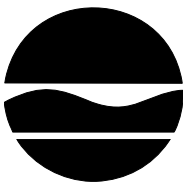


Croton Watershed Phase II Phosphorus TMDL Implementation Plan

Prepared in accordance with the New York City Watershed
Memorandum of Agreement (January 1997)

New York State Department of
Environmental Conservation

Division of Water



January 14, 2009



Executive Summary

This report outlines goals and tasks to reduce phosphorus pollution in the Croton watershed. Typical pollutant sources include stormwater runoff from impervious surfaces, agricultural land and construction sites, excessive fertilizer use, leachate from septic systems and effluent from wastewater treatment plants. The purpose of this report is to provide goals to reduce the phosphorus concentration levels in the eight (8) water-quality impaired East of Hudson (EOH) reservoirs in the Croton watershed, as identified in the Phase II Phosphorus Total Maximum Daily Load (TMDL) report (New York State Department of Environmental Conservation (DEC), June 2000).

This plan is largely structured to use existing programs, primarily the New York State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-08-002 for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). New York State has designated each municipality in the Croton watershed as an entity requiring Phase II stormwater permit coverage. GP-0-08-002 requires MS4 permittees to develop, implement and enforce a stormwater management program (SWMP) to reduce the discharge of pollutants from their MS4s in accordance with NYS Environmental Conservation Law and the Clean Water Act.

To facilitate water quality improvement in the Croton watershed, the MS4 general permit has articulated enhanced criteria entitled “Minimum Control Measures – Watersheds with Improvement Strategies”, which describe additional measures required for permit compliance. The additional measures in the EOH Watershed include the development and submission of an approvable plan to the DEC outlining stormwater retrofit plans. The plans must meet a minimum threshold for phosphorus reduction. These proposed reductions are indicated in this report and have been established according to relative values of high-density development land use in the EOH Watershed.

Phosphorus source control, such as the use of phosphorus –free lawn fertilizer and dishwasher detergent and the prevention of animal access to waterbodies should also be implemented. Ultimately, societal awareness of the sources of phosphorus pollution can play a key role in reducing phosphorus pollution.

DEC recognizes that conducting phosphorus reduction programs will require significant funding. Section 3 of this Implementation Plan includes a list of funding sources currently available. DEC looks forward to the continued support of all involved agencies and watershed stakeholders toward the goal of reducing phosphorus loads to improve water quality and meet the phosphorus water quality criteria for these drinking water sources.

ACKNOWLEDGMENTS

The DEC gratefully acknowledges the agencies and people that have contributed to the development of this Phosphorus TMDL NPS Implementation Plan.

The TMDL Work Group, composed of scientists and engineers from the New York City Department of Environmental Protection (DEP), the U.S. Environmental Protection Agency (EPA) and DEC have all provided input, comments and technical guidance for this implementation plan. Shohreh Karimipour of the DEC, Dr. Kimberlee Kane of the DEP, Maureen Krudner of the EPA, Sabrina Charney of the Town of Somers, John Lynch of the Putnam County Department of Planning and the Watershed Protection and Partnership Council's Technical Advisory Committee chairperson, Nicholas L. Clesceri deserve a special thank you for their assistance. Additional thanks are extended to Rich Williams of the Town of Patterson, Beth Coursen of the Town of Pawling and Dave Graves of the New York State Department of Transportation for their for valuable advice and comment.

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REFERENCES:

Phase II Phosphorus Total Maximum Daily Loads For Reservoirs in the New York City Watershed, June 2000

Recommendations to the New York State Department of Environmental Conservation for the Development of its Phase II TMDL Implementation Plan, April 2004

1.0 Introduction

The Federal Clean Water Act (CWA), Sections 301, 303 and 304, requires states to identify all water bodies in the state that cannot meet applicable water quality standards with existing point source (wastewater treatment plant) effluent limitations alone. The CWA requires states to establish EPA-approvable total maximum daily loads (TMDLs) for these waterbodies which, when implemented, will achieve the water quality standards.

The 2008 New York State Section 303(d) list of impaired water bodies identified phosphorus as the pollutant of concern for the eight impaired East of Hudson (EOH) reservoirs that are listed in Table 1 below. These eight reservoirs, their contributing basins and sub-basins are illustrated below in Figures 1 and 2.

The phosphorus reduction that is required in the reservoirs is to be achieved through a combination of wastewater treatment plant effluent phosphorus reductions and stormwater runoff-related phosphorus reductions. Upgrades to the wastewater treatment plants within the NYC Watershed include tertiary treatment (e.g. micro-filtration) and, where completed, have resulted in reductions in point source phosphorus loading. Non-wastewater treatment plant phosphorus loading and the strategy for reducing this type of pollution is the primary subject of this report.

2.0 Croton Watershed TMDL Development and Phosphorus Reduction Efforts

The development of phosphorus TMDLs for the New York City reservoirs was completed in two phases:

The Phase I TMDL was completed in 1997 and included initial assessments from monitoring data and phosphorus reduction from wastewater treatment plant upgrades required by the New York City Watershed Rules and Regulations.

The Phase II TMDL was completed in 2000, relying on more recent monitoring data, modeling and further assessment of permissible phosphorus levels in individual reservoirs. The Phase II Phosphorus TMDL is available at: http://www.dec.ny.gov/docs/water_pdf/nycjune2000.pdf.

Phase II TMDL phosphorus reduction data is reproduced as Table 1 on the following page. This information is provided to indicate the level of phosphorus reduction required in the Croton watershed. The column entitled “Remaining Reductions Needed” assumes all WWTP upgrades have been completed and shows all non-WWTP reductions that are still required to achieve compliance with the TMDLs.

Table 1 - Water Quality Limited Reservoirs - Remaining Phosphorus Reductions							
RESERVOIR	Current PS Loads (Kg/yr)	Current NPS Load (Kg/yr)	Available Load TMDL-MOS (Kg/yr)	WLA (Kg/yr)	LA (Available Load - WLA) (Kg/yr)	Total Reductions Needed (Kg/yr)	Remaining Reductions Needed (Kg/yr)
Amawalk	241	1,077	1,196	390	806	122	122
Croton Falls	1,710	3,300	3,030	615	2,415	1,980	885
Diverting	159	3,685	2,392	322	2,070	1,452	983
East Branch	233	3,229	2,469	449	2,020	993	993
Middle Branch	99	921	816	184	632	204	204
Muscot	1,631	9,929	8,457	1,405	7,052	3,103	2,058
New Croton	191	10,998	8,758	209	8,549	2,431	1,356
Titicus	0	1,124	984	0	984	140	140

Note: Current PS is WWTP measured load from 1996. Current NPS is (1992-1996) measured reservoir concentrations minus Current PS. WLA is WWTP loads once upgrades are achieved with all WWTPs operating at design flow. Total Reductions Required is Current PS + Current NPS minus Available Load. Remaining Reductions is Current NPS + WLA minus Available Load (once WWTP upgrades are achieved).

Target High-Intensity Development First

DEC has performed an analysis of the MS4s in the Croton Watershed and prioritized areas where stormwater retrofits will most effectively result in reduction of phosphorus loading to adjacent waterbodies. This analysis is focused on high intensity developed land use within the various reservoir watersheds, because this land use produces higher phosphorus loading than other less intensely developed land uses, as indicated in Appendix B.

Table 2 below shows the results of Arc View Generalized Watershed Loading Function (AVGWLF) modeling of high intensity development phosphorus loading per reservoir basin by DEC. Boyd's Corners and West Branch Basins are included, though these basins are not water-quality limited, because these reservoirs feed downstream reservoirs that are water-quality limited. DEC has used the results of this model to allocate five-year phosphorus reduction values for MS4s in the Croton watershed that will meet plan approval from DEC, a requirement for compliance with the MS4 General Permit.

Since these modeled phosphorus reductions are derived from a specific subset of urbanized land use, it does not fully describe the phosphorus reductions required in the Croton watershed. Targeting retrofits in high intensity developed areas alone will achieve perhaps 20% of the required phosphorus reductions. Therefore, retrofits in lower intensity urban areas and non-

urban areas may be required, along with other permit compliance measures to further reduce phosphorus, as part of achieving compliance with the TMDLs. Table 2 reveals the level of high intensity development-based phosphorus loading each MS4 contributes to a given reservoir basin. This information will be useful to a regional approach to permit compliance in allowing a more complete view of the Croton reservoir system.

Table 2 – Modeled High Intensity Development Phosphorus Loading By Watershed Basin											
Watershed	Municipal High Intensity Development Phosphorus Load (kg/yr)									Total	
Amawalk	Carmel			Putnam Valley			Somers			220	
	190			0			30				
Croton Falls	Carmel		Kent		Somers		Southeast		139		
	106		25		6		2				
Diverting	Brewster			Patterson			Southeast			135	
	37			0			98				
East Branch	Kent		North Salem		Patterson		Pawling		Southeast		192
	1		6		98		48		39		
Middle Branch	Beekman	Carmel	East Fishkill		Kent	Patterson	Pawling	SE		165	
	1	5	12		88	12	2	45			
Muscoot	Bedford	Carmel	Lewisboro	North Salem	Pound Ridge	Somers	SE	Yorktown		786	
	143	48	72	106	23	207	34	153			
Boyd’s Corners	East Fishkill			Kent			Putnam Valley			47	
	4			38			5				
West Branch	Carmel			East Fishkill			Kent			68	
	30			2			36				
New Croton	Bedford	Cortlandt	Mount Kisco	New Castle	North Castle	Somers	Yorktown		480		
	46	49	115	131	0	5	134				
Titicus	Lewisboro				North Salem					17	
	1				16						
Cross River	Bedford		Lewisboro		North Salem		Pound Ridge		138		
	2		114		0		22				
Bog Brook	Patterson				Southeast					4	
	1				3						
Total										2,391*	

* This table has been extracted from Appendix B, "Technical Background for Retrofitting Practices." This total does not include values for the towns of Harrison and Mount Pleasant, as these towns are not part of the Croton watershed.

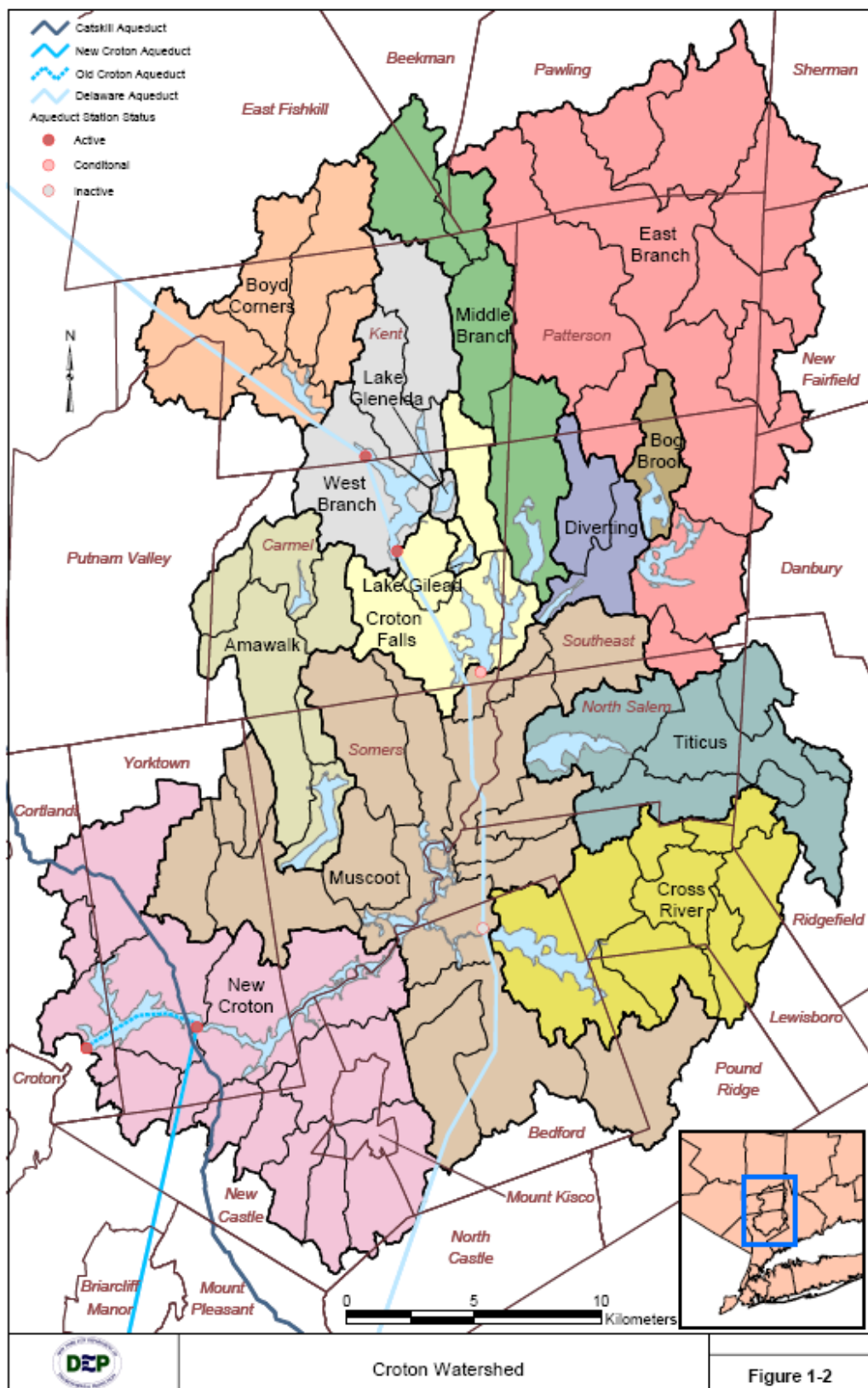
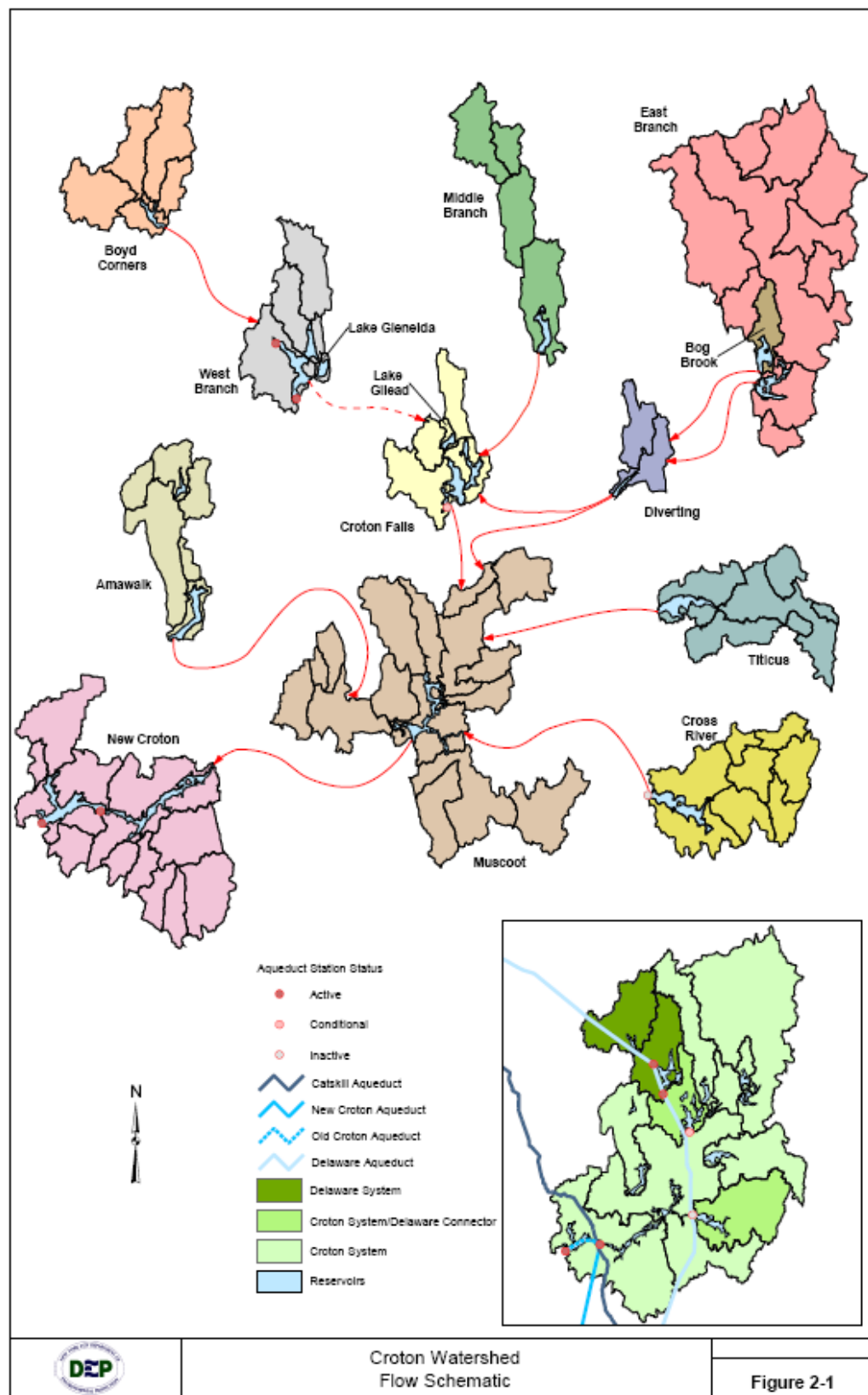


Figure 1-2



2.1 Institutional Framework

The Phosphorus TMDL NPS Implementation Plan framework includes the following six distinct institutions; 1) citizens; 2) local government; 3) NYC Watershed Protection and Partnership Council Technical Advisory Committee (TAC); 4) NYC government (DEP); 5) State government (DEC and NYSDOT), and 6) EPA. A description of the main role each institution plays is presented below:

Citizens play an essential role. They are primarily land owners; their activities generate phosphorus (e.g. lawn and auto care, septic systems, pet/farm animal waste). Citizen education and outreach efforts are a necessary requirement to fully implement phosphorus controls. Citizen acceptance and participation in this plan will be essential to successful phosphorus reduction efforts.

Local Governments also generate phosphorus and implement phosphorus controls. They provide the first line of regulatory oversight by controlling local land use activity. Local governments are also developing specific action-oriented Stormwater Management Programs (SWMP)s as required by the MS4 general permit. This permit includes requirements for education, outreach and phosphorus control from municipal operations. It also requires that local governments map both their storm sewer configuration and other sources of drainage.

Task 2.1a	Local Government
Each local government in the Croton watershed is required to collect basic site specific data for all projects and programs within their jurisdiction that potentially affect phosphorus loads and monitor project and program implementation status. Coincident with the MS4 general permit annual report date and reporting period, by June 1 every year, each local government is required to provide the DEC with phosphorus reduction project and program information.	

The Watershed Protection and Partnership Council's Technical Advisory Committee (TAC) is a valuable intermediary between local government and the two agencies, DEP and DEC. The New York City Watershed Memorandum of Agreement (MOA) empowers the TAC to, among other things, review watershed data and make recommendations regarding water quality problems.

Task 2.1b	Technical Advisory Committee
The TAC will assist DEC to evaluate phosphorus reduction projects and program data from the previous MS4 annual reporting period.	

The City of New York has a vested interest in NPS phosphorus reduction because their water resource use is the primary impairment and because of their Safe Drinking Water Act and Filtration Avoidance Determination commitments. The DEP supports project implementation and has water quality monitoring and modeling tools to help evaluate management practice implementation and assess water quality.

Task 2.1c	DEP
The DEP will assist DEC and the TAC to evaluate phosphorus reduction project data and estimate resulting phosphorus reduction. DEP assists the regulated watershed communities with GIS mapping of watershed sub-basins.	

DEC administers water quality regulations according to the NYS Environmental Conservation Law (ECL) and the CWA and is responsible for TMDL development and oversight. The DEC has an ongoing working relationship with the New York Nonpoint Source Coordinating Committee to administratively coordinate various state agencies and other interested partners having regulatory, outreach, incentive-based, or funding programs that focus on reducing nonpoint source (NPS) pollution. Local implementation and statewide coordination and evaluation are conducted on a watershed basis. The DEC also provides NPS technical assistance and outreach. As noted below, the DEC will periodically re-evaluate this TMDL NPS Implementation Plan to promote compliance with TMDLs.

Task 2.1d	DEC
By January 1 st each year, the DEC will produce a comprehensive phosphorus reduction progress report.	

The EPA also administers the CWA. The EPA should continue to seek to provide additional Federal funding for state and local water quality programs, continue to support Safe Drinking Water Act and Water Resources Development Act projects (including those involving water quality monitoring) and provide TMDL implementation guidance that addresses the role of watershed planning and other non-structural management practices to reduce phosphorus pollution.

2.2 Implementation Plan Updates

This Implementation Plan is an intermediary step in the EOH phosphorus reduction process. To account for new information, changing conditions, and to realize the effects of MS4 SWMPs, periodic re-evaluations and revisions are an integral element of this plan.

Task 2.2	DEC
This Implementation Plan should be re-evaluated five years from issuance of the general permit (in 2013), or upon recommendation from the NYC Watershed Protection and Partnership Council Technical Advisory Committee.	

2.3 Potential Additional Point Source Phosphorus Reductions

The New York City Watershed Rules and Regulations (WRR) require EOH wastewater treatment plants to remove phosphorus using best management practices (BMPs) with discrete limits dependent on the permitted flow. SPDES permit modifications are in place and plant upgrades are underway or complete. The TMDL modeling calculations reflect these point source reductions, since the wasteload allocations assumed full compliance with the WRR.

The WRR regulates facilities with permitted flows under 50,000 gpd at 1.0 milligram per liter (mg/l), facilities with permitted flows between 50,000 gpd and 500,000 gpd at 0.5 mg/l and facilities with permitted flows above 500,000 at 0.2 mg/l. Additional phosphorus reduction from point sources could be obtained by modifying the permits for all facilities with flows under 500,000 gpd to require phosphorus limits of 0.2 mg/l. The phosphorus reduction to be achieved in this modification has been calculated to be over 1,700 kg/yr.

Task 2.3a	DEC
The DEC will continue to provide technical assistance and training to wastewater treatment plant operators to optimize their phosphorus reduction capabilities. Additionally, the DEC will modify SPDES permits as they become due for renewal.	

Because sanitary sewer collection systems represent a potentially significant phosphorus source and because stream monitoring data suggest that sanitary sewer collection systems may contribute to the phosphorus load, the following task is emphasized in this implementation plan:

Task 2.3b	DEC
DEC will continue to seek proper sanitary sewer collection system operation and maintenance by assuring compliance with 6NYCRR Part 750 - 2.1 (General Provisions of a SPDES Permit) and Part 750 - 2.8 (Disposal System Operation and Quality Control).	

2.4 State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from MS4s (GP-0-08-002)

On May 1, 2008, the DEC SPDES General Permit GP-0-08-002 for the discharge of stormwater from small municipal separate storm sewer systems (MS4) became effective. The MS4 permit requires MS4 operators to develop, implement and enforce a stormwater management program (SWMP) designed to reduce the discharge of pollutants from their MS4s to the maximum extent practicable (MEP) in order to protect water quality and to satisfy the appropriate water quality requirements of the ECL and CWA. MS4 operators must provide adequate resources to fully implement the SWMP no later than January 8, 2013. The MS4 permit and associated guidance can also be found on the DEC website: <http://www.dec.ny.gov/chemical/43150.html>.

2.4.A Coverage Area

The entire NYC East-of-Hudson Watershed, including the Croton system, is either urbanized or additionally designated (criteria for these areas are described in Part X B of the General Permit) and is required to obtain SPDES permit coverage. Appendix C lists municipalities designated under the Phase II stormwater regulations that are required to obtain GP-0-08-002 coverage.

Task 2.4	DEC
DEC will continue to provide technical assistance and outreach to MS4 operators to help SWMP development and implementation. This assistance may include support of modeling, data distribution, field assistance, evaluation of options, training and other assistance as required and requested.	

2.4.B Compliance

GP-0-08-002 Part V (Program Assessment, Record Keeping, Reporting and Certification Requirements) requires MS4 operators to conduct annual evaluations of their program compliance and submit a report to the DEC.

Task 2.4.B	DEC
DEC will continue to pursue GP-0-08-002 compliance by reviewing MS4 operator annual reports to ensure that SWMPs are developed and implemented in a manner consistent with the terms and conditions of GP-0-08-002, including the required SWMP modifications for MS4s in the EOH watershed, with emphasis on illicit connection elimination, septic repair, retrofits and other phosphorus reduction activities.	

2.4.C Additional Requirements for MS4s in the East of Hudson Watershed

To assist with this phosphorus reduction effort, the Part IX of the MS4 General Permit includes additional best management practices for MS4s in the East of Hudson watershed.

Task 2.4.C	DEC
The Department will review design of the required stormwater retrofit plans for MS4s in the East of Hudson watersheds and grant approval based on ability of design to demonstrate the proposed phosphorus reduction.	

The Arc-View Generalized Watershed Loading Function (AVGWLF) model was utilized by DEC to estimate phosphorus loading from stormwater runoff in specific, high intensity developed areas of the Croton watershed. This modeling indicated approximately 2,400 kg/yr of phosphorus due to high-density development land use. The breakdown of MS4 contributions to this phosphorus load is shown in Table 3 on page 12 of this report. While implementation of the reductions listed in these tables will not alone achieve compliance with TMDL values, other non-structural measures, including those listed on the following page and discussed further in this plan, are expected to provide further reductions. MS4s are required to continue with enhanced phosphorus reduction efforts until the TMDLs have been met.

- Further point source reductions due to lower SPDES effluent limits
- Illicit discharge detection and elimination
- Septic inspection and repair programs
- Reduction in use of phosphorus-based fertilizer and detergents
- Restriction of domestic animal access to water bodies
- Future retrofits of lower intensity developed areas

2.4.D Retrofit Design

Based on the rationale provided below, DEC watershed-wide retrofit phosphorus reduction for the Croton Watershed MS4s for the next five year period has been set at 600 kg/yr, with 120 kg/yr as an annual target. The phosphorus reduction values to be attained by retrofit of stormwater conveyances have been apportioned among the regulated Croton Watershed MS4 Towns/Villages, New York State Department of Transportation (DOT) and Westchester, Putnam and Dutchess Counties.

These values were established assuming that approximately 50% (1200 kg) of the HID phosphorus load reduction can be achieved, and aim to achieve this goal over a ten-year period. Therefore, it is expected that approximately 18% of the “remaining reductions” required of MS4s in the Croton watershed can be achieved through retrofitting in HID areas. Clearly, further retrofitting in lower intensity developed areas may be required, in addition to other non-structural measures, to achieve compliance with the TMDLs.

As noted previously, this implementation plan will be evaluated in 2013 based on available data. The modeling and allocation assumptions will be adjusted according to ambient monitoring results and according to further modeled phosphorus reduction opportunities.

The annual phosphorus load reduction targets to be attained from retrofits for each MS4 should be shown on retrofit design plans to be submitted to DEC for approval. The suggested modeling tools for MS4 retrofit evaluation are Source Loading and Management Model (WinSLAMM) and Watershed Treatment Model (WTM). Consistent use of these models will facilitate a more equitable evaluation of proposed phosphorus load reductions.

The retrofit responsibilities allocated to DOT and Westchester, Putnam and Dutchess Counties were calculated by apportioning approximately 5% of the total DEC-modeled HID phosphorus load according to the relative amounts of Town, Village, County and DOT road miles in each MS4 municipality as indicated in Appendix F.

2.4E Regional Stormwater Entity (RSE) Formation

Participation in a RSE is voluntary and will enable resource sharing, as well as enhanced funding opportunities among participating MS4s. A regional stormwater entity may site retrofits to obtain a better cost-to-phosphorus-reduction ratio. An RSE might discover that phosphorus reduction could be most economically obtained through projects situated solely in one or more municipalities or basins.

Compliance will be judged by the ability of the RSE to demonstrate that it is satisfying the individual permit requirements, including the combined phosphorus reduction requirements of member MS4s. If the RSE is deemed non-compliant, all member MS4s will be required to achieve compliance individually or will be judged non-compliant.

In order to comply with the retrofit requirement and achieve these phosphorus load reductions and other measures on a regional basis, the Department will require that a large majority of the land area in the EOH be represented by coalition members.

Table 3 on the following page shows the five-year phosphorus reduction values for individual MS4s that will achieve compliance with the retrofit requirement of the SPDES General Permit for Stormwater Discharges.

Table 3: High Intensity Development Retrofit Phosphorus Reduction Targets by MS4 (kg/yr)

MS4	Five Year Phosphorus Reduction	Annual Phosphorus Reduction
Bedford	32.2	6.5
Beekman	1	0.2
Brewster	9.2	1.8
Carmel	72.0	14.4
Cortlandt	11.6	2.3
East Fishkill	3.2	0.6
Kent	33.6	6.7
Lewisboro	35.5	7.1
Mount Kisco	18.7	3.7
New Castle	25.1	5.0
North Castle	1	0.2
North Salem	19.1	3.8
Patterson	17.2	3.4
Village of Pawling	4.3	0.9
Town of Pawling	3.5	0.7
Pound Ridge	9.5	1.9
Putnam Valley	1	0.2
Somers	50.0	10.0
Southeast	31.1	6.2
Yorktown	54.0	10.8
Dutchess County	3.1	0.5
Putnam County	30.9	6.2
Westchester County	8.2	1.6
NYS DOT	126.1	25.2

2.4.F Non-traditional MS4s

The term “municipal” referred to in the Federal regulations describing the Phase II stormwater program includes “traditional” municipal governments (cities, towns, villages and counties) and any “non-traditional” publicly funded entity that owns or operates a separate stormwater sewer system. All MS4s are required to develop and implement appropriate SWMPs.

A town level program could cover the smaller non-traditional entities by formal agreement. Doing so will facilitate a coordinated program by, among other things, consolidating services and sharing expertise. DEC promotes the coordination among MS4s by establishing it as a grant priority.

Task 2.4.F	Local Government
Local governments should identify the non-traditional MS4s within their jurisdiction and consider including them in their SWMPs.	

2.5 Additional Areas of Concern

2.5.A. Source Control

Fertilizer, animal manure and wastewater are primary phosphorus sources throughout the state of New York. Although wastewater generation will continue, there are things that can be done to reduce phosphorus sources. Since controlling the source of phosphorus exposed to stormwater is generally more cost effective and reliable than removing phosphorus from stormwater by providing treatment, phosphorus source control must play an important role.

Task 2.5.A(a)	DEC
DEC shall promote phosphorus source control on three fronts:	
<ol style="list-style-type: none">1. Chemical-based fertilizer use2. Phosphate content of automatic dishwasher detergent3. Domestic animal access to waterbodies	

A Watershed Nutrient Workgroup, charged with reducing phosphorus entering the Croton reservoirs, has developed an education program to reduce fertilizer runoff from residential lawns. Its members include DEP, Environmental Protection Bureau of the NYS Office of Attorney General, Putnam and Westchester County Cornell Cooperative Extension, Putnam County Planning, Westchester County Planning, DOH, DEC, NYS Turf Grass Association, Chem. Lawn and EPA. Workgroup recommendations may extend to other areas of the state where phosphorus

impacts water quality. In addition, DEC has participated in an agreement among major lawn fertilizer manufacturers to reduce the amount of phosphorus applied to lawns, including the greater availability of lawn fertilizer with no phosphorus.

Throughout the NYC Watershed TMDL process, both WWTP and stormwater phosphorus load sources have been modeled. Because stormwater sources are wide spread and disperse, source control is particularly important. Importantly, analysis by the DEP in their “Croton Watershed Stakeholder Report -May 2004” shows the distribution of stormwater phosphorus loads concentrated in populated urban areas. SWMPs should focus attention on reducing phosphorus runoff in these areas, where modeling and monitoring continue to show these higher phosphorus loads.

Task 2.5.A(b)	Local Government
In each MS4 area, SWMPs should emphasize phosphorus source control and target areas with potentially high levels of phosphorus runoff, particularly in those communities with relatively high percentages of impervious cover, small lot sizes, and/or compacted soils.	

As they control phosphorus sources, the detection and elimination of illicit MS4 connections, proper storage and disposal practices and targeted education and outreach are important components of phosphorus reduction efforts. This is particularly important in areas with relatively high percentages of impervious land cover, small lots sizes, and compacted soils that are in close proximity to storm sewer systems and/or receiving waters. Accordingly:

1. Places where fertilizer use is concentrated, such as retail and wholesale garden supply stores (including “big-box” retailers) and plant nurseries, commercial lawn care/landscapers, and golf courses, should be evaluated for illicit connections. Also, fertilizer consumers can be provided with tailored outreach materials such as those available at the EPA website on the public education and outreach webpage: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=min_measure&min_measure_id=1.
2. Places where animal wastes are concentrated, such as pet stores and animal care/boarding facilities should be evaluated for illicit connections and exposure to stormwater, provided with tailored outreach materials, and serve as places to disseminate tailored outreach materials to animal owners.
3. Places where yard or food wastes are stored, such as “dumpsters” serving restaurants and grocery stores and yard waste composting and disposal areas, should also be similarly evaluated for illicit connections and exposure to stormwater and provided with tailored outreach materials.

4. Storm sewer infrastructure should be closely evaluated for the presence of septic system wastewater in places where septic systems are in close proximity to the storm sewer infrastructure. To be effective, these evaluations should occur in dry weather so any flow can be assumed to be evidence of an illicit connection.

2.5.B. Agriculture

Although generally it is not a prevalent land use in this watershed, agricultural activity, including traditionally recognized farm enterprises and smaller “hobby farms”, are also phosphorus sources that present viable opportunities for phosphorus source reduction. In particular, horse farms should be identified and selected for attention because they have a relatively high potential for phosphorus laden runoff.

In addition, because of the potential for elevated phosphorus levels in the soil and movement of this soil during construction or other development activity, careful attention to erosion and sediment control should be paid when construction or other development occurs on abandoned agricultural land.

Task 2.5.B	MS4
MS4s should endeavor, through their program of public outreach and education, to discourage animal access to waterways, as well as the placement of manure piles in the drainage path of waterways.	

2.6 New York City Department of Environmental Protection Programs

The April 2001 NPS Implementation Report detailed the various DEP implementation programs and efforts that are underway. These include: the Wastewater Treatment Plant Upgrade Program, the Watershed Agricultural Program, East of Hudson Water Quality Investment Funds, Watershed Protection and Partnership Programs, Watershed Rules and Regulations, Filtration Avoidance Determination, Croton Process Studies, the Croton Watershed Strategy and Croton System Special Studies. In particular, phosphorus source investigations resulting from the Croton Process Studies project conducted by the DEP have provided valuable information.

Detailed information relating to the above programs can be found in Sections 3 and 5 of the April 2001 Report. This report is available at <http://www.dec.ny.gov/chemical/23835.html>. The Watershed Protection and Partnership Council’s annual reports also provide detailed information on ongoing progress. These reports are available at <http://www.dos.state.ny.us/watershed/REPORTS.htm> and <http://www.dos.state.ny.us/watershed/wppc.htm>. The DEP site, http://www.nyc.gov/html/dep/html/watershed_protection/home.html also provides information on watershed program activities.

Task 2.6	DEP
<p>It would be beneficial if DEP continued to conduct water quality monitoring and modeling in accordance with its ongoing programs. These efforts are important to understanding reservoir water quality and, on a system-wide basis, the impacts of both wastewater treatment plant and NPS phosphorus reduction implementation projects. The monitoring program is described in DEP's October 2003 Integrated Monitoring Report and includes stream, reservoir and BMP effectiveness monitoring. DEP is currently developing and testing hydrothermal and water quality models in accordance with multi-year Safe Drinking Water Act grants.</p>	

2.6.A Filtration Avoidance Determination (FAD)

Although the focus of the DEP East-of-Hudson NPS Management Plan is on turbidity and fecal coliform bacteria, (Section 4.9, as required by the 2007 FAD), many of its associated stormwater remedial components have ancillary phosphorus reduction benefits. For example, soil stabilization efforts also have a phosphorus reduction benefit because phosphorus-laden sediment is not transported to waterways when soil erosion is prevented. FAD Section 4.9 milestone/reporting requirements are included in Appendix E of this plan.

Task 2.6.A	DEP
<p>While continuing to fulfill their East-of- Hudson NPS obligations in the FAD, the accounting of phosphorus reduction activity will improve by estimating phosphorus reduction gleaned from Stormwater Infrastructure Remediation, Turf and Pesticide Management and Wastewater Infrastructure Remediation projects.</p>	

2.6.B New York City Watershed Partnership Program - Croton Planning

The New York City Watershed Partnership Program was formed by Executive Order in October 1997 in connection with the NYC Watershed Memorandum of Understanding (MOA). It has introduced a number of initiatives to create partnerships to protect and enhance water quality. The Watershed Protection and Partnership Council (WPPC) was formed as a permanent, regional forum to aid in the long-term protection of drinking water quality and the economic viability of watershed communities.

Most of the Watershed Partnership Programs have been funded by New York City and include projects such as infrastructure improvements, environmentally sound development, wastewater treatment plant upgrades, sewer extensions, septic system rehabilitation/replacement, stormwater

retrofits or new stormwater controls and stream corridor protection. As part of the partnership program, Croton Watershed Protection Plans were developed by Putnam and Westchester Counties. One of the goals of this Croton Planning is to improve water quality in the Croton Watershed, thereby assisting in the attainment of water quality standards by reducing³ phosphorus.

Task 2.6.B	DEP
NYC should continue to implement its Watershed Protection and Partnership Programs.	

2.7 Putnam County Croton Watershed Plan

Putnam County's Croton Plan began in November 1997 with the signing of an Intermunicipal Agreement (IMA) between Putnam County and the Putnam municipalities in the New York City watershed. The IMA determined that the Putnam Croton Plan would be produced jointly by the County and the watershed municipalities.

Task 2.7	Local Government
Putnam County has submitted a draft final report to DEP. DEP will develop comments in order that Putnam County may finalize and implement their Putnam Croton Plan.	

2.7.A Putnam County/DEP East of Hudson Water Quality Investment Fund

Putnam County has authorized several water quality improvement projects to be funded with the EOH Water Quality Investment Fund (WQIF). A Putnam County Septic Repair Program has also been implemented and was funded from the EOH WQIF. A current list of the water quality improvement projects and septic repair programs is included in Appendix E.

Task 2.7.A	Local Government
Basic site specific data for all projects and programs funded by the EOH WQIF that potentially affect phosphorus loads is accounted for by local government, with assistance from Putnam County, in the MS4s June 1 annual report to DEC. This type and frequency of reporting should be continued.	

2.8 Westchester County Croton Watershed Plan

In Spring 1998, the ten Westchester County Croton Watershed Communities (Bedford, Cortlandt, Lewisboro, Mt. Kisco, New Castle, North Castle, North Salem, Pound Ridge, Somers

and Yorktown) passed municipal resolutions to cooperate with Westchester County and develop the Croton Watershed Water Quality Protection Plan (the Croton Plan) as outlined in the WRR.

Task 2.8	Local Government
Westchester County has submitted a draft final report to DEP. DEP will develop comments in order that Westchester County may finalize and implement their Westchester Croton Plan.	

2.8.A Westchester County/DEP East of Hudson Water Quality Investment Fund

The March 2003 Draft Comprehensive Croton System Water Quality Protection Plan for Westchester County outlines 99 recommendations to include in a strategy to protect water quality. Of those 99 recommendations, the following recommendations are particularly beneficial to phosphorus reduction:

1. Set up a program modeled after the Town of Lewisboro to require property owners to show proof of proper septic operation upon application for permits for home additions or expansions.
2. Expand Westchester County's existing Septic Management Program to include a pilot inspection/maintenance program.
3. Conduct a comprehensive subwatershed conveyance system capacity analysis for each of the remaining 39 subwatersheds, modeled after the analysis conducted by Westchester County for the Hallocks Mill Brook Watershed.
4. Each municipality should create a storm water conveyance system inspection/maintenance routing schedule.

Task 2.8.A	Local Government
Basic site specific data for all projects and programs funded by the EOH WQIF that potentially affect phosphorus loads is accounted for by local government, with assistance from Westchester County, in the MS4s June 1 annual report to DEC.	

2.9 New York State NPS Programs

In accordance with CWA, Section 319, DEC has prepared a NPS Assessment and a NPS Management Program. References are found in the DEC MS4 toolbox, <http://www.dec.ny.gov/chemical/8695.html>, and in the EPA non-point source webpage, <http://www.epa.gov/owow/nps/whatis.html>.

Task 2.9(a)	DEC
DEC will continue to build partnerships and increase public knowledge regarding NPS pollution control.	

Task 2.9(b)	DEC
New York State will continue to provide funding to encourage the implementation of nonpoint source management practices. Implementation of NPS management practices that are in watersheds with approved TMDLs, such as the Croton Watershed, is a funding priority.	

2.9.A Safe Drinking Water Act (SDWA) and Water Resources Development Act (WRDA) Projects

Projects conducted by DEC through funding by SDWA and WRDA relate directly or indirectly to phosphorus water quality concerns in the Croton Watershed and can help provide opportunities for phosphorus load reductions. These projects are associated with the following activities:

- Wetlands Mapping and Assessment
- Educational Outreach
- BMP Assessment
- Phosphorus Management
- Monitoring and Modeling
- Community Involvement and Stewardship
- Enhancement Program for Land Use Planning and Zoning Regulations
- Stormwater Management Facilities Evaluation
- Sewer System and Wastewater Treatment Facility Projects
- Agricultural NPS Assessment
- Croton Stormwater Conveyance and Implementation Projects
- Agricultural BMP Implementation

For example: Westchester County has received a WRDA grant award to map and assess the stormwater conveyance system in the Croton Watershed. This study is currently underway and will assist municipalities comply with required SWMP modifications, particularly related to minimum control measure 3 (detecting and eliminating illicit connections). The study will also provide the Croton Watershed municipalities with a stormwater guidance manual and detailed information regarding stormwater restoration in a demonstration watershed.

Task 2.9.A(a)	DEC
DEC will consider the development of recommendations in TMDL Implementation Plans as a ranking factor in its grant selection process.	

Task 2.9.A(b)	DEC
To facilitate Croton Planning and NPS implementation efforts, DEC will continue to share pertinent phosphorus reduction related outcomes of SDWA and WRDA funded projects with Putnam and Westchester Counties, the TAC and DEP.	

2.9.B Division of Water - Region 3

Region 3 Division of Water staff is involved with several NPS programs which may directly or indirectly reduce NPS phosphorus loads in the Croton Watershed. These include:

1. Education: Region 3 staff participates in the delivery of educational programs designed to increase public awareness of water quality issues associated with stormwater runoff. The educational programs include problem identification and potential solutions. Increased public awareness of stormwater issues is important because it helps generate the public resolve necessary to reduce stormwater impacts.
2. Coordinated NPS Control Efforts: By participating in County programs, such as County Water Quality Coordinating Committees, Regional staff assist the development and implementation of efforts to coordinate NPS runoff projects with Federal, State, County, local municipalities, and private environmental organizations.
3. Funding: Regional staff assist municipalities to identify potential funding sources for corrective measures.

2.10 DEC-DEP Coordinated Stormwater Enforcement Protocol

Since January 2001, the DEC has implemented an enhanced stormwater enforcement initiative designed to assure compliance with the SPDES General Permit for Stormwater Discharges from Construction Activity and the DEP Watershed Rules and Regulations for stormwater.

In fall 2003, this initiative, implemented with the DEP, was further formalized by creating DEP/DEC Memorandum of Understanding Addendum S: DEC-DEP Coordinated Stormwater Enforcement Protocol. This Protocol seeks to better utilize DEC and DEP resources by eliminating duplication and by coordinating investigations and enforcement of violations. The Protocol was revised in 2008.

3.0 Costs/Funding Sources

The costs associated with this Implementation Plan will vary. Better cost information will be known when MS4 SWMPs are fully developed and implemented. The following funding sources may be used to support this Implementation Plan:

SDWA: Water quality monitoring and assessment projects (non-construction) associated with the NYC Watershed Protection Program may be funded by the SDWA grant program. This grant program is administrated by DEC. In the past decade, approximately \$80 million (including matching State funds) has been available for projects within the NYC Watershed (East and West of Hudson). Project types considered are: Nonpoint Source Abatement and Control (demonstration projects); Assessment, Planning and Research; and Outreach and Education. Currently over \$3 million dollars of Federal funds are available.

EOH Water Quality Investment Program Funds: As part of the NYC Watershed Agreement, DEP has provided Westchester County with \$38 million dollars and Putnam County with \$30 million dollars to support a program of water quality investments in the East of Hudson watershed. The types of projects that could be funded include, but are not limited to, stormwater management practices, streambank stabilization, water quality measures identified through the Croton Planning Process and septic system rehabilitation.

Water Quality Improvement Projects (WQIP): The WQIP program has approximately \$35 million available to municipalities for non-agricultural nonpoint source, wastewater treatment improvement, aquatic habitat restoration and MS4 projects. The Department has not yet scheduled the next call for projects.

Watershed Environmental Assistance Program: Water Resources Development Act (WRDA) Grants are being provided that seek to conserve and develop water and related resources. The act includes a special provision to provide environmental assistance to New York City watershed communities. DEC coordinates the WRDA grant program with the U.S. Army Corps of Engineers, which is responsible for overall program management. The DEC works with the DEP and with municipalities in the watershed to identify water quality needs and to identify eligible projects that meet program goals and criteria. Approximately \$400,000 is available this year.

Drinking Water State Revolving Fund (DWSRF): NY's DWSRF is a program that provides low interest rate loans to municipalities to construct water quality protection projects. The DWSRF is administered jointly by the New York State Department of Health and the New York State Environmental Facilities Corporation (www.nysefc.org).

Water Quality Planning and Implementation Grants for NYC Watershed Communities (WQPIG): This program replaced the Master Planning and Zoning Incentive Grants

program after six successful funding rounds. Round 7 began the new program, and the Request for Applications for Round 8 of this program was recently released to all municipalities in the NYC Watershed. Every municipality in the New York City Watershed is eligible to apply for this funding to assist in the creation and implementation of local land use and development tools to protect the Watershed environment, while encouraging local growth that is consistent with good Watershed stewardship. All applications received are scored and ranked by trained personnel, using an approved scoring methodology. The ceiling for any single awardee remains \$25,000 for planning and zoning projects, and \$50,000 for the project implementation category. Applications by multiple municipalities are encouraged and would be eligible for greater funding levels.

Brownfield Opportunity Areas Program (BOAP): DEC's BOAP provides municipalities and community based organizations with assistance to complete area-wide approaches to brownfields redevelopment planning. Through the BOAP, communities will have opportunities to return dormant areas back to productive use and simultaneously restore environmental quality during redevelopment of the sites. The associated Environmental Restoration Program provides grants to municipalities to reimburse up to 90 percent of on-site eligible costs and 100 percent of off-site eligible costs for site investigation and remediation activities.

The SDWA, WRDA and NYS Environmental Protection Fund have annual funding cycles. Requests for funding are announced by the DEC and are routinely published in the NYS Environmental Notice Bulletin (<http://www.dec.ny.gov/enb/enb.html>). Municipalities are encouraged to apply for these competitive grants.

Because current funding levels may be insufficient and/or may fluctuate, communities should also consider other means to generate revenue, including the establishment of stormwater utility districts. It is particularly important to generate continuous revenue for the staff resources that municipalities will likely need to fully develop, implement, maintain and enforce SWMPs.

4.0 Other Considerations

This Implementation Plan considers contributions from several sources, including the Phase II Phosphorus TMDLs for the New York City Watershed, DEP's March 1999 TMDL-related reports and its Croton Watershed Strategy, New York State's Nonpoint Source Management Program, Croton Planning for Putnam and Westchester Counties, DEC's Phase II Stormwater Program, and projects potentially funded by Safe Drinking Water Act and Water Resources Development Act. Although there is substantial activity in the above programs and other ongoing activities that relate to NPS implementation efforts, there are limitations to what can be incorporated into this Implementation Plan at this time. For example:

1. The completion of this Implementation Plan does not coincide with the completion of many ongoing activities, planning efforts and their prospective findings. For example:

The Croton Plans for Putnam and Westchester Counties are drafted and are currently going through the final stages of approval.

2. Practices needed to control many NPSs cannot be identified for specific locations at this time. These decisions are ultimately best linked to local decision-making processes as specific practices are defined and scheduled for implementation. Specific plans are being developed by each municipality to attain required phosphorus reductions in the reservoir watersheds within each municipality. Under the MS4 general permit, MS4 operators must modify their SWMPs to ensure that reduction of the pollutant of concern specified in the TMDL is achieved. The required SWMP modifications set forth in the MS4 general permit are considered to be satisfactory first steps toward compliance with this TMDL strategy in the MS4 general permit. The SWMPs must show consistent annual progress and be fully implemented by May 1, 2009.
3. Many implementation aspects of the MS4 general permit, such as the public education and outreach minimum control measure, are non-structural. They are critical components because they address behavioral changes and source controls that have the potential to significantly reduce phosphorus loads. However, it is difficult to precisely quantify expected reductions.
4. More phosphorus reduction may be achieved by additional point source reductions from wastewater treatment plants. This includes increased phosphorus treatment removal levels and diversion(s) out of the basin.
5. 40%, 10%, and 8%, respectively, of the estimated phosphorus NPS load to the Titicus, East Branch and Cross River Reservoirs, respectively, comes from Fairfield County, Connecticut.
6. To avoid the development of two separate and distinct SWMPs to satisfy stormwater control requirements of both DEC and DEP, efforts are underway to resolve apparent inconsistencies in the stormwater control design/performance standards referenced in the WRR and MS4 general permit.
7. Section VIII of the Phase II TMDL describes future TMDL development. While no specific plan yet exists, future revisions to the phosphorus TMDL would be expected to include MS4 wasteload allocations.
8. A law passed in 2005 promotes the reuse of reclaimed wastewater by requiring DEC to develop rules and regulations for their use. Such re-use could reduce phosphorus loadings to streams from wastewater.

Appendix A: 2008 MS4 General Permit

Appendix A is available on the DEC website at:
http://www.dec.ny.gov/docs/water_pdf/ms4permit08.pdf

Appendix B: Technical Background for Retrofitting Practices

Appendix B is available on the DEC website at: <http://www.dec.ny.gov/chemical/23835.html>

Appendix C: Croton Reservoir Watershed MS4 list

	DEC ID #		DEC ID #
Dutchess County	NYR20A386	School Districts:	-----
Beekman (T)	NYR20A365		
East Fishkill (T)	NYR20A183	Katonah –Lewisboro Union S.D.	NYR20A482
Pawling (T)	NYR20A472	Somers Central School District	NYR20A483
Pawling (V)	NYR20A477	Yorktown Central School District	NYR20A404
Putnam County	NYR20A343	Mahopac Central School District	NYR20A506
Carmel (T)	NYR20A294	Carmel Central School District	NYR20A510
Kent (T)	NYR20A346	Brewster Central School District	NYR20A512
Patterson (T)	NYR20A140		
Putnam Valley (T)	NYR20A345		
Southeast (T)	NYR20A320		
Brewster (V)	NYR20A256		
Westchester County	NYR20A128		
Cortlandt (T)	NYR20A181		
Bedford (T)	NYR20A218		
Lewisboro (T)	NYR20A227		
Mount Kisco (V)	NYR20A325		
New Castle (T)	NYR20A177		
North Castle (T)	NYR20A044		
North Salem (T)	NYR20A056		
Pound Ridge (T)	NYR20A226		
Somers (T)	NYR20A405		
Yorktown (T)	NYR20A007		
NYS Thruway Authority	NYR20A025		
NYSDOT	NYR20A288		

Appendix D: Putnam County projects authorized under DEP EOH Water Quality Investment Funds:

Peach Lake Wastewater Study (1)

Tilly Foster County Conservation Area

Town of Patterson Sewer Treatment Project

Twin Brooks Manor Wastewater Disposal

Town of Carmel Drainage - Prince Road (2)

Town of Carmel Drainage - Mahopac Firehouse

Town of Carmel Mahopac High School Stream Rehabilitation and Education Project

Putnam County's "Storm Drain, Culvert and Catch Basin Maintenance Program" (3)

Town of Kent - Barrett Hill Road Storm Water Quality Drainage Improvements

Town of Southeast Garage Drainage Project

Town of Southeast Storm Drainage Project for Marvin Avenue - Gold Lot (in Village of Brewster)

Town of SE Drainage Project - Brewster Heights (development sewer upgrade)

Great Swamp Property Purchase

Lake Macgregor Golf Course Property Purchase

Town of Kent Terry Hill Road Storm Water Quality Improvements

Town of Carmel Lake Gilead Road North Storm Water Quality Improvements

- (1) The study concluded that the area must be sewered – subsequent sewerage work funding source to be determined, but likely ½ Putnam and ½ Westchester.
- (2) This project will not directly improve water quality.
- (3) Benefits Towns of Southeast and Kent. Includes purchase of "Vac-all" equipment for the storm drain maintenance program.

The following Putnam County Septic Repair Program has also been authorized to be funded with the East of Hudson Fund:

Phase I: 4 Years	Town(s)	Number of Parcels
Reservoirs and stems:		
within 500' of West Branch and Reservoir Stem	Kent/Carmel	about 125
within 500' of Boyd Corners and Reservoir Stem	Kent	about 60
within 500' of Croton Falls and Reservoir Stem	Carmel/Southeast	about 160
Croton Watershed Strategy:		
Sagamore Lake	Kent/Putnam Valley	82
Seven Hills Lake	Kent	83
East of West Branch	Kent	139
North of Long Pond	Carmel	266
Stream Corridors:		
Long Pond to West Branch	Carmel	about 40
Horse Pound Brook from Kentwood Lake to West Branch	Kent	about 20
Lake Zones:		
within 200' of Lake Carmel	Kent	366
within 200' of Lake Tonetta	Southeast	59
within 200' of Putnam Lake	Patterson	218
Phase I Total:		about out 1,618

Phase II: 3 Years

within 200' of Lake Casse	Carmel	52
within 200' of Lake Mahopac	Carmel	267
within 200' of Peach Lake	Southeast	124
within 200' of Middle Branch	Southeast	79
within 200' of Kirk Lake	Carmel	93
Phase II Total:		615

Phase III: 3 Years

within 200-300' of Phase I and II
target areas

Phase III Total: 190 (1)

- The Phase III Total number of parcels is dependent on the amount of funds remaining following Phase I and II.

Appendix E: Filtration Avoidance Determination, Section 4.9

2007 NYC Water Supply Filtration Avoidance Determination (FAD) Section 4.9 (East of Hudson Non-Point Source Pollution Control Program) states:

“DEP has developed a comprehensive non-point source program for the West Branch, Boyd’s Corner, Croton Falls and Cross River Reservoir basins located east of the Hudson. Under the 2002 FAD, the City began to implement the following program elements in these basins: agricultural program, forestry program, and new septic and stormwater initiatives. Other elements of the program that have been implemented by the City include planning efforts by the City (Croton Watershed Strategy) and the two Counties (Westchester and Putnam Counties) that will provide for integrated watershed management to protect and improve water quality in the West Branch, Boyd’s Corner, Croton Falls and Cross River Reservoir basins. In addition, NYCDEP will address many concerns in the East-of-Hudson watersheds through the aggressive implementation of the Watershed Rules and Regulations, continued increased involvement in project reviews and through a grant program to assist stormwater districts or municipalities to reduce stormwater pollutant loading to the Croton Falls and Cross River basins. The City and Westchester and Putnam County officials shall continue to keep each other informed of planned and ongoing East-of-Hudson non-point source pollution control actions.

The City’s 2006 Long-Term Watershed Protection Program includes a NPS Pollution Strategy for east-of-Hudson Catskill/Delaware basins and Cross River and Croton Falls basins (Section 2.3.9). The 2007 FAD requires full implementation of the Strategy, in accordance with the milestones therein and the clarifications below:

Milestone/Reporting Requirements for Catskill/Delaware Basins east-of-Hudson and Cross River and Croton Falls:"

Requirement	Due Date
East-of-Hudson Stormwater Facility Maintenance for constructed facilities.	Ongoing
<p>Stormwater Remediation Projects:</p> <ul style="list-style-type: none"> • BC-1 (Kent, Putnam County) <p>Cleanout of sediment/debris and stabilize embankment along the stream channel.</p> <p>Install forebays with a drainage ditch.</p> <ul style="list-style-type: none"> • WB-1 (Kent, Putnam County) <p>Install drainage structures and outlet protection.</p> <ul style="list-style-type: none"> • WB-2 (Carmel, Putnam County) <p>Install porous pavers.</p> <p>Cleanout sediment/debris buildup.</p> <ul style="list-style-type: none"> • CF-1 (Carmel, Putnam County) <p>Stream channel embankment stabilization.</p> <p>Michael Brook/Hughson Road Improvements.</p> <ul style="list-style-type: none"> • CR-1 (Bedford, Westchester County) <p>Construct drainage ditches, culverts, outlet protections, and stabilize steep slopes. Install porous pavers and vegetation.</p>	<p>Award Contract: 10/31/08</p> <p>Completion of all projects: 12/31/09</p>

Milestone/Reporting Requirements (Continued from previous page)

Requirement	Due Date
<p>Stormwater Retrofit Projects:</p> <ul style="list-style-type: none"> • Design and Construct Hemlock Dam Retrofit – Croton Falls. • Design and Construct Magnetic Mine Road Retrofit – Croton Falls. 	<p>Award Contract: 9/30/08</p> <p>Completion: 12/31/09</p>
<p>Stormwater Remediation Small Projects Program:</p> <ul style="list-style-type: none"> • Complete design and construction of stormwater management practices. • Assess effectiveness of program. • Conduct an assessment and submit a report on the potential value of initiating a pilot study that would evaluate the impacts of stormwater improvements on stream corridors. 	<p>9/30/08</p> <p>1/31/09</p> <p>3/31/09</p>
<p>East-of-Hudson Stormwater Mapping and Inspection:</p> <ul style="list-style-type: none"> • Complete digital mapping and stormwater inspection of Boyd Corners and West Branch basins. • Review results and coordinate with counties to remediate illicit connections in Boyd Corners and West Branch basins. Stormwater infrastructure capacity evaluation. 	<p>Completion: 12/31/07</p> <p>Completion: 12/31/10</p>
<p>East-of-Hudson Stormwater Prioritization Assessment (NYCDEP Properties):</p> <ul style="list-style-type: none"> • Determine prioritization criteria. • Determine location of potential future stormwater projects to be implemented by NYCDEP. Develop and submit a schedule for implementation of selected practices. 	<p>3/31/09</p> <p>9/30/09</p>
<p>Establish a \$4.5 million program to address stormwater pollution in the Croton Falls and Cross River basins and upstream/hydrologically connected basins. These funds are presently intended to provide grants to stormwater districts or municipalities for projects that will reduce stormwater pollutant loading to the Croton Falls and Cross River basins and upstream/ hydrologically connected basins,¹ subject to the following terms:</p> <ul style="list-style-type: none"> • Develop program rules, in collaboration with NYSDEC, and model contract, including provision for local match of at least 50%. • Solicit applications from interested parties. • Convene inter-agency technical panel to evaluate and select projects. • Begin process to award selected projects 	<p>3/31/08</p> <p>5/31/08</p> <p>11/30/08</p> <p>1/1/09</p>

¹ The City is empowered to develop program rules that will provide for a phased program with priority given to projects directly affecting Cross River and Croton Falls Reservoirs.

Milestone/Reporting Requirements (Continued from previous page)

Requirement	Due Date
<p>Completed projects may be used by the awarded district or municipality toward their efforts to comply with the requirements of the NYSDEC SPDES General Permit, stormwater discharges from Municipal Separate Storm Sewer Systems (MS4).</p> <p>The New York State Departments of Environmental Conservation and State are currently working together to identify potential structures for ensuring appropriate coordination among the east-of-Hudson watershed communities in complying with the NYSDEC SPDES General Permit, stormwater discharges from Municipal Separate Storm Sewer Systems (MS4). EPA and NYSDOH will entertain a joint proposal from NYCDEP and NYSDEC, if submitted no later than 1/31/08, to allocate some portion of this \$4.5 million program toward establishment and start-up of a public benefit corporation, utility, special district, or other entity that would assist with MS4 permit compliance in the east-of-Hudson Watershed.</p> <p>It is understood that the MS4 Requirements are requirements of federal and State law and that responsibility for meeting those requirements rests with the east-of-Hudson watershed communities and not with the City of New York.</p>	
<p>Sanitary Infrastructure Mapping/Inspection:</p> <ul style="list-style-type: none"> • Complete inspection and mapping. • Prepare report identifying defects. • Coordinate with responsible entities to remediate identified deficiencies. 	6/30/09
<p>Septic Program East-of-Hudson:</p> <ul style="list-style-type: none"> • Coordinate with county in prioritizing the program target areas. • Review and approve designs from program participants. 	Ongoing
<p>East-of-Hudson Non-point Source Program Semi-Annual Report – Submit brief report discussing material events in the east-of-Hudson program implementation.</p>	Semi-annually
<p>East-of-Hudson Non-point Source Program Annual Report – Submit report discussing all program elements:</p> <ul style="list-style-type: none"> • Ongoing stormwater facility maintenance; • Stormwater Remediation and Retrofit Projects; • Small Projects Program (include effectiveness assessment in the 2009 Annual Report); • Stormwater Mapping and Inspection; • Sanitary Infrastructure Mapping/Inspection; • East-of-Hudson Septic Program; • Stormwater Capacity Evaluation; • Prioritization Assessment for NYCDEP Properties; • Funding Program for Cross River/Croton Falls Basins • Croton Strategy and Croton Planning Activities. 	Annually

Appendix F: 5 - Year Modeled Apportioning Calculations

	Total Modeled Load	Town	County	State
Bedford	48.0	32.2	1.4	14.4
Beekman	1	1	0	0
Brewster	9.2	9.2	0	0
Carmel	94.8	72.0	15.2	7.6
Cortlandt	12.0	11.6	0	0.4
East Fishkill	4.8	3.2	0.3	1.3
Kent	47.4	33.6	4.7	9.1
Lewisboro	46.8	35.5	0	11.3
Mount Kisco	28.4	18.7	0.9	8.8
New Castle	33.0	25.1	1.0	6.9
North Castle	1	1	0	0
North Salem	31.8	19.1	2.9	9.8
Patterson	27.6	17.2	4.4	6.0
Village of Pawling	4.3	4.3	0	0
Town of Pawling	8.3	3.5	2.8	2.0
Pound Ridge	11.4	9.5	0	1.9
Putnam Valley	1	1	0	0
Somers	61.8	50.0	0.6	11.2
Southeast	55.4	31.0	6.6	17.8
Yorktown	72.0	54.0	1.4	16.6
TOTAL:	600	432.7	42.2	125.1
Dutchess County Total:			3.1	
Putnam County Total:			30.9	
Westchester County Total:			8.2	
NYSDOT Total:				125.1

Appendix G: Modeled HID loading by sub-basin

Town of Bedford

Total High Intensity Development Phosphorus Load: 191	
Cross River	2
New Croton	46
Muscot	143

Town of Beekman

Total High Intensity Development Phosphorus Load: 1	
Middle Branch	1

Village of Brewster

Total High Intensity Development Phosphorus Load: 37	
Diverting	37

Town of Carmel

Total High Intensity Development Phosphorus Load: 379	
Middle Branch	5
West Branch	30
Muscot	48
Croton Falls	106
Amawalk	190

Appendix G: Modeled HID loading by sub-basin

Town of Cortlandt

Total High Intensity Development Phosphorus Load: 49	
New Croton	49

Town of East Fishkill

Total High Intensity Development Phosphorus Load: 18	
Middle Branch	12
Boyds Corners	4
West Branch	2

Town of Kent

Total High Intensity Development Phosphorus Load: 188	
East Branch	1
Croton Falls	25
Middle Branch	88
Boyds Corners	38
West Branch	36

Town of Lewisboro

Total High Intensity Development Phosphorus Load: 187	
Titicus	1
Muscoot	72
Cross River	114

Appendix G: Modeled HID loading by sub-basin

Village of Mount Kisco

Total High Intensity Development Phosphorus Load: 115	
New Croton	115

Town of New Castle

Total High Intensity Development Phosphorus Load: 131	
New Croton	131

Town of North Castle

Total High Intensity Development Phosphorus Load: 0	
New Croton	0

Town of North Salem

Total High Intensity Development Phosphorus Load: 128	
Cross River	0
East Branch	6
Muscot	106
Titicus	16

Town of Patterson

Total High Intensity Development Phosphorus Load: 111	
Diverting	0
Bog Brook	1
Middle Branch	12
East Branch	98

Appendix G: Modeled HID loading by sub-basin

Town of Pawling

Total High Intensity Development Phosphorus Load:	
Middle Branch	2
East Branch	20

Village of Pawling

Total High Intensity Development Phosphorus Load:	
East Branch	28

Town of Pound Ridge

Total High Intensity Development Phosphorus Load: 45	
Muscoot	23
Cross River	22

Town of Putnam Valley

Total High Intensity Development Phosphorus Load: 5	
Amawalk	0
Boyd's Corners	5

Town of Somers

Total High Intensity Development Phosphorus Load: 248	
Croton Falls	6
New Croton	5
Amawalk	30
Muscoot	207

Appendix G: Modeled HID loading by sub-basin

Town of Southeast

Total High Intensity Development Phosphorus Load: 221	
Croton Falls	2
Bog Brook	3
Middle Branch	45
Muscot	34
Diverting	98
East Branch	39

Town of Yorktown

Total High Intensity Development Phosphorus Load: 287	
New Croton	134
Muscot	153