pass 3,000 cfs. The estimated design capacity of the existing system, with the Cannonsville Reservoir elevation maintained at 1150 feet msl (spillway crest elevation) is approximately 2,400 cfs. As the reservoir elevation declines, the release capacity also declines due to the drop in the net head.

Drawings of the Project are included in Exhibit F, but are classified as Critical Energy Infrastructure Information ("CEII"). These drawings are considered preliminary until final binding bids are obtained and the ongoing feasibility analysis related to the Project is completed based on such bids. However, it is expected that the final design will not materially alter the location, size and related details of the Project.

Penstocks

The existing conduit leading to the low-level release works will be bifurcated with a wye connection to a 12-foot steel diameter pipe. The 12-foot diameter pipe will run in a south to north direction and will be tapped with four individual wye connections to convey flow to individual steel penstocks leading to four turbines.

Powerhouse

An approximate 168-foot long by 54-foot wide powerhouse will be located adjacent to the existing low-level release works building. Equipment within the powerhouse will include four turbines and generators, switchgear, generator phasing cabinets, control panels, hydraulic power unit, cooling water equipment, station battery and charger, oil/water separator sump with pump, and other related equipment. The powerhouse walls will be cast in place concrete. The conceptual design of the powerhouse includes two entrance/exit locations on the east side of the building at its north and south ends. The roof will be flat, composed of built-up roofing over metal decking and supported on steel wide flange beams at five feet on center spanning the full 54-foot depth of the building. The roof will have a removable hatch to aid in the installation and maintenance of the turbines and generators. A single lay down area in the powerhouse

will be accessible by the removable hatch and large items will be placed inside the powerhouse with an external crane. Movement and placement of power generating equipment inside the powerhouse will be accomplished by a 60-ton rail crane running the length of the building.

One set of stoplogs will be included in the powerhouse superstructure to allow dewatering of the draft tube exit chamber.

Tailrace

Excavation will be required for both the powerhouse and tailrace channel. Please refer to Volume 4, Appendix E-2 for a full description of the excavation required for the Project and the measures that will be implemented to protect areas around the tailrace.

Drainage Control

The existing rockfill material on the downstream toe of the embankment serves to drain seepage that passes through the earthen dam. To enhance drainage around the powerhouse, a drainage system will capture the seepage flow and convey it around the powerhouse. A chimney drain will be constructed upstream of the penstock running parallel to the toe of the dam. It will be constructed between the penstock bedding material/backfill and the rockfill material and run the length of the penstocks. A perforated pipe will be located at the base of the chimney drain throughout its length to enhance the seepage conveyance. The perforated pipe will carry flow around the powerhouse and through the tailrace wall. The pipe is proposed to enter the tailrace, with an invert elevation just at the maximum turbine flow capacity tailwater elevation so that tailwater will not back up into the pipe.

A second perforated pipe surrounded by graded filter material will be installed adjacent to the upstream face of the powerhouse. The high point of the pipe will be at the approximate mid-point of the powerhouse, and water will be carried around both sides of the powerhouse. The pipes will discharge through each of the tailrace walls, with the pipe invert at the maximum turbine flow capacity tailwater elevation. Since the existing rockfill material is being used as backfill and the material is coarse, much of the subsurface flow will likely drain around the powerhouse through the voids in the backfill, in addition to the flow captured in the perforated pipe adjacent to the powerhouse.

Construction Related Issues

There will be roughly three months where no flow is passed through the low-level release works to allow for the connection of the turbine. During this period, conservation releases will be maintained via two 200 cfs (total of 400 cfs) temporary siphons. Siphons have a lift of 20 feet, thus the reservoir elevation must be maintained within 20 feet of the spillway crest elevation of 1150 feet msl. The siphons will be placed over the spillway crest and flow passed to the spillway channel. The location of staging areas, substation, powerhouse, and new transmission lines is shown in Figure A-1.

Volume 11, Appendix E-9, includes a Flow Management Plan during the estimated three month period in which the siphons operate. The plan details the proposed timing and duration of siphon operation.

(2) Description of Impoundment

The impoundment, known as the Cannonsville Reservoir, is approximately 12 miles long. The usable storage capacity between the spillway crest elevation (1150 feet above msl) and the lowest recorded elevation (1035 feet above msl) is approximately 92.726 billion gallons ("BG"), or 296,840 acre-feet. The surface area at the spillway crest is approximately 4,670 acres. The mean depth of the impoundment,

relative to the spillway crest elevation, is approximately 61 feet. The timing and magnitude of Cannonsville Reservoir releases is dependent on water supply demands, conservation flow releases, directed releases, discharge mitigation releases, snowpack, and water quality.

The drainage area of the West Branch of the Delaware as measured at the Cannonsville Dam is approximately 454 square miles ("mi^2").

(3) Description of Turbines/Generators

The powerhouse will house four turbine-generator units with a total hydraulic capacity of 1,500 cfs. Two turbines will have a maximum hydraulic capacity of 625 cfs, and two turbines will have a maximum hydraulic capacity of 125 cfs. The turbines are capable of operating down to approximately 40% of their respective maximum hydraulic capacities. Thus, the smaller turbines are capable of operating down to approximately 50 cfs (40% of 125 cfs), while the larger turbines can operate down to approximately 250 cfs (40% of 625 cfs). The larger units have a rated capacity of 5.855 MW, while the smaller units have a rated capacity of 1.185 MW, for a total station capacity of 14.08 MW. The rated head, based on the headpond elevation being at the spillway crest elevation, is approximately 122 feet.

The addition of the turbines will supplement and enhance the redundancy of the existing low-level release works in that additional options for release of water into the West Branch of the Delaware River will be available. The four separately valved turbines will provide up to 1,500 cfs of release capacity.

The turbines will be horizontal-shaft, with Francis-type runners, each in a pressure case. Table A-1 summarizes the turbine equipment, which is subject to change after final binding bids are received.

Table A-1: Description of Turbines

Feature	Size
No. of Turbines/Runner Diameter	2 @ 1760 millimeters ("mm") (5.7 ft) 2 @ 890 mm (2.9 ft)
Turbine Type	Horizontal Francis
Rated Net Head	122 feet (37.2 meters ("m"))
Minimum and Maximum Turbine Hydraulic Capacity	2 @ 50-125 cfs 2 @ 250-625 cfs Maximum Hydraulic Capacity: 1,500 cfs Minimum Operating Hydraulic Capacity: 50 cfs (40% of 125 cfs)
Maximum Electrical Capacity	2 @ 1.185 MW 2 @ 5.855 MW Total Electrical Capacity: 14.080 MW
Rated Speed	2 @ 257.1 revolutions per minute ("rpm") 2 @ 450 rpm

(4) Description of Primary Transmission Lines

The electrical interconnection between the turbine generation and the New York State Electric & Gas Corporation ("NYSEG") transmission system will be via the adjacent 46 kilovolt ("kV") transmission line. A new 46 kV tap will be performed at NYSEG pole #519 and a "slack span" of new 46 kV line will be extended to new poles approximately 45 feet above ground. The first set of new poles will be equipped with a fused group operated switch to protect and isolate the NYSEG transmission line from the new 46 kV line for the Project. The new 46 kV line will then continue to a new City-owned substation. The total length of the proposed 46 kV line will be approximately 460 feet. The ROW width for the 46

kV line will be approximately 100 feet. This substation will consist of a galvanized "H" frame termination structure with surge arresters, a group operated air break switch, primary net metering potential transformers ("PT's") and current transformers ("CTs"), an SF6 outdoor circuit breaker for transformer protection, and a 20/26.6 megavolt ampere ("MVA") oil filled transformer with concrete containment pad. A substation control house will be provided to house the protective relays for the transformer, a 120/240 volt ("V") alternating current ("AC") power panel for a battery charger, transformer fans and heat, and a direct current ("DC") battery bank for substation relay and breaker operations. The 120/240 V power source for the substation control house will originate in the adjacent maintenance building. The substation equipment inclusive from the H frame through the transformer will be located in a chain link fenced area with a gravel base. An overhead static wire system for lightning protection will be installed at the substation.

The secondary voltage from this substation will be 12.47 kV and will be run aerially from the transformer secondary bushings for 1200 feet, then 150 feet underground to the new powerhouse structure, because the existing 4.8 kV aerial line extending from the maintenance building to the low level release works building is inadequate for conveying the generator power output to NYSEG. The new aerial 12.47 kV from the transformer will consist of new poles approximately 30 feet above ground, conductors and cross arms capable of supporting the nominal 16 MVA of generation output. The ROW width for the 12.47 kV line will be approximately 30 feet. A fiber optic cable link will be installed from the new powerhouse switchgear to the substation. This link will enable communication for relay protection and for the required NYSEG transfer trip control to the generator breakers in the 12.47 kV switchgear.

The 12.47 kV service will terminate in a new metal clad 15 kV switchgear housing located in the new turbine powerhouse. This switchgear will contain vacuum circuit breakers, consisting of one 2000 ampere ("A") main, four 1200A generator breakers and one 1200A station service breaker. The switchgear will also contain the protective relays and controls for generator synchronization with utility power. New turbine generators will be connected to the switchgear within the powerhouse building utilizing polyvinyl chloride ("PVC") coated rigid steel raceways. The station service feeder will be connected to a new pad mounted cast coil (dry type) exterior 75 kVA transformer. The transformer secondary output at 120/208 V three phase will be connected to the existing motor control center ("MCC") on the outfall structure. A new 120/208 V panelboard to support basic building lighting, heating, ventilation and air conditioning ("HVAC") and miscellaneous power will be installed in the new powerhouse. This panel will be connected to the existing MCC in the low level outlet structure.

(5) Specifications of Additional Mechanical, Electrical, and Transmission Equipment Appurtenant to the Project

Other than the equipment described in the sections above that is necessary to construct the Project, no additional equipment is anticipated.

(6) Lands of the United States

There are no lands of the United States within the Project boundary (See Exhibit G for Project Boundary Maps).

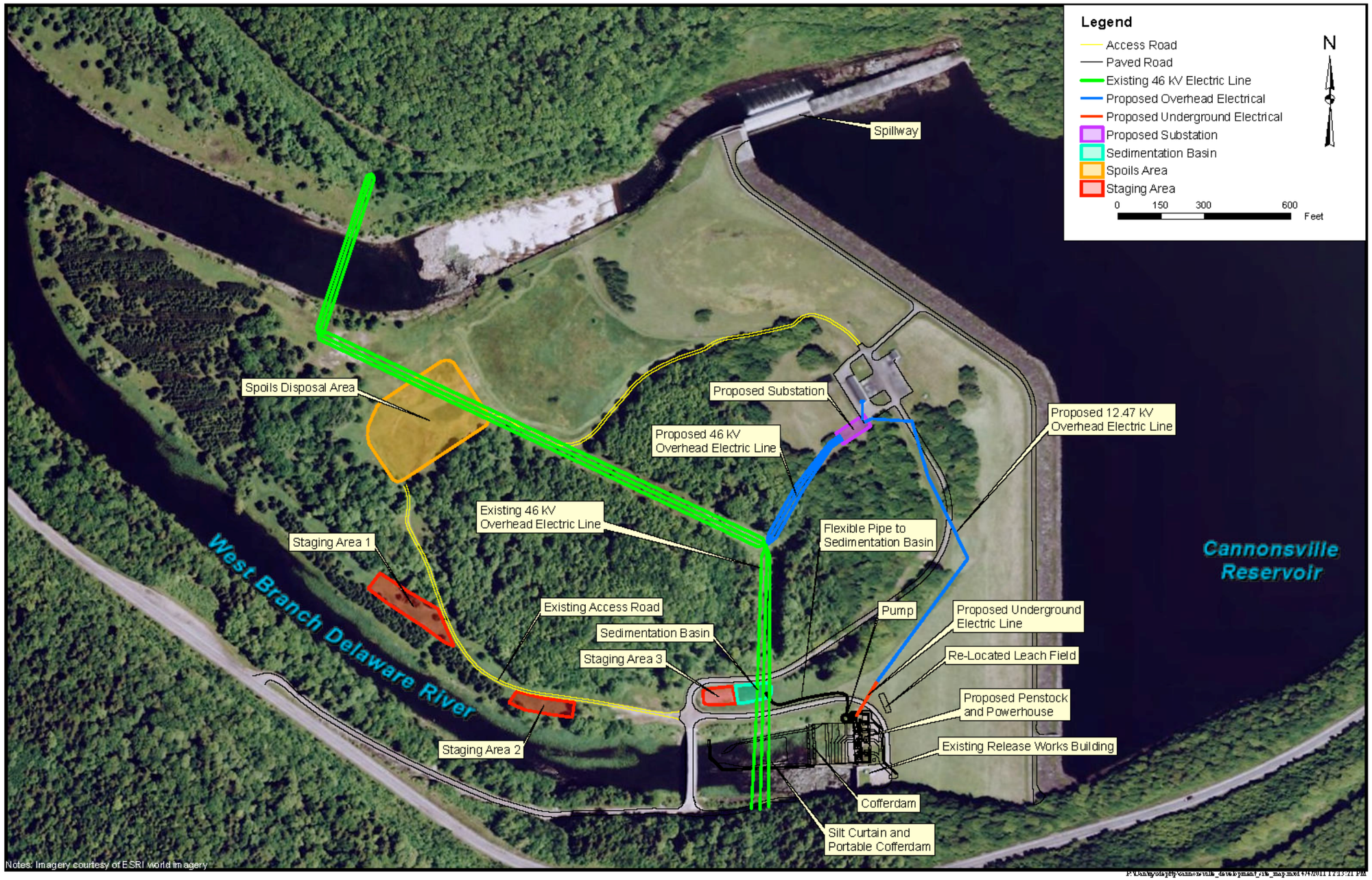


Figure A-1: Cannonsville Project Site Map

EXHIBIT B: PROJECT OPERATION AND RESOURCE UTILIZATION

(1) Project Operation

Background

In order to properly understand the proposed operation of the Project, it is important to provide background on the development of the Delaware River Basin for water supply, as well as background on how the Cannonsville Dam is operated.

In the 1920s, the States of NY and New Jersey ("NJ") and the Commonwealth of Pennsylvania ("PA") were interested in the development of water supplies in the Delaware River Basin as a source for meeting their individual needs. Between 1924 and 1927, these States made two attempts to forge an agreement for coordinated development of water supplies. Both attempts, however, were unsuccessful. In 1928, faced with little prospect of a multilateral agreement, and confronted with water shortages and growth pressures, the City, which lies outside the Delaware River Basin, moved to develop new sources of water supply from within the Basin. This action resulted in an interstate conflict and, in 1930, the State of NJ brought an action in the U.S. Supreme Court to enjoin the City and State of NY from using the waters of any tributary to the Delaware River. On May 25, 1931, the Court issued a decree granting the City the right to withdraw 440 million gallons per day ("MGD") of water from two reservoirs the City planned to build on headwater tributaries feeding the mainstem of the Delaware River. The reservoirs—Neversink on the Neversink River and Pepacton on the East Branch of the Delaware River—became fully operational in the late summer of 1955.

The 1931 decree controlled the States' and City's use of the Delaware River Basin waters for 23 years. In 1952, the City filed a petition with the Supreme Court seeking to increase its diversion of Delaware River Basin waters for water supply purposes. After a hearing before a Special Master, the Supreme Court issued a new decree which modified and superseded the 1931 decree. The 1954 decree permitted the City to increase its withdrawal rate to 800 MGD contingent upon its construction of a third in-basin water reservoir—the Cannonsville impoundment on the West Branch of the Delaware River, which was completed in 1967. The 1954 decree also required the City to release from its three upper basin reservoirs into the Delaware River a sufficient quantity of water to meet a flow objective of 1,750 cfs at Montague, NJ. The 1954 decree also permitted an out-of-basin diversion of 100 MGD to central and northeastern NJ. A River Master employed by the United States Geological Survey ("USGS") was appointed by the Court to administer specific provisions of the decree. Subsequently, in 1961, the Decree Parties entered into a compact with the federal government which created the Delaware River Basin Commission ("DRBC") to manage this regional resource. The compact empowers the Commission to allocate the waters of the basin to and among the states signatory to the compact and to impose conditions, obligations and release requirements with the limitation that the Commission may not impair, diminish, or otherwise adversely affect the diversions, compensating releases, rights, conditions, obligations or provisions established by the Supreme Court without unanimous consent of the Decree Parties. The DRBC has codified the management of the Delaware River Basin in its Comprehensive Plan, which is based on adaptive management principles. The Comprehensive Plan provides a forum for the Decree Parties and the Commission to adapt reservoir operations to hydraulic conditions and flow needs not contemplated by the Decree on a temporary basis. The Water Code of the River Basin, a component of the Comprehensive Plan, prescribes requirements for diversions, releases, flow objectives, and water quality that have been unanimously agreed upon by the Decree Parties and have gone through the DRBC's public process.

The DRBC Comprehensive Plan and Water Code have undergone several revisions since 1962. The last promulgation of the Water Code occurred in 1983. Since that time, the DRBC, with agreement of the

Decree Parties, has adopted many resolutions that have temporarily modified the provisions of the Comprehensive Plan and Water Code on an experimental basis. Two of the main revisions include Resolution No. 2004-3, DRBC Docket D-77-20 CP (Revision 7) and Resolution No. 2006-18, DRBC Docket D-77-20 (Revision 9). Revision 7 included interim releases from the Delaware River Basin reservoirs to protect tailwater fisheries in each river. Revision 9 included a temporary spill mitigation program for the Delaware River Basin reservoirs. Revisions 7 and 9 terminated on May 31, 2007, with the goal of developing a comprehensive plan for meeting the various water interests. This collaborative effort resulted in the development of the Flexible Flow Management Program ("FFMP"), which served as the applicable operating protocol from October 1, 2007 until May 31, 2011.

In May 2011, the Decree Parties unanimously agreed on a new operating protocol to govern operations of the City's Delaware River basin reservoirs (i.e., Cannonsville, Neversink and Pepacton) to replace the prior FFMP protocol. This new plan, referred hereinafter as FFMP with Operations Support Tool ("FFMP-OST") is currently slated to remain in effect until May 31, 2012, providing an option for the Decree Parties, by unanimous consent, to extend operation of the FFMP-OST for an additional year (i.e., until May 31, 2013). The FFMP-OST builds upon the design principles of the prior FFMP protocol and is intended to facilitate the redirection of water that would otherwise be spilled to managed water, thereby providing the potential for additional releases to benefit downstream rivers to improve protection of downstream habitats and help further cushion local storm impacts when water in the City's Delaware River basin reservoirs are forecasted to be available for purposes other than the water supply purposes to New York City.

The City plans to operate the Project in accordance with the requirements of the applicable operating protocol agreed to by the Decree Parties, as may be modified from time to time. The water available for generation at the Project will be comprised of conservation releases, directed releases, and water that would otherwise spill to the extent that such releases are consistent with discharge mitigation releases as outlined in such operating protocol.

For the purposes of this Application, the City has based the operation of the Cannonsville Hydroelectric Project on the FFMP-OST – the operating protocol agreed to by the Decree Parties in effect as of the date of this Application.

Flexible Flow Management Plan with Operations Support Tool

The FFMP-OST is a set of principles, rules, and procedures for the management of storage, water supply diversions, conservation releases, and flow targets relating to the apportioning of water from the Delaware River Basin under the 1954 decree that builds upon the framework of the prior FFMP protocol and is informed by the information and experience gained during the implementation of the prior FFMP protocol as well as input from various stakeholder groups and the public.

The prior FFMP protocol was intended to provide a more adaptive means for managing multiple and competing uses of storage with sustainable sources of water, while protecting water supply rights of the Decree Parties. The FFMP included the following aspects:

- managing discharges (conservation releases) from the City's Delaware River basin reservoirs;
- assisting in mitigating the impacts of flooding; and
- providing flow in the mainstem and the Delaware Bay to help protect ecological health, and support withdrawal and non-withdrawal uses.

Generally, the FFMP-OST differs from the prior FFMP protocol with respect to the following key elements:

- use of additional tables/schedules of reservoir release rates for the City's Delaware River basin reservoirs, which are developed on the basis of Forecast-based Available Water ("FAW") that is not contemporaneously needed to meet the water supply requirements of New York City;
- use of revised release tables replacing the tables utilized by the prior FFMP protocol;
- use of the City's OST to guide the selection of the appropriate governing release table;
- release rates based, in part, upon the joint recommendations of NYSDEC and the Pennsylvania Fish and Boat Commission set forth in such agencies' Joint Fisheries Paper dated January 12, 2010;
- use of consistent release rates across the release tables during drought conditions (L3, L4 and L5);
- modifications to NJ's diversion during drought conditions and the establishment of a Diversion Offset Bank for New Jersey;
- incorporation of the seasonal releases design from the Temporary Summer 2010 fisheries program conducted under the prior FFMP protocol;
- redirection of the Interim Excess Release Quantity ("IERQ") used to support the seasonal flow increment. (The IERQ under the prior FFMP protocol was intended to increase the Montague, NJ flow objective from 1,750 cfs to 1,850 cfs between June 15th and September 15th);
- use of 6,045 cfs-days of the IERQ to increase the base release rates in the tables;
- return to basing the Montague, NJ flow objective on the location of the Delaware Estuary salt front, and;
- modifying the spill mitigation program to endeavor to maintain reservoir levels at the Conditional Storage Objective ("CSO"), thereby creating a higher probability of maintaining ten percent void spaces in the City's Delaware River basin reservoirs from September 1, 2011 through March 15, 2012

The following section provides information regarding certain key parameters of the FFMP-OST that impact the operation of the Cannonsville Hydroelectric Project. Additional details regarding the FFMP-OST are included in the Agreement of the Parties to the 1954 U.S. Supreme Court Decree dated June 1, 2011 available at http://water.usgs.gov/osw/odrm/documents/ffmp_ost_052511_final.pdf.

(2) Key Elements of the FFMP-OST

DEP Water Supply Diversions

In accordance with the 1954 Supreme Court decree, the maximum total quantity of water diverted by DEP (combined for Cannonsville, Pepacton and Neversink Reservoirs) from June 1 to May 31 may not exceed 800 MGD, approximately 2,455 acre-feet/day; or 107 million cubic feet/day. Thus, over a standard calendar year of 365 days, the maximum withdrawal volume may not exceed 292,000 million gallons (approximately 896,119 acre-feet; or 39,035 million cubic feet).

Conservation Releases and Discharge Mitigation Releases for Cannonsville Reservoir

The FFMP-OST includes a Habitat Protection ("HPP") Program designed to protect the coldwater fisheries while maintaining aquatic community diversity, structure and function through improved ecological flow releases. The HPP consists of conservation releases designed for the protection of coldwater fisheries below the City's Delaware River basin reservoirs.

Under the FFMP-OST, DEP makes conservation releases from the City's Delaware River basin reservoirs in accordance with Figure B-1 and Figure B-2 and Table B-1 through Table B-7 (specific to the Cannonsville Reservoir only). As shown in Table B-1 through Table B-7, conservation releases from Cannonsville Reservoir vary based on the time of year, available storage capacity of all reservoirs (see

storage zones defined in Figure B-1 and Figure B-2 and FAW as determined by the OST. Generally, as the Cannonsville Reservoir storage declines, conservation releases also decline to preserve the drinking water supply. Likewise as the reservoir storage reaches level L1-a, L1-b, and L1-c, conservation releases generally increase.

Table B-1: Schedule of Cannonsville Releases (cfs) with 0 MGD FAW

Cannonsville Storage Zone	Winter		Spring		Summer			Fall		
	Dec 1-Mar 31	*Apr 1-Apr 30*	*May 1-May 20*	*May 21-May 31*	*Jun 1-Jun 15*	*Jun 16-Jun 30*	*Jul 1-Aug 31*	*Sep 1-Sep 15*	*Sep 16-Sep 30*	*Oct 1-Nov 30*
L1-a	1500	1500	*	*	*	1500	1500	1500	1500	1500
L1-b	400	400	*	*	*	*	400	400	400	400
L1-c	110	110	200	250	275	275	275	275	175	110
L2-a	75	75	150	200	225	225	225	225	150	75
L2-b	60	60	135	175	190	190	190	190	135	60
L3	55	55	85	85	135	135	135	85	85	85
L4	50	50	60	60	100	100	100	50	50	50
L5	40	40	40	40	90	90	90	40	40	40

* Indicates storage zone not present at this time period; release is entry in cell below

Table B-2: Schedule of Cannonsville Releases (cfs) with 10 MGD FAW

Cannonsville Storage Zone	Winter		Spring		Summer			Fall		
	Dec 1-Mar 31	*Apr 1-Apr 30*	*May 1-May 20*	*May 21-May 31*	*Jun 1-Jun 15*	*Jun 16-Jun 30*	*Jul 1-Aug 31*	*Sep 1-Sep 15*	*Sep 16-Sep 30*	*Oct 1-Nov 30*
L1-a	1500	1500	*	*	*	1500	1500	1500	1500	1500
L1-b	400	400	*	*	*	*	400	400	400	400
L1-c	125	125	225	300	300	300	300	300	200	125
L2-a	85	85	160	235	245	245	245	235	160	85
L2-b	70	70	140	200	210	210	210	200	140	70
L3	55	55	85	85	135	135	135	85	85	85
L4	50	50	60	60	100	100	100	50	50	50
L5	40	40	40	40	90	90	90	40	40	40

* Indicates storage zone not present at this time period; release is entry in cell below

Table B-3: Schedule of Cannonsville Releases (cfs) with 20 MGD FAW

Cannonsville Storage Zone	Winter		Spring		Summer			Fall		
	Dec 1-Mar 31	*Apr 1-Apr 30*	*May 1-May 20*	*May 21-May 31*	*Jun 1-Jun 15*	*Jun 16-Jun 30*	*Jul 1-Aug 31*	*Sep 1-Sep 15*	*Sep 16-Sep 30*	*Oct 1-Nov 30*
L1-a	1500	1500	*	*	*	1500	1500	1500	1500	1500
L1-b	500	500	*	*	*	*	500	500	500	500
L1-c	150	200	250	300	325	325	325	325	225	150
L2-a	90	140	175	260	275	275	275	260	170	90
L2-b	80	90	150	220	240	240	240	220	145	80
L3	55	55	85	85	135	135	135	85	85	85
L4	50	50	60	60	100	100	100	50	50	50
L5	40	40	40	40	90	90	90	40	40	40

* Indicates storage zone not present at this time period; release is entry in cell below

Table B-4: Schedule of Cannonsville Releases (cfs) with 35 MGD FAW

Cannonsville Storage Zone	Winter		Spring		Summer			Fall		
	Dec 1-Mar 31	*Apr 1-Apr 30*	*May 1-May 20*	*May 21-May 31*	*Jun 1-Jun 15*	*Jun 16-Jun 30*	*Jul 1-Aug 31*	*Sep 1-Sep 15*	*Sep 16-Sep 30*	*Oct 1-Nov 30*
L1-a	1500	1500	*	*	*	1500	1500	1500	1500	1500
L1-b	600	600	*	*	*	*	600	600	600	600
L1-c	175	250	300	375	400	400	400	375	275	175
L2-a	110	175	225	300	325	325	325	300	210	110
L2-b	90	115	175	250	275	275	275	250	150	90
L3	55	55	85	85	135	135	135	85	85	85
L4	50	50	60	60	100	100	100	50	50	50
L5	40	40	40	40	90	90	90	40	40	40

* Indicates storage zone not present at this time period; release is entry in cell below

Table B-5: Schedule of Cannonsville Releases (cfs) with 50 MGD FAW

Cannonsville Storage Zone	Winter		Spring		Summer			Fall		
	Dec 1-Mar 31	*Apr 1-Apr 30*	*May 1-May 20*	*May 21-May 31*	*Jun 1-Jun 15*	*Jun 16-Jun 30*	*Jul 1-Aug 31*	*Sep 1-Sep 15*	*Sep 16-Sep 30*	*Oct 1-Nov 30*
L1-a	1500	1500	*	*	*	1500	1500	1500	1500	1500
L1-b	700	700	*	*	*	*	700	700	700	700
L1-c	200	325	400	400	500	500	500	400	325	200
L2-a	125	200	250	325	400	400	400	325	250	125
L2-b	100	150	200	275	300	300	300	275	150	100
L3	55	55	85	85	135	135	135	85	85	85
L4	50	50	60	60	100	100	100	50	50	50
L5	40	40	40	40	90	90	90	40	40	40

* Indicates storage zone not present at this time period; release is entry in cell below

Table B-6: Schedule of Cannonsville Releases (cfs) with 75 MGD FAW

Cannonsville Storage Zone	Winter		Spring		Summer			Fall		
	Dec 1-Mar 31	*Apr 1-Apr 30*	*May 1-May 20*	*May 21-May 31*	*Jun 1-Jun 15*	*Jun 16-Jun 30*	*Jul 1-Aug 31*	*Sep 1-Sep 15*	*Sep 16-Sep 30*	*Oct 1-Nov 30*
L1-a	1500	1500	*	*	*	1500	1500	1500	1500	1500
L1-b	700	700	*	*	*	*	700	700	700	700
L1-c	225	475	475	525	600	600	600	475	375	225
L2-a	150	400	400	400/450+	500/525+	500/525+	500/525+	400	300	150
L2-b	100	150	200	275	300	300	300	275	200	100
L3	55	55	85	85	135	135	135	85	85	85
L4	50	50	60	60	100	100	100	50	50	50
L5	40	40	40	40	90	90	90	40	40	40

* Indicates storage zone not present at this time period; release is entry in cell below

+ Second entry after slash indicates reduction in release rate for New Jersey Diversion Offset Bank

Table B-7: Schedule of Cannonsville Releases (cfs) with 100 MGD FAW

Cannonsville Storage Zone	Winter		Spring		Summer			Fall		
	Dec 1-Mar 31	*Apr 1-Apr 30*	*May 1-May 20*	*May 21-May 31*	*Jun 1-Jun 15*	*Jun 16-Jun 30*	*Jul 1-Aug 31*	*Sep 1-Sep 15*	*Sep 16-Sep 30*	*Oct 1-Nov 30*
L1-a	1500	1500	*	*	*	1500	1500	1500	1500	1500
L1-b	700	700	*	*	*	*	700	700	700	700
L1-c	225	475	475	525	600	600	600	475	375	225
L2-a	150	400	400	400/450+	500/525+	500/525+	500/525+	400	300	150
L2-b	150	400	400	400/450+	500/525+	500/525+	500/525+	400	300	150
L3	55	55	85	85	135	135	135	85	85	85
L4	50	50	60	60	100	100	100	50	50	50
L5	40	40	40	40	90	90	90	40	40	40

* Indicates storage zone not present at this time period; release is entry in cell below
+ Second entry after slash indicates reduction in release rate for New Jersey Diversion Offset Bank

In addition to the conservation releases discussed above, in order to enhance flood mitigation already provided by the City's Delaware River basin reservoirs, DEP also makes certain discharge mitigation releases from such reservoirs in accordance with the following guidelines:

- For the period June 16 through April 30, if the combined (Cannonsville, Pepacton and Neversink reservoirs) reservoir usable storage is in Zone L1 (see Figure B-1) discharge mitigation releases shall be made based upon individual reservoir usable storage in accordance with Zones L1-a, L1-b and L1-c as provided in Figure B-2 and Table B-1 through Table B-7, as applicable. During the period October 1 through April 30, 50% of the water equivalent of snowpack in the watershed above the reservoir shall be included in the determination of combined and individual reservoir usable storage in relation to Figure B-1 and Figure B-2 provided, however, that, under certain circumstances and subject to certain conditions and limitations, DEP may increase the water equivalent of snowpack in the watershed above the reservoirs to be included in determination of combined and individual reservoir usable storage to 100%.

- For the period May 1 through June 15, Zones L1-a and L1-b shall not be applicable in accordance with Figure B-2, and discharge mitigation releases shall be made in accordance with Zone L1-c as provided in Figure B-2 and Table B-1 through Table B-7, as applicable.

Flow Objectives on Delaware River at Montague, New Jersey - Directed Releases

Releases from the City's Delaware River basin reservoirs should be in quantities designed to maintain, during normal storage conditions (L1 and L2, as shown in Figure B-1), a minimum basic rate of flow of 1,750 cfs at the USGS gage on the Delaware River at Montague, NJ, as directed by the Delaware River Master in accordance with the 1954 Supreme Court decree.

During drought conditions (L3 through L5, as shown in Figure B-1), the flow objective for Montague, NJ varies based upon the time of year and location of the Delaware Estuary salt front in accordance with Table B-8.

The Delaware River Master orders directed releases on a daily basis for the purpose of meeting the applicable flow objective at Montague, NJ. The City must comply with these directives but may use any of the three Delaware River basin reservoirs to meet the flow target. The drainage area at the Montague USGS gage is 3,480 mi^2.

Drought Management

Figure B-1 defines five zones (L1, L2, L3, L4 and L5) of combined reservoir usable storage for Cannonsville, Pepacton, and Neversink reservoirs. Three of the zones constitute drought conditions: (1) Drought Watch (L3); (2) Drought Warning (L4); and (3) Drought Emergency (L5). Additionally, the Normal zone is defined by two zones (L1 and L2). Shown in Table B-8 are the diversions, and flow objectives based on the storage available in the City's Delaware River basin reservoirs.

Table B-8: Interstate Operation Formula for Diversions and Flow Objectives

NYC Storage Condition	NYC Diversion (MGD)	NJ Diversion (MGD)	Montague Flow Objective (cfs)	Trenton Flow Objective (cfs)
Normal (L1, L2)	800	100	1,750	3,000
Drought Watch (L3)	680	100	1,650	2,700
Drought Warning (L4)	560	100	1,550	2,700
Drought Emergency (L5)	520	85	1,100-1,650*	2,500-2,900*
Severe Drought	(to be negotiated depending upon conditions)			

*Varies with time of year and location of Delaware Estuary salt front

Interim Excess Release Quantity

An IERQ in an amount equal to 15,468 cfs-days is provided. This amount is computed as 83% of the difference between 1,257 MGD (i.e., the highest year's consumption of the City's water supply system between 2002 and 2006) and 1,290 MGD (i.e., the City's current estimate of continuous safe yield of the City's water supply system obtainable without pumping).

Pursuant to the FFMP-OST, 6,045 cfs-days of the IERQ was incorporated into the release tables to increase the base releases from the City's Delaware River basin reservoirs. The balance of the IERQ amount (i.e., 9,423 cfs-days) is reserved and may be used for additional releases to meet the applicable Trenton, NJ flow objective during normal reservoir storage conditions (L1 and L2), as determined pursuant to Table B-8, during the June 15 through March 15 period. However, the IERQ required to be released by the City during such period for these purposes shall not exceed 70 BG.

In addition, if unanimously agreed to by the Decree Parties, the remaining balance of the IERQ or a portion thereof can be used to establish an Extraordinary Needs Bank. Such Extraordinary Needs Bank would be used to provide extraordinary water needs to support such research, aquatic-life, or other water-use activity as may be approved by DRBC.

Proposed Mode of Operation

The City plans to operate the Project in accordance with the requirements of the applicable operating protocol agreed to by the Decree Parties, as may be modified from time to time. The water available for generation at the Project will be comprised of conservation releases, directed releases, and water that would otherwise spill to the extent that such releases are consistent with discharge mitigation releases as outlined in such operating protocol. For the purposes of this Application, the City has based the operation of the Project on the FFMP-OST (i.e., the operating protocol agreed to by the Decree Parties in effect as of the date of this Application).

The City plans on automating the Project by remotely operating the turbines from DEP's Grahamsville office.

(3) Average Annual Generation, Plant Factor, Dependable Capacity

Operations Model

The DEP has developed a simulation model of the City's water supply system (*i.e.*, all 19 impoundments including Cannonsville Reservoir). The model, called the New York City Water Supply Operational Analysis Simulation of Integrated Systems ("OASIS"), which is a proprietary version of the publicly available OASIS model, simulates the water supply demands, conservation releases, directed releases, water level drawdowns, discharge mitigation releases, and other requirements set forth in the FFMP-OST. Output from the OASIS model includes daily reservoir elevation, total discharge, hydropower discharge, conservation release, water supply withdrawal, and spillage. The rules of the FFMP-OST were incorporated into the model to simulate the estimated discharges from the Cannonsville Reservoir using the historic inflow hydrology. Note that for modeling purposes the City's full 800 MGD allocation is included in the analysis.

Historic inflow to Cannonsville Reservoir was computed using a USGS gage on the West Branch of the Delaware River above the impoundment that measures 73% of the inflow. The model includes a set of rules dictating how each of the City's Delaware River basin reservoirs will operate. For example, if flow on the Delaware River drops below the prescribed flow objective for Montague, NJ, the OASIS model will require releases from the City's Delaware River basin reservoirs, as needed, to maintain the applicable Montague prescribed flow. The model's period of record extends from 1948 to 2008. Although some of the Delaware River Basin reservoirs were constructed after 1948, for modeling purposes it was assumed that all of the reservoirs were in place in 1948. The purpose of the modeling effort was to determine how the reservoirs would operate under conditions in the FFMP-OST based on using long-term historic inflow information. The general premise is that the previous 61 years of inflow will be representative of future inflows.

Estimated Average Annual Generation and Hydraulic Capacity of Power Plant

The OASIS model simulated the FFMP-OST conditions. Model outputs—discharges and reservoir elevations—were used along with other inputs in a post-processor to compute daily generation over the 61 years of record. Other inputs to the post-processor included a headloss rating curve, tailwater rating curve, turbine/generator efficiency curve, and the minimum and maximum hydraulic capacity of the turbines. The post-processor computed daily, monthly and annual generation.

The average annual generation was computed by averaging the total annual generation for the 61 years of record. To account for scheduled and unscheduled outages, the computed average annual generation was decreased by 5%. Based on the foregoing, the estimated average annual generation is 42,281 megawatt-hours ("MWh") per year for the Project.

Annual Plant Factor

The total capacity of the Project is 14.08 MW. If the Project were to operate continuously at full capacity year round, it would produce approximately 123,340 MW. Thus, the annual plant factor equates to approximately 34% (42,281 MWh/123,340 MWh).

Estimate of Dependable Capacity

Discharges available for generation at the Project will be governed by the applicable operating protocol agreed to by the Decree Parties, and will be a function of the releases from the Cannonsville Reservoir as required by such operating protocol. For example, when the Cannonsville Reservoir elevation is

exceptionally low, DEP will not release up to the maximum hydraulic capacity of the Project (i.e., 1,500 cfs) as it could impact available water supply withdrawals. Based on the conservation flow releases during Drought Emergency (L5) conditions for the FFMP-OST, which vary seasonally (see Table B-1 through Table B-7), there may be instances where no generation occurs because the lowest potential conservation release flow during such conditions (i.e., 40 cfs) is less than the lowest flow needed to spin the smallest turbine (i.e., 50 cfs).

According to Civil Engineering Guidelines for Planning and Designing Hydroelectric Developments published by the American Society of Civil Engineers (1989), dependable capacity is defined as "*the load-carrying ability of a power plant under adverse load and flow conditions*." For a hydroelectric facility with operating characteristics similar to the Project, this would occur during a period of high demand and low flow. For the Project, November is the lowest discharge month, but not the highest demand period. Typically, the highest demand period is August. The median flow during November and August, based on the FFMP-OST, is 150 cfs and 600 cfs, respectively. The median reservoir elevation during November and August based on the FFMP-OST is 1123.53 and 1133.51 feet above msl, respectively. The resulting dependable capacity of the Project may vary from approximately 1,586 kW to 5,088 kW, in November and August, respectively.

Power Plant Capacity versus Head

Figure B-3 and Figure B-4 show the relationship between power plant capacity, head and flow for a 625 cfs turbine and 125 cfs turbine, respectively.

(4) Minimum, Mean and Maximum Flows

The USGS currently operates two gaging stations in close proximity to the Project as summarized in Table B-9. One gaging station, located on the West Branch of the Delaware River at Walton, NY, measures 73% of the inflow to Cannonsville Reservoir. A second gage on the West Branch of the Delaware River at Stilesville, NY, located just below Cannonsville Dam, measures the total discharge from Cannonsville Dam, including spill.

Table B-9: USGS Gages in Proximity to the Project

Gage No.	Gage Name	Period of Record	Drainage Area	Comments
01350000	West Br. Delaware River at Walton, NY	Oct 1950-Sep 2007	332 mi^2	Measures 73% of the inflow to Cannonsville Reservoir
01350101	West Br. Delaware River at Stilesville, NY	Jan 1964-Sep 2007	456 mi^2	Measures discharge directly below Cannonsville Dam

Shown in Table B-10 are monthly and annual maximum, minimum, median, and mean flows for the period of available stream flow record for both USGS gages.

Table B-10: Flow Statistics for USGS Gages in Proximity to the Project

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
West Branch Delaware River at Walton, NY, Drainage Area = 332 mi^2, Period of Record: Oct 1950-Sep 2007													
Min	70	64	74	191	96	36	21	16	13	14	14	17	13
Max	14,500	10,300	16,000	14,500	7,390	22,400	5,430	8,650	11,700	8,860	13,300	10,700	22,400
Mean	669	665	1,117	1,281	669	396	213	162	231	366	643	739	595
Median	358	380	780	923	492	228	121	82	80	152	431	500	330
West Branch Delaware River at Stilesville, NY, Drainage Area = 456 mi^2, Period of Record: Jan 1964-Sep 2007													
Min	7	7	9	11	24	23	16	26	19	18	16	8	7
Max	7,730	7,340	12,500	13,300	6,780	27,700	7,430	2,340	9,620	6,570	9,230	7,760	27,700
Mean	382	411	821	1,260	701	573	619	628	600	550	355	412	640
Median	51	95	299	973	419	346	427	551	498	320	47	47	333

Note: Cannonsville Dam was constructed in 1964. All flows in cfs.

Shown in Figure B-5 through Figure B-8 are monthly flow duration curves (three months per figure), and shown in Figure B-9 is an annual flow duration curve based on the flows recorded at the USGS Gage below the Cannonsville Dam. Also shown on the monthly flow duration curves are the discharges under the FFMP-OST as predicted by the OASIS model. The period of record for the USGS gage data and FFMP-OST data varies as shown on the figures.

Shown in Table B-11 are flow statistics at the West Branch of the Delaware River just below the Cannonsville Dam based on the FFMP-OST OASIS modeling results.

Table B-11: Flow Statistics at West Branch Delaware River just below Cannonsville Dam based on OASIS Modeling Results

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
West Branch Delaware River at Cannonsville Dam, Drainage Area = 456 mi^2, Period of Record: 1948-2008, OASIS Modeling Results													
Min	40	40	40	40	40	90	135	90	40	40	40	40	40
Max	6,124	4,679	10,407	15,321	6,727	27,188	7,246	1,823	6,701	7,728	3,477	6,720	27,188
Mean	490	523	708	1,266	576	545	669	659	595	531	337	410	610
Median	225	225	465	1,300	300	500	530	600	475	276	150	150	410

All flows in cfs.

(5) Operation: Adverse, Mean, and High Water Years

The hydraulic capacity of the hydropower facility ranges from 50 to 1,500 cfs. Under the FFMP-OST, during Drought Emergency (L5), conservation releases may be less than 50 cfs during certain times of the year, in which case discharges would be maintained through the existing low level release works and no generation would occur. However, so long as discharges are above 50 cfs, one of the two smaller turbines will operate.

Under average annual release conditions (approximately 610 cfs, based on OASIS model), one large turbine will operate. In general, as the discharge increases, the appropriate number of turbines will be brought on-line to maximize generation. The turbines have been sized such that there is continuous generation for discharges between 50 cfs and 1,500 cfs.

The operation of the Project during high flows is dependent on anticipated inflow, reservoir elevation, and the river stage on the West Branch of the Delaware River. A USGS gage at Hale Eddy, approximately eight miles downstream of Cannonsville Dam, is monitored such that Cannonsville Reservoir releases are

managed to stay within two feet of the flood stage. Under high flow events, discharges are still governed by the FFMP-OST. Discharges up to 1,500 cfs may be released depending on the river stage at Hale Eddy and available reservoir storage.

(6) Area Capacity Curve and Rule Curve

Figure B-10 is the Cannonsville Reservoir elevation versus storage curve. The usable storage capacity between the intake elevation and the spillway crest elevation is 92.726 BG or 296,840,000 acre-feet.

Figure B-11 shows the following:

- The average daily reservoir elevation based on OASIS modeling for the period 1948-2008.
- The average daily reservoir elevation based on observed data for the period 1982-2007.
- The spillway crest elevation = 1150 feet above msl.
- The intake sill elevation = 1020.5 feet above msl.
- The 1963 reservoir elevations based on OASIS modeling for the period 1948-2008. The year 1963 had the largest drawdown elevation over the 61-year period of record.
- The 2001 observed reservoir elevations based on the period 1982-2007. The year 2001 had the largest observed drawdown elevation over the 25-year period of record.

The latter two annual reservoir elevation data were added to Figure B-11 to illustrate the range of potential drawdown.

Under average hydrologic conditions, the reservoir elevation is maintained just below the spillway crest in May and June. Starting in mid-June through approximately November, the reservoir elevation is slowly drawn down to meet water supply needs, conservation flow releases, directed releases, and to create storage for the spring freshet. Maximum drawdown generally occurs in November; however, the extent and timing of the maximum drawdown varies annually and is driven by several factors including snowpack, water supply needs, conservation flow releases, directed releases, discharge mitigation releases, and anticipated precipitation. Generally, the greater the moisture content of the snowpack, the larger the reservoir drawdown. Reservoir refill occurs during March and April due to precipitation and snowmelt.

(7) Tailwater Rating Curve

A hydraulic model was developed to estimate the relationship between the tailwater elevation and flow below the low-level release works for purposes of developing a tailwater rating curve. To develop the hydraulic model, river and bridge[2] cross-section data were surveyed in December 2009. The survey data and flows recorded at the USGS gage below the dam were used to calibrate the hydraulic model to measured water surface elevations at various cross-sections. The uppermost cross-section in the hydraulic model was located immediately below the low-level release works at the powerhouse location; the rating curve (water surface elevation versus flow) for this cross-section represents the tailwater rating curve as shown in Figure B-12.

(8) Power Utilization

A minimal amount of power produced at the Project may be used on-site to offset on-site electricity requirements; however, the bulk of the power will be sold into the wholesale markets administered by the

[2] An access bridge is located just below the low-level release works.

New York Independent System Operator, Inc. ("NYISO") or disbursed through a power purchase agreement.

(9) Plans for Future Development

The City only plans on developing the hydropower facilities at Cannonsville that are proposed in this Application. The City is considering developing hydropower facilities at its two other Delaware River Basin reservoirs (i.e., Neversink and Pepacton).

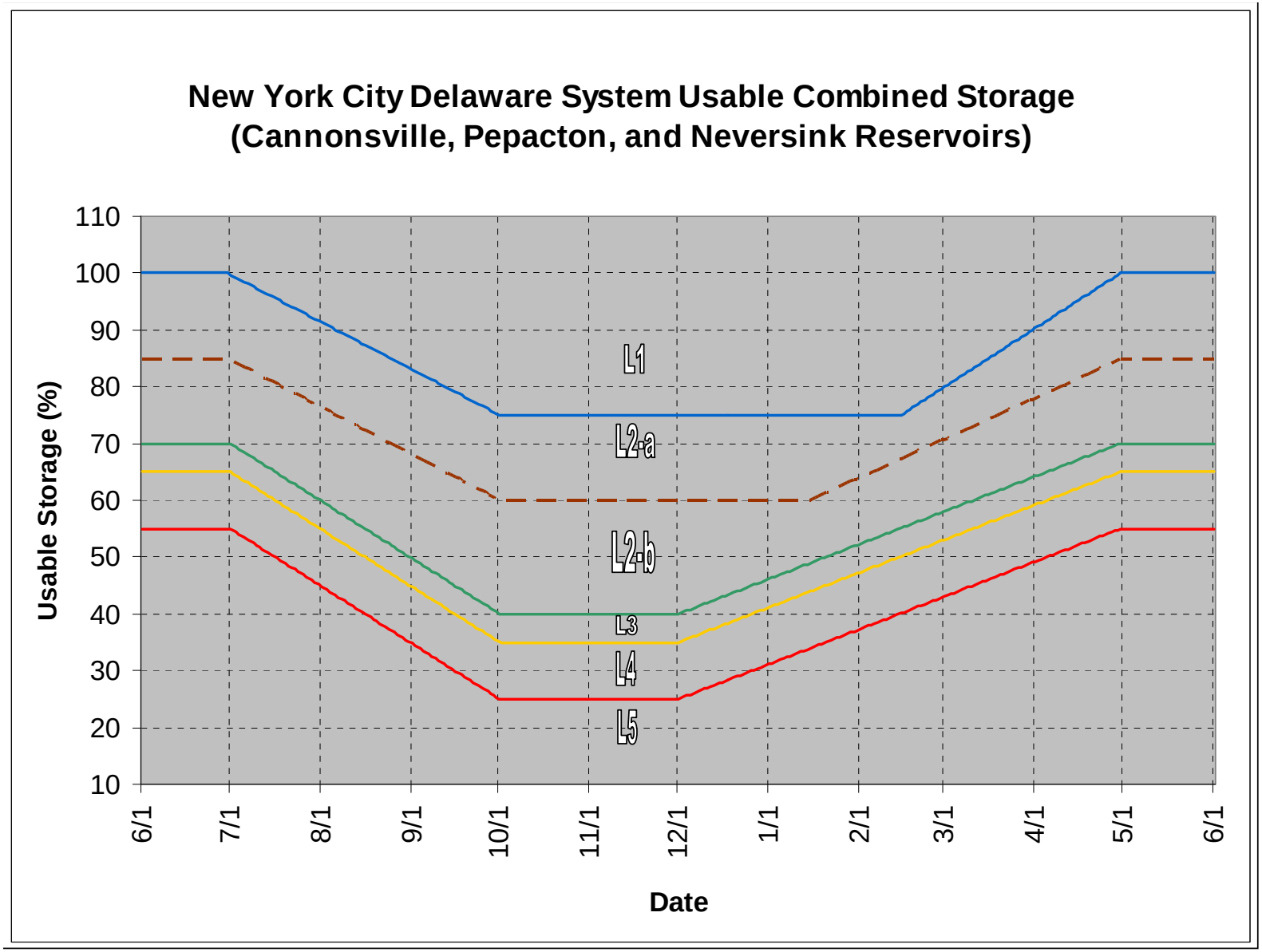


Figure B-1: NYC Delaware System Usable Combined Storage

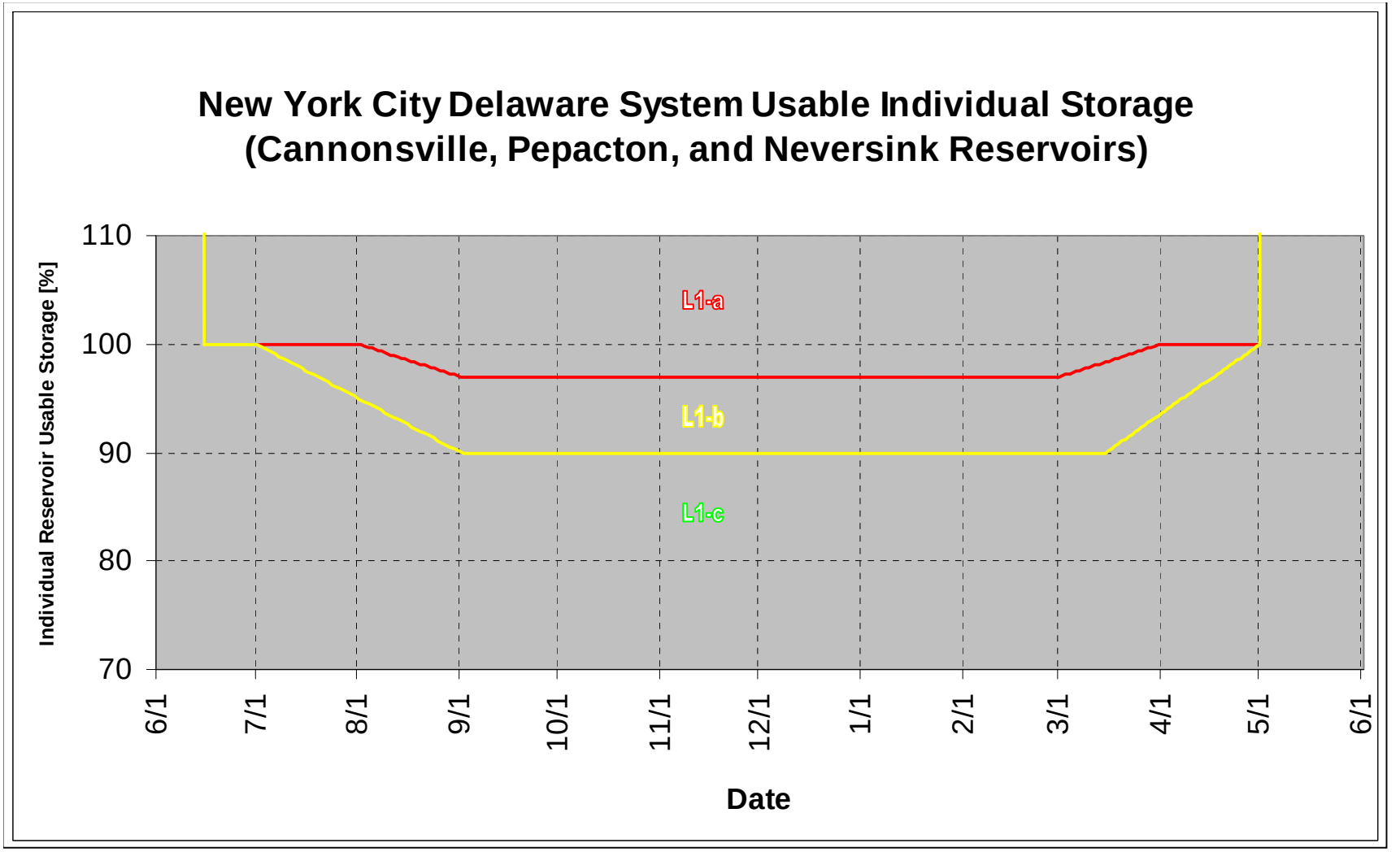


Figure B-2: NYC Delaware System Usable Individual Storage

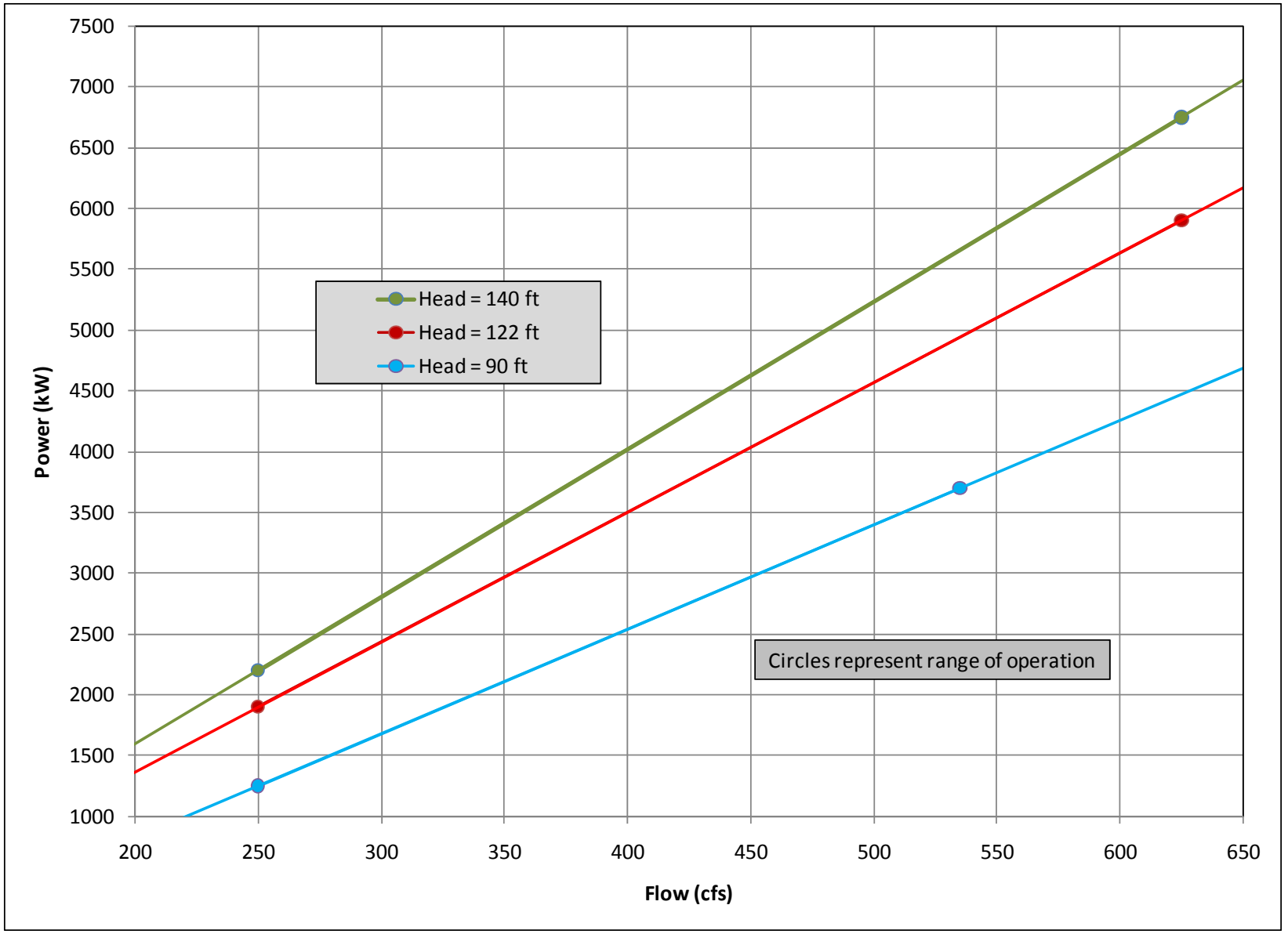


Figure B-3: Power Plant Capacity versus Head and Flow for 625 cfs Turbine

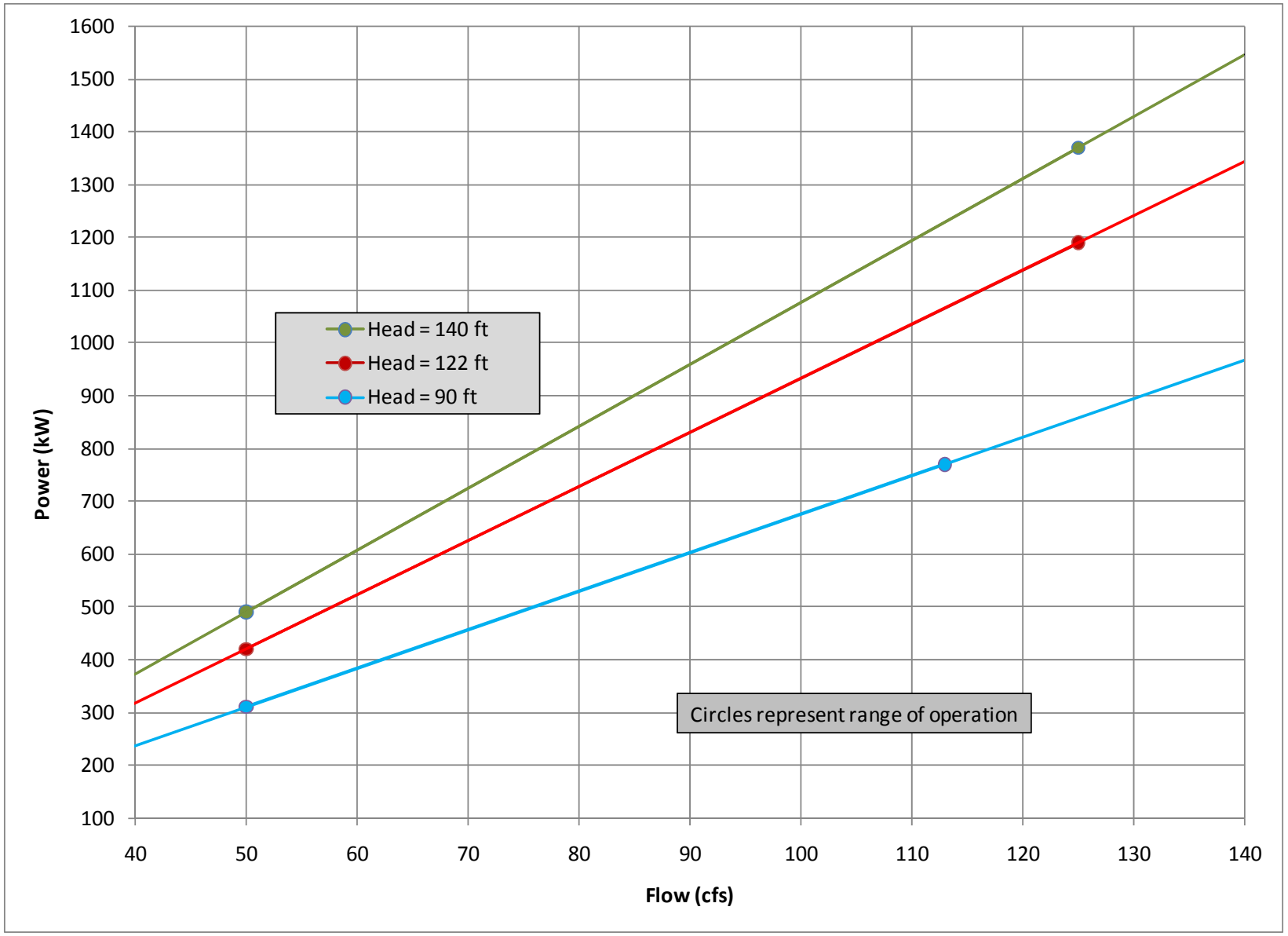


Figure B-4: Power Plant Capacity versus Head and Flow for 125 cfs Turbine

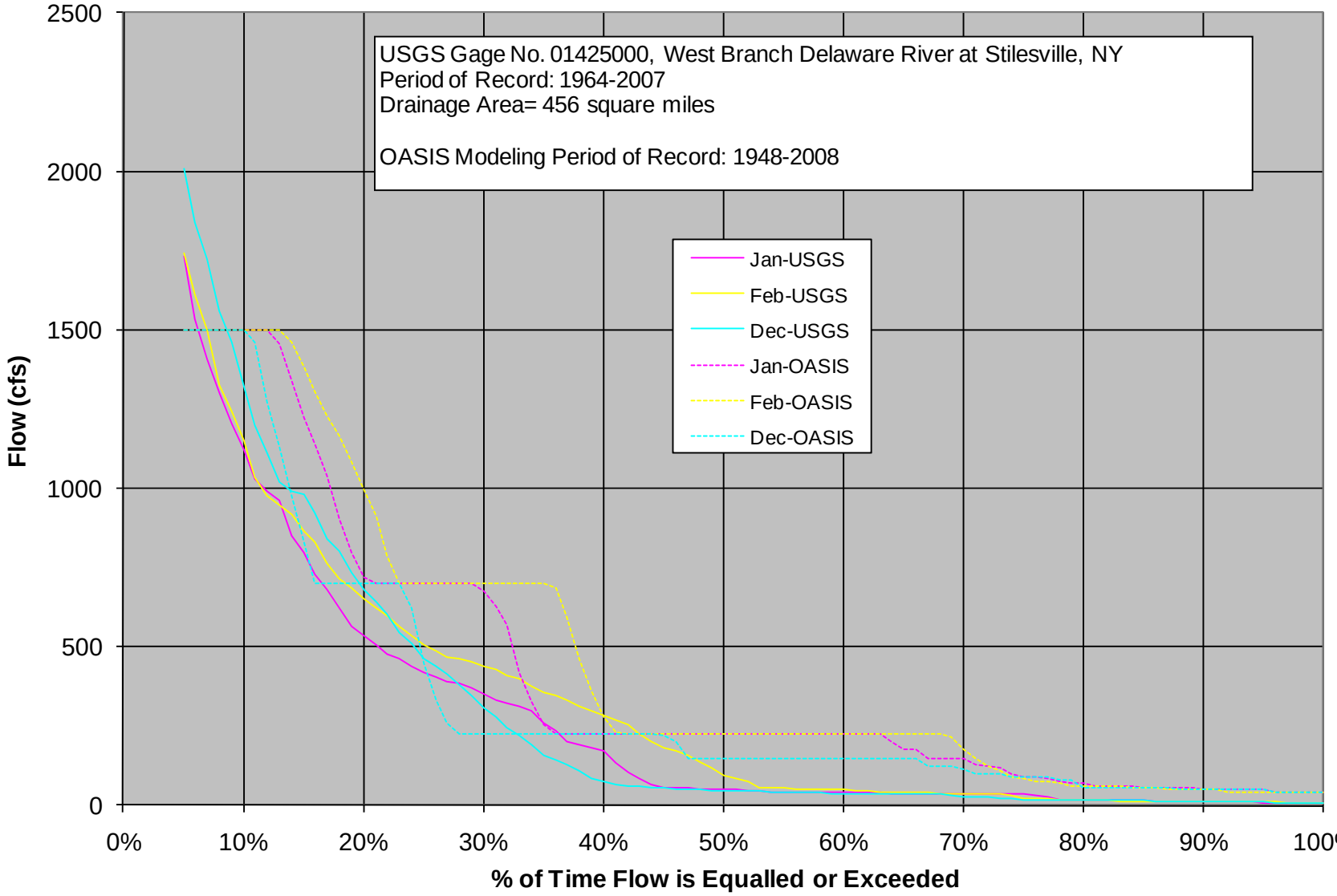


Figure B-5: West Branch Delaware River below Cannonsville Dam – Monthly Flow Duration Curves for Dec, Jan, & Feb (USGS Gage and OASIS Results), Drainage Area = 456 mi^2

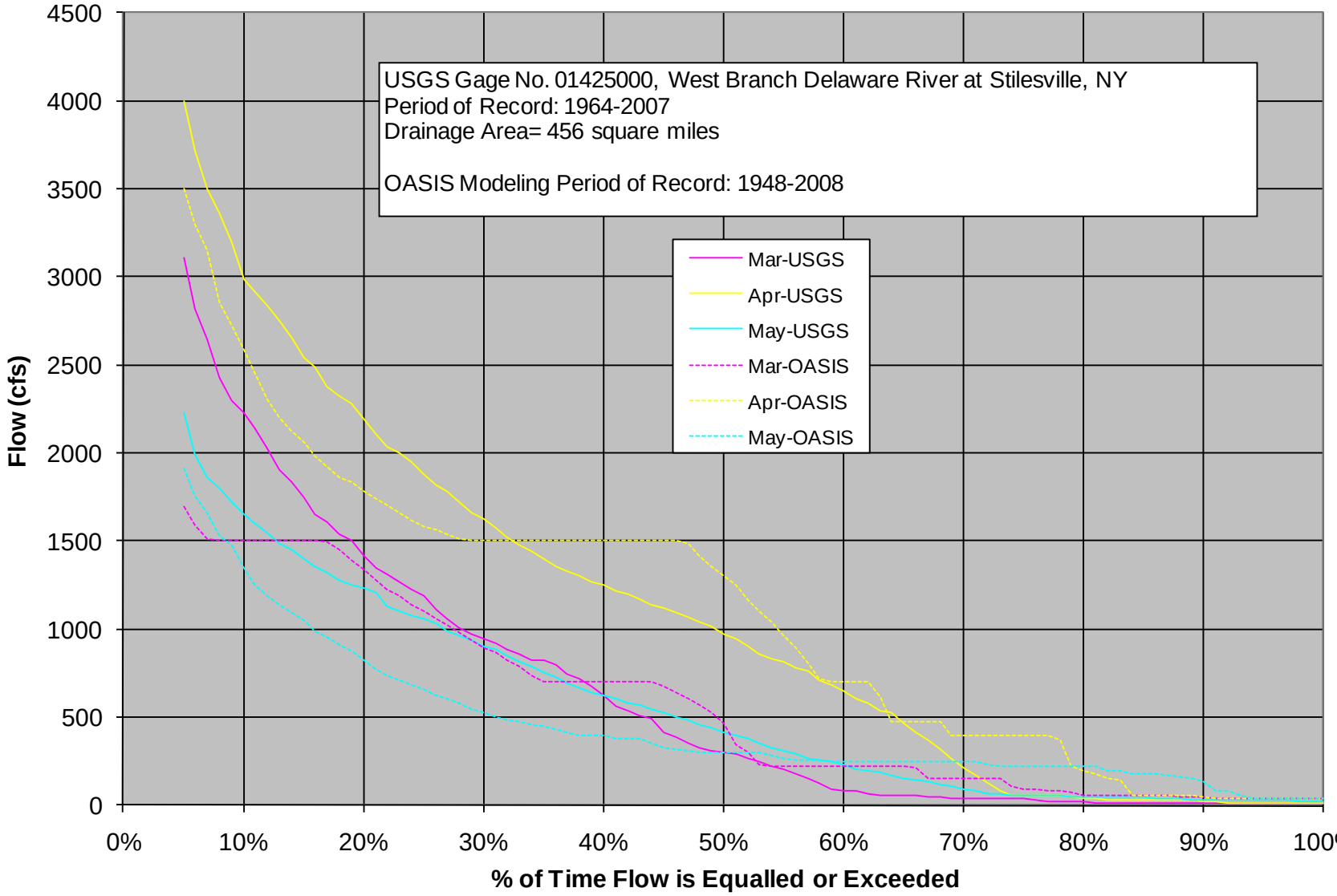


Figure B-6: West Branch Delaware River below Cannonsville Dam – Monthly Flow Duration Curves for Mar, Apr & May (USGS Gage and OASIS Results), Drainage Area = 456 mi^2

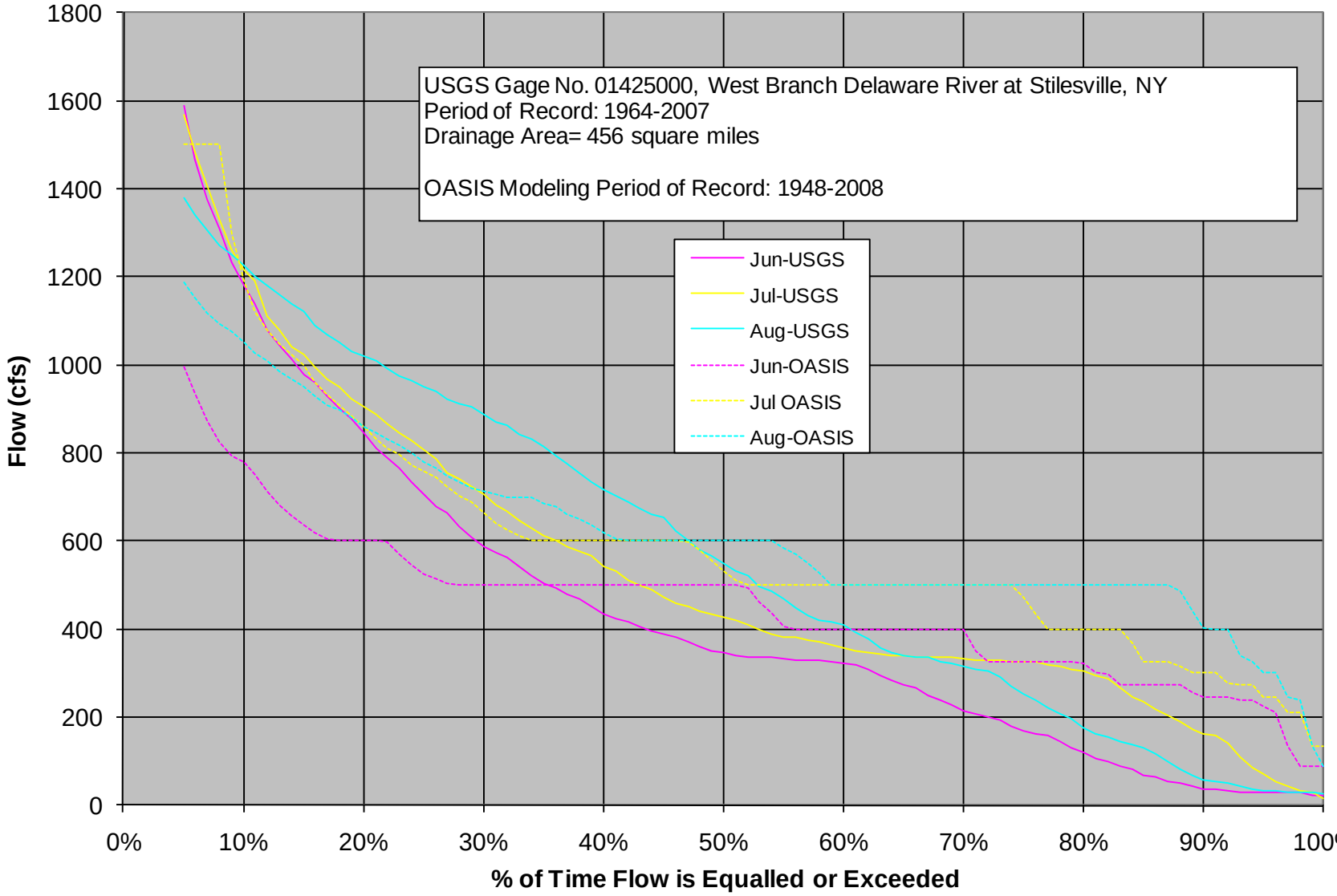


Figure B-7: West Branch Delaware River below Cannonsville Dam – Monthly Flow Duration Curves for Jun, Jul & Aug (USGS Gage and OASIS Results), Drainage Area = 456 mi^2

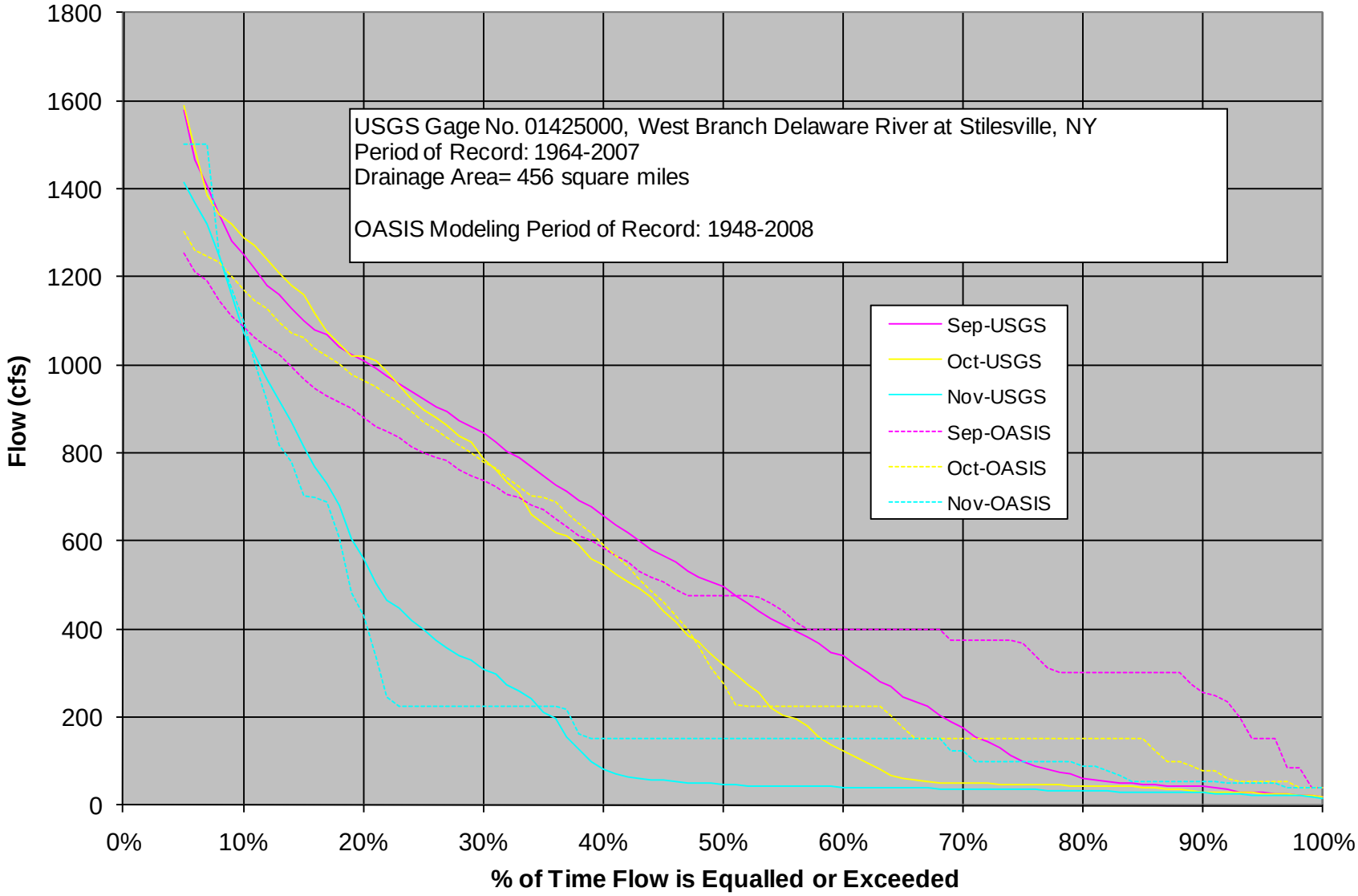


Figure B-8: West Branch Delaware River below Cannonsville Dam – Monthly Flow Duration Curves for Sep, Oct, & Nov (USGS Gage and OASIS Results), Drainage Area = 456 mi^2

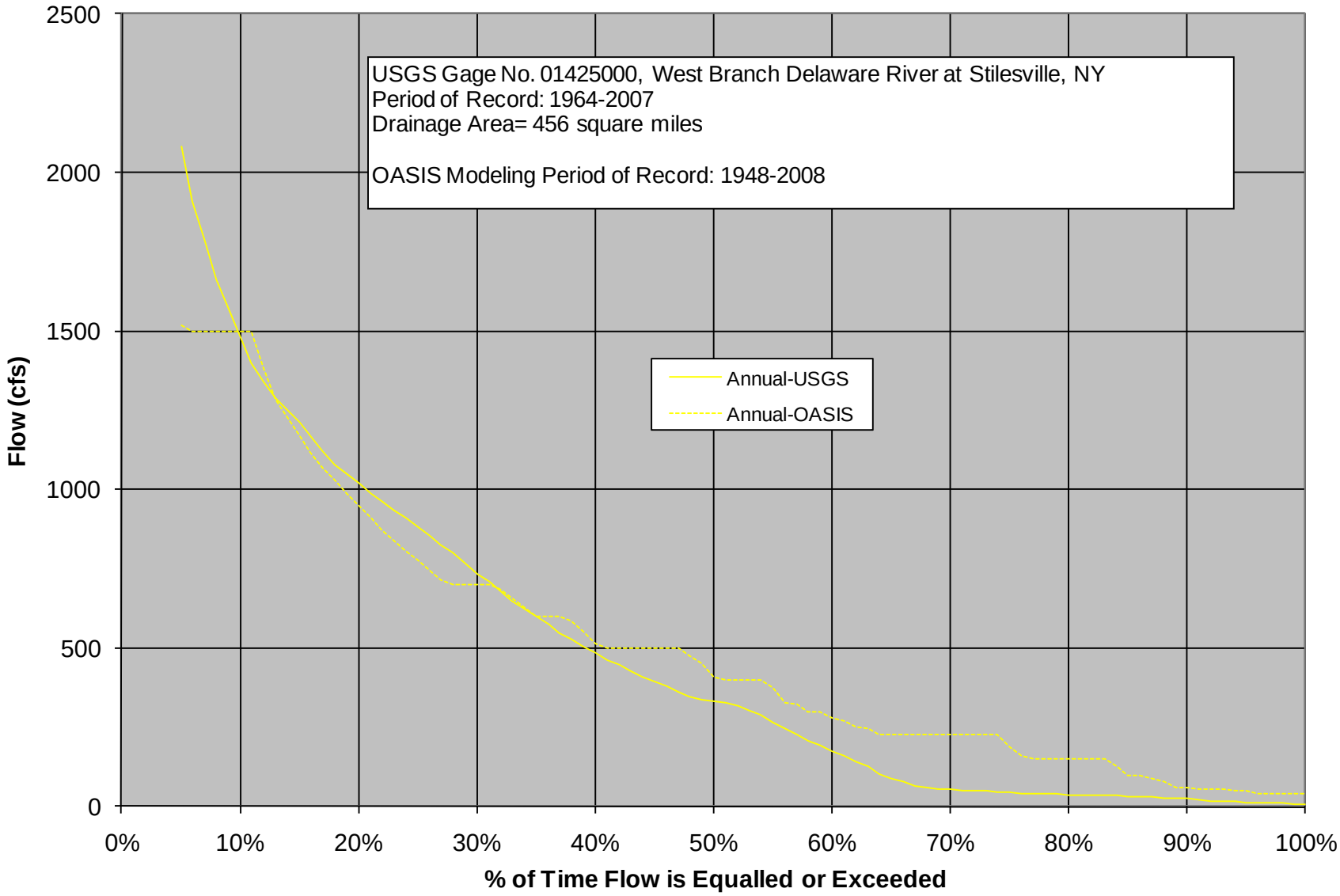


Figure B-9: West Branch Delaware River below Cannonsville Dam – Annual Flow Duration Curve (USGS Gage and OASIS Results), Drainage Area = 456 mi^2

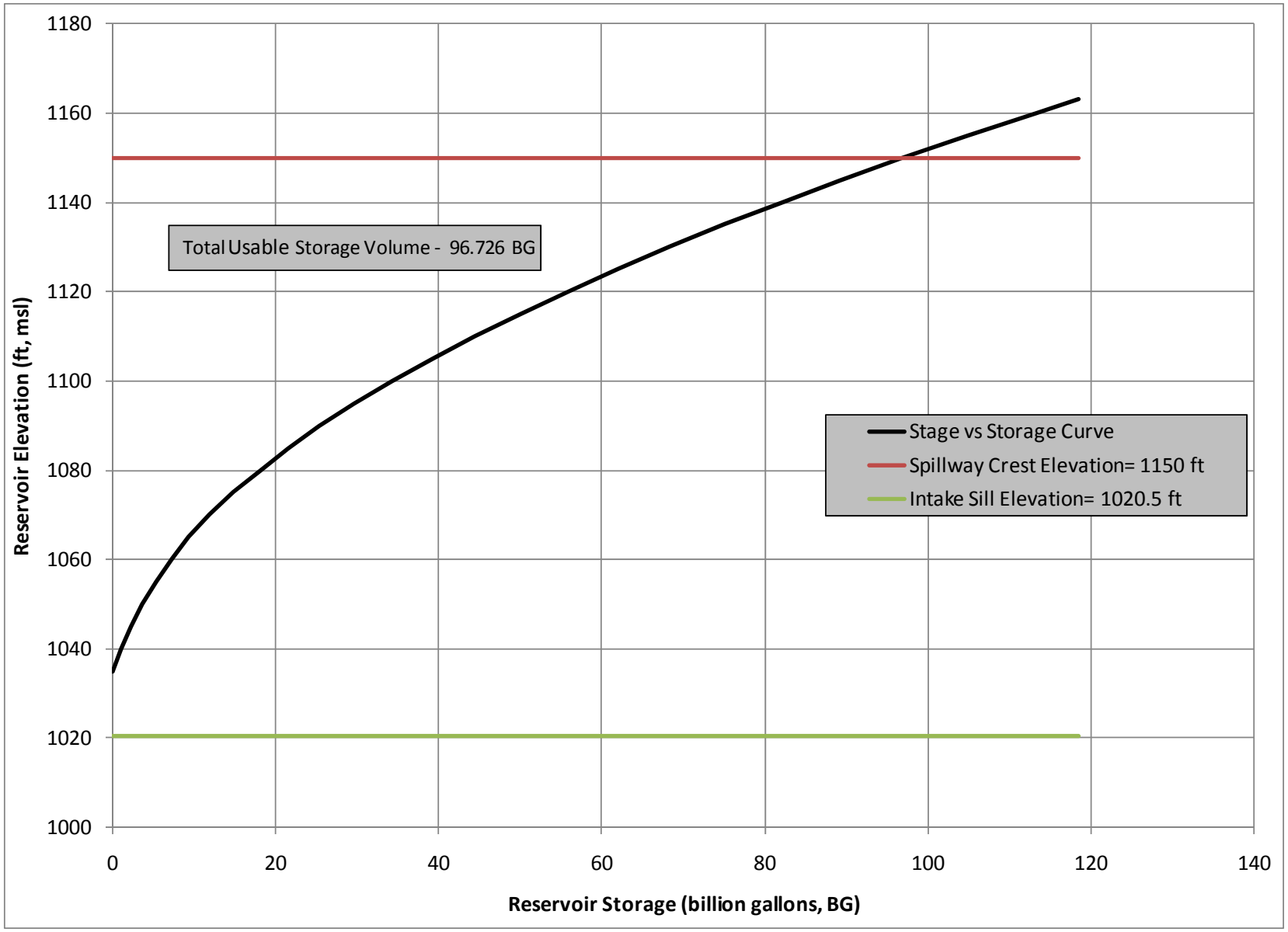


Figure B-10: Cannonsville Reservoir Elevation versus Storage Curve

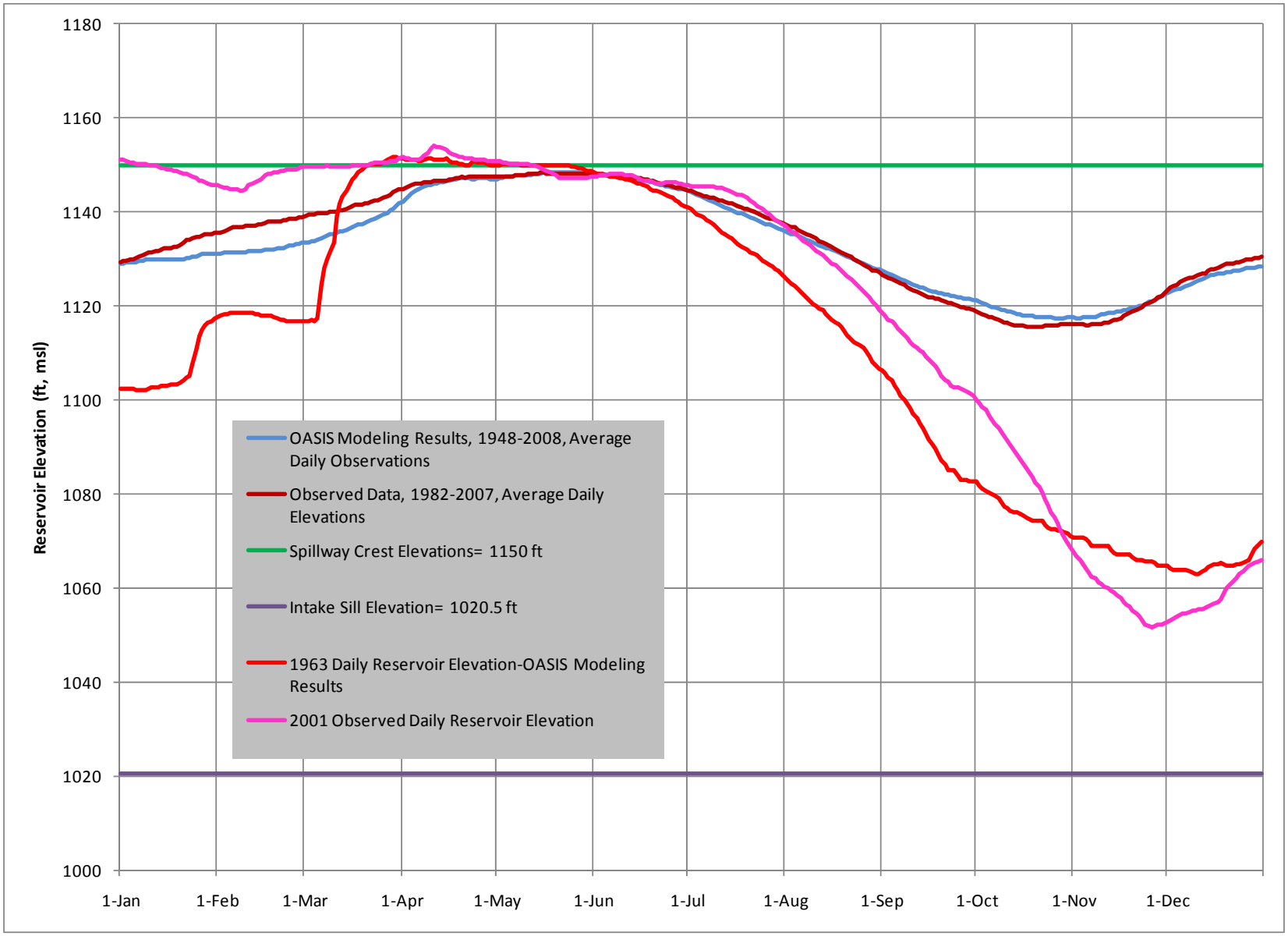


Figure B-11: Cannonsville Reservoir- Annual Elevations

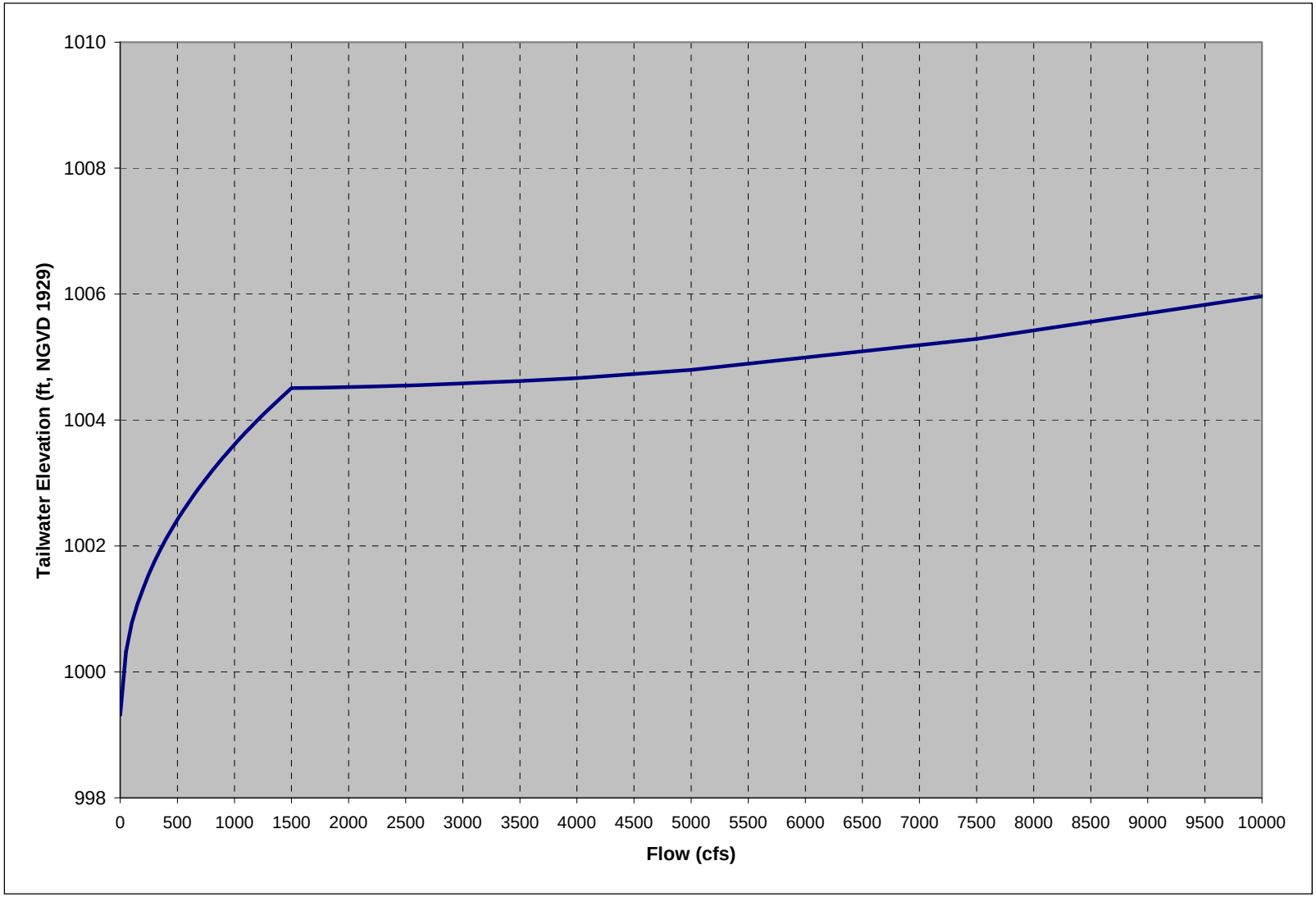


Figure B-12: Cannonsville Tailwater Rating Curve

EXHIBIT C: CONSTRUCTION HISTORY AND PROPOSED CONSTRUCTION SCHEDULE

(1) Existing Facilities

The construction history of the existing facilities related to the Project is summarized in Table C-1.

Table C-1: Cannonsville Construction History

Facility	Construction Commencement	Construction Completion	In-Service Date (commencement of operation)	Additions/ Modifications	Notes (nature of additions/ modifications, proposed new developments, if any)
Dam	1956	1965	1965		
Spillway	1958	1965	1965		Spillway capacity increase evaluation, 2009
Release Works Building	1960	1965	1965	Polyjet Release Valves (5), 1998	Emergency gate tower improvements/isolation of Water Release Facility, 2003
Water Supply Intake Building	1960	1965	1965		Enclosure for intake facility stop shutters, 2003

(2) Construction Schedule for Hydroelectric Facilities

As currently envisioned, work will begin promptly following license issuance and approval of any required plans by FERC's Regional Office and any other applicable regulatory agencies. Construction activities are scheduled for completion within 36 months after commencement. Full commercial operation of the Project will begin promptly after completion of construction and commissioning activities. The proposed schedule shown below is subject to change pending the timing of obtaining binding bids and the City's process for reviewing and selecting a contractor.

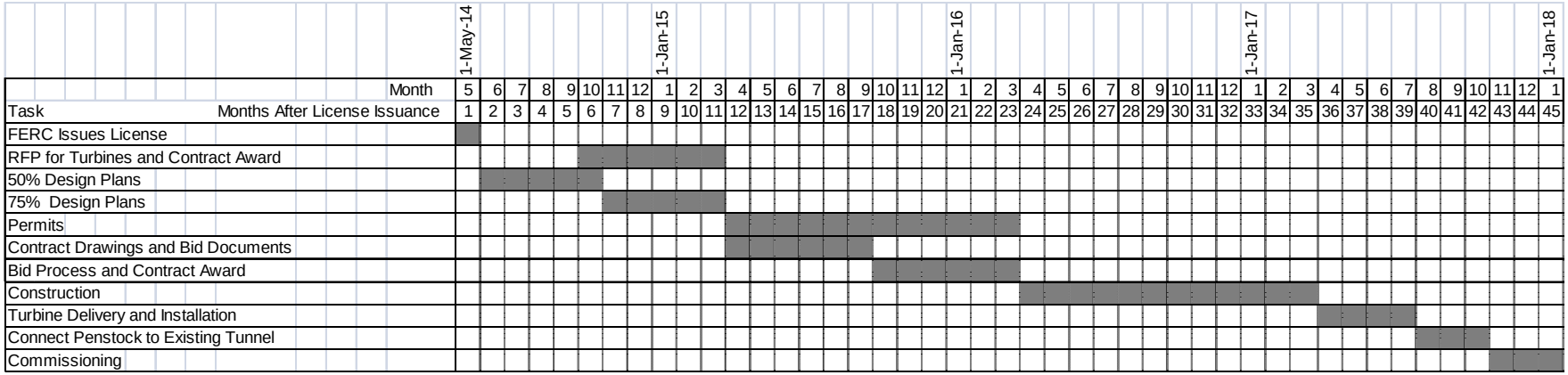

1-May-14
1-Jan-15
1-Jan-16
1-Jan-17
1-Jan-18
Month
Task
Months After License Issuance
FERC Issues License
RFP for Turbines and Contract Award
50% Design Plans
75% Design Plans
Permits
Contract Drawings and Bid Documents
Bid Process and Contract Award
Construction
Turbine Delivery and Installation
Connect Penstock to Existing Tunnel
Commissioning

EXHIBIT D: STATEMENT OF COSTS AND FINANCING

(1) Cost of Original Construction

The total cost of construction for the entire project, according to the City's records, was approximately $11,695,110 (year of expenditure dollars), based on a contract awarded on July 1, 1960. The City's records do not account for the split between the dam, spillway, water supply intake building, and low-level release works.

The cost associated with the acquisition of lands and damages, additional to the cost of construction, was approximately $4,220,212 (year of expenditure dollars).

(2) Estimated Amount Payable upon Federal Takeover

In accordance with 18 CFR § 4.51(e)(2) this is not applicable because the City is a municipality.

(3) Estimated Costs of New Development

(i) Cost of Land or Water Rights

All land and water rights were previously secured by the City for development of the water supply system. Accordingly, no such costs are required to be incurred for the purposes of the Project.

(ii) Cost of New Development, including Major Items, Indirect Construction Costs, Interest During Construction and Overhead, Construction, Legal Expenses, Taxes and Contingencies

The City developed an opinion of construction cost ("OPCC") to develop the Project as shown in Table D-1 at the end of this section. The estimated cost to construct the Project is $43,518,000 in 2012 dollars. All assumptions relative to contingencies, engineering/administration, and construction management are shown in Table D-1. As summarized in the table below, the estimated nominal cost of the Project is $51,478,000

Total Estimated Project Development Costs

New Development Costs	Project Costs
Present Value	**(2012 - $000s)**
Mobilization/Demobilization	$3,053
Power plant structures and improvements	$4,207
Reservoir Dam and Waterway	$7,030
Waterwheels, Turbines, and Generator	$15,270
Accessory electric equipment	$1,511
Substation and Switching Station Equipment	$2,100
Transmission Poles and Conductors	$408
Contingencies (15%)	$5,037
Sub Total Direct Costs	**$38,616**
Eng, Admin, and Part time Construction Services (10%)	$3,862
Full Time Construction Management	$1,000
Contractor OPCC and Review, Tunnel Inspection	$40
Sub Total Indirect Costs	**$4,902**
Total Development Costs Excluding Inflation	**$43,518**
Nominal Dollars	**(2012-2018)**
Total Development Costs Including 4% Annual Escalation Rate	**$51,478**

(4) Estimated Average Annual Costs of New Development

(i) Cost of Capital

The City expects to finance the Project entirely from public funds, although it is investigating its options for involving private sector financing. The City would fund the Project from general bond proceeds or other general fund moneys. For internal planning purposes to assess feasibility of projects, the New York City Office of Management & Budget directs the use of an all-in interest rate of 6.75% for long term projects, such as the Project. Depending on the market conditions at the time of debt issuance, the actual interest rate could be higher or lower than the planning rate.

(ii) Local, State, and Federal Taxes

As a municipality, the City is exempt from local, state, and federal taxation.

(iii) Depreciation or Amortization

Straight line depreciation is being applied to capitalized costs over the life of the asset, in this case, 50 years.

Capitalized Project Costs (Year of Expenditure - $000s)	Annual depreciation Cost (Year of Expenditure -$000s)
$51,478	$1,030

(iv) Operation and Maintenance Expenses

The annual operation and maintenance ("O&M") cost was estimated based on applying a cost per MWh rate of $20/MWh (2012 dollars). This amount was determined by the City through evaluation of similar hydroelectric facilities in the region, including certain other facilities owned by the City. Based on this assumption the annual O&M cost was estimated at $845,620 (2012 dollars). This amount includes O&M expenses, interim replacement costs, administrative and general expenses and contingencies.

In addition to annual O&M costs, a major turbine overhaul has been assumed in year 25 (2043) and a generator re-wind in year 30 (2048).

(v) Estimated Capital Cost and Estimated Annual Operation and Maintenance Expense of Each Proposed Environmental Measure

As described more fully in Exhibit E, the City is not proposing any additional environmental measures beyond the existing measures in place at the Cannonsville Dam and Reservoir. Since there are no proposed environmental measures, there are no estimated capital costs or operation and maintenance expenses associated with such measures.

(5) Estimated Annual Value of Project Power

The value of Project generation is based, in part, on information from the New York Mercantile Exchange and the Energy Information Administration for the period through 2035, adjusted for average growth rate assumptions thereafter. The estimated average annual energy price is $36.53/MWh (2012 dollars).

Energy generation of the Project was estimated in the OASIS model based on the FFMP-OST operating protocols. The Project's estimated annual energy production is 42,281 MWh. Consistent with the proposed construction schedule set forth in Exhibit C, it is assumed that actual Project-related construction would begin in approximately 2016 and would be completed by the end of 2018, a period of approximately three years. The table below provides estimates for the annual value of power represented in 2012 dollars.

Estimated Average Annual Value of Power

Assumptions	2012 dollars
Average Annual Price	$36.53/MWh
Energy Production	42,281 MWh
Annual Value of Power	$1,544,524

(6) Sources and Extent of Financing and Annual Revenues

The City finances capital projects using a combination of debt obligations and internal funding sources. For purposes of this Exhibit D, tax exempt financing costs were estimated assuming the issuance of General Obligation bonds with a term of 30 years as level debt service at an all-in interest rate of 6.75%. The estimated annual debt service expense for the Project is as follows:

Estimated Annual Debt Service Expense for the Cannonsville Hydroelectric Project

	Amount ($000)
Bond Issuance Amount	$51,478
Assumed Issuance Costs (2% of bond issue)	$1,030
Total Bond Issuance Amount	$52,508
Estimated Annual Debt Service Expense	**$4,126**

(7) Cost to Develop License Application

As of February 2012, the total cost to develop the license application, including studies, consultation, and the feasibility assessment was approximately $708,000.

(8) On and Off-Peak Value of Power

The City will operate the Project based on required conservation flows, directed flows and discharge mitigation flows. The on-peak and off-peak price of power in 2012 was estimated, on average, to be $41.83/MWh and $31.90/MWh, respectively.

(9) Estimated Average Annual Change in Project Generation

As the Project is a new hydropower facility this section is not applicable.

Table D-1: Cannonsville Opinion of Probable Construction Cost

Cannonsville Opinion of Probable Construction Cost - Voith two 1760 mm units and two 890 mm units 15% Contingency, Wye penstock connection at existing tunnel					
Item No.	Item	Quantity	Unit	Unit Price	Cost
330	**Land and Land Rights[1]**				**---**
	Mobilization/Demobilization (assume 10%)[2]	1	LS	$3,052,600	**$3,052,600**
331	**Powerplant Structures and Improvements**				
	Powerhouse Superstructure (includes misc. equip)	1	LS	$2,946,000	$2,946,000
	Powerhouse Excavation	25,000	CY	$20	$500,000
	Powerhouse Backfill	13,000	CY	$10	$130,000
	Sheet Piling	140	TON	$1,250	$175,000
	Haul Spoil to Stockpile Area	12,000	CY	$3.00	$36,000
	Diversion and Care of Water	80	DAY	$1,000	$80,000
	Relocate Sewer Pipe, Pump Sta. and Leach Field	1	LS	$60,000	$60,000
	Toe Drain at Powerhouse	1	LS	$15,000	$15,000
	SCADA system	1	LS	$40,000	$40,000
	Architectural Acrylic Based Simulated Granite Finish	15,000	SF	$15	$225,000
	331 Subtotal				**$4,207,000**
332	**Reservoir, Dam and Waterway**				
	Tunnel Demolition	1	LS	$172,000	$172,000
	Steel Penstock	1	LS	$2,195,000	$2,195,000
	Thrust Blocks	450	CY	$300	$135,000
	Penstock, Tailrace and Channel Excavation	15,000	CY	$20	$300,000
	Penstock Backfill	4,000	CY	$10	$40,000
	Haul Spoil to Stockpile Area	11,000	CY	$3.00	$33,000
	Sheet Piling	530	TON	$1,250	$662,500
	Tailrace Walls	470	CY	$350	$164,500
	Counterweight Butterfly Valves	1	LS	$1,093,000	$1,093,000
	Earth Cofferdam for Tailrace and PH Construction	1	LS	$40,000	$40,000
	Silt Curtain	1	LS	$50,000	$50,000
	Pre-fabricated Cofferdam for Channel Construction	1	LS	$100,000	$100,000
	Diversion and Care of Water	140	DAY	$1,000	$140,000
	Temp. Conservation Flow Siphon During Construct.	2	LS	$700,000	$1,400,000
	Site Restoration	1	LS	$100,000	$100,000
	Haul Road Maintenance	80	DAY	$1,100	$88,000
	Dust Control	80	DAY	$1,000	$80,000
	Toe Drain at Penstock	1	LS	$25,000	$25,000
	Flow Meter in 12 ft Penstock	1	LS	$60,000	$60,000
	Wetland Mitigation	1	LS	$75,000	$75,000
	Stone Fill in Tailrace	1,100	CY	$50	$55,000
	Blowers for 1760 mm turbines	2	EA	$11,000	$22,000
	332 Subtotal				**$7,030,000**
333	**Waterwheels, Turbines and Generator[3]**	1	LS	$15,270,000	**$15,270,000**
334	**Accessory Electric Equipment[4]**	1	LS	$1,511,000	**$1,511,000**
353	**Substation and Switching Station Equipment[5]**	1	LS	$2,100,000	**$2,100,000**
355/356	**Transmission Poles and Conductors[5]**	1	LS	$408,000	**$408,000**
	Subtotal Direct Cost				**$33,578,600**
	Contingencies (15%)[6]				$5,037,000
	Total Direct Cost[7]				**$38,616,000**
	Engineering, Admin. and Part Time Constr.Services (10%)[8]				$3,862,000
	Full Time Construction Management				$1,000,000
	Contractor OPCC and Review, Tunnel Inspection				$40,000
	Total				**$43,518,000**

Notes

1 - There are no land costs required for Cannonsville. The transmission line connection to the electric system is made on City property.

2 - The mobilization and demobilization costs are 10% of Item Nos. 331-356.

3 - Two 1760 mm and two 890 mm mm horizontal Francis turbines and four generators.

4 - Control panels, programmable logic controller and hydraulic power unit.

5 - Costs from O'Brien and Gere Electrical Engineers.

6 - The contingency is 15% of all items. Rounded to $1000.

7 - Rounded to $1000.

8 - Includes Soil Borings. Rounded to $1000.

EXHIBIT E: ENVIRONMENTAL REPORT

(1) General Description of the Locale

(i) Climate

The climate of the Catskill Mountains is considered primarily humid continental, which tends to dominate the northeastern states. Cool, dry air masses generally move eastward through the area throughout the year, while warm, humid maritime air masses generally move northeastward in the summer (Delaware Co. SWCD, 2007). The summers are cool, with relatively few hot days. Cold winter temperatures prevail whenever Arctic air masses flow southward from central Canada. Mean daily temperatures range from the low 20°F's in the winter to the upper 60°F's in the summer. Rainfall is usually adequate during the growing season (May – September) but deficiencies of precipitation may occur periodically. Mean annual precipitation is approximately 46.69 inches in nearby Walton, NY. Average snowfall in the valleys is near 65 inches, with higher terrains receiving slightly more. Table E-1 shows the monthly averages for precipitation and temperature for the period 1971 through 2000 (NOAA, 2002) (Note: water content in snowfall is computed by the National Weather Service and is included in the precipitation figures). Solar aspect, the orientation of a land slope to the sun, also affects the local microclimatic conditions. South facing land slopes are warmer and drier than the cool, often moist north facing land slopes of the valley.

Table E-1. Monthly Average Precipitation and Temperature in the West Branch of the Delaware Basin

Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Walton, NY													
Precipitation Normals (inches)	3.29	2.83	3.72	3.98	4.34	4.28	4.31	4.13	4.07	3.91	4.26	3.57	46.69
Delhi, NY													
Average Snowfall (inches)	17.1	10.9	11.9	4.3	0	0	0	0	0	0	4.8	13.7	63.1
Temperature Normals (°F)	21.5	23.6	32.9	44.0	55.3	63.5	67.6	66.3	58.8	47.9	37.8	26.9	45.5

Data from Climatography of the United States Nos. 20 & 81, 1971-2000. National Oceanic and Atmospheric Administration National Climate Data Center.

(ii) Topography

Figure E-1 shows the general topography of the West Branch of the Delaware River in the vicinity of the Cannonsville Reservoir. The watershed is located in the eastern portion of the Allegheny Plateau physiographic province, which is the northern part of the Appalachian Plateau that extends from southern New York to central Alabama. Locally, the Allegheny Plateau extends throughout southern New York and includes the Catskill Mountains and southern sections of the Mohawk River basin (Isachsen et al., 1991). Rivers and their tributaries have cut the originally level plateau into hilly uplands. The plateau surface is evident in the pattern of hilltops all tending to reach the same elevations in their respective locations in the watershed, creating a dissected plane that slopes gradually upward from northwest to southeast (Delaware Co. SWCD, 2004).

The West Branch of the Delaware River is the principal drainage channel for the basin and delivers flows from northeast to southwest through a relatively narrow, flat-floored valley. The valley is approximately one mile across at its maximum width, which is in the Village of Walton. Hillsides along the West Branch of the Delaware River valley tend to be asymmetric with steeper slopes facing north and gentler slopes facing south. Tributary streams typically occupy very narrow valleys, or hollows, that generally intersect the West Branch of the Delaware River at right angles (Delaware Co. SWCD, 2004).

(iii) Wetlands

Wetland delineations and classification information in the vicinity of the Cannonsville Reservoir was obtained from the United States Fish and Wildlife Service ("USFWS") National Wetland Inventory ("NWI"), which was developed from aerial photography. The land surrounding the reservoir is generally not conducive to supporting wetlands. The wetlands present tend to be associated with the areas where tributary streams feed the reservoir.

Included in the following sections are a series of maps showing NWI wetlands within or very near the project boundary for the site. Wetlands mapped by NYSDEC are also shown for comparison. Note that because the wetlands are shown at a scale covering the entire reservoir area, many of the smaller wetlands may be hard to distinguish due to their size relative to the impoundment.

Figure E-2 shows NWI and NYSDEC wetlands within or near the project boundary. Figure E-3 shows a close-up of NWI wetlands in the vicinity of the dam.

The reservoir is classified as a palustrine limnetic, permanently flooded impoundment with an unconsolidated bottom. There are several small wetlands near the upper end of the impoundment. A few larger wetlands are present at the upper tip of the large north-facing finger bay of the reservoir. The largest is a 52-acre freshwater emergent, seasonally flooded wetland classified as PEM1E. The next largest is a 12-acre deciduous, scrub-shrub, semi-permanent wetland located at the mouth of Trout Creek classified as PSS1/EM1E.

(iv) Vegetative Cover

The periphery of the reservoir is generally remote and undeveloped with the exception of a few roads. The dominant vegetation cover type throughout the basin is deciduous tree forest, with some north facing hill-slopes dominated by coniferous species. Deciduous tree species include maples, beech, birches, oaks, ash and cherries. East hemlock is the predominant conifer; some eastern white pine stands exists, as well as many fields that have been planted with various spruce and pine species. These forests encompass the majority of the upland area and the timber is frequently harvested.

Along watercourses and the adjacent hillsides, cover types range from grass to a mix of grass and shrub, grass, corn and alfalfa. These cover types are indicative of the agricultural character of the basin. The grass and shrub component represents successional land composed of grasses, forbs and woody plants, with hawthorns being common. The grass component includes turf, pasture and hayland.

(v) Land Development

The area surrounding the dam and reservoir is generally remote and undeveloped, consisting primarily of forests or shrubland; little to no development is present throughout the watershed above the dam. The areas proposed for disturbance resulting from the Project consist of mowed lawn along the earthen dam and DEP roads to access the maintenance building and low-level release works building.

In the early settlement days, the entire area was covered by forests. As a result, forest materials were used for construction of equipment and housing. Certain trees were utilized for making fine furniture, while

the bark of other trees was used in tanneries. Sugar maple trees were tapped for syrup and sugar (Greene Co. SWCD, 2007). The DEP allows agricultural uses of City-owned lands in certain cases, including tapping sugar maple trees for sap used to produce maple syrup.

As the forests were cleared, the rocks and stumps were pulled to make way for farmland. The shallow, infertile soil proved not to be conducive to sustained grain farming; however, the abundance of cold-hardy grasses and water supported dairy farming (Delaware Co. SWCD, 2007). Dairy farming and forestry remain the dominant land uses. Table E-2 lists the land cover types within the West Branch of the Delaware River watershed.

Table E-2: Land Cover Types; West Branch of the Delaware River

Cover Type	Land Cover Type expressed in percentages
Forest	68.8%
Shrubland	11.3%
Grassland	N/A*
Urban*	6.7%
Water	1.8%
Wetland	1.2%
Agricultural Land	10.1%
Roads	N/A*

*Roads were not separated from the urban cover type for the West Branch of the Delaware River watershed. Grasslands were not separated from the agricultural land cover type for the West Branch of the Delaware River watershed.

(vi) Population and Socioeconomic Information

The Cannonsville Reservoir is located within Delaware County. The population of the county was 48,057 in 2000 and 47,980 in 2010, remaining relatively unchanged over this period (U.S. Census Bureau).

In 2010, the annual average unemployment rate in Delaware County was 8.7% - nearly equivalent to the statewide annual average unemployment rate of 8.6%, and less than the national average unemployment rate of 9.6% in 2010 (New York State Department of Labor and U.S. Bureau of Labor Statistics). Table E-3 lists the employment breakdown of Delaware County.

Table E-3: 2010 Percent Employment Breakdown in Delaware County, NY

Industry	2010 Employment	% Total
Government (Federal, State and Local)	4,633	30.0%
Manufacturing	3,445	22.3%
Health Care and Social Assistance	1,956	12.7%
Retail Trade	1,634	10.6%
Accommodation and Food Services	978	6.3%
Other Services	501	3.2%
Construction	446	2.9%
Finance and Insurance	422	2.7%
Wholesale Trade	279	1.8%

Industry	2010 Employment	% Total
Information	238	1.5%
Transportation and Warehousing	217	1.4%
Professional and Technical Services	164	1.1%
Agriculture, Forestry, Fishing Hunting	119	0.8%
Mining	109	0.7%
Arts, Entertainment, and Recreation	109	0.7%
Real Estate and Rental and Leasing	78	0.5%
Administrative and Waste Services	68	0.4%
Management of Companies and Enterprises	24	0.2%
Unclassified	13	0.1%
Delaware County Total	15,433	100.0%

Source: New York State Department of Labor, 2011

A. Study – Socioeconomic Study

Hugh O'Neill Ltd d/b/a Appleseed ("Appleseed") and Bates White, LLC ("Bates White") conducted a socioeconomic study for the City's proposed Cannonsville, Pepacton and Neversink hydroelectric developments, which is included in Volume 9, Appendix E-7.

The overall objective of the socioeconomic study was to identify and quantify the impacts of constructing and operating the Project on employment, population, housing, personal income, local government services, local tax revenues and other relevant factors with respect to the municipalities and counties in the vicinity of the Project ("Impact Area").

In order to accomplish this objective, the following activities were included in the socioeconomic study of the Project:

- Identify the appropriate Impact Area for conducting the socio-economic study, based on the Project location, existing demographic and economic linkages;

- Identify demographic and economic trends for the Impact Area, including:
  - Population;
  - Employment;
  - Personal income;
  - General economic condition;
  - Real estate characteristics;
  - Government Services and Facilities (e.g., police, fire, health, roads, education);

- Identify the economic impacts (direct, indirect, and induced) of Project construction and on-going Project operation on the demographic and economic trends for the Impact Area, including:
  - Evaluating whether the existing supply of housing (temporary and permanent) is sufficient to meet the needs of any additional population resulting from Project construction and operation;
  - Identifying any additional revenues (e.g., taxes) provided to the Impact Area resulting from Project construction and operation;

- Evaluate the incremental local government expenditures in the Impact Area (including school operating costs, road maintenance and repair, public safety costs and public utility costs) compared to the local government revenues in the Impact Area that would result from Project construction and operation;

- Evaluate the impact of the Project on recreational activities and character of the communities within the Impact Area;

- Identify and quantify, to the extent practicable, environmental externality benefits to the public, generally, associated with Project construction and operation (e.g., air pollution reduction resulting from the offset of fossil-fuel generation by the power generated by the Project); and

- Evaluate the potential impacts of the Project on wholesale electricity prices and electric system reliability in the Impact Area.

Findings and Description of Potential Project-Related Impacts

The Project is estimated to have a modestly positive impact on employment, earnings and economic output in Delaware County. In part, because of the relatively small number of jobs the Project is estimated to create, adverse socioeconomic impacts are likely to be minimal or non-existent.

Moreover, the generation output from the Project is expected to cause a small reduction in wholesale electricity market prices in New York and modest reductions in annual pollutant emissions by fossil-fuel fired generation sources by displacing the output from such sources with the renewable electricity generated by the developments. In addition, the Project may provide modest additional reliability and power quality benefits at both the local and statewide level.

The following sections summarize the key findings of the socioeconomic study.

Economic Impact of Project Construction and Operation

Using the IMPLAN input-output modeling system – an econometric modeling system commonly used in the analyses of economic impacts – the direct, indirect and induced (or "multiplier") effects of Project construction and ongoing operation was estimated.

Of a total estimated construction cost of approximately $42.5 million, it is projected that nearly $3.1 million would be paid either to Delaware County subcontractors or to Delaware County residents employed by non-local contractors and subcontractors, generating 49 person-years of employment for Delaware County residents in construction and related industries during the anticipated 36 month construction period associated with the Project. Through the multiplier effect, construction of the Project is estimated to generate approximately $1.2 million in additional economic output in Delaware County and ten person-years of employment.

Once fully operational, ongoing operation of the Project is estimated to increase Delaware County's annual economy by more than $2.7 million.

Impact on Local Tax Revenues and Local Governmental Services

Assuming that: (a) the market value of the Project development is roughly equal to its estimated construction costs; and (b) equalization rates and tax rates for the applicable town in which the Project would be located are the same as they were in 2010, an estimate of the applicable annual town, county

and school property taxes to be paid by the Project was calculated. Utilizing these assumptions, the estimated annual town, county and school property taxes to be paid by the Project are approximately $1.7 million.

Due primarily to the relatively small number of equivalent new jobs associated with ongoing operations relating to the Project, the impact of the Project on local government services is expected to be minimal.

Impact on Character of the Affected Communities

The impact the Project on the character of the affected communities is expected to be minimal for several reasons, including: (a) the small increase in labor demands associated with the Project is unlikely to affect wages in either the directly affected industries of the labor force more broadly; (b) because the resident labor force in Delaware County and the immediate surrounding areas would easily absorb the small increase in labor demands generated by the Project, the Project is not anticipated to affect demand for housing or housing costs in the affected communities; and (c) due to its small impact on labor demands, the Project is not expected to affect other aspects of community character such as the predominantly low-density, rural character of the affected communities, existing patterns of land use and development, or the overall mix of local economic activity.

Impacts on Wholesale Energy Prices, Pollutant Emissions and System Reliability

In addition to the traditional socioeconomic impact assessment, three additional analyses were performed to assess the effects of the Project on reducing wholesale energy prices, reducing pollutant emissions and supporting reliability of the electric system.

Wholesale Energy Market Impacts

Electricity generated from the City's proposed Cannonsville, Pepacton and Neversink hydroelectric developments would lower wholesale market energy prices by displacing higher cost marginal generation in some hours. The estimated annual dollar benefit of such price reductions for the western region of the control area administered by the NYISO is approximately $13.6 million annually.

The generation associated with the Project accounts for approximately 74 percent of such estimated savings, or approximately $10.1 million annually.

Environmental Externality Benefits

Total generation from the City's proposed Cannonsville, Pepacton and Neversink hydroelectric developments is estimated to be approximately 57,000 megawatt-hours ("MWh") per year of emissions-free electricity, which would provide environmental benefits by displacing generation of electricity from fossil fuels. Electricity generated from the City's three proposed developments will result in reductions in emissions by fossil-fueled generation sources by as much as 64,000 tons of carbon dioxide ("CO_2"), 170 tons of nitrogen oxides ("NOx"), and 370 tons of sulfur dioxide ("SO_2") annually, depending on the type of fossil-fuel generation displaced by the electricity produced from the City's proposed developments. The estimated CO_2 emissions reductions associated equivalent to removing between approximately 5,600 and 11,100 vehicles from the road, depending on depending on the type of fossil-fuel generation displaced.

The generation associated with the Project accounts for approximately 74 percent of such emissions reductions, or as much as approximately 47,400 tons of CO_2, 127 tons of NOx, and 274 tons of SO_2. The estimated CO_2 emissions reductions associated with the Project are equivalent to the removal of between

approximately 4,100 and 8,200 vehicles from the road, depending on depending on the type of fossil-fuel generation displaced.

Electric System Reliability Benefits

Interconnection of the Project may provide additional reliability and power quality benefits at both the local and the Statewide level, including the provision of certain ancillary services. These ancillary services are typically used by the transmission system operator to balance supply and demand and maintain the reliability and security of the system within acceptable standards. The ancillary services that the Project may be suited to provide include regulation service and frequency control, and reactive power supply and voltage support. Additionally, the Project may have the effect of delaying the need for NYSEG to invest in upstream capacity needed to meet future load growth along the feeders to which the Project is connected.

(vii) Floodplain Presence and Flood Events

The Cannonsville Reservoir is managed such that reservoir elevations are lowered in the late summer and fall to maintain water supply needs and downstream conservation flow releases and directed releases. The lowering of the water level continues through the fall providing storage capacity for the spring freshet. The seasonal operation allows the reservoir to operate in a store mode during flood events; the FFMP-OST dictates the maximum permitted release through the low-level release works during flood events. Discharge mitigation releases up to 1,500 cfs are passed through the low-level outlet works depending on the reservoir elevation and the river stage at the USGS gage at Hale Eddy, located approximately eight miles downstream of the Cannonsville Dam on the West Branch of the Delaware River. The National Weather Service flood stage at Hale Eddy is 11.0 feet. Based on the FFMP, Zone L1 discharge mitigation releases will not be made from Cannonsville Dam when the river stage at Hale Eddy is above 9.0 feet, or is forecasted to be above 9.0 feet within 48 hours of planned discharge mitigation releases.

USGS Gage No. 0142500, located directly below Cannonsville Dam records the total discharge (spill over the dam and low-level outlet releases) from the dam. The drainage area of the gage and dam is the same--456 mi^2. The period of record for the gage extends from 1952 to current; however, construction of the dam began in 1956 and was completed in 1965. A Log-Pearson Type III flood frequency analysis was conducted using the instantaneous annual peak flows for the full period of record to estimate the 10-, 50-, 100- and 500-year floods; the results are shown in Table E-4.

Table E-4: Flood Frequency Flows at USGS Gage located just below Cannonsville Dam

Return Interval	Estimated Flood Flow
10-year	14,610 cfs
50-year	24,250 cfs
100-year	28,700 cfs
500-year	39,730 cfs

Figure E-4 shows the instantaneous annual peak flows recorded at the gage for the period of record. The highest recorded flow on record, 33,100 cfs, occurred on June 28, 2006. This flow was equivalent to approximately the 200-year flood based on the Log-Pearson Type III flood frequency analysis.

(viii) Geology and Soils

Geology

The West Branch of the Delaware River watershed is located in the eastern portion of the Allegheny Plateau, which is a part of the Appalachian Plateau physiographic province within the Northeastern Highlands ecoregion. The Appalachian Plateau is a large natural region lying west of the Hudson lowlands and south of the Mohawk River valley and the Lake Ontario-Lake Erie plains. The Appalachian Plateau is underlain with nearly horizontal rock strata, and all of it was covered by a glacier as recently as 10,000 to 12,000 years ago. Ice and the force of rivers have dissected or cut into the bedrock, giving the whole region a rugged, hilly aspect. The Appalachian Plateau is highest in the eastern part of the state, where it forms the Catskill Mountains.

This region is characterized by nutrient-poor soils and successional communities comprised of northern hardwood and spruce-fir forests. The region consists of a deeply dissected plateau sloping gently to the southwest (Greene Co. SWCD, 2007). The streams and rivers have cut this originally level plateau province into upland hills. The plateau surface is evident in the pattern of hilltops all tending to reach similar elevations in the watershed (Delaware Co. SWCD, 2004). The erosional characteristics of the sedimentary rock formations found in this region are responsible for the typical valley-ridge topography of the Catskill Mountains (Greene Co. SWCD, 2007).

Generally, the bedrock underlying the region is of sedimentary origin resulting from the erosion of an ancient high peaks Taconic mountain range that existed to the east approximately 370 million years ago in the Devonian Period. The sediments that form the Devonian Period bedrock are interpreted to be the deposits of a vast deltaic river system that are often referred to as Catskill Delta deposits. The Catskill Delta deposits were buried beneath younger sediments and then uplifted as a plateau. Prior to and during the uplifting, intersecting sets of vertical fractures formed. As the overlying rock was eroded away over time, streams incised multiple channels in the slowly rising plateau (Greene Co. SWCD, 2007).

The rivers deposited layers of sediment that eventually became the current sandstone, siltstone, and shale beds of the plateau valleys. Rock groups and some of their component formations include:

- The Genesee Group, including the Unadilla and Oneonta formations;
- The Sonyea Group, including the Lower Walton formation;
- The Moscow Group (hosts the famous Gilboa forest fossils); and
- The West Falls group, including the Slide Mountain and Upper Walton formations.

None of these formations include beds of limestone, but rather include silica. As such, they are considered acidic rocks and spring water rising through these layers tends to be low in calcium and magnesium carbonates (Delaware Co. SWCD, 2004).

Surficial Geology and Soils

Long periods of glaciation deposited varying layers of glacial till in the valleys and uplands of the project area. The most recent Laurentide ice sheet reached a maximum thickness over the Catskill region approximately 22,000 years ago and fully retreated only about 12,000 years ago. The retreating glaciers left ice deposits in the valleys, sometimes long after the uplands were relatively ice-free. Meltwater flowed around and beneath the remaining ice, removing much of the silt and clay from the sand and gravel. As a result, gravelly terraces and kame (ice-contact sand and gravel) deposits tend to occur along valley margins where they were left when the ice sheets began their retreat (Greene Co. SWCD, 2007).

Lakes impounded by ice and recessional moraines allowed silt and clay to settle and form thick deposits. Other areas were scoured by the glacial runoff. Soil series descriptions are presented below and were adapted from the USDA-NRCS Soil Survey Division Official Soil Survey Descriptions website (accessed 10 December 2008).

Soil groups found in the West Branch of the Delaware River watershed are listed below in order of highest to lowest percentage. Dominant soil groups or types within the one-mile buffer surrounding the Project area are shown in Figure E-5 and listed below:

- Halcott, Mongaup, & Vly soils (23%)
- Lackawanna & Bath soils (22%)
- Oquaga, Lordstown, & Arnot soils (15%)

A close-up of specific soil types in the vicinity of Cannonsville Dam is shown in Figure E-6.

Arnot: The Arnot series consists of shallow, somewhat excessively to moderately well drained soils formed in loamy till. Bedrock is at depths of to 10 to 20 inches. Slope ranges from 0 to 70 percent. Saturated hydraulic conductivity in the mineral soil is moderately high or high. Arnot soils developed in a thin mantle of till of Wisconsin age. The till is derived mainly from acid sandstone, siltstone, and shale. In some places the regolith is a mixture of till and residuum. Elevation ranges from 1000 to 1800 feet above msl. The Arnot series is considered to be the lithic analogue of the Lordstown and Oquaga series.

Bath: The Bath series consists of very deep, well drained soils formed in till. They are nearly level to steep soils on uplands. Slope ranges from 0 to 60 percent.

Halcott: The Halcott series consists of shallow, somewhat excessively drained soils formed in till. They are nearly level to very steep soils on glaciated bedrock controlled uplands. Permeability is moderate or moderately rapid throughout. Thickness of the solum ranges from 6 to 20 inches. Depth to bedrock ranges from 10 to 20 inches. The Halcott series is the frigid analogue of the Arnot series.

Lackawanna: The Lackawanna series consists of very deep, well drained soils on uplands. They formed in till derived from reddish colored sandstone, siltstone, and shale. A dense fragipan is present starting at a depth of 17 to 36 inches below the soil surface. Slope ranges from 0 to 55 percent. Depth to bedrock is greater than 60 inches. Lackawanna soils are on nearly level to steep glaciated uplands. The elevation of these soils ranges from 750 to 1800 feet above msl.

Lordstown: The Lordstown series consists of moderately deep, well drained soils formed till and cryoturbated material derived from siltstone and sandstone on bedrock controlled landforms of glaciated dissected plateaus. They are nearly level to very steep soils on hillsides and hilltops in glaciated bedrock controlled uplands. Thickness of solum and depth to bedrock ranges from 20 to 40 inches. Lordstown soils are nearly level to very steep soils with slopes ranging from 0 to 90 percent. These soils formed in till and cryoturbated material derived from siltstone and sandstone on bedrock controlled landforms of glaciated dissected plateaus. Elevation ranges from 800 to 1800 feet above msl. Lordstown is the mesic equivalent of Mongaup.

Mongaup: The Mongaup series consists of moderately deep, well drained soils formed in till derived from sandstone, siltstone and shale. They are nearly level through very steep soils on hillsides and hilltops in glaciated, bedrock controlled uplands. Depth to hard bedrock is 20 to 40 inches. Slope ranges from 0 to 70 percent. Thickness of solum and depth to bedrock ranges from 20 to 40 inches. These soils formed in acid till on bedrock controlled uplands. Elevation ranges from 1000 to 2400 feet above msl.

Oquaga: The Oquaga series consists of moderately deep, somewhat excessively drained soils formed in a thin mantle of till over sandstone, siltstone, and shale bedrock on nearly level to very steep uplands. Slope ranges from 0 to 70 percent. Permeability is moderate. Depth to bedrock ranges from 20 to 40 inches. Oquaga soils are in uplands and formed in a thin mantle of reddish till with lithology dominated by the local and underlying reddish sandstone, siltstone, and shale.

Vly: The Vly series consists of moderately deep, well drained or somewhat excessively drained soils formed in till. These soils are on glaciated bedrock controlled uplands. Slope ranges from 0 to 70 percent. Thickness of the solum and depth to bedrock ranges from 20 to 40 inches. Vly soils are on bedrock controlled till uplands. These soils formed in reddish till that is derived from reddish sandstone, siltstone and shale. Elevation ranges from 1750 to 4025 ft. above msl.

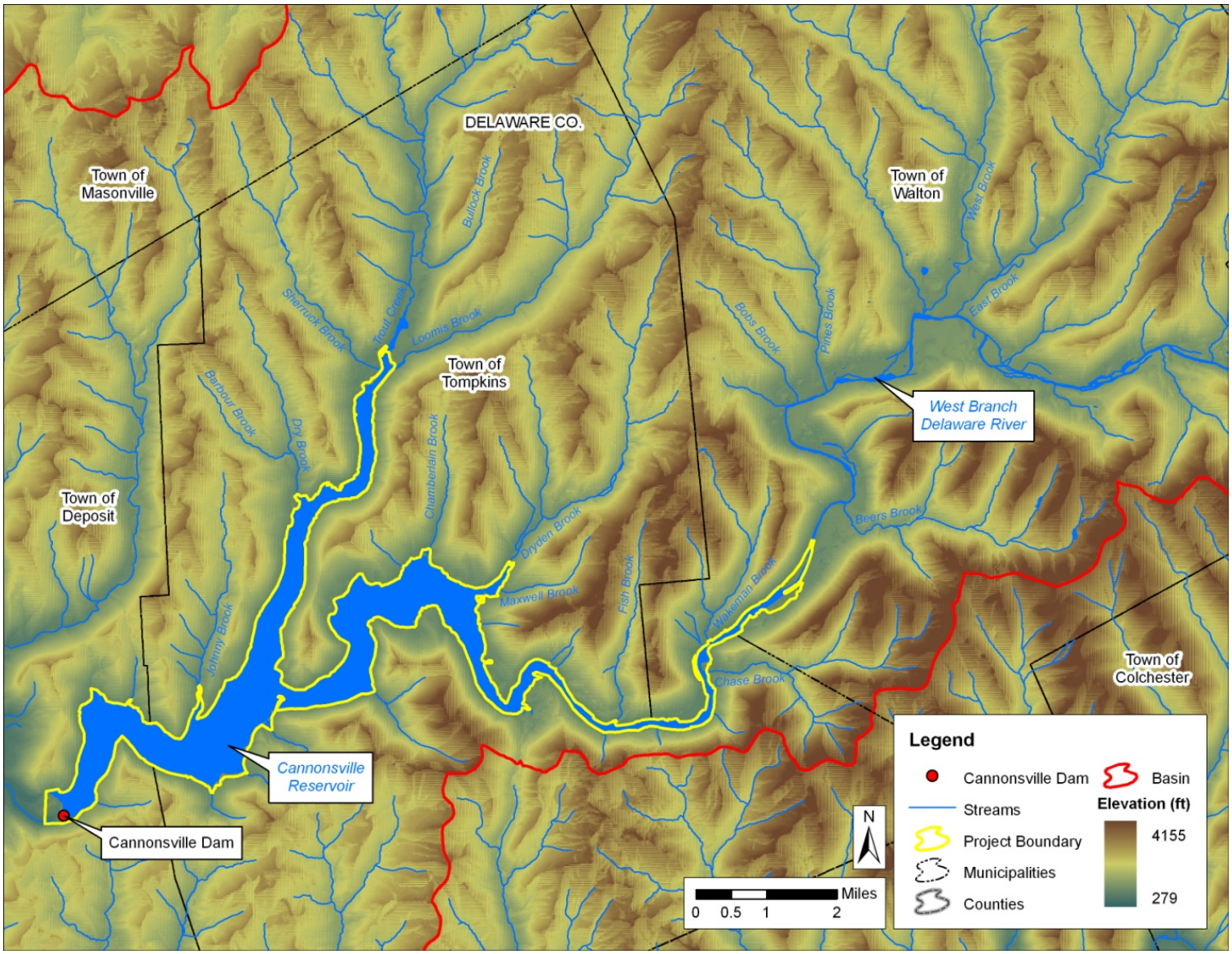


Figure E-1: Cannonsville Reservoir Topographic Map

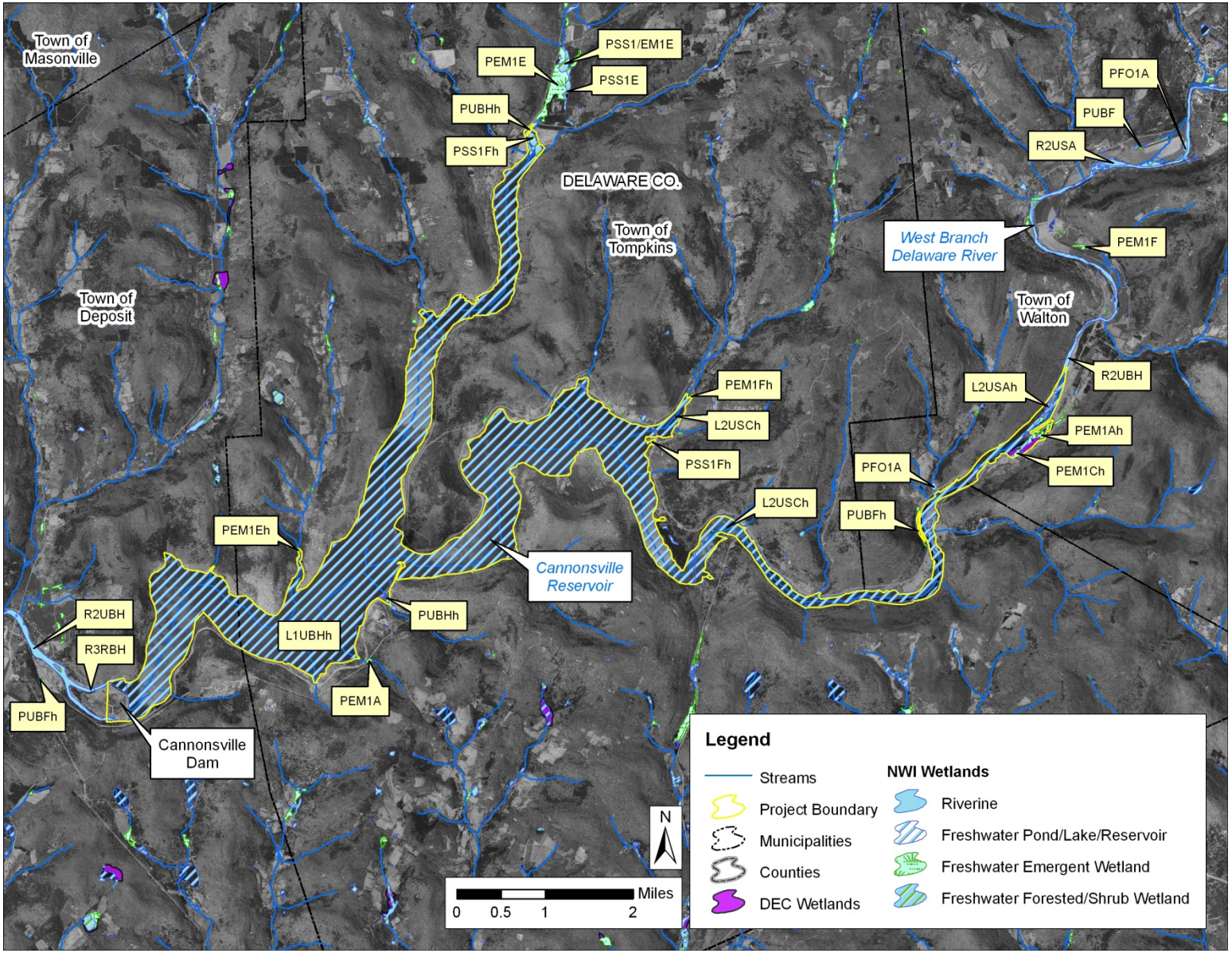


Figure E-2: NWI & NYSDEC Wetlands near the Cannonsville Reservoir

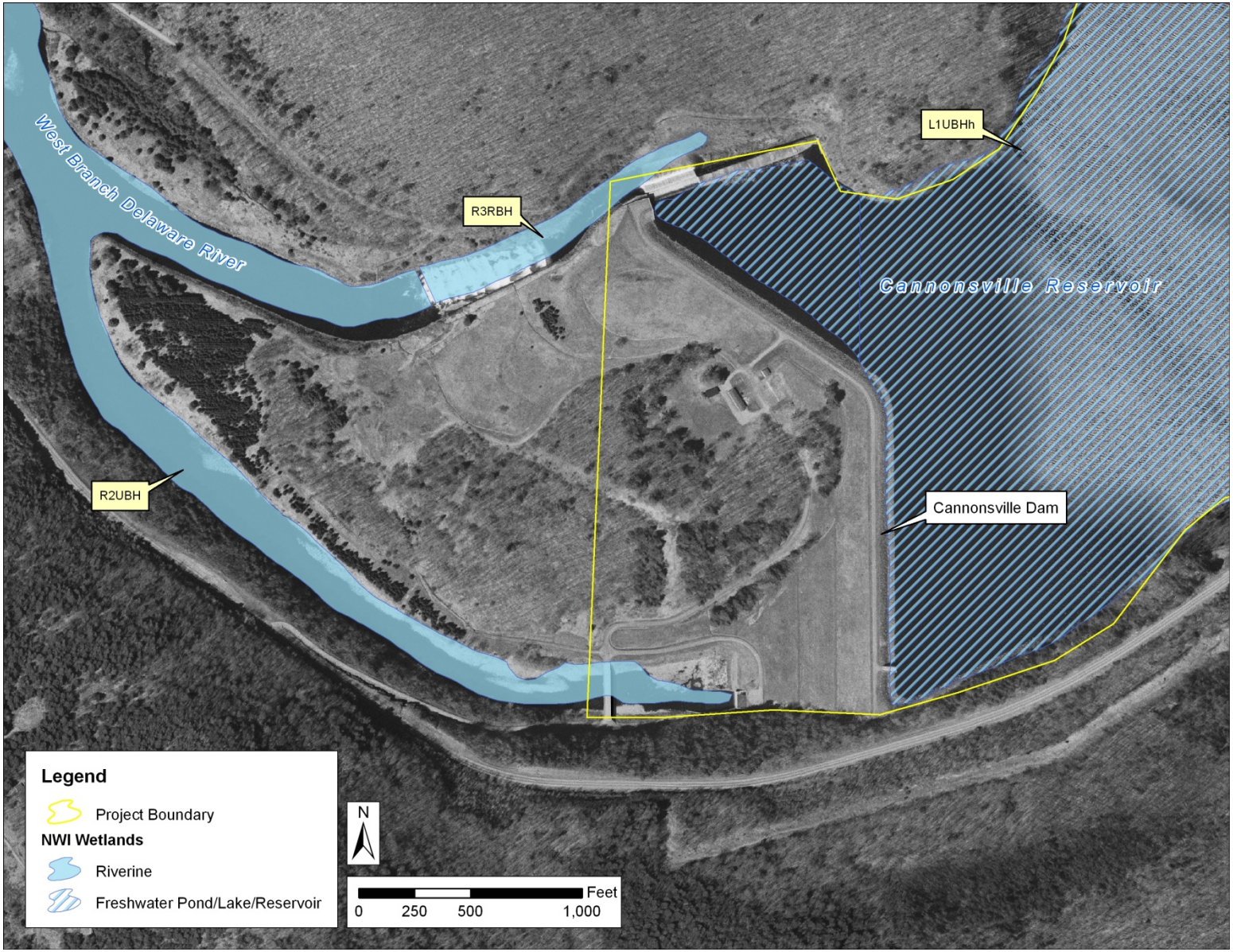


Figure E-3: NWI Wetlands near Cannonsville Dam

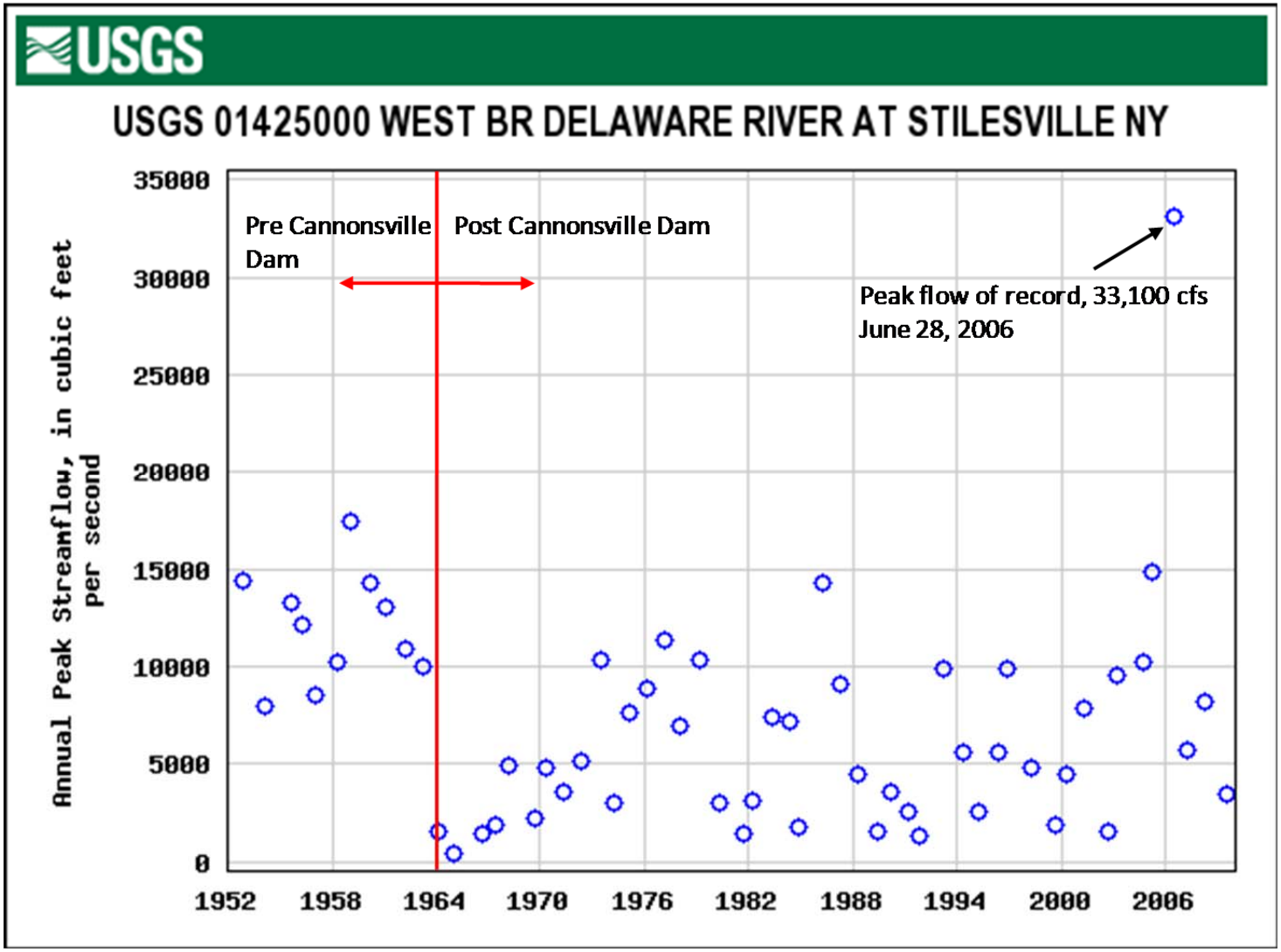


Figure E-4: Instantaneous Peak Flow at West Branch of the Delaware River at Stilesville, NY

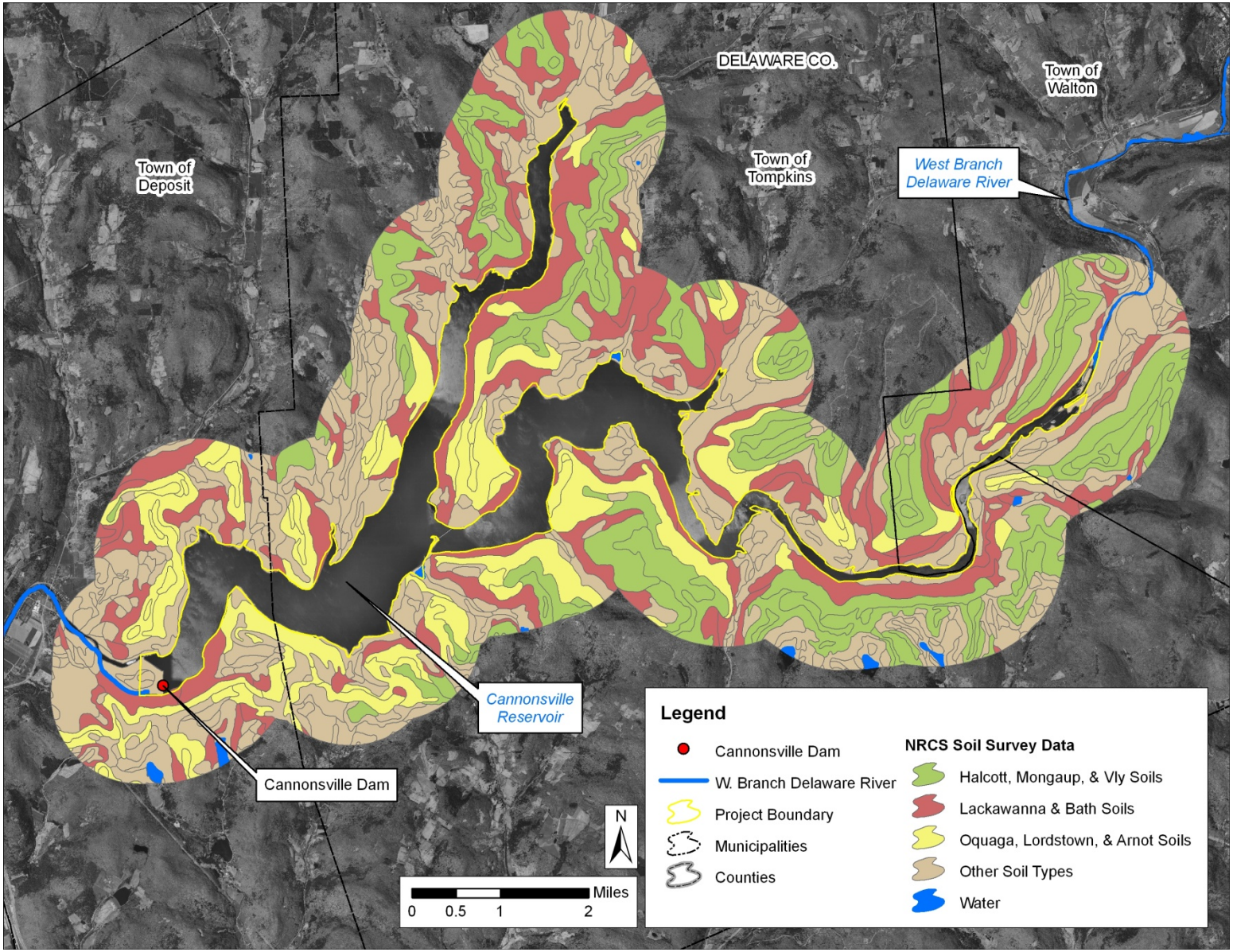


Figure E-5: Dominant Soil Types within 1 Mile of the Cannonsville Reservoir

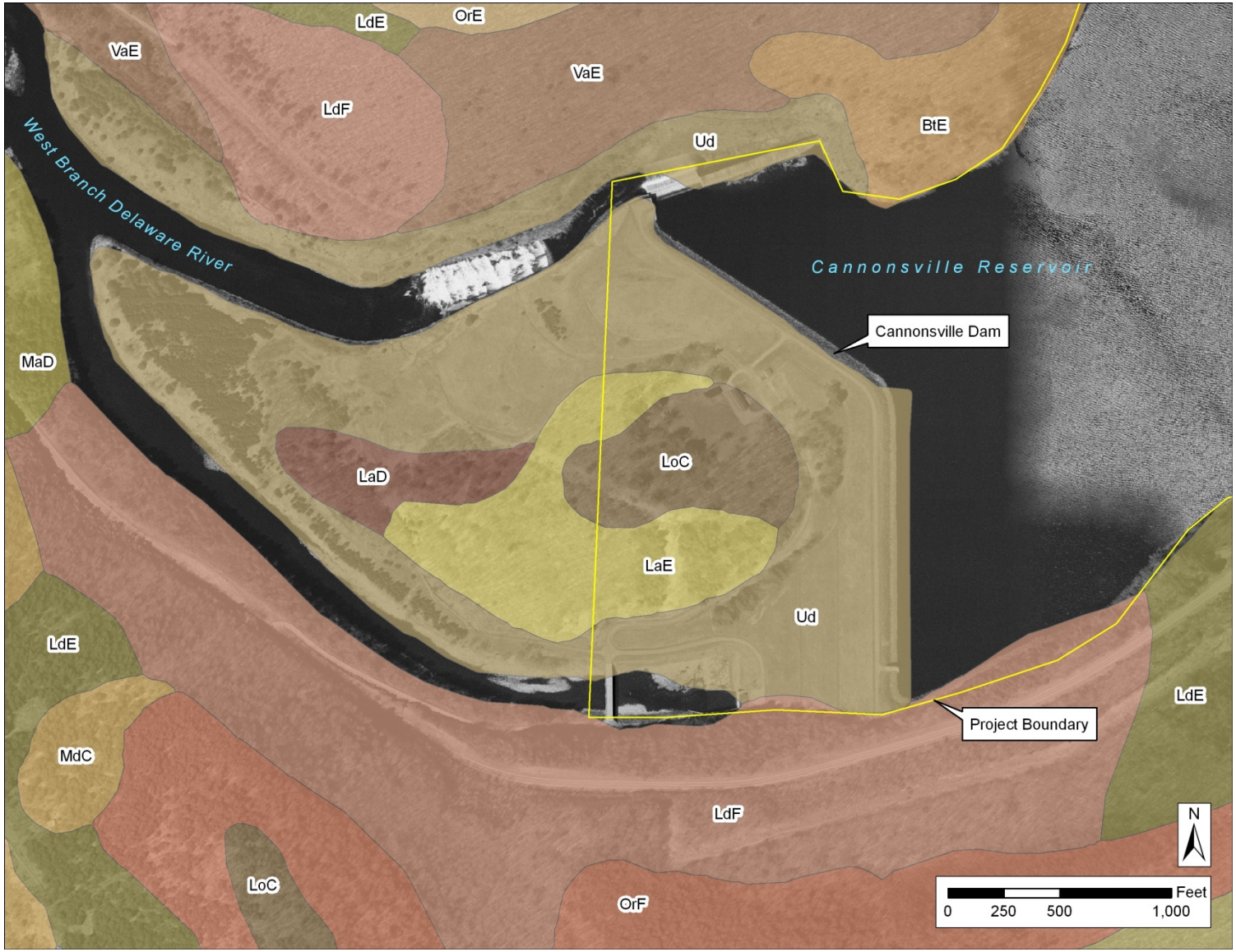
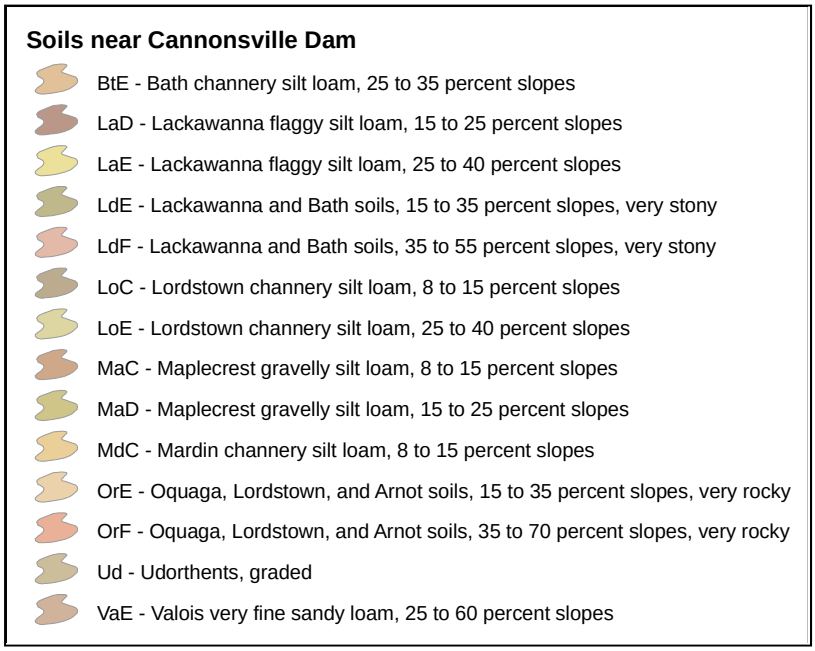


Figure E-6: Soil Types near Cannonsville Dam
See legend of soil types on following page.

Legend for Figure E-6



(2) Water Use and Quality

(i) Description of Existing and Proposed Uses of Project Waters

All correspondence on the Project, including all environmental resource areas, is included in Volume 3, Appendix E-1.

Cannonsville Dam and reservoir is one of several water supply dams that are owned by the City and operated by DEP to provide potable water for New York City and four nearby counties. The entire water supply system currently provides approximately 1.1 BG of unfiltered high quality drinking water daily to approximately nine million New York State residents (approximately 50% of the State's total population), as well as the millions of tourists and commuters who visit New York City annually.

The DEP has maintained long-term records on water supply withdrawals from Cannonsville Reservoir. Figure E-7 is a bar chart showing the total annual water supply withdrawal for consumptive purposes from 1982 to 2007. The annual withdrawal volume varies, ranging from a low of 14,687 million gallons ("MG") in 2006 to a high of 105,536 MG in 1992. The average annual withdrawal volume over the period 1982-2007 was 55,492 MG. The variation in annual withdrawal volumes is a function of many issues including storage capacity, precipitation, snowfall, water quality in the City's water supply reservoirs, and demand.

Figure E-8 shows the average monthly withdrawal volume for consumptive purposes from 1982 to 2007. The minimum and maximum withdrawal volume ranged from 2,623 MG in November to 6,342 MG in March.

There are three registered National Pollutant Discharge Elimination System ("NPDES") facilities in the immediate vicinity of the Cannonsville Reservoir as shown in Figure E-9. The local Board of Cooperative Education Services ("BOCES") has a wastewater treatment plant ("WWTP") on Trout Creek, which flows into the middle portion of the reservoir. Two facilities are located on the West Branch of the Delaware River just upstream of the Cannonsville Reservoir. The Village of Walton maintains a WWTP that discharges into the river. Kraft, Inc. discharges non-contact cooling water only from a facility just upstream of the Walton WWTP. There are several other facilities considerably farther up in the West Branch of the Delaware River Basin (NYCDEP, 2000).

DEP is proposing to use dam releases, specifically discharges to the West Branch of the Delaware River, to generate hydroelectric power at the Project. As described in Exhibits A and B, DEP is proposing to generate with discharges up to 1,500 cfs.

(ii) Description of Existing Water Quality in Project Waters

Water Quality Standards

New York State water classifications and water quality standards apply to the Cannonsville Reservoir and the West Branch of the Delaware River. Table E-5 describes NYSDEC fresh surface water classifications. Only Class AA and A waters are designated as suitable for drinking; however, other uses include primary and secondary contact, fishing, and recreational activities. This designation may also be given to waters that, upon treatment for naturally occurring impurities, meet New York State Department of Health ("NYSDOH") drinking water standards. Table E-6 describes the water quality criteria for the various water quality classifications. Additional designations of 'T' or 'TS' may be added to the classifications if the watercourse contains sufficient dissolved oxygen ("DO") to support trout (T) and/or trout spawning (TS). Watercourses that are designated as C(T), C(TS), B or A are protected streams, subject to additional regulations and require a state permit to disturb the bed or banks.

The water quality standards program is a New York State program with EPA oversight. It predates the federal Clean Water Act and protects both surface and groundwater. Standards and guidance values were developed to protect New York State's waters. The guidance values were derived and continue to be revised according to scientific procedures identified in Title 6 of the NYCRR.

Table E-7 includes the water quality classifications of the West Branch of the Delaware River.[3]

Table E-5: New York Fresh Surface Water Quality Classifications

Class	Description and Designated Uses
AA	The best usages of Class AA waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival. This classification may be given to those waters that, if subjected to approved disinfection treatment, with additional treatment if necessary to remove naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.
A	The best usages of Class A waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival. This classification may be given to those waters that, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.
B	The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival.
C	The best usage of Class C waters is fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
D	The best usage of Class D waters is fishing. Due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery, or stream bed conditions, the waters will not support fish propagation. These waters shall be suitable for fish, shellfish, and wildlife survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

[3] With respect to additional classifications shown in the table, which do not relate to the Project, "S" pertains to saline surface waters; "I" is an additional classification of saline surface waters; "G" pertains to fresh groundwater; and "GS" pertains to saline groundwater.

Table E-6: Summary of New York State Surface Water Quality Criteria

Parameter	Classes	Standard
Taste-, color-, and odor-producing, toxic and other deleterious substances	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special, GA, GSA, GSB	None in amounts that will adversely affect the taste, color or odor thereof, or impair the waters for their best usages.
Turbidity	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	No increase that will cause a substantial visible contrast to natural conditions.
Suspended, colloidal and settleable solids	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages.
Oil and floating substances	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules of grease.
Garbage, cinders, ashes, oils, sludge and other refuse	SA, SB, SC, I, SD	None in any amounts.
Phosphorus and nitrogen	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.
Radioactivity	A-Special	Should be kept at the lowest practicable levels, and in any event should be controlled to the extent necessary to prevent harmful effects on health.
Thermal discharges	GA, GSA, GSB	None in amounts that will impair the waters for their best usages.
Thermal discharges	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	See 6 NYCRR Part 704, Criteria Governing Thermal Discharges.
Flow	AA, A, B, C, D, A-Special	No alteration that will impair the waters for their best usages.
pH	AA, A, B, C, AA-Special, A-Special, GA	Shall not be less than 6.5 nor more than 8.5.
	D	Shall not be less than 6.0 nor more than 9.5.
	SA, SB, SC, I, SD	The normal range shall not be extended by more than one-tenth (0.1) of a pH unit.
Dissolved oxygen (DO)	A-Special	In rivers and upper waters of lakes, not less than 6.0 mg/L at any time. In hypolimnetic waters, it should not be less than necessary for the support of fish life, particularly cold water species.
	AA, A, B, C, AA-Special	For trout spawning waters (TS), the dissolved oxygen ("DO") concentration shall not be less than 7.0 mg/L from other than natural conditions. For trout waters (T), the minimum daily average shall not be less than 6.0 mg/L, and at no time shall the concentration be less than 5.0 mg/L. For non-trout waters, the minimum daily average shall not be less than 5.0 mg/L, and at no time shall the DO concentration be less than 4.0 mg/L.
Dissolved Solids	A-Special	Shall not exceed 200 mg/L.
	AA, A, B, C, AA-Special, GA	Shall be kept as low as practicable to maintain the best usage of waters but in no case shall it exceed 500 mg/L.
Odor	GA	Shall not exceed a threshold number of 3.

Parameter	Classes	Standard
Color	GA	Shall not exceed 15 color units (platinum-cobalt method).
Turbidity	GA	Shall not exceed 5 nephelometric units.
Total Coliform (per 100 mL)	AA	The monthly median value and more than 20 percent of the samples, from a minimum of five examinations, shall not exceed 50 and 240, respectively.
	A, B, C, D, SB, SC	The monthly median value and more than 20 percent of the samples, from a minimum of five examinations, shall not exceed 2,400 and 5,000, respectively.
	A-Special	The geometric mean, of not less than five samples, taken over not more than a 30-day period shall not exceed 1,000.
Fecal Coliform (per 100 mL)	A, B, C, D, SB, SC	The monthly geometric mean, from a minimum of five examinations, shall not exceed 200

Source: NYSDEC, 2008b

Table E-7: Surface Water Quality Classifications of the West Branch Delaware River and Tributaries to Cannonsville Reservoir

Water Body	Classification	Standards	Notes
West Br. Delaware River	B	B(T)	As the river enters the reservoir
Cannonsville Reservoir	A	A(T)	Main body of reservoir
Cannonsville Reservoir	AA	AA(T)	Within 1 mile of intake
West Br. Delaware River	B	B(T)	NY-PA boundary to Cannonsville Dam
Chase Brook	A	A(TS)	Lower stream as it enters the reservoir
Fish Brook	A	A(T)	Lower stream as it enters the reservoir
Dryden Creek	A	A(TS)	Lower stream as it enters the reservoir
Chamberlain Brook	A	A(T)	Lower stream as it enters the reservoir
Loomis Creek	A	A(T)	Lower stream as it enters the reservoir
Trout Creek	A	A(TS)	Lower stream as it enters the reservoir
Sherruck Brook	A	A(TS)	Lower stream as it enters the reservoir
Dry Brook	A	A(TS)	Lower stream as it enters the reservoir
Johnny Brook	A	A(T)	Lower stream as it enters the reservoir

Source: NYSDEC, 2008b

Historic Water Quality Data

The water quality of the City's water supply, its watershed streams, reservoirs, WWTP's, and aqueducts, is routinely monitored by the City's Watershed Water Quality Operations ("WWQO") group. West of the Hudson River, WWQO has a staff of 62 people, stationed in two laboratories (Grahamsville and Kingston), who are directly responsible for monitoring and maintaining the high water quality in the water supply system.

The WWQO staff includes facility managers, field and laboratory directors, chemists, microbiologists, laboratory support and sample collection personnel, scientists, technical specialists, and administrative staff. The Grahamsville and Kingston laboratories are certified by the NYSDOH Environmental Laboratory Approval Program for over 70 environmental analyses in the non-potable water and potable water categories. These analyses include physical parameters (e.g., pH, turbidity, color, conductivity), chemical parameters (e.g., nitrates, phosphates, chloride, chlorine residual, alkalinity), microbiological parameters (e.g., total and fecal coliform bacteria, algae), trace metals (e.g., lead, copper, arsenic, mercury, nickel), and organic parameters (e.g., organic carbon). Pathogens (e.g., Giardia, Cryptosporidium, and viruses) are assessed at the Kingston laboratory.

Water quality monitoring of the water supply is conducted for a host of reasons including regulatory compliance, meeting Filtration Avoidance Determination requirements, modeling, and surveillance. The rationale, analytes, sites, and frequencies are outlined for these and other specific objectives in a comprehensive Watershed Water Quality Monitoring Plan. Standard water quality data collection includes temperature and DO; a summary of this data for 2006 and 2007 are described below.[4]

Cannonsville Reservoir – Dissolved Oxygen and Temperature Profiles

Limnological surveys of the Cannonsville Reservoir have historically been performed by the DEP twice monthly from April through November. The surveys include DO and temperature profiles at various locations in the reservoir.

Shown in Figure E-10 and listed in Table E-8 are the DO and temperature sampling locations in the Cannonsville Reservoir.

Table E-8: Sampling Locations for Dissolved Oxygen and Temperature Profiles in the Cannonsville Reservoir

Sample ID No.	Sample Location Description
1WDC	Cannonsville Reservoir, Site 1, mid-channel at Cannonsville Dam
2WDC	Cannonsville Reservoir, Site 2, mid-channel at the spot from which Johnny Brook can be sighted, as approached from the west.
3WDC	Cannonsville Reservoir, Site 3, up Trout Creek arm, mid-channel between two hills on west bank
4WDC	Cannonsville Reservoir, Site 4, mid-channel across from the water supply intake chamber
5WDC	Cannonsville Reservoir, Site 5, mid-channel at widest part of the bay at Chamberlain Brook
6WDC	Cannonsville Reservoir, Site 6, mid-channel at the influent of the West Branch of the Delaware River

Shown in Figure E-11 and Figure E-12 are temperature profiles for Sample Site 1WDC for 2006 and 2007, respectively. This sampling location was selected due to it close proximity to the intake leading to

[4] 2006 and 2007 were originally selected because they were the two most recent years of complete data available at the time the City filed its Pre-Application Document relating to the Project. However, the data from these years is used in this Application because it is representative of the water quality trends relating to the Project.

the low-level release works. Shown in Figure E-13 and Figure E-14 are DO profiles for Sample Site 1WDC for 2006 and 2007, respectively.

As the temperature profiles show, a thermocline generally develops during May and June. As the summer progresses, the thermocline moves lower in the reservoir and there are greater thermal differences between surface water temperatures and bottom temperatures. Near the intake to the low-level release works, the water temperatures ranged from 6-10 degrees Celsius ("ºC"), which is much colder than the surface water temperatures (which could be as high as 25ºC in the summer). As described later, the water temperatures in the West Branch of the Delaware River, just below the dam, are typically less than 10ºC when the flow is comprised only of the low-level release works discharge.

As the DO profiles show, in the spring the DO concentrations are relatively uniform throughout the water column. As summer begins and air temperatures warm, DO concentrations become stratified, with lower concentrations in the lower depths of the reservoir. As described below, the DO concentrations in the West Branch of the Delaware River, immediately below the dam, are well above New York State water quality standards.

Cannonsville Dam Release – West Branch of the Delaware River – DO and Temperature

Conservation flow releases and directed releases are maintained through the low-level release works and into the West Branch of the Delaware River. In addition, when the spillway crest is exceeded spill flows are passed to the West Branch of the Delaware River. The DEP obtains DO and temperature data below the dam near the USGS gage (Sample Site CNB—see Figure E-8), which represents conservation flow releases, directed releases and spillage flows. Sampling is conducted monthly (at a minimum) throughout the year and the samples are generally collected between 9:00 am and 11:00 am.

Figure E-15 shows the 2006 and 2007 temperature data, while Figure E-16 shows the 2006 and 2007 DO concentrations. Also shown on the temperature and DO figures are the total discharges on the dates that water quality data was collected as recorded at the USGS gage. The reason for displaying discharge is that although there are times when the water temperature may rise, this is attributable to spillage where warmer temperatures from the reservoir surface water are mixing with the cooler low-level outlet releases.

As Figure E-15 shows, water temperatures at the USGS gage are cool throughout the year due to the deep intake leading to the low-level release works. The highest measured water temperature during the two years occurred on September 5, 2006 at 16.7 ºC. However, releases were generally less than 10ºC throughout the year.

As Figure E-16 shows, DO concentrations are relatively high in the spring and gradually decline to a low point in the early fall before rebounding again. This phenomenon was observed in 2006 and 2007. Generally, DO levels were well above State standards; however, the lowest reading, which occurred on October 1, 2007, was 5.6 milligrams per liter ("mg/L")- all other measurements were above 7 mg/L.

(iii) Minimum Flow Releases, Changes in Project Works or Operations, or Other Measures Recommended by the Agencies for Protecting or Improving Water Quality

Minimum Flow Releases: In 1977, NYSDEC issued regulations that required minimum releases from the City's Delaware River basin reservoirs for conservation purposes. As noted in Exhibit B, the City operates the Cannonsville Reservoir to maintain conservations flows in the West Branch of the Delaware in accordance with the operating protocol agreed to by the Decree Parties. The conservation flow requirements of the FFMP-OST – the applicable operating protocol in effect as of the date of this Application – ensures compliance with such NYSDEC release requirements

Changes in Project Works or Operation: The existing facilities at Cannonsville will be modified to include the following major features needed for the Project: (1) a powerhouse located adjacent to the existing low-level release works building; (2) new overhead and underground electric lines; and (3) a substation located adjacent to the existing maintenance building.

The DEP plans on maintaining conservation flow releases, directed releases, and discharge mitigation releases from the Cannonsville Reservoir in accordance with the requirements of the applicable operating protocol agreed to by the Decree Parties. The only difference in operations is that up to 1,500 cfs of these releases will be capable of being conveyed through turbines associated with the Project for the purpose of generating power.

Evaluation – Impact on Water Quality due to the Project: There are no long term impacts or changes to water quality resulting from the Project. Required flow releases will be maintained in accordance with the requirements of the applicable operating protocol agreed to by the Decree Parties. In addition, the hydropower intake will be the same as the current intake related to required discharges from the reservoir.

Short term unavoidable adverse impacts to water quality during construction will occur in the tailrace channel.[5] There will be roughly three months where no water is conveyed to the tailrace channel when the pipe leading to low-level release works is bifurcated to accommodate the powerhouse. During this period, conservation releases will be maintained in the spillway channel via two temporary siphons installed over the spillway crest. The temporary siphons will have the capacity to convey up to 400 cfs into the spillway channel. A Flow Management Plan during the estimated three month period of siphon operation is attached in Volume 11, Appendix E-9.

Hydraulic modeling was conducted on (a) the tailrace channel, (b) the spillway channel, and (c) from the confluence of the tailrace and spillway channels to the USGS gage located further downstream. The hydraulic model was run assuming 200 cfs (one siphon at maximum capacity) was maintained in the spillway channel only (no water discharge to the tailrace channel) via one of the temporary siphons to determine if it creates a backwater up the tailrace channel. The hydraulic modeling demonstrated that a backwater extends up the tailrace channel to the low-level release works outlet (see Figure E-17), when 200 cfs is maintained in the spillway channel. However, the water depth, and channel width in the tailrace channel is reduced and there is no velocity. The water depth, channel width, and distance from the confluence up the tailrace channel will be reduced further for temporary siphon releases less than 200 cfs. Water in the tailrace channel will be backwatered (pool-like) and will be subject to increased heating due to decreased water depth and channel width. However, as noted in the Flow Management Plan, DEP is proposing to have the siphons operable during the October through December timeframe, when air temperatures drop thus less heating of the water is expected. In addition, the lack of flowing water through the tailrace channel may impact DO in this reach on a diurnal basis. DO concentrations in the tailrace channel may be higher during the daylight hours when plants emit oxygen; while DO concentrations during the night hours may be lower than "normal" when plants respire.

A. Study – Impact of Construction-Related Activities on Erosion

Preliminary erosion and control measures were developed for the Project to prevent water quality impacts as a result of construction activities. The full report, which also addresses the City's proposed Pepacton and Neversink hydroelectric developments, is included in Volume 4, Appendix E-2.

[5] The tailrace channel is defined as the reach from the low-level release works discharge point to the confluence with the spillway channel. The spillway channel is defined as the reach from the spillway to the confluence with the tailrace channel, or the West Branch of the Delaware River.

During construction, sediment and erosion control measures and stormwater management practices will be employed to minimize erosion and prevent sedimentation in surface waters. All erosion and sediment control measures will be designed and implemented in accordance with the *New York State Standards and Specifications for Erosion and Sediment Control* (NYSDEC, 2005). A NYSDEC State Pollution Discharge Elimination System ("SPDES") General Permit for Stormwater Discharges will be required because the area of soil disturbance is more than one acre. As part of this permit, a stormwater pollution prevention plan ("SWPPP") will be required.

Prior to any ground disturbing activities, all applicable soil erosion and sediment controls (silt fencing, temporary berms, turbidity curtains, portable dams, hay bales, sedimentation basins, etc.) will be installed and maintained. Upon the completion of construction, all disturbed areas will be restored. As appropriate, the areas will be repaved, covered with gravel, or covered with top soil, mulch, and seed.

Details on the erosion control measures are included in the full report. It is expected that once the Project advances to the final design stage, a more detailed sediment and erosion control plan will be prepared and submitted as part of the permitting process.

(iv) Existing or Proposed Measures for Protecting or Improving Water Quality

Water quality conditions in the Cannonsville Reservoir and West Branch of the Delaware River are excellent; water temperatures are cool year-round due to the low-level outlet releases and DO concentrations are above state standards. The DEP is not proposing any changes in operations or measures to improve water quality conditions. The DEP carefully monitors water quality in the reservoir and in the West Branch of the Delaware River due to its use for water supply purposes.

The resource agencies (USFWS and NYSDEC) did not request any additional measures to improve water quality.

(v) Continuing Impact on Water Quality of Continued Operation of the Project; Existing or Proposed Measures for Protecting or Improving Water Quality

There is no continuing impact on water quality due to continued Project operation because no changes to existing operations at Cannonsville Reservoir are proposed as a result of the Project.

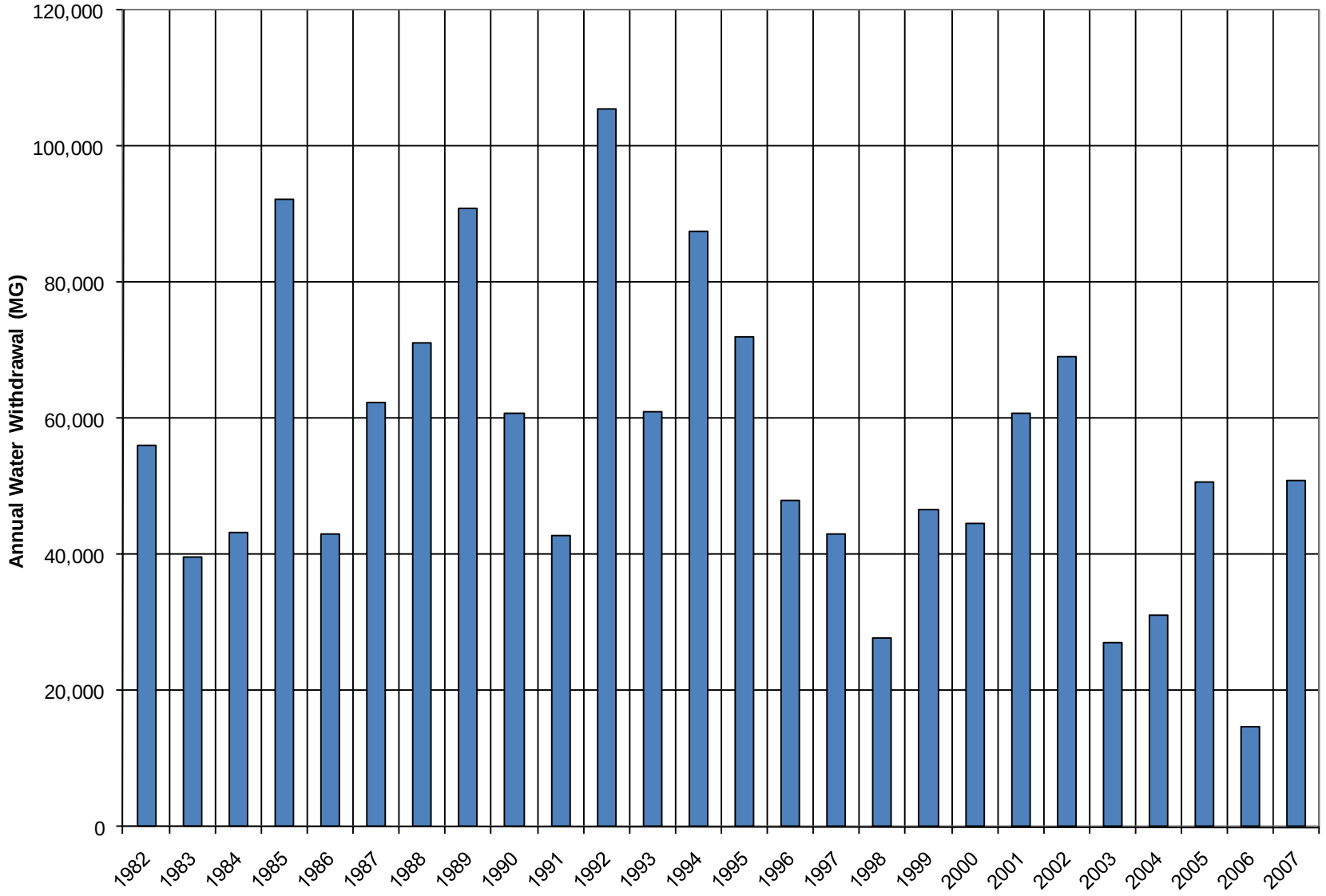


Figure E-7: Cannonsville Annual Water Supply Withdrawals from 1982-2007, Drainage area at dam = 454 mi^2

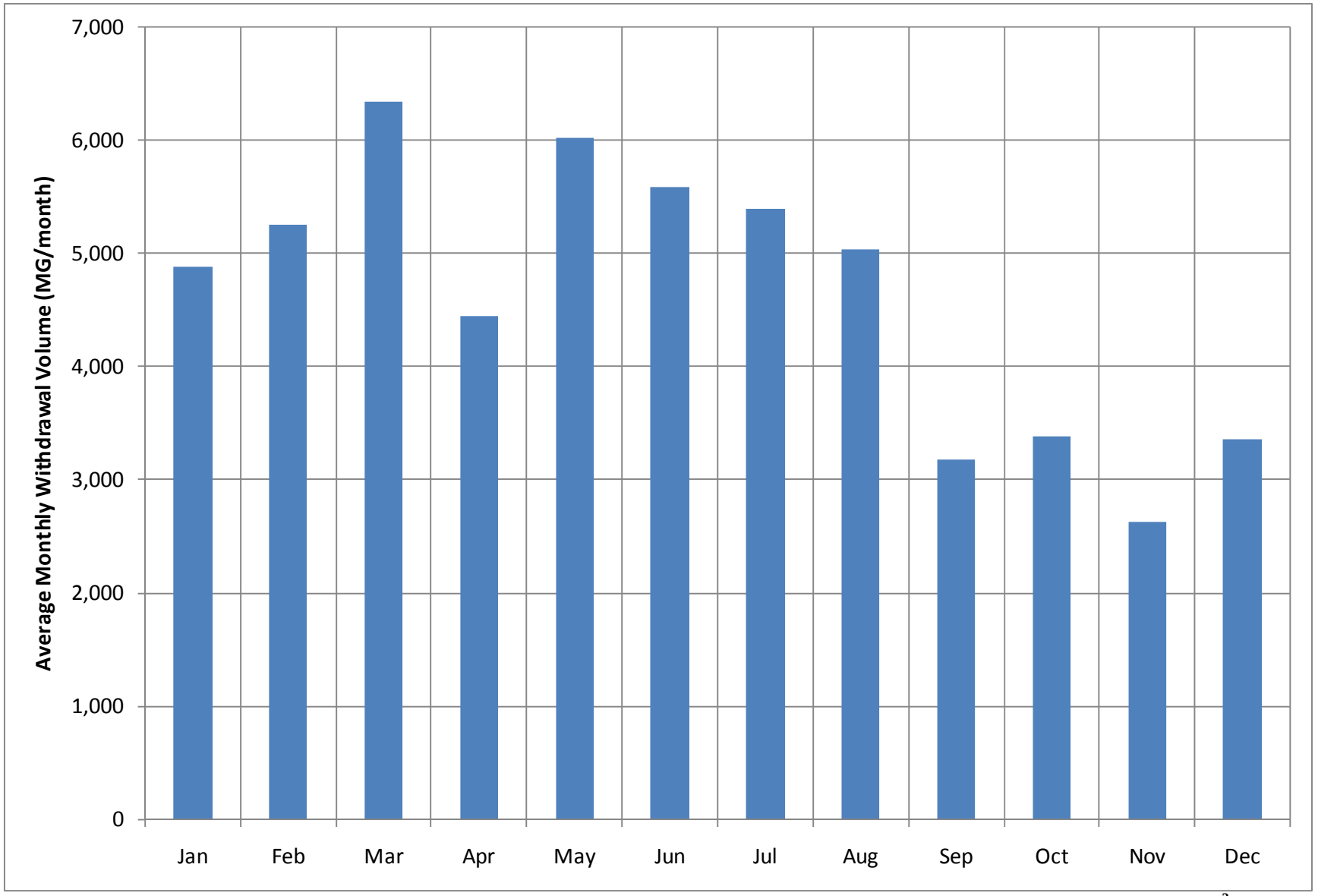


Figure E-8: Cannonsville Average Monthly Water Supply Withdrawals from 1982-2007, Drainage area at dam = 454 mi^2

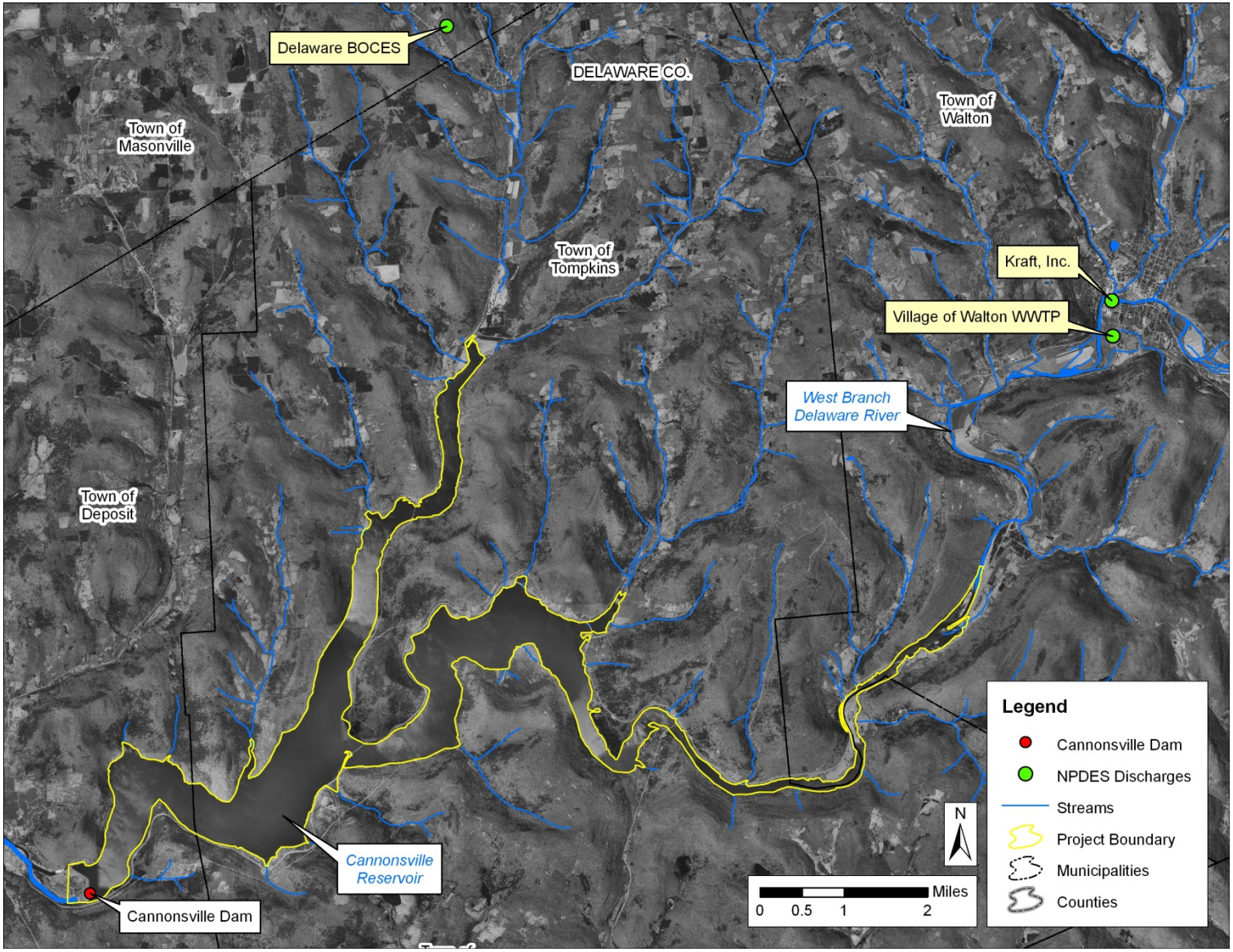


Figure E-9: NPDES Facilities near the Cannonsville Reservoir

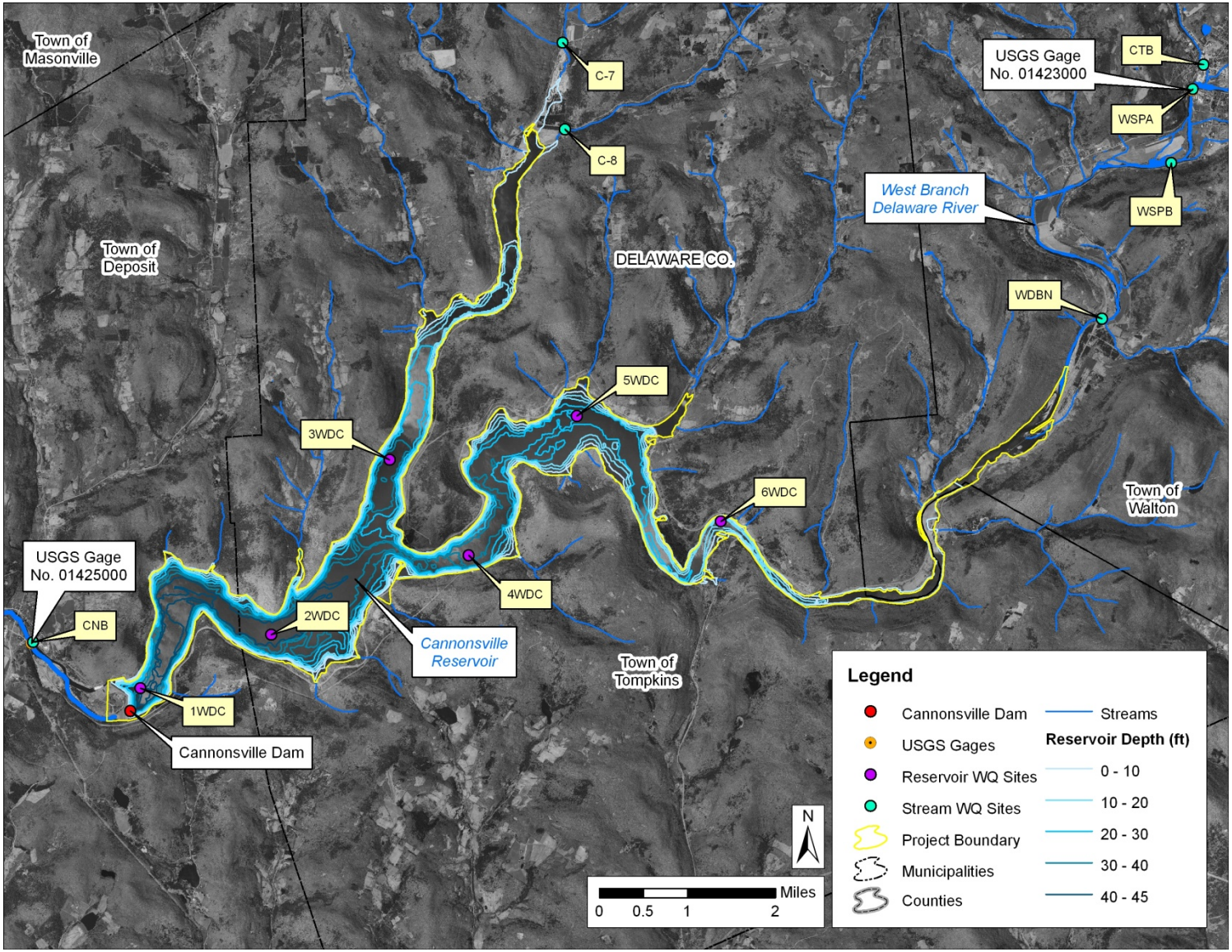


Figure E-10: Water Quality Sampling Locations near the Cannonsville Reservoir

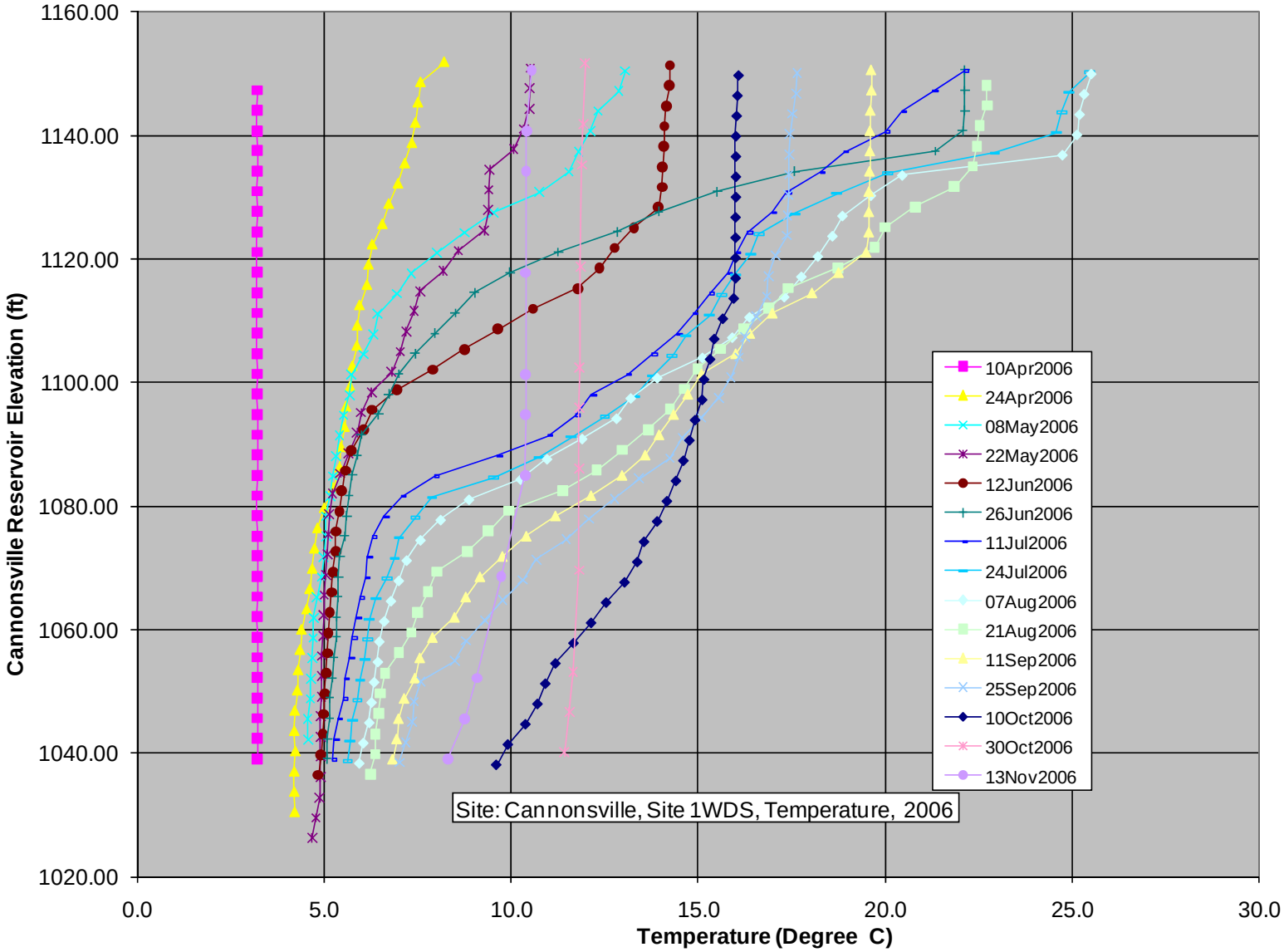


Figure E-11: Cannonsville Reservoir, Sample Site 1WDC – 2006 Temperature Profiles (mid-channel at Cannonsville Dam)

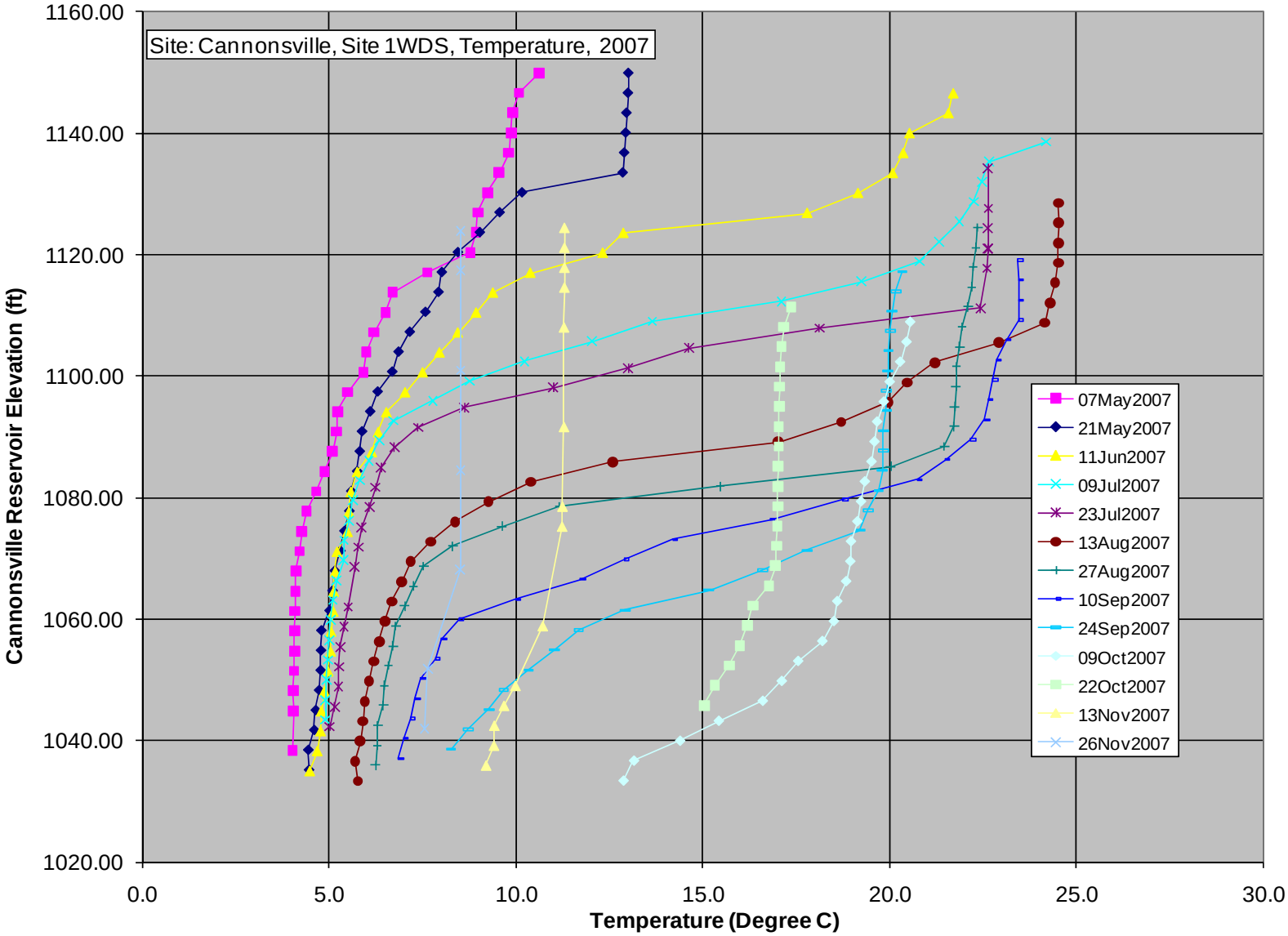


Figure E-12: Cannonsville Reservoir, Sample Site 1WDC – 2007 Temperature Profiles (mid-channel at Cannonsville Dam)

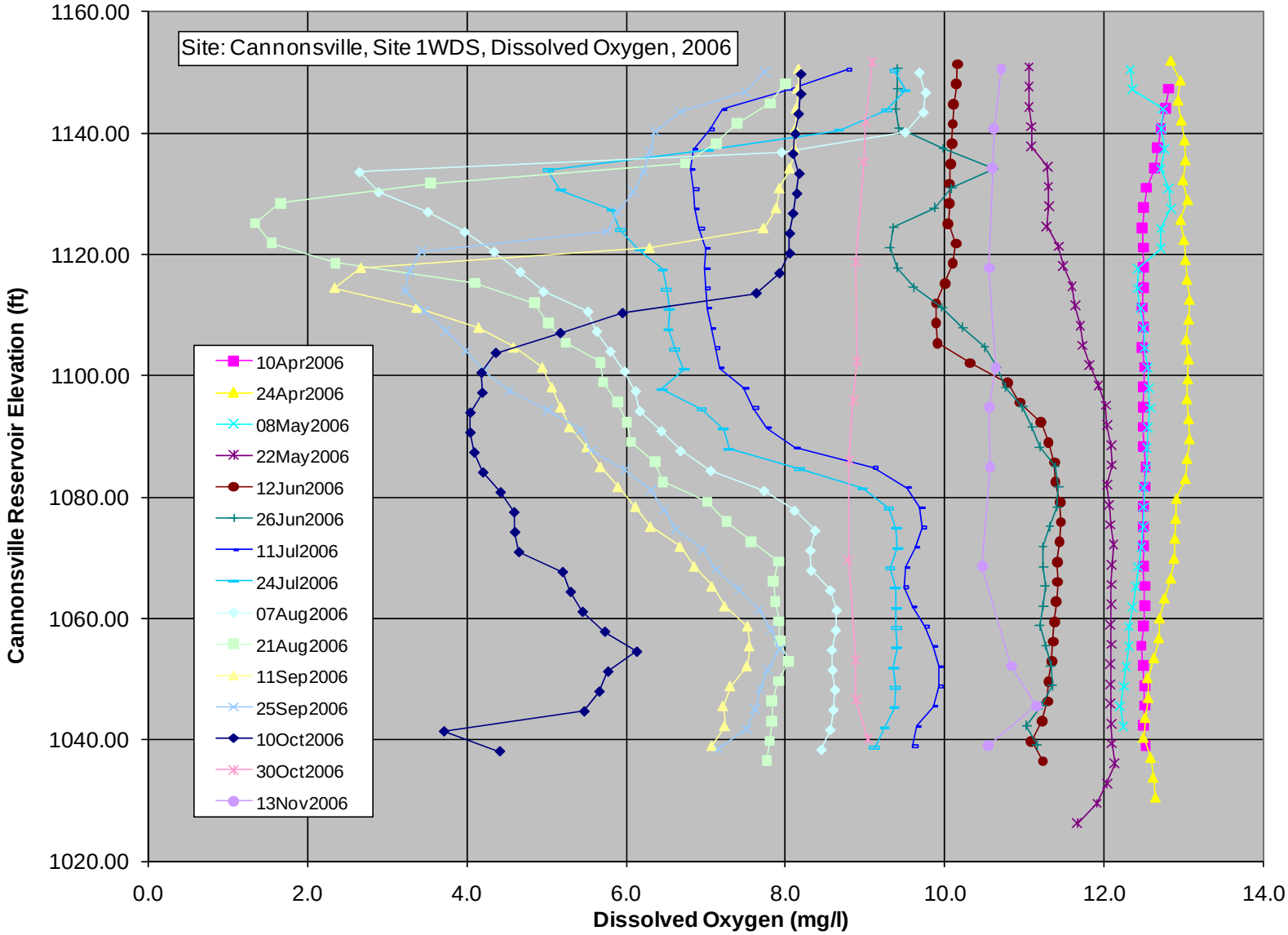


Figure E-13: Cannonsville Reservoir, Sample Site 1WDC – 2006 DO Profiles (mid-channel at Cannonsville Dam)

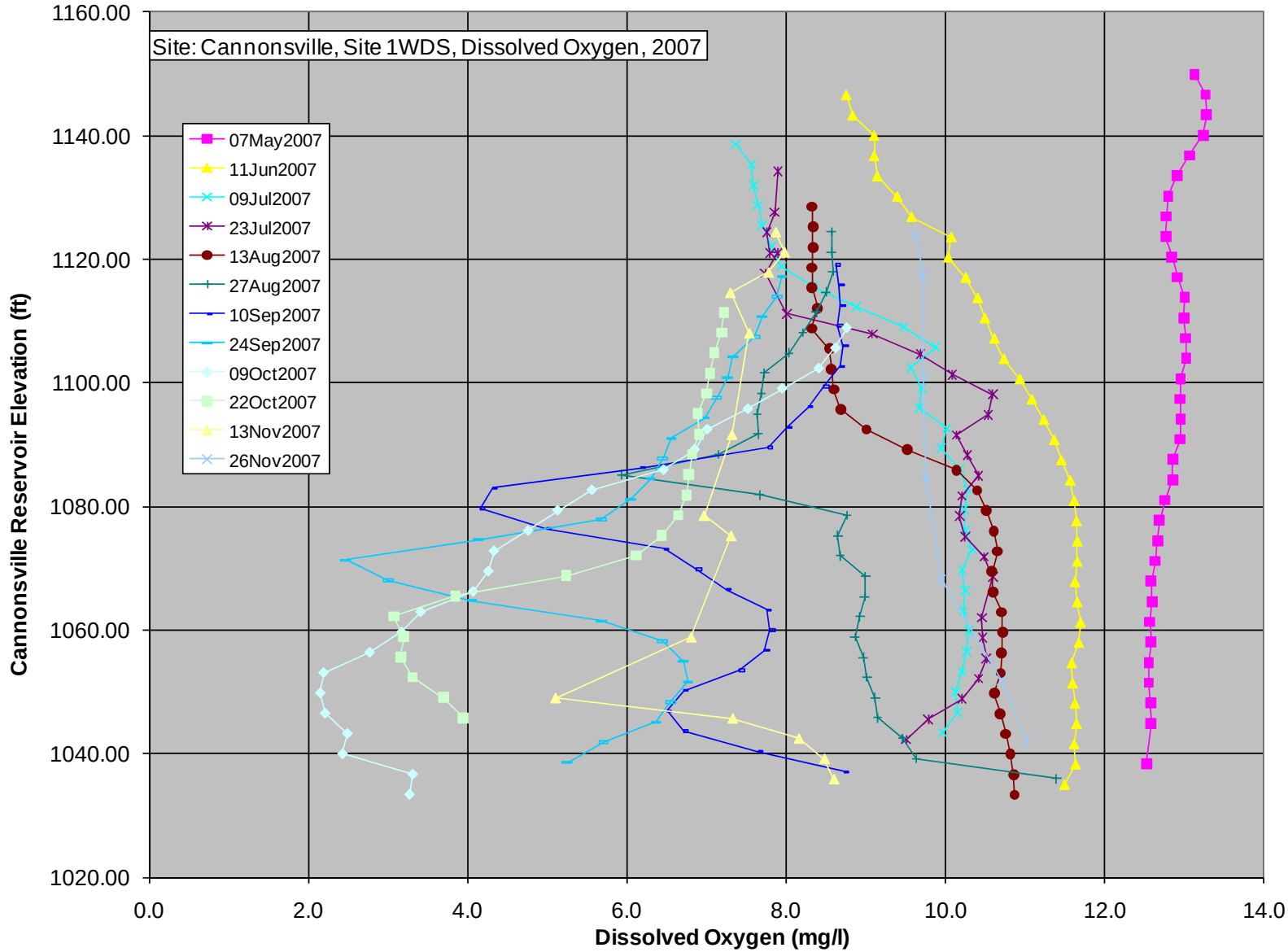


Figure E-14: Cannonsville Reservoir, Sample Site 1WDC – 2007 DO Profiles (mid-channel at Cannonsville Dam)

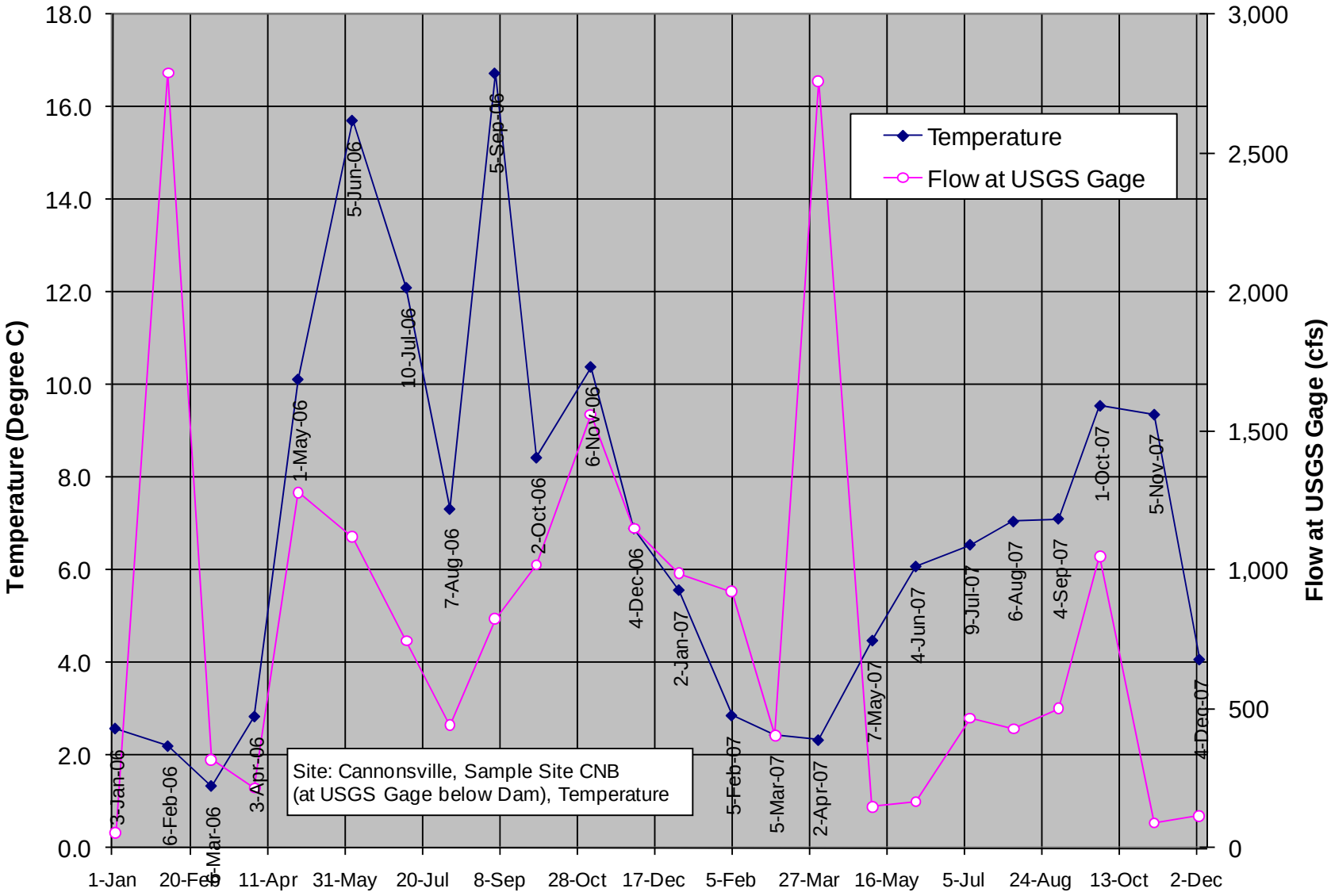


Figure E-15: Cannonsville Release, Sample Site CNB – 2006 & 2007 Temperature Data (near Stilesville Bridge, at USGS Gage)

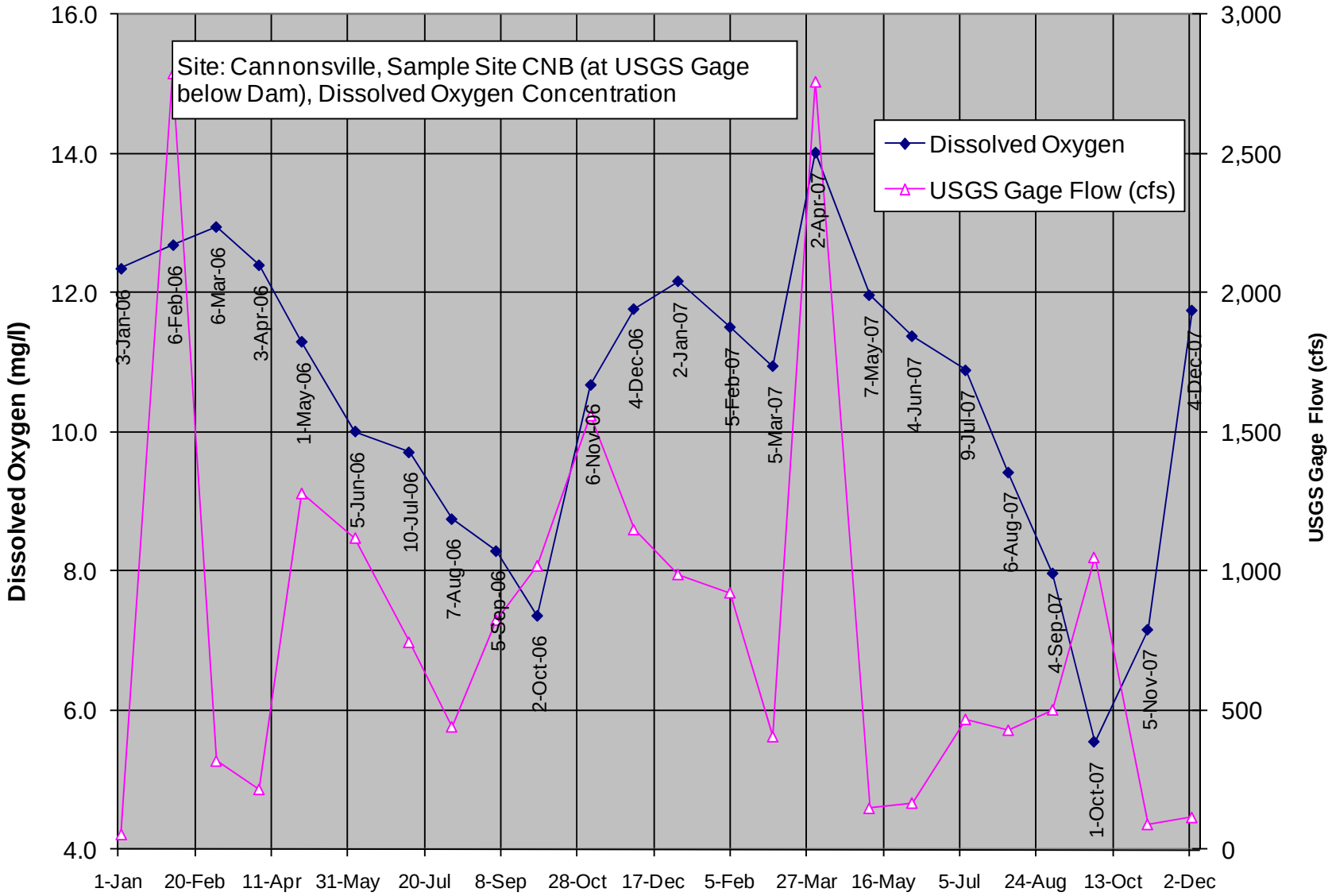


Figure E-16: Cannonsville Release, Sample Site CNB – 2006 & 2007 DO Data (near Stilesville Bridge, at USGS Gage)

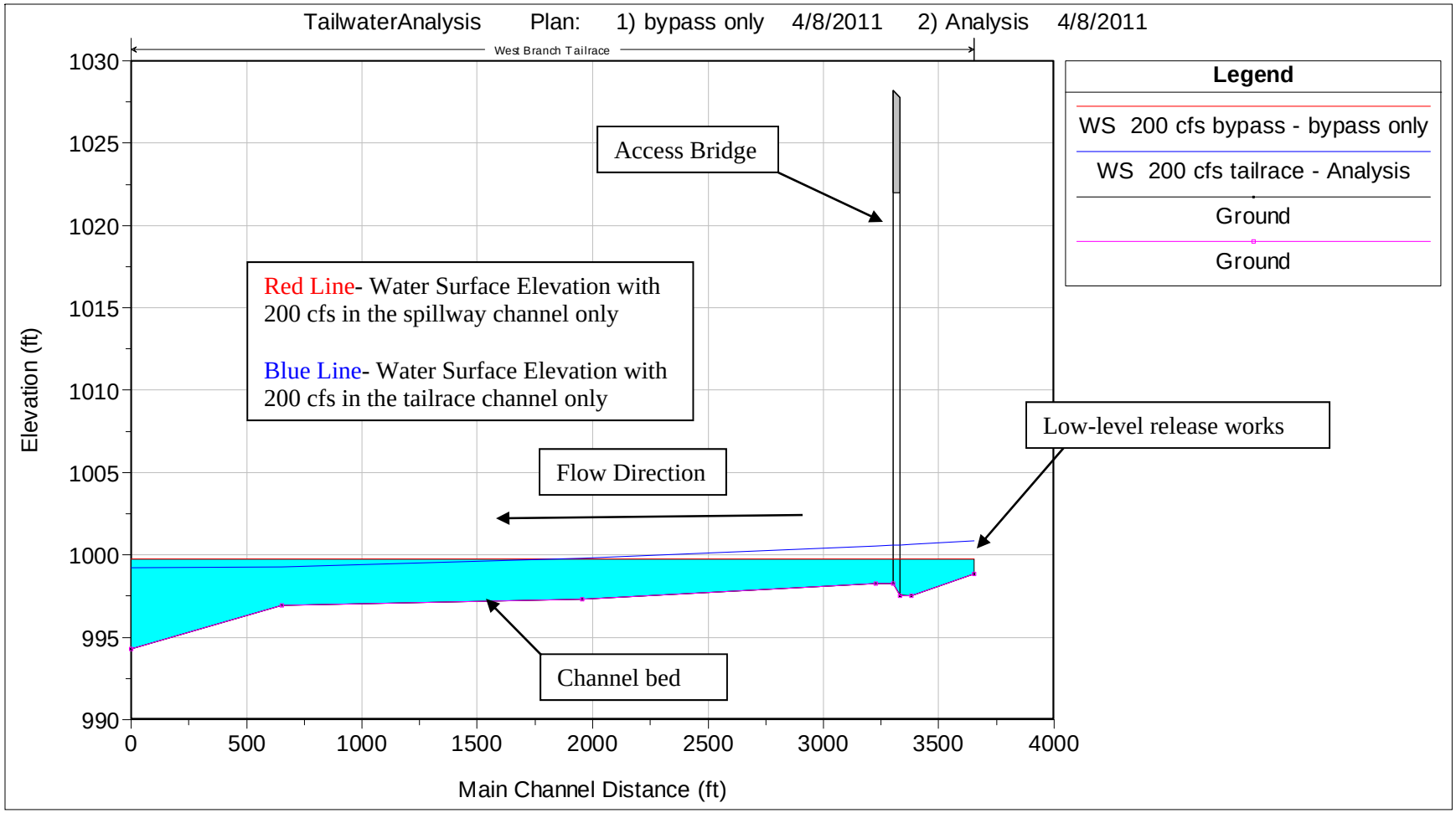


Figure E-17: Tailrace Reach - Comparison of Water Surface Elevation with 200 cfs in Tailrace Channel Only, and 200 cfs in Spillway Channel Only

(3) Fish, Wildlife, and Botanical Resources

(i) Description of Fish Wildlife, and Botanical Resources

Fishery Resources

West Branch of the Delaware River above Cannonsville Reservoir and Tributaries

The West Branch of the Delaware River is generally separated into two areas—above and below the Cannonsville Reservoir. From its headwaters in Schoharie County to the Cannonsville Dam, the West Branch of the Delaware River runs approximately 43 miles and passes through mostly farmland. Brown trout are stocked by the State in mid-April and again in mid-May. Approximately one-third of the brown trout residents are wild fish. It has been reported that wild brook trout can be found in the tributaries that empty into the West Branch of the Delaware River as well as the lower sections of tributaries that empty into the Cannonsville Reservoir. Brook trout are not stocked by NYSDEC biologists and are not as abundant in the upper river as brown trout (Delaware Co. SWCD, 2004). Large and smallmouth bass, chain pickerel, and yellow perch also are present in the upper West Branch of the Delaware River.

Cannonsville Reservoir

The Cannonsville Reservoir supports both warm and coldwater fish communities. Fish species found in the reservoir are listed in Table E-9. The NYSDEC manages the upper (above Cannonsville Dam) West Branch of the Delaware River as a coldwater trout fishery and has been monitoring trout populations in the reservoir through angler creel surveys and angler diaries. Brown trout were stocked in the reservoir from 2005 to 2008 to determine whether the population would respond to enhancement efforts. The study results indicate that the population has responded well to the stocking and has provided additional opportunities to catch trout. Through angler diaries recorded since the inception of the reservoir stocking program, the trout fishery has been monitored and will continue to be monitored (NYSDEC 2005; 2007a; 2007b, 2008b).

Table E-9: Fish Species Potentially Found in the Cannonsville Reservoir

Common Name	Scientific Name	Common Name	Scientific Name
Brown trout	*Salmo trutta*	White sucker	*Catostomus commersonii*
Brook trout	*Salvelinus fontinalis*	Slimy sculpin	*Cottus cognatus*
Smallmouth bass	*Micropterus dolomieu*	Fallfish	*Semotilus corporalis*
Yellow perch	*Perca flavescens*	Creek chub	*Semotilus atromaculatus*
Alewife	*Alosa pseudoharengus*	Blacknose dace	*Rhinichthys atratulus*
Rock bass	*Ambloplites rupestris*	Longnose dace	*Rhinichthys cataractae*
Pumpkinseed	*Lepomis gibbosus*	Common shiner	*Luxilus cornutus*
Bluegill	*Lepomis macrochirus*	Golden shiner	*Notemigonus crysoleucas*
Chain pickerel	*Esox niger*	Tessellated darter	*Etheostoma olmstedi*
Brown bullhead	*Ameiurus nebulosus*	Goldfish	*Carassius auratus*
Common carp	*Cyprinus carpio*	Rudd	*Scardinius erythrophthalmus*
Black crappie	*Pomoxis nigromaculatus*		

West Branch of the Delaware River below the Cannonsville Dam

Cold water releases in the summer from the Cannonsville Reservoir provide suitable temperatures for trout to reside in the entire 17.7 miles to the confluence with the East Branch of the Delaware River. Consequently, the West Branch of the Delaware River below the Cannonsville Reservoir supports a renowned trout fishery. Fish population sampling showed that brown trout are the most abundant species followed by rainbow trout and lastly a small component of brook trout. Additionally, trout abundance was

higher in the upper reaches (near the dam) than in the lower 12 miles to the confluence with the East Branch of the Delaware River (NYSDEC 2008a).

The NYSDEC conducted an Angler Diary Program within five reaches in the West Branch of the Delaware River (below Cannonsville dam) from 2002 through 2007 as listed in Table E-10. Although the Angler Diary Program extended to the East Branch of the Delaware River, Delaware River mainstem, and Neversink River, the West Branch of the Delaware River comprised 61% of the hourly angler effort. Additionally, the majority of trout were caught in the West Branch of the Delaware River, with smaller proportions caught in the East Branch of the Delaware River and mainstem of the Delaware River. Angler catches were dominated by wild brown trout with a small component of reservoir and Oquaga Creek hatchery brown trout. Small numbers of rainbow and brook trout were caught, and did not comprise a large portion of the West Branch of the Delaware River catch (NYSDEC 2007c).

Table E-10: West Branch of the Delaware River below Cannonsville Dam, Angler Diary Reach Names

Reach No.	Starting At	Ending At	Reach Name
1	Cannonsville Dam	Stilesville Weir	Cannonsville Dam
2	Stilesville Weir	Route 17 Bridge, Deposit	Stilesville
3	Route 17 Bridge, Deposit	Lower Boundary No Kill Zone	No Kill
4	Lower Boundary No Kill Zone	NY-PA Border (Monument Pool)	Hale Eddy
5	NY-PA Border (Monument Pool)	Confluence with the Delaware River	Border Water

The trout fishery in the lower West Branch of the Delaware River is managed under special regulations. The entire section in New York has open season from April 1 through October 15. There is a 12-inch minimum length limit and a two fish creel limit with no fishing allowed outside the listed season dates. Additionally, fishing is prohibited in the 1.4 mile reach between the dam and the Town of Stilesville. The season dates for the section that borders New York and Pennsylvania are the first Saturday after April 11 to October 15. Fishing is allowed in this section outside the regular season, but there is an artificial lure, catch-and-release only restriction.

In 1992, a 2.2 mile reach of the West Branch of the Delaware River in the Town of Deposit was designated with a "No Kill" regulation in an attempt to demonstrate the trout potential of the river. The regulation was popular among anglers and catch rates were higher immediately following implementation.

A 12-inch minimum size limit and three fish creel limit was implemented in 1991 as it was believed that the nine inch size limit did not make use of the excellent survival and growth potential of the river. Although catch rates did not improve with the implementation of these regulations, the mean length of creeled trout increased (NYSDEC 2007c).

The National Marine Fisheries Service ("NMFS") was sent a letter on July 19, 2011 to verify that the West Branch of the Delaware River is not considered Essential Fish Habitat.

[As of the filing date of this Application, no response has been received from NMFS regarding the City's July 19th letter.]

Aquatic Habitat Study

Background: The USGS received Congressional funding to study instream habitat needs in the upper portion of the Delaware River Basin, including the East and West Branches of the Delaware River and the

Neversink River. These three tributaries were studied from the City's Delaware River basin reservoirs to their respective confluences with the Delaware River. The specific objectives of the study were:

- The quantification of habitat metrics over a range of discharges and seasons at selected locations in the three tributaries and the mainstem of the Delaware River.
- Development of a prototype Delaware River Decision Support System to assist the DRBC and stakeholders in analyzing and interpreting water management and reservoir operations alternatives.

The USGS study resulted in a report entitled *A Decision Support Framework for Water Management in the Upper Delaware River* and was published in 2007 (Bovee, Waddle, Bartholow, and Burris, 2007). It contains considerable information on the East and West Branches of the Delaware River and the Neversink River. The USGS report has been included in Volume 10, Appendix E-8.

Segmentation and Target Species: The West Branch of the Delaware River was segmented into two reaches based on geomorphic changes, temperature classification (coldwater, transitional or warmwater) and target species. Within the two reaches, representative study sites were selected based primarily on planform. The reaches included Cannonsville Dam to the confluence with Oquaga Creek (segment WB0, 2.4 miles, 456 mi^2), and from Oquaga Creek to Hancock, NY (segment WB1, 14.4 miles, 595 mi^2). The target species of interest were brown trout adult, brown trout juvenile, shallow-fast guild and shallow-slow guild.

Habitat Suitability: Ranges of suitable depths and velocities for each of the target species were defined using the Delphi process, which is described in much greater detail in the USGS report. In short, the Delphi process results in developing relationships between depth, velocity and substrate relative to habitat—commonly called habitat suitability index curves. A hydraulic model was developed within the representative study sites to compute the range of depths and velocities over a range of flows.

Habitat versus Flow Relationships: Using the hydraulic modeling results, in addition to the habitat suitability index curves, habitat versus flow relationships were developed for each species. Shown in Appendix 3 of the USGS report are the habitat versus flow relationships on the West Branch of the Delaware River for the various fish species. The habitat versus flow relationships developed as part of this study and others (Sheppard, 1983) informed the development of conservation flows contained in the FFMP. In fact, NYSDEC and Pennsylvania Fish and Boat Commission ("PFBC") jointly developed a paper entitled "Recommended Improvements to the Flexible Flow Management Program for Coldwater Ecosystem Protection in Delaware River Tailwater" dated January 12, 2010. The paper represents the collaborative effort of fisheries biologists from both NYSDEC and PFBC and summarizes how previous fish habitat studies were used to develop a conservation flow regime below the Cannonsville, Downsville and Neversink Dams. The paper is available at the following web link: http://www.dec.ny.gov/docs/fish_marine_pdf/delaflexflow.pdf

A. Study – Literature Based Characterization of Resident Fish Entrainment and Mortality

DEP was requested by USFWS and NYSDEC to evaluate the potential for fish entrainment and mortality at the City's proposed Cannonsville, Pepacton and Neversink hydroelectric developments. A study plan was developed in consultation with USFWS and NYSDEC. The full study report, which applies to the City's proposed Cannonsville, Pepacton and Neversink hydroelectric developments, is included in Volume 5, Appendix E-3.

Entrainment

The DEP used an incremental analysis approach to determine the potential for fish entrainment, including: (1) evaluating which fish species and life stages have the potential to be present in the vicinity

of the Cannonsville intake structure based on habitat preferences; (2) evaluating water quality conditions at the intake location and reservoir water levels to determine how these factors affect the potential for fish entrainment; and (3) comparing swimming speeds of fish that may be susceptible to entrainment to calculated water velocities at the intake structure. In addition, results of field-based entrainment and survival studies were reviewed at other hydroelectric projects where quantitative sampling was conducted, and applying these results to site-specific conditions at the Project to evaluate the potential impacts of entrainment on the identified fish species of potential concern in Cannonsville Reservoir.

Water quality factors may influence the distribution and movements of cold water fish in the Cannonsville Reservoir. Because the reservoir capacity is often reduced during hot, dry summers, entrainment potential is the greatest during these situations. When the volume of the bottom layer of the reservoir decreases, fish may be forced to concentrate near the intake area where cooler, more oxygenated water is located, thereby increasing entrainment potential. Thus, the potential for fish entrainment and impingement peaks during dry summer drawdowns, and the fish species most likely subject to entrainment are those seeking deep, cool water as thermal refuge, such as brown and brook trout, rainbow smelt, and alewife. Likewise in the winter, because the bottom layer of the reservoir is warmer than the surface, fish may tend to congregate near the bottom and stay active throughout the winter, thus having a moderate potential of being in the vicinity of the intake structure during the winter.

Fish that spend at least part of their life cycle in deep, cool waters are likely to be found in the vicinity of the existing deep water intake associated with the Project. As part of the entrainment analysis, literature-based swim speed data for these fish were compared to the intake velocity. The maximum hydroelectric capacity of the Project is 1,500 cfs, resulting in an intake[6] velocity of 2.9 feet per second ("ft/s"). However, in considering conservation and directed release flows at Cannonsville Reservoir (i.e., the flows utilized for power generation) based on the OASIS modeling of the FFMP-OST (i.e., the operating protocol in effect at the time of this Application), the median annual discharge associated with such operating protocol is 410 cfs, resulting in an intake velocity of 0.80 ft/s – below the USFWS intake velocity design criteria of 2 ft/s.

Although adults and large juveniles of some species may exhibit behavior that would potentially expose them to entrainment during generation (such as trout seeking out cool, deep water during summer, or deep-water refuge during winter) such species generally exhibit swimming performance exceeding the expected intake velocity.

Some fish species such as juvenile white suckers and adult and juvenile catfishes, including bullheads and margined madtom, were identified as having minimal likelihood of being found near the intake structure based on habitat preferences but could not be ruled out from the potential for entrainment solely because their swimming speed is unknown based on the available literature.

Based on the habitat and life history requirements and swimming speeds of the fish species found in the Cannonsville Reservoir, fish entrainment is expected to be low for all species. Additionally, because there is no shoreline habitat near the intake structure, and the intake structure is located in deep-water habitat, the risk of entrainment for fry and juvenile fishes—regardless of intake velocity—is minimal.

[6] There are two openings at the intake – one 10 feet by 15 feet, and another 7 feet by 15 feet for a total gross area of 510 ft^2. The back rack clear spacing is approximately 7.5 inches.

Mortality

Fish mortality due to entrainment through the hydroelectric development, pressure differential between the intake location and the downstream release point, and impingement on intake protection devices was also evaluated.

Due to the existing deep water intake structure associated with the Project, the pressure differential between the intake location and the low-level release works experienced by a potentially entrained fish is likely to cause significant fish mortality regardless of the presence or absence of hydroelectric facilities at this site. Under most reservoir water level conditions, it is likely that any fish entrained and passed through the low-level release works would not survive due solely to the pressure differential that would be experienced between the intake structure and the low-level release works. Therefore, the addition of turbines and their potential effects on entrained fish is unlikely to materially affect fish mortality at Cannonsville Reservoir.

Intake Protection

The deep water intake structure at Cannonsville already utilizes intake protection in the form of bar racks.

Regardless, various options for providing additional intake protection were evaluated. A brief overview of the common physical and behavioral barriers for intake protection including the constructability and feasibility thereof were assessed, as described in the full report (see Volume 5, Appendix E-3), but these options were determined to be unnecessary and/or not viable alternatives for The Project.

Based on the assessment of potential entrainment and mortality at the Project, the City is not proposing additional intake protection measures as part of the Project.

Fish Passage

At the request of USFWS, the need for downstream fish passage and any appropriate mechanisms to facilitate passage was examined relative to the resource agencies' (i.e., USFWS and NYSDEC) expressed objectives for downstream fisheries management. The feasibility of providing downstream fish passage either through the low-level release works or at the surface of the Cannonsville Reservoir was evaluated. Physical factors related to water quality impacts of downstream fish passages at Cannonsville were also addressed.

Because of the high fish mortality rate associated with the large pressure differentials between the existing intake structure and low-level release works associated with the Project, the low-level fish passage alternative was determined to be impractical.

The potential for providing surface-oriented downstream fish passage facilities was also evaluated. It was determined that the changes to downstream temperature regimes arising from the conveyance flows associated with surface-oriented passages at Cannonsville Reservoir would likely adversely affect the downstream coldwater fisheries by warming up the river. Because the fisheries management objectives for the West Branch of the Delaware River is focused on providing coldwater trout fisheries, such a result would be inconsistent with these management objectives. Additionally, downstream fish passage is not required to complete the life cycles of any fish species in the reservoir.

For these reasons, constructing downstream fish passage at Cannonsville Reservoir as part of the Project is neither desirable nor warranted. Accordingly, the City is not proposing any such downstream fish passage as part of the Project.

Consultation and Conclusion

The entrainment report was provided to NYSDEC and USFWS for review and comment. As stated in the NYSDEC comment letter of December 8, 2010 (see Volume 3, Appendix E-1), NYSDEC concluded that based on the information provided by DEP regarding the operation of the Project, the Project will not have a significant impact on fish mortality at Cannonsville, thus, no additional field studies were deemed necessary. The NYSDEC noted that its determination was based on the fact that the City was proposing to maintain flows consistent with the requirements of the operating protocol agreed to by the Decree Parties and not proposing to modify the magnitude, frequency, duration, or timing of such discharges. The NYSDEC noted that if there is a change in the proposed operation that would increase flows through the turbines and release structures, then further studies or protective measures may be warranted.

Similarly, as stated in the USFWS comment letter of September 15, 2010 (see Volume 3, Appendix E-1), USFWS concluded that, based on the information provided and the results of the entrainment analysis conducted, no further studies were necessary at this time.

The initial entrainment analysis discussed with NYSDEC and USFWS was based on the FFMP – the operating protocol agreed to by the Decree Parties in effect at the time the consultation with NYSDEC and USFWS was conducted. Effective June 1, 2011, the FFMP was superseded by the FFMP-OST. Accordingly, subsequent to the discussions with NYSDEC and USFWS, the prior analysis was updated to reflect the change in the applicable operating protocol. However, although the FFMP-OST generally results in a slightly greater overall volume of releases from Cannonsville Reservoir compared to the FFMP, the findings and conclusions based on the FFMP, which were previously discussed with NYSDEC and USFWS and served as the basis for their respective conclusions regarding the lack of need for additional studies at this time, remain valid and are unchanged by the revised analysis based on the FFMP-OST. In particular, the change in operating protocol has no impact on the fact that the pressure differential between the intake structures and the release works associated with the Project experienced by any potentially entrained fish is likely to cause significant fish mortality regardless of whether hydropower facilities are added at the site. A comparative analysis of the two flow regimes was presented to NYSDEC, USFWS, and other stakeholders on July 21, 2011.

<u>Evaluation – Impacts on Aquatic Resources due to Project Construction</u>

The Project will not create any long term impacts or changes to aquatic habitat. The City will maintain flow releases in accordance with the requirements of the operating protocol agreed to by the Decree Parties.

A short term unavoidable impact to aquatic resources will occur in the tailrace channel. There will be a period, estimated to be on the order of three months, where no water is conveyed to the tailrace channel to allow tie-in of the new powerhouse. During this period, conservation flow releases will be provided via two 200 cfs temporary siphons over the spillway crest to convey up to 400 cfs into the spillway channel.

As noted earlier, when flow is maintained in the spillway channel only, the tailrace channel is partially backwatered resulting in reduced water depths and channel widths. This reduction in wetted area will directly impact aquatic habitat in the tailrace channel. To alleviate these short-term impacts, prior to ceasing low-level outlet releases, the releases will be ramped down to permit fish in the tailrace channel to relocate further downstream to avoid potential stranding. In addition, DEP proposes to walk the 4,000-foot long tailrace reach immediately after the releases are ceased to physically relocate any potentially stranded fish and mussels below the tailrace channel/spillway channel confluence and into deeper waters.

Wildlife Resources

The Project is located in a section of the State that is generally sparsely populated and relatively remote. The large tracts of forested mountains support a wide variety of wildlife. Table E-11 through Table E-14 (end of section) list mammal, bird, amphibian, and reptile species potentially present in the Project area. Bald eagles use the Project area for nesting and wintering. The Mongaup and Delaware Rivers support the highest concentration of wintering bald eagles in New York State and one of the highest concentrations in the northeast. Additionally, waterfowl likely use the stream corridor and reservoir for nesting and feeding.

The species listed in Table E-11 through Table E-14 were generated from the West Branch Delaware River Stream Corridor Management Plan (Delaware Co. SWCD, 2007 and 2004), and the USFWS' Significant Habitats and Habitat Complexes of the New York Bight Watershed (USFWS, 1997). The list includes the vast majority of species likely to be found in the Project area.

Federal and State Rare, Threatened and Endangered Species

During the study plan development process, existing data relative to rare, threatened and endangered ("RTE") species were gathered. The New York Natural Heritage Program and USFWS' website was consulted to verify and update RTE information for the Project area. The initial RTE species identified as having the potential of being found in the Project were as follows:

- Dwarf wedge mussel (federally-listed Endangered)
- Indiana bat (federally-listed Endangered)
- Bog turtle (federally-listed Threatened)
- Northern wild monkshood (federally-listed Threatened)
- Brook floater (state-listed Threatened)
- Bicknell's thrush (state-listed Special Concern)
- Timber rattlesnake (state-listed Threatened)
- Jefferson salamander (state-listed Special Concern)
- Longtail salamander (state-listed Special Concern)

As noted in the USFWS' February 12, 2010 comment letter on DEP's proposed study plan, suitable habitats for the Indiana bat and bog turtle in NY have not been found at elevations above 900 and 1,000 feet, respectively. Given that the Cannonsville Dam is located above elevation 1,400 feet, it is unlikely that the habitat for these species would be present in or near the areas that would be impacted by the construction or operation of the Project. The NYSDEC was contacted to determine if they agree with USFWS' assertion that the Indiana bat and bog turtle are not likely to be found in project area given the high altitude, and they agreed in an email correspondence. Based on this information from USFWS and NYSDEC, the assessment did not include these two species.

NMFS has jurisdiction over marine species and migratory fish, working within the Endangered Species Act to promote marine species and habitat stewardship. NMFS has indicated that there are no jurisdictional, listed or proposed endangered or threatened species or critical habitats in the Delaware River in the immediate vicinity of the Project.

Based on the foregoing, the RTE species having the potential of being found in the Project area based on their respective geographic range and habitat preferences are described below:

Dwarf wedge mussel (federally listed Endangered)

Typical habitat for this mussel includes running waters of all sizes, from small brooks to large rivers. Bottom substrates include silt, sand and gravel, which may be distributed in relatively small patches behind larger cobbles and boulders. The river velocity is usually slow to moderate. Dwarf wedge mussels appear to select or are at least tolerant of relatively low levels of calcium in the water.

Northern wild monkshood (federally-listed Threatened plant species)

The Northern wild monkshood is noted for its very distinctive, blue hood-shaped flowers which bloom between June and September. The plant is typically found on shaded to partially shaded cliffs, algific talus slopes, or on cool, streamside sites. These areas have cool soil conditions, cold air drainage, or cold groundwater flowage. On algific talus slopes, these conditions are caused by the outflow of cool air and water from ice contained in underground fissures. These fissures are connected to sinkholes and are a conduit for the air flows.

Brook floater (state listed Threatened)

The Brook Floater is strictly a running water species favoring gravelly riffles in creeks and small rivers. Considered to be a species of creeks and small rivers where it is found among rocks in gravel substrates and in sandy shoals, the brook floater inhabits flowing-water habitats. Although typically found in riffles and moderate rapids, this species can be found in a range of flow conditions but is usually not found in very slow flow conditions. The species has no consistent substrate preference but it is thought to prefer stable habitats such as coarse sand and gravel.

Bicknell's thrush (state-listed Special Concern bird species).

The Bicknell's thrush is an elusive neotropical migrant that breeds in the high elevation forests of northeastern North America and winters in the Caribbean. It is a habitat specialist restricted to montane forests of balsam fir. In New York, the Bicknell's thrush breeds at high elevations in the Adirondack and Catskill Mountains, which represent the southern-most boundary of its breeding range. Because of its preference for stands of dense fir trees on ridgelines, the Bicknell's thrush is often associated with recently disturbed areas characterized by standing dead conifers and dense regrowth of balsam fir.

Timber rattlesnake (state-listed Threatened reptile species)

Populations of the timber rattlesnake were once found on Long Island and in most mountainous and hilly areas of New York State, except in the higher elevations of the Adirondacks, Catskills, and Tug Hill region. They are now found in isolated populations in southeastern New York, the Southern Tier, and in the peripheral eastern Adirondacks. Timber rattlesnakes are generally found in deciduous forests in rugged terrain in these areas. In the summer, pregnant females seem to prefer open, rocky ledges where temperatures are higher, while the males and non-pregnant females seem to prefer cooler, thicker woods where the forest canopy is more closed.

Jefferson salamander (state-listed Special Concern amphibian species)

The geographic range of the Jefferson salamander includes southern New York, northern New Jersey, and most of Pennsylvania to Ohio and southern Indiana. Jefferson salamanders have a strong affinity for upland forests and prefer to reside most of the year in well drained deciduous or mixed forest, within 250 to 1600 meters of a small vernal pool or pond, commonly surrounded by alder, red maple, buttonbush, and dogwood. They hide beneath leaf litter, loose soil, and stones, or in rotting logs, rodent burrows, or

subterranean burrows which they excavate. Vernal pools, or temporary ponds, are necessary for reproduction and need to be full of dead and decaying leaves for cover and overhanging bushes or grass for egg deposition.

Jefferson salamanders hibernate underground in the winter months, usually near breeding sites. In March and April (sometimes as early as February), they begin to migrate to breeding ponds which is thought to be triggered by the first early warm spring rains or other conditions of high humidity and above-freezing temperatures. Adult Jefferson salamanders are rarely seen outside of the breeding season, but are presumed to eat earthworms and other invertebrates underground. The ideal time of year to locate the Jefferson salamander is during the breeding months of March and April.

Longtail salamander (state-listed Special Concern amphibian species)

The range of the longtail salamander extends from southern New York and northern New Jersey southwest through southern Illinois, southeastern Missouri, as well as western Tennessee. Longtail salamanders can be found near streams or around caves, where they seek shelter under rocks, rotting logs, or in shale banks. Adults are found in moist or wet terrestrial situations, usually along the borders of streams, seeps, or wetlands. Breeding presumably occurs in late autumn and early winter. Eggs are laid in the winter, but are rarely found, probably because they are attached to rocks in dark, subsurface streams or seepages. The aquatic larvae hatch in 4-12 weeks and probably complete metamorphosis in the same year, although some may remain as larvae until the following spring or summer.

Bald eagle (state-listed Threatened bird species)

Historically, bald eagles nested in forests along the shorelines of oceans, lakes or rivers throughout most of North America, often moving south in winter to areas where water remained open. Wintering grounds are from southern Canada south, along major river systems, in intermountain regions, and in the Great Plains. In the northern United States, bald eagles will typically begin courting and nest building in the winter. The typical breeding season for the bald eagles in the vicinity of the Project begins with nest construction in January and ends with the last chick fledged in early summer. The locations of existing nesting areas of bald eagles in the vicinity of the Project were identified from DEP records prior to conducting any field work. DEP located two bald eagle nests within one mile from the Cannonsville Dam.

Table E-11: List of Mammals Potentially Present in the Project Area

Common Name	Scientific Name	Common Name	Scientific Name
Eastern Coyote	*Canis latrans*	Hairy-tailed Mole	*Parascalops breweri*
Eastern Pipistrelle	*Pipistrellus subflavus*	Eastern Mole	*Scalopus aquaticus*
Eastern Red Bat	*Lasiurus borealis*	Small-footed Myotis	*Myotis leibii*
Hoary Bat	*Lasiurus cinereus*	Big Brown Bat	*Eptesicus fuscus*
Indiana Myotis	*Myotis sodalis*	Eastern Red Bat	*Lasiurus borealis*
Silver-haired Bat	*Lasionycteris noctivagans*	New England Cottontail	*Sylvilagus transitionalis*
Woodland Jumping Mouse	*Napaeozapus insignis*	Snowshoe Hare	*Lepus americanus*
Long-tailed Shrew	*Sorex dispar*	European Hare	*Lepus europaeus*
Southern Bog Lemming	*Synaptomys cooperi*	Eastern Chipmunk	*Tamias striatus*
Porcupine	*Erethizon dorsatum*	Woodchuck	*Marmota monax*
Red Fox	*Vulpes vulpes*	Eastern Gray Squirrel	*Sciurus carolinensis*
Gray Fox	*Urocyon cinereoargenteus*	Eastern Fox Squirrel	*Sciurus niger*
White-tailed Deer	*Odocoileus virginanus*	Red Squirrel	*Tamiasciurus hudsonicus*
Black Bear	*Ursus americanus*	Southern Flying Squirrel	*Glaucomys volans*
Fisher	*Martes pennanti*	Northern Flying Squirrel	*Glaucomys sabrinus*
Bobcat	*Lynx rufus*	North American Deermouse	*Peromyscus maniculatus*
Eastern Cottontail	*Sylvilagus floridanus*	White-footed Mouse	*Peromyscus leucopus*
Eastern Cougar[1,2]	*Felis concolor cougar*	Eastern Woodrat	*Neotoma floridana*
River Otter	*Lutra canadensis*	Southern Red-backed Vole	*Myodes gapperi*
Muskrat	*Ondatra zibethicus*	Meadow Vole	*Microtus pennsylvanicus*
Beaver	*Castor canadensis*	Rock Vole	*Microtus chrotorrhinus*
Mink	*Mustela vison*	Woodland Vole	*Microtus pinetorum*
Striped Skunk	*Mephitis mephitis*	Northern Bog Lemming	*Synaptomys borealis*
Raccoon	*Procyon lotor*	Roof Rat	*Rattus rattus*
Virginia Opossum	*Didelphis virginiana*	Brown Rat	*Rattus norvegicus*
Cinereus Shrew	*Sorex cinereus*	House Mouse	*Mus musculus*
American Water Shrew	*Sorex palustris*	Meadow Jumping Mouse	*Zapus hudsonius*
Smoky Shrew	*Sorex fumeus*	American Marten	*Martes americana*
American Pygmy Shrew	*Sorex hoyi*	Ermine	*Mustela erminea*
Northern Short-tailed Shrew	*Blarina brevicauda*	Long-tailed Weasel	*Mustela frenata*
North American Least Shrew	*Cryptotis parva*	Moose	*Alces americanus*

[1]Federally Endangered
[2]State Endangered

Table E-12: List of Birds Potentially Present in the Project Area

Common Name	Scientific Name	Common Name	Scientific Name
Acadian Flycatcher	*Empidonax virescens*	Chipping Sparrow	*Spizella passerina*
Alder Flycatcher	*Empidonax alnorum*	Cliff Swallow	*Hirundo pyrrhonota*
American Black Duck	*Anas rubripes*	Common Grackle	*Quiscalus quiscula*
American Crow	*Corvus brachyrhynchos*	Common Merganser	*Mergus merganser*
American Goldfinch	*Carduelis tristis*	Common Raven	*Corvus corax*
American Kestrel	*Falco sparverius*	Common Yellowthroat	*Geothlypis trichas*
American Redstart	*Setophaga ruticilla*	Cooper's Hawk[3]	*Accipiter cooperii*
American Robin	*Turdus migratorius*	Dark-eyed Junco	*Junco hyemalis*
American Woodcock	*Scolopax minor*	Downy Woodpecker	*Picoides pubescens*
Bald Eagle[4]	*Haliaeetus leucocephalus*	Eastern Bluebird	*Sialia sialis*
Bank Swallow	*Riparia riparia*	Eastern Kingbird	*Tyrannus tyrannus*
Barn Swallow	*Hirundo rustica*	Eastern Meadowlark	*Sturnella magna*
Barred Owl	*Strix varia*	Eastern Phoebe	*Sayornis phoebe*
Belted Kingfisher	*Megaceryle alcyon*	Eastern Screech Owl	*Megascops asio*
Bicknell's Thrush[3]	*Catharus bicknelli*	Eastern Towhee	*Pipilo erythrophthalmus*
Black-and-white Warbler	*Mniotilta varia*	Eastern Wild Turkey	*Meleagris gallopavo*
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Eastern Wood-pewee	*Contopus virens*
Blackburnian Warbler	*Dendroica fusca*	European Starling	*Sturnus vulgaris*
Black-capped Chickadee	*Poecile atricapillus*	Field Sparrow	*Spizella pusilla*
Blackpoll Warbler	*Dendroica striata*	Golden-crowned Kinglet	*Regulus satrapa*
Black-throated Blue Warbler	*Dendroica caerulescens*	Golden-winged Warbler[3]	*Vermivora chrysoptera*
Black-throated Green Warbler	*Dendroica virens*	Grasshopper Sparrow[3]	*Ammodramus savannarum*
Blue-gray Gnatcatcher	*Polioptila caerulea*	Gray Catbird	*Dumetella carolinensis*
Blue-headed Vireo	*Vireo solitarius*	Great Blue Heron	*Ardea herodias*
Blue Jay	*Cyanocitta cristata*	Great Crested Flycatcher	*Myiarchus crinitus*
Blue-winged Warbler	*Vermivora pinus*	Great Horned owl	*Bubo virginianus*
Bobolink	*Dolichonyx oryzivorus*	Hairy Woodpecker	*Picoides villosus*
Broad-winged Hawk	*Buteo platypterus*	Hermit Thrush	*Catharus guttatus*
Brown Creeper	*Certhia americana*	Hooded Merganser	*Lophodytes cucullatus*
Brown-headed Cowbird	*Molothrus ater*	House Finch	*Carpodacus mexicanus*
Brown Thrasher	*Toxostoma rufum*	House Sparrow	*Passer domesticus*
Canada Goose	*Branta canadensis*	House Wren	*Empidonax minimus*
Canada Warbler	*Wilsonia canadensis*	Indigo Bunting	*Passerina cyanea*
Cedar Waxwing	*Bombycilla cedrorum*	Killdeer	*Charadrius vociferus*
Chestnut-sided Warbler	*Dendroica pensylvanica*	Least Flycatcher	*Empidonax minimus*
Chimney Swift	*Chaetura pelagica*	Louisiana Waterthrush	*Seiurus motacilla*
Magnolia Warbler	*Dendroica magnolia*	Spotted Sandpiper	*Actitis macularius*

Common Name	Scientific Name	Common Name	Scientific Name
Mallard	*Anas platyrhynchos*	Swamp Sparrow	*Melospiza georgiana*
Mourning Dove	*Zenaida macroura*	Swainson's Thrush	*Catharus ustulatus*
Mourning Warbler	*Oporomis philadelphia*	Tree Swallow	*Tachycineta bicolor*
Nashville Warbler	*Vermivora ruficapilla*	Tufted Titmouse	*Baeolophus bicolor*
Northern Bobwhite	*Colinus virginianus*	Turkey Vulture	*Cathartes aura*
Northern Cardinal	*Cardinalis cardinalis*	Veery	*Catharus fuscescens*
Northern Flicker	*Colaptes auratus*	Vesper Sparrow	*Pooecetes gramineus*
Northern Goshawk[3]	*Accipiter gentiles*	Warbling Vireo	*Vireo gilvus*
Northern Oriole	*Icterus spurius*	Whip-poor-will[3]	*Caprimulgus vociferous*
Northern Rough-winged Swallow	*Steldidopteryx serripennis*	White-breasted Nuthatch	*Sitta carolinensis*
Northern Saw-whet Owl	*Aegolius acadicus*	White-throated Sparrow	*Zonotrichia albicollis*
Northern Waterthrush	*Seiurus noveboracensis*	Willow Flycatcher	*Empidonax traillii*
Olive-sided Flycatcher	*Contopus cooperi*	Winter Wren	*Troglodytes troglodytes*
Ovenbird	*Seiurus aurocapillus*	Wood Duck	*Aix sponsa*
Pileated Woodpecker	*Dryocopus pileatus*	Wood Thrush	*Hylocichla mustelina*
Pine Siskin	*Carduelis pinus*	Worm-eating warbler	*Helmitheros vermivorus*
Common Name	*Scientific Name*	Yellow-bellied Flycatcher	*Empidonax flaviventris*
Pine Warbler	*Dendroica pinus*	Yellow-bellied Sapsucker	*Sphyrapicus varius*
Prairie Warbler	*Dendroica discolor*	Yellow-billed Cuckoo	*Coccyzus americanus*
Purple Finch	*Carpodacus purpureus*	Yellow-rumped Warbler	*Dendroica coronata*
Red-bellied Woodpecker	*Melanerpes carolinus*	Yellow-throated Vireo	*Vireo flavifrons*
Red-breasted Nuthatch	*Sitta canadensis*	Yellow Warbler	*Dendroica petechia*
Red-eyed Vireo	*Vireo olivaceus*		
Red-headed Woodpecker	*Melanerpes erythrocephalus*		
Red-shouldered Hawk[3]	*Buteo lineatus*		
Red-tailed Hawk	*Buteo jamaicensis*		
Red-winged Blackbird	*Agelaius phoeniceus*		
Rock Pigeon	*Columba livia*		
Rose-breasted Grosbeak	*Pheucticus ludovicianus*		
Ruby-throated Hummingbird	*Archilochus colubris*		
Ruffed Grouse	*Bonasa umbellus*		
Savannah Sparrow	*Passerculus sandwichensis*		
Scarlet Tanager	*Piranga olivacea*		
Sharp-shinned Hawk[3]	*Accipiter striatus*		
Snowy Owl	*Bubo scandiacus*		
Song Sparrow	*Melospiza melodia*		

[3]State Special Concern
[4]State Threatened

Table E-13: List of Amphibians Potentially Present in the Project Area

Common Name	Scientific Name
Allegheny Mountain Dusky Salamander	*Desmognathus ochrophaeus*
Jefferson Salamander[3]	*Ambystoma jeffersonianum*
Spotted Salamander	*Ambystoma maculatum*
Dusky Salamander	*Desmognathus fuscus*
Redback Salamander	*Plethodon cinereus*
Slimy Salamander	*Plethodon glutinosus*
Spring Salamander	*Gyrinophilus porphyriticus*
Northern Two-lined Salamander	*Eurycea bislineata*
Longtail Salamander[3]	*Eurycea longicauda*
Four-toed Salamander	*Hemidactylium scutatum*
Common Mudpuppy	*Necturus maculosus*
Northern Red Salamander	*Pseudotriton ruber ruber*
Northern Leopard Frog	*Rana pipiens*
Wood Frog	*Rana sylvatica*
Bullfrog	*Rana catesbeiana*
American Toad	*Bufo americanus*
Gray Treefrog	*Hyla versicolor*
Green Frog	*Hyla cinerea*
Spring Peeper	*Pseudacris crucifer*
Pickerel Frog	*Rana palustris*
[3]State Special Concern	

Table E-14: List of Reptiles Potentially Present in the Project Area

Common Name	Scientific Name
Wood Turtle	*Clemmys insculpta*
Eastern Box Turtle	*Terrapene carolina*
Common Snapping Turtle	*Chelydra serpentina*
Northern Painted Turtle	*Chrysemys picta*
Spotted Turtle	*Clemmys guttata*
Common Gartersnake	*Thamnophis sirtalis*
Timber Rattlesnake[4]	*Crotalus horridus*
Eastern Hognose	*Heterodon platirhinos*
Brownsnake	*Storeria dekayi*
Smooth Greensnake	*Opheodrys vernalis*
Red-bellied Snake	*Storeria occipitomaculata*
Milksnake	*Lampropeltis triangulum*
Northern Copperhead	*Agkistrodon contortrix*
Ring-necked Snake	*Diadophis punctatus*
Northern Watersnake	*Nerodia sipedon*

[4]State Threatened

Botanical Resources

The Project area is within the Northeastern Highlands ecoregion and the Appalachian Plateau physiographic province. In general, this area is characterized by nutrient-poor soils and is blanketed by beech-birch-maple hardwood forests with the upper elevations transitioning to spruce-fir forests. Oak-hickory forests are also present in some of the low valleys. Though the land was typically heavily forested, it was cleared for farmland in the early nineteenth century. The forests have naturally re-grown as the farmland was abandoned beginning in the mid-1800s (USFWS, 1997).

The dominant species that comprise the northern hardwood forest are American beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), and sugar maple (*Acer saccharum*). The shrub layer in this type of forest generally consists of hobblebush (*Viburnum lantanoides*), maple-leaved viburnum (*Viburnum acerifolium*), and raspberries (*Rubus* spp.). The oak-hickory low elevation forests are dominated by red oak (*Quercus rubra*), white oak (*Q. alba*), chestnut oak (*Q. prinus*), scrub oak (*Q. ilicifolia*), shagbark hickory *(Carya ovata*) and bitternut hickory (*C. cordiformis*). The shrub layer generally consists of flowering dogwood (*Cornus florida*), witch hazel (*Hamamelis virginiana*), shadbush (*Amelanchier arborea*), and choke-cherry (*Prunus virginiana*). The high elevation spruce-fir forests are generally dominated by red spruce (*Picea rubens*) and balsam fir (*Abies balsamea*) with the shrub layer dominated by huckleberry (*Gaylussacia buccata*), lowbush blueberry (*Vaccinium angustifolium*), and mountain laurel (*Kalmia latifolia*) on rocky outcrops (USFWS, 1997).

Several populations of the federally threatened northern monkshood (*Aconitum noveboracense*) occur in the Catskill high peaks and the globally rare Jacob's ladder (*Polemonium caeruleum*) may be found in similar areas. The moist woods of the Catskills support two of the only three known extant populations of nodding pogonia (*Triphora trianthophora*) in New York and the only populations of musk-root (*Adoxa moschatellina*). The Catskills are also home to other state-listed threatened or endangered plant species (USFWS, 1997).

B. Study – Impact of Hydroelectric Development Construction-Related Activities on Wildlife and Botanical Resources, including Wetlands, Riparian, and Littoral Habitat, and Rare, Threatened and Endangered Species

A field assessment of the Project area was conducted by two field biologists on June 29-30, 2010 and April 26, 2011. The assessment included documentation of habitat conditions in areas that will be temporarily or permanently disturbed as part of the Project, as well as in 100 foot buffer zones around the disturbed areas (see Figure E-18). In order to establish a study area, locations proposed for disturbance during construction were presented as "proposed construction areas." Buffer zones of up to 100 feet were established around the construction areas and added to the study area in order to identify any sensitive resources that may be adjacent to the construction areas.

The field biologists traversed the areas designated on Figure E-18 to document wildlife resources, botanical resources, and RTE species. The full report, which pertains to the City's proposed Cannonsville, Pepacton and Neversink hydroelectric developments, is included in Volume 6, Appendix E-4.

Botanical Resources

Vegetative cover types in the areas proposed for disturbance (i.e., construction-related activities) and associated buffer zones relating to the Project consist of open fields, mixed forest and, in the area of the tailrace excavation, emergent and riverine wetlands and deepwater habitats. Table E-15 provides a description of construction and buffer areas and Figure E-19 presents this information on a map. Table E-16 lists the ecological community types observed during the field assessment.

Impacts to upland botanical resources will be limited to temporary disturbances to existing mowed fields, which will serve as the construction staging areas. No impacts to upland botanical resources within the buffer locations are expected. The locations of the generator lead, substation, and interconnection facilities are located primarily in mowed areas and thus are not expected to cause or lead to any adverse environmental impacts. However, selective trimming and removal of adjacent trees will occur, as necessary. The right-of-way ("ROW") for the 46 kV line will be approximately 100 feet wide and 460 feet long. The ROW for the 12.47 kV line will be approximately 30 feet wide and 1,200 feet long. Clearing the 46 kV ROW corridor will result in minor fragmentation of the upland forest, but this area is isolated from surrounding continuous forest blocks due to the river channels and dam. Therefore, the fragmentation is not expected to cause impacts to wildlife passage routes.

With regard to vegetation maintenance within the ROWs, the 12.47 kV ROW is currently mowed by DEP. The new 46 kV ROW is currently forested; clearing grubbing, final grading and seeding will occur during construction and will provide for an area that can be mowed by DEP for maintenance purposes.

Table E-15: Description of Project-related Construction and Buffer Areas

Parcel No.	Description	Notes
C-1	Proposed spoils disposal area	Mowed field
C-1a	Proposed spoils disposal area buffer zone	Primarily mowed turf, with a few scattered trees; Stone-lined drainage ditch present
C-2	Proposed spoils disposal area buffer zone	Mixed upland forest with areas of brush understory; Contains existing unpaved access road
C-3	Proposed spoils disposal area buffer zone	Primarily mowed turf, with areas of shrub and scattered ornamental trees
C-4	Proposed Staging Area 1 buffer zone	Deciduous forest
C-4a	Proposed Staging Area 1 buffer zone	Groundwater-fed wetland
C-5	Proposed Staging Area 1	Open field containing a few coniferous trees
C-5a	Proposed Staging Area 1 buffer zone	Open field, adjacent to and inclusive of a portion of Vernal Pool 3
C-6	Proposed Staging Area 1 buffer zone	Mature Norway spruce plantation; very little understory
C-7	Proposed Staging Area 1 buffer zone	Riverbank. Vegetated riparian zone, primarily herbaceous plants
C-8	Proposed Staging Area 2	Mowed field, bordered by drainage swales on east and west
C-9	Proposed Staging Area 2 buffer zone	Mature Norway spruce plantation; very little understory
C-10	Proposed Staging Area 2 buffer zone	Floodplain wetland; dominant plant species is reed canary grass
C-11	Proposed Staging Area 2 buffer zone	Shrubby upland
C-12	Proposed Staging Area 2 buffer zone	Riverbank. Mix of tree, shrub and herbaceous riparian plants. Contains drainage swale
C-13	Shoreline buffer zone	Shrubby shoreline dominated by black locust seedlings (invasive species)
C-14	Tailrace excavation area	Emergent wetland, dominated by reed canary grass
C-15	Access road and release works	Paved area

Parcel No.	Description	Notes
C-16	Buffer zone between access road and riverbank	Mowed turf
C-17	Septic tank & underground electric line	Mowed turf
C-18	Open channel of Delaware River	Free-flowing, shallow, no submerged vegetation
C-19	Buffer zone	Mixed mature forest, extremely steep
C-23	Proposed Staging Area 3	Mowed turf
C-24	Proposed Overhead electric line buffer zone	Thin strip of mixed upland forest with a small seep along edge toward a man-made drainage ditch
C-25	Existing overhead electric line	Mowed turf with drainage ditch
C-26	Proposed Overhead electric line buffer zone	Mixed upland forest with minimal ground cover
C-27	Proposed Overhead electric line buffer zone	Mixed upland forest containing a portion of Vernal Pool 1 and Vernal Pool 2
C-28	Proposed Overhead electric line from substation to NYSEG poles	Mixed upland forest
C-28a	Buffer zone around proposed overhead electric line	Mixed upland forest
C-29	Proposed substation location	Mowed turf
C-30	Existing transmission line ROW	Mixed upland shrub

Table E-16: Description of Ecological Community Types in Project-related Construction and Buffer Areas

Parcel	System	Subsystem	Ecological Community
C-1	Terrestrial	Terrestrial Cultural	Mowed lawn
C-1a	Terrestrial	Terrestrial Cultural	Mowed lawn
C-2	Terrestrial	Forested Upland	Rich mesophytic forest
C-3	Terrestrial	Forested Upland	Rich mesophytic forest
C-4	Terrestrial	Forested Upland	Rich mesophytic forest
C-4a	Palustrine *	Forested Mineral Soil Wetlands	Persistent emergent, saturated wetland
C-5/5a	Terrestrial	Terrestrial Cultural	Mowed lawn
C-6	Terrestrial	Terrestrial Cultural	Spruce/fir plantation
C-7	Terrestrial	Open Upland	Herbaceous riparian riverbank**
C-8	Terrestrial	Terrestrial Cultural	Mowed lawn
C-9	Terrestrial	Terrestrial Cultural	Spruce/fir plantation
C-10	Palustrine *	Open Mineral Soil Wetlands	Persistent emergent, seasonally flooded wetland
C-11	Terrestrial	Open Upland	Successional shrubland
C-12	Terrestrial	Open Upland	Shrub/tree riparian riverbank**
C-13	Terrestrial	Terrestrial Cultural	Riprap artificial shore**
C-14	Palustrine*	Open Mineral Soil Wetlands	Persistent emergent, seasonally flooded wetland
C-15	Terrestrial	Terrestrial Cultural	Paved road/path
C-16	Terrestrial	Terrestrial Cultural	Riprap artificial shore**
C-17	Terrestrial	Terrestrial Cultural	Mowed lawn
C-18	Riverine*	Natural Stream	Lower perennial, unconsolidated bottom, permanently flooded
C-19	Terrestrial	Forested Upland	Hemlock-northern hardwood forest
C-23	Terrestrial	Terrestrial Cultural	Mowed lawn
C-24	Terrestrial	Forested Upland	Hemlock-northern hardwood forest
C-25	Terrestrial	Terrestrial Cultural	Mowed lawn
C-26	Terrestrial	Forested Upland	Hemlock-northern hardwood forest
C-27	Terrestrial	Forested Upland	Hemlock-northern hardwood forest
C-28/28a	Terrestrial	Forested Upland	Hemlock-northern hardwood forest
C-29	Terrestrial	Terrestrial Cultural	Mowed lawn
C-30	Terrestrial	Terrestrial Cultural	Brushy cleared land

Notes: * Indicates wetland community type classified using Cowardin *et al.*, 1979. ** Indicates riparian community type not found in Edinger *et al.*, 2002.

Invasive Plant Species

The invasive plants species found in the proposed construction areas and associated buffer zones relating to the Project are listed below and the locations are shown on Figure E-20.

- Reed canary grass
- Black locust
- Common mullein
- Multiflora rose
- Japanese knotweed
- Common mugwort
- Japanese barberry
- Honeysuckle
- Hairy willow herb
- Autumn olive

Wetlands, Riparian and Littoral Habitats

The NWI mapped deepwater habitats in the Project area include the Cannonsville Reservoir and the West Branch of the Delaware River. The Cannonsville Reservoir is classified as *lacustrine, limnetic, unconsolidated bottom, permanently flooded and impounded* (L1UBHh). The upper portion of the spillway channel is classified as *riverine, upper perennial, unconsolidated bottom, permanently flooded* (R3RBH). Starting approximately 2,000 feet below the spillway, the spillway channel is classified as *riverine, lower perennial, unconsolidated bottom, permanently flooded* (R2UBH). The tailrace channel is classified as *riverine, lower perennial, unconsolidated bottom, permanently flooded* (R2UBH). There are no NYSDEC regulated wetlands present in or adjacent to the construction areas.

During the field study, three unmapped wetlands were identified as shown in Figure E-19. The first is a wetland of less than 0.1 acre north of Staging Area 1 in a depressional, spring-fed location (parcel no. C-4A). Although surrounded by upland forest, this wetland is classified as *palustrine, persistent emergent, saturated wetland* (PEM1B) due to the emergent vegetation and saturated soils conditions found there. Dominant wetland plants found included jewelweed, sensitive fern, marsh bedstraw, horsetail and foxtail sedge.

The floodplain (parcel no. C-10) in the buffer area adjacent to staging area 1 is classified as *palustrine, persistent emergent, seasonally flooded wetland* (PEM1E). This wetland is 0.6 acres and is classified as a palustrine system due to the presence of persistent emergent plants, primarily reed canary grass, and is a seasonally flooded riparian system. Other dominant plants found in this location included jewelweed, sensitive fern, and spotted joe pye weed.

The area for tailrace excavation consists of two wetland types. The open water channel (parcel no. C-18) is classified as *riverine, lower perennial, unconsolidated bottom, permanently flooded,* as described above, because there were no submerged aquatic vegetation species found in this area and the bottom substrate was a mix of gravel and cobble overlain by silt. Adjacent to the channel, in the area proposed for excavation (parcel no. C-14), is a wetland of approximately 1.05 acres classified as *palustrine, persistent emergent, seasonally flooded* (PEM1E). This wetland is classified as a palustrine system due to the presence of persistent emergent plants, such as reed canary grass and yellow rocket, and is a seasonally flooded riparian area. Additional wetland plants found in this location include jewelweed and shrub willows.

The riparian and littoral areas of the tailrace channel were observed during the April site visit. Starting at the low-level release works building and looking downstream, the river right[7] riparian area downstream to the access bridge (parcel no. C-13) is a riprapped shore with moderately sloped 10-foot high banks

[7] River right refers to the right side of the river while looking in the downstream direction.

dominated by shrub cover. Downstream of the access bridge, the riparian area remains moderately sloped and high, but is naturally vegetated and contains an expansive sidebar containing herbaceous vegetation (dominated by reed canary grass). The river right shoreline vegetation consists of a mix of plantation trees (Norway spruce), white pine, black locus, sycamore, multiflora rose and invasive Japanese knotweed. Staying on river right from a point approximately 2,500 feet downstream of the low-level release works to the confluence with the spillway channel, the bank slope flattens out and the riparian vegetation transitions to herbaceous cover. The river left riparian area consists of a moderately steep riprapped bank with shrubby vegetation from the low-level release works building to a point just downstream of the access bridge. Beyond this point the bank becomes extremely steep and forested. The spillway channel riparian zone of both riversides consists of riprap banks.

The tailrace channel is a long deep run containing extensive sidebars on river right, and one riffle area approximately 1,000 feet downstream of the release works. The littoral area is composed of very fine silt and clay lacking any submerged vegetation. The sidebars were submerged during the April visit due to relatively high flows occurring at this time.

Discharges from the low-level release works will cease for roughly three months when tie-in to the powerhouse occurs. As noted previously, this will result in reducing the wetted width and depth in the tailrace channel. The area immediately below the low-level release works will be dewatered for excavation. Downstream areas will remain partially wetted due to the backwater received from the spillway channel. Based on hydraulic modeling, if 200 cfs is maintained in the spillway channel, water depths in the tailrace channel will be lower (one foot or less) for approximately 1,600 feet downstream of the low-level release works (see Figure E-17). Downstream of this point, water depths will be at or above levels related to the same flow provided through the low-level release works. Normal velocities in tailrace channel vary according to the flow releases; water velocity is expected to be zero during the time releases from the low-level releases works ceases. Because this area will remain partially wetted during construction, impacts to the riparian and littoral areas as well as the plant and animal species that use these areas as habitat, are not anticipated.

Wildlife Species and Habitat Observations

Wildlife observations in the construction areas and associated buffer zones relating to the Project included: American crow, red-winged blackbird, pileated woodpecker, Eastern cottontail, whitetail deer, common merganser, Northern flicker, Canada goose, American robin, and black capped chickadee. Hermit thrush was also recognized as being present based on sound/auditory observation.

Three vernal pools were identified during the April 2011 field work. Vernal Pool 1 is located in a mixed upland forest with little ground cover (parcel no. C-27) adjacent to a mowed area near the paved road (Figure E-19), but outside any proposed construction areas relating to the Project. This small depression was approximately 200 ft^2 and part of a man-made drainage ditch and contained cinder blocks and old road signs at the outlet. No signs of biological life were observed in Vernal Pool 1.

Vernal Pool 2 was located within the buffer zone adjacent to the overhead electric line (parcel no. C-27). This pool was approximately 600 ft^2 and supported wildlife, as a Northern red-backed salamander was observed. Because Vernal Pool 2 is located outside of any of the proposed construction areas relating to the Project, no material impacts to Vernal Pool 2 are anticipated to occur as a result of construction-related activities.

Vernal Pool 3 is approximately 7,500 ft^2 in area and a small portion thereof is located within the outer limits of the buffer zone associated with proposed Staging Area 1 (parcel no. C-5). This vernal pool is fed by seasonal groundwater seepage which is captured in a long, ditch-like depression adjacent to the

mowed field, and it extends well beyond the study area. Approximately 20 amphibian egg masses were found in this pool.

Based on the site visits, many of the areas where construction will occur are currently disturbed (mowed); and thus offer little valuable wildlife habitat. The upland forest areas in the buffer zones around the construction areas provide very good wildlife habitat as do the vernal pools found at the site. However, given that the areas will not be disturbed during construction, their relative character is not expected to be materially impacted by construction-related activities associated with the Project.

RTE Species and Habitat Observations

The locations of existing nesting areas of bald eagles in the vicinity of the Project were identified from DEP records prior to conducting any field work. As shown in Table E-17, DEP located six bald eagle nests in the vicinity of the Project in 2009.

Table E-17: Bald Eagle Nest Locations in Proximity to the Project (2009)

Nest ID	Reservoir	County	Town	Distance To Dam (Miles)
NY 13	Cannonsville	Delaware	Deposit	1.5
NY 34	Cannonsville	Delaware	Tompkins	5.8
NY 88	Cannonsville	Delaware	Deposit	1
NY 89	Cannonsville	Delaware	Tompkins	8.7
NY 89	Cannonsville	Delaware	Tompkins	9
NY 93	Cannonsville	Delaware	Tompkins	1

Adult and juvenile bald eagles were observed flying in the vicinity of the Cannonsville Dam during the field assessment on June 29-30, 2010. However, no nesting, roosting or feeding activities were observed near the construction areas and/or associated buffer zones relating to the Project. Bald eagles were also observed during the April 26, 2011 field work. Juvenile and adult bald eagles were observed perched over the tailrace channel, two adult eagles were perched above the spillway, and a few others were observed soaring around the reservoir. However, consistent with the June 2010 field assessment, no nesting or feeding activities were observed near the Project-related construction areas and/or associated buffer zones.

Vernal Pool 3 described above could potentially serve as suitable habitat for the Jefferson and longtail salamanders.

No other RTE species or habitat was observed in the proposed construction areas and/or associated buffer zones relating to the Project.

(ii) Description of Measures Recommended by Agencies for Enhancement of Project Impacts on Fish, Wildlife, and Botanical Resources

No recommendations for enhancement of Project impacts on fish, wildlife and botanical resources were provided by USFWS or NYSDEC.

(iii) Statement of Existing and Proposed Measures for Enhancement of Fish, Wildlife, and Botanical Resources

Relative to fish and aquatic resources, the City maintains seasonal conservation flow releases through the low-level release works for the protection of aquatic resources in the West Branch of the Delaware River. Moreover, the City will maintain required releases in accordance with the requirements of the applicable

operating protocol agreed to by the Decree Parties. During the period of construction when discharges from the low-level release works are ceased in order to allow for tie-in of the new powerhouse, conservation releases will be maintained via temporary siphons over the spillway crest.

Relative to wildlife, the Project area is home to breeding populations of bald eagles. The bald eagle is protected under the Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668d) and the Migratory Bird Treaty Act (16 U.S.C. §§ 703-712), and continues to be listed as a threatened species in New York State.

The DEP currently monitors bald eagle activity at Cannonsville Reservoir and will continue to do so during Project-related construction. Based on the field observations, there does not appear to be any nesting or roosting habitat (*e.g.*, tall trees) in the construction areas or associated buffer zones relating to the Project. However, bald eagle habitat use may change from year to year. Accordingly, prior to construction, DEP proposes to identify any bald eagle nests within one mile of any Project-related construction activities (i.e., the distance criteria included in the agreed to study plans related to the Project). DEP will provide this information to USFWS and NYSDEC, maps will be developed, and conceptual buffer zones around nests will be established, as appropriate.

Further, to prevent disturbances to nests, foraging areas, and roosting areas, restrictions may be incorporated into the construction plan associated with the Project, as appropriate, consistent with the suggested measures in the USFWS Bald Eagle Management Guidelines (USFWS, 2007). These measures may include:

- Avoid clear cutting or removal of overstory trees within 330 feet of eagle nests at any time.

- If nests are found within 330-660 feet of the construction areas, construction sequencing may be altered to occur outside of the nesting season (typically January – July), in consultation with USFWS and NYSDEC, depending on whether the construction activity will be visible from the nest.

- Currently it is not anticipated that blasting will be required for the tailrace excavation. If site conditions require shallow blasting, DEP will consult with USFWS and NYSDEC, as necessary, regarding any required blasting plans.

Construction activities are not likely to adversely affect foraging activities of bald eagle. The tailrace excavation area is localized to a relatively small area (~1 acre), and there are other undisturbed areas that would afford ample alternative foraging opportunities, such as Cannonsville Reservoir, the channel downstream of the spillway, and other downstream locations. Based on the foregoing, no specific mitigation measures are proposed at this time. New information regarding bald eagle nest locations at the time of construction may warrant additional protection measures as indicated above.

At the Cannonsville Project, the new poles supporting the 46 kV transmission line will be approximately 45 feet above ground. The new poles supporting the 12.47 kV supply line will be approximately 30 feet above ground. DEP has incorporated raptor protection measures in the design of the new overhead supply and transmission lines to greatly reduce the collision and electrocution risk for raptors, including bald eagles. The design measures include tangent construction and overhead grounded static wires on the transmission lines, and cross arms for safe raptor perching installed on the new supply line poles, as recommend by Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (APLIC 2006).

As noted above Vernal Pool 3 is located at the outer limits of the 100 foot buffer zone associated with proposed Staging Area 1 and could potentially serve as suitable habitat for the Jefferson and longtail salamanders. DEP proposes to avoid Vernal Pool 3 and mark the area such that it is not disturbed by any construction related activities.

Relative to invasive plant species, the City will strive to avoid any invasive plant species, if possible. In those locations, where disturbance may occur, the City will take precautions to not further spread these species to other areas. The spoils with potential invasive seeds and rhizomes will be placed on the spoils disposal area and covered with landscape fabric to debilitate the vegetation. The City will then place six inches of topsoil on the fabric and seed with a cold season grass mix.

(iv) Description of Continuing Impact on Fish, Wildlife, and Botanical Resources by Continued Operation

Continued Project operations will have no continuing impacts on botanical and wildlife resources. Continued Project operations will have the potential to entrain fish. It was determined, however, that due to the existing deep water intake structure associated with the Project, the pressure differential between such intake structure and the low-level release works experienced by any potentially entrained fish is likely to cause significant fish mortality—regardless of whether hydropower facilities are added to this site.

Figure E-18: Project-related Construction and Buffer Zone Areas

Notes: Imagery source: ESRI world imagery. All other data layers created by Gomez and Sullivan Engineers, P.C.

Figure E-19: Vegetative Cover Types and Wetlands in Project-related Construction and Buffer Zone Areas

Notes: Imagery source: ESRI world imagery. All other data layers created by Gomez and Sullivan Engineers, P.C.

Figure E-20: Invasive Plant Species Found in Project-related Construction and Buffer Zone Areas

Notes: Imagery source: ESRI world imagery. All other data layers created by Gomez and Sullivan Engineers, P.C.

(4) Historical and Archeological Resources

(i) Sites Listed or Eligible for Inclusion in the National Register of Historic Places

A. Study- Phase IA Archeological Literature Review and Sensitivity Assessment

Hartgen Archeological Associates, Inc. ("Hartgen") conducted a Phase IA Archeological Literature Review and Sensitivity Assessment for the City's proposed Cannonsville, Pepacton and Neversink hydroelectric developments, which is included in Volume 7, Appendix E-5.

A systematic search was conducted through the archeological site files maintained by the New York State Office of Parks, Recreation and Historic Preservation ("OPRHP") and the New York State Museum ("NYSM") located at the OPRHP archives on Peebles Island, in Waterford, NY. Information concerning all reported precontact and historic period archeological sites within a three-mile (4.8 km) radius of the dam was collected. In addition, data relating to those sites located within and immediately adjacent to the reservoir, but outside of the 3-mile (4.8 km) search radius was also collected. The OPRHP's electronic database was also searched for properties listed on or eligible for listing on both the State and National Registers of Historic Places ("National Register") that are located within or immediately adjacent to each of the dam sites. The following summarizes the research findings.

OPRHP and NYSM Identified Archeological Sites

The NYSM and OPRHP files contain 33 reported sites within three miles (4.8 km) of Cannonsville Dam and 14 reported sites outside of the three-mile (4.8 km) search radius but within or immediately adjacent to the reservoir. These sites include 39 historic sites and eight precontact sites. The nearest site, a mid 19th-century sawmill, was identified during a 1979 historic industrial resources survey and is located immediately adjacent to the east side of Cannonsville Dam. Thirty-four of the historic sites located within three miles (4.8 km) of Cannonsville Dam or within and adjacent to the reservoir were identified over the course of the 1979 historic industrial resources survey by utilizing historic maps rather than subsurface archeological investigation. All of those sites identified during the 1979 survey represent 19th-century industrial complexes that were once located along the Delaware River or its contributing tributaries; many of which are now submerged within Cannonsville Reservoir. The location, brief description, and National Register status of each site are provided below in Table E-18. The National Register status of each resource is determined by the OPRHP. Typically, resources are determined to be eligible or ineligible for listing on the National Register based on criteria developed by the National Park Service (1990, revised 2002). In some circumstances, resources have not been evaluated and are listed as unevaluated, in several other instances there were no records to indicate whether resources were evaluated or unevaluated; and for the purposes of this table are listed as unknown.

Table E-18: OPRHP/NYSM Archeological sites within three miles of the Cannonsville Dam and within or adjacent Cannonsville Reservoir.

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
02506.000001		Cider mill (WBD-139)	Mid 19th-century map documented industrial site	Unevaluated	1.5 miles (2.4 km) northeast (now within reservoir boundary)
02506.000002		Sawmill (WBD-141)	Mid 19th-century map documented industrial site	Unevaluated	Immediately adjacent to the east side of dam
02506.000003		Sawmill (WBD-142)	Mid 19th-century map documented industrial site	Unevaluated	1.3 miles (2 km) northwest
02506.000009		H. Hess Sawmill	Remains of stone foundation	Unevaluated	2.4 miles (3.8 km)

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
		(WBD-156)	and dam associated with mid 19th-century sawmill		northeast
02506.000010		Sawmill, Wagon Shop (WBD-157)	Mid 19th-century map documented industrial site	Unevaluated	2.1 miles (3.3 km) north
02506.000011		Blind Manufacture (WBD-158)	Mid 19th-century map documented industrial site	Unevaluated	2.2 miles (3.5 km) northwest
02506.000012		Ira Snyder Carding Mill (WBD-159)	Mid 19th-century map documented industrial site	Unevaluated	1.4 miles (2.2 km) northwest
02506.000013		Ira Snyder Axe Factory (WBD-160)	Mid to late 19th-century map documented industrial site	Unevaluated	1.4 miles (2.2 km) northwest
02506.000014		Ira Snyder Sawmill (WBD 161)	Mid to late 19th-century map documented industrial site	Unevaluated	1.4 miles (2.2 km) northwest
02506.000015		Southern NY Power Co. (WBD-160A)	Foundation remains as well as smokestack, sills, and exterior waterwheel associated with early 19th-century power plant	Unevaluated	1.4 miles (2.2 km) northwest
02506.000016	5851	Briggs Site (SUBi-1124)	Late Archaic and Woodland period camp site	Unevaluated	1.3 (2.0 km) miles northwest
02506.000017		Site 2	Late Archaic camp site	Not eligible	1.7 miles (2.7 km) west
02506.000018		DEL-186	Historic quarry	Unevaluated	1.5 miles (2.4 km) south
02506.000019		DEL-187	Historic quarry	Unevaluated	2.1 miles (3.3 km) southeast
02506.000020		DEL-189	Historic quarry	Unevaluated	2.5 miles (4.0 km) southeast
02506.000024		DEL-9932	Undated stone foundation; possibly a barn	Unevaluated	4,900 ft (1,493 m) southwest
02506.000026		Deposit Airport I Site (SUBi-2048)	Late Archaic, Middle Woodland, and Late Woodland components: chert flakes, fire-cracked rock, points, biface, pottery fragments	Unevaluated	2.5 miles (4.0 km) southwest
02506.000027		Deposit Airport II Site (SUBi-2049)	Archaic through Late Woodland: biface, points, pottery fragments, flakes, and an adze	Unevaluated	2.4 miles (3.8 km) southwest
02506.000028		Wheeler Historic Site (SUBi-2070)	Architectural and domestic deposits dating to the mid-19th century	Unevaluated	2.4 miles (3.8 km) southwest
02518.000002		Sawmill (WBD-97)	Mid 19th-century map documented industrial site	Unevaluated	9.5 miles (15.2 km) northeast
02518.000004		Sawmill (WBD-99)	Mid 19th-century map documented industrial site	Unevaluated	7 miles (11.2 km) northeast (now within reservoir boundary)

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
02518.000009		N. Boyd Sawmill (WBD-103)	Mid 19th-century map documented industrial site	Unevaluated	6.9 miles (11.1 km) northeast (now within Dryden Brook inlet of reservoir boundary)
02518.000010		Sawmill (WBD-104)	Mid 19th-century map documented industrial site	Unevaluated	6.4 miles (10.2 km) northeast (now within reservoir boundary)
02518.000011		Gregory Sawmill (WBD-105)	Early through mid 19th-century map documented industrial site	Unevaluated	6.1 miles (9.8 km) northeast (now within reservoir)
02518.000012		Sawmill (WBD-106)	Early 19th-century map documented industrial site	Unevaluated	5.5 miles (8.8 km) northeast (now within reservoir boundary)
02518.000013		W.H. Sprague Lumber Manufactory (WBD-107)	Mid 19th-century map documented industrial site	Unevaluated	3.6 miles (5.7 km) northeast (now within reservoir boundary)
02518.000014		E.B. & M.W. Owens Wagon Shop, Blacksmith Shop (WBD-109)	Mid 19th-century map documented industrial site	Unevaluated	3.5 miles (5.6 km) northeast (now within reservoir boundary)
02518.000025		J. Tillotson Sawmill (WBD-128)	Mid 19th-century map documented industrial site	Unevaluated	7.9 miles (12.7 km) northeast (now within reservoir boundary)
02518.000026		W. Huggins/W.B. McGibbon Sawmill (WBD-130)	Early through mid 19th-century map documented industrial site	Unevaluated	5.5 miles (8.8 km) northeast (now within reservoir boundary)
02518.000028		Sprague/Ogden & Leal/Jester/Deposit Milling Co./McLaughlin Gristmill (WBD-132)	Early through late 19th-century map documented industrial site	Unevaluated	3 miles (4.8 km) northeast (now within reservoir boundary)
02518.000029		J.A. Kenyon Tannery (WBD-133)	Mid through late 19th-century map documented industrial site	Unevaluated	3 miles (4.8 km) northeast (now within reservoir boundary)
02518.000030		Sawmill (WBD-134)	Early through mid 19th-century map documented industrial site	Unevaluated	3 miles (4.8 km) northeast (now within reservoir boundary)

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
02518.000031		Huntington Sawmill (WBD-135)	Early through late 19th-century map documented industrial site	Unevaluated	2.1 miles (3.3 km) east (now within reservoir boundary)
02518.000033		E. Boyd Sawmill (WBD-137)	Mid 19th-century map documented industrial site	Unevaluated	2.9 miles (4.6 km) northeast
02518.000034		Burr Map Sawmill (WBD-138)	Early 19th-century map documented industrial site	Unevaluated	1.5 miles (2.4 km) northeast (now within reservoir boundary)
02519.000032		E. Beers/W. Beers/O. Hanford Sawmill (WBD-96)	Mid 19th-century map documented industrial site	Unevaluated	9.4 miles (15.1 km) northeast
02544.000003		Tannery (WBD-162)	Mid 19th-century map documented industrial site	Unevaluated	2 miles (3.2 km) west
02544.000004		Deposit Steam Mill (WBD-163)	Mid 19th-century map documented industrial site	Unevaluated	2 miles (3.2 km) west
02544.000005		R. H. Evans Cottage D Sawmill (WBD-164)	Mid 19th-century map documented industrial site	Unevaluated	1.9 miles (3.0 km) west
02544.000006		W. Evans/B.E. Hadley Sawmill (WBD-165)	Mid 19th-century map documented industrial site	Unevaluated	1.9 miles (3.0 km) west
02544.000007		Hadley Steam Mill (WBD-167)	Late 19th-century map documented industrial site	Unevaluated	2.1 miles (3.3 km) west
02544.000008		N.K.W. Sash Factory (WBD-168)	Mid 19th-century map documented industrial site	Unevaluated	2.2 miles (3.5 km) west
02544.000009		Organ Factory and Wagon Shop (WBD-169)	Mid 19th-century map documented industrial site	Unevaluated	2.3 miles (3.7 km) west
02544.000013		Deposit Airport III Site	Chert flakes, cortical chunk, chert shatter fragments	Unevaluated	2.4 miles (3.8 km) west
	761	No information	One fluted projectile point identified as a stray find	Unknown	3 miles (4.8 km) northeast (now within reservoir boundary)
	3131	No information	Reported location of a precontact village burial site	Unknown	1.4 miles (2.2 km) west
	8407	No information	Reported traces of precontact occupation	Unknown	2 miles (3.2 km) west

State and National Register of Historic Places

A review of the OPRHP computer inventory identified no properties listed on the State or National Register of Historic Places or eligible for such a listing immediately adjacent to the Cannonsville Dam.

Findings and Recommendations

Although the Project area has moderate sensitivity for both precontact and historical archaeological sites, the potential for locating intact archaeological sites that may be eligible for the National Register has been

greatly diminished by the prior construction related to Cannonsville Reservoir and Dam. Land clearing, moving and building associated with such prior construction has thoroughly disturbed the Project area. Accordingly, there is no likelihood of locating archaeological sites at the proposed location of the turbines, powerhouse or substation at the Cannonsville Hydroelectric Project. Similarly, the proposed transmission line, staging areas and spoils area are all located in areas of previous disturbance. Therefore, based on these findings, the City is not proposing to conduct additional archaeological work/studies with respect to the Cannonsville Hydroelectric Project.

(ii) Description of Measures Recommended by the Agencies for Locating, Identifying and Salvaging Resources that would be Affected by Existing or Proposed Operations

The OPRHP was provided with the Hartgen Archeological Associates report, which included a Phase IA Archeological Literature Review and Sensitivity Assessment for the City's proposed Cannonsville, Pepacton and Neversink hydroelectric developments. In a July 20, 2011 email (see Appendix E-1) from OPRHP to DEP, they noted the following:

- OPRHP concurred with Hartgen's findings that the direct impact areas associated with the Project have all be previously disturbed, and therefore there is no need for Phase IB testing.
- An Historic Properties Management Plan ("HPMP") should be developed for each hydroelectric development, which should address the many sites identified by Hartgen that are now submerged as well as the potential for more sites and continued erosion of them along the edges of the reservoir.
- OPRHP noted that for the submerged sites, the HPMP should acknowledge they exist, identify that any substantial reservoir drawdown could expose them, and address the potential for future archeological research.

(iii) Statement of Activities Proposed for Locating, Identifying and Salvaging Resources

Since the potential for locating intact archaeological sites that may be eligible for the National Register has been greatly diminished by the prior construction related to Cannonsville Reservoir and Dam, the City is not proposing to locate, identify or salvage resources.

(5) Recreational Resources

(i) Description of Existing Recreational Facilities at the Project

The Cannonsville Reservoir is approximately 150 miles from New York City and 120 miles from Albany, NY. As of August 25, 2011, the City owns approximately 30,705 acres in fee simple within the Cannonsville Reservoir Basin (also known as the West Branch of the Delaware River watershed) and 834 acres just outside the basin (connecting DEP land within). Of these 31,539 total acres owned in fee simple by the City, 21,417 acres are available for public recreation. Public access areas ("PAA") to City-owned property and other recreation features in the vicinity of the reservoir are shown in Figure E-21 and listed in Table E-19. There are several large tracts of DEP-owned land opened for public recreation that border the impoundment (a DEP access permit is required on some of these lands as noted on the figure).

Table E-19: Cannonsville Recreation Uses and Acreages

Recreation Unit	Use	Acres
Johnny Brook	Hunting	3,791
Speedwell Mountain	PAA	3,908
Beerston	Hunting	871
Barbour Brook	PAA	417
Fletcher Hollow	PAA	358
Sands Creek	Hunting	1,608
Roods Creek	PAA	349
	Total	11,302

The reservoir provides fishing opportunities for trout, bass, carp, perch, pickerel, panfish, and bullhead. The reservoir shorelines are open for fishing from shore. Many people park along the public roads and walk to the waters' edge. Brown trout are the primary sought-after species, but brook trout and rainbow trout are occasionally caught as well. The West Branch of the Delaware River and the reservoir are actively managed fisheries by NYSDEC. The West Branch of the Delaware River and tributaries above the reservoir are renowned for their trout fishery.

The area around the West Branch of the Delaware River offers four managed trail systems for year-round recreation off City-owned land. The Catskill Scenic Trail lies on the old Ulster-Delaware railroad bed and parallels the West Branch of the Delaware River for about 19 miles, crossing it at several points. Another trail system, including the Utsayantha Trail, has stunning views of the West Branch of the Delaware River. Also, the West Branch Preserve, which was donated to The Nature Conservancy in 1973, consists of two short trails (Delaware Co. SWCD, 2004). Other protected areas in the vicinity of the reservoir not owned by the City include:

- Oquaga Creek State Park
- Chenango Valley State Park
- Hunt's Pond State Park
- Salt Spring State Park
- Bear Spring Mountain Wildlife Management Area

(ii) Estimate of Existing and Potential Recreational Use of the Project Area during the Daytime and Nighttime

Recreational activities available to the public outside of City-owned lands include camping, hiking, fishing, canoeing, kayaking, hunting, mountain biking, cross-country skiing, snowmobiling, horseback riding, picnicking, swimming, and bird watching. At night, people fish along the Cannonsville shoreline, although it is more popular to fish from a boat. Night angling use appears evenly distributed during the spring, summer, and fall.

Hunting for deer, turkey, and small game is permitted throughout most of the City-owned lands around the reservoir, but all hunters must first obtain a DEP Access Permit. Hunting, fishing, hiking, and trapping are permitted in PAAs without an Access Permit. PAAs include City-owned lands that are across a public road but within a few hundred feet of a reservoir shoreline but do not include lands that are immediately adjacent to the reservoir. Listed in Table E-19 and shown in Figure E-21 are the areas open for hunting with an Access Permit.

Hiking is permitted only in PAAs (see Figure E-21). The topography is "rolling" to steep, and there are no designated trails. Therefore, hikers must "bushwhack" and/or follow previously established logging roads.

The number of permitted boats currently found in each zone (see Figure E-22 for zones) on the reservoir is shown in Table E-20.

Table E-20: Number of Permitted Boats in Cannonsville Zones

Zone	No. of Boats
Unassigned	3
ZONE 1	51
ZONE 2	53
ZONE 3	69
ZONE 4	5
ZONE 5	57
ZONE 6	35
ZONE 7	6
ZONE 8	10
ZONE 9	108
ZONE 10	39
Total	**436**

There are three designated parking areas at Cannonsville Reservoir, with capacities of three, six, and 10 vehicles, for scenic vistas or overlooks.

Cannonsville Reservoir Recreational Boating Pilot Project

In 2008, DEP began developing a pilot program to expand recreational boating opportunities at the Cannonsville Reservoir. A committee was formed consisting of DEP staff, the Delaware County Chairman of the Board of Supervisors, the Town Supervisors of the Towns of Tompkins and Deposit, the Delaware County Watershed Affairs Commissioner, representatives from the EPA, NYSDEC, NYSDOH, and the Catskill Center for Conservation and Development. The committee pursued a program that allows several different types of watercraft (kayaks, canoes, sculls, rowboats, johnboats, and sailboats) to be used. Most of the watercraft can be launched from several specified sites around the reservoir, and small sailboats can be launched from a single site (see Figure E-23). The launch sites were coordinated with NYSDEC to prevent conflicts with nesting eagles and with the New York State Department of Transportation for public safety for access along NY State Route 10. The program includes requirements for participants to obtain Access Permits and Recreational Boat Tags which are given to boaters after they have their vessels and appurtenant devices (oars, paddles, sails) steam cleaned. Boaters are able to secure temporary (seven days or less) or seasonal boat tags. The program runs from Memorial Day weekend through Columbus Day each year for three successive years starting in 2009. The Rules for the Recreational Use of Water Supply Lands and Waters have been amended to include this program and became effective May 15, 2009.

(iii) Description of Measures Recommended by Agencies for Creating, Preserving or Enhancing Recreational Opportunities

The USFWS and NYSDEC did not provide any recommendations for creating, preserving or enhancing recreational opportunities.

(iv) Existing Recreational Measures to be Enhanced

DEP will maintain the current recreational measures already established at Cannonsville Reservoir; no new recreational measures are proposed as part of the Project.

(v) Material and Information Regarding the Resources and Facilities Identified under (i) and (iv) of this Section

(a) Identification of the entities responsible for implementing, constructing, operating, or maintaining any existing or proposed measures or facilities;

Existing recreational facilities will continue to be managed and maintained by DEP. Maps showing existing recreational facilities are shown in Figure E-21, Figure E-22 and Figure E-23. No new recreational facilities are proposed as part of the Project.

(b) A schedule showing the intervals following issuance of a license at which implementation of the measures or construction of the facilities would be commenced and completed;

Not applicable. No new recreational facilities are proposed as part of the Project.

(c) An estimate of the costs of construction, operation, and maintenance of any proposed facilities, including a statement of the sources and extent of financing;

Not applicable. No new recreational facilities are proposed.

(d) A map or drawing that conforms to the size, scale, and legibility requirements of §4.39 showing by the use of shading, cross-hatching, or other symbols the identity and location of any facilities, and indicating whether each facility is existing or proposed (the maps or drawings in this exhibit may be consolidated); and

Maps showing existing recreational facilities are shown in Exhibit G. All recreation facilities depicted already exist; no new facilities are proposed as part of the Project.

(vi) A description of any areas within or in the vicinity of the proposed project boundary that are included in, or have been designated for study for inclusion in, the National Wild and Scenic Rivers System, or that have been designated as wilderness area, recommended for such designation, or designation as a wilderness study area under the Wilderness Act.

There are no known areas within or in the vicinity of the Project area that are included in or have been designated for study for inclusion in the National Wild and Scenic Rivers System.

There are no known areas within the Project area that are known to be under the provisions of the Wilderness Act or that have been designated as wilderness areas, recommended for designation as wilderness area, or designated as wilderness study.

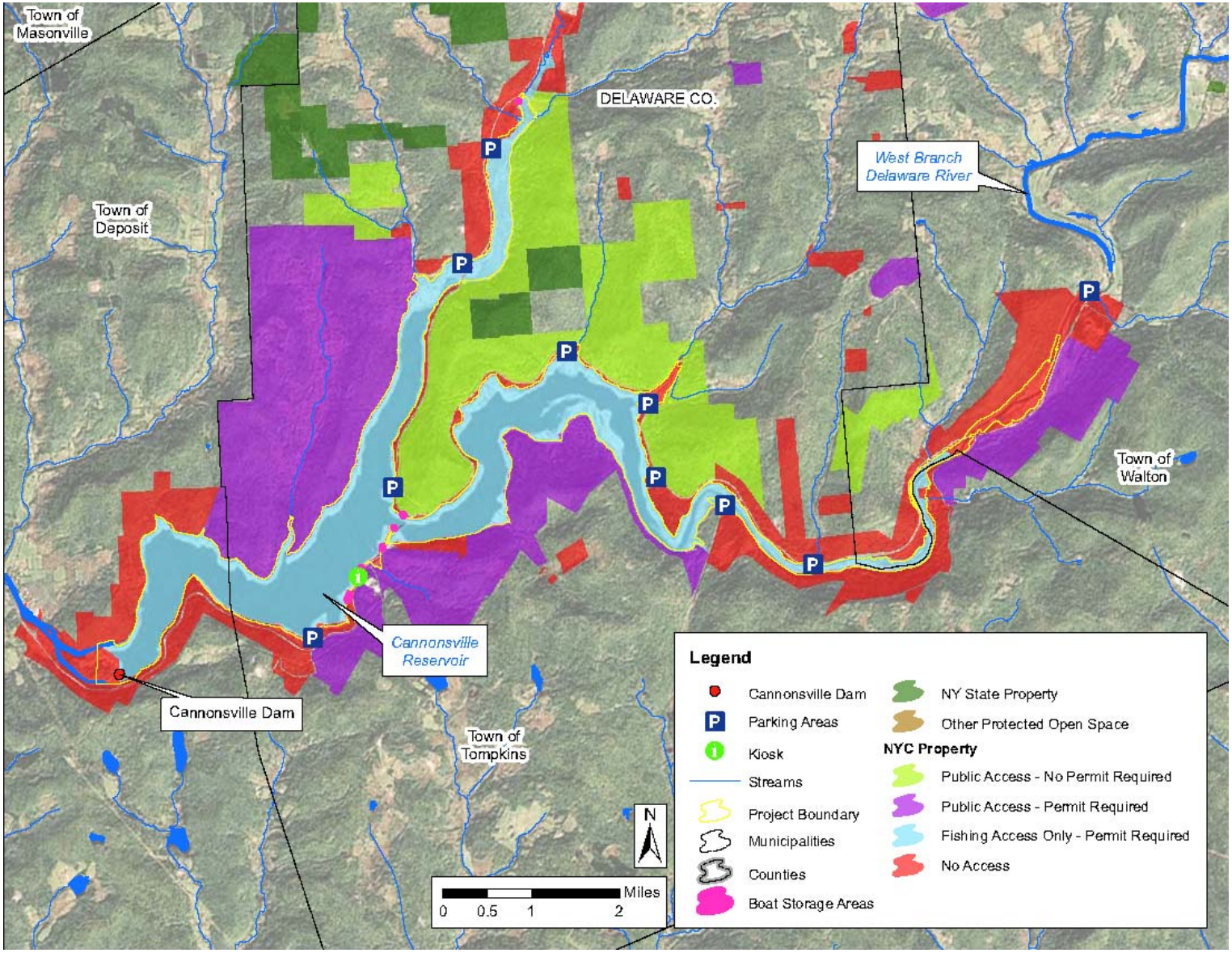


Figure E-21: Recreation Access near the Cannonsville Reservoir

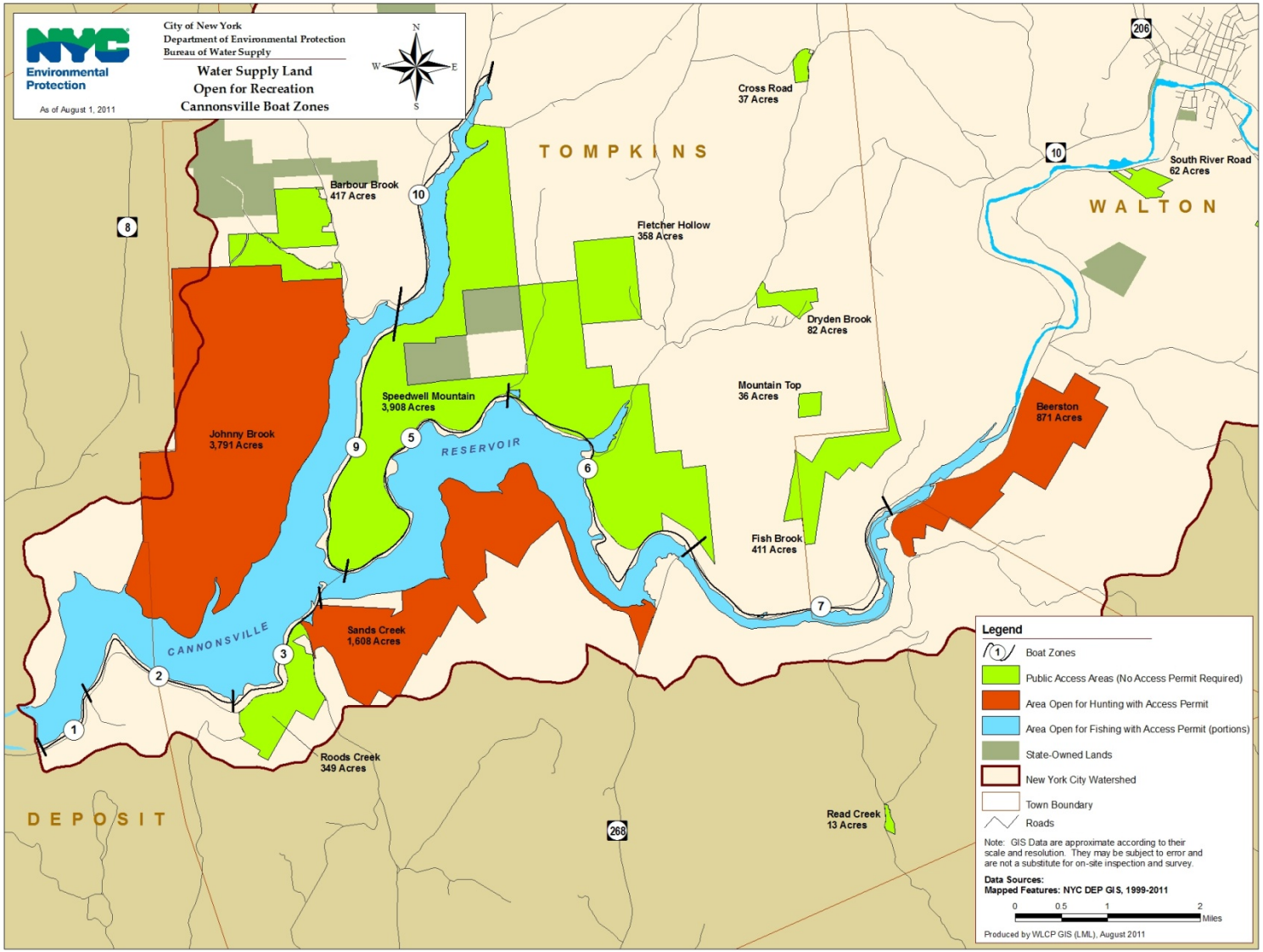


Figure E-22: Cannonsville Reservoir – Areas Open for Recreation and Boat Zones

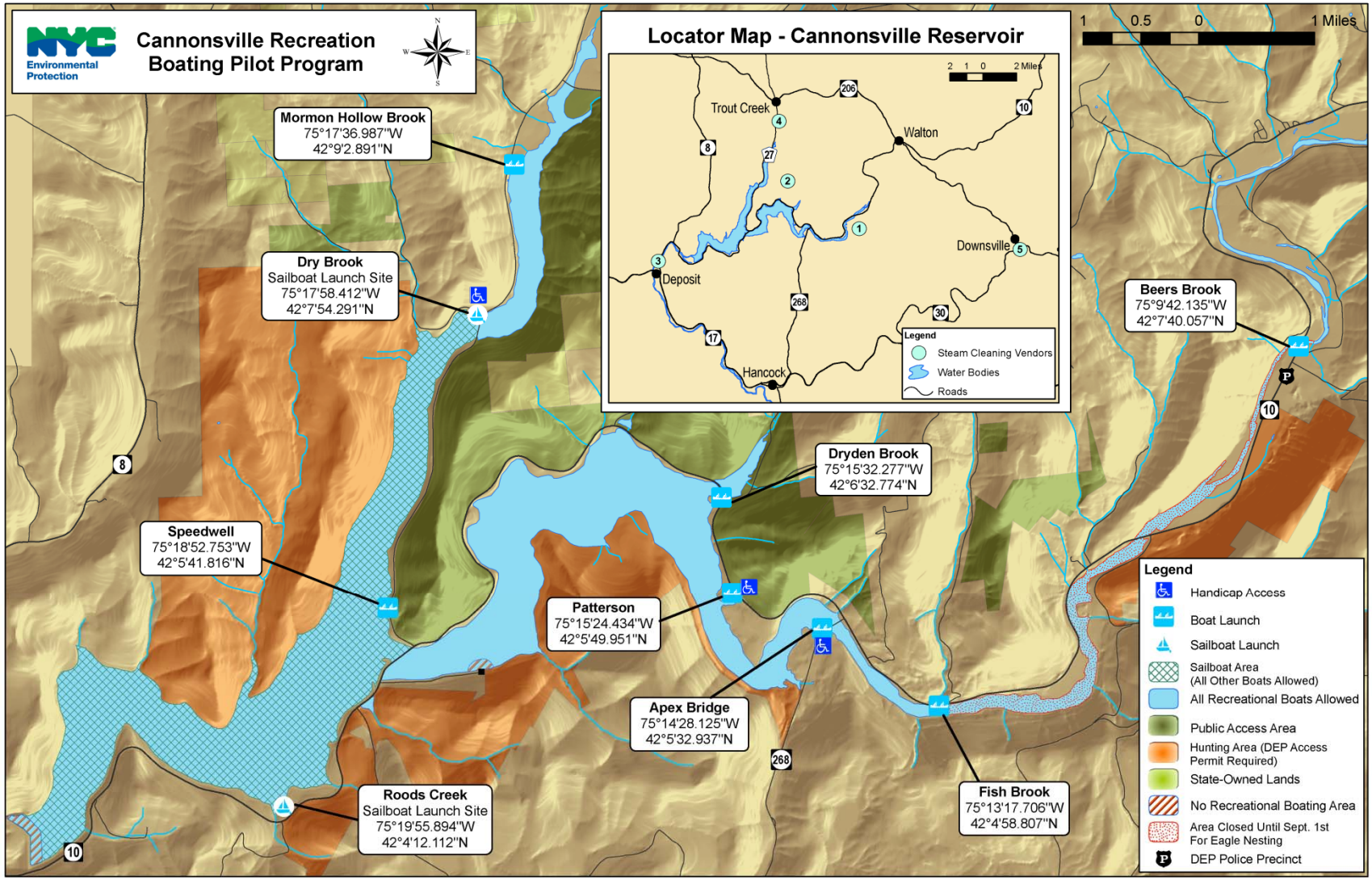


Figure E-23: Cannonsville Reservoir – Boating Pilot Program

(6) Land Management and Aesthetics

(i) Description of Existing Development and Use of Project Lands and Lands Abutting the Project Impoundment

Land Resources

The existing development consists of the following major features:

- Earthen Dam
- Spillway
- Intake
- Low-Level Release Works
- Water Supply Withdrawal Building

The land surrounding the reservoir and dam are dominated by forest cover. There is extremely limited development in the Project Area, with the exception of State Route 10. No infrastructure, in the forms of buildings, is located within the entire shoreline. All lands within the Project boundary are City-owned.

Table E-21 lists the land cover in the West Branch of the Delaware River watershed.

Table E-21: Land Cover Types; West Branch of the Delaware River Watershed

Cover Type	Land Cover Type expressed in percentages
Forest	68.8%
Shrubland	11.3%
Grassland	N/A*
Urban*	6.7%
Water	1.8%
Wetland	1.2%
Agricultural Land	10.1%
Roads	N/A*

*Roads were not separated from the urban cover type for West Branch watershed. Grasslands were not separated from the agricultural land cover type for the West Branch watershed.

The lands immediately around the Project consist of mowed lawn, access roads, and large stands of trees as shown in Figure A-1.

Aesthetic Resources

A. Study – Impact of Project Related Construction and Permanent Facilities on Aesthetic Resources

The DEP conducted an aesthetic study of the Project area. The full report, which addresses the City's proposed Cannonsville, Pepacton and Neversink hydroelectric developments collectively, is included in Volume 8, Appendix E-6.

Background

A field survey focused on public viewsheds at the location of the low level release works and powerhouse, the work/staging areas, the substation and the route for interconnection facilities associated with the Project. The survey considered both the long-term aesthetic impacts of new construction, and temporary impacts as a result of construction activities. On June 28, 29, and 30, 2010, the field survey was conducted and photographs were taken documenting the current character of the Project Area. In addition, photographs were taken from identified public viewsheds as well as from City-owned lands, referred to as "restricted areas".

Figure E-24 shows the photo locations from the Project area, which are labeled C1-C6. Photo locations are color-coded and reflect publicly accessible viewsheds (C1-C2) and restricted area viewsheds (C3-C6). ArcGIS software was used to determine what, if any, public viewsheds of the Project could be seen from the reservoir. Using a digital elevation model and 3D analyst extension, it was determined that the only sightlines from readily-accessible public viewsheds are from State Route 10, as shown on C1 and C2.[8] However, the views of the Project from those locations are highly obstructed by the surrounding vegetation.

Using Adobe Photoshop, photo renderings were developed to depict the visual effect permanent structures and appurtenances related to the Project will have on the character of the Project area and, to the extent such new facilities are visible, to depict their aesthetic effect. Because a permanent powerhouse and substation will be constructed, photo renderings were developed from views not publically accessible. These renderings demonstrate the effects the powerhouse and substation will have on the character of the area.

Aesthetics Assessment

Figure E-25 shows the sightlines from the potential viewsheds discussed above . Based on the field survey and the ArcGIS analysis (which included a digital elevation model and 3D analyst extension), it was concluded that the areas proposed for disturbance relating to the Project are not visible along any of the sightlines from the public viewsheds east of Cannonsville Dam. The height of the earthen dam exceeds the height of the new structures and appurtenances associated with the Project. Therefore, and as shown in Figure E-25, the dam fully screens the areas proposed for disturbance relating to the Project from the eastern viewsheds. Moreover, the dense vegetation around such areas similarly screens the Project-related structures from the northern, western, and southern public viewsheds.

Figure E-26 shows a public viewshed located on State Route 10, about one-half mile east of the areas proposed for disturbance relating to the Project. This photograph demonstrates the above conclusion that Cannonsville Dam, as well as the vegetation in the area of the viewshed and behind the dam, fully screen the areas proposed for disturbance relating to the Project. Indeed, the existing service building that is next to the planned location of the substation is not visible at all from this location, indicating that the substation and other appurtenances related to the Project also will not be visible.

To the west of the areas proposed for disturbance relating to the Project there is a pull-off on State Route 10, just before the access road, shown on Figure E-27. This viewshed is about 1,700 feet from the Project construction-related activities to occur at the dam. Due to the dense vegetation around this public viewshed, the bulk of the areas proposed for disturbance relating to the Project are fully screened.

[8] While the Cannonsville Reservoir is generally accessible to the public, boaters must stay at least 500 feet away from Cannonsville Dam and the spillway.

Although, construction vehicles entering and leaving the Project site would be visible from this location, the relatively compact nature of the construction activities and the plan to dispose of spoils on-site, the number of vehicle trips is expected to be relatively limited and primarily involve mobilization, deliveries, demobilization, and the arrival and departure of the construction workers.

Findings

The Project will not have any material adverse impact on aesthetics or the character of the Project area because none of the areas proposed for disturbance relating to the Project are visible from the identified public viewsheds. Moreover, most of the new structures and appurtenances related to the Project will be constructed adjacent or near to existing structures, thereby minimizing the magnitude of the disruption to the natural environment. To the extent possible, the new structures will be constructed using materials and techniques that will harmonize them with the existing structures. Further, while the distances from the public viewsheds to the areas proposed for disturbance relating to the Project and the dam are sufficient to screen such areas from most vantage points, a majority of the trees comprising the vegetative screening are coniferous, obstructing views even during winter months.

(ii) Description of Proposed Measures

Because no material adverse impacts have been identified related to the construction activities or permanent structures to be added as part of the Project, the development and assessment of mitigation strategies is not warranted.

(iii) Wetlands and Floodplains

As noted previously, DEP intends on continuing to operate the Cannonsville Reservoir consistent with current operations whereby water levels are drawn down in the summer and fall period and then refilled during the spring. As operation of the reservoir is not changing there are no anticipated impacts on wetlands associated with hydroelectric operations. A few larger wetlands are present at the upper tip of the large north-facing finger bay of the reservoir. The largest is a 52-acre freshwater emergent, seasonally flooded wetland classified as PEM1E. The next largest is a 12-acre deciduous, scrub-shrub, semi-permanent wetland located at the mouth of Trout Creek classified as PSS1/EM1E.

Wetland and floodplain impacts due to Project-related construction or constructed related activities (excavation) are located in the tailrace area just downstream of the new powerhouse associated with the Project. The area for tailrace excavation consists of two wetland types. The open water channel (parcel no. C-18) is classified as *riverine, lower perennial, unconsolidated bottom, permanently flooded,* because there were no submerged aquatic vegetation species found in this area and the bottom substrate was a mix of gravel and cobble overlain by silt. Adjacent to the channel, in the area proposed for excavation (parcel no. C-14), is a wetland of approximately 1.05 acres classified as *palustrine, persistent emergent, seasonally flooded* (PEM1E). This wetland is classified as a palustrine system due to the presence of persistent emergent plants, such as reed canary grass and yellow rocket, and is a seasonally flooded riparian area.

Just over one acre of emergent wetland (parcel C-14) will be impacted by the construction of the powerhouse and tailrace. Impacts will include excavation and removal of the vegetation and substrate to allow for a deeper tailrace area to accommodate the turbine draft tube. The existing riverine deepwater habitat (parcel C-18) will also be excavated to allow for a deeper tailrace channel. There will be no net loss of wetlands due to this construction. However, the emergent wetland will be transformed into deepwater habitat.

The emergent wetland is currently of poor value due to the incursion of the invasive plant species reed canary grass. Unlike native wetland vegetation, dense stands of reed canary grass have little value for wildlife. Few species eat the grass, and the stems grow too densely to provide adequate cover for small mammals and waterfowl. Accordingly, no mitigation measures are proposed.

(iv) Statement of Applicant's Ability to Provide a Buffer Zone Around the Impoundment for the Purpose of Ensuring Public Access and Protection Recreational and Aesthetic Values of Impoundment and Shoreline

The City already owns a buffer zone around the impoundment and already provides public access to the reservoir for certain recreational purposes. Public access to the impoundment through these buffer zones will not be affected by the Project.

(v) Description of Applicant's Policy, if any, with Regard to Permitting Development of Piers, Docks, Boat Landings, Bulkheads, and Other Shoreline Facilities on Project Lands and Waters

Private development is not allowed on the City-owned lands associated with the Project.

(vi) Location Maps

As noted above the new facilities generally cannot be seen from any public viewshed. Moreover, most of the new structures and appurtenances related to the Project will be constructed adjacent or near to existing structures, thereby minimizing the magnitude of the disruption to the natural environment. To the extent possible, the new structures will be constructed using materials and techniques that will harmonize them with the existing structures. In addition, any new facilities located on City-owned lands must meet the applicable requirements of the City's Design Commission.

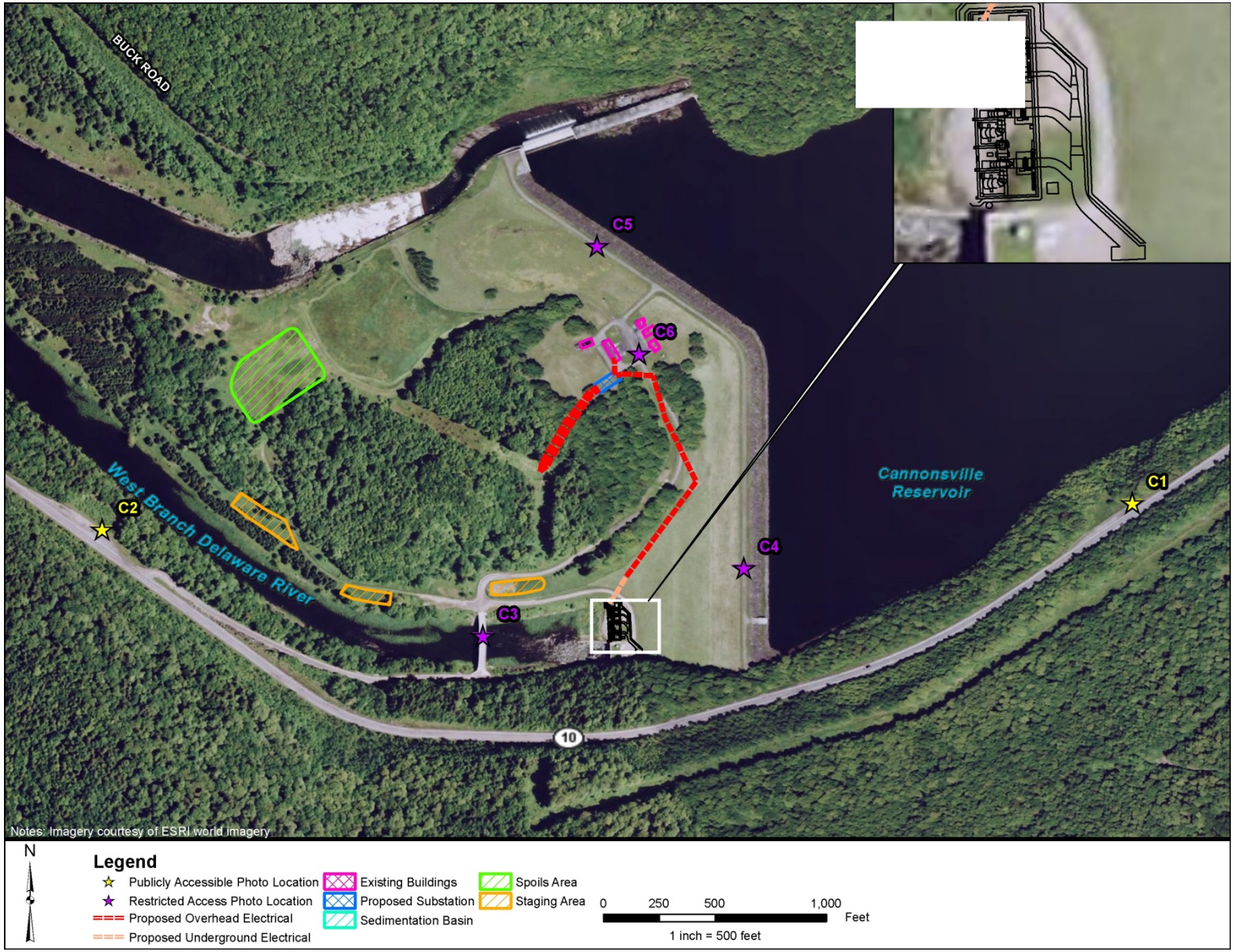


Figure E-24: Cannonsville Photo Locations

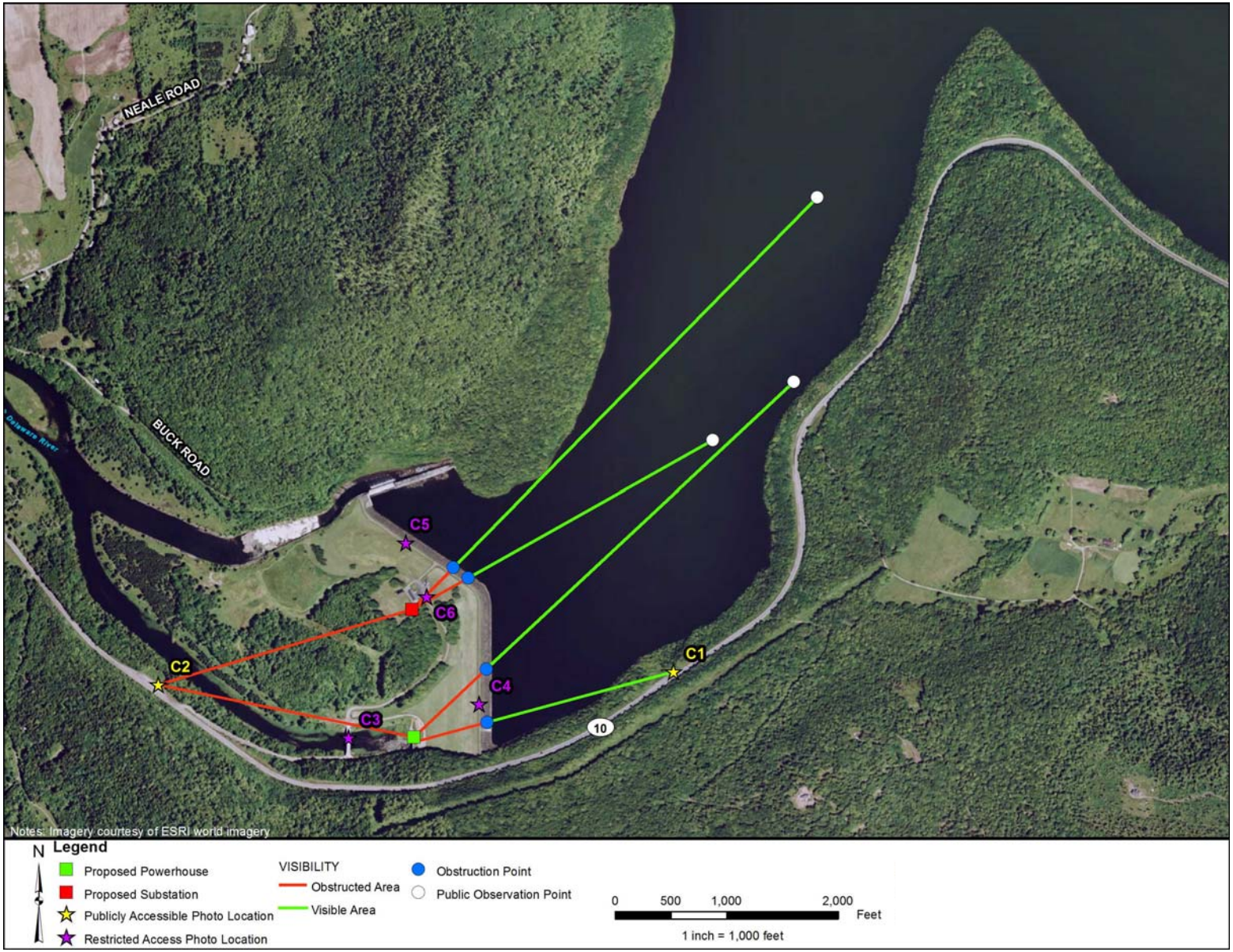


Figure E-25: Cannonsville Viewsheds and Sightlines

Figure E-26: C1 – View of Cannonsville from pull off on State Route 10

Figure E-27: C2 – View of Cannonsville from State Route 10

(7) Responsiveness Summary[9]

Comment No.	Comment	Response
New York State Department of Environmental Conservation (NYSDEC), December 19, 2011 (letter)		
NYSDEC-1	**Siphon Use During Construction:** The operation of siphons for a three month period during construction is a concern for the reservoirs at Pepacton, Cannonsville, and Neversink. The siphons will draw warm water from the surface; however, the normal release regime must sustain a coldwater ecosystem in the stream below the reservoir. The time of year in which the siphons may be used will be limited in the 401 Water Quality Certificate to October 1st through May 15th. This window of siphon use will not adversely impact the coldwater fisheries downstream of the reservoirs because the ambient surface water temperature during this period is typically 60°F or cooler.	The City will take steps to prevent adverse impacts on the downstream coldwater fisheries associated with the use of the siphons. A detailed discussion of this matter can be found in the Flow Management Plan included in the application in Volume 11, Appendix E-9.
NYSDEC-2	**Siphon Operational Ability:** Current release protocols must be outlined in the 401 Water Quality Certificate and approved by NYSDEC. When releases of water are compromised by events including, but not limited to, the plugging of siphons with woody debris and lower reservoir levels below the operation of the siphons, the operation of the siphon is negatively impacted. The protocols shall include: 1) measures that the NYCDEP will employ to maintain protocol requirements; 2) alternative measures (i.e., pumps) and an evaluation of additional impacts such as noise and exhaust; and 3) quantification of the capacity of the siphons and their ability to maintain the release requirements.	The concerns raised by this comment are addressed in the Flow Management Plan.
NYSDEC-3	**Cannonsville Proposal to Increase Capacity:** Although the current maximum release capacity at Cannonsville is 1500 cfs, the draft application proposes to increase the physical capacity to 3000 cfs. The NYSDEC intends to maintain (through the 401 Water Quality Certificate) the current operation limits of 1500 cfs in order to protect the aquatic species at the project site and downstream. NYSDEC staff contends that aquatic species will be negatively impacted from entrainment and the drawdown of cold water which will provide inadequate amounts of coldwater releases to maintain downstream fishery flows. If the NYCDEP can demonstrate that the proposed capacity increase will not have an adverse impact on the aquatic species, the NYSDEC will consider this information.	Per the current FFMP-OST, the maximum discharge through the low-level release works is set at 1,500 cfs. While the project will result in an increase in the total physical release capacity, the City has no plans to discharge more than 1,500 cfs through the new combined low-level release works/hydropower facility. While the City has no objection to the NYSDEC's intent to maintain an operational limit of 1,500 cfs at this time via the 401 Water Quality Certificate, the City notes that the flow regime is periodically reviewed and revised by the Decree Parties, and the requirements of the 401 Water Quality Certificate will need to be harmonized with any future flow regime agreed upon by the Decree Parties.

[9] The City will respond to the comments related to the Neversink and Pepacton Developments at a later date, if and when it decides to file applications related to such Developments.

Comment No.	Comment	Response
		As stated above, per the FFMP-OST the maximum discharge is 1,500 cfs. The design capacity of the proposed hydropower facility is 1,500 cfs. However, the future maximum discharge from the Project, including the release works and hydropower facility, is not cumulative. The intake pipe leading from the reservoir, through the dam, and feeding the release works was not designed to pass 3,000 cfs. The estimated design capacity of the existing system, with the Cannonsville Reservoir elevation maintained at 1150 feet msl (spillway crest elevation) is approximately 2,400 cfs. As the reservoir elevation declines, the release capacity also declines due to the drop in the net head.
NYSDEC-4	**Ashokan to Kensico Tunnel:** The entrainment and mortality of fish is undesirable and will attract birds in the project areas; certain mitigation measures may help alleviate this problem. Accordingly, the NYCDEP should explore and employ certain intake protections, such as barrier nets or other aquatic life exclusion devices. Simple studies can be used to determine which technology best avoids fish entrainment such as monitoring and recording the daily entrainment of fishes (size, number, specie), and correlating that to operations and reservoir conditions. Additionally, a hydroacoustic array may be used to record fish location in the water column during different times of the year. This technology will help determine which technology or operational modifications should be deployed. Once this information is recorded and collected, the NYSDEC will work with NYCDEP staff to assess the effectiveness of the various techniques.	The Ashokan and Kensico tunnel hydropower facilities have no nexus to the Cannonsville Hydroelectric Project (or West of Hudson Hydroelectric Project generally). Therefore, the City is not proposing any modifications to, or studies relating to, these facilities as part of the Project.
United States Fish and Wildlife Service (USFWS), December 14, 2010 letter		
USFWS-1	The literature-based fish impingement and entrainment study indicated that impingement and entrainment are likely to be minimal at these sites. The Service will likely include language in our comments on the Cannonsville license application and our mandatory conditions for the two exemption applications reserving the opportunity to request fish protection at a future date if impingement or entrainment is deemed to be a problem.	No response required.
USFWS-2	Downstream fish passage is not currently a viable alternative at these sites. Deep intakes would be unlikely to attract many downstream migrants and the fish would suffer mortality due to pressure changes. Surface releases could be designed, but these	No response required.

Comment No.	Comment	Response
	would lead to the release of warmer water than is currently released, thus likely increasing water temperatures to the detriment of the downstream coldwater fisheries. Therefore, the Service will not be requiring fish passage at this time. However, we will reserve the authority of the Secretary of the Interior to prescribe fish passage at Cannonsville and will include mandatory conditions for the exemptions reserving our right to require fish passage in the future if deemed necessary.	
USFWS-3	Construction impacts to fish and wildlife resources are expected to be negligible as most of the construction is occurring within existing building or on mowed lawns. As such, the NYCDEP has not proposed any mitigation measures. The Service will include mandatory conditions for the exemptions reserving the right to add conditions in the future if project plans change or unforeseen impacts to fish and wildlife resources occur.	No response required.
Delaware County Board of Supervisors (DCBS), December 19, 2011 (letter)		
DCBS-1	At public meetings there was no commitment by the City to have the electricity that would be generated to be beneficial locally. We strongly recommend that the City in consultation with watershed communities develop a method that enables communities in watershed counties to benefit from lower cost electric generation produced at these sites.	The City has not yet made any final determinations regarding the ultimate disposition of any power and/or other related energy products to be produced by the Cannonsville Hydroelectric Project. However, any such disposition shall comply with all applicable laws, rules and regulations, including, but not limited to, the limitations imposed by New York City Administrative Code § 24-364 relating to the City's use of any electricity generated by such Project.
DCBS-2	We recommend that the City make every effort to assure local residents and local contractors be hired by contractors for the construction of these project and to buy supplies locally where practical and reasonable.	Any contracts for services entered in by the City for construction-related activities associated with the Cannonsville Hydroelectric Project will be entered into in accordance with the City's applicable open and transparent procurement procedures.
Federal Energy Regulatory Commission (FERC), December 20, 2011 (email)		
FERC-1	Exhibit A – please provide length of transmission line in the final license application (FLA).	The 46 kV transmission line is approximately 460 feet long. The secondary 12.47 kV supply line from the substation to the powerhouse is approximately 1,350 feet long. See Exhibit A. Section (4) Description of Primary Transmission Lines.
FERC-2	Exhibit F – please provide the Supporting Design Report in the FLA	Exhibit F is in the Final License Application.
FERC-3	Exhibit G – the surveyor needs to sign the certification	A professional surveyor has stamped the drawings.
FERC-4	Exhibit C – please provide a metes and bounds description of the proposed project boundary, if available	Provided in Exhibit G.

Comment No.	Comment	Response
FERC-5	Exhibit H – please provide the information required in section 16.10(c)	The Exhibit H information related to 18 C.F.R. § 16.10(c) is not required to be included in an Original License Application pursuant to 18 C.F.R. § 4.51. Accordingly, the City's license application with respect to the Cannonsville Hydroelectric Project does not contain such information.
FERC-6	Cost Estimates for Environmental Measures - In Table D-1, you provide costs for two environmental measures (siphon for environmental flows, and wetland mitigation). You do not provide cost estimates for other apparent environmental measures that you describe generally within Exhibit E, including: 1) avoidance/protection of wetlands (i.e., signage for avoiding vernal pool habitat); 2) Bald Eagle monitoring and potential mitigation; and 3) invasive species management (i.e., spoil pile capping practices and other measures.). Further, it is not clear what the wetland mitigation line item ($75,000) represents, as applicant states in Exhibit E (p. 115-116) that no wetland mitigation measures are proposed for the removal of 1.05 acres of emergent wetland within the tailrace, and that "there will be no net loss of wetlands due to proposed construction."	The line item cost for wetland mitigation was included in Table D-1 as a potential cost and was developed assuming a wetland creation project may be requested by the USACE to address impacts to the emergent wetland (vegetated shallows) within the proposed tailrace area. Although specific wetland mitigation measures have not been proposed by resource agencies (i.e., USFWS and NYSDEC), permitting consultation with the USACE has not yet occurred. Cost estimates for other potential environmental measures are explained below: 1) Signage for avoiding vernal pools during construction is a minor expense that is included in the contingencies. 2) The DEP currently monitors bald eagle activity at Cannonsville Reservoir and will continue to do so during Project-related construction. No additional expenses were included for monitoring. Although no specific mitigation measures for bald eagles were recommended by the resource agencies, DEP is proposing to add raptor protection measures to the overhead electric lines, such as pole top static lines and cross arms to greatly reduce electrocution risk. Costs for these measures were included in the "Transmission Poles and Conductors" line item in Table D-1. 3) Costs associated with invasive species control are included in the general "Site Restoration" line item in Table D-1.

Comment No.	Comment	Response
FERC-7	Buffer Zones - In your application, you illustrate buffer zones of up to 100 feet (i.e., Fig E-18) around proposed project features. The purpose of these buffer zones is unclear; in some cases, it appears there would be construction- and/or operation-related impacts due to the proposed project within the defined buffer zones, such as transmission line corridors. Please define and discuss the rationale for the term "buffer zone" as it applies to your proposed project, and discuss what construction-related or operation-related impacts would occur in these areas, and whether they represent a protective boundary to limit impacts to sensitive resources, such as wetlands (including vernal pools that may support Jefferson and longtail salamander breeding), forested habitat, and bald eagles.	The impacts of project –related construction at all three developments were studied in accordance with the study plan developed for this issue. In order to establish a study area, locations proposed for disturbance during construction were presented as "proposed construction areas." Buffer zones of up to 100 feet were established around the construction areas and added to the study area in order to identify any sensitive resources that may be adjacent to the construction areas. In the case of the overhead transmission and supply lines, at the time of the study, the width of the ROWs were not yet defined, so a linear feature was used to represent the construction area. This linear feature was then buffered by 100 feet and added to the study area. Figure E-18 was revised to reflect the proposed width of the ROWs (i.e., the "construction area") now that they are known. No construction activities will occur in the buffer zones, and sensitive resources, such as vernal pools, within these buffer zones will be marked and avoided.
FERC-8	Transmission Lines - Exhibit E of your application does not provide a clear description of transmission line features, including tower height and length and location of line segments. However, the supporting Erosion Report (p. 2) provides the following description of the proposed transmission lines: *"The route for the generator lead is not yet finalized, but it is likely to run underground from the powerhouse indoor switchgear to a pole, then overhead approximately 1200 feet to the substation (approximately 43 feet wide by 115 feet long). There are existing poles in this area which will be replaced with 50-foot poles, of which approximately 10 feet will be below ground. The interconnection facilities between the new substation and the transmission line, approximately 460 feet, will consist of new overhead poles approximately 40 feet above ground."*	The route and locations of the transmission line features were shown in the most feasible locations. The ROW width for the 46 kV line is approximately 100 feet. The ROW width for the 12.47 kV line is approximately 30 feet. Exhibit E has been revised to include a description of the transmission line features, consistent with Exhibit A. The Final License Application has been revised to show the ROW widths plus the surrounding buffer areas. Potential construction-related impacts to terrestrial resources in both the ROW and buffer

Comment No.	Comment	Response
	Additionally, the proposed right-of-way (ROW) width for overhead transmission lines is not provided in the application or supporting reports, and it is unclear whether the right-of-way would fall within the buffer zone illustrated in Figure E-18. Without this information, potential construction- and operation-related impacts to terrestrial resources, specifically to forested habitat, wetlands, and raptors, are not adequately described. Please confirm the transmission line design, ROW width, and discuss potential impacts due to design (such as collision and electrocution risk for raptors, including Bald Eagles), construction (temporary or permanent disturbance to forested or wetland habitat, including acreage of affected habitat), and operation (vegetation maintenance within ROWs, etc.) of the proposed project.	areas were evaluated in the Draft License Application. With regard to vegetation maintenance within the ROWs, the area in which the 12.47 kV ROW will be located is routinely mowed by DEP. The area in which the new 46 kV ROW will be located is forested. Clearing, grubbing, grading and seeding will occur during construction. Thereafter, the ROW will be routinely mowed by ROW. With regard to potential impacts on raptors from the overhead transmission and supply lines, DEP plans to add raptor protection measures such as pole top static lines and cross arms to greatly reduce electrocution risk. Exhibit E has been revised to include a description of the power line design measures provided to greatly reduce potential impacts on avian wildlife.
FERC-9	Please address consistency of proposed project with the Coastal Zone Management Act	See Appendix E-3: Correspondence Log. Letter from NY Department of State re: Coastal Zone Management Act

(8) List of Literature

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