Evaluation of Water Quality Standards in Watershed Streams Using the Protocols of the DEC/DEP MOU, Addendum E

New York City Water Supply

Report for 2010

Prepared by: Bureau of Water Supply
Watershed Water Quality Science & Research
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1. Introduction

In September 1997, the New York State Department of Environmental Conservation (DEC) and the New York City Department of Environmental Protection (DEP) finalized a Memorandum of Understanding (MOU) governing several aspects of enforcement protocols in the New York City water supply watersheds. Addendum E of the MOU describes a series of methods to examine routine stream sampling data collected by DEP's Division of Watershed Water Quality Operations to evaluate water quality. According to Addendum E, DEP will submit reports describing the results of this analysis along with any other documentation of water quality concerns (*e.g.*, exceedances of TMDLs, results of non-routine special sampling efforts, biomonitoring information).

2. Data Analysis Description

Fecal and total coliform bacteria, pH, total phosphorus, dissolved oxygen, total ammonia, and nitrate-nitrite are the analytes routinely examined by these protocols. However, according to Addendum E, any constituent listed in 6 NYCRR §703 can be included in this analysis. The means of the analytes were calculated for each site, and compared to the stream water quality guidance values listed in Table I of Addendum E, which is reproduced here as Table 1. Values below detection were converted to one-half the detection limit for the purpose of calculating mean values. Mean coliform concentrations were calculated in the log system. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics for each sampling site because they could not be converted into a numerical value. To calculate the compliance of streams with the Addendum E pH standards ($6.5 \leq pH \leq 8.5$) this protocol converts pH values to hydrogen ion concentrations, calculates the mean, and compares the mean to the pH standards also expressed as hydrogen ion concentrations (*i.e.*, $0.31623 \geq [H^+] \geq 0.0031623$).

Table 1. Water Quality Guidance Values used to compare routine stream monitoring data.

Parameter	Guidance Value
pH	$6.5 \leq pH \leq 8.5$
fecal coliform bacteria	≤ 200 CFU $100ml^{-1}$
total coliform bacteria	≤ 2400 CFU $100ml^{-1}$
total phosphorus	≤ 50 µg L^{-1}
dissolved oxygen	≥ 6 mg L^{-1}
total ammonia (NH_3+NH_4-N)	≤ 2 mg L^{-1}
nitrate-nitrite (NO_3+NO_2-N)	≤ 10 mg L^{-1}

Summary statistics for all sites for the year 2010 can be found in Appendix A. Maps showing routine stream sample sites, surface discharging WWTPs, and stream biomonitoring sites are included as Appendix B. Table 2 lists the 50 sites with contraventions of water quality standards out of the 123 sites analyzed. The 11 sites at which mean concentrations contravened the Table 1 guidance values are noted in the third column of Table 2.

Most of the sites in Table 2 are there not because their mean concentrations actually contravened the Table 1 guidance values, but because there were more than two contraventions of the spike concentration values at

the site. A spike is defined in the Addendum as "...an ambient water quality concentration found to be above the [guidance] value by three standard deviations of the...mean at a given site." The concept of the spike concentration is important because most loading from non-point sources occurs during rainfall events. Since the routine samples are collected on a fixed frequency basis, average values from the routine sampling data may not reveal sites that occasionally receive excessive non-point loading. Such sites could be considered for special investigation. If there are a total of more than two spikes at a site, they are listed in the fourth column of Table 2. If the number of samples taken at a site during the sample period was unusually high (>30) or low (<10), it is so noted in the table.

Addendum E also specifies the application of a t-test to examine differences in concentrations of the seven constituents listed in Table 1 between sampling sites that are paired above and below selected wastewater treatment plant (WWTP) discharges. This test looks at the difference between the upstream and downstream concentrations, subtracts an allowable amount of increase (one half of the guidance value or one standard unit in the case of pH) and determines if the result is statistically less than zero at the 95% confidence level. The null hypothesis for this test is that the difference is greater than or equal to zero, that is, that the plant is increasing in-stream concentrations above an allowable amount. To reject the null hypothesis, and so conclude that the plant is not increasing in-stream concentrations above an allowable amount, the t-statistic must fall within the lower tail (or the upper tail in the case of alkaline pH and dissolved oxygen). The results of this analysis are listed in Table 3.

The second column of Table 3 lists those analytes for which the WWTP was found by this test to be a significant source, and whose mean concentrations at the downstream sampling site contravene the water quality guidelines listed in Table 1. WWTPs with entries in this column may be considered sources of water quality problems.

The third column of Table 3 lists those analytes for which the WWTP was found by this test to be a significant source, but whose mean concentrations at the downstream site do not contravene the Table 1 guidelines. For these analytes, the WWTP can be considered to be a significant source, but not a significant problem.

New York State does not have a numeric water quality standard for phosphorus. In the past, DEP has used the DEC phosphorus guidance value of 20 $\mu g\ L^{-1}$ when determining Phosphorus Restricted Basins and the Phase I TMDLs. The Phase II TMDLs, which were approved by EPA in October 2000, incorporate a site-specific guidance value of 15 $\mu g\ L^{-1}$ for source water reservoirs (New Croton, Cross River, Croton Falls, Kensico, West Branch, Rondout and Ashokan), and apply the existing New York State guidance value of 20 $\mu g\ L^{-1}$ for upstream reservoirs. For this stream water analysis, a 50 $\mu g\ L^{-1}$ guidance value is used. This value, intended to protect downstream impoundments from eutrophication, was taken from the Federal Water Quality Criteria "Gold Book", and has been accepted by New York State.

If a reservoir is listed as phosphorus restricted ("P-restricted") as of this report's time frame, it is so noted in Table 2. DEC removed Cannonsville Reservoir from the list of phosphorus restricted reservoirs in 2002, and added Bog Brook Reservoir and New Croton Reservoir in 2002 and 2004 respectively. Two phosphorus restricted reservoirs in the Croton System, Diverting and Bog Brook Reservoirs, are not listed in Table 2 because, for 2010, they had no stream sites meeting the criteria for inclusion.

3. Discussion

For the year 2010, 1,978 samples from 123 stream sample sites were analyzed. Of these, 50 sites are listed in Table 2. As in previous Addendum E water quality reports, most of the sites listed in Table 2 are there because of intermittently high concentrations ("spikes") of coliform bacteria, from sources other than WWTPs. See "Likely sources" in Table 2.)

Regarding pollutants from WWTPs, Addendum E analysis since 1997 has shown that sites downstream of WWTPs have often had excess total phosphorus (TP) concentrations. For 2010, however, only 5 stream sample site had a mean TP>50 $\mu g\ L^{-1}$ and 2 are located downstream of a WWTP. These low numbers continue to indicate a significant reduction in phosphorus loading in general, and in particular from WWTPs.

Previous Addendum E reports have shown by t-test analysis that, as each plant has been upgraded, it is no longer a source of unacceptably high levels of phosphorus, and is therefore no longer listed for phosphorus in the second column of Table 3. For 2010, of the 11 WWTPs analyzed by this method all plants have been upgraded. Yorktown Heights WWTP was the last to be upgraded, and is no longer listed in the second column of Table 3. For the first time since the report was started there are no entries in Table 3, another sign of improved water quality.

Addendum E reports for 1998 through 2009 reported that stream sample sites with mean TP>50 $\mu g\ L^{-1}$ often exhibited a significant correlation between phosphorus and turbidity measurements (Spearman's correlation analysis, at $p<0.1$). In 2010, there were two sites with mean TP>50 $\mu g\ L^{-1}$ and with sufficient turbidity data required to perform the analysis. Two sites exhibited a significant correlation between phosphorus and turbidity measurements, which has decreased from four sites in 2009. Due to improved water quality, the number of sites still available for this analysis is low. However, the TP/turbidity correlation continues to suggest that management strategies, such as stormwater retrofit and whole farm planning that reduce turbidity and/or suspended solids also mitigate non-point source TP loading.

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2010.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
East-of-Hudson					
Kensico	E10		1-fecal coli.; 5-total coli.	highway runoff; wildlife	Site not sampled for nutrients.
	E11		3-fecal coli.; 4-total coli.	urban runoff; wildlife	
	E9		3-fecal coli.; 3-total coli.	urban runoff; wildlife	Site not sampled for nutrients.
	MB-1		2-fecal coli.; 2-total coli.	urban runoff; wildlife	
	N5-1	TP	2-fecal coli.; 4-total coli.	urban runoff; wildlife	Significant TP/turbidity correlation. Benthic monitoring ’97: slightly impaired.
	N12	total coli.	4-fecal coli.; 6-total coli.	urban runoff; wildlife	
	WHIP		1-total coli.	urban runoff; wildlife	Benthic monitoring ’05, ‘09 - slightly impaired. ’10 – not sampled for benthic monitoring.
	BG9		2-fecal coli.; 2-total coli.	urban runoff; wildlife	
New Croton (P-restricted)	HUNTER1		2-fecal coli.; 5-total coli.	urban runoff; wildlife	Benthic monitoring ’00, ’01, ’02, ’03, ’04, ’05, ’06, ’07, ’08, ’09, ‘10 - slightly impaired.

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2010.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
New Croton (P-restricted)	CORNELL1		7-fecal coli.; 11-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	CATHY7		4-fecal coli.; 9-total coli.	urban runoff; wildlife; construction site	Site sampled for bact. only. Benthic monitoring ’05, ‘06 - slightly impaired.
	FRENCH5		4-fecal coli.; 7-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	COLABAUGH1		4-fecal coli.; 9-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	ILLINGTON1		2-fecal coli.; 6-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	KITCHAWAN1		4-fecal coli.; 9-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	NCBAILEY1		5-fecal coli.; 5-total coli.	urban runoff; wildlife	Site sampled for bact. only. Benthic monitoring ’05, ‘06 - slightly impaired.
	PURDY1		6-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	SAWMILL1		7-fecal coli.; 5-total coli.	urban runoff; wildlife	Site sampled for bact. only. Benthic monitoring ’05 - slightly impaired.
	GEDNEY3		4-fecal coli.; 8-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	WHITE2		5-fecal coli.; 11-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	KISCO3		9-fecal coli.; 7-total coli.	urban runoff; wildlife	Benthic monitoring ’95, ’96, ’01, ‘06 - slightly impaired.

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2010.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
Muscoot (P-restricted)	HMILL1		1-pH	urban runoff; wildlife	Small no.of samples: n=1. Located below Yorktown Heights WWTP. Benthic monitoring ’07, ‘10 - moderately impaired; ’08, ‘09 - slightly impaired.
	HMILL7	total coli.	10-fecal coli.; 13-total coli.; 1-pH	urban runoff; wildlife	Located above Yorktown Heights WWTP. Benthic monitoring: ’94, ’98, ’99, ’07, ’08, ‘09 , ’10 –slightly impaired; ’95, ’00, ’04, ‘06 – moderately impaired. Site not sampled for nutrients.
	HMILL4		13-fecal coli.; 10-total coli.; 1-pH	municipal WWTP; urban runoff, wildlife	Located below Yorktown Heights WWTP. Benthic monitoring: ’94, ’98, ’06, ‘08 – moderately impaired; ’95, ’99, ’00, ‘07 – severely impaired; ’09, ’10 - slightly impaired. Site not sampled for nutrients.
	MUSCOOT5		3-fecal coli.; 6-total coli.	municipal WWTP; urban runoff; wildlife	Located below Yorktown Heights WWTP. Benthic monitoring: ’95-moderately impaired; ’96, ’99, ’01, ‘06 – slightly impaired.

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2010.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
Muscoot (P-restricted)	PLUM2		1-fecal coli.; 5-total coli.	urban runoff; wildlife	Benthic monitoring: ’98 – moderately impaired; ‘99, ’00, ‘04 – slightly impaired.
	STONE5	TP	5-fecal coli.; 6-total coli.	WWTP; urban runoff; wildlife	Downstream from WWTP on Broad Brook; Benthic monitoring upstream: ’97, ’98, ’01, ’02, ’04, ’05, ’06, ’07, ’08, ‘10 - slightly impaired;
	HOLLY12		7-fecal coli.; 5-total coli.	urban runoff; wildlife	Site located in Town of Southeast, on Holly stream.
Cross River	CROSS2		7-fecal coli.; 8-total coli.	wildlife	Site located in Ward Pound Reservation (county park).
	MUSCOOT 9		1-pH	urban runoff; wildlife	Small no.of samples: n=1. Site located in Town of Somers, on Muscoot River. Benthic monitoring ’09, ‘10 – slightly impaired.
Amawalk (P-restricted)	MUSCOOT 10	TP	6-fecal coli.; 9-total coli.	urban runoff; wildlife	Significant TP/turbidity correlation. Benthic monitoring ‘06 – slightly impaired.

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2010.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
Titicus (P-restricted)	TITICUS3		5-fecal coli.; 5-total coli.	urban runoff; wildlife	
Croton Falls (P-restricted)	MIKE2	fecal coli.; TP	10-fecal coli.; 11-total coli	municipal WWTP; wildlife, agriculture	Located below Carmel #2 WWTP; Benthic monitoring ’99, ’00, ’05, ‘10 – slightly impaired.
Middle Branch (P-restricted)	MIDBR3	TP	7-fecal coli.; 9-total coli.	urban runoff; wildlife	Benthic monitoring upstream: ’00, ’01, ‘10 – slightly impaired.
East Branch (P-restricted)	EASTBR		6-fecal coli.; 8-total coli.	urban runoff; wildlife	Benthic monitoring ’06, ’08, ’09, ‘10 – slightly impaired.
	HH7		2-fecal coli.; 3-total coli.	urban runoff; wildlife	Large no.of samples: n=34.
	MUDTRIB1		8-fecal coli.; 6-total coli.; 1-pH	urban runoff, wildlife; WWTPs	Located below Patterson V. and Cornwall Meadows WWTPs. Site not sampled for nutrients.
	BB5		4-fecal coli.; 7-total coli.	urban runoff; wildlife	Benthic monitoring: ’94, ’95, ’98, ’99, ’00, ’01, ’02, ’03, ’05, ’08, ‘10 - slightly impaired. ’04 – moderately impaired. Site not sampled for nutrients.
West Branch	GYPSYTRL1		4-fecal coli.; 8-total coli.	urban runoff; wildlife	Benthic monitoring: ’00, ’01, ‘09 – slightly impaired.

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2010.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
West Branch	LONGPD1		5-fecal coli.; 4-total coli.	urban runoff; wildlife	Benthic monitoring: ’00, ’03, ’10 - slightly impaired.
	HORSEPD12		5-fecal coli.; 6-total coli.		Benthic monitoring: ’10 - slightly impaired.
	WESTBR7		2-fecal coli.; 2-total coli.	urban runoff; wildlife	
	LEETOWN3		2-fecal coli.; 9-total coli.	urban runoff; wildlife	
Catskill District					
Schoharie	S10		1-fecal coli.	urban runoff; wildlife	Benthic monitoring ‘06 – not impaired; ’08, ’09, ’10 - slightly impaired.
Delaware District					
Cannonsville	WDHOA		2-fecal coli.	urban runoff; agriculture; wildlife.	
Neversink	NK6		1-fecal coli.	acid precipitation	
	NK4	pH (acid)	1-pH	wildlife	Benthic monitoring ’08, ‘10 – slightly impaired.
	NCG	pH (acid)	1-pH	acid precipitation	
Rondout	RRHG	pH (acid)	1-pH	acid precipitation	Benthic monitoring ‘06 – slightly impaired.
	RGB	pH (acid)	1-pH	acid precipitation	Benthic monitoring ‘06 – slightly impaired.

Table 3. WWTPs shown by t-tests of upstream/downstream sampling to be sources of contraventions of water quality standards at the downstream site for 2010.

WWTP (and upstream/downstream sample sites)	Parameters excessively contributed to by WWTP, and the mean at downstream site contravenes Table 1 guidelines.	Parameters excessively contributed to by WWTP, but the mean at downstream site does not contravene Table 1 guidelines.
Yorktown Heights (HMILL7 / HMILL4)	*none*	*none*
Margaretville (PMSA / PMSB)	"	"
Pine Hill (E3 / E15)	"	"
Grand Gorge (S8 / S9)	"	"
Tannersville (S1 / S2)	"	"
Hobart (WDHOM / WDHOB)	"	"
Delhi (DTPA / DTPB)	"	"
Walton (WSPA / WSPB)	"	"
Mountainside (DCDA / DCDB) (Subsurface Industrial Discharge)	"	"
Grahamsville (RGA / RGB)	"	"
Roxbury Run (EDRA / EDRB)	"	"
Stamford (WDSTM / WDSTB)	"	"

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2010.
The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as “too numerous to count” in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml^{-1})	total coliform (CFU 100ml^{-1})	total phosphorus (µg l^{-1})	dissolved oxygen (mg l^{-1})	total ammonia (mg l^{-1})	nitrate-nitrite (mg l^{-1})
East-of-Hudson District							
BB5	2	24	24	0	2	0	0
	7.8	910	16000	.	12.93	.	.
	7.71	3(nd)	160	.	8.7	.	.
	7.755	**64**	**959**	**.**	**10.8**	**.**	**.**
BG9	11	12	12	11	11	3	10
	7.5	800	3000	57	12.77	0.048	0.604
	6.7	2(nd)	83(nd)	8(nd)	1.38	0.01(nd)	0.01(nd)
	7.155	**35**	**670**	**25.7**	**8.64**	**0.0317**	**0.3082(nd)**
CATHY7	0	23	24	0	0	0	0
	.	350	8700	.	.	.	.
	.	4(nd)	140	.	.	.	.
	.	**46**	**1549**	**.**	**.**	**.**	**.**
COLABAUGH1	0	24	24	0	0	0	0
	.	1200	24000	.	.	.	.
	.	1(nd)	80(nd)	.	.	.	.
	.	**40**	**1100**	**.**	**.**	**.**	**.**
CORNELL1	0	24	24	0	0	0	0
	.	1240	13000	.	.	.	.
	.	7	250	.	.	.	.
	.	**122**	**1249**	**.**	**.**	**.**	**.**
CROSS2	12	24	24	12	11	3	12
	7.92	460	7000	39	19.08	0.01(nd)	0.416
	7.35	3(nd)	83	11	9.09	0.01(nd)	0.018
	7.736	**65**	**1497**	**25.2**	**12.4**	**0.0100(nd)**	**0.1885**
E10	12	12	12	0	10	0	0
	7.89	250	4700	.	14.58	.	.
	7.33	5	83(nd)	.	7.76	.	.
	7.653	**45**	**1140**	**.**	**11.4**	**.**	**.**
E11	12	11	12	12	11	3	11
	7.64	350	15000	60	13.41	0.01(nd)	0.443
	7.12	2(nd)	50(nd)	13	1.7	0.01(nd)	0.01(nd)
	7.387	**27**	**1157**	**31.8**	**7.79**	**0.0100(nd)**	**0.1359**

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site	pH	fecal coliform (CFU 100ml^{-1})	total coliform (CFU 100ml^{-1})	total phosphorus (µg l^{-1})	dissolved oxygen (mg l^{-1})	total ammonia (mg l^{-1})	nitrate-nitrite (mg l^{-1})
E9	10	9	10	0	9	0	0
	7.15	2700	26000	.	13.38	.	.
	6.7	2	83	.	2.14	.	.
	6.950	**64**	**1349**	**.**	**6.11**	**.**	**.**
EASTBR	13	24	24	12	13	3	12
	7.6	1300	25000	96	13.11	0.01(nd)	0.434
	7.02	2(nd)	8(nd)	12	3.85	0.01(nd)	0.01(nd)
	7.245	**55**	**949**	**43.7**	**8.38**	**0.0100(nd)**	**0.1358**
FRENCH5	0	24	24	0	0	0	0
	.	1200	11000	.	.	.	.
	.	1(nd)	100	.	.	.	.
	.	**36**	**1049**	**.**	**.**	**.**	**.**
GEDNEY3	0	24	24	0	0	0	0
	.	780	16000	.	.	.	.
	.	8(nd)	250(nd)	.	.	.	.
	.	**54**	**1649**	**.**	**.**	**.**	**.**
GYPSYTRL1	11	23	22	12	12	3	12
	8.02	780	7700	133	14.8	0.01(nd)	0.404
	6.9	3(nd)	50(nd)	12	8	0.01(nd)	0.01(nd)
	7.256	**46**	**1304**	**30.2**	**10.9**	**0.0100(nd)**	**0.0898**
HH7	12	24	24	12	12	3	12
	7.8	550	11000	23	15.66	0.01(nd)	0.478
	7.28	3(nd)	50(nd)	7	7.72	0.01(nd)	0.105
	7.555	**38**	**710**	**11.8**	**11.5**	**0.0100(nd)**	**0.3017**
HMILL1	1	0	0	0	1	0	0
	7.76	.	.	.	10.3	.	.
	7.76	.	.	.	10.3	.	.
	7.760	**.**	**.**	**.**	**10.3**	**.**	**.**
HMILL4	1	24	24	0	1	0	0
	7.6	6900	7600	.	8.2	.	.
	7.6	16	130	.	8.2	.	.
	7.600	**176**	**2249**	**.**	**8.20**	**.**	**.**
HMILL7	1	24	24	0	1	0	0
	7.8	1300	8300	.	8.2	.	.
	7.8	18	83	.	8.2	.	.
	7.800	**157**	**2700**	**.**	**8.20**	**.**	**.**

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site	pH	fecal coliform (CFU 100ml^{-1})	total coliform (CFU 100ml^{-1})	total phosphorus (µg l^{-1})	dissolved oxygen (mg l^{-1})	total ammonia (mg l^{-1})	nitrate-nitrite (mg l^{-1})
HOLLY12	12	17	17	12	12	3	12
	7.74	2200	40000	58	15.24	0.01(nd)	0.805
	7.24	12	170	16	7.62	0.01(nd)	0.389
	7.563	**150**	**1300**	**29.0**	**11.3**	**0.0100(nd)**	**0.5867**
HORSEPD12	12	24	24	12	13	3	12
	8.2	830	8600	193	15	0.01(nd)	1.212
	7.2	1(nd)	83(nd)	9	8.7	0.01(nd)	0.01(nd)
	7.639	**32**	**800**	**34.4**	**11.4**	**0.0100(nd)**	**0.3766**
HUNTER1	12	24	24	12	11	3	12
	8.03	350	20000	57	15.81	0.01(nd)	0.862
	7.59	8	83(nd)	8	8.42	0.01(nd)	0.282
	7.798	**54**	**670**	**24.6**	**11.3**	**0.0100(nd)**	**0.5791**
ILLINGTON1	0	24	24	0	0	0	0
	.	630	4700	.	.	.	.
	.	3(nd)	170(nd)	.	.	.	.
	.	**35**	**746**	.	.	.	.
KISCO3	12	24	24	12	11	3	12
	7.69	500	6870	104	14.84	0.01(nd)	1.047
	6.46	20	83(nd)	7	8.08	0.01(nd)	0.307
	7.418	**123**	**1000**	**38.1**	**11.5**	**0.0100(nd)**	**0.6598**
KITCHAWAN1	0	24	24	0	0	0	0
	.	510	11000	.	.	.	.
	.	5(nd)	100(nd)	.	.	.	.
	.	**66**	**1140**	.	.	.	.
LEETOWN3	12	24	24	12	12	3	12
	7.8	530	14000	94	13.9	0.01(nd)	0.462
	6.29	1(nd)	45(nd)	11	6.3	0.01(nd)	0.01(nd)
	7.340	**17**	**1775**	**27.6**	**10.4**	**0.0100(nd)**	**0.1736**
LONGPD1	13	24	24	12	13	3	12
	7.9	1350	15000	59	14	0.037	0.487
	7.3	1(nd)	83	9	8.38	0.01(nd)	0.028
	7.653	**51**	**735**	**25.4**	**11.1**	**0.0190(nd)**	**0.2036**
MB-1	12	12	12	12	12	3	11
	7.56	3300	15000	97	14.75	0.049	0.681
	7.1	5(nd)	250(nd)	14	6.8	0.01(nd)	0.029
	7.367	**49**	**843**	**36.9**	**10.3**	**0.0230**	**0.3101**

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site	pH	fecal coliform (CFU 100ml^{-1})	total coliform (CFU 100ml^{-1})	total phosphorus (µg l^{-1})	dissolved oxygen (mg l^{-1})	total ammonia (mg l^{-1})	nitrate-nitrite (mg l^{-1})
MIDBR3	11	24	24	12	12	3	12
	8.7	830	16000	144	14.9	0.038	0.677
	7.2	7	170(nd)	17	8.6	0.01(nd)	0.048
	7.853	**111**	**2145**	**50.4**	**11.5**	**0.0193(nd)**	**0.3636**
MIDBR4	1	0	0	0	1	0	0
	8	.	.	.	9.1	.	.
	8	.	.	.	9.1	.	.
	8.000	**.**	**.**	**.**	**9.10**	**.**	**.**
MIKE2	12	24	24	12	13	3	12
	8.4	11000	28000	98	15.3	0.064	9.721
	7	13	83	20	8.19	0.01(nd)	0.721
	7.698	**207**	**2300**	**53.7**	**11.2**	**0.0280**	**2.5978**
MUDTRIB1	1	24	22	0	1	0	0
	7.71	6800	29000	.	12.36	.	.
	7.71	5	170	.	12.36	.	.
	7.710	**96**	**1049**	**.**	**12.4**	**.**	**.**
MUSCOOT10	12	24	24	12	12	3	12
	7.7	11000	38000	135	13.4	0.065	2.196
	7	4	83(nd)	25	4.22	0.01(nd)	0.239
	7.335	**133**	**1597**	**58.2**	**9.21**	**0.0340**	**0.8019**
MUSCOOT5	12	24	24	12	11	3	12
	8.12	560	4000	41	15.17	0.01(nd)	2.223
	7.15	4	83(nd)	14	9.77	0.01(nd)	0.75
	7.753	**59**	**1140**	**23.2**	**12.1**	**0.0100(nd)**	**1.2286**
MUSCOOT9	1	0	0	0	1	0	0
	7.8	.	.	.	10.1	.	.
	7.8	.	.	.	10.1	.	.
	7.800	**.**	**.**	**.**	**10.1**	**.**	**.**
N12	12	12	12	12	12	3	11
	8.22	670	9000	28	13.89	0.01(nd)	1.714
	7.12	10	83	9	8.6	0.01(nd)	0.516
	7.789	**107**	**2683**	**16.8**	**11.4**	**0.0100(nd)**	**1.0178**
N5-1	12	12	12	12	12	3	11
	7.78	5300	25000	164	15.47	0.01(nd)	1.909
	7.22	16(nd)	140(nd)	13	0.8	0.01(nd)	0.058
	7.463	**82**	**911**	**67.4**	**9.04**	**0.0100(nd)**	**0.9340**

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site	pH	fecal coliform (CFU 100ml^{-1})	total coliform (CFU 100ml^{-1})	total phosphorus (µg l^{-1})	dissolved oxygen (mg l^{-1})	total ammonia (mg l^{-1})	nitrate-nitrite (mg l^{-1})
NCBAILEY1	0	24	24	0	0	0	0
	.	4200	8000	.	.	.	.
	.	5	180	.	.	.	.
	.	**56**	**1449**	**.**	**.**	**.**	**.**
PLUM2	12	24	24	12	11	3	12
	8.09	230	8300	66	14.98	0.01(nd)	1.324
	7.55	2(nd)	50(nd)	14	7.29	0.01(nd)	0.531
	7.802	**28**	**665**	**29.3**	**11.7**	**0.0100(nd)**	**0.8378**
PURDY1	0	23	23	0	0	0	0
	.	200	10000	.	.	.	.
	.	1(nd)	160	.	.	.	.
	.	**26**	**1000**	**.**	**.**	**.**	**.**
SAWMILL1	0	23	24	0	0	0	0
	.	3100	9500	.	.	.	.
	.	3(nd)	100(nd)	.	.	.	.
	.	**61**	**970**	**.**	**.**	**.**	**.**
STONE5	13	23	24	11	12	3	12
	8.19	560	8670	139	14.91	0.01(nd)	2.619
	7.24	20	50(nd)	16(nd)	8.8	0.01(nd)	0.627
	7.845	**92**	**1300**	**50.2**	**11.9**	**0.0100(nd)**	**1.1052**
TITICUS3	12	24	24	12	12	3	12
	8.6	5400	60000	95	15.28	0.01(nd)	0.92
	7.38	5	120	15	7.16	0.01(nd)	0.136
	7.918	**82**	**1300**	**32.7**	**11.7**	**0.0100(nd)**	**0.4672**
WESTBR7	13	24	24	12	13	3	12
	7.7	410	3700	25	15	0.01(nd)	0.249
	7.2	2(nd)	50(nd)	8	7.9	0.01(nd)	0.01(nd)
	7.501	**24**	**809**	**13.9**	**10.8**	**0.0100(nd)**	**0.0652**
WHIP	12	12	12	12	12	3	11
	7.93	160	3300	33	14.07	0.01(nd)	1.412
	7.34	5(nd)	83(nd)	8	8.9	0.01(nd)	0.581
	7.675	**26**	**1000**	**19.0**	**11.2**	**0.0100(nd)**	**0.9286**
WHITE2	0	24	24	0	0	0	0
	.	1200	19000	.	.	.	.
	.	1(nd)	83	.	.	.	.
	.	**39**	**1442**	**.**	**.**	**.**	**.**

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site	pH	fecal coliform (CFU 100ml^{-1})	total coliform (CFU 100ml^{-1})	total phosphorus (µg l^{-1})	dissolved oxygen (mg l^{-1})	total ammonia (mg l^{-1})	nitrate-nitrite (mg l^{-1})
CATSKILL DISTRICT							
ABCG	10	9	0	10	9	10	10
	8.08	120	.	30	14.9	0.01(nd)	0.32
	7.04	1(nd)	.	9	10.21	0.01(nd)	0.01(nd)
	7.532	**5**	**.**	**17.3**	**11.9**	**0.0100(nd)**	**0.171**
AEHG	7	6	0	8	7	8	8
	7.74	10	.	13	14.17	0.01(nd)	1.01
	6.14	1(nd)	.	2.5(nd)	9.27	0.01(nd)	0.18
	6.833	**2(nd)**	**.**	**7.7**	**12.2**	**0.0100(nd)**	**0.3838**
ASCHG	12	10	0	12	11	12	12
	8.02	50	.	18	14.35	0.01(nd)	0.64
	6.62	1(nd)	.	6	10.53	0.01(nd)	0.23
	7.074	**3(nd)**	**.**	**11.5**	**12.2**	**0.0100(nd)**	**0.4133**
BK	12	11	0	12	11	12	12
	8.3	100	.	37	18.59	0.01(nd)	0.22
	7.25	1(nd)	.	5	9.84	0.01(nd)	0.01(nd)
	7.610	**3**	**.**	**13.8**	**12.5**	**0.0100(nd)**	**0.0775**
BNV	11	11	0	12	11	12	12
	7.8	70	.	17	15.1	0.01(nd)	0.36
	7.08	1(nd)	.	10	10.42	0.01(nd)	0.11
	7.426	**5**	**.**	**13.2**	**12.8**	**0.0100(nd)**	**0.2383**
BRD	11	11	0	12	11	12	12
	7.72	50	.	100	15.53	0.01(nd)	0.44
	7.03	1(nd)	.	7	9.66	0.01(nd)	0.01(nd)
	7.405	**5(nd)**	**.**	**25.2**	**12.6**	**0.0100(nd)**	**0.2058**
E10I	12	11	0	12	11	12	12
	7.78	100	.	10	15.16	0.01(nd)	0.17
	6.86	1(nd)	.	5	9.64	0.01(nd)	0.01(nd)
	7.365	**6**	**.**	**7.8**	**12.2**	**0.0100(nd)**	**0.0858**
E16I	11	11	0	11	11	11	11
	8.45	100	.	41	16.64	0.01(nd)	0.33
	7.08	2(nd)	.	6	10.35	0.01(nd)	0.08
	7.705	**14**	**.**	**15.7**	**13.2**	**0.0100(nd)**	**0.1736**
E5	11	11	0	12	11	12	12
	8.53	50	.	33	15.54	0.01(nd)	0.29
	7.04	1(nd)	.	7	9.91	0.01(nd)	0.01(nd)
	7.564	**5**	**.**	**12.9**	**12.7**	**0.0100(nd)**	**0.1483**

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site	pH	fecal coliform (CFU 100ml^{-1})	total coliform (CFU 100ml^{-1})	total phosphorus (µg l^{-1})	dissolved oxygen (mg l^{-1})	total ammonia (mg l^{-1})	nitrate-nitrite (mg l^{-1})
LBK	12	12	0	12	11	12	12
	7.89	200	.	14	17.08	0.01(nd)	0.12
	7.03	1	.	6	9.69	0.01(nd)	0.01(nd)
	7.462	**7**	**.**	**10.4**	**12.4**	**0.0100(nd)**	**0.0283**
S10	10	11	0	11	8	11	11
	8.07	240	.	92	14.68	0.04	0.49
	6.74	1(nd)	.	6	10.75	0.01(nd)	0.01(nd)
	7.523	**13**	**.**	**19.5**	**12.5**	**0.0145(nd)**	**0.1536**
S4	11	10	0	12	9	12	12
	7.93	88	.	30	15.39	0.01(nd)	0.45
	6.59	1(nd)	.	2.5(nd)	11.37	0.01(nd)	0.01(nd)
	7.238	**9**	**.**	**8.3**	**13.0**	**0.0100(nd)**	**0.1883**
S5I	8	9	0	9	6	9	9
	8.18	80	.	39	13.12	0.02	0.19
	6.92	1(nd)	.	5	10.03	0.01(nd)	0.01(nd)
	7.576	**13**	**.**	**12.0**	**11.9**	**0.0111(nd)**	**0.0744**
S6I	11	9	0	12	9	12	12
	8.48	108	.	77	16.47	0.03	1.45
	7.12	1(nd)	.	10	9.66	0.01(nd)	0.06
	7.717	**12**	**.**	**27.4**	**13.0**	**0.0125(nd)**	**0.4608**
S7I	11	11	0	12	9	12	12
	8.04	96	.	43	16.23	0.01(nd)	0.24
	7.34	1(nd)	.	5	9.84	0.01(nd)	0.01(nd)
	7.676	**10**	**.**	**14.0**	**12.7**	**0.0100(nd)**	**0.0692**
SBKHG	12	9	0	12	9	12	12
	7.72	28	.	22	14.71	0.01(nd)	0.53
	6.55	1(nd)	.	6	10.37	0.01(nd)	0.14
	6.898	**2**	**.**	**11.4**	**12.3**	**0.0100(nd)**	**0.3175**
SCL	12	12	0	12	11	12	12
	9.03	100	.	67	18.01	0.01(nd)	0.41
	7.05	1(nd)	.	7	10.66	0.01(nd)	0.01(nd)
	7.703	**12**	**.**	**24.8**	**13.0**	**0.0100(nd)**	**0.1917**
SCL-A	11	0	0	0	11	0	0
	7.69	.	.	.	21.3	.	.
	6.91	.	.	.	10.96	.	.
	7.229	**.**	**.**	**.**	**13.5**	**.**	**.**

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site	pH	fecal coliform (CFU 100ml^{-1})	total coliform (CFU 100ml^{-1})	total phosphorus (µg l^{-1})	dissolved oxygen (mg l^{-1})	total ammonia (mg l^{-1})	nitrate-nitrite (mg l^{-1})
SCL-B	10	0	0	0	10	0	0
	7.71	.	.	.	19.21	.	.
	7.07	.	.	.	10.9	.	.
	7.365	**.**	**.**	**.**	**13.0**	**.**	**.**
SEK	11	11	0	11	9	11	11
	7.98	50	.	27	16.21	0.01(nd)	0.37
	6.67	1(nd)	.	2.5(nd)	9.33	0.01(nd)	0.01(nd)
	7.365	**6**	**.**	**7.9**	**13.0**	**0.0100(nd)**	**0.1045**
SSHG	12	10	0	12	9	12	12
	7.24	60	.	14	15.18	0.01(nd)	0.33
	6.05	1(nd)	.	2.5(nd)	8.76	0.01(nd)	0.01(nd)
	6.683	**2**	**.**	**7.6**	**12.3**	**0.0100(nd)**	**0.2075**
SSMA	11	7	0	11	9	11	11
	7.61	16	.	12	15.87	0.01(nd)	0.23
	6.31	1(nd)	.	2.5(nd)	10.13	0.01(nd)	0.01(nd)
	6.868	**3**	**.**	**7.6**	**13.0**	**0.0100(nd)**	**0.0855**
SSMB	12	10	0	12	9	12	12
	7.37	100	.	14	16.01	0.01(nd)	0.36
	6.54	1(nd)	.	2.5(nd)	9.8	0.01(nd)	0.01(nd)
	6.959	**12**	**.**	**8.0**	**13.3**	**0.0100(nd)**	**0.125**
STHHG	10	9	0	11	8	11	11
	7.57	68	.	37	15.11	0.01(nd)	0.41
	6.88	1(nd)	.	10	9.82	0.01 (nd)	0.13
	7.210	**5**	**.**	**20.2**	**12.3**	**0.0100(nd)**	**0.2691**
SWK	11	9	0	11	8	11	11
	8.12	44	.	84	16.7	0.01(nd)	0.35
	7.01	1(nd)	.	2.5(nd)	9.65	0.01(nd)	0.01(nd)
	7.588	**8**	**.**	**18.4**	**12.1**	**0.0100(nd)**	**0.0845**
SWKHG	12	9	0	12	9	12	12
	7.18	24	.	13	15.32	0.01(nd)	0.37
	6.4	1(nd)	.	5	9.99	0.01(nd)	0.12
	6.858	**2**	**.**	**9.5**	**12.4**	**0.0100(nd)**	**0.2567**
WDL	11	12	0	12	11	12	12
	8.49	88	.	86	16.17	0.01(nd)	0.3
	6.87	1(nd)	.	6	9.3	0.01(nd)	0.06
	7.443	**10**	**.**	**23.8**	**12.3**	**0.0100(nd)**	**0.1592**

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DELAWARE DISTRICT							
C-7	11	11	0	12	12	12	12
	7.79	290	.	27	13.64	0.05	0.45
	6.74	1	.	9	9.72	0.01(nd)	0.13
	7.100	**24**	**.**	**15.0**	**11.5**	**0.0133(nd)**	**0.2725**
C-8	11	12	0	12	12	12	12
	7.52	200	.	25	16.14	0.02	0.42
	6.69	3	.	7	8.67	0.01(nd)	0.1
	7.211	**23**	**.**	**15.8**	**11.3**	**0.0117(nd)**	**0.2350**
CCBHG	10	9	0	11	11	11	11
	7.48	140	.	70	13.07	0.01(nd)	0.82
	6.66	1(nd)	.	10	7.39	0.01(nd)	0.2
	6.876	**10**	**.**	**20.6**	**10.6**	**0.0100(nd)**	**0.4255**
CDG	4	4	0	4	4	4	4
	8.51	240	.	44	13.61	0.01(nd)	0.64
	6.9	8	.	14	9.73	0.01(nd)	0.34
	7.480	**30**	**.**	**23.8**	**11.8**	**0.0100(nd)**	**0.4925**
CDG1	7	8	0	8	8	8	8
	8.72	180	.	44	13.41	0.02	1
	6.95	2	.	18	8.77	0.01(nd)	0.39
	7.621	**20**	**.**	**28.5**	**11.2**	**0.0113(nd)**	**0.6625**
CEBG	11	12	0	12	12	12	12
	7.8	360	.	22	14.59	0.02	0.45
	6.73	3	.	5	8.83	0.01(nd)	0.05
	7.250	**31**	**.**	**12.7**	**11.5**	**0.0117(nd)**	**0.2117**
CEBHG	11	10	0	12	12	12	12
	7.06	90	.	51	14.2	0.02	0.32
	6.64	1(nd)	.	7	7.47	0.01(nd)	0.07
	6.825	**8**	**.**	**17.7**	**10.6**	**0.0108(nd)**	**0.1817**
CLDG	11	11	0	12	12	12	12
	8.84	370	.	34	14.44	0.01(nd)	0.53
	6.92	1	.	10	8.46	0.01(nd)	0.025(nd)
	7.670	**17**	**.**	**19.0**	**11.4**	**0.0100(nd)**	**0.2483**
CTNBG	11	11	0	12	12	12	12
	8.19	140	.	41	13.72	0.01(nd)	0.67
	6.98	1(nd)	.	12	8.6	0.01(nd)	0.025(nd)
	7.501	**14**	**.**	**24.4**	**11.2**	**0.0100(nd)**	**0.2767**

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CTNHG	10	8	0	11	11	11	11
	6.97	39	.	32	13.34	0.01(nd)	0.62
	6.76	1(nd)	.	10	8.27	0.01(nd)	0.29
	6.875	**7**	**.**	**20.1**	**10.8**	**0.0100(nd)**	**0.4082**
CWBA	11	11	0	12	12	12	12
	8.19	210	.	48	13.45	0.12	0.63
	6.96	2	.	18	8.61	0.01(nd)	0.1
	7.458	**16**	**.**	**29.5**	**11.2**	**0.0200(nd)**	**0.3242**
CWBB	11	10	0	12	12	12	12
	8.24	200	.	74	13.43	0.08	0.68
	7.03	3	.	18	8.89	0.01(nd)	0.15
	7.541	**30**	**.**	**33.6**	**11.3**	**0.0175(nd)**	**0.3833**
NCG	12	10	0	12	12	12	12
	6.63	40	.	10	19.73	0.02	0.27
	5.71	1	.	2.5(nd)	9	0.01(nd)	0.08
	6.307	**9**	**.**	**5.7**	**11.6**	**0.0108(nd)**	**0.1600**
NK4	12	6	0	12	12	12	12
	6.72	93	.	8	13.86	0.01(nd)	0.32
	5.71	1(nd)	.	2.5(nd)	5.91	0.01(nd)	0.05
	6.383	**6**	**.**	**4.9**	**10.6**	**0.0100(nd)**	**0.1458**
NK6	12	10	0	13	12	12	12
	6.8	290	.	135	13.17	1.25	0.68
	6.11	1(nd)	.	16	8.59	0.01(nd)	0.3
	6.552	**28**	**.**	**31.1**	**10.6**	**0.1225**	**0.4900**
P-13	12	11	0	12	12	12	12
	7.72	120	.	17	20.87	0.02	0.57
	7	2	.	7	8.84	0.01(nd)	0.1
	7.303	**15**	**.**	**13.8**	**12.1**	**0.0117(nd)**	**0.2842**
P-21	12	12	0	12	12	12	12
	8.57	48	.	22	20.61	0.02	0.44
	6.97	1	.	8	9.14	0.01(nd)	0.05
	7.698	**8**	**.**	**14.8**	**12.2**	**0.0108(nd)**	**0.2092**
P-50	11	11	0	12	12	12	12
	8.11	100	.	21	13.94	0.03	0.31
	6.96	1(nd)	.	8	8.96	0.01(nd)	0.025(nd)
	7.614	**7**	**.**	**14.5**	**11.6**	**0.0117(nd)**	**0.1413**

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2010.
The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as “too numerous to count” in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml^{-1})	total coliform (CFU 100ml^{-1})	total phosphorus (µg l^{-1})	dissolved oxygen (mg l^{-1})	total ammonia (mg l^{-1})	nitrate-nitrite (mg l^{-1})
P-60	12	10	0	12	12	12	12
	7.88	22	.	9	20.13	0.01(nd)	0.44
	6.53	1(nd)	.	2.5(nd)	9.12	0.01(nd)	0.1
	7.404	**5**	**.**	**6.1**	**12.1**	**0.0100(nd)**	**0.2517**
P-7	12	12	0	12	12	12	12
	7.79	150	.	34	19.13	0.02	0.56
	7.03	1(nd)	.	13	8.76	0.01(nd)	0.1
	7.365	**25**	**.**	**20.1**	**11.9**	**0.0108(nd)**	**0.3400**
P-8	12	11	0	12	12	12	12
	7.53	48	.	20	18.42	0.03	0.55
	7.01	4	.	7	8.84	0.01(nd)	0.14
	7.278	**10**	**.**	**14.2**	**11.8**	**0.0133(nd)**	**0.3258**
PBKG	11	12	0	12	12	12	12
	7.4	400	.	22	14.15	0.03	0.41
	6.34	4	.	6	8.93	0.01(nd)	0.025(nd)
	7.157	**30**	**.**	**13.1**	**11.6**	**0.0117(nd)**	**0.2163**
PBRA	11	8	0	12	12	12	12
	7.67	22	.	18	13.77	0.01(nd)	0.36
	7.08	1	.	7	8.68	0.01(nd)	0.06
	7.429	**4**	**.**	**12.8**	**11.3**	**0.0100(nd)**	**0.2067**
PBRB	11	12	0	12	12	12	12
	7.88	180	.	26	13.96	0.02	0.44
	7.07	12	.	7	8.92	0.01(nd)	0.07
	7.632	**71**	**.**	**13.5**	**11.1**	**0.0108(nd)**	**0.2267**
PDRY	11	12	0	12	12	12	12
	7.38	70	.	15	14.45	0.01(nd)	0.39
	6.61	1(nd)	.	5	8.96	0.01(nd)	0.025(nd)
	7.143	**8**	**.**	**9.8**	**11.7**	**0.0100(nd)**	**0.2046**
PMSB	11	11	0	12	12	12	12
	7.95	210	.	25	14.6	0.02	0.57
	6.86	3	.	8	9.34	0.01(nd)	0.025(nd)
	7.311	**22**	**.**	**17.3**	**11.8**	**0.0108(nd)**	**0.2954**
PROXG	10	12	0	12	11	12	12
	7.06	400	.	81	12.66	0.04	0.41
	6.67	1(nd)	.	22	8.29	0.01(nd)	0.13
	6.882	**16**	**.**	**40.8**	**10.6**	**0.0167(nd)**	**0.2383**

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site	pH	fecal coliform (CFU 100ml^{-1})	total coliform (CFU 100ml^{-1})	total phosphorus (µg l^{-1})	dissolved oxygen (mg l^{-1})	total ammonia (mg l^{-1})	nitrate-nitrite (mg l^{-1})
RD1	11	11	0	12	11	12	12
	7.06	44	.	18	13.41	0.02	0.21
	6.47	1	.	8	8.71	0.01(nd)	0.025(nd)
	6.727	**10**	**.**	**13.4**	**11.4**	**0.0117(nd)**	**0.1079**
RD4	11	8	0	12	11	12	12
	7.2	20	.	31	13.63	0.01(nd)	0.15
	6.31	1	.	6	9.19	0.01(nd)	0.025(nd)
	6.779	**4**	**.**	**10.7**	**11.3**	**0.0100(nd)**	**0.0588**
RDOA	12	11	0	13	12	12	12
	7.3	28	.	9	14.18	0.01(nd)	0.2
	6.13	1	.	2.5(nd)	9.63	0.01(nd)	0.025(nd)
	6.644	**7**	**.**	**6.4**	**11.7**	**0.0100(nd)**	**0.1004**
RGA	12	12	0	12	12	12	12
	7.01	140	.	23	14.16	0.01(nd)	0.3
	6.49	1	.	11	8.92	0.01(nd)	0.13
	6.837	**15**	**.**	**14.8**	**11.2**	**0.0100(nd)**	**0.2142**
RGB	13	12	0	12	13	12	12
	6.99	180	.	18	14.15	0.02	0.41
	5.14	3	.	12	8.78	0.01(nd)	0.16
	6.680	**18**	**.**	**14.4**	**11.3**	**0.0108(nd)**	**0.2650**
RRHG	11	5	0	12	11	12	12
	6.21	12	.	7	14.85	0.02	0.26
	4.61	3	.	2.5(nd)	9.34	0.01(nd)	0.09
	5.666	**7**	**.**	**4.4**	**11.6**	**0.0108(nd)**	**0.1817**
WDBN	11	12	0	12	12	12	12
	8.15	180	.	35	13.27	0.03	0.89
	6.92	2	.	8	8	0.01(nd)	0.24
	7.380	**24**	**.**	**18.1**	**11.1**	**0.0125(nd)**	**0.5050**
WDHOA	11	11	0	12	12	12	12
	8.2	360	.	53	13.7	0.03	1.16
	6.93	3(nd)	.	14	8.58	0.01(nd)	0.44
	7.401	**50**	**.**	**31.4**	**11.2**	**0.0150(nd)**	**0.7950**

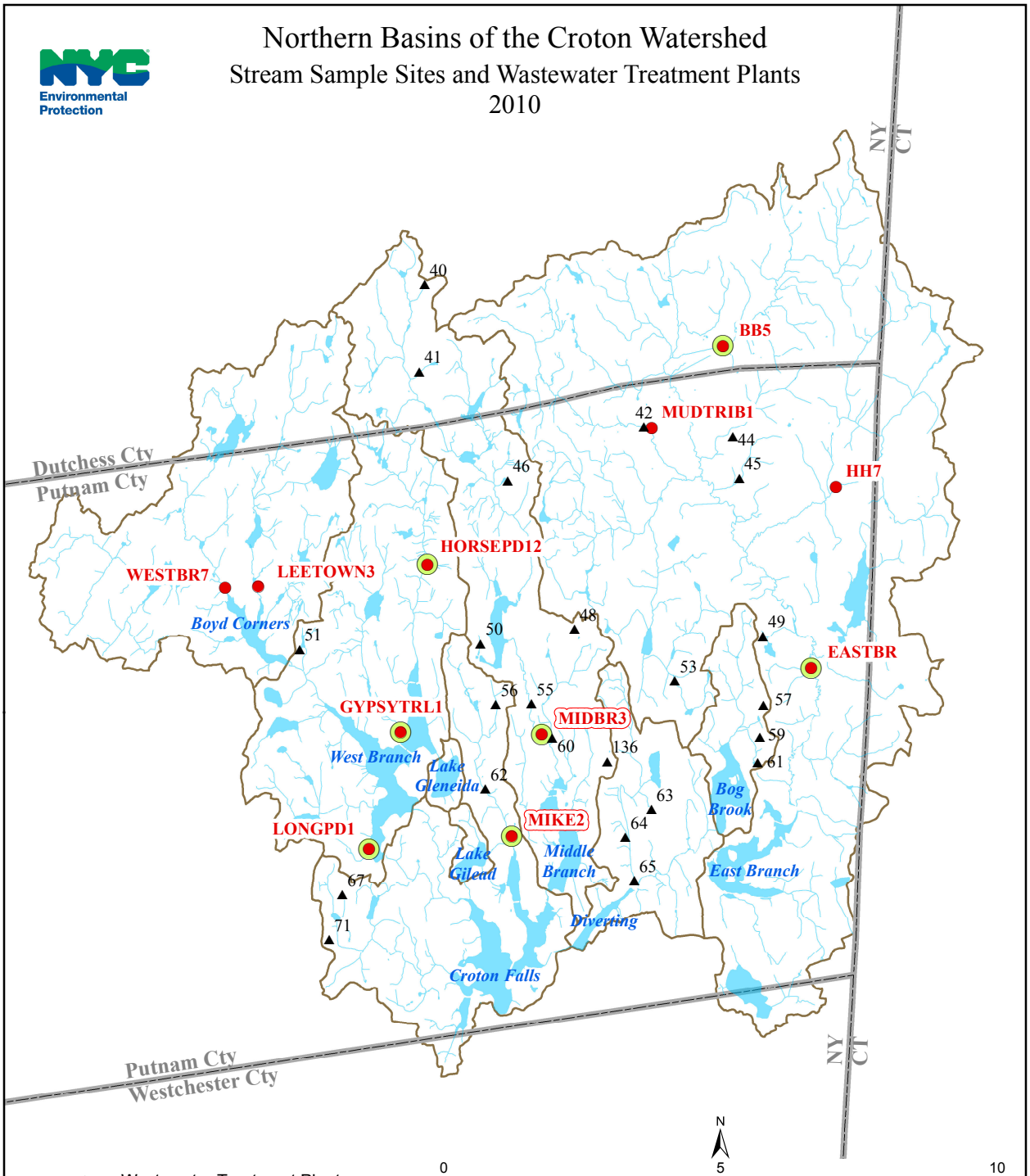
APPENDIX B

SITE MAPS

Northern Basins of the Croton Watershed

Stream Sample Sites and Wastewater Treatment Plants

2010



▲ Wastewater Treatment Plant

● Hydrology Sampling Site

● Biomonitoring Site

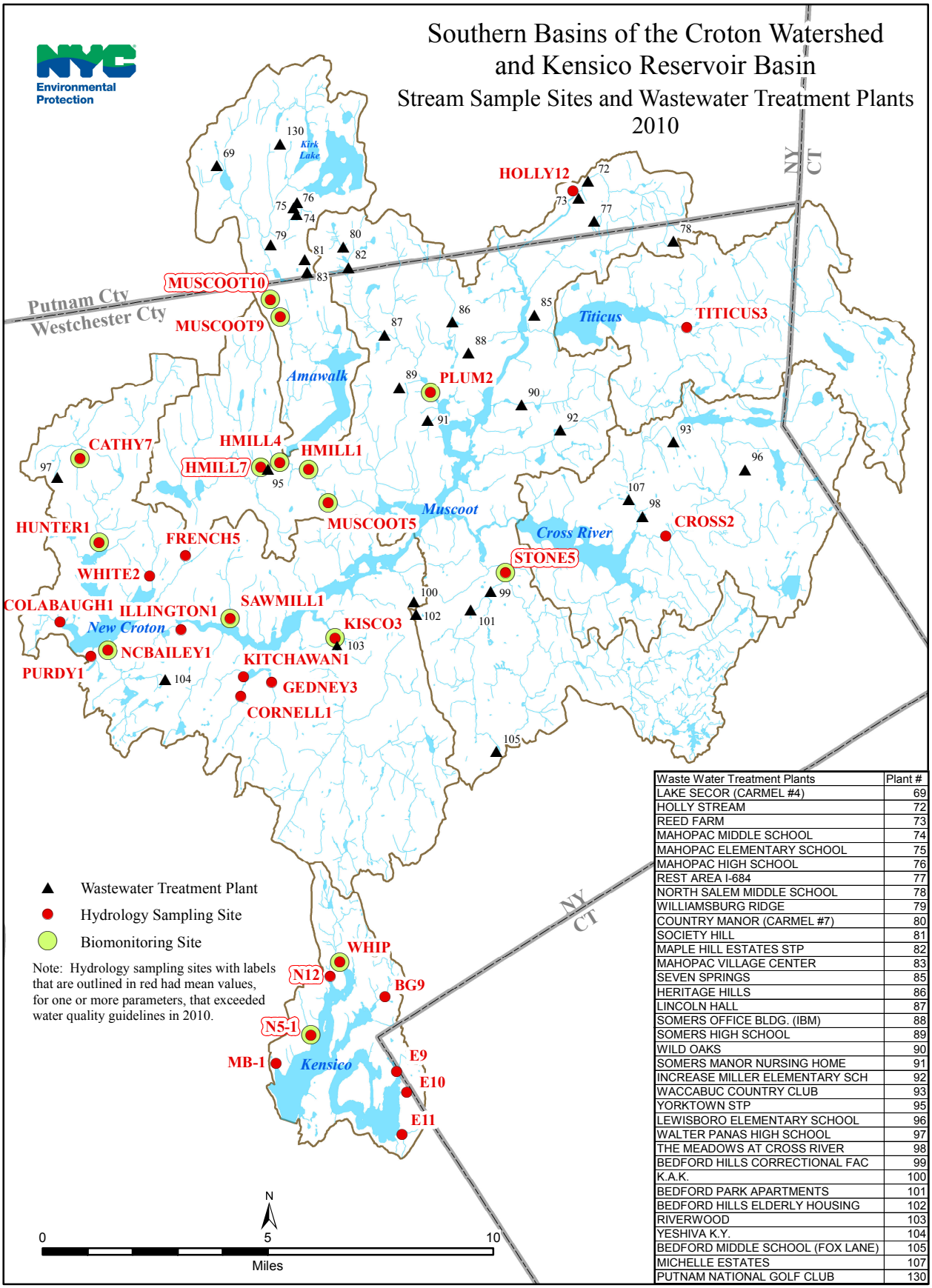
Note: Hydrology sampling sites with labels that are outlined in red had mean values, for one or more parameters, that exceeded water quality guidelines in 2010.

Wastewater Treatment Plants	Plant #
CAMP LUDDINGTON	40
CAMP EDWARD ISAACS	41
PATTERSON HAMLET	42
THUNDER RIDGE SKI AREA	44
WATCHTOWER SOCIETY	45
PUTNAM NURSING & REHABILITATION	46
FOX RUN	48
CAMP RE	49
FRANGEL	50
CLEAR POOL CAMP	51
BREWSTER SCHOOLS	53
GEORGE FISCHER MIDDLE SCHOOL	55

Wastewater Treatment Plants	Plant #
HILL SPARROW	56
MOUNT EBO	57
TOWNE CENTRE SOUTHEAST	59
HUNTERS GLEN	60
TRACY TERTIARY (CLOCKTOWER)	61
CARMEL SD#2 STP	62
BLACKBERRY HILL	63
BREWSTER HEIGHTS	64
BREWSTER STP	65
LAKE PLAZA	67
MAHOPAC STP	71
THE HIGHLANDS	136

Southern Basins of the Croton Watershed and Kensico Reservoir Basin

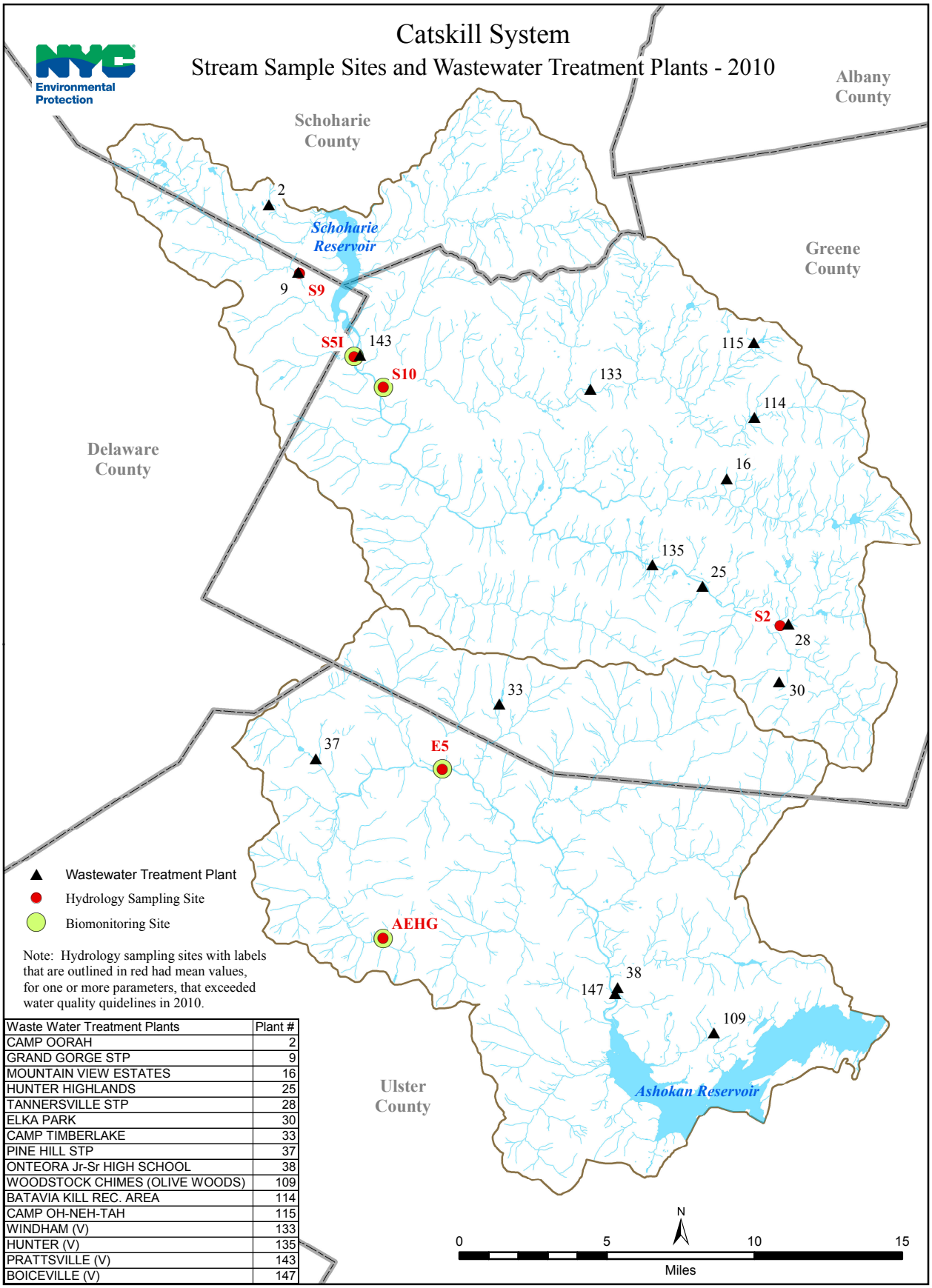
Stream Sample Sites and Wastewater Treatment Plants 2010



Waste Water Treatment Plants	Plant #
LAKE SECOR (CARMEL #4)	69
HOLLY STREAM	72
REED FARM	73
MAHOPAC MIDDLE SCHOOL	74
MAHOPAC ELEMENTARY SCHOOL	75
MAHOPAC HIGH SCHOOL	76
REST AREA I-684	77
NORTH SALEM MIDDLE SCHOOL	78
WILLIAMSBURG RIDGE	79
COUNTRY MANOR (CARMEL #7)	80
SOCIETY HILL	81
MAPLE HILL ESTATES STP	82
MAHOPAC VILLAGE CENTER	83
SEVEN SPRINGS	85
HERITAGE HILLS	86
LINCOLN HALL	87
SOMERS OFFICE BLDG. (IBM)	88
SOMERS HIGH SCHOOL	89
WILD OAKS	90
SOMERS MANOR NURSING HOME	91
INCREASE MILLER ELEMENTARY SCH	92
WACCABUC COUNTRY CLUB	93
YORKTOWN STP	95
LEWISBORO ELEMENTARY SCHOOL	96
WALTER PANAS HIGH SCHOOL	97
THE MEADOWS AT CROSS RIVER	98
BEDFORD HILLS CORRECTIONAL FAC	99
K.A.K.	100
BEDFORD PARK APARTMENTS	101
BEDFORD HILLS ELDERLY HOUSING	102
RIVERWOOD	103
YESHIVA K.Y.	104
BEDFORD MIDDLE SCHOOL (FOX LANE)	105
MICHELLE ESTATES	107
PUTNAM NATIONAL GOLF CLUB	130

Catskill System

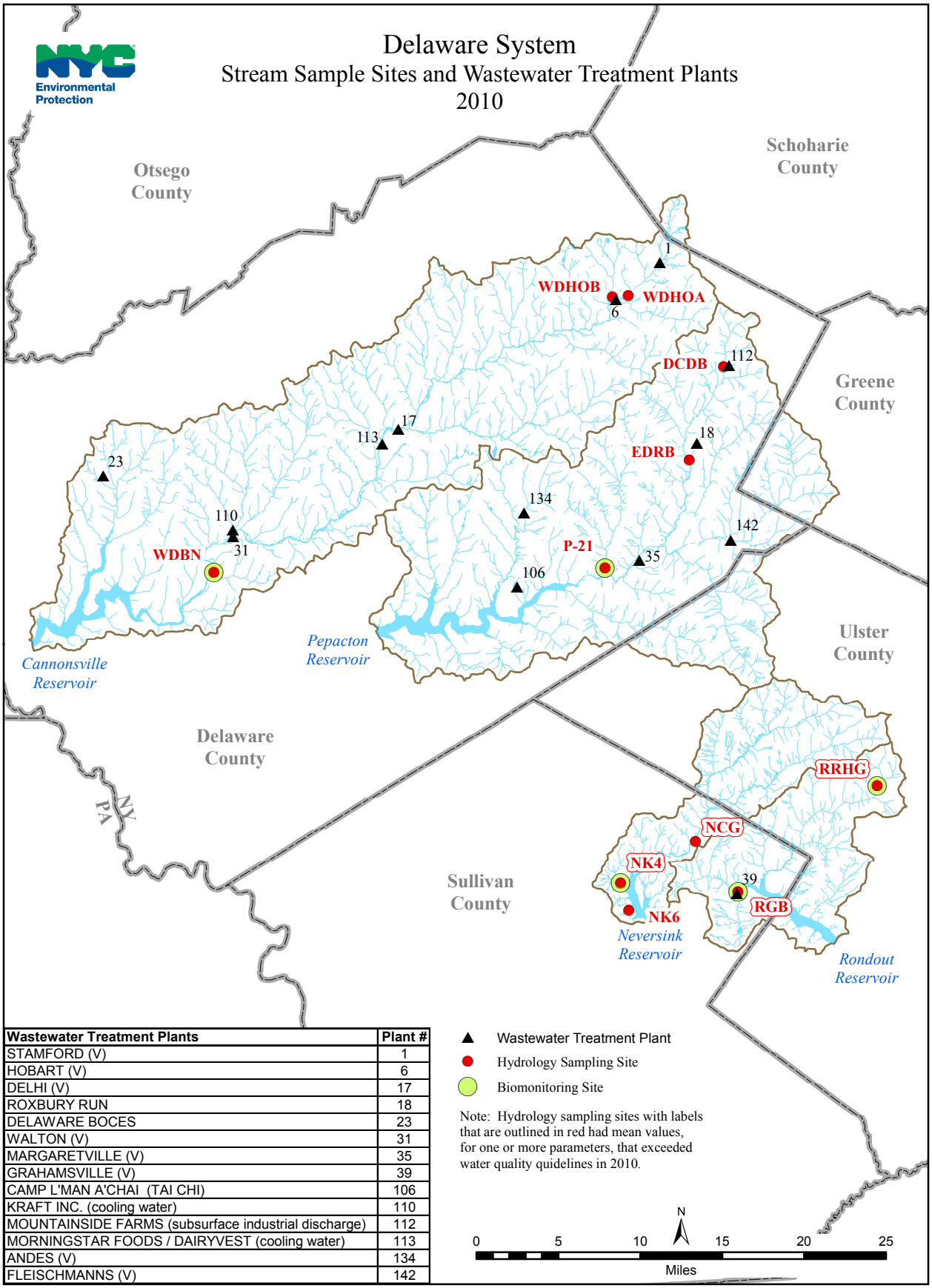
Stream Sample Sites and Wastewater Treatment Plants - 2010



Note: Hydrology sampling sites with labels that are outlined in red had mean values, for one or more parameters, that exceeded water quality guidelines in 2010.

Waste Water Treatment Plants	Plant #
CAMP OORAH	2
GRAND GORGE STP	9
MOUNTAIN VIEW ESTATES	16
HUNTER HIGHLANDS	25
TANNERSVILLE STP	28
ELKA PARK	30
CAMP TIMBERLAKE	33
PINE HILL STP	37
ONTEORA Jr-Sr HIGH SCHOOL	38
WOODSTOCK CHIMES (OLIVE WOODS)	109
BATAVIA KILL REC. AREA	114
CAMP OH-NEH-TAH	115
WINDHAM (V)	133
HUNTER (V)	135
PRATTSVILLE (V)	143
BOICEVILLE (V)	147

Delaware System
Stream Sample Sites and Wastewater Treatment Plants
2010



Wastewater Treatment Plants	Plant #
STAMFORD (V)	1
HOBART (V)	6
DELHI (V)	17
ROXBURY RUN	18
DELAWARE BOCES	23
WALTON (V)	31
MARGARETVILLE (V)	35
GRAHAMSVILLE (V)	39
CAMP L'MAN A'CHAI (TAI CHI)	106
KRAFT INC. (cooling water)	110
MOUNTAINSIDE FARMS (subsurface industrial discharge)	112
MORNINGSTAR FOODS / DAIRYVEST (cooling water)	113
ANDES (V)	134
FLEISCHMANNS (V)	142

▲ Wastewater Treatment Plant

● Hydrology Sampling Site

◯ Biomonitoring Site

Note: Hydrology sampling sites with labels that are outlined in red had mean values, for one or more parameters, that exceeded water quality guidelines in 2010.