United States Nuclear Regulatory Commission Official Hearing Exhibit
In the Matter of: Entergy Nuclear Operations, Inc.
(Indian Point Nuclear Generating Units 2 and 3)
ASLBP #: 07-858-03-LR-BD01
Docket #: 05000247 | 05000286
Exhibit #: ENT00320A-00-BD01
Identified: 10/15/2012
Admitted: 10/15/2012
Withdrawn:
Rejected:
Stricken:
Other:

ENT00320A
Submitted: March 29, 2012

HAVERSTRAW WATER SUPPLY PROJECT WATER SUPPLY PERMIT APPLICATION

COPIES FOR PUBLIC REVIEW – CRITICAL INFRASTRUCTURE INFORMATION EXEMPT FROM FREEDOM OF INFORMATION REQUESTS REMOVED

SUBMITTED TO:
New York State Department of Environmental Conservation
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, New York 12233-1750

SUBMITTED BY:
UNITED WATER NEW YORK INC.
360 West Nyack Road
West Nyack, New York 10994

PREPARED BY:
AKRF, Inc.
440 Park Avenue South
New York, New York 10016

CDM
60 Crossways Park Drive West
Woodbury, NY 11797

December 2011
Originally submitted October 2011

AKRF

Environmental and Planning Consultants

440 Park Avenue South
7th Floor
New York, NY 10016
tel: 212 696-0670
fax: 212 213-3191
www.akrf.com

Memorandum

To:	Christopher M. Hogan, Division of Environmental Permits
From:	Maureen Heimbuch
Date:	December 9, 2011
Re:	Revisions to United Water New York Inc.'s Water Supply Application for the proposed Haverstraw Water Supply Project
cc:	S. Master, M. Pointing, and J. Dillon, Esq., UWNY; R. Newell, NYSDOS; R. Alessi, Esq., D&L; K. Kelly, K. Smith, and N. Vignola-Henry, CDM; J. Cowing and J. Feingold, AKRF

The United Water New York Inc. (UWNY) Water Supply Application for the proposed Haverstraw Water Supply Project has been revised to reflect the new location for the intake structure. Enclosed is a copy of this application containing revised pages. These revised pages include the following:

- Section 1:
  - Water Supply Application Supplement W-1 for Public Water Supply Permit form
- Section 2:
  - Pages B-2 and B-5
- Section 3:
  - Pages C.1-2, C.1-3, C.2-2, C.2-8, C.2-28, and C.2-33
- Section 4:
  - Redacted versions of Figures D-5a and D-5b
- Section 5:
  - Pages 1-1 through 1-10
- Section 6:
  - Water Supply Application Supplement W-1 for Public Water Supply Permit form
  - Figures D-5a and D-5b

Also enclosed is a CD containing three files: the revised Water Supply Application, the redacted version of this revised application, and a version of the application showing the specific changes that have been made.

If you have any questions, please contact me at 646-388-6659 or mheimbuch@akrf.com.

Maureen Heimbuch

Sameet Master
Project Manager

UNITED WATER
700 Kinderkamack Road
Oradell, NJ 07649
TEL 201-634-4232
FAX 201-225-5125
Sameet.Master@unitedwater.com
WWW.UNITEDWATER.COM

October 5, 2011

Ms. Andrea Sheeran
Division of Environmental Permits
New York State Department of Environmental Conservation
625 Broadway, 4th Fl.
Albany, NY 12233-1750

Reference: United Water New York Inc.
Haverstraw Water Supply Project
6 NYCRR Part 601 Water Supply Permit Application

Dear Ms. Sheeran:

United Water New York Inc. ("UWNY") respectfully submits three (3) signed copies of Water Supply Application for the proposed Haverstraw Water Supply Project. As required by the 6 NYCRR Part 601 ("Public Water Supply") permitting process, please note the following project specific information:

l) Name and location of a suitable place in which to hold a public hearing should one prove necessary:

Town of Haverstraw
Haverstraw Town Hall
1 Rosman Road
Garnerville, New York 10923
(845) 429-2200

Local newspaper of record (published daily) is the Rockland County edition of the *Journal News*.

2) Names, titles, mailing addresses, and phone numbers of other concerned officials, including:

<u>Applicant</u>
United Water New York Inc.
360 West Nyack Road
West Nyack, New York 10994
Contact: Sameet Master, P. E.
(845) 620-3300, ext. 4232

Sameet Master
Project Manager

UNITED WATER
700 Kinderkamack Road
Oradell, NJ 07649
TEL 201-634-4232
FAX 201-225-5125
Sameet.Master@unitedwater.com
WWW.UNITEDWATER.COM

Applicant's Attorney
Dewey & LeBoeuf, LLP
99 Washington Avenue, Suite 2020
Albany, New York 12210
Contact: Robert Alessi, Partner
(518) 626-9000

Applicant's Engineer
CDM
60 Crossways Park Drive West, Suite 340
Woodbury, NY 11797
Contact: Keith Kelly
(516) 496-8400

Applicant's Permitting Consultant
AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, NY 10016
Contact: Maureen Heimbuch
(646) 388-9659

Municipality Chief Executive Officer
Town of Haverstraw
1 Rosman Road
Garnerville, New York 10923
Contact: Honorable Howard T. Phillips, Jr., Supervisor
(845) 429 – 2200

New York State Department of State
Division of Coastal Resources
41 State Street
Albany, New York 12231 – 0001
Contact: Jeffrey Zappieri, Coastal Resources Specialist
(518) 473 - 2476

New York State Office of General Services
Empire State Plaza
Corning Tower
Albany, New York
Contact: Richard Bennett, Real Estate Officer
(518) 473-1288

New York State Department of Public Service
Empire State Plaza
Agency Building 3
Albany, New York 12223
Contact: James Austin, Deputy Director,

Sameet Master
Project Manager

UNITED WATER
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Sameet.Master@unitedwater.com
WWW.UNITEDWATER.COM

Office of Energy Efficiency and the Environment
(518) 473-4635

3) List of materials and exhibits:

Water Supply Permit Application, Supplement W-1

Exhibit A:	Water Conservation Program Form
Exhibit B:	Summary of Permit Application Requirements (§601.5) Project Justification
Exhibit C:	Project Description and Project Purpose
C.1	Description of Project and Water Treatment Process
C.2	Purpose and Need for the Project
Exhibit D:	General Service Area and Project Location Maps
Exhibit E:	Engineer's Report

United Water is requesting that certain information in the Water Supply Application be excepted from disclosure under the Freedom of Information Law ("FOIL," Article 6 of the New York Public Officers Law ["POL"]) because they contain critical infrastructure information.

POL § 87(2)(f) provides that if the disclosure of a document "could endanger the life or safety of any person," that document may be excepted from disclosure under FOIL. More specifically, POL § 89(5)(a)(1-a) and 6 NYCRR § 616.7 provide that documents containing critical infrastructure information are excepted from disclosure under FOIL. "Critical infrastructure" is defined as "systems, assets, places or things, whether physical or virtual, so vital to the state that the disruption, incapacitation or destruction of such systems, assets, places or things could jeopardize the health, safety, welfare, or security of the state, its residents or its economy." 6 NYCRR § 616.7(c)(2)(i)(*c*).

United Water is requesting that the following portions of the Water Supply Application be considered critical infrastructure information and excepted from disclosure under FOIL:

- Section 1 – Water Supply Application Supplement W-1.

This portion of the Water Supply Application contains information on the precise location of the proposed intake for the Haverstraw Water Supply Project. This information, which is not otherwise publicly available, could be used to disrupt, incapacitate, or damage the Haverstraw Water Supply Project and the public water supply it will furnish, thereby jeopardizing the health, safety, welfare, and security of New York State's residents and economy. Accordingly, this portion of the Water Supply Application represents critical infrastructure information excepted from disclosure under FOIL. *See* 6 NYCRR § 616.7(c)(2)(i)(*c*); *see also*, NYSDEC FOIL Appeal Determination no. 04-18-3A (John V. Tait), dated November 10, 2004 ("The records on

Sameet Master
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critical infrastructure that are being withheld provide more detailed information relating to various aspects (such as physical structure, location, etc.) of these vital transportation and communication links than what is currently available through other means, and, consistent with the Department's responsibility to protect the public security and safety of the state and its residents, this information is not being released.") (*citing Stronza v. Hoke*, 148 A.D.2d 900, (3d Dep't 1989); *Flowers v. Sullivan*, 149 A.D.2d 287 (2d Dep't 1989)).

The portion of the Water Supply Application that contains critical infrastructure information excepted from disclosure under FOIL has been redacted and the page has been marked with the designation: **CRITICAL INFRASTRUCTURE INFORMATION REDACTED.** A separate section, Section 6, has been added to the Water Supply Application binder; Section 6 includes the un-redacted page containing the critical infrastructure information, which have each been labeled: **CRITICAL INFRASTRUCTURE INFORMATION -- EXEMPT FROM FREEDOM OF INFORMATION REQUESTS.**

We will continue to copy your office on all correspondence with other agencies associated with the Haverstraw Water Supply Project approval process. If you have any questions or would like to arrange an update meeting please call me at (201) 634-4232 or you can e-mail me at Sameet.Master@UnitedWater.com.

Respectfully submitted,

Sameet Master

Sameet Master, P.E.
Project Manager

cc: M. Pointing and J. Dillon, Esq., UWNY
R. Newell, NYSDOS
S. Jensen, USACE
R. Alessi, Esq., D&L
M. Heimbuch, J. Cowing, and J. Feingold, AKRF
K. Kelly, K. Smith, and N. Vignola-Henry, CDM

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WWW.UNITEDWATER.COM

September 29, 2011

Ms. Andrea Sheeran
Division of Environmental Permits
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-1750

Reference: United Water New York Inc. - Haverstraw Water Supply Project
DEC Tracking #: 3-3922-00221/00001
Town of Haverstraw, Rockland, NY
6 NYCRR Part 601 Water Supply Permit Application

Dear Ms. Sheeran:

United Water New York Inc. ("UWNY") respectfully submits three (3) signed copies of Water Supply Application for the proposed Haverstraw Water Supply Project. As required by the 6 NYCRR Part 601 (Public Water Supply) permitting process, please note the following project specific information:

1) Name and location of a suitable place in which to hold a public hearing should one prove necessary:

   Town of Haverstraw
   Haverstraw Town Hall
   1 Rosman Road
   Garnerville, New York 10923
   (845) 429-2200

   Local newspaper of record (published daily) is the Rockland County edition of the *Journal News*.

2) Names, titles, mailing addresses, and phone numbers of other concerned officials, including:

   Applicant
   United Water New York Inc.
   360 West Nyack Road
   West Nyack, New York 10994
   Contact: Sameet Master, P. E.
   (845) 620-3300, ext. 4232

   Applicant's Attorney
   Dewey & LeBoeuf, LLP
   99 Washington Avenue, Suite 2020
   Albany, New York 12210
   Contact: Robert Alessi, Partner
   (518) 626-9000

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60 Crossways Park Drive West, Suite 340
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7250 Parkway Drive, Suite 210
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Contact: Maureen Heimbuch
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Agency Building 3
Albany, New York 12223
Contact: James Austin, Deputy Director,
Office of Energy Efficiency and the Environment
(518) 473-4635

3) List of materials and exhibits:

Section 1:

Exhibit A	Water Supply Permit Application, Supplement W-1
Exhibit A.1	Water Conservation Program Form
Exhibit A.2	2010 AWWA Water Audit

Section 2:

Exhibit B	Summary of Permit Application Requirements (§601.5)
	Project Justification

Section 3:

Exhibit C	Project Description and Project Purpose
Exhibit C.1	Description of Project and Water Treatment Process
Exhibit C.2	Purpose and Need for the Project

Section 4:

Exhibit D	General Service Area and Project Location Maps

Section 5:

Exhibit E	Engineer's Report

We will continue to copy your office on all correspondence with other agencies associated with the Haverstraw Water Supply Project approval process. If you have any questions or would like to arrange an update meeting please call me at (201) 634-4232 or you can e-mail me at Sameet.Master@UnitedWater.com.

Respectfully submitted,

Sameet Master

Sameet Master, P.E.
Project Manager

cc: M. Pointing, United Water
J. Dillon, Esq., United Water
R. Alessi, Esq., Dewey & LeBoeuf
J. Cowing, AKRF
J. Feingold, AKRF
M. Heimbuch, AKRF
K. Kelly, CDM
K. Smith, CDM

HAVERSTRAW WATER SUPPLY PROJECT
WATER SUPPLY PERMIT APPLICATION

COPIES FOR PUBLIC REVIEW – CRITICAL INFRASTRUCTURE INFORMATION EXEMPT FROM FREEDOM OF INFORMATION REQUESTS REMOVED

SUBMITTED TO:
New York State Department of Environmental Conservation
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, New York 12233-1750

SUBMITTED BY:
UNITED WATER NEW YORK INC.
360 West Nyack Road
West Nyack, New York 10994

PREPARED BY:
AKRF, Inc.
440 Park Avenue South
New York, New York 10016

CDM
60 Crossways Park Drive West
Woodbury, NY 11797

December 2011
Originally submitted October 2011

Public Water Supply Permit Application (6 NYCRR Part 601)
Proposed Haverstraw Water Supply Project

TABLE OF CONTENTS

Section 1:

Exhibit A Water Supply Permit Application, Supplement W-1
Exhibit A.1 Water Conservation Program Form
Exhibit A.2 2010 AWWA Water Audit

Section 2:

Exhibit B Summary of Permit Application Requirements (§601.5)
Project Justification

Section 3:

Exhibit C Project Description and Project Purpose
Exhibit C.1 Description of Project and Water Treatment Process
Exhibit C.2 Purpose and Need for the Project

Section 4:

Exhibit D General Service Area and Project Location Maps

Section 5:

Exhibit E Engineer's Report

Section 6:

CRITICAL INFRASTRUCTURE INFORMATION – EXEMPT FROM FREEDOM OF INFORMATION REQUESTS

Section 1

Exhibit A: Water Supply Permit Application, Supplement W-1

Exhibit A

Water Supply Permit Application, Supplement W-1

95-19-4 (JULY 2000)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK, 12233-0001

WATER SUPPLY APPLICATION
Supplement W-1 for Public Water Supply Permit

READ THE INSTRUCTIONS ON PAGE 2 BEFORE COMPLETING THIS FORM

FOR DEPARTMENT USE ONLY
APPLICATION NUMBER
WSA NUMBER

PLEASE TYPE OR PRINT CLEARLY IN INK

1. PROJECT DESCRIPTION (INCLUDE LOCATION - for multiple well heads, identify and attach additional coordinates)

The Proposed Project entails the construction and operation of a new water intake, intake pumping station, and water treatment facility in the Town of Haverstraw, Rockland County, New York. The Proposed Project would collect and treat water from the Hudson River and deliver up to 7.5 milion gallons per day (mgd) of potable water. See Exhibit C.1.

COORDINATES
NYTM-E 587023
NYTM-N 4563621

2. PROJECT PURPOSE

The purpose of the Proposed Project is to provide an additional water supply source to increase the safe yield of the United Water Rockland County water supply system by 7.5 mgd, to accomodate future growth with an adequate margin of safety. See Exhibit C.2.

3. THIS PROJECT INVOLVES: (Check all that apply and, for each item checked, provide a brief description or identification)

- [ ] ACQUISITION of existing facilities
- [x] INSTALLATION of new facilities Construction of a new water intake, intake pumping station, and water treatment facility
- [ ] CHANGES in capacities of existing facilities
- [ ] ABANDONMENT of existing facilities

4. This project will involve the taking of up to 10 millio gallons of water [ ] (per minute) [x] (per day) from the Hudson River (Name of source)

Figure given represents [ ] increase in taking, [x] total taking.

5. If certain exhibits are omitted or reduced in scope because of reference to documents submitted with prior applications, list the exhibits so affected, identify the prior application (by Water Supply Application Number and name of applicant) and specify the document(s) to be referenced.

EXHIBIT	WSA NO.	APPLICANT'S NAME	REFERENCED DOCUMENT(S)

6. PROJECT AUTHORIZATION

This application must be accompanied by proof of adequate authorization for the proposed project. List below all exhibits documenting such authorization, such as resolutions, certificates of incorporation, contracts, referendum results, etc. (See *Public Water Supply Program, Applicant's Guide* for further details.)

See Exhibit B(a).

7. PROJECT JUSTIFICATION

By the act of signing this application, the applicant certifies that each of the following statutory conditions is or will be satisfied, AND that a proper justification for each is given in the specified exhibits attached to this application:

A.	The proposed project is justified by the public necessity	See Exhibit(s) B and C.2
B.	The proposed project takes proper consideration of other sources of supply that are or may become available.	See Exhibit(s) B
C.	All work and construction connected with the proposed project will be proper and safe	See Exhibit(s) B
D.	The supply will be adequate	See Exhibit(s) B
E.	There will be proper protection of the supply and watershed or proper treatment of any additional supply	See Exhibit(s) B
F.	The proposed project is just and equitable to all affected municipalities and their inhabitants and in particular with regard to their present and future needs for sources of water supply	See Exhibit(s) B
G.	There is provision for fair and equitable determinations of and payments of any direct and indirect legal damages to persons or property that will result from the acquisition of any lands in connection with the proposed project or from the execution of the proposed project	See Exhibit(s) B
H.	The applicant has developed and implemented a water conservation program in accordance with local water resource needs and conditions	See Exhibit(s) A and C.2

8. SEQR STATUS

A Draft Environmental Impact Statement (EIS) is submitted herewith.

9. SIGNATURE M. Paintney

10 DATE 12/9/11

Revised December 2011

Exhibit A.1

Water Conservation Program Form

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

WATER CONSERVATION PROGRAM FORM

(Revised - May 2006)

(A PDF version of this form is available at: http://www.dec.ny.gov/docs/permits_ej_operations_pdf/program.pdf)

TO BE COMPLETED AND SUBMITTED AS PART OF A NYSDEC WATER SUPPLY PERMIT APPLICATION - SEE PAGE 6 FOR FURTHER INTRODUCTION AND INSTRUCTION REGARDING THIS FORM -

If your water system already has its own written water conservation program, please feel free to submit it as a supplement to this WCPF. If your system is new, please indicate the water conservation measures that will be taken when the system is completed (e.g., all sources of supply and customers will be 100% metered).

I. GENERAL SYSTEM INFORMATION

Name of Applicant: United Water New York Inc.		**DEC No.**
Street Address: 360 West Nyack Road		**WSA No.**
Post Office: West Nyack	**County:** Rockland	**State & ZIP:** NY 10994
Name & Title of Contact: Mr. Sameet Master, PE, Project Manager		
Street Address: 700 Kinderkamack Rd.		
Post Office: Oradell	**State & ZIP:** NJ 07649	
Applicant Telephone: 201 634 4232	**Contact Telephone:** 201 634 4232	

II. SOURCES OF WATER SUPPLY

Please give amounts in gallons per minute (**gpm**), per day (**gpd**) or million gallons per day (**mgd**).

Source Type: **S** = Surface supply, **G** = Ground supply, **P** = Purchased supply
Source Status: **R** = Regular use, **S** = Standby use, **E** = Emergency use

Name of Source	Source Type	Source Status	Tested Capacity	Actual Current Withdrawal	Start-up Year
Lake DeForest	S	R	See attached	9.4 mgd	1956
Letchworth Reservoirs	S	R	See attached	0.2 mgd	2006
Ramapo Valley Well Field	G	R	See attached	7.7 mgd	1976
System Wells	G	R	See attached	12.3 mgd	Various

Name of Applicant: United Water New York Inc.	**WSA No .**

III. WATER USAGE AND METERING

The water production data requested in this section should be available from the monthly "Water System Operation Reports" required by the State or Local Department of Health.

For unmetered systems, please provide your best estimates for water production and/or consumption.

Are all sources of supply (including major interconnections) equipped with master meters? Yes	
What percentage of your system is metered? 100 %	How often are they read? Residential: Quarterly Commercial: Monthly
Number of service connections? 73,354	Total population served? 272,726 (estimated)
How many meters are recalibrated and/or replaced each year? 7%	

Water Production for calendar year 2010		**Water Consumption for calendar year** 2010	
Total metered water production :	10,879 mg	Total metered water consumption:	8,703.1 mg
Average day production (total/365):	29.8 mgd	Average day consumption (total/365):	23.8 mgd
Peak day production (largest single day):	47.4 mgd	Per capita usage per day (avg. day/pop. served):	87.4 (gpcd)

What are your future goals and schedule for water system metering? See attached.

Recommendations:

* 100% metering of all water system connections, including public buildings.

* Master meters should be tested and calibrated annually.

* Customer meters should be recalibrated or replaced at least once every 15 years or in accordance with an optimum meter replacement schedule developed using the American Water Works Association (AWWA) Manual M6.

* Quarterly meter reading and prompt billing with rates that reflect amount of water used.

Name of Applicant: United Water New York Inc.	**WSA No.**

IV. WATER SUPPLY AUDIT

Do you conduct a system water audit at least once each year? Yes. See Attachment A.1.
If yes, please submit a copy of your latest audit in addition to completing the following section.

** Water Supply Audit for Calendar Year 2010

Total metered water production (from previous section)		Total	10,879 mg	% of Total
Total metered water consumed (from previous section)		subtract	8,703.1 mg	80.0
Authorized unmetered usage	unbilled unmetered	subtract	26.3 mg	0.2
e.g. Unmetered public bldgs. Firefighting & training Main flushing Street cleaning		subtract		
		subtract		
		subtract		
Water lost to leaks that have since been repaired		subtract		
TOTAL UNACCOUNTED-FOR WATER		Sub-total	2,149.6 mg	19.8
Unaccounted-for water breakdown	Meter under-registration	subtract	158.0 mg	1.5
	Unrepaired leakage	subtract	1,463.6 mg	13.5
	Other:	subtract	528.0 mg	4.9
** Water measurement and accounting techniques are available in NYSDEC's January 1989, (re-printed February 1998) Water Conservation Manual.			0	

What are your future goals for water system auditing? See attached.

Recommendations:

* At least once each year, a system water audit should be conducted using metered water production and consumption data to determine unaccounted-for water.

* Quantify all authorized water uses by consumption categories (e.g. residential, industrial, municipal etc.).

* Keep accurate estimates of authorized unmetered water use (e.g. firefighting, main flushing, etc.).

Name of Applicant: United Water New York Inc.	**WSA No**.

V. LEAK DETECTION AND REPAIR

Do you regularly survey your system for leaks with listening equipment?

Total miles of distribution pipe	Percent of system surveyed each year	Miles of pipe surveyed each year	Listening equipment used	Year of last survey	Number of leaks found	Number of leaks repaired
1,041	Continuous	Continuous	HL 90 HL 400 PAL 300	Continuous	416	416

Do you have a regular water system rehabilitation program? Yes.
If yes, give details: See attached.

What are your future goals for water system leak detection and repair? See attached.

Recommendations:

* Check at least one third of your water distribution system for leaks each year.

* Fix every detectable leak as soon as possible.

* Have an on-going system rehabilitation program.

Name of Applicant: United Water New York Inc.	**WSA No**.

VI. WATER USE REDUCTION

Have you distributed information to residential customers on household water saving devices and ways to reduce water use? Yes.

Have you distributed water conservation information to industrial and commercial customers that promotes recycling and reuse? Yes.

Do you have a program to retrofit public buildings with water savings fixtures and encourage the private sector to do the same? Yes.

Do you have lawn sprinkling time restrictions during the summer or periods of peak demand?____.
If yes, please describe: See attached.

Do you have a plan that takes progressive steps to further reduce outdoor water use during drought conditions with a procedure to assure compliance? Yes. If yes, please describe:
UWNY follows Rockland County Department of Health's Protocol for water use restrictions during droughts - see attached.

What are your future goals for reducing water usage? See attached

Recommendations:

* Carry out a public information program that promotes water conservation practices by all categories of water users (e.g. residential, commercial, industrial, etc.).

* Retrofit public buildings with water saving fixtures and encourage the private sector to do the same.

* Use lawn sprinkling time restrictions (e.g. Odd/even days, morning and evening hours) during the summer and outdoor water use bans during times of drought.

* Adopt a procedure to be followed in times of drought that calls for a progression of restrictions on water use specifying: who will reduce, how, and by how much, along with actions to be taken to assure compliance.

Name of Applicant: United Water New York Inc.	**WSA No.**

VII. CERTIFICATION OF WATER CONSERVATION PROGRAM:

To be signed by the owner or official of the municipality or corporation operating this water system.

I hereby affirm that the information provided on this form is true to the best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to Section 210.45 of the Penal Law.

Date: 9/28/2011 Signature: M. Pointing Title: Vice President and General Manager, UWNY

DISCUSSION:

Effective January 1, 1989, New York State Environmental Conservation Law (ECL 15-1501) has required that all new applications for a NYSDEC Public Water Supply Permit include a water conservation program. This Water Conservation Program Form (WCPF) is intended to be a guide in completing this requirement.

The WCPF has been set up to cover the following basic elements of a water conservation program: Source Water Inventory, Water Usage and Metering, Water Supply Auditing, Leak Detection/Repair and Water Use Reduction. The recommended actions listed at the bottom of each page represent DEC water conservation policy objectives and should be factored into your program development. Additional water conservation measures such as increasing block water rate structuring, non-residential water use reduction or water efficient landscaping may also play an important role in your system's program and should certainly be considered when applicable.

Water supply permit applicants can consult the NYSDEC publication entitled, "Water Conservation Manual For Development of a Water Conservation Plan", January, 1989 (Re-printed February 1998) for details regarding the development of these water conservation practices. A PDF version of this manual is available on our website at: http://www.dec.ny.gov/docs/permits_ej_operations_pdf/program.pdf Copies can also be obtained through your DEC Regional Offices.

The American Water Works Association (AWWA) is also an excellent source of information regarding water conservation and public water supply systems in general. Information ranging from technical manuals to public education bill stuffers are available from AWWA at reasonable cost by calling 1-800-926-7337.

As a final note, the former "Bureau of Water Resources" has been incorporated into the "Bureau of Water Resource Management" and can now be contacted at (518) 402-8099.

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATER CONSERVATION PROGRAM FORM

ATTACHMENTS

Page 1 — II. Sources of Water Supply

The capacity of each of the sources in United Water New York's (UWNY) water supply system is determined by the conditions of their WSA permits and their New York State Department of Health (NYSDOH) permits governing their treatment systems:

Lake DeForest: WSA 2189 requires that at least 10 million gallons per day (mgd) of the water in Lake DeForest is forever reserved for the needs of the inhabitants of Rockland County (i.e., the safe yield of Lake DeForest for Rockland County is 10 mgd). The Lake DeForest Water Treatment Plant is operated subject to an approval from NYSDOH, issued in 2003 (Log No. 16321, CWS NY4303673), which limits daily intake of raw water to the treatment plant to 20.8 mgd, with a maximum daily production of up to 20 mgd, and the running annual average intake of raw water to 10 mgd.

Letchworth Reservoirs: WSA 9947 allows withdrawal of 1 mgd on an annual average basis and a maximum of 45 million gallons in a month. The permit also sets conditions regarding releases of water between the three reservoirs of the Letchworth Reservoirs, to preserve water in the reservoir system without allowing any of the reservoirs to become too depleted. All water is withdrawn from the first reservoir. The permit sets the following conditions:

A. When water supply withdrawal from the first reservoir is greater than 0.8 mgd, the following conditions apply:

   1. Water must be released from the second reservoir in an amount equal to the amount withdrawn from the first reservoir above 0.8 mgd.

   2. If the first reservoir reaches 30 percent of its capacity, water must be released from the second reservoir at a rate equal to the first reservoir withdrawal.

   3. If the second reservoir reaches 30 percent of its capacity, water must be released from the third reservoir in an amount equal to the first reservoir withdrawal.

B. If storage in each reservoir reaches 30 percent, release from the third reservoir shall cease and the first reservoir withdrawal shall not exceed 0.5 mgd.

C. If storage in the second and first reservoirs reach 10 percent, all water supply withdrawals from the first reservoir shall cease.

The NYSDOH approval for the Letchworth Water Treatment Plant (Log No. 17981, NY 4303673) allows its operation at an annual average of 1.0 mgd, with monthly production not exceeding 45 million gallons per month. The NYSDOH approval allows a seasonal peak production of 3.0 mgd.

Ramapo Valley Well Field: WSA 6507 permits a total of 14 mgd to be withdrawn from the Ramapo Valley Well Field on any given day, but the total amount of water pumped in any given month may not exceed an average of 10 mgd for that month. (Condition D of WSA 6507 states: "The total volume of water pumped from any combination of the 10 Ramapo Valley wells shall

not exceed 14 million gallons per day on any given day and the total amount of water pumped in any calendar month shall not exceed the figure obtained by multiplying the number of days in that month by an average pumping rate of 10 million gallons per day.") That condition is permitted as long as flow in the Ramapo River at a U.S. Geological Service (USGS) gauge downstream of the well field, in Suffern, is greater than 10 mgd. When flow in the river is less than 10 mgd at the Suffern gauge, permitted withdrawals are lower:

- When flow in the Ramapo River at the Suffern gauge is lower than 10 mgd but greater than 8 mgd, maximum withdrawal of 8 to 10 mgd is permitted.
- When flow in the Ramapo River at the Suffern gauge is at or below 8 mgd, no withdrawal is permitted.

System Wells: UWNY's system wells serving Rockland County have a recognized peak capacity of about 24.44 mgd and an average capacity of 15.9 mgd on a longer term (annual) basis.

Page 2 — III. Water Usage and Metering

What are your future goals and schedule for water system metering?

UWNY's Rockland County water system has 100 percent metering of all water system connections. UWNY recalibrates or replaces about 7 percent of the meters in its system annually. Production well meters are tested and calibrated every two years. Plant meters are tested and calibrated annually.

Customer meters are read either monthly (for commercial users) or quarterly (for residential users).

Page 3 — IV. Water Supply Audit

What are your future goals for water system auditing?

UWNY has an ongoing non-revenue water reduction initiative to identify real losses of water (i.e., the element of non-revenue water that can be controlled to some extent by the utility) and to reduce them where practicable and economically feasible. The first component of this initiative is ongoing system auditing using a methodology established by the American Water Works Association (AWWA) to identify water losses in the distribution system and evaluate those losses in comparison to performance indicators. Annual reports are submitted to the New York State Public Service Commission (PSC) including unaccounted-for water, consumption categories, and authorized unmetered water use.

UWNY has internal guidelines to use its ongoing non-revenue water reduction initiative to correct the errors that result in apparent losses and to reduce the percentage of average daily water demand that is due to real losses. To address apparent losses, UWNY has a program to recalibrate or replace water meters system-wide on a regularly scheduled basis. Typically, UWNY recalibrates or replaces about 7 percent of the meters in its system annually. In addition, UWNY has a program to review accounts to identify any that are active but not metered, and those that are using less water than would be expected, so that such metering errors can be corrected. To address real losses that are avoidable, UWNY has an ongoing program to reduce system water losses, including the Underground Infrastructure Renewal Program (UIRP) (see section V).

Page 4 — V. Leak Detection and Repair

Do you have a regular water system rehabilitation program? If yes, give details.

UWNY has an annual flushing program. In addition, UWNY has an ongoing program, the UIRP, to rehabilitate and replace the various components of UWNY's distribution system on a regular basis. As part of this program, UWNY replaces about 1 percent of its distribution lines annually on a system-wide basis, to replace aging and deteriorating pipes as they reach the end of their useful lives. The conditions of the UIRP are set forth in the 2006 and 2010 Rate Orders issued by the PSC.

One of the key efforts is UWNY's leak detection program to identify and address "invisible" leaks, which are those that are occurring but cannot be seen from the surface. UWNY's distribution inspectors conduct daily sounding of hydrants, valves and services as part of a routine leak survey. UWNY conducts continuous monitoring of the system using acoustic monitors.

In addition, UWNY is using its Supervisory Control and Data Acquisition (SCADA) system to closely monitor and manage system-wide water pressures in an effort to reduce the number of water main breaks.

What are your future goals for water system leak detection and repair?

It is expected that leak detection and monitoring will be enhanced through the use of permaloggers (i.e., leak detection device), which have recently been tested as part of a pilot study. In addition, distribution inspectors will continue to conduct leak surveying on a daily basis. Repairs of leaks are made within three days or less.

Page 5 — VI. Water Use Reduction

Have you distributed information to residential customers on household water saving devices and ways to reduce water use?

Have you distributed water conservation information to industrial and commercial customers that promotes recycling and reuse?

Do you have a program to retrofit public buildings with water saving fixtures and encourage the private sector to do the same?

Do you have lawn sprinkling restrictions during the summer or periods of peak demand? If yes, please describe.

What are your future goals for reducing water usage?

UWNY is a private company and does not have the regulatory authority to mandate or enforce water conservation by customers. UWNY follows the Rockland County Department of Health's protocol for water use restrictions during droughts.

UWNY continues to maintain an active conservation program to educate customers about conservation and provide them with incentives that encourage conservation. In accordance with

the New York State Department of Environmental Conservation guidance and PSC's requirements, conservation programs are regularly filed with the PSC in connection with Rate Orders. This program includes the following components:

Summer–Winter Rates

In 1981, UWNY implemented a summer–winter rate structure, in which higher water rates are charged from May 1 to September 30 in order to encourage conservation during the period of peak demand. Initially, the rate structure was 3:1, so that summer rates were three times higher than non-summer rates. In response to strong customer opposition, during the following summer the PSC reduced the differential to 1.5:1, which has remained since its adoption in 1982.

Water Conservation Device Distribution

UWNY has initiated three different programs to distribute water-saving devices to its residential customers. The first such program, in 1983, included distribution of conservation kits with low-flow devices for fixtures and a water conservation guide to all single-family customers in the service area. Kits were also available to multi-family building owners and managers upon request. In 1993, a second water conservation program was initiated that included offering water-conserving retrofit devices to all residential customers in the service area. The third program, in 1997, offered water conservation products at deeply discounted prices to all residential customers in UWNY's service area. This program, which is still ongoing, is available through UWNY's website and is advertised in the company's annual Water Conservation Guide and via newspaper advertising. Through this program, UWNY offers indoor kits that include a toilet dam, low-flow nozzles and showerheads, leak detection dye tablets for toilets, and a shower timer; and outdoor kits that include a hose timer, moisture meter, a rain gauge, and a low-flow hose nozzle.

Evapotranspiration (ET) Lawn Watering Program

In an effort to reduce unnecessary and excessive lawn irrigation, UWNY also has a lawn watering guide program that monitors and disseminates information on regional evapotransportation (ET) rates. ET is the loss of water from the soil through a combination of evaporation and plant transpiration. UWNY first implemented an ET education program for customers in the early 1990s, to provide information on determining the best methods for lawn watering and how to determine the daily ET number, which can be used to guide lawn-watering. UWNY's current ET program was developed in cooperation with the Cornell University Cooperative Extension and the State of New York, and was launched in 2006. As a customer service, UWNY provides the current ET number (how many minutes of lawn/garden water is needed as part of a once-every-four days watering cycle) via telephone, local AM radio (since 1994), and the internet (since 2007).

Conservation Education and Outreach Efforts

Since 1993, as part of its education program, UWNY has disseminated customer conservation information widely via mailed advertisements, bill inserts, radio ads, cable television, and public events and presentations. Beginning in 2007, UWNY has published an *Annual Conservation Guide* in the *Journal News* for customers in Rockland County. Among other items, the Annual Conservation Guide provides information on the purchase of water-saving kits that can be installed by customers to minimize water use. Since 2007, the information provided in the print version of the *Annual Conservation Guide* has also been available on the UWNY website.

UWNY's outreach efforts include specific information on xeriscaping (low-moisture landscaping), including recommended plant species, use of mulch to reduce water needs;

indoor/outdoor water use conservation tips; and instructions on how to detect water leaks. The xeriscaping program is based on the selection of appropriate plantings and horticultural/ irrigation techniques that make the best use of water. Demonstration gardens using these techniques were installed at UWNY's corporate headquarters in West Nyack in 1993, and at the Lake DeForest Water Treatment Plant starting in 1994. Xeriscaping is also promoted at community events and quarterly bill inserts. Since 2008, UWNY has partnered with a local nursery to provide xeriscape plants at discounted prices via a coupon in UWNY's *Annual Conservation Guide*.

In an effort to increase awareness about the importance of water and to educate future customers, UWNY has formed water education partnerships with two Rockland County school districts, and has plans to expand the reach of this program in the future with the goal of having every student take part in the program at least once during grade school or middle school. Lessons include an explanation of the role of evaporation and rainfall in providing Rockland County's water supply, and a demonstration of the sensible use of water at home.

In addition, UWNY staff members regularly engage customers on the benefits of water conservation and distribute conservation literature at a wide range of public and private events, including business and environmental expositions, street fairs, association meetings, rotaries, gardening clubs, senior clubs, and other functions.

Exhibit A.2

2010 AWWA Water Audit

AWWA WLCC Water Audit Software: Reporting Worksheet

Back to Instructions

? Click to access definition

Water Audit Report for: United Water New York
Reporting Year: 2010

Please enter data in the white cells below. Where possible, metered values should be used; if metered values are unavailable please estimate a value. Indicate this by selecting a choice from the gray box to the left, where M = measured (or accurately known value) and E = estimated.

ALL VOLUMES TO BE ENTERED AS ANNUAL QUANTITIES

WATER SUPPLIED

Volume from own sources:	?	M	10,784.7	million gallons (US) per year
Master meter error adjustment:	?	E	182.5	under-registered million gallons (US) per year
Water Imported:	?	M	0.0	million gallons (US) per year
Water Exported:	?	M	88.2	million gallons (US) per year
WATER SUPPLIED:			10,879.0	million gallons (US) per year

AUTHORIZED CONSUMPTION

Billed metered:	?	M	8,618.6	million gallons (US) per year
Billed unmetered:	?	NA	0.0	million gallons (US) per year
Unbilled metered:	?	M	84.5	million gallons (US) per year
Unbilled unmetered:	?	E	26.3	million gallons (US) per year
AUTHORIZED CONSUMPTION:			8,729.4	million gallons (US) per year

WATER LOSSES (Water Supplied - Authorized Consumption) 2,149.6 million gallons (US) per year

Apparent Losses

Unauthorized consumption:	?	E	528.0	million gallons (US) per year
Customer metering inaccuracies:	?	E	158.0	million gallons (US) per year
Data handling errors:	?	NA	0.0	million gallons (US) per year
Apparent Losses:			686.0	million gallons (US) per year

Real Losses

Real Losses (Water Losses - Apparent Losses):			1,463.6	million gallons (US) per year
WATER LOSSES:			2,149.6	million gallons (US) per year

NON_REVENUE WATER

NON-REVENUE WATER: 2,260.4 million gallons (US) per year

SYSTEM DATA

Length of mains:	?	M	1,041.0	miles
Number of active AND inactive service connections:	?	M	73,354	
Connection density:			70	conn./mile main
Average length of private pipe:	?	E	50.0	ft (pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	?	E	100.0	psi

COST DATA

Total annual cost of operating water system:	?	M	$23,341,489	$/Year
Customer retail unit cost (applied to apparent losses):	?	E	$3.55	$/100 cubic feet (ccf)
Variable production cost (applied to real losses):	?	M	$396.00	$/million gallons (US)

DATA REVIEW - Please review the following information and make changes above if necessary:

- Input values should be indicated as either measured or estimated. You have entered:
  - **9 as measured values**
  - **7 as estimated values**
  - **0 without specifying measured or estimated**
- *It is important to accurately measure the master meter - you have entered the measurement type as: measured*
- Cost Data: No problems identified

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume:	20.8%
Non-revenue water as percent by cost:	16.6%
Annual cost of Apparent losses:	$3,252,997
Annual cost of Real Losses:	$579,584

Operational Efficiency Indicators

Apparent losses per service connection per day:	25.62	gallons/connection/day
Real losses per service connection per day*:	54.66	gallons/connection/day
Real losses per length of main per day*:	N/A	
Real losses per service connection per day per psi pressure:	0.55	gallons/connection/day/psi
? Unavoidable Annual Real Losses (UARL):	2.18	million gallons/day
? **Infrastructure Leakage Index (ILI) [Real Losses/UARL]:**	**1.84**	

* only the most applicable of these two indicators will be calculated

Section 2

Exhibit B: Summary of Permit Application Requirements (§601.5)

EXHIBIT B:
SUMMARY OF PERMIT APPLICATION REQUIREMENTS (§601.5)
PROJECT JUSTIFICATION

Public Water Supply Permit Application (6 NYCRR Part 601)
Proposed Haverstraw Water Supply Project

EXHIBIT B

This exhibit summarizes the documentation provided for the Haverstraw Water Supply Project consistent with the requirements outlined in 6 NYCRR Part 601.5 "Water Supply Applications."

(a) *Project Authorization*. United Water New York Inc. (UWNY) is a public utility organized under the New York State Transportation Corporations Law and its services and rates are regulated by the New York State Public Service Commission ("PSC"). A July 20, 2010 Order by the PSC (the "2010 Rate Order") continued the obligations of a December 14, 2006 Order by the PSC (the "2006 Rate Order"), and commits UWNY to increasing the average water supply for Rockland County by a total of 1.5 million gallons per day (mgd) and the peak supply by a total of 7.1 mgd by the end of 2015. Beyond 2015, UWNY agreed under the 2006 and 2010 Rate Orders to proceed with preparation of materials for a long-term major water supply project (i.e., the "Proposed Project") that UWNY will build and operate. As a result, UWNY initiated the proposed Haverstraw Water Supply Project, and the appropriate UWNY management has authorized the project to proceed with the necessary permits and approvals. The 2006 and 2010 Rate Orders are publicly available and can be accessed on the PSC's website.[1]

(b) *General Map*. Maps showing the extent of the UWNY service area in Rockland County and the location of the proposed water treatment plant facilities are provided in **Exhibit D**. The existing service area boundary and location of water system components, including pressure districts, system wells, reservoirs, operating and emergency interconnections, are shown in **Figures D-1 and D-2. Figure D-3** shows the water system facilities within each pressure district. The location of the Proposed Project, including water intake site, water treatment plant site, and transmission and distribution mains, are shown in **Figures D-4, D-5a, D-5b, and D-6.** Information regarding the locations of sewer outfalls or other potential sources of contamination of the water supply is provided in Technical Memorandum # SW-1, *Source Water and Receiving Water Analysis*, July 2, 2010 (see Appendix C in **Exhibit E**). The Haverstraw Water Supply

[1] 2006 Rate Order:
http://documents.dps.state.ny.us/public/MatterManagement/CaseMaster.aspx?MatterSeq=22633
http://documents.dps.state.ny.us/public/MatterManagement/CaseMaster.aspx?MatterSeq=22997
2010 Rate Order:
http://documents.dps.state.ny.us/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=09-W-0731)

Project is proposed in order to meet the long-term water supply needs in the service area. The Proposed Project would not result in any change to UWNY's service area.

(c) *Watershed Map*. A map showing the affected watershed, including the location of the proposed water treatment plant facilities, is provided as **Figure D-9** in **Exhibit D**.

(d) *Profiles*. Preliminary plans of the proposed facilities will be included in the 50% Design Report expected to be provided in February 2012. Final design of the proposed facilities is subject to the approval of the New York State Department of Health (NYSDOH) and will be provided when submitted to the NYSDOH.

(e) *Contract Plans* and *Specifications*. Preliminary plans of the proposed facilities will be included in the 50% Design Report expected to be provided in February 2012. Final design of the proposed facilities is subject to the approval of the NYSDOH and will be provided when submitted to the NYSDOH.

(f) *En 's Report*. An Engineer's Report is provided in **Exhibit E**.

(g) *Acquisition Map*. The Proposed Project requires acquisition of the following parcels:

- Water Treatment Plant Site—Consists of portions of four tax parcels currently owned by the Town of Haverstraw (tax parcel numbers 20.16-2-1, 20.16-2-2.1, 20.16-2-2.2, 20.16-2-5) and the entirety of a privately owned parcel (tax parcel number 20.16-2-6). See Figure D-5a in Exhibit D.
- Intake Site—Upland areas consist of acquisition of a portion of one tax parcel currently owned by U.S. Gypsum (USG) (tax parcel number 21.09-2-1) and an access easement providing connection to Beach Road. The intake pipe requires easements within underwater lands in the Hudson River, including: 1) within USG's parcel 21.09-2-1; 2) within USG's Water Grant area; and 3) additional underwater lands under the jurisdiction of the New York State Office of General Services (NYSOGS). See **Figure D-5b** in **Exhibit D**. An application for acquisition of a real property interest in lands underwater has been filed with the NYSOGS on October 31, 2008.

(h) *Cost Estimate*. Table 1 below provides a preliminary cost estimate for the proposed project. Further cost estimates will be prepared and will be provided when submitted to the NYSDOH.

Table 1
Cost Estimate by Project Phase

Cost	Phase 1	Phase 2	Phase 3	Total
Capital Costs (millions)	$97.2 to $144.8	$16.7 to $16.9	$25.2to $27.8	$139.2 to $189.3
Note: All amounts are shown as 2010 dollars.				

(i) *Water Analysis*. Review of Hudson River water quality data collected for the Proposed Project in the vicinity of the proposed location for the Project's intake structure indicates that the quality of the Hudson River makes it a suitable source of drinking water with treatment. The results of numerical hydrodynamic modeling conducted for the Proposed Project indicate that point and non-point discharges to the Hudson River within a 25-mile radius of the intake structure would not adversely affect the suitability of the Hudson River as a water supply source. Similarly, the results of modeling indicate that the Proposed Project's withdrawal of Hudson River water at the intake structure, discharge of reverse osmosis (RO) concentrate through the Joint Regional Sewage Treatment Plant (JRSTP) effluent outfall, and the discharge of other residual waste streams to the JRSTP for treatment and, ultimately, for discharge to the Hudson River would not adversely affect the quality of the Hudson River water. Detailed water quality information, including historical Hudson River water quality data (2007–2008) and raw water quality data collected as part of the Haverstraw Water Supply Project Pilot Study operations, is provided in the Engineer's Report (**Exhibit E, Appendix B**).

(j) *Treatment Methods*. The water drawn from the Hudson River would be subjected to a rigorous multi-step treatment process to ensure that it meets all applicable health standards and is compatible with the other water in UWNY's Rockland County system. This would provide multiple barriers for removing various water quality parameters of concern, to allow the finished water to meet or exceed all applicable drinking water standards. The potential water treatment process that may be used at the water treatment plant, based on conceptual designs, would include the following (see also **Exhibit C.1**):

- Pretreatment for solids removal
- Filtration
- RO
- Removal of organic contaminants
- Post-treatment
- Finished water storage and pumping

The proposed treatment process would remove various contaminants from the raw water so that the finished water delivered to the distribution system will meet or exceed all safe drinking water standards (or MCLs) for contaminants of concern, including PCBs, radionuclides, and pesticides.

(k) *Project Justification*:

(1) *The need for and the reasons why the proposed source was selected among alternative supplies which are or may become available*.

The purpose and need for the project are described in **Exhibit C.2**. As noted in that exhibit, the water demand in UWNY's Rockland County service area is projected to grow as population in the service area grows, and in the long-term, an additional water supply source will be needed to meet demand and to continue to provide water for fire-fighting and other public safety needs. To address the need for increased supply beyond 2015, the 2006 and 2010 Rate Orders require UWNY to implement a long-term water supply project that it will build and operate and set forth milestone commitments related to planning, analysis, permits, and construction of that long-term water supply project so that it will be in service by the end of 2015.

An extensive review of potential alternatives to the Proposed Project was conducted, including but not limited to: a reservoir alternative (the Ambrey Pond Reservoir alternative); operational alternatives (such as alternative water system management or enhanced water conservation); surface water storage alternatives (such as increased storage at Lake DeForest); other water supply and storage alternatives (such as wastewater reuse); and various project design alternatives (such as alternatives sites for the intake facility or alternative energy sources). The analysis concludes that on an individual basis, most of the alternatives examined are either impractical or insufficient to provide a long-term increase to the system's safe yield of 7.5 mgd and, therefore, individually do not meet the purpose and need for the project and are not viable alternatives to the Proposed Project. A combination or composite of more than one alternative would be less efficient, inherently more energy-intensive, more costly, and more prone to disruption and repair. A combination of alternatives would also require substantially more management by United Water to oversee both construction and operations of these multiple systems.

Other alternatives, such as the Ambrey Pond Reservoir Alternative and the Wastewater Reuse Alternative, could achieve a safe yield increase similar to the Proposed Project but would have higher costs than the Proposed Project and would have a greater impact on ratepayers and consumers in the United Water service area.

The Proposed Project represents a sustainable, cost-effective water supply source that will improve the reliability of the water supply system and meet

the long-term needs for water in Rockland County. A review of alternatives to the Proposed Project demonstrates that the proposed Haverstraw Water Supply Project is the alternative that best meets the need for the project as well as the goals outlined below:

- **Reliable Supply:** The new long-term water supply project must improve the reliability of the water supply system while meeting future demands by introducing a supply that is less dependent on localized precipitation conditions. The Northeast U.S. experiences a short-term drought (i.e., a drought with a duration of one to three months) every one to three years on average, and experiences longer droughts (i.e., greater than three months) once every 20 to 30 years. The long-term water supply project should be developed to be responsive to the occurrence of drought events and the potential effects of climate change on the frequency and severity of droughts and storm events. The Haverstraw Water Supply Project would improve the reliability of the water supply system while meeting future demands for water by providing a supply of water that is less dependent on climate conditions. Rockland County is currently served by groundwater supplies and reservoirs. Including a drought-tolerant river source adds to the diversity of the water supply portfolio and provides greater flexibility in managing the system.
- **Cost-Effectiveness:** As a public utility, UWNY has a responsibility to its customers (i.e., the rate-payers) to develop a cost-effective project to address the need for a new water supply source. Costs to be considered include initial capital expenditures associated with construction of the project and ongoing operations and maintenance costs once the project is complete. To benefit from economies of scale gained by capital investment in, and operation and maintenance of, a single project, the long-term water supply project will most likely be most cost-effective if implemented as a single project, rather a combination of capital projects. The Haverstraw Water Supply Project has been identified as the most cost-effective of the alternatives available to UWNY for the long-term water supply project.
- **Ability to be Implemented in Stages:** To meet future demands for water supply as they develop over time, and thereby minimize unnecessary capital costs to the ratepayers as well as unnecessary environmental effects, the long-term water supply project should have the ability to be implemented in stages. Designing, permitting, and constructing a water supply project is a costly, time-consuming, and resource-intensive undertaking. Prudent planning compels a water supplier to, when possible, undertake projects that can be expanded efficiently and cost effectively in stages as need arises. The proposed

Haverstraw Water Supply Project would be built in phases to correspond with future growth in water demand.

- **Avoid and Minimize Environmental Impacts:** Consistent with the requirements of New York State's environmental laws, and particularly the State Environmental Quality Review Act, a key goal for the long-term water supply project is to avoid and minimize the potential environmental impacts of the Proposed Project to the maximum extent practicable given the other goals and objectives for the Proposed Project and the capabilities of the Project sponsor. This includes environmental impacts that would potentially occur as a consequence of both the construction and operation of the Proposed Project. The Haverstraw Water Supply Project has been identified as the project that best meets the goal of mitigating environmental impacts.

(2) *The provision of proper and safe construction of all phases of the project*. The proposed construction and operation of the Proposed Project would follow all applicable health and safety standards, including federal Occupational Safety and Health Administration (OSHA) regulations. A construction Health and Safety Plan (HASP) would be prepared and implemented to address potential issues related to any potential contamination of soil and groundwater near the Project Sites. A Stormwater Pollution Prevention Plan (SWPPP) would be implemented to minimize potential construction impacts on water resources.

(3) *The provision of adequate protection of the water supply and watershed from contamination*. As mentioned above, during construction, a SWPPP would be implemented to minimize potential construction impacts on water resources (including the Hudson River and Minisceongo Creek).

The numerical hydrodynamic modeling conducted of the Hudson River for the Proposed Project indicates that the Proposed Project's withdrawal of Hudson River water at the intake structure, discharge of RO concentrate through the JRSTP effluent outfall, and the discharge of other residual waste streams to the JRSTP for treatment and, ultimately, for discharge to the Hudson River would not adversely affect the quality of the Hudson River water.

The Proposed Project's treatment process (see **Exhibit C.1**) would include continuous water quality monitoring and multiple treatment methods to address potential contaminants that may be present in the water.

(4) *The proper treatment of the water supply*. The water supply would be treated to meet or be better than drinking water standards established by the

United States Environmental Protection Agency and the NYSDOH. See discussion above under "*J: Treatment Methods*".

(5) *The adequacy of the water supply to meet the demands of the service area*. To plan for the future, UWNY regularly undertakes an assessment of future water demands. As part of the proceeding in the 2006 Rate Case, a forecast of future water demands was undertaken to determine the level of future investment in water supply infrastructure required. An alternative water demand forecast was conducted in 2010, using future population projections prepared by Rockland County, to confirm the conclusions of the 2006 forecast. These forecasts both demonstrate the need for a long-term water supply project. Utilization of the Hudson River as a water supply source would allow for an increase of the safe yield of the UWNY Rockland County water supply system by 7.5 mgd to accommodate future growth with an adequate margin of safety through the year 2015 or beyond. Including a drought-tolerant river source adds to the diversity of the water supply portfolio and provides greater flexibility in managing the system. The Proposed Project would improve the reliability of the water supply system while meeting future demands for water by providing a supply of water that is less dependent on climate conditions.

(6) *The proposed project is just and equitable to other municipalities or civil divisions of the state*. The proposed project would not deny a water supply to any municipality or other water purveyor.

(7) *Proposed method to determine and provide proper compensation for any direct or indirect legal damages to persons or property that may result from the acquisition of any lands in connection with the project*. Property required for the Proposed Project is expected to be acquired by mutual agreement, without the need for the use of eminent domain. No direct or indirect damage to persons or property is anticipated as a result of the Proposed Project.

Section 3

Exhibit C: Project Description and Project Purpose

EXHIBIT C:
PROJECT DESCRIPTION AND PROJECT PURPOSE

EXHIBIT C.1
PROJECT DESCRIPTION

Public Water Supply Permit Application (6 NYCRR Part 601)
Proposed Haverstraw Water Supply Project

EXHIBIT C.1
DESCRIPTION OF PROJECT AND WATER TREATMENT PROCESS

The proposed Haverstraw Water Supply Project (the Proposed Project) entails the construction and operation of a water intake, intake pumping station, water treatment plant, and transmission and distribution mains, to be located in the Town of Haverstraw, Rockland County, New York (see **Figures D-4, D-5a, and D-5b in Exhibit D**). The Proposed Project would draw and treat water from the Hudson River and deliver up to 7.5 million gallons per day (mgd) of potable water to the existing United Water New York Inc. (UWNY) distribution system serving Rockland County. The Proposed Project would allow UWNY to increase the capacity of its water supply system to meet the projected future demands for water in Rockland County, and therefore is critical to United Water's ability to continue to provide water for the county, including providing adequate quantity, quality, and water pressure to meet the projected future demands for county residents, businesses, and firefighting capabilities.

The Proposed Project would draw water through an intake structure located in Haverstraw Bay in the Hudson River, through an intake pumping station to a water treatment plant via a raw water transmission main. At the water treatment plant, water would be treated to remove impurities, including salinity. The potable water would be transmitted from the plant via new underground water transmission mains that would connect to UWNY's existing water distribution network. Wastewater generated by the water treatment process would be transmitted to the Haverstraw Joint Regional Sewage Treatment Plant (JRSTP). Wastewater from the Proposed Project's reverse osmosis process would be discharged to the JRSTP's effluent pipe, requiring modifications to that pipe to create a physical tie-in.

The Proposed Project would be implemented in three separate phases, to meet growth in water demand as Rockland County's population increases. When the facility opens for operation in 2015, it would initially treat and deliver up to 2.5 mgd of potable water. As Rockland County's water demand increases, the Proposed Project would be expanded to meet that demand, with the ultimate capacity at 7.5 mgd. As described in Exhibit C.2, "Purpose and Need for the Project," the projected future water demand is consistent with population forecasts prepared by planning agencies and independent institutions.

PROJECT SITES

The sites where the Project's facilities would be located (the Project Sites) would be as follows:

- **Intake Site:** This approximately one-acre parcel (as well as additional land underwater) located on the south side of Beach Road along the Hudson River would house the intake pumping station that would pump water from the river. The site, currently owned by the U.S. Gypsum Company (USG), is vacant land used for off-season boat storage by the Haverstraw Marina and is adjacent to the enclosed conveyor that is used by USG to move supplies from barges that dock at a USG pier in the Hudson River.
- **Hudson River:** Water would be withdrawn from the Hudson River through an intake system (described below). It is anticipated that the water intake pipeline would extend from the shoreline of the Intake Site approximately 900 feet into the Hudson River offshore of the Intake Site. The pipeline would be installed in a tunnel buried below the river bottom.
- **Water Treatment Plant Site:** This 15.38-acre vacant site located to the west and south of the closed Town of Haverstraw Landfill would house the water treatment plant. Most of the Water Treatment Plant Site (the northern portion) is a reclaimed area located within the boundary of the now-closed Haverstraw Landfill, and is owned by the Town of Haverstraw. The southern portion of the Site is a privately owned vacant parcel currently owned by DSB Realty Associates, LLC.
- **Raw Water Transmission Main:** Untreated ("raw") water pumped from the Hudson River by the intake pumping station would be transmitted to the water treatment plant site via an underground raw water transmission main. The proposed route is located primarily beneath Beach Road in the public right-of-way, as shown in **Figure D-5a in Exhibit D**.
- **Potable Water Distribution Mains:** Potable water from the water treatment plant would be transmitted to existing mains in UWNY's water distribution system via new connections from the water treatment plant. Currently, several possible connection routes are being considered for these mains, as shown in **Figure D-6 in Exhibit D.**

WATER TREATMENT FACILITIES AND PROCESSES

RAW WATER INTAKE SYSTEM

Raw water to be supplied to the new Water Treatment Plant would be pumped from the Hudson River through an intake system consisting of an intake structure in the Hudson River, approximately 900 feet from the shoreline, an intake pipeline from the structure to the shore, and intake pumping station on the Intake Site. The intake pumping station would consist of a single building, approximately 3,000 square feet in size, which would house the pumps, electrical and mechanical systems, air compressors, and other equipment.

The intake system would be designed to minimize adverse effects to aquatic resources in the Hudson River. The intake in the river would use five 36-inch cylindrical-shaped wedge-wire screens with a small slot size (0.5-millimiter), which would minimize potential adverse effects to aquatic resources related to potential impingement (in which aquatic resources are pulled against the screen) or entrainment (in which they are drawn into the intake). The intake system would be supported on deep foundations (piles) that

would extend to bedrock an estimated 180 to 200 feet below the river mudline). The intake screens would be located a minimum of four feet above the river bottom while the top of the screens would be approximately 7.36 feet below the water surface at mean low low water (MLLW). An air cleaning system would be used to periodically clean the intake screens of debris and to prevent biofouling, and a chemical cleaning system would be used to clean the interior of the raw water intake line. Beneath the river bottom, a 7-foot diameter raw water intake sleeve would house the intake water pipe, air supply lines for the air cleaning system, and small-diameter chemical cleaning supply lines for the chemical cleaning system that would be used to clean the inside of the pipes. The air cleaning system would consist of an air compressor and compressed air receiver at the Intake Site, and five 6-inch air supply lines within the intake sleeve. The chemical piping would be contained within a carrier pipe within the pipe casing that also houses the raw water intake pipe. Chemicals in the piping would not be able to leak into the river.

The water intake system would be operated to draw high quality water from the river each day. To produce 7.5 mgd of treated water, a maximum volume of 10 million gallons would be withdrawn from the Hudson River during a 24-hour period. It would be pumped from the intake pumping station into raw water storage tanks at the water treatment plant, from which it would be drawn for treatment.

The raw water transmission main would transmit the raw water to the Water Treatment Plant Site via a new 30-inch-diameter raw water transmission force main buried primarily beneath public streets.

WATER QUALITY MONITORING

At the intake pumping station, water quality would be continuously monitored to detect any significant change in-river water quality that could affect finished water quality before it is processed at the water treatment plant. In the event that potential contamination events occur, the water quality monitoring would allow maximum response time from the point the water is withdrawn from the river to when it enters the treatment process. The system would be tied to UWNY's greater Supervisory Control and Data Acquisition (SCADA) system (discussed below) to allow remote, real-time monitoring by the water treatment plant operators. When a potential contamination event is identified, the possible responses that may be taken can include confirmatory and more frequent water quality sampling and laboratory analysis; adjustment to process operating conditions to mitigate potential upsets; and temporary shutdown of the intake pumping station until the anomalous condition dissipates or until such time that the river water quality is determined to be acceptable.

WATER TREATMENT PROCESS

At the Water Treatment Plant Site, the water treatment plant would consist of an integrated series of interconnected buildings sized to house the water treatment equipment, as well as storage tanks, potable water reservoirs, pumps, and chlorine basins.

The water drawn from the Hudson River would be subjected to a rigorous multi-step treatment process to ensure that it meets all applicable health standards and is compatible with the other water in UWNY's Rockland County system. This would provide multiple barriers for removing various water quality parameters of concern, to allow the finished water to meet or exceed all applicable drinking water standards. The potential water treatment process that may be used at the water treatment plant, based on conceptual designs, would include the following:

- **Pretreatment for solids removal:** Pretreatment consists of a combination of processes to remove particles that are suspended in the water (i.e., turbidity). Chemicals are added in this step to maximize the removal of suspended and colloidal particulates in addition to certain dissolved inorganics. Powdered activated carbon (PAC) may be added during pretreatment to improve removals of dissolved organics through adsorption.
- **Filtration:** Following pretreatment, the filtration process (currently proposed to use microfiltration/ultrafiltration [MF/UF]) would remove the remaining particulate matter and provide a barrier to bacteria and viruses.
- **Reverse Osmosis (RO)**: Following filtration, the process water would be free of suspended solids, at which point it would be subject to a RO treatment system that would force water under high pressure through semi-permeable membranes to remove dissolved solids, such as salts, from the filtered water as required based on the raw water salinity.
- **Removal of Organic Contaminants**: The treatment process currently includes the use of PAC. In the future it is possible that after pre-treatment and RO processing, the water would be re-filtered by passing it through a granular activated carbon (GAC) unit to remove organic contaminants. If GAC is added to the treatment system, it would replace the use of PAC.
- **Post-treatment:** This final step would stabilize the water and provide for disinfection.
- **Finished Water Storage and Pumping:** Finished (treated or potable) water would flow to the above-grade finished water storage reservoirs where a corrosion inhibitor is added prior to the water being pumped through new potable water main connections. Potable water distribution mains would extend from the new water treatment plant to connect to existing UWNY distribution water mains. At this time, several options for the potable water main routes are under consideration.

RESIDUALS PROCESSING

The water treatment process would produce several waste products (residuals). The main residual streams that would need to be disposed include wastewater created during the water treatment process; solids removed during the water treatment process; and the RO concentrate produced by the RO membrane process.

A number of the treatment trains used in the water treatment process would produce wastewater. Most of this would be recycled to the head of the water treatment plant for re-use in the water treatment process. Some wastewater, including flows from clean-in-place (CIP) maintenance procedures and other cleaning procedures (backwashing and rinsing of equipment) would be sent to the JRSTP, which is adjacent to the Water Treatment Plant Site, via the existing sanitary sewer. The wastewater from the water treatment process would be sent to the head of the JRSTP for treatment. UWNY would obtain an Industrial Wastewater Discharge Permit for the Proposed Project from the Joint Regional Sewage Board for this waste.

Solids removed by the pretreatment and MF/UF processes would be in the form of a liquid sludge. The sludge would be thickened in sludge thickeners and dewatered in belt filter press units at the water treatment plant. The resulting dewatered sludge, or sludge "cake," would then be disposed of at a suitable off-site facility, similar to sludge from the other water treatment plants UWNY operates in Rockland County. Alternatively, the thickened sludge from the water treatment process could instead be conveyed to the JRSTP for dewatering and handling with the sludge produced by the JRSTP's wastewater treatment process.

The concentrate generated by the RO process (RO concentrate, or brine) would be sent by force main to the JRSTP, where it would be discharged to the Hudson River through the JRSTP outfall. In this way, the high salinity in the RO concentrate would be mixed with the greater volumes of non-saline effluent being discharged to the river.

IMPROVEMENTS TO THE JRSTP

For the water treatment plant RO concentrate to be blended with the JRSTP effluent, facility modifications would be required; specifically new facilities to make the physical tie-in at the outfall.

In addition, if the Proposed Project's sludge is transmitted to the JRSTP for dewatering, the existing solids dewatering equipment at the JRSTP would need to be replaced or upgraded with a technology of sufficient capacity to dewater the combined volume of JRSTP and water treatment plant sludges.

SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM

The Proposed Project would be designed with a SCADA system that would be part of the larger UWNY Rockland County water supply SCADA system. SCADA systems collect data from instrumentation and control panels and send the data to central locations where it is monitored and managed.

EXHIBIT C.2
PURPOSE AND NEED FOR THE PROJECT

EXHIBIT C.2

PURPOSE AND NEED FOR THE PROJECT

C.2.1 INTRODUCTION AND BACKGROUND

The Haverstraw Water Supply Project (the Proposed Project) would provide a major new water source for Rockland County, New York. The project has been proposed by United Water New York Inc. (UWNY) to meet a regulatory requirement to satisfy Rockland County's future water needs. UWNY is a public utility organized under the New York State Transportation Corporations Law. UWNY provides a public water supply system, including drinking water and water for fire protection, to the residents and businesses in Rockland County, New York, excluding the Villages of Suffern, Nyack, and South Nyack. UWNY also serves a small portion of Orange County (in portions of the Towns of Tuxedo, Warwick, and Monroe). Its mandate, like all water suppliers, is to provide a dependable, adequate supply of water to meet the needs for domestic water use and firefighting, and to provide water that meets or exceeds all safe drinking water standards.

UWNY's services and rates are regulated by the New York State Public Service Commission (PSC). A July 20, 2010 Order by the PSC (2010 Rate Order) continued the obligations of a December 14, 2006 Order by the PSC (2006 Rate Order), and commits UWNY to increasing the average water supply for Rockland County by a total of 1.5 million gallons per day (mgd) and the peak supply by a total of 7.1 mgd by the end of 2015. Beyond 2015, UWNY agreed under the 2006 and 2010 Rate Orders to proceed with preparation of materials for a long-term major water supply project that UWNY will build and operate. The PSC and the parties to the 2006 and 2010 Rate Orders found that "it is in the customers' best interest and in the public interest for UWNY to develop new sources of long-term water supply."

Demand for water in Rockland County has increased substantially over the past decades and is projected to increase further as Rockland County's residential and employee populations increase. The existing water supply system has limited ability to provide the additional water needed over the long-term to meet projected demand. Projections of future water demand over the next two decades indicate that within that timeframe, the demand for water will outpace the available supply if no new water supply source is developed. Therefore, UWNY, as a responsible water supplier, must develop new water sources that will increase the amount of water that can be supplied. The purpose of the Proposed Project, the Haverstraw Water Supply Project, is to allow UWNY to meet projected future demands for water in Rockland County, consistent with the requirements of UWNY's franchise and responsibility as a water supply company and with the requirements set forth by the 2010 Rate Order.

The Proposed Project entails the development and operation of a new water intake, intake pumping station, and water treatment facility in the Town of Haverstraw, Rockland County, New York. The Proposed Project would collect and treat water from the Hudson River and deliver up to 7.5 mgd of potable water to the existing UWNY distribution system serving Rockland County, for the exclusive use of UWNY's Rockland County customers. The Proposed Project would be executed in stages as needed to meet future water demands.

C.2.2 PROJECT HISTORY

As early as the 1960s, the Spring Valley Water Company (the predecessor to UWNY) identified the need for a new source of drinking water to meet the projected future demands for water in Rockland County. At that time, development of a surface water reservoir was identified as the most reasonable approach to meeting this projected demand. A new 2-billion-gallon reservoir, known as the Ambrey Pond Reservoir, was planned and designed for a location in the Town of Stony Point. A Final Environmental Impact Statement (FEIS) assessing the impacts of the Ambrey Pond Reservoir was completed in accordance with the New York State Environmental Quality Review Act (SEQRA), and in 1987, the New York State Department of Environmental Conservation (NYSDEC) conditionally approved the water supply application of the Spring Valley Water Company for the Ambrey Pond Reservoir. The NYSDEC's conditional approval contained a "trigger" mechanism that allowed construction permits to be issued only when demands on the water system reached a designated level. As set forth in the 1987 Findings Determination of the NYSDEC Commissioner for the Ambrey Pond Reservoir, the water use trigger for the construction of Ambrey Pond was an average demand for two consecutive years that exceeded 27.9 mgd.

At the time of NYSDEC's conditional approval of the Ambrey Pond Reservoir, the reservoir project was opposed by the County of Rockland, the Town of Stony Point, and numerous non-governmental organizations. The concerns cited by opponents included the need for the project; its cost; its impact on fisheries, wetlands, and marshes; the trigger mechanism that would activate the conditional approval; and the potential seismic risks associated with constructing dams in close proximity to the Ramapo Fault. The NYSDEC Commissioner's conditional approval of the project was challenged in court but ultimately upheld by the Supreme Court of New York, Appellate Division, Third Department in 1988.

Since 1988, UWNY has continued to study the Ambrey Pond Reservoir and over the years has purchased almost all the land that would be necessary to construct the reservoir. At the same time, given the level of investment required to develop a major new water source and the financial impact such an investment might have on the ratepayers, UWNY undertook a number of measures that were successful in delaying the need for the reservoir. These included implementation of a water conservation program (described in detail later in this exhibit and in Exhibit A), implementation of a summer-winter rate structure that also led to conservation, a series of short-term water supply improvements, and the addition of the Ramapo Valley Well Field to the UWNY supply system. As discussed in greater detail below, UWNY's customers now practice conservation and are prudent in their use of water, and additional conservation measures will not be feasible as a means to avoid the need for a long-term water supply project. At this time, UWNY is proposing the Haverstraw Water Supply Project because with 30 years of technological advancements in water treatment technology, the Haverstraw Water Supply Project is a more reliable and more financially and environmentally prudent project than the Ambrey Pond project.

2006 RATE ORDER AND JOINT PROPOSAL

On December 14, 2006, the PSC issued an Order concluding two rate cases initiated by UWNY and a sister company, United Water South County. These two rate cases, Case 06-W-0131 and 06-W-1244, were consolidated and considered as one by the PSC (referred to in this chapter as

the "2006 Rate Case").[1] This PSC Order (referred to as the "2006 Rate Order") approved a proposed merger between two United Water affiliated companies, UWNY and United Water South County Water Inc., and established the terms of the rate plan for the merged company. Prior to the 2006 Rate Order, UWNY provided water to the majority of Rockland County (the Towns of Ramapo, Clarkstown, Orangetown, Stony Point, and Haverstraw) and United Water South County provided water to approximately 486 customers in Orange County (in portions of the Towns of Tuxedo, Warwick, and Monroe). The 2006 Rate Order approved the proposed merger of the two companies into UWNY and adopted and incorporated into the Rate Order the terms of the Joint Proposal dated September 29, 2006 (the 2006 Joint Proposal), that represented the agreement in principle reached by all active parties in the case.

One of the requirements set forth in the 2006 Rate Order is a mandate that UWNY increase the available water supply through implementation of specific water supply projects, to be covered by a new water supply surcharge. The new water supply source component of the 2006 Joint Proposal, together with the 2010 Rate Order and Joint Proposal (see below) constitute the regulatory mandate and authority for the Proposed Project.

Sections XI and XIII, and related Exhibits 8 through 11, of the 2006 Joint Proposal set forth a plan for increasing the available water supply in the future to meet projected demands, including milestones for implementing new supplies and penalties if the milestones are missed. Section XI of the 2006 Joint Proposal states:

> The Parties agree that it is in the customers' best interest and in the public interest for the Company [United Water New York] to accelerate its development of new sources of supply. It is understood and agreed that the development of the commitments discussed in Section XIII and Exhibit 11 increase supply, meet the supply needs of Rockland County and specifically consider the development allowed under current land use control throughout Rockland County and the Town of Ramapo's Comprehensive Plan. All parties contributed to the development of these commitments.[2]

Exhibit 8 of the 2006 Joint Proposal includes a list of projects that could be undertaken to meet the water supply goals in the short and medium-term (with anticipated in-service dates in 2008 and 2009). However, the 2006 Joint Proposal commits UWNY to meet specific increases in supply rather than to implement the projects listed. The peak and yearly average day volume commitments that must be met through 2015 are listed in Exhibit 11 of the 2006 Joint Proposal. The commitments presented in Exhibit 11 of the 2006 Joint Proposal will increase the total three-day sustainable peak supply by 7.1 mgd by 2015, over the existing 45.5 mgd in 2006; and will increase the yearly average daily supply by 1.5 mgd by 2015, over the existing 33 mgd in 2006.

In addition, to address the need for increased supply beyond 2015, the 2006 Joint Proposal also requires UWNY to implement a long-term water supply project and sets forth milestone

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[1] *Cases 06-W-0131 and 06-W-0244 – Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of United Water New York Inc. and United Water South County for Water Service*, Order Approving Merger and Adopting Three-Year Plan (issued and effective December 14, 2006).

[2] 2006 Joint Proposal, p. 11.

commitments related to planning, analysis, permits, and construction of that long-term water supply project so that it will be in service by the end of 2015.

As summarized in the 2006 Rate Order (see p. 24), the Parties to the 2006 Joint Proposal presented the following arguments related to the new water supply element of the proposal:

- UWNY's position was that the new water supply project is critical to its ability to meet its obligation to provide water to all who request it within the service area. After accounting for the future increases to be implemented by 2015 in accordance with the terms of the 2006 Joint Proposal, and recognizing the role of UWNY's ongoing program to encourage conservation by its customers, demand projections prepared by UWNY indicate the need for a new major supply of water beyond 2015.
- Rockland County supported the new water supply initiative, including the need for a long-term water supply. It noted that UWNY had an immediate problem in satisfying peak demand, as well as a similar but less immediate problem in meeting average demand, and that previous capital projects implemented were not able to increase supply as much as was expected (yielding only 3.4 mgd rather than the 8.9 mgd anticipated in UWNY's 2000 Master Plan). Rockland County also supported the Joint Proposal's requirement for United Water to meet specific volume commitments and interim milestones, rather than to implement specific capital projects.
- The Town of Ramapo and the Fire Chiefs supported the new water supply commitments of the Joint Proposal, indicating that specific commitments were needed to meet future growth in peak demand and average usage.

The PSC considered the expert testimony submitted regarding water demand growth projections and as part of that review, water conservation and efficiency measures were evaluated by the PSC in approving the increased water volume commitments included in the 2006 Rate Order.

2010 RATE ORDER AND JOINT PROPOSAL

On July 20, 2010, the PSC issued an Order concluding a rate case initiated by UWNY in 2009, Case 09-W-0731.[1] This Rate Order (the 2010 Rate Order) approved a new rate plan for UWNY for the three-year period beginning in September 2010 and adopted and incorporated the terms of a Joint Proposal, dated April 20, 2010 (the 2010 Joint Proposal), as modified by the 2010 Rate Order, representing the agreement in principle reached by all active parties in the case. The parties to the 2010 Joint Proposal were UWNY and staff of the Department of Public Service.

While the terms of the 2010 Rate Order relate primarily to the three-year rate increase, the 2010 Rate Order also continues the obligations of the 2006 Rate Order, including the new water supply source volume and construction milestones and hydrant maintenance schedules established in 2006 Rate Order. The 2010 Rate Order re-establishes the new water supply source milestones originally stated in the 2006 Rate Order. The new water supply source component of the 2010 Rate Order constitutes the regulatory mandate and establishes the need for the Proposed Project (which had previously been established in the 2006 Rate Order). During the 2010 Rate Case, the Town of Ramapo and other entities argued that the PSC's 2006 Rate Order notwithstanding, there was no need for a long-term water supply project. Among other things,

[1] Case 09-W-0731 – Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations for United Water New York Inc., Adopting Joint Proposal as Modified and Establishing a Three-Year Rate Plan (issued and effective July 20, 2010).

the Town of Ramapo argued that United Water could eliminate the need for a long-term water supply project by stopping the release of water from Lake DeForest for downstream users. By reconfirming in the 2010 Rate Order the mandate of the 2006 Rate Order regarding the need for a long-term water supply project, the PSC rejected the argument that there was no need for the Proposed Project. In the 2010 Rate Order, the PSC found that given the financial investment UWNY has already made in the long-term water supply project, the incentive mechanism (i.e., the performance payments) was no longer necessary or applicable. The long-term major water supply project milestone commitments set forth in the 2006 and 2010 Rate Orders remain operative.

C.2.3 EXISTING WATER SUPPLY SYSTEM

Rockland County consists of the Towns of Orangetown, Ramapo, Clarkstown, Haverstraw, and Stony Point. Within those towns are 19 incorporated villages. The southern border of Rockland County adjoins the northern borders of Bergen and Passaic County, New Jersey.

UWNY is responsible for providing water to the residents and businesses of Rockland County, excluding the Villages of Suffern, Nyack, and South Nyack. Within this "service area," the great majority of the water is supplied by UWNY, with a small amount supplied by private wells for locations that are not served by UWNY's infrastructure or for users who choose not to use UWNY's supply. UWNY also supplies water to the businesses, institutions, and parks in Rockland County, including the Palisades Interstate Park system. In addition to potable water for its customers, UWNY also provides water for fire suppression via fire hydrants and fire system connections throughout the service area.[1] **Figure D-2** in Exhibit D illustrates UWNY's service area. The existing water supply system, including the water sources and distribution system as well as how the system is managed, is described below.

WATER SOURCES

UWNY's existing water supply system in Rockland County is composed of a combination of surface water and groundwater supplies. These include: two surface water supplies, the Lake DeForest and Letchworth Reservoirs, in the Towns of Clarkstown and Haverstraw, respectively, which together provide approximately 32 percent of the water supplied annually by UWNY on an average daily basis; the Ramapo Valley Well Field in Ramapo, which provides 25 percent of the average daily supply; and approximately 50 additional active system wells located throughout Rockland County, which provide the remaining 43 percent of the average daily supply.[2] These water supply elements are shown in **Figure D-2** and described below.

The discussion in this section describes the capacity of each water source in terms of its safe yield, average supply, and peak supply, as follows:

- **Safe Yield:** The capacity of a water source is measured first by its "safe yield," also sometimes referred to as "dependable yield" or "reliable yield." This is a measure of the maximum quantity of water that can be sustained from a source, without depleting the

[1] United Water New York also operates an independent water system (formerly operated by United Water South County) that serves the Towns of Tuxedo, Warwick, and Monroe in Orange County. This system is separate from the Rockland County system and would not be affected by the Proposed Project.

[2] See Table C.2-3, which illustrates the average water production from 2000 to 2010.

source, during a critically dry period, which is the "drought of record." The drought of record is the drought that had the worst effect on availability of water from the water source, which could be a single year's drought or a combination of several drought years.

As defined in the *Ten-State Standards* document used by the PSC and New York State Department of Health (NYSDOH) as a regulatory standard,[1] the quantity of water that should be maintained in water sources—which is the safe yield—is set forth as:

- For **surface water**, "the quantity of water at the source shall be adequate to meet the maximum projected water demand of the service area as shown by calculations based on a one in fifty year drought or the extreme drought of record, and should include consideration of multiple year droughts."
- For **groundwater**, "the total developed groundwater source capacity, unless otherwise specified by the reviewing authority, shall equal or exceed the design maximum day demand with the largest producing well out of service."

The planning threshold for determining safe yield for surface waters is the worst drought on record. For groundwater, calculations of yield are more complex, so the term "safe yield" is often not applied to groundwater. Further, in calculating its available groundwater supply, UWNY does not include consideration of capacity with the largest producing well out of service as recommended by the *Ten-State Standards*.

- **Average Supply Capacity:** The **average supply capacity** of a water supply is the amount of water that can be sustainably provided over an extended period of time, typically a year. Although, as noted above, calculations of yield from groundwater resources is complex, in general, the average supply capacity is equivalent to the safe yield.
- **Peak Supply Capacity:** The **peak supply capacity** describes the ability of a water source to provide high volumes of water over a short period of time to meet an elevated demand. Typically, the peak level of production can be sustained only for a few days. The Rockland County Department of Health (RCDOH) requires that all supply sources be capable of meeting the maximum day demand for two three-day periods. Therefore, UWNY uses the combination of two three-day peaks as the peak period for water supply planning purposes. As defined in the 2006 and 2010 Rate Orders, a peak increase is defined as "sustainable for three days, twice per summer season."[2]

Like all public water supply systems in New York State, UWNY's water system is subject to NYSDEC regulation via specific water supply permits for each water source that set the amount of water that can be withdrawn from each water source. It is also subject to NYSDOH regulations via permits that set the conditions for water treatment for each source. The permit conditions are intended to reflect the safe yield of the water source and the capacity of the water treatment facilities at each source. The components of the existing water supply system, including their safe yield, permit conditions, and factors that affect their reliability, are described below.

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[1] *Recommended Standards for Water Works*, *Policies for the Review and Approval of Plans and Specifications for Public Water Supplies*, 2007 Edition, Part 3.

[2] 2006 Rate Order (Exhibit 11 of the Joint Proposal) and 2010 Rate Order (Appendix 7 to the Joint Proposal).

LAKE DEFOREST

Lake DeForest is a 985-acre, 5.6-billion-gallon reservoir in the Town of Clarkstown, New York, that supplies approximately 32 percent of the average daily water that UWNY provides to Rockland County on an annual basis. Lake DeForest is supplied by the Hackensack River, located in the 26-square-mile Hackensack River watershed in Rockland County. The reservoir, its dam, and the Lake DeForest Water Treatment Plant were constructed by the Spring Valley Water Company (the predecessor to UWNY) and began operation in 1956.

Water withdrawn from Lake DeForest is treated at the Lake DeForest Water Treatment Plant at the southern end of the reservoir before being pumped into the water distribution system. The treatment plant uses standard water treatment technologies, including flocculation, dissolved air flotation (clarification), filtration, and chlorination, to produce clean drinking water in compliance with drinking water standards.

As discussed in more detail below, downstream of Lake DeForest, the Hackensack River also provides drinking water to the Village of Nyack in Rockland County and a number of communities in Bergen and Hudson Counties in New Jersey. Information on how UWNY manages Lake DeForest is provided below.

Safe Yield of Lake DeForest

The safe yield of Lake DeForest has been determined to be 19.75 mgd. However, as discussed below, the water supply permit for Lake DeForest requires release of some of that yield for downstream users and to maintain downstream riparian rights. After satisfying those permit requirements, the safe yield of Lake DeForest for Rockland County is 10 mgd.

Permit Conditions for Lake DeForest

Withdrawal of water from Lake DeForest is governed by NYSDEC water supply permit WSA 2189 and the volume of water that can be produced at the water treatment plant is governed by the approval for its operation from NYSDOH.

WSA 2189 was issued in 1952 and was subsequently modified; the permit now in effect is the Sixth Modifying Decision, issued by NYSDEC in 1982. The permit conditions are intended to maintain the ecological health of the river and the riparian rights of downstream communities. As discussed below, the permit obligates UWNY to maintain a daily average flow of 9.75 mgd or greater in the Hackensack River immediately above the intake works of the Village of Nyack. Daily records demonstrating compliance with this flow condition are provided to NYSDEC. Of that 9.75 mgd, the Village of Nyack has a permit for withdrawal of 2 mgd and the rest flows to the reservoirs downstream.

According to WSA 2189, “at least 10 mgd of the water in Lake DeForest is forever reserved for the needs of the inhabitants of Rockland County.” In addition to that 10 mgd, WSA 2189 establishes the amount of water that must be maintained in the Hackensack River downstream of the Lake DeForest Dam, which depends on the water supply in the reservoir and the conditions in the three downstream reservoirs—Lake Tappan, Woodcliff Lake, and Oradell Reservoir. WSA 2189 establishes a reservoir operating curve, or “Rule Curve,” which is a measure to be used to determine the amount of water that may be released for downstream communities. According to the permit, the Rule Curve was established “to ensure that Rockland County’s water supply needs and those of downstream users are met under both normal and drought conditions.”

Using the Rule Curve, WSA 2189 specifies the amount of water that must be released from Lake DeForest and the additional amount that may be released, which varies throughout the year depending on the amount of water present in Lake DeForest and on the amount of water present in the three downstream reservoirs. The permit conditions are as follows:

A. If the Lake DeForest storage is below the Rule Curve at any time of the year, release from Lake DeForest shall be made to maintain a daily average flow of 9.75 mgd in the stream immediately above the intake works of the Village of Nyack.

B. If the Lake DeForest storage is above the Rule Curve at any time of the year:

   1. When the total storage in the three downstream water supply reservoirs (Lake Tappan, Woodcliff Lake and Oradell Reservoir with a total combined available storage capacity of 7.74 billion gallons) is more than 50 percent of their capacity, or 3.87 billion gallons, release from Lake DeForest shall be made to maintain a daily average flow of 9.75 mgd in the stream immediately above the intake works of the Village of Nyack.

   2. When the total storage in the three downstream reservoirs is less than 50 percent of their capacity and at a higher percentage storage than the percentage storage in Lake DeForest, a larger release may be made to maintain a monthly average flow of up to 15 mgd in the stream immediately below the intake works of the Village of Nyack.

   3. When the total storage in the three downstream reservoirs is less than 50 percent of their capacity and at a lower percentage than the percentage storage in Lake DeForest, a larger release may be made to maintain a monthly average flow of up to 25 mgd in the stream immediately below the intake works of the Village of Nyack.

These permit conditions establish a minimum release for downstream users of 9.75 mgd and provide for increased releases when Lake DeForest has adequate water (and therefore it is above the Rule Curve) and the downstream reservoirs are less than half full. Consistent with these permit conditions, and in consultation with the various stakeholders, UWNY routinely releases water from the Lake DeForest Dam to the Hackensack River. At times when water is spilling over the dam, United Water closes the release valve at the dam since the water that spills over the dam, or a combination of the spilling water and a reduced amount of water released, is enough to satisfy the minimum flow requirements in the Hackensack River.

As noted above, WSA 2189 requires that "at least 10 mgd of the water in Lake DeForest is forever reserved for the needs of the inhabitants of Rockland County." To preserve the safe yield in the reservoir (which is 10 mgd for Rockland County) in case of drought conditions, UWNY operates Lake DeForest to provide an annual average of 10 mgd for Rockland County customers from Lake DeForest. A higher flow can be withdrawn from the reservoir during peak summer months, but flow must be reduced at other times of the year to maintain a total average that meets the annual average requirement. For example, in 2005, when summer demand required Lake DeForest production levels of approximately 20 mgd, the flow was reduced to 7 mgd in October and November and 5 mgd in December to limit the annual average production to 10 mgd.

The Lake DeForest Water Treatment Plant is operated subject to an approval from NYSDOH, issued in 2003 (Log No. 16321, CWS NY4303673), which limits daily intake of raw water to the treatment plant to 20.8 mgd, with a maximum daily production of up to 20 mgd, and the running annual average intake of raw water to 10 mgd.

Reliability of Lake DeForest

Lake DeForest can reliably provide the 10 mgd of water to Rockland County that is set by its permit limits. In addition, Lake DeForest can be used on a short-term basis (peak) at 20 mgd, as long as its average yield on an annual basis remains at 10 mgd. However, like any reservoir supply, the supply in Lake DeForest is entirely dependent on rainfall amounts in its relatively small watershed, located entirely within Rockland County.

LETCHWORTH RESERVOIRS

The three Letchworth Reservoirs, located in Harriman State Park in the Minisceongo Creek watershed, have a total capacity of 173 million gallons. The Letchworth reservoir system was originally developed as the water supply for the former state psychiatric institution at Letchworth Village (in the Towns of Stony Point and Haverstraw). In 2006, UWNY entered into a long-term lease with the Palisades Interstate Park Commission for use of the Letchworth Reservoirs, made improvements to the water treatment plant and piping connections, and began operating the Letchworth Water Treatment Plant as an additional source for the UWNY distribution system. Water from the reservoirs is treated at the Letchworth Water Treatment Plant for use in the water distribution system. The treatment plant uses standard water treatment technologies, including flocculation, clarification, filtration, and chlorination, to produce clean drinking water in compliance with drinking water standards. Use of the reservoirs is subject to the conditions of the long-term lease, which protect the recreation use of these resources located in the Palisades Interstate Park system.

UWNY typically uses the Letchworth system as a "peaking" source, to provide water during the peak demand season (i.e., May through September). Over the past 10 years, the Letchworth Reservoirs have provided less than 1 percent of UWNY's average daily water supply for Rockland County. In the four full years that the Letchworth Reservoirs have been operated by UWNY (2007–2010), these reservoirs provided an average of 1.4 percent of UWNY's average daily water supply for Rockland County.

Safe Yield of Letchworth Reservoirs

The safe yield of the Letchworth Reservoirs is 1.0 mgd.

Permit Conditions for Letchworth Reservoirs

The NYSDEC water supply permit for the Letchworth Reservoirs, WSA 9947, allows withdrawal of 1 mgd on an annual average basis and a maximum of 45 million gallons in a month. The permit also sets conditions regarding releases of water between the three reservoirs, to preserve water in the reservoir system without allowing any of the reservoirs to become too depleted. All water is withdrawn from the first reservoir. The permit sets the following conditions:

A. When water supply withdrawal from the first reservoir is greater than 0.8 mgd, the following conditions apply:

    1. Water must be released from the second reservoir in an amount equal to the amount withdrawn from the first reservoir above 0.8 mgd.

    2. If the first reservoir reaches 30 percent of its capacity, water must be released from the second reservoir at a rate equal to the first reservoir withdrawal.

3. If the second reservoir reaches 30 percent of its capacity, water must be released from the third reservoir in an amount equal to the first reservoir withdrawal.

B. If storage in each reservoir reaches 30 percent, release from the third reservoir shall cease and the first reservoir withdrawal shall not exceed 0.5 mgd.

C. If storage in the second and first reservoirs reach 10 percent, all water supply withdrawals from the first reservoir shall cease.

In addition, if the capacity of the third reservoir has reached 30 percent in two consecutive operating years, UWNY must undertake an assessment of the fisheries resources including habitat and aquatic vegetation in each reservoir during the next operating year. WSA 9947 does not require that a release be made to the stream immediately below the most downstream dam, Horse Chock Brook.

The NYSDOH approval for the Letchworth Water Treatment Plant (Log No. 17981, NY 4303673) allows its operation at an annual average of 1.0 mgd, with monthly production not exceeding 45 million gallons per month. The NYSDOH approval allows a seasonal peak production of 3.0 mgd.

Reliability of Letchworth Reservoirs

Like Lake DeForest, the Letchworth Reservoirs and water treatment plant can reliably provide the amount of water set by their permit limits. However, like any reservoir supply, the supply in the Letchworth Reservoirs is entirely dependent on rainfall amounts in its relatively small watershed, located entirely within Rockland County.

RAMAPO VALLEY WELL FIELD

The Ramapo Valley Well Field consists of 10 shallow wells that draw groundwater from the Ramapo Aquifer on the eastern bank of the Ramapo River, immediately upstream of the New Jersey border in the Village of Hillburn and Town of Ramapo in Rockland County. The well field was developed and implemented by the Spring Valley Water Company through the 1970s, with the last well coming on line in 1981. Water from the 10 wells in the Ramapo Valley Well Field is pumped into a common transmission main to one central pump station, where the water is treated to remove volatile organic compounds and chlorinated. The Ramapo Valley Well Field component of UWNY's system also includes a related surface water source, Potake Pond, which is used to augment flow in the Ramapo River to support operation of the well field. The Ramapo Valley Well Field provides approximately 25 percent of the average daily water supply in the UWNY system in Rockland County on an annual basis, but less during the summer peak when this source can be adversely affected by low precipitation, which can affect the groundwater and flow in the Ramapo River.

The Ramapo Aquifer is hydraulically connected to surface water flows in the adjacent Ramapo River (i.e., water flows back and forth between the two depending on the relative water levels of each); the well field's water is drawn by infiltration from the river through permeable sand and gravel to the wells. Most of the Ramapo River's drainage area is upstream in Orange County.

UWNY uses water stored in Potake Pond, a reservoir that straddles the New York–New Jersey border, to supplement the flow of water in the Ramapo River so that the well field can remain operational when flows in the river would otherwise be too low. Water is withdrawn from

Potake Pond through an intake structure and carried by pipe to a brook that feeds the Ramapo River.

Safe Yield of Ramapo Valley Well Field

UWNY has been able to reliably extract an annual average of about 7 mgd from the Ramapo Valley Well Field when it can be operated. However, as described in the discussion of permit conditions below, during periods of low flow in the Ramapo River, the well field is not as productive and/or cannot be operated because of limitations set by its water supply permit from NYSDEC, which requires a minimum passing flow in the river immediately downstream of the well field. During peak summer conditions when Ramapo River flows are low, the sustainable withdrawal rate from the Ramapo Valley Well Field is about 4 mgd on average.

This sustainable rate is possible because of the augmentation of river flow by releases from Potake Pond. Prior to 2003, UWNY had a lease agreement to take water from Potake Pond and another nearby water body, Cranberry Pond, to augment flow in the Ramapo River. In 2003, UWNY purchased Potake Pond, constructed a pipeline from the pond to Nakoma Brook (a tributary of the Ramapo River), and consolidated the water supply permit to withdraw 190 million gallons from both water bodies through Potake Pond, which has a total volume of approximately 700 million gallons.

Permit Conditions for Ramapo Valley Well Field

Withdrawal of water from the Ramapo Valley Well Field is governed by NYSDEC water supply permit WSA 6507, which was issued in 1976; a Modifying Decision for this permit was issued in 1982. The permit was developed in accordance with terms of stipulations with the Village of Hillburn and with the New Jersey Department of Environmental Protection. The permit conditions are intended to maintain the ecological health of the Ramapo River and the riparian rights of downstream communities, including the Village of Suffern and communities in New Jersey that also use the Ramapo River for drinking water or other purposes.

WSA 6507 permits a total of 14 mgd to be withdrawn from the Ramapo Valley Well Field on any given day, but the total amount of water pumped in any given month may not exceed an average of 10 mgd for that month.[1] That condition is permitted as long as flow in the Ramapo River at a U.S. Geological Service (USGS) gauge downstream of the well field, in Suffern, is greater than 10 mgd. When flow in the river is less than 10 mgd at the Suffern gauge, permitted withdrawals are lower:

- When flow in the Ramapo River at the Suffern gauge is lower than 10 mgd but greater than 8 mgd, maximum withdrawal of 8 to 10 mgd is permitted.
- When flow in the Ramapo River at the Suffern gauge is at or below 8 mgd, no withdrawal is permitted.[2]

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[1] Condition D of WSA 6507 states: "The total volume of water pumped from any combination of the 10 Ramapo Valley wells shall not exceed 14 million gallons per day on any given day and the total amount of water pumped in any calendar month shall not exceed the figure obtained by multiplying the number of days in that month by an average pumping rate of 10 million gallons per day."

[2] When the Ramapo Valley Well Field is not operating, the permit does not require UWNY to maintain a minimum flow in the Ramapo River.

The 1982 Modifying Decision to WSA 6507 added a new condition requiring a detailed feasibility study of alternative corrective measures needed to ensure that the Ramapo Valley Well Field can be used most of the time, to increase the reliability of the well field. The condition required that special emphasis be placed on the alternative of low flow augmentation from upstream lakes or reservoirs.

The use of Potake Pond was developed in response to the 1982 Modifying Decision. Use of Potake Pond was allowed by NYSDEC permit No. 3-3926-00207/0003-0, issued in 1993 and later modified by WSA 8620, issued in 2002. WSA 8620 permits release of water from Potake Pond for augmentation of the Ramapo River at a rate of 10 mgd or less per day, with maximum drawdown not to exceed usage of the upper 7 feet of the pond (190 million gallons). These releases shall occur only when necessary and effective in enabling use of the Ramapo Valley Well Field by raising the flow of the Ramapo River to at least 8 mgd when measured at the Suffern gauge. This permit does not require a minimum release to a water body downstream of Potake and Cranberry Ponds.

Reliability of Ramapo Valley Well Field

Because of the well field's connection to the Ramapo River and its permit restrictions to protect flows in the river, pumping from the Ramapo Valley Well Field can be unavailable when precipitation is low. This typically occurs during late summer and fall, but it could also occur during other seasons in the event of a drought. As discussed later in this chapter, the summer season is the period when water demand in Rockland County is the greatest, so this limitation to one of the key components of the water supply system adversely affects the system's reliability when it is most needed.

SYSTEM WELLS

In addition to the Ramapo Valley Well Field, UWNY also operates 50 other wells throughout Rockland County that together provide approximately 43 percent of UWNY's water supply. These system wells include deep bedrock wells, primarily located in the southern half of Rockland County (in the Towns of Ramapo, Clarkstown, and Orangetown), and shallow wells in glacial sand and gravel (overburden) located near the Mahwah River, Minisceongo Creek, and Sparkill Creek.

Water from the system wells is pumped to the surface, and collected at water storage tanks throughout Rockland County. Water from the wells is treated with sodium hypochlorite (i.e., chlorine) and/or other commonly used water treatment chemicals. Some of the wells include "air strippers" to treat groundwater contamination resulting from gasoline, dry cleaning solvents, and other volatile organic compounds. Wells are susceptible to contamination from surrounding development, and a small number of wells (in addition to the 50 active wells) are not in use because their yield is low and their water has become contaminated.

Safe Yield of System Wells

As noted above, the concept of safe yield is difficult to apply to groundwater resources. The total capacity of the wells is determined by the capacity of their pumps and by the groundwater conditions at the well. Some of UWNY's system wells are closely spaced and cannot be operated simultaneously without adversely affecting production of the other wells. All the wells can operate simultaneously to meet peak demands, but this cannot be continued on a sustained

basis. Moreover, operating the wells at their peak capacity for more than a few days would adversely affect groundwater levels in the aquifer.

In total, UWNY's system wells serving Rockland County have a recognized peak capacity of about 24.44 mgd and an average capacity of 15.9 mgd on a longer term (annual) basis. As noted above, the *Ten-State Standards* guidance suggests that the safe yield of a system of wells can be considered as "the design maximum day demand with the largest producing well out of service." However, in calculating its available groundwater supply, UWNY does not include consideration of capacity with the largest producing well out of service as recommended by the *Ten-State Standards*. Taking this factor into account would reduce the average and peak capacity of UWNY's system wells by approximately 1.5 mgd.

Permit Conditions for System Wells

Withdrawal rates at system wells are governed by NYSDEC permits, based on the results of aquifer testing at each well. In addition, the NYSDOH, in coordination with RCDOH, issues approvals for public water supply wells related to their construction, operation, and decommissioning. These approvals cover the location, drilling method and design of the well, construction and operation of the well pumps, and well yield.

Reliability of System Wells

Groundwater levels in Rockland County are typically lower in the summer than at other times of the year because of a combination of reduced precipitation resulting in a reduction in recharge of the aquifer and higher demands. This can adversely affect the performance of system wells and result in the need to reduce pumping rates from the wells. In addition, as noted earlier, a continuing challenge for UWNY's system wells is protecting them from contamination that may result from surrounding development.

SUMMARY OF REQUIRED RELEASES

As discussed above, use of each of UWNY's water sources is governed by water supply permits issued by the NYSDEC. Those permits set the amount of water that can be withdrawn for use as drinking water, and, for many sources, they also dictate the amount of water that must be released downstream to support stream flows so as to maintain ecological conditions, riparian rights, and the other rights of downstream water users. These conditions are summarized in **Table C.2-1**.

Table C.2-1
Permit Requirements for Existing Water Supply System Sources

Water Source	Identification	WSA #	Permitted Withdrawal	Permit Conditions: Obligations to Support Stream Flows	
				Water Body	Release Requirements
Lake DeForest	5.6 billion gallon reservoir	WSA 2189	10 mgd average 20 mgd peak	Hackensack River	Permit establishes Rule Curve to determine amount of water that must and may be released downstream to maintain riparian rights and downstream reservoirs. Permit requires UWNY to maintain a daily average flow of 9.75 mgd or greater in the stream immediately above the intake works of the Village of Nyack.
Letchworth Reservoirs	Three reservoirs with total capacity of 173 million gallons	WSA 9947	1 mgd average 3 mgd peak	Horse Chock Brook	Permit regulates water releases between the three Letchworth Reservoirs to ensure none becomes too depleted. Permit does not require specific release to the stream downstream of third reservoir.
Ramapo Valley Well Field (RVWF)	10 shallow wells that draw groundwater from the Ramapo Aquifer near the Ramapo River	WSA 6507	Depends on flow in Ramapo River	Ramapo River	Permitted withdrawal depends on the amount of flow in the Ramapo River downstream of the wellfield. When the flow is greater than 10 mgd, maximum withdrawal is permitted. When the flow is between 8 and 10 mgd, less withdrawal is permitted and when the flow is at or below 8 mgd, no withdrawal is permitted.
	Potake and Cranberry Ponds used to augment Ramapo River to support RVWF	WSA 8620	10 mgd	—	Permit does not require a specific release to the stream downstream of Potake and Cranberry Ponds.
System Wells	50 wells throughout Rockland County	Multiple	15.9 mgd average 24.44 mgd peak	—	NYSDEC permits govern withdrawal rates at system wells based on results of aquifer testing at each well.

WATER DISTRIBUTION SYSTEM

ROCKLAND COUNTY SYSTEM

UWNY's water distribution system in Rockland County consists of more than 1,000 miles of water mains, 14 storage tanks, and 14 booster pump stations. Water enters the water distribution system from the water treatment plants and pump stations described above and is transmitted through water mains for distribution in Rockland County. The water distribution system is divided into 15 pressure districts, which are areas of similar ground elevation within which one common hydraulic gradient (water pressure) is maintained. Pump stations are used to transmit the water through the mains at the appropriate pressure for each pressure district. Pressure-reducing valves reduce the pressure so water can flow from districts with higher pressure to districts with lower pressure. Pump stations are used to pump water in the opposite direction (i.e., from lower pressure systems to higher pressure systems).

Water can be transmitted between pressure districts through the use of appropriately sized pipes and pumping stations that bring the water to the correct pressure for the respective district. However, the design of the transmission system limits the amount of water that can be distributed to pressure districts beyond where the supply is generated. **Figures D-1** and **D-3** in Exhibit D show the relationship of the pressure districts and water sources in UWNY's system.

CONNECTIONS TO OTHER SYSTEMS

UWNY's water supply system in Rockland County is largely self-contained, with only limited connections outside the county boundaries. However, a small number of connections exist from the Rockland County system to other systems not managed by UWNY. As discussed below, these water main connections are predominantly available for emergencies and are not regularly used. The interconnections are shown in **Figure D-2** and **Table C.2-2** and include the following:

- Village of Nyack: Five emergency interconnections between the Village of Nyack's water system and the UWNY system.
- Village of Suffern: Three emergency interconnections between the Village of Suffern's water system and the UWNY system.
- New Jersey: Along the Rockland County–New Jersey border, there are five locations with emergency interconnections between the UWNY and United Water New Jersey systems.
- In addition, the Village of Hillburn in Rockland County purchases its water on a wholesale basis from UWNY, pursuant to the terms of WSA 6507 (the permit for the Ramapo Valley Well Field) and an agreement between UWNY and the Village of Hillburn, dated July 30, 1975 as amended. This water is provided on a daily basis via a water main connection.
- UWNY supplies water on a daily basis to a small number of customers in Montvale, New Jersey via two water main connections across the New York–New Jersey border pursuant to the terms of WSA 4214 and WSA 5398. On average, a total of approximately 110,000 gallons per day (gpd) is provided to these customers in Montvale. UWNY is currently seeking permits for a new Montvale pump station that will allow United Water New Jersey to provide water to this New Jersey community.

Agreements between UWNY and the adjacent water supply companies govern when the emergency connections are used. In addition, an intercompany agreement between UWNY and United Water New Jersey (originally executed by the Spring Valley Water Company and the

Hackensack Water Company) sets forth the allocation of costs associated with maintaining the Lake DeForest Dam. The costs allocated to UWNY and United Water New Jersey are determined on the basis of the safe yield allocated to each in WSA 2189.

Table C.2-2
UWNY Connections to Other Systems

Connection / Location	Purpose	Permit #
Connections in New York State		
Village of Nyack, NY		
10" connection at Route 303	Emergency conditions	Permit is forthcoming
4" connection at Route 9W	Emergency conditions	
4" connection at Front Street	Emergency conditions	
12" connection at N. Broadway	Emergency conditions	
6" connection at South Blvd.	Emergency conditions	
Village of Suffern, NY		
10" connection at Route 202	Emergency conditions	Permit is forthcoming
6" connection at Orchard Street	Emergency conditions	
10" connection at Cragmere Road	Emergency conditions	
Village of Hillburn, NY		
Metered connection at Fourth Street	Wholesale water supply	WSA 6507
Connections to State of New Jersey		
Borough of Montvale, NJ		
12" connection at Route 45	Regular water supply	WSA 5398
8" connection at Fox Hill Road	Regular water supply	WSA 4214
8" connection at Old Pascack Road	Emergency conditions	Permit is forthcoming
6" connection at Pearl Street	Emergency conditions	
6" connection at S. Main Street	Emergency conditions	
6" connection at Middletown Road	Emergency conditions	
Borough of Old Tappan, NJ		
16" connection at Blaisdell Road	Emergency conditions	Permit is forthcoming
Note: See Figure D-2 in Exhibit D.		

CURRENT WATER SYSTEM MANAGEMENT AND AVAILABLE WATER SUPPLY

UWNY meets the demand for water with a mix of water from the sources discussed above.[1] The amount of water provided from each source depends on the availability of water from that source and its permit conditions, which protect the water source, quality of the water produced, aquatic life and ecology, and the riparian rights of downstream water users. The mix of water sources available to UWNY allows it to provide water to meet the annual average demand and to meet short-term demands, which during peak periods can be 50 to 60 percent higher than the average annual demand. The current production capacity of UWNY's Rockland County water supply

[1] United Water's future management of Lake DeForest when the Proposed Project is operating is discussed below under "*Water System Management with the Proposed Project*."

system for average day and peak day conditions is summarized in **Table C.2-3**. As noted earlier, the average day supply is equivalent to the safe yield, or the supply that can be reliably provided over an extended period of time during drought conditions equivalent to those in the drought of record.

Table C.2-3
UWNY Rockland County
Water Supply System Capacity (mgd)
(as of June 30, 2011)

Water Source	Average Day Supply (Safe Yield)	Peak Day Supply
Lake DeForest / Water Treatment Plant	10.00	20.00
Letchworth Reservoirs / Water Treatment Plant	1.00	3.00
Ramapo Valley Well Field	7.00	4.00
System Wells	15.90	24.44
Total	**33.90**	**51.44**

Throughout the year, the amount of water that can be provided from each source varies depending on the amount of precipitation and the other factors that affect compliance with permit conditions. As described in the previous section, the permit for Lake DeForest allows an annual average withdrawal of 10 mgd, and UWNY's approach to meet water demands is to withdraw 10 mgd as an annual average from Lake DeForest with the remainder of the water being supplied by the other sources. In other words, UWNY maximizes the use of Lake DeForest to the extent allowed by its permit and the amount of its safe yield that is reserved for Rockland County (10 mgd).

During summer months, when demand is typically higher, UWNY draws larger volumes from Lake DeForest. This compensates for the lower volumes that can typically be withdrawn from the Ramapo Valley Well Field during that time, when volumes in the Ramapo River tend to be lower. However, this use of more than 10 mgd on a monthly average over the summer from Lake DeForest means that UWNY must reduce the flow drawn from the reservoir at other times of the year to maintain the annual average of 10 mgd required to protect Lake DeForest's safe yield.

A review of monthly water production records from each of the water sources serving UWNY's Rockland County service area over the past 10 years (2000–2010, but excluding the drought year of 2002)[1] illustrates the adjustments made over the course of the year to provide enough water to meet the demand while complying with permit conditions. This information is presented in **Table C.2-4** and **Figure D-8 in Exhibit D**.

[1] During the drought year of 2002, mandatory water restrictions were imposed by the RCDOH, which resulted in lower than normal water consumption. This year therefore does not reflect typical water consumption in Rockland County.

Table C.2-4
Average Monthly Water Production, 2000–2010, Excluding Drought Year (2002)

Month	Lake DeForest		Ramapo Valley Well Field		System Wells		Letchworth Reservoirs		Total	
	mgd	% of Total	mgd	% of Total	mgd	% of Total	mgd	% of Total	mgd	% of Total
January	7.8	28.4	7.7	28.1	12.0	43.5	0.0	0.0	27.6	100.0
February	8.1	29.1	7.6	27.5	12.0	43.5	0.0	0.0	27.7	100.0
March	8.1	29.2	7.8	28.2	11.8	42.6	0.0	0.0	27.7	100.0
April	8.5	30.1	8.1	28.7	11.6	41.1	0.0	0.0	28.1	100.0
May	9.5	31.1	7.9	25.7	13.1	42.8	0.1	0.4	30.6	100.0
June	11.4	34.3	7.6	22.7	13.9	41.8	0.4	1.2	33.3	100.0
July	12.4	36.0	6.6	19.1	15.0	43.5	0.5	1.4	34.5	100.0
August	11.9	35.4	6.3	18.7	15.0	44.4	0.5	1.5	33.8	100.0
September	10.9	34.9	6.3	20.2	13.7	43.8	0.4	1.1	31.3	100.0
October	8.9	31.7	6.4	22.9	12.6	44.9	0.2	0.6	28.0	100.0
November	7.7	28.9	7.4	27.6	11.6	43.1	0.1	0.4	26.8	100.0
December	7.5	27.9	7.5	27.7	11.9	44.2	0.0	0.1	27.0	100.0
Annual Average	**9.4**	**31.7**	**7.3**	**24.5**	**12.9**	**43.3**	**0.2**	**0.6**	**29.7**	**100.0**

Note: UWNY began operation of Letchworth Reservoirs in August 2006.

As shown in Table C.2-4, over the past 10 years (excluding 2002) Lake DeForest was used to provide approximately 32 percent of the water supplied each year, with the Ramapo Valley Well Field providing 25 percent and the system wells 43 percent. The Letchworth Reservoirs, which have been operated for four full years (2007–2010) provided less than 1 percent. (In the four full years that the Letchworth Reservoirs have been operated by UWNY, these reservoirs provided an average of 1.4 percent of UWNY's average daily water supply for Rockland County.) During the summer months (June, July, August, and September), when the Ramapo Valley Well Field often becomes unavailable and the demand for water peaks, Lake DeForest was used to supply 35 percent of the water produced (with a monthly average of 11.7 mgd), while the Ramapo Valley Well Field was used for 20 percent (monthly average of 6.7 mgd) and the system wells most of the remainder (14.4 mgd, 43 percent). Letchworth Reservoirs supplied 0.4 mgd, or 1.3 percent, of that summer demand when averaged over that 10-year period. (However, when averaged over the four years when UWNY operated the Letchworth Reservoir water treatment plant, the average summer supply provided by that source was 0.9 mgd, or 2.8 percent of the total supply.) During winter months, use of Lake DeForest was lower, so that the 10 mgd annual average required by its NYSDOH water supply permit could be maintained.

During the summer and early fall, demand for water is substantially higher than during the rest of the year. During this peak time, UWNY can meet the higher demand by providing additional water from its water sources, as long as this additional draw is not sustained for long periods of time. Some of the factors that contribute to UWNY's ability to meet existing peak demands include:

- Use of the Letchworth Reservoirs during the summer months to provide water during periods of high demands.

- Use of Potake Pond to augment Ramapo River flow so that the Ramapo Valley Well Field can remain in use when flows in the river would otherwise be too low.
- Provision of up to 20 mgd from Lake DeForest for short periods of time.
- Use of system wells at higher rates for short periods of time.

In addition, as discussed later in this chapter, UWNY is continuing to improve its system to enhance its ability to meet peak demands.

SYSTEM RELIABILITY

While overall, UWNY's Rockland County water supply system can meet current demands for water, during the peak summer/early fall season, meeting the increased demand can be difficult. Furthermore, despite the robustness and flexibility of the system, it can be less reliable during periods with low precipitation.

UWNY's existing water supply system is particularly vulnerable to the effects of a drought, since its water supplies are all from the same geographic area (i.e., Rockland County). Thus, Rockland County's existing water supply system is almost completely dependent on rainfall within the county's boundaries and all supplies are therefore simultaneously affected by drought conditions. As noted above, the Ramapo Valley Well Field is the most susceptible to periodic dry spells, short-term droughts, and prolonged water shortage since it is hydraulically linked to the flow in the Ramapo River and is not permitted to operate at all during very low-flow conditions in the Ramapo River. Supply wells may be less susceptible to dry conditions, but during prolonged dry periods are also adversely affected. It is typically not possible to pump wells continuously at maximum capacity without adversely affecting the quality of water from the well or nearby wells, or even the well's ability to produce water. Thus, wells cannot be operated for long periods of time without allowing "rest" periods for the wells to recharge. Groundwater levels and recharge rates are also adversely affected by drought conditions, which diminish the robustness of groundwater resources.

Long-term precipitation records indicate that the Northeast U.S. experiences a short-term drought (a drought with a duration of one to three months) once every two or three years on average, while longer droughts (droughts longer than three months) occur once every 20 to 30 years. There is increasing concern that global climate change may bring greater fluctuations in weather conditions, including more frequent or severe drought conditions or more frequent storm events. The safe yield of the system, which was designed based on the worst drought of record, does not account for conditions that might occur should a still worse drought occur.

During periods of water shortages, RCDOH implements emergency measures to reduce water demand. (UWNY does not have the regulatory authority to mandate or regulate water conservation by its customers during drought or non-drought conditions.) Over the past 30 years, Rockland County has faced drought-related water use restrictions five times; three of those times have occurred in the past 13 years. Emergency drought conditions were in place for several months in both 1995 and 1999, and for most of the year in 2002. In addition, both 2001 and 2005 were particularly dry, although drought restrictions were avoided in both years.

C.2.4 EXISTING AND FUTURE WATER DEMAND

UWNY's Rockland County supply system currently provides water for a predominantly residential customer base. Today, the available supply is adequate to meet the demand for water over most of the year, including during the summer and early fall peak season, when demand is much higher. In the future, water demand is projected to grow as population in the service area grows, and in the long-term, an additional water supply source will be needed to meet demand and to continue to provide water for fire-fighting and other public safety needs. The existing and future water demand characteristics of the service area are described below.

WATER DEMAND CHARACTERISTICS

This section describes the existing water demand patterns and trends for UWNY's Rockland County water supply system. These include the demand for water on an annual average basis as well as during the peak period, consideration of the types of customers who use the water, the effects of conservation on water demand, and the contribution of "non-revenue water" to that demand.

EXISTING WATER DEMAND PATTERNS AND TRENDS

Similar to the discussion of the capacity of the water supply system, which considers the average supply capacity and peak supply capacity of the water system, the discussion of water consumption considers the **average demand** and the **peak demand**:

- **Average demand:** To evaluate the sustained demand on water resources over an extended period of time, the average demand is considered. Measures used include the **annual average demand,** which is the total amount of water used in a year, divided by the number of days, so that it is expressed in mgd. Similarly, the **monthly average demand** (also in mgd) can be considered to evaluate the demand on water resources on a monthly basis.
- **Peak demand:** Peak demand is the maximum daily demand (i.e. the amount of water used on the single day of highest demand).

As discussed later in this section, the water demand in UWNY's Rockland County service area varies greatly from year to year, depending on the weather and particularly on the rainfall. Consequently, an average of demand in a number of years is typically evaluated to understand water demand, but consideration must also be given to the peaks reached during that time.

Over the past 30 years, there has been a general trend toward increased annual average daily and peak daily water demand. In 1980, the annual average water demand was 25.9 mgd. By 2007, average water usage was at its highest over the 30-year period, with annual average daily demand at 31.43 mgd. Over the 10-year period of 1980–1989, but excluding drought years of 1981, 1982, and 1985 when mandatory water restrictions resulted in lower water consumption, the annual average water demand was 26.1 mgd.[1] In contrast, over the period of 2000–2010, the annual average daily water demand was 29.4 mgd; excluding the drought year of 2002, when water use restrictions were being enforced by RCDOH, the average daily water demand was 29.7 mgd.

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[1] During years when mandatory drought restrictions are enforced by the RCDOH, water consumption is lower than normal and does not reflect typical water consumption in Rockland County.

There is great variability that occurs from year to year in terms of peak demand, and a wide range between the peak day demand and the average day demand in a given year. Peak demands typically occur during the summer/early fall, and average monthly water demand during the four-month period of June through September is typically 15 to 30 percent higher than average monthly water demand during the rest of the year. Summer demand tends to be higher because of the water use patterns in UWNY's service area—customers in Rockland County use more water during the summer for outdoor water use (e.g., watering lawns and gardens, car washing, and filling swimming pools). These seasonal fluctuations vary from year to year, depending on the temperature and precipitation during the summer and early fall. For example, in years with hot, dry summers, such as the summers of 2005 and 2010, outdoor water use increases because of increased watering of lawns and gardens when precipitation is low.

During the summer/early fall season, water demand on peak days is much higher than the monthly average and annual average. During the most recent 10-year period (again, excluding the drought year of 2002), the maximum day ranged from 35.3 mgd (during the rainy summer of 2009) to 47.4 mgd (during the heat wave in the summer of 2010). The 2010 peak was the historic maximum daily demand for UWNY's Rockland County system.

Overall, the water demand during the peak summer/early fall season can strain the current water supply system by requiring production of water at close to or above the system's sustainable capacity for three to four months at a time. This challenge is exacerbated by the fact that periods of high water demand typically correspond with periods of low precipitation. When rainfall is greatest, and water supply therefore is most abundant, the demand is also lowest. Conversely, in dry periods, when the water supply system is less abundant, demand is higher.

For purposes of water supply planning, considering the stakes surrounding having an adequate water supply (e.g., fire suppression, hospital operations), any projections of the need for water supply must account for the wide range in demand over the course of the year, including the seasonal peak that occurs during the summer and early fall period.

UWNY EXISTING CUSTOMER PROFILE

As noted earlier, UWNY's service area consists of all of Rockland County excluding the Villages of Suffern, Nyack, and South Nyack. The service area, like all of Rockland County and the rest of the New York metropolitan area, has grown steadily over recent decades.

As shown in **Table C.2-5**, in 1980 Rockland County had an estimated 259,530 residents, and an estimated 80,684 people worked in Rockland County. By 2010, the residential population had grown by approximately 20 percent to an estimated 311,687 residents, while the worker population (i.e., those working in Rockland County) increased by approximately 37.9 percent to an estimated 111,257 workers.

Within the UWNY service area, the estimated population in 2000 was 266,193 residents, based on the 2000 Census. Thus, the residential population of the geographic area where UWNY provides service constituted approximately 92.8 percent of the total population of Rockland County. In 2010, according to the 2010 Census, a total of 291,379 residents (living in approximately 90,563 households) live within the area where UWNY provides service, constituting approximately 93.5 percent of the county's population. Most of the residents of the service area are served by UWNY, but some residents and businesses use private wells for water supply. Accounting for those residents who live within the service area but are not currently

served by UWNY, it is estimated that 87.5 percent of the residents of Rockland County are served by UWNY.

Table C.2-5
Rockland County Residential and Worker Populations
1980-2010

Year	Residential Population	Worker Population
1980	259,530	80,684
1990	265,475	99,182
2000	286,753	106,358
2010	311,687	111,941

Sources: Residential population estimates from the U.S. Census of Population and Housing, decennial census; 2010 census information from Redistricting Data Summary File. Worker population estimates from New York State Department of Labor annual employment data by place of work (Quarterly Census of Employment and Wages).

UWNY's customer base in Rockland County consists predominantly of residential accounts. Approximately 90 percent of the UWNY accounts are residential accounts, and consequently the majority of water used in the UWNY service area is used by residential customers. As shown in **Table C.2-6**, more than half the water demand in the UWNY service area is by residences, rather than businesses, institutions, or industries. Table C.2-4 presents information on the average water consumption in the service area over the past 10 years (2000–2010, excluding 2002). The information excludes consumption in 2002, which was a year when mandatory drought restrictions imposed by Rockland County affected water demand patterns. As shown in the table, approximately 58 percent of the water consumed in the service area was consumed by residential users, and of that, 80 percent was used by single-family residential households. Thus, the notable growth in Rockland County's residential population over the past 30 years has been the major factor contributing to the increasing water demands in the area.

Overall, over the past 10 years (2000–2010, excluding the drought year of 2002) the average per capita water demand for residential customers served by UWNY was 66.0 gpd, which is lower than average residential water use elsewhere in the U.S., as discussed in the following section.

Table C.2-6
Average Water Consumption by Account Type, 2000 –2010 (Excluding 2002)

Type of Water Use	Average Water Consumption	
	Amount (mgd)	% of Total
Residential Single Family	13.92	46.6
Apartments, High-Rise, and Residential Multi-Family	3.42	11.5
Commercial	2.89	9.7
Municipal	0.37	1.3
School	0.67	2.2
Hospital	0.58	1.9
Industrial and Warehouse	2.17	7.3
Building Rates[1]	0.01	0.0
Resale Account[2]	0.16	0.5
Non-Revenue Water[3]	5.66	19.0
Total	**29.85**	**100.0**

Notes:
1 Building rates are temporary meters used during building construction.
2 Resale accounts include the wholesale provision of water to the Village of Hillburn and to the small areas of New Jersey served by the Rockland County system.
3 Non-revenue water consists of water that is used but not billed, and includes water used during the water treatment process, to chlorinate new mains, to flush fire hydrants, and for fire-fighting; water not metered correctly or inaccurately billed; and water lost through leaks in the distribution system.

CONTRIBUTION OF NON-REVENUE WATER TO EXISTING DEMAND

Over the past 10 years, excluding 2002 when water restrictions were implemented by the RCDOH, approximately 19 percent of the water produced by UWNY for Rockland County on average has been "non-revenue water." Non-revenue water consists of water that is produced but not billed, such as water used during the water treatment process, to flush fire hydrants, and for fire-fighting, as well as water lost through leaks in the distribution system and from water main breaks. A certain amount of non-revenue water is normal for any water supply system, and cannot be avoided. In general, non-revenue water can be divided into three broad categories:

- **Unbilled, authorized consumption**. This includes water used within the water treatment processes and water used for critical public safety functions (i.e., firefighting and hydrant flushing). This water usage is not billed and therefore does not generate revenue for the water utility. Nonetheless, this element of non-revenue water cannot be reduced and is considered unavoidable.
- **Apparent losses**. This includes unauthorized consumption (theft), water that is not metered or is metered inaccurately, and data errors. This water is used by customers but does not produce revenue for the water utility. This element of non-revenue water can be converted to revenue-producing water by making corrections to the system (i.e., corrections to the meters), but it will nonetheless be consumed.
- **Real losses**. This is water lost through system leakage, including leakage on mains, leakage and overflows at storage tanks, and leakage at service connections. This is the only element of non-revenue water that can be controlled to some extent by the water utility. All water

supply systems include some leakage of this type, and those that operate at relatively high pressure (like the system in Rockland County) have higher leakage rates than those operating at lower pressures. In addition, water main breaks are an expected occurrence within a distribution system of the age of the UWNY system.

The American Water Works Association (AWWA) has established standard methods for calculating a system's unavoidable annual real losses, which is the theoretical minimum system leakage that could be achieved if all leak reduction methods were in place. The methodology for calculating the unavoidable annual real losses takes into account the miles of mains, pressure of water, number of service connections, and other system components. This information can then be used to assess the efficiency of the water system, using AWWA's "Infrastructure Leakage Index." The Infrastructure Leakage Index is the ratio of actual annual real loss to the unavoidable annual real loss. A ratio of 1.0 would represent a system operating perfectly, with absolutely no unavoidable loss. Following AWWA's Water Loss guidelines, systems with Infrastructure Leakage Indices less than 2.0 are optimal, and systems with Infrastructure Leakage Indices greater than 8.0 have high levels of loss and would benefit from an increased leak detection program. For systems with Infrastructure Leakage Indices between 2.0 and 8.0, the ratios may suggest efficiency targets that depend on the specific water utility and the availability of water and cost of infrastructure improvements. Using the AWWA water auditing method, UWNY's Infrastructure Leakage Index was 1.95 in 2007 and 1.84 in 2010, indicating that the real losses from leakage in the UWNY system are within the range expected for a well-run water distribution system.

UWNY has an ongoing non-revenue water reduction initiative to identify real losses of water and reduce them where practicable and economically feasible. This initiative is described below, under "*Reduction of Non-Revenue Water Use.*" UWNY intends to use its ongoing non-revenue water reduction initiative to reduce the portion of average daily water demand that is due to real losses.

FUTURE WATER DEMAND PROJECTIONS

As part of its mandate to provide safe and adequate water supply service to its Rockland County customers, UWNY, like all water purveyors, must plan to provide adequate safe yield in each of its water sources and for the system overall. As set forth in the *Ten-State Standards* that are incorporated into New York State's water supply regulations, the quantity of water should "provide a reasonable surplus for anticipated growth."[1]

To plan for the future, UWNY regularly undertakes an assessment of future water demands. In recent years, three efforts have been undertaken to assess future water demand:

- As part of the 2006 Rate Case, a forecast of future water demands was undertaken to determine the level of future investment in water supply infrastructure required. This forecast and the administrative process that followed at the PSC was the basis for the PSC's determination of future demand in the 2006 Rate Case.
- An alternative water demand forecast was conducted in 2010, using population projections prepared by Rockland County, to confirm the conclusions of the 2006 forecast. In addition, in 2010 the 2006 forecast was projected further into the future (to 2035). The 2010 water

[1] *Recommended Standards for Water Works*, *Policies for the Review and Approval of Plans and Specifications for Public Water Supplies*, 2007 Edition, Part 3, "Source Development," section 3.1.

demand forecast also included a sensitivity analysis to evaluate the effects of increased water conservation and/or of greater reduction of non-revenue water on the future demand for water.

- In 2011, the results of the 2010 Census were applied to the 2010 forecast in a sensitivity analysis, to identify the effects of updated population numbers on the conclusions of that forecast.

These evaluations are described below.

WATER DEMAND FORECASTS CONDUCTED IN 2006

As part of the administrative process that led to the 2006 Joint Proposal and 2006 Rate Order, UWNY worked with the RCDOH to develop projections of future water demand through the year 2025. The projection of future water demands was based on a forecast that had been completed in 2000, which was then updated and adjusted to account for recent development trends in coordination with the RCDOH.

Methodology for 2006 Demand Forecasts

The methodology for the 2006 water demand forecast consisted of the following steps:

1. **Statistical analysis of water demand patterns.** Water demand data from the past two decades (1981–1999, but excluding drought years of 1981, 1982, 1985, and 1999) were reviewed to identify the historical annual average day demand patterns. These data were analyzed using a linear regression analysis to identify the trend for annual average day water demand.

2. **Estimate of 95 percent confidence interval.** In coordination with the RCDOH, a statistical confidence interval was used to develop a target for water supply planning purposes. The purpose of this approach was to reflect the great variability that occurs in water demand over a period of several years, with the intention of predicting the upper limit of that range for prudent water planning purposes. This analysis was conducted using water demand data from 1985 to 2005, including drought years. Thus, UWNY used the standard error from the regression analysis to calculate a 95 percent confidence interval, which represents the upper limit of the variation in annual average demand.

3. **Adjustment to reflect anticipated developments.** The trend line developed in Step 1 was then adjusted to add specific notable development applications that were known for the immediate future. This information indicated that an average of 730 new connections (i.e., new customers) was expected each year. In addition, additional demand was projected for the Town of Ramapo, based on the town's comprehensive growth strategy. To reflect this growth strategy, an additional 300 connections per year were added through 2015, after which growth was assumed to stabilize. Using this approach, the total number of new connections each year through 2015 was estimated at 1,030 per year and from 2015 to 2025 at 730 new connections per year. The connections were then used to estimate additional population anticipated, using assumptions about average household size. This information was then added to the water demand projection developed in Step 1.

4. **Average day demand.** The average day demand was projected based on the historical trend line and the adjustment for anticipated developments. Average day demand was projected to the year 2025.

5. **Maximum day (peak) demand.** Maximum day demand projections were calculated based on applying a peaking factor ratio[1] to the average day projection. The peaking factor was based on the highest peaking factor observed since 1981 (a factor of 1.56), and was escalated to a factor of 1.6 for 2015 and beyond, to account for the observed trend of increasing summer demands related to irrigation-intensive activities, among other factors, in the county. This peaking factor was applied to the annual average demand to develop maximum day demand projections through the year 2025. (Although the 95 percent confidence interval projections were not adjusted for Step 3, both the 95 percent confidence interval and maximum day projections were accepted in the 2006 Rate Case.)
6. **Comparison to alternative population forecasts.** To verify that the water demand forecast yielded reasonable results, other population forecasts prepared by planning agencies and independent institutions were reviewed. These included population projections prepared by the Rockland County Department of Planning in 2001, the New York Metropolitan Transportation Council (NYMTC) in 2004, and Cornell Institute for Social and Economic Research in 2002. The population forecasts prepared by UWNY were within the range presented by the other forecasts, so they were considered reasonable.

The forecasts did not assume any additional water conservation beyond what is already reflected in the existing demand by UWNY's customer base. As discussed above, based on customer survey results, UWNY believes the majority of its customers are prudent in their water use and currently employ conservation measures, and the per capita water demand for UWNY's customers is relatively low in comparison to residential water use elsewhere in the U.S. and in Canada. Thus, the existing per capita water demand for the UWNY system reflects this level of conservation. Making speculative assumptions about additional future water conservation beyond what is already occurring would not represent good planning practice for a water utility, which must be sure that adequate water is available in the future—particularly a private company like UWNY that has no ability to mandate conservation measures yet has an obligation to provide water for extremely important public uses. For the same reason, Exhibit 11 of the 2006 Joint Proposal and Appendix 7 of the 2010 Joint Proposal, which set forth the supply commitments that UWNY must meet, state that "Supply increases are those above the current capacity that result from new, permitted and operable supply projects or demonstrable increases in usable capacity resulting from infrastructure improvements. Theoretical increases or those based on change of operation without physical change are not counted toward satisfaction of the supply increase commitment."

Results of 2006 Water Demand Forecast

The 2006 water demand forecast estimates that the average annual demand using the 95 Percent Confidence Interval will reach 34.3 mgd by 2015, while the available supply will be only slightly higher, at 34.5 mgd. Similarly, in terms of peak demand, the 2006 forecast estimates that the peak demand will be 52.7 mgd in 2018, approximately the same as the available peak supply in that year without a new long-term water supply project. By 2035, the average annual demand is projected to be 39.1 mgd and the peak demand is projected to be 59.2 mgd.

[1] The peaking factor is the ratio of maximum demand to annual average demand.

PSC Water Demand Projections Used in 2006 Rate Case

The PSC's methodology to calculate the water demand growth projections incorporated into the 2006 Rate Case was based on the PSC's analysis of the testimony and other filings on the topic submitted by the parties to the 2006 Rate Case. Both UWNY and Rockland County submitted expert testimony regarding water demand growth projections. As stated in Rockland County's October 13, 2006 Statement in Support of the Joint Proposal, UWNY and Rockland County used different methodologies but "reached roughly similar conclusions" in calculating their respective water demand growth projections. The parties to the 2006 Joint Proposal agreed that the increased water volume commitments set out in the 2006 Joint Proposal reflected their consensus on water demand growth projections.

It should be noted that water conservation and efficiency measures were evaluated by the PSC in approving the increased water volume commitments included in the 2006 Rate Order. During the 2006 Rate Case, multiple witnesses from different parties testified regarding UWNY's multifaceted and distinct water conservation measures. When the administrative law judge presiding over the 2006 Rate Case asked in writing on October 6, 2006 (in response to the 2006 Joint Proposal) if "some or all of the new sources of water supply could not be avoided in whole or in part through rate design changes or water conservation programs," all of the parties to the 2006 Joint Proposal agreed in their consensus-written response submitted on October 20, 2006 that "rate design changes and water conservation efforts have been virtually exhausted," and the increased water volume commitments incorporated into the 2006 Joint Proposal (and 2006 Rate Order) were "above that which can be achieved through further rate design or conservation methods." Section XX of the of the 2006 Joint Proposal, which was incorporated into the 2006 Rate Order, requires, among other things, that UWNY continue implementation of its customer outreach and education programs. Section XX of the 2006 Joint Proposal also obligates UWNY to provide annual reports to the PSC on its customer outreach and education programs.

2010 WATER DEMAND FORECAST

In 2010, a separate water demand forecast was prepared using a different methodology than the 2006 forecast, to verify the 2006 conclusions and update the results by extending the forecast year further into the future. The 2010 water demand forecast was based on population projections for the UWNY service area, rather than on water demand trends as the 2006 forecast had been. Since the 2010 Census was not yet available, these population projections included estimates of existing population in the county from 2000 to 2009. The methodology used for the forecast and the results of the forecast are described below. In addition, as noted above, in 2010 the 2006 water demand forecast was projected further into the future, to 2035.

Methodology for 2010 Water Demand Forecast

The methodology for the 2010 water demand forecast consisted of the following steps:

1. **Identification of future population growth for Rockland County.** Estimates of population, number of households, and employment for Rockland County for 2000–2009 and forecasts through 2035 were collected from a variety of public and private sources including the Rockland County Department of Planning's forecast prepared in 2010, Cornell University's Applied Demographics Program's forecast prepared in 2008, NYMTC forecast prepared in 2009, and a forecast prepared in 2010 by Woods & Poole Economics, an independent consulting firm that specializes in long-term county economic and demographic forecasts. Rockland County's forecast of population for the county through 2035, which was

prepared in coordination with Cornell University's Applied Demographics Program, showed a growth of almost 57,000 people (20 percent) between 2000 and 2035, for a total population of 343,636 by 2035.

During development of the recently completed Rockland County Comprehensive Plan, the Rockland County Department of Planning also prepared a "build-ou
the future growth potential of the county under existing zoning.[1] The analysis considered existing zoning, existing development patterns, and constraints that restrict development, such as existing structures, parks and institutions, steep slopes, water bodies, and wetlands. The build-out analysis did not make adjustments for future changes in zoning or variances that might be granted and that could intensify the density of development that occurs, although such changes can reasonably be anticipated in the future. On the basis of this build-out analysis, Rockland County estimated the potential for 17,948 additional housing units to be developed in the county based on current zoning and constraints and without any changes to or variances from zoning.[2] The Rockland County Comprehensive Plan notes the following about the build-out analysis: "The build-out analysis is a potential saturation point scenario that assumes all of the undeveloped residentially zoned land in Rockland County is actually developed; this information is a guide and does not suggest actual, or desired, building levels. In fact, it is highly unlikely that a full build-out would occur in the foreseeable future, as remaining land tends to be less desirable in terms of ease and cost of development because of such limiting elements as wetlands, floodplains and steep slopes, multiple ownership, varying estate issues and a lack of land actually for sale. For more accurate and realistic growth projections, a number of factors should be examined such as population forecasts, household size estimates and economic growth opportunities."[3]

2. **Adjustment for UWNY service area.** The future population forecasts were adjusted to reflect the portion of Rockland County that is located within UWNY's service area (e.g., areas not served by UWNY—the Villages of Suffern, Nyack, and South Nyack—were removed).

3. **Identification of water demand characteristics.** The water demand patterns, based on billing records by account type and on production volumes, in the UWNY service area over the previous 10 years (2000–2009, both with and without the drought year of 2002) were reviewed together with the estimates of population, households, and employment for those years to identify the average water demand (in gpd) per person, per household, and per employee.

4. **Projection of future water demand.** The water demand characteristics identified in step 3, which were on a per capita basis, were then applied to the future population projections

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[1] *Rockland Tomorrow: Rockland County Comprehensive Plan.* Rockland County, adopted March 1, 2011. Chapter 5.0, "Land Use and Zoning," p. 63. Included as Appendix 20.1 of the Haverstraw Water Supply Project DEIS

[2] The Rockland County build-out analysis did not assume redevelopment of the Ambrey Pond lands. As shown in the Rockland County Comprehensive Plan (page 65), this land was considered to have little or no development potential. Therefore, the estimated 50 residential units that could potentially be developed on the Ambrey Pond lands if the Proposed Project is approved, and if the Ambrey Pond lands are redeveloped would be in addition to the 17,948 units.

[3] *Rockland Tomorrow: Rockland County Comprehensive Plan.* Rockland County, adopted March 1, 2011. Chapter 5.0, "Land Use and Zoning," p. 63.

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collected in step 1. The Rockland County forecasts of population and households were used as the baseline. For the employment forecast, Rockland County's forecast did not include employees, so the average of the employment forecasts prepared by NYMTC and Woods & Poole were used. As part of this projection, the following water demand assumptions were made:

- Average per capita demand will remain steady in the future. The per capita rates used, based on the average of the previous 10 years (based on projections, since 2010 Census data were not yet available), were 67.6 gpd per person (residential), 26.4 gpd per person (non-residential, i.e., employment), and additional 0.6 gpd per resident to account for other water use (i.e., building rates and resale accounts). These assumptions reflected the average water consumption patterns over the previous 10 years and therefore incorporated the existing level of conservation measures being used by UWNY customers. Similar to the 2006 projection discussed in the previous section, the 2010 projection did not assume that any additional conservation measures are added in the future, that more water-efficient technologies are developed, or that a greater percentage of the households in the service area will use water-conserving measures than today. As discussed in the previous section, UWNY believes its customers are already prudent in their use of water, and making speculative assumptions about future water conservation beyond what is already occurring—particularly when UWNY possesses no legislative or regulatory powers over conservation measures—would not represent good planning practice for a water utility. As discussed below, a sensitivity analysis was also prepared to identify the water demand projections if additional conservation measures are employed.
- The percent of non-revenue water was assumed to remain the same as the 2009 share, which was 24 percent. As discussed below, a sensitivity analysis was also prepared to identify the water demand projections if the percentage of non-revenue water is reduced in the future.

In addition to the Rockland County forecasts, forecasts prepared using the same methodology but with population forecasts prepared by NYMTC and Woods & Poole—which were lower and higher than Rockland County forecasts, respectively—were used as a way of identifying the possible range in future demand, to account for the likelihood that water demand will vary from year to year above and below the average demand.

Results of 2010 Water Demand Forecast

The 2010 water demand forecast indicates that the annual average demand will reach 33.6 mgd in 2015 and 34.4 mgd by 2018. These projections are consistent with the 95 Percent Confidence Interval demand results of the 2006 water demand forecast (which show an annual average demand of 34.3 mgd in 2015). By 2035, the 2010 water demand forecast predicts an annual average demand of 38.6 mgd, the same as the prediction by the 2006 water demand forecast.

The alternative water demand forecasts prepared using the NYMTC and Woods & Poole population forecasts show lower and higher future demands for water, respectively. The NYMTC forecast estimates an annual average demand of 38.2 mgd in 2035 and the Woods & Poole forecast estimates an annual average demand of 41.2 mgd for that year.

Overall, the 2010 water demand forecast confirms the validity of the 2006 water demand forecast in terms of annual average demand. The validity of the peak day forecast prepared in

2006, which applied a peaking factor to the regression forecast for annual average demand, is also therefore confirmed.

2010 WATER DEMAND FORECAST: EFFECTS OF CONSERVATION ON FUTURE DEMAND

UWNY's conservation measures have been effective in reducing the overall water use patterns in the service area and the per capita water demand for residential customers is relatively low. As noted above, this per capita demand was estimated in the 2010 water demand forecast to be an average of 67.6 gpd per person over the past 10 years and now, based on 2010 Census data, is estimated to be 66.0 gpd, as discussed below. (These conservation measures and their effects on water demand are described in detail below, under "*Ongoing Water Conservation Program.*")

The baseline water demand forecast assumed that the percentage of UWNY customers who use water-conserving fixtures and practices remains steady, and that any new customers added to the system as a result of population growth will have the same distribution in terms of customers who use water-conserving fixtures and practices. Thus, the baseline water demand forecast assumed a steady water consumption rate for residential customers into the future. This reflects the uncertainty related to water consumption, which includes several competing factors: (1) all new houses built in Rockland County will have to include water-saving fixtures to comply with federal and New York State laws, so the percentage of houses with water-saving fixtures will gradually increase into the future; (2) the per capita water consumption figure is directly related to the type of housing stock, with single-family homes on large properties using much larger amounts of water for irrigation than houses on smaller properties or apartments, so the per capita figure will be affected by the type of future development that occurs; and (3) there is an increasing trend toward increased water use with new construction, such as multiple showerheads for shower stalls and automatic irrigation systems, which may lead to an increase in water use per household.

To address this uncertainty, in addition to the baseline water demand forecast, the 2010 forecast also included a sensitivity analysis to identify the effect on water demand projections if the percent of customers using water-conserving fixtures and practices increases in the future. This sensitivity analysis assumed that residential water use will gradually be more efficient over time, at a rate of 0.1 percent per year. This rate accounts for the increasing efficiency gained as more customers in Rockland County have water-saving fixtures, taking into account the uncertainties noted above. The result of this analysis is a water demand forecast (using the same Rockland County population forecast as the baseline water demand forecast) with a total annual average demand of 37.9 mgd in 2035, a savings of 0.7 mgd over the baseline forecast of 38.6 mgd.

2010 WATER DEMAND FORECAST: CONTRIBUTION OF NON-REVENUE WATER TO FUTURE DEMAND

The baseline water demand forecast assumed that the percentage of water demand that is due to non-revenue water remains at the same percentage as in 2009, when it was 24 percent of UWNY's total water production. As discussed earlier, the real losses from leakage in the UWNY system are within the range expected for a well-run water distribution system. UWNY has an ongoing non-revenue water reduction initiative to identify real losses of water (i.e., the element of non-revenue water that can be controlled to some extent by the utility) and to reduce them where practicable and economically feasible. (See the discussion below, under "*Reduction of Non-Revenue Water Use.*") The non-revenue water initiative also includes an effort to correct

billing and metering errors that lead to apparent losses in water. This will not reduce the amount of water demand, but it will shift the demand from non-revenue water into billed demand.

To address the uncertainties related to future non-revenue water demand, in addition to the baseline water demand forecast, the 2010 forecast also included a sensitivity analysis to identify the effect on water demand projections if the percentage of non-revenue water is reduced in the future. This analysis used information on UWNY's 2009 non-revenue water production developed as part of a water audit of the UWNY system using the AWWA Water Loss Control Committee software, which identified the amount of non-revenue water that was due to apparent losses versus real losses and authorized uses.

This analysis assumed that apparent losses (i.e., billing and metering errors) can be reduced from 6.5 percent of water production (the 2009 value) to 5 percent, with the associated volume of water shifted from non-revenue water to billed water (residential and non-residential). It also assumed that the total of real losses (i.e., leaks) and authorized uses can be reduced to about 13 percent of total production from the 2009 value of 17.2 percent. With these assumptions in place, non-revenue water would be reduced to 18 percent of total production. The forecast of annual average demand for 2035, considering such a reduction in non-revenue water, would decrease by 1.3 mgd, from the baseline value of 38.6 mgd to 37.3 mgd.

Combining both the additional conservation assumed in the conservation sensitivity analysis and the non-revenue water savings assumed in this analysis would further reduce future demands. Taking into account both these factors, the water demand forecast predicts an annual average demand of 36.7 mgd for the year 2035, in comparison to the baseline value of 38.6 mgd.

UPDATED WATER DEMAND FORECAST REFLECTING 2010 CENSUS

As noted above, the 2010 water demand forecast was based on population information prepared by the Rockland County Department of Planning, as well as information from several other sources (forecasts prepared by Cornell University's Applied Demographics Program, NYMTC, and Woods & Poole Economics). All of these sources were based on 2000 Census data and updated information available from the U.S. Census Bureau prior to release of the 2010 Census. Future population was projected from a base year of 2010, using estimates of 2010 population. However, 2010 Census data, which was released in early 2011, indicate that Rockland County's population for 2010 is higher than the population previously estimated by Rockland County Department of Planning, NYMTC, Cornell PAD, and Woods & Poole.

The estimated 2010 population for Rockland County used as the base for the forecasts was 302,600. However, the 2010 Census indicates that Rockland County's 2010 population was actually 311,687, which is 3 percent higher than anticipated by the forecasts. The population of UWNY's service area grew at a slightly higher rate than that of the county, so that the service area population in 2010 was 291,379 rather than the 262,959 anticipated based on previous forecasts, an increase of 10.8 percent.

Rockland County has not prepared revised forecasts based on this new information, and therefore the 2010 water demand forecast has not been revised. The effects of the 2010 Census on the conclusions of the 2010 water demand forecast would be as follows:

- **Lower per capita water demand:** As noted above in the discussion of the 2010 water demand forecast, information on the average residential water demand over the previous 10 years and the estimated residential population as of the year 2009 were used to calculate the existing per capita residential water demand for UWNY's Rockland County water system.

That demand was calculated to be 67.6 gpd per person. However, with the higher population numbers for 2010, and including the water demand information for 2010 as well, the actual per capita residential water demand was 66.0 gpd.

- **Changes to future projections:** Since Rockland County has not revised its future population projections, the expected effects of the higher 2010 number on future levels are not clear. It is possible that either: 1) the same rate of growth will occur, but beginning from the higher level realized in 2010; or 2) less growth will occur, so that the same level of population will be achieved by 2035 as previously predicted.
- **Effects of lower per capita water demand and changes to future projections on future water demand:** The effects of these changes on future water demand would vary, depending on the rate of future growth:
  - If the same rate of growth occurs, so that future population levels are 3 percent higher than previously predicted, using the lower per capita water demand results in slightly higher future water demand than predicted in the 2010 water demand forecast—0.2 mgd higher in both 2015 and 0.1 mgd higher in 2035. The total demand would be 33.8 mgd in 2015, compared to the 33.6 mgd predicted in the 2010 forecast and 34.3 mgd predicted in the 2006 forecast. By 2035, the demand would be 38.7 mgd, compared to the 38.6 mgd predicted in the 2010 forecast and 39.1 mgd predicted in the 2006 forecast.
  - If a lower rate of growth occurs, so that future population levels are the same by 2035 as previously predicted, using the lower per capita water demand results in slightly less future water demand than predicted in the 2010 water demand forecast. By 2015, water demand would be essentially the same as originally predicted for that year (because of the higher base in 2010), but by the year 2035, the demand for water would be 1.0 mgd less than previously predicted. The total demand would be 33.6 mgd in 2015, compared to the 33.6 mgd predicted in the 2010 forecast and 34.3 mgd predicted in the 2006 forecast. By 2035, the demand would be 37.6 mgd, compared to the 38.6 mgd predicted in the 2010 forecast and 39.1 mgd predicted in the 2006 forecast.

Thus, while the 2010 Census data shifts the results of the 2010 water demand forecast slightly, overall it continues to confirm the validity of the 2006 water demand forecast in terms of annual average and peak demand.

C.2.5 PLANNED FUTURE IMPROVEMENTS TO AUGMENT SUPPLY AND ONGOING WATER CONSERVATION PROGRAM

As a prudent water supplier, UWNY is making improvements to its Rockland County water system to meet anticipated future demand. These improvements are consistent with the requirements of the 2006 and 2010 Rate Orders, which include specific commitments for increases to peak and yearly average day volumes through the year 2015. These commitments, listed in Exhibit 11 of the 2006 Joint Proposal and Appendix 7 of the 2010 Joint Proposal, are summarized in **Tables C.2-4 and C.2-5**. As shown in the tables, UWNY has committed to increase the total three-day sustainable peak supply by 7.1 mgd by 2015, over the existing 45.5 mgd in 2006; and will increase the supply on an annual average basis (i.e., safe yield) by 1.5 mgd by 2015, over the existing 33 mgd in 2006. The 2006 and 2010 Rate Orders commit UWNY to meet specific increases in supply rather than to implement specific projects. As defined in the 2010 Rate Order (Appendix 7 of the 2010 Joint Proposal), "supply increases are those above the current capacity that result from new, permitted and operable supply projects or demonstrable increases in usable

capacity resulting from infrastructure improvements. Theoretical increases or those based on change of operation without physical change are not counted toward satisfaction of the supply increase commitment."[1]

Tables C.2-7 and C.2-8 also indicate the volume increases already achieved (as of June 30, 2011) in accordance with the commitments required by the 2006 Rate Order. As shown in the tables, a total of 5.94 mgd in additional peak capacity and 0.9 mgd in average capacity has been added to the system since 2006. The peak capacity increases were achieved through improvements to pumps and treatment facilities at a number of system wells, construction of a new booster pump station, and by the improvement of the Letchworth Reservoirs water treatment plant to increase its capacity from 1.0 to 3.0 mgd.

Table C.2-7
Peak Volume Commitments and Peak System Capacity Required by 2006 and 2010 Rate Orders through 2015 (mgd)

Year	Target Incremental Increase to Peak Supply	Target Cumulative Addition to Peak Supply	Total System Peak Capacity with Target Increase	Actual Peak Supply Cumulative Increase Achieved	Actual Peak Supply Capacity with Increase
2006 (Baseline)	—	—	45.5	—	45.5
2007	3.4	3.4	48.9	4.02	49.52
2008	0.5	3.9	49.4	4.45	49.95
2009	0.4	4.3	49.8	5.83	51.33
2010	—	—	49.8	5.94	51.44
2011	0.9	5.2	50.7	—	—
2012	—	—	50.7	—	—
2013	0.9	6.1	51.6	—	—
2014	—	—	51.6	—	—
2015	1	7.1	52.6	—	—

Notes: 2006 peak supply capacity consisted of the following: Lake DeForest at 20 mgd, Ramapo Valley Well Field at 4 mgd; system wells at 20.5 mgd; Letchworth Reservoirs at 1 mgd.

As defined in the 2006 Rate Order (Exhibit 11 to the 2006 Joint Proposal) and the 2010 Rate Order (Appendix 7 to the 2010 Joint Proposal), a peak increase is defined as "sustainable for three days, t ."

Supply commitments achieved are as of June 30, 2011.

[1] 2010 Joint Proposal, Appendix 7.

Table C.2-8
Average Volume Commitments and Average System Capacity Required by 2006 and 2010 Rate Orders through 2015 (mgd)

Year	Target Incremental Increase to Average Supply	Target Cumulative Addition to Average Supply	Total System Average Capacity with Target Increase	Actual Average Supply Cumulative Increase Achieved	Actual Average Supply Capacity with Increase
2006 (Baseline)	—	—	33.0	—	33.0
2007	—	—	33.0	—	33.0
2008	—	—	33.0	—	33.0
2009	0.1	0.1	33.1	0.13	33.13
2010	0.3	0.4	33.4	0.9	33.9
2011	0.2	0.6	33.6	—	—
2012	0.2	0.8	33.8	—	—
2013	0.2	1.0	34.0	—	—
2014	0.3	1.3	34.3	—	—
2015	0.2	1.5	34.5	—	—

Notes: 2006 average supply capacity consisted of the following: Lake DeForest at 10 mgd, Ramapo Valley Well Field at 7 mgd; system wells at 15 mgd; Letchworth Reservoirs at 1 mgd.
Supply commitments achieved are as of June 30, 2011.

In accordance with the 2006 and 2010 Rate Orders of the PSC, UWNY is pursuing a number of projects to meet its future supply commitments through 2015, collectively referred to as the Short-Term Water Supply program. In addition to these initiatives to increase water supply, UWNY also has ongoing programs to improve its Rockland County water supply system in accordance with PSC requirements. These include an Underground Infrastructure Renewal Program (UIRP) to rehabilitate and replace various components of the distribution system on a regular basis, an Integrated Water Resources Management Program (IWRMP) that will optimize management of the water supply system; a program to replace and upgrade water meters; and a number of measures to reduce leaks in the distribution system and from water main breaks. UWNY also has an ongoing hydrant maintenance program, consistent with New York State law, which requires public water suppliers to inspect and test each hydrant a minimum of once every three years with a minimum of one-third of hydrants being inspected and tested annually. In addition, UWNY has an ongoing program to reduce the amount of non-revenue demand and an ongoing customer outreach program to encourage conservation. These measures are summarized below.

SHORT-TERM WATER SUPPLY PROGRAM

The short-term actions include a number of different projects and measures to increase available capacity in order to meet UWNY's average and peak day demands. The specific nature and timing of the projects will depend on the results of ongoing and additional design work, feasibility analyses, permitting and other approvals, and, depending on the specific initiative, the acquisition and preparation of project sites.

The projects currently planned or under investigation to meet the commitments to increase peak capacity and annual average supply (i.e., safe yield) in the near future include the following.

EXISTING SYSTEM WELLS

One of the primary components of the Short-Term Water Supply program is improvements to existing system wells that (1) will allow them to operate more reliably or to provide greater volumes during peak periods, or that (2) will bring existing wells that are currently out of service back into operation. Since 2007, UWNY has made pump improvements at 12 wells; has installed air stripping towers to treat gasoline-contaminated water at the Sparkill well field, allowing it to be put back into production; installed treatment systems at the Garnerville 46 well, also allowing it to be put back into production; and installed air treatment (to address the condition of air entrained in the water) at the Willow Tree and New Hempstead wells. In total, these improvements have provided an additional 3.83 mgd in peak capacity and 0.13 mgd in annual average capacity (safe yield).

Future projects to improve the performance of existing system wells include projects to address the following conditions:

- Pump fatigue due to age or corrosion.
- System pressure where the pump total dynamic head[1] is not sufficient to pump water from deep wells to provide the appropriate system pressures during drought conditions.
- De-aeration to address certain wells where air becomes entrained in the groundwater at high pumping rates.
- Introduction of air stripping at additional wells to allow use of their full capacity by treating containments that may be found in the water.
- Improvements to piping and well pumps where wells are currently limited by hydraulic capacity of the infrastructure.
- Treatment improvements (such as improvements that increase disinfection contact time) to maintain supply capacity and meet water quality requirements.

These types of improvements will add to the peaking capacity of the system when they allow wells to be pumped more efficiently or for longer periods. They do not, however, generally increase the safe yield of the wells, except when wells that are out of service can be brought back on line. This is because the improvements that can be made to existing wells serve to increase their reliability during periods of peak demand, for example by allowing them to produce water for longer periods at high flows. This does not increase the amount of water that the wells can produce over the long term because long-term sustainability of the well will depend on the capacity of the aquifer rather than the capacity of the pump itself.

NEW SYSTEM WELLS

UWNY is currently pursuing the development of new system wells, conversion of existing test wells to production wells, and improvements to existing wells to increase capacity. However, the development of new system wells face the same challenges as new wells related to pump test results, water quality, and obtaining required easements to comply with state laws.

While UWNY will continue to seek locations for additional well development, available well locations are limited based on the siting requirements mandated by the NYSDOH regulations for

[1] The total dynamic head is the head, or pressure differential, that the pump must develop to overcome the static elevation and friction forces at the desired flow.

wells that are part of public water supply systems. NYSDOH's public water supply regulations (10 NYCRR § 5-1, Appendices 5B and 5D) require that the water company control the area within 200 feet of the well and that buffer areas of up to 300 feet be maintained between the well and a range of other land uses.

Finding available land in a suitable aquifer with an adequate buffer area is difficult in Rockland County. As documented in two reports completed by the USGS in 2010, *Water Resources of Rockland County, New York, 2005-07, with Emphasis on the Newark Basin Bedrock Aquifer,* and *Hydrogeology and Simulation of Groundwater Flow in Fractured Rock in the Newark Basin, Rockland County, New York*,[1] a large portion of the county is within less productive areas of the aquifer, whereas the more productive water supply is based in the central and southwestern portions of the county. Numerous additional conditions also factor into decisions regarding the siting of new wells, including the underlying geology, topography, climate (i.e., rainfall), soil conditions and surface water drainage.

Moreover, the development, permitting, engineering, and approval is a rigorous process and can take up to two years for each well. The challenge of obtaining land suitable for well development in Rockland County and for approval and getting individual wells on line severely limits the potential for new wells to provide sufficient new capacity.

Even if available land can be obtained that has the required buffer area, it is not clear whether the aquifer has capacity to support additional wells. The USGS reports were prepared in response to concerns about the sustainability of continued and expanded use of the aquifer systems as a key component of the public water supply. The reports identified and summarized key issues related to aquifer sustainability. Among the concerns are the seasonal limitations during the growing season, when higher demand and reduced availability limit the capacity and expansion of water supply from groundwater, as well as the potential increase in dry stream beds resulting from groundwater diversions to production wells. The reports indicate that while to date the aquifer has been able to replenish prior to the next growing season, this is an ongoing concern.

Based on these constraints, and based on recent experience pursuant to the development of groundwater resources, the development of new groundwater resources is considered a viable short-term resource, but not as a long-term, predictable, and developable resource. While UWNY is seeking to maximize the availability of new well capacity as part of its short-term water supply program, the addition of new wells can add only marginally to the safe yield of UWNY's Rockland County water supply system. This effort is expected to yield another 1 to 1.5 mgd, but will not contribute toward meeting the identified incremental need of 7.5 mgd additional water beyond that initial 1 to 1.5 mgd.

DISTRIBUTION SYSTEM IMPROVEMENTS

There are several improvements that have been made, or will be made, to UWNY's distribution system to achieve better performance from the system wells. These include the following:

- Middletown Road pipe replacement, which would decrease friction losses and allow more flow from nearby wells (planned for design and construction in 2011).

[1] United States Department of the Interior, USGS, Scientific Investigations Reports 2010-5245 and 2010-5250. Available on the internet at http://pubs.usgs.gov/sir/2010/5245 and http://pubs.usgs.gov/sir/2010/5250.

- Maplebrook Tank replacement, to replace a water storage tank that has leaks and structural deficiencies with a new tank.
- Maple Avenue Booster Station, which will be used to transfer water from Pressure District 10 to Pressure District 20 under certain circumstances. Lake DeForest, which is the single largest source of supply for UWNY, is located in Pressure District 10, so it is often necessary to transfer water out of Pressure District 10 to other districts. In addition, this project will allow the transfer of water from the eastern part of Rockland County to the western part during the peak summer months when the Ramapo Valley Well Field has reduced capacity.
- Potential creation of a new pressure district, allowing similar transfers between pressure districts to be fed by increased pumping from existing wells.

IMPROVEMENTS TO RELIABILITY OF RAMAPO VALLEY WELL FIELD (POTAKE POND)

As described above, UWNY currently uses Potake Pond, a reservoir that straddles the New York–New Jersey border close to the Ramapo River in the southwest corner of Rockland County, to supplement the flow of water in the Ramapo River so that the Ramapo Valley Well Field can remain operational when flows in the river would otherwise be too low. The NYSDEC water supply permit for the Ramapo Valley Well Field limits the amount of water that can be drawn from these wells when the flow in the Ramapo River immediately downstream of the wellfield is below 10 mgd. When river flow is below 8 mgd, no water may be withdrawn from the Ramapo Valley Well Field. When river flows are low, UWNY pipes water from Potake Pond to the river to Nakoma Brook, a tributary of the Ramapo River, to augment the flow and allow greater use of the well field.

UWNY's water supply permit from NYSDEC for Potake Pond allows withdrawal of water from the top 7 feet (190 million gallons) of Potake Pond. UWNY has proposed to increase the permitted drawdown of Potake Pond from 190 million gallons per year (7.0 feet below full pool) to 300 million gallons per year (11.0 feet below full pool). But UWNY continues to analyze the efficacy of the proposal, as the ability of the proposal to add to the safe yield has not been determined due to uncertainty about the connection between groundwater and the Ramapo River.

The use of additional storage in Potake Pond would increase summer yield from the Ramapo Valley Well Field by an estimated 1.5 mgd. This would improve UWNY's ability to meet peak conditions and provide greater system flexibility and reliability by extending the period when the Ramapo Valley Well Field can be used. It would not, however, add to the safe yield of the system as it is primarily a reliability measure to minimize restrictions in using the Ramapo well field during low flow conditions.

UNDERGROUND INFRASTRUCTURE RENEWAL PROGRAM (UIRP)

UWNY has an ongoing program, the UIRP, to rehabilitate and replace the various components of UWNY's distribution system on a regular basis. As part of this program, UWNY replaces about 1 percent of its distribution lines annually on a system-wide basis, to replace aging and deteriorating pipes as they reach the end of their useful lives. To improve fire flow, UWNY regularly replaces fire hydrants and improves water pressure to hydrants through pressure increases or replacement of undersized mains. The conditions of the UIRP are set forth in the 2006 and 2010 Rate Orders issued by the PSC.

INTEGRATED WATER RESOURCES MANAGEMENT PROGRAM (IWRMP)

UWNY is aggressively pursuing this program to develop an operations protocol that will integrate UWNY's Supervisory Control and Data Acquisition (SCADA) system with varying demands so that water resources are utilized in an optimal manner. The SCADA system is a centralized electronic monitoring system that allows real-time monitoring of UWNY's entire water supply system. The IWRMP will enhance the SCADA system so that it can be used to optimize use of water resources by prioritizing which sources should be used on a given day, considering the need to balance the use of groundwater and surface water, as well as the energy required for each and the availability of water from each source. The IWRMP will allow close management of UWNY's wells, to avoid the risks associated with over pumping.

REDUCTION OF NON-REVENUE WATER USE

As discussed above, when water restrictions were implemented by the RCDOH in response to drought conditions—approximately 19 percent of the water produced by UWNY for Rockland County on average has been non-revenue water (i.e., water that is produced but not billed, such as water used during the water treatment process, to flush fire hydrants, and for fire-fighting, as well as water lost through leaks in the distribution system and from water main breaks).

Over the past 10 years, UWNY's volume of non-revenue water has generally been between 4.6 and 6.4 mgd, and has ranged from 16.1 to 24 percent of the annual average demand (this does not include 2002 data, when mandatory water restrictions were imposed by the RCDOH due to drought conditions).

UWNY has an ongoing non-revenue water reduction initiative to identify real losses of water (i.e., the element of non-revenue water that can be controlled to some extent by the utility) and to reduce them where practicable and economically feasible. The first component of this initiative is ongoing system auditing using a methodology established by the AWWA to identify water losses in the distribution system and evaluate those losses in comparison to performance indicators.

Using the AWWA water auditing method (described above under "Contribution of Non-Revenue Water to Existing Demand"), UWNY's Infrastructure Leakage Index was 1.95 in 2007 and 1.84 in 2010, indicating that the real losses from leakage in the UWNY system are within the range expected for a well-run water distribution system.

UWNY intends to use its ongoing non-revenue water reduction initiative to correct the errors that result in apparent losses and to reduce the percentage of average daily water demand that is due to real losses.

To address apparent losses, UWNY has a program to recalibrate or replace water meters system-wide on a regularly scheduled basis. Typically, UWNY recalibrates or replaces about 7 percent of the meters in its system annually. In addition, UWNY has a program to review accounts to identify any that are active but not metered, and those that are using less water than would be expected, so that such metering errors can be corrected.

To address real losses that are avoidable, UWNY has an ongoing program to reduce system water losses, including the UIRP (described above). One of the key efforts is UWNY's leak detection program to identify and address invisible leaks, which are those that are occurring but cannot be seen from the surface. In addition, UWNY is using its SCADA system to closely monitor and manage system-wide water pressures in an effort to reduce the number of water

main breaks. For example, by placing less water in storage each night, lower pressure can be maintained. The amount of water in storage each night must be carefully calibrated to the anticipated demand for the following day in order to maintain adequate supply and pressure.

The forecast of future water demand that was conducted in connection with the 2006 Rate Order, and the additional water demand forecast conducted in 2010, both assumed that the percentage of non-revenue water will remain the same in the future absent the Proposed Project as in the current condition. This assumption is conservative (i.e., most prudent) from a water planning perspective, because the success of efforts to reduce non-revenue water is not certain.

In addition, the 2010 forecast included a sensitivity analysis to identify the effect on water demand projections if the percentage of non-revenue water is reduced in the future. The analysis assumed that apparent losses (i.e., billing and metering errors) can be reduced from 6.5 percent of water production (the 2009 value) to 5 percent, with the associated volume of water shifted from non-revenue water to billed water (residential and non-residential). It also assumed that the total of real losses (i.e., leaks) and authorized uses can be reduced to about 13 percent of total production from the 2009 value of 17.2 percent. With these assumptions in place, non-revenue water would be reduced to 18 percent of total production, resulting in a savings of 1.3 mgd by 2035.

ONGOING WATER CONSERVATION PROGRAM

In addition to capital projects described above, UWNY will continue its ongoing program to encourage water conservation by customers. UWNY is a private company and does not have the regulatory authority to mandate or enforce water conservation by customers. The company is thereby limited in its ability to rely on conservation as a means to reduce demand. During periods of water shortages, Rockland County through the RCDOH has in the past implemented mandatory water restrictions. Such restrictions have been in place five times in the past 30 years, with three of five those times occurring in the past 13 years. UWNY has an active conservation program intended to educate customers about conservation and provide them incentives that encourage conservation. In accordance with the PSC's requirements, conservation programs are regularly filed with the PSC in connection with Rate Orders. This program includes the following components:

SUMMER–WINTER RATES

In 1981, UWNY implemented a summer–winter rate structure, in which higher water rates are charged from May 1 to September 30 in order to encourage conservation during the period of peak demand. Initially, the rate structure was 3:1, so that summer rates were three times higher than non-summer rates. In response to strong customer opposition, during the following summer the PSC reduced the differential to 1.5:1, which has remained since its adoption in 1982.

WATER CONSERVATION DEVICE DISTRIBUTION

New York State passed a law in 1981 mandating the use of low-flow plumbing fixtures (e.g., toilets with 3.5 gallons per flush, showers with 2.5 gallons per minute flow, and low-flow faucets). Following this state law, federal laws mandating the use of low-flow plumbing fixtures were passed in 1992, requiring lower flow fixtures than those required by the State of New York (e.g., toilets with 1.6 gallons per flush, showers with 1.5 gallons per minute flow, and low-flow faucets).

UWNY has initiated three different programs to distribute water-saving devices to its residential customers. The first such program, in 1983, included distribution of conservation kits with low-flow devices for fixtures and a water conservation guide to all single-family customers in the service area. Kits were also available to multi-family building owners and managers upon request. In 1993, a second water conservation program was initiated that included offering water-conserving retrofit devices to all residential customers in the service area. The third program, in 1997, offered water conservation products at deeply discounted prices to all residential customers in UWNY's service area. This program, which is still ongoing, is available through UWNY's website and is advertised in the company's annual Water Conservation Guide and via newspaper advertising. Through this program, UWNY offers indoor kits that include a toilet dam, low-flow nozzles and showerheads, leak detection dye tablets for toilets, and a shower timer; and outdoor kits that include a hose timer, moisture meter, a rain gauge, and a low-flow hose nozzle.

EVAPOTRANSPIRATION (ET) LAWN WATERING PROGRAM

In an effort to reduce unnecessary and excessive lawn irrigation, UWNY also has a lawn watering guide program that monitors and disseminates information on regional evapotransportation (ET) rates. ET is the loss of water from the soil through a combination of evaporation and plant transpiration. UWNY first implemented an ET education program for customers in the early 1990s, to provide information on determining the best methods for lawn watering and how to determine the daily ET number, which can be used to guide lawn-watering. UWNY's current ET program was developed in cooperation with the Cornell University Cooperative Extension and the State of New York, and was launched in 2006. As a customer service, UWNY provides the current ET number (how many minutes of lawn/garden water is needed as part of a once-every-four days watering cycle) via telephone, local AM radio (since 1994), and the internet (since 2007).

CONSERVATION EDUCATION AND OUTREACH EFFORTS

Since 1993, as part of its education program, UWNY has disseminated customer conservation information widely via mailed advertisements, bill inserts, radio ads, cable television, and public events and presentations. Beginning in 2007, UWNY has published an *Annual Conservation Guide* in the *Journal News* for customers in Rockland County. Among other items, the Annual Conservation Guide provides information on the purchase of water-saving kits that can be installed by customers to minimize water use. Since 2007, the information provided in the print version of the *Annual Conservation Guide* has also been available on the UWNY website.

UWNY's outreach efforts include specific information on xeriscaping (low-moisture landscaping), including recommended plant species, use of mulch to reduce water needs; indoor/outdoor water use conservation tips; and instructions on how to detect water leaks. The xeriscaping program is based on the selection of appropriate plantings and horticultural/ irrigation techniques that make the best use of water. Demonstration gardens using these techniques were installed at UWNY's corporate headquarters in West Nyack in 1993, and at the Lake DeForest Water Treatment Plant starting in 1994. Xeriscaping is also promoted at community events and quarterly bill inserts. Since 2008, UWNY has partnered with a local nursery to provide xeriscape plants at discounted prices via a coupon in UWNY's *Annual Conservation Guide*.

In an effort to increase awareness about the importance of water and to educate future customers, UWNY has formed water education partnerships with two Rockland County school districts, and has plans to expand the reach of this program in the future with the goal of having every student take part in the program at least once during grade school or middle school. Lessons include an explanation of the role of evaporation and rainfall in providing Rockland County's water supply, and a demonstration of the sensible use of water at home.

In addition, UWNY staff members regularly engage customers on the benefits of water conservation and distribute conservation literature at a wide range of public and private events, including business and environmental expositions, street fairs, association meetings, rotaries, gardening clubs, senior clubs, and other functions.

EFFECT OF ONGOING WATER CONSERVATION INITIATIVES ON DEMAND

UWNY's conservation measures, together with changes in New York State law requiring the use of low-flow-fixtures, have been influential in reducing the overall water use patterns in the service area. Based on recent surveys by UWNY (the most recent of which was conducted in 2009), it is estimated that within UWNY's service area approximately two-thirds of showerheads are currently low-flow, 85 percent of toilets are low volume, and three-fourths of faucets are low-flow. Recent surveys also show that customers in the service area appear to be prudent about outdoor water use. Prior to implementation of the ET lawn watering program, a survey of UWNY customers in 1990 found that 90 percent of the customers watered their lawns on a regular basis. In contrast, a more recent survey (2009) found that only 42 percent of customers water their lawn on a regular basis. The per capita water demand of 66.0 gpd for the UWNY system reflects the presence of these conservation measures and practices already in place by UWNY customers.

In comparison to residential water use elsewhere in the U.S. and in Canada, UWNY's residential water use is relatively low. The AWWA Research Foundation conducted a detailed study of residential end uses of water across the U.S. and Canada.[1] This study measured water use in households in 12 systems and found that average water use per household (including indoor and outdoor water use) varied from 192 to 825 gpd per household (with a mean of 400 gpd), The wide range was due to the influence of outdoor water use, and the indoor water use was much more consistent between the systems surveyed. Average indoor water use ranged from 79 to 267 gpd with an average (mean) of 173 gpd per household. On a per capita basis, this indoor water use ranges from 57 to 84 gpd per capita, with an average of 69 gpd per capita.

Comparing UWNY residential water use to the average residential water use identified in the AWWA Research Foundation study, the UWNY average of **total** residential water use per household (209 gpd) is slightly higher than the study's average **indoor** water use (173 gpd) per household. However, on a per capita basis, the UWNY average total residential water use (66.0 gpd per capita) is slightly lower than the study's average indoor water use (69 gpd per capita). For single-family accounts, this number was lower, at 62.2 gpd per person. This suggests that even with outdoor water use, the UWNY residential customers are water efficient relative to other systems. Based on a recent analysis of seasonal water use patterns that compared water use by single-family households in the summer to water use in other seasons, UWNY estimates that the average per capita **indoor** water use of its Rockland County customers is 56.5 gpd per capita. This is below the AWWA study's average indoor water use per capita.

[1] *Residential End Uses of Water*, Mayer et al., AWWA Research Foundation, 1999.

The continuation of these water conservation programs is important in maintaining the level of awareness and current water use efficiency practices within the UWNY service area into the future. However, conservation measures recommended and promoted by UWNY are entirely voluntary on the part of customers, and the sensible use of water by customers is entirely beyond the control and capabilities of UWNY. Moreover, UWNY believes that a large number of its customers already use water-conserving fixtures and practices. For these reasons, the future water demand forecast (discussed in the next section) does not assume any additional gains in terms of water conservation in the future. A sensitivity analysis was conducted to determine what reduction in demand could be achieved if the percent of customers using water-conserving fixtures and practices increases in the future. This sensitivity analysis assumed that residential water use will gradually become more efficient over time, at a rate of 0.1 percent per year. The result of this analysis showed a decrease in future water demand of 0.7 mgd over the baseline forecast. However, given the uncertainty relative to such increases in water conservation by customers, UWNY does not believe that assuming such savings in the water demand forecast is prudent, particularly given the nature of its obligations to provide a safe and reliable public water supply.

C.2.6 PURPOSE AND NEED FOR THE PROJECT

LONG-TERM SUPPLY GAP

As discussed earlier, UWNY's existing water supply system consists of a number of different surface water and groundwater sources that are managed to respond to climatic conditions and seasonal fluctuations in demand. The mix of water sources available to UWNY allows it to provide water to meet the annual average demand and to meet short-term demands, which during peak periods can be 50 to 60 percent higher than the average annual demand. However, during the peak summer/early fall season, meeting the increased demand can be difficult. Furthermore, despite the robustness and flexibility of the system, it can be less reliable during periods with low precipitation.

As Rockland County's population grows, the demand for water will increase, including the peak demand on summer days. As the designated water utility for its service area, which comprises most of Rockland County, UWNY is legally obligated to provide a safe, dependable, and adequate supply of potable water and adequate water pressure and water service to meet firefighting and public safety needs for its service area. Thus, the purpose of the proposed long-term water supply project is to develop an additional reliable and sustainable water supply source that will allow UWNY's Rockland County water supply system to meet the needs for water in Rockland County in the future, consistent with the 2006 and 2010 PSC Rate Orders.

UWNY currently has the capacity to provide 33.9 mgd on an annual average basis, with a peak capacity of 51.44 mgd (sustainable for three days, twice per summer season).[1] By 2015, UWNY has committed to increase those supplies to a total of 34.5 mgd on an annual average basis, with a peak supply of 52.6 mgd.

At the same time, water demand in the service area is projected to grow over the long-term. As noted in the discussion of projected future population in the 2011 Rockland County Comprehensive Plan, "Development pressures will be placed on infrastructure systems that

[1] As noted earlier, this does not account for conditions with the largest supply well out of operation, as recommended in *Ten-State Standards*. This would reduce available supply by approximately 1.5 mgd.

provide water, sewer, waste disposal, energy and telecommunications services. Capacity expansions and system upgrades will be needed to accommodate new development and maintain the quality of service."[1]

The planned future capacity increases will be sufficient to meet the projected demand through 2015, but they will not be sufficient to meet the demand projections in the long-term. The available average and peak supply and projected annual average and peak day demand (with the addition of the Proposed Project) are shown in **Figure D-7** in Exhibit D. By 2015, without a long-term water supply project, the average annual demand will reach the available supply level and by 2018, the peak demand will reach the peak supply, so that it will be difficult for UWNY to meet the increased demands during the summer/early fall period, when demand is typically substantially higher than the annual average.

As part of its mandate to provide safe and adequate water supply service to its New York State customers, UWNY, like all water purveyors, must plan to provide sufficient safe yield in its water supply system. This is consistent with the PSC's regulations (16 NYCRR § 503.4), which require water companies that use surface water sources to take into consideration forecasted growth or decline for at least a 10-year period into the future, and when projections show that demand will exceed supply, the water company "shall undertake all reasonable efforts to reduce and control future demands to bring them into balance with supply. If appropriate, the water corporation shall develop plans, consistent with existing state requirements, to secure additional supply."

UWNY's obligation to provide adequate water is underscored in the language of its water supply permits from NYSDEC for Lake DeForest and Ramapo Valley Well Field, which state the following:

- **Lake DeForest permit:** "It is good engineering practice for a water utility to look to the future and to develop additional sources of supply so that it will be in a position to meet rising demands on its system in the years ahead. This is particularly so in a case such as here, where increased population and industrial development are indicated." [item 21 on page 7]
- **Ramapo Valley Well Field permit:** "The Applicant has an obligation to provide water under all conditions and at all times of the year to meet average and peak demands on its system as these demands arise and to plan ahead to have the necessary sources of supply, transmission, distribution and storage facilities constructed prior to the time such facilities are needed." [item 8 on page 22]

UWNY's future plans to comply with the supply commitments set forth in the 2006 and 2010 Rate Orders are expected to provide adequate capacity to meet average annual and peak-day demands through the end of 2015 and potentially to 2020. However, UWNY currently relies on local water resources that are finite in their capacity to provide a safe supply of drinking water to its customers, and a major long-term water supply project is needed beyond that point to increase the system's safe yield to meet the future water demands of UWNY's service area in Rockland County.

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[1] *Rockland Tomorrow: Rockland County Comprehensive Plan.* Rockland County, adopted March 1, 2011. Chapter 3.0, "Demographics," p. 32.

For prudent water supply planning, this supply should include a margin of error above the projected demand, to ensure that adequate water is available. To ensure that adequate supply is available in the long term, UWNY is seeking to implement a long-term water supply project that can provide 2.5 mgd in additional safe yield by 2016, with the ability to provide up to an additional 5 mgd (for a total of 7.5 mgd) in the longer term future. For prudent long-term planning, and to benefit from economies of scale gained by capital investment in one single project, the long-term water supply project would therefore address the need for 7.5 mgd of additional safe yield while allowing that additional yield to be added incrementally to meet demand as it increases in the future.

Water conservation programs and UWNY's ongoing initiatives to maximize the efficiency and reduce water loss in its system will continue to play an important role in the UWNY's multifaceted strategy to satisfy both its general mandate to provide a dependable supply of water to meet its customers' needs and the specific volume commitments included in the 2006 and 2010 Rate Orders and the Joint Proposals. Water conservation and efficiency programs alone, however, cannot generate the levels of increased supply needed to satisfy the PSC mandates in the 2006 and 2010 Rate Orders, including addressing long-term water demand in Rockland County beyond 2015.

Thus, the purpose of the proposed long-term water supply project is to develop an additional, sustainable water supply source that will increase the safe yield of the UWNY supply system to meet the growing needs for water in Rockland County over the long term, in compliance with UWNY's general legal obligations and the specific mandates included in the PSC's 2006 and 2010 Rate Orders.

WATER SYSTEM MANAGEMENT WITH THE PROPOSED PROJECT

As discussed previously, UWNY's current operational practice is to meet water demands by maximizing the use of Lake DeForest to the extent allowed by its permit and its safe yield, with the remaining water supplied from the other sources. The permit for Lake DeForest allows an annual average withdrawal of 10 mgd, and UWNY's strategy is to take 10 mgd as an annual average from Lake DeForest. During summer months, when demand is highest, UWNY draws larger volumes from Lake DeForest to compensate for the lower volumes that can typically be withdrawn from the Ramapo Valley Well Field during that time. The system wells and Letchworth Reservoirs are used to provide the remaining water needed to meet demand.

The proposed Haverstraw Water Supply Project would introduce a new surface water source to the Rockland County water supply system, the Hudson River. Unlike the reservoirs, smaller rivers, and groundwater sources that currently supply UWNY's system in Rockland County, the Hudson River by virtue of its size and connection to the Atlantic Ocean is far less affected by local drought conditions. For this reason, and for most efficient plant operation, UWNY proposes to operate the Haverstraw Water Supply Project at or close to its design capacity, to provide a steady source of clean water regardless of changes in the hydrologic cycle elsewhere in Rockland County.

With the introduction of the new water supply source, UWNY would continue to operate Lake DeForest in the same manner as it does today to meet water demands, maximizing its use to the extent allowed by its permit and safe yield. The Ramapo Valley Well Field and Letchworth Reservoirs would also continue to be operated as they are today. The addition of the steady supply of Hudson River water would allow UWNY to reliably meet summer demand and, when demand lessens, to rest its supply wells, which can become overdrawn through constant use.

Figure D-8 in Exhibit D illustrates the water supply at various times of the year with Phases 1, 2, and 3 of the Proposed Project in operation. This figure illustrates the conceptual plan for operation of the water system with the Proposed Project in place, assuming non-drought conditions.

PROJECT GOALS AND BENEFITS

The purpose of the long-term water supply project is to provide additional water supply source to increase the safe yield of the UWNY Rockland County water supply system by 7.5 mgd, to accommodate future growth with an adequate margin of safety and comply with the 2006 and 2010 PSC Rate Orders. Consistent with the requirements of UWNY's franchise and its mission as a water supply company, the water supplied must be high-quality drinking water that meets all drinking water standards. Based on this need, and within its capabilities as the Project sponsor, UWNY has identified the following goals and benefits for the Proposed Project.

RELIABLE SUPPLY

The new long-term water supply project must improve the reliability of the water supply system while meeting future demands by introducing a supply that is less dependent on localized precipitation conditions. The Northeast U.S. experiences a short-term drought (i.e., a drought with a duration of one to three months) every one to three years on average, and experiences longer droughts (i.e., greater than three months) once every 20 to 30 years. The long-term water supply project should be developed to be responsive to the occurrence of drought events and the potential effects of climate change on the frequency and severity of droughts and storm events.

The Haverstraw Water Supply Project would improve the reliability of the water supply system while meeting future demands for water by providing a supply of water that is less dependent on climate conditions. Rockland County is currently served by groundwater supplies and reservoirs. Including a drought-tolerant river source adds to the diversity of the water supply portfolio and provides greater flexibility in managing the system.

COST-EFFECTIVENESS

As a public utility, UWNY has a responsibility to its customers (i.e., the rate-payers) to develop a cost-effective project to address the need for new water supply source. Costs to be considered include initial capital expenditures associated with construction of the project and ongoing operations and maintenance costs once the project is complete. To benefit from economies of scale gained by capital investment in, and operation and maintenance of, a single project, the long-term water supply project will most likely be most cost-effective if implemented as a single project, rather a combination of capital projects.

The Haverstraw Water Supply Project has been identified as the most cost-effective of the alternatives available to UWNY for the long-term water supply project.

ABILITY TO BE IMPLEMENTED IN STAGES

To meet future demands for water supply as they develop over time, and thereby minimize unnecessary capital costs to the ratepayers as well as unnecessary environmental effects, the long-term water supply project should have the ability to be implemented in stages. Designing, permitting, and constructing a water supply project is a costly, time-consuming, and resource-

intensive undertaking. Prudent planning compels a water supplier to, when possible, undertake projects that can be expanded efficiently and cost effectively in stages as need arises.

AVOID AND MINIMIZE ENVIRONMENTAL IMPACTS

Consistent with the requirements of New York State's environmental laws, a key goal for the long-term water supply project is to avoid and minimize the potential environmental impacts of the Proposed Project to the maximum extent practicable given the other goals and objectives for the Proposed Project and the capabilities of the Project sponsor. This includes environmental impacts that would potentially occur as a consequence of both the construction and operation of the Proposed Project.

The Haverstraw Water Supply Project has been identified as the project that best meets the goal of mitigating environmental impacts. ✷

Section 4

Exhibit D: General Service Area and Project Location Maps

EXHIBIT D:
GENERAL SERVICE AREA AND PROJECT LOCATION MAPS

7.22.11

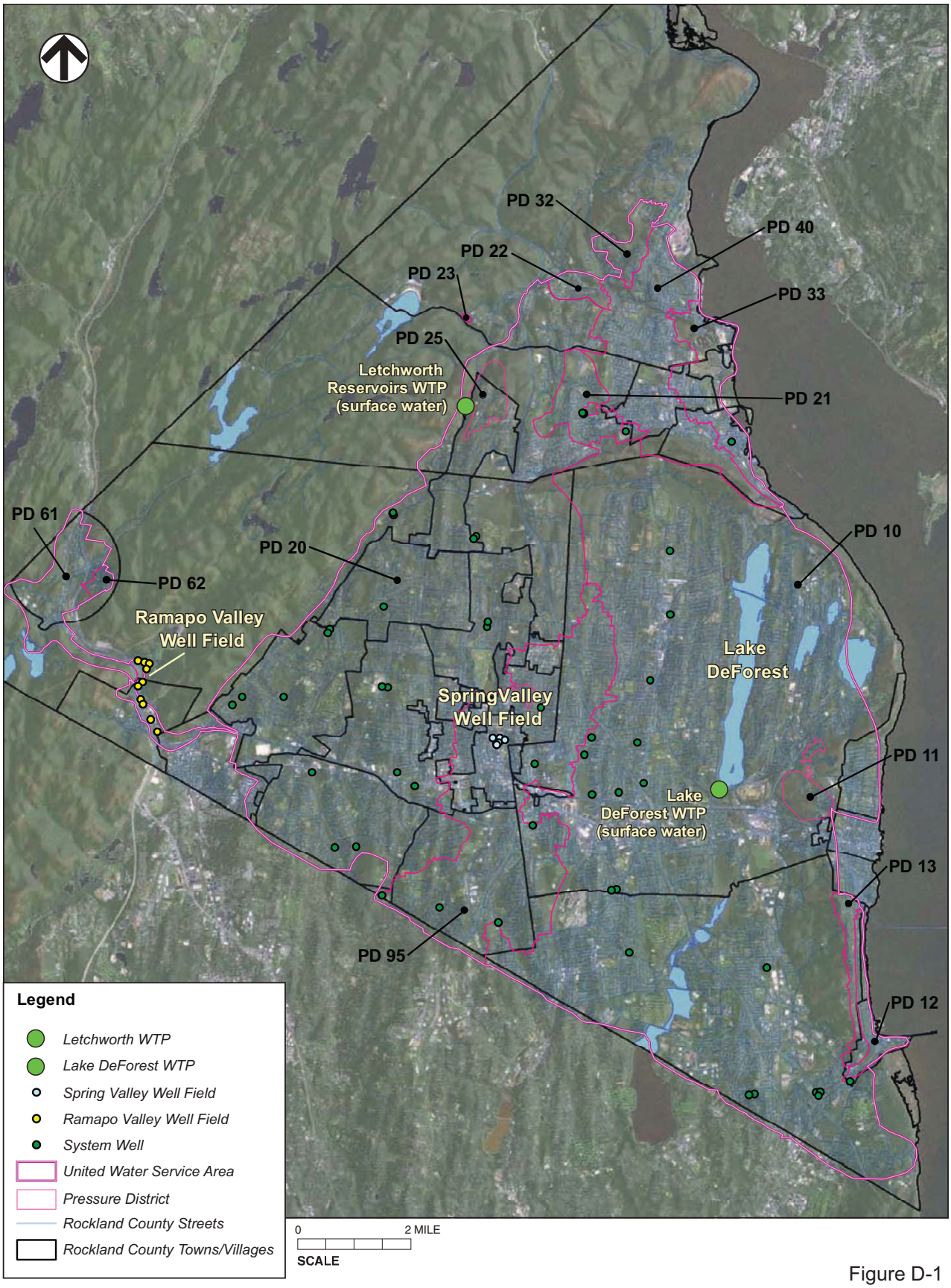
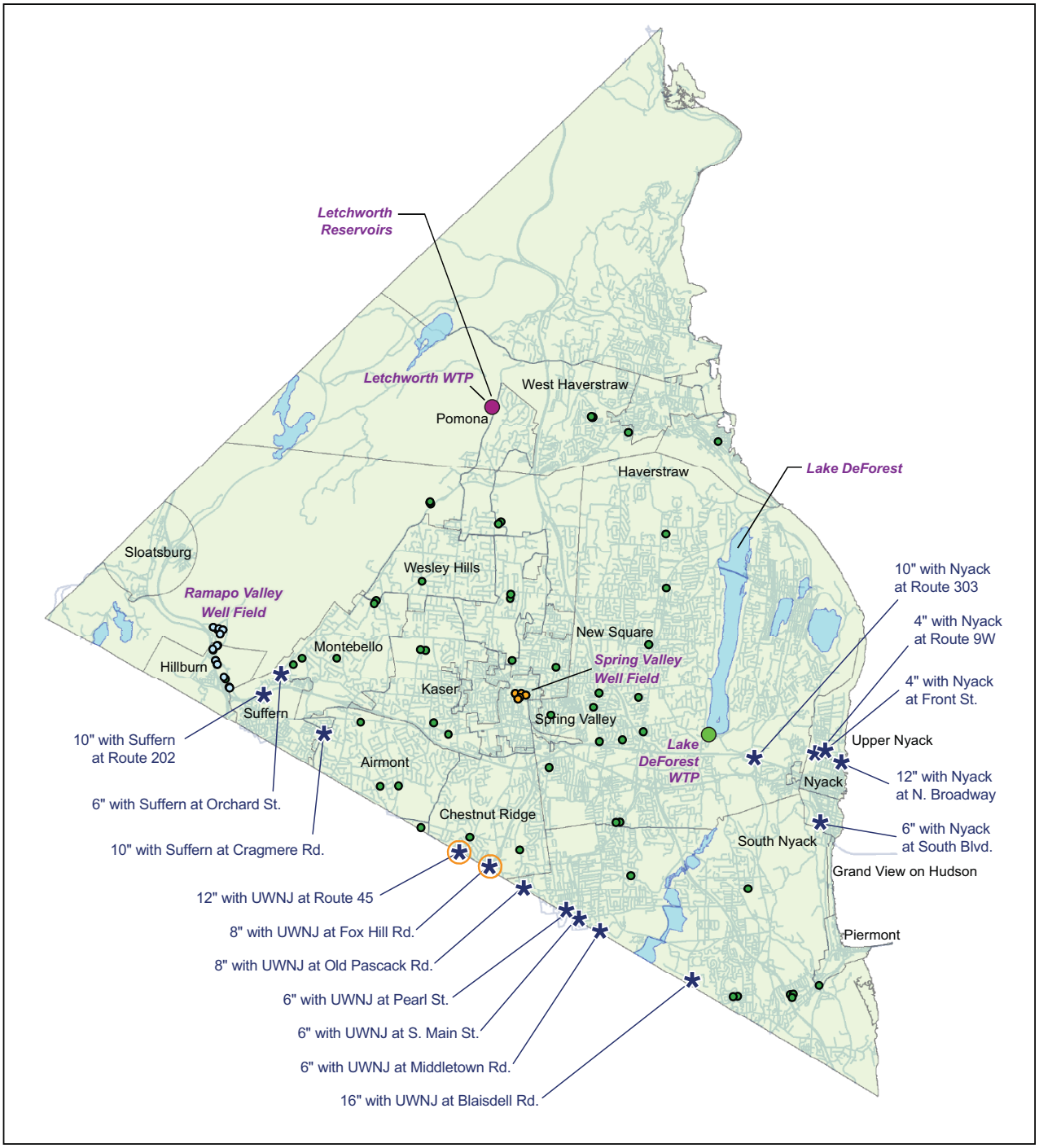


Figure D-1

UNITED WATER Haverstraw Water Supply Project

United Water Rockland County Service Area

7.22.11



Legend

- *Letchworth WTP*
- *Lake DeForest WTP*
- *Spring Valley Well Field*
- *Ramapo Valley Well Field*
- *System Wells*
- *Operating Interconnections with Other Systems*
- *Emergency Interconnections with Other Systems*
- *Rockland County Streets*
- *Rockland County Towns/Villages*

0 2 4 MILES
SCALE

UNITED WATER Haverstraw Water Supply Project

Figure D-2

Existing United Water Rockland County Water Supply System

7.22.11

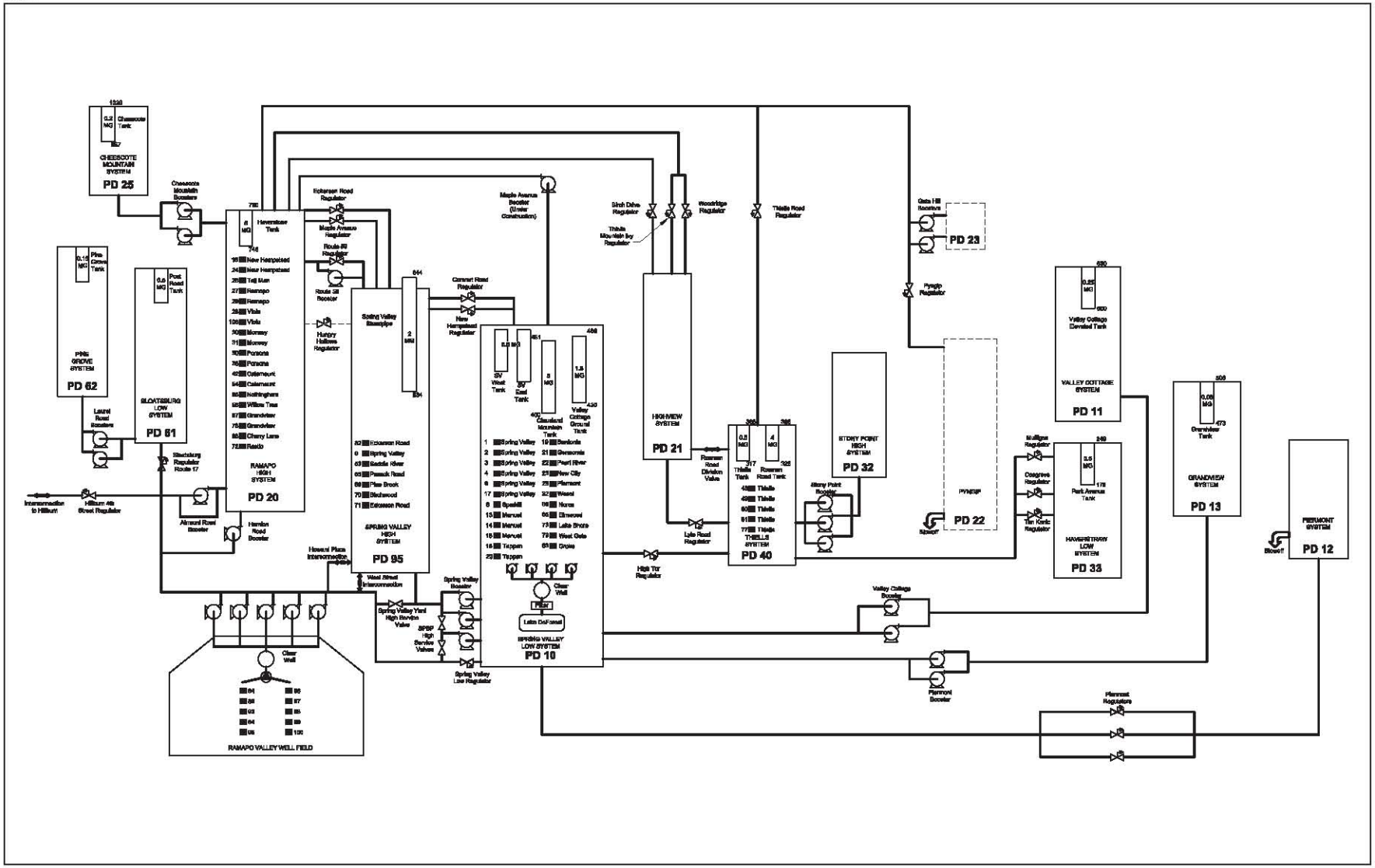


Figure D-3

UNITED WATER Haverstraw Water Supply Project

United Water System Facilities

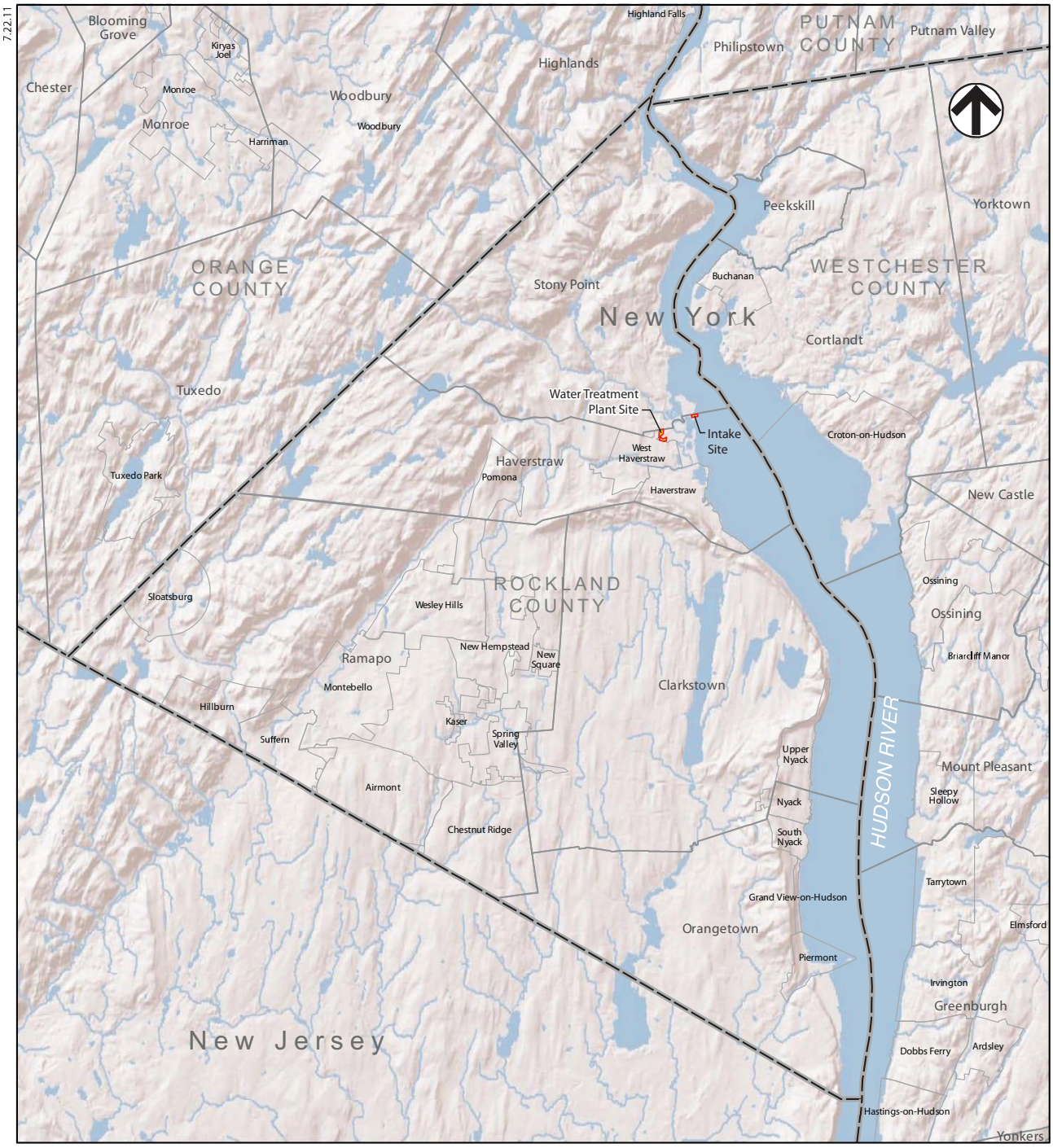


Figure D-4

Project Location

UNITED WATER Haverstraw Water Supply Project

12 2 11

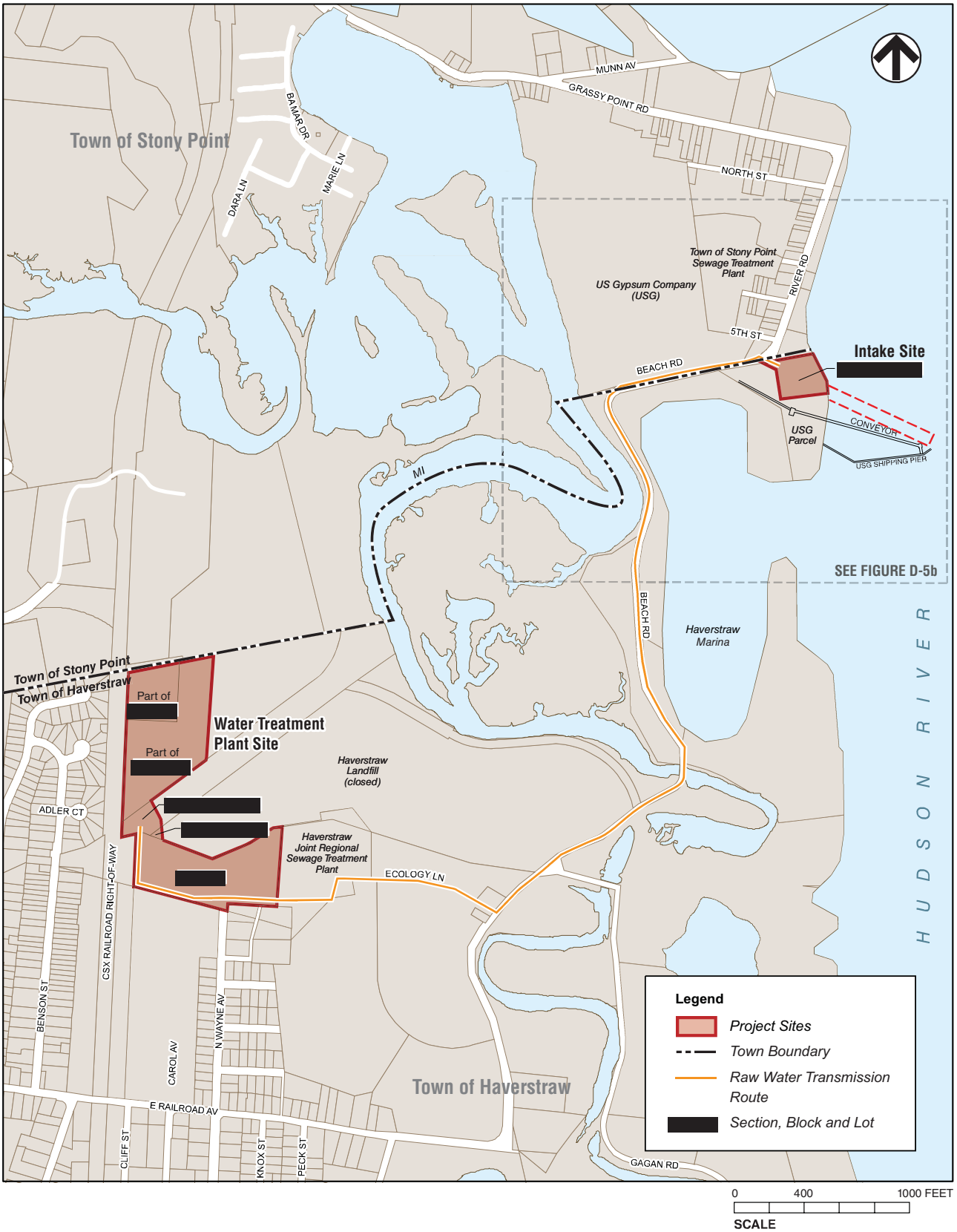


Figure D-5a

UNITED WATER Haverstraw Water Supply Project

Acquisition Map - Water Treatment Plant Site

Revised December 2011

12.2.11

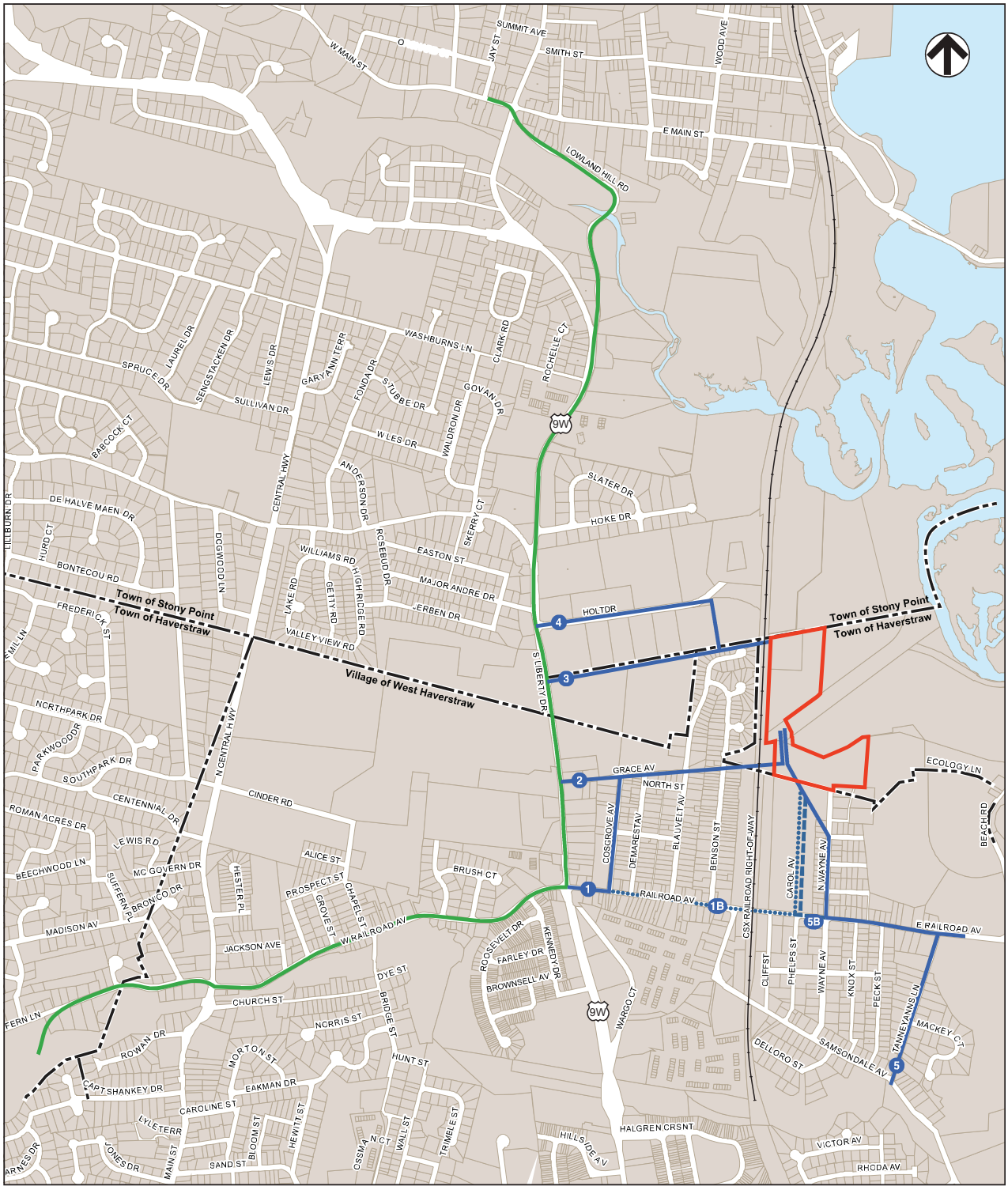
Revised December 2011

Figure D-5b

UNITED WATER Haverstraw Water Supply Project

Acquisition Map - Intake Site

7.22.11



Water Treatment Plant Site

Potential New Potable Water Main Routes

Potential Rehabilitation or Replacement of Existing Main

0 2000 FEET

SCALE

Figure D-6

UNITED WATER Haverstraw Water Supply Project

Potential Potable Water Main Routes

7.22.11

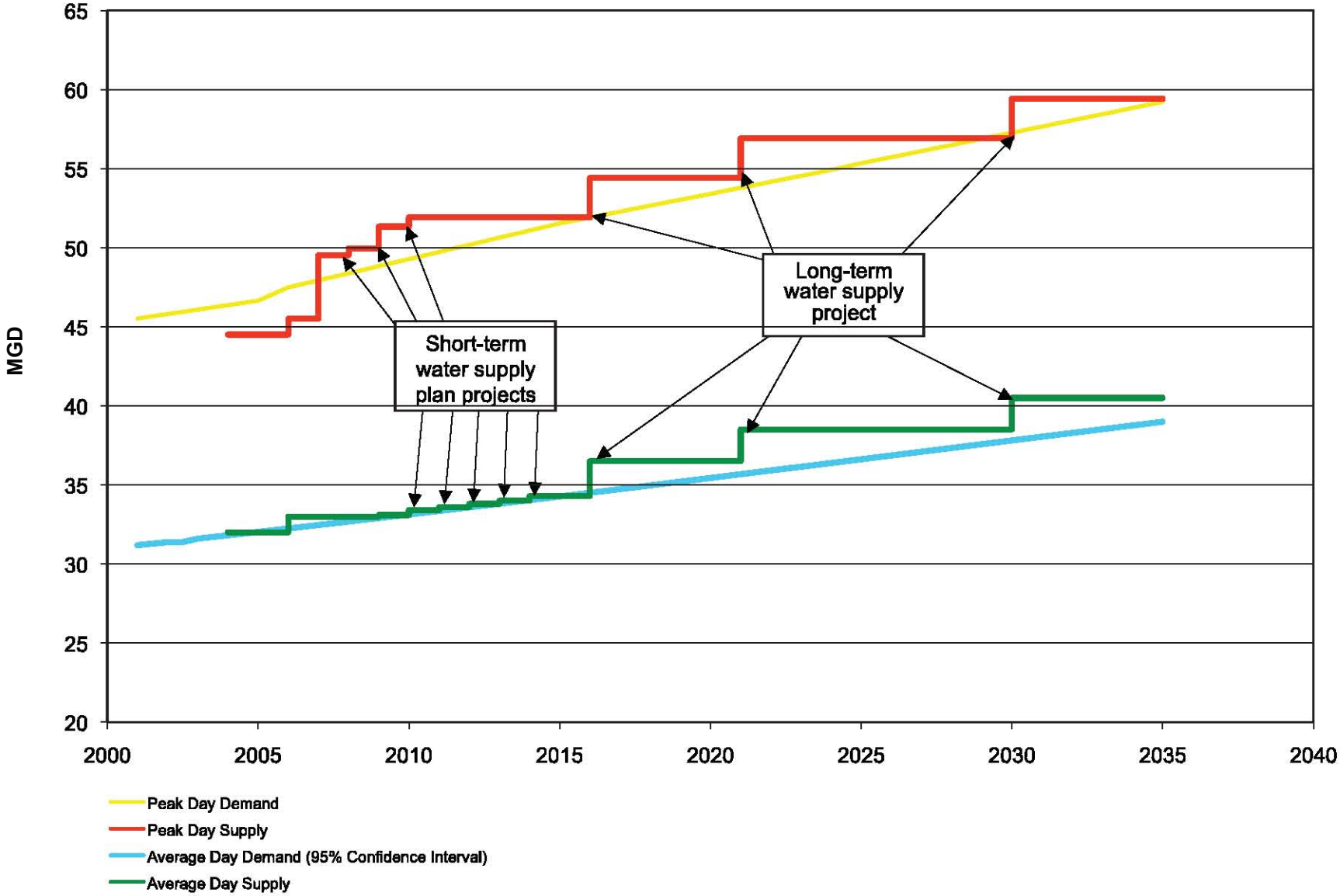
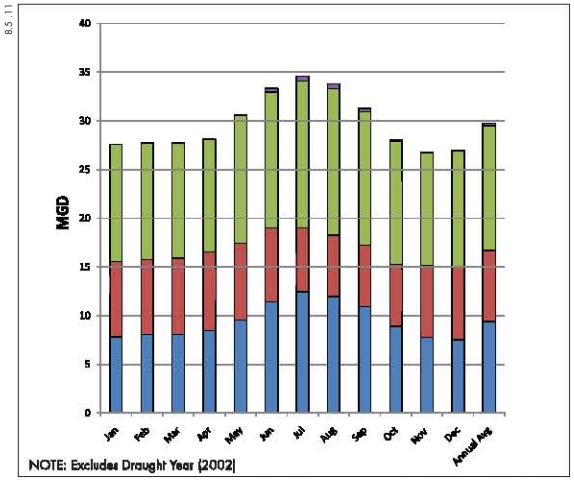
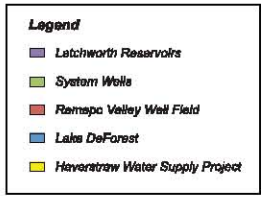


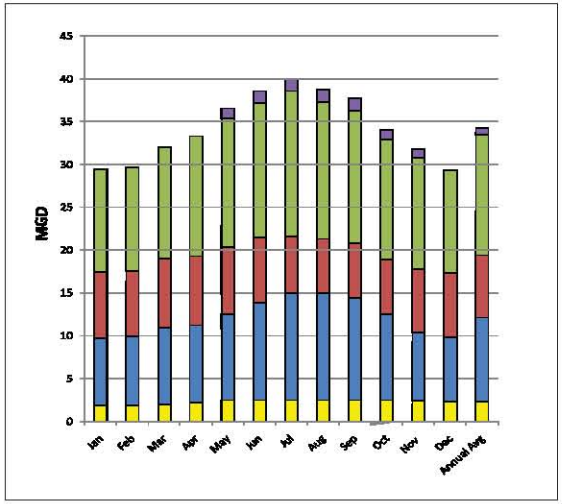
Figure D-7

Water Demand Projections vs. Available Supply With Long-Term Water Supply Project

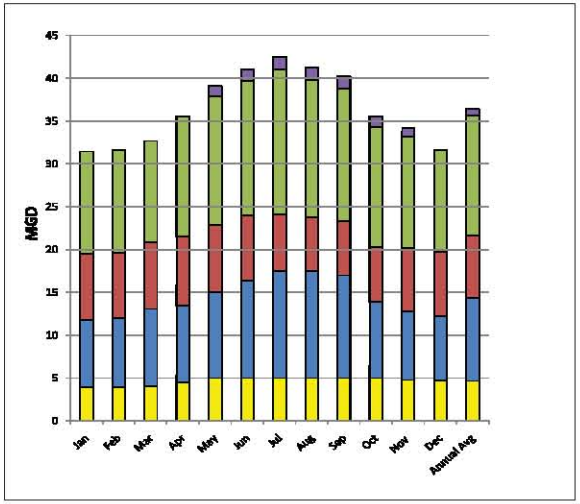


Existing Monthly Average Day Supply (2000 - 2010)

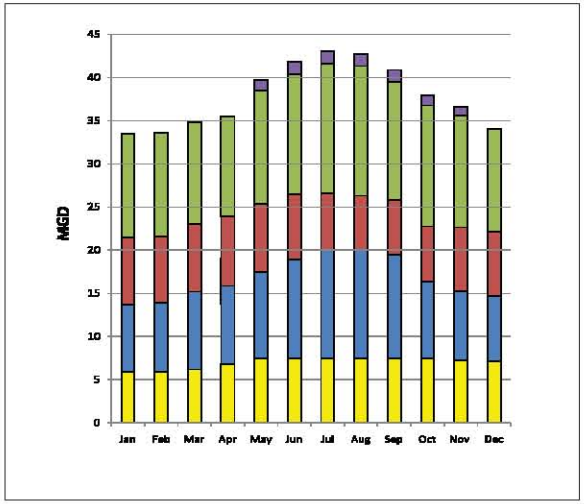




Future Monthly Average Day Supply with Haverstraw Water Supply Project
Phase 1, 2015



Future Monthly Average Day Supply with Haverstraw Water Supply Project
Phase 2, 2020



Future Monthly Average Day Supply with Haverstraw Water Supply Project
Phase 3, 2030

Figure D-8

Illustrative Monthly Average Day Supply without and with the Proposed Project

7.27.11

Background Topo Map: National Georgraphic Society, U.S. Geological Survey
Watershed Boundaries: U.S. Geological Survey, U.S. Dept. of Agriculture, NY State Dept. of Environmental Conservation

0 1/2 1 Mile
SCALE

Project Sites

Watershed Boundary

Figure D-9
Watershed

UNITED WATER Haverstraw Water Supply Project

Section 5

Exhibit E: Engineer's Report

EXHIBIT E:
ENGINEER'S REPORT

United Water New York Inc.

Haverstraw Water Supply Project

NYSDEC Water Supply Application

September 2011

Engineer's Report

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Section 1
Introduction

1.1 Background

1.1.1 United Water New York

United Water New York Inc. (UWNY) is a U.S. corporation incorporated in accordance with the laws of New York State. UWNY's parent company is Suez Environnement S.A., a French company. As a U.S. corporation, UWNY is subject to the rules and regulations that apply to businesses in the United States. UWNY is the successor to the Spring Valley Waterworks and Supply Company, founded in 1893 to provide water to Rockland County. Together, these companies have been providing water to Rockland County for more than 100 years.

UWNY is a public utility/water-works corporation organized under Article 4 of the New York Transportation Corporations Law (TCL). The TCL applies to "transportation corporations," law include gas, electric, telephone, waterworks, sewage works, steam, ferry, pipe line, and freight terminal corporations. Pursuant to its tariff established under TCL § 42, and New York Public Service Law § 89-b, UWNY is legally required to supply the inhabitants of its service area with "pure and wholesome water, at reasonable rates."

UWNY provides a public water supply system, including drinking water and water for fire protection, to the residents and businesses in Rockland County, New York, excluding the Villages of Suffern, Nyack, and South Nyack. UWNY also serves a small portion of Orange County (in portions of the Towns of Tuxedo, Warwick, and Monroe). Its mandate, like all water suppliers, is to provide a dependable, adequate supply of water to meet the needs for domestic water use and firefighting, and to provide water that meets or exceeds all safe drinking water standards.

1.1.2 2006 Rate Order and Joint Proposal

On December 14, 2006, the New York State Public Service Commission (PSC) issued an Order concluding two rate cases initiated by UWNY and a sister company, United Water South County. These two rate cases, Case 06-W-0131 and 06-W-1244, were consolidated and considered as one by the PSC (referred to in this report as the "2006 Rate Case").[1] This PSC Order (as noted earlier, referred to throughout this report as the "2006 Rate Order") approved a proposed merger between two United Water affiliated companies, UWNY, and United Water South County Water Inc., and established the terms of the rate plan for the merged company.

Sections XI and XIII, and related Exhibits 8 through 11, of the 2006 Joint Proposal set forth a plan for increasing the available water supply in the future to meet projected

[1] *Cases 06-W-0131 and 06-W-0244 – Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of United Water New York Inc. and United Water South County for Water Service*, Order Approving Merger and Adopting Three-Year Plan (issued and effective December 14, 2006).

demands, including milestones for implementing new supplies and penalties if the milestones are missed. Section XI of the 2006 Joint Proposal states:

> The Parties agree that it is in the customers' best interest and in the public interest for the Company [UWNY] to accelerate its development of new sources of supply. It is understood and agreed that the development of the commitments discussed in Section XIII and Exhibit 11 increase supply, meet the supply needs of Rockland County and specifically consider the development allowed under current land use control throughout Rockland County and the Town of Ramapo's Comprehensive Plan. All parties contributed to the development of these commitments.[2]

Exhibit 8 of the 2006 Joint Proposal includes a list of projects that could be undertaken to meet the water supply goals in the short and medium-term (with anticipated in-service dates in 2008 and 2009). However, the 2006 Joint Proposal commits UWNY to meet specific increases in supply rather than to implement the projects listed. The peak and yearly average day volume commitments that must be met through 2015 are listed in Exhibit 11 of the 2006 Joint Proposal. The commitments presented in Exhibit 11 of the 2006 Joint Proposal will increase the total three-day sustainable peak supply by 7.1 million gallons per day (mgd) by 2015, over the existing 45.5 mgd in 2006; and will increase the yearly average daily supply by 1.5 mgd by 2015, over the existing 33 mgd in 2006.

In addition, to address the need for increased supply beyond 2015, the 2006 Joint Proposal also requires UWNY to implement a long-term water supply project and sets forth milestone commitments related to planning, analysis, permits, and construction of that long-term water supply project so that it will be in service by the end of 2015.

1.1.3 2010 Rate Order and Joint Proposal

On July 20, 2010, the PSC issued an Order concluding a rate case initiated by UWNY in 2009, Case 09-W-0731.[3] This Rate Order (the 2010 Rate Order) approved a new rate plan for UWNY for the three-year period beginning in September 2010 and adopted and incorporated the terms of a Joint Proposal, dated April 20, 2010, (the 2010 Joint Proposal) as modified by the 2010 Rate Order, representing the agreement in principle reached by all active parties in the case. The parties to the 2010 Joint Proposal were UWNY and staff of the Department of Public Service.

While the terms of the 2010 Rate Order relate primarily to the three-year rate increase, the 2010 Rate Order also continues the obligations of the 2006 Rate Order, including the new water supply source volume and construction milestones and hydrant maintenance schedules established in 2006 Rate Order. The new water supply source

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[2] 2006 Joint Proposal, p. 11.

[3] *Case 09-W-0731 - Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of United Water New York Inc.*, Order Adopting Joint Proposal as Modified and Establishing a Three-Year Rate Plan (issued and effective July 20, 2010).

component of the 2010 Rate Order constitutes the regulatory mandate and establishes the need for the Proposed Project described in this report (which had previously been established in the 2006 Rate Order). During the 2010 Rate Case, the Town of Ramapo and other entities argued that the PSC's 2006 Rate Order notwithstanding, there was no need for a long-term water supply project. Among other things, the Town of Ramapo argued that United Water could eliminate the need for a long-term water supply project by stopping the release of water from Lake DeForest for downstream users (see the discussion in section 1.3.1.1.1 below). By reconfirming in the 2010 Rate Order the mandate of the 2006 Rate Order regarding the need for a long-term water supply project, the PSC rejected the argument that there was no need for the Proposed Project. In the 2010 Rate Order, the PSC also found that given the financial investment UWNY has already made for the long-term water supply project, the incentive mechanism (i.e., the performance payments) is no longer necessary or applicable.

1.2 Purpose and Scope

The New York Environmental Conservation Law establishes NYSDEC as the conservator of New York State's water resources and provides NYSDEC with the power to control, regulate, and preserve the water resources of the entire state. In addition, as part of its role, NYSDEC, together with NYSDOH, administers the state's public water supply program. A NYSDEC water supply permit is required before a person or public corporation may "acquire, take or develop any source of water supply in connection with a new water supply system;" or "acquire, take, or develop any new or additional source of water supply in connection with an existing water supply system," among other actions.[4]

NYSDEC regulates New York State water supply under Title 15 of Article 15 of the New York Environmental Conservation Law (ECL). Under Title 15 and its implementing regulations (6 NYCRR Part 601), drinking water supply is regulated by NYSDEC through public water supply application (WSA) permits, which set the withdrawal amounts and other conditions under which drinking water can be withdrawn from each drinking water source (6 NYCRR Part 601). In accordance with 6 NYCRR § 601.6, to issue a water supply permit, NYSDEC must determine: (1) that the proposed project is justified by the public necessity; (2) that the applicant properly considered other sources of water supply that are or may become available; (3) that all work and construction connected with the project will be proper and safe; (4) that the water supply will be adequate to meet the needs of the proposed service area; (5) that there will be proper protection and treatment of the water supply and watershed; (6) that the proposed project is just and equitable to all affected municipalities and their inhabitants, and in particular with regard to their present and future needs for sources of water supply; and (7) that any property acquisition is fairly compensated. In accordance with ECL § 15-1503(1), each applicant for a water supply permit must document its existing and future water conservation plans as part of the permit review process.

[4] 6 NYCRR § 601.3.

The purpose of this Engineer's Report is to demonstrate that the Haverstraw Water Supply Project is a necessary, technically sound means of fulfilling UWNY's long term water supply requirements identified in 2006 Rate Order and the 2010 Rate Order. This Engineer's Report shows that the project adequately meets the future needs of the service area, is justified by public necessity, properly protects the contributing water supply source and watershed, and provides adequate treatment in compliance with drinking water regulations. The following key aspects of the Haverstraw Water Supply Project are presented in subsequent sections of this report.

- Historical and current water use trends combined with water demand projections directly support the need for additional long term water supply capacity.
- Vulnerable condition of the existing supply under drought conditions.
- The Haverstraw Water Supply Project will provide increased long term water supply capacity and introduce a new, more reliable water source, the Hudson River, which is not impacted by local drought conditions.
- Water quality data from the vicinity of the proposed intake location in the Hudson Rivers shows that it is an acceptable drinking water source.
- Due to the vast size of the Hudson River it will sufficiently support the proposed withdrawal quantities for the Haverstraw Water Supply Project.
- The Haverstraw Water Supply Project will comply with all drinking water regulations.

Additional aspects of the project will be addressed as follows: (1) the ongoing environmental review for the project will ensure that all other possible water sources were considered, while maintaining a just and equitable approach for all the affected municipalities; (2) UWNY is undergoing negotiations with U.S. Gypsum Company (USG) for the necessary land acquisition; and (3) the project will be designed and constructed based on sound engineering practices.

1.3 Project Description

The Proposed Project entails the development and operation of a new water intake, intake pumping station, and water treatment facility in the Town of Haverstraw, Rockland County, New York. The Proposed Project would collect and treat water from the Hudson River and deliver up to 7.5 mgd of potable water to the existing UWNY distribution system serving Rockland County, for the exclusive use of UWNY's Rockland County customers.

The Proposed Project would allow UWNY to increase the capacity of its water supply system to meet the projected future demands for water in Rockland County, and therefore is critical to UWNY's ability to continue to provide water for the county,

including providing adequate quantity, quality, and water pressure to meet the projected future demands for county residents, businesses, and firefighting capabilities.

The Proposed Project would draw water through an intake structure located in Haverstraw Bay in the Hudson River, through an intake pumping station to a water treatment plant via a raw water transmission main. At the water treatment plant, water would be treated to remove impurities, including salinity. The potable water would be transmitted from the plant via new underground water transmission mains that would connect to UWNY's existing water distribution network. The impurities and salinity removed from the water would be processed and disposed of in accordance with applicable laws and regulations.

1.3.1 Project Sites

The sites where the Project's facilities would be located (the Project Sites) would be as follows:

- **Intake Site:** This approximately one-acre parcel (as well as additional land underwater) located on the south side of Beach Road along the Hudson River would house the intake pumping station that would pump water from the river. The site, currently owned by the USG, is vacant land used for off-season boat storage by the Haverstraw Marina and is adjacent to the enclosed conveyor that is used by USG to move supplies from barges that dock at a USG pier in the Hudson River.

- **Hudson River:** Water would be withdrawn from the Hudson River through an intake system (described below). It is anticipated that the water intake pipeline would extend from the shoreline of the Intake Site approximately 900 feet into the Hudson River offshore of the Intake Site. The pipeline would be installed in a tunnel buried below the river bottom.

- **Water Treatment Plant Site:** This 15.38-acre vacant site located to the west and south of the closed Town of Haverstraw Landfill would house the water treatment plant. Most of the Water Treatment Plant Site (the northern portion) is a reclaimed area located within the boundary of the now-closed Haverstraw Landfill, and is owned by the Town of Haverstraw. The southern portion of the Site is a privately owned vacant parcel currently owned by DSB Realty Associates, LLC.

- **Raw Water Transmission Main:** Untreated ("raw") water pumped from the Hudson River by the intake pumping station would be transmitted to the water treatment plant site via an underground raw water transmission main.

- **Potable Water Distribution Mains:** Potable water from the water treatment plant would be transmitted to existing mains in UWNY's water distribution system via new connections from the water treatment plant.

1.3.2 Water Treatment Facilities and Processes

1.3.2.1 Raw Water Intake System

Raw water to be supplied to the new Water Treatment Plant would be pumped from the Hudson River through an intake system consisting of an intake structure in the Hudson River, approximately 900 feet from the shoreline, an intake pipeline from the structure to the shore, and intake pumping station on the Intake Site. The intake pumping station would consist of a single building, approximately 3,000 square feet in size, which would house the pumps, electrical and mechanical systems, air compressors, and other equipment.

The intake system would be designed to minimize adverse effects to aquatic resources in the Hudson River. The intake in the river would use five 36-inch cylindrical-shaped wedge-wire screens with a small slot size (0.5-millimeter), which would minimize potential adverse effects to aquatic resources related to potential impingement (in which aquatic resources are pulled against the screen) or entrainment (in which they are drawn into the intake). The intake system would be supported on deep foundations (piles) that would extend 180 to 200 feet below the river mudline. The intake screens would be located a minimum of four feet above the river bottom while the top of the screens would be approximately 7.36 feet below the water surface at mean low low water (MLLW). An air cleaning system would be used to periodically clean the intake screens of debris and to prevent biofouling, and a chemical cleaning system would be used to clean the interior of the raw water intake line. Beneath the river bottom, a 7-foot diameter raw water intake sleeve would house the intake water pipe, air supply lines for the air cleaning system, and small-diameter chemical cleaning supply lines for the chemical cleaning system that would be used to clean the inside of the pipes. The air cleaning system would consist of an air compressor and compressed air receiver at the Intake Site, and five 6-inch air supply lines within the intake sleeve. The chemical piping would be contained within a carrier pipe within the pipe casing that also houses the raw water intake pipe. Chemicals in the piping would not be able to leak into the river.

The raw water intake system would be operated to draw high quality water from the river each day. To produce 7.5 mgd of treated water, a maximum volume of 10 million gallons would be withdrawn from the Hudson River during a 24-hour period. It would be pumped from the intake pumping station into raw water storage tanks at the water treatment plant, from which it would be drawn for treatment.

The raw water transmission main would transmit the raw water to the Water Treatment Plant Site via a new 30-inch-diameter raw water transmission force main buried primarily beneath public streets. Under normal conditions the raw water will not be altered until it reaches the Water Treatment Plant for subsequent treatment.

Periodically, sodium hypochlorite will be added to the raw water at the intake pump station to control biofouling in the intake line and raw water transmission main. The chlorinated water will be subsequently dechlorinated in the water treatment process.

1.3.2.2 Water Quality Monitoring

At the intake pumping station, water quality would be continuously monitored to detect any significant change in river water quality that could affect finished water quality before it is processed at the water treatment plant. In the event that potential contamination events occur, the water quality monitoring would allow maximum response time from the point the water is withdrawn from the river to when it enters the treatment process. The system would be tied to UWNY's greater Supervisory Control and Data Acquisition (SCADA) system (discussed below) to allow remote, real-time monitoring by the water treatment plant operators. When a potential contamination event is identified, the possible responses that may be taken can include confirmatory and more frequent water quality sampling and laboratory analysis; adjustment to process operating conditions to mitigate potential upsets; and temporary shutdown of the intake pumping station until the anomalous condition dissipates or until such time that the river water quality is determined to be acceptable.

1.3.2.3 Water Treatment Process

The water treatment plant would consist of an integrated series of interconnected buildings sized to house the water treatment equipment, as well as storage tanks, potable water reservoirs, pumps, and chlorine basins.

The water drawn from the Hudson River would be subjected to a rigorous multi-step treatment process to ensure that it meets all applicable health standards and is compatible with the other water in UWNY's Rockland County system. This would provide multiple barriers for removing various water quality parameters of concern, to allow the finished water to meet or exceed all applicable drinking water standards. The potential water treatment process that may be used at the water treatment plant, based on conceptual designs, would include the following:

- **Pretreatment for solids removal:** Pretreatment consists of a combination of processes to remove particles that are suspended in the water (i.e., turbidity), including coagulation, flocculation, and sedimentation. Chemicals including acid for pH adjustment and coagulant are added in this step to maximize the removal of suspended and colloidal particulates in addition to certain dissolved inorganics. The resulting sludge is processed further for volume reduction and disposed of offisite. Powdered activated carbon (PAC) may also be added during pretreatment to improve removals of dissolved organics through adsorption. Spent PAC will be removed and disposed along with the settled sludge.

- **Filtration:** Following pretreatment, the filtration process (currently proposed to use microfiltration/ultrafiltration [MF/UF]) would remove the remaining particulate matter and provide a barrier to bacteria and viruses. Solids removed in the filtration step are periodically backwashed from the filters and are subjected to further processing. These solids are ultimately combined with the solids from the pretreatment step and disposed of offsite.

- **Reverse Osmosis (RO)**: Following filtration, the process water would be free of suspended solids, at which point it would be subject to a RO treatment system that would force water under high pressure through semi-permeable membranes to remove dissolved constituents, such as salts and most organic constituents, from the filtered water as required based on the raw water salinity. The residual water and dissolved constituents which are rejected by the RO membranes are discharged as a concentrated brine solution (i.e., RO concentrate). In the process, chemicals including acid, antiscalant, and sodium bisulfate may be added. The RO concentrate will be discharged back to the Hudson River through the existing Haverstraw Joint Regional Sewage Treatment Plant (JRSTP) outfall (SPDES #: NY 002 8533). The RO concentrate would be sent by force main to the effluent junction box at the JRSTP, where it would be discharged in accordance with a SPDES permit into the JRSTP's effluent pipe.

- **Removal of Organic Contaminants**: The treatment process currently includes the use of PAC. In the future it is possible that after pre-treatment and RO processing, the water would be re-filtered by passing it through a granular activated carbon (GAC) unit to remove organic contaminants. If GAC is added to the treatment system, it would replace the use of PAC.

- **Post-treatment:** This final step would stabilize the water and provide for disinfection.

- **Finished Water Storage and Pumping:** Finished (treated or potable) water would flow to the above-grade finished water storage reservoirs where a corrosion inhibitor is added prior to the water being pumped through new potable water main connections. Potable water distribution mains would extend from the new water treatment plant to connect to existing UWNY distribution water mains. At this time, several options for the potable water main routes are under consideration.

1.3.2.4 Residuals Processing

The water treatment process would produce several waste products (residuals). The main residual streams that would need to be disposed include wastewater created during the water treatment process; solids removed during the water treatment process; and the RO concentrate produced by the RO membrane process.

A number of the treatment trains used in the water treatment process would produce wastewater. Most of this would be recycled to the head of the water treatment plant for re-use in the water treatment process. Some wastewater, including flows from clean-in-place (CIP) maintenance procedures and other cleaning procedures would be sent to the JRSTP, which is adjacent to the Water Treatment Plant Site, via the existing sanitary sewer. The wastewater from the water treatment process would be sent to the head of the JRSTP for treatment. UWNY would obtain an Industrial Wastewater Discharge Permit for the Proposed Project from the Joint Regional Sewage Board for this waste.

Solids removed by the pretreatment, and MF/UF processes would be in the form of a liquid sludge. The sludge would be thickened in sludge thickeners and dewatered in belt filter press units at the water treatment plant. The resulting dewatered sludge, or sludge "cake," would then be disposed of at a suitable off-site facility, similar to sludge from the other water treatment plants UWNY operates in Rockland County. Alternatively, the thickened sludge from the water treatment process could instead be conveyed to the JRSTP for dewatering and handling with the sludge produced by the JRSTP's wastewater treatment process.

The concentrate generated by the RO process (RO concentrate, or brine) would be sent by force main to the effluent junction box at the JRSTP, where it would be discharged in accordance with a SPDES permit into the JRSTP's effluent pipe. The RO concentrate would use the same outfall pipe into the Hudson River as the JRSTP's effluent.The RO concentrate will be added to the JRSTP secondary effluent at the existing effluent junction box. From the junction box, the flow is conveyed via underground pipe to the JRSTP outfall diffuser (Outfall 001) located in Haverstraw Bay, just south of the Town marina. In this way, the high salinity in the RO concentrate would be mixed with the greater volumes of non-saline effluent being discharged to the river.

1.3.3 Project Phasing

The Proposed Project is being designed to treat and deliver up to 7.5 mgd of potable water for the exclusive use of UWNY's Rockland County customers. When the facility opens for operation, it would initially treat and deliver up to 2.5 mgd of potable water. As Rockland County's water demand increases, the Proposed Project would be expanded to meet that demand, with the ultimate capacity at 7.5 mgd. Except where otherwise noted, this report describes the Proposed Project at its full capacity of 7.5 mgd. As described in Section 3, "Purpose and Need," the projected future water demand is consistent with population forecasts prepared by planning agencies and independent institutions.

The Proposed Project would be implemented in three separate phases, based on growth in water demand as Rockland County's population increases. Water treatment capacity would be added in phases to meet demands rather than building the complete water treatment plant at once; the intake, intake pumping station, and raw water transmission mains would be constructed to accommodate full production

capacity. The three phases for the Proposed Project are summarized in Table 1-1 and described below.

Table 1-1
Phasing of the Proposed Project

Phase	Finished Water Production Capacity	In-Service Date
Phase 1	2.5 mgd	2015
Phase 2	5.0 mgd	Estimated 2020
Phase 3	7.5 mgd	Estimated >2030

By the end of 2015, the initial phase of the Proposed Project would be ready for operation. By that time, the intake pumping station and water treatment plant would be constructed and operating to meet an initial production capacity of 2.5 mgd. The intake system and the raw water transmission line would be constructed to accommodate the ultimate build-out production capacity of 7.5 mgd to eliminate subsequent disruptions when the facility is expanded. As demand for water increases, by approximately 2020, additional treatment plant equipment would be installed to bring production to 5.0 mgd. A third phase would increase the capacity of the intake pumping station and the treatment capacity of the water treatment plant to accommodate an ultimate projected production capacity of 7.5 mgd.

Section 2
Existing System Information

2.1 United Water Rockland County Water Supply System

Rockland County is located on the west side of the Hudson River approximately 12 miles north of New York City. Rockland County consists of the Towns of Orangetown, Ramapo, Clarkstown, Haverstraw, and Stony Point. Within those towns are 19 incorporated villages. The southern border of Rockland County adjoins the northern borders of Bergen County and Passaic County, New Jersey.

United Water New York (UWNY) is responsible for providing water to the residents and businesses of Rockland County, excluding the Villages of Suffern, Nyack, and South Nyack. Within this "service area," the great majority of the water is supplied by UWNY, with a small amount supplied by private wells for locations that are not served by UWNY's infrastructure or for users who choose not to use UWNY's supply. UWNY also supplies water to the businesses, institutions, and parks in Rockland County, including the Palisades Interstate Park system. In addition to potable water for its customers, UWNY also provides water for fire suppression via fire hydrants and fire system connections throughout the service area.[1] Figure 2-1 illustrates UWNY's service area. The existing water supply system, including the water sources and distribution system as well as how the system is managed, are described in this section of the report.[2]

2.1.1 Water Sources

UWNY's existing water supply system in Rockland County is composed of a combination of surface water and groundwater supplies. These include: two surface water supplies, the Lake DeForest and Letchworth Reservoirs, in the Towns of Clarkstown and Haverstraw, respectively, which together provide approximately 32 percent of the water supplied annually by UWNY on an average daily basis; the Ramapo Valley Well Field in Ramapo, which provides 24 percent of the average daily supply; and approximately 50 additional active system wells located throughout Rockland County, which provide the remaining 44 percent of the average daily supply.[3] These water supply elements are shown in Figure 2-1 and described below.

The discussion in this section describes the capacity of each water source in terms of its safe yield, average supply, and peak supply, as follows:

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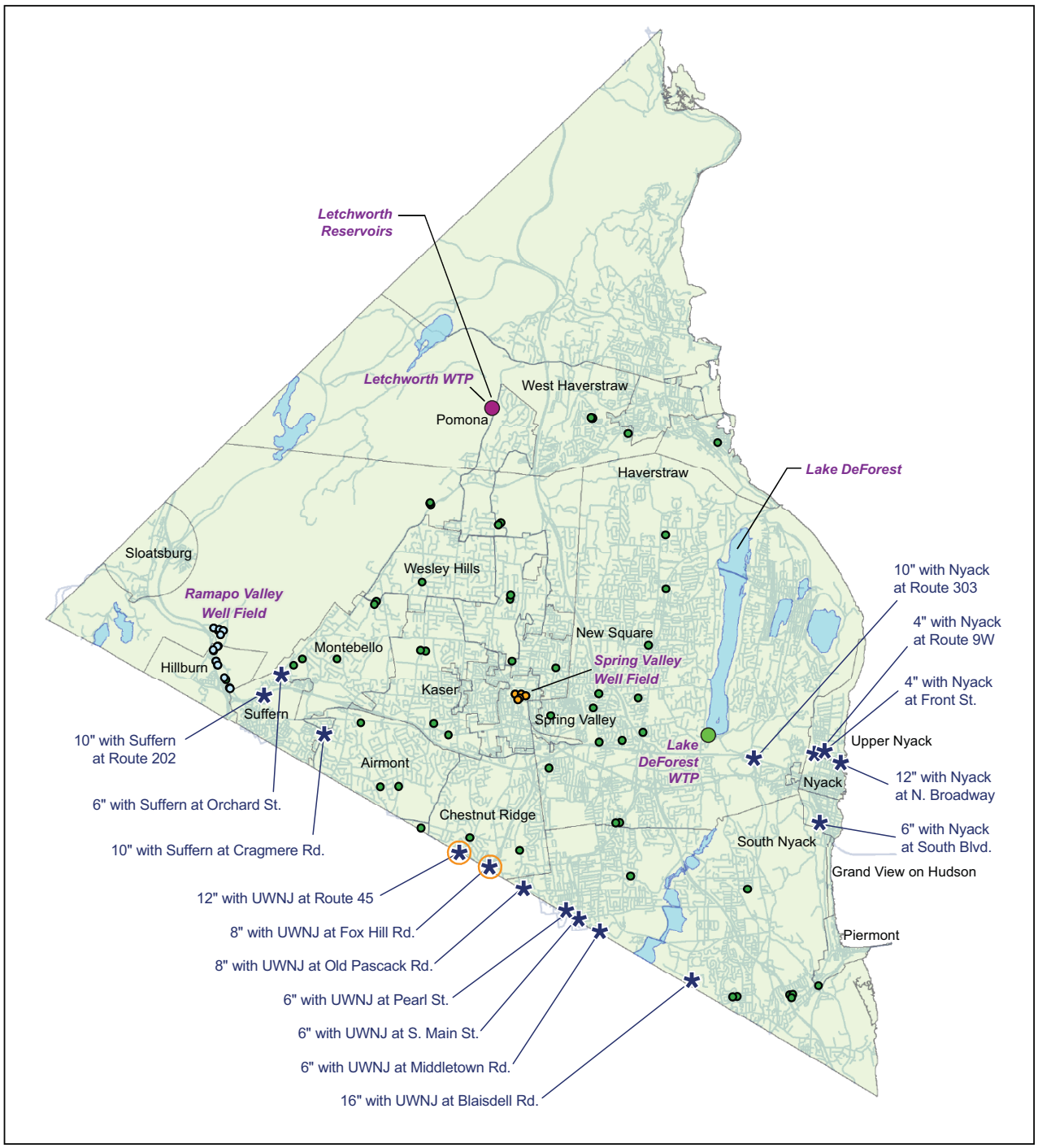
[1] UWNY also operates an independent water system (formerly operated by United Water South County) that serves the Towns of Tuxedo, Warwick, and Monroe in Orange County. This system is separate from the Rockland County system discussed in this DEIS and would not be affected by the Proposed Project.

[2] Information on how the proposed Haverstraw Water Supply Project would affect management of the water supply system is provided in section 2.4.4 of Chapter 2, "Project Description."

[3] See Table 1-3, which illustrates the average water production from 2000 to 2009.

10.1.10



Legend

- *Letchworth WTP*
- *Lake DeForest WTP*
- *Spring Valley Well Field*
- *Ramapo Valley Well Field*
- *System Wells*
- *Operating Inteconnections with Other Systems*
- *Emergency Interconnections with Other Systems*
- *Rockland County Streets*
- *Rockland County Towns/Villages*

0 2 4 MILES
SCALE

Figure 2-1

Existing United Water Rockland County Water Supply System

UNITED WATER Haverstraw Water Supply Project

- **Safe Yield**: The capacity of a water source is measured first by its "safe yield," also sometimes referred to as "dependable yield" or "reliable yield." This is a measure of the maximum quantity of water that can be sustained from a source, without depleting the source, during a critically dry period, which is the "drought of record." The drought of record is the drought that had the worst effect on availability of water from the water source, which could be a single year's drought or a combination of several drought years.

As defined in the *Ten-State Standards* document used by the New York State Public Service Commission (PSC) and New York State Department of Health (NYSDOH) as a regulatory standard,[4] the quantity of water that should be maintained in water sources—which is the safe yield—is set forth as:

- For **surface water**, "the quantity of water at the source shall be adequate to meet the maximum projected water demand of the service area as shown by calculations based on a one in fifty year drought or the extreme drought of record, and should include consideration of multiple year droughts."

- For **groundwater**, "the total developed groundwater source capacity, unless otherwise specified by the reviewing authority, shall equal or exceed the design maximum day demand with the largest producing well out of service."

The planning threshold for determining safe yield for surface waters is the worst drought on record. For groundwater, calculations of yield are more complex, so the term "safe yield" is often not applied to groundwater. Further, in calculating its available groundwater supply, in consultation with the Rockland County Department of Health (RCDOH), UWNY does not include consideration of capacity with the largest producing well out of service as recommended by the *Ten-State Standards*.

- **Average Supply Capacity:** The average supply capacity of a water supply is the amount of water that can be sustainably provided over an extended period of time, typically a year. Although, as noted above, calculations of yield from groundwater resources is complex, in general, the average supply capacity is equivalent to the safe yield.

- **Peak Supply Capacity:** The peak supply capacity describes the ability of a water source to provide high volumes of water over a short period of time to meet an elevated demand. Typically, the peak level of production can be sustained only for a few days. The RCDOH requires that all supply sources be capable of meeting the maximum day demand for two three-day periods. Therefore, UWNY uses the combination of two three-day peaks as the peak period for water supply planning purposes. As defined in the December 14, 2006 Rate Order and the July 20, 2010

[4] *Recommended Standards for Water Works, Policies for the Review and Approval of Plans and Specifications for Public Water Supplies*, 2007 Edition, Part 3.

Rate Order issued by the PSC, a peak increase is defined as "sustainable for three days, twice per summer season."[5]

Like all public water supply systems in New York State, UWNY's water system is subject to New York State Department of Environmental Conservation (NYSDEC) regulation via specific water supply permits for each water source that set the amount of water that can be withdrawn from each water source. It is also subject to NYSDOH regulations via permits that set the conditions for water treatment for each source. The permit conditions are intended to reflect the safe yield of the water source and the capacity of the water treatment facilities at each source. The components of the existing water supply system, including their safe yield, permit conditions, and factors that affect their reliability, are described below.

2.1.1.1 Lake DeForest

Lake DeForest is a 985-acre, 5.6-billion-gallon reservoir in the Town of Clarkstown, New York, that supplies approximately 32 percent of the average daily water that UWNY provides to Rockland County on an annual basis. Lake DeForest is supplied by the Hackensack River, located in the 26-square-mile Hackensack River watershed in Rockland County. The reservoir, its dam, and the Lake DeForest Water Treatment Plant were constructed by the Spring Valley Water Company (the predecessor to UWNY) and began operation in 1956.

Water withdrawn from Lake DeForest is treated at the Lake DeForest Water Treatment Plant at the southern end of the reservoir before being pumped into the water distribution system. The treatment plant uses standard water treatment technologies, including flocculation, dissolved air flotation (clarification), filtration, and chlorination, to produce clean drinking water in compliance with drinking water standards.

As discussed in more detail below, downstream of Lake DeForest, the Hackensack River also provides drinking water to the Village of Nyack in Rockland County and a number of communities in Bergen and Hudson Counties in New Jersey. Information on how UWNY manages Lake DeForest is provided later in this section.

Safe Yield of Lake DeForest

The safe yield of Lake DeForest—i.e., the amount of water that can be continuously withdrawn from the reservoir during a period of drought equivalent to the worst drought of record—has been determined to be 19.75 million gallons per day (mgd). However, as discussed below, the water supply permit for Lake DeForest requires release of some of that yield for downstream users and to maintain downstream riparian rights. After satisfying those permit requirements, the safe yield of Lake DeForest for Rockland County is 10 mgd.

[5] 2006 Rate Order (Exhibit 11 of the Joint Proposal) and 2010 Rate Order (Appendix 7 to the Joint Proposal).

Permit Conditions for Lake DeForest

Withdrawal of water from Lake DeForest is governed by NYSDEC water supply permit WSA 2189 and the volume of water that can be produced at the water treatment plant is governed by the approval for its operation from NYSDOH.

WSA 2189 was issued in 1952 and was subsequently modified; the permit now in effect is the Sixth Modifying Decision, issued by NYSDEC in 1982. The permit conditions are intended to maintain the ecological health of the river and the riparian rights of downstream communities. As discussed below, the permit obligates UWNY to maintain a daily average flow of 9.75 mgd or greater in the Hackensack River immediately above the intake works of the Village of Nyack. Daily records demonstrating compliance with this flow condition are provided to NYSDEC.

According to WSA 2189, "at least 10 mgd of the water in Lake DeForest is forever reserved for the needs of the inhabitants of Rockland County." In addition to that 10 mgd, WSA 2189 establishes the amount of water that must be maintained in the Hackensack River downstream of the Lake DeForest Dam, which depends on the water supply in the reservoir and the conditions in the three downstream reservoirs—Lake Tappan, Woodcliff Lake, and Oradell Reservoir. WSA 2189 establishes a reservoir operating curve, or "Rule Curve," which is a measure to be used to determine the amount of water that may be released for downstream communities. According to the permit, the Rule Curve was established "to ensure that Rockland County's water supply needs and those of downstream users are met under both normal and drought conditions."

Using the Rule Curve, WSA 2189 specifies the amount of water that must be released from Lake DeForest and the additional amount that may be released, which varies throughout the year depending on the amount of water present in Lake DeForest and on the amount of water present in the three downstream reservoirs.

The permit conditions establish a minimum release for downstream users of 9.75 mgd and provide for increased releases when Lake DeForest has adequate water (and therefore it is above the Rule Curve) and the downstream reservoirs are less than half full. Consistent with these permit conditions, and in consultation with the various stakeholders, UWNY routinely releases water from the Lake DeForest Dam to the Hackensack River.

As noted above, WSA 2189 requires that "at least 10 mgd of the water in Lake DeForest is forever reserved for the needs of the inhabitants of Rockland County." To preserve the safe yield in the reservoir (which is 10 mgd for Rockland County) in case of drought conditions, UWNY operates Lake DeForest to provide an annual average of 10 mgd for Rockland County customers from Lake DeForest. A higher flow can be withdrawn from the reservoir during peak summer months, but flow must be reduced at other times of the year to maintain a total average that meets the annual average requirement. For example, in 2005, when summer demand required Lake

DeForest production levels of approximately 20 mgd, the flow was reduced to 7 mgd in October and November and 5 mgd in December to limit the annual average production to 10 mgd.

The Lake DeForest Water Treatment Plant is operated subject to an approval from NYSDOH, issued in 2003 (Log No. 16321, CWS NY4303673), which limits daily intake of raw water to the treatment plant to 20.8 mgd, with a maximum daily production of up to 20 mgd, and the running annual average intake of raw water to 10 mgd.

Reliability of Lake DeForest

Lake DeForest can reliably provide the 10 mgd of water to Rockland County that is set by its permit limits. In addition, Lake DeForest can be used on a short-term basis (peak) at 20 mgd, as long as its average yield on an annual basis remains at 10 mgd. However, like any reservoir supply, the supply in Lake DeForest is entirely dependent on rainfall amounts in its relatively small watershed, located entirely within Rockland County.

2.1.1.2 Letchworth Reservoirs

The three Letchworth Reservoirs, located in Harriman State Park in the Minisceongo Creek watershed, have a total capacity of 173 million gallons. The Letchworth reservoir system was originally developed as the water supply for the former state psychiatric institution at Letchworth Village (in the Towns of Stony Point and Haverstraw). In 2006, UWNY entered into a long-term lease with the Palisades Interstate Park Commission for use of the Letchworth Reservoirs, made improvements to the water treatment plant and piping connections, and began operating the Letchworth Water Treatment Plant as an additional source for the UWNY distribution system. Water from the reservoirs is treated at the Letchworth Water Treatment Plant for use in the water distribution system. The treatment plant uses standard water treatment technologies, including flocculation, clarification, filtration, and chlorination, to produce clean drinking water in compliance with drinking water standards. Use of the reservoirs is subject to the conditions of the long-term lease, which protect the recreation use of these resources located in the Palisades Interstate Park system.

UWNY typically uses the Letchworth system as a “peaking” source, to provide water during the peak demand season (i.e., May through September). Over the past 10 years, the Letchworth Reservoirs have provided less than 1 percent of UWNY’s average daily water supply for Rockland County. In the three full years that the Letchworth Reservoirs have been operated by UWNY (2007–2009), these reservoirs provided an average of 1.5 percent of UWNY’s average daily water supply for Rockland County.

Safe Yield of Letchworth Reserviors

The safe yield of the Letchworth Reservoirs is 1.0 mgd.

Permit Conditions for Letchworth Reservoirs

The NYSDEC water supply permit for the Letchworth Reservoirs, WSA 9947, allows withdrawal of 1 mgd on an annual average basis and a maximum of 45 million gallons in a month. The permit also sets conditions regarding releases of water between the three reservoirs, to preserve water in the reservoir system without allowing any of the reservoirs to become too depleted. All water is withdrawn from the first reservoir. The permit sets the following conditions:

A. When water supply withdrawal from the first reservoir is greater than 0.8 mgd, the following conditions apply:

    1. Water must be released from the second reservoir in an amount equal to the amount withdrawn from the first reservoir above 0.8 mgd.

    2. If the first reservoir reaches 30 percent of its capacity, water must be released from the second reservoir at a rate equal to the first reservoir withdrawal.

    3. If the second reservoir reaches 30 percent of its capacity, water must be released from the third reservoir in an amount equal to the first reservoir withdrawal.

B. If storage in each reservoir reaches 30 percent, release from the third reservoir shall cease and the first reservoir withdrawal shall not exceed 0.5 mgd.

C. If storage in the second and first reservoirs reach 10 percent, all water supply withdrawals from the first reservoir shall cease.

In addition, if the capacity of the third reservoir has reached 30 percent in two consecutive operating years, UWNY must undertake an assessment of the fisheries resources including habitat and aquatic vegetation in each reservoir during the next operating year. WSA 9947 does not require that a release be made to the stream immediately below the most downstream dam, Horse Chock Brook.

The NYSDOH approval for the Letchworth Water Treatment Plant (Log No. 17981, NY 4303673) allows its operation at an annual average of 1.0 mgd, with monthly production not exceeding 45 million gallons per month. The NYSDOH approval allows a seasonal peak production of 3.0 mgd.

Reliability of Letchworth Reservoirs

Like Lake DeForest, the Letchworth Reservoirs and water treatment plant can reliably provide the amount of water set by their permit limits. However, like any reservoir supply, the supply in the Letchworth Reservoirs is entirely dependent on rainfall amounts in its relatively small watershed, located entirely within Rockland County.

2.1.1.3 Ramapo Valley Well Field

The Ramapo Valley Well Field consists of 10 shallow wells that draw groundwater from the Ramapo Aquifer on the eastern bank of the Ramapo River, immediately upstream of the New Jersey border in the Village of Hillburn and Town of Ramapo in Rockland County. The well field was developed and implemented by the Spring Valley Water Company through the 1970s, with the last well coming on line in 1981. Water from the 10 wells in the Ramapo Valley Well Field is pumped into a common transmission main to one central pump station, where the water is treated to remove volatile organic compounds and chlorinated. The Ramapo Valley Well Field component of UWNY's system also includes a related surface water source, Potake Pond, which is used to augment flow in the Ramapo River to support operation of the well field. The Ramapo Valley Well Field provides approximately 24 percent of the average daily water supply in the UWNY system in Rockland County on an annual basis, but less during the summer peak when this source can be adversely affected by low precipitation, which can affect the groundwater and flow in the Ramapo River.

The Ramapo Aquifer is hydraulically connected to surface water flows in the adjacent Ramapo River (i.e., water flows back and forth between the two depending on the relative water levels of each); the well field's water is drawn by infiltration from the river through permeable sand and gravel to the wells. Most of the Ramapo River's drainage area is upstream in Orange County.

UWNY uses water stored in Potake Pond, a reservoir that straddles the New York–New Jersey border, to supplement the flow of water in the Ramapo River so that the well field can remain operational when flows in the river would otherwise be too low. Water is withdrawn from Potake Pond through an intake structure and carried by pipe to a brook that feeds the Ramapo River.

Safe Yield of Ramapo Valley Well Field

UWNY has been able to reliably extract an annual average of about 7 mgd from the Ramapo Valley Well Field when it can be operated. However, as described in the discussion of permit conditions below, during periods of low flow in the Ramapo River, the well field is not as productive and/or cannot be operated because of limitations set by its water supply permit from NYSDEC, which requires a minimum passing flow in the river immediately downstream of the well field. During peak summer conditions when Ramapo River flows are low, the sustainable withdrawal rate from the Ramapo Valley Well Field is about 4 mgd on average.

This sustainable rate is possible because of the augmentation of river flow by releases from Potake Pond. Prior to 2003, UWNY had a lease agreement to take water from Potake Pond and another nearby water body, Cranberry Pond, to augment flow in the Ramapo River. In 2003, UWNY purchased Potake Pond, constructed a pipeline from the pond to Nakoma Brook (a tributary of the Ramapo River), and consolidated the water supply permit to withdraw 190 million gallons from both water bodies through Potake Pond, which has a total volume of approximately 700 million gallons.

Permit Conditions for Ramapo Valley Well Field

Withdrawal of water from the Ramapo Valley Well Field is governed by NYSDEC water supply permit WSA 6507, which was issued in 1976; a Modifying Decision for this permit was issued in 1982. The permit was developed in accordance with terms of stipulations with the Village of Hillburn and with the New Jersey Department of Environmental Protection. The permit conditions are intended to maintain the ecological health of the Ramapo River and the riparian rights of downstream communities, including the Village of Suffern and communities in New Jersey that also use the Ramapo River for drinking water or other purposes.

WSA 6507 permits a total of 14 mgd to be withdrawn from the Ramapo Valley Well Field on any given day, but the total amount of water pumped in any given month may not exceed an average of 10 mgd for that month.[6] That condition is permitted as long as flow in the Ramapo River at a U.S. Geological Service (USGS) gauge downstream of the well field, in Suffern, is greater than 10 mgd. When flow in the river is less than 10 mgd at the Suffern gauge, permitted withdrawals are lower:

- When flow in the Ramapo River at the Suffern gauge is lower than 10 mgd but greater than 8 mgd, maximum withdrawal of 8 to 10 mgd is permitted.
- When flow in the Ramapo River at the Suffern gauge is at or below 8 mgd, no withdrawal is permitted.[7]

The 1982 Modifying Decision to WSA 6507 added a new condition requiring a detailed feasibility study of alternative corrective measures needed to ensure that the Ramapo Valley Well Field can be used most of the time, to increase the reliability of the well field. The condition required that special emphasis be placed on the alternative of low flow augmentation from upstream lakes or reservoirs.

The use of Potake Pond was developed in response to the 1982 Modifying Decision. Use of Potake Pond was allowed by NYSDEC permit No. 3-3926-00207/0003-0, issued

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[6] Condition D of WSA 6507 states: "The total volume of water pumped from any combination of the 10 Ramapo Valley wells shall not exceed 14 mgd on any given day and the total amount of water pumped in any calendar month shall not exceed the figure obtained by multiplying the number of days in that month by an average pumping rate of 10 mgd."

[7] When the Ramapo Valley Well Field is not operating, the permit does not require UWNY to maintain a minimum flow in the Ramapo River.

in 1993 and later modified by WSA 8620, issued in 2002. WSA 8620 permits release of water from Potake Pond for augmentation of the Ramapo River at a rate of 10 mgd or less per day, with maximum drawdown not to exceed usage of the upper 7 feet of the pond (190 million gallons). These releases shall occur only when necessary and effective in enabling use of the Ramapo Valley Well Field by raising the flow of the Ramapo River to at least 8 mgd when measured at the Suffern gauge. This permit does not require a minimum release to a water body downstream of Potake and Cranberry Ponds.

Reliability of Ramapo Valley Well Field

Because of the well field's connection to the Ramapo River and its permit restrictions to protect flows in the river, pumping from the Ramapo Valley Well Field can be unavailable when precipitation is low. This typically occurs during late summer and fall, but it could also occur during other seasons in the event of a drought. As discussed later in this chapter, the summer season is the period when water demand in Rockland County is the greatest, so this limitation to one of the key components of the water supply system adversely affects the system's reliability when it is most needed.

2.1.1.4 System Wells

In addition to the Ramapo Valley Well Field, UWNY also operates 50 other wells throughout Rockland County that together provide approximately 44 percent of UWNY's water supply. These system wells include deep bedrock wells, primarily located in the southern half of Rockland County (in the Towns of Ramapo, Clarkstown, and Orangetown), and shallow wells in glacial sand and gravel (overburden) located near the Mahwah River, Minisceongo Creek, and Sparkill Creek.

Water from the system wells is pumped to the surface, and collected at water storage tanks throughout Rockland County. Water from the wells is treated with sodium hypochlorite (i.e., chlorine) and/or other commonly used water treatment chemicals. Some of the wells include "air strippers" to treat groundwater contamination resulting from gasoline, dry cleaning solvents, and other volatile organic compounds. Wells are susceptible to contamination from surrounding development, and a small number of wells (in addition to the 50 active wells) are not in use because their yield is low and their water has become contaminated.

Safe Yield of System Wells

As noted above, the concept of safe yield is difficult to apply to groundwater resources. The total capacity of the wells is determined by the capacity of their pumps and by the groundwater conditions at the well. Some of UWNY's system wells are closely spaced and cannot be operated simultaneously without adversely affecting production of the other wells. All the wells can operate simultaneously to meet peak demands, but this cannot be continued on a sustained basis. Moreover, operating the

wells at their peak capacity for more than a few days would adversely affect groundwater levels in the aquifer.

In total, UWNY's system wells serving Rockland County have a recognized peak capacity of about 24.3 mgd and an average capacity of 15.13 mgd on a longer term (annual) basis. As noted above, the *Ten-State Standards* guidance suggests that the safe yield of a system of wells can be considered as "the design maximum day demand with the largest producing well out of service." However, in calculating its available groundwater supply, UWNY does not include consideration of capacity with the largest producing well out of service as recommended by the *Ten-State Standards*. Taking this factor into account would reduce the average and peak capacity of UWNY's system wells by approximately 1.5 mgd.

Permit Conditions for System Wells

Withdrawal rates at system wells are governed by NYSDEC permits, based on the results of aquifer testing at each well. In addition, the NYSDOH, in coordination with RCDOH, issues approvals for public water supply wells related to their construction, operation, and decommissioning. These approvals cover the location, drilling method and design of the well, construction and operation of the well pumps, and well yield.

Reliability of System Wells

Groundwater levels in Rockland County are typically lower in the summer than at other times of the year because of a combination of reduced precipitation resulting in a reduction in recharge of the aquifer and higher demands. This can adversely affect the performance of system wells and result in the need to reduce pumping rates from the wells. In addition, as noted earlier, a continuing challenge for UWNY's system wells is protecting them from contamination that may result from surrounding development.

2.1.1.5 Summary of Required Releases

As discussed above, use of each of UWNY's water sources is governed by water supply permits issued by NYSDEC. Those permits set the amount of water that can be withdrawn for use as drinking water, and, for many sources, they also dictate the amount of water that must be released downstream to support stream flows so as to maintain ecological conditions, riparian rights, and the other rights of downstream water users. These conditions are summarized in Table 2-1.

Table 2-1
Permit Requirements for Existing Water Supply System Sources

Water Source	Identification	WSA #	Permitted Withdrawal	Permit Conditions: Obligations to Support Stream Flows	
				Water Body	Release Requirements
Lake DeForest	5.6 billion gallon reservoir	WSA 2189	10 mgd average 20 mgd peak	Hackensack River	Permit establishes Rule Curve to determine amount of water that must and may be released downstream to maintain riparian rights and downstream reservoirs. Permit requires UWNY to maintain a daily average flow of 9.75 mgd or greater in the stream immediately above the intake works of the Village of Nyack.
Letchworth Reservoirs	Three reservoirs with total capacity of 173 million gallons	WSA 9947	1 mgd average 3 mgd peak	Horse Chock Brook	Permit regulates water releases between the three Letchworth Reservoirs to ensure none becomes too depleted. Permit does not require specific release to the stream downstream of third reservoir.
Ramapo Valley Well Field (RVWF)	10 shallow wells that draw groundwater from the Ramapo Aquifer near the Ramapo River	WSA 6507	Depends on flow in Ramapo River	Ramapo River	Permitted withdrawal depends on the amount of flow in the Ramapo River downstream of the wellfield. When the flow is greater than 10 mgd, maximum withdrawal is permitted. When the flow is between 8 and 10 mgd, less withdrawal is permitted and when the flow is at or below 8 mgd, no withdrawal is permitted.
	Potake and Cranberry Ponds used to augment Ramapo River to support RVWF	WSA 8620	10 mgd	—	Permit does not require a specific release to the stream downstream of Potake and Cranberry Ponds.
System Wells	50 wells throughout Rockland County	Multiple	15.9 mgd average 24.44 mgd peak	—	NYSDEC permits govern withdrawal rates at system wells based on results of aquifer testing at each well.

2.1.2 Water Distribution System

2.1.2.1 Rockland County System

UWNY's water distribution system in Rockland County consists of more than 1,000 miles of water mains, 14 storage tanks, and 14 booster pump stations. Water enters the water distribution system from the water treatment plants and pump stations described above and is transmitted through water mains for distribution in Rockland County. The water distribution system is divided into 15 pressure districts, which are areas of similar ground elevation within which one common hydraulic gradient (water pressure) is maintained. Pump stations are used to transmit the water through the mains at the appropriate pressure for each pressure district. Pressure-reducing

valves reduce the pressure so water can flow from districts with higher pressure to districts with lower pressure. Pump stations are used to pump water in the opposite direction (i.e., from lower pressure systems to higher pressure systems). Water can be transmitted between pressure districts through the use of appropriately sized pipes and pumping stations that bring the water to the correct pressure for the respective district. However, the design of the transmission system limits the amount of water that can be distributed to pressure districts beyond where the supply is generated. Figures 2-2, 2-3, and 2-4 show the relationship of the pressure districts, hydraulic gradeline, and water sources in UWNY's system.

UWNY has a Supervisory Control and Data Acquisition (SCADA) system used to collect and coordinate information from all elements of the water supply system. Among other things, the SCADA system monitors the production, demands, pressures, and amount of water in each storage tank throughout the system. Supervisory personnel monitor the SCADA system 24 hours per day.

2.1.2.2 Connections to Other Systems

UWNY's water supply system in Rockland County is largely self-contained, with only limited connections outside the county boundaries. However, a small number of connections exist from the Rockland County system to other systems not managed by UWNY. As discussed below, these water main connections are predominantly available for emergencies and are not regularly used. The interconnections are shown in Figure 2-1 above and include the following:

- Village of Nyack: Five emergency interconnections between the Village of Nyack's water system and the UWNY system.
- Village of Suffern: Three emergency interconnections between the Village of Suffern's water system and the UWNY system.
- New Jersey: Along the Rockland County–New Jersey border, there are five locations with emergency interconnections between the UWNY and United Water New Jersey systems.
- In addition, the Village of Hillburn in Rockland County purchases its water on a wholesale basis from UWNY, pursuant to the terms of WSA 6507 (the permit for the Ramapo Valley Well Field) an agreement between UWNY and the Village of Hillburn, dated July 30, 1975 as amended. This water is provided on a daily basis via a water main connection.
- UWNY supplies water on a daily basis to a small number of customers in Montvale, New Jersey via two water main connections across the New York–New Jersey border. On average, a total of approximately 110,000 gallons per day (gpd) is provided to these customers in Montvale. UWNY is currently seeking permits for a

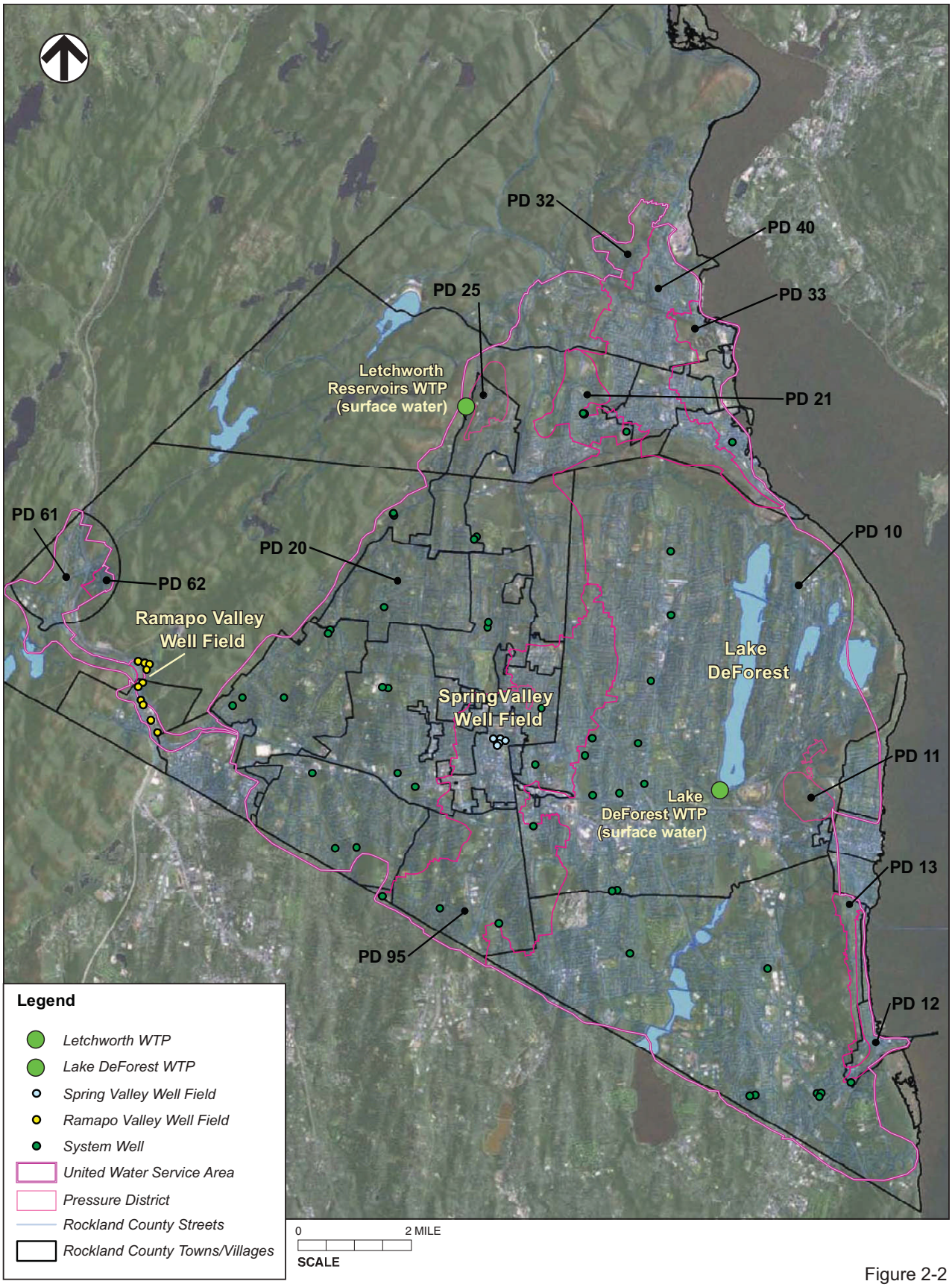

Figure 2-2

UNITED WATER Haverstraw Water Supply Project

United Water Rockland County Service Area

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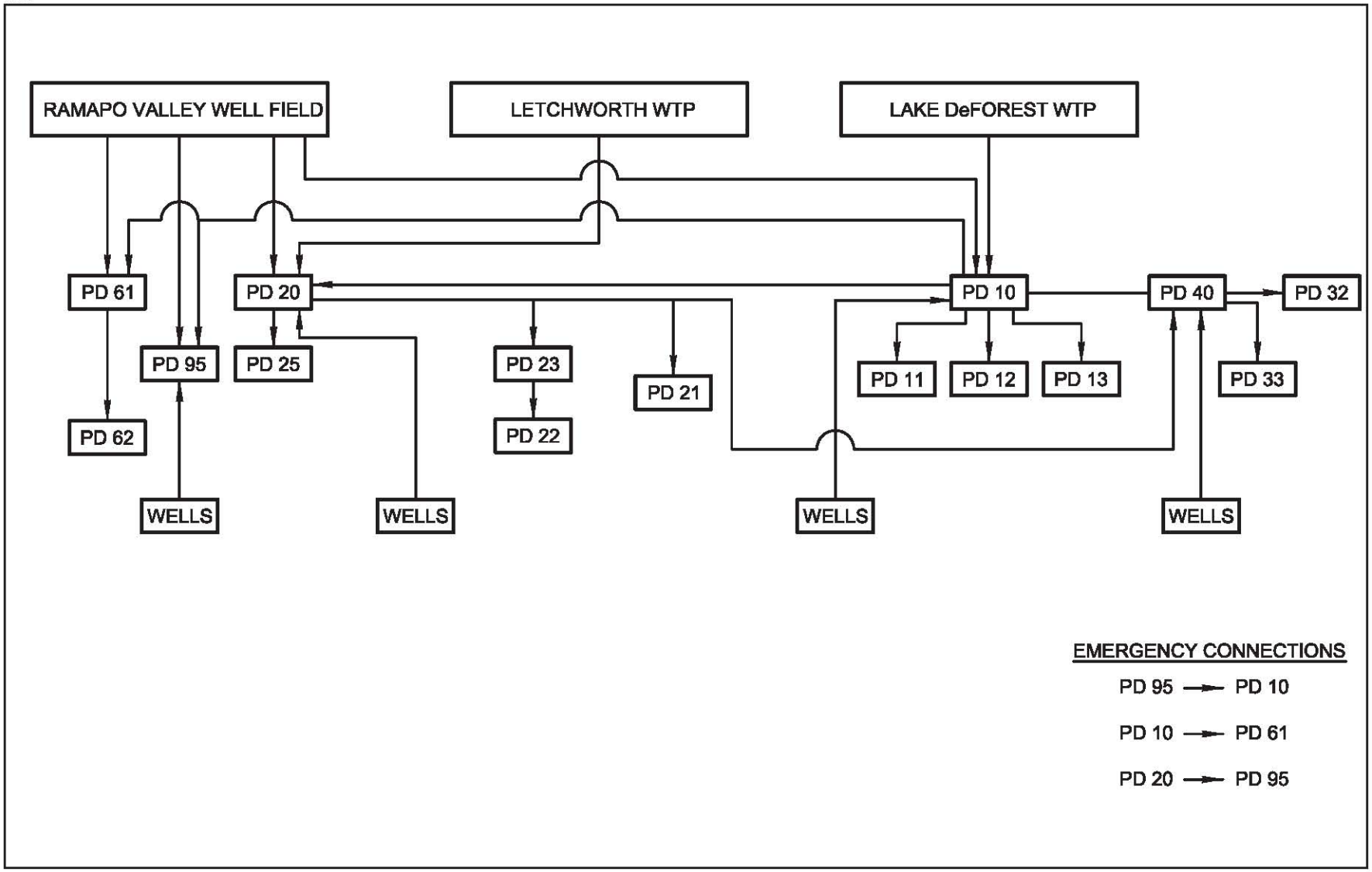

Project Site

Study Area Boundary (400-Foot Perimeter)

Figure 2-3

UNITED WATER Haverstraw Water Supply Project

United Water Rockland County Pressure Districts

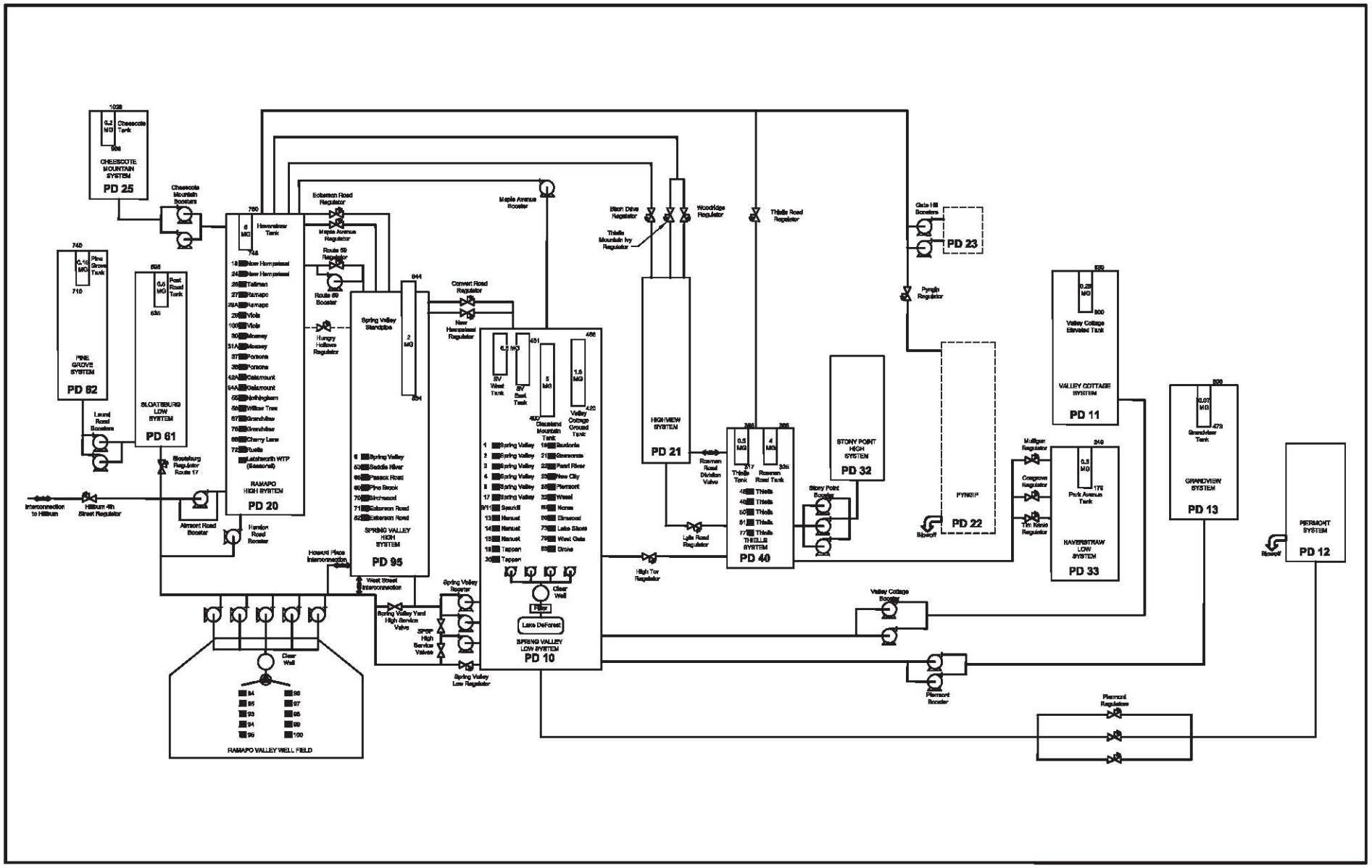

Figure 2-4
United Water Rockland County Water Supply System Hydraulic Grade Line

CDM

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new Montvale pump station that will allow United Water New Jersey to provide water to this New Jersey community.

Agreements between UWNY and the adjacent water supply companies govern when the emergency connections are used. In addition, an intercompany agreement between UWNY and United Water New Jersey (originally executed by the Spring Valley Water Company and the Hackensack Water Company) sets forth the allocation of costs associated with maintaining the Lake DeForest Dam.

2.1.3 Water System Management and Available Water Supply

UWNY meets the demand for water with a mix of water from the sources discussed above.[8] The amount of water provided from each source depends on the availability of water from that source and its permit conditions, which protect the water source, quality of the water produced, aquatic life and ecology, and the riparian rights of downstream water users. The mix of water sources available to UWNY allows it to provide water to meet the annual average demand and to meet short-term demands, which during peak periods can be 50 to 60 percent higher than the average annual demand. The current production capacity of UWNY's Rockland County water supply system for average day and peak day conditions is summarized in Table 2-2. As noted earlier, the average day supply is equivalent to the safe yield, or the supply that can be reliably provided over an extended period of time during drought conditions equivalent to those in the drought of record.

Table 2-2
UWNY Rockland County
Water Supply System Capacity (mgd)
(as of June 30, 2011)

Water Source	Average Day Supply (Safe Yield)	Peak Day Supply
Lake DeForest / Water Treatment Plant	10.00	20.00
Letchworth Reservoirs / Water Treatment Plant	1.00	3.00
Ramapo Valley Well Field	7.00	4.00
System Wells	15.9	24.44
Total	**33.9**	**51.44**

Throughout the year, the amount of water that can be provided from each source varies depending on the amount of precipitation and the other factors that affect compliance with permit conditions. As described in the previous section, the permit for Lake DeForest allows an annual average withdrawal of 10 mgd, and UWNY's approach to meet water demands is to withdraw 10 mgd as an annual average from Lake DeForest with the remainder of the water being supplied by the other sources. In other words, UWNY maximizes the use of Lake DeForest to the extent allowed by its

[8] Information on United Water's management of Lake DeForest when the Proposed Project is operating is provided in section 2.4.4 of Chapter 2, "Project Description."

permit and the amount of its safe yield that is reserved for Rockland County (10 mgd).

During summer months, when demand is typically higher, UWNY draws larger volumes from Lake DeForest. This compensates for the lower volumes that can typically be withdrawn from the Ramapo Valley Well Field during that time, when volumes in the Ramapo River tend to be lower. However, this use of more than 10 mgd on a monthly average over the summer from Lake DeForest means that UWNY must reduce the flow drawn from the reservoir at other times of the year to maintain the annual average of 10 mgd required to protect Lake DeForest's safe yield.

A review of monthly water production records from each of the water sources serving UWNY's Rockland County service area over the past 11 years (2000–2010, but excluding the drought year of 2002)[9] illustrates the adjustments made over the course of the year to provide enough water to meet the demand while complying with permit conditions. This information is presented in Table 2-3 and Figure 2-5; more detailed information is provided in Appendix A.

Table 2-3
Average Monthly Water Production, 2000–2010, Excluding Drought Year (2002)

	Lake DeForest		Ramapo Valley Well Field		System Wells		Letchworth Reservoirs		Total	
Month	**mgd**	**% of Total**	**mgd**	**% of Total**	**mgd**	**% of Total**	**mgd**	**% of Total**	**mgd**	**% of Total**
January	7.8	28.4	7.7	28.1	12.0	43.5	0.0	0.0	27.6	100.0
February	8.1	29.1	7.6	27.5	12.0	43.5	0.0	0.0	27.7	100.0
March	8.1	29.2	7.8	28.2	11.8	42.6	0.0	0.0	27.7	100.0
April	8.5	30.1	8.1	28.7	11.6	41.1	0.0	0.0	28.1	100.0
May	9.5	31.1	7.9	25.7	13.1	42.8	0.1	0.4	30.6	100.0
June	11.4	34.3	7.6	22.7	13.9	41.8	0.4	1.2	33.3	100.0
July	12.4	36.0	6.6	19.1	15.0	43.5	0.5	1.4	34.5	100.0
August	11.9	35.4	6.3	18.7	15.0	44.4	0.5	1.5	33.8	100.0
September	10.9	34.9	6.3	20.2	13.7	43.8	0.4	1.1	31.3	100.0
October	8.9	31.7	6.4	22.9	12.6	44.9	0.2	0.6	28.0	100.0
November	7.7	28.9	7.4	27.6	11.6	43.1	0.1	0.4	26.8	100.0
December	7.5	27.9	7.5	27.7	11.9	44.2	0.0	0.1	27.0	100.0
Annual Average	**9.4**	**31.7**	**7.3**	**24.5**	**12.9**	**43.3**	**0.2**	**0.6**	**29.7**	**100.0**

Note: UWNY began operation of Letchworth Reservoirs in August 2006.

As shown in Table 2-3, over the past 11 years (excluding 2002) Lake DeForest was used to provide approximately 32 percent of the water supplied each year, with the

[9] During the drought year of 2002, mandatory water restrictions were imposed by the RCDOH, which resulted in lower than normal water consumption. This year therefore does not reflect typical water consumption in Rockland County.

8.5.11

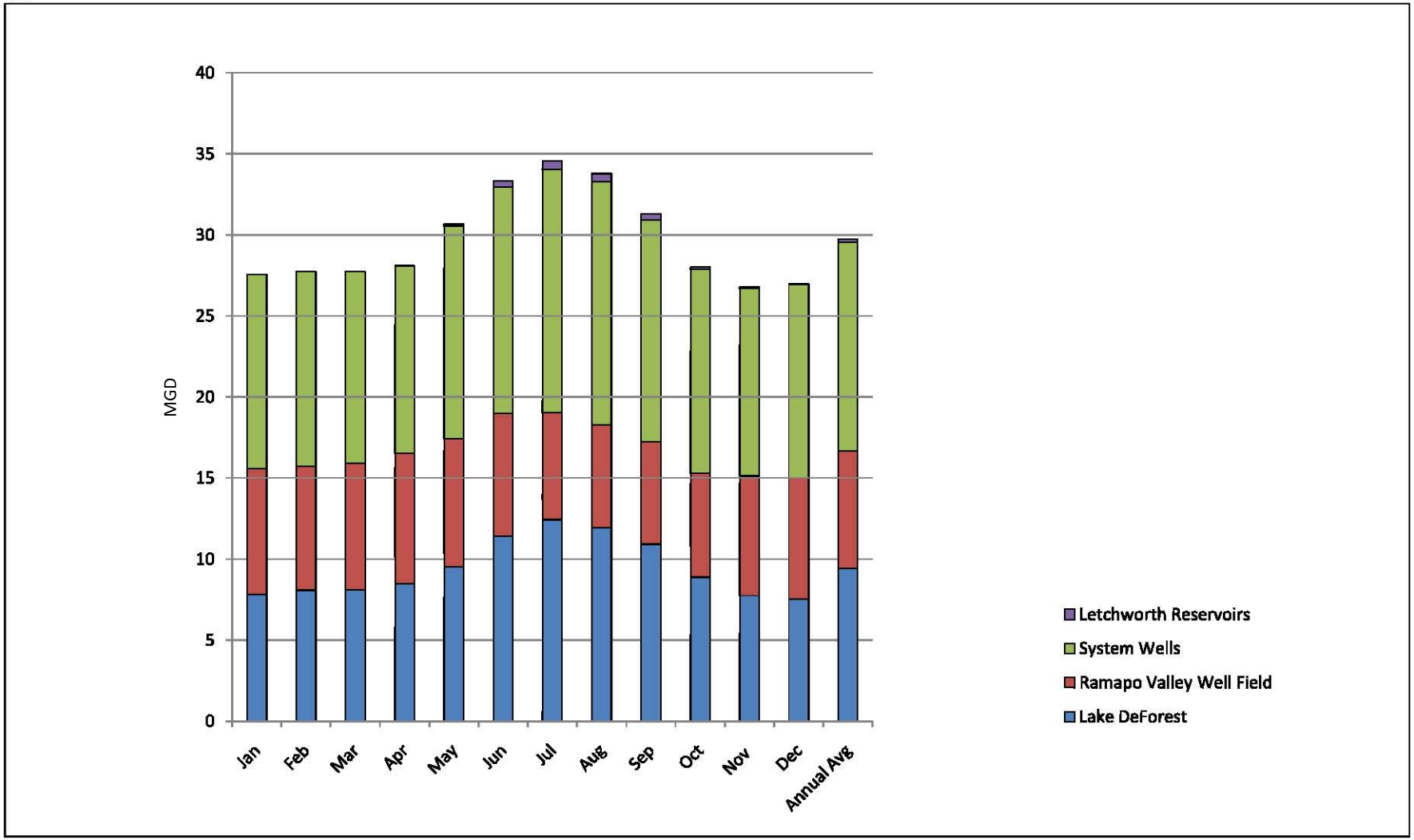

Figure 2-5

Monthly Average Day Supply, 2000 - 2010
Excluding Drought Year (2002)

UNITED WATER Haverstraw Water Supply Project

Ramapo Valley Well Field providing 25 percent and the system wells 43 percent. The Letchworth Reservoirs, which have been operated for four full years (2007–2010) provided less than 1 percent. (In the four full years that the Letchworth Reservoirs have been operated by UWNY, these reservoirs provided an average of 1.4 percent of UWNY's average daily water supply for Rockland County.) During the summer months (June, July, August, and September), when the Ramapo Valley Well Field often becomes unavailable and the demand for water peaks, Lake DeForest was used to supply 35 percent of the water produced (with a monthly average of 11.7 mgd), while the Ramapo Valley Well Field was used for 20 percent (monthly average of 6.7 mgd) and the system wells most of the remainder (14.4 mgd, 43 percent). Letchworth Reservoirs supplied 0.4 mgd, or 1.3 percent, of that summer demand when averaged over that 10-year period. (However, when averaged over the four years when UWNY operated the Letchworth Reservoir water treatment plant, the average summer supply provided by that source was 0.9 mgd, or 2.8 percent of the total supply.) During winter months, use of Lake DeForest was lower, so that the 10 mgd annual average required by its NYSDOH water supply permit could be maintained. During the summer and early fall, demand for water is substantially higher than during the rest of the year. During this peak time, UWNY can meet the higher demand by providing additional water from its water sources, as long as this additional draw is not sustained for long periods of time. Some of the factors that contribute to UWNY's ability to meet existing peak demands include:

- Use of the Letchworth Reservoirs during the summer months to provide water during periods of high demands.
- Use of Potake Pond to augment Ramapo River flow so that the Ramapo Valley Well Field can remain in use when flows in the river would otherwise be too low.
- Provision of up to 20 mgd from Lake DeForest for short periods of time.
- Use of system wells at higher rates for short periods of time.

In addition, as discussed later in Section 3, UWNY is continuing to improve its system to enhance its ability to meet peak demands.

Section 3
Purpose and Need

3.1 Existing and Future Water Demand

United Water New York's (UWNY) Rockland County supply system currently provides water for a predominantly residential customer base. Today, the available supply is adequate to meet the demand for water over most of the year, including during the summer and early fall peak season, when demand is much higher. In the future, water demand is projected to grow as population in the service area grows, and in the long-term, an additional water supply source will be needed to meet demand and to continue to provide water for fire-fighting and other public safety needs. The existing and future water demand characteristics of the service area are described below.

3.1.1 Water Demand Characteristics

This section of the report describes the existing water demand patterns and trends for UWNY's Rockland County water supply system. These include the demand for water on an annual average basis as well as during the peak period, consideration of the types of customers who use the water, the effects of conservation on water demand, and the contribution of "non-revenue water" to that demand.

3.1.1.1 Existing Water Demand Patterns and Trends

The discussion of water consumption considers the average demand and the peak demand:

- **Average demand:** To evaluate the sustained demand on water resources over an extended period of time, the average demand is considered. Measures used include the annual average demand, which is the total amount of water used in a year, divided by the number of days, so that it is expressed in million gallons per day (mgd). Similarly, the monthly average demand (also in mgd) can be considered to evaluate the demand on water resources on a monthly basis.

- **Peak demand:** Peak demand is the maximum daily demand (i.e. the amount of water used on the single day of highest demand).

Water demand in UWNY's Rockland County service area varies greatly from year to year, depending on the weather and particularly on the rainfall. Consequently, an average of demand in a number of years is typically evaluated to understand water demand, but consideration must also be given to the peaks reached during that time.

Over the past 30 years, there has been a general trend toward increased annual average daily and peak daily water demand. This is a result of the increase in population in the Rockland County service area rather than an increase in per capita usage. The increase in demand is illustrated in Figure 3-1, which shows the annual average daily and peak daily water demand from 1980 through 2010. As shown in the

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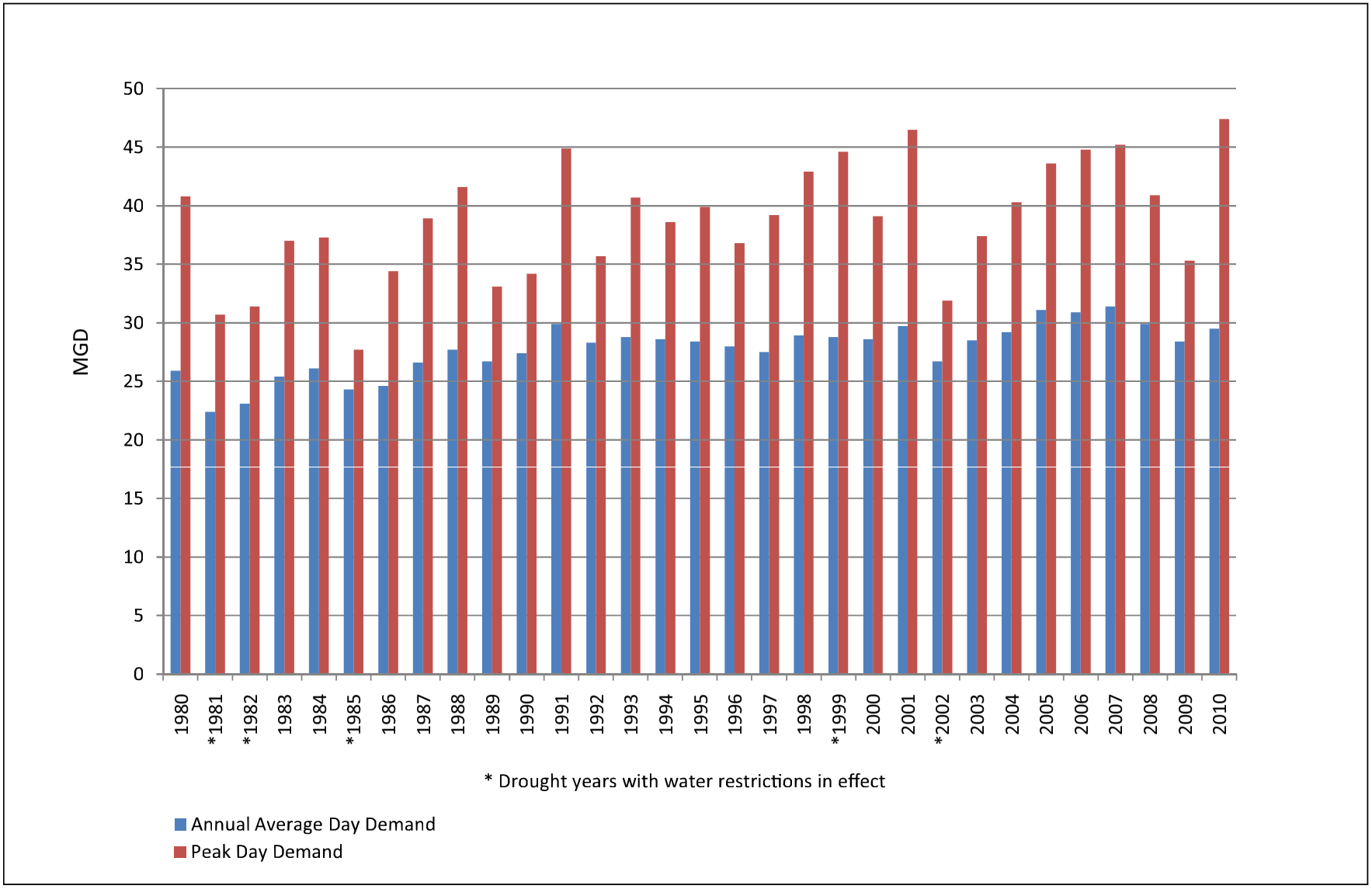

Figure 3-1

Annual Average Day Demand and Maximum Day Demand, 1980 - 2010

UNITED WATER Haverstraw Water Supply Project

figure, in 1980, the annual average water demand was 25.9 mgd. By 2007, average water usage was at its highest over the 30-year period, with annual average daily demand at 31.43 mgd. Over the 10-year period of 1980–1989, but excluding drought years of 1981, 1982, and 1985 when mandatory water restrictions resulted in lower water consumption, the annual average water demand was 26.1 mgd.[1] In contrast, over the period of 2000-2010, the annual average daily water demand was 29.4 mgd; excluding the drought year of 2002, when water use restrictions were being enforced by Rockland County Department Of Health (RCDOH), the average daily water demand was 29.7 mgd. It should be noted that Over the period of 2000–2010, excluding the drought year of 2002, annual water demand by residential customers served by United Water in Rockland County averaged 207.1 gpd per household, or 66.0 gpd per person.

Figure 3-1 also illustrates the great variability that occurs from year to year in terms of peak demand, and the wide range between the peak day demand and the average day demand in a given year. Peak demands typically occur during the summer/early fall, and average monthly water demand during the four-month period of June through September is typically 15 to 30 percent higher than average monthly water demand during the rest of the year. This monthly fluctuation over the course of the year, and the peak day demand, are shown in Figure 3-2. Summer demand tends to be higher because of the water use patterns in UWNY's service area—customers in Rockland County use more water during the summer for indoor (e.g, additional showers or baths and longer showers) and outdoor water use (e.g., watering lawns and gardens, car washing, and filling swimming pools). As shown in Figure 3-2, these seasonal fluctuations vary from year to year, depending on the temperature and precipitation during the summer and early fall. For example, in years with hot, dry summers, such as the summers of 2005 and 2010, outdoor water use increases because of increased watering of lawns and gardens when precipitation is low.

During the summer/early fall season, water demand on peak days is much higher than the monthly average and annual average. As shown in Figure 3-2, during the most recent 10-year period (again, excluding the drought year of 2002), the maximum day ranged from 35.3 mgd (during the rainy summer of 2009) to 47.2 mgd (during the heat wave in the summer of 2010). The 2010 peak was the historic maximum daily demand for UWNY's Rockland County system.

Overall, the water demand during the peak summer/early fall season can strain the current water supply system by requiring production of water at close to or above the system's sustainable capacity for three to four months at a time. This challenge is exacerbated by the fact that periods of high water demand typically correspond with periods of low precipitation. When rainfall is greatest, and water supply therefore is most abundant, the demand is also lowest. Conversely, in dry periods, when the water supply sources are less abundant, demand is higher.

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[1] During years when mandatory drought restrictions are enforced by the RCDOH, water consumption is lower than normal and does not reflect typical water consumption in Rockland County.

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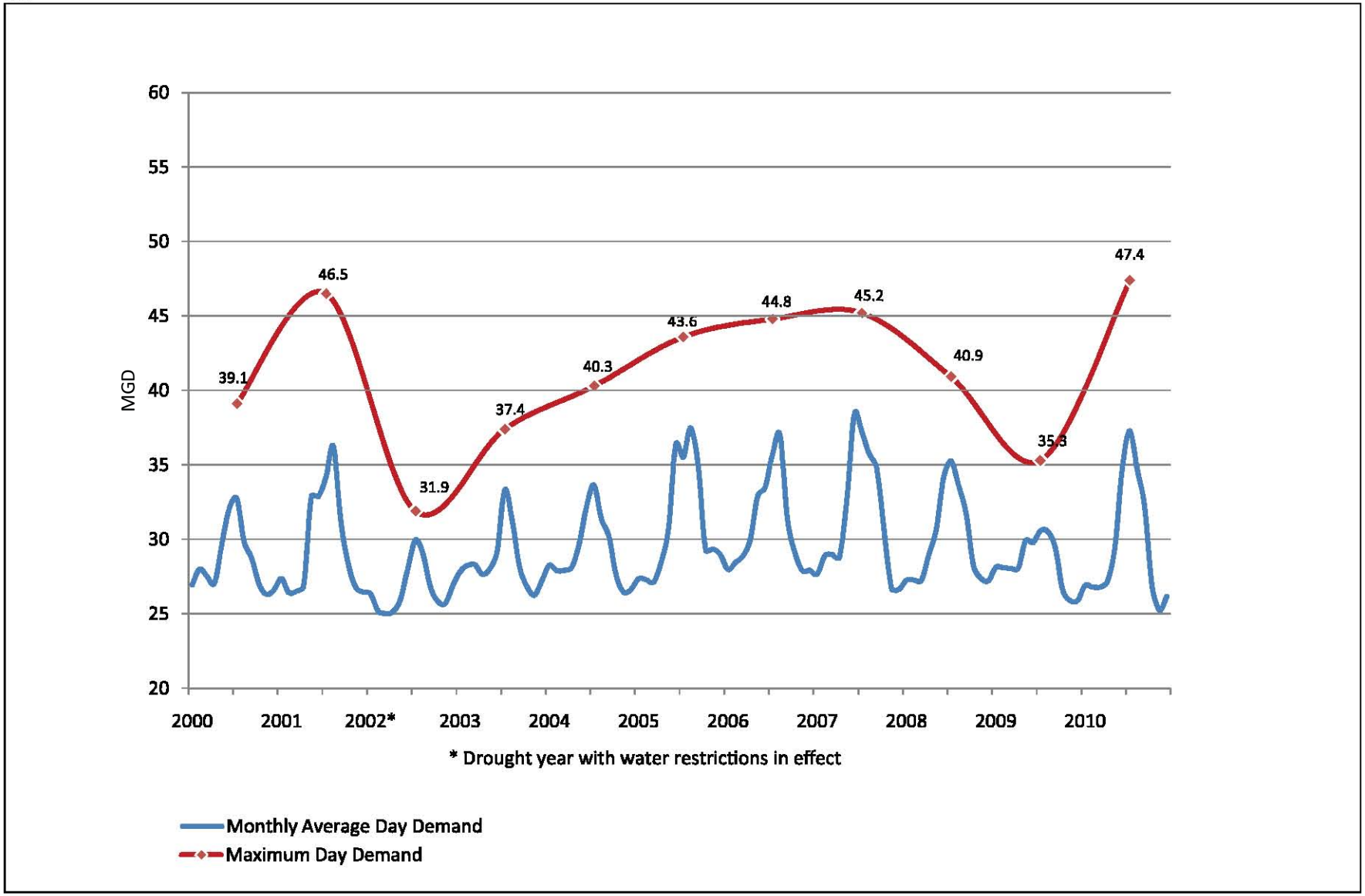

Figure 3-2

Monthly Average and Maximum Day Water Demand, 2000-2010

For purposes of water supply planning, considering the need for adequate water supply (e.g., fire suppression, hospital operations), any projections of the need for water supply must account for the wide range in demand over the course of the year, including the seasonal peak that occurs during the summer and early fall period.

3.1.1.2 UWNY Existing Customer Profile

As noted earlier, UWNY's service area consists of all of Rockland County excluding the Villages of Suffern, Nyack, and South Nyack. The service area, like all of Rockland County and the rest of the New York metropolitan area, has grown steadily through the last quarter of the 20th century.

As shown in Table 3-1, in 1980 Rockland County had an estimated 259,530 residents, and an estimated 80,684 people worked in Rockland County. By 2010, the residential population had grown by approximately 20 percent to an estimated 311,687 residents, while the worker population (i.e., those working in Rockland County) increased by approximately 38.7 percent to an estimated 111,941 workers.

Table 3-1
Rockland County Residential and Worker Populations
1980-2010

Year	Residential Population	Worker Population
1980	259,530	80,684
1990	265,475	99,182
2000	286,753	106,358
2010	311,687	111,941

Sources: Residential population estimates from the U.S. Census of Population and Housing, decennial census; 2010 census information from Redistricting Data Summary File. Worker population estimates from New York State Department of Labor annual employment data by place of work (Quarterly Census of Employment and Wages).

Within the UWNY service area, the estimated population in 2000 was 266,193 residents, based on the 2000 Census. Thus, the residential population of the geographic area where UWNY provides service constituted approximately 92.8 percent of the total population of Rockland County. In 2010, according to the 2010 Census, a total of 291,379 residents (living in approximately 90,563 households) live within the area where UWNY provides service, constituting approximately 93.5 percent of the county's population. Most of the residents of the service area are served by UWNY, but some residents and businesses use private wells for water supply. Accounting for those residents who live within the service area but are not currently served by UWNY, it is estimated that 87.5 percent of the residents of Rockland County are served by UWNY.

UWNY's customer base in Rockland County consists predominantly of residential accounts. Approximately 90 percent of the UWNY accounts are residential accounts, and consequently the majority of water used in the UWNY service area is used by

residential customers. As shown in Table 3-2, more than half the water demand in the UWNY service area is by residences, rather than businesses, institutions, or industries. Table 3-2 presents information on the average water consumption in the service area over the past 11 years (2000–2010, excluding 2002). The information excludes consumption in 2002, which was a year when mandatory drought restrictions imposed by Rockland County affected water demand patterns. As shown in the table, approximately 58 percent of the water consumed in the service area was consumed by residential users, and of that, 80 percent was used by single-family residential households. Thus, the notable growth in Rockland County's residential population over the past 30 years has been the major factor contributing to the increasing water demands in the area.

Overall, over the past 11 years (2000–2010, excluding the drought year of 2002) the average per capita water demand for residential customers served by UWNY was 66.0 gallons per day (gpd).

Table 3-2
Average Water Consumption by Account Type, 2000 – 2010 (Excluding 2002)

Type of Water Use	Average Water Consumption	
	Amount (mgd)	% of Total
Residential Single Family	13.92	46.6
Apartments, High-Rise, and Residential Multi-Family	3	11.5
Commercial	2.89	9.7
Municipal	0.37	1.3
School	0.67	2.2
Hospital	0.58	1.9
Industrial and Warehouse	2.17	7.3
Building Rates[1]	0.01	0.0
Resale Account[2]	0.16	0.5
Non-Revenue Water[3]	5.66	19.0
Total	**29.85**	**100.0**

Notes:
1 Building rates are temporary meters used during building construction.
2 Resale accounts provide water to the Village of Hillburn and, for brief periods, other locations (such as the Village of Nyack, which received water during a water emergency).
3 Non-revenue water consists of water that is used but not billed, and includes water used during the water treatment process, to chlorinate new mains, to flush fire hydrants, and for fire-fighting; water not metered correctly or inaccurately billed; and water lost through leaks in the distribution system.

3.1.1.3 Effects of Conservation on Existing Demand

UWNY, as a private company, does not have the regulatory authority to mandate or regulate water conservation by its customers during drought or non-drought periods. As noted earlier, during periods of water shortages, Rockland County, through the RCDOH, has implemented mandatory water restrictions in the past. Such restrictions

have been in place five times in the past 30 years, with three of those times in the past 13 years. During those years, water demand was notably lower (for example, see the demand for 2002 in the tables and graphics provided earlier in this section).

Nonetheless, as water demand grew close to the limits of available supply over the past decades, a combination of New York State and federal laws mandating use of low-flow fixtures and UWNY's implementation of a conservation program and a summer–winter rate structure slowed the increase in demand in Rockland County and allowed UWNY to delay the need for a new long-term water supply project.

3.1.1.4 Contribution of Non-Revenue Water to Existing Demand

As shown in Table 3-2, above, over the past 11 years, excluding 2002 when water restrictions were implemented by the RCDOH, approximately 19 percent of the water produced by UWNY for Rockland County on average has been "non-revenue water." (The average annual percent of non-revenue water varies as a result of variations in both the volume of non-revenue water and the total volume of water produced each year.) Non-revenue water consists of water that is produced but not billed, such as water used during the water treatment process, to flush fire hydrants, and for fire-fighting, as well as water lost through leaks in the distribution system and from water main breaks. A certain amount of non-revenue water is normal for any water supply system, and cannot be avoided. In general, non-revenue water can be divided into three broad categories: unbilled and authorized consumption, apparent losses, and real losses. UWNY has an ongoing non-revenue water reduction initiative to identify real losses of water and reduce them where practicable and economically feasible.

3.1.2 Future Water Demand Projections

As part of its mandate to provide safe and adequate water supply service to its Rockland County customers, UWNY, like all water purveyors, must plan to provide adequate safe yield in each of its water sources and for the system overall. As set forth in the *Ten-State Standards* that are incorporated into New York State's water supply regulations, the quantity of water should "provide a reasonable surplus for anticipated growth."[2]

To plan for the future, UWNY regularly undertakes an assessment of future water demands. In recent years, three efforts have been undertaken to assess future water demand:

- As part of the 2006 Rate Case[3], a forecast of future water demands was undertaken to determine the level of future investment in water supply infrastructure required.

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[2] *Recommended Standards for Water Works*, *Policies for the Review and Approval of Plans and Specifications for Public Water Supplies*, 2007 Edition, Part 3, "Source Development," section 3.1.

[3] *Case 06-W-0131 – Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of United Water New York Incorporated for Water Service and Case 06-W-0244 – Joint Petition of United Water New York Incorporated and United Water South County for Approval of a*

This forecast and the administrative process that followed at the New York State Public Service Commission (PSC) was the basis for the PSC's determination of future demand in the 2006 Rate Case.

- A water demand forecast was conducted in 2010, using population projections prepared by Rockland County, to confirm the conclusions of the 2006 forecast. The 2010 water demand forecast also included a sensitivity analysis to evaluate the effects of increased water conservation and/or of greater reduction of non-revenue water on the future demand for water.

- In 2011, the results of the 2010 census were applied to the 2010 forecast in a sensitivity analysis, to identify the effects of updated population numbers on the conclusions of that forecast.

These evaluations are described below and illustrated in **Figures 3-3 through 3-7**.

3.1.2.1 Water Demand Forecasts Conducted in 2006

As part of the administrative process that led to the 2006 Joint Proposal[4] and 2006 Rate Order, UWNY worked with the RCDOH to develop projections of future water demand through the year 2025. The projection of future water demands was based on a forecast that had been completed in 2000, which was then updated and adjusted to account for recent development trends in coordination with the RCDOH.

The results of the 2006 water demand forecast are shown in Figure 3-3. As shown in the figure, the 2006 water demand forecast estimates that the average annual demand using the 95 Percent Confidence Interval will reach 34.3 mgd by 2015, while the available supply will be only slightly higher, at 34.5 mgd. Similarly, in terms of peak demand, the 2006 forecast estimates that the peak demand will be 52.7 mgd in 2018, approximately the same as the available peak supply in that year without a new long-term water supply project. By 2035, the average annual demand is projected to be 39.1 mgd and the peak demand is projected to be 59.2 mgd.

The PSC's methodology to calculate the water demand growth projections incorporated into the 2006 Rate Case was based on the PSC's analysis of the testimony and other filings on the topic submitted by the parties to the 2006 Rate Case. Both United Water and Rockland County submitted expert testimony regarding water demand growth projections. As stated in Rockland County's October 13, 2006 Statement in Support of the Joint Proposal, United Water and Rockland County used different methodologies but "reached roughly similar conclusions" in calculating their respective water demand growth projections. The parties to the 2006 Joint Proposal agreed that the increased water volume commitments set out in the 2006 Joint Proposal reflected their consensus on water demand growth projections.

Certificate of Merger with United Water New York Inc. being the Surviving Corporation, Order Adopting Merger and Adopting Three-Year Rate Plan (Dec. 14, 2006) (2006 Rate Order).
[4] *Cases 06-W-0131 and 06-W-0244*, Joint Proposal (Sept. 29, 2006) (2006 Joint Proposal).

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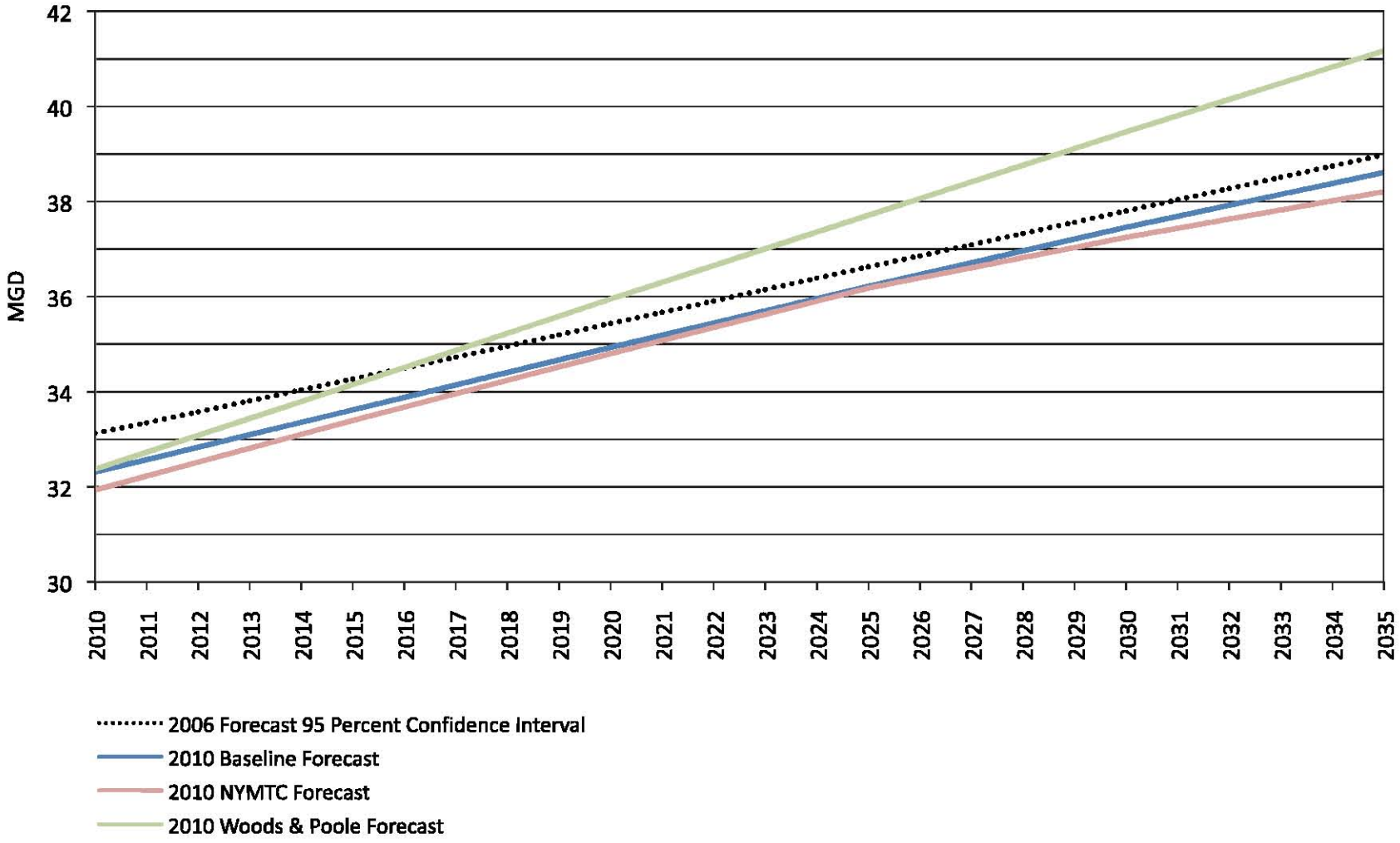

Figure 3-3

UNITED WATER Haverstraw Water Supply Project

Water Demand Forecasts: Annual Average Day Demand

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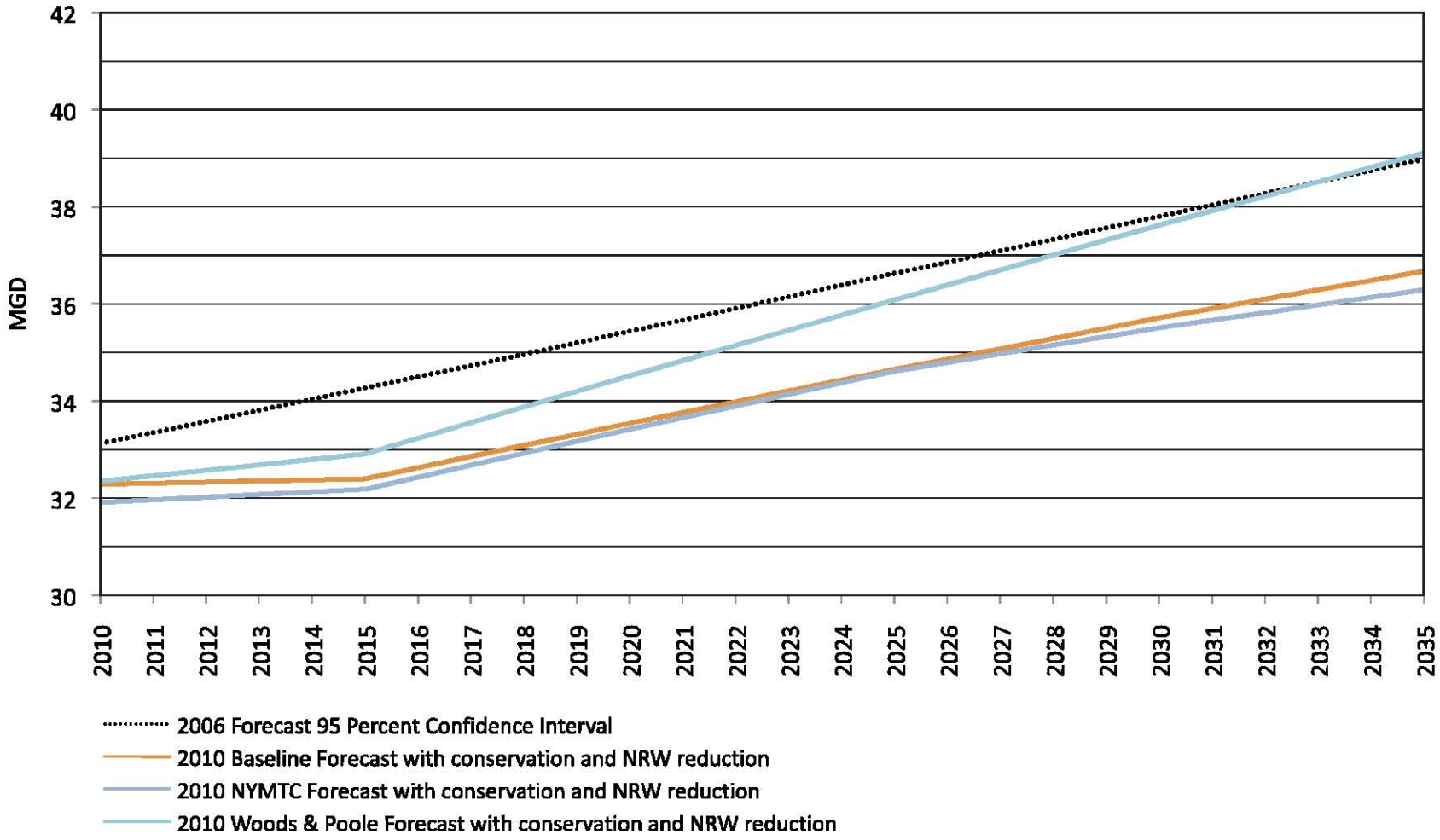

Figure 3-4

Water Demand Forecasts: Combined Sensitivity Analysis
Annual Average Day Demand

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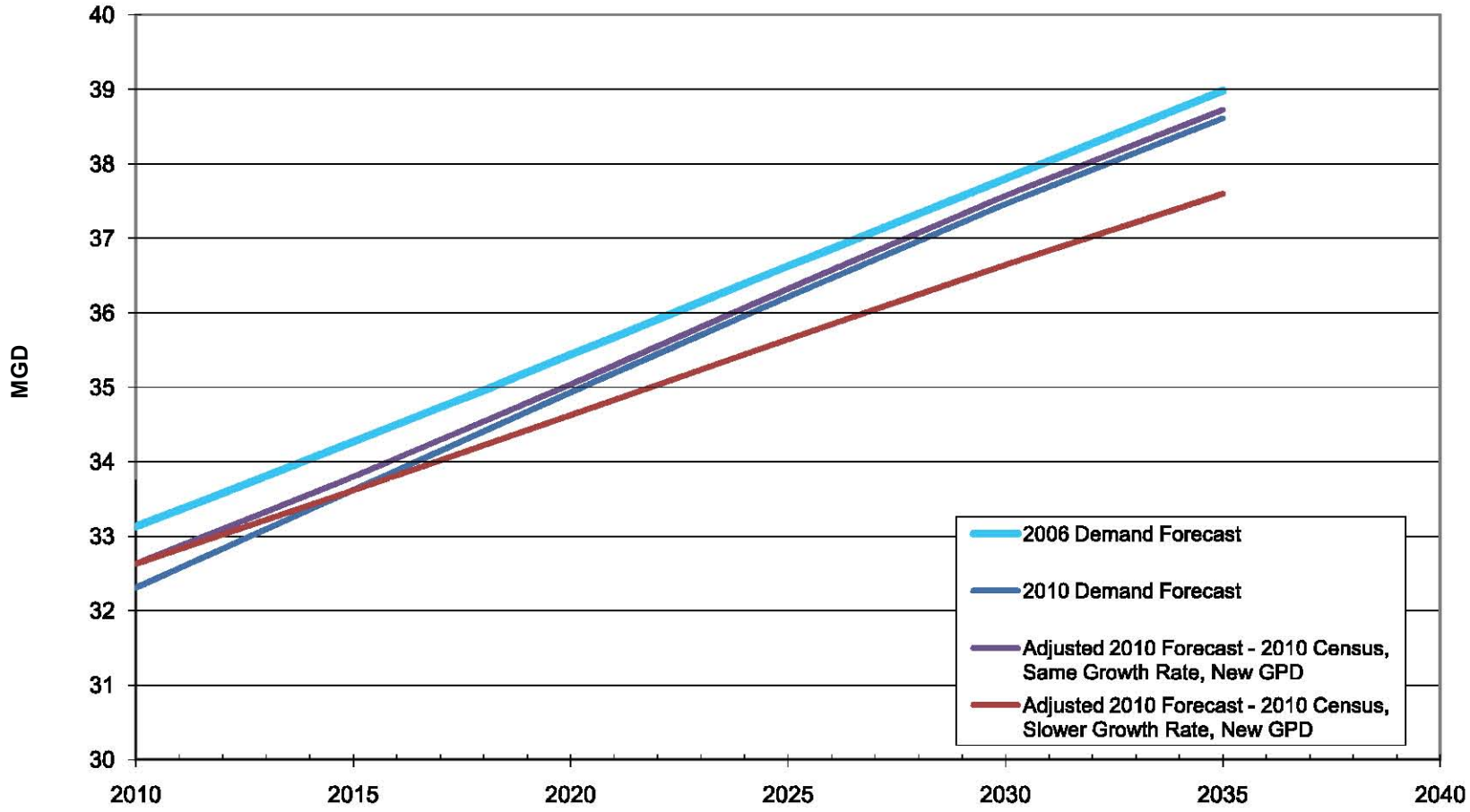

Figure 3-5

Comparison of Water Demand Projections Before and After 2010 Census

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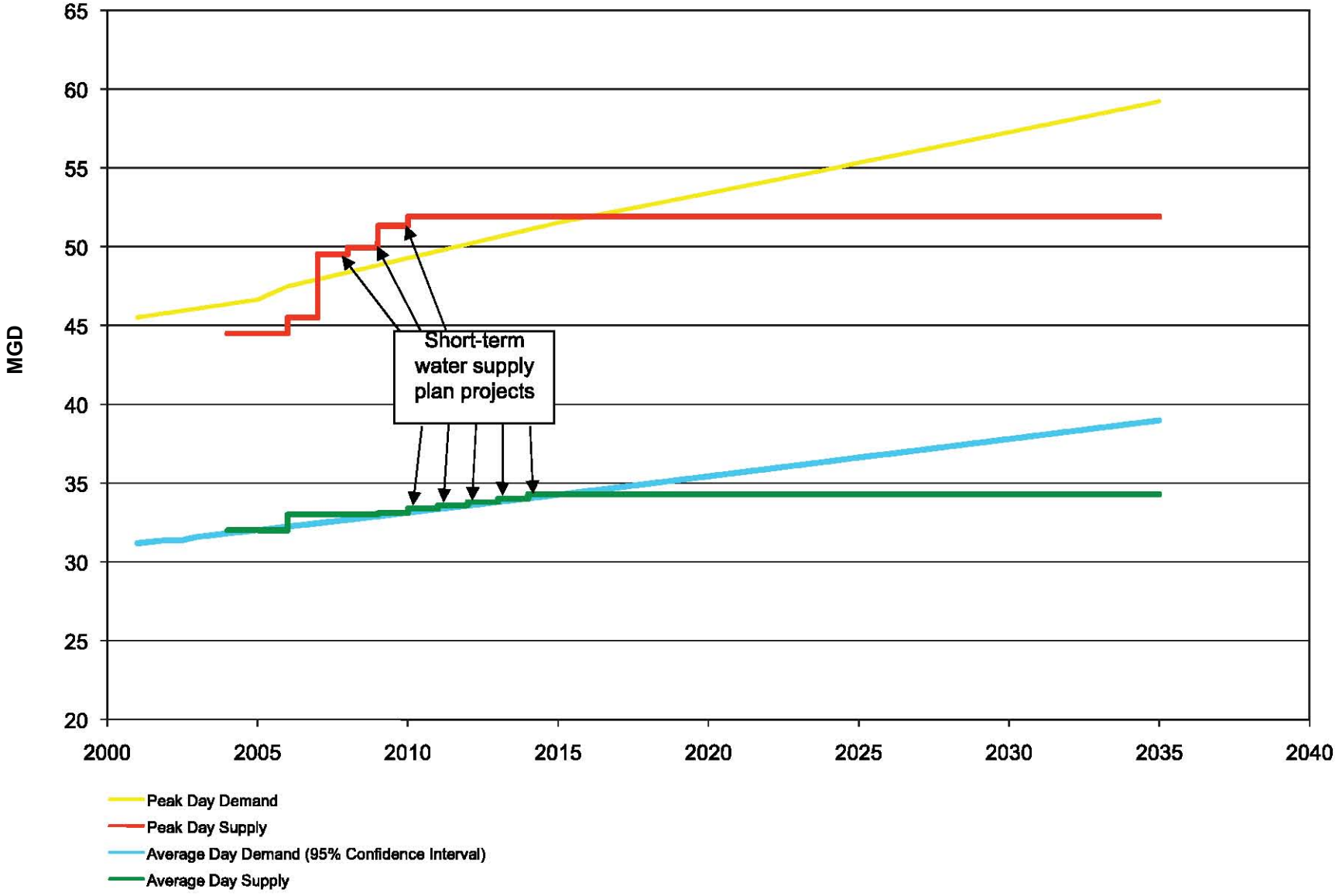

Figure 3-6

Water Demand Projections vs. Available Supply Without Long-Term Water Supply Project

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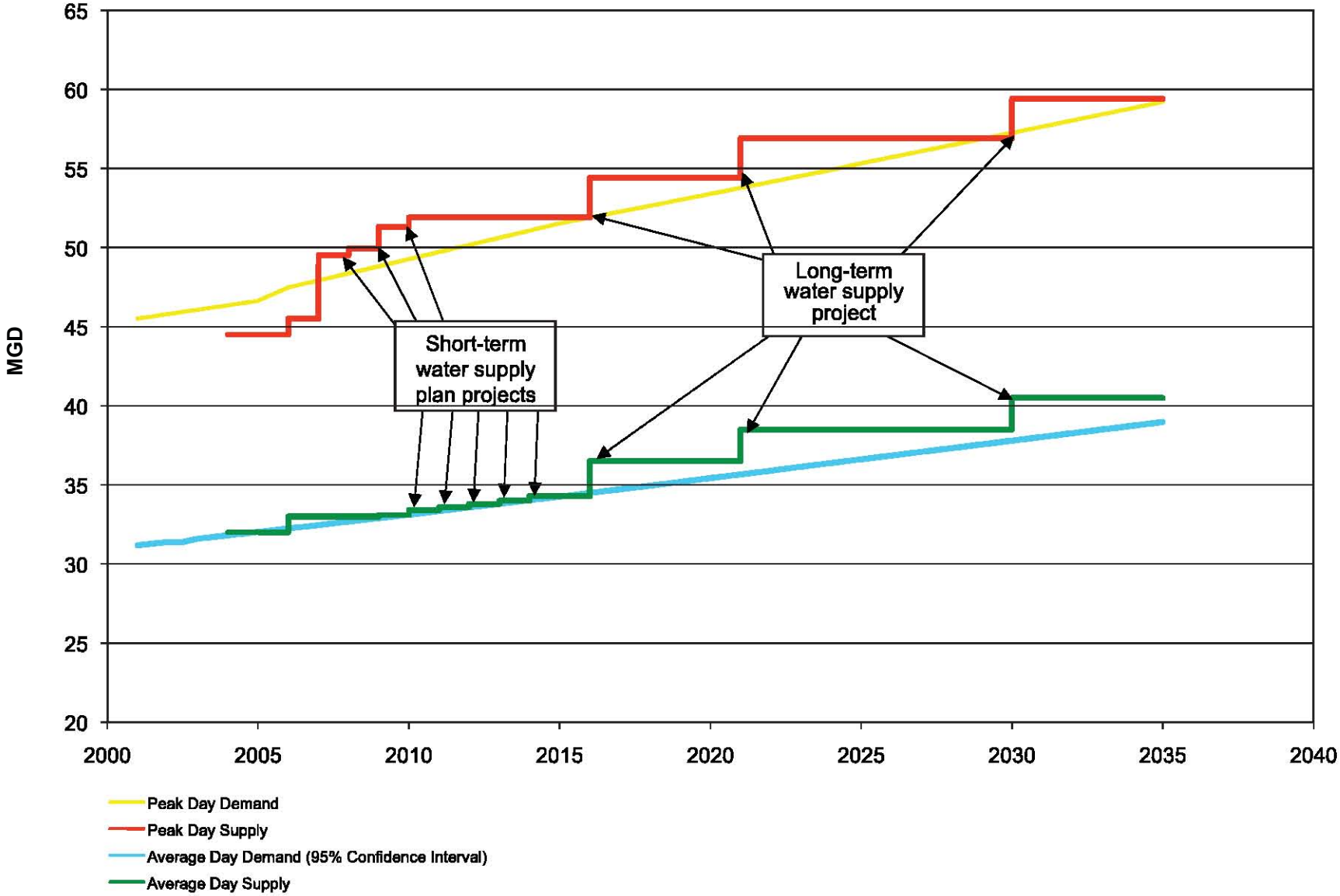

Figure 3-7

Water Demand Projections vs. Available Supply With Long-Term Water Supply Project

It should be noted that water conservation and efficiency measures were evaluated by the PSC in approving the increased water volume commitments included in the 2006 Rate Order. During the 2006 Rate Case, multiple witnesses from different parties testified regarding United Water's multifaceted and distinct water conservation measures. When the administrative law judge presiding over the 2006 Rate Case asked in writing on October 6, 2006 (in response to the 2006 Joint Proposal) if "some or all of the new sources of water supply could not be avoided in whole or in part through rate design changes or water conservation programs," all of the parties to the 2006 Joint Proposal agreed in their consensus-written response submitted on October 20, 2006 that "rate design changes and water conservation efforts have been virtually exhausted," and the increased water volume commitments incorporated into the 2006 Joint Proposal (and 2006 Rate Order) were "above that which can be achieved through further rate design or conservation methods." Section XX of the of the 2006 Joint Proposal, which was incorporated into the 2006 Rate Order, requires, among other things, that United Water continue implementation of its customer outreach and education programs. Section XX of the 2006 Joint Proposal also obligates United Water to provide annual reports to the PSC on its customer outreach and education programs.

3.1.2.2 2010 Water Demand Forecast

In 2010, a separate water demand forecast was prepared using a different methodology than the 2006 forecast, to verify the 2006 conclusions and update the results by extending the forecast year further into the future. The 2010 water demand forecast was based on population projections for the UWNY service area, rather than on water demand trends as the 2006 forecast had been. Since the 2010 census was not yet available, these population projections included estimates of existing population in the county from 2000 to 2009. In addition, as noted above, in 2010 the 2006 water demand forecast was projected further into the future, to 2035.

Estimates of population, number of households, and employment for Rockland County for 2000–2009 and forecasts through 2035 were collected from a variety of public and private sources including the Rockland County Department of Planning's forecast prepared in 2010, Cornell University's Applied Demographics Program's forecast prepared in 2008, New York Metropolitan Transportation Council (NYMTC) forecast prepared in 2009, and a forecast prepared in 2010 by Woods & Poole Economics, an independent consulting firm that specializes in long-term county economic and demographic forecasts. Rockland County's forecast of population for the county through 2035, which was prepared in coordination with Cornell University's Applied Demographics Program, shows a growth of almost 57,000 people (20 percent) between 2000 and 2035, for a total population of 343,636 by 2035.

The 2010 water demand forecast indicates that the annual average demand will reach 33.6 mgd in 2015 and 34.4 mgd by 2018. These projections are consistent with the 95

Percent Confidence Interval demand results of the 2006 water demand forecast (which show an annual average demand of 34.3 mgd in 2015). By 2035, the 2010 water demand forecast predicts an annual average demand of 38.6 mgd, the same as the prediction by the 2006 water demand forecast. The results of the 2010 forecast are shown in Figure 3-3 in comparison to the results of the 2006 forecast (projected to 2035).

The alternative water demand forecasts prepared using the NYMTC and Woods & Poole population forecasts show lower and higher future demands for water, respectively. These are also illustrated on Figure 3-3. As shown in the graphic, the NYMTC forecast estimates an annual average demand of 38.2 mgd in 2035 and the Woods & Poole forecast estimates an annual average demand of 41.2 mgd for that year.

Overall, the 2010 water demand forecast confirms the validity of the 2006 water demand forecast in terms of annual average demand. The validity of the peak day forecast prepared in 2006, which applied a peaking factor to the regression forecast for annual average demand, is also therefore confirmed.

3.1.2.3 2010 Water Demand Forecast: Effects of Conservation on Future Demand

UWNY's conservation measures have been effective in reducing the overall water use patterns in the service area and the per capita water demand for residential customers is relatively low. As noted above, this per capita demand was estimated in the 2010 water demand forecast to be an average of 67.6 gpd per person over the past 10 years and now, based on 2010 Census data, is estimated to be 66.0 gpd, as discussed below.

The baseline water demand forecast assumed a steady water consumption rate for residential customers into the future. This reflects the uncertainty related to water consumption, which includes several competing factors.

To address this uncertainty, in addition to the baseline water demand forecast, the 2010 forecast also included a sensitivity analysis to identify the effect on water demand projections if the percent of customers using water-conserving fixtures and practices increases in the future. This sensitivity analysis assumed that residential water use will gradually be more efficient over time, at a rate of 0.1 percent per year. This rate accounts for the increasing efficiency gained as more customers in Rockland County have water-saving fixtures, taking into account the uncertainties noted above. The result of this analysis is a water demand forecast (using the same Rockland County population forecast as the baseline water demand forecast) with a total annual average demand of 37.9 mgd in 2035, a savings of 0.7 mgd over the baseline forecast of 38.6 mgd.

3.1.2.4 2010 Water Demand Forecast: Contribution of Non-Revenue Water to Future Demand

The baseline water demand forecast assumed that the percentage of water demand that is due to non-revenue water remains at the same percentage as in 2009, when it was 24 percent of UWNY's total water production. (As noted above, this is a result of the volume of non-revenue water as well as the total volume of water produced in 2009.) The real losses from leakage in the UWNY system are within the range expected for a well-run water distribution system. UWNY has an ongoing non-revenue water reduction initiative to identify real losses of water (i.e., the element of non-revenue water that can be controlled to some extent by the utility) and to reduce them where practicable and economically feasible. The non-revenue water initiative also includes an effort to correct billing and metering errors that lead to apparent losses in water. This will not reduce the amount of water demand, but it will shift the accounting of demand from non-revenue water into billed demand.

To address the uncertainties related to future non-revenue water demand, in addition to the baseline water demand forecast, the 2010 forecast also included a sensitivity analysis to identify the effect on water demand projections if the percentage of non-revenue water is reduced in the future.

This analysis assumed that apparent losses (i.e., billing and metering errors) can be reduced from 6.5 percent of water production (the 2009 value) to 5 percent, with the associated volume of water shifted from non-revenue water to billed water (residential and non-residential). It also assumed that the total of real losses (i.e., leaks) and authorized uses can be reduced to about 13 percent of total production from the 2009 value of 17.2 percent. With these assumptions in place, non-revenue water would be reduced to 18 percent of total production. The forecast of annual average demand for 2035, considering such a reduction in non-revenue water, would decrease by 1.3 mgd, from the baseline value of 38.6 mgd to 37.3 mgd.

Combining both the additional conservation assumed in the conservation sensitivity analysis and the non-revenue water savings assumed in this analysis would further reduce future demands. Taking into account both these factors, the water demand forecast predicts an annual average demand of 36.7 mgd for the year 2035, in comparison to the baseline value of 38.6 mgd. This combined sensitivity demand forecast is illustrated in Figure 3-4.

3.1.2.5 Updated Water Demand Forecast Reflecting 2010 Census

As noted above, the 2010 water demand forecast was based on population information prepared by the Rockland County Department of Planning, as well as information from several other sources (forecasts prepared by Cornell University's Applied Demographics Program, NYMTC, and Woods & Poole Economics). All of these sources were based on 2000 census data and updated information available from the U.S. Census Bureau prior to release of the 2010 census. Future population was projected from a base year of 2010, using estimates of 2010 population. However,

2010 Census data, which was released in early 2011, indicate that Rockland County's population for 2010 is higher than the population previously estimated by Rockland County Department of Planning, NYMTC, Cornell PAD, and Woods & Poole.

The estimated 2010 population for Rockland County used as the base for the forecasts was 302,600. However, the 2010 Census indicates that Rockland County's 2010 population was actually 311,687, which is three percent higher than anticipated by the forecasts. The population of UWNY's service area grew at a slightly higher rate than that of the county, so that the service area population in 2010 was 291,379 rather than the 262,959 anticipated based on previous forecasts; an increase of 10.8 percent.

Rockland County has not prepared revised forecasts based on this new information, and therefore the 2010 water demand forecast has not been revised. The effects of the 2010 Census on the conclusions of the 2010 water demand forecast would be as follows:

- **Lower per capita water demand:** As noted above in the discussion of the 2010 water demand forecast, information on the average residential water demand over the previous 10 years and the estimated residential population as of the year 2009 were used to calculate the existing per capita residential water demand for UWNY's Rockland County water system. That demand was calculated to be 67.6 gpd per person. However, with the higher population numbers for 2010, and including the water demand information for 2010 as well, the actual per capita residential water demand was 66.0 gpd.

- **Changes to future projections:** Since Rockland County has not revised its future population projections, the expected effects of the higher 2010 number on future levels are not clear. It is possible that either: 1) the same rate of growth will occur, but beginning from the higher level realized in 2010; or 2) less growth will occur, so that the same level of population will be achieved by 2035 as previously predicted.

- **Effects of lower per capita water demand and changes to future projections on future water demand:** The effects of these changes on future water demand would vary, depending on the rate of future growth:

  - If the same rate of growth occurs, so that future population levels are 3 percent higher than previously predicted, using the lower per capita water demand results in slightly higher future water demand than predicted in the 2010 water demand forecast—0.2 mgd higher in both 2015 and 0.1 mgd higher in 2035. The total demand would be 33.8 mgd in 2015, compared to the 33.6 mgd predicted in the 2010 forecast and 34.3 mgd predicted in the 2006 forecast. By 2035, the demand would be 38.7 mgd, compared to the 38.6 mgd predicted in the 2010 forecast and 39.1 mgd predicted in the 2006 forecast.
  - If a lower rate of growth occurs, so that future population levels are the same by 2035 as previously predicted, using the lower per capita water demand

results in slightly less future water demand than predicted in the 2010 water demand forecast. By 2015, water demand would be essentially the same as originally predicted for that year (because of the higher base in 2010), but by the year 2035, the demand for water would be 1.0 mgd less than previously predicted. The total demand would be 33.6 mgd in 2015, compared to the 33.6 mgd predicted in the 2010 forecast and 34.3 mgd predicted in the 2006 forecast. By 2035, the demand would be 37.6 mgd, compared to the 38.6 mgd predicted in the 2010 forecast and 39.1 mgd predicted in the 2006 forecast.

Thus, while the 2010 Census data shifts the results of the 2010 water demand forecast slightly, overall it continues to confirm the validity of the 2006 water demand forecast in terms of annual average and peak demand. Figure 3-5 provides a comparison of the 2006 water demand forecast, the 2010 water demand forecast, and the two adjusted forecasts reflecting 2010 Census data discussed above.

3.2 Long-Term Supply Deficit

As Rockland County's population grows, the demand for water will increase, including the peak demand on summer days. As the designated water utility for its service area, which comprises most of Rockland County, UWNY is legally obligated to provide a safe, dependable, and adequate supply of potable water and adequate water pressure and water service to meet firefighting and public safety needs for its service area. Thus, the purpose of the proposed long-term water supply project is to develop an additional reliable and sustainable water supply that will allow UWNY's Rockland County water supply source system to meet the needs for water in Rockland County in the future, consistent with the 2006 and 2010 PSC Rate Orders.

As discussed in section 2, UWNY currently has the capacity to provide 33.9 mgd on an annual average basis, with a peak capacity of 51.44 mgd (sustainable for three days, twice per summer season).[5] By 2015, UWNY has committed to increase those supplies to a total of 34.5 mgd on an annual average basis, with a peak supply of 52.6 mgd.

At the same time, water demand in the service area is projected to grow over the long-term. As noted in the discussion of projected future population in the 2011 Rockland County Comprehensive Plan, "Development pressures will be placed on infrastructure systems that provide water, sewer, waste disposal, energy and telecommunications services. Capacity expansions and system upgrades will be needed to accommodate new development and maintain the quality of service."[6]

The planned future capacity increases will be sufficient to meet the projected demand through 2015, but they will not be sufficient to meet the demand projections in the long-term. The available average and peak supply and projected annual average and

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[5] As noted earlier, this does not account for conditions with the largest supply well out of operation, as recommended in *Ten-State Standards*. This would reduce available supply by approximately 1.5 mgd.

[6] *Rockland Tomorrow: Rockland County Comprehensive Plan.* Rockland County, adopted March 1, 2011. Chapter 3.0, "Demographics," p. 32.

peak day demand are shown in Figure 3-6 (without the addition of the Haverstraw Water Supply Project) and Figure 3-7(with the addition of the Proposed Project). As shown in Figure 3-6, by 2015, without a long-term water supply project, the average annual demand will reach the available supply level and by 2015 - 2018, the peak demand will reach the peak supply, so that it will be difficult for UWNY to meet the increased demands during the summer/early fall period, when demand is typically substantially higher than the annual average.

As part of its mandate to provide safe and adequate water supply service to its New York State customers, UWNY, like all water purveyors, must plan to provide sufficient safe yield in its water supply system. This is consistent with the PSC's regulations (16 NYCRR § 503.4), which require water companies that use surface water sources to take into consideration forecasted growth or decline for at least a 10-year period into the future, and when projections show that demand will exceed supply, the water company "shall undertake all reasonable efforts to reduce and control future demands to bring them into balance with supply. If appropriate, the water corporation shall develop plans, consistent with existing state requirements, to secure additional supply."

UWNY's obligation to provide adequate water is underscored in the language of its water supply permits from New York State Department of Environmental Conservation (NYSDEC) for Lake DeForest and Ramapo Valley Well Field, which state the following:

- **Lake DeForest permit:** "It is good engineering practice for a water utility to look to the future and to develop additional sources of supply so that it will be in a position to meet rising demands on its system in the years ahead. This is particularly so in a case such as here, where increased population and industrial development are indicated." [item 21 on page 7]

- **Ramapo Valley Well Field permit:** "The Applicant has an obligation to provide water under all conditions and at all times of the year to meet average and peak demands on its system as these demands arise and to plan ahead to have the necessary sources of supply, transmission, distribution and storage facilities constructed prior to the time such facilities are needed." [item 8 on page 22]

UWNY's future plans to comply with the supply commitments set forth in the 2006 and 2010 Rate Orders[7] are expected to provide adequate capacity to meet average annual and peak-day demands through the end of 2015 and potentially to 2020. However, UWNY currently relies on local water resources that are finite in their capacity to provide a safe supply of drinking water to its customers, and a major long-

[7] *Case 09-W-0731 – Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations for United Water New York Inc.*, Order Adopting Joint Proposal as Modified and Establishing a Three-Year Rate Plan (Jul. 20, 2010) (2010 Rate Order).

term water supply project is needed beyond that point to increase the system's safe yield to meet the future water demands of UWNY's service area in Rockland County.

For prudent water supply planning, this supply should include a margin of error above the projected demand, to ensure that adequate water is available. To ensure that adequate supply is available in the long term, UWNY is seeking to implement a long-term water supply project that can provide 2.5 mgd in additional safe yield by 2016, with the ability to provide up to an additional 5 mgd (for a total of 7.5 mgd) in the longer term future. For prudent long-term planning, and to benefit from economies of scale gained by capital investment in one single project, the long-term water supply project would therefore address the need for 7.5 mgd of additional safe yield while allowing that additional yield to be added incrementally to meet demand as it increases in the future.

Water conservation programs and UWNY's ongoing initiatives to maximize the efficiency and reduce water loss in its system will continue to play an important role in UWNY's multifaceted strategy to satisfy both its general mandate to provide a dependable supply of water to meet its customers' needs and the specific volume commitments included in the 2006 and 2010 Rate Orders and the Joint Proposals. Water conservation and efficiency programs alone, however, cannot generate the levels of increased supply needed to satisfy the PSC mandates in the 2006 and 2010 Rate Orders, including addressing long-term water demand in Rockland County beyond 2015.

Thus, the purpose of the proposed long-term water supply project is to develop an additional, sustainable water supply source that will increase the safe yield of the UWNY supply system to meet the growing needs for water in Rockland County over the long term, in compliance with UWNY's general legal obligations and the specific mandates included in the PSC's 2006 and 2010 Rate Orders.

3.3 System Reliability

While overall, UWNY's Rockland County water supply system can meet current demands for water, during the peak summer/early fall season, meeting the increased demand can be difficult. Furthermore, despite the robustness and flexibility of the system, it can be less reliable during periods with low precipitation.

UWNY's existing water supply system is particularly vulnerable to the effects of a drought, since its water supplies are all from the same geographic area (i.e., Rockland County). Thus, Rockland County's existing water supply system is almost completely dependent on rainfall within the county's boundaries and all supplies are therefore simultaneously affected by drought conditions. As noted above, the Ramapo Valley Well Field is the most susceptible to periodic dry spells, short-term droughts, and prolonged water shortage since the aquifer is hydraulically linked to the flow in the Ramapo River and is not permitted to operate at all during very low-flow conditions in the Ramapo River. Supply wells may be less susceptible to dry conditions, but

during prolonged dry periods are also adversely affected. It is typically not possible to pump wells continuously at maximum capacity without adversely affecting the quality of water from the well or nearby wells, or even the well's ability to produce water. Thus, wells cannot be operated for long periods of time without allowing "rest" periods for the wells to recharge. Groundwater levels and recharge rates are also adversely affected by drought conditions, which diminish the robustness of groundwater resources.

As documented in two reports completed by the USGS in 2010, *Water Resources of Rockland County, New York, 2005-07, with Emphasis on the Newark Basin Bedrock Aquifer,* and *Hydrogeology and Simulation of Groundwater Flow in Fractured Rock in the Newark Basin, Rockland County, New York*,[8] there are seasonal limitations during the growing season, when higher demand and reduced availability limit the capacity of water supply from groundwater. The reports indicate that while to date the aquifer has been able to replenish prior to the next growing season, this is an ongoing concern.

Long-term precipitation records indicate that the Northeast U.S. experiences a short-term drought (a drought with a duration of one to three months) once every two or three years on average, while longer droughts (droughts longer than three months) occur once every 20 to 30 years. There is increasing concern that global climate change may bring greater fluctuations in weather conditions, including more frequent or severe drought conditions or more frequent storm events. The safe yield of the system, which was designed based on the worst drought of record, does not account for conditions that might occur should a still worse drought occur.[9]

During periods of water shortages, RCDOH implements emergency measures to reduce water demand. (UWNY does not have the regulatory authority to mandate or regulate water conservation by its customers during drought or non-drought conditions.) Over the past 30 years, Rockland County has faced drought-related water use restrictions five times; three of those times have occurred in the past 13 years. Emergency drought conditions were in place for several months in both 1995 and 1999, and for most of the year in 2002. In addition, both 2001 and 2005 were particularly dry, although drought restrictions were avoided in both years.

The new long-term water supply project must improve the reliability of the water supply system while meeting future demands by introducing a supply that is less dependent on localized precipitation conditions. The Northeast U.S. experiences a short-term drought (i.e., a drought with a duration of one to three months) every one to three years on average, and experiences longer droughts (i.e., greater than three months) once every 20 to 30 years. The long-term water supply project should be

[8] United States Department of the Interior, United States Geological Survey, Scientific Investigations Reports 2010-5245 and 2010-5250. Available on the internet at http://pubs.usgs.gov/sir/2010/5245 and http://pubs.usgs.gov/sir/2010/5250.
[9] For groundwater, calculations of yield are more complex, so the term "safe yield" is often not applied to groundwater.

developed to be responsive to the occurrence of drought events and the potential effects of climate change on the frequency and severity of droughts and storm events.

The Haverstraw Water Supply Project would improve the reliability of the water supply system while meeting future demands for water by providing a supply of water that is less dependent on climate conditions. Rockland County is currently served by groundwater supplies and reservoirs. Including a drought-tolerant river source, like the Hudson River, adds to the diversity of the water supply portfolio and provides greater flexibility in managing the system. Section 1.3 provides a description of how the project will be phased and managed for optimum benefit.

3.4 Project Goals and Benefits

The purpose of the long-term water supply project is to provide additional water supply source to increase the safe yield and reliability of the UWNY Rockland County water supply system by 7.5 mgd, to accommodate future growth with an adequate margin of safety and comply with the 2006 and 2010 Rate Orders. Consistent with the requirements of UWNY's franchise and its mission as a water supply company, the water supplied must be high-quality drinking water that meets all drinking water standards. Based on this need, and within its capabilities as the Project sponsor, UWNY has identified the following goals and benefits for the Proposed Project.

- Avoid and Minimize Environmental Impacts: Consistent with the requirements of New York State's environmental laws, and particularly New York State Environmental Quality Review Act, a key goal for the long-term water supply project is to avoid and minimize the potential environmental impacts of the Proposed Project to the maximum extent practicable given the other goals and objectives for the Proposed Project and the capabilities of the Project sponsor.

- Ability to be Implemented in Stages: To meet future demands for water supply as they develop over time, and thereby minimize unnecessary capital costs to the ratepayers as well as unnecessary environmental effects, the long-term water supply project should have the ability to be implemented in stages.

- Cost Effectiveness: The Haverstraw Water Supply Project has been identified as the most cost-effective of the alternatives available to UWNY for the long-term water supply project.

Section 4
Water Quality, Quantity and Compliance with Drinking Water Regulations

4.1 Hudson River Water Quality

The Proposed Project's location on the Hudson River, and its use of Hudson River water as a water supply source, is based on extensive monitoring and analyses of water quality in Haverstraw Bay, as well as upstream and downstream of the Intake Site. As discussed in more detail section 4.1.6, Hudson River water is currently being withdrawn and treated for distribution as drinking water by more than 20 other municipalities, including both the City and Town of Poughkeepsie. As more fully detailed in section 4.1.5, the water quality analyses are based on model projections from a number of samples, and conclude that the Hudson River waters of Haverstraw Bay are suitable as a drinking water source.

Some level of contaminants are found in all drinking water sources, and United Water New York (UWNY), like all other purveyors of public water throughout New York State and beyond, encounters and addresses regulated substances on a daily basis. Many of these substances are ubiquitous and can be found in groundwater, in surface water, and in reservoirs. In addition, purveyors of public water like UWNY, routinely address potential threats to their public water supplies from nearby land uses such as landfills, industry, commercial vessels, and the like. Operators of public water supplies are trained in and familiar with this co-existence, which is heavily regulated by governmental entities in New York State and in the United States, generally.

The New York State Department of Environmental Conservation (NYSDEC) has assigned water classifications to all waters of New York State pursuant to the Environmental Conservation Law, 6 NYCRR Part 701. These classifications identify the best usages for that water body, based on its water quality. The Hudson River within the study area is designated by NYSDEC as Class SB saline surface water. The best usages of Class SB waters are primary and secondary contact recreation (e.g., swimming and water sports), and fishing. Class SB waters should be suitable for fish propagation and survival. Designated best usages are not exhaustive lists of permissible or legal uses—other uses may also take place in a particular reach of water so long as those other uses do not degrade water quality to the extent that it either no longer supports the designated best usages or falls below the numeric water quality standards.[1] The Class SB classification does not prevent the use of Class SB waters to create a public water supply through the conversion of withdrawn saline

[1] See, e.g., *In the Matter of the Applications of the Spring Valley Water Co., Inc. (Ambrey Pond Project)*, 1987 WL 55415 (Williams, Commissioner) (NYSDEC) Jan. 6, 1987), *aff'd sub nom, Hudson River Fisherman's Assoc. v. Williams*, 139 A.D.2nd 234 (3d Dep't 1988); *In the Matter of the Applications by the Lake Minnewaska Joint Venture*, 1984 WL 19314 (Williams, Commissioner) (NYSDEC Dec. 10, 1984); *accord, Arnold Irrigation District v. Dept. of Environmental Quality*, 79 Or. App. 136, 143-144 (1986), *cert. denied*, 301 Or. 765 (1986).

waters (through desalination) and treatment. The Proposed Project would not require a reclassification of the relevant reach of the Hudson River to use this water for drinking water.

4.1.1 Hudson River Historical Water Quality Data

Between April 2007 and May 2008, UWNY implemented a water quality monitoring program to classify the Hudson River. A range of water quality parameters were monitored on a weekly, monthly and quarterly basis and are described below.

Water monitoring was conducted at five locations within the Haverstraw Bay vicinity of the Hudson River at multiple depths and varying tidal cycles. Figure 4-1 indicates the site number and location for each sampling station. Table 4-1 below provides a summary of the approximate site location, description and installation date. (Site 2 is located in the vicinity of the proposed intake location.)

Table 4-1 – Sample Locations for 2007-2008 Water Quality Monitoring

SITE ID	APPROX. RIVER MILE	LOCATION	SAMPLING PERIOD
1	42	Tompkin's Cove, NY, north of (former) Lovett Power Generating Station.	April 2007 to July 2007
2	40	Stony Point, NY, off Grassy Point Rd.	April 2007 to Aug 2007
3	39	Haverstraw, NY, Bowline Pond	April 2007 to Aug 2007
4	37	Haverstraw, NY, off Tilcon Quarry	April 2007 to Aug 2007
4s	37	Haverstraw, NY, 250 feet west of Site 4	Aug 2007 to May 2008
5	39	Haverstraw, NY, 500 feet east of Site 3 (in river channel)	June 2007 to May 2008

4.1.1.1 Parameters Analyzed and Frequency

As mentioned above, several water quality parameters were analyzed at varying frequencies at each of the five sites located along the Hudson River. Table 4-2 summarizes the analyte groups and monitoring frequencies for each site.

The parameters monitored and associated analytical method, as well as the number of samples and detections, are detailed in Tables 1A (Clean Water Act Methods - 40 CFR 136) and 2A (other EPA-approved methods) of Appendix B, and Tables 1B (Clean Water Act Methods - 40 CFR 136) and 2B (other EPA-approved methods). Table 3, Summary of 2008-2011 Hudson River Sonde Water Quality Data and Summary of Hudson River and Raw Water Quality Data from Field Analysis, presents the

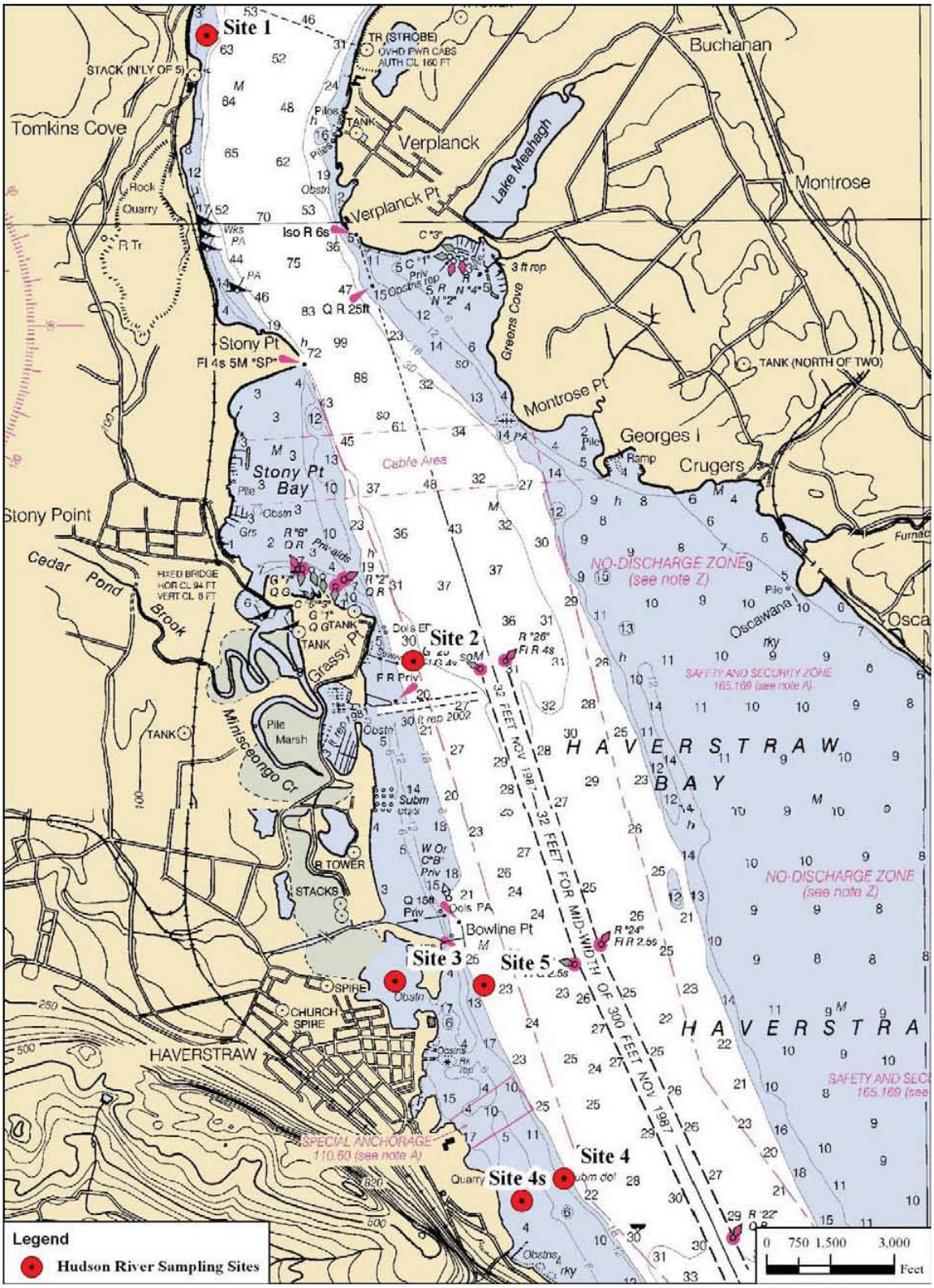

Figure 4-1

Hudson River Water Quality Sampling Sites