# New York City
# Department of Environmental Protection

## Filtration Avoidance Annual Report
## For the period January 1 through December 31, 2003

***Prepared in accordance with the November 2002 EPA Filtration Avoidance Determination***

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# 1. Introduction

In 2003, New York City continued to make significant strides in implementing a comprehensive watershed protection program to protect and improve the quality of the Catskill/Delaware water supply. The City, primarily through the New York City Department of Environmental Protection (DEP), and its partner agencies and organizations continued to advance the many programs that target present and possible future sources of pollution in the Catskill/Delaware watershed.

Since embarking on an aggressive watershed protection program in the early 1990s, the City has made remarkable progress in assessing the potential sources of water contamination and has designed and implemented programs to address these sources. As part of DEP's source water monitoring program, samples are collected and tests are conducted throughout the watershed. Each year, DEP collects more than 36,000 samples from 300 sites and performs more than 400,000 laboratory analyses. Based upon the information collected through its monitoring and research efforts, DEP designed a comprehensive watershed protection strategy, which focused on implementing both protective (antidegradation) and remedial (specific actions taken to reduce pollution generation from identified sources) initiatives. DEP's assessment efforts pointed to several key potential sources of pollutants: waterfowl on the reservoirs; wastewater treatment plants discharging into watershed streams; failing septic systems; farms located throughout the watershed; and stormwater runoff from development. DEP has crafted a protection strategy to target those primary pollution sources and a host of secondary ones.

In the context of this long-term commitment, 2003 was yet another year of significant achievements. The City continues to advance efforts in key program areas: land acquisition; regulatory enforcement; implementation of key environmental partnership programs; upgrades of non-City-owned wastewater treatment plants; and water quality monitoring and research.

## 1.1 Land Acquisition

While the 2002 Filtration Avoidance Determination (FAD) and the Watershed Memorandum of Agreement (MOA) set no specific solicitation targets for 2003, DEP initiated an aggressive campaign to resolicit owners in key priority areas who had previously not responded or had declined to sell land to the City. Owners of more than 100,000 acres of land have been contacted to date. Nearly a quarter of those owners have expressed some interest in participating in the program, and 14% have agreed to have their property appraised. DEP anticipates that resolicitation will continue to be a key element of the Land Acquisition Program in the future.

By the end of 2003, DEP and its partners had protected more than 53,000 acres of land either through fee acquisition or conservation easement. Easements and agricultural easement have become an increasingly important tool to the program and more than 50% of the land protected in 2003 was protected via easement. Key parcels continue to be protected in top priority areas, including:

- Of the 1,038 acres eligible in the Kensico Reservoir basin, the total number of acres acquired or under contract stands at 180 acres, or 17%. Negotiations continued on several significant parcels totaling over 200 acres.
- Of the 4,830 acres eligible in Rondout 1A, the total number of acres acquired or under contract was raised to 2,678 acres (55%).
- Of the 12,645 acres eligible in West Branch 1A and 1B, the total number of acres acquired or under contract was raised to 8,010 acres (63%).

## 1.2 Environmental and Economic Partnership Programs

West of the Hudson River, many of the partnership programs are being administered by the Catskill Watershed Corporation (CWC), a non-profit corporation formed specifically for that purpose. Together, CWC and DEP continued to implement programs that remediated more than 1,830 failing septics in the Catskill and Delaware watershed since 1997. In addition, DEP and CWC initiated a new program to pay homeowners to maintain their septic systems through regular pump outs.

DEP, in cooperation with the Watershed Agricultural Council (WAC), has helped make the Farm program into a national model. The Farm Program has a solid history of achievement: 327 farms have signed up to participate (versus a FAD goal of 297); 260 farms have commenced implementation of Whole Farm Plans; and 152 farms have substantially completed installation of Best Management Practices (BMPs). In addition to continuing to install Best Management Practices on participating farms, WAC has made great strides in forest management, initiating a small farms program, and implementing an expansive research strategy. In addition, the Conservation Reserve Enhancement Program (CREP) continues to be successful at removing environmentally sensitive lands from agricultural production and treating those lands with conservation practices. To date, nearly 1,350 acres of riparian buffer lands have been enrolled in CREP, which represents a dramatic increase over traditional rates of enrollment in the Conservation Reserve Program in the watershed region.

When coupled with DEP's own efforts in the areas of stream management, sewer extensions, and land management, 2003 was a year of tremendous activity and water quality protection.

## 1.3 Wastewater Treatment

There are 34 non-City-owned surface-discharging Wastewater Treatment Plants (WWTPs) in the Catskill/Delaware watershed, which account for approximately 60% of the WWTP flow in the west of Hudson watershed. By the end of 2003, upgrades were complete at facilities that account for more than 90% of non-City-owned Catskill/Delaware WWTP flow. In addition, at a cost of more than $240 million, DEP has completed the upgrades of the six City-owned wastewater treatment facilities that account for 40% of the WWTP flow in the west of Hudson watershed. These upgraded facilities continue to operate well, and effluent quality has improved markedly since completion of the upgrades.

Under the New Infrastructure Program, seven new WWTPs will be built west of Hudson in communities with demonstrated wastewater problems. Of the five projects initiated under the 1997 FAD, four are under construction. In addition, in 2003, DEP executed a change order to the Program contract to commit an additional $12.15 million in new infrastructure funds to complete wastewater projects in Phoenicia and Prattsville.

## 1.4 Water Quality Monitoring

During 2003, DEP continued its comprehensive water quality monitoring efforts. Both in the City distribution system and in the watershed, DEP collects literally thousands of samples each year and conducts millions of analyses. The City's sampling program continues to be much more extensive than is required by federal or State law. More than 36,000 samples were collected in the City and approximately 415,000 analyses were completed. Once again, the results are impressive. The City complied with the Objective Criteria of the Surface Water Treatment Rule. Of the 11,065 in-City Compliance samples collected pursuant to the Total Coliform Rule in 2003, a mere 0.2% were total coliform positive. All resamples, except one, were negative for total coliform. Since November 1994, DEP has collected approximately 100,000 Compliance samples and only seven of those samples have tested positive for *E. coli.*

## 1.5 Water Supply Security

In the wake of the events of September 11, 2001, New York City took a number of steps to enhance the security of the water supply system. These measures include increased surveillance at critical facilities upstate and in the City, enhanced water quality monitoring and initiation of a contract to install surveillance and access control measures at key locations. In 2003, DEP completed construction of five new police precincts west of Hudson to house the expanded DEP Police force. The City continues to place the highest priority on protection of the water supply.

## 1.6 2003 Annual Report

This report covers the period January 1, 2003, through December 31, 2003, and is compiled to satisfy requirements of the November 2002 FAD, which requires DEP to submit a comprehensive annual report on the status of the watershed protection program. Material in this report is organized to parallel the sections of the November 2002 FAD, which is somewhat different from previous FAD annual reports.

While this report provides a thorough overview of those programs that are directly connected to watershed protection or water quality preservation and enhancement in the City's Catskill and Delaware water supply systems, there is a wide variety of additional information that is compiled and available in other formats. Under the filtration avoidance waivers that have been in effect since December 27, 1991, DEP produces and provides an extensive schedule of other reports, data and documents to EPA and the New York State Department of Health (DOH). Further information on the programs discussed here can be found in the reports submitted pursuant to the May 1997 and November 2002 FADs.

In addition, in 2003, DEP launched a new portion of its website devoted to the watershed protection program. The new site contains a host of information on watershed protection programs, including recent press releases, reservoir storage status and up-to-date water quality data. Please visit the website at http://www.nyc.gov/watershed.

While this report focuses, of necessity, on the efforts of New York City, it is important to note that DEP works in partnership with dozens of agencies and organizations throughout the region to achieve the common goal of water quality protection. Many of those organizations are acknowledged in the body of this report. The other private, governmental and non-profit entities that share a role in this complex effort are too numerous to list. However, DEP gratefully acknowledges their help and support.

# 2. SWTR Objective Criteria Compliance

## 2.1 Water Quality Monitoring and Special Studies

During 2003, DEP continued its comprehensive water quality monitoring efforts. Both in the City distribution system and in the watershed, DEP collects literally thousands of samples each year and conducts over 600,000 analyses. The City's sampling program continues to be much more extensive than required by federal or State law. More than 36,900 samples were collected in the City and approximately 415,500 analyses were completed. Once again, the results are impressive. The City complied with the Objective Criteria of the Surface Water Treatment Rule. Of the 11,065 in-City Compliance samples collected pursuant to the Total Coliform Rule in 2003, a mere 0.2% were total coliform positive, of which three samples were also *E. coli* positive. All resamples, except one, were negative for total coliform. Since November 1994, DEP has collected almost 100,000 Compliance samples and only seven of those samples have tested positive for *E. coli.*

## 2.2 Federal and State Objective Water Quality Criteria

On the tenth of every month, DEP provides both EPA and State DOH with the results of its enhanced monitoring program, developed to comply with the requirements of the Surface Water Treatment Rule (SWTR), the Total Coliform Rule and other federal regulations that went into effect in 1991. The City, as an unfiltered surface drinking water supplier, must meet these objective criteria. The information provided below demonstrates compliance with all pertinent standards.

## 2.3 SWTR Monitoring and Reporting

Monthly raw water and entry point monitoring for coliform concentrations, turbidity, disinfection, and chlorine residuals, complied with all federal water quality requirements, as did quarterly monitoring for trihalomethanes and haloacetic acids. These results indicate the continued maintenance of a high quality water supply.

### 2.3.1 *Raw Water Fecal Coliform Concentrations (40 CFR Section 141.71 (a)(1))*

Both the Catskill and Delaware Aqueduct effluent from Kensico Reservoir exhibited fecal coliform concentrations, in water prior to disinfection, at levels less than or equal to 20 CFU/100 mL in at least 90% of the samples collected during the year, for six month running percentages. In fact, the running percentages of samples for the Catskill and Delaware Systems never dipped below 98.28% and 97.22%, respectively.

### 2.3.2 *Raw Water Turbidity (40 CFR Section 141.71(a)(2))*

Both the Catskill and Delaware Aqueduct effluent from Kensico Reservoir exhibited turbidity levels less than or equal to 5 Nephelometric Turbidity Units (NTU) in water prior to disinfection, on an ongoing basis, with one exception. That exception occurred in the Delaware

System's change over to "By-Pass" at Kensico Reservoir on August 26, in order to test the hypochlorite system at the Rondout Effluent Chamber. Some turbidity spikes were experienced as a result of gate operations. The two most significant spikes occurred at approximately 11:30 a.m. and 5:20 p.m. and peaked just below 10 NTU. The turbidity was elevated throughout this period, but did not exceed 5 NTU for more than one hour for either spike. EPA and State DOH were notified. Continuous monitoring of source water turbidity was maintained during the year. With that one exception, turbidity values did not exceed 3.7 NTU for the Catskill System and 2.5 NTU for the Delaware System.

### 2.3.3 *Raw Water Disinfection/CT Values (40 CFR Section 141.71(b)(1)(i) and 141.72(a)(1))*

CT values recorded each day during the year for the Catskill and Delaware Systems produced net inactivation ratios greater than or equal to 1.0 at all times, with the exception of a twenty minute period on July 24 as discussed below. The actual lowest net inactivation ratio was 1.1 for the Catskill System and 1.0 for the Delaware System.

On July 24 there was a chlorine gas leak at the Shaft 18 Delaware aqueduct facility resulting in a drop in chlorination in both the Catskill and Delaware Systems. This drop in chlorination began at approximately 11 a.m and lasted for about thirty minutes. The chlorine residual in the Catskill aqueduct measured at CATEV reached a minimum of 0.3 mg/l at 11:30 a.m. The chlorine residual in the Delaware aqueduct measured at DEL19 dropped to 0.0 mg/l at 10:55 a.m. for approximately ten minutes. The chlorine residual in the Delaware aqueduct measured at Bx 2 dropped to 0.0 mg/l at 3:14 p.m. for approximately twenty minutes. During this episode CT at peak flow continued to be met. EPA and State DOH were notified.

### 2.3.4 *Entry Point Chlorine Residual (40 CFR Section 141.71(b)(1)(iii) and 141.72(a)(3))*

Chlorine residuals were maintained at concentrations at or above 0.20 mg/l at all entry points during the year. The lowest chlorine residual measured at an entry point was 0.36 mg/l.

### 2.3.5 *Distribution System Disinfection Residuals (40 CFR Section 141.71(b)(1)(iv) and 141.72(a)(4))*

All chlorine residuals for Compliance samples, measured within the distribution system during the year, were measurable/detectable (the lowest being 0.01 mg/l), with the exception of four Compliance samples with a 0.0 mg/l free chlorine residual. Three (3) of the samples had a heterotrophic plate count (HPC) of <1 CFU/ml. HPC was not performed on the fourth sample but it was total coliform negative, and a resample collected from the same site was also total coliform negative, had a chlorine residual of 0.53 mg/l, and an HPC of <1 CFU/ml. Samples with an HPC less than or equal to 500 CFU/ml would be deemed to have a detectable disinfectant residual for purposes of determining compliance with this requirement.

All Surveillance samples had measurable/detectable free chlorine residuals, the lowest being 0.04 mg/l. Surveillance sites are located on mains that do not have direct service connections to consumers and are not used for compliance purposes. Surveillance samples supplement Compliance sites and are collected to gather additional water quality data in the distribution system. Surveillance samples make it possible to optimize process control, assess water quality, facilitate water quality management, and to determine the source and extent of physical and/or biological quality changes, such as high turbidity, color or coliform occurrences.

### 2.3.6 *Trihalomethane Monitoring (40 CFR Section 141.71(b)(6)) and HAA5 Monitoring (40 CFR Section 141.171)*

The analysis for trihalomethanes, performed on a quarterly basis, resulted in a maximum total trihalomethane (TTHM) level of 56 µg/l. The analysis for haloacetic acids, also performed on a quarterly basis, resulted in a maximum haloacetic acid five (HAA5) level of 71 µg/l.

The highest TTHM Quarterly Running Average during the year was 34 µg/l for the Catskill/Delaware System, recorded during the fourth quarter, and below the regulated level of 80 µg/l. The highest HAA5 Quarterly Running Average during the year was 45 µg/l for the Catskill/Delaware System, also recorded during the fourth quarter, and below the regulated level of 60 µg/l.

## 2.4 Total Coliform Monitoring

### 2.4.1 *Monthly Coliform Monitoring (40 CFR Section 141.71(b)(5))*

Within the distribution system, coliform monitoring indicated monthly levels below the 5% maximum of the Total Coliform Rule. The number of Compliance samples collected for total coliform analysis was 11,065. Of the Compliance samples collected, 28 samples were total coliform positive of which three samples were also *E. coli* positive. All resamples, except one, were negative for total coliform. The actual percentage of Compliance samples that were total coliform positive was 0.2%.

### 2.4.2 *Chlorine Residual Maintenance in the Distribution System*

During the year DEP has continued a number of programs to ensure adequate levels of chlorine throughout the distribution system. These have included: 1) maintaining chlorination levels at the distribution system's four entry points, 2) conducting spot flushing when necessary, and 3) providing local chlorination booster stations at remote locations. Three permanent local chlorination booster stations have been continuously operating to improve the chlorine residual levels at the Fort Tilden, Roxbury and Breezy Point areas (Rockaway Peninsula in Queens), City Island in the Bronx and Floyd Bennett Field in Brooklyn.

As a result of these steps taken by DEP, chlorine residuals have been continuously maintained throughout the distribution system. In 2003, in over 11,000 Compliance samples, all samples had a measureable/detectable chlorine residual.

Table 2.1. Monthly average free residual chlorine at system entry points.

| **Month** | **1989** | **1990** | **1991** | **1992** | **1993** | **1994** | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **City Tunnel No.1 at BX4/154/15450/10250** | | | | | | | | | | | | | | | |
| JAN | 0.61 | 0.59 | 0.63 | 0.69 | 0.94 | 1.03 | 0.95 | 1.18 | 0.80 | 0.73 | 0.94 | 0.70 | 0.71 | 0.92 | 0.94 |
| FEB | 0.57 | 0.56 | 0.65 | 0.65 | 0.80 | 1.05 | 0.88 | 0.90 | 0.78 | 0.73 | 0.88 | 0.68 | 0.67 | 0.92 | 0.91 |
| MAR | 0.58 | 0.62 | 0.63 | 0.68 | 0.93 | 1.00 | 0.92 | 1.00 | 0.67 | 0.72 | 0.79 | 0.67 | 0.64 | 0.96 | 0.87 |
| APR | 0.48 | 0.56 | 0.57 | 0.66 | 1.00 | 0.97 | 1.07 | 1.04 | 0.70 | 0.77 | 0.85 | 0.62 | 0.69 | 0.92 | 0.91 |
| MAY | 0.55 | 0.60 | 0.60 | 0.69 | 0.91 | 0.93 | 1.00 | 0.89 | 0.74 | 0.75 | 0.78 | 0.70 | 0.68 | 0.93 | 0.83 |
| JUN | 0.54 | 0.64 | 0.64 | 0.68 | 0.90 | 0.89 | 1.01 | 0.83 | 0.81 | 0.81 | 0.86 | 0.73 | 0.72 | 0.93 | 0.83 |
| JUL | 0.52 | 0.63 | 0.59 | 0.82 | 0.94 | 1.14 | 1.01 | 0.95 | 0.87 | 0.98 | 1.01 | 0.74 | 0.69 | 0.92 | 0.78 |
| AUG | 0.56 | 0.57 | 0.65 | 0.79 | 0.99 | 1.02 | 1.06 | 1.14 | 0.95 | 1.29 | 0.96 | 0.75 | 0.71 | 0.96 | 0.85 |
| SEP | 0.51 | 0.63 | 0.69 | 0.87 | 1.14 | 1.18 | 1.14 | 1.16 | 1.03 | 1.20 | 0.88 | 0.76 | 0.71 | 0.87 | 0.88 |
| OCT | 0.52 | 0.61 | 0.81 | 0.89 | 1.16 | 1.08 | 1.07 | 1.02 | 1.04 | 1.19 | 0.83 | 0.72 | 0.72 | 0.92 | 0.84 |
| NOV | 0.61 | 0.58 | 0.70 | 0.87 | 1.16 | 1.14 | 1.15 | 0.90 | 0.92 | 1.22 | 0.78 | 0.78 | 0.82 | 0.95 | 0.89 |
| DEC | 0.61 | 0.74 | 0.70 | 0.93 | 1.12 | 1.04 | 1.05 | 0.87 | 0.83 | 1.03 | 0.80 | 0.74 | 0.91 | 0.94 | 0.81 |
| **City Tunnel No.2 at BX5/121/12150** | | | | | | | | | | | | | | | |
| **Month** | **1989** | **1990** | **1991** | **1992** | **1993** | **1994** | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** |
| JAN | 0.50 | 0.59 | 0.64 | 0.74 | 0.97 | 0.99 | 1.03 | 1.14 | 0.89 | 0.79 | 0.88 | 0.83 | 0.83 | 1.15 | 1.06 |
| FEB | 0.46 | 0.55 | 0.66 | 0.68 | 0.85 | 1.11 | 1.02 | 0.97 | 0.80 | 0.74 | 0.81 | 0.76 | 0.84 | 1.17 | 1.03 |
| MAR | 0.45 | 0.58 | 0.65 | 0.66 | 0.95 | 1.10 | 0.95 | 1.13 | 0.74 | 0.80 | 0.78 | 0.77 | 0.78 | 1.19 | 1.01 |
| APR | 0.50 | 0.54 | 0.55 | 0.68 | 1.01 | 1.02 | 1.04 | 1.08 | 0.76 | 0.87 | 0.88 | 0.70 | 0.83 | 1.22 | 1.00 |
| MAY | 0.73 | 0.59 | 0.58 | 0.71 | 1.03 | 1.12 | 1.01 | 0.94 | 0.83 | 0.95 | 0.91 | 0.71 | 0.82 | 1.14 | 0.95 |
| JUN | 0.65 | 0.66 | 0.64 | 0.69 | 1.13 | 1.25 | 1.05 | 0.97 | 1.02 | 1.00 | 0.97 | 0.76 | 0.79 | 1.15 | 0.92 |
| JUL | 0.69 | 0.69 | 0.69 | 0.83 | 1.10 | 1.19 | 1.06 | 1.01 | 1.08 | 1.13 | 1.02 | 0.89 | 0.82 | 1.15 | 0.94 |
| AUG | 0.75 | 0.64 | 0.71 | 0.87 | 1.24 | 1.17 | 1.11 | 1.14 | 1.16 | 1.25 | 1.07 | 0.96 | 0.92 | 1.18 | 0.92 |
| SEP | 0.68 | 0.67 | 0.75 | 1.02 | 1.24 | 1.36 | 1.16 | 1.20 | 1.24 | 1.28 | 1.10 | 0.95 | 0.93 | 1.16 | 0.96 |
| OCT | 0.62 | 0.68 | 0.91 | 0.91 | 1.24 | 1.30 | 1.09 | 1.05 | 1.19 | 1.23 | 1.02 | 0.94 | 0.94 | 1.11 | 0.91 |
| NOV | 0.61 | 0.66 | 0.76 | 0.88 | 1.13 | 1.22 | 1.15 | 0.93 | 0.99 | 1.14 | 1.02 | 0.88 | 0.98 | 1.01 | 0.93 |
| DEC | 0.63 | 0.75 | 0.69 | 0.94 | 1.19 | 1.18 | 1.12 | 0.94 | 0.85 | 1.01 | 0.90 | 0.83 | 1.05 | 1.04 | 0.84 |
| **City Tunnel No.3 at 15450** | | | | | | | | | | | | | | | |
| Month | **1989** | **1990** | **1991** | **1992** | **1993** | **1994** | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** |
| JAN | | | | | | | | | | | 1.11 | 0.69 | 0.70 | 1.00 | 0.97 |
| FEB | | | | | | | | | | | 0.94 | 0.70 | 0.70 | 0.97 | 0.94 |
| MAR | | | | | | | | | | | 0.76 | 0.69 | 0.67 | 0.92 | 0.99 |
| APR | | | | | | | | | | | 0.68 | 0.65 | 0.69 | 0.94 | 0.93 |
| MAY | | | | | | | | | | | 0.70 | 0.70 | 0.74 | 0.84 | 0.83 |
| JUN | | | | | | | | | | | 0.79 | 0.72 | 0.70 | 0.80 | 0.75 |
| JUL | | | | | | | | | | 1.15 | 0.90 | 0.74 | 0.68 | 0.83 | 0.78 |
| AUG | | | | | | | | | | 0.89 | 0.94 | 0.74 | 0.69 | 0.84 | 0.91 |
| SEP | | | | | | | | | | 0.89 | 0.85 | 0.77 | 0.70 | 0.86 | 0.93 |
| OCT | | | | | | | | | | 0.92 | 0.82 | 0.74 | 0.69 | 0.87 | 0.96 |
| NOV | | | | | | | | | | 1.06 | 0.78 | 0.79 | 0.79 | 0.88 | 0.92 |
| DEC | | | | | | | | | | 1.12 | 0.78 | 0.74 | 0.91 | 0.96 | 0.88 |

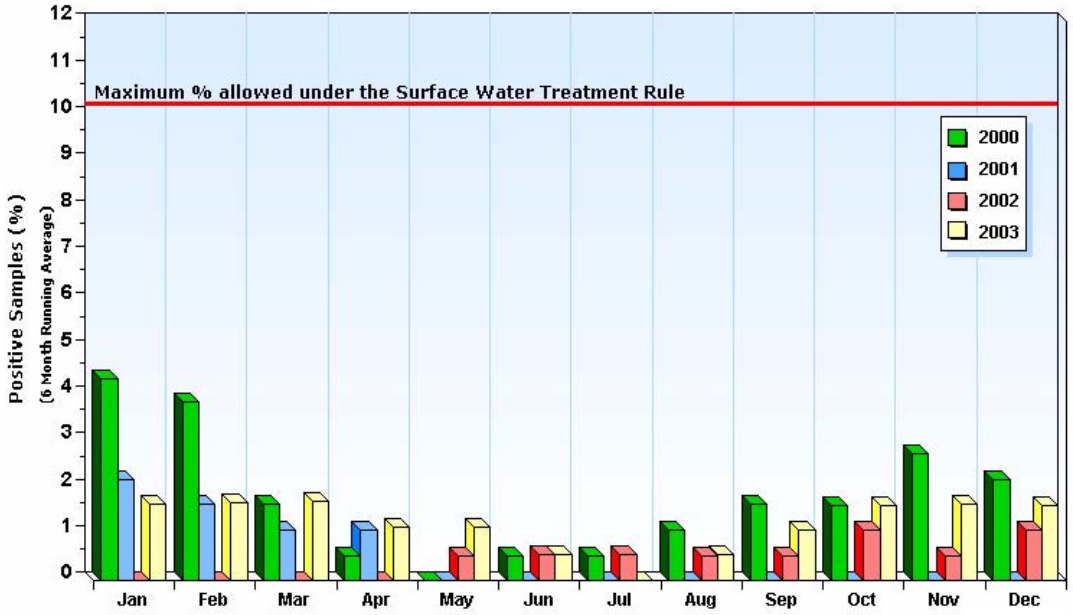


Figure 2.1. Positive fecal coliform samples, Kensico Reservoir, Catskill System, 2000 - 2003.

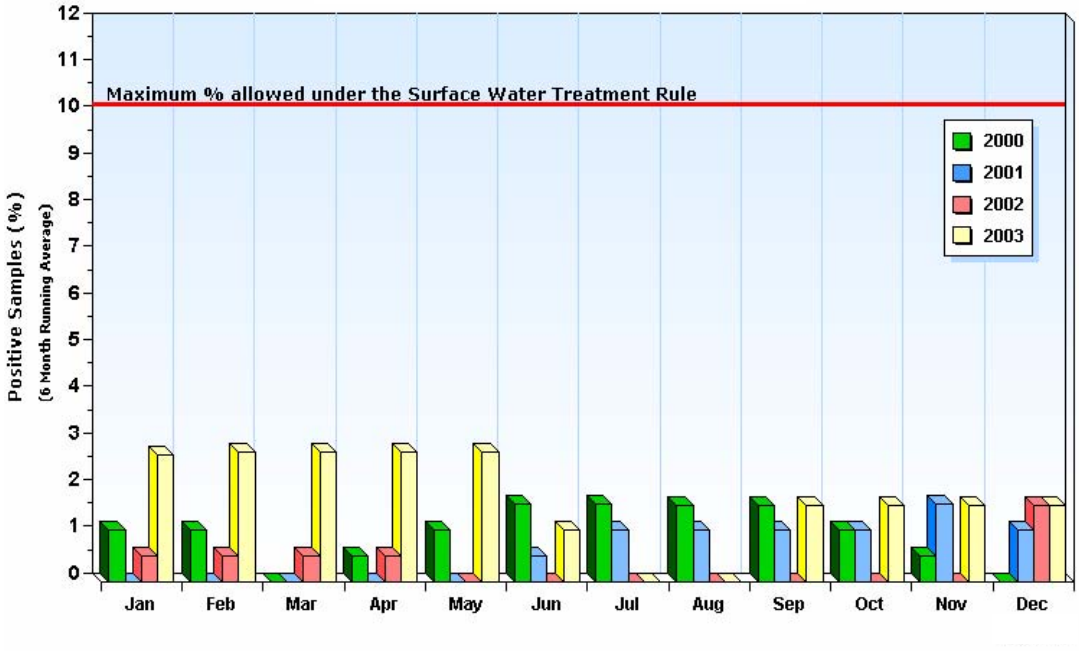


Figure 2.2. Positive fecal coliform samples, Kensico Reservoir, Delaware System, 2000 - 2003.

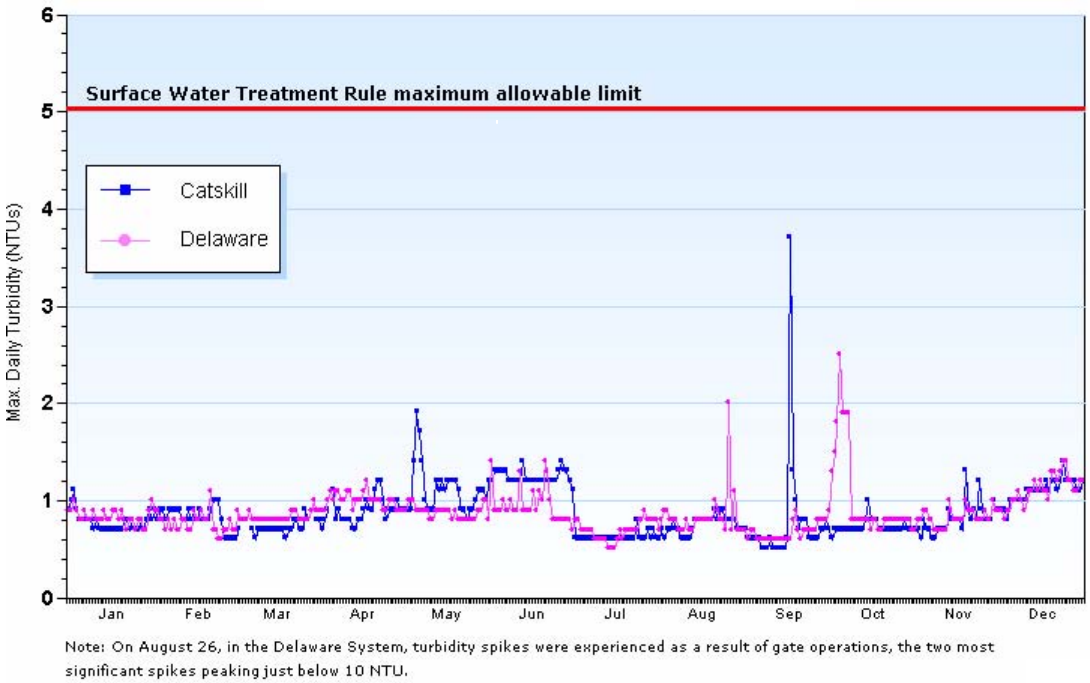


Figure 2.3. Catskill and Delaware source water turbidity, 1/1/03 - 12/31/03.

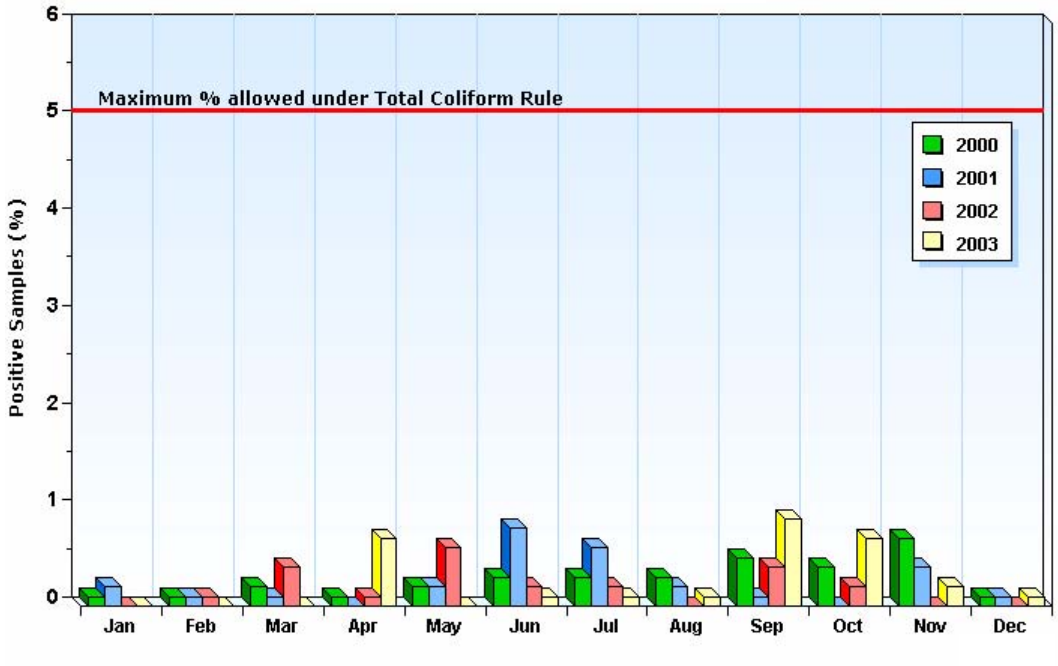


Figure 2.4. Positive total coliform samples in the City's Water Distribution System, 2000 - 2003.

# 3. Environmental Infrastructure

## 3.1 Septic and Sewer Programs

### 3.1.1 Septic System Rehabilitation and Replacement Program

The Septic System Rehabilitation and Replacement Program Phase II (Septic Phase II) contract for $15 million between DEP and CWC was executed in April 2003 and an Order to Commence Work was issued on May 27, 2003. The Septic Phase II contract continues the MOA program of rehabilitating, replacing and upgrading septic systems in New York City's West of Hudson watersheds.

Included under the umbrella of the CWC Septic Rehabilitation and Replacement Program (Phases I and II) are the Priority Area Program, the Hardship Program, the SDWA-Septic Monitoring Program, and the Coordinator (before July 1999) and Reimbursement Programs.

The centerpiece and most active component, the Priority Area Program, is an inspection and repair program implemented geographically according to priority criteria. In 2003, the Priority Area Program expanded from the 60-Day Travel Time Area to include septic systems located within 50 feet of a watercourse and/or 300 feet of a reservoir or reservoir stem. CWC has sent out 1,700 letters soliciting program participation to homeowners with septic systems in close proximity to watercourses or reservoirs.

In June, the CWC Board passed a resolution authorizing reimbursements to homeowners who repaired or replaced septic systems outside of the Priority Area Program based on failures identified after July 1, 1999 (the end of the Coordinator Program) and May 26, 2003. Approximately 300 homeowners repaired or replaced their septic systems during this period.

CWC paid for the remediation of 275 residential septic systems in the West of Hudson Watershed in 2003. Since 1997, a total of 1,832 septic system failures have been addressed through the Septic Rehabilitation and Replacement Program.

### 3.1.2 Septic Maintenance Program

The Septic Maintenance Program, a new component of the 2002 FAD, is a $1.5 million program administered by CWC and aimed at extending the useful life of residential septic systems in the City's West of Hudson Watershed. It is a voluntary program intended to reduce the occurrence of septic system failures through regular pump-outs and maintenance.

On July 15, 2003, DEP issued the Notice to Commence Work on the Septic Maintenance Program contract.

The CWC Board adopted Septic Maintenance Program Rules on October 28, 2003. Under the program, CWC will reimburse homeowners for half of the eligible costs of inspections and pump-outs.

A two-year pilot phase is scheduled to begin in priority areas in 2004. Following the pilot phase, the program will be implemented throughout the City's West of Hudson Watershed.

### 3.1.3 Alternate Design Septic Systems Program

The Alternate Design Septic Systems Program is a $3 million program to pay for the importation of fill material and/or pumping apparatus for the construction of septics where required solely by DEP or its delegatee in order to comply with the Watershed Regulations.

No Alternate Design Septic System projects were funded in 2003.

In May, CWC transferred $100,000 in Alternate Design Septic Systems Program funding to the Septic Hardship Program. In July, CWC transferred $60,000 in Alternate Design Septic Systems Program funding to the Septic Program for a cost-share for Town of Bovina Community Septic WEAP/WRDA grant.

### 3.1.4 Sewer Extension Program

The Department has made significant in-roads in implementing the Sewer Extension Program during the past year. All of the involved communities have made important strides in advancing the implementation of the Program. The following provides a summary of the steps and activities each community made during the past year.

*Town of Hunter (Tannersville Wastewater Treatment Plant)*

During 2003, the Town received all applicable permit approvals pertaining to the planned sewer extensions and prepared final sets of plans and specifications for the project. In September, the Town solicited bids for the construction of the extensions and in December, awarded a construction contract. The Town is currently in the process of obtaining all necessary easements for the construction of the new sewer mains and laterals as well as for the future maintenance of the system by the Department. Construction of the extensions is anticipated to commence in April or May 2004.

*Town of Roxbury (Grand Gorge Wastewater Treatment Plant)*

Department staff has continued to advance planning and design activities for the proposed sewer extension along NYS Rt. 23 just west of the Hamlet of Grand Gorge. Toward this end, the design plans and specifications of the planned extension have been revised in response to comments from the New York State Department of Environmental Conservation (NYSDEC) and from the Department's WOH Engineering Unit. All of the applicable permit approvals are expected in the second quarter of 2004. The Town has also commenced obtaining easements that are required in order to begin construction. Construction of the planned extension is expected to take place during the 2005 construction season.

*Town of Neversink (Grahamsville Wastewater Treatment Plant)*

After several years of negotiating with the Town with respect to issues pertaining to the Agreement for implementing the Program, the Town and City finalized the draft Agreement in December 2003. In the first quarter of 2004 the contract is moving through the City's administrative/procurement approval process. In 2004, as design proceeds, the Town is expected to finalize language on a new Sewer Use Law. Construction is expected to commence on the planned extensions during the 2005 construction season.

*Village of Margaretville/Town of Middletown (Margaretville Wastewater Treatment Plant)*

During the past year, the Department has worked closely with the Village and Town in resolving the few remaining outstanding issues associated with the draft Agreement for implementing the Program. It is expected that the Village and Town will be in a position to sign the Agreement in the spring of 2004.

The Department also completed an Archeological Resources Investigation and an Environment Site Assessment of the areas planned for sewer extensions in the Village and Town during the past year. The Department, through its consultant, has also continued to update the project's preliminary design plans following meetings with Village and Town officials as well as with individual property owners. SEQRA requirements and all applicable permits are expected to be met and in place in 2004. DEP will work closely with Town and Village officials in 2004, to finalize a new Sewer Use Law. Final design is expected to be completed in time to allow construction of the planned extensions to begin as early as the 2005 construction season.

## 3.2 New Sewage Treatment Infrastructure Program

During 2003, wastewater treatment projects progressed in each of the top five Identified Communities. Wastewater projects were under construction in 2003 in Hunter, Windham, Andes and Roxbury. The Village of Fleischmanns saw a change in administration in 2003, and a subsequent change in the engineering firm overseeing the proposed WWTP project design. The new engineering firm retained by the Village of Fleischmanns has set a target date of March 2004, for soliciting bids for the WWTP and collection system construction contracts.

In October 2003, DEP executed a Change Order to its New Sewage Treatment Infrastructure Program contract with NYSEFC and CWC. The Change Order authorizes the expenditure of $12,150,000 in new infrastructure funds to complete wastewater projects in Phoenicia and Prattsville.

The table below shows the design flows and agreed upon block grants for wastewater projects in Identified Communities 1-7.

Table 3.1. Design flows and block grants for wastewater projects.

| Municipality | Maximum Permitted Flow* | Block Grant Award | Total Contract Award** |
|---|---|---|---|
| Hunter | 338,400 gpd | $15,300,000 | $19,241,000 |
| Fleischmanns | 146,000 gpd | $11,505,986 | $11,505,986 |
| Windham | 373,800 gpd | $20,000,000 | $23,120,000 |
| Andes | 62,000 gpd | $6,250,000 | $6,250,000 |
| Roxbury | 100,000 gpd*** | $8,550,000 | $8,550,000 |
| Phoenicia | 185,000 gpd | $11,000,000 | $11,000,000 |
| Prattsville | 86,000 gpd | $8,238,137 | $8,238,137 |

* Includes flow from WWTPs being decommissioned

**Includes Consolidation Increments for connection of Tie-in Facilities

*** Roxbury Maximum Permitted Flow includes possible future flow from Hubbell Corners

*Status/Activity as of December 2003*

Andes - The WWTP project is on schedule to be functionally complete by September 2004.

Roxbury - The Force Main to Grand Gorge project is on schedule to be functionally complete by December 2004.

Windham - The WWTP project is on schedule to be functionally complete by November 2004.

Hunter - The WWTP project is on schedule to be functionally complete by April 2005.

Fleischmanns - The Village hired a new project engineer in 2003. The WWTP and collection system constructions contracts are expected to be bid out in March 2004.

Phoenicia - The 2003 NIP Change Order authorizes funding of Phoenicia wastewater project. The Town needs to award a design/construction contract to proceed. In the first quarter of 2004, the Town is interviewing engineering firms. The Town is expected to enter into contract with EFC in the second quarter of 2004, which will begin a 1-year design and 2-year construction schedule.

Prattsville - The 2003 NIP Change Order authorizes funding for Prattsville wastewater project. Prattsville executed a design/construction contract with EFC on January 22, 2004, beginning the 1-year design period. The 2-year construction phase will commence upon the award of construction contracts.

Additional information on Program development and components is included in previous Annual Reports.

## 3.3 Community Wastewater Management Program

The Community Wastewater Management Program is the successor program to the New Infrastructure Program. Funded for $10,000,000, the Program builds upon experience gained in the New Infrastructure Program to address MOA-listed priority communities not addressed in the New Infrastructure Program. It is expected that communities entering the Program will opt to pursue septic maintenance districts that are likely to include cluster systems for groups of properties where on-site systems are not viable.

The Community Wastewater Management Program contract was registered on December 18, 2003 and a Notice to Commence Work issued to the Catskill Watershed Corporation on the same date. The contract calls for Community Wastewater Management Program Rules to be developed by March 2004.

The Program calls for CWC to hire an engineering firm to work with the five communities to develop community wastewater management programs within block grant allocations. Once designs are complete, communities will solicit bids for construction contracts for the work.

## 3.4 Stormwater Programs

### 3.4.1 Stormwater Programs: MOA 145

In 2003, the City received four applications for funding the design and implementation of stormwater controls pursuant to paragraph 145 of the Watershed Memorandum of Agreement. All of the applications received were associated with projects in the East of Hudson watershed.

The following summarizes the applications for funding the City received during the reporting period, and the disposition of those applications:

- The City paid $1,200 to one applicant to cover 50% of the cost of designing and implementing an Individual Residential Stormwater Permit (IRSP) associated with the construction of a single-family residence. The WR&Rs required that an IRSP be prepared because the dwelling was within a limiting distance to a watercourse specified in the WR&Rs;
- The City paid $8,300 to a small Business to fund 50% of the costs incurred from designing and implementing a Stormwater Pollution Prevention Plan (SPPP) that was required solely by the WR&R to construct the small business structure;
- The City denied an application for funding the design and implementation of an SPPP for one business that claimed to be a “small business” as defined in the WR&Rs. The applicant failed to demonstrate that the business met the definition of a small business in the WR&Rs;
- A third application for funds to pay for 50% of the cost of designing and implementing a SPPP was reviewed during the reporting period, but was determined by the City to be incomplete. The City requested documentation supporting the application, but at the close of the reporting period had not received the requested information.

In summary, the City paid a total of $9,500 for stormwater controls in the East of Hudson watershed, and nothing in the West of Hudson watershed, during 2003. The funds paid for 50% of the incremental cost of designing and implementing stormwater measures required by the WR&Rs, which are not otherwise required by State or Federal law, regulation, or enforceable standard.

### 3.4.2 Stormwater Retrofits Program

On June 6, 2003, a change order to the existing contract between DEP and CWC was registered by the Comptroller of the City of New York, expanding the Stormwater Retrofit Program to $13.925 million. In addition to the original $7.625 million funding level established in 1997, as a follow-through for the 2003 FAD, $6.3million was added to continue the existing program as currently administered. The Agreement also provides an additional $1.25 million for Stormwater Infrastructure Assessment and Planning in order to conduct detailed and comprehensive assessments of existing community stormwater infrastructure, with the goal of identifying and prioritizing potential areas and Stormwater BMPs for funding under the Program.

Throughout 2003, CWC and DEP solicited for program applications, conducted site inspections, completed project evaluations, and administered previously funded projects.

Thirteen applications were received and identified for further review and inspection as a result of the Project solicitation that took place between June 17, 2003, and September 2, 2003. Upon completion of the evaluation process, eleven project applications met the minimum requirements for funding consideration based upon their "Site Factor/Pollutant Removal" score and compliance with Program purposes and goals.

All project evaluations, ranking and suggested funding limits were approved by CWC's Board in January 2004. Capital funding for Round 5 is projected to be $1,332,239. The tables below and accompanying map provide information on each Program component for each Funding Round to date. The project numbers on the map refer to the numbers listed in the tables.

Table 3.2. Stormwater Retrofit Program - 1999 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 1 | Village of Hobart | Main Street | Sewer Separation & Stormwater Treatment, I/I Reduction | Sedimentation (Deep Sump Catch Basins) | $75,000 | Cannonsville | Complete 12/11/00 |
| 2 | Village of Walton | Water Street | Collection, Conveyance & Treatment of Stormwater from Village Center, Eliminate Direct Discharge | Sedimentation | $304,170 | Cannonsville | Planning |

Table 3.2. Stormwater Retrofit Program - 1999 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 3 | Village of Delhi | Court Street | Collection, Conveyance & Treatment of Stormwater from Medium Density Residential and Commercial Areas, Eliminates Untreated Direct Discharge | Sedimentation (CDS) | $109,219 | Cannonsville | Design |
| 4 | Village of Delhi | Delaware Street | Collection, Conveyance & Treatment of Stormwater from Low Density Residential and Service Roads, Eliminates Untreated Direct Discharge | Sedimentation (CDS) | $105,469 | Cannonsville | Design |
| 5 | Village of Delhi | Clinton Street | Collection, Conveyance & Treatment of Stormwater from Medium Density Residential Areas, Eliminates Untreated Direct Discharge | Sedimentation (CDS) | $123,188 | Cannonsville | Design |
| 6 | Village of Walton | Bruce Street | Collection, Conveyance & Treatment of Stormwater from Low and Medium Density Residential Areas, Eliminates Untreated Direct Discharge | Sedimentation (Stormfilter) | $450,000 | Cannonsville | Complete 9/29/03 |
| 7 | Village of Delhi | Meredith Street | Collection, Conveyance & Treatment of Stormwater from Medium Density Residential and Commercial Areas, Eliminates Untreated Direct Discharge | Sedimentation (CDS) | $175,781 | Cannonsville | Design |
| 8 | Margaretville Central School | Main Street | Collection, Conveyance & Treatment of Stormwater from School Bus Garage and Parking Lot and Adjacent Local streets, Eliminates Untreated Direct Discharge | Filtration (Sand Filter) | $37,500 | Pepacton | Complete 9/26/03 |
| 9 | Town of Roxbury | Johnson Hollow Road | Increase Culvert Capacity to Eliminate Headwall Scour, Backwater Effects and Washoff of Adjacent Dairy Barn and Barnyard | Channel Improvements (Culvert Replacement) | $9,900 | Schoharie | Complete 6/13/00 |
| 10 | Greene County S & W | Various Locations | Establish Critical Area Seeding Program to Minimize Erosion of Newly Disturbed Earth Surfaces | Critical Area Seeding (Hydroseeder) | $85,000 | Schoharie | Complete 10/16/00 |

Table 3.2. Stormwater Retrofit Program - 1999 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 11 | Roxbury Central School | Main Street | Improve Stormwater Collection and Conveyance from Vehicle Parking Facility to an Existing Treatment Device | Channel Improvements (Regrading) | $40,900 | Pepacton | Complete 3/14/01 |
| 12 | Town of Wawarsing | Campbell Road | Improve Stormwater Collection, Conveyance and Treatment of Roadside Drainage | Channel Improvements (Reshaping of Roadside Ditches/ Stabilization/ Culvert Replacement) | $41,510 | Rondout | Construction |

Table 3.3. Stormwater Retrofit Program - 2000 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 13 | Delaware County DPW | Bovina Center/ County Rt 6 | Improve Stormwater Collection and Conveyance and Provide Treatment and Controlled Discharge of Roadside Drainage in Conjunction with Anticipated Sewer and Water Improvements | Sedimentation/ Filtration (Deep Sump Catch Basins W/ "Snouts" and "Stormfilter") | $187,500 | Cannonsville | Design |
| 14 | Delaware County DPW | County Wide | Acquisition of Truck-Mounted Vacuum Equipment for the Purpose of Cleaning and Maintaining Stormwater Treatment Devices | Maintenance Equipment (Truck-Mounted "Vac-All") | $168,750 | Cannonsville | Complete 5/7/03 |
| 15 | Village of Margaretville | Main Street | Reconstruction of the Bull Run Creek Culvert at Main Street or the installation of an appropriately sized By-pass Culvert to convey floodwaters, avoiding introduction of flood borne pollutants to the East Branch | Channel Improvements (Culvert Replacement) | $470,000 | Pepacton | On-Hold |

Table 3.3. Stormwater Retrofit Program - 2000 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 16 | Town of Halcott | Elk Creek Road | Installation of Collection, Conveyance and Erosion Control Devices for the Treatment of Stormwater Runoff from Upland Areas, Medium Density Residential and Local Highway Surfaces Prior to Discharge to Elk Creek | Sedimentation (Deep Sump Catch Basins) | $75,000 | Pepacton | Construction |
| 17 | Town of Denning | Denning Plank Road | Installation of Erosion Control Devices, Grassed Swales, Conveyance, Sedimentation and Infiltration Devices for the Treatment of Stormwater Runoff from "Solid Waste Transfer Station" Surfaces and Adjacent Upland Areas Prior to Discharge to Neversink River | Infiltration (Dry Well) | $21,375 | Neversink | Complete 10/10/02 |
| 18 | Town of Windham | Mitchel Hollow Road/ Mill Race | Installation of Collection, Conveyance and Sedimentation Devices for the Treatment of Stormwater Runoff from Medium Density Residential and Adjacent Upland Areas Prior to Discharge to Mill Creek or Batavia Kill | Sedimentation (Deep Sump Catch Basins) | $50,000 | Schoharie | Complete 12/23/03 |
| 19 | Town of Neversink | NYS Rt 55 | Installation/Extension of Separated Stormsewers for the Collection, Conveyance and Sedimentation of Highway Drainage and the Installation of Individual Household Stormwater Laterals to Eliminate Sources of Sanitary Inflow | Stormwater Separation (Individual Household Stormwater Lateral) | $20,000 | Rondout | Planning |
| 20 | Village of Tannersville | Various Locations | Installation/Extension of Separated Stormsewers for the Collection, Conveyance and Sedimentation of Local Highway Drainage and the Installation of Individual Household Stormwater Laterals to Eliminate Sources of Sanitary Inflow | Stormwater Separation (Individual Household Stormwater Lateral) | $108,075 | Schoharie | Complete 12/6/03 |

Table 3.3. Stormwater Retrofit Program - 2000 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 21 | Town of Roxbury | Ridge Street | Installation of Collection, Conveyance and Sedimentation Devices for the Treatment of Stormwater Runoff from Medium Density Residential and Adjacent Upland Areas Prior to Discharge to East Branch | Sedimentation (Deep Sump Catch Basins) | $52,031 | Pepacton | Construction |
| 22 | Village of Tannersville | Park Lane | Installation of Collection, Conveyance and Sedimentation Devices for the Treatment of Stormwater Runoff from Medium Density Residential and Adjacent Upland Areas Prior to Discharge to the Saw Mill Creek | Sedimentation (Wet Pond) | $95,738 | Schoharie | Planning |
| 23 | Grahamsville Deli | NYS Rt 55 | Installation of Collection, Conveyance, Sedimentation and Erosion Control Devices for Stormwater Drainage from Gravel Parking Surfaces and Adjacent Upland Areas prior to discharge to Chestnut Creek | Sedimentation (Deep Sump Catch Basins) | $5,625 | Rondout | Complete 9/26/03 |

Table 3.4. Stormwater Retrofit Program - 2001 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 24 | Village of Stamford | Railroad Avenue | Installation/Extension of Separated Stormsewers for the Collection, Conveyance and Sedimentation of Local Highway Drainage and the Installation of Individual Household Stormwater Laterals to Eliminate Sources | Stormwater Separation (Individual Household Stormwater Lateral) | $196,000 | Cannonsville | Construction |

Table 3.4. Stormwater Retrofit Program - 2001 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 25 | Town of Windham | Hickory Hill Road | Installation of Collection, Conveyance, Erosion Control and Sedimentation Devices for the Treatment of Stormwater Runoff from Local Highway Surfaces and Adjacent Upland Areas Prior to Discharge to Batavia Kill | Sedimentation (Check Dams/ Wet Pond) | $73,950 | Schoharie | Construction |
| 26 | Town of Hunter | NYS Rt. 23 R.O.W. | Installation of Conveyance, Erosion Control and Sedimentation Devices for Stormwater Drainage from Highway Surfaces and Adjacent Upland Areas Prior to Discharge to Batavia Kill | Channel Improvements (Culvert Replacement) | $37,500 (Funding Request Withdrawn) | Schoharie | Completed 2002 by NYSDOT Forces |

Table 3.5. Stormwater Retrofit Program - 2002 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 27 | Village of Margaretville | Access Roadway for Commercial Loading Docks | Installation of Collection, Conveyance, Sedimentation and Erosion Control Devices for Stormwater Drainage from Paved and Gravel Commercial Parking and Access Roadway Surfaces Prior to Discharge to the East Branch | Sedimentation/ Infiltration (Deep Sump Catch Basin and Grassed Swale) | $6,878 | Pepacton | Construction |
| 28 | Delaware County Department of Public Works | Local Streets and Parking Lots Adjacent to Public Facilities | Replacement of Existing Stormsewers with New Deep Sump Catch Basins and Piping, Discharging to a Previously Approved CDS Treatment Device | Sedimentation (Deep Sump Catch Basins/ CDS) | $280,500 | Cannonsville | Design |

Table 3.5. Stormwater Retrofit Program - 2002 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 29 | Village of Margaretville | Village Wide Sump Pump Investigation and Remediation | Identification of Existing Sump Pump Discharges to Sanitary Sewers and the Installation of Individual Household Stormwater Laterals to provide for alternative disposal | Stormwater Separation (Individual Household Stormwater Lateral) | $212,243 | Pepacton | Design |
| 30 | Town of Andes | Highway Garage | Installation of Collection, Conveyance and Sedimentation Devices for Stormwater Drainage from Paved and Gravel Highway Garage Parking and Access Roadway Surfaces Prior to Discharge to Middle Brook | Sedimentation (Deep Sump Catch Basin W/ "Snout") | $13,800 | Pepacton | Design |
| 31 | Windham Ventures | Parking Lots and Access Roadways | Installation of Collection and Sedimentation Devices for Stormwater Drainage from Existing Local Streets and Gravel Parking Lot | Sedimentation (Deep Sump Catch Basins) | $20,719 | Schoharie | Construction |
| 32 | Town of Hunter | Highway Garage | Installation of Collection, Conveyance and Sedimentation Devices for Stormwater Drainage from Paved Highway Garage Parking and Access Roadway Surfaces Prior to Discharge to Batavia Kill | Sedimentation (Deep Sump Catch Basins/ Un-Named Hydrodynamic Device) | $56,100 | Schoharie | Design |
| 33 | Greene County | County Route 56 | Installation of Collection, Conveyance, Sedimentation and Erosion Control Devices for Stormwater Drainage from Paved Highway Surfaces Prior to Discharge to Batavia Kill Tributaries | Channel Improvements (Roadside Ditch Reshaping/ Stabilization) | $9,825 | Schoharie | Design |
| 34 | Greene County | County Route 40 | Installation of Collection, Conveyance, Sedimentation and Erosion Control Devices for Stormwater Drainage from Paved Highway Surfaces Prior to Discharge to Batavia Kill Tributaries | Channel Improvements (Roadside Ditch Reshaping/ Stabilization) | $20,290 | Schoharie | Design |

Table 3.5. Stormwater Retrofit Program - 2002 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 35 | Town of Middletown | NYS Route 28/ Antonio's Pizza | Installation of Collection, Conveyance and Sedimentation Devices for Stormwater Drainage from Paved Highway Surfaces Prior to Discharge to Dry Brook | Sedimentation (Deep Sump Catch Basins) | $37,500 | Pepacton | Design |
| 36 | Town of Jewett | Carr Road | Design Review and Impact Study for Flood Mitigation of Local Highway which may lead to Culvert Replacement and Roadway Re-Profiling to Provide for High Water Flows | Channel Improvements (Culvert Replacement) | $10,000 | Schoharie | Design |

Table 3.6. Stormwater Retrofit Program - 2003 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 37 | Delaware County Department of Public Works | Various Locations | "Vac-Truck" Accessories to Assist Maintenance Operations and Comply with Confined Space Requirements | Maintenance Equipment | $3,126 | Cannonsville/ Pepacton | Approved Jan, 2004 |
| 38 | Village of Andes | Delaware County Route 2 | Installation of Collection, Conveyance and Sedimentation Devices for Stormwater Drainage from Medium Density Residential, Commercial and County Highway Surfaces | Sedimentation (Deep Sump Catch Basins/ CDS) | $260,000 | Pepacton | Approved Jan, 2004 |
| 39 | Delaware County Department of Public Works (DeLancey) | Delaware County Route 2 | Installation of Collection, Conveyance and Sedimentation Devices for Stormwater Drainage from Medium Density Residential, Commercial and County Highway Surfaces | Sedimentation (Deep Sump Catch Basins) | $300,000 | Cannonsville | Approved Jan, 2004 |

Table 3.6. Stormwater Retrofit Program - 2003 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 40 | Hunter Mt Ski Bowl | Hunter Mt Ski Bowl Parking Lot | Installation of Collection, Conveyance, Sedimentation and Stabilization Devices of Stormwater from Commercial Gravel Parking Lot | Sedimentation (CDS) | $75,000 | Schoharie | Approved Jan, 2004 |
| 41 | Clark Companies | Clark Companies Parking Lot and Vehicle access | Installation of Collection, Conveyance, Sedimentation and Infiltration Devices for Stormwater Drainage from Paved and Gravel Commercial Parking and Vehicle Access | Sedimentation/ Infiltration (CDS/ Infiltration Gallery) | $156,000 | Cannonsville | Approved Jan, 2004 |
| 42 | Greene County SWCD | Windham Mountain | Installation of Collection, Conveyance and Sedimentation of Stormwater Drainage from High and Medium Density Residential and Commercial Surfaces | Sedimentation (Un-Named Hydrodynamic Device/ Constructed Wetlands) | $279,630 | Schoharie | Approved Jan, 2004 |
| 43 | Delaware County Department of Public Works | Various Locations | Programmable Ice Control System for Highway De-Icing Operations | Maintenance Equipment | $8,483 | Cannonsville/ Pepacton | Approved Jan, 2004 |
| 44 | Greene County Highway Department | Various Locations | Street Sweeping Equipment/ Program | Maintenance Equipment | $180,000 | Schoharie | Approved Jan, 2004 |
| 45 | Town of Roxbury | Cronk Lane | Installation of Collection, Conveyance and Sedimentation Devices for Stormwater from Medium Density Residential, Commercial Parking and Local Highways | Sedimentation (Deep Sump Catch Basins) | $52,000 | Schoharie | Approved Jan, 2004 |
| 46 | Greene County Department of Solid Waste/ Recycling | Greene County Transfer Station - Hunter | Installation of Collection, Conveyance and Sedimentation of Stormwater from the Hunter Transfer Station | Sedimentation (Deep Sump Catch Basin W/ "Snout"/ Constructed Wetlands) | $18,000 | Schoharie | Approved Jan, 2004 |

Table 3.6. Stormwater Retrofit Program - 2003 applications

| Number | Applicant | Project Area | Project Description | Treatment Mechanism | Suggested Funding Limit | Reservoir Watershed | Project Status |
|---|---|---|---|---|---|---|---|
| 47 | Delaware County Department of Public Works | Delaware County Route 6 (Addendum) | Improve Stormwater Collection and Conveyance and Provide Treatment and Controlled Discharge of Roadside Drainage in Conjunction with Anticipated Sewer and Water Improvements | Sedimentation/ Filtration (Deep Sump Catch Basins W/ "Snouts" and "Stormfilter") | Under Review | Cannonsville | Approved Jan, 2004 |

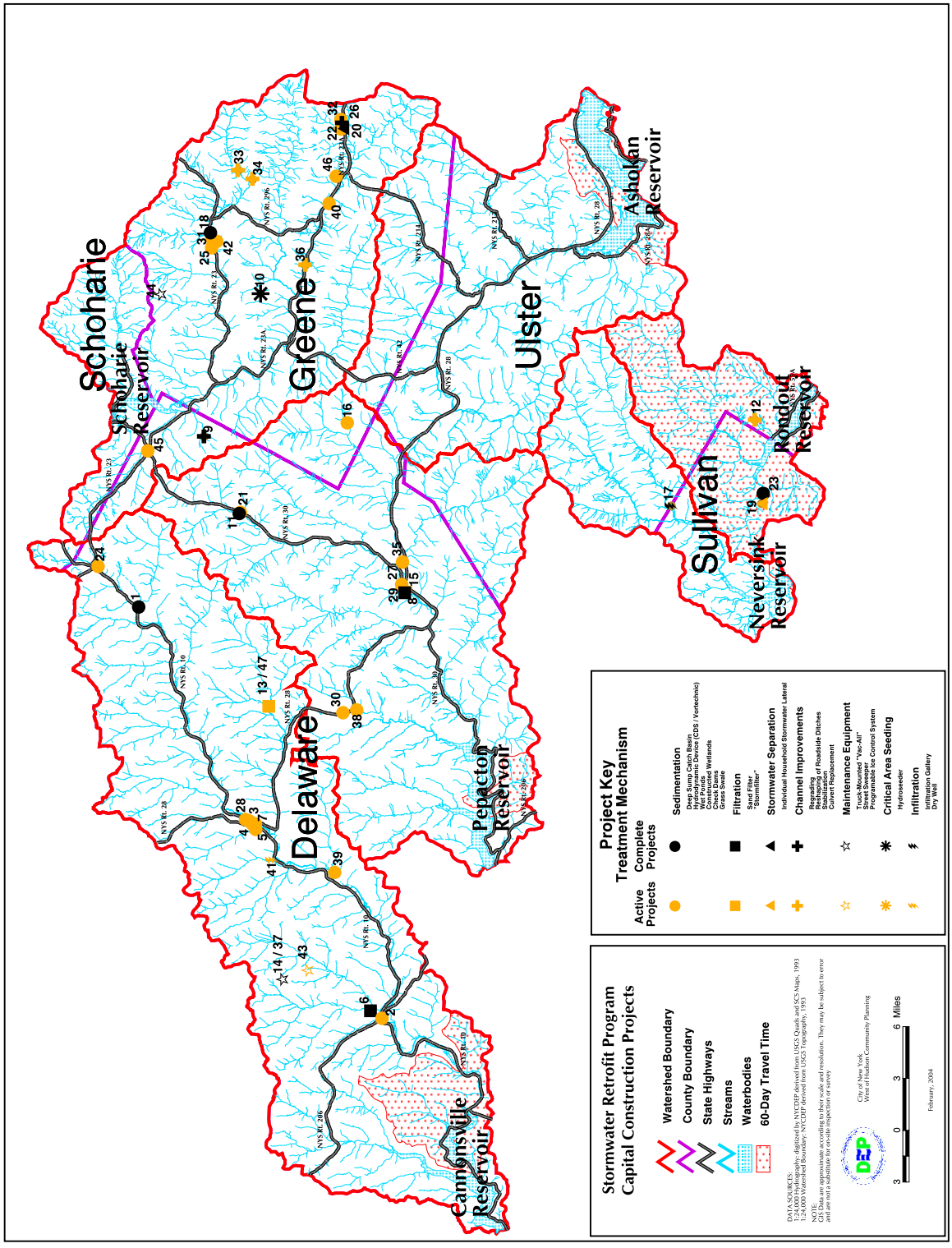


Figure 3.1. Stormwater Retrofit Program, Capital Construction Projects.

Table 3.7. Stormwater Retrofit Program Planning & Assessment Projects

| Applicant | Project Area | Project Description | CWC Award |
|---|---|---|---|
| Del. Cty. DPW (Towns of Andes and Kortright) | Town-wide | Stormwater Inventory and Assessment | $30,000 |
| Ashland (T) | Town-wide | Stormwater Inventory and Assessment | $9,320 |
| Prattsville (T) | Town-wide | Stormwater Inventory and Assessment | $12,438 |
| Hunter (V) | Village-wide | Stormwater Inventory and Assessment | $42,260 |
| Ulster County | County/Watershed | Stormwater Inventory and Assessment | $50,000 |
| Roxbury (T) | Hamlet of Grand Gorge | Stormwater Inventory and Assessment | $34,000 |
| Hurley (T) | Hamlet of Glenford | Stormwater Inventory and Assessment | $4,000 |
| Tannersville (V) | Village-wide | Stormwater Inventory and Assessment | $30,000 |
| Schoharie County | County/Watershed | Stormwater Inventory and Assessment | $38,500 |

The Stormwater Retrofit Program Rules were revised October 2003 to incorporate provisions for Stormwater Infrastructure Assessment and Planning. Under the Assessment Program applicants will conduct detailed and comprehensive inventory and assessments of existing community stormwater infrastructure with the goal of identifying and prioritizing potential areas and Stormwater BMPs for funding. In addition, the Rules were modified to include “minimum control measures” as defined within the Environmental Protection Agency’s 2002 Stormwater Phase II Final Rule for the small MS4, design goals for the removal of total suspended solids and total phosphorus, provisions for flow measurement and sampling, and a reduction in the local share from 25% to 15%.

In early 2004, standard maintenance contracts for stormwater retrofits funded by the Stormwater Retrofit Program on private and municipal properties are being developed by CWC and DEP. The Contract incorporates provisions for ownership, maintenance, reimbursement of costs, entry and inspection, and the maintenance of records. Once property owners sign a maintenance contract with CWC they will be eligible to receive maintenance funds.

To this date, no emergency remediation projects or issues have been identified.

## 3.5 WWTP Upgrade Program

As part of the MOA, the City agreed to fund the upgrades of all existing non-City-owned WWTPs in the watershed. (As reported in previous annual reports, upgrades of City-owned WWTPs, which account for more than a third of WWTP flow in the Catskill/Delaware watershed, proceeded on a separate track and were completed in 1999.) The upgrades will provide highly advanced treatment of wastewater treatment plant effluent. The task of coordinat-

ing these complex projects with the WWTP owners, their consultants and contractors, in the Catskill/Delaware watershed is enormous. Many of the owners are restaurateurs, hoteliers, camp operators, school administrators and managers of recreational facilities, and are not professional WWTP operators or construction specialists. DEP has proceeded diligently with this vast undertaking and provided step-by-step guidance on a host of engineering, operating, contracting and regulatory issues.

DEP's contract with the New York State Environmental Facilities Corporation (EFC) identifies a wide range of tasks to be performed by both DEP and EFC to ensure comprehensive management of the overall WWTP Upgrade Program. DEP's and EFC's tasks have included, but are not limited to: program start-up, establishing contracts with each WWTP owner, providing technical assistance to each WWTP owner and their consulting engineer, change order administration, construction oversight, funds management (including invoice review and reconciliation) and extensive project management. DEP and EFC have continued to provide technical and program guidance to each of the owners and their engineers to assist them through the process of upgrading each unique facility.

The upgrades of non-City-owned WWTPs are divided into two distinct programs: Regulatory Upgrades and SPDES Upgrades (West of Hudson only). Although two separate programs, the Upgrade Agreement between EFC and the WWTP owner encompasses both programs.

The Regulatory Upgrade Program is designed to assist WWTPs in meeting requirements imposed solely by the WR&R. Treatment technologies required by the Regulatory Upgrade Program include, but are not limited to: phosphorus removal, sand filtration with redundancy, back up power, back up disinfection, tertiary treatment via microfiltration (or DEP-approved equivalent), effluent flow metering and alarm telemetering.

The SPDES Upgrade Program is designed to assist certain WWTPs in meeting the conditions of their current SPDES permits. Equipment that is unreliable or reaching the end of its useful life is eligible for replacement under this program. Additionally, certain SPDES improvements conducted at a facility after November 2, 1995, are also eligible for reimbursement under this program.

During 2003, DEP redirected its focus from the largest eight facilities to the smaller WWTPs in the Upgrade Program. Across-the-board progress was made in moving these projects forward in all program phases. Almost 200 disbursements were made to West of Hudson WWTP Owners, valued at some $10.1 million. Of this amount, some $6.8 million was disbursed for construction costs, evidencing a high level of construction activity on specific projects. Twenty-nine projects were in some phase of design and $1.7 million was expended for project design costs. In

2003, WWTPs representing 95% of the original total WOH flow were either in the construction stage of the program or had achieved Functional Completion. Construction at WWTPs, representing 90% of the WOH flow, had achieved Functional Completion.

Activities for Startup and Performance Testing (SPT) at completed facilities were very successful. Almost $1.2 million was disbursed in 13 payments for SPT efforts at facilities where construction was completed and system performance was being fine-tuned. In addition, both DEP and EFC expended considerable effort to negotiate and execute Operations and Maintenance (O&M) Agreements with WWTP Owners. In additional to those already completed in 2002, six O&M Agreements were under negotiation with owners of both public (3) and non-public (3) West of Hudson facilities.

During 2003, aggressive action was taken to address eleven new, small WWTPs added to the Upgrade Program in 2002. These projects, as well as other projects in the program, faced significant challenges in securing adequate insurance coverage. Since the September 2001 attacks, many WWTP owners in the program reported difficulties securing the required insurance and faced rapidly escalating costs. DEP made appropriate program and policy adjustments to address those concerns. Consequently, all eleven projects have fully executed Upgrade Program Agreements and were directed to solicit engineer proposals. DEP and EFC received proposals for nine WWTPs, four of which were approved by DEP.

Existing WWTPs scheduled to connect to New Infrastructure Program (NIP) facilities also made excellent progress. Consistent with EPA's direction, these facilities were directed to design and install interim UV disinfection systems, pending connection to the NIP facilities. Design was completed for all seven WWTPs and all progressed to system construction. Construction was completed for four of these facilities, three of which are currently operating and one, a seasonal facility, is pending Functional Completion Certification and will begin operation when the 2004 camping season begins.

Also significant in 2003 was the full commitment of the SPDES funding provided by DEP to assist WWTP owners to come into compliance with NYS SPDES and I&I requirements (not solely required by the NYC Watershed Rules & Regulations). All $5.0 million ($4.6 SPDES and $0.4 I&I) was committed to 26 projects in the West of Hudson watershed.

# 4. Protection and Remediation Programs

## 4.1 Waterfowl Management Program

Pursuant to the November 2002 FAD, the Waterfowl Management Program will submit a separate annual report on July 31, 2004.

## 4.2 Land Acquisition

During 2003, there were no formal solicitation goals required in the 2002 FAD, the 1997 MOA, and the 1997 Water Supply Permit (WSP) other than resolicitation, as outlined further below and in a submission of October 2003. Purchase contracts signed during 2003 were the result of deals solicited or resolicited in prior years, or resolicited in 2003.

By the end of calendar year 2003, a total of 642 purchase contracts comprising 45,821 acres were secured throughout the Cat/Del watershed (signed to purchase contract or closed) by DEP. Of these, 496 projects totaling 35,551 acres have been acquired, with the remaining 146 projects totaling 10,270 acres under purchase contract. During year 2003, 99 projects comprising 8,536 acres (record high acreage for the Program) were closed and 76 projects accounting for 6,238 acres were signed to purchase contract. Among the significant accomplishments during 2003:

- In Kensico, approximately 112 acres of land were acquired, including roughly 85 acres under conservation easement and two parcels in fee simple (12 acres and 17 acres) in Priority 1B. A 4-acre commercial parcel was offered and accepted as a donation (expected to close during 2004). Of the 1,038 acres eligible in the basin, the total number of acres acquired or under contract stands at 180 acres, or 17%. Negotiations continued on several significant properties totaling over 200 acres.
- Of the 4,830 estimated eligible acres in Rondout 1A, the total number of acres acquired or under contract was raised to 2,678 acres (55%).
- Of the 12,645 estimated eligible acres in West Branch 1A and 1B, the total number of acres acquired or under contract was raised to 8,010 acres (63%).

### 4.2.1 Individual Program Summaries

During 2003 (Year 7 of the MOA), there were no formal solicitation requirements set forth in the 2002 Filtration Avoidance Determination (FAD) or the MOA, although the City committed separately to re-contact owners of 87,000 acres of lands previously solicited (a process termed ‘resolicitation’), and did attain this goal. It should be noted that resolicitation has taken place almost since the Program began, not withstanding the formal commitment made in 2003. Thus, during the first seven years of the program, the City has solicited owners of over 320,000 acres in the Catskill and Delaware systems and resolicited in excess of 87,000 of those acres to date.

During the past seven years, the City has increased its holdings significantly compared with historic ownership patterns. In Rondout, the City has secured almost five times the amount of buffer land than it owned prior to 1997. In West Branch the City now owns 11 times more buffer land than it did in 1997, while in Schoharie more than 8 times is under City ownership; in Pepacton and Ashokan, City-owned buffer lands have more than doubled.

Table 4.1. Purchase Contracts Executed between 1/1/03 and 12/31/03, Catskill/Delaware Systems.

| Reservoir Basin | Priority | # of Parcels | Acres | Appraised Value |
|---|---|---|---|---|
| Ashokan | 1B | 1 | 6.80 | $63,872 |
| Ashokan | 2 | 8 | 436.56 | $1,078,146 |
| Cannonsville | 1A | 1 | 50.80 | $40,640 |
| Cannonsville | 3 | 6 | 434.66 | $454,729 |
| Cannonsville | 4 | 4 | 740.10 | $884,187 |
| Kensico | 1B | 1 | 4.00 | $0 |
| Pepacton | 3 | 6 | 535.32 | $765,771 |
| Pepacton | 4 | 9 | 820.64 | $1,089,877 |
| Rondout | 1A | 4 | 108.27 | $229,920 |
| Rondout | 1B | 3 | 85.98 | $215,207 |
| Schoharie | 3 | 12 | 1,023.75 | $1,853,507 |
| Schoharie | 4 | 8 | 1,512.56 | $2,632,817 |
| West | 1A | 1 | 20.33 | $1,711,467 |
| West | 1B | 12 | 458.72 | $10,834,230 |
| Totals: | | 76 | 6,238.49 | $21,854,368 |

*Solicitation*

All solicitation requirements to date have been satisfied, with the total acres solicited exceeding 320,000 acres. During 2003, the Resolicitation Plan (outlined in documents submitted previously) was implemented.

*Resolicitation Plan*

As previously reported and detailed further below, the resolicitation plan is being implemented and has yielded good results to date:

- "Same Owners" Resolicited: 89,520 acres owned by landowners who were previously solicited and either did not respond, said they were not interested, or rejected our purchase offer(s). Of these, 20,883 (23%) acres expressed interest following resolicitation, of which 13,477 (15%) have been appraised to date. If average success rates to date hold, roughly 4,000 of these acres will go to contract.
- "New Owners" Resolicited: 14,207 acres were resolicited by contacting new owners who purchased lands from owners we previously solicited. Of these new owners, 2,608 acres, or 18% have expressed interest, of which 1,226 were appraised, and 368 are projected to go to contract.

These results suggest that re-contacting landowners who have previously been uninterested ("no response", "not interested" or "rejected offers") yields additional levels of interest (currently 9%, 14% and 52% of those categories contacted, respectively). As expected, (re)solicitation of new owners results in higher rates of interest, currently 18 percent, compared with prior owners who expressed no interest. As with any solicitation exercise, rates of interest and acceptance will grow over time, as late responses are received. In addition to the 47,800 acres to be newly solicited this year, 74,000 additional acres will be resolicited during 2004.

*Acquisition*

During 2003 throughout the Cat/Del systems, 6,238 acres in 76 purchase contracts were signed, while 99 projects comprising 8,536 acres were closed (surpassing last year's record closings). As of the end of 2003, a total of 642 purchase contracts comprising 45,821 acres were secured by DEP program-wide (signed to purchase contract or closed) in the Cat/Del. Of these, 496 projects totaling 35,551 acres have been acquired, with the remaining 146 projects totaling 10,270 acres under purchase contract.

The number of acres signed to contract by DEP in 2003 was higher by 6% than 2002, within the most competitive market to date; during 2003, WAC signed 3,382 acres to farm easements, tripling the number of acres signed during 2002.

714 acres of WOH wetlands and deepwater habitat have been protected (closed or under contract) WOH to date, and 719 acres EOH.*

*Program Improvements*

Despite continued challenges of the real estate market, the Land Acquisition Program has continued to adapt with some marked successes. During 2003, the City improved and revised program documents, policies, and staffing in order to maximize Program competitiveness within the confines of the MOA, FAD, WSP, and City code:

- Two new staff members were hired to assist with closings;
- Significant advancements were made with regard to software programs (LATS and WaLIS) to allow for enhanced project management and tracking of solicitations;
- The closing term in the model purchase contract, for fee simple deals not involving subdivisions, was lowered from 18 to 14 months, and the down payment was increased from 3% to

10% for most projects. Plans were also discussed to insert an interest payment provision, expected to be reviewed and approved by the Office of Management and Budget and Corporation Counsel in 2004;
- Significant revisions were made to the model conservation easement, expected to be reviewed and approved by Corporation Counsel early in 2004; and
- A public outreach effort to enhance landowner understanding and acceptance of the easement program was designed for implementation in 2004

*Conservation Easement Program*

During 2003, ten conservation easement contracts totaling 1,619 acres were signed by DEP and 17 easements totaling 2,208 acres were closed. This brings DEP's easement program to 22 easements totaling 2,962 acres acquired, and 19 easements on 2,678 acres under contract.

*Whole Farm Easement Program*

The Watershed Agricultural Council (WAC) now holds Farm Easements (FE) on 13 farms totaling 3,283 acres, and has executed contracts for another 3,457 acres. These numbers indicate that the FE Program, like the City's CE Program, has ramped up and is now a viable, functional, and successful enterprise.

*Transfer of Conservation Easements on Fee Acquisitions to NYS*

The first four CEs were processed during 2003 and formally conveyed to the State in the first week of 2004. Once DEC records deeds and confirms the process works, additional larger rafts of CEs are expected to be conveyed during 2004.

* The 2002 Annual Report erred in reciting 40 acres of wetlands protected WOH and 483 acres EOH; those numbers should have been 604 and 629, respectively.

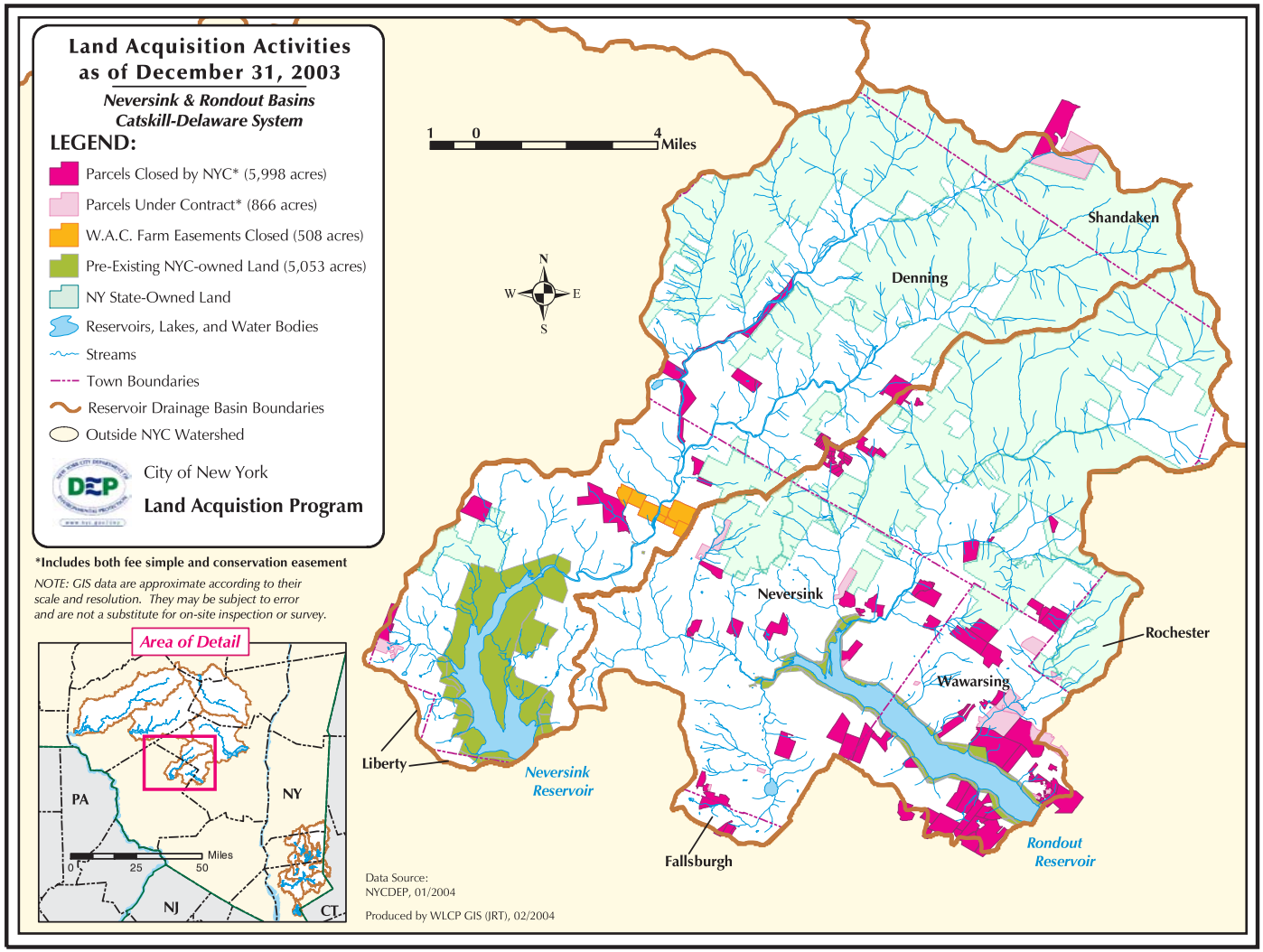


Figure 4.1. Land acquisition activities in the Neversink & Rondout Basins as of December 31, 2003.

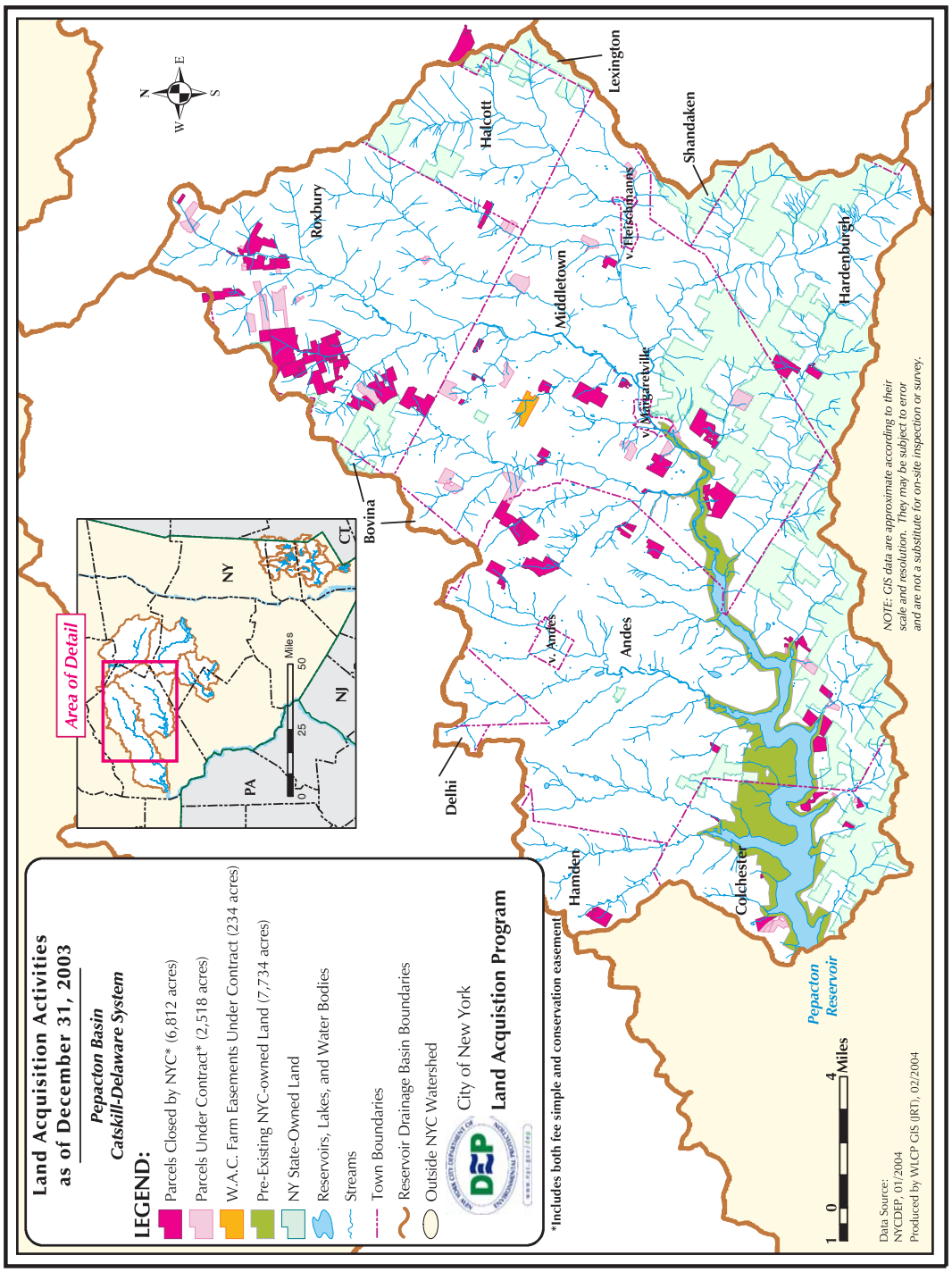


Figure 4.2. Land acquisition activities in the Pepacton Basin as of December 31, 2003.

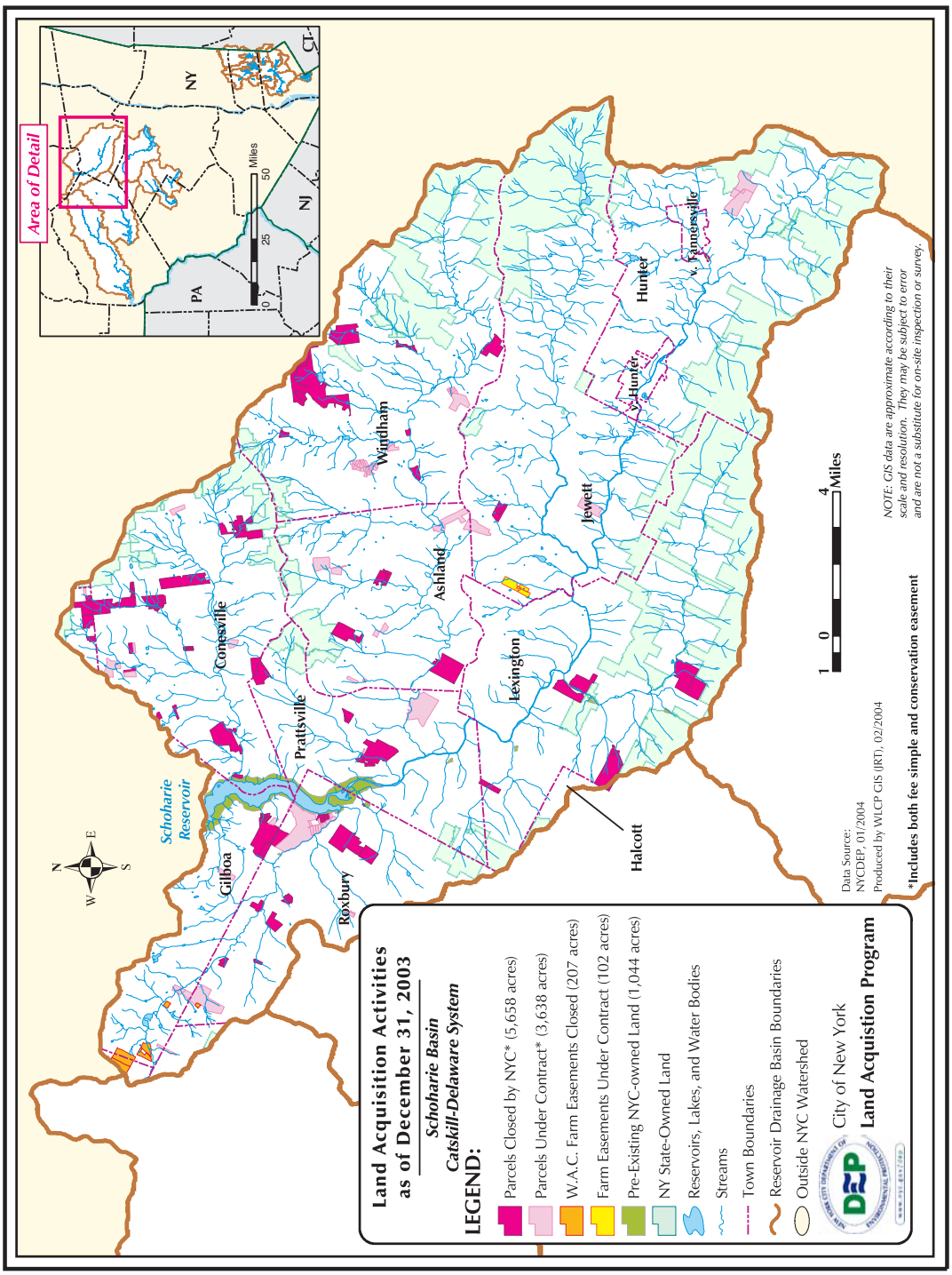


Figure 4.3. Land acquisition activities in the Schoharie Basin as of December 31, 2003.

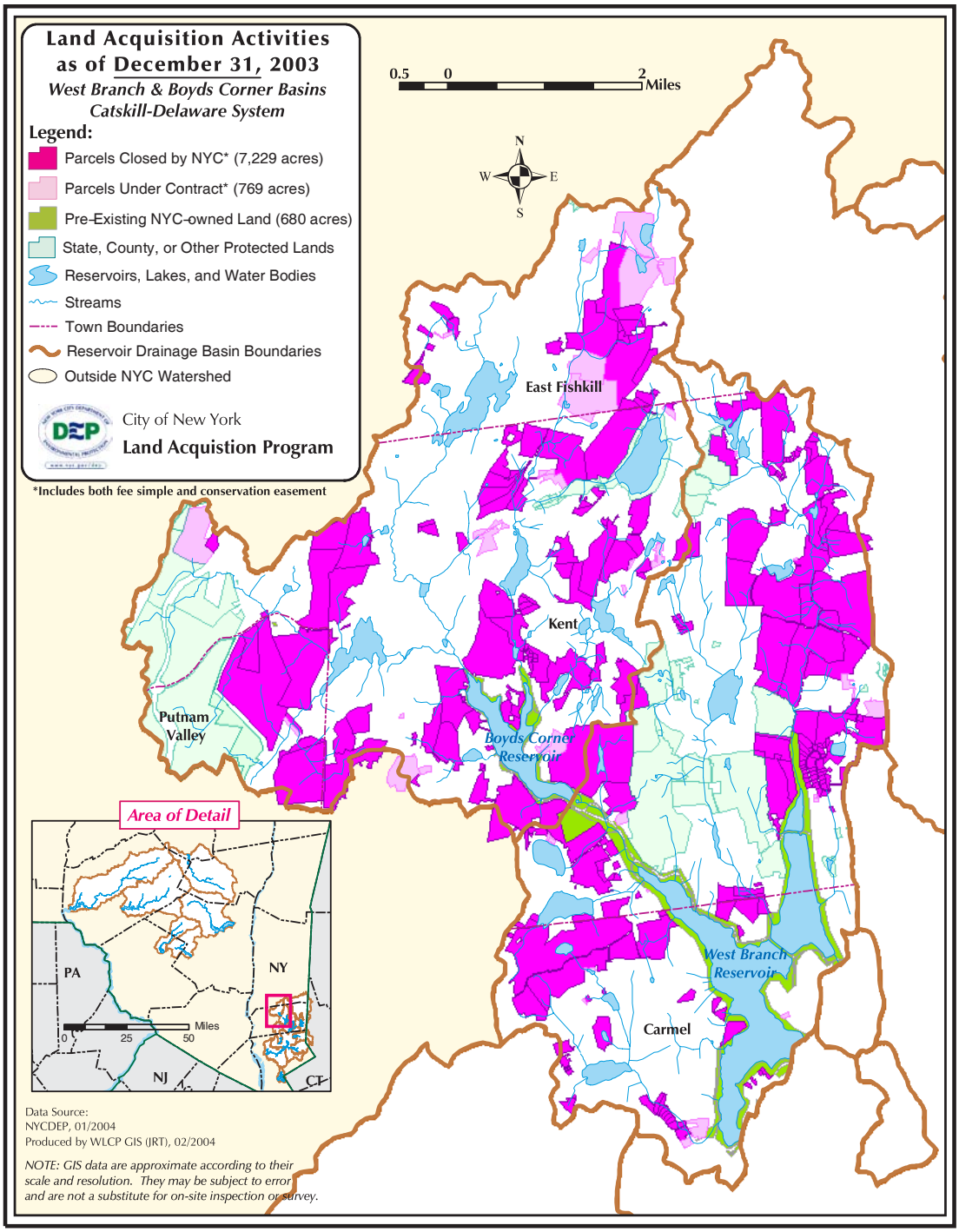


Figure 4.4. Land acquisition activities in the West Branch and Boyds Corner Basins as of December 31, 2003.

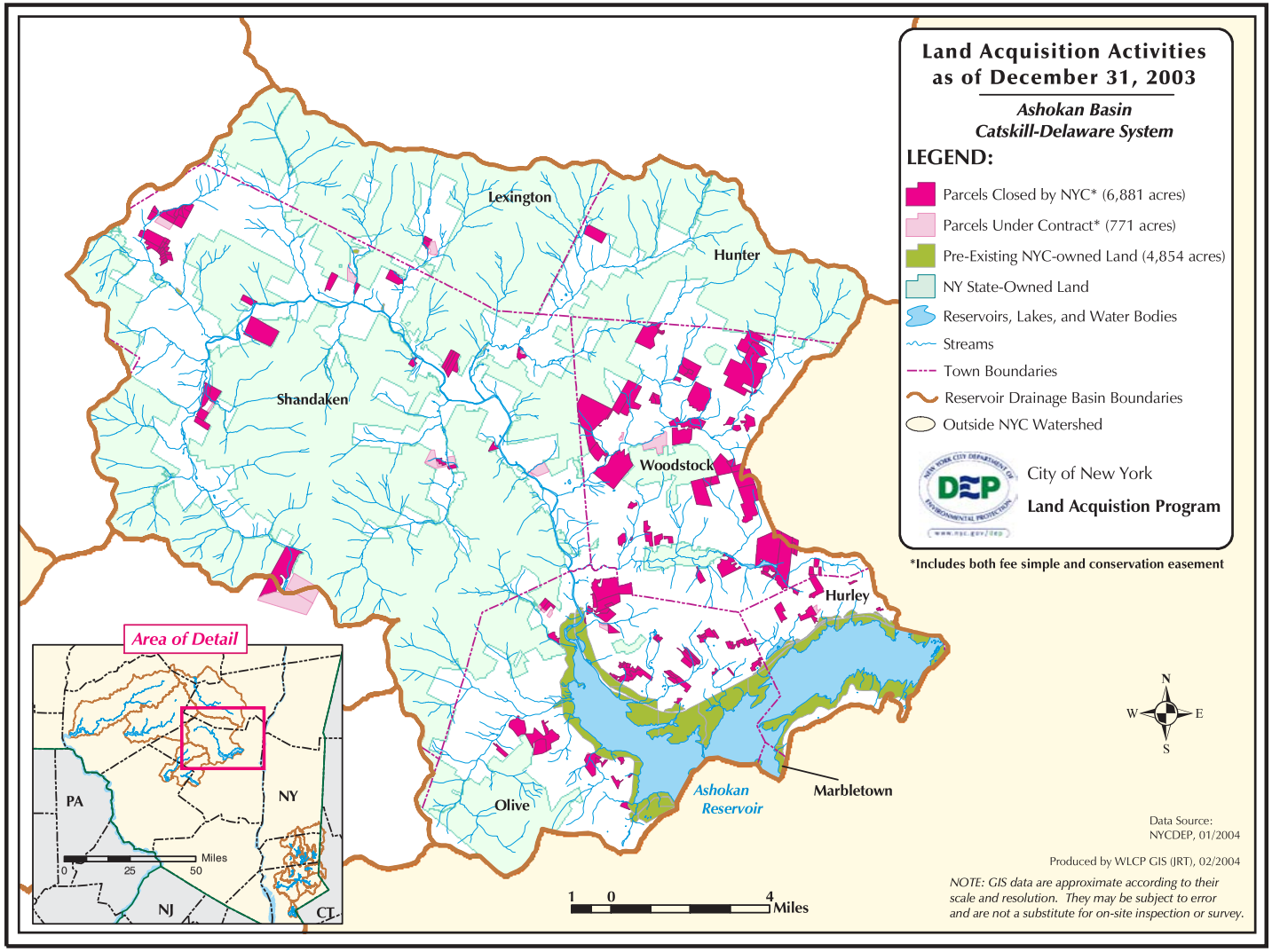


Figure 4.5. Land acquisition activities in the Ashokan Basin as of December 31, 2003.

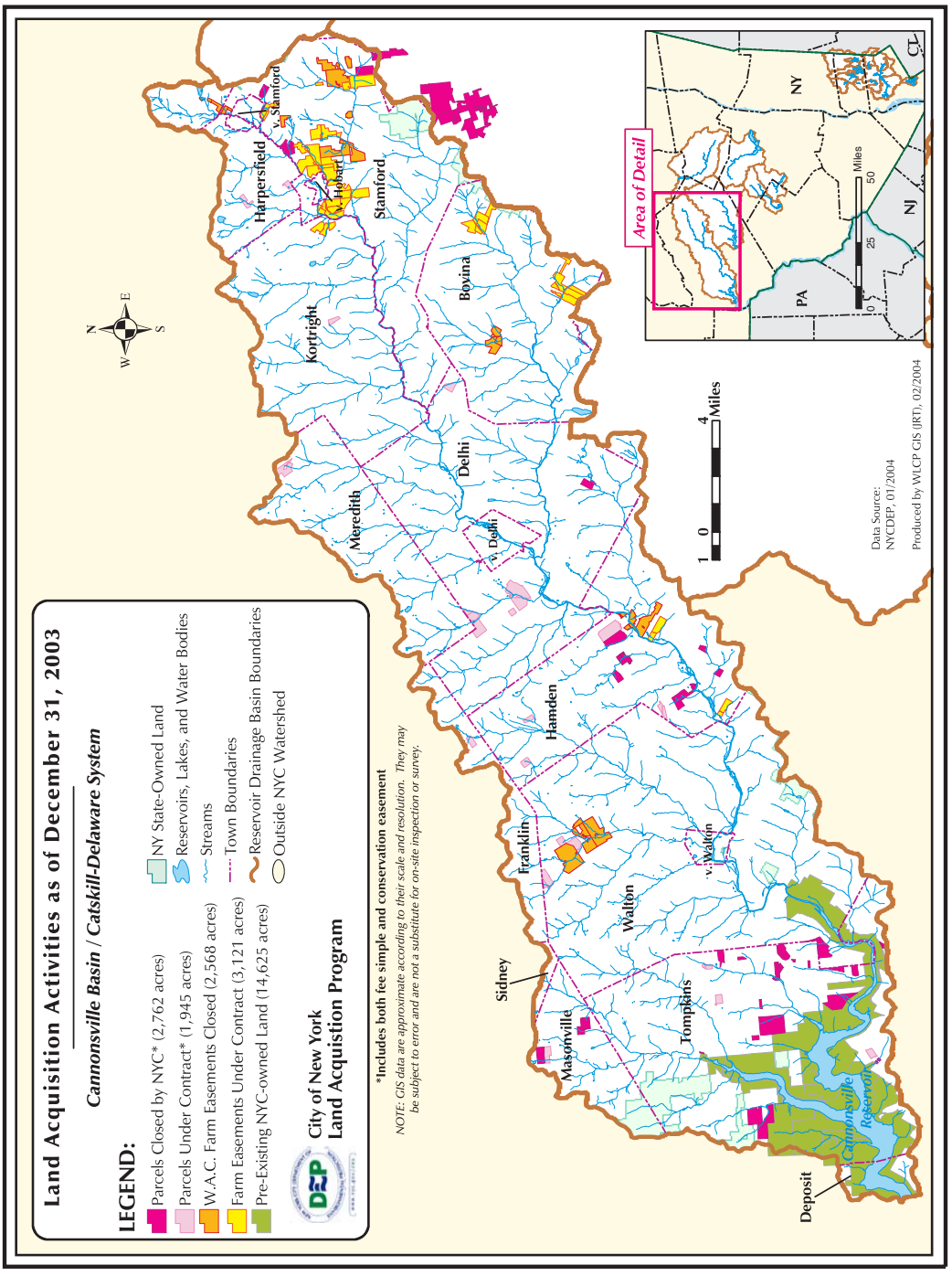


Figure 4.6. Land acquisition activities in the Cannonsville Basin as of December 31, 2003.

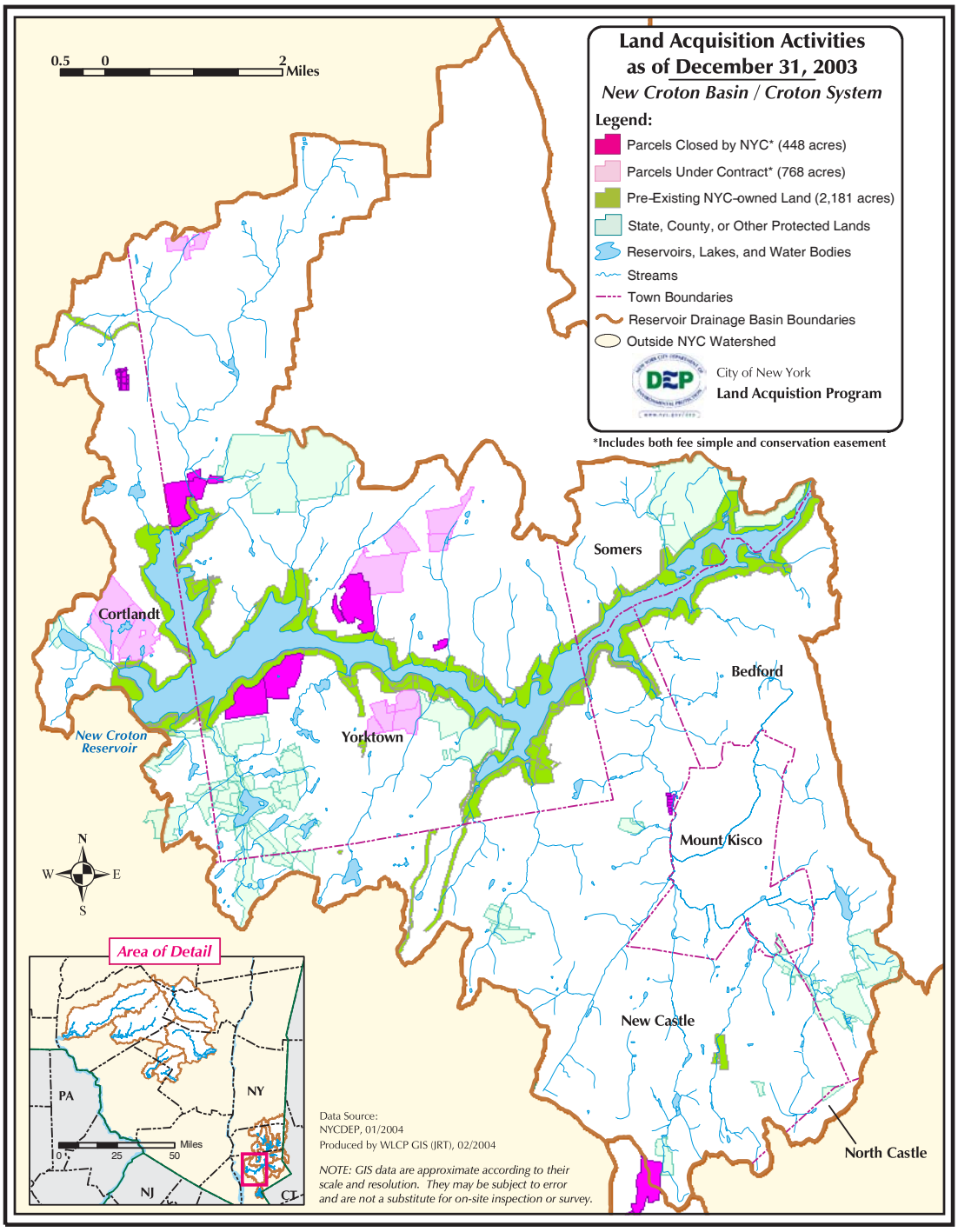


Figure 4.7. Land acquisition activities in the New Croton Basin as of December 31, 2003.

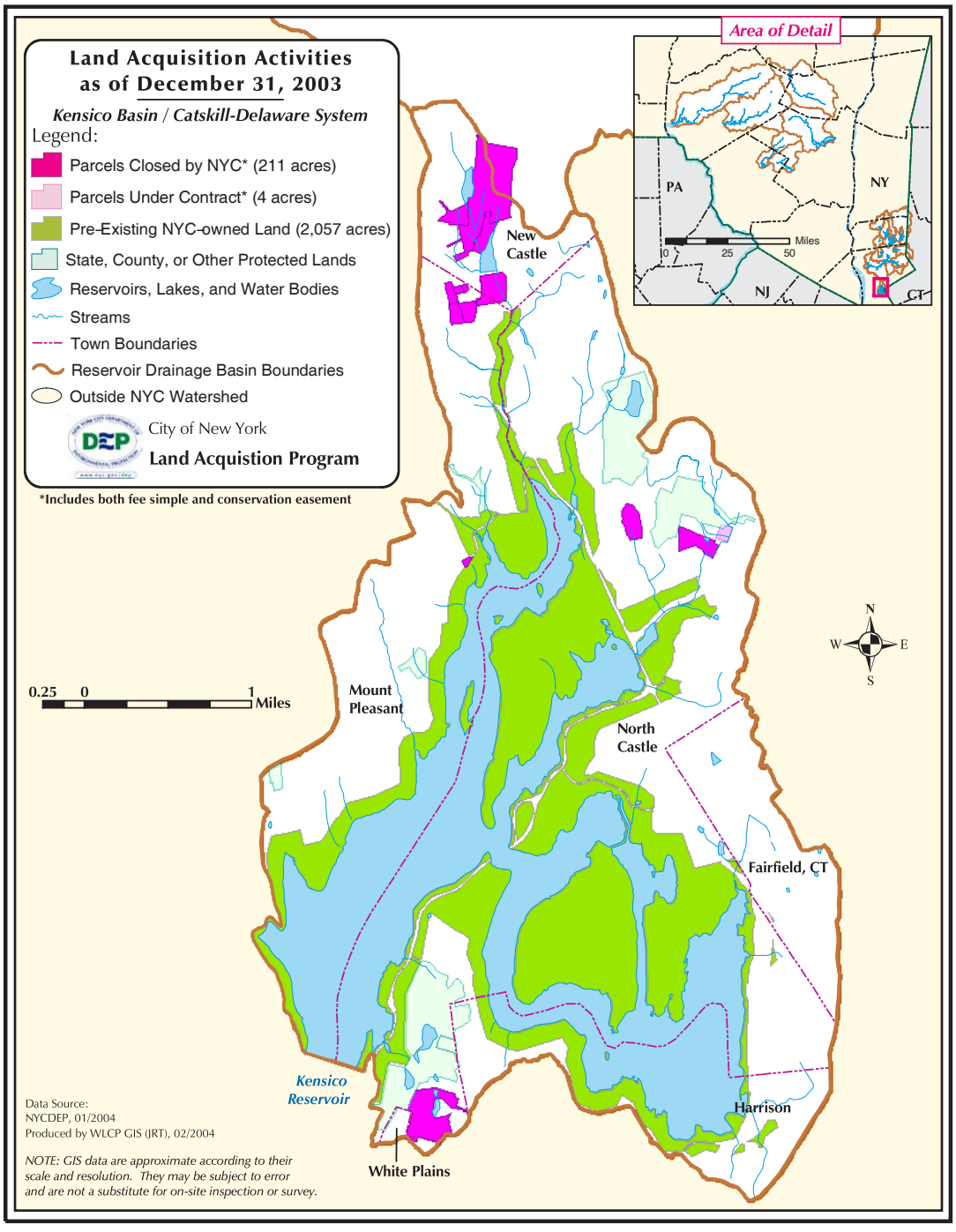


Figure 4.8. Land acquisition activities in the West Branch and Kensico Basins as of December 31, 2003.

## 4.3 Watershed Agricultural Program

The Watershed Agricultural Program (WAP) began in 1992 as a comprehensive effort to develop and implement pollution prevention plans on 85% of the commercial farms in the City's Catskill and Delaware watersheds. The program is a voluntary partnership between the City and farmers in the watershed to manage nonpoint sources of agricultural pollution, with particular emphasis on waterborne pathogens, nutrients, and sediment. In addition, the program incorporates the economic and business concerns of each farm into the development of its Whole Farm Plan (WFP) in order to fully establish the principles and goals of pollution prevention into the farm operation.

The Watershed Agricultural Program strives to maintain and protect the existing high quality of the NYC water supply system from agricultural nonpoint source pollution through the planning and implementation of Best Management Practices (BMPs) on farms. When possible, the Program uses traditional BMPs that are proven to protect and enhance source water quality, and, if necessary, to employ and evaluate innovative BMPs to increase the number of alternatives available to farmers to address "non-traditional" agricultural water pollution concerns, especially waterborne pathogens.

Fully funded by the City, the Program is administered by the not-for-profit Watershed Agricultural Council (WAC), whose board consists of farmers, agri-business representatives and the DEP Commissioner. Over time, the City and WAC have been able to leverage generous financial support from other sources to enhance the Program, particularly the US Department of Agriculture, EPA, and Army Corps of Engineers. Local, State, and federal agricultural assistance agencies provide planning, technical, educational, engineering, scientific and administrative support for the program under sub-contractual agreements with the Council.

In recent years, the City and WAC have expanded the Watershed Agricultural Program to include priority "small" farms (earning less than $10,000 annually) West of Hudson and farms in the Croton Watershed East of Hudson.

### 4.3.1 FAD Program Goals

The table below summarizes the accomplishments to date of the Watershed Agricultural Program (WAP) in meeting the goals and milestones of the November 2002 FAD. (See attached WAP activity maps which demonstrate the program's accomplishments including: WFPs approved, commenced plan implementation, farms substantially implemented and plans that had follow-up visits in 2003)

Table 4.2. Accomplishments to date of the Watershed Agricultural Program (WAP).

| Task | Farms | Sub-Farms | Total Farms | FAD Goal 12/31/03 |
|---|---|---|---|---|
| Farm Sign-ups | 327 | - | 327 | Monitor |
| Current Sign-ups* | 246 | 41 | 287 | |
| WFP Implementation Agreements | 241 | 41 | 282 | All Participating Farms |
| WFPs Commenced Implementation | | | | |
| Active | 187 | 40 | 227 | |
| Under Revision | 5 | 1 | 6 | |
| Inactive | 27 | | 27 | |
| Total | 219 | 41 | 260** | 287 |
| WFPs Substantially Implemented | | | | |
| Active | 105 | 9 | 114 | |
| Under Revision | 5 | 1 | 6 | |
| Inactive | 32 | | 32 | |
| Total | 142 | 10 | 152 | 181 |
| WFP Annual Follow-up | 50 | | 173 | 143 |

*Note: 81 farms that have signed up are no longer eligible for the program due to a change in the farm operation (i.e. farm is out-of-business, all animals were sold etc.)

**In addition, there were six WFPs written for farms that went out of business before any BMPs were implemented.

There are two milestones that WAP was unable to meet last year even though it continues to maintain an aggressive rate of implementation. The first is farms with "commenced implementation" (see Figure 4.9 below). The goal for 2003 was to have commenced implementation on 288 (or all participating farms) farms. The number achieved was 260 farms (not including 6 farms that went out of business before any implementation occurred). This leaves approximately 16 approved WFPs that have no documented implementation. Five of these farms have had a nutrient management plan developed, but are lacking WAP documentation to confirm that the landowner received the plan. WAP Nutrient Management Team staff have attempted unsuccessfully to contact these landowners. On the remaining farms there has been no implementation to date either because the BMPs are low priority, or due to a lack of cooperation from landowners. It is impor-

tant to note that even though certain farmers agreed to participate in the program, a few, for various reasons, are not prepared to implement their plan. DEP will encourage the Watershed Agricultural Council to strive to meet this milestone in 2004.

The second milestone that was not achieved was "farms substantially implemented" (see Figure 4.10). DEP has reported in the past that this milestone would be difficult to achieve this year. However, the chart does demonstrate that the rate of farms being classified as substantially implemented is increasing and DEP is optimistic that WAP will catch-up and meet this milestone over the next 2-3 years.

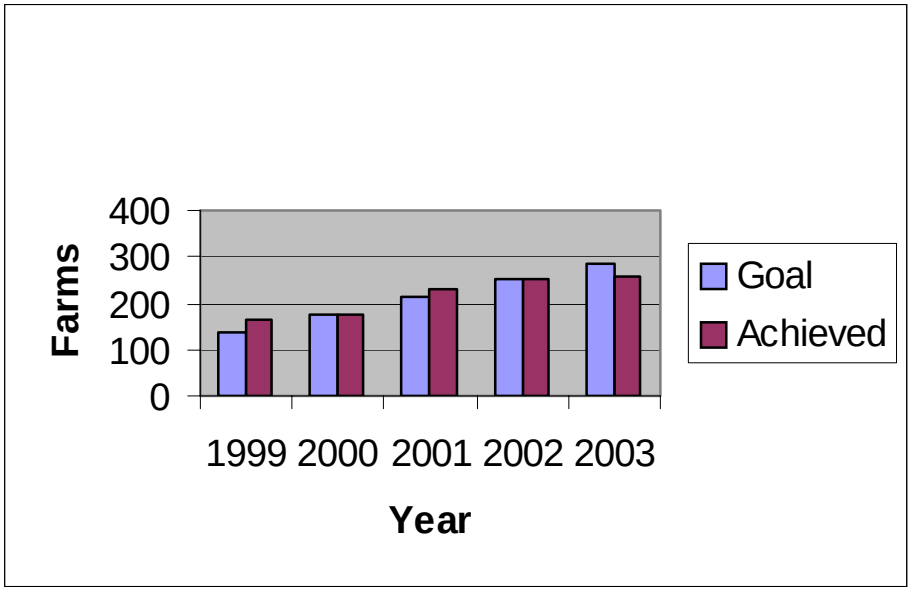


Figure 4.9. Farms with commenced implementation.

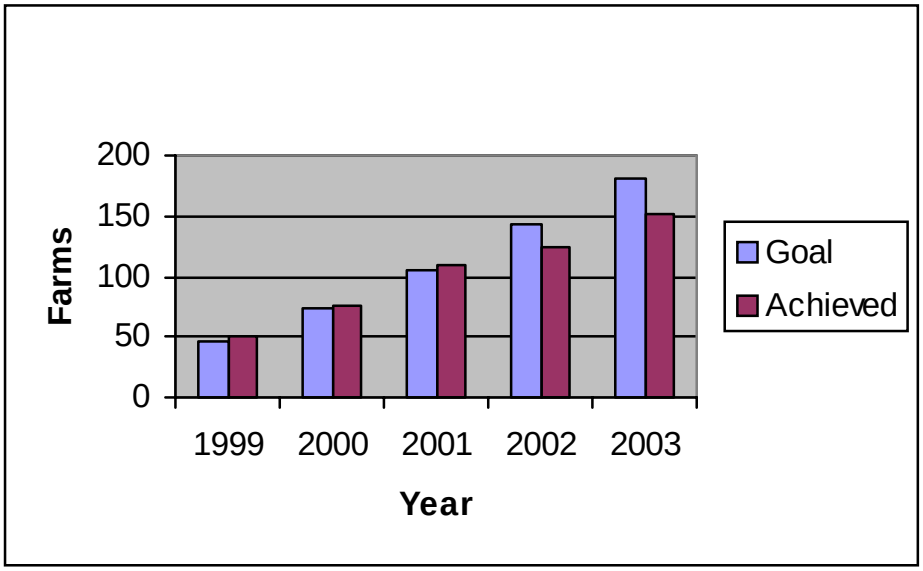


Figure 4.10. Farms substantially implemented.

### 4.3.2 Status of Farm Numbers in the Watershed

Currently, there are 282 farms (including 41 "sub-farms") with WFP agreements. In January 2003, DEP reported that there were 7 additional farms that have signed up but did not yet have a plan. There was one new WFP approved in 2003, and one new farm sign-up in 2003 (a new dairy farm). Two of these farms are no longer eligible for the program (one is out-of-business; one moved out of the watershed).

This leaves five farms that still need to be planned. Of these five farms: the planners have been unable to reach agreement on a final WFP on two; and two farms are on hold either for farmer health reasons, or because the farmer is not cooperating in the planning process. Planners continue to make contact with these four farms to find a resolution and/or encourage the farmers to participate. As noted above, the fifth farm is new to the Program and is cooperating in the development of a WFP.

In 2003, WAC has continued efforts to recruit farms that have not yet agreed to participate in the program. Planners have contacted the 12 remaining commercial farms in the watershed that have not signed-up to let them know how the program can benefit their farming operation and encourage them to sign-up. This did not result in any new sign-ups this year, but a few farmers said they would consider participating, while others clearly are not interested.

There are currently 287 (including 41 sub-farms) commercial farms signed up for the program out of a possible 299 farms. This represents 95.6 percent participation rate. There are 282 farms with WFP agreements, which represent 94% of the commercial farms in the watershed. The original FAD goal to have 85% participation has thus been surpassed.

### 4.3.3 BMP Implementation

Over the past eleven years (1992-2003) WAP has implemented 2,534 BMPs at a cost of $18.7 million on over 210 commercial farms. This past year alone 263 BMPs were implemented at a cost of $2.94 million. The majority of the design and implementation oversight of BMPs is accomplished with WAP staff. However, WAC has developed a pre-qualified list of private engineering firms that can be called upon to design and oversee construction of BMPs. This has been very helpful to get more projects implemented with the existing staff.

### 4.3.4 Conservation Reserve Enhancement Program (CREP)

There are now under contract a total of 1,347.8 acres of riparian forest buffers, which is equivalent to approximately 374.4 miles of streams protected by riparian buffers. In addition, there are more than 340 acres of riparian buffers that have been approved by the Council that are in the CREP contract development pipeline. There are a total of 127 contracts of which 101 are complete and have all the associated BMPs implemented.

The location of these contracts can be seen on the attached CREP Activities map (Figures 4.14 and 4.15) .

### 4.3.5 Farmer Education Program

WAP has continued its Farmer Education Program that provides educational opportunities for watershed farmers in the following areas:

Nutrient Management: WAP staff presented a two-day workshop on November 4th and 6th. Fifteen farmers participated, which brings the total number of farmers who completed the course to 94. These workshops are designed to help dairy and livestock farmers understand nutrient management issues in the watershed and the factors that control nutrient movement in the landscape. This workshop is now a requirement for farmers who want to participate in the Nutrient Management Credit Program.

New York State Cattle Health Assurance Program (NYSCHAPS): A total of 30 farms have volunteered to participate in NYSCHAPS, which is a State sponsored program that brings a farmer and his veterinarian together with State veterinarians to develop a herd health plan that is specific to the individual farm. WAC has initiated a series of meetings to help integrate NYSCHAPS, into the whole farm planning process.

Precision Feed and Forage Management: The second 2-day course in this series will be offered to all watershed farmers at five different locations in February and March 2004. WAC is also collaborating with Delaware County CCE and Department of Watershed Affairs on a 3-year pilot program to implement precession feed and forage management practices on more watershed farms.

### 4.3.6 Small Farm Program

WAC has approved 26 Small Farm Whole Farm Plans (see Figure 4.16) which includes seven that were approved in the last six months of 2003. Nine of these farms had originally signed up for the “large farm” program, but due to a change in their operation were no longer eligible as such. To date, 16 of the 26 approved WFPs have commenced BMP implementation. This year 60 BMPs have been installed at a cost of $302,521.00.

In 2004, the Small Farms team has a goal to develop 10 more plans on priority farms and continue to keep the current rate of implementation of BMPs.

### 4.3.7 Croton Agricultural Program

WAC has approved to date 14 WFPs on farms in the EOH watersheds (see Figure 4.17) and commenced implementation on 9 farms. In addition, 31 BMPs have been implemented at a cost of $290,413.00. Four WFPs are substantially implemented.

Paddock Management Demonstration Project For Equine Operations in New York City's East of Hudson/Croton Watersheds: The farm has continued its policy of no rough board in paddocks. WAC has purchased a new soil quality testing kit to continue monitoring the soil in the paddocks. Extremely wet weather this fall prevented a second evaluation, but one will be scheduled for this spring. Reseeding of a paddock will be scheduled in 2004.

Conservation Reserve Enhancement Program (CREP) in the Croton Watershed: On October 29, 2003, Secretary of Agriculture, Ann M. Veneman and New York State Commissioner of Ag & Markets, Nathan Rudgers signed an agreement that will provide $62 million to farmers to retire highly erodible cropland and to establish riparian forest buffers on agricultural lands adjacent to watercourses. There are twelve major watersheds in NYS that are eligible to participate and the Croton watershed is part of one of those watersheds. The Federal Government will provide annual rental payment to farmers who agree to voluntary retire environmentally sensitive lands from production and will also pay 50% of the eligible costs to establish needed conservation practices. CREP has been used successfully in the Catskill/Delaware watersheds to establish riparian buffers and exclude livestock from streams, and should prove to be an excellent tool to protect water quality from the impacts of agriculture in the Croton watershed. WAC and DEP are considering how best to incorporate CREP into the Croton agricultural effort.

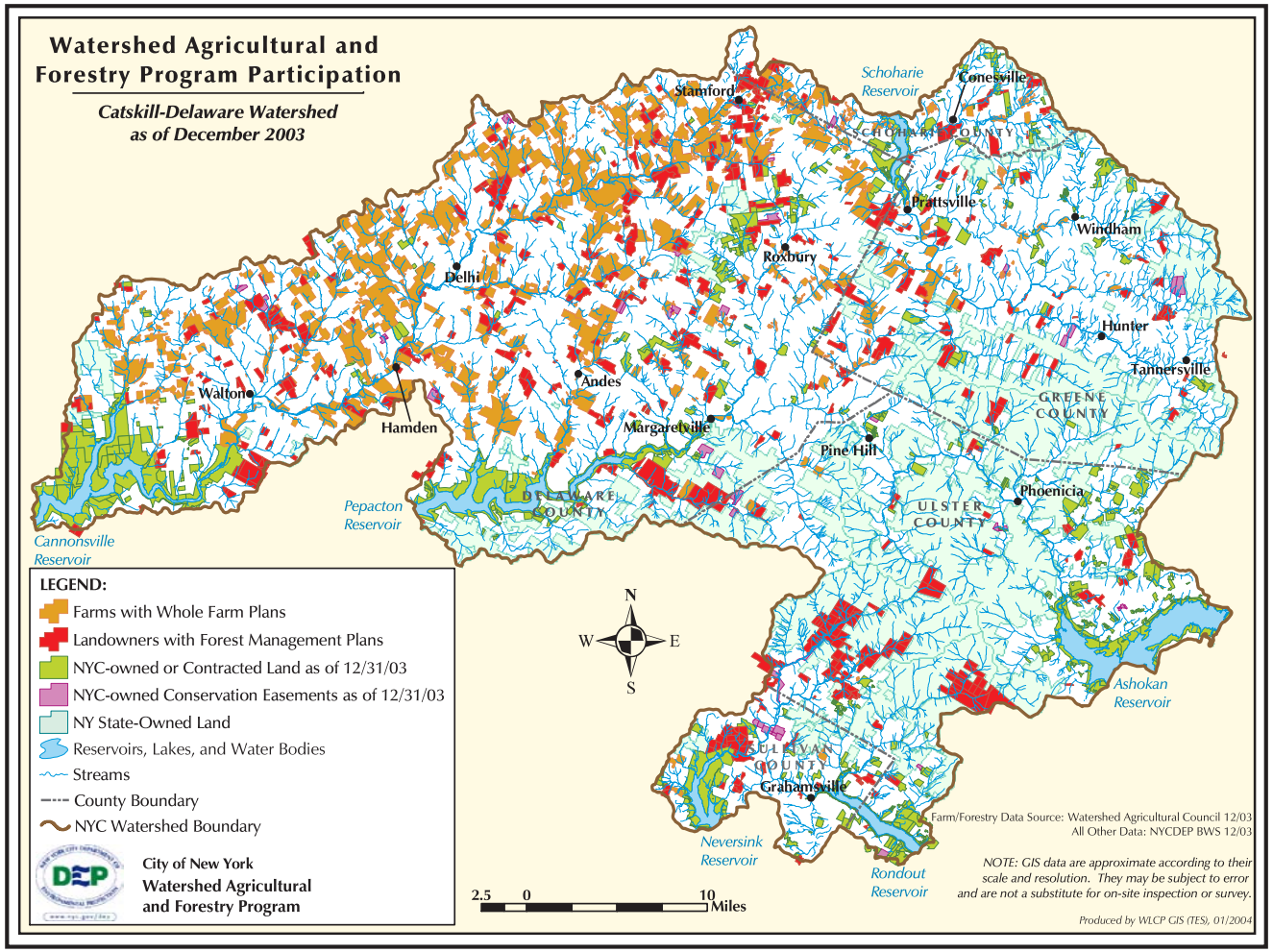


Figure 4.11. Watershed Agricultural and Forestry Program Participation, Catskill-Delaware Watershed as of December 2003.

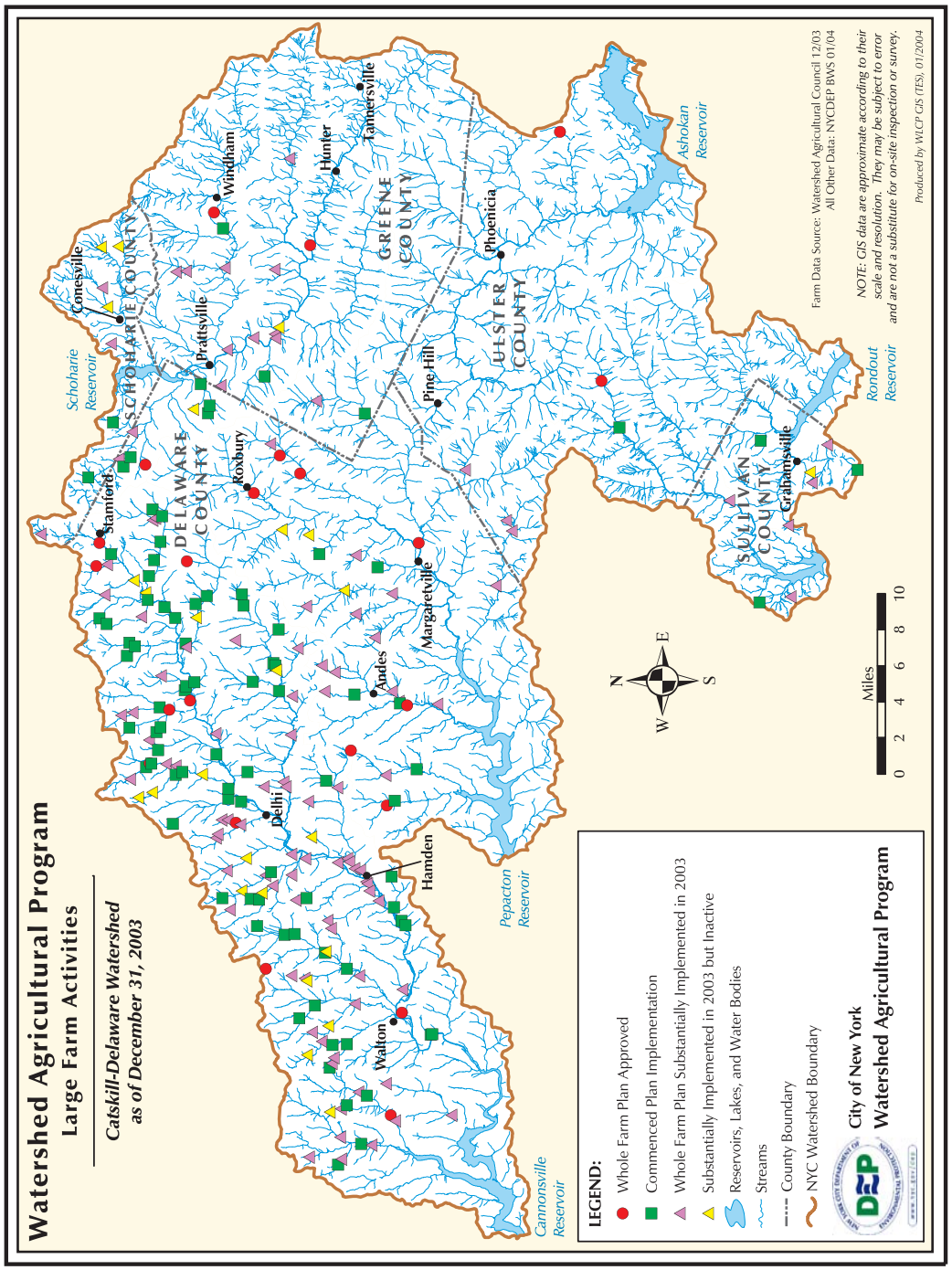


Figure 4.12. Watershed Agricultural Program. Large Farm Activities. Catskill-Delaware Watershed as of December 31, 2003.

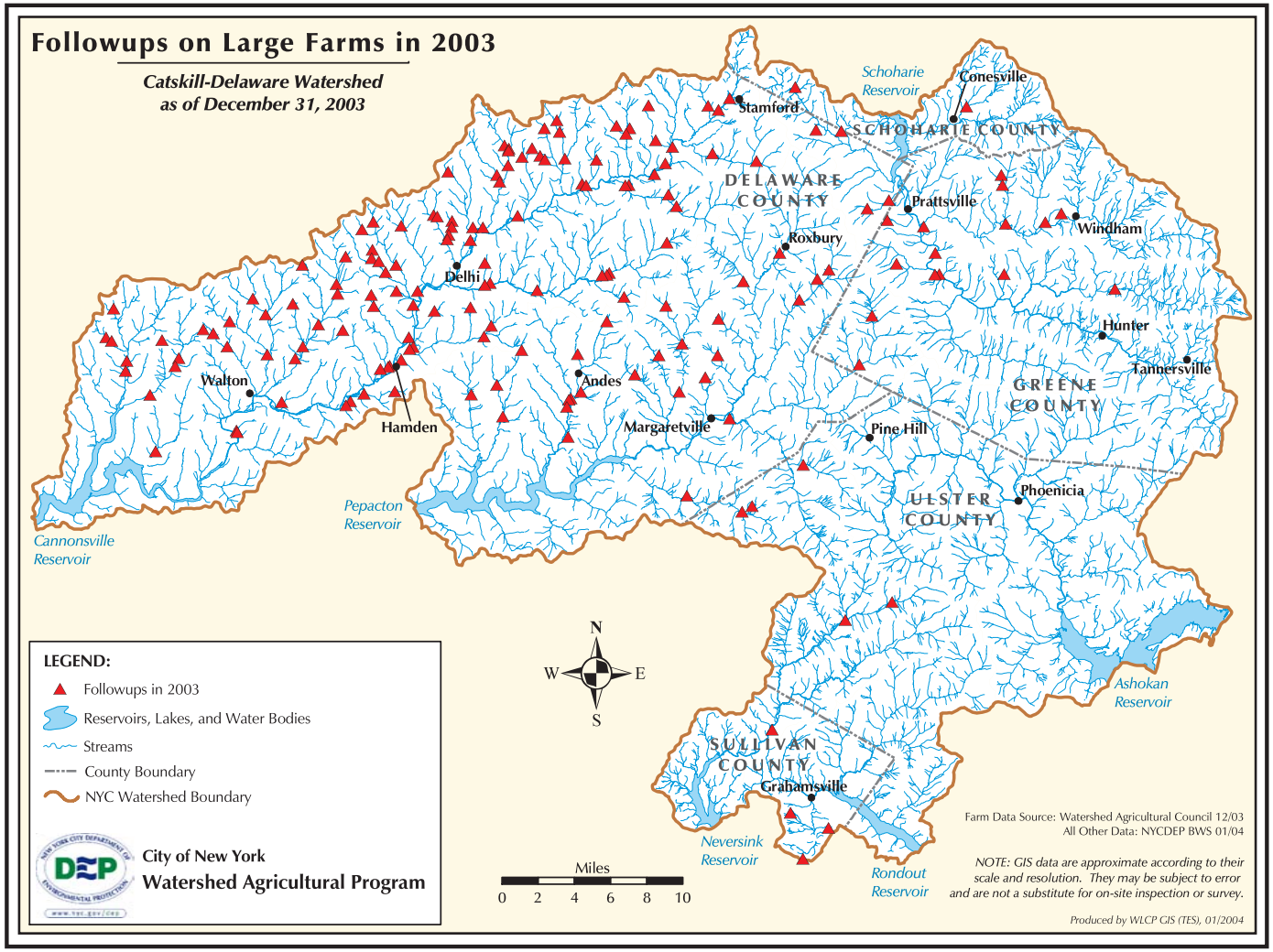


Figure 4.13. Followups on Large Farms in 2003. Catskill-Delaware Watershed as of December 31, 2003.

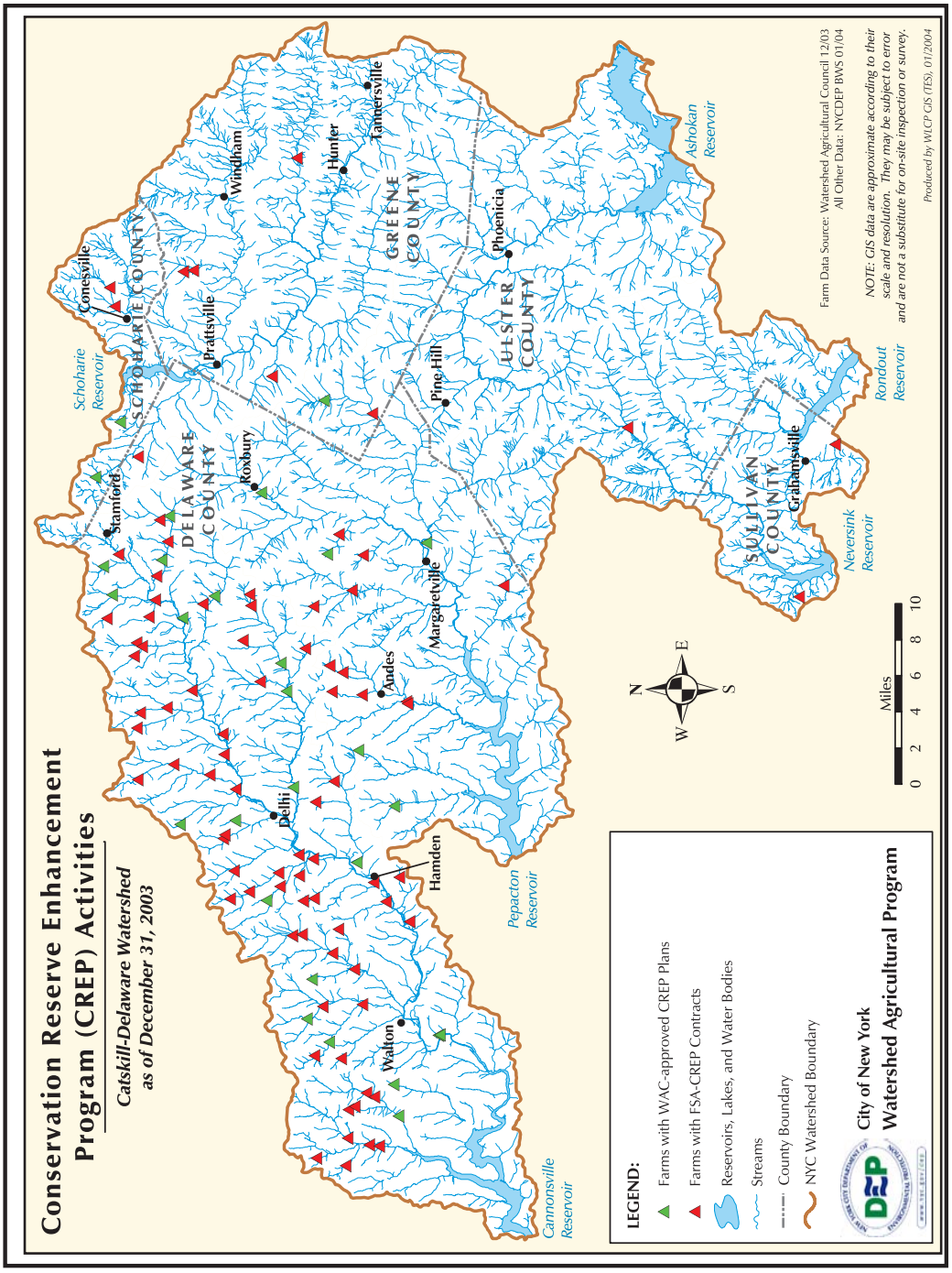


Figure 4.14. Conservation Reserve Enhancement Program (CREP) Activities, Catskill-Delaware Watershed as of December 31, 2003.

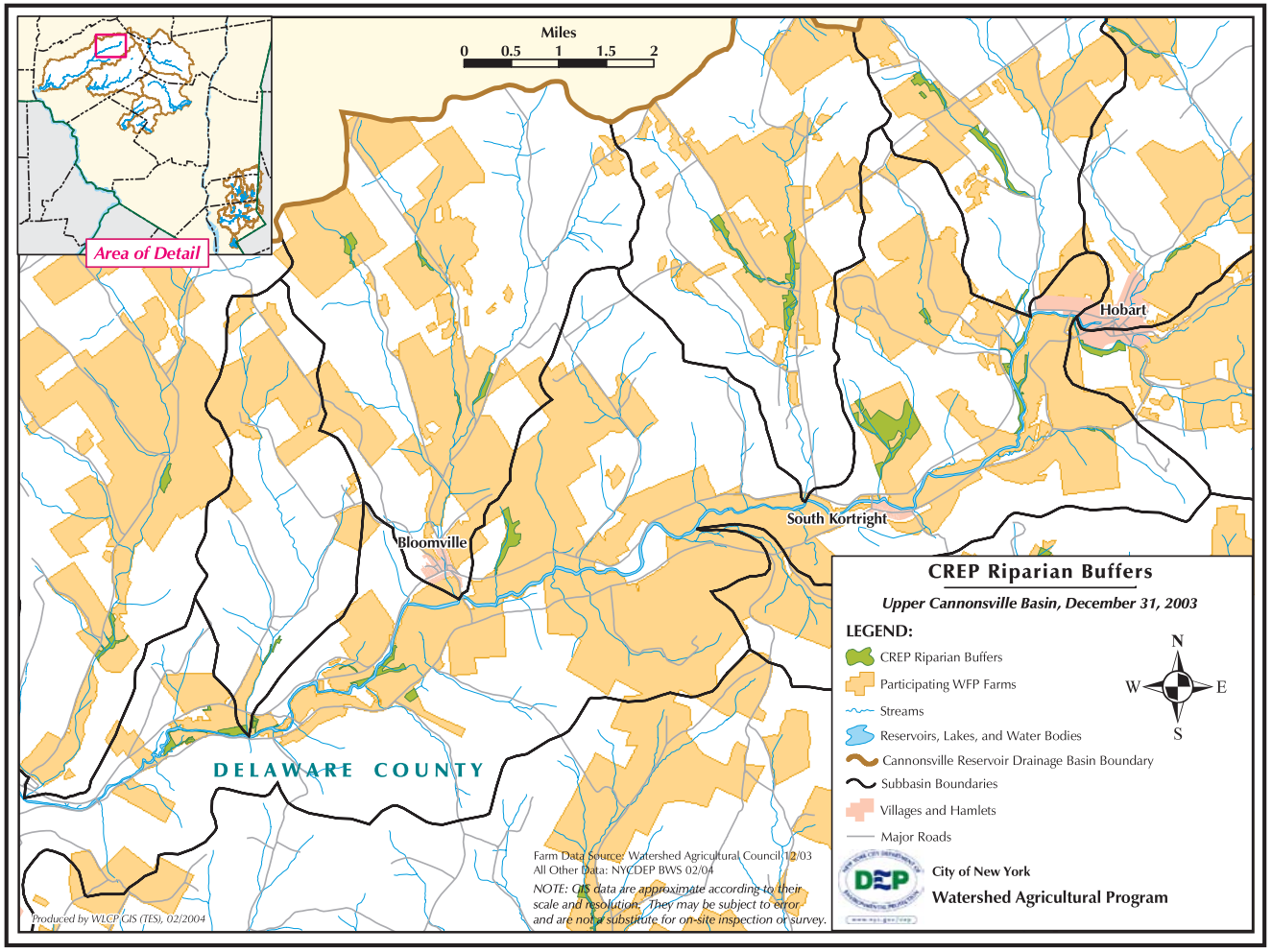


Figure 4.15. CREP Riparian Buffers, Upper Cannonsville Basin, December 31, 2003.

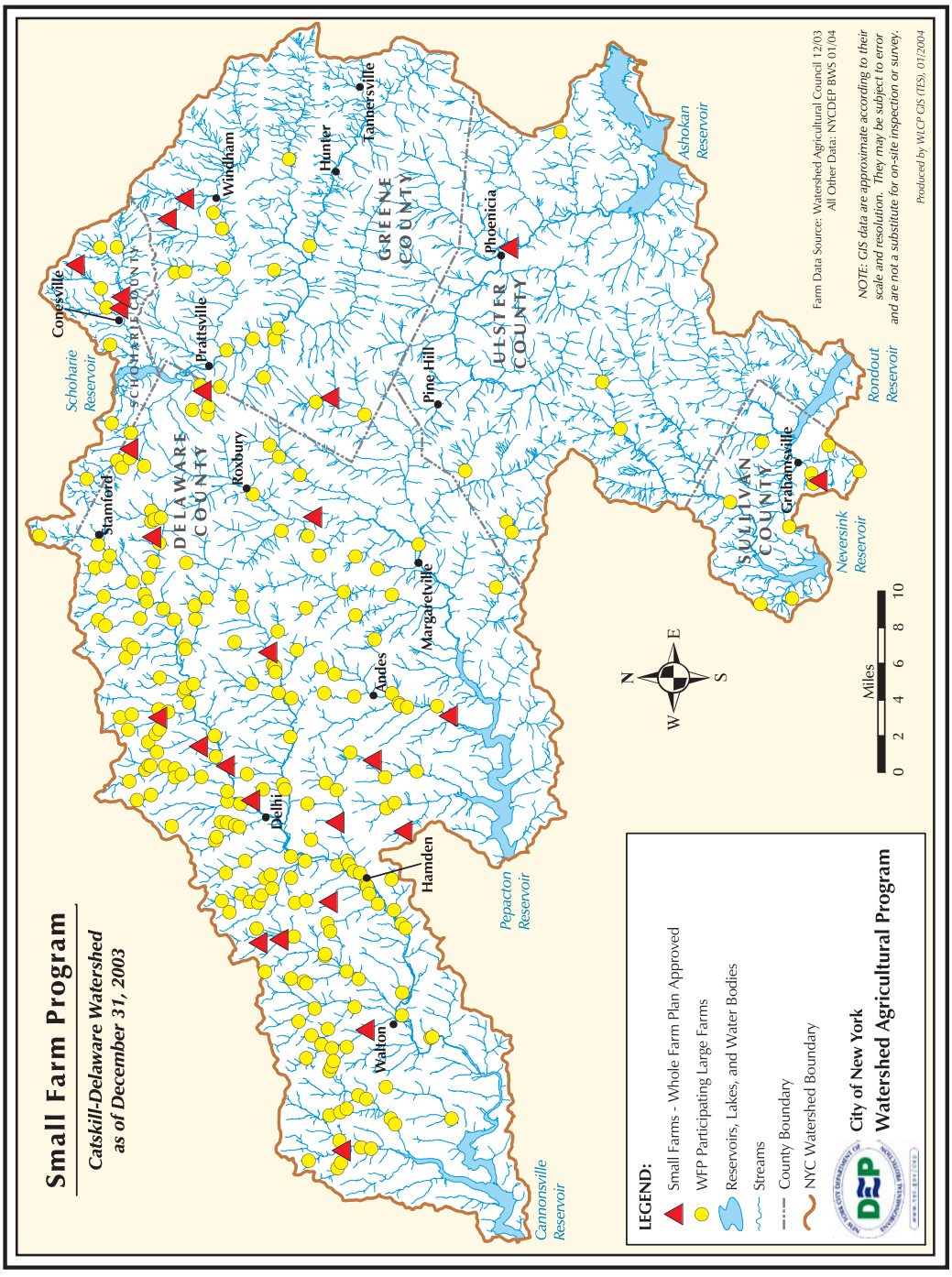


Figure 4.16. Small Farm Program. Catskill-Delaware Watershed as of December 31, 2003.

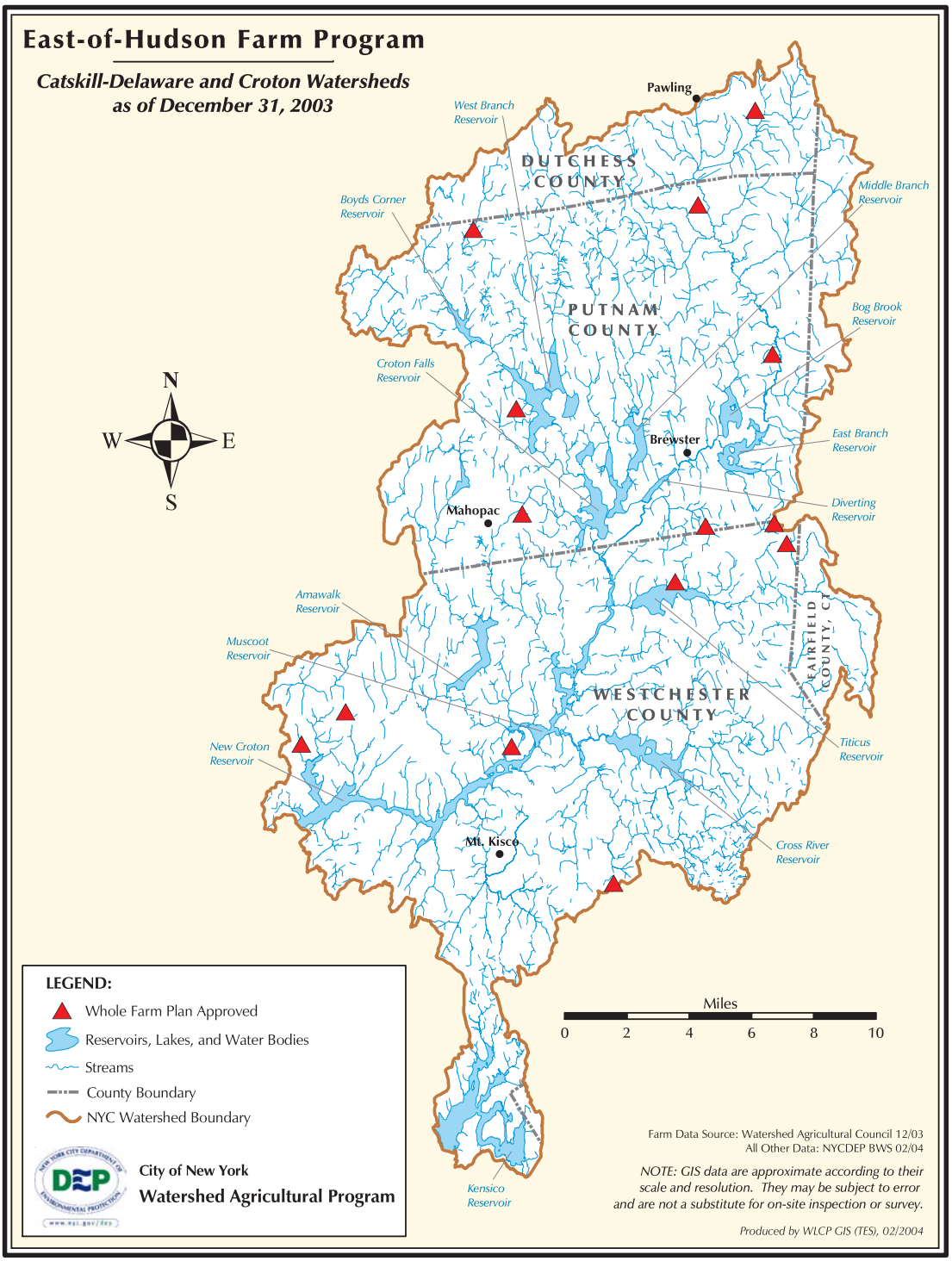


Figure 4.17. East of Hudson Farm Program. Catskill-Delaware and Croton Watersheds as of December 31, 2003.

## 4.4 Watershed Forestry Program

### 4.4.1 Program Overview

The Watershed Forestry Program is a voluntary pollution prevention partnership that DEP began funding in 1997, to support and maintain well-managed private forests as a beneficial land use for water quality protection. DEP implements the Forestry Program by contracting with the Watershed Agricultural Council (WAC) to administer the following core program tasks: forest management planning; best management practice (BMP) implementation; logger training; and research, demonstration and education. With matching federal grants from the USDA Forest Service (USFS), the Forestry Program also supports economic initiatives aimed at strengthening the viability of wood-using businesses and the regional forest products industry. Additional USFS stewardship funding helps underwrite WAC riparian buffer projects and forestry education programs targeting both upstate and downstate audiences.

### 4.4.2 Summary of Accomplishments

The six-year old Watershed Forestry Program underwent a substantial reorganization during 2003. In addition to creating and filling its first WAC Forester position for the East of Hudson watershed, WAC also hired a new Executive Director, Forestry Program Manager, West of Hudson Forester, Forestry Economic Grants Specialist, and Forestry Administrative Assistant. Several founding members of the Watershed Forestry Task Force also stepped down during 2003, prompting WAC to initiate a search for new landowner and forest industry representatives to the WAC Forestry Program Committee. Despite a year-long transition period which produced some minor continuity issues with respect to logger training, riparian planning, and certain education projects, one of the most promising developments to emerge during 2003 was the enhanced application of WAC's Geographic Information System to improve the ability to track the status and progress of forest management planning and BMP implementation projects.

*Forest Management Planning.* The Forestry Program provides funding to landowners for developing 10-year WAC forestry plans by trained professional foresters. The Forestry Program also provides funding for upgrading non-WAC forestry plans (480-a tax law plans, federal stewardship plans) to current WAC plan specifications. During 2003, the Forestry Program initiated a new pilot program to enable landowners having 5-year old WAC plans to update their plans to current watershed standards. Also this past year, in an effort to stimulate increased participation by foresters and landowners in Dutchess, Putnam and Westchester counties, the Forestry Program adopted a higher schedule of WAC plan cost-sharing rates for the East of Hudson watershed and conducted a water quality training workshop for 12 professional foresters working East of Hudson. To date, 45 foresters are qualified to write WAC forestry plans.

*Riparian Planning.* Since 2001, the Forestry Program has encouraged foresters to attend a special riparian training workshop as a prerequisite for delineating riparian areas and developing riparian management recommendations for WAC forest management plans. During 2003, the Forestry Program conducted its third riparian training workshop for nine professional foresters. To date, 17 foresters are qualified to develop riparian recommendations for WAC plans.

*5-Year Plan Evaluation Report.* This past year, DEP evaluated the 5-year implementation status of 30 WAC forestry plans and submitted a report to the EPA in January 2004. Among the report's highlights, two landowners (7%) sold their properties to a public agency since completing their forest management plans five years ago, and three landowners (10%) applied for WAC cost-sharing to update their 5-year old plans. Four landowners (13%) participated in a road BMP cost-sharing program, including one landowner who participated twice. Twelve out of 19 eligible landowners (63%) who own more than 50 acres of forest land enrolled their WAC forestry plans in the New York State Forest Tax Law (480-a).

Table 4.3. Highlights of forest management planning.

| Highlights | 2003 | To Date |
|---|---|---|
| Total number of landowner applications approved: | 111 | 486 |
| Forest management plan upgrades | 12 | 21 |
| WAC 5-year plan updates | 7 | 7 |
| Total number of forest management plans completed: | 73 | 334 |
| Forest management plan upgrades | 7 | 10 |
| WAC 5-year plan updates | 0 | 0 |
| Riparian plans | 6 | 26 |
| Total acres under a completed forest management plan: | 10,524 | 63,417 |
| Forested acres | 7,789 | 49,974 |
| Riparian acres | 184 | 1,787 |

### 4.4.3 Best Management Practice (BMP) Implementation

The Forestry Program offers funding, technical assistance and other incentives to watershed loggers and landowners for implementing forestry BMPs such as portable bridges and erosion control technology. Regarding the latter, WAC has distributed approximately three dozen free samples of geotextile fabric, silt fencing, traditional pipe culverts, open-topped pipe culverts, non-petroleum chainsaw oil, rubber tire land mats, and rubber dam water deflectors.

*Portable Bridges*. WAC owns three short-span skidder bridges and one long-span haul bridge that are available for temporary loan to interested loggers. These bridges have been borrowed and installed at 23 watershed logging sites to date. The Forestry Program has also cost-shared the construction of 15 short-span bridges and the rental of one long-span bridges to date.

*Road BMP Projects*. The Forestry Program cost-shares the proper installation of new timber harvest roads and the remediation of existing forest roads having erosion problems. During 2003, 19 projects were approved for funding and 16 projects were completed. Sixteen projects are currently in progress and scheduled for completion in 2004. A total of 59 projects have been completed to date representing 90 miles of properly designed forest access roads containing 2,560 water bars, 209 broad-based dips, 93 traditional pipe culverts, and more than 4,000 linear feet of geotextile road fabric and silt fencing.

*Riparian Buffer Grants*. During 2003, the Forestry Program awarded $175,000 in competitive matching grants to Soil and Water Conservation Districts (SWCDs) in Greene and Sullivan counties to establish riparian buffers and conduct riparian education programs in the Batavia Kill, West Kill, Brandywine, Stony Creek and Chestnut Creek watersheds, all of which are stream restoration projects currently in progress via DEP's Stream Management Program. These riparian buffer grant projects are scheduled for completion during 2004.

Table 4.4. Highlights of the BMP implementation.

| Highlights | 2003 | To Date |
|---|---|---|
| Number of portable bridges constructed, rented or cost-shared: | 1 | 16 |
| Number of logging sites where a loaner bridge was installed: | 6 | 23 |
| Number of road BMP projects approved: | 19 | 75 |
| Timber harvest road projects | 13 | 38 |
| Road remediation projects | 6 | 37 |
| Number of road BMP projects completed: | 16 | 59 |
| Timber harvest road projects | 8 | 28 |
| Road remediation projects | 8 | 31 |

### 4.4.4 Logger Training

During 2003, the Forestry Program merged its "watershed qualified" logger training program with the state-wide Trained Logger Certification Program administered by New York Logger Training, Inc. (NYLT). As a result, watershed loggers are now encouraged to become NYLT certified by completing three workshops: Forest Ecology & Silviculture, First Aid & CPR, and Chainsaw Safety (Game of Logging Level 1). During 2003, WAC sponsored a Forest Ecology & Silviculture workshop and a First Aid & CPR workshop, while the Catskill Forest Association (CFA) sponsored a Forest Ecology & Silviculture workshop and three sessions each of four Game of Logging workshops (Levels 1-4). For the entire Catskill/Lower Hudson region (covering the 8 watershed counties plus Otsego, Columbia, Nassau, Suffolk and New York City), NYLT currently reports more than 250 individuals in their logger database. Twenty four of these individuals are fully certified watershed loggers representing at least 16 different companies or businesses, while 33 of these individuals are loggers who had previous certifications which have since expired. The remaining 200+ people in the NYLT database are either partially trained commercial loggers lack-

ing one or two workshops to fully complete their certification, or they are agency staff, consulting foresters, landowners, natural resource professionals, and other interested participants who are not commercial loggers but attended a logger workshop.

Table 4.5. Highlights of logger training.

| Highlights | 2003 | To Date |
|---|---|---|
| Number of training workshops sponsored for watershed loggers: | 15 | 135+ |
| Number of participants attending logger training workshops: | 130+ | 1,330+ |

### 4.4.5 Research, Demonstration and Education

*Model Forests*. During 2003, the Forestry Program completed initial construction activities on a demonstration access road at the Frost Valley Model Forest. A ribbon-cutting ceremony was held in October to celebrate its official opening and showcase its newly installed interpretive signs. At the State-owned Nimham Model Forest in Putnam County, the Forestry Program continued working with the State DEC and other partners to plan for the project's construction during 2004. However, a vocal contingent of environmental groups and local resident activists has since launched a publicized media campaign that opposes the model forest project and objects to DEC's overall plans for the larger Nimham Mountain Multiple Use Area. To help raise awareness and generate support for the Nimham Model Forest, the Forestry Program is planning a series of community outreach meetings in early 2004. At the City-owned Mink Hollow Model Forest, DEP and WAC continued working with the USGS and SUNY College of Environmental Science and Forestry to develop a project work plan that integrates their research needs with DEP's land management goals and recreational opportunities.

*Watershed Forestry Institute for Teachers*. In July 2003, the Forestry Program partnered with the Catskill Forest Association to organize and implement the fifth annual Watershed Forestry Institute for Teachers for 22 participants, including 15 teachers from New York City and seven teachers from the upstate watersheds. For the nine speakers who presented workshops and information sessions, the 22 Institute participants rated their presentations an average of 88-94% for usefulness and 87-99% for overall value.

*Green Connections*. During the 2002-2003 school year, the Forestry Program partnered with the Catskill Center for Conservation and Development to successfully conduct a second "Green Connections" youth education program for 100+ students. Two downstate teachers from The Center School in Manhattan (MS 243) and Mott Haven Village in the Bronx (PS 220) were partnered with two upstate teachers from Ellenville and Walton. During 2003, the Catskill Center coordinated two downstate field trips to Inwood Park in Manhattan and one upstate overnight field trip to Belleayre Mountain in the Catskills. Throughout the school year and especially during the field trips, participating students visited both urban and rural forest settings, planted tree seedlings, conducted hands-on activities, and learned about the relationships between healthy forest ecosystems and clean water. When the Catskill Center evaluated Green Connections in June

2003, post-test scores increased 143-220% compared to pre-test scores, with the majority of students able to define a watershed and indicate at least two ways to assess a stream's health, two ways to conserve water, and three ways that trees help keep stream healthy.

*Landowner Education*. During 2003, the Forestry Program continued its partnership with Cornell Cooperative Extension of Greene County to publish the fourth and fifth issues of the *Watershed Woodlands* newsletter targeting forest landowners in the East of Hudson watershed and other specific geographic regions. The Forestry Program also partnered with Cornell Cooperative Extension of Delaware County, the Catskill Forest Association, New York State Forest Owners Association and the State DEC to sponsor and support a new "Friday Forestry School" for 40+ watershed forest landowners. This six-month course took place between April and September, with plans underway to expand this course to other watershed counties in 2004.

*Media Outreach*. In 2002, the Forestry Program partnered with the Empire State Forest Products Association (ESFPA) to conduct a downstate media outreach campaign funded by the USFS. The first part of this campaign concluded in early 2003 following a series of meetings with the editorial boards of several New York City newspapers (including *The New York Times*, *Staten Island Advance*, and *Associated Press*), downstate public radio stations, and weekly public television programs. ESFPA is currently developing watershed forestry informational kiosks to be installed at one location along the New York State Thruway and one location along a major thoroughfare in the Catskills.

*Forestry Bus Tour Grants*. The Forestry Program continues to offer matching grants funded by the USFS to support upstate forestry bus tours for downstate audiences. During 2003, 13 grants were approved for funding and seven bus tours were arranged for the High School for Law and Public Service (Manhattan), Ditmas Intermediate School (Brooklyn), PS 133 (Queens), Rocking the Boat (Bronx), School of the Future (Manhattan), New York State Outdoor Education Association, and the Council on the Environment (Manhattan) who coordinated separate upstate field trips for Samuel Gompers and DeWitt Clinton High Schools, both in the Bronx.

*Forestry Economic Action Grants*. The Forestry Program continues to support an Economic Action/Rural Development Through Forestry Grants Program funded by the USFS to improve the economic viability of local wood-using businesses. During 2003, 13 grants were approved for funding (totaling $300,000) and 20 grants were completed. To date, 53 grants have been awarded (totaling $1.76 million), of which $1.5 million has been delivered to recipients and $2+ million has been matched locally. Thirty-six grants have been fully completed.

*Forest Taxation Study*. In June 2003, Professor Hugh Canham (SUNY-ESF) completed a tax study commissioned by the Forestry Program to analyze and assess the economic impact of local property tax rates on private forest landowners in the New York City watershed. This study concluded that property taxes are confiscatory on at least half the watershed forest land and that

tax exempt real property has a great impact on tax shifts, with some watershed towns having 50% of all real property value exempt from taxation. The Forestry Program is currently combining the results of this study with additional research relating to forest fragmentation and parcelization.

*Conferences and Presentations*. The Forestry Program participated in several major outreach events and speaking engagements during 2003, including: New York Forestry Awareness Day in Albany (April), "Northeast Forest Owner Cooperation" Conference in Massachusetts (May), Catskill Mountain Culture Festival (July), Deposit Lumberjack Festival (July), Delaware County Fair (August), Andes Lumberjack Festival (August), Greene County Environmental Awareness Days (September), World Forest Congress in Quebec City, Canada (September), Society of American Foresters Annual Convention in Buffalo (October), and the "Joint Ventures: Partners in Stewardship" Conference in Los Angeles, California (November).

Table 4.6. Highlights of research, demonstration and education.

| Highlights | 2003 | To Date |
|---|---|---|
| Number of participants in the Watershed Forestry Institute: | 22 | 83 |
| Number of participants in the Green Connections program: | 100+ | 220+ |
| Number of watershed forestry bus tours grants awarded: | 13 | 13 |
| Number of watershed forestry bus tours completed: | 7 | 7 |
| Number of forestry economic grants awarded: | 13 | 53 |
| Dollar amount of grant awards (millions) | $0.3 | $1.76 |
| Number of forestry economic grants completed: | 20 | 36 |

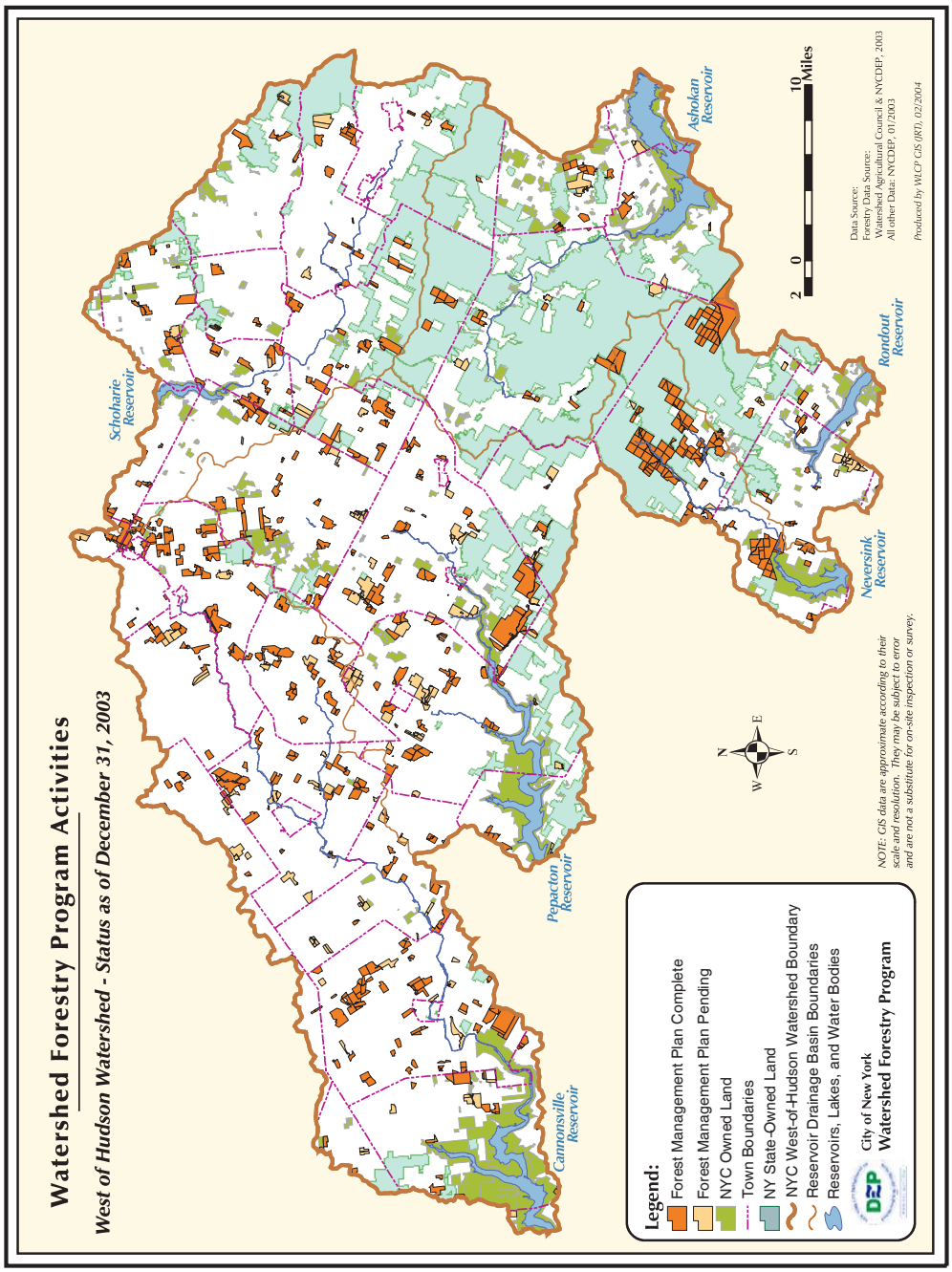


Figure 4.18. Watershed Forestry Program activities, West of Hudson watershed - Status as of December 31, 2003.

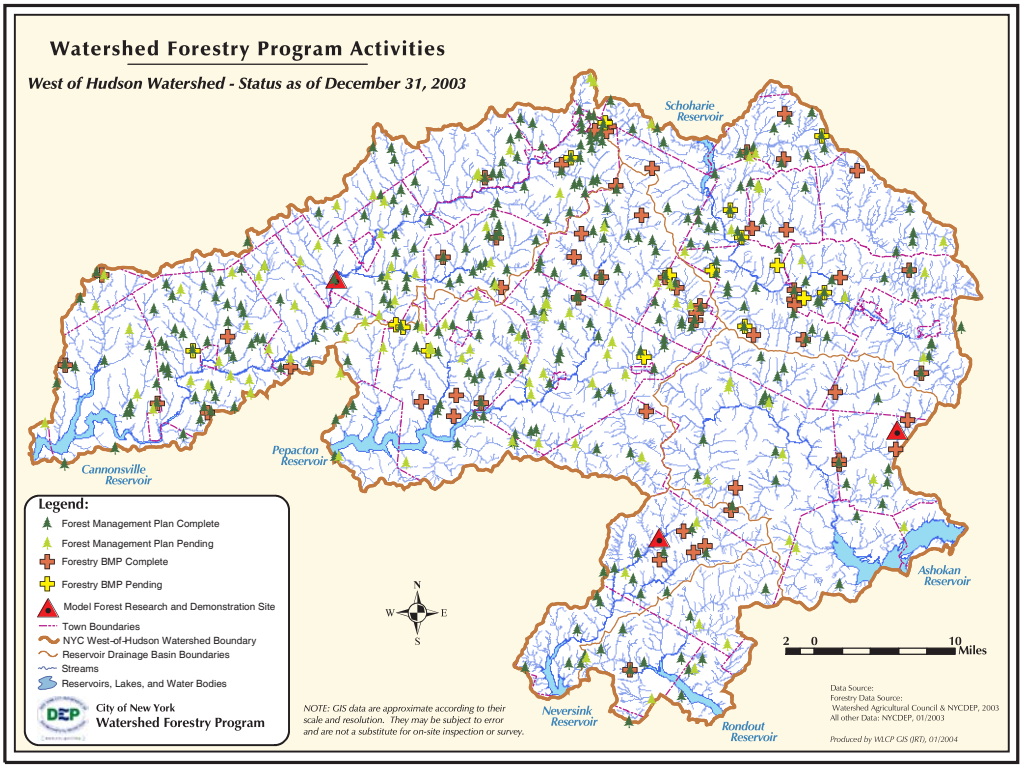


Figure 4.19. Watershed Forestry Program activities, West of Hudson watershed - Status as of December 31, 2003.

## 4.5 Stream Management Program

This report provides a narrative of the activities of the DEP Stream Management Program (SMP) and its local planning partners for 2003. A more detailed account of the history and mission of the SMP is provided in its Five Year Plan (December, 2001) and other periodic reports.

### 4.5.1 Partnership and Education

The SMP Advisory Board met in November 2003 to provide further guidance to the program as it reviewed the first round of stream management planning efforts and advised the program on its scoping, stream/watershed assessment and riparian protection activities. The group of 16 professionals, which has become very familiar with stream management related issues facing the program, also toured sites of interest along the West Branch of the Delaware River where Delaware County Soil and Water Conservation District has been active in its assessment and restoration design phase of its planning process. The Board's critique of the program's activities and plans has enabled DEP and the program's partners to learn from our previous efforts, reflect on and modify our current initiatives, and envision our program's direction. This assistance will be invaluable as the Stream Management Program prepares its biennial program evaluation in 2004.

The SMP and its partners continue to rely on Project Advisory Committees (PACs) as the primary link to communities involved in stream management planning. PACs in all current planning basins met in 2003 to provide input to planning teams and to review their progress. PAC members have assisted by writing sections of stream management plan documents, contributing materials and information included in the documents, and volunteering their time on restoration projects. PAC members are presenting completed plans to residents of the watersheds and community political leaders and municipal managers. DEP will continue to support the PACs through the plan adoption and recommendation prioritization processes.

In 2003, private landowners living in both the Stony Clove (SC) and Broadstreet Hollow (BSH) sub-basins exemplified the SMP goal of greater local stream stewardship by pursuing the formation of Watershed Landowner Associations (WLAs). By taking a more proactive role with partnering agencies developing Stream Management Plans these groups will help direct the implementation of the plans, provide local knowledge and commitment for the effort, and transfer information to other residents. Both WLAs held events in 2003 and initiated efforts to establish a set of by-laws as a precursor to seeking not-for-profit organization status.

The SMP recognizes that stream stewardship is not just for adults. To affect long-term change in the way individuals relate to streams and the streamside environment, the program extended its support to local schools through initiation of the *Catskill Stream and Watershed Education Program (CSWEP).* In 2003, SMP and Catskill Center for Conservation and Development (CCCD) launched this new program focusing on schools within stream management planning sub-basins and reached 263 $4^{th}$ –$12^{th}$ grade students from five schools in the WOH watersheds. Students received interactive lessons on water characteristics and water quality, aquatic environments, stream processes and stream stewardship during both classroom and field sessions. In addition to CSWEP, the SMP continues to support streamside planting efforts of schools from both upstate and downstate regions.

The SMP also produced a program brochure describing program activities and basic stream concepts for the general public, contributed to the establishment of a stream management program website www.nyc.gov/html/dep/watershed/html/streams.html, and prepared newsletter articles for local publications.

In an effort to diversify its stream protection and restoration practices, the SMP offered an Ecological Restoration Workshop for DEP and project partner staff. The goal of the workshop was to improve the biological component of our stream restoration projects, especially ecological functions of the riparian zone. The instructor, John Munro from the Society for Ecological Restoration, focused on use of native plant materials, and emphasized ecological restoration as distinguished from stream stability restoration. A project installation component of the workshop will be held in 2004.

SMP continued both its summer Watershed Conservation Corps intern program through Ulster Community College, and its Catskill Watershed Americorps Program through the Youth Resources Development Corporation of Poughkeepsie. These programs provide learning opportunities for college students and recent graduates, while greatly assisting the DEP and Soil and Water Conservation Districts with tasks associated with stream assessments, research, public outreach/education and plan preparation.

### 4.5.2 Stream Management Plans

This report provides a narrative of the activities of the DEP and the local planning partners for specific planning projects. A map of stream management planning sub-basins and status of the plans accompanies this report.

Batavia Kill SMP – A comprehensive draft of this plan was completed and submitted to the EPA in January 2003, with the same document submitted for professional review and comment by Greene County Soil and Water Conservation District (GCSWCD). Professional review was completed at the end of 2003, and provided Greene County with only minor suggested amendments. Greene County has informed DEP SMP that they are nearly finished making changes to the January 2003, draft and it will be submitted for local community adoption in spring 2004. Sections of the Batavia Kill SMP, including relevant management units and recommendations, are being printed and delivered to Batavia Kill landowners for comment as part of the prioritization of recommendations process. DEP SMP is prepared to submit its prioritized set of recommendations to the EPA by the end of June 2004.

Greene County is proceeding with its Phase II contract for the Batavia Kill. Towards implementation of the stream management plan, GCSWCD received $89,000 in funding from the CWC Stormwater Retrofit Program for two projects in the Batavia Kill watershed to address chronic turbidity from roadside ditches on steep roads. The District is also working with multiple project partners to address impervious areas at Windham Mountain ski facility. This project includes development of a stormwater treatment system with “finishing” wetlands constructed on DEP streamside property. GCSWCD has proposed enhancements to riparian buffers along this section of Batavia Kill with assisted restoration of short sections of early streambank failure. Increased emphasis on stormwater management and riparian restoration where appropriate to stabilize streambanks were identified as high priorities in the stream management plan.

The plan also recommended adoption of new digital flood insurance rate maps (FIRMs) for the Batavia Kill watershed. DEC is currently working to update maps for the entire Schoharie basin. In 2003, GCSWCD trained with DEC staff in the use of flood mapping software and worked with DEC surveyors to establish a permanent survey control network. Final FIRMs should be delivered to the County by DEC in 2004.

Using Phase II funds, GCSWCD contracted with Hudsonia to conduct a baseline assessment of the invasive plant, Japanese Knotweed, which has colonized many stream banks along the Batavia Kill. The assessment included mapping of knotweed colonies and general riparian vegetation and establishment of trial plots for both monitoring rates of spread and testing potential control treatments. GCSWCD and Hudsonia prepared a grant application to the US Fish and Wildlife Service Pulling Together Initiative. Funds from this grant will be used to develop various outreach materials for highway departments, municipal officials, and private landowners. Continuing monitoring and sampling of trial plots will be another focus of Hudsonia's work.

GCSWCD received funding from the WAP Riparian Buffer Grant Program for additional riparian vegetation at Maier Farm and Brandywine stream restoration project sites. GCSWCD was awarded $20,000 and $25,000 respectively for this work which will be completed in 2004.

GCSWCD continued to monitor the completed restoration projects at Maier farm, Brandywine and Big Hollow. Project teams also continued to monitor erosion and deposition at a series of permanent cross sections along the mainstem of the Batavia Kill. Additional monitoring efforts were instituted at the "control" reach upstream from the Big Hollow project site. Finally, a major GPS walkover mapping effort was completed for 21 miles of the river in 2003. This walkover mapped erosion and deposition features, bridges, culverts, headcuts, hydraulic controls, revetments, berms, etc. This assessment will be compared and linked the first assessment conducted in the late 1990s using the district's GIS.

Broadstreet Hollow SMP – DEP SMP and Ulster County Soil and Water Conservation District (UCSWCD) submitted the first complete draft of the Broadstreet Hollow Stream Management Plan to the EPA on April 1, 2003, and the final plan on June 1, 2003.

The UCSWCD and SMP coordinated an extensive outreach effort to ensure all stakeholders to the plan provided input, review and approval at all stages of development. Complete summaries of each of 19 Management Units were mailed with review questionnaires to each streamside landowner, and all plan materials were mailed in draft form to all PAC members, also with review questionnaires. Follow-up meetings were held after mailings to discuss stakeholder reviews and concerns and to document suggested edits. Individual meetings were also held with specific stakeholders providing information or complete plan sections or review of plan sections. In all, over a dozen separate agencies, organizations and groups contributed directly to the final plan, with additional stakeholders providing review. In addition, two streamside landowners wrote local history sections for the introductory chapters, and three local landowners contributed artwork and photos that appear throughout the final plan.

Recommendations for the completed Broadstreet Hollow SMP were prioritized and a report was delivered to the EPA in December 2004, outlining DEP's intentions for implementing this plan, including its support for the BSH Watershed Landowner Association. DEP continues to seek local government adoption of the plan in both Greene and Ulster counties.

Chestnut Creek SMP – In addition to constructing their stream restoration project at Grahamsville (see below), Sullivan County SWCD worked vigorously to prepare the SMP for Chestnut Creek. Following input received from public meetings held in the spring of 2003, Sullivan County staff, its consultants, DEP staff and local contributors prepared sections of the plan related to relevant local history, stormwater management, hydrology and water quality, geology, fisheries, riparian vegetation and the technical description of each of management unit. Submission of the plan, due at the end of December 2003, was delayed to allow for final review and editing of the document. The final plan was submitted to the EPA on March 1, 2004.

Stony Clove SMP – In addition to activities associated with construction of the stream restoration demonstration project on the Stony Clove at Lanesville (see below), GCSWCD and DEP spent much of 2003 finalizing data analysis and preparing the management plan document.

The Stony Clove SMP document and local review process is organized similar to the Broadstreet SMP. Results of the stream assessments will be presented by management unit (stream reach), and recommendations will also be referenced to specific management units. Stony Clove SMP also includes the results of the MesoHABSIM assessment of fish habitat, which were delivered to DEP by Cornell in June 2003.

The contract between DEP and the District was extended by one year to allow completion of the delayed construction project and writing of the plan. The final plan was submitted to EPA on March 1, 2004.

DEP SMP has proposed a pilot riparian buffer improvement program for the Stony Clove in which the District and DEP would assist non-agricultural landowners with design and installation of a riparian buffer. SMP and the District identified funding for this project through the WAC Forestry Program and have negotiated a contract for design of 8 project planting sites. The pilot program is seeking additional DEP funds for plant materials and installation scheduled for fall 2004.

West Branch Delaware River SMP – Delaware County Soil and Water Conservation District (DCSWCD) teams continued with stream assessment activities and GPS mapping on the West Branch and its Town Brook tributary, identified and surveyed a site for its demonstration stream restoration project on Town Brook (see below), produced GIS maps of riparian vegetation for the West Branch and Town Brook, reviewed the results of landowner surveys for the lower half of the basin and Town Brook, and solicited, received and reviewed conceptual designs for two Delaware County priority projects at Terrace Avenue and South Street in the Village of Walton. DCSWCD also organized a tour of the West Branch and Town Brook for the DEP SMP Advisory Board and program partners. DCSWCD is on schedule to complete both the demonstration restoration project at the David Post farm on Town Brook and the stream management plan in 2004.

West Kill SMP – Most activity on the West Kill Creek project focused on construction of a restoration project in Lexington (see below). DEP and SCSWCD staff also reviewed the stream feature inventory that was completed for the West Kill in 2001, and a draft protocol was prepared for a watershed assessment to be conducted in summer 2004. Negotiations were held with Cornell University's Instream Habitat Program to conduct their MesoHABSIM field assessment on the creek during summer 2004.

### 4.5.3 Restoration Demonstration Projects

Projects demonstrating stream restoration practices are included in the stream management planning effort for each priority sub-basin. This section of the report presents a summary of status and activities on restoration or protection projects during 2003. Tables included in this section present descriptions of stream management planning demonstration projects and other restoration projects in each reservoir basin worked on during the reporting period. A map is included, depicting the geographic distribution of completed, ongoing and planned projects in the WOH watershed.

*Schoharie Watershed Stream Restoration Projects*

A non-FAD deliverable stream restoration project proceeded in the Schoharie watershed this year. In early August, GCSWCD and Evergreen, Inc. initiated construction of a restoration project on the West Kill located in the Town of Lexington, Greene County. This long reach (~3,400 ft.) has incised into glacial lake clays and is a significant source of suspended sediments in the Schoharie watershed. The project design by GCSWCD and KEA Engineering was completed in 2002. Unusually high runoff conditions of the summer and fall of 2003 forced a halt to construction activities prior to completion. GCSWCD plans to resume and complete construction in summer 2004.

Table 4.7. Schoharie Watershed projects (2003).

| Project Details | West Kill at Shoemaker Property |
|---|---|
| Location: | Town of Lexington, West Kill |
| Project specifications: | 3,400 feet, full channel reconstruction with structures, bioengineering, NCD principles |
| Project Status: | 1,300 feet, 8 of 21 rock structures, 47% cut and fill volumes completed. Project to be completed in 2004. |
| Primary project partners: | GCSWCD, FEMA |
| Partnering agencies and interested parties: | DEP |
| Project primary goals: | Mitigate turbidity and TSS from clay-rich sources; reduce flood hazard erosion risk |
| Project secondary goals: | Improve ecological integrity; sport fish habitat |

*Ashokan Watershed Stream Restoration Projects*

Two stream restoration projects proceeded on in the Ashokan Reservoir watershed this year: the Esopus creek at Woodland valley project and the Stony Clove at Lanesville project.

DEP contracted with UCSWCD to manage construction of a channel restoration and bank stabilization project on the Esopus Creek at the Woodland Valley creek confluence. In 2000, DEP hired FIScH Engineering to assess the geomorphic condition of this reach, characterized by a split channel with significant streambank erosion, and to prepare a design utilizing natural channel design principles. In coordination with DEP and FIScH Engineering, UCSWCD put the project out to bid and contracted with the successful bidder (Hubbell, Inc.) in July, 2003. The project was constructed in two phases: Phase 1 – channel construction, bank stabilization, and flood plain reconstruction from August 18 – September 30; Phase 2 – bioengineering and further bank stabilization from November 10 – December 15.

DEP has contracted with GCSWCD to develop a stream management plan for the Stony Clove watershed. The contract includes design and construction of a stream restoration demonstration project. The site selected is a reach of the Stony Clove in Lanesville that has incised into glacial lake clays and cut into a hillside deposit of unstable, clay-rich glacial deposits. The design was completed in 2002 and a contractor hired in mid-2003 (Fast-Tracks, Inc). Project construction was initiated in July 2003. However, due to unusually high runoff conditions the project was stopped repeatedly and finally halted for the season in September 2003. GCSWCD plans to resume and complete construction in summer 2004.

Table 4.8. Ashokan Watershed projects (2003).

| Project Details | Esopus Creek at Woodland Valley | Stony Clove at Lanesville |
|---|---|---|
| Associated SMP project: | Esopus Creek Stream Management Planning Project | Stony Clove Stream Corridor Management Plan Project |
| Location: | Town of Shandaken, Esopus Creek at Woodland Valley stream confluence | Town of Hunter, mainstem Stony Clove Creek |
| Project specifications: | 1,000 feet, full channel reconstruction with NCD principles, VRSS bioengineering/ riprap hybrid | 1,700 feet, full channel reconstruction with NCD principles, floodplain bioengineering with salvaged native plant materials |
| Project Status: | Construction completed December 2003 | 850 feet, 4 of 9 rock structures, 30 % of cut and fill volumes completed. Project to be completed in 2004 |
| Primary project partners: | DEP, UCSWCD | DEP, GCSWCD |
| Partners, funders and interested parties: | USACOE, FIScH Engineering, 7 landowners | 4 primary landowners |
| Project primary goals: | Mitigate clay/silt inputs, reduce drainage field damage risk, reduce bank erosion rates | Mitigate clay silt inputs from channel and bank sources. Stabilize mass wasting bank. |
| Project secondary goals: | Maintain/improve safety, aesthetics & recreation | Improve aquatic and riparian ecology. |

*Rondout Watershed Stream Restoration Projects*

DEP has contracted with SCSWCD to develop a stream management plan for the Chestnut Creek watershed. The contract includes design and construction of a stream restoration demonstration project. The Chestnut Creek project is a small section of the creek behind the Town of Neversink Town Hall that has experienced repeated streambank instability, in part exacerbated by lack of a riparian buffer. The project involved using stacked rock and a riparian planting program to stabilize the reach. The design was completed in early 2003. Project construction was completed in October 2003.

Table 4.9. Rondout Watershed projects (2003).

| Project Details | Chestnut Creek at Town Hall |
|---|---|
| Associated SMP project: | Chestnut Creek Stream Management Planning Project |
| Location: | Town of Neversink, Hamlet of Grahamsville, mainstem Chestnut Creek behind Neversink Town Hall |
| Project specifications: | 100 feet, assisted restoration – bank stabilization with stacked rock, bankfull bench and riparian vegetative enhancements |
| Project Status: | Construction completed Fall 2003 |
| Primary project partners: | SCSWCD, WAC, DEP |
| Partners, funders and interested parties: | Town of Neversink |
| Project primary goals: | Address bank stability, demonstrate use of native riparian vegetation |
| Project secondary goals: | Enhance aesthetics as a public park area, fire department water withdrawal |

*Cannonsville Watershed Stream Restoration Projects*

DEP has contracted with DCSWCD to develop a demonstration project for the West Branch Delaware River watershed. The selected demonstration project site is on the Town Brook at the Post Farm and is part of the farm's Whole Farm Plan. DCSWCD is working with the Whole Farm Plan team for site inclusion in CREP and construction of a cattle crossing on the project reach. During the reporting period, site topography was surveyed and project design was initiated. Construction is scheduled for summer 2004. Additional future (non-FAD deliverable) stream restoration projects in the planning basin include an additional site on Town Brook and two sites on the West Branch Delaware in the Village of Walton. Although these projects are not FAD-deliverables, DEP will continue to provide technical support and some funding for project completion.

Table 4.10. Cannonsville Watershed projects (2003).

| Project Detail | Town Brook at Post Farm | Town Brook at Lamport Farm | West Branch Delaware River at Terrace Avenue and South Street |
|---|---|---|---|
| Associated SMP project: | West Branch Delaware River Stream Management Planning Project | West Branch Delaware River Stream Management Planning Project | West Branch Delaware River Stream Management Planning Project |
| Location: | Town of Stamford near Hobart, Town Brook, Post Farm | Town of Stamford, lower Town Brook, Lamport farm | Village of Walton, mainstem WBDR |
| Project specifications: | Demonstration full channel reconstruction, NCD Principles, riparian and livestock fencing | Full channel reconstruction, NCD Principles, riparian buffer installation | Two separate bank stabilization projects (design specs. To be determined) |
| Project Status: | Design stage – Construction 2004 | Design stage – Construction 2004 | Conceptual design |
| Primary project partners: | DEP, DCSWCD | DEP, DCSWCD | DEP, DCSWCD |
| Partners, funders and interested parties: | Whole Farm Planning, landowner (Post), NYS NPSAPPP | Whole Farm Planning, landowner (Lamport), NYSAPPP | DEP, Partnership for Progress fund, landowners |
| Project primary goals: | Bank erosion, headcutting, prep. for CREP program | Bank erosion, channel migration, prep. for CREP program | Bank erosion/sediment loss |
| Project secondary goals: | Stable cattle crossing | | Property protection |

### 4.5.4 Regional Stream Databases and Other Research

SMP continued the multi-year effort to develop and distribute regional stream morphology databases to support stream management decisions, stream design specifications, and program and project evaluation. This collection of studies is a coordinated set of projects, funded in part by SDWA grants, to:

- identify channel forming flows and associated hydraulic geometry at United States Geological Survey (USGS) stream gages in order to improve the accuracy of regional relationships of bankfull discharge/hydraulic geometry to drainage area;
- develop design geometry and fluvial processes data for up to 15 reference stream reaches and monitor biological and aquatic habitat;
- monitor the effectiveness of stream restoration demonstration projects installed on three unstable stream reaches, and to monitor six control sites (three stable and three unstable sites), over a five year period; and
- monitor rates of streambank erosion and stream bed scour at up to 11 stream reaches in support of projects described in the previous two bullets.

USGS performs hydrologic and biologic project components; DEP personnel are responsible for geomorphic components. Following two tables include a brief summary of research project components and status for 2003, and a comprehensive list of stream reaches included in each project.

The table below lists the tasks completed in support of three research objectives. Tasks are summarized according to the year in which the task was completed. Some tasks were completed prior to the reporting period, but are included to demonstrate progress toward project and program goals.

Table 4.11. Completed research tasks 2003 – DEP Stream Management Program.

| Project Task Component | Regional Curve Development | Reference Reach Design/Database | Restoration BMP Site Monitoring |
|---|---|---|---|
| [1]Approved QAPPs | 2002 (1) | 2002 (2) | 2002 (1) |
| [2]Identify sites | 2002 (13) | 2002 (9) | 2002 (12), 2003 (3) |
| [3]Secure contracts | 2002 (USGS) | 2002(USGS), 2003(KMS) | 2002 (USGS) |
| [4]Train personnel | 2002 (5), 2003 (7) | 2002 (5), 2003 (7) | N/A |
| [5]Instrument sites | N/A | 2002 (3), 2003 (3) | 2002 (8) |
| [6]Install CSGs | N/A | 2002 (5), 2003 (3) | 2003 (4) |
| [7]CSG rating development | N/A | 2002 (5), 2003 (8) | 2003 (4) |
| [8]Reactivate gages | 2002 (5), 2003 (5) | N/A | N/A |
| [9]Calibrate gages | 2002 (4), 2003 (3) | N/A | N/A |
| [10]Geomorphic surveys | 2002 (6), 2003 (3) | 2002 (3), 2003 (2) | 2002 (12), 2003 (12) |
| [11]Design level survey | N/A | 2003 (1) | 2002 (4), 2003 (9) |
| [12]Bed mobility studies | N/A | 2002 (1), 2003 (4) | 2002 (1), 2003 (2) |
| [13]Biomonitoring | N/A | 2002 (9) | 2002 (12), 2003 (15) |
| [14]Habitat assessment | N/A | 2002 (9), 2003 (2) | 2002 (12), 2003 (15) |
| [15]Present/publish reports | 2002 (1), 2003 (1) | Pending (2004) | Pending (2004) |

1. Number of Quality Assurance Project Plans (QAPP) developed and approved by EPA for Safe Drinking Water Act (SDWA) grant funding.
2. Number of study sites selected for inclusion. Sites serving multiple projects are reported under each project.
3. United States Geological Survey (USGS) contract is multi-year; Kaatskill Mountain Surveyors (KMS) contract covers one year.
4. Number of personnel may be reported multiple times if a field crew worked on multiple projects in a single season.

5. Number of sites in which permanent monuments were placed for future monitoring purposes. Regional Curve study gage sites have permanent USGS benchmarks. Select sites were monumented prior to the reporting period.
6. Crest Stage Gage (CSG) installation is reported by number of sites monitored. Some sites have two or more gages.
7. CSG rating table development is ongoing through the reporting period; each active gage is reported each year.
8. Each reactivated USGS gage requires updated rating table development; each active gage is reported each year.
9. Only gages with current rating table and flood frequency curves were used. Once finished, the site is dismissed – only sites calibrated or updated during the reporting period are shown.
10. Geomorphic surveys are reported for the number of sites each year including repeated or overlapping sites.
11. BMP design surveys largely completed prior to reporting period, and not done for control sites and selected reference sites.
12. Bed mobility studies reported for BMP project are overlapping sites applied to Reference Reach project.
13. Biomonitoring includes fish and benthic macroinvertebrate sampling for each site, including repeated or overlapping sites.
14. Habitat assessment reported for each site may include repeated or overlapping sites.
15. Regional Curve project results were presented as a conference poster in 2002, and as a peer-reviewed published paper in June 2003.

The table below provides a summary list of project sites in support of various research efforts.

Table 4.12. Research project sites 2003 – DEP Stream Management Program.

| Project Site | Regional Curve | Reference Reach | BMP Monitoring |
|---|---|---|---|
| EBNR NE Denning | 2002 | | |
| Biscuit Brook at Frost Valley | 2002 (update) | | |
| Tremper Kill near Andes | 2002 (update) | | |
| Little Elk Creek near Westford | 2002 (DCSWCD) | | |
| Trout Creek near Trout Creek | 2002 (DCSWCD) | | |
| Little Delaware River near Delhi | 2002 (DCSWCD) | | |
| Mill Brook near Dunraven | 2003 | | |
| WBNR at Winnisook | 2003 | | |
| Dryden Brook near Granton | 2003 (reactivated 2002) | | |
| Charlotte Creek at West Davenport | 2002 (reactivated) 2003 | | |
| Beaverkill at Craigie Clair | 2002 (reactivated) 2003 | | |
| Beaverkill at Turnwood | 2002 (reactivated) 2003 | | |
| Dry Brook at West Shokan | 2002 (reactivated) 2003 | | |
| Broadstreet Hollow – Treatment | | | 2002-2003 |
| Broadstreet Hollow – Control | | | 2002-2003 |
| Broadstreet Hollow – Reference | | 2002-2003 | 2002-2003 |
| Batavia Kill (BH) – Treatment 1 | | | 2002-2003 |
| Batavia Kill (BH) – Treatment 2 | | | 2002-2003 |
| Batavia Kill (BH) – Control | | | 2002-2003 |
| Batavia Kill (BH) – Reference | | 2002-2003 | 2002-2003 |

Table 4.12. Research project sites 2003 – DEP Stream Management Program.

| Project Site | Regional Curve | Reference Reach | BMP Monitoring |
|---|---|---|---|
| Stony Clove – Treatment | | | 2002-2003 |
| Stony Clove – Control | | | 2002-2003 |
| Stoney Clove – Reference | | 2002-2003 | 2002-2003 |
| West Kill – Treatment | | | 2002-2003 |
| West Kill – Control | | | 2002-2003 |
| West Kill – Reference | | | 2002-2003 |
| East Kill – Treatment | | | 2003 |
| East Kill – Control | | | 2003 |
| East Kill – Reference | | | 2003 |
| Warner Creek 1 | | 2002-2003 | |
| Warner Creek 2 | | 2002-2003 | |
| Bear Kill 1 | | 2002-2003 | |
| Bear Kill 2 | | 2002-2003 | |
| Chestnut Creek | | 2002-2003 | |
| Schenevus Creek | | 2002-2003 | |

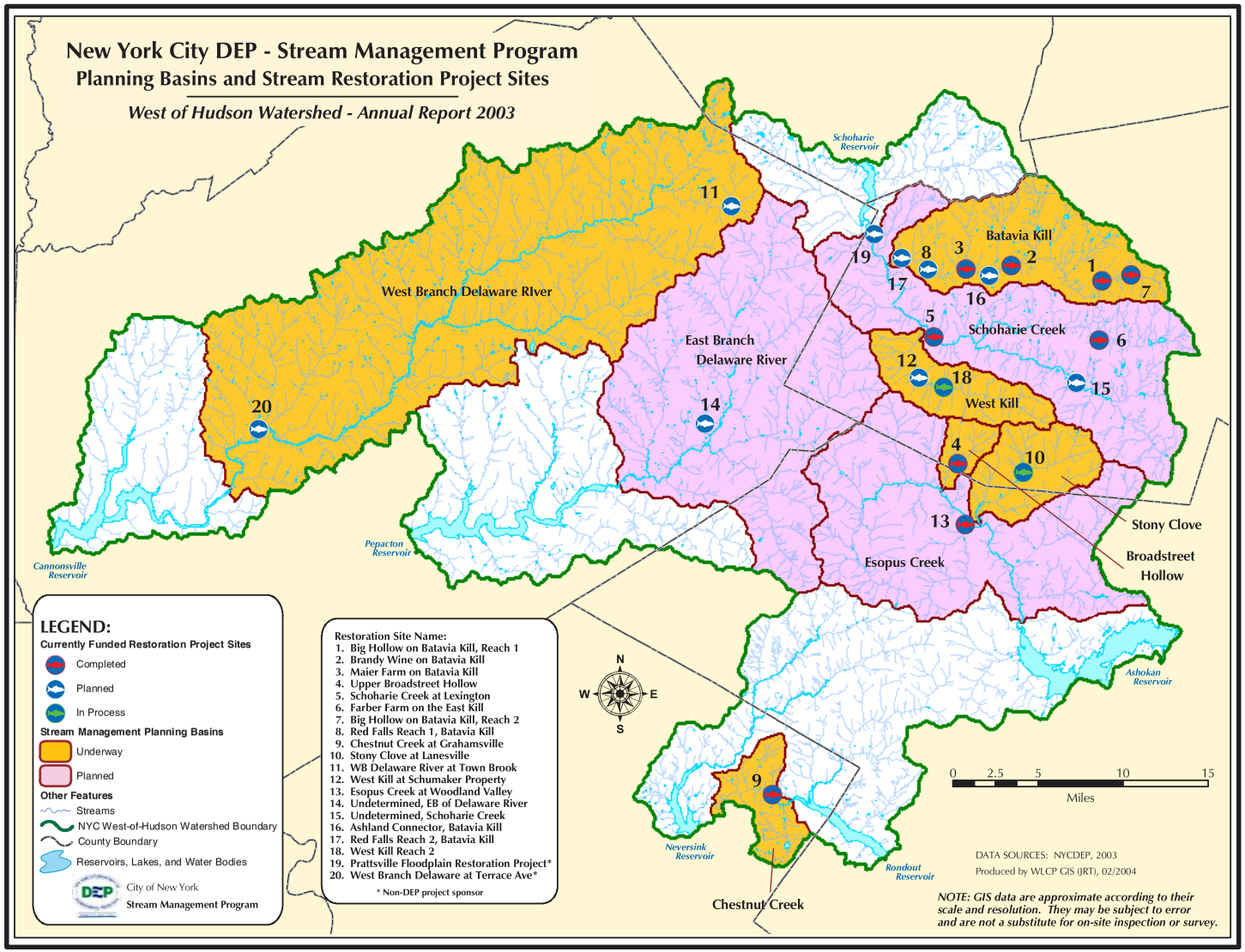


Figure 4.20. Planning basins and stream restoration project sites, West of Hudson watershed.

## 4.6 Wetlands Protection Program

In 1996, DEP developed and began implementation of an interdisciplinary Wetlands Protection Strategy consisting of regulatory and non-regulatory elements designed to protect and preserve the water quality function of wetlands in the watershed. In September 2001, DEP completed an enhanced Wetland Protection Strategy that, like the previous strategy, includes regulatory and non-regulatory components. However, the September 2001 strategy includes important additions to DEP's approach to protecting wetlands in the watershed, and their water quality protection and improvement functions.

The enhanced wetlands protection strategy includes, among other things, provisions to review land use and development proposals before federal, State and municipal agencies that regulate wetlands. Further, the strategy includes administration of the WR&R, the review of federal, State and municipal legislation that may affect wetlands in the watershed, and inter-agency coordination of enforcement, science, research and mapping programs of value to DEP in implementing the regulatory component of the strategy. Data collected in the non-regulatory programs will assist DEP in assessing the potential impacts on the water quality functions of wetlands anticipated from proposed land use and development projects and by helping to substantiate conclusions DEP draws in those assessments.

### 4.6.1 Regulatory Programs

DEP continued to implement the regulatory components of its Wetlands Protection Strategy (Strategy) throughout the 2003 reporting period. The regulatory components, consisting of project review and enforcement, review of legislation affecting wetlands, and additional wetlands mapping, aim to help protect and improve the quality of the water supply by preserving the water quality function of certain wetlands in the watershed. DEP also relies upon inter-and-intra-agency coordination to assess the impacts on wetland from land use and development proposals, pursue enforcement actions and conduct wetland mapping programs.

*Project Reviews*

During the past year DEP continued to aggressively review federal, State, municipal, and City applications that could have direct or secondary impacts on watershed wetlands. Since these regulations afford varying levels of protection to watershed wetlands, reviewing applications before all of the agencies for the same project ensures, to the extent possible, that all activities that threaten the water quality functions of wetlands in the watershed are carefully reviewed by DEP. Reviewing proposals before federal, State, City and municipal wetland agencies allows DEP to assess a proposal's compliance with applicable wetland regulations and permitting criteria, its potential impact on the water quality protection and improvement functions of a particular wetland, and to identify and develop opportunities to avoid, minimize, and mitigate impacts on the water quality function of wetlands.

United States Army Corps of Engineers (USACE) Applications - During the reporting period, DEP contacted the USACE to solicit confirmation that it will continue to forward all Pre Construction Notifications (PCNs) and Individual Permit Applications for projects in the watershed to DEP for review and comment. During the same period, DEP contacted the Corps to schedule a meeting to discuss DEP's efforts and coordination with the USACE's wetland permitting and enforcement programs in effect in the watershed.

DEP reviews PCNs submitted by project sponsors to notify the USACE that the sponsor believes his, or her, project is authorized by a Nationwide Permit and that an Individual Permit will not be sought before the project begins, to confirm that the proposed activity complies with the recently amended federal wetland regulations, and that the activity will not have an adverse impact on federally designated wetlands or water quality in the watershed. DEP also reviews Individual Permit Applications to assess a project's compliance with the Corps' Regulations and EPA's 414(b) guidelines for the review of Individual Permit applications.

If, based on its review of a PCN, DEP concludes that a project will adversely impact a wetland, or water quality in the watershed, DEP will request that the USACE require an Individual Permit Application to allow for thorough review of the proposal. In those instances, DEP will encourage the USACE to require an alternative project design, or location, that will avoid adverse impacts. If this is not entirely achievable, DEP will pursue opportunities with the USACE to minimize impacts, also through modification of the project design and, or, its location. Finally, if opportunities to avoid or minimize impacts do not exist, DEP assesses mitigation options that would compensate for any wetland impacts that result from the project. In these cases, DEP applies federal mitigation standards to assess the location and design of the proposed mitigation, as well as alternatives that might better replicate any water quality function(s) of the impacted wetland. During the reporting period DEP staff continued to review proposals under consideration by the USACE.

Notwithstanding the USACE recently adopted, and significantly reduced, wetland disturbance threshold for requiring an Individual Permit (.10 acres in the East of Hudson Watershed), DEP has incorporated a policy of requesting the USACE require an Individual Permit application, rather than a PCN, for projects in the watershed that may have a significant adverse impact on water quality. During reporting period, 12 wetland permit applications, or Pre-Construction Notifications, were reviewed by DEP in both the East and West of Hudson Districts.

*Regulatory Violations*

In addition to the exchange of applications to conduct proposed activities, DEP, the USACE, and EPA exchange information concerning possible violations of wetland protection regulations in the watershed. During the reporting period, DEP responded to one referral from

EPA. The wetland in question has not been officially mapped by DEC, and as such, is exempt from the watershed regulations. The disposition of the matter had not been finalized as of the date this report was released.

*New York State Department of Environmental Conservation Permit Applications*

Under the terms of a 1991 Memorandum of Understanding (MOU), DEC forwards certain wetland and stream disturbance applications to DEP for review and comment. During the past year, DEP continued to review State wetland permit applications and issue comments to DEC Regions 3 and 4 concerning the impacts that the proposals may have on wetlands and water quality in the watershed. The comments also identify instances of noncompliance with State permitting criteria, potential impacts on the water quality functions of wetlands, and measures that could be incorporated into a proposal to avoid, minimize, and mitigate any impacts on the water quality improvement function of the wetland anticipated from the activity.

In 2003, DEP and DEC met on several occasions and discussed, among other things, wetland permitting and enforcement activity in the watershed, and the benefits of exchanging information to assist each agency in administering their wetland programs. The discussions focused on the MOU between the agencies that commits DEC to forwarding certain wetland permit and stream disturbance permit applications to DEP. DEC has also agreed to forward all 401 Water Quality Certification Applications to DEP. Although the outcome of the discussions was a commitment from DEC to forward all stream disturbance, "Major" and "Minor" freshwater wetland, and 401 Water Quality Certifications Applications to DEP's Valhalla office, both agencies agreed to review the MOU and proposed amendments that would facilitate DEP's review of DEC permit applications. Discussions with DEC and preparation of draft revisions to the MOU, were ongoing at the end of the reporting period.

*State Wetland Mapping*

DEP is authorized under the WR&Rs to regulate certain activities that are within limiting distances, or otherwise affect, wetlands that have been mapped by the State. During the last year DEC significantly advanced the mapping effort by completing the process to map some 800 acres West of Hudson and some 2,000 acres East of Hudson.

At the close of the 2003 reporting period, DEC had completed the West of Hudson remapping program which included a public hearing process, and formally revising the regulatory maps. East of Hudson, DEC has completed all of the field and data transfer work necessary to complete the project, but has extended the public comment period to maximize public input.

*401 Water Quality Certifications*

DEP continued to meet with DEC during the reporting period to secure copies of 401 Water Quality Certification Applications DEC receives for projects in the watersheds. While DEC has committed to forwarding the certification applications to DEP's central wetland unit in

Valhalla for review, none were received during the 2003 reporting period. Note that DEP provided EPA with the 401 Water Quality Certification form DEP prepared to ensure consistency in DEP's reviews of the 401 certification requests.

*State Environmental Quality Review Act (SEQRA)*

In its role as a SEQRA "Involved Agency," DEP often becomes involved in State and municipal environmental reviews of projects that may impact wetlands in the City's watershed. DEP also tries to become involved in the SEQRA environmental review process at the earliest stages of a project's development. During SEQRA scoping DEP will often identify a wide range of potential wetland impact issues that must be addressed if a positive declaration is to be issued issued and an Environmental Impact Statement is to be prepared. If no formal scoping is conducted, or no EIS prepared, DEP identifies potential impacts on the water quality functions of wetlands, that a project may have, and project alternatives that would avoid, minimize, or mitigate the potential impacts in response to a SEQRA Environmental Assessment Form.

Nearly 600 proposed projects in the watershed were reviewed by DEP, during the SEQRA environmental review process, to identify the presence of, and impact on, wetlands in the watershed.

*Municipal Wetland Permit Applications and Violation Enforcement*

In addition to its role in SEQRA, DEP's regulatory wetland staff review land use proposals before municipal regulatory bodies, in the EOH Watershed, concentrating on a proposal's compliance with the municipal wetland regulations and the threat that a proposal poses to wetlands. DEP reviewed some 581 land use and development proposals in 2003, to determine their compliance with federal, State, municipal, and City regulations, and to assess their impacts on wetlands and watercourses pursuant to SEQRA and municipal regulations.

During the reporting period, DEP continued its dialogue with the five municipal agencies in the Catskill/Delaware Watersheds EOH (no municipalities West of Hudson have adopted wetland protection legislation as of the date this report was released.) that administer wetlands regulations. Citing the importance of protecting the water quality functions of wetlands and water quality, DEP may advocate denial of a wetlands permit application under consideration at the municipal level, or modification of the project to avoid, minimize or mitigate the impacts. Since municipal regulations can vary significantly, DEP maintains a compendium of updated federal, State, and municipal wetland regulations so that DEP can use each municipality's current regulations as the basis for its application review.

*DEP Wetland Tracking System*

To better understand the distribution and magnitude of wetland impacts resulting from various land use and development projects, DEP enhanced its permit tracking system by creating a spatial database that allows DEP to monitor extensive wetland permit application, and violation

activity. Originally developed as a database that would record information such as the type of wetland impacted by the proposed activity and the area of wetland impacted, DEP's enhanced system significantly broadens its data management capabilities. This spatial database now allows staff to quickly view a wetland in a GIS format, and determine whether it is likely to provide an important water quality function, if its been impacted in the past, and its position in the watershed. These data will assist DEP in developing comments to regulating agencies, and in determining the extent to which DEP will involve itself in the review of a permit application or regulatory violation.

The enhanced spatial database also enables DEP to track wetland disturbance and loss, and manage other information associated with wetlands related activities in the watershed. Input data includes a description of a proposed activity, the project or site location(s), and the level of permitting required. Fields in the database also include: the agency(ies) with regulatory jurisdiction (USACE, State, or municipally designated wetlands); wetland permits required (USACE, State, municipal); project acreages (total acres of the project); total acres of site disturbance; total acres of on-site wetlands and on-site wetland acreage disturbed, and any regulated buffer area disturbed.

*Regulatory Enforcement*

During the reporting period, DEP continued to pursue wetlands subjected to unauthorized disturbances. In addition to enforcing the provisions of the WR&Rs relating to wetlands, which involved responding to numerous violation referrals in past years, the regulatory component of the wetlands strategy includes providing technical assistance to other regulatory agencies with common wetland protection goals.

In 2003, DEP staff redistributed DEC's wetlands violation form to its field staff with a protocol for documenting and reporting suspected wetland violations to DEP's regulatory wetland management unit. DEP will pursue similar arrangements with the USACE, and with the municipalities that occupy portions of the Catskill/Delaware Watersheds East of Hudson.

### 4.6.2 Wetland Mapping and Research

DEP continued to implement and expand its Wetland Mapping and Research Programs. Work begun to update the West-of-Hudson (WOH) National Wetlands Inventory Maps (NWI) and to continue analysis of East of Hudson wetlands trends. Progress was also made in expanding the wetland monitoring and functional assessment programs to the entire watershed. These wetland mapping and research projects are designed to support both the regulatory and non-regulatory aspects of the Wetlands Protection Strategy.

*National Wetland Inventory (NWI) Map and EOH Trends Update*

The first NWI was completed in the mid-1990s and was based on the best existing aerial photography (1982-1987 NAPP CIR). The first EOH wetland trend analysis was completed in 1999 and summarized trends from 1968-1984, and 1984-1994. As part of the overall Wetland Protection Strategy, both of these are being updated. In September 2003, an agreement with the USFWS to update the NWI data for the EOH and WOH watersheds and continue the analysis of EOH wetland trends was registered.

In the spring of 2003, color infrared (CIR) photography was collected watershed-wide to serve as the basis for both projects. However, the aerial photography for the EOH watershed failed to meet technical specifications and will be reflown in spring 2004. This delay in acquiring adequate data required a time extension for the aerial photography contract and a revised payment schedule and internal deliverable schedule for the NWI wetland update and trend contract. However, we expect to be able to meet the projected schedule of deliverables outlined in the FAD.

The need for hard copy wetland map updates for community outreach was also evaluated in 2003. Such maps were produced for DEP by USFWS after the first NWI and included 1:24,000 mylar and paper maps, and bound, small scale wetland atlases. Similar products based on the NWI update would be redundant given planned access to the new data through the USFWS NWI Internet site. The GIS data will be available to the public for download from the USFWS server. The USFWS site also features an interactive map viewer and custom map maker http://wetlands.fws.gov/mapper_tool.htm. In addition, DEP will continue to make the digital GIS data available by request.

*Wetland Functional Assessment*

DEP's Wetland Functional Assessment Program combines the USFWS Watershed-based Wetland Characterization and Preliminary Assessment of Wetland Functions (W-PAWF) with a reference wetlands monitoring program to determine baseline characteristics and water quality functions of wetlands among various hydrogeomorphic settings. For the W-PAWF, the USFWS attaches hydrogeomorphic modifiers to each wetland polygon in the NWI database to support preliminary, basin-wide assessments of eight wetland functions. DEP is conducting a monitoring program to verify the hydrogeomorphic classifications and preliminary functional assessments and to provide additional measures of ecological and water quality conditions for reference wetlands.

Work continues on completing a W-PAWF for the entire Catskill, Croton, and Delaware watersheds. Methodological improvements gained from work in Cannonsville and Neversink (completed in 2002), and from previous work in the Boyd Corners and West Branch basins (completed in 1999), has greatly benefited the current project. During 2003, DEP reviewed and pro-

vided extensive comments on a total of 64 draft maps covering the entire watershed. Complete reports with functional assessments for each reservoir basin are expected from the USFWS in 2004.

*Pilot Reference Wetland Monitoring Program*

The Pilot Reference Wetland Monitoring Program, conducted in the West Branch and Boyd Corners basins, concluded monitoring in April 2002, and the remainder of 2002 and much of 2003 centered on data review and analysis. The goals of the monitoring program were to:

- assess the boundaries, Cowardin classifications, hydrogeomorphic classifications, and preliminary functional assessments W-PAWF ascribed to wetlands by the USFWS in the NWI and W-PAWF;
- compare surface water quality between terrene and lotic wetlands and to investigate the effects of surrounding land use and other factors on wetland surface water quality;
- compare vegetation community characteristics among terrene and lotic wetland types; and
- establish monitoring methodology for future DEP wetland monitoring programs.

The pilot program collected a total of 504 water quality samples from 8 sites. Each sample was analyzed for six analytes (TP, TDP, TOC, DOC, TSS and color). Extensive data analysis and interpretation of the pilot data was completed in 2003, and the results are presented in a separate report. In general, the pilot results indicate:

- a negative relationship with flow, suggesting that the water chemistry is most influenced by baseflow and is not driven by storm-events;
- landscape position is not a driving influence on water chemistry;
- these wetlands have a net export of carbon and color.

Additional analysis is planned, including the calculation of loads and incorporation of vegetation and soil data. The pilot results have already been used to guide the monitoring design for the WOH Reference Wetland Monitoring Program and the reviews of the W-PAWF draft classifications.

*WOH Reference Wetland Monitoring Program*

The WOH Reference Wetland Monitoring Program is a two-year project which will sample water quality, vegetation, and soils at 22 reference wetlands located throughout the Catskill and Delaware watersheds. The project officially started in September 2003, as the SDWA grant got underway and two new wetland staff were hired. As of January 2004, significant progress has been made: the contract for water quality monitoring by SUNYESF was registered, a Quality Assurance Project Plan was prepared and approved by DEC and EPA, site selection continued to make progress with additional fieldwork. DEP is currently working with the consultants to finalize the selection of 22 wetland siteS for the study, including the 4 intensive sites. Monitoring of the study sites will start in the spring of 2004, and continue through 2005. Water quality samples

will be collected from the outflows of the 22 wetland study sites for at least one year and analyzed for dissolved major cations, pH, specific conductance, total alkalinity, Cl, TN, TP, and DOC. Storm and groundwater sampling will be conducted at a subset of the study sites in order to develop rudimentary mass balances.

DEP will continue to analyze data collected from reference wetlands in conjunction with the hydrogeomorphic data generated through the W-PAWF in order to characterize the distribution, composition, and functions of watershed wetlands. This approach will provide a means of identifying wetlands for strengthened protection based on their landscape positions and associated water quality functions.

*Acquisition of Wetlands*

DEP's Land Acquisition Program seeks to protect future water quality by purchasing vacant land in environmentally sensitive areas within the watersheds, thereby precluding development which could potentially harm water quality. Vacant parcels that contain, in whole or in part, a wetland greater than 5 acres identified by the National Wetlands inventory are one of several criteria used by DEP to target sensitive areas for acquisition.

Table 4.13 indicates wetlands either under contract or closed by DEP as of December 31, 2003, as well as wetlands located within a 1,000 foot buffer of total lands acquired by DEP. These include wetlands identified by the USFWS 1996 National Wetlands Inventory and DEC mapped wetlands.

To date, 714 acres of wetlands and deep water habitats have been protected by acquisition West of Hudson. These small wetlands are found throughout the headwaters and riparian zones of Catskill stream corridors. They are generally smaller than the 12.4 acre DEC threshold and are often overlooked by local Planning Boards that do not require applicants to submit a wetland delineation that would identify the presence of federal wetlands that are subject to further review. Protection in perpetuity is the most effective way to ensure the water quality and other benefits provided by the mosaic of small Catskill wetlands.

Table 4.13. Wetlands Acquired or Protected by DEP in the Catskill/Delaware and Croton Systems as of December 31, 2003*

| Description | Acres | % of Total Watershed Acreage | % of Total Land Acquired |
|---|---|---|---|
| **For West-of-Hudson (All Basins):** | | | |
| Total Acreage of Entire Watershed | 1,013,954 | | |
| Total Acreage of Wetlands (both NWI and DEC-regulated) in Entire Watershed (excluding Deepwater Habitats**) | 11,448 | 1.13% | |
| Total Acreage of Deepwater Habitats in Entire Watershed | 24,521 | 2.42% | |
| Total Acreage of Wetlands and Deepwater Habitats in Entire Watershed | 35,969 | 3.55% | |
| Total Lands Under Contract or Closed by DEP as of 12/31/03†: | 44,300* | | |
| *Within those total lands under contract or closed:* | | | |
| Total Acreage of Wetlands (both NWI and DEC-regulated, excluding Deepwater Habitats**) | 620 | | 1.40% |
| Total Acreage of Deepwater Habitats** | 94 | | 0.21% |
| Total Acreage of Wetlands and Deepwater Habitats** | 714 | | 1.61% |
| *Either within those total lands under contract or closed, or within a 1000 ft buffer of those lands:* | | | |
| Total Acreage of Wetlands (both NWI and DEC-regulated, excluding Deepwater Habitats**) | 1,983 | | 4.48% |
| Total Acreage of Deepwater Habitats** | 948 | | 2.14% |
| Total Acreage of Wetlands and Deepwater Habitats** | 2,931 | | 6.62% |
| **For East-of-Hudson (All Basins):** | | | |
| Total Acreage of Entire Watershed | 248,102 | | |
| Total Acreage of Wetlands (both NWI and DEC-regulated) in Entire Watershed (excluding Deepwater Habitats**) | 18,889 | 7.61% | |
| Total Acreage of Deepwater Habitats in Entire Watershed | 14,679 | 5.92% | |
| Total Acreage of Wetlands and Deepwater Habitats in Entire Watershed | 33,568 | 13.53% | |
| Total lands under contract or closed by DEP as of 12/31/03†: | 9,430* | | |
| *Within those total lands under contract or closed:* | | | |
| Total Acreage of Wetlands (both NWI and DEC-regulated, excluding Deepwater Habitats**) | 717 | | 7.60% |
| Total Acreage of Deepwater Habitats** | 2 | | 0.03% |

Table 4.13. Wetlands Acquired or Protected by DEP in the Catskill/Delaware and Croton Systems as of December 31, 2003*

| Description | Acres | % of Total Watershed Acreage | % of Total Land Acquired |
|---|---|---|---|
| Total Acreage of Wetlands and Deepwater Habitats** | 719 | | 7.63% |
| *Either within those total lands under contract or closed, or within a 1000 ft buffer of those lands:* | | | |
| Total Acreage of Wetlands (both NWI and DEC-regulated, excluding Deepwater Habitats**) | 1,727 | | 18.32% |
| Total Acreage of Deepwater Habitats** | 1,146 | | 12.16% |
| Total Acreage of Wetlands and Deepwater Habitats** | 2,874 | | 30.48% |

** Source: WLCP GIS, January, 2004. Note: Acres are calculated directly from areas of GIS polygons and therefore may not match exactly other acreage totals submitted by DEP. NWI Wetlands acreages now exclude all upland (U), unconsolidated shore (L2US), and streambeds (RSB) categories (previous reports included them, hence lower watershed-wide wetland acreages are reported here).*

*** Categories considered "deepwater habitats" from NWI wetlands include reservoirs or large lakes (L1), unconsolidated shoreline (L2US), riverbeds (RUB) or streambeds (RSB), but not ponds or small lakes.*

*† Includes fee, conservation easements, and farm easements.*

*Statistics produced by T. Spies, WLCP, 2/04/04*

## 4.7 East of Hudson Non-Point Source Pollution Control Program

DEP has developed a comprehensive strategy to address potential non-point pollution sources in the Catskill/Delaware basins east of the Hudson River. This strategy includes continued implementation of several ongoing efforts, most notably the Watershed Rules and Regulations; expansion of several successful west of Hudson programs to the east of Hudson watershed (e.g., the farm and forestry programs); completion of an assessment of potential sources of contamination; and development and implementation of a non-point source plan. Updates on the various efforts follow, or, in some cases, can be found elsewhere in this report.

### 4.7.1 Croton Watershed Strategy

The Croton Watershed Strategy project started in December 2000. The primary goal of this project was to develop an integrated watershed management plan for the Croton System which would allow DEP to optimize management efforts and focus limited resources on critical areas to achieve maximum water quality benefit. This was achieved by:

1) conducting a subbasin watershed assessment for four critical indicator variables: total phosphorus, total suspended solids, pathogens, and toxic chemicals;
2) implementing the methodology in a Decision Support Tool; and
3) recommending watershed management alternatives for DEP's consideration.

The watershed assessment examined both existing and full build-out conditions in the watershed for 74 subbasins. The methodology focuses on impairment from point and nonpoint watershed sources to identify each subbasins' relative potential to impair water quality. The results were compiled in a series of documents and released in March 2003:

- Basin Reports. Individual reports were developed for each of the reservoir basins which provide: potential point and nonpoint water quality impairment sources for each variable ("Areas of Concern"); subbasin scores that indicate the relative potential for water quality impairment from each source and each subbasin; and basin-specific management recommendations. Background information on the physical, environmental, and demographic characteristics of each basin are also included in the reports.
- Watershed Report. A watershed-wide analysis of the individual basin results was also conducted as part of the project. The analysis compares subbasins and Areas of Concern across the watershed objectively, prioritizing the recommendations based on several factors including: reservoir operations, 60-day travel time, phosphorus restricted basins, trout streams, and wetlands/sensitive environments. Management recommendations were grouped into five general areas: wastewater, stormwater, open space preservation, road drainage improvement and agricultural.

During the remainder of 2003, the project continued with development of a Project Tracking Tool, an additional management tool linked with the Decision Support System. This tool will track implementation of projects by basin (remedial, protective and new development), estimate reductions of phosphorus based on existing or proposed implementation projects, estimate increases of phosphorus based on new development, and generate basin status reports. The Project Tracking Tool will primarily be utilized to track implementation of the phosphorus TMDLs.

In addition to the Project Tracking Tool, several other tasks were initiated in 2003:

- Stakeholder Reports, summarizing the watershed assessment results, were developed for the counties and municipalities.
- Impervious surface analysis, comparing the mapped impervious data to literature values and examining the results by land use category and by subbasin.
- Water quality analysis, comparing the watershed assessment results to monitoring data at select sites.

These supplemental reports are expected to be finalized during 2004.

### 4.7.2 Nonpoint Source Management Plan

During 2003, DEP completed development of a nonpoint source management plan and schedule to address potential pollution sources in four Catskill/Delaware basins east of the Hudson River (West Branch, Boyds Corners, Croton Falls and Cross River). In addition to the work

described below, a number of other programs – including the Farm Program, the Forestry Program, DEP's regulatory enforcement, and a septic program developed in coordination with Putnam County – address certain nonpoint sources. The work of those other programs is described elsewhere in this report.

During the reporting period DEP made significant strides implementing its various nonpoint source pollution programs that are part of the comprehensive Nonpoint Source Management Plan for the Catskill/Delaware Reservoir Watersheds East of Hudson (EoH NPS Plan). DEP formulated this strategy to ensure a coordinated, appropriately prioritized approached to nonpoint source management with clearly identified schedules for implementation.

Elements of the Plan completed in 2003 address wastewater and septic systems; stormwater runoff and infrastructure; spill containment and a turbidity curtain; hazardous materials; and pesticide and turf management. Details on each Plan component are discussed below.

*Wastewater*

The four Catskill/Delaware EoH watersheds are rural in character and primarily served by septic systems. DEP's Nonpoint Plan addresses the potential for wastewater to enter the water supply in several ways. First, a contractor is being engaged to map the entire wastewater infrastructure system in the four target watersheds and to video inspect certain sections of the infrastructure that are most likely to be defective and as such allow for the exfiltration of wastewater into the water supply. To accomplish that task, the contractor must first conduct a thorough investigation to identify the locations of all sanitary infrastructure. This, and the other information generated during the mapping and inspection program will be used to formulate a Wastewater Infrastructure Remediation Plan. DEP will implement the Remediation Plan in cooperation with infrastructure owners and operators, and will fund, and oversee the repair of, all defects that may result in nonpoint discharges of wastewater into the water supply. Illegal connections to the infrastructure will also be identified under this program and addressed by appropriate enforcement authorities.

During the reporting period, DEP prepared contract specifications for this work. After the contract specifications for the wastewater infrastructure mapping and inspection were reviewed and approved by DEP and Corporation Counsel, and awarded to the lowest bidder, the City Comptroller rejected the $78,000 contract citing that its funding source should be capital rather than expense. While the mapping and inspection contract specifications were immediately resubmitted under the capital budget, the mapping and inspection start of work has been postponed by an estimated four months, extending the projected start date to June 2004. Despite the delay in completing the infrastructure mapping, and inspection, DEP anticipates that the Remediation Plan will be completed in accordance with the implementation schedule prepared by DEP.

DEP and Putnam County have a signed agreement that calls for Putnam County to initiate a septic inspection and repair program in priority areas of the EOH watershed. Putnam County is developing the Septic Repair Program with information gleaned from DEP's successful septic program in the WOH watershed, although some variations exist due to local preferences. Key elements of the Program are as outlined below with anticipated milestone dates to be provided in the first quarter 2004 pending approval by the Putnam County Legislature:

- Administration – The program will be administered by Putnam County through the PCDOH and the Putnam County Watershed Coordinator. Putnam will contract out septic system designs and rehabilitations and is currently developing an RFP. The contractor will perform inspections, track data and provide conceptual design strategies for systems to be repaired. Actual repair work would be completed by one of a number of certified septic repair contractors identified by the County.
- Participation – Participation in the program is voluntary. Putnam will announce the program using various media outlets as well as individual mailings to eligible participants.
- Reimbursement Eligibility – To maximize participation, Putnam will fund 100% of repairs for primary residents within the program boundaries.
- Prioritization – The program will target priority areas identified by DEP and Putnam County to be particularly important due to watershed location or other conditions. Implementation will initially focus on the following:
    - SSTSs within 500 feet of the reservoir and reservoir stems of Cat/Del Basins located in Putnam County,
    - SSTSs within the four Wastewater Management Areas in West Branch and Boyd Corners that DEP identified through Croton Watershed Strategy,
    - SSTSs within 250 feet of two streams within the West Branch watershed,
    - SSTSs within 200 feet of priority lakes with high density residential (Lake Carmel, Lake Tonetta, Putnam Lake).
    - Other areas that will be within the secondary prioritization include SSTS's within 200 feet of Middle Branch, Lake Casse, Lake Mahopac, Peach Lake, and Kirk Lake.
- Funding – Putnam County has authorized at least $3.3 million in Water Quality Investment Program (WQIP) funds to initiate the project for the high priority areas. The County may dedicate additional funds depending on program participation or interest in expanding the program beyond the initially agreed to prioritization areas.
- Maintenance – The County has made participation in the inspection and repair program contingent on commitments by homeowners to properly maintain systems.

As part of the wastewater management component of the Nonpoint Plan, DEP proposes to implement a septic operation and maintenance outreach program. The goal of the program is to inform septic system owners of the proper use of their systems, the limitations of septic systems, and the need for routine pump outs to ensure proper performance and longevity of the system. These will prevent failures that may result in the discharge of effluent into the water supply. DEP

engaged Westchester and Putnam County officials in discussions concerning a joint outreach program. At the time this report was released, the DEP was developing a strategy to implement the program in cooperation with the two counties using existing and new outreach tools including:

- Web
- Existing educational forums
- New publications
- Existing and new distribution outlets for publications

*Stormwater*

The Nonpoint Plan proposes a multifaceted approach to address the wide variety of contaminants generated by improperly managed stormwater and conveyed to the water supply by runoff from numerous land uses and covers,. The proposed actions to reduce stormwater related nonpoint pollution fall into three categories as follows:

- Assessment: synthesize existing and collect new information;
- Management: stormwater management measures to reduce nonpoint pollutants in runoff; and
- Remediation and Retrofits: site remediation and retrofits to reduce existing sources of stormwater based pollutants.

Stormwater Infrastructure Mapping and Inspection - The stormwater infrastructure mapping effort will provide much of the baseline information needed to develop the Stormwater Infrastructure Remediation Plan. The mapping and inspection process involves the use of global positioning units to map the infrastructure. Data concerning the infrastructure's size, age, material composition, capacity, and catch basin locations, are needed to identify sites where repairs, retrofits and treatment modifications would achieve the greatest load reductions. Illicit connections that discharge pollutants into the system which ultimately discharges into one of the reservoirs, will be identified during the video inspection effort. To video inspect the infrastructure, the piping must be cleaned by flushing with water, and using a remote controlled video unit to photograph the condition of the infrastructure.

By the end of 2003, portions of infrastructure in the West Branch, Boyd's Corners, and Cross River watersheds had been mapped and inspected. DEP's contractor was progressing on schedule with the exception of some time lost as a result of freezing weather that precluded the cleaning of the stormwater piping, and snow that obstructed certain stormwater management structures.

DEP notes that during the early stages of the inspection, the contractor identified an illicit connection from a dog shelter that drains into the stormwater system. Immediately upon being notified of the connection, DEP contacted the Putnam County Department of Health. DEP is pursuing steps to have this illicit pipe disconnected.

Stormwater Infrastructure Remediation Plan - Based upon the results of the stormwater mapping and inspection program described above that began in 2003, DEP will develop a plan to disconnect any illicit connections that contribute pollutants to the stormwater system, repair or retrofit any sites that are eroding and contributing suspended solids to the reservoirs, assess the treatment capacity of the stormwater infrastructure, identify maintenance schedules for catchment structures, install and maintain a turbidity curtain in the West Branch Reservoir to deflect non-point pollutants conveyed from Long Brook to the Reservoir, and identify a spill containment plan to contain pollutants that may be discharged from the stormwater drainage system of roads adjacent to the reservoirs and their tributaries. The assessment of the existing infrastructure's capacity will be used to formulate several of the plan's components, including siting and design small and large stormwater remediation sites, spill containment facilities, and modifications to existing sites, and to refine the maintenance program.

Small Stormwater Remediation Sites - During 2003, DEP identified and repaired ten eroding sites on City owned lands in the four target watersheds. The sites, shown in Figure 4.21, were stabilized by applying stone, seed and mulch, and constructing headwalls, endwalls, and check dams. During the reporting period, DEP also identified an additional ten sites that will be repaired in 2004, also shown in Figure 4.21, prepared contract plans and specifications for their repair, and issued the plans and specifications to DEP's contracting unit for processing. In addition, some 30 sites shown in Figure 4.22, identified by Trout Unlimited as erosion damaged, have been repaired.

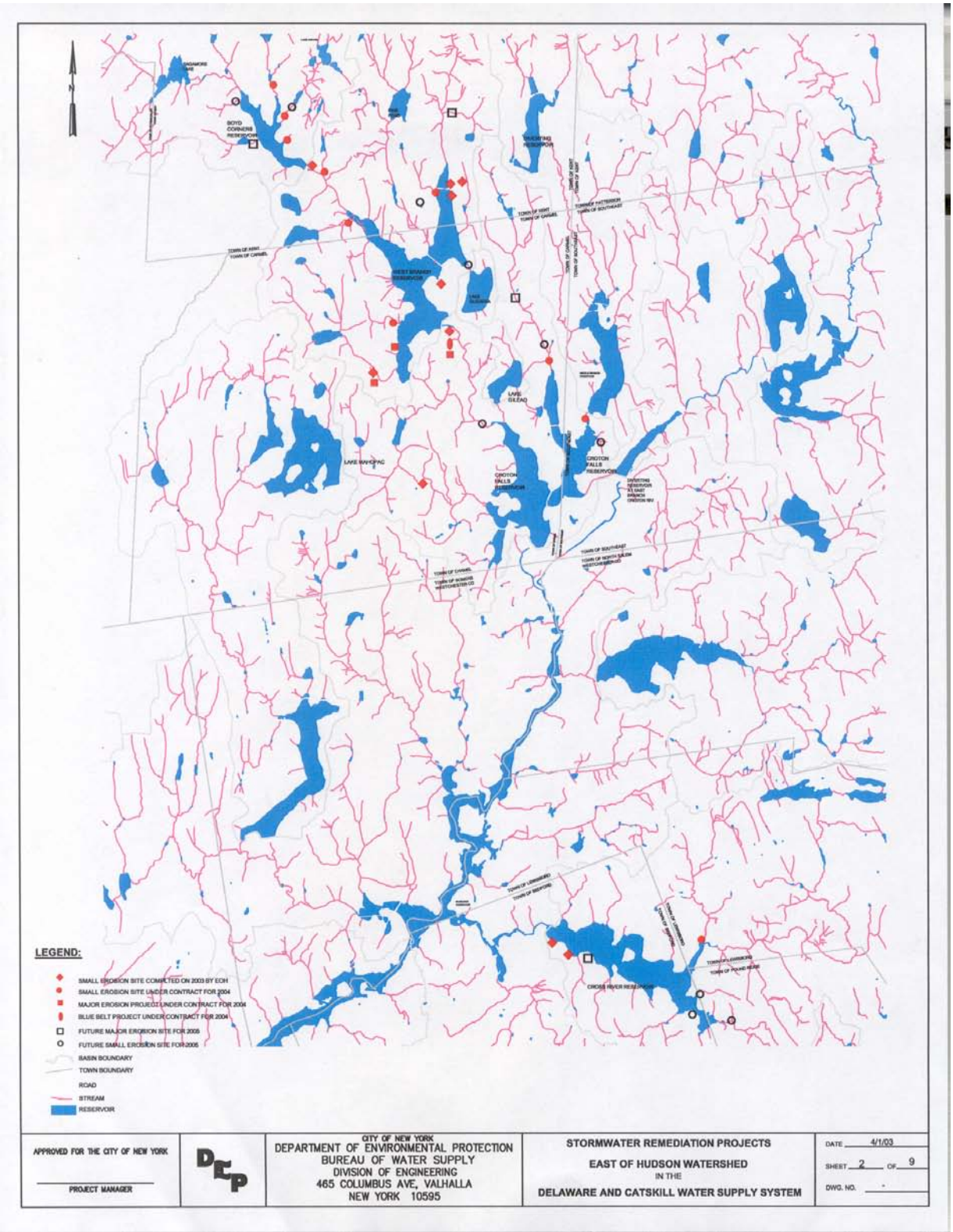


Figure 4.21. Location of Stormwater Remediation Projects in the Catskill/Delaware EOH Reservoir Basins.

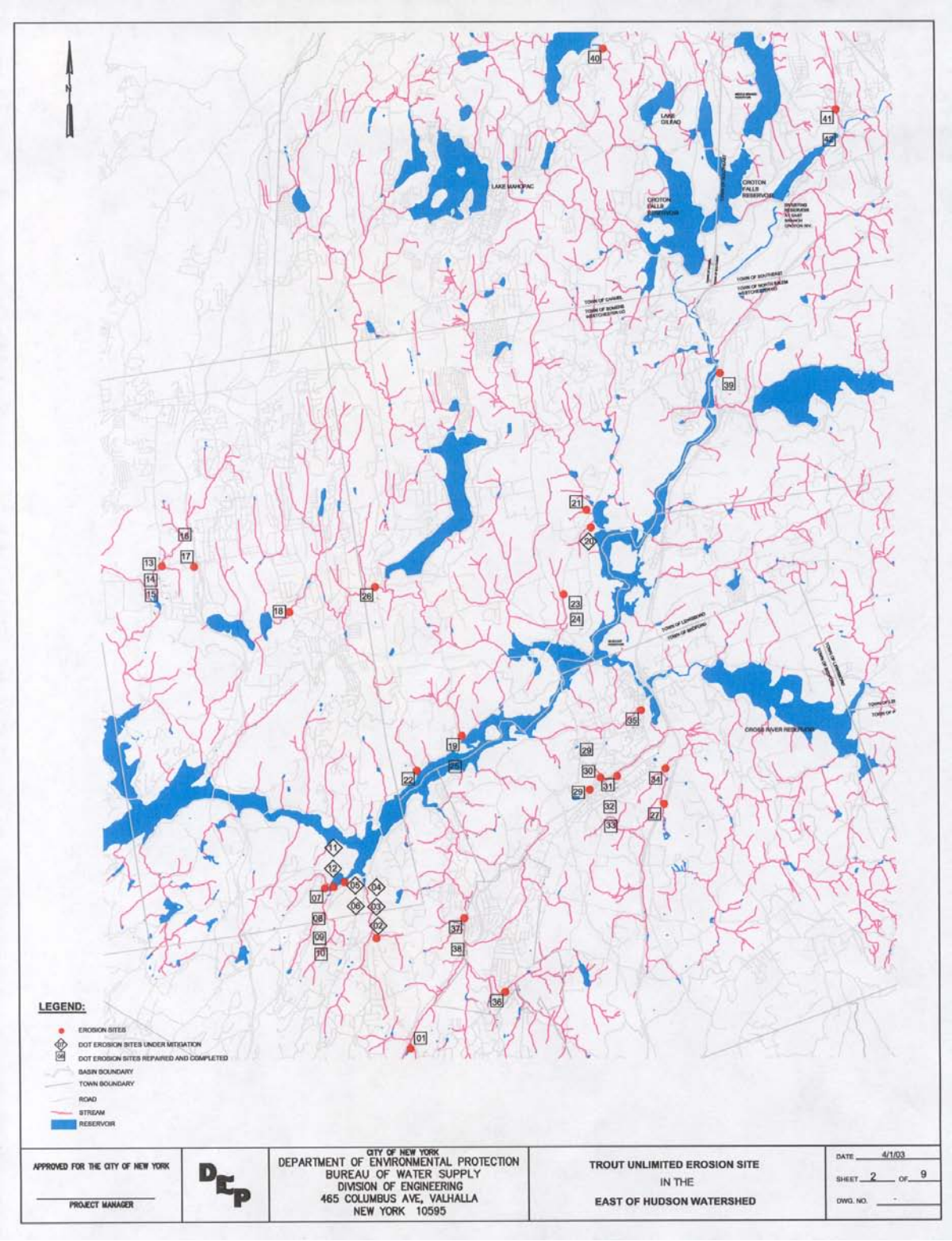


Figure 4.22. Location of Trout Unlimited Erosion Repair Sites.

Large Stormwater Remediation Sites - DEP has identified several locations in the four EOH watersheds where stormwater management remediation measures would reduce the delivery of non-point pollutants to the drinking water supply. DEP prepared engineering designs and contract specifications to construct three of these sites and a request for engineering design services to prepare designs, plans and specifications for the remaining sites. The three sites that have been designed are as follows:

- Washington Road: stabilization and drainage improvements along an unpaved road that parallels a portion of the West Branch Reservoir's western shore.
- Pennebrook Road: Retrofit of an existing detention basin that has failed to function as designed. Improvements include construction of a forebay, a detention basin with created wetlands and controlled outlets for both, embankment stabilization, construction of drainage channels and swales, and installation of stormwater infrastructure improvements such as drainage pipes, catch basins and manholes.
- Meadowlark Drive: Improvements include construction of a forebay, a detention basin with created wetlands and controlled outlets for both, embankment stabilization, and construction of drainage channels and swales.

DEP has also prepared and submitted specifications for Engineering Design Services to design stormwater retrofits in the 4 watersheds (CRO-364). That contract is going under legal review.

Turbidity Curtain(s) - During 2003, DEP evaluated various turbidity curtain deployment alternatives to determine which would be the most effective in deflecting pollutant-laden flows from Long Pond Brook into the body of the West Branch Reservoir and away from the Shaft 10 intake. DEP completed the analysis, designed and prepared contract specifications for the curtain, and completed State and municipal permit applications. Upon issuance of the necessary regulatory approvals, DEP will deploy the curtain with in-house resources now expected for late 2004.

Spill Containment Plan - DEP completed an overall spill containment plan the East of Hudson Catskill/Delaware Reservoirs. The plan, modeled after the integrated Kensico Spill Containment Plan, is designed to ensure that material spilled on a road, and discharged in the form of sheet flow, or through a stormwater drainage system, is sufficiently contained to allow for expedited and simplified recovery. This will prevent migration of the material through the Reservoir, minimizing the impact to water quality.

In 2003, DEP developed the engineering designs and specifications for proposed containment facilities. The plan includes the installation of 72 spill containment booms at stream inlets and other critical points in four East of Hudson Catskill/Delaware Reservoirs, construction or improvement of 17 boat access ramps at strategic locations along the reservoirs' shorelines, and development of a containment facility labeling system to facilitate the identification of spill locations (Figures 4.23 - 4.28). The project will be completed in two phases, with Phase I focusing on the West Branch and Boyd Corners basins and Phase II focusing on the Croton Falls and Cross River Reservoirs.

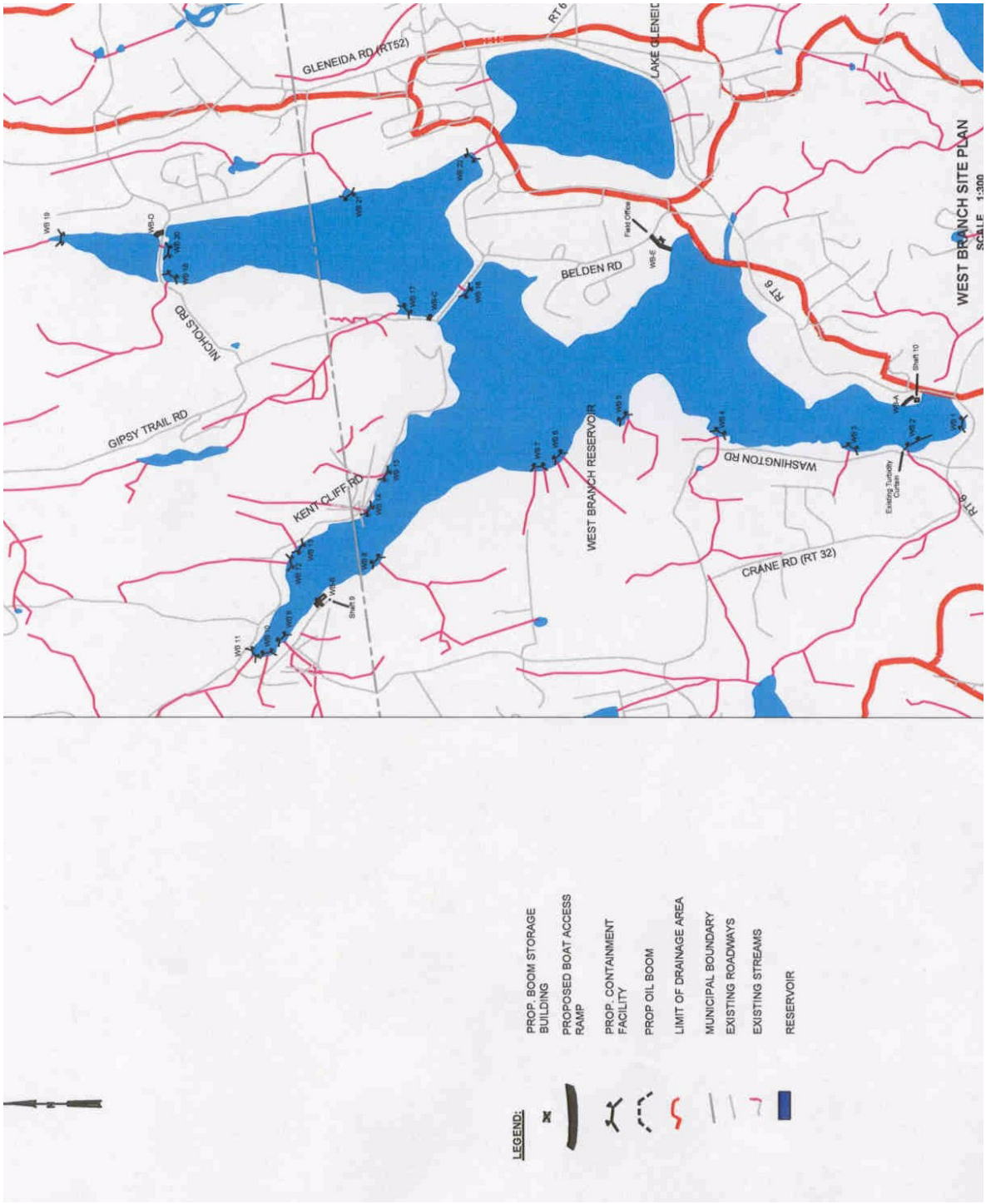


Figure 4.23. Locations of proposed spill containment facilities in the West Branch Reservoir.

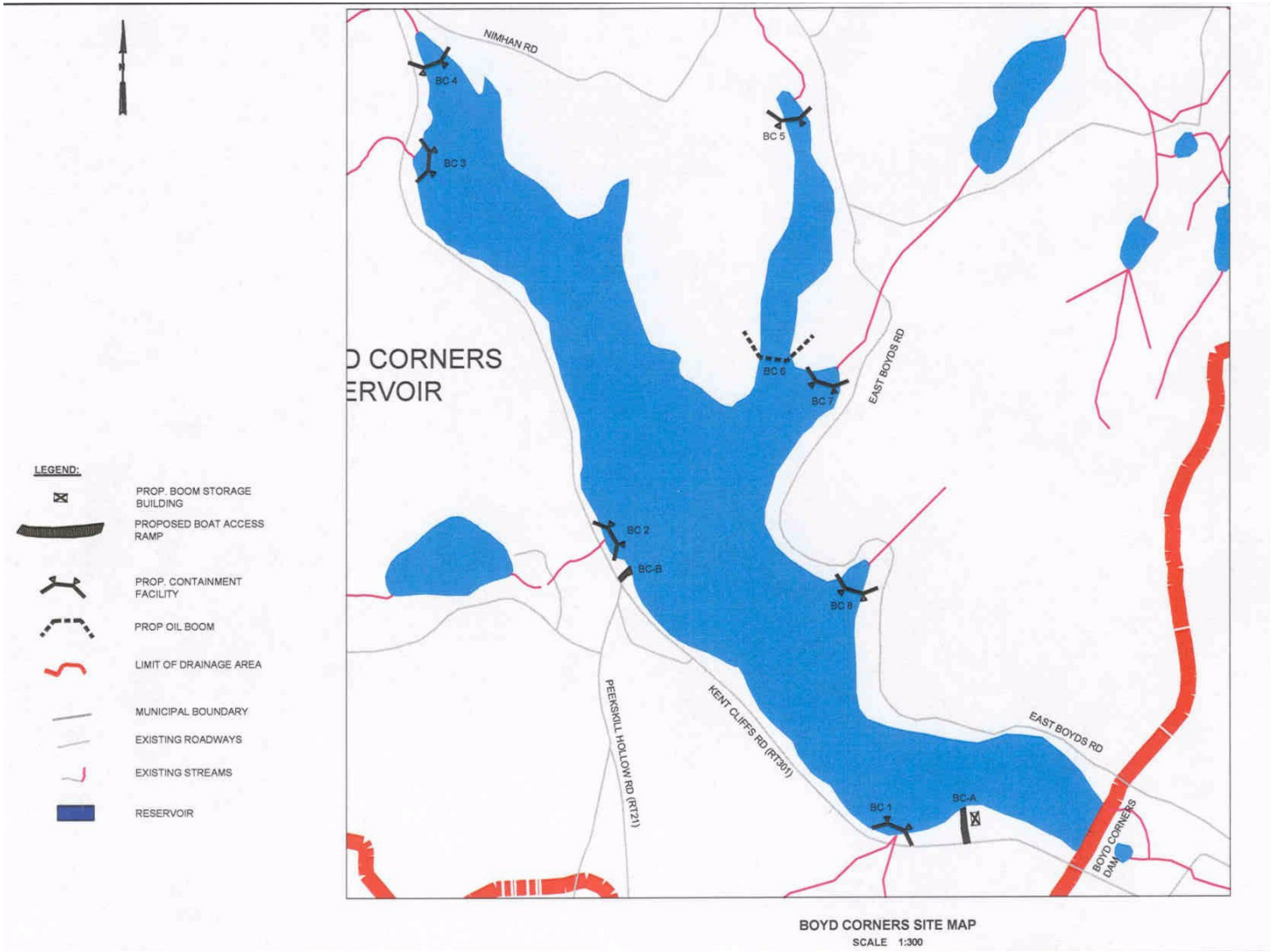


Figure 4.24. Locations of proposed spill containment facilities in the Boyd Corners Reservoir.

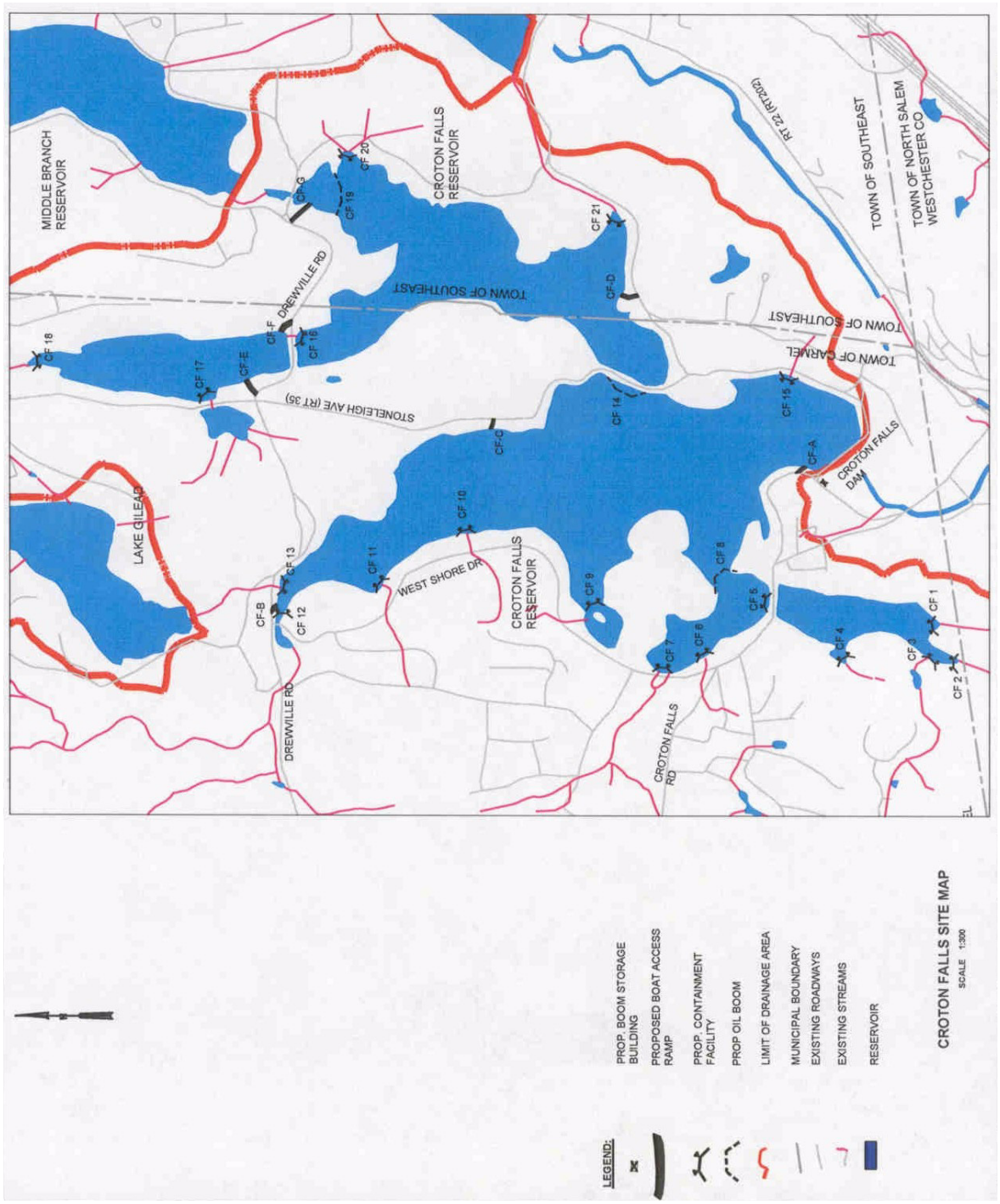


Figure 4.25. Locations of proposed spill containment facilities in the Croton Falls Reservoir.

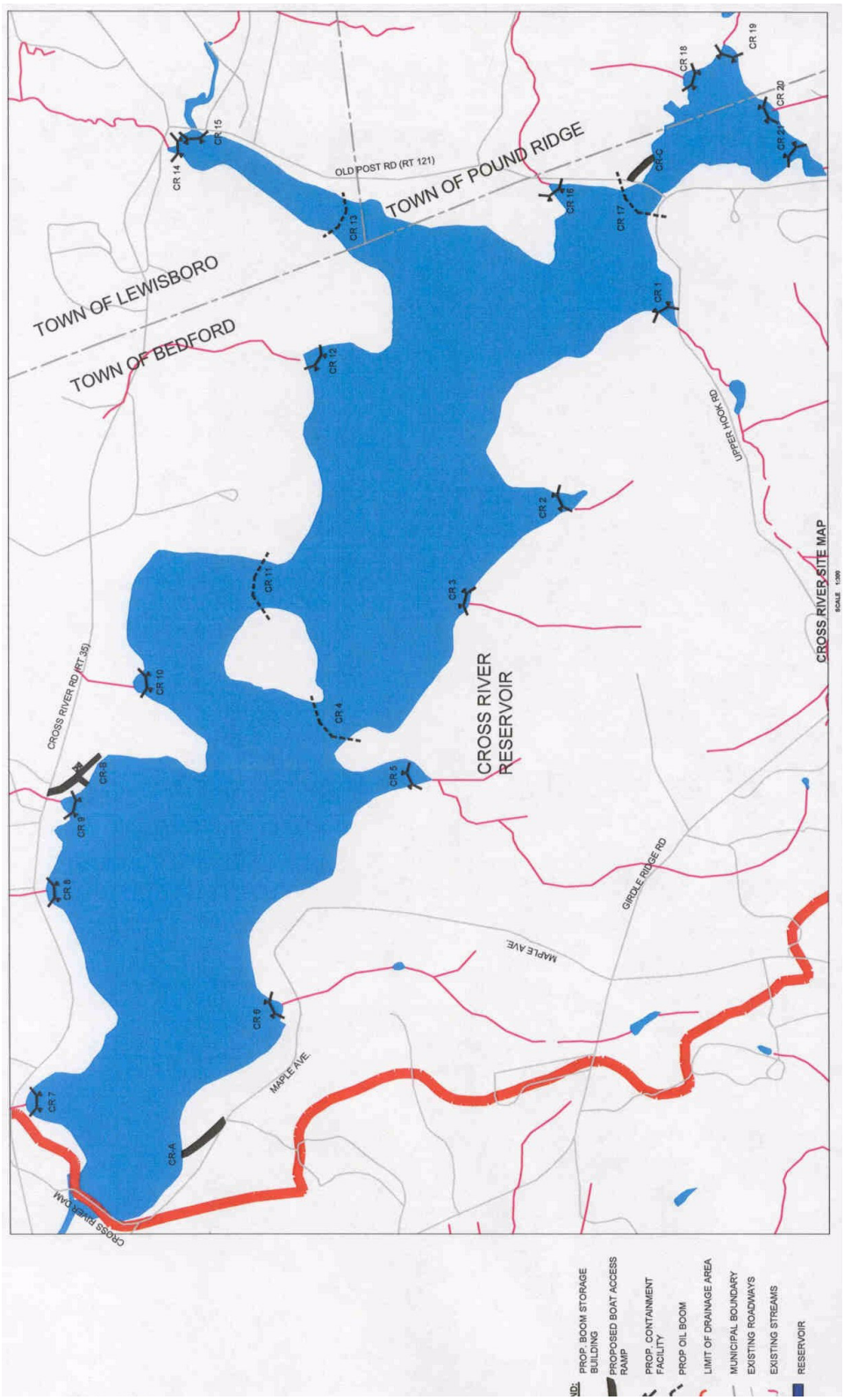


Figure 4.26. Locations of proposed spill containment facilities in the Cross River Reservoir.

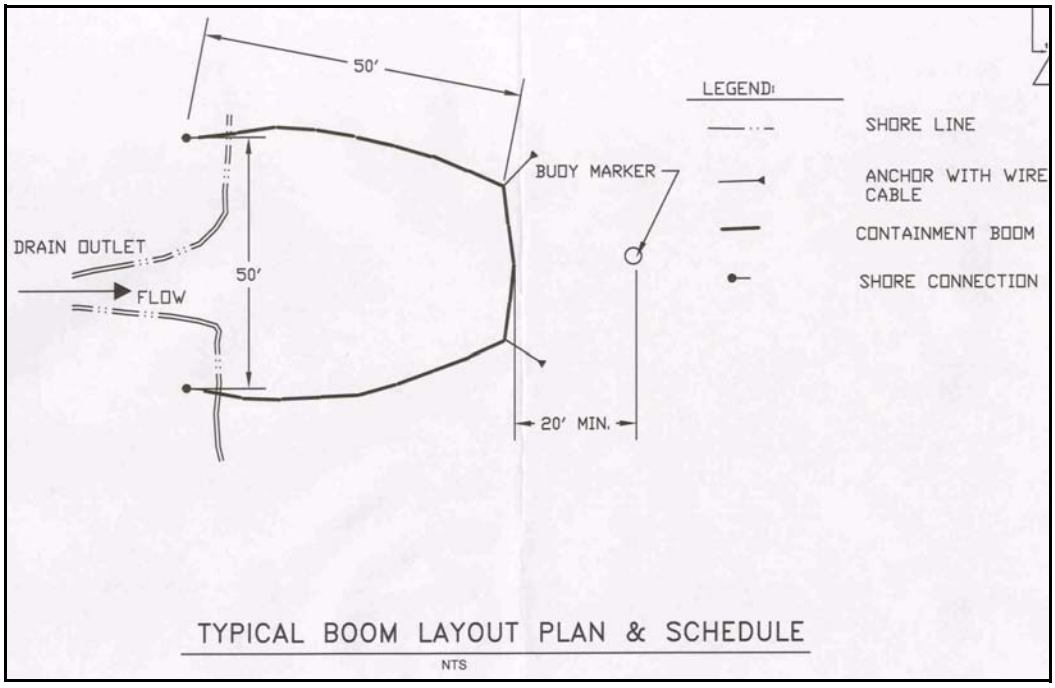


Figure 4.27. Schematic of proposed spill containment booms to be installed as part of the East of Hudson Catskill and Delaware Spill Containment Plan.

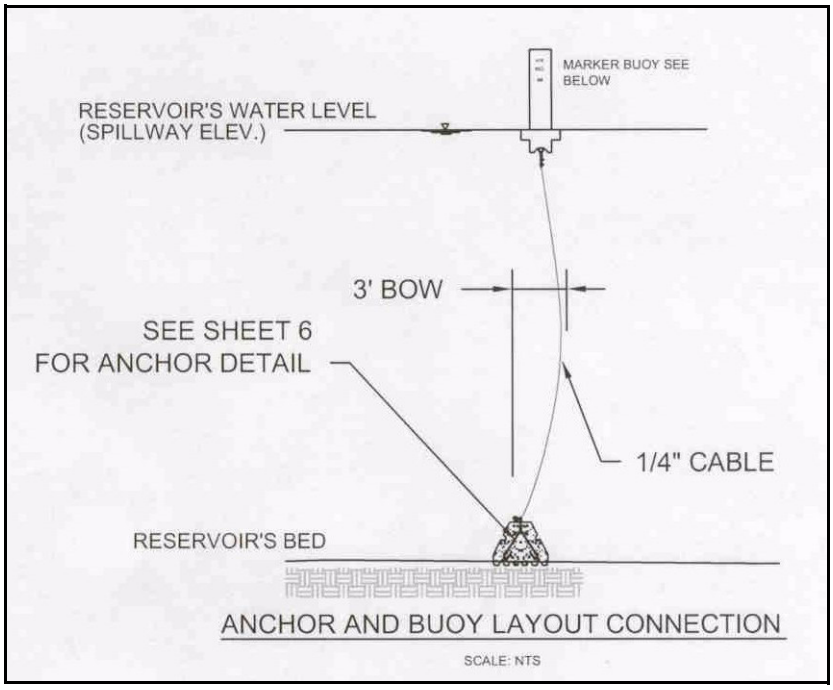


Figure 4.28. Schematic of offshore sign to be installed as part of the East of Hudson Catskill and Delaware Spill Containment Plan. Sequentially numbered marker buoys are to be installed at each spill containment location to allow for expedited identification of spill location.

It is anticipated that the spill containment plan will not only enhance containment, but will also decrease response time in the event of a release. Furthermore, the containment structures have been specifically designed to preclude waterfowl roosting through the use of deterrents on the tops of the boom buoys, which will reduce the likelihood of pathogen contamination. Currently, the engineering designs are undergoing internal review by various DEP project sections.

Stormwater Facilities Construction, Operations, and Maintenance Tracking - The guidelines developed to maintain the stormwater management facilities and erosion controls constructed in the Kensico watershed will be applied to the facilities installed and constructed under the Nonpoint Plan. DEP has prepared specifications for a 3-year contract to maintain all of the nonpoint source facilities, including stormwater retrofits, erosion controls, spill containment facilities, and turbidity curtains. Maintenance schedules for catchment structures will be developed and included in the overall inspection and maintenance program and all tracking databases.

DEP and its contractors are developing a Computer Assisted Facilities Management system to track nonpoint source management measure implementation, operation, inspection, monitoring and maintenance efforts. The pilot CAFM Tracking Program, developed for the Kensico Reservoir, is being expanded to include the EoH Catskill Delaware Reservoir programs and watersheds. The program will provide a critical function, tracking all program activities, including construction, operation, maintenance, and monitoring. Its most unique and useful function is to provide pop up reminders on computer calendars to complete routine and non-routine program activities such as:

- routine and weather-event triggered post construction inspection and monitoring;
- maintenance schedules and emergency requisition requirements and deadlines;
- construction schedule compliance requirements; and
- program schedule compliance reminders including reporting deadlines.

This, plus the field data logging capabilities, make the CAFM system an important addition to DEP's data management program.

*Hazardous Materials Audit*

As part of the Non Point Source Management Plan, DEP proposed a voluntary audit program for sites that generate, use, store, or dispose of hazardous materials and/or petroleum products in the East of Hudson Catskill/Delaware watersheds. The purpose of this program is to confirm the presence of existing hazardous material use, storage and transfer sites identified in the Croton Watershed Strategy, identify additional facilities not documented in the Croton Watershed Strategy, digitally map and characterize these sites, and determine the need for further risk assessment, site improvement, or outreach efforts to prevent contamination of the water supply.

In 2003, DEP compiled an inventory of facilities to be included in the program, conducted field investigations to verify site locations and operational status, digitally mapped sites using GIS software, and developed a preliminary protocol to be used during site inspections.

Sites were initially identified using information contained the Croton Watershed Strategy, which includes facilities listed on various State and federal regulatory databases, as well as New York State Office of Real Property Services land use classifications contained in DEP tax parcel databases. Once a preliminary listing of sites was developed, field investigations were conducted to verify site location and operational status. Based on the field investigation, a total of 80 sites were selected for inclusion in the audit program (Figure 4.29).

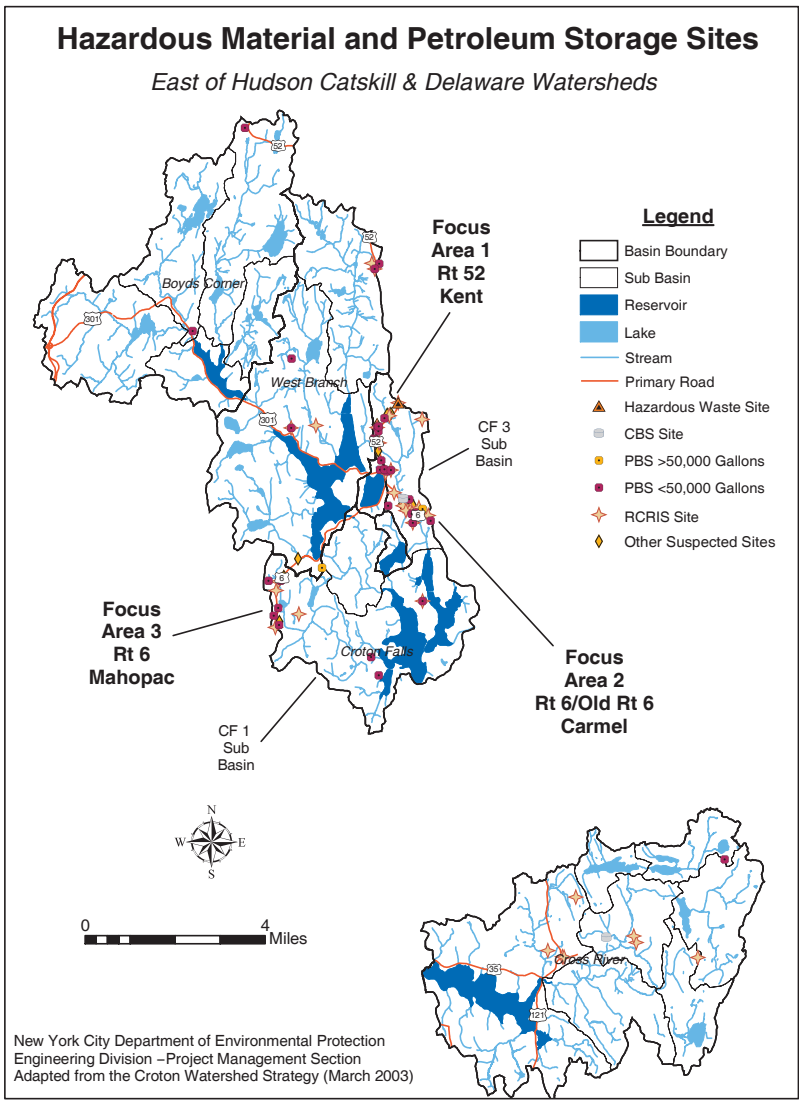


Figure 4.29. Confirmed locations of hazardous material and petroleum storage sites in the East of Hudson Catskill/Delaware reservoir basins. Data compiled from the final Croton Watershed Strategy Basin Reports (March 2003).

The majority of sites were found to be clustered in three focused areas along major roadways in the watershed basins: Route 52 in the Town of Kent, Route 6 in the Hamlet of Mahopac, and Route 6/Old Route 6 in the Town of Carmel, which fall largely within the Croton Falls watershed. The majority of facilities identified were petroleum bulk storage or RCRA-waste generating facilities associated with automobile filling and repair stations. Other sites included dry cleaners, municipal facilities, light industrial operations, and a hospital.

Based upon the types of sites identified, DEP developed a preliminary audit protocol to be used during on-site inspections. The protocol is based upon applicable portions of DEP's internal health and safety procedures, American Society for Testing and Materials (ASTM) protocol for conducting Phase I Environmental Assessments (ASTM 2000), and the EPA voluntary compliance audit program.

DEP plans to begin conducting facility audits in the spring of 2004. Depending on the level of cooperation on the part of local property owners, it is anticipated that inspections can be completed by the fall 2004. The results of these audits will be used to determine the level of compliance with applicable federal, state, and local regulations and to determine the need for further risk assessment, site improvement, or outreach efforts to prevent contamination of the water supply.

*Pesticide Storage Audit*

As part of the Croton Watershed Strategy, a DEP contractor developed a preliminary database of facilities likely to store significant quantities of pesticides in the four East of Hudson Catskill/Delaware watersheds. During 2003, DEP worked to confirm the presence and operational status of these sites and digitally map them using GIS software. In all, a total of 13 sites were confirmed to be operational (Figure 4.30). Inspection of these facilities will be conducted in conjunction with the hazardous materials audit program described above.

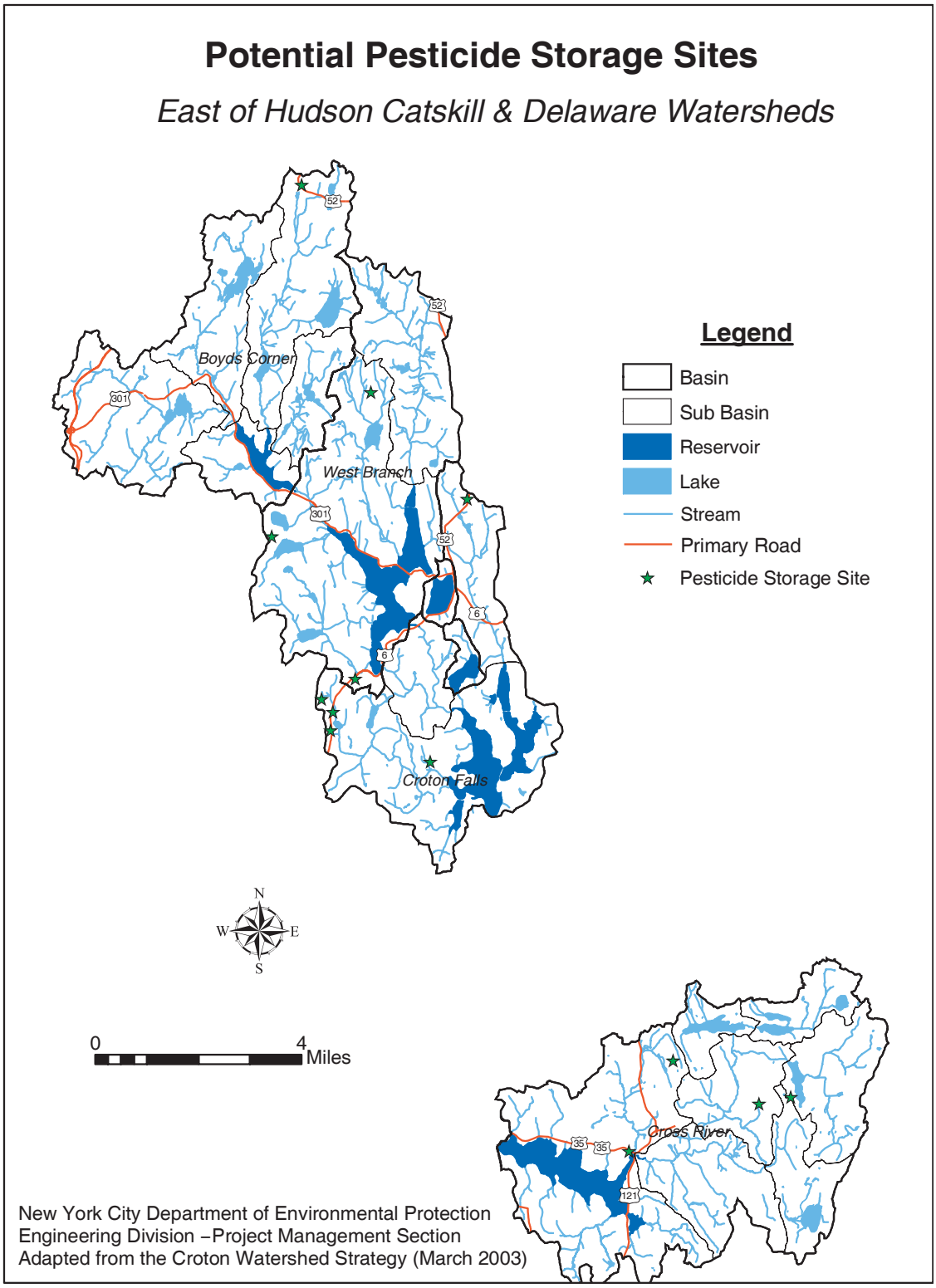


Figure 4.30. Confirmed locations of potential pesticide storage sites in the East of Hudson Catskill/Delaware reservoir basins. Data compiled from the final Croton Watershed Strategy Basin Reports (March 2003).

*Turf Management Practices*

In its Non Point Source Management Plan, DEP proposed to implement a turf and pesticide management program to minimize the impacts of commercial, residential, and municipal pesticide and fertilizer use on the water supply. The major elements of this program include: 1) evaluating existing turf management practices within the East of Hudson Catskill/Delaware basins; 2) establishing Watershed Improvement Committees modeled after North Castle's Committee for the Kensico Reservoir; and 3) developing and implementing a Turf and Pesticide Management Action Plan.

During 2003, DEP compiled an inventory of sites to be included in the proposed evaluation. The inventory includes a wide range of land use types including high and low density residential parcels, agricultural land, golf courses, parks, athletic fields, and cemeteries. In addition, DEP has begun to evaluate different approaches to accurately characterize current turf management practices within the watershed areas. Furthermore, DEP staff has begun to identify appropriate individuals to include in the Watershed Improvement Committees.

During the next reporting period, DEP will convene initial meetings of the Watershed Improvement Committees, finalize evaluation methods, implement the comprehensive evaluation of turf management practices, and develop a draft Turf and Pesticide Management Action Plan designed to minimize the impact of pesticide and fertilizer use on water quality.

## 4.8 Kensico Water Quality Control Program

In 2003, DEP made continued progress developing and implementing its programs to protect the Kensico Reservoir and its 13 square mile watershed. DEP continued to enhance its Kensico Water Quality Improvement Program by adding programs to further identify and eliminate potential sources of pollution. To advance the enhanced plan, DEP conducted detailed watershed assessments, field reconnaissance and mapping efforts, evaluated wastewater and stormwater infrastructure, and implemented other programs discussed below.

The Kensico Reservoir is the terminal reservoir for the City's Catskill/Delaware water supply system. Because it is the last impoundment of Catskill/Delaware water prior to its entering the City's distribution system, protecting and improving the quality of water in the Kensico is of critical importance. Recognizing the role that the Kensico Reservoir plays in New York City's drinking water supply system, DEP has enhanced its multi-faceted Kensico Water Quality Control Program (KWQCP) to further protect the Kensico and its watershed. Implementation by DEP of the elements of the enhanced program will continue to reduce the risk of turbidity and fecal coliform bacteria entering the water supply.

The following sections discuss DEP's progress in implementing and expanding, the KWQCP in 2003.

### 4.8.1 Stormwater Management Practices (BMPs)

The Stormwater Management Plan originally described in the 1995 Final Environmental Impact Statement prepared for the KWQCP was substantially refined in 1998 to address important design, maintenance, and water quality considerations; site constraints; and permitting, private property and other local issues. The final Stormwater Management Plan specified installation, operation, and maintenance of 44 BMPs in the Kensico watershed. The BMPs were designed to repair and control erosion of reservoir tributaries, treat stormwater flows to reduce fecal coliform and suspended solids, and associated pollutants conveyed to the reservoir, and to control peak rates of stormwater discharge. Between 1998 and 2000, 40 stormwater management facilities were constructed throughout the Kensico Reservoir Watershed. Monitoring results, suggest that the practices are very effective in removing contaminants from stormwater

Stormwater Facilities 74 and 75, Subbasin E11 - Two facilities planned for the E11 subbasin could not be constructed in accordance with the approved construction schedule due to the presence of a Verizon fiber optic cable in the work zone. Following negotiations with Verizon, the company relocated the cable in August 2002. However, Verizon continued to experience considerable difficulties with the relocation and was not able to decommission the cable running through the work zone. As a result of these delays, the contractor engaged to construct the stormwater practices in the Kensico Watershed, filed a claim of "substantial completion" and was not required to construct these two practices.

In order to avoid further delays, DEP completed a second design for the practices, substituting the amended plan for the original one, and proceeded with the contracting process. Construction began during the first quarter of 2004.

### 4.8.2 BMP Maintenance

In 2003, relying on its 2002 Stormwater Management Practices Operations and Maintenance Manual, DEP engaged a contractor and continued to maintain the 42 stormwater management practices that it had constructed in the Kensico Watershed. Since 2000, DEP has contracted for maintenance services on an annual basis at an annual cost of approximately $100,000.00. During the reporting period, DEP prepared contract specifications for a three year contract to maintain the Kensico Stormwater Practices.

DEP has found that routine maintenance of even the simplest practices is necessary if they are to continue to function as designed.

### 4.8.3 Storm Sewer Infrastructure Inspection

During 2003, DEP conducted an intensive evaluation of the stormwater infrastructure inspection video that was collected during the pervious reporting period. Based upon that review, DEP has confirmed that no significant threats to the water supply are apparent.

The inspection program, which included the video inspection of over 30,000 linear feet of drainage pipe and more than 260 structures (catch basins, manholes, inlets and outlets), found no evidence of illicit connections that might contribute wastewater to the system. In fact, the only potential pollutant sources (fecal coliform bacteria) attributable to the infrastructure were animals living in the stormwater drainage system.

### 4.8.2 Con Ed Right of Way

Eighteen of the stormwater BMPs discussed above are located adjacent to an unpaved road that Consolidated Edison (Con Ed) uses to maintain its power lines along the western shore of the reservoir.

In the course of implementing its programs in the Kensico Watershed, DEP identified sections of that road that were eroding and discharging sediment into intermittent watercourses the vicinity of the reservoir. While lengthy sections of the road were stabilized by DEP during construction of the stormwater practices, DEP viewed the erosion of certain sections of road as a significant source of suspended solids, and the repair of those sections as the sole responsibility of Con Ed. Accordingly, in 2002, DEP concluded its negotiations with Con Ed regarding the company's revocable permit application, and ultimately secured a commitment from the Con Edison to repair the eroding sections in 2003. All of the specified repairs were completed by the fall of 2003, and surrounding areas were stabilized without incident. The contractor that Con Edison engaged to complete the remediation of the City-owned land billed the company some $93,000.00 for the work.

### 4.8.4 Sewer System Protocol

In accordance with DEP's 2001 Long-term Watershed Protection Plan, DEP developed a Operations and Maintenance Protocol for Westchester County owned sewers in the Catskill/Delaware Basins East of Hudson. Accordingly, DEP engaged in discussions with a representative of the Westchester County Department of Environmental Facilities (WCDEF). Through these discussions, DEP learned that the County owns a sewer line in the Kensico Watershed, but not in any other of the Catskill/Delaware basins. The protocol DEP developed and submitted to the County commits DEP and the WCDEF to inspect and maintain the sewer system in the Kensico Reservoir watershed and to take other such action as necessary to prevent wastewater discharges to the reservoir. The protocol developed by DEP included annual manhole inspections for structural condition, water tightness, and accumulation of grease in the pipes, and video inspection of the entire sewer line five years.

After review by County staff, the protocol was approved. However, following a wastewater discharge to the Kensico Reservoir, caused by an obstruction in the County's sewer line, the County submitted an abbreviated protocol to DEP. During 2003, DEP completed its review of Westchester County amended sewer operation and maintenance protocol and determined that it was not sufficient protection for the Kensico Reservoir. Accordingly, DEP advised the County, in

its response to the County's application for approval to allow the sewer to remain on City land, and that the initial protocol would be included as a condition of any DEP approval to allow the sewer to remain. At the close of the reporting period, discussions between DEP and the County are ongoing.

### 4.8.5 Enhanced Spill Containment Plan

In December 2002, DEP completed the plans and specifications for the Enhanced Spill Containment Plan that includes measures to contain otherwise uncontrolled spills from Routes 120/22 and Nannyhagen Road. During the winter of 2003, the plans and specifications were forwarded to DEP's contracting unit in anticipation of deploying the measures by the autumn of 2004.

### 4.8.6 Repair Of Sewer Leaks

As part of its Kensico Sewer Inspection Program, DEP video inspected approximately 55,000 of the 95,000 linear feet of sanitary sewer line in the Kensico Watershed in 1998. The purpose of the inspections was to identify, and repair, defects in County and municipally owned sewer lines that may result in exfiltration of wastewater into the reservoir. That program identified some 39 sections of defective sewer that DEP repaired by grouting, relining, or excavating and replacing. During the reporting period, DEP prepared and issued to its contracting unit, contract specifications for mapping and inspecting additional sewer lines in the Kensico Watershed.

### 4.8.7 Turbidity Curtain/Spill Containment Facilities

In order to protect the Kensico Reservoir from hazardous spills, DEP is integrating its Interstate 684 Spill Containment Plan with an enhanced Spill and Emergency Response Protocol, and an enhanced spill containment project that addresses the threat that spills on additional roads around the reservoir pose to water quality. The I-684 plan includes the deployment of twenty-five spill containment booms at the stormwater outfalls from the highway, while the enhanced protocol includes updated notification procedures, improved preparedness, and updated material cleanup, transportation and disposal procedures.

Figure 4.31 depicts the locations of the I-684 stormwater outfalls and the spill containment booms. The containment system, detailed in Figure 4.32, is designed to ensure material spilled on a road, and discharged in the form of sheet flow, or through a stormwater drainage system, is sufficiently contained to allow for simplified recovery. This will prevent migration of the material through the reservoir, minimizing water quality impacts. Furthermore, the system has been specially designed to preclude waterfowl roosting through the use of deterrents on the tops of the boom buoys.

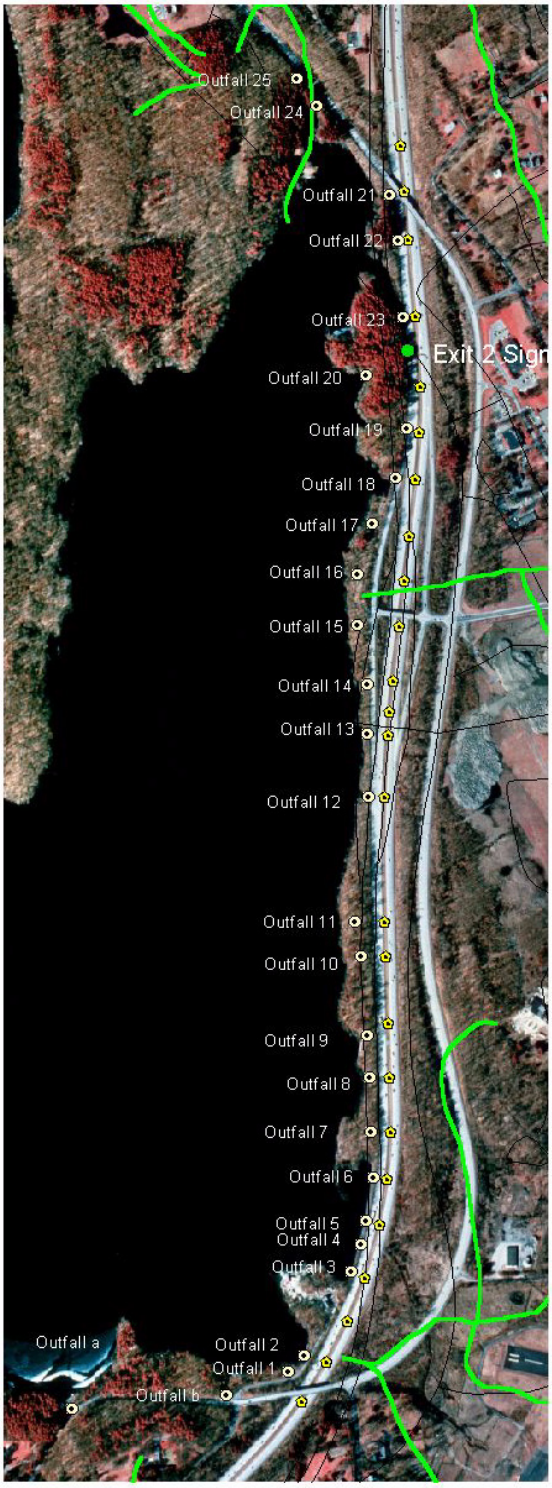


Figure 4.31. Spill containment facility sites - catch basins and storm drain outfall locations in the Kensico Reservoir.

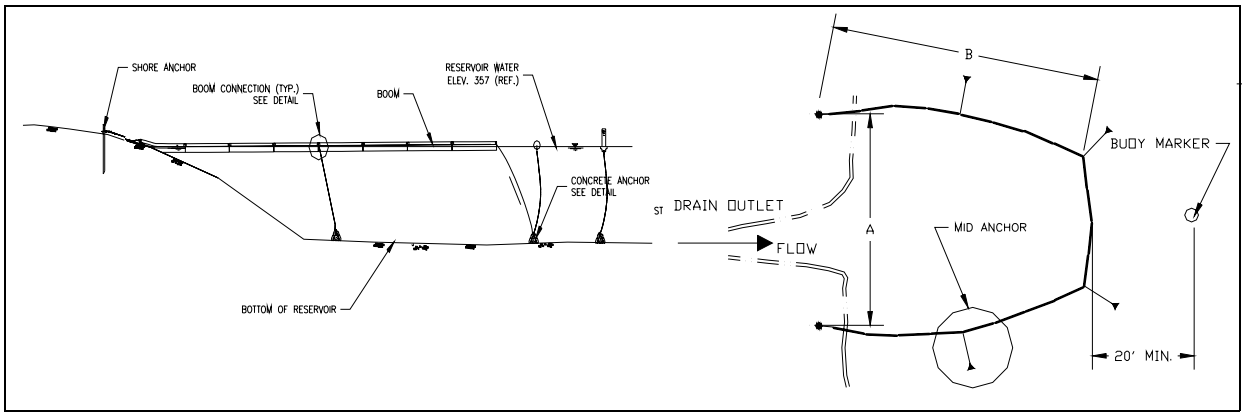


Figure 4.32. Spill Containment Boom - Plan and Cross Sectional Views.

In addition, DEP initiated replacement of the turbidity curtain at Malcolm Brook.

In August 2002, DEP issued an "order to commence work" to the contractor who was awarded the Kensico Turbidity Curtain/Spill Containment Facilities Project. While DEP anticipated that the project would begin shortly after issuance of the order, the contractor notified DEP that it would be necessary for the 850' long turbidity curtain and the spill containment facilities for the twenty-six stormwater outfalls from Interstate 684 to be fabricated. Furthermore, because of the nature of the work, the firm would be required to prepare a Health and Safety Plan and secure DEP approval for that plan.

By the summer of 2003 the turbidity curtain had been installed and all of the spill containment facilities had been deployed at the locations depicted below.

### 4.8.8 Route 120/22

During 2003, DEP continued to meet with the DOT's Route 120 Advisory Committee and apprise the group of DEP's position on the proposed work. As the project has been significantly modified and now includes extensive stormwater retrofit and management practices, DEP is not opposed to the plan as presented in conceptual form.

The Route 120/22 project, and accompanying stormwater management facilities, remained under scrutiny by a committee established in 2001, so as to further evaluate stormwater management options. Various governmental officials and environmental and public advocacy groups participate on the committee.

### 4.8.9 Westchester County Airport

*Tree Cutting*

During the reporting period, Westchester County was notified by the Federal Aviation Administration (FAA) that it would not authorize the County to use the parallel taxiway it constructed at the County airport due to trees that obstructed the view from the control tower to sections of the recently constructed taxiway. In an effort to resolve the matter, the County contacted DEP and requested approval to clear cut some five acres of trees to clear the obstructions. Since a portion of the proposed clearing was within the limiting distance to a watercourse, the City notified the County that a Stormwater Pollution Prevention Plan would be required for the project. Moreover, the City expressed its concern that clear cutting of that magnitude would, by way of erosion and sedimentation, impact Kensico water quality, and indicated the need to assess the potential impacts of the action pursuant to the State Environmental Quality Review Act.

Faced with the time involved developing and securing DEP approval of an SPPP, and conducting a SEQRA environmental review, the County and DEP met to explore options that would satisfy the City's regulatory requirements and allow the County to utilize the taxiway for which it had received a $5,000,000.00 construction grant from the FAA. The County noted that because the FAA was prohibiting the use of the taxiway, FAA was seeking reimbursement of the grant funds.

Following lengthy negotiations, the City's advised the County to revise its proposal to fell, and leave in place, only those trees that obstructed the view. Since that alternative reduced the disturbed area to well below two acres the County could remove obstruction and significantly reduce any potential impact on water quality in the Kensico.

Prior to beginning the cutting, the County agreed to install, and maintain, any erosion controls that DEP deemed necessary. DEP identified the erosion controls necessary to prevent any migration of sediment, and inspected them prior to, and during, the cutting. No incidents of sedimentation resulted from the cutting.

In the future, certain trees that interfere with the sight line between the control tower and the taxiway will be felled on an individual basis, and the County has agreed to notify DEP prior to any such cutting.

*Soil Remediation and Groundwater Protection*

During the reporting period, DEC and the County agreed upon the terms of a voluntary remediation agreement under which the County prepared a plan to remediate by closure, a contaminated section of the airport. The closure is intended to prevent the migration of contaminants in the soil that were released during prior uses of the site. The remediation, which is a component of the County's overall program to remediate similar areas sites at the airport, requires the review

and approval of an SPPP from the City. The County has submitted the SPPP and provided documentation, currently under review by the City, that the project underwent an environmental review that satisfied the requirements of SEQRA.

*Stormwater Management*

At New York State Department of Transportation's (NYSDOT) request, representatives of the Westchester County Executive, NYSDOT and DEP met to discuss enhancements to the Route 120/Interstate 684 stormwater remediation plan and DEP's Kensico Watershed Stormwater Management Plan. Of the three remaining State Pollution Discharge Elimination System regulated stormwater discharges at the airport, only one will not be collected and treated by either the City's or NYSDOT proposed actions. The agency representatives met to discuss the possibility of collaborating on the design and construction of the regulated outfall on Airport Road.

While noncommittal, County representatives expressed an interest in the project which the City will pursue with County and NYSDOT officials

## 4.9 Catskill Turbidity Control

Due to the nature of the underlying geology, the Catskill system is prone to elevated levels of turbidity in streams and reservoirs. High turbidity levels are mostly associated with high flow events, which mobilize the streambeds and suspend the glacial clays that underlie the streambed armor. The Catskill system was designed with the local geology in mind, and provides for settling within Schoharie, Ashokan West Basin, Ashokan East Basin and the upper reaches of Kensico Reservoir. Under normal circumstances this extended detention time in the reservoirs is sufficient to allow turbidity to settle out, and the system easily meets turbidity standards at the Kensico effluents. Periodically, however, the City has had to use chemical treatment to control high turbidities.

DEP is engaged in numerous projects and studies designed to reduce turbidity in the waters of the Catskill system. A summary of the major projects and studies that are underway is below. There are also several efforts planned (e.g., dredging of the Schoharie intake channel) which will not begin until 2004 or later.

*Analysis of Engineering Alternatives*

DEP is undertaking a comprehensive analysis of engineering and structural alternatives to reduce turbidity levels entering Esopus Creek. DEP has engaged a consulting firm to conduct the engineering analysis. In addition, DEP has hired the Upstate Freshwater Institute (UFI) to enhance the existing Schoharie Reservoir model to allow for full assessment of the effectiveness of potential engineering alternatives in reducing turbidity.

In 2003, UFI continued work that was initiated in 2002, with initial efforts focused on deployment of data collection equipment:

- Reservoir Remote Underwater Sampling Station (RUSS) units – RUSS units have been placed on the reservoir to allow for continuous data collection at key locations throughout the waterbody. A single RUSS unit was tested in 2002 near the intake. Two other units were deployed in May 2003, one near the dam and one approximately mid-way between the intake and the dam.
- Stream sampling units (Robohuts) – Specially fabricated for this effort, Robohuts have been placed along stream to collect continuous stream data for a host of constituents. A Robohut was placed on Schoharie Creek in March 2003. A second Robohut was installed near the mouth of Esopus Creek in July 2003. UFI also proposed to construct Robohuts on the Esopus upstream and downstream of the Shandaken Tunnel outfall; the upstream unit was installed in late 2003. DEP anticipates that the downstream Robohut will be installed in the first half of 2004, when siting issues have been resolved.

With data collection equipment in place, UFI has begun to review some early information and to develop the necessary models.

In 2002, DEP developed a scope of work for engineering services. During 2003, the contract was put out to bid and a low bidder was selected in September. The contract is now in place and work has begun.

*Expand Water Quality Telemetry System*

Expansion of DEP's existing telemetry system to the Schoharie Reservoir and the Shandaken tunnel will provide DEP with better access to timely water quality information. DEP installed new water quality instruments at the Schoharie Intake Chamber, and connected those instruments to the existing Delaware Telemetry System in spring 2003. A building to house a similar connection at the Shandaken Tunnel Portal was constructed, and the water quality pumps and instrumentation were installed prior to the end of 2003.

*Sources of Turbidity Report*

In July 2003, DEP produced a report designed to present the City's current data and information on the sources of turbidity in the Schoharie reservoir watershed. The report compiled existing water quality monitoring data, along with reports from field staff from a variety of programs that are active in the Schoharie basin. The collected information points to three tributaries – the Batavia Kill, the West Kill and Johnson Hollow Brook – as being the primary contributors of turbidity to the reservoir. Johnson Hollow, due to its much smaller size, is relatively smaller contributor than the other two tributaries. DEP's report further identified the watershed protection programs that are active in these areas that are helping to reduce current turbidity loads or prevent these sources from getting worse.

*Coordination with New York State*

DEP has agreed to work with the State on several efforts related to turbidity control. In particular, DEP has been meeting with DEC to develop a release management strategy, along with an implementation schedule, for water from Schoharie Reservoir. DEP and DEC met during fall 2002, to discuss the release management strategy. In the spring 2003, DEC submitted to DEP a draft release management strategy. DEP provided comments on the draft strategy to the State in June 2003. As of the close of the reporting period, the State had not responded to DEP's comments.

In addition to the release management strategy, in February 2004, DEC issued a draft SPDES permit for the Shandaken Tunnel for public comment. The release management strategy, the regulations governing releases from Schoharie (which DEC intends to revise), and the SPDES permit will need to be integrated into a coherent framework under which DEP can manage the Catskill water supply system.

DEP also discussed two other collaborative efforts with DEC during 2003: development of a sediment transport model for the Schoharie and Esopus basins, and providing technical support to DEC in DEC's development of a suspended sediment TMDL for the Schoharie and Esopus basins. DEP has recommended to DEC that our agencies work cooperatively on the ongoing modeling efforts by UFI as an alternative to developing a separate modeling effort. DEP understands that DEC is still evaluating for advancing this effort. Regarding development of a sediment TMDL, DEP stands ready to provide assistance to the State when requested.

# 5. Watershed Monitoring, Modeling and GIS

## 5.1 Watershed Monitoring Program

An "Integrated Monitoring Report" was delivered to EPA and DOH in October 2002. This report presented reviews of DEP's three key upstate water quality monitoring programs: Hydrology, Limnology, and Pathogens. These reviews were designed to meet the expanding scope of DEP's data uses including requirements for watershed and reservoir models, mandates, and regulations, as well as fulfilling data needs to ensure that management requirements are adequately addressed. The programs are designed to meet the current and future data requirements of DEP including the long-term evaluation of watershed protection programs.

The overall goal of the framework is to establish an objective-based water quality monitoring network, which provides scientifically defensible information regarding the understanding, protection, and management of the New York City water supply. The information needs required to achieve this goal are compiled as objectives, each of which is clearly defined (in statistical terms if possible). The list of objectives for each program was derived by compiling the information needs of existing and prospective DEP programs, and the review of legally binding mandates, agreements, and/or documents which pertain to New York City's Watershed Water Quality Monitoring Program. The definition of objectives was the starting point for this comprehensive review because, ultimately, the objectives define the temporal, spatial, and analytical requirements of the programs. Statistical features of the historical database were used to guide the sampling design.

To ensure the most efficient gathering of data, the monitoring programs are integrated with each other through common data requirements. Several data collection programs, e.g., Hydrology and Limnology, may contribute to a single objective, e.g., Reservoir Modeling, so it is essential that data from each collection program be coordinated.

Any minor changes to any of these monitoring programs will be formally documented and maintained as an annual addendum to the Integrated Monitoring Report (IMR). After a 5-year period, a new version of the IMR will be issued that incorporates the changes reported in the annual addenda. Major modifications in these monitoring programs will be submitted to appropriate agencies for prior review and approval, and will be documented in the annual addenda and revised IMR.

Pursuant to the City's Long-Term Watershed Protection Program, DEP now produces a Watershed Water Quality Annual Report which is released in July of each year. This document contains chapters discussing issues, including water quantity (e.g., the effects of droughts during the reporting period); water quality of streams and reservoirs; watershed management; and water quality models (terrestrial and reservoir). For 2003, the limnology and hydrology components of the document will draw largely on information obtained from approximately 270 reservoir and

stream routinely-sampled sites resulting in about 7,000 samples and over 124,000 analyses. For the pathogens component, a total of 911 samples for *Cryptosporidium* and *Giardia* spp. analyses were collected at 152 sampling sites (including keypoints), and 314 samples were collected for human enteric viruses analyses in 2003.

With regard to protozoan pathogens, the following reports were issued in 2003: monthly Filtration Avoidance Report, monthly Croton Consent Decree Report, Semi-Annual Reports of "DEP Pathogen Studies of *Giardia* spp. and *Cryptosporidium* spp. and Human Enteric Viruses". In addition, contributions to the Research Objectives Report, Kensico Reservoir Report, and Watershed Water Quality Annual Report were issued.

Additionally, results from weekly *Cryptosporidium* and *Giardia* sampling at the three source waters are posted on DEP's web site.

As part of FAD section 4.8 Kensico Water Quality Control Program, DEP submits to EPA a semi-annual deliverable "Kensico Watershed Management Report". In this report there will be an annual contribution (in January of each year, commencing 2003) presenting, discussing, and analyzing monitoring data from the Kensico watershed. This report will contain information on, for instance, keypoints, streams, the reservoir, BMPs, groundwater, monitoring for toxic substances, and the Kensico water quality model.

## 5.2 Multi-Tiered Water Quality Modeling Program

DEP's Multi-Tiered Water Quality Modeling Program is an integrated set of watershed and reservoir modeling tools to support both long-term watershed management and short-term operational strategies for maintaining high-quality NYC drinking water. Major elements of the program include:

- Data Acquisition and Organization
- GWLF Model Calibration and Verification
- Model Development and Improvement
- Model Integration and Software Development
- Applications for Watershed/Reservoir Management

Progress regarding major elements of the program in 2003 is reported below.

### 5.2.1 Data Acquisition and Organization

Watershed modeling data includes meteorological data to drive the models; stream flow and water chemistry data for watershed model calibration and testing; and spatial GIS data that characterize the watershed land use and physiography. GIS data is organized in a GIS library. Time-series data for modeling is organized in a Modeling Time-Series Data Library.

Reservoir modeling data includes reservoir morphometry GIS data, and a daily time-series of meteorology, reservoir inputs and reservoir outputs. The input data include stream flows and nutrient loading either estimated directly from measurements of stream discharge and chemistry, or taken from the output of the GWLF model. To calculate the outputs information on reservoir operations is needed including: aqueduct flows, reservoir discharge, spillage, and water level (stage). To verify and calibrate the models water column measurements of temperature, chemistry and phytoplankton biomass are needed.

Meteorological time-series data in the Modeling Data Library were updated to include daily precipitation and air temperature through calendar year 2002 for Northeast Regional Climate Center weather stations in the NYC watersheds region. In 2003, the methods used to calculate average daily precipitation and temperature data to obtain appropriate watershed wide values for model input were revisited and improved. The method changes include; (1) use of Thiessen Polygons instead of inverse distance squared weighting for spatial averaging of precipitation; (2) the implementation of an environmental lapse rate for temperature measurements and; (3) inverse distance weighting instead of even weighting for spatial averaging of temperature.

Streamflow and water chemistry time-series data were updated through calendar year 2002. Streamflow data were acquired from the USGS for all active gaging stations in the watersheds. Water chemistry data, including storm event monitoring data, were acquired from the DEP hydrology program, which conducts routine and storm event monitoring, and DEC, which conducts water chemistry sampling of the West Branch Delaware River at Beerston. Storm event data were collected by DEP in 2003, for Schoharie, Neversink and Rondout watersheds. Wastewater treatment plant effluent data through 2002 were acquired through DEP's watershed management program.

Data to support reservoir modeling activities were also acquired. These data were primarily from 2002, and were used to update existing databases. They included:

- Reservoir storage, outflows, draw depths, and operations
- Catskill stream discharge turbidity and suspended solids data (mainly from 2003)
- Water quality data from reservoirs, aqueducts and streams.

In addition, a variety of data collected as part of UFI contracts were delivered to DEP.

GIS data development to support modeling continued in 2003. Drainage areas were delineated for 15 additional USGS stream monitoring sites from 30-meter DEMs and added to the GIS library raster and vector drainage area coverages. A SSURGO soil viewer developed by USDA Natural Resources Conservation Service (NRCS) to facilitate access to Soil Survey Geographic Database (SSURGO) digital soil data for analysis and display purposes was installed and tested.

SSURGO soil data for the Cannonsville basin were adapted for use in the AVSWAT2000 interface to the SWAT watershed model. Work continued, under SDWA contract with PAR Government Systems Corporation, to develop an updated land use map for the NYC watersheds.

### 5.2.2 GWLF Model Calibration and Verification

Calibration and verification of GWLF watershed loading models for Catskill and Delaware System Reservoir watersheds is an objective of DEP's modeling program for 2003-2007; water quality data collection to support model calibration and testing continues through DEP's ongoing stream monitoring program. In 2003, storm event water quality monitoring data were collected in the Schoharie, Neversink and Rondout watersheds. Analyses necessary to calculate constituent loads began on the most recently collected storm event data for Pepacton watershed. These data will be used to complete final calibration and verification of the GWLF models.

In addition further model calibration was performed and revised calibration processes were developed. Preliminary calibration and testing for the water quality portion of GWLF was performed for the Neversink watershed. The method for hydrologic calibration was revised to include separation of direct runoff and baseflow in the hydrology calibration for GWLF, as described below.

### 5.2.3 Model Development and Improvement

Model development and improvement is an ongoing process as new data and research results become available. Watershed model development in 2003 focused on improving the GWLF hydrologic calibration methodology to account for partitioning between direct runoff and baseflow as estimated from streamflow data; commencing a SWAT model application for Cannonsville watershed; and research on effectiveness of agricultural BMPs in the Town Brook watershed.

Previous GWLF modeling studies used default SCS runoff curve numbers to calculate the partitioning of rain and snowmelt into infiltration and direct runoff. In 2003, DEP utilized baseflow-separation techniques to generate time-series of direct runoff and baseflow from measured streamflow data, and used the resultant baseflow-separated data to calibrate SCS runoff curve numbers in GWLF. This calibration procedure was successfully tested for the Cannonsville watershed, and will be applied in the final GWLF model calibrations for the other Catskill and Delaware System reservoir watersheds.

In 2003, DEP began developing and testing a SWAT (Soil Water Assessment Tool) model application of the Cannonsville watershed. The SWAT Model, developed and supported by the USDA, has advanced phosphorus (P) algorithms that calculate P loading coefficients dynamically and account for specific watershed conditions. In addition, SWAT explicitly models watershed management practices and their effects on loads. These features, which are not currently in GWLF, should improve the accuracy of P loading coefficients for agricultural land uses and man-

agement practices used in DEP's watershed modeling applications. Initial work with SWAT focused on calibrating and testing the SWAT model's hydrologic predictions for the Cannonsville Watershed.

The Town Brook Research Group (TBRG) developed and implemented research projects in the Town Brook Watershed, a sub-basin within the Cannonsville Reservoir Watershed, to address effects of BMPs on agricultural P-loss. Research projects in 2003 focused on: (1) evaluating the use of soil amendments as a BMP for high-P soils that has the potential to reduce P loss in runoff; (2) evaluating potential benefits of stream bank fencing and riparian buffers; (3) demonstrating beneficial effects of filter strips used to treat milkhouse waste and barnyard runoff; and (4) quantifying potential for subsurface transport of P below cropped and pasture land. It was demonstrated that some existing BMPs, such as stream fencing and vegetated filter strips, can decrease field losses and watershed-scale export of P, as long as the BMPs are properly and continuously managed and maintained. Soil amendments have the potential to decrease soil P solubility, and thereby runoff P, with no negative effects on crop yield or trace metal transport. These results will be incorporated in future modeling of the effects of agricultural BMPs on P loadings.

Reservoir model development focused largely on upgrading the Cannonsville reservoir eutrophication model to include simulation of sediment re-suspension, and the effects of sediment re-suspension on phosphorus cycling and light attenuation (DEP 2003b). A diverse and extensive program of measurements and process studies was conducted to support the development of modeling algorithms describing sediment re-suspension and its related effects. Based on these studies, the upgrade of the Cannonsville Reservoir nutrient-phytoplankton model included:

- A new inorganic particle/tripton sub-model that adds inorganic (or fixed) suspended solids as a model state variable (predicted by the model).
- A modified phosphorus sub-model to accommodate the effects of phosphorus adsorption/desorption associated with re-suspended inorganic tripton. Mass balance calculations are conducted on a new state variable in this sub-model, total reactive phosphorus, composed of both particulate reactive (subject to adsorption/desorption transformations) and soluble reactive components.
- A strong empirical relationship that was developed from observations, that describes the influence of suspended sediments on the underwater light levels that regulate phytoplankton growth.

Inclusion of sediment re-suspension in the model, led to improved predictions of suspended solids, particulate phosphorus and parameters related to phytoplankton primary production.

The sediment re-suspension algorithms were incorporated into the Cannonsville Reservoir Trihalomethane (THM) precursor model (DEP 2002). The upgraded THM model was also delivered to DEP during 2003, and a comparison was made between the original THM model and the upgraded version (DEP 2004). The development of the Cannonsville THM model remains an

experimental undertaking. The THM algorithms, while providing an excellent first cut mechanistic model, are based on a limited data set, and the model results, while useful for general guidance, have a number of shortcomings. The upgraded Cannonsville THM model is an improvement over the earlier version of the model, but limitations of the original model still remain. For this reason the upgraded model is considered an experimental application – not a management tool.

### 5.2.4 Model Integration and Software Development

DEP is developing software tools, through a SDWA contract with PAR Government Systems Corporation (PAR), to improve the integration of watershed and reservoir modeling components. The watershed modeling software consists of two main sub-programs: the Modeling Support Tool System (MSTS) and the Scenario Support Tool System (SSTS). The MSTS integrates the watershed and reservoir models, and includes tools for model data preparation and to facilitate model development and testing. The SSTS links the MSTS with a database of watershed management program implementation and effectiveness measures to provide support for evaluating the effectiveness of watershed management and BMPs in maintaining reservoir water quality. The MSTS and SSTS are set up to link directly to DEP's reservoir models. During 2003, software programming proceeded and draft individual tools were developed and tested. These tools will be combined in an integrated toolset to support multi-tiered water quality model applications.

Additionally, two software tools specifically used to support reservoir modeling activities were received from PAR during 2003. One tool, LINKRES, allows simulations of two or more WOH reservoirs as a coupled system. The other, 2D tool set, facilitates data preparation needed to run the two dimensional models in the WOH system. Evaluation of both tools is underway and reports on our evaluations will be delivered to EPA during 2004.

### 5.2.5 Applications for Watershed/Reservoir Management

In 2003, the Nutrient Management Eutrophication Modeling System was used to assess the adequacy of Phase II TMDLs for Cannonsville Reservoir (DEP 2003a). Results of this application were submitted to EPA in December 2003. The study highlighted the importance of dissolved phosphorus loads entering the reservoir during the late spring and summer. Using the waste load allocation and load allocation as set under the current Phase II TMDL resulted in large shifts in the summer average epilimnetic chlorophyll-*a* concentration. Additionally, implementation of the already planned watershed management activities produces even greater decreases in reservoir chlorophyll-*a* concentrations.

Two-dimensional simulations of Kensico reservoir turbidities were made to support DEP planning efforts, regarding the placement of a potential aqueduct intake in Rye Lake. Preliminary simulations used a scenario based on average conditions during early 2001 (a period of elevated Catskill turbidities), and turbidities were estimated at the existing aqueduct outlet and at the loca-

tion of the proposed Rye Lake aqueduct outlet to City Tunnel #3. When all water was withdrawn using the present aqueduct, the simulated turbidities agree with DEP monitoring data of the early 2001 period. Diverting all outflow to the Rye lake site increased the flow of Catskill waters towards Rye Lake, but despite this the Rye Lake turbidities remain three to four times lower than those simulated at the present aqueduct location. These simulations suggest potential drinking water quality benefits derived from increased dilution of Catskill waters during Catskill turbidity events, and suggest that a new Rye Lake intake site would provide three to four times more dilution of Catskill waters than a new intake south of DEL-18.

## 5.3 Geographic Information System

DEP continued to develop the upstate Geographic Information System (GIS) and use it in support of FAD and MOA programs. The GIS was used for hardcopy mapping, geographic analysis, spatial data development, visualization and analysis of remotely sensed imagery, and water quality modeling.

The upstate GIS includes networked Windows and UNIX workstations at laboratories in Kingston and Valhalla, and on individual desktops. Each lab has hardware capabilities for scanning documents, digitizing data, and producing hardcopy maps on a variety of small- and large-format output devices. Users access spatial data stored in data libraries on central servers. ESRI (ArcGIS, ArcInfo, ArcView) and ERDAS (Imagine) are the GIS software vendors of choice. There are Windows workstations for on-site GIS work at Shokan and Grahamsville. Global Positioning System (GPS) technology is used for field data collection.

### 5.3.1 Utilizing GIS for Watershed Management Applications

Maps were created to support a diversity of program activities, including but not limited to: the location of watershed monitoring stations; special investigation reports regarding spills and other water quality impairment issues; reservoir navigation; development of watershed communication networks; status of land acquisition, conservation easement, forestry management, and watershed agricultural programs; site reviews and infrastructure location; inclusion in presentations, reports, and promotional materials; to fulfill outside agency requests; use in briefings of upper management; and general overview.

Significantly, in the context of heightened concern for homeland security and watershed protection, the DEP Police required an increased level of mapping support. Maps were created for special investigation reports, to identify infrastructure locations, to develop a radio communications scheme, in support of reservoir access limitation and protection, for recruitment efforts, and to assist with search and recovery efforts.

Several Land Acquisition Program maps indicating basin status and watershed priority areas were created for a December press conference at City Hall with Mayor Bloomberg. The event recognized the milestone of acquiring 50,000 acres for watershed protection and the City's commitment of an additional $25 million to the Croton acquisition effort. Staff also produced maps for the press to use as reference materials in newspaper articles.

The GIS was used to support PAR Government Systems Corporation (PAR) efforts to create updated land cover/land use information and delineate impervious surfaces within the watershed, to prepare for evaluation of riparian forest vegetation, and to evaluate wetland change, among others. Increased use was made of 1-foot ortho imagery as contracted EMERGE products and 2001 data from the NYS Clearinghouse became available.

DEP used the GIS to address water quality issues throughout the watershed. Data were used to design a snow core survey program, to evaluate the current status of remote data acquisition from DEP meteorological stations and consider including other projects in the program, to display the results of pathogen analyses at monitoring site locations, support special investigations of spills and other incidents that may threaten water quality, and to accomplish review of USACOE permit applications, the Millennium and Crossroads projects, and bridge reconstruction project plans, among others.

The GIS was used extensively to support watershed and reservoir water quality modeling. The link between the GIS and modeling applications was enhanced by continued development of the Watershed Characteristics Tool, a pre-processor being developed by PAR to derive spatial inputs for GWLF, using the ArcMap module of ArcGIS. This work expands upon a similar past effort using the Avenue programming language in the ArcView 3 environment. Modeling staff also installed and began testing the ArcView Interface for SWAT2000, a graphical interface for deriving spatial inputs for water quality modeling using SWAT (Soil and Water Assessment Tool).

DEP used the GIS to support the mapping of stormwater infrastructure and sanitary sewers, to evaluate potential development site constraints and limitations for new development, for project review, to formulate the Nonpoint Source Management Plan and its Implementation Schedule for the Catskill/Delaware reservoir watersheds, for an impervious surface cover threshold evaluation in EOH towns, to begin a comprehensive dataset of intermediate sized sewage treatment plants, and to track activities affecting wetlands, among others.

DEP used the GIS to establish baseline documentation of conservation easements, support a consultant's inventory of forest stands depicting species and other forest metrics on City-owned lands, for Stream Management's effort to integrate USGS hydrologic data with stream survey data into a geographically referenced database, to guide a Land Acquisition re-solicitation effort, and as a key component of the Land Acquisition Tracking System (LATS) and Watershed Lands Information System (WALIS), among others.

### 5.3.2 GIS Data Development, Management, and Dissemination

Recognizing the importance of a high-quality spatial data library as a fundamental component of the GIS, DEP continued to upgrade, create, and obtain data products. With projection of USGS Digital Raster Graphic (DRG) imagery, work was completed on upgrading the coverage library from NAD 27 to NAD 83. The library was copied to the Valhalla server and an automated UNIX script created for replication from the Kingston master to Valhalla on a daily basis. The library was also copied to GIS workstations at Shokan (2) and Grahamsville (1). Using UNIX and Windows ("Vice-Versa") replication software, the GIS library at Kingston is now replicated to four other sites on a daily basis, insuring that GIS users have access to identical versions of the upstate GIS spatial data.

Substantial progress was made on implementing the geodatabase, utilizing ArcSDE as a gateway for the storage of attributed spatial data in an Oracle RDBMS. DEP prepared material in the NAD 83 coverage library for import to the geodatabase, often appending what previously had been separate East of Hudson (EOH) and West of Hudson (WOH) layers of the same theme into a single layer. Mosaics of the 1-foot resolution EMERGE orthoimagery for Cannonsville and EOH, the NYSDOT planimetric imagery, and the USGS DRGs (1:24,000, 1:100,000, 1:250,000) were created as basemap layers in the geodatabase. Most feature datasets were also imported; work continued on importing and developing metadata.

Among data acquired were a coverage of Cannonsville impervious surface, ASTER satellite imagery from the NASA EOS program, forest stand information on pre-MOA City-owned lands, NYSDOT political boundaries, NYS 2001 1-foot resolution CIR ortho imagery for the WOH region, a coverage of DEC Wildlife Management Units, and NYS postal zip codes and post office names, among others. Revised data included coverages of wastewater treatment plants, newly-acquired lands, and USGS stream gage locations, among others.

Work continued on developing data for watershed and reservoir modeling. Additional drainage areas above USGS stream monitoring sites were delineated from 30-meter DEMs. SCS Runoff and Soil Erosion Potential grids were created at a 10-meter resolution for EOH. Bathymetry was either created or updated for three EOH reservoirs. Thiessen polygons were used in the Cannonsville basin to develop a weighted time series of daily precipitation using data from 18 monitoring stations. SSURGO soil data were updated and adapted for use with a pilot application of the SWAT model in the Cannonsville basin.

DEP continued to disseminate data to stakeholders according to data sharing policies. Data were forwarded to DEP consultants, local government representatives, college/university research staff, The Nature Conservancy, NYPIRG, the Army Corps of Engineers, the Watershed Agricultural Council, and the NYC Office of Emergency Management, among others.

DEP successfully installed ArcIMS as a server based GIS application. The ArcIMS application is one of several information services directly linked to an internal web site supported by the Bureau of Water Supply. The application allows staff to use MS Internet Explorer browsers as the primary interface for access to a limited GIS information data store. Users select geographic areas and data sets through their local browser application and the server generates maps from a standard set of GIS libraries. The service is now available to all DEP employees with network connections to the Bureau of Water Supply's intranet.

### 5.3.3 GIS Infrastructure

Hardware acquisition included nine Trimble GeoExplorer XT GPS units for the Stream Management and Land Management programs, enabling field data collection at sub-meter accuracy. A digital transfer scope was installed in the Kingston GIS lab. This is a portable stereoscopic workstation that enables users to create new digital GIS data and revise existing GIS data directly from aerial photography, operating through an ArcView/ArcGIS extension.

Software enhancement continued, with upgrades to ArcGIS 8.3, ERDAS IMAGINE 8.6, and GeoExpress 3.1 (formerly MrSid). Two upgrades were made to the ArcSDE and Oracle software required for geodatabase implementation. Additional ArcInfo licenses were obtained for Kingston due to an ever-increasing number of users.

# 6. Regulatory Programs

## 6.1 Watershed Rules and Regulations and Other Enforcement/Project Review

### 6.1.1 Regulatory Review and Enforcement

*Watershed Regulations*

A primary component of DEP's overall watershed protection strategy is the enforcement of applicable environmental regulations, which include the revised WR&R, also promulgated as State law, the federal Clean Water Act, SEQRA and others. Of these, the primary mechanism for protection of the water supply is the WR&R. DEP's enforcement efforts are focused on three major areas: review and approval of projects within the watershed; regulatory compliance and inspection; and environmental enforcement.

*Project Review*

Because DEP has specific review and approval authority granted by State law, it is considered an "Involved Agency" under SEQRA for those projects where a DEP approval is required, and must review and issue findings statements regarding projects that have potential environmental impacts in the watershed. The project applicant must address comments or questions raised by DEP during the SEQRA process to the satisfaction of both DEP and the lead agency .

Each project proposed in the watershed, including those designed or sponsored by DEP, is reviewed to ensure compliance with the WR&R, as well as federal, State and local laws. Projects that require DEP review and approval include all wastewater treatment facilities, including the installation and maintenance of subsurface sewage treatment systems (SSTSs), preparation of stormwater pollution prevention plans (SPPPs) and the construction of certain impervious surfaces. In addition, DEP reviews and issues permits for individual residential stormwater plans (IRSPs) and for impervious surfaces associated with stream diversions or pipings. DEP also ensures that during and after construction, projects that require SPPPs or IRSPs have the necessary BMPs and that erosion controls are properly installed and maintained. In addition, DEP also reviews applications that have been sent to DEC for special permits involving mining operations, timber harvesting, stream crossings and wetland issues. These applications are forwarded to DEP for review and comment as provided for in the DEP/DEC MOU.

Tables 6.1 and 6.2 list project applications received in the Boyds Corner, West Branch, Croton Falls, Cross River and Kensico Reservoir basins for the 2$^{nd}$, 3$^{rd}$ and 4$^{th}$ quarters of 2003. There were no new project applications received in these basins for the first quarter of 2003. The project location are depicted on Figures 6.1 through 6.3.

Table 6.1. Boyds Corner, West Branch, Croton Falls, Cross River and Kensico Reservoirs new projects for 2003.

| Reservoir Basin | Project Name | Town | DEP Approval Required | Project Status as of 12/31/03 |
|---|---|---|---|---|
| Boyds Corner | Mt. Ninham Estates Lot 30/Chavez-Rojas | Kent | Variance | New |
| Boyds Corner | Elof Nilsson Residence | Kent | Variance | New |
| Croton Falls | Stoneleigh Woods | Carmel | SPPP | Incomplete |
| Croton Falls | Plumway Commercial Subdiv. II | Carmel | SPPP | Complete |
| Croton Falls | Carmel Corporate Center | Carmel | SPPP | Incomplete |
| Croton Falls | McLaughlin Drive & Croton Falls Road | Carmel | Variance | Complete |
| Croton Falls | Hidden Acres Lot 1/10 | Carmel | Ind. Residential SPPP | Complete |
| Croton Falls | Stoneleigh Ave.(CR35) Reconstruction | Carmel | Other | No Application |
| Croton Falls | Seven Hills Lake Subdivision Lot 78/ McDonagh | Kent | SPPP | Incomplete |
| Croton Falls | Putnam County Courthouse | Carmel | SPPP | Incomplete |
| Croton Falls | Carmel Sewer District #2 STP | Carmel | SPPP | Approved |
| Croton Falls | T/Southeast Landfill | Southeast | SPPP | Incomplete |
| Kensico | Wyman Subdivision | North Castle | SPPP | Incomplete |
| Kensico | Watercourse Piping/Ivan Kijac Property | North Castle | CPDP | New |
| West Branch | Donald Mitchell Subdivision | Kent | SPPP | New |
| West Branch | South Lake Section A Lot 36/Drana Vukaj | Kent | Variance | New |
| West Branch | Sedgewood Club Lot 15/Nilsson | Kent | Variance | New |
| West Branch | Sedgewood Club Lot 21/Nilsson | Kent | Variance | Incomplete |

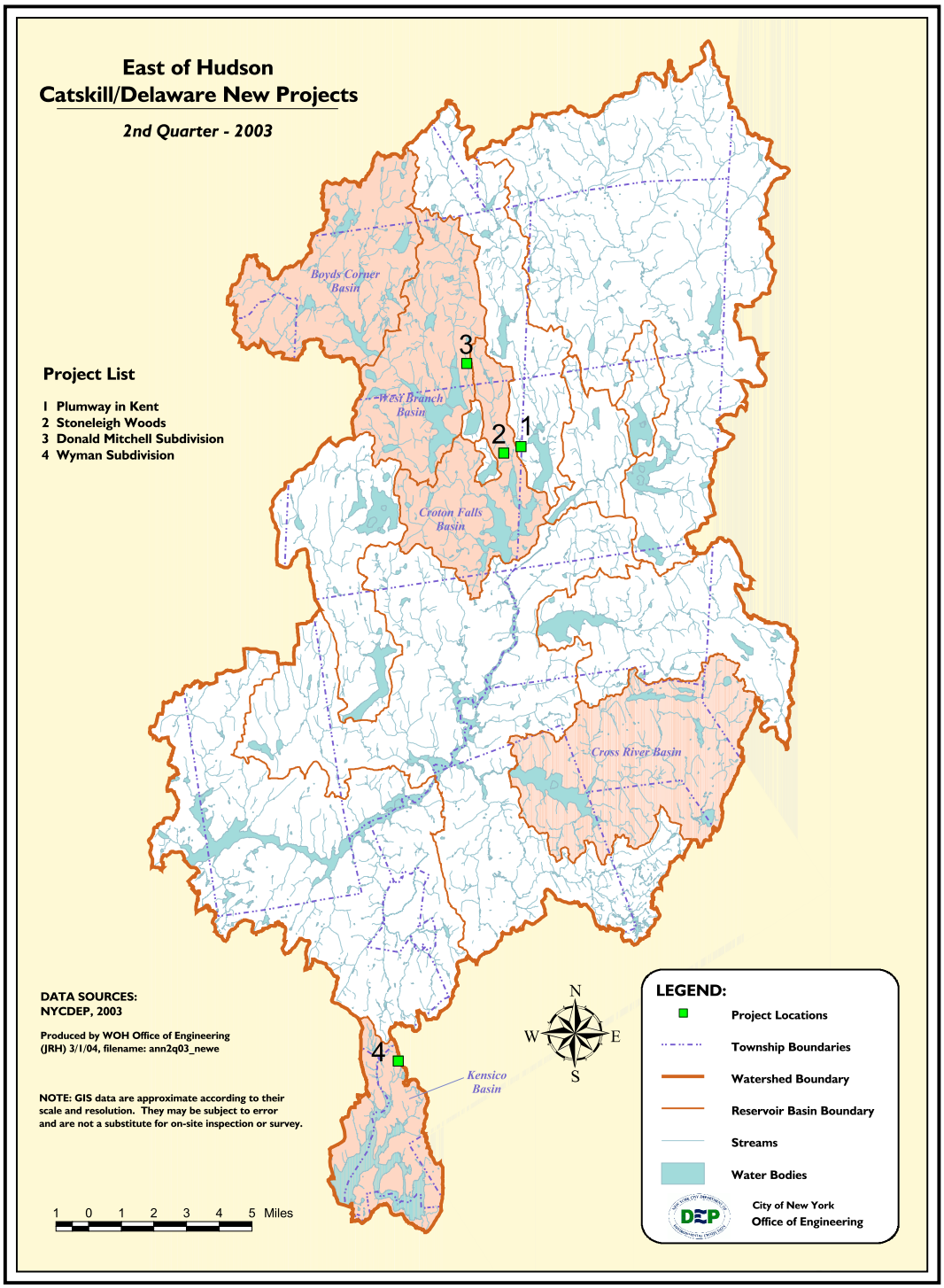


Figure 6.1. East of Hudson Catskill/Delaware new projects, 2nd quarter - 2003.

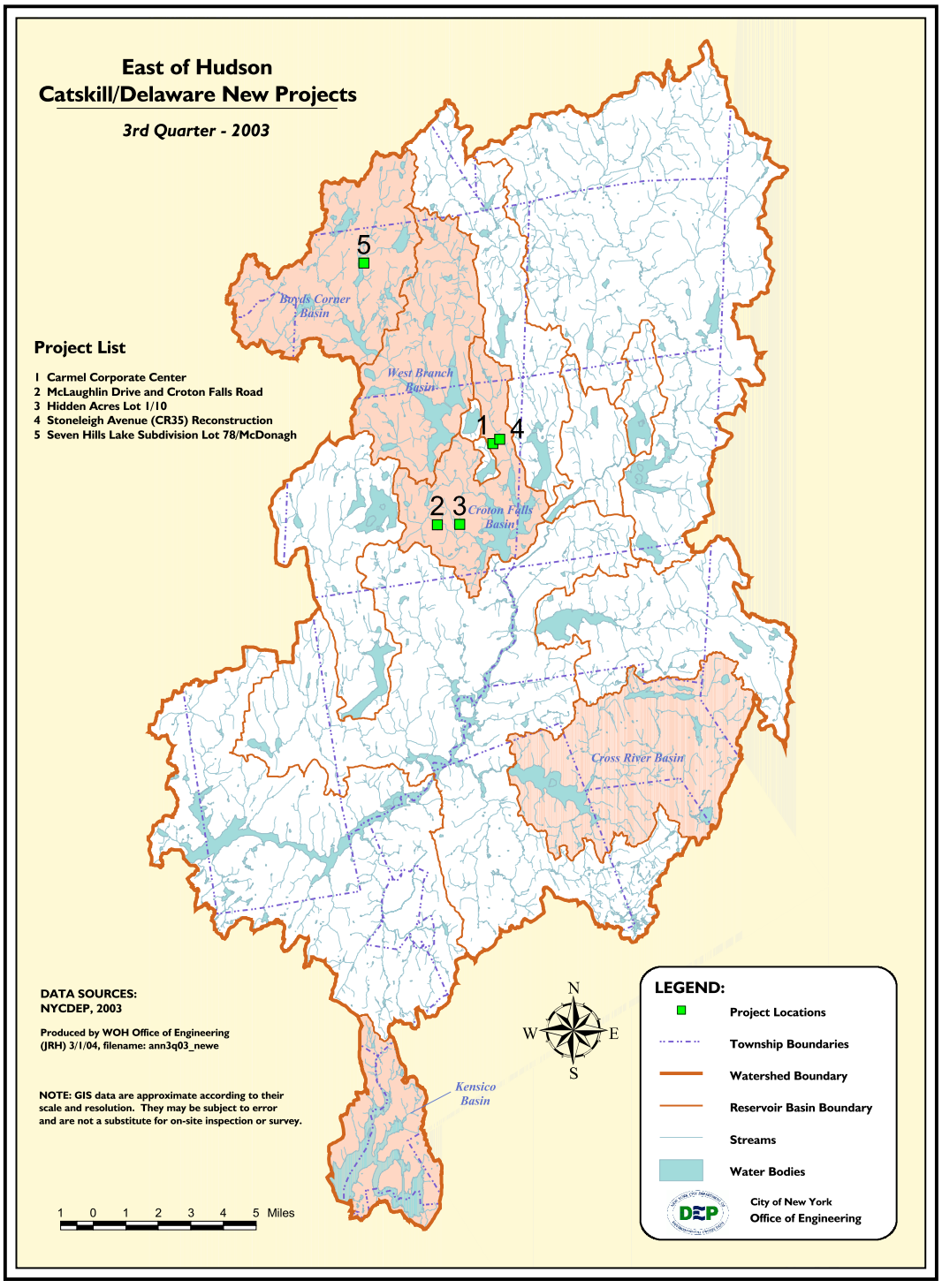


Figure 6.2. East of Hudson Catskill/Delaware new projects, 3rd quarter - 2003.

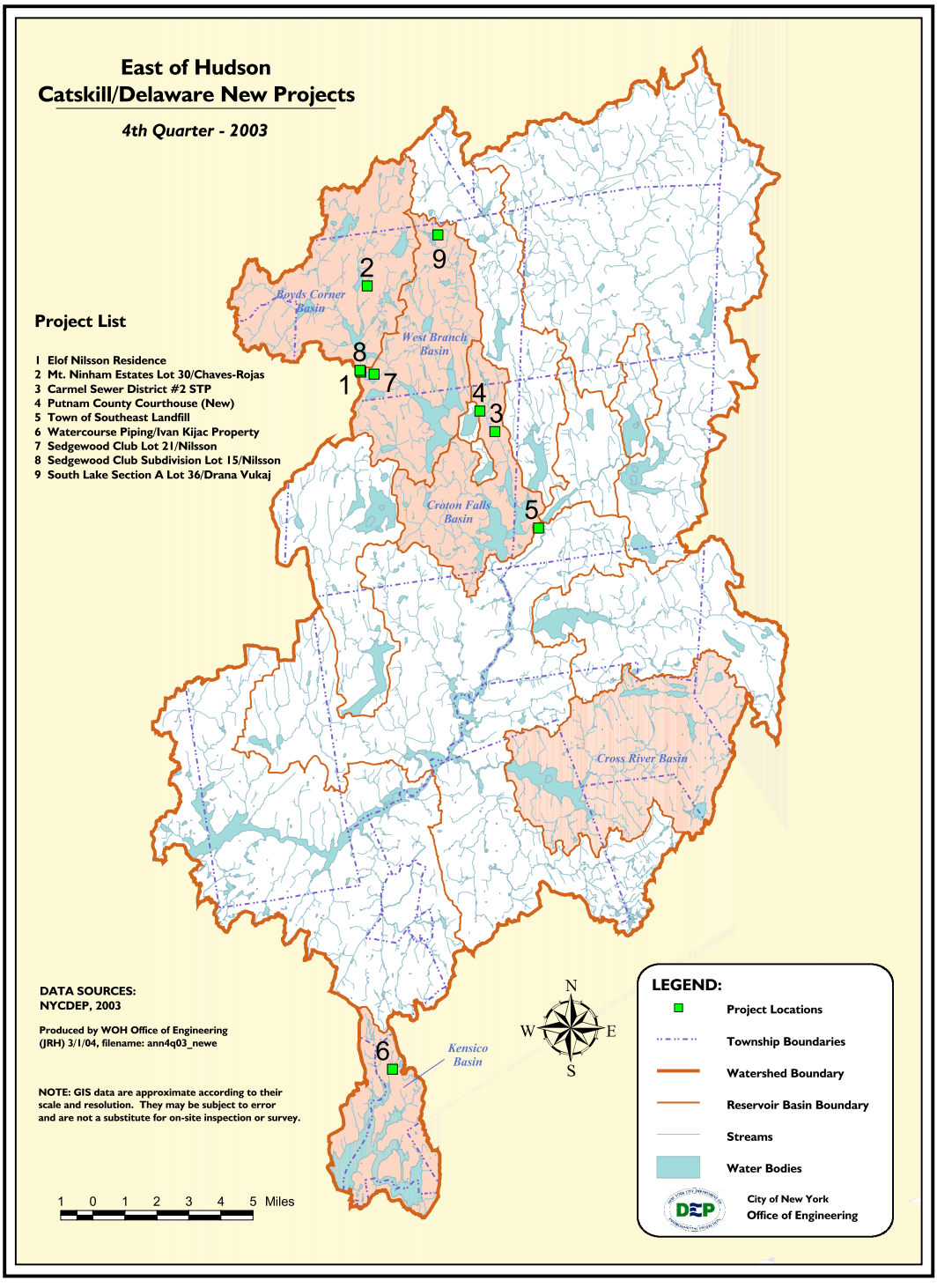


Figure 6.3. East of Hudson Catskill/Delaware new projects, 4th quarter - 2003.

All new individual septic system applications in Kensico, West Branch, Boyd Corners, Croton Falls and Cross River basins are subject to joint review by DEP and the Putnam and Westchester County Health Departments.

Table 6.2. Boyds Corner, West Branch, Croton Falls, Cross River and Kensico Reservoirs individual SSTSs for 2003.

| Reservoir | Town | # of Delegated Septics | # of New Septics | # of Septic Repairs | # of Approvals | # of Constructions |
|---|---|---|---|---|---|---|
| Boyds Corner | Kent | 0 | 7 | 0 | 4 | 0 |
| Cross River | Bedford | 4 | 0 | 0 | 4 | 0 |
| Cross River | Lewisboro | 13 | 3 | 0 | 14 | 0 |
| Cross River | Pound Ridge | 1 | 0 | 0 | 1 | 0 |
| Croton Falls | Carmel | 4 | 2 | 0 | 5 | 0 |
| Croton Falls | Southeast | 2 | 0 | 0 | 2 | 0 |
| Kensico | New Castle | 1 | 2 | 0 | 3 | 0 |
| Kensico | North Castle | 0 | 2 | 0 | 0 | 0 |
| West Branch | Carmel | 0 | 2 | 0 | 2 | 0 |
| West Branch | East Fishkill | 0 | 1 | 0 | 1 | 0 |
| West Branch | Kent | 0 | 7 | 0 | 2 | 0 |
| **Totals** | | **25** | **26** | **0** | **38** | **0** |

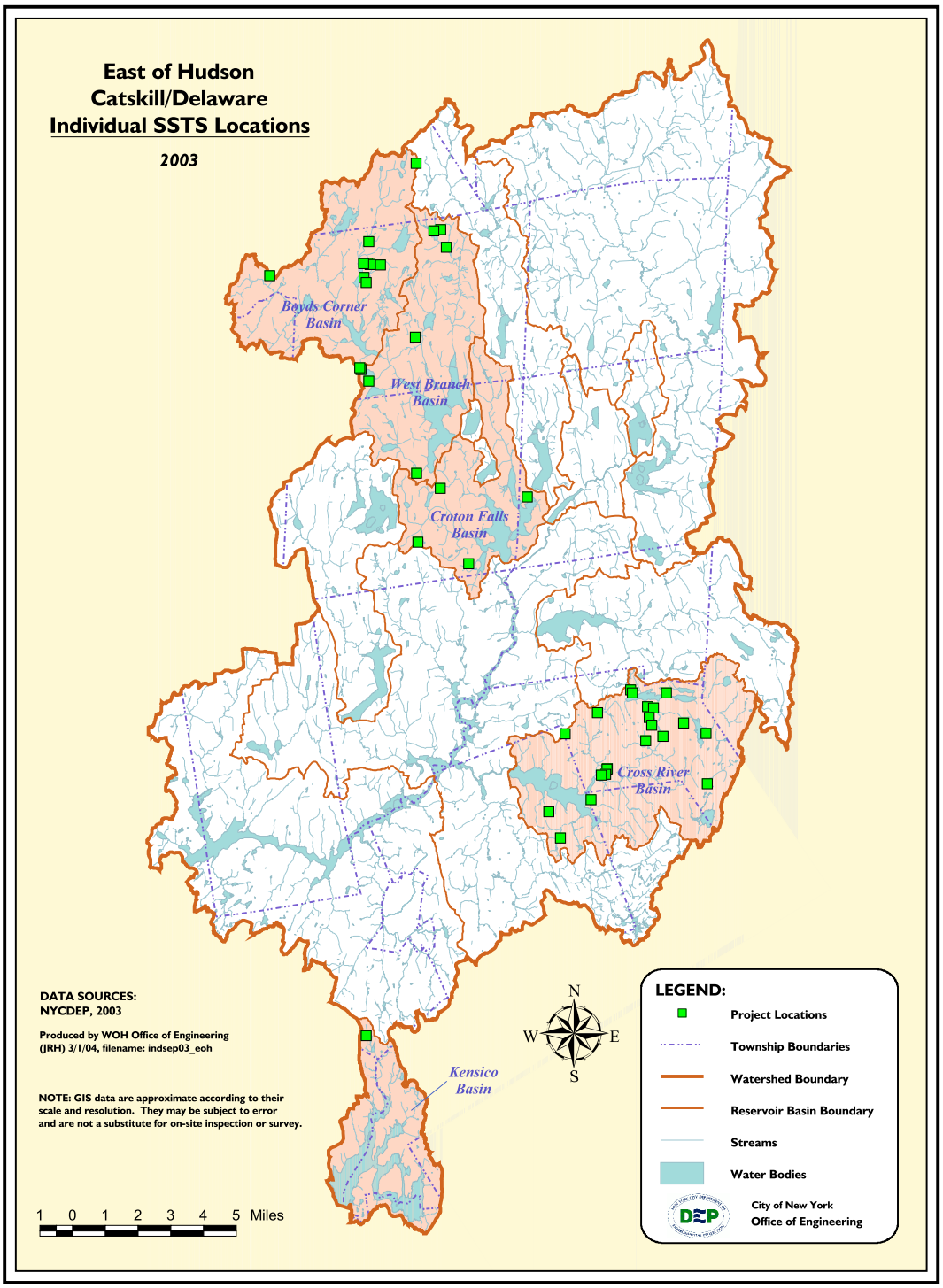


Figure 6.4. East of Hudson Catskill/Delaware individual SSTS locations, 2003.

Table 6.3 lists all projects received in 2003 in the Cannonsville, Pepacton, Rondout, Neversink, Schoharie and Ashokan basins in the Delaware and Catskill systems. The "Other" projects consist of DOT projects, wetland, stream disturbances and mining applications from DEC, timber harvests and Stormwater Retrofit projects. The septic projects listed below are new or repaired commercial, institutional, multi-family or individual advanced aerobic treatment units (ATU) septics or the lot is part of a subdivision. The new, delegated and remediated individual septic systems are listed in Tables 6.4 and 6.5. Figures 6.4 through 6.9 show the locations of these projects.

Table 6.3. Ashokan, Cannonsville, Neversink, Pepacton, Rondout, Schoharie Reservoirs new projects for 2003

| Reservoir Basin | Project Name | Town | DEP Approval Required | Project Status as of 12/31/02 |
|---|---|---|---|---|
| All | OWSL #4242 | Various | SEQRA | Closed |
| Ashokan | Castro Karate Studio | Olive | Comm. SSTS Repl. | Incomplete |
| Ashokan | Catskill Lodge | Shandaken | Comm. SSTS Repl. | Approved |
| Ashokan | Catskill Mountain Cabins (Camp Alert) | Woodstock | New Comm. SSTS/CPDP | Approved |
| Ashokan | Colontonio, William & Donna | Woodstock | Indiv. SSTS Replacement | Approved |
| Ashokan | Cutillo, James | Shandaken | CPDP | Approved |
| Ashokan | Glenford Service Station | Hurley | Comm. SSTS Repl. | Approved |
| Ashokan | Nichols, Daniel & Oksana | Shandaken | Ind. Residential SPPP | Approved |
| Ashokan | Peekamoose Tavern | Shandaken | SSTS/Variance | Incomplete |
| Ashokan | Phoenicia Plaza | Shandaken | Comm. SSTS Repl. | Withdrawn |
| Ashokan | Shandaken Rod & Gun Club | Shandaken | Stream Disturbance | Closed |
| Ashokan | Shandaken Wild Forest Draft Unit Management Plan | Shandaken | Other | Closed |
| Ashokan | Stancarone, Vincent | Woodstock | Comm. SSTS Repl. | Approved |
| Ashokan | Stang, Robert | Woodstock | Other | Closed |
| Ashokan | Sunshine Timrud | Woodstock | Other | Closed |
| Ashokan | Tibet House | Shandaken | Stream Disturbance | Closed |
| Ashokan | Timothy Schussler Woodworking Shop | Shandaken | Comm. SSTS Repl. | Approved |
| Ashokan | Turkl Timber Harvest | Woodstock | Timber Harvest | Closed |
| Ashokan | Windschuh, Marga & Arno | Hurley | Comm. SSTS Repl. | Closed |
| Ashokan | Woodland Valley/Esopus Creek SPPP | Shandaken | SPPP | Approved |
| Cannonsville | Bovina Center SPPP Retrofit | Bovina | Other | Closed |
| Cannonsville | Bruce Street/Pool Area | Walton (V) | Other | Closed |
| Cannonsville | Clark Companies SPPP Retrofit | Delhi | Other | Closed |
| Cannonsville | Clark Management Group | Delhi (V) | SEQRA | Closed |
| Cannonsville | Clark, B. Scott | Delhi | Comm. SSTS Repl. | Approved |
| Cannonsville | DCSWMF - 1st Quarter 2003 EMR | Walton | Other | Closed |

Table 6.3. Ashokan, Cannonsville, Neversink, Pepacton, Rondout, Schoharie Reservoirs new projects for 2003

| Reservoir Basin | Project Name | Town | DEP Approval Required | Project Status as of 12/31/02 |
|---|---|---|---|---|
| Cannonsville | DCSWMF - 2nd Quarter 2003 EMR | Walton | Other | Closed |
| Cannonsville | DCSWMF - 3rd Quarter 2003 EMR | Walton | Other | New |
| Cannonsville | DeLancey SPPP Retrofit | Hamden | Other | Closed |
| Cannonsville | Delaware Opportunities Office Bldg. | Hamden | New Comm. SSTS | New |
| Cannonsville | Eklund Gravel Pit | Stamford | Other | Incomplete |
| Cannonsville | Frank Lamport Stream Disturbance | Stamford (V) | Stream Disturbance | Closed |
| Cannonsville | Kilmer Gravel Mine | Walton | Other | Closed |
| Cannonsville | Moyse, William | Meredith | Ind. Residential SPPP | Approved |
| Cannonsville | Pat Ryan Property | Stamford (V) | Stream Disturbance | Closed |
| Cannonsville | Ploutz Gravel Mine | Hamden | Other | Closed |
| Cannonsville | Programmable Ice Control SPPP Retrofit | Delhi | Other | Closed |
| Cannonsville | Railroad Ave. WS & Storm Sewer Improvements | Stamford (V) | Other | Closed |
| Cannonsville | Rockefeller Gravel Mine | Delhi | Other | Closed |
| Cannonsville | Shields Composting Toilet | Delhi | New Comm. SSTS | Approved |
| Cannonsville | T/Kortright Town Hall | Kortright | SPPP/SSTS | Approved |
| Cannonsville | Vacuum Truck O&M SPPP Retrofit | Delhi | Other | Closed |
| Cannonsville | Village View Apartments | Stamford (V) | SPPP | Incomplete |
| Neversink | Osterhout, Glenn CPD | Neversink | CPDP | Approved |
| Neversink | OWSL #4228 | Neversink | SEQRA | Closed |
| Neversink | OWSL #4229 | Neversink | SEQRA | Closed |
| Neversink | T/Denning Town Hall | Denning | Comm. SSTS Repl. | Closed |
| Neversink | Wintoon Waters, Inc. | Denning | Stream Disturbance | Closed |
| Pepacton | Andel Inn | Andes | Comm. SSTS Repl. | Approved |
| Pepacton | Andes Hotel | Andes | Comm. SSTS Repl. | Incomplete |
| Pepacton | Andes/Kortright SPPP Retrofit | Andes | Other | Closed |
| Pepacton | Arkville Court Mobile Home Park | Margaretville (V) | Sewer Connection | Denied |
| Pepacton | Arnold Property | Roxbury | Stream Disturbance | Closed |
| Pepacton | Charles Ingram Auto Body | Middletown | Other | Closed |
| Pepacton | Citihope International | Andes | Comm. SSTS Repl. | Closed |
| Pepacton | Cronk Lane Stormwater Retrofit | Roxbury | Other | Closed |
| Pepacton | Cutsogeorge, G. Douglas | Middletown | Variance | Complete |
| Pepacton | Grand Gorge Sewer Extension | Roxbury | Sewer Connection/Other | Complete |
| Pepacton | Higgins, Richard | Roxbury | Variance | Denied |
| Pepacton | Maloney, Patrick | Roxbury | CPDP | Withdrawn |
| Pepacton | Minteer B&B | Margaretville (V) | Sewer Connection | Approved |
| Pepacton | Mountain Laurel Garden Apartments | Middletown | SEQRA | Closed |
| Pepacton | OWSL #4222 | Colchester | SEQRA | Closed |

Table 6.3. Ashokan, Cannonsville, Neversink, Pepacton, Rondout, Schoharie Reservoirs new projects for 2003

| Reservoir Basin | Project Name | Town | DEP Approval Required | Project Status as of 12/31/02 |
|---|---|---|---|---|
| Pepacton | OWSL #4223 | Colchester | SEQRA | Closed |
| Pepacton | OWSL #4233 N | Andes | SEQRA | Closed |
| Pepacton | Pelka Diversion Plans | Colchester | CPDP | Approved |
| Pepacton | Profidio Quarry | Colchester | Other | Closed |
| Pepacton | Richard Gulde Property | Middletown | Stream Disturbance | Closed |
| Pepacton | Sidrane B&B | Middletown | Comm. SSTS Repl. | Approved |
| Pepacton | Sky Towers, Inc. | Colchester | SPPP/SSTS/SEQRA | Incomplete |
| Pepacton | Vitale, Edward & Mary | Roxbury | Variance | Denied |
| Rondout | Grahamsville Lab | Neversink | SPPP | Approved |
| Rondout | Campbell Road Stormwater Retrofit | Wawarsing | Other | Closed |
| Rondout | OWSL #4231 N | Denning | SEQRA | Closed |
| Rondout | OWSL #4239 | Neversink | SEQRA | Closed |
| Rondout | Rondout Effluent Chamber Upgrade | Wawarsing | Comm. SSTS Repl. | Approved |
| Rondout | Sacco, Anthony | Neversink | New Indiv. SSTS | Approved |
| Schoharie | Amy's Take Away | Hunter | SSTS/SPPP/Variance | Approved |
| Schoharie | Beyer, Karen | Lexington | Variance | Complete |
| Schoharie | Buckskin Realty, Lot #16 | Windham | Variance/SSTS | Denied |
| Schoharie | Buckskin Realty | Windham | Variance/SSTS | Denied |
| Schoharie | Bunce Subdivision | Windham | Sewer Connection/Other | Complete |
| Schoharie | Corsie, Richard Lot #1 | Jewett | New Indiv. SSTS | Closed |
| Schoharie | Corsie, Richard Lot #2 | Jewett | New Indiv. SSTS | Approved |
| Schoharie | Corsie, Richard Lot #3 | Jewett | New Indiv. SSTS | Approved |
| Schoharie | Corsie, Richard Lot #4 | Jewett | New Indiv. SSTS | Incomplete |
| Schoharie | Cumberland Farms - Pizza Shop | Hunter (V) | Comm. SSTS Repl. | Closed |
| Schoharie | Galiano, Ronald | Ashland | Variance | Approved |
| Schoharie | GCSWCD - Lanesville Project | Hunter | Stream Disturbance/SPPP | Closed |
| Schoharie | Godlewski, Lilla & Maciek | Jewett | Indiv. SSTS Replacement | Approved |
| Schoharie | Greene County Highway Garage | Hunter | New Comm. SSTS | Approved |
| Schoharie | Hickory Hill Road SPPP Retrofit | Windham | Other | Closed |
| Schoharie | Hoff, Tom | Windham | CPDP | Approved |
| Schoharie | Kaatskill Mtn. Club (Frosty Land, Inc.) | Hunter (V) | SPPP | Incomplete |
| Schoharie | Kossakowska, Anna | Jewett | New Comm. SSTS | Approved |
| Schoharie | Lubitz, Robert | Ashland | CPDP | Approved |
| Schoharie | Maplecrest Lodge, LLC | Windham | SPPP/SSTS | Approved |
| Schoharie | Maynard, Jordon (Earlyon, Inc.) | Hunter | Comm. SSTS Repl. | Closed |
| Schoharie | Mountain Drive-In Theater | Jewett | Comm. SSTS Repl. | Closed |
| Schoharie | Nagler, Stephen | Windham | New Comm. SSTS | Approved |
| Schoharie | North Ridge Estates - Lots 25/26 | Windham | New Comm. SSTS | Approved |

Table 6.3. Ashokan, Cannonsville, Neversink, Pepacton, Rondout, Schoharie Reservoirs new projects for 2003

| Reservoir Basin | Project Name | Town | DEP Approval Required | Project Status as of 12/31/02 |
|---|---|---|---|---|
| Schoharie | North Ridge Estates - Lots 31/32 | Windham | New Comm. SSTS | Approved |
| Schoharie | North Ridge Estates - Lots 33/34 | Windham | New Comm. SSTS | Approved |
| Schoharie | North Ridge Estates - Lots 35/36 | Windham | New Comm. SSTS | Approved |
| Schoharie | North Ridge Estates - Lots 37/38 | Windham | New Comm. SSTS | Approved |
| Schoharie | NYSDOT - Bridge Cleaning Rt. 23 | Prattsville | Other | Closed |
| Schoharie | Park Lane SPPP Retrofit | Tannersville (V) | Other | Closed |
| Schoharie | Prattsville Floodplain Restoration | Prattsville | Stream Disturbance/SPPP | Closed |
| Schoharie | Quackenbush, (Alpine Garden Village) | Windham | New Comm. SSTS | Closed |
| Schoharie | Quinn, John | Hunter | Variance | Incomplete |
| Schoharie | Schiele, Linda | Hunter | Indiv. SSTS Replacement | Closed |
| Schoharie | Spirito, Paulette Hughes - Dog Kennel | Windham | New Comm. SSTS | Approved |
| Schoharie | T/Hunter Commerce Park Project | Hunter | SEQRA | Closed |
| Schoharie | Torah Foundation/Gellman | Hunter | Comm. SSTS Repl. | Approved |
| Schoharie | Wayside Park | Hunter | SEQRA | Closed |
| Schoharie | Windham Country Club | Windham | Stream Disturbance | Closed |
| Schoharie | Windham Ventures SPPP Retrofit | Windham | Other | Closed |
| Various | Revision of the Catskill Park State Land Master Plan | Various | Other | Closed |

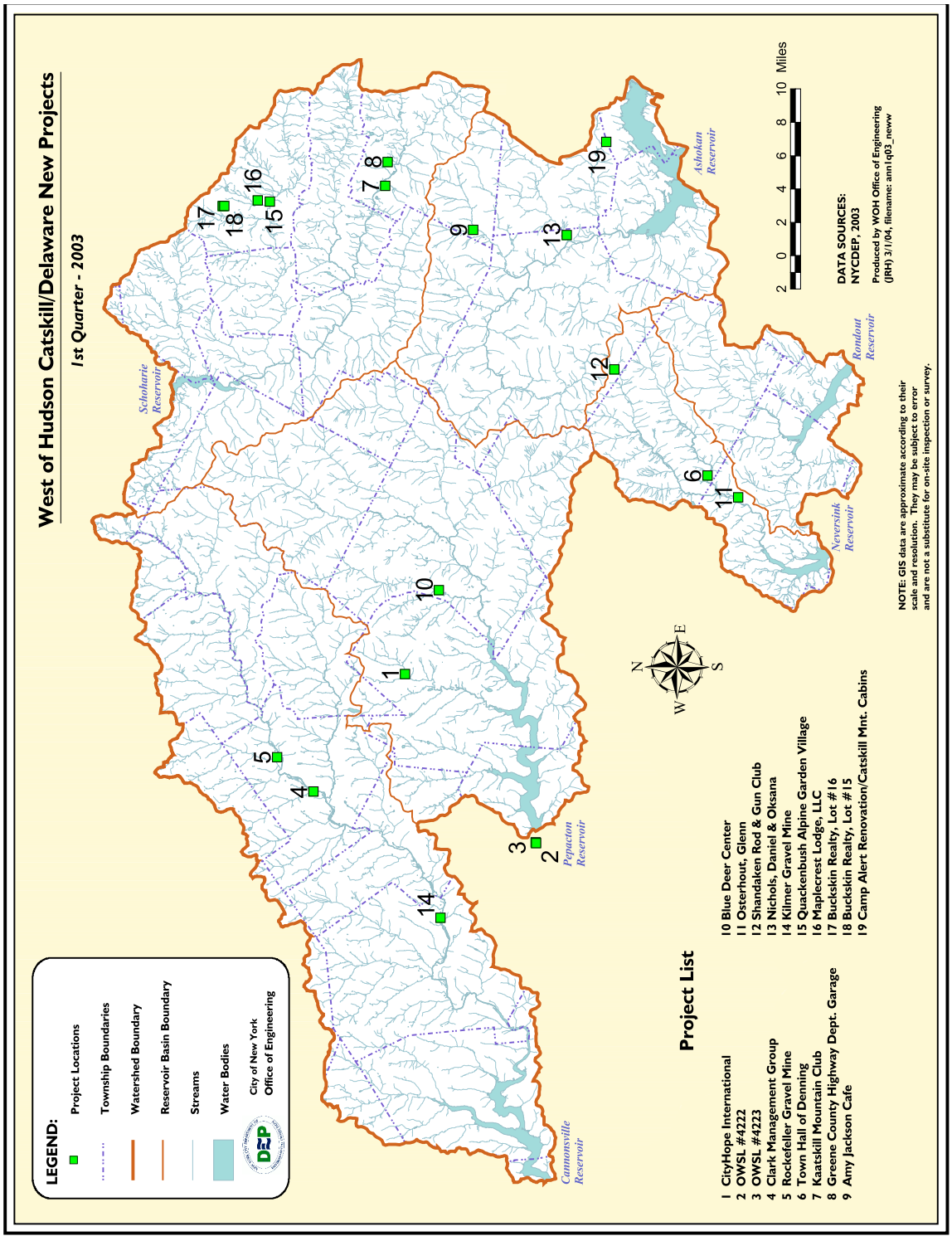


Figure 6.5. West of Hudson Catskill/Delaware new projects, 1st quarter - 2003.

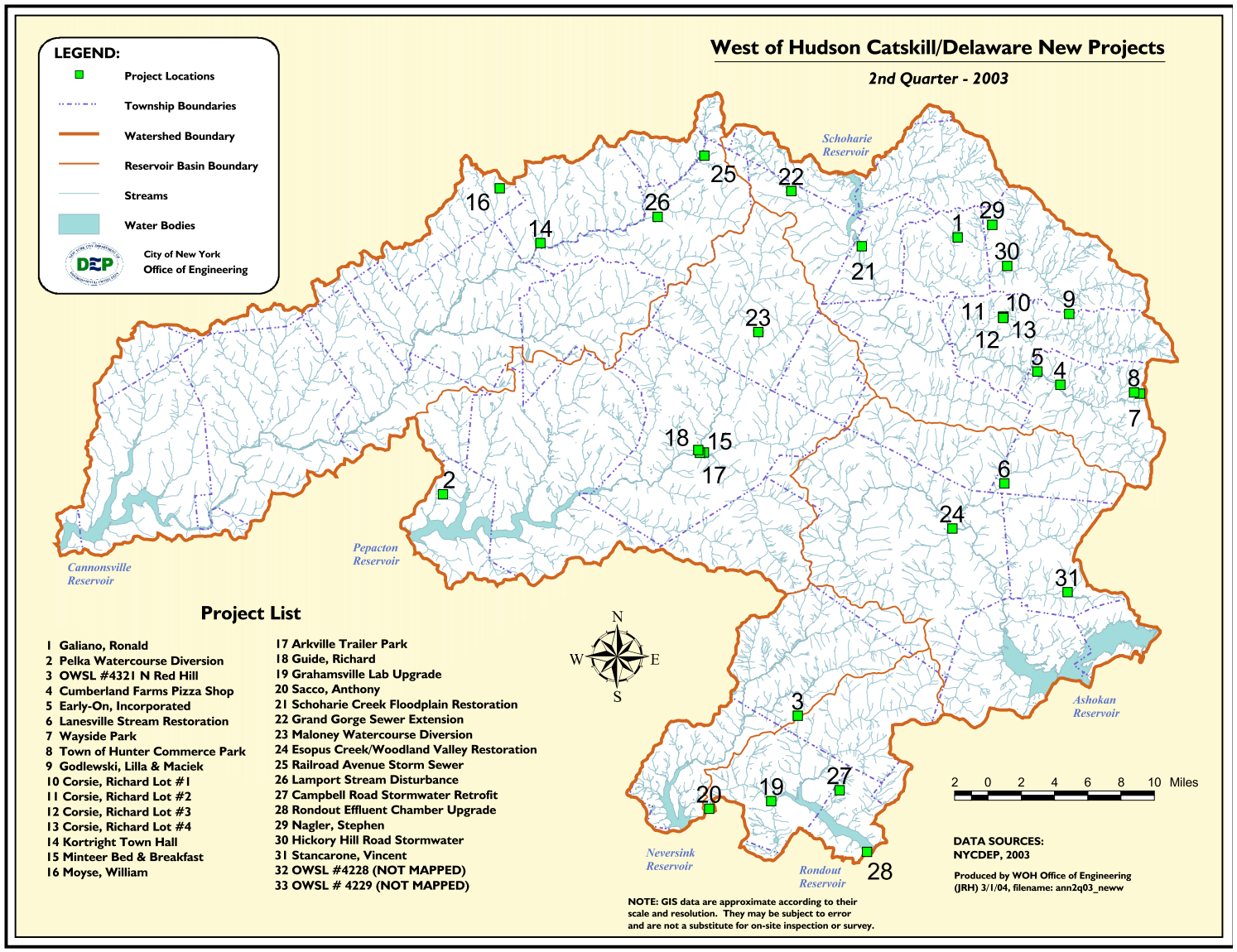


Figure 6.6. West of Hudson Catskill/Delaware new projects, 2nd quarter - 2003.

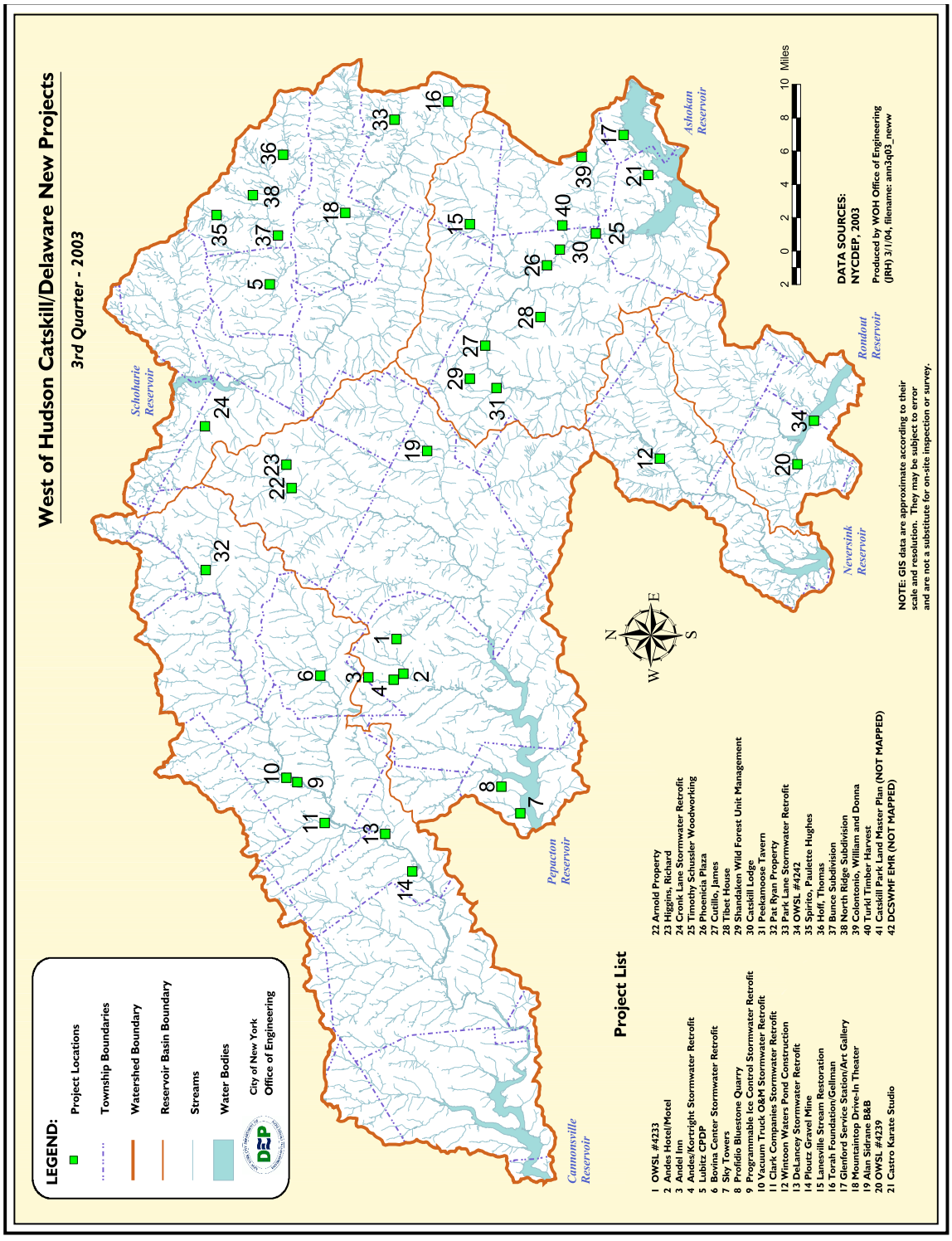


Figure 6.7. West of Hudson Catskill/Delaware new projects, 3rd quarter - 2003.

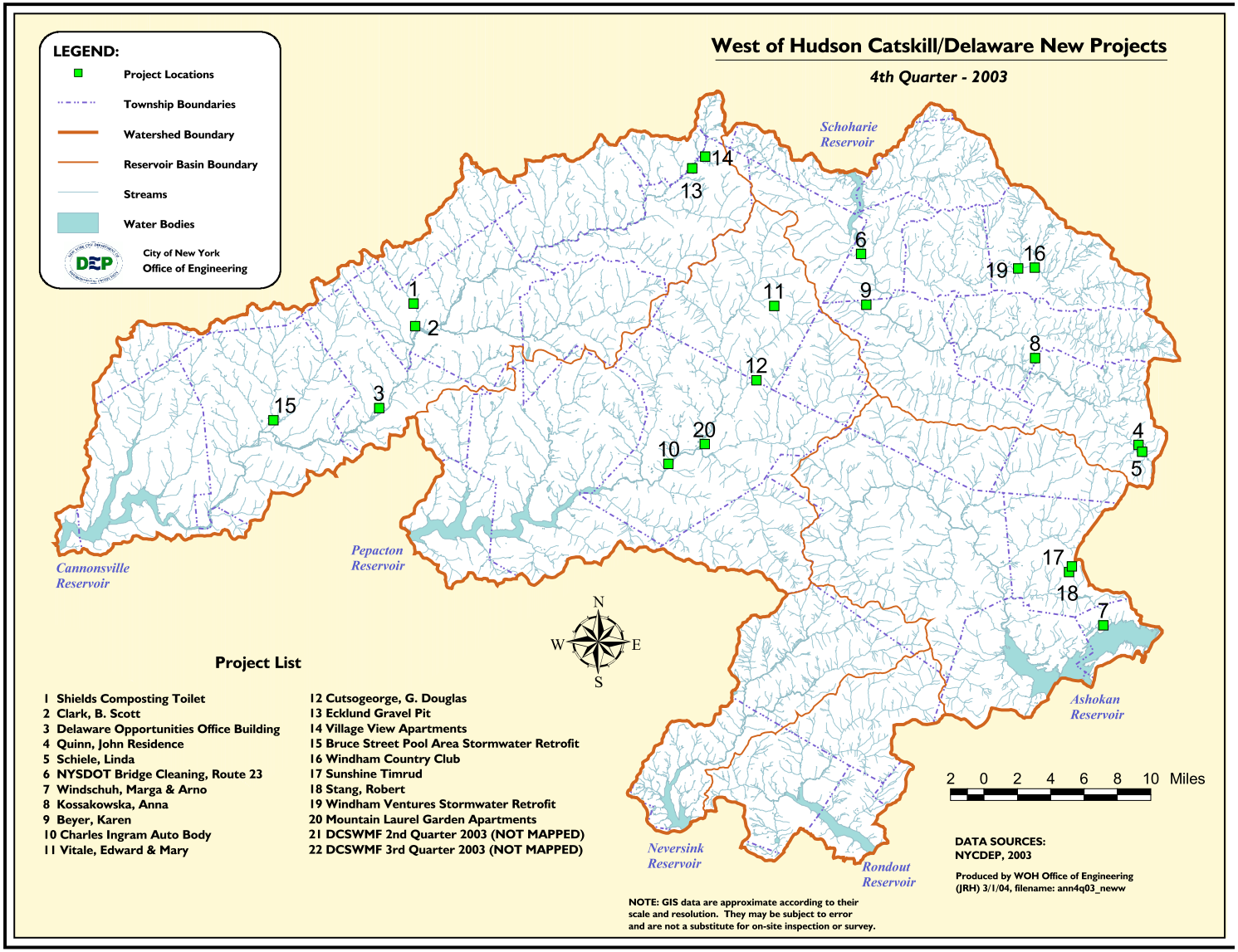


Figure 6.8. West of Hudson Catskill/Delaware new projects, 4th quarter - 2003.

Table 6.4. Ashokan and Schoharie Reservoirs individual SSTSs for 2003

| Reservoir | Town | # of Delegated Septics | # of New Septics | # of Septic Repairs | # of Approvals | # of Constructions |
|---|---|---|---|---|---|---|
| Ashokan | Hurley | 5 | N/A | 9 | 11 | 5 |
| Ashokan | Olive | 14 | N/A | 25 | 33 | 22 |
| Ashokan | Shandaken | 22 | N/A | 10 | 11 | 15 |
| Ashokan | Woodstock | 9 | N/A | 6 | 7 | 7 |
| | | | | | | |
| Schoharie | Ashland | N/A | 9 | 3 | 10 | 9 |
| Schoharie | Conesville | N/A | 7 | 1 | 8 | 5 |
| Schoharie | Gilboa | N/A | 2 | 0 | 2 | 4 |
| Schoharie | Hunter | N/A | 13 | 0 | 12 | 3 |
| Schoharie | Hunter (V) | N/A | 0 | 0 | 0 | 0 |
| Schoharie | Jewett | N/A | 21 | 1 | 21 | 12 |
| Schoharie | Lexington | N/A | 17 | 1 | 15 | 10 |
| Schoharie | Prattsville | N/A | 10 | 3 | 11 | 7 |
| Schoharie | Roxbury | N/A | 1 | 0 | 1 | 2 |
| Schoharie | Stamford | N/A | 0 | 0 | 0 | 0 |
| Schoharie | Tannersville (V) | N/A | 0 | 0 | 0 | 0 |
| Schoharie | Windham | N/A | 20 | 1 | 26 | 17 |
| **Totals** | | **50** | **100** | **60** | **168** | **118** |

Table 6.5. Cannonsville, Pepacton, Rondout, Neversink Reservoirs individual SSTSs for 2003.

| Reservoir | Town | # of Delegated Septics | # of New Septics | # of Septic Repairs | # of Approvals | # of Constructions |
|---|---|---|---|---|---|---|
| Cannonsville | Bovina | N/A | 8 | 0 | 8 | 3 |
| Cannonsville | Delhi | N/A | 6 | 4 | 8 | 7 |
| Cannonsville | Franklin | N/A | 2 | 0 | 2 | 1 |
| Cannonsville | Hamden | N/A | 7 | 4 | 9 | 6 |
| Cannonsville | Harpersfield | N/A | 4 | 0 | 4 | 1 |
| Cannonsville | Hobart (V) | N/A | 0 | 0 | 0 | 1 |
| Cannonsville | Jefferson | N/A | 2 | 0 | 2 | 1 |
| Cannonsville | Kortright | N/A | 2 | 1 | 4 | 2 |
| Cannonsville | Masonville | N/A | 2 | 0 | 1 | 1 |
| Cannonsville | Meredith | N/A | 4 | 1 | 5 | 2 |
| Cannonsville | Sidney | N/A | 0 | 0 | 2 | 0 |
| Cannonsville | Stamford (V) | N/A | 3 | 1 | 4 | 2 |
| Cannonsville | Tompkins | N/A | 5 | 1 | 7 | 5 |
| Cannonsville | Walton | N/A | 16 | 7 | 24 | 14 |

Table 6.5. Cannonsville, Pepacton, Rondout, Neversink Reservoirs individual SSTSs for 2003.

| Reservoir | Town | # of Delegated Septics | # of New Septics | # of Septic Repairs | # of Approvals | # of Constructions |
|---|---|---|---|---|---|---|
| Neversink | Denning | 1 | N/A | 2 | 2 | 0 |
| Neversink | Hardenburgh | N/A | 0 | 0 | 0 | 0 |
| Neversink | Neversink | N/A | 3 | 4 | 6 | 3 |
| Pepacton | Andes | N/A | 10 | 7 | 19 | 11 |
| Pepacton | Bovina | N/A | 0 | 0 | 0 | 1 |
| Pepacton | Colchester | N/A | 3 | 0 | 3 | 2 |
| Pepacton | Fleischmann's | N/A | 0 | 0 | 1 | 1 |
| Pepacton | Halcott | N/A | 3 | 0 | 3 | 2 |
| Pepacton | Hamden | N/A | 1 | 0 | 2 | 0 |
| Pepacton | Hardenburgh | 5 | N/A | 0 | 1 | 1 |
| Pepacton | Middletown | N/A | 25 | 5 | 32 | 14 |
| Pepacton | Roxbury | N/A | 13 | 1 | 13 | 8 |
| Pepacton | Wawarsing | 0 | N/A | 0 | 0 | 0 |
| Rondout | Denning | 0 | N/A | 1 | 1 | 0 |
| Rondout | Fallsburg | N/A | 2 | 1 | 1 | 1 |
| Rondout | Hardenburgh | 0 | N/A | 0 | 0 | 0 |
| Rondout | Neversink | N/A | 7 | 21 | 29 | 13 |
| Rondout | Rochester | 1 | N/A | 0 | 1 | 0 |
| Rondout | Wawarsing | 0 | N/A | 5 | 5 | 6 |
| **Totals** | | **7** | **128** | **66** | **199** | **109** |

* DEP has an agreement with Ulster County to review new individual SSTS applications

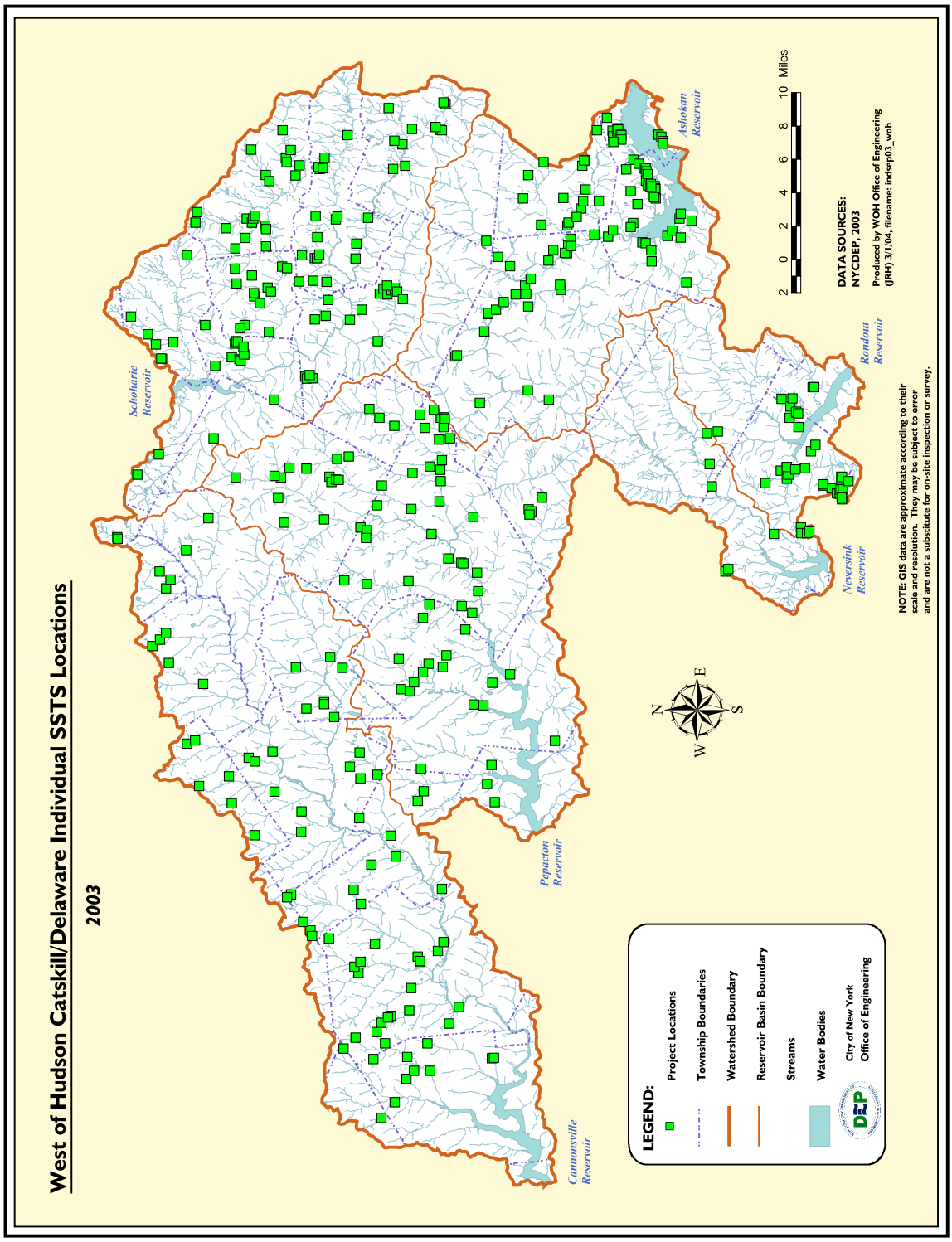


Figure 6.9. West of Hudson Catskill/Delaware individual SSTS locations - 2003.

### 6.1.2 Enforcement Activities

Over the course of the past decade, New York City's comprehensive watershed protection program has evolved dramatically. DEP has used the results of scientific and engineering studies to focus on protection efforts. DEP also now has extensive contracts for watershed protection programs with organizations such as the Watershed Agricultural Council and the Catskill Watershed Corporation, which has changed the way the City protects its watershed. As the program has evolved, DEP's organizational structure has changed to better focus on watershed protection resources. In light of these changes, DEP re-evaluated the functions performed by the Protection Section, and determined that those functions could be carried out more efficiently and effectively if Protection staff was reallocated to other existing units.

Protection Section staff was reassigned to three Bureau of Water Supply Divisions in January 2003: Engineering, Operations, and Watershed Lands & Community Planning (WL&CP). Staff reassigned to WL&CP will focus on the management and protection of City-owned water supply lands. As of December 2003, these lands totaled approximately 112,000 acres. Duties of new staff in the WL&CP now include inspection and boundary maintenance on all City lands and conservation easements; greater involvement with overseeing recreational activities; preparing properties for purchase by the City; checking public access and boating permits; referring events to DEP Police; checking properties for and resolving encroachments; issuing and validating boating permits; and steam cleaning boats.

Staff reassigned to the Engineering Division are responsible for reviewing applications, conducting site visits, witnessing soil tests, and inspecting construction of all new individual septic systems in the Catskill and Delaware Districts. On a limited basis, this Section also performs discovery and confirmation of septic failures, issues Notices of Violation (NOV), pursues enforcement actions on failed subsurface sewage treatment systems, and refers other potential WR&R violations to the Engineering Division and criminal activity to the DEP Police. Additionally, these activities are coordinated with DEP Legal and Corporation Counsel, local County Health Departments, local building inspectors, and the Catskill Watershed Corporation in the MOA program areas.

As part of the reorganization of the Protection Section, the DEP Police have taken a larger role in patrolling for and detecting violations of the WR&R. In recent years, DEP has expanded the Police force from approximately 75 officers to more than 200 officers. Police officers are specially trained to enforce federal, State and local laws. The Police Division's Environmental Police Academy trains environmental police officers to the unique mission of DEP. The Environmental Police Academy is accredited by The New York State Division of Criminal Justice Services and offers not only the required 510 hours of mandatory state police training but also offers 320 hours of training in environmental law and sciences and 170 hours of practical field training in environmental and infrastructure protection. The Environmental Police Academy also conducts, coordinates and documents in service training for veteran environmental police officers in order to train

and update members in state of the art techniques and new technologies. The DEP Police coordinate closely with other DEP divisions to be aware of ongoing construction projects in the watershed and to ensure that areas of special concern are closely monitored.

In 2003, the DEP Police:

- Completed 19,000 hours of training
- Conducted 3,744 preliminary investigations
- Conducted 168 long-term investigations related to pollution, crime or terrorism
- Conducted 53 suspicious incident investigations related to terrorism
- Patrolled 2,000,000 miles
- Conducted 260,000 physical security inspections

Also in 2003, the DEP Police made 134 arrests, issued 1,047 summonses and served 146 Notices of Warning for violations of the New York State Penal Law, New York State Environmental Conservation Law, New York State Vehicle & Traffic Law, New York City rules and regulations and various other state and local statutes.

In 2003, WL&CP, Engineering and the DEP Police accomplished the following (the East of Hudson figures are watershed wide, and include both the Boyds Corner, West Branch, Croton Falls, Cross River and Kensico, and all Croton System Reservoirs, aqueducts, and watershed areas):

Table 6.6. 2003 WL&CP Activities.

| WORKLOAD ITEM DESCRIPTION | East of Hudson | Catskill | Delaware |
|---|---|---|---|
| Properties fully inspected (acres) | 5,676 | 8,792 | 5,737 |
| Properties partially inspected (#) | 240 | 503 | 171 |
| Miles of boundary painted | 74 | 110 | 64 |
| Miles of boundary posted | 65 | 148 | 45 |
| Site visits (#) | 31 | 8 | 13 |
| Pre-closing site inspections (acres) | 120 | 1,302 | 301 |
| Debris/hazards identified (#) | 22 | 44 | 41 |
| Debris/hazard cleaned/resolved | 23 | 25 | 26 |
| Encroachments identified | 16 | 30 | 28 |
| Encroachments referred (#) | 3 | 3 | 20 |
| Encroachments resolved | 16 | 11 | 7 |
| Road/access areas secured (#) | 13 | 10 | 6 |
| Contacts with NYC neighbors (#) | 215 | 141 | 88 |

Table 6.6. 2003 WL&CP Activities.

| WORKLOAD ITEM DESCRIPTION | East of Hudson | Catskill | Delaware |
|---|---|---|---|
| Contacts with NYC Recreational users (#) | 188 | 1,715 | 1,228 |
| Number of non-compliant boats removed (#) | 645 | 100 | 60 |
| Number of boats steam-cleaned (#) | 574 | 59 | 113 |

Table 6.7. 2003 Engineering Activities.

| WORKLOAD ITEM DESCRIPTION | East of Hudson | Catskill | Delaware |
|---|---|---|---|
| New, Remediated or Delegated Onsite SSTSs Construction Approved | N/A | 118 | 109 |
| New, Remediated or Delegated Onsite SSTSs Design Approved | 38 | 168 | 199 |
| NOVs/NOFs Issued | 5 | 52 | 16 |

### 6.1.3 Delegation Agreements

Westchester, Putnam and Ulster County Health Departments continued to perform reviews of septic systems in accordance with the Delegation Agreements. DEP received documentation concerning the review of 82 delegated systems in the Catskill and Delaware systems in the East and West of the Hudson during the calendar year 2003.

### 6.1.4 Winter Road Deicer Policy and Protection Development

In April, 2002, the Watershed Inspector General's (WIG) Office of the NYS Attorney General posted an advisory on their website concerning total phosphorus concentrations in liquid highway deicing materials then beginning to come in to widespread use by Town Departments of Public Works (DPWs). This advisory was created by a multi-agency work group composed of representatives from WIG, DEC, DOH, DOT, and DEP. Through this work group, DEP learned that most roads are maintained by local town DPWs rather than by New York State or by the counties, and practices and materials used vary widely. DEP has set aside funding to analyze new liquid deicer products as they become available. To date, one manufacturer and one town DPW has approached DEP to have deicers analyzed for total phosphorus and compared to the levels suggested in the WIG's advisory (Endorsed: products that contain 50 ppm TP or less, Discouraged: products that contain more than 100 ppm, and Avoid: any deicer that contains greater than 250 ppm). DEP has also collected samples from selected DPW stockpiles at the end of the winter season for analysis of TP and other compounds.

In 2002, the WIG's office sent a survey form to Town DPWs and requested that they provide information on their usage of winter highway maintenance materials. Only two survey forms were forwarded to DEP for entry into a proposed data base. Current plans are to re-issue the survey form with a reminder that DEP and other agencies still hope to track type and quantities of winter highway maintenance materials being used in the watershed.

## 6.2 WWTP Inspection Program

### 6.2.1 Wastewater Treatment Facility Compliance Inspection Program

At each surface discharging wastewater facility that operates on a year-round basis, DEP conducts four inspections, one for each calendar quarter. At seasonal surface discharging facilities, a minimum of two inspections per year is conducted during the facility's operating season. Similarly, at least two inspections per year are conducted at non-contact cooling water discharges to surface waters. Treated industrial waste discharges to groundwater, via ground surface application, are inspected four times per year.

Exclusive of the new but unfinished New Infrastructure Program (NIP) WWTPs, a total of 42 WOH wastewater treatment facilities were inspected on a regular schedule. Of those, 32 facilities are permitted for year-round discharge and 10 are permitted for seasonal discharge. Of this overall total, four are wastewater treatment facilities permitted to discharge to groundwater. These are the Hamlet of Chichester, Frog House Restaurant, Mountainside Farms, and Hanah Country Club. Three other discharges are industrial non-contact cooling water discharges. These are Ultra Dairy, DMV and Kraft Non-Contact Cooling Water dischargers. 216 regularly scheduled inspections of WWTPs were conducted in the Catskill/Delaware watershed in 2003. This does not include the approximately 100 inspections related to the DEP's upgrade construction work.

In addition to regular inspections, DEP conducts follow-up inspections when necessary. If it is determined at the initial inspection that non-complying conditions exist and corrective action is necessary, a follow-up inspection is scheduled to ensure that corrective actions are implemented and that an effort is being made to return the facility to compliance or to correct operational deficiencies. Also, following an enforcement initiative, staff may periodically conduct a follow-up unannounced visit to ensure that the facility is continuing in its efforts to remain in compliance. Out of the 216 inspections conducted last year approximately 30 of them were follow-up inspections, which were made at various facilities throughout the year.

Wastewater treatment plants in the Catskill and Delaware watersheds continue to show improvement in compliance with their State Pollutant Discharge Elimination System (SPDES) permits over the past year, in large part due to DEP's Wastewater Treatment Facility Compliance Inspection Program. Facilities showing notable improvement in compliance records in 2003 include Onteora High School, Roxbury Run Village and Whistletree Development.

Another facility, Regis Hotel, which has suffered from chronic and acute SPDES permit violations due to its failed and antiquated sand filter system, received a mobile treatment unit in July 2003. Since the unit included an enhanced ultra-violet disinfection system, DEP was able to fund the mobile treatment unit, which combined sand filtration, micro filtration and carbon filtration, at a lower cost than an UV-only stand-alone upgrade. For the first time in many years, the hotel consistently met its SPDES permit parameters.

Latvian Church Camp, which was permitted for a surface discharge, was completely converted to subsurface and fully functionally completed before the commencement of its 2003 season. It is no longer a WWTP and will not be included in the DEP's inspection program.

Camp L'Man Achai was again subject to a "no surface discharge" requirement for its entire 2003 operating season. The camp continued to hold-and-haul its entire WWTP flow. DEP staff met with DOH and camp representatives in April 2003, to discuss operational and maintenance concerns the camp had during the previous year. More diligent O&M oversight was agreed to by the DEP and DOH for the 2003 season. The facility upgrade plans were approved and construction commenced late November. It is anticipated that functional completion will be granted prior to the July 2004 camp startup.

The Roxbury Run Village upgrade plans were also approved early in 2003, and construction commenced early June. Functional completion was granted in December 2003. Improvements were also made, using SPDES funds to address post-aeration and equalization issues. This has helped the plant perform better than usual, although the facility still suffers from excessive inflow and infiltration.

Notification by the inspection program staff, and in one case directly by DEP sampling staff, caused several facilities to take immediate corrective action during specific incidents of acute operational or equipment failures. This resulted in avoidance or elimination of non-compliant discharges. These facilities included Whistletree Development, Mountain View Estates, Onteora High School, Mountainside Restaurant, Elka Park, (V) Delhi and (V) Hobart.

Several facilities had construction remediation or improvements made in response to compliance actions initiated by DEP. During and after construction work on any facility, DEP visits the facility to observe the work and to ensure the construction is in accordance with approved plans. Approximately 10 non-upgrade program construction inspections were performed in 2003.

DEP also visits facilities to meet with owners and/or operators to address special problems and to offer operating suggestions. In addition, DEP labs conduct special analyses to help identify reasons for actual or potential violations by determining if the collection of special samples in the treatment process train is needed. DEP conducted approximately 10 such visits in 2003. Many of

these facilities involved those WWTPs, which receive peak flow and high organic loading during the busy ski weekends. These are: Ski Windham, Liftside, Hunter Highlands, Forester Motor Lodge and Whistletree Development.

In 2003, five Compliance Assistance Conferences were held between DEP and facility owners. No NOVs were issued. There were two referrals to DOH for assistance in implementing enforcement actions.

In addition, DEP coordinates enforcement activities with DEC through the quarterly Watershed Enforcement Coordination Committee (WECC) meetings. At these meetings the status of watershed WWTPs is discussed and steps are taken to ensure that adequate enforcement activities are pursued. Staff from EPA and DOH also participates in the WECC.

The East of Hudson (EOH) Regulatory Compliance and Inspection Group (RCI) is responsible for the inspection, compliance evaluation and enforcement efforts for all point source pollution discharges within the EOH watershed including: wastewater treatment plants, wastewater collection systems, groundwater remediation systems, landfills and oil/water separators. RCI ensures that measures are taken to ensure compliance with the SPDES permits issued to the 72 WWTPs that discharge into the EOH watershed. Verbal warnings, written warnings, compliance conferences, Notices of Violation (NOV), Clean Water Act litigation and other enforcement actions are conducted when repetitive, abnormal operating conditions exist at the WWTPs. RCI conducted 485 quarterly compliance, emergency response and WWTP upgrade construction inspections in 2003.

Following is a summary of the WWTP and collection systems inspections conducted within the West Branch, Croton Falls, and Cross River basins. There are nine WWTPs that discharge effluent into these basins. However, there are no WWTPs in the Kensico and Boyds Corner Basins.

The Waccabuc Country Club, the City owned Mahapac plant, the Lewisboro Elementary School, Lake Plaza and the Carmel Sewer District #2 facilities were all operating satisfactorily during 2003. Minor problems, such as low pH readings or low chlorine residuals were corrected after recommendations made by the RCI staff.

Clear Pool Camp experienced fecal coliform exceedances during the 2003 season. The operator stated that flow through the facility is minimal, and at times, filtered effluent will not discharge from the chlorine contact tank for an extended period of time. RCI advised the operator to monitor the chlorine residual in the contact tank and make adjustments as necessary, and recommended that the operator properly clean the chlorine contact tank and the effluent discharge line to improve the disinfection process. When RCI conducted the year-end compliance inspection, the DEP effluent monitoring data indicated chlorine exceedances. The operator stated that the chlorine pump runs on a timer and if the flow were low or non-existent, the chlorine readings

would be higher. RCI advised the operator to maintain the chlorine feed to keep the residual within the SPDES permitted range. The upgrade at this facility was delayed because of buried timbers and metal discovered during the excavations for the foundation of the new building. Currently the upgrade work is moving ahead.

Facility records at the Fairways (Hill & Dale) indicated that the plant experienced hydraulic surges throughout the last quarter of 2003. The SPDES permitted flow is 0.065 MGD, and the operator's logbook shows daily flows ranging from 0.055 to 0.104 MGD. The operator was unable to determine the cause of the excessive flows to the plant. Investigations to the possible cause of the high flow are continuing.

### 6.2.2 Sampling of Wastewater Treatment Plant Effluents

Sampling of wastewater treatment plant (WWTP) effluents is conducted by DEP's District Laboratories: Grahamsville Lab in the Delaware District, Ben Nesin Lab in the Catskill District, and Brewster Lab East-of-Hudson. Non-City-owned surface-discharging WWTPs are sampled twice monthly. West-of-Hudson City-owned WWTPs are sampled at least weekly, exceeding State Pollutant Discharge Elimination System (SPDES) monitoring requirements. Sampling data are shared regularly with DEP's Facilities Compliance Section for the purpose of tracking compliance with SPDES-permitted effluent limits.

At City-owned plants, DEP laboratories collect compliance samples, including grab and composite samples, for reporting on Discharge Monitoring Reports. At non-City-owned facilities, grab samples are taken, and in addition a composite sample is collected once a year from those plants that have composite sample monitoring requirements on their permits. In the Catskill District in 2003, composite samples were collected from Snowtime, Hunter Highlands, and Liftside. In the Delaware District, composite samples were collected from Village of Walton, Village of Stamford, Village of Hobart, Village of Delhi, and Mountainside Farms, and from the non-contact cooling water discharge at Kraft. Effluent total phosphorus concentration data are collected from all facilities regardless of whether or not this parameter is permitted, so that the data can be used to develop point-source phosphorus loads. In 2003, the Ben Nesin Laboratory conducted 4,047 analyses on 839 effluent samples and the Grahamsville Laboratory conducted 3,476 analyses on 434 effluent samples from WWTPs (and non-contact cooling water discharges) discharging within the water-supply watershed only. For plants in the East-of-Hudson FAD basins (West Branch, Cross River, and Croton Falls), the Brewster Laboratory collected 191 effluent samples for 1,811 analyses.

To monitor the effluent quality of WWTPs that receive periodic high usage during the ski season, special efforts were made to collect and analyze samples from certain facilities. The following facilities were visited an additional time, during the Christmas-New Year week: Colonel's Chair, Forester Motor Lodge, Hunter Highlands, Liftside, Mountain View Estates, Mountain

View Homeowners Association, Snowtime, and Whistle Tree. In general, these samples contained slightly more exceedances of SPDES-permitted parameters than standard weekday samples collected during the ski season.

## 6.3 SEQRA Coordination

In accordance with DEP's January 2002 commitment to EPA, DEP has created the position of SEQRA Coordinator to ensure that DEP's policies and procedures concerning SEQRA are carried out in a timely, professional, and thorough manner. The SEQRA Coordinator will be charged, in addition to other things, with successfully executing the tasks outlined below. The following sections summarize the roles and responsibilities of the SEQRA Coordinator, the benefits of establishing the position, what the roles and responsibilities of the Coordinator are, and how DEP envisions the SEQRA process improving with the Coordinator.

The Coordinator position was created to help ensure timely, thorough, and effective SEQRA environmental review of projects undertaken in the watershed. To manage these often highly visible and complex projects, and the accompanying SEQRA environmental reviews, the Coordinator will track all SEQRA projects in the watershed; coordinate DEP participation in SEQRA; maintain a database of new projects and development trends in the watershed; interact with local, State and federal officials and other interested parties on DEP's involvement in SEQRA environmental reviews, and make certain that the highest levels of DEP management are kept apprised of the presence, and status, of potentially controversial SEQRA reviews. As head of DEP's SEQRA Technical Team, the Coordinator will draw heavily on the expertise within the Bureau, DEP Legal and the NYC Law Department, and DEP's Office of Environmental Planning in reviewing watershed projects and developing City responses. Note that DEP is fortunate to employ an experienced pool of seasoned professionals in a wide range of disciplines. DEP will utilize the expertise of these employees to the fullest extent possible during the environmental review process.

The Coordinator assumes the primary SEQRA role for DEP on projects in the watershed, and watershed projects funded of undertaken by DEP. Working in close coordination with appropriate Bureau and Agency staff, including those the SEQRA Technical Team, the Coordinator will assess projects and determine whether a project poses significant potential water quality impacts, monitor the SEQRA status of individual projects, attend meetings of local agencies reviewing projects, and submit appropriate comment letters. As appropriate, the Coordinator will pool all relevant knowledge or expertise about existing conditions at a project site, potential project impacts, existing and proposed development in the same reservoir or subbasin, and localized water quality concerns and issues.

Chaired by the SEQRA Coordinator, the Technical Team's membership includes staff from Engineering Project Review, DEP Legal Affairs, the New York City Law Department, and the Office of Environmental Planning. Because comments DEP submits during SEQRA may

form the basis of a subsequent legal challenge (if DEP determines that SEQRA processes has not been properly followed, or proper SEQRA determinations have not been reached), comment letters on a troublesome or unusual SEQRA review will generally be reviewed by the Technical Team, as well as DEP management, before they are issued.

# 7. Catskill/Delaware Filtration/UV Disinfection Facilities

For 2003, the primary focus of the Catskill/Delaware water treatment projects continued to be the development of designs for an Ultraviolet (UV) light disinfection facility. Though no deliverables associated with the UV facility were due this year, DEP and their engineering design consultants, the Joint Venture of Hazen and Sawyer/Camp Dresser & McKee (the JV), made significant progress toward meeting future UV related deliverables. These efforts include selection of a preferred lamp technology, success with computer based UV equipment modeling for validation, the identification of a full-scale validation facility and the initiation of the environmental assessment process.

To maintain the time-neutral dual-track approach for meeting the goals of the Surface Water Treatment Rule, the current FAD calls for the completion of biennial updates of the preliminary designs for a water filtration facility. This update, completed in September, was the only 2003 deliverable for the Catskill/Delaware water treatment projects.

## 7.1 Ultraviolet Disinfection Planning & Design

Though no UV related deliverables were due during 2003, a significant amount of work needed to be completed during this calendar year to support future deliverables. In 2003, DEP decided to proceed with a Low-Pressure High Output UV Disinfection system, advanced the computer modeling method for equipment validation, identified a facility for performing full-scale validation testing and released the draft scope of work for the preparation of an Environmental Impact Statement.

### 7.1.1 Lamp Technology Evaluation

Two types of UV lamps are currently widely used in the drinking water industry -- low pressure/high output, and medium-pressure lamps. These designations refer to the operating pressure of the mercury within each lamp. While there are differences in their properties, each delivers light within the germicidal wavelength of 230-300 nanometers (nm). Low-pressure/high output (LPHO) lamps deliver nearly monochromatic light with peak wavelengths at 185 nm and 253.75 nm. Due to the natural absorbance of water (up to 220nm), only the peak at 253.7 nm will be applicable for the disinfection of microorganisms in drinking water. Medium-pressure (MP) lamps deliver polychromatic light with wavelengths within and beyond the germicidal range.

Though conceptual plans have been prepared for both LPHO and Medium pressure UV facilities, DEP determined that it would be prudent to avoid maintaining parallel design tracks and developing duplicate environmental assessments for the two lamp technologies. In addition to streamlining the eventual procurement of UV disinfection equipment, the selection of a single lamp technology allows the design team to focus their attention on a single design.

With input from the leading UV equipment vendors, estimates for the construction and operating costs for facilities using each type of lamp were prepared. These costs, as well as several non-economic factors (including ease of operation, likelihood of technological improvement and availability of manufacturers) provided the basis for comparing the two technologies.

On June 24th and 25th representatives from DEP and the JV visited several UV disinfection facilities to observe both medium pressure and low-pressure/high-output UV equipment in operation. In Westview, Pennsylvania the project team was able to inspect a single Calgon Corporation Medium Pressure UV disinfection chamber. In Clayton County, Georgia the team visited two facilities featuring Wedeco Low Pressure/High Output UV equipment. The tour participants had the opportunity meet and interview facility operators about their experiences with the selection, installation, testing, operation and maintenance of their UV equipment. Though all of these facilities were installed downstream of pre-existing water filtration plants, each had unique design characteristics (lamp type, design flow, dose, etc.). Details of the specific facilities appear in the table below:

Table 7.1. UV Facilities Inspected for Lamp Evaluation.

| Municipality/Plant | West View Water Authority/ West View WTP | Clayton County Water Authority/ Freeman Road WTP | Clayton County Water Authority/ W.J. Hooper WTP |
|---|---|---|---|
| PLANT LOCATION | Pittsburgh, PA 15229 | Jonesboro, GA | Stockbridge, GA |
| Plant Capacity (mgd) | 40 | 12 | 25 |
| Plant Source Water | Ohio River | Surface Water | Surface Water |
| Location of UV Disinfection | Post Filtration and Post Chlorination, Lime for pH adjustment downstream of UV | Post Filtration, upstream of chemical addition | Post Filtration, upstream of chemical addition |
| UV Model/Type | Calgon - Sentinel (6 lamps per row, 1 horizontal row) | Wedeco – K143 (10 lamps per row, 3 rows) | Wedeco – K143 (12 lamps per row, 4 rows) |
| UV Technology | MP | LPHO | LPHO |
| Start-up Date | March 2001 | March 2003 | In testing phase |
| UV Dose (mJ/cm2) | 28 | 50 | 50 |
| Min. UVT (%) | 89.0 | 89.0 | 89.0 |
| Avg. UVT (%) | 91.5 | 92 - 94 | 92 – 93 |
| UV Unit Flow (mgd) | 40 | 5 - 6 | 5 – 5.5 |
| Validation | None | Bioassay | Bioassay |
| Control Logic | Irradiance based on flow and UVT | Combination of Flow, UVT and Intensity | Combination of Flow, UVT and Intensity |

Observations gathered during these facility visits enabled the design team to identify possible improvements to the Catskill/Delaware designs and to better understand the differences between medium pressure and low-pressure/high-output installations that are not readily apparent from technical literature or product descriptions. As a result of these visits and the cost and non-economic evaluation, DEP was able to confirm the preference for the low-pressure/high-output UV technology.

### 7.1.2 Equipment Validation through Computer Based Modeling

Due to the substantial flow that will be treated at the Catskill/Delaware UV facility, the design team has determined that it would be appropriate to use custom sized UV equipment with a design capacity of 40 MGD per unit. Using data collected during biodosimetry validation of UV smaller equipment and correlated computer based light intensity and fluid dynamic models, the Joint Venture has been developing the means to use similar models to predict the performance of the 40 mgd disinfection units that will be installed in the Catskill/Delaware UV Facility.

Since the early phases of this work, Bolton PhotoSciences, Inc has been providing the expertise to develop light intensity distribution (LID) models using while Fluent, Inc. has been supporting the development of computational fluid dynamic (CFD) models. By integrating these two models, the radiation and hydrodynamic characteristics of the disinfection equipment can be captured in a format that can be used to predict its inactivation capability. This information can then be used to develop equipment-specific operating parameters to achieve a prescribed delivered dose.

To date testing has been completed on four different disinfection units including two LPHO units manufactured by Wedeco and two MP units from Trojan Technologies. The LPHO units underwent bioassay validation at the DVGW testing center while the Trojan units were tested in Ontario. The modeling runs and validation testing were performed using several operating flows, and varied lamp power conditions to simulate a range of operating conditions that could occur during the life of a UV lamp. With the exception of flawed data-points, the comparison of certification points between the data sets shows promising results. This work has been discussed in-depth during project progress meetings.

A Peer Review Panel has also been monitoring the implementation of the modeling protocols and reviewing the predictions of each model that has been developed. In response to concerns for the statistical integrity of the modeling process, Cadmus, Inc. was engaged to develop a protocol for statistically evaluating the date generated from both the bioassay and computer model validation processes. Using this protocol, Cadmus, Inc. then evaluated collimated beam data and microbiological challenge results from 2 Low-Pressure/High-Output and 1 Medium

Pressure UV systems and determined that the results of the modeling were not statistically different from the bioassay challenge testing. Several members of the Peer Review Panel have assessed the work by Cadmus.

Responding to inquiries by EPA and DOH, the design team entered into a blind testing arrangement with the assistance of Wedeco Ideal Horizons. Using detailed drawings of the K143 LPHO disinfection unit, testing and stand piping of the temporary validation in Portland, Oregon the design team developed a mesh for the computer model and established hydraulic solutions for several flow conditions. Though Wedeco will provide results from the collimated beam analysis for the prediction of Reduction Equivalent Doses (REDs) for each set of testing conditions, the microbiological testing results will be delivered directly to EPA and DOH. Comparison of the modeling predictions against the observations (influent and effluent MS-2 counts, log inactivation and calculated REDs) from the bioassay testing will be conducted in early 2004.

### 7.1.3 Investigation into Full-Scale Reactor Validation

Though the Catskill/Delaware UV planning process did not originally focus upon validation through the computer modeling process, DEP has been requested by EPA and DOH to pursue full-scale bioassay validation. To conduct validation for 40 MGD UV disinfection units using biodosimetry methods, a number of requirements must be met. These include:

- A suitable supply of source water (+/- 1.5 MG per run of water with appropriate water quality characteristics)
- The infrastructure to deliver, spike, treat, test and dispose of the water used in testing at a flow rate no less than 40 MGD
- Sufficient Volumes of Challenge microbes (or suitable surrogate) to support multiple runs
- An ability to achieve or simulate a range of UV transmittance conditions
- Weather protection for testing equipment and support facilities (i.e.: electrical equipment and storage space)

At the start of 2003, the largest internationally available validation facility could deliver no more than 20MGD to an individual test unit. DEP continued investigating opportunities to meet the requirements noted above so that full-scale bio-assay testing can be performed on equipment with a design flow greater than or equal to 40 MGD. To this end, DEP has opened dialogue with several vendors, evaluated several city-owned siting opportunities and received proposals from several entities that have expressed an interest in developing a testing facility.

DEP and the Joint Venture evaluated three City-owned sites -- Kensico Reservoir, Jerome Park Reservoir, and Spring Creek Combined Sewer Overflow Facility – to see if any would be suitable for a full-scale validation facility. For each site, the availability of source water volumes, storage facilities, drainage infrastructure and suitable space for a testing structure was determined. Cost estimates for providing site-specific supplemental facilities were established. Other non-economic factors were also taken into account.

Based on these evaluations, DEP determined that it would not be feasible to perform full-scale validation within a time frame consistent with the design schedule for this project.

DEP also evaluated three opportunities for conducting validation at proposed testing facilities outside New York State. Each proposal provided a host-facility and cooperation by vendors and utilities.

In March 2003, DEP's Senior Project Manager was invited to serve on a Technical Advisory Committee for a project by Hydroqual and NYSERDA (New York State Energy Research & Development Authority) to design, assemble and operate a validation testing facility in New York State for drinking water associated UV Disinfection equipment. Following an initial meeting, several site visits were conducted at the Gloversville/Johnstown Water Treatment Plant to determine the feasibility of conducting full-scale validation for the Catskill/Delaware UV project. The existing water treatment plant was designed and built for an industrial base that is no longer in the area. The location of the underutilized wastewater treatment facility is ideal for obtaining high-quality influent and providing post validation treatment and disposal. DEP and the Joint Venture entered into negotiations with the facility sponsors and have agreed to conduct the necessary validation tests at Gloversville/Johnstown.

A Request for Expression of Interest was published in the Engineering News Record (ENR) on November 10,17 & 24, inviting Low-Pressure/High Output UV vendors to identify their interest in this project. Three vendors responded: Wedeco, Trojan and Ultratech/Emcor. Trojan and Wedeco have been invited to develop disinfection equipment that will undergo testing at the NYSERDA/Hydroqual facility.

### 7.1.4 Fouling Study

To better understand the operation and maintenance of the UV disinfection reactors, DEP intends to conduct a pilot study focused on lamp-sleeve fouling. The protocol for this study is under development. DEP and the Joint Venture are also defining the space needs and site-support requirement that will be necessary to perform this study. As currently conceived, the pilot will allow for parallel testing of LPHO and MP lamp units. For each type of lamp being tested, two units will be installed so that side-by-side runs to assess varying operating conditions can be performed.

The research plan will also incorporate an assessment of the potential impact of the visible light emitted by UV lamps on algae growth as well as any impacts to taste and odor that may result from UV disinfection. Mechanical and Chemical cleaning methods will both be used during this study. Information that may be helpful to future operators will be noted and incorporated in the training and documentation delivered during start-up of the Catskill/Delaware UV Disinfection facilities.

### 7.1.5 Optimization of UV Reactor Validation

In October 2002, DEP agreed to champion a proposal for an AWWARF Tailored Collaboration project entitled "Optimization of UV Reactor Validation". Carollo Engineers, Clancy Environmental, Inc. and the Optical Laboratory of the Institute of Medical Physics and Biostatistics of the University of Veterinary Medicine of Vienna, Austria developed the research plan for this study. The cities of Phoenix, Arizona and Tacoma, Washington have agreed to co-sponsor this work.

This work is intended to address three primary issues associated with UV reactor validation. The research will evaluate a promising new surrogate challenge microbe, assess the ability of a UV-absorbing compound to better simulate the physical and chemical properties of source waters and study lamp & sleeve fouling to provide useful data regarding dose delivery by aged units. The results of this study are intended to optimize reactor validation methods, limit the uncertainties in design and ultimately reduce the costs of implementation for full-scale UV installations.

## 7.2 Environmental Assessment and EIS Preparation

In late October, a draft scope of work was issued for the Environmental Impact Statement along with an announcement for a public hearing to be held on November 19, 2003. This announcement indicated that DEP would be serving as Lead Agency for the development of the Environmental Impact Statement. Following its release, and prior to the scheduled hearing, the Town of Mount Pleasant issued a letter challenging the City's role as Lead Agency. As a result, the hearing was postponed until the matter of Lead Agency status could be resolved. By the close of the year, the Town of Mount Pleasant agreed that DEP would serve as Lead Agency and public hearing was rescheduled for February 2004. AKRF will be contributing as a subcontractor to the Joint Venture for this work.

To prepare the Draft Environmental Impact Statement, a substantially detailed "snapshot" of the proposed project must be established. To implement the draft scope of work significant fieldwork will also need to be completed. To these ends, DEP initiated or performed the following activities in 2003:

## 7.3 Value Engineering Workshop

During the week of August 4 through August 8, a value-engineering (VE) workshop was conducted by the City's Office of Management and Budget. For the first of two VE workshops that will be conducted for the Catskill/Delaware UV project, a team of academic and industry professionals were gathered to review and assess the conceptual level designs for the UV facility at the Eastview site. The value-engineering workshop is a structured forum that begins with a presentation by the design team and a review of the projects goals. The next phases of the workshop include an analysis of the specific functions of the proposed facility and a brainstorming session

to identify modifications to the design that address specific facility needs. These suggestions are then ranked and reviewed with DEP to ensure that suggested alterations to the project would not be prohibited. Top ranked suggestions are then developed and their implementation costs or related costs savings are calculated. A closing session is conducted to share the recommendations of the VE team with the design team.

In addition to the traditional feedback from a workshop, the Value Engineering team has been asked to comment on choice of lamp technology and design parameters, and to provide guidance on the constructability/schedule for this project.

As a result of the August 2003 VE workshop, DEP and the Joint Venture were presented with a written report of the VE teams recommendations. Following a period of review and evaluation, DEP issued a response to the report, indicating which proposals would be implemented, studied further or rejected. An implementation meeting will be held in early 2004, to discuss DEP's responses. Following the development of preliminary designs a second VE workshop will be conducted in the fall of 2004.

## 7.4 Topographic Surveys and Borings

To prepare for the possibility of the Cat/Del water treatment projects sharing the Eastview site with these projects DEP and the Joint Venture have been developing staging concepts for a number of site development scenarios. To address changes of building footprints and support a master plan for the site additional topographic surveys and geotechnical investigations have been undertaken at Eastview.

## 7.5 Catskill Aqueduct Inspection Program

As currently operated, the Catskill Aqueduct delivers water from Kensico Reservoir to the Eastview site at an operating head which is too low to meet the hydraulic gradeline of the proposed UV disinfection facilities. To meet the design flow of the proposed UV facilities and address DEP's concerns for redundancy and reliability (either partially or completely), an alternate operating strategy will need to be implemented. The following three options have been identified: 1) Complete the segment of the Kensico-NYC tunnel between Kensico and Eastview, 2) Pressurize the Catskill Aqueduct between Kensico Reservoir and Eastview or 3) Install pumps for lifting water from the Catskill Aqueduct to the proposed influent elevation for the plant. Through the Kensico NYC Tunnel project, DEP is investigating the first of these options**.** DEP has a long history of delivering water to consumers through a gravity fed system and would like to avoid the introduction of a lift station with its inherent costs and vulnerabilities. Pressurizing the aqueduct may be the most suitable and timely solution and is therefore being investigated under this project.

With the assistance of Jenny Engineering Corporation, DEP and the JV have collected information, which will serve as the basis for a scope of work for inspecting the aqueduct between Kensico Reservoir to the Catskill Connection Chamber at Eastview. The project team has been developing a two-part work plan for a "walk–through" inspection of the Catskill Aqueduct followed by a series of sample collections and integrity tests. In addition to learning the condition of the aqueduct, these inspections will help the design team better assess options for pressurizing the aqueduct.

## 7.6 Coordination with the Kensico City Tunnel Project

A September 2002 workshop defined the need for the Kensico City Tunnel (KCT); it was concluded "a new parallel aqueduct between Kensico Reservoir and the City is the only viable alternative to providing redundancy for the critical components of the system below Kensico Reservoir." The KCT would be needed for reliability purposes. In addition to providing redundancy for the Catskill and Delaware Aqueducts, the KCT would bypass Hillview Reservoir.

A draft planning study report for the KCT was completed in July 2003. The report summarized the results of four Technical Memoranda and presented the recommended Planning Concept for implementing the project, along with alternatives that warrant further consideration. In summary the report evaluated various flow scenarios and described hydraulic analyses to establish corresponding tunnel diameters and velocities; explored the location of new intakes in Kensico Reservoir and addressed alternatives for connecting the intakes to the water treatment facilities that may be constructed at Eastview; focused on the operation of the City water conveyance system between Kensico and Hillview Reservoirs after the KCT has been placed in service, and identified operating strategies for periods when Hillview Reservoir is either in or out of service; and addressed three potential alignments for the Kensico-City Tunnel. The basic findings from this study have been integrated into this preliminary design update.

## 7.7 Additional Studies

For the EIS, DEP will need to offer projections of both the construction and long-term impacts of the Catskill/Delaware UV facility on the local community. To do this, certain baselines must be established for the current condition of the site and its surroundings. During the latter part of 2003, the design team has conducted a tree-tagging survey, identified traffic intersections that will need to be analyzed in early 2004, and collected photographs of the site.

## 7.8 Filtration Planning Design Update

In accordance with the FAD modifications that introduced the UV Disinfection Facility deliverables and provided relief from certain filtration related deliverables, DEP submitted the first biennial update for the Catskill/Delaware filtration facility preliminary designs. Since the designs were first completed in September 2001, DEP has considered siting several additional

facilities at Eastview. In addition to being the proposed site for a DEP police precinct and shafts for the future Kensico-NYC Tunnel, the Eastview site is one of three locations currently being evaluated for the Croton Filtration Facility.

A Master Planning Study for the Kensico City Tunnel (KCT) has been initiated and Preliminary Design for the Croton Water Treatment Plant at the Eastview Site has been completed. The September 2003 Preliminary Design Update integrates these projects and the Catskill and Delaware Filtration Plant.

The design capacity for the Catskill and Delaware Water Treatment used in the September 2001 Preliminary Design Update was 1,840 mgd, with a maximum plant throughput of 1,920 mgd, which includes 80 mgd for recycle flows. A study is currently being performed to update the annual average in-City demand projections. Since the results of this study are not available at this time, the plant design capacity remained unchanged. However, to plan for future high range demand projections, an analysis was done to investigate the impact of high range projections on plant hydraulics.

For the purpose of this update, the design team incorporated infrastructure planned for the UV facility into the filtration facility designs. The connections to the existing Delaware Aqueduct and Catskill Aqueduct will be performed as part of the UV Disinfection Facility project; including the connection of the Catskill Aqueduct to Shaft 19 upon completion of pressurization of the aqueduct. Uptake and downtake shafts for the future KCT are also anticipated to be complete prior to the construction of the filter plant. Provisions for connections (bulkheads) for four raw water conduits to the filter plant and four filtered water conduits to the UV facility have been incorporated into the UV facility design. The Delaware Aqueduct, the pressurized Catskill Aqueduct, and the future KCT will supply all raw water conveyed to the treatment plant. After the three aqueducts converge at the Shaft 19 forebay, ozone would be added to the four raw water conduits, which will in turn convey water to the Main Process Area. Filtered water would be conveyed through the UV Disinfection Facility and then to either Shaft 19 (Delaware Aqueduct), the Catskill Connection Chamber (Catskill Aqueduct) or to the future KCT downtake chamber. The flow splitting controls for the three aqueducts will be implemented as part of the UV Disinfection Facility.

The September 2003 update also addressed the following concepts:

- Revise the site plan to accommodate the Filter Plant, the UV Disinfection Facility, the KCT, and the Croton WTP.
- Relocate the post-feed chemicals from the Filter Plant Process Modules (sodium hypochlorite and hydrofluosilicic acid) and Hillview Reservoir (sodium hydroxide, and orthophosphate) to a separate Post Feed Chemical Building.
- Revise the hydraulic profile for the filter plant to accommodate include the UV facility and a future worst-case maximum day flow scenario of 2,110 mgd through filter plant

- Assess the impact of the revised conduit layout and increased flow (decreased contact time) on the ozone contact time in the raw water conduits.

It is estimated that more than eight years would be required for construction of the Catskill and Delaware Treatment Plant. Prior to beginning construction it is estimated that six years would be needed for final design, preparation of a final Environmental Impact Statement, permitting, contract bidding and award.

## 7.9 Industry Recognitions

The efforts of the design team were also recognized through two industry award programs this year.

- New York Association of Consulting Engineers
- Catskill/Delaware UV Study and Conceptual Design
- Diamond Award –Studies, Research & Consulting Engineering Services
- American Academy of Environmental Engineers
- Catskill/Delaware UV Study
- National Recognition Award for Engineering Excellence

# 8. In-City Programs

## 8.1 Waterborne Disease Risk Assessment Program

New York City's Waterborne Disease Risk Assessment Program (WDRAP) was developed and implemented to:

- obtain data on the rates of giardiasis and cryptosporidiosis, along with demographic and risk factor information on case patients;
- provide a system to track diarrheal illness to assure rapid detection of any outbreaks; and
- determine the contribution (if any) of tap water consumption to gastrointestinal disease.

WDRAP is a joint agency program involving the Department of Health and Mental Hygiene (NYCDOHMH) and DEP. Brief program highlights for 2003 are provided below.

Active surveillance for giardiasis and cryptosporidiosis continued as in prior years. All clinical laboratories located in New York City currently performing parasitology examinations for *Giardia lamblia* and *Cryptosporidium* (n=52), as well as certain laboratories in the NYC vicinity (n=8) are contacted on a regular basis to solicit case reports on all positive specimens. For all cryptosporidiosis cases, and as needed for giardiasis cases, public health epidemiologists contact cases to verify the data collected on the case report, to collect additional demographic and clinical information, and to identify possible sources of exposure. At the time of this writing, the 2003 *preliminary* count of cases reported to the NYCDOHMH is as follows: 1,183 cases of giardiasis, and 127 cases of cryptosporidiosis.

With regard to outbreak detection systems, New York City currently has four types of systems in operation, each one tracking a different indicator of gastrointestinal illness in the community (Note: these systems are not specific to giardiasis or cryptosporidiosis, nor are they specific to waterborne illness). One system involves the tracking of chief complaints from hospital Emergency Department logs; another system tracks the number of stool specimens submitted to clinical laboratories for microbiological testing; and under a third system, NYCDOHMH monitors, and assists in the investigation of, GI outbreaks in sentinel nursing homes. The fourth type of system includes monitoring of sales of anti-diarrheal medications (ADMs). The City's ADM monitoring activities now include three components: one in which the volume of sales of non-prescription ADMs at a major drug store chain are monitored; a second now in place, involving another major drug store chain, in which daily sales of both prescription and non-prescription medications are monitored; and a third in which NYCDOHMH receives data from a national retail data source.

Additional results and program information can be found in the WDRAP semi-annual and annual reports.

## 8.2 Cross Connection Control Program

The Cross Connection Control Program has as its primary objective the avoidance of any potential for backflow from within premises to the public water supply system. To accomplish this objective, property owners are required to install backflow prevention containment devices in water service lines for premises that pose a potential hazard. After installation, backflow prevention containment devices are required to be tested by a certified tester at least once a year. Installation of containment devices, or a review leading to an exemption from installation of such a device, is initiated due to one of the following reasons:

- Complaints to DEP indicating that there may be a potential for a backflow to the public water supply system.
- Construction of new premises or renovation of existing premises which require installation of a tap or wet connection in a size two (2) inches or larger.
- Premises that appear to be at "high hazard" for contamination of the public water supply in the event of a backflow.

Construction of new premises and/or renovation of existing premises that involves installation of a two inch tap or a larger connection frequently involves a potentially hazardous occupancy. Such construction/renovation requires a mandatory cross connection control review. This review may result in installation of a containment device as part of the construction/renovation, or an exemption from installation of such a device.

Enforcement efforts continued to be accelerated by DEP during 2003, and a significant increase continued to be seen in property owners' willingness to comply with cross connection control requirements.

The major tool used by DEP during 2003, which had not been used prior to 2002, was the issuance of Notices of Violation to non-compliant property owners. A property owner who receives a Notice of Violation is required to appear at an Environmental Control Board hearing where a monetary fine of up to $1,000 may be imposed. Any property owner who fails to appear at a hearing receives a default fine of $1,000.

Notices of Violation were issued to property owners for failure to install backflow preventers and also for failure to test backflow preventers at least once a year. The real estate industry, which had opposed issuance of Notices of Violation in prior years, did not object to such issuance in 2002 and had only limited objections to such issuance in 2003.

Strong real estate industry objection to DEP enforcement of cross connection control requirements has become more difficult because of DEP's recent changes in the method of conducting its cross connection control program.

Prior to 2002, DEP's cross connection control program was directed toward specific categories of building occupancy, such as hospitals, funeral homes, educational facilities, etc. Each of these categories of building occupancy complained that they were being "singled out" for enforcement.

In 2002 and 2003, DEP's cross connection control program was directed toward approximately 21,143 premises which appeared to be potentially hazardous due to their inclusion in selected Department of Finance Building Classification Categories. Any complaints about being "singled out" can be easily addressed by DEP, because inclusion in the selected Building Classification Categories indicates a potential hazard regardless of specific building occupancy.

Through issuance of Notices of Violation, followed in a few cases by issuance of Cease of Desist Orders, and in one case by termination of water service, DEP was able to achieve a significant increase in compliance.

# 9. Education and Outreach

Public education and outreach efforts have been a component of the City's watershed protection strategy since the expansion of the protection program in the early 1990s. DEP's activities are built on the principle that an informed base of watershed residents and water consumers facilitate development and implementation of protection strategies. An effective outreach program enhances consumer confidence in the safety and quality of the water supply, while teaching watershed residents and consumers alike the importance of watershed protection.

DEP's efforts have included, and will continue to include, both program-specific education efforts and broad-based outreach. In many cases, program-specific outreach efforts are conducted in coordination with DEP partner agencies and organizations – the Catskill Watershed Corporation, the Watershed Agricultural Council, KEEP and the watershed counties, to name a few. It is important to acknowledge the contributions of these locally-based groups in spreading the word about the links between land use activities and water quality.

## 9.1 Program-specific Education Efforts

Many of the individual watershed protection programs have incorporated outreach since their inception. In many cases, that outreach is designed to reach a target group of involved or interested parties. For instance, the Farm Program focuses efforts on reaching farmers and the Stream Program has held a number of training sessions for agencies and contractors who work in streams. In addition, these programs have a more general educational component to disseminate basic information to a wider audience.

DEP has collaborated with WAC, CWC and other partner organizations on a variety of programs, including the Farm Program, the Forestry Program, the Stream Management Program, Partnership Programs run by CWC and Croton Planning.

Details on some of these targeted outreach efforts can be found in the specific program write-ups in this report, including the Stream Management Program section, the Watershed Agricultural Program section and the Watershed Forestry Program section.

## 9.2 Watershed Museum

For the period January through September, DEP, CWC and the Catskill Watershed Museum had continual discussions about the September 2003 deadline for the possible CWC commitment of funds under CWC-DEP extension under CWC's Public Education contract. As they were not able to meet the deliverable deadlines in the extension, the Museum was satisfied to let the MOA "museum" funds be used for CWC's regular education grant program. Following meetings and discussions with DEP's Commissioner and the CWC Public Education Committee,

the Museum concluded that their short-term focus should be to secure contacts and assistance as part of their capital fund raising campaign. DEP provided the museum with a support letter, and agreed to assist with contacts as part of their campaign.

With support from DEP, the Museum was awarded $30,000 from the foundation New York Community Trust, to enable the museum to hire a professional fund-raiser.

## 9.3 Grants and Projects

CWC's Public Education Advisory Group recommended 26 projects totaling $99,997 under Round 6 of CWC's Public Education Grants Program. Following the CWC Board's approval of those projects, DEP issued its formal approval on April 29, 2003.

With input from DEP, CWC finalized the text and graphics for new roadside signs that would commemorate hamlets and villages that were lost to the construction of the reservoirs. The new roadside signs will identify the local reservoir and commemorate a community displaced by the reservoir.

DEP coordinated with CWC on a joint CWC-WAC-DEP flyer that would be distributed to WOH realtors, in order to be given out to prospective property purchasers. The flyer entitled "What's so special about the Catskills?" highlights the region as New York City's watershed, and lists programs, responsibilities and contacts for CWC, WAC and DEP. CWC reached out to WOH realtors, and offered the possibility of providing more detailed information regarding watershed partnership programs and the City's watershed rules and regulations.

DEP agreed to serve as an "advisor" for the proposed Neversink Watershed Museum, which was going through the "charter" process with the NYS Board of Regents.

## 9.4 DEP Watershed Website

On June 30, 2003, DEP launched a new area on its website with information on the watershed protection program. This new portion of the site can be accessed directly at www.nyc.gov/watershed. It contains detailed information on all the major components of the City's watershed protection efforts; provides access to a host of reports and other relevant documents; contains links to the websites of some of DEP's partner agencies and organizations; and offers quick access to information about recreational uses of City-owned watershed land.

# 10. Miscellaneous Reporting Provisions

## 10.1 Water Conservation

Water demand in the City of New York had been increasing at a rate of more than 1% per year through the 1950s, 1960s, 1970s and early 1980s. Since the late 1960s the City's water consumption has been beyond the "dependable yield" of the reservoir system. Three drought warnings or emergencies occurred during the 1980s. At the same time, wastewater flows to the Wards Island, Newtown Creek, North River and Coney Island wastewater treatment plants either exceeded or approached permit levels. Avoiding the capital cost of expanding the water supply and wastewater treatment infrastructure and the costs incurred by droughts led New York City to develop a lower cost plan for providing water/sewer services.

The best proof of the success of these programs is the drop in New York City's water consumption. From an average of 1450 - 1500 million gallons per day (MGD) in 1990 - 1991, consumption has dropped continuously in the 1990s to under 1250 MGD since 1996 and under 1200 MGD for 2001, 2002 and 2003, even through some of the hottest summers on record. Wastewater flows have been decreasing consistently every year since the early 1990s.

Highlights of DEP's ongoing water efficiency program include:

*Leak Detection*

DEP has undertaken an aggressive sonar leak detection program, which surveys approximately 1 million linear feet of water mains each year. One-third of the city's water mains are scanned for leaks every nine months while the remainder are scanned at least once every three years. Leak reduction also includes regular inspection of system blow-off valves and hydrant locks. The ultrasonic leak detection program is estimated to have significantly reduced supply systems losses since the mid-1980s, with system-wide savings of at least 30- 50 MGD in the early years and 5-20,000 gpd in recent years.

DEP will continue a program of leak detection and street repairs. DEP estimates that the largest benefits of this program accrued in the early years. Going forward, DEP anticipates that the program will maintain equilibrium, rather than yield significant further reductions in leakage.

*Water Metering*

New York has completed its Universal Metering Program. A metered rate structure provides customers with a long-term incentive for leak repair and efficient use. Quarterly billing for metered customers began regularly in 1995. Some multifamily buildings are being offered the option to continue to be billed on a per-apartment fixed charge if they meter and undertake a number of water efficiency measures. The City is now almost 95% metered.

***Incentive Programs***

From March 1994 through April 1996, the New York City Toilet Rebate Program (TRP) accepted applications from more than 120,000 property owners seeking to replace 1.6 million old toilets with water-saving models. More than 1.3 toilets were replaced in 110,000 properties through June 1997, reducing consumption by 70 - 90 MGD. Tracking of actual savings at several score apartment buildings participating in the Program found that the average reduction in water consumption was 29%.

Now that regulations require installation of low flow fixtures, normal turnover of fixtures should lead to further savings. If 1% of existing old toilets are replaced each year in the course of bathroom renovations or equipment reaching the end of its useful life, that provides a new saving of 1.2 - 2.5 MGD each year which will continue for another 10-20 years.

DEP expects to initiate a second phase of the Toilet Rebate Program next year and is currently planning the scope of that effort, which may involve the replacement of anywhere from 100,000 – 500,000 toilets and may also include urinals.

In addition, the New York City Housing Authority (NYCHA) has been replacing tens of thousands of old toilets over the last decade and is about 90% complete performing such work in their properties located in the consent decree drainage areas.

*Expanded Use of Non-Potable Water for Non-Potable End Uses*

DEP has begun discussion with the New York City Department of Buildings ("DOB") and the New York City Department of Health ("DOH") about the development of standard code requirements for "greywater" and rainwater harvesting systems. Several new buildings have been constructed which recycle part or all of their wastewater for use in toilet flushing and other non-potable end uses. Con Edison's headquarters building has used steam condensate for toilet flushing since the 1980's. The Department of Parks and Recreation's GreenThumb Program, along with Council on the Environment of New York City has installed rainwater harvesting systems at 20 community gardens.

There is a great potential for reducing water demands, wastewater and stormwater flows by using rainwater and greywater to meet non-potable end uses. The development of formal building and health code requirements and procedures will help realize this potential. DEP will also consider providing incentives for the incorporation of such systems in future construction.

*Education Programs*

DEP conducts educational programs, which include publications and videotapes, teaching training and curriculum efforts, training for apartment building superintendents, an annual Water Art and Poetry Contest, internships and tours. DEP staff speak at hundreds of community meetings each year on the subjects of water efficiency and water quality.

*General Water Use and Drought Regulations*

DEP enforces standard regulations prohibiting certain outdoor water uses peak hours of the day, requirements for evaporative cooling towers for all but the smallest air conditioning and refrigeration units and penalties for significant leak and waste violations. During drought periods the city can implement a three-stage series of increasing restrictions on water use including outdoor water use, air conditioning and commercial water use, increased hydrant patrols and other measures.

*Federal Clothes Washer Efficiency Standards*

Beginning in 2004, the Department of Energy will implement minimum efficiency standards for new clothes washers, which will, over 15 years or so, provide significant savings as people replace their old washers. The standard becomes a bit tighter in 2007.

A specific savings estimate for New York City has not been completed, but a very conservative one would look only at one- and two-family homes. There are approximately 775,000 one- or two-family homes in the City. Assuming there are two people per property, DEP estimates a saving of about 9 gallons per person per day, or about 14 MGD.

The one- and two-family home analysis excludes a NYSERDA program which is providing incentives to "route operators" to replace the machines in apartment building laundry rooms and our agreement with NYCHA wherein they will be replacing the machines in theirs. Perhaps 20-25% of apartment buildings will be required to replace older equipment with newer, more efficient units.

DEP estimates that these programs will lead to a total savings of up to 10-20 MGD in the next five years and another 30-55 MGD over the following 15 years as the existing stock of clothes washers is replaced.

## 10.2 Drought Management Plan

In 2003, New York City and the region rebounded strongly from the 2001/2002 drought event. Due to improved storage and hydrologic conditions, DEP ended the drought on January 3, 2003. During the remainder of the year, it was not necessary to invoke any of the components of the City's Drought Management Plan, as precipitation, runoff and storage levels all remained high.

The Drought Management Plan has three phases - Drought Watch, Drought Warning and Drought Emergency - that are invoked sequentially as conditions dictate. The Drought Emergency phase is further subdivided into four stages with increasingly severe mandated use restrictions. Guidelines have been established to identify when a Drought Watch, Warning or Emergency should be declared and when the appropriate responses should be implemented.

These guidelines are based on factors such as prevalent hydrological and meteorological conditions, as well as certain operational considerations. In some cases, other circumstances may influence the timing of drought declarations.

- Drought Watch – Drought Watch is declared when there is less than a 50% probability that either of the two largest reservoir systems, the Delaware (Cannonsville, Neversink, Pepacton, and Rondout Reservoirs) or the Catskill (Ashokan, and Schoharie Reservoirs), will fill by June 1 - the start of the water-year.
- Drought Warning – A Drought Warning is declared when there is less than a 33% probability that either the Catskill or Delaware Systems will fill by June 1.
- Drought Emergency – A Drought Emergency is declared when there is a reasonable probability that, without the implementation of stringent measures to reduce consumption, a protracted dry period would cause the City's reservoirs to be drained. This probability is estimated during dry periods in consultation with the New York State Drought Management Task Force and the New York State Disaster Preparedness Commission. The estimation is based on analyses of the historical record, the pattern of the dry period months, water quality, subsystem storage balances, delivery system status, system construction, maintenance operations, snow cover, precipitation patterns, use forecasts, and other factors. Because no two droughts have identical characteristics, no single probability profile can be identified in advance that would generally apply to the declaration of a drought emergency.

DEP continues to encourage consumers to conserve water and to observe the City's year-round water use restrictions, which remain in effect. These restrictions include prohibition on watering sidewalks and lawns between November 1st and March 31st and illegally opening fire hydrants.

## 10.3 Delaware Aqueduct Leak

Efforts to evaluate the condition of, and to develop unwatering and repair plans for, the Rondout-West Branch Tunnel (RWBT) have been ongoing in 2003 and involve the following components:

- DEL-134 Hydraulic Investigations of the RWBT
- DEL-35 Investigation of Hudson River Water Supply Alternatives: Water Supply Dependability Improvements Planning
- DEL-146 Autonomous Underwater Vehicle (AUV) Inspection of the RWBT
- DEL-135 Remote Operated Vehicle (ROV) Inspection of the RWBT
- DEL-138 /DEL-185 Tunnel Unwatering System Improvements and Repair

The following is a description of the activities on these projects during 2003:

*DEL-134 – Hydraulic Investigations of the RWBT*

A Horizontal Boring Program was conducted at a suspected leak area of the tunnel in Orange County, near the Town of Roseton, between Shafts 5A and 6.

A directional drill subcontractor was employed to take core samples, perform geophysical testing, and determine water pressure in a region approximately forty feet from the tunnel, in an area where suspected leaks and known geological faults are located. The drilling subcontractor drilled diagonally from the surface to a depth near the tunnel. Drilling was continued approximately 1,900 feet horizontally, parallel to the tunnel and was completed in early 2003.

Data from this drilling operation, such as the nature of the rock surrounding the tunnel, possible flow pathways and water pressure, was used in conjunction with data from other investigations to assess the condition of the tunnel and further refine the tunnel repair program. Data gathering and analysis related to this horizontal boring program was completed in August 2003.

The Tunnel Monitoring Program effort continued in 2003. On a routine basis the DEP monitors tunnel flow rates, operational trends and surface expressions, and conducts tests to determine if tunnel conditions, such as the leakage rate, are changing. To facilitate this effort DEP is currently planning the installation of additional instrumentation and telemetry to continually monitor the hydraulic grade line of the tunnel.

Risk Analysis Program: A risk analysis of tunnel failure was developed in 2001, based on existing information such as original contract drawings, prior tunnel inspection logs and former personnel interviews. This risk analysis is continually revised based on new data gathered from ongoing investigations. The data collected from the Directional Drilling Program (described above), and the AUV inspections (described in Contract DEL-146) will be used to further refine the Risk Analysis in 2004.

Shaft 6 Unwatering System for the RWBT: In 2003, the facility plan for the unwatering of the RWBT tunnel was completed. In order to perform a tunnel repair, it is necessary to unwater the tunnel. Several pumping configurations and shaft modifications were evaluated with the goal of unwatering the tunnel as reliably and quickly as possible. The design of this unwatering system began fall 2003, under contracts DEL-138 and DEL-185 (described below).

*DEL-35 – Water Supply Dependability Improvements Planning*

In 2003, DEP continued its evaluation of the dependability needs for the Water Supply System. This analysis was conducted to evaluate the Water Supply System's ability to meet projected water demands if one of its critical components was off line for any length of time, such as for routine maintenance and repair. The RWBT, among other components, was identified as a critical element of the System needed to meet the annual average demand and water needs for the City and portions of the upstate community.

The Water Supply Dependability analysis was divided into two phases. Given the known condition of the RWBT, the first phase is to address the present need to meet water demands during the repair of the RWBT. Phase 2 shall address the water supply dependability needs for all components of the System in each of the three watersheds.

Several projects were identified that, individually or in combination, could enable the System to meet demand during a planned or emergency repair of the RWBT. These projects include alternative means of increasing system conveyance and storage; providing additional supply through expansion of existing sources, or development of other sources; and implementing demand management and reduction measures. The feasibility of these potential projects has been considered based on a preliminary analysis of their effectiveness and implementability. The projects will be further investigated and developed in the facilities planning phase with additional consideration to their degree of dependability. Alternative combinations of projects that could provide the water supply dependability needed during repair of the RWBT will be evaluated.

This work is scheduled to begin in 2004.

*DEL-146 – Autonomous Underwater Vehicle (AUV) Inspection of the RWBT*

Woods Hole Oceanographic Institute has designed and built an AUV capable of inspecting the RWBT.

DEP conducted the tunnel inspection in June 2003. This AUV inspection captured 180,000 digital photographs and other data, such as pressure and sound along the 45-mile length of the tunnel. Post processing of this data, and review and coding of the images proceeded following the inspection and was completed in January 2004. Additional AUV inspections are planned beginning late 2004.

*DEL-135 – Remote Operated Vehicle (ROV) Inspection of the RWBT*

DEP has evaluated options for procuring a contract for ROV Inspections of the tunnel.

DEP has begun the procurement of a contract to develop an ROV and long fiber-optic tether for the purpose of performing additional tunnel investigations. The ROV will allow capture of real-time tunnel data, and provide the ability to perform real-time, close-up investigations of suspect areas.

*DEL-138/DEL-185 – Tunnel Unwatering System Improvements and Repair*

In 2003, DEP began the procurement of a multi-phase contract for the rehabilitation of the existing unwatering system at Shaft 6, construction of an enhanced tunnel unwatering system, and implementation of the planned Tunnel Repair. The contract will include specific work to repair the tunnel as described below.

The first phase of the work is to rehabilitate the existing shaft and tunnel unwatering system to be used prior to the enhanced tunnel unwatering system. This phase will also include the preparation of shaft sites, and the procurement of materials and equipment that will be used in the event of an emergency or planned repair. The contractor will be on retainer to unwater the tunnel and perform repair work in response to an emergency as required for the duration of the contract. This work is schedule to be completed in the fall 2005.

The second phase of the work is to provide an enhanced tunnel unwatering system at Shaft 6, and possibly the addition of supplemental unwatering capability at Shaft 5A. These improvements are necessary, as the existing tunnel unwatering system may not have sufficient capacity to unwater the tunnel. This work is scheduled to be completed by mid-2007.

The final phase of the work is to perform the planned tunnel repair. When sufficient alternate water supply is available to allow the Rondout-West Branch tunnel to be taken out of service for an extended period, the tunnel repair will be performed. The tunnel will be taken out of service, inspected and repaired. This work is anticipated to start in 2012.

In addition, contract documents have been prepared that can be used in the event of an emergency to unwater, inspect and repair the tunnel during the development and procurement of the above contract. This contract includes installing the existing shaft and tunnel unwatering system, unwatering the tunnel and entering the tunnel to affect a repair. After the tunnel unwatering system improvements and repair contract is procured, the emergency contract will no longer be needed and improvements and repair work will be performed using contracts DEL-138/DEL-185.