STORMWATER MANAGEMENT PROGRAM

National Pollution Discharge Elimination System (NPDES) Permit
No. PA 0054712
Covering the Period from July 1st, 2006 to June 30th, 2007

Submitted to:

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Water Quality Management

And

ENVIRONMENTAL PROTECTION AGENCY – REGION III
Water Protection Division

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Executive Summary
Stormwater Program Highlights 2006-2007

Managing and mitigating the impacts of stormwater in older and dense urban environments represents a significant challenge nationwide. In Philadelphia, our challenges are no less significant, but we believe that we can implement strategies which overcome these challenges while protecting and restoring our natural resources. PWD has worked with PADEP, EPA, and other stakeholders to manage stormwater as a resource using groundbreaking initiatives to solve this long-term challenge.

Though we have made significant strides to improve the management of stormwater in Philadelphia over the past year, our job is not done. We are now embarking on watershed plans that will guide our future efforts to protect and restore our streams and rivers while still providing necessary stormwater conveyance and help address flooding concerns citywide.

This report provides a summary of the various efforts to manage stormwater in Philadelphia as related to permit obligations. However, we have attempted to provide additional information to demonstrate our commitment to go beyond regulation and achieve meaningful outcomes and to emphasize the myriad of efforts throughout the city that are linked to stormwater management. Here are some of the highlights of our progress:

BMP Implementation

PWD is implementing innovative restoration projects. This year PWD continued designing its first Natural Channel Stream Design and Restoration on the Wises Mill tributary of the Wissahickon Creek (one of the top 3 tributaries designated for restoration in the prioritization). The Saylor Grove Wetland, the first stormwater treatment wetland in the city, has been operating since May 2006. In October 2006, PWD distributed 249 rain barrels to citizens in the Poquessing and Wissahickon Creeks working with community organizations and schools as part of a long term annual rain barrel distribution program. Also, the natural channel stream design and restoration of the Redd Rambler Run tributary of the Pennypack Creek has completed the design process and will be sent out for bids in FY 2008. PWD has also been assisting with the design of public facility improvements such as the Baxter water treatment plant visitors' parking lot that is incorporating infiltration and bio-retention to manage runoff. Other parking lot retrofits include the East Falls parking lot and the Pennypack Park wetland and parking lot. Another ongoing project is improvements at the Saul Agricultural High School to develop stream bank fencing and riparian buffers to address runoff.

Cleaning & Greening

During this year PWD initiated the following activities to keep pollution out of our waterways with the following impacts:

- Inlet Cleaning – 76,561 inlets cleaned removing over 16,000 tons of debris.
- Waterways Restoration Team – Removal of 441 tons of debris at 142 sites in Fiscal Year 2007 including 41 cars, 1201 tires, and 84 shopping carts from local waterways.
- Skimming/Floatable Vessel – Delaware and tidal Schuylkill River: 39.83 tons of floatable debris removed during FY 2007, total of 60.38 tons to date.
- Skimming/Floatable Pontoon Boat - non-tidal Schuylkill River: Obtained in June 2006, operated for 8 days in FY 2007 removed 18.5 cubic yards.
- Private development projects – Three pervious paving projects representing 19,318 square feet (0.44 acres) and 8 green roof projects representing 176,743 square feet (4.06 acres)

Development Stormwater Management

In January 2006, PWD implemented new stormwater management regulations for new and redevelopment in the City of Philadelphia and developed staffing capabilities to coordinate with PADEP and function in the capacity similar to a Conservation District. Now not only is development greater than 15,000 square feet of earth disturbance subject to stormwater management for water quality, channel erosion, and flood control, but erosion and sediment control and construction inspections are performed by 2 new full time PWD E&S inspectors. From July to June 2007, 81 E&S plans were reviewed and 570 site visits were conducted to construction sites including actions such as reporting to PADEP for violations or issuance of site shut-down order from Licenses and Inspection.

In addition, through the efforts to implement new stormwater regulations, PWD has worked with other city agencies to revamp the city development process to require conceptual approval for stormwater management prior to zoning to ensure developers are aware of their stormwater management requirements prior to zoning permit issuance to prevent site redesigns. As a result of these efforts, PWD has reviewed plans for stormwater management that will impact stormwater management for future development that will be infiltrated instead of sent to the storm sewers. PWD's regulations also provided incentives for Low Impact Development Techniques which has encouraged an increased number of submissions proposing eight green roofs (4.06 acres) and three porous pavement parking lots (0.44 acres). From July to June 2007, 271conceptual plans for zoning approval have been reviewed for stormwater management and 186 full technical plan reviews have been conducted. Of the 186

technical plans, 60 are located within the MS4: 19 plans within Pennypack watershed, plans within 11 Poquessing watershed and 16 within Wissahickon watershed.

Defective Laterals

Eleven years ago PWD initiated its defective lateral program. Since that time, we have abated hundreds of defective laterals and conducted thousands of inspections and tests. A comprehensive review of our efforts in the Monoshone Creek has shown dramatic reductions in outfall and in-stream bacteria measurements suggesting that efforts to date have made significant progress towards meeting in-stream water quality goals. The study also identifies defective lateral abatements were the most cost-effective technique resulting in much lower cost per bacteria unit reduced compared to sewer relining and stormwater treatment wetlands.

The positive in-stream results and overall low annual bacteria load contribution compared to stormwater runoff suggests that these activities may be reaching of point of diminished returns in the Monoshone sewershed on a per-dollar-spent basis and a discussion between PADEP and PWD regarding standards for lowering the priority of these outfalls on the priority list should be considered. In addition, PWD is conducting studies of cutting edge technologies such as anti-microbial filters inside stormwater outfalls as an interim method of reducing high dry weather bacteria concentrations to receiving streams while the defective lateral testing and abatement programs continue to achieve long term solutions.

Education

PWD has been conducting education about water for over 23 years. Some of the highlights this year include the following:

- Homeowner Stormwater Management Manual

- *Watershed Information Center Website* – www.PhillyRiverInfo.org – an on-line internet based compendium and clearinghouse of watershed information including studies, data, and resources for public access.

- *Fairmount Fish Ladder Web Viewer* – www.PhillyRiverInfo.org – this website allows the public to view real time and on-line the passage of fish and other creatures through the Fairmount Fish Ladder. In the past two years, we have observed species that have not been seen in the area for over a century including river otters, red bellied turtles, and other endangered species.

- *Philly Rivercast* – www.PhillyRivercast.org – the first on-line internet based tool in the world that predicts bacteria water quality for recreation on the Schuylkill River for the 100,000 annual users in and along the river. It has received over 40,000 visits annually.

- *Fairmount WaterWorks Interpretive* Center – educates over 30,000 visitors annually
- More than 30 educational activities ranging including events, tours, handbooks, public meetings, certification and training programs, partnerships, etc.
- Twelve stormwater related educational billstuffers mailed to over 460,000 households

Monitoring Programs

During the first year of the permit PWD has developed and implemented an extensive sediment monitoring program which was used to help develop our tributary restoration feasibility ranking for the Wissahickon Creek. The study suggested a large majority of sediment load in the city is a result of streambank erosion helping to focus restoration efforts towards appropriate solutions. Special monitoring included infrastructure assessments of the entire Wissahickon, Pennypack, and Poquessing watersheds listing outfalls and structures in the stream and tributaries. Infrared monitoring via helicopter flyovers was conducted to detect potential dry weather discharges of sewage inside and outside the city in these watersheds. Continued monitoring as part of our 5 year monitoring plan is aimed to refining future estimates. Projects have been initiated to employ cutting edge research with Drexel University and Lehigh University to use DNA fingerprinting of *Cryptosporidium* and *E. Coli* as well as multiple antibiotic resistance to identify sources of pathogens in the watershed.

Planning

A PCB Pollutant Minimization Plan has been completed for the MS4 areas. The Wissahickon Watershed Plan has been initiated and is scheduled to be completed in 2007. The Wissahickon Creek Characterization Plan is schedule for distribution in fall 2006. PWD is also participating in a 104b3 grant to prioritize and design retrofits of detention basins for the Wissahickon Creek Watershed, but also develop a template to be used in other regional watersheds. The Pennypack Creek and Poquessing Creek River Conservation Plans have been completed.

Partnerships

We are sponsors and active members in over 7 active watershed partnerships including hundreds of stakeholders covering the city's watersheds and the entire Schuylkill and Delaware River. These partnerships have been able to reach out to public officials, change policies, educate stakeholders, develop plans, and secure funding and implement projects to restore and protect local streams. It is PWD's belief that sustainable protection and restoration of our watersheds for future generations cannot be achieved without partnerships that create a shared sense of stewardship of these resources through cooperation and communication.

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List of Acronyms
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ACSP	Audobon Cooperative Sanctuary Program
ANS	Academy of Natural Science
BEHI	Bank Erosion Hazard Index
BLS	Bureau of Laboratory Services, Philadelphia Water Department
BMP	Best Management Practice
CAC	Citizens Advisory Council
CCIWMP	Cobbs Creek Integrated Watershed Management Plan
CNP	Coastal Non-Point Pollution
CO&A	Consent Order and Agreement
CPCs	Compounds of Potential Concern
CSO	Combined Sewer Overflow
CSOMP	Combined Sewer Overflow Management Program
CWP	Clean Water Partners
DCNR	Department of Conservation and Natural Resources
DMR	Discharge Monitoring Report
DRBC	Delaware River Basin Commission
E&S	Erosion and Sedimentation
EDCs	Endocrine Disrupting Compounds
EWS	Early Warning System
FGM	Fluvial Geomorphology
FOW	Friends of the Wissahickon
FPC	Fairmount Park Commission
FWWIC	Fairmount Water Works Interpretive Center
HHW	Household Hazardous Waste
IPM	Integrated Pest Management
IWMP	Integrated Watershed Management Plan
IWU	Industrial Waste Unit
MS4	Municipal Separate Storm Sewer System
NBS	Near Bank Stress
NCSD	Natural Stream Channel Design
NPDES	National Pollution Discharge Elimination System
O&M	Operation and Maintenance
OOW	Office of Watersheds
PADEP	Pennsylvania Department of Environmental Protection
PCB	Polychlorinated Biphenyl
PCIWMP	Pennypack Creek Integrated Watershed Management Plan
PCSMP	Pre-Construction Stormwater Management Plan
PCWCCR	Pennypack Creek Watershed Comprehensive Characterization Report
PDE	Partnership for the Delaware Estuary

PFBC	Pennsylvania Fish and Boat Commission
PMP	Pollutant Minimization Plan
PWD	Philadelphia Water Department
QAPP	Quality Assurance Project Plan
RBP	Rapid Bioassessment Protocol
RCP	River Conservation Plan
SAN	Schuylkill Action Network
SCEE	Schuylkill Center for Environmental Education
SEC	Senior Environmental Corps
SMP	Stormwater Management Program
SOP	Standard Operating Procedure
SWMM	Stormwater Management Model
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
TTF	Tookany/Tacony-Frankford
TTFIWMP	Tookany/Tacony-Frankford Integrated Watershed Management Plan
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency, Region III
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
WCIWMP	Wissahickon Creek Integrated Watershed Management Plan
WCWCCR	Wissahickon Creek Watershed Comprehensive Characterization Report
WMR	Watershed Mitigation Registry
WRT	Waterways Restoration Team

Section A
Legal Authority

The City maintains adequate legal authority to enforce the Stormwater Management Program, in accordance with the National Pollutant Discharge Elimination System (NPDES) regulations 40 Code of Federal Regulations CFR122.26(D)(2)(i). Legal authority to operate and maintain the Stormwater Management Program includes various ordinances, regulations, and policies enforced by City departments, many of them in place prior to the EPA Stormwater Regulation. The ordinances and regulations may be found at www.Phila.gov.

This Annual Report is submitted to the Pennsylvania Department of Environmental Protection (PADEP), in accordance with requirements of the City of Philadelphia's NPDES Stormwater Management Permit No. PA 0054712. This Report is a compilation of the progress made on the Stormwater Management Program, during the reporting period from July 1, 2006 to June 30, 2007.

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Section B
Sediment Total Maximum Daily Load (TMDL) for Wissahickon Creek – Feasibility Study & Monitoring Plan

The City has achieved the first goal of the sediment TMDL effort which requires the City "to establish baseline data on the City's contribution of sediment loading and flow variations". The City conducted a feasibility study to determine MS4 outfalls and tributaries to the Wissahickon Creek (within Philadelphia) that cause an adverse impact to in-stream habitats as a result of transport of sediment and/or stream-bank erosion. The study which was initiated in October 2005 and scheduled to continue through August 2007, includes an evaluation of the outfalls and tributaries that have the greatest potential for improvement through implementation of BMPs and/or other methods. The final study will list all MS4 outfalls and tributaries to the Wissahickon Creek that have been evaluated and/or chosen for further study, provide rational for selection, and present modeling results.

As a result of the study, the City has designed and implemented a monitoring plan that includes modeling results and monitoring for Total Suspended Solids (TSS) and flow at selected MS4 outfalls and at the confluence of selected tributaries to the Wissahickon Creek during various flow events (low flow, normal flow, and storm flow). The following provides a brief summary of the major elements, actions, and findings of the sediment and stream restoration feasibility study. The feasibility study document and supporting data is located in FY 2006 Stormwater Annual Report Appendix A. Updates based on data acquired between July 1 2006 and June 30 2007 are presented in the following summary of the sediment and stream restoration feasibility study.

B.1 Summary of Sediment and Stream Restoration Feasibility Study

B.1.1 Study Objectives

- To identify stream reaches with the most degradation and the greatest potential for restoration
- To estimate sediment loads from erosion, suspended sediments, bed load from tributaries and outfalls
- To establish flow rating curves for tributaries
- To provide a sediment budget

- To provide an objective means of ranking the stream reaches for restoration

B.1.2 Study Approach

The TMDL is based on models used to estimate Total Suspended Solids (TSS) from stream bank erosion and stormwater runoff. PWD developed an approach based on field data and modeling, with conclusions tested using each of the following approaches:

- SWMM modeling to estimate runoff loads and flows from outfalls and tributaries.
- Stream assessment techniques (BEHI scores) and Rosgen derived stream bank erosion rates to estimate in-stream TSS load. (can be applied to entire watershed)
- Bank pin measurements to verify or improve BEHI score approach. (reality check on BEHI based estimates)
- Measured TSS and flow to estimate total annual load and compare to SWMM and BEHI score TSS load estimates. (reality check on sum of SWMM and BEHI estimates)
- Estimate of total volume of soil eroded from pre-development conditions to current stream profile. This was used to estimate time to reach current stream profile using estimated erosion rates from BEHI (an independent reality check on the estimated erosion rate using an entirely different approach).

B.1.2.1 Estimated Outfall Loadings and Runoff

Methods used to develop stormwater outfall flows and loads are described in detail in the Wissahickon Comprehensive Characterization Report. Drainage area and estimated mean annual runoff volume for each outfall, estimated mean annual pollutant loads for each outfall and a summary of the total number of outfalls per tributary are reported in tabular form. Each of these tables is included in FY 2006 Stormwater Annual Report Appendix A**.**

B.1.2.2 In-Stream Loading Assessment Techniques

There are two elements to the monitoring program designed to assess in-stream loading of TSS. The first estimates the sediment load originating from stream banks. The second estimates the total sediment load being carried by the stream. Data collection is ongoing for both parts.

PWD employed the Bank Erosion Hazard Index (BEHI) and Near Bank Stress (NBS) as defined by Rosgen (1996) to predict erosion rates and classify the erosion potential of the tributaries. Three hundred and sixty eight reaches in 12 tributaries have been assessed

using BEHI and NBS criteria. Reaches were assessed based on visual inspection of obvious signs of erosion. BEHI and NBS scores were grouped as very low, low, moderate, high or very high. Reaches not assessed with BEHI and NBS criteria were visually assessed with modified BEHI criteria. Visual assessments relied on a combination of bank angle, weighted root density, surface protection, and best professional judgment of the field crew to categorize a bank as very low, low, moderate, high, very high, or extreme erosion potential. A combination of the aforementioned assessment types was used to predict the sediment load originating from streambank erosion (Table B.1.2-2). Predictions were based on measured streambank erosion rates in a reference stream in Colorado (Rosgen, 1996). The total sediment load predicted for all 12 Wissahickon tributaries within Philadelphia County was 4.2 millions pounds per year.

Table B.1.2-1 Wissahickon Tributary Characteristics and Erosion Assessment Bank Lengths

Tributary	Drainage Area acres	Stream Length ft	BEHI Erosion Bank Length ft	Visual Erosion Assessment Bank Length			Zero erosion / channelized Bank Length ft
				High Confidence ft	Medium Confidence ft	Low Confidence ft	
Bells Mill	323	6,722	1,712	0	8,653	0	3,079
Cathedral	160	2,770	425	0	5,025	0	91
Creshiem	1,218	14,143	1,180	4,258	9,360	3,748	9,740
Gorgas Lane	499	2,170	280	3,644	0	0	415
Hill Crest	217	3,530	318	2,853	1,181	2,133	576
Hartwell	144	5,272	25	0	5,817	0	4,702
Kitchens Lane	234	7,753	1,175	0	0	12,741	1,589
Monoshone	1,056	6,926	32	3,406	2,258	1,455	6,700
Thomas Mill	104	4,009	600	0	5,323	2,095	0
Valley Green	128	2,874	158	3,462	0	884	1,245
Wises Mill	446	7,056	782	2,389	9,467	0	1,474
Rex Ave	137	1,947	255	0	1,370	2,189	81

Table B.1.2-2 Wissahickon Tributary Streambank Erosion Estimate – Colorado Stream Based

Tributary	BEHI Erosion lb/yr	Visual Assessment Erosion				Total Erosion lb/yr	Erosion Per Foot of Eroding Stream Length
		High Confidence lb/yr	Medium Confidence lb/yr	Low Confidence lb/yr	Total lb/yr		lb/ft/yr
Bells Mill	286,483	-	305,664	-	305,664	592,146	114
Cathedral	60,535	-	298,843	-	298,843	359,378	132
Creshiem	128,046	252,094	404,815	82,503	739,411	867,458	94
Gorgas Lane	67,263	312,646	-	-	312,646	379,909	194
Hill Crest	28,263	41,591	46,879	73,176	161,645	189,908	59
Hartwell	819	-	62,167	-	62,167	62,985	22
Kitchens Lane	108,235	-	-	261,886	261,886	370,121	53
Monoshone	11,113	41,428	28,173	72,777	142,378	153,491	43
Thomas Mill	56,159	-	183,125	115,178	298,303	354,462	88
Valley Green	8,101	198,429	-	15,629	214,058	222,159	99
Wises Mill	101,877	25,525	285,400	-	310,925	412,802	65
Rex Ave	30,656	-	108,208	97,388	205,596	236,252	124

B.1.2.3 Bank Profile Measurements

Bank pins were installed in Monoshone, Kitchens Lane, Gorgas Lane, Cresheim, Valley Green, Hartwell, Wises Mill, Cathedral Run, Rex Ave, Thomas Mill, Bells Mill, and Hillcrest in an effort to measure streambank erosion at these sites. A total of 82 bank pin sites were chosen to reflect varying BEHI and NBS scores in order to validate and calibrate the prediction model. Twenty-two bank pin sites were installed during the fall of 2005, and 60 bank pin sites were installed during the summer of 2006. A detailed explanation of how to install and analyze bank pin data is found in FY 2006 Stormwater Annual Report Appendix A. The current bank pin installation locations can be seen in Figure B.1.2-1 on the following page.

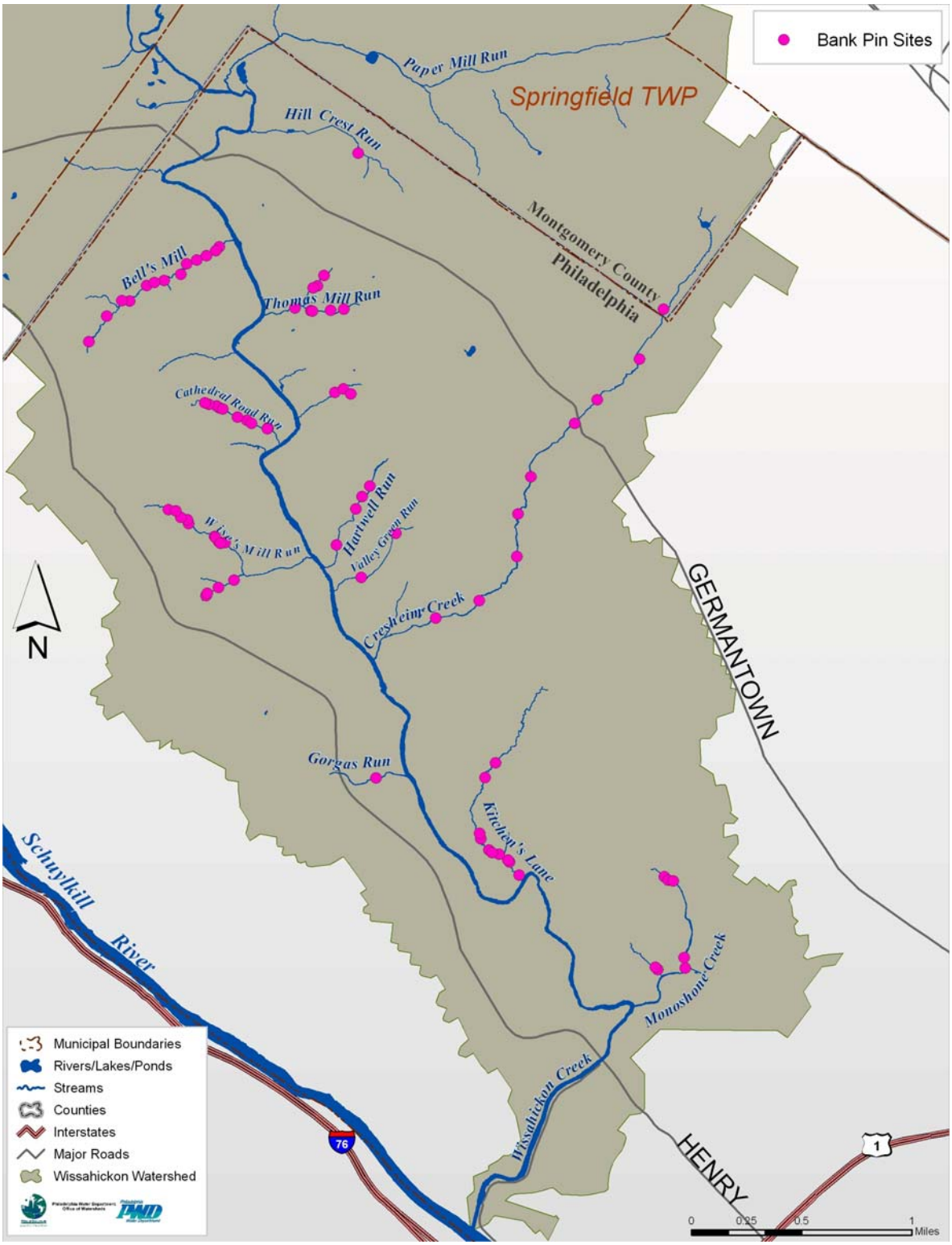

Figure B.1.2-1 Bank Pin Installation Locations

Bank profiles at bank pin sites are measured quarterly to document the effects of seasonality on erosion rates. Bank profiles were last measured April 2007 and the next measurement will occur August 2007. Erosion rates and sediment loads are calculated from the bank profile measurements following the steps listed below:

1. Each set of bank pin measurements taken on a particular day is plotted. The vertical axis represents height from the toe pin, and the horizontal axis represents distance from that same toe pin. All measurements at a given site are taken relative to this plane.

2. The individual measurements are connected using straight lines to form a profile of the bank shape at the time the measurements were taken.

3. The area between the bank profile and vertical plane is calculated. This area has units of length^2 perpendicular to the bank.

4. To estimate erosion rate between two bank profiles taken on different days, a difference in area perpendicular to the bank is taken.

5. This area is divided by difference in height between the top and bottom bank pins. The result is an average erosion rate with units of length perpendicular to the bank.

6. An estimate of bank area is calculated by multiplying estimated bank height and reach length.

7. The erosion rate (length perpendicular to the bank) is multiplied by bank area to yield an estimated erosion rate with units of length^3 (volume of soil) over the time period between two sets of measurements.

8. The volume of soil is related to a mass of soil using a reasonable assumption of soil dry bulk density.

The bank pin measuring program has been active for over a year. The 82 bank pin sites cover the majority of BEHI-NBS combinations assessed in the Wissahickon Creek tributaries. There are 20 sites that have a complete year of data, and an additional 2 sites with 6 months of useful data. These 2 sites have been active for over a year; however the toe pin could not be located during the last measurement. Of these sites, 10 have a high BEHI rating (including the two 6 month measurements) and 12 have moderate BEHI ratings. The present analysis relies on these 22 sites; the remaining sites were not included due to the lack of reliability in bank pin measurements of less than 1 year.

Average erosion rates for the 10 sites rated high and 12 sites rated moderate were used in combination with visual assessments to estimate a sediment load originating from the Wissahickon tributaries within Philadelphia County (Table 3). The average erosion rate for either a high or moderate rating was applied to the stream length associated with that ratings. The remaining areas (sites with low, very high or extreme BEHI ratings) utilized erosion rates based on the Colorado stream reference. Using this method, a total sediment load of 4.3 million pounds of sediment per year is estimated to originate from streambank erosion. Upon completion of the August 2007 bank profile measurements, data from all 82 sites will be used to estimate a sediment load.

Table B.1.2-3 Wissahickon Tributary Streambank Erosion Estimate – Bank Pin Based

Tributary	BEHI Erosion	Visual Assessment Erosion				Total Erosion	Erosion Per Foot of Eroding Stream Length
		High Confidence	Medium Confidence	Low Confidence	Total		
	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/ft/yr
Bells Mill	157,435	-	360,900	-	360,900	518,335	100
Cathedral	139,312	-	275,495	-	275,495	414,808	152
Creshiem	123,300	287,433	415,823	84,231	787,488	910,788	98
Gorgas Lane	78,365	319,622	-	-	319,622	397,987	199
Hill Crest	34,551	41,304	59,832	88,820	189,957	224,508	69
Hartwell	4,178	-	64,412	-	64,412	68,590	23
Kitchens Lane	95,165	-	-	269,316	269,316	364,482	52
Monoshone	8,035	41,206	34,225	86,744	162,174	170,209	48
Thomas Mill	54,030	-	191,501	123,413	314,915	368,944	92
Valley Green	18,311	196,433	-	15,629	212,061	230,372	102
Wise's Mill	140,461	25,525	302,182	-	327,707	468,168	74
Tributary I	30,069	-	111,457	117,114	228,572	258,640	136

B.1.2.4 Stage Discharge and Sediment Discharge Rating Curves

In order to estimate the total suspended sediment load in the stream, a stage discharge and a sediment discharge rating curve are generated. Stage is continuously recorded and used in conjunction with the rating curves to calculate an estimated sediment load per year.

Stage data from Bells Mill, Cathedral Run, Wise's Mill and Monoshone tributaries were recorded near the Wissahickon confluence downstream of all stormwater outfalls. Stage was measured every six minutes by either an ultrasonic down-looking water level sensor or a pressure transducer and recorded on a Sigma620. PWD staff periodically downloaded stage data and performed quality assurance. Any data determined to be incorrect was removed and saved in another location.

Dates of ultrasonic down-looking sensor installation in Bells Mill, Cathedral Run and Wises Mill tributaries were May 2005, September 2005 and August 2005 respectively. Pressure transducers were installed in Monoshone in July 2005 and Bells Mill in November 2005. Stage recording devices were removed from these tributaries in May 2007.

Pressure transducers and staff gages are in the process of being installed in Gorgas Lane, Kitchens Lane, and Cresheim Creek. Stage will be recorded and downloaded in these tributaries following the same procedures employed for Bells Mill, Cathedral Run, Wises Mill, and Monoshone tributaries. Discharge rating curves were established in the Monoshone, Wises Mill and Bells Mill tributaries following a modified version of the USGS protocol (Buchanan and Somers 1969). Discharge was measured in a cross section close to the staff gage using a SonTek Flowtraker Handheld ADV and plotted against the stage it was recorded at. Due to lack of a suitable monitoring location, the discharge rating curve in Cathedral Run will be mathematically modeled instead of measured in the field.

In order to estimate suspended sediment loading, automated water collection devices (ISCO model no. 6712) were used to collect water samples during wet weather events in the Wissahickon Creek tributaries. In the attempt to characterize an entire storm event, automated samplers were triggered by a 0.2 ft elevation change in stream height and collected samples every 20 minutes for the first hour. Following this step, samples were then collected every 2-4 hours until discharge returned to base flow conditions. Suspended sediment loads were related to the discharge at which they were collected to create a suspended sediment rating curve. Four tributaries were selected based on visual inspection of obvious signs of erosion to estimate sediment loads and calibrate methods used in other tributaries. The location of installed samplers can be seen in Figure B.1.2-2.

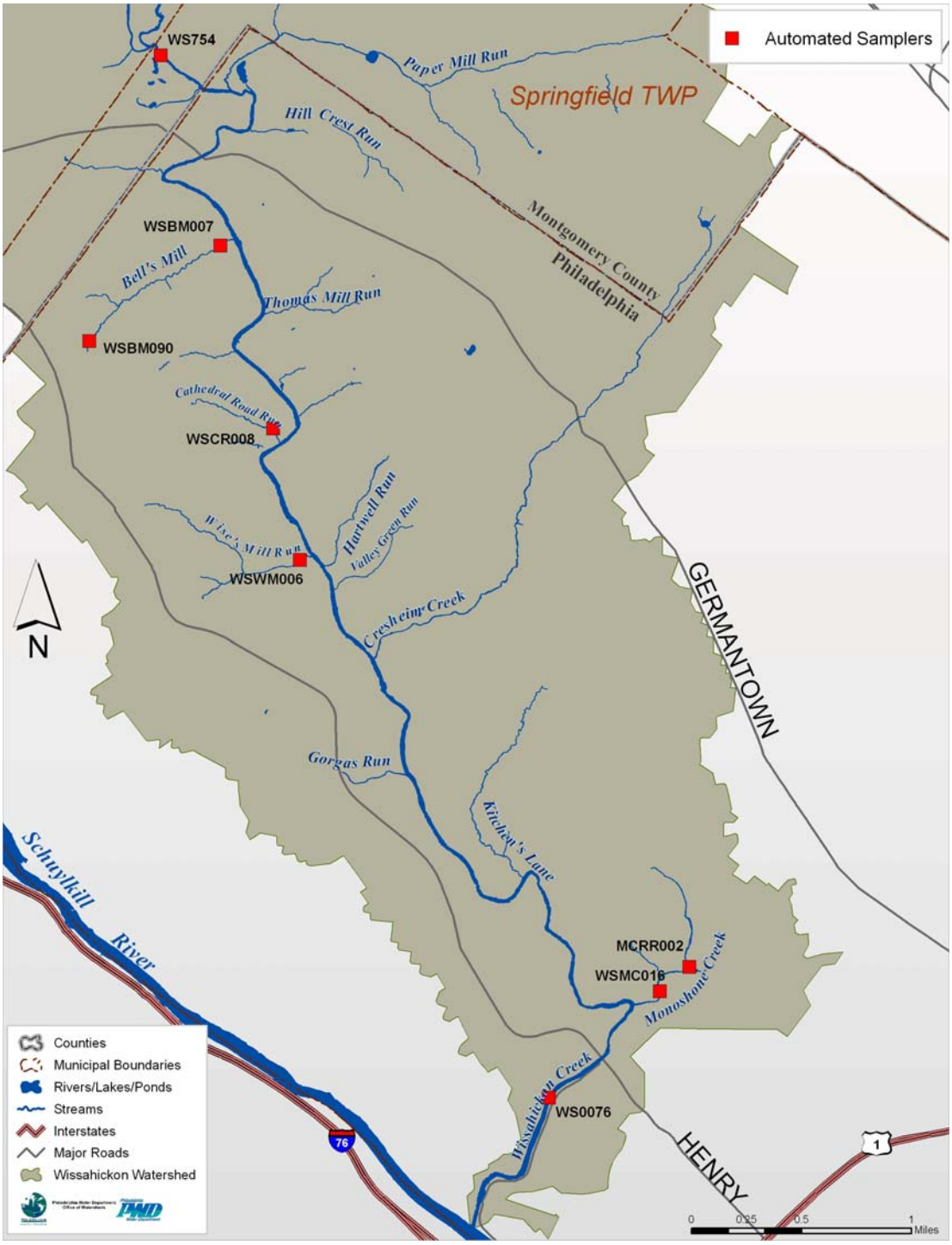

Figure B.1.2-2 Automatic Sampler Locations

B.2 Tributary Restoration Potential Ranking

Any stream channel and corridor restoration plan for the Wissahickon requires a ranking of tributaries. EVAMIX has been chosen to rank the restoration potential of tributaries and stream reaches. EVAMIX is a matrix-based, multi-criteria evaluation program that makes use of both quantitative and qualitative criteria within the same evaluation; regardless of the units of measure. The algorithm behind EVAMIX is unique in that it maintains the essential characteristics of quantitative and qualitative criteria, yet is designed to eventually combine the results into a single appraisal score. This critical feature gives the program much greater flexibility than most other matrix-based evaluation programs, and allows the evaluation team to make use of all data available to them in its original form.

Criteria chosen to evaluate restoration potential are summarized in Table B.2-1 and discussed in more detail below.

Table B.2-1 Ranking Criteria

Criterion	Unit	Need for Restoration				Potential for Restoration	
		Sediment Reduction	Habitat	Riparian	Infrastructure	Channel	Riparian
Estimated stream bank erosion load	lb/ft/yr	XX	X	N/A	N/A	N/A	N/A
Habitat index	% ref. cond.	N/A	XX	N/A	N/A	N/A	N/A
Benthic macroinvertebrate index	# species	N/A	XX	N/A	N/A	N/A	N/A
Construction difficulty and disturbance	TBD	N/A	N/A	X	N/A	XX	XX
Fairmount Park projects	Number	N/A	N/A	N/A	N/A	XX	XX
Identified sanitary sewer problems	Number	N/A	N/A	N/A	XX	N/A	N/A
XX - need or potential for restoration is highly related to the criterion X - need or potential for restoration is somewhat related to the criterion							

Ranking analyses were performed with several sets of criteria weights. One set of weights for the restoration project is shown in Table . The results obtained with that weight set are presented in Table B.2-3. Also shown in Table B.2-3 is the sum of all the reach lengths for each category identified as low, medium, and high priority within each

tributary. The tributary restoration ranking is graphically represented in Figure B.2-1, and reach restoration ranking is graphically represented in Figure B.2-2.

Table B.2-2 Criteria Weights

Criteria	Weight 0<wt<1
Estimated stream bank erosion load	0.300
Habitat index	0.100
Benthic macroinvertebrate index	0.100
Fairmount Park projects	0.100
Identified sanitary sewer problems	0.100
Construction difficulty/disturbance index	0.300

Table B.2-3 Tributary Ranking Results

Tributary	Ranking	Mean Rank	Total Reach Length (ft)		
			Low	Medium	High
Wise's Mill	High	1		1507	4051
Cathedral Road Run	High	2.5			2771
Cresheim Creek	High	2.5	7192	5383	2806
Monoshone Creek	High	4	1662	1573	1658
Kitchen's Lane	Medium	6	4720		2019
Gorgas Run	Medium	6.5			1750
Hill Crest Run	Medium	7		3816	
Bell's Mill	Low	8	2912	1846	
Thomas Mill Run	Low	8.5			2689
Valley Green Run	Low	9.5		2868	
Paper Mill Run	Low	11	5442		
Hartwell Run	Low	11.5	3423		

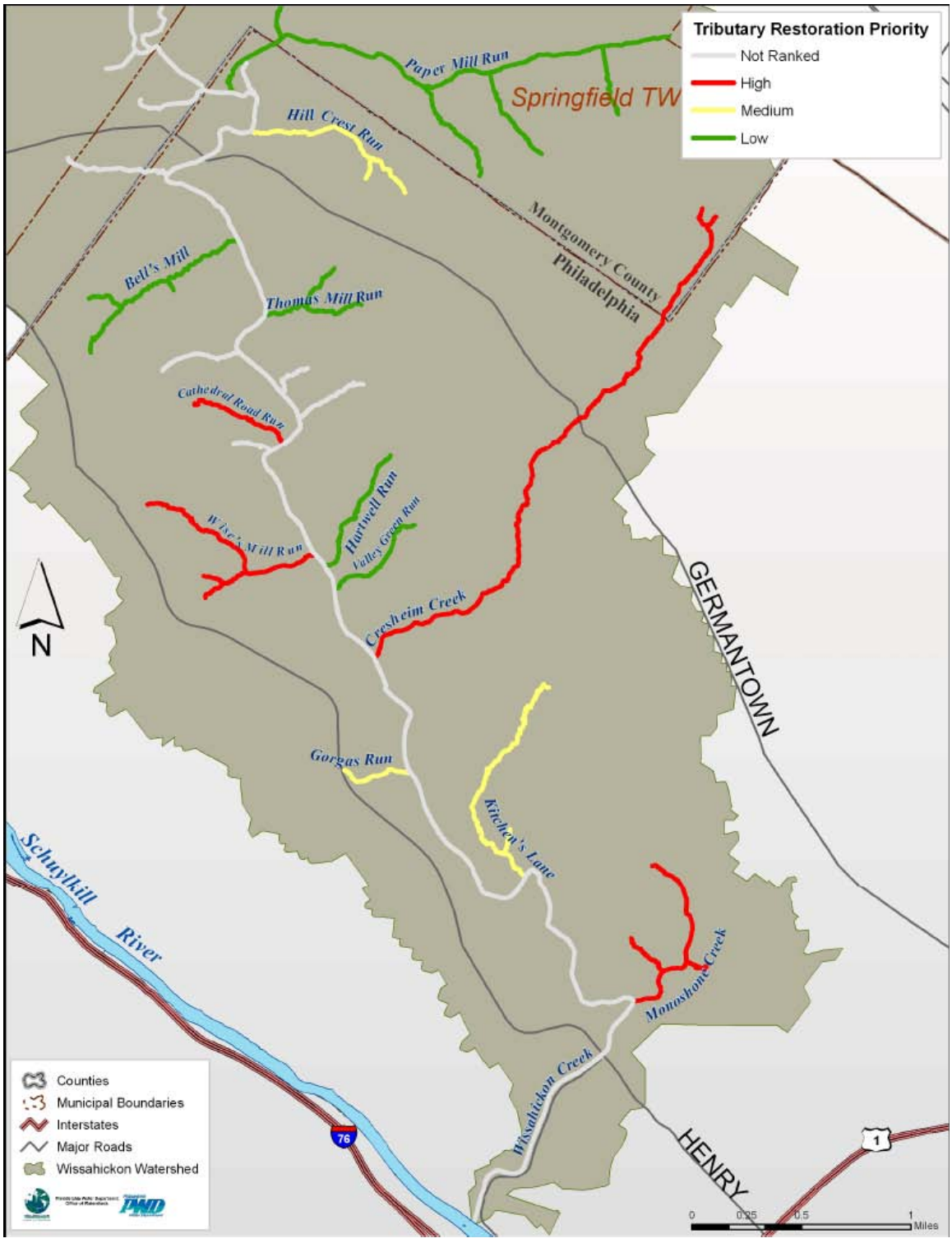

Figure B.2-1 Tributary Restoration Priority Ranking

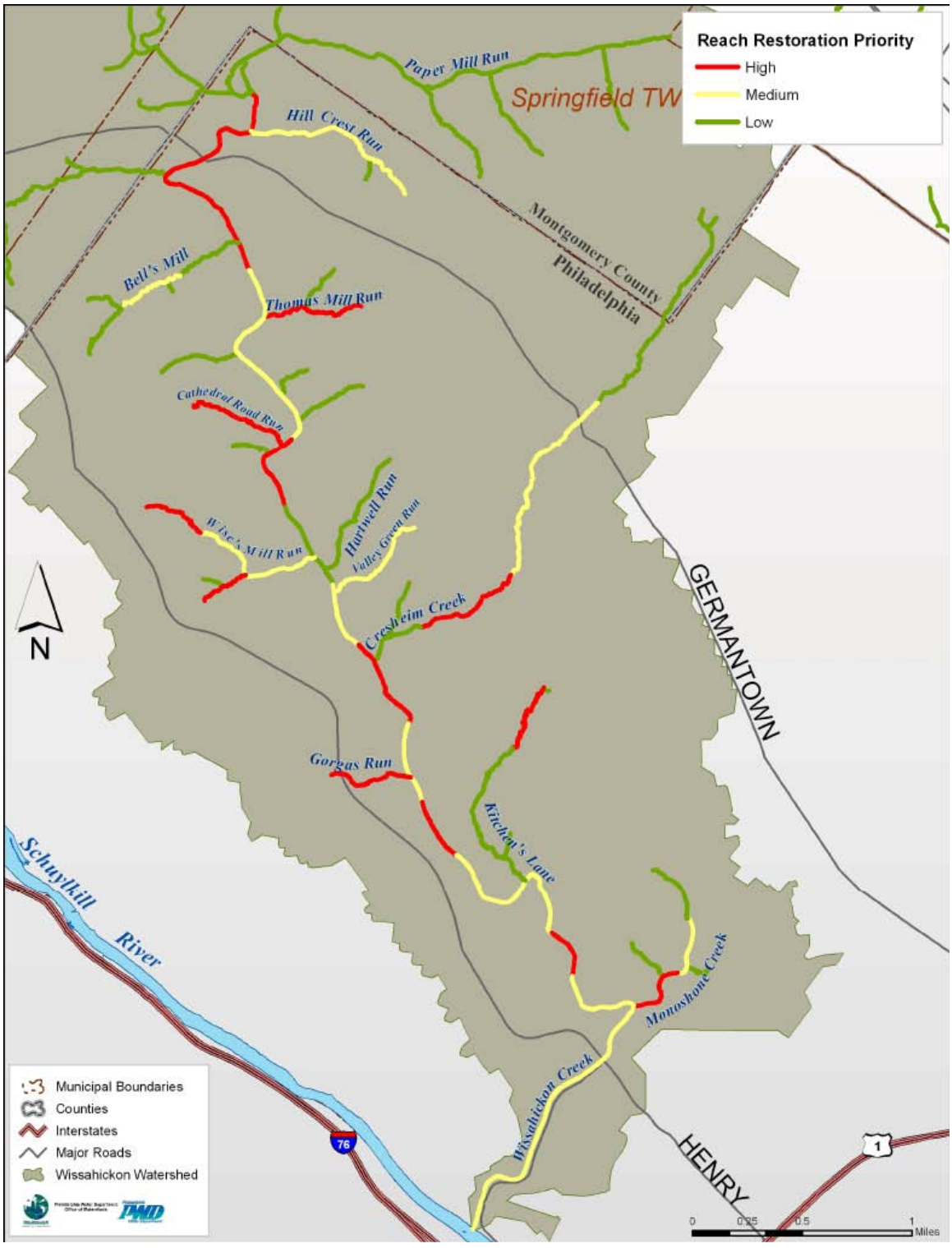

Figure B.2-2 Reach Restoration Priority Ranking

B.2.1 Sediment Loading and Erosion Results

- The estimates from the study are reasonable and accurate.
- The estimate of total sediment load in Philadelphia tributaries (4.42 million lb/yr) was approximately 3 times the load reported in the USEPA TMDL (1.5 million lb/yr) for tributaries plus Wissahickon main stem.
- PWD's SWMM model estimated overland flow load matches the TMDL model estimated load quite closely.
- PWD's estimated erosion load for just the tributaries is 23 times higher than the rate estimated in the TMDL for the tributaries plus main stem.
- PWD's estimated erosion rate is estimated using bank pin extrapolation and Rosgen based erosion rate estimates, and "reality checked" against the total mass eroded over the past century. All the numbers are consistent.
- PWD's assessed rate of erosion would result in the down-cutting of the streams from their natural state to today's condition in 155 years, a very plausible length of time and independent confirmation of our estimated erosion rate. EPA's erosion rate would take 3,500 years to create today's stream profile.
- PWD's results suggest that the load is comprised of approximately 83% stream bank erosion and 17% overland runoff load. The TMDL indicates that the load is approximately 10% stream bank erosion and 90% overland runoff.
- PWD's estimate of stream bank erosion indicates that approximately 55% (2.4 million lb/yr) is generated by the high-erosion areas (17% of total tributary length), while 21% (0.9 million lb/yr) is generated by the low-erosion areas.
- While the load from stream bank erosion is larger and must be addressed, the load from overland flow is also significant. A mix of stream restoration and stormwater management practices will most likely be needed to address the problem.
- Restoring the high-erosion stream reaches (17% of tributary length) identified by the field team would address approximately 65% of the stream bank load. If the combination of stormwater management and restoration of these reaches is not sufficient to meet the reduction target, restoration of the lower-priority reaches may be necessary. It is expected that reducing sediment loads in these areas would be much less cost-effective.

Table B.2.1-1 Estimates of Existing Loads

System	TSS Stream bank Existing Load (lb/yr)	TSS Stream bank Existing Load (ton/sq. mi/yr)	Calculation Method
Philadelphia Tributaries Only	4,201,069	200	BEHI/NBS Analysis and Colorado Reference Stream
Philadelphia Tributaries Only	4,420,115	155	BEHI/NBS Analysis and Bank Pins
Philadelphia Tributaries and Main Stem	3,685,717	176	Flow-TSS Regression
Philadelphia Tributaries and Main Stem	1,413,863	67.4	EPA TMDL Existing Load

Table B.2.1-2 Estimates of Sediment Endpoints

Tributary	TSS Stream bank Load Endpoint (lb/yr)	TSS Stream bank Load Endpoint (ton/sq. mi/yr)	Calculation Method
Philadelphia Tributaries Only	1,520,951	73	BEHI/NBS Analysis and Colorado Reference Stream
Philadelphia Tributaries Only	1,522,860	34	BEHI/NBS Analysis and Bank Pins
Philadelphia Tributaries and Main Stem	115,091	5.5	EPA TMDL Endpoint
French Creek	7,570,800	54	French Creek Estimated Sediment Load (USGS, 1985)
Neshaminy Creek	32,831,254	54	Neshaminy Creek TMDL Endpoint
East Branch Perkiomen Creek (reference stream for Skippack TMDL)	28,148,642	356	Skippack Creek TMDL Endpoint

B.2.2 Future Sampling

In efforts to comply with the Wissahickon Creek Sediment TMDL and the continuing goal of reducing sediment load from tributaries within City boundaries, PWD has developed a five-year strategy (Table B.2.2-1).

Table B.2.2-1 Time Line Strategy for Monitoring Components of the Wissahickon TMDL.

Monitoring Program	2005				2006				2007				2008				2009				2010			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Tributary Prioritization																								
BEHI/NBS Studies																								
Bank Profile Measurements																								
Stream Modelling																								
Flow Monitoring																								
Discharge Rating Curve																								
Continuous Stage Recording																								
Sediment Transport Rates																								
TSS Rating Curve																								
Bedload Sediment Rating Curve																								
BMP Monitoring																								
Post Construction TSS Monitoring																								
Post Construction Bank Profile Measurements																								
Post Construction Stream Modelling																								

B.2.2.1 Continued Bank Pin Program

PWD established 82 bank pin sites throughout 12 Wissahickon Creek tributaries within Philadelphia County. The main objective of the bank pin program is to quantify the load of sediment originating from streambank erosion within the Wissahickon tributary system. Another objective of the bank pin program is to define a local relationship between measured stream bank erosion and qualitative stream bank erosion (using Rosgen's BEHI/NBS method). PWD established bank pin sites in areas that were assessed to have a range of BEHI/NBS scores in order to better estimate the true standard deviations and arrive at a relationship between the empirical bank pin data and the visual assessment.

Bank profiles at bank pin sites will be measured quarterly so that the effect of seasonality on erosion rates can be documented in addition to calculating yearly erosion rates and sediment loads. Erosion rates and sediment loads are calculated from the bank profile measurements following the protocol outlined in FY 2006 Stormwater Annual Report, Appendix A.

Continuous Stage Data

Discharge characterization on the thirteen tributaries within Philadelphia County limits will be completed based on the aforementioned prioritization ranking. Stage data will

be recorded at designated monitoring sites using a fixed Sigma ultrasonic sensor and/or pressure transducer. Stage data will be downloaded bimonthly and QA/QC will be performed by PWD staff. Over a years worth of stage data has been collected from Bells Mill, Cathedral Run, Wises Mill, and Monoshone. Currently, stage data is being collected from Gorgas Lane, Kitchens Lane, and Cresheim Creek.

Stage Discharge Rating Curve

Stage-discharge rating curves for Bells Mill, Monoshone, and Wises Mill were completed following a modified version of the USGS protocol (Buchanan and Somers 1969). Future stage-discharge rating curves will be modeled using data collected at designated monitoring sites. The cross section and slope will be used to estimate discharge at various stages and a relationship between the two variables will be established.

Sediment Discharge Rating Curve

Automated water collection devices (ISCO model no. 6712) have been used to collect water samples during wet weather events in all of the Wissahickon Creek tributaries within Philadelphia County. In the attempt to characterize an entire storm event, automated samplers were triggered by a 0.2 ft elevation change in stream height and collected samples every 20 minutes for the first hour. Following this step, samples were collected every 2-4 hours until discharge returned to base flow conditions. Suspended sediment loads will be related to the discharge at which they were collected to create a suspended sediment rating curve.

Post Construction Monitoring

The final objective of the TMDL monitoring program is to measure (i.e., quantify) the efficacy of Best Management Practices (BMPs) and their benefit in terms of sediment reduction in the Wissahickon drainage. To meet this objective PWD will compare the results of wet weather monitoring from pre-BMP and post-BMP implementation. In this manner the total suspended sediment load reduction can be estimated.

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Section C
Pollutant Minimization Plan (PMP) for Polychlorinated Biphenyls (PCBs) in the City's Municipal Separate Storm Sewer System (MS4)

The City has polychlorinated biphenyl (PCB) Pollutant Minimization Plans in effect under each of the three Water Pollution Control Plants individual NPDES permits which set forth a more stringent plan than is requested within the City's MS4 NPDES Permit. For additional information on the City's PCB PMP, see the City's NPDES permits for each of its three wastewater treatment plants:

NEWPCP	PA0026689
SEWPCP	PA0026662
SWWPCP	PA0026671

C.1 City PMP Contact Information

Keith Houck, Manager
(215) 685 - 4910
Industrial Waste Unit
Aramark Tower, 3rd Floor
1101 Market Street
Philadelphia, PA 19107

C.2 City of Philadelphia MS4 Service Area

A table and maps for the MS4 service area referencing known locations where PCB material, equipment, processes, soil area, or facilities are or have been located can be found in FY 2006 Stormwater Annual Report Appendix B.

C.3 PCB Locations

Within the City's MS4 service area, there are no known materials, equipment, processes, soil areas or facilities that are known to be releasing, directly or indirectly. To that effect, there are also no known PCB sources within its MS4 system that the City believes may require some degree of control to reduce its discharge. However the City has compiled a list of known locations where PCB material, equipment, processes, soil area, or facilities are or have been located. This list has been compiled from 2 lists discussed below:

Description of "Devices" List

This list is a compilation of information obtained from USEPA, PADEP, DRBC, Partnership for the Delaware Estuary, the Philadelphia Fire Department, the Philadelphia Department of Public Health and PECO, along with PWD's inventory of PCB-containing equipment. The sites listed are those within PWD's MS4 service area and at which PCB-containing devices may exist. In accordance with PWD's PCB Pollutant Minimization Plan (PCB PMP) which was submitted to DRBC on September 30, 2005, PWD's Industrial Waste Unit (IWU) will visit the listed sites over a five-year period to determine the status of each site's PCB-containing devices. IWU will characterize that status using a list of forty (40) descriptors to determine the site's potential as a possible source of PCBs. Appropriate corrective steps will be taken for any site found to be releasing or having the potential to release PCBs.

Description of "Health Dept." List

This list contains sites at which the Philadelphia Department of Public Health has some record of a past PCB release. In accordance with PWD's PCB PMP mentioned above, IWU will visit the listed sites over a two-year period to determine the status of each and will recommend additional risk reduction measures where appropriate.

During FY 2007, PWD inspected and investigated 28 of the 64 facilities included in the FY 2006 Annual Report. A discussion of the results of each of these inspections is provided in the PWD PCB PMP, located in Appendix A.

C.4 In-Stream PCB Sampling

At this time, PWD is awaiting input from the Department and the DRBC with respect to the locations of the in-stream PCB sampling. The City wishes that this round of sampling supports the existing PCB TMDL for the Delaware Estuary. As the results of this data become available, the City looks forward to sharing this data with the Department. In addition, any actions taken in the furtherance of the PMP will also be reported accordingly.

C.5 Delaware River Basin Commission (DRBC) Cooperation

As the City moves forward in implementing its PCB PMP, it looks forward to continuing to enlist the cooperation of stakeholders throughout the Delaware Estuary in developing a template for other MS4 systems. PWD's PCB PMP was also submitted to the DRBC on September 30, 2005.

Section D
Source Identification

Presented is a description of the City of Philadelphia municipal separate storm sewer system (MS4) including the sewershed, combined sewer system sewershed, non-contributing areas, and watershed boundaries. The following tables presents a summary of the Philadelphia infrastructure and MS4 system, including; stormwater outfalls (434 total), lengths of sanitary sewer, and lengths of stormwater sewer within Philadelphia and contributing neighboring townships. These areas are depicted in Figure D-1 on the following page.

Table D-1 Infrastructure Area of Philadelphia and Neighboring Contributors

Watershed	Square Miles of Philadelphia and Contributing Area Infrastructure				
	MS4 Area	Combined Area	Un-Sewered Area	Stormwater Area	Non-Contributing Area
Darby-Cobbs	86.0	4.4	0	0	1.4
Delaware Direct	39.9	22.0	0	0.4	0.1
Pennypack	21.7	0.6	0	0.2	4.9
Poquessing	28.5	0	0	0	4.0
Schuylkill	15.3	17.3	0	1.5	11.1
Tacony	1.6	19.7	0	0	1.4
Wissahickon	14.0	0.0	1.1	0	2.9
Total	**207.0**	**64.0**	**1.1**	**2.1**	**25.8**

Table D-2 Description of MS4 Infrastructure

Watershed	Miles of Pipe			MS4 Outfalls	
	Stormwater	Sanitary	Total MS4	PWD Owned	Other
Darby-Cobbs	0	9.0	9.0	3	0
Delaware Direct	28.6	56.5	85.1	17	0
Pennypack	1.5	234.2	235.7	129	3
Poquessing	0.0	143.9	143.9	145	1
Schuylkill	23.7	130.6	154.3	42	0
Tacony	0.4	58.8	59.2	32	1
Wissahickon	0	91.2	91.2	64	0
Total	**54.1**	**724.1**	**778.2**	**429**	**5**

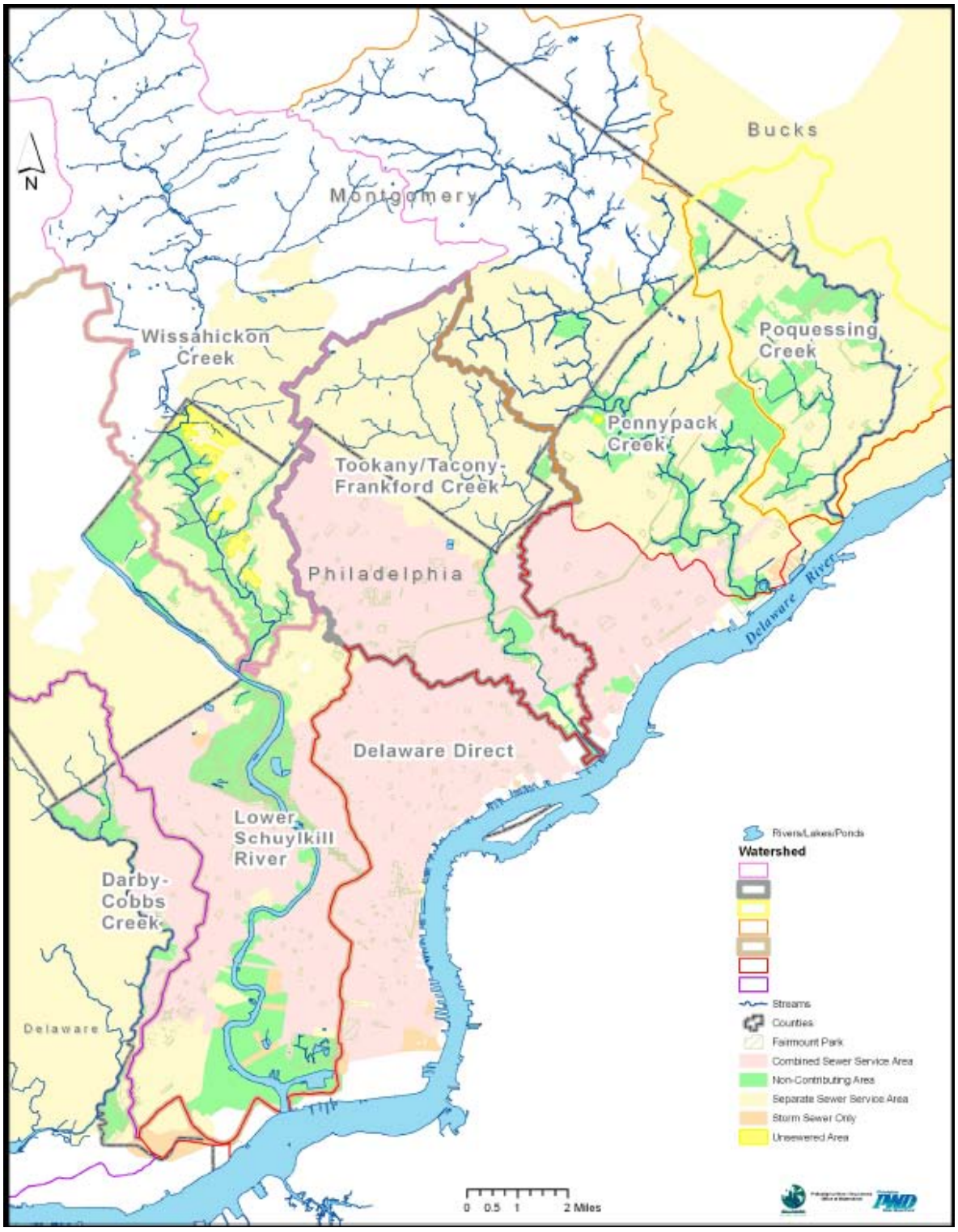

Figure D-1 Philadelphia Infrastructure System Areas

Table D-3 GIS Data Layers and Filenames Submitted on Data CD

GIS Data Layers and Filename	
FY 2007 E&S Inspection Locations	Philadelphia Area Land Use
FY 2007 PADEP Coordinated Reviews	Philadelphia Major Watersheds
FY 2007 Permitted Industries	Philadelphia Population 2000 Census
FY 2007 Plan Review Locations	Philadelphia Sewersheds
FY 2007 Stormwater Permit Tracking	Poquessing Watershed
Known Historical PCB Locations	PWD Monitoring Locations
Pennypack Watershed	Wissahickon Hydrology Polygon
Philadelphia Area Hydrology Polygon	Wissahickon Hydrology Polyline
Philadelphia Area Hydrology Polyline	Wissahickon Watershed
Philadelphia Detention Basins	

PWD has included the GIS layers referenced above on the accompanying CD to this report in response to the requirements of the Permit.

FY 2007E&S Inspection Locations
This layer presents the locations of erosion and sedimentation inspections carried out at construction sites within Philadelphia in FY 2007. The contents of this layer are discussed in Section H.

FY 2007 PADEP Coordinated Reviews
This layer presents the locations of new plan reviews coordinated with PADEP and PWD. The contents of this layer are discussed in Section H.

FY 2007 Permitted Industries
This layer presents the location of significant industrial users that possess a permit allowing discharge into the stormwater sewer system.

FY 2007 Plan Review Locations
This layer presents the locations of new plan reviews conducted by PWD during FY 2007. The contents of this layer are discussed in Section H.

FY 2007 Stormwater Permit Tracking
This layer presents the locations of all new applicants for stormwater permits within Philadelphia County.

Known Historical PCB Locations
This layer presents the location of all known and historical polychlorinated biphenyl (PCB) locations within Philadelphia.

Pennypack Watershed
This layer presents the delineation of the Pennypack Creek watershed that drains parts of Montgomery, Bucks, and Philadelphia Counties.

Philadelphia Area Hydrology Polygon
This layer presents the boundaries of Philadelphia County hydrology in a polygon based shapefile.

Philadelphia Area Hydrology Polyline
This layer presents the boundaries of Philadelphia County hydrology in a polyline based shapefile.

Philadelphia Detention Basins
This layer presents the location of all stormwater detention basins within Philadelphia County.

Philadelphia Area Land Use
This layer presents land use within Philadelphia, Bucks, Chester, Delaware, and Montgomery Counties. The source of this data is the Delaware Valley Regional Planning Commission. Metadata contained within this file further explains the source and processing of this data.

Philadelphia Major Watersheds
This layer presents the delineation of the Philadelphia County portion of the Darby-Cobbs, Delaware-Direct, Pennypack, Poquessing, Schuylkill, Tacony-Frankford, and Wissahickon watersheds.

Philadelphia Population 2000 Census
This layer presents the results of the 2000 Census in Philadelphia County.

Philadelphia Sewersheds
This layer presents the boundaries of the MS4, combined sewer, un-sewered, non-contributing, and stormwater only areas within Philadelphia County and the neighboring contributing areas.

Poquessing Watershed
This layer presents the delineation of the Poquessing watershed that drains parts of Bucks, Montgomery, and Philadelphia Counties.

PWD Monitoring Locations
This layer presents the locations of the PWD's chemical, fish, macroinvertebrate, and algae sampling sites.

Wissahickon Hydrology Polygon
This layer presents the boundaries of Wissahickon watershed hydrology in a polygon based shapefile.

Wissahickon Hydrology Polyline
This layer presents the boundaries of Wissahickon watershed hydrology in a polyline based shapefile.

Wissahickon Watershed
This layer presents the delineation of the Wissahickon Creek watershed that drains parts of Montgomery and Philadelphia Counties.

Also included in the Data CD is a Geodatabase titled StormwaterDataConversion.mdb. This database is the PWD inventory of all assets and each layer has extensive metadata to explain the origin and contents of all data. The features most pertinent to this report include the outfalls, manholes, inlets, and various pipe layers.

Table D-4 GIS Stormwater Data Conversion Geodatabase Layers on Data CD

GIS Stormwater Data Conversion Geodatabase Layers	
DataConv_GISAD_stBasin	DataConv_GISAD_stInletPipe
DataConv_GISAD_stBoring	DataConv_GISAD_stMeterChamber
DataConv_GISAD_stCasin	DataConv_GISAD_stOffsetAccess
DataConv_GISAD_stChamber	DataConv_GISAD_stOpenChannel
DataConv_GISAD_stCulvert	DataConv_GISAD_StormNetwork_Junctions
DataConv_GISAD_stDisconnectedInlet	DataConv_GISAD_stOutfall
DataConv_GISAD_stFitting	DataConv_GISAD_stPointFeature
DataConv_GISAD_stFlare	DataConv_GISAD_stPump
DataConv_GISAD_stForceMain	DataConv_GISAD_stRainGauges
DataConv_GISAD_stGravityMain	DataConv_GISAD_stStructure
DataConv_GISAD_stHostPipe	DataConv_GISAD_stTunnel
DataConv_GISAD_stManhole	DataConv_GISAD_stVentPipe
DataConv_GISAD_stManholeOther	DataConv_GISAD_stVirtualLink
DataConv_GISAD_stInlet	DataConv_GISAD_stVirtualNode

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Section E
Discharge Management, Characterization, and Watershed-Based Assessment and Management Program

E.1 Step 1 – Preliminary Reconnaissance: Permit Issuance through end of Year 2

E.1.1 Comprehensive Watershed Monitoring Program

The City of Philadelphia recognizes the potential impacts of discharges from stormwater, CSO and other discharges and conditions that affect drinking water and other designated uses of our waterways.

Comprehensive assessment of our waterways is integral to planning for the long-term health and sustainability of our water systems. The Philadelphia Water Department (PWD) considers such assessments as essential to raising awareness in Southeastern Pennsylvania as to the impact that land development activities are having on waterbody health. By measuring all factors that contribute to supporting fishable, swimmable, and drinkable water uses, appropriate management strategies can be developed for each watershed land area that Philadelphia shares.

Specifically, biological monitoring is a useful means of detecting impacts to the aquatic ecosystems necessary for sustainable fisheries and other designated uses. Biological communities respond to wide variety of chemical, physical and biological factors in the environment and can reveal natural and anthropogenic stressors. In this respect, resident biota in a water body act as natural monitors of environmental quality and can reveal the effects of episodic and cumulative pollution and habitat alteration.

Bioassessments, however, must be integrated with appropriate chemical and physical measures, land use characterizations, and pollutant source information necessary to establish linkages between stressors and environmental quality. These linkages can then be used to create decision-making frameworks for selecting restoration techniques that are appropriately balanced between in-stream restoration, land-based management practices, and new water and sewer infrastructure

From 1999 to 2007, the PWD Office of Watersheds (OOW) has implemented a comprehensive watershed assessment strategy, integrating biological, chemical and physical assessments to provide both quantitative and qualitative information regarding the aquatic integrity of the Philadelphia regional watersheds. This information is being used to plan improvements to the watersheds in the Southeast Region of Pennsylvania.

E.1.2 Background

PWD has carried out extensive sampling and monitoring programs to characterize conditions in the seven watersheds (Figure E.1.2-1), both within the county boundaries and outside counties/municipalities. The program is designed to document the condition of aquatic resources and to provide information for the planning process needed to meet regulatory requirements imposed by EPA and PADEP. The program includes hydrologic, water quality, biological, habitat, and fluvial geomorphological aspects. PWD is well suited to carry out the program because it merges the goals of the city's stormwater, combined sewer overflow, and sourcewater protection programs into a single unit dedicated to watershed-wide characterization and planning.

Under the provisions of the Clean Water Act, the National Pollution Discharge Elimination System (NPDES) requires permits for point sources that discharge to waters of the United States. In the six watersheds entering Philadelphia, stormwater outfalls and wet weather sewer overflow points discharging to surface waters are classified as point sources and are regulated by NPDES.

Regulation of stormwater outfalls under the NPDES program requires operators of medium and large municipal stormwater systems, MS4s, to obtain a permit for discharges and to develop a stormwater management plan to minimize pollution loads in runoff over the long term. Partially in administration of this program, PADEP assigns designated uses to water bodies in the state and performs ongoing assessments of the condition of the water bodies to determine whether the uses are met and to document any improvement or degradation. These assessments are performed primarily with biological indicators based on the USEPA's Rapid Bioassessment Protocols (RBPs) and physical habitat assessments.

PWD's Office of Watersheds is responsible for characterization and analysis of existing conditions in local watersheds to provide a basis for long-term watershed planning and management. The extensive sampling and monitoring program described in this section is designed to provide the data needed for the long-term planning process.

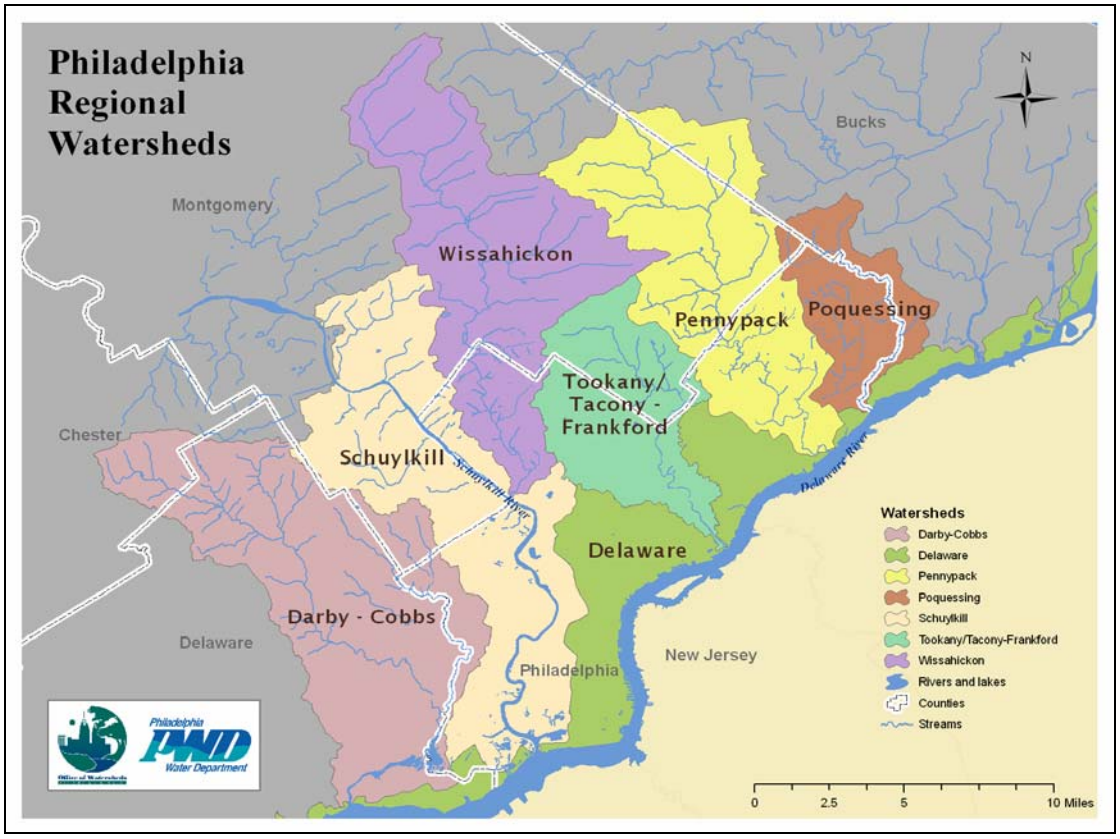


Figure E.1.2-1 Philadelphia Regional Watersheds

E.1.3 Water Quality Monitoring

E.1.3.1 Discrete Water Chemistry Assessment

During an assessment cycle, four water quality samples are manually collected during winter, spring and summer at designated locations in each watershed (n=12 sampling events at each location). Parameters are chosen because state water quality criteria apply to them or because they are known or suspected to be important in urban watersheds. The parameters sampled during each sampling event are listed in Table E.1.3-1. The sampling and analysis program meets AMSA *et al.* (2002) recommendations for the minimum criteria that should form the basis for impairment listings:

- Data collected during the previous five years may be considered to represent current conditions.

- At least ten temporally independent samples should be collected and analyzed for a given parameter.

- A two-year minimum data set is recommended to account for inter-year variation, and the sample set should be distributed over a minimum of two seasons to account for inter-seasonal variation.

- Samples collected fewer than four days apart at the same river location should be considered one sample event.

- Samples collected within 200 meters [about 0.1 miles] of each other will be considered the same station or location." This convention was followed except where two sampling sites were chosen to represent conditions upstream and downstream of a modification such as a dam.

E.1.3.2 Continuous Water Quality Assessment

In addition to discrete chemical sampling, PWD incorporates automated equipment at strategic locations within each watershed as part of the comprehensive monitoring strategy. During continuous sampling, data for selected parameters are collected at 15-minute increments by a submerged instrument (YSI Sonde 6600, 6600 EDS and 600 XLM) over deployments of approximately two weeks. Sondes are then replaced in order to produce seamless data for spatial and temporal analyses. All Sondes must pass an extensive QA/QC procedure prior to installation. Parameters measured include stream stage, dissolved oxygen, temperature, pH, conductivity and turbidity. Comprehensive Sonde deployments have occurred in the Darby-Cobbs, Tookany/Tacony-Frankford, and Wissahickon watersheds. Sondes have been deployed in the Pennypack Creek watershed and data collection is ongoing at the time of writing (Table E.1.3-2).

E.1.3.3 Wet Weather Chemical Monitoring

During runoff producing events, automated samplers (Isco, Inc. models 6712, 6700) are strategically placed in locations throughout the watershed and are used to collect samples during the rain event. The automated sampler system obviates the need for scientists to manually collect samples, thereby greatly increasing sampling efficiency. Automated samplers are programmed to commence sampling with a small (0.1ft.) increase in stage. Once sampling is initiated, a computer-controlled peristaltic pump and distribution system collects grab samples at 30 min. to 1 hr. intervals. The data allow characterization of water quality responses to stormwater runoff and wet weather sewer overflows. Chemical analytes processed during wet weather events are displayed in Table E.1.3-1.

Table E.1.3-1 Chemical Analytes Collected During Chemical Monitoring Programs

Master List	Units	Discrete	Wet Weather	Continuous	Special Projects
Alkalinity	mg/L as CaCO3	X	X		
Aluminum	mg/L	X	X		
Dissolved Aluminum	mg/L	X			
Ammonia	mg/L as N	X	X		
Arsenic	mg/L	X	X		
Dissolved Arsenic	mg/L	X			
BOD5	mg/L	X	X		
Cadmium	mg/L	X	X		
Dissolved Cadmium	ug/L	X			
Calcium	mg/L	X	X		
Total Chlorophyll	µg/L	X			
Chlorophyll a approx	mg/m²				X
Chlorophyll a approx	µg/L	X	X		
Chromium	mg/L	X	X		
Dissolved Chromium	mg/L	X			
Specific Conductance	µMHO/cm @ 25C	X	X	X	
Copper	mg/L	X	X		
Dissolved Copper	mg/L	X			
E. coli	CFU / 100 mL	X	X		X
Fecal Coliform	CFU / 100 mL	X	X		X
Fluoride	mg/L		X		X
Geosmin	ng/L				X
Hardness	mg/L	X	X		
Iron	mg/L	X	X		
Dissolved Iron	mg/L	X			
Lead	mg/L	X	X		
Dissolved Lead	mg/L	X			
Magnesium	mg/L	X	X		
Manganese	mg/L	X	X		
Dissolved Manganese	mg/L	X			
Methylisoborneol	ng/L				X
Nitrate	mg/L	X	X	X	
Nitrite	mg/L	X	X		
Orthophosphate	mg/L	X	X		
Dissolved Oxygen	mg/L	X	X	X	
pH	pHU	X	X	X	
Total Phosphorus	mg/L	X	X		
Sodium	mg/L	X	X		
Total Suspended Solids	mg/L	X	X		X
Total Solids	mg/L	X	X		
Temperature	deg C	X	X	X	
Total Kjeldahl Nitrogen	mg/L	X	X		
Turbidity	NTU	X	X	X	
Zinc	mg/L	X	X		
Zinc (Dissolved)	mg/L	X			

E.1.3.3 Biological Monitoring

PWD continues to integrate biological assessments into the monitoring program as a means of identifying potential physical impairments or chemical stressors. In addition, biological indices produced from the various monitoring strategies serve as a baseline for future restoration projects. The biological monitoring protocols employed by PWD are in accordance with methods developed by the United States Environmental Protection Agency (EPA) and the PADEP. These procedures are as follows:

- Rapid Bioassessment Protocol III (Benthic Macroinvertebrate Sampling)
- Rapid Bioassessment Protocol V (Fish Sampling)
- Periphyton Assessment (Algae Monitoring)

E.1.3.4 Physical Monitoring

E.1.3.4.1 Habitat Assessments

Habitat assessments are conducted at each monitoring site based on the EPA's *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers* (Barbour *et al*., 1999). Reference conditions are used to normalize the assessment to the "best attainable" situation. Habitat parameters are separated into three principal categories: (1) primary, (2) secondary, and (3) tertiary parameters:

- Primary parameters are those that characterize the stream "microscale" habitat and have greatest direct influence on the structure of indigenous communities.
- Secondary parameters measure "macroscale" habitat such as channel morphology characteristics.
- Tertiary parameters evaluate riparian and bank structure and comprise three categories: (1) bank vegetative protection, (2) grazing or other disruptive pressure, and (3) riparian vegetative zone width.

E.1.3.4.2 Habitat Suitability Index (HSI) Modeling

In addition to habitat assessments, Habitat Suitability Index (HSI) models, developed by the U.S. Fish and Wildlife Service (USFWS), have been incorporated into the monitoring program. Based on empirical data and supported by years of research and comprehensive review of scientific literature, these models present numerical relationships between various habitat parameters and biological resources, particularly game-fish species and species of special environmental concern. To date, HSI indices have been created for the Darby-Cobbs, Tookany/Tacony-Frankford, and Wissahickon Creeks.

E.1.3.4.3 Fluvial Geomorphologic (FGM) Analysis

To date, FGM analysis has been conducted on the Darby-Cobbs, Tookany/Tacony-Frankford Wissahickon, Pennypack and Poquessing-Byberry Creeks. Analysis was conducted in order to characterize channel morphology, disturbance, stability, and habitat parameters as well as to provide a template for hydrologic and hydraulic modeling and serve as a baseline for assessing channel bank and bed changes. Data provided from the FGM analyses will also serve to develop reach rankings within each watershed in order to prioritize restoration strategies. For a detailed description of the FGM standard operating procedures, refer to http://www.phillyriverinfo.org/.

E.1.3.5 Summary of Monitoring Locations

Biological, physical and chemical monitoring locations are based on 3 criteria: 1) appropriate habitat heterogeneity; 2) accessibility; and 3) proximity to PADEP 305b monitoring sites. In general, the number of monitoring sites is proportional to the size of the drainage and the watershed's link magnitude (*i.e.*, number of 1st order streams).

A river mile-based naming convention has been created for sampling and monitoring sites in the regional watersheds. The naming convention includes two to four letters and three or more numbers which denote the watershed, stream, and distance from the mouth of the stream. For example, site TF280 is located as follows:

- "TF" stands for the Tacony-Frankford watershed.
- "280" places the site 2.80 miles upstream of the mouth of Frankford Creek, where it flows into the Delaware River.

Table E.1.3-2 explains the current number of assessment sites in each watershed relative to the various monitoring programs. In addition, Appendix B Monitoring Locations displays the locations and types of monitoring procedures that have been conducted at each assessment site.

Table E.1.3-2 Number of Monitoring Locations Relative to the Monitoring Program

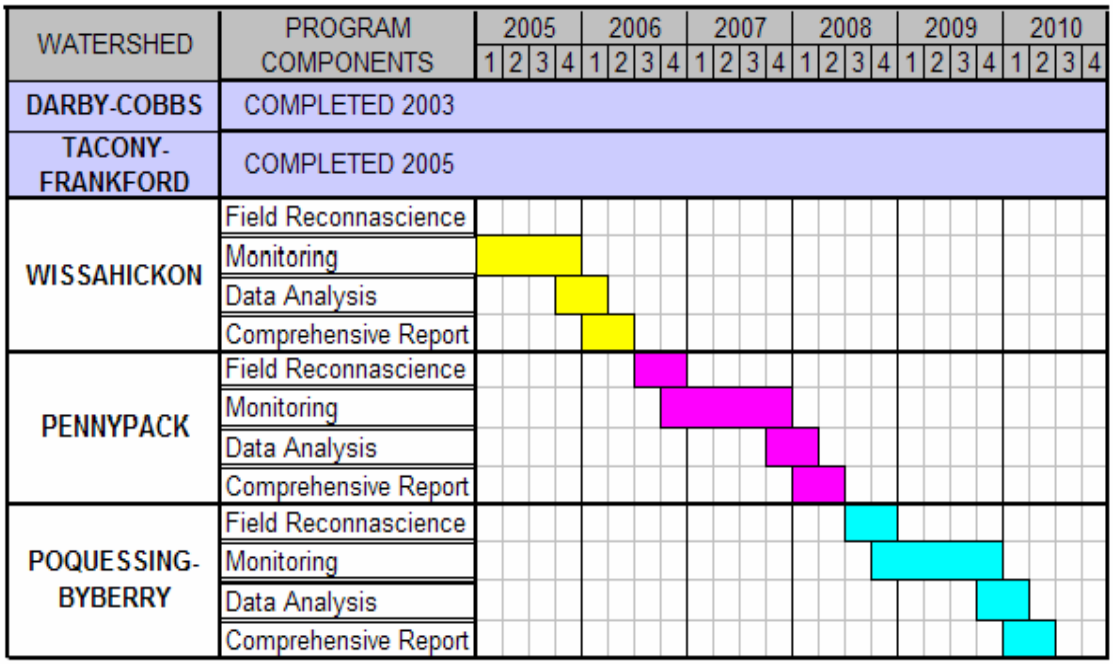
Watershed	Monitoring Program								
	Biological			Chemical			Physical		
	RBP III	*RBP V*	*Algae*	*Discrete*	*Continuous*	*Wet Weather*	*Habitat*	*HSI Index*	*FGM*
Tacony-Frankford	12	7	4	9	8	6	12	7	102
Wissahickon	32	10	5	10	6	8	32	10	230
Pennypack	24	11	4	13	4	4	24	6	130
Poquessing	13	7	NC	7	NC	NC	13	NC	160
Tidal Schuylkill	NA	4	NC	4	2	2	NC	NC	NC

NC Not Completed
NA Not Applicable

E.1.3.6 Monitoring Time Line Strategy

Prior to the creation of a comprehensive monitoring strategy, baseline assessments were conducted in all of the Philadelphia regional watersheds (Figure E.1.2-1) to ascertain the degree, location and type of impairments occurring within each system. Typically, baseline assessments, encompassing benthic, fish, habitat and discrete water quality monitoring, were routinely completed on a watershed within one year. With the addition of continuous and wet-weather water quality monitoring, periphyton assessments, and specialized physical assessment programs (e.g., FGM assessments), comprehensive characterization reports are now accomplished on a two-year timeline. Table E.1.3-3 depicts the proposed watershed monitoring strategy for 2005-2010.

Table E.1.3-3 Proposed Watershed Monitoring Timeline 2005-2010



E.1.3.7 Goals and Measures of Success

The proposed watershed monitoring strategy is an integrated approach which will improve the evaluations of non-point source pollution controls and the combined effectiveness of current point and non-point source controls. Similarly, biological attributes can be used to measure site-specific ecosystem responses to remediation or mitigations directed at reducing non-point source pollution impacts. Through the monitoring programs described in this permit cycle, PWD will be able to measure the relative success of remediation and restoration programs occurring within the Philadelphia regional watersheds. As a major stakeholder in the watersheds, PWD will also be able to provide insight and direction for smaller communities within the watersheds and parties involved in the watershed approach.

E.1.3.8 Reporting

Based on the monitoring time line strategy (Section E.1.3.6), PWD is in the process of completing all required preliminary and comprehensive assessments in the Pennypack Creek Watershed during this permit year. In addition, The Wissahickon Creek Watershed Comprehensive Characterization Report (WCWCCR) detailing the biological, chemical and physical attributes of the Wissahickon Creek Watershed has been completed (Section E.1.5.1). Reporting timelines for the Pennypack and Poquessing-Byberry watersheds are displayed above in Table E.1.3-3.

E.1.4 Land Use and Resource Mapping

The City has conducted extensive mapping of information relevant to stormwater management planning. Previously discussed in Section D of this document, the GIS files include MS4 outfalls and contributing drainage areas, land use, population, monitoring locations, and other relevant layers. The maps and supporting GIS layers are included in the accompanying CD. These figures are also presented in FY 2006 Stormwater Annual Report Appendix C – Land Use and Resource Mapping, separated by watershed.

E.1.5 Preliminary Problem Assessment

E.1.5.1 Wissahickon Creek Watershed

A Comprehensive Characterization Report was completed for the Wissahickon Creek Watershed in February 2007 which included analysis of data collected over the 2005-2006 monitoring period and presented a characterization of problems within this watershed area. The comprehensive characterization report is currently available to the public through the internet at the following address: www.PhillyRiverInfo.org.

E.1.5.2 Pennypack Creek Watershed

As discussed throughout Section E.2, PWD will complete a comprehensive characterization report of the Pennypack Creek Watershed in October 2008. This report will serve as the technical framework for the Pennypack Creek Integrated Watershed Management Plan (PCIWMP) to be completed in 2009. The technical report will also provide state and federal agencies and local officials with a succinct problem statement, outlining the biological, physical and chemical integrity of the system and the potential sources of impairment. The comprehensive characterization report will be disseminated to the public through the internet at the following address: www.PhillyRiverInfo.org.

E.1.5.3 Poquessing Creek Watershed

A comprehensive characterization report for the Poquessing-Byberry Creek Watershed including problem statements will be completed in 2010.

E.1.6 Inventory of Point and Non-Point Sources

There are no new point and non-point sources to be included in the FY 2007 Stormwater Annual Report that were not presented in the FY 2006 Stormwater Annual Report. For a complete listing of all NPDES permitted dischargers in Philadelphia please refer to pages 29-35 of the FY 2006 Stormwater Annual Report.

The City is also actively involved in developing annual and seasonal estimates of non-point source pollutants. As the results of this analysis become available, they will be included in subsequent annual reports.

E.2 Step 2 – Watershed Plan Development: Permit Issuance through End of Year 5

PWD's Integrated Watershed Management Planning (IWMP) process is based on a carefully developed approach to meeting the challenges of watershed management in an "urban" setting. An IWMP is a long-term road map designed to achieve the twin goals of a healthy community and healthy natural resources. An integrated plan embraces the laws designed to save our streams, preserve the streams' ecology, and enhance the parkland and riparian buffers that shelter these streams. The planning process also involves incorporation of the best of municipal and conservation planning efforts, which strive to ensure that growth within the targeted watershed occurs with particular attention to the impacts on the environment.

IWMPs focus on attaining priority environmental goals in a phased approach, making use of the consolidated goals of the numerous existing programs that directly or indirectly require watershed planning. They are built upon the solid, scientific foundation composed of water quality monitoring (wet and dry weather), macroinvertebrate and fish bio-assessments, physical stream surveys (FGM) and computer simulated modeling programs for stormwater flows and pollutant loading described herein.

E.2.1 Monitoring and Sampling

In February 2007 the WCWCCR was completed and can be found at www.PhillyRiverInfo.org . With the completion of the WCWCCR, the current activities of the PWD center on monitoring and sampling the Pennypack Creek watershed in preparation for a comprehensive baseline characterization. To meet the regulatory requirements and long-term goals of its stormwater, and drinking water source protection programs, PWD has embraced a comprehensive watershed characterization, planning, and management program for the Pennypack Creek Watershed. Watershed management fosters the coordinated implementation of programs to control sources of pollution, reduce polluted runoff, and promote managed growth in the city and surrounding areas, while protecting the region's drinking water supplies, fishing and other recreational activities, and preserving sensitive natural resources such as parks and streams. PWD has helped form watershed partnerships with surrounding urban and suburban communities to explore regional cooperation based on an understanding of the impact of land use and human activities on water quality.

Coordination of these different programs has been greatly facilitated by PWD's creation of the Office of Watersheds (OOW), which is composed of staff from the PWD's planning and research, CSO, collector systems, laboratory services, and other key functional groups. One of OOW's responsibilities is to characterize existing conditions in local watersheds to provide a basis for long-term watershed planning and

management. The focus of OOW during FY 2007 and FY 2008 is the Pennypack Creek watershed.

OOW is developing a series of watershed management programs for each of the City's watersheds. Cobbs Creek was the first watershed for which an IWMP was completed; the Tookany/Tacony-Frankford Watershed Partnership was second to complete a plan. The WCWCCR, completed in February 2007, was third in this series of technical documents. PWD has designed these reports to complement IWMPs by characterizing a watershed's land use, geology, soils, topography, demographics, meteorology, hydrology, water quality, ecology, fluvial geomorphology, and pollutant loads. These reports are intended as a single compilation of background and technical documents that can be periodically updated as additional field work or data analyses are completed. PWD is presently in the first year (monitoring and data analysis phase) of The PCWCCR.

E.2.1.1 Water Quality Sampling and Monitoring

In order to comply with the State-regulated stormwater permit obligations, water quality sampling was conducted throughout 2006 and 2007 in both Wissahickon Creek Watershed and Pennypack Creek Watershed. A watershed-wide comprehensive water quality characterization program was implemented in Pennypack Creek Watershed, while wet weather water quality sampling continued in Wissahickon Creek Watershed. The sampling and monitoring sites are presented in Appendix B Monitoring Locations. A list of the parameters sampled during the discrete, continuous, and wet weather sampling can be found in Table E.1.3-1. Three types of sampling were performed as discussed below. Parameters were chosen based on state water quality criteria or because they are known or suspected to be important in urban watersheds.

E.2.1.1.1 Discrete Interval Sampling

PWD staff collected surface water grab samples at thirteen (n=13) locations within Pennypack Creek Watershed for chemical and microbial analysis (Appendix B). Each site along the stream was sampled once during the course of a few hours, to allow for travel time and sample processing/preservation. The purpose of discrete sampling is initial characterization of water quality under both dry and wet conditions and identification of parameters of possible concern.

Sampling events were planned to occur at each site at weekly intervals for one month during three separate seasons. Actual sampling dates were as follows: "winter" samples collected 1/17/07, 1/24/07, 1/31/07, 2/7/07; "spring" samples collected 4/25/07, 5/2/07, 5/9/07, 5/16/07; "summer" samples collected 8/1/07, 8/8/07, 8/15/07, 8/22/07. A total of 156 discrete samples, comprising 6240 chemical and microbial analytes, were collected and recorded during the 2007 assessment of Pennypack Creek Watershed. To add statistical power, additional discrete water quality samples from

PWD's wet-weather chemical sampling program were included in analyses when appropriate. Discrete sampling was conducted on a weekly basis and was not specifically designed to target wet or dry weather flow conditions.

E.2.1.1.2 Continuous Monitoring

Physicochemical properties of surface waters are known to change over a variety of temporal scales, with broad implications for aquatic life. Several important, state-regulated parameters (e.g., dissolved oxygen, temperature, and pH) may change considerably over a short time interval, and therefore cannot be measured reliably or efficiently with grab samples. Self-contained data logging continuous water quality monitoring Sondes (YSI Inc. Models 6600, 600XLM) were deployed beginning 5/22/07 at four (n=4) sites within Pennypack Creek Watershed in order to collect DO, pH, temperature, conductivity and depth data. Sondes are typically maintained until the month of December or when freezing temperatures are expected.

E.2.1.1.3 Wet Weather Event Sampling

Automated samplers (Isco, Inc.) were used to collect samples from 4 mainstem sites in Pennypack Creek Watershed during runoff producing rain events in 2007. Samples were collected from 4 mainstem locations during wet weather events that took place 5/9/07, 8/9/07. Two more wet weather sampling events are planned for fall 2007. Additional samples were collected from several tributary streams within the Wissahickon Creek Watershed. Wet weather data collection in tributary sites is on-going, along with the streambank erosion component of PWD's sediment source assessment (Section B). The data will allow characterization of water quality responses to stormwater runoff.

Automated samplers are equipped with vented in-stream pressure transducers that allowed sampling to commence beginning with an increase in stage. Once sampling was initiated, a computer-controlled peristaltic pump and distribution system collected the first 4 grab samples at 40 minute intervals and the remaining samples at 1 hr. intervals.

E.2.1.2 Biological Assessments

E.2.1.2.1 Benthic Macroinvertebrate Assessments

During March 2007, PWD conducted Rapid Bioassessment Protocols (RBP III) at twenty four (n=24) locations within Pennypack Creek Watershed (Appendix B). Surveys were conducted at 13 mainstem locations and 11 tributary locations. Six of the 11 tributary sites are located within Philadelphia County. There are a disproportionate number of assessment sites within Philadelphia because of the need to establish baseline conditions for future BMPs.

E.2.1.2.2 Fish Assessments

Between 6/4/07 and 6/22/07, PWD biologists conducted fish assessments at six (n=6) locations within Pennypack Creek Watershed (Appendix B). All surveys were conducted at mainstem stations using electrofishing gear as described in EPA RBP V (Barbour, et al.).

E.2.1.2.3 Algae Assessments

Periphyton communities were sampled from sites PP340, PP970, PP1680, and PP2020, chiefly to assess the role of periphyton regulating stream metabolism. Surveys were conducted at mainstem locations only, and 2 sites were located within Philadelphia County. Sites were chosen based on proximity to continuous water quality monitoring stations, but some adjustments were made in order to situate the periphyton sampling locations in areas with sufficient depth and substrates and to attempt to control for differences in canopy cover.

PWD's 2007 periphyton monitoring in Pennypack Creek Watershed has been enhanced with partnerships from the Philadelphia Academy of Natural Sciences (ANS) and Widener University. PWD collected estimates of periphyton chlorophyll-*a* at four sites in spring and summer (24 periphyton samples total), while the ANS laboratory analyzed periphyton intercellular nutrient ratios (C:N:P). Effects of scouring and sloughing of periphyton biomass on DO dynamics were investigated in partnership with the engineering department of Widener University.

E.2.1.2.4 Physical Assessments

E.2.1.2.4.1 EPA Habitat Assessment

Immediately following benthic macroinvertebrate sampling procedures, habitat assessments were completed at twenty four (n=24) sites (Appendix B) based on the Environmental Protection Agency's Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers (Barbour et al. 1999). Physical habitat assessments were performed at each benthic macroinvertebrate sampling location. Reference conditions were used to normalize the assessment to the "best attainable" situation.

Habitat parameters were separated into three principal categories: (1) primary, (2) secondary, and (3) tertiary parameters. Primary parameters are those that characterize the stream "microscale" habitat and have greatest direct influence on the structure of indigenous communities. Secondary parameters measure "macroscale" habitat such as channel morphology characteristics. Tertiary parameters evaluate riparian and bank structure and comprise three categories: (1) bank vegetative protection, (2) grazing or other disruptive pressure, and (3) riparian vegetative zone width.

E.2.1.2.4.2 Habitat Suitability Index (HSI) Evaluation

HSI models for nine species were selected for Pennypack Creek Watershed. Models were chosen to reflect the range of habitat types and attributes needed to support healthy, naturally-reproducing native fish communities and provide recreational angling opportunities in the watershed. Two centrarchid fish, redbreast sunfish (*Lepomis auritus*), and smallmouth bass (*Micropterus dolomieu*), were included in the analysis. These species are tolerant of warmer water temperatures and require extensive slow, relatively deep water (i.e., pool) habitats with appropriate cover or structure to achieve maximum biomass.

While black basses (*M. dolomieu* and its congener *M. salmoides*) are not native to Southeast Pennsylvania, they occupy the top carnivore niche and are among the most sought-after freshwater game fish in water bodies where they occur. Moreover, the only other large bodied piscivores known to occur naturally in Pennypack Creek Watershed are American eels, native catadromous fish for which no HSI have been developed. Salmonid HSI models were used for brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*). While these coldwater fish generally cannot establish and maintain reproducing populations in warm water streams, the Pennsylvania Fish and Boat Commission (PFBC) actively stocks both rainbow and brown trout in Pennypack Creek Watershed.

Four native minnow species were selected for HSI analysis: blacknose dace (Rhinichthys atratulus), common shiner (Luxilis cornutus), creek chub (Semotilus atromaculatus), and longnose dace (Rhinichthys cataractae). These minnow species have different habitat requirements and tend to occur in different portions of a watershed overall. Furthermore, these species are known to occur in Pennypack Creek Watershed, and are generally common throughout southeast Pennsylvania streams with appropriate habitat.

HSI model output for each site was compared to EPA habitat data results. With the exception of fallfish, brown trout and rainbow trout HSI data, HSI model output was compared to observed fish abundance and biomass with correlation analyses. As fish known to associate primarily with pool habitats generally grow to larger sizes, a successful model should perhaps correlate with the biomass per unit volume. Conversely, models that aim to predict habitat suitability for small minnows that inhabit riffles might be expected to have a stronger relationship with fish abundance per unit surface area. Several habitat models likely require modification in order to be useful in guiding or evaluating stream habitat improvement activities. While time constraints precluded the modification of models to better suit Pennypack Creek Watershed, it is hoped that such modifications will increase the usefulness of these models in the future. Simple correlations between habitat and fish abundance/biomass data are included in individual model results when appropriate, and PWD is currently exploring other statistical tools to study fish and macroinvertebrate habitat relationships.

E.2.1.2.4.3 Infrastructure Assessment

As an extension of the fluvial geomorphological investigation of stream channels within Wissahickon Creek Watershed during 2006, an infrastructure assessment was completed. In order to document infrastructure throughout the basin, PWD staff and trained consultants walked along stream segments with GPS, digital photography, and portable computer equipment, compiling an inventory of every infrastructure feature encountered. These features included bridges, culverts, dams, stormwater outfalls and drain pipes greater than 8" in diameter, sewers, pipe crossings, confluences, manholes, and areas where one or more of the stream banks were artificially channelized. During FY 2007, the entire Wissahickon infrastructure assessment was completed.

Preliminary findings of the infrastructure assessment will be disseminated in the WCWCCR to better integrate the results with the findings of other assessments (e.g., to help explain observed impairments found in the biological assessments). Because the inventory of infrastructure features in the City of Philadelphia is complete and the City portion of the watershed, tributaries in particular, was subject to more scrutiny in other assessments, findings have been divided into features within the city of Philadelphia and features within Montgomery County.

E.2.1.2.4.4 Fluvial Geomorphologic (FGM) Analysis

Wissahickon Creek Watershed

A geomorphologic stream survey and infrastructure assessment, consisting of the assessment of approximately 115 miles of stream channel within the watershed, was completed on the Wissahickon Creek in early FY 2007. The stream survey was completed during FY 2005 and the infrastructure investigation was completed from FY 2005 to FY 2007. The Main Stem of Wissahickon Creek is approximately 25 miles in length with about 90 miles of tributary creeks and streams. About 24 miles of Wissahickon Creek mainstem and tributaries are located in Philadelphia County, with the rest located within Montgomery County. Field crews consisting mainly of environmental scientists from A.D. Marble & Company were used to conduct both the geomorphologic survey and infrastructure assessment.

The geomorphologic survey involved walking the entire length of the main stems of the Wissahickon Creek, its large tributaries, and some unnamed smaller tributaries to record specific information about the channel and surrounding habitat. One representative stream channel cross section was measured per reach, with 213 reaches and most reaches being smaller than 2000 feet in length. Measured field data was collected to determine stream channel types for each reach and to help evaluate channel stability. Qualitative habitat data was also collected.

This survey and assessment will aid in the determination of the flow patterns in the Wissahickon Watershed which will allow for the conceptual planning of projects that will mitigate the effects of storm flow on the stream by decreasing the erosive effects of the stormwater, decreasing the quantity of water that reaches the streams, and stabilizing and restoring the banks using natural techniques to withstand storm flows. It will also provide data that will help in the development of an approach for the restoration of Wissahickon Creek with an emphasis on hydraulic sustainability, enhancement to riparian habitat, improved aesthetics, and biological improvement.

Pennypack Creek Watershed

A geomorphologic stream survey, consisting of the assessment of approximately 83 miles of stream channel within the watershed, was completed on the Pennypack Creek during FY 2005. The Main Stem of Pennypack Creek is approximately 23 miles in length with about 60 miles of tributary creeks and streams. About 28 miles of Pennypack Creek mainstem and tributaries are located in Philadelphia County, with the rest located within Montgomery County and Bucks County. Field crews consisting mainly of environmental scientists from A.D. Marble & Company were used to conduct the geomorphologic survey.

The geomorphologic survey involved walking the entire length of the main stems of the Pennypack Creek, its large tributaries, and some unnamed smaller tributaries to record specific information about the channel and surrounding habitat. One representative stream channel cross section was measured per reach, with 128 reaches and most reaches being smaller than 2000 feet in length. Measured field data was collected to determine stream channel types for each reach and to help evaluate channel stability. Qualitative habitat data was also collected.

This survey will aid in the determination of the flow patterns in the Pennypack Watershed which will allow for the conceptual planning of projects that will mitigate the effects of storm flow on the stream by decreasing the erosive effects of the stormwater, decreasing the quantity of water that reaches the streams, and stabilizing and restoring the banks using natural techniques to withstand storm flows. It will also provide data that will help in the development of an approach for the restoration of Pennypack Creek with an emphasis on hydraulic sustainability, enhancement to riparian habitat, improved aesthetics, and biological improvement.

Poquessing Creek Watershed

A geomorphologic stream survey, consisting of the assessment of approximately 50 miles of stream channel within the watershed, was completed on the Poquessing Creek. The stream survey was completed during the period February – April 2007. The Main Stem of Poquessing Creek is approximately 12 miles in length, with approximately 38

miles of tributaries that stem from it. A majority of the watershed is located in Philadelphia County, with small portions in both Bucks and Montgomery Counties. Field crews consisting of personnel from the Philadelphia Water Department conducted the geomorphologic survey.

The geomorphologic survey involved walking the entire length of the main stems of the Poquessing Creek, its large tributaries, and some unnamed smaller tributaries to record specific information about the channel and surrounding habitat. One representative stream channel cross section was measured per reach, with 160 reaches and most reaches being smaller than 2000 feet in length. Measured field data was collected to determine stream channel types for each reach and to help evaluate channel stability. Qualitative habitat data was also collected.

In addition, a full infrastructure assessment is being planned for 2008 to survey and record the spatial location of all manholes, sewers, outfalls, culverts, channels, dams and bridges that impact the waterway.

The data collected from this study is currently being processed and analyzed. This survey and assessment will aid in the determination of the flow patterns in the Poquessing Watershed which will allow for the conceptual planning of projects that will mitigate the effects of storm flow on the stream by decreasing the erosive effects of the stormwater, decreasing the quantity of water that reaches the streams, and stabilizing and restoring the banks using natural techniques to withstand storm flows. It will also provide data that will help in the development of an approach for the restoration of Poquessing Creek with an emphasis on hydraulic sustainability, enhancement to riparian habitat, improved aesthetics, and biological improvement.

E.2.1.2.5 Reporting

The final version of the Pennypack Creek Watershed Comprehensive Characterization Report (PCWCCR) shall be available for public review and comment in fall 2008. Upon completion, three copies will be delivered to the PADEP (Southeast Regional Office) and will be disseminated to the public at the following web address: www.PhillyRiverInfo.org. The final version of the WCWCCR is also located at: www.PhillyRiverInfo.org .

E.2.1.2.6 2008 Sampling and Monitoring Program

As discussed in Section 2: Step 1 (part b) of the City's Stormwater Permit, the PWD is presently conducting a comprehensive assessment in the Pennypack Creek Watershed during 2007-2008. Discrete chemical sampling has been completed, while continuous and wet weather monitoring shall progress through 2008. Biological and physical assessments were completed in 2007 and data analysis is presently underway. Completion of the PCWCCR is allotted for fall of 2008.

E.2.2 QA/QC and Data Evaluation

OOW and the Bureau of Laboratory Services (BLS) have planned and carried out an extensive sampling and monitoring program to characterize conditions in Pennypack Creek Watershed. The program includes hydrologic, water quality, biological, habitat, and fluvial geomorphological components. Again, because the OOW has merged the goals of the city's stormwater, combined sewer overflow, and sourcewater protection programs into a single unit dedicated to watershed-wide characterization and planning, it is uniquely suited to administer this program.

Sampling and monitoring follow the Quality Assurance Project Plan (QAPP) and Standard Operating Protocols (SOPs) as prepared by BLS. These documents cover the elements of quality assurance, including field and laboratory procedures, chain of custody, holding times, collection of blanks and duplicates, and health and safety. They are intended to help the program achieve a level of quality assurance and control that is acceptable to regulatory agencies. SOPs for chemical and biological assessments can be found at the following address: www.PhillyRiverInfo.org.

E.2.2.1 Water Quality Criteria for Wissahickon Creek Watershed

An analysis will be conducted on the water quality data currently being collected in the Pennypack Creek watershed. Using the data collected from discrete wet and dry weather sampling, comparisons are to be made to PADEP water quality standards. National water quality standards and reference values will be used where state water quality standards are not available. The water quality standards or reference values and their sources are listed in Table E.2.2-1.

Table E.2.2-1 Water Quality Standards and Reference Values

Parameter	Criterion	Water Quality Criterion or Reference Value	Source
Alkalinity	Minimum	20 mg/L	PA DEP
Aluminum	Aquatic Life Acute Exposure Standard	750 ug/L	PA DEP
Aluminum	Aquatic Life Chronic Exposure Standard	87 ug/L (pH 6.5-9.0)	53FR33178
Chlorophyll *a*	Reference reach frequency distribution approach for Ecoregion IX, subregion 64, 75th percentile	3 ug/L, (Spectrophotometric) ***	EPA 822-B-00-019
Dissolved Cadmium	Aquatic Life Acute Exposure Standard	0.0043 mg/L *	PA DEP
	Aquatic Life Chronic Exposure Standard	0.0022 mg/L *	PA DEP
	Human Health Standard	10 mg/L	PA DEP
Dissolved Chromium	Aquatic Life Acute Exposure Standard	15 mg/L	PA DEP
	Aquatic Life Chronic Exposure Standard	10 mg/L	PA DEP
Dissolved Copper****	Aquatic Life Acute Exposure Standard	0.013 mg/L *	PA DEP
	Aquatic Life Chronic Exposure Standard	0.0090 mg/L *	PA DEP
	Human Health Standard	1000 mg/L	PA DEP
Dissolved Iron	Maximum	0.3 mg/L	PA DEP
Dissolved Lead	Aquatic Life Acute Exposure Standard	0.065 mg/L *	PA DEP
	Aquatic Life Chronic Exposure Standard	0.025 mg/L *	PA DEP
	Human Health Standard	50 mg/L	PA DEP
Dissolved Zinc	Aquatic Life Acute Exposure Standard	0.120 mg/L *	PA DEP
	Aquatic Life Chronic Exposure Standard	0.120 mg/L *	PA DEP
	Human Health Standard	5000 mg/L	PA DEP
Dissolved Oxygen	Average Min (August 1 to February 14)	5 mg/L	PA DEP
	Instantaneous Min (August 1 to February 14)	4 mg/L	PA DEP
	Average Min (February 15 to July 31)	6 mg/L	PA DEP
	Instantaneous Min (February 15 to July 31)	5 mg/L	PA DEP
Fecal Coliform	Maximum	200/100mL (Swimming season) or 2000/100mL (Non-swimming season)	PA DEP
Fluoride	Maximum	2.0 mg/L	PA DEP
Iron	Maximum	1.5 mg/L	PA DEP
Manganese	Maximum	1.0 mg/L	PA DEP
NH_3-N	Maximum	pH and temperature dependent	PA DEP
$NO_{2\text{-}3}$-N	Nitrates – Human Health Consumption for water + organisms	2.9 mg/L ***	EPA 822-B-00-019
$NO_2 + NO_3$	Maximum (Public Water Supply Intake)	10 mg/L	PA DEP
Periphyton Chl-*a*		Ecoregion IX – 20.35 mg/m2	USEPA 1986 (Gold book)
pH	Acceptable Range	6.0 - 9.0	PA DEP
Phenolics	Maximum	0.005 mg/L	PA DEP
TDS	Maximum	750 mg/L	PA DEP
Temperature		Varies w/ season. **	PA DEP
TKN	Maximum	0.675 mg/L ***	EPA 822-B-00-021
TN	Maximum	4.91 mg/L ***	EPA 822-B-00-020
TP	Maximum	140 ug/L ***	EPA 822-B-00-022
TSS	Maximum	25 mg/L	Other US states
Turbidity	Maximum	8.05 NTU ***	EPA 822-B-00-023

* - Water quality standard requires hardness correction; value listed is water quality standard calculated at 100 mg/L $CaCO_3$ hardness

** - Additionally, discharge of heated wastes may not result in a change of more than 2°F during a 1-hour period.

*** - Ecoregion IX, subregion 64 seasonal median

**** - All locations except site WS1850 have permitted exemptions of state dissolved copper standards due to a Water Effects Ratio.

E.2.3 Watershed & Water Body Modeling – Estimates of Loadings from the City's MS4 System

PWD's approach to resolving impacts of stormwater discharges is one part of a carefully developed approach to meeting the challenges of watershed management in an urbanized setting. Designed to meet the goals and objectives of numerous, water resources related regulations and programs, the method recommends the use of adaptive management approaches to implement recommendations on a watershed-wide basis. Its focus is on attaining priority environmental goals in a phased approach, making use of the consolidated goals of the numerous existing programs that directly or indirectly require watershed planning. Central to the approach is development of IWMPs for each of the watersheds that drains to the City of Philadelphia. The Wissahickon Creek IWMP (WCIWMP) is the third to be completed, following the Cobbs Creek IWMP (CCIWMP) in 2004 and Tookany/Tacony-Frankford IWMP (TTFIWMP) in 2005. Watershed management plans for the Pennypack and Poquessing watersheds are planned for completion during the term of the current NPDES stormwater permit.

The approach followed has four major elements, each with multiple tasks specific to the planning efforts within the watershed.

- Data collection, organization and analysis
- Systems description
- Problem identification and development of plan objectives
- Strategies, policies and approaches

Data Collection, Organization and Analysis

The initial step in the planning process is the collection and organization of existing data on surface water hydrology and quality, pollutant loads, wastewater collection and treatment, stormwater control, land use, stream habitat and biological conditions, and historic and cultural resources. In addition, existing rules, regulations, and guidelines pertaining to watershed management at federal, state, basin commission, county, and municipal levels also are examined for coherence and completeness in facilitating the achievement of watershed planning goals.

Data are collected by many agencies and organizations in various forms, ranging from reports to databases and Geographic Information System (GIS) files. Field data collection efforts were undertaken throughout the study, and expanded as data gaps were identified.

Systems Description

The planning approach for an urban stream must focus on the relationship between the natural watershed systems (both groundwater and surface water) and the constructed systems related to land use that influence the hydrologic cycle, such as water supply, wastewater collection and treatment, and stormwater collection. A critical step in the planning process is to examine this relationship in all its complexity.

Problem Identification and Development of Plan Objectives

Existing problems and issues of water quality, stream habitat, and streamflow related to the urbanization of the watershed can be identified through analyses of:

- Prior studies and assessments
- Existing data
- New field data
- Stakeholder input

Problems and issues identified through data analysis must be compared with problems and issues brought forward by stakeholders. An initial list of problems and issues then are transformed into a preliminary set of goals and objectives. These goals and objectives may reveal data gaps and may require additional data collection and analysis. Ultimately, with stakeholder collaboration, a final list of goals and objectives is established that truly reflects the conditions of the watershed. These goals and objectives are prioritized by the stakeholders based on the results of the data analysis.

The priority of objectives becomes the basis for developing planning alternatives. Potential constraints on implementation require that the objectives be broken down into phased targets, in which alternatives are developed to meet interim objectives. In this way, the effectiveness of implementation can be monitored, and targets adjusted, as more is learned about the watershed, its physical characteristics, and evolving water quality regulations.

In conjunction with Section D (Sediment Total Maximum Daily Load (TMDL) For Wissahickon Creek) of the City's stormwater permit, PWD has initiated a monitoring plan that addresses the adverse impacts to in-stream habitats as a result of transport of sediment and/or stream bank erosion. Baseline data from 13 perennial tributaries that originate in the City will be monitored to define their contribution of sediment loading.

There are two elements to the monitoring program. The first estimates the sediment load originating from stream banks. The second estimates the total sediment load being carried by the stream. Data collection is ongoing for both parts.

Strategies, Policies and Approaches

Once end targets and interim targets are established, with a clear list of associated planning objectives based on sound scientific analysis and consensus among stakeholders, effective sets of management alternatives are developed to meet the agreed upon targets and objectives. These alternatives are a combination of options that may include suggested municipal actions, recommendations on water supply and wastewater collection system improvements, potential measures to protect water quality from point sources, best management practices for stormwater control, measures to control sanitary sewer overflows, changes to land use and zoning, stream channel and stream bank restoration measures, etc.

IWMPs provide guidelines on how best to combine the many options in a coherent fashion within the context of the watershed-wide management objectives. The plans are designed to provide an implementation process and guidelines to achieve the stated objectives over a specified period of time.

E.2.3.1 Wissahickon Watershed

A detailed hydrologic model has been developed for the Wissahickon watershed using EPA's Stormwater Management Model (SWMM). The results of this model can be found in the WCWCCR online at www.PhillyRiverInfo.org .

E.2.3.2 Pennypack and Poquessing Watersheds

The modeling of stormwater volumes within the Pennypack Creek watershed is currently in the data collection stage. Cross-section data from the Pennypack Creek is being collected in the summer of 2007 and will continue into the fall of 2007. Modeling will be conducted in FY 2008 and results will be presented in the PCWCCR, scheduled to be available on www.PhillyRiverInfo.org in the fall of 2008.

An updated loading analysis of the Poquessing Creek watershed will be performed in FY 2009 as a part of the Comprehensive Characterization Report development process.

E.2.4 Problem Definition and Water Quality Goal Setting

E.2.4.1 Problem Definition

The extensive monitoring program initiated by PWD in the Wissahickon Creek Watershed between 2005 and 2006 culminated with the production of the WCWCCR. The WCWCCR highlighted a multitude of water quality related issues within the watershed drainage. As stated in the WCWCCR, "problems faced by the Wissahickon

Creek Watershed stem from many sources; primarily, the creek suffers from physical disturbance due to urbanization and excess nutrient input from municipal wastewater treatment plants." These effects are evident in the comprehensive assessment of the aquatic habitat, biological communities and water chemistry documented in this report. Please review the entire report at the following address: www.PhillyRiverInfo.org.

E.2.4.2 Water Quality Goal Setting

In the spring of 2006, PWD initiated a watershed-wide stakeholder goal setting process within the Wissahickon Creek Watershed as a part of the IWMP development. For the purposes of this exercise, the term "goal" was used to define a broad set of "wishes" and "aspirations" for the watershed. The purpose was to derive a comprehensive watershed-wide "wish list" of goals for the Wissahickon. These goals are not specifically measurable, but through the goal setting process, they are further derived into measurable "objectives", utilized for planning purposes. The "objective" allows for the establishment of progress over time as implementation occurs. Utilizing the input from the Wissahickon Watershed Partnership, this goal setting process was designed to be inclusive of all partner perspectives.

PWD staff prepared for the goal setting process by reviewing existing watershed plans and reports (i.e. River Conservation Plans, NIER study, Wissahickon TMDLs, etc.) and synthesizing a compilation of "existing goals" established by these various documents. A series of three meetings of the Wissahickon Watershed stakeholders were conducted between spring of 2006 and winter of 2007, during which the stakeholders were taken through a facilitated process to review the list of "existing goals" for the Wissahickon Watershed and add to them as appropriate. (During this process, no goals were eliminated from consideration; wording from older goals was tweaked in some cases, but in this process goals were only being added and not eliminated.)

A diversely representative group consisting of roughly 40 stakeholders actively participated in the goal setting process. Of these, 10 participants represented municipalities within the drainage area, 9 represented nonprofit organizations, 3 represented the PADEP, 1 represented the USEPA, 5 represented colleges and universities in the watershed, 3 represented large businesses within the watershed, 3 represented Montgomery County agencies, 2 represented the Montgomery County Conservation District, and 5 represented City of Philadelphia agencies. This stakeholder assemblage developed a final "wish list" consisting of 23 goals for the Wissahickon Creek Watershed.

Table E.2.4-1 Wissahickon Watershed Stakeholders Goals

Category	Goal
Water Quality	*Improve and protect groundwater quality*
	Improve and protect surface water quality
	Eliminate untreated sewage discharges to Wissahickon Creek
	Reduce channel erosion and sediment loads caused by runoff
Drinking Water	Protect drinking water quality (both surface and groundwater)
	Improve drinking water taste and odor
Water Quantity	*Reduce frequency and severity of damaging (out of bank) flooding*
	Reduce flood loss (damages resulting from devastating flood events)
	Improve and maintain baseflow through increased infiltration to support water quality and aquatic community health.
Habitat	Improve aquatic habitat
	Restore aquatic ecosystem health
Education and Outreach	Encourage multi-municipal watershed planning
	Improve awareness of watershed issues at a local level (municipalities and stakeholders)
	Make educational opportunities available to every stakeholder in the watershed
	Achieve compliance with appropriate regulations
Emergency Preparedness	Increase preparedness for natural hazards, spills, discharges and terrorism
	Increase communications within the watershed
Recreation	*Improve "stream corridor" recreational opportunities (passive and active) and reduce their environmental impact and incorporate recommendations of Sustainable Trails Initiative.*
	Protect historic and cultural resources
Land Use	*Conserve and increase permanently protected open space*
	Encourage multi-municipal watershed planning
	Integrate water resource management into land use planning
	Encourage redevelopment and revitalization coupled with proper stormwater management over green field development (smart growth)

As previously noted, the WCWCCR presents scientific data that identifies existing water quality problems within the watershed. Following the completion of the WCWCCR, goals were evaluated against the identified "problems" in order to determine the goal relevance and priority. As the IWMP is developed – including both Implementation Guidelines and Implementation Plan, it will be designed to specifically address problems identified through the extensive monitoring and characterization program; as such, the IWMP will not specifically address goals for which a problem has not been identified. That is not to say that these goals will be excluded from consideration, but rather that the goals addressing problems would be considered higher priority than those that do not. In Table E.2.4-1, several goals have been italicized; these goals do not specifically address problems identified through the WCWCCR. (Note: the WCWCCR did not conduct a detailed assessment of flooding or land use related ordinances for the

Montgomery County portion of the watershed as this was beyond the scope of the study. Because neither of these were identified as issues for the Philadelphia portion of the watershed, goals associated with both are highlighted in red.) Therefore, the WCIWMP will specifically address the remaining 14 stakeholder goals.

The development of the WCIWMP is currently underway; through this process goals and objectives will be further evaluated as implementation options are considered for addressing problems identified within the Wissahickon Creek Watershed.

E.2.5 Technology Evaluation

An integral component of developing the Watershed Management Plans is implementing appropriate stormwater management options in response to the key stormwater issues identified under Step 1 of the NPDES permit. The overall goal for mitigating stormwater is to improve the quality of runoff and decrease the quantity and rate of runoff as it reaches the receiving water bodies through the MS4. There are numerous approaches to achieving these stormwater runoff improvements. The City is responsible for ensuring that any technology that is implemented to address stormwater issues is also evaluated for its effectiveness. What has become increasingly evident over the past year is the contribution of private development in addressing stormwater runoff problems. A discussion of the programs, technology and approaches implemented to date are included specifically within this section and also as part of the Best Management Practices narrative located in Section K.

E.2.5.1 Household Hazardous Waste Collections

During FY 2006, the City of Philadelphia held 7 Household Hazardous Waste Collection events, during which a total of more than 120 tons of hazardous waste and 30 tons of computer material were collected and disposed of properly. These materials include oil, paint, and other toxic household substances. In FY 2007 45,762 tons of recycled materials were collected from residents of the City of Philadelphia as well as 3,994 tons of composting leaves. A summary of the collections over the last 4 fiscal years is provided below in Table **E.2.5-12** E.2.5-12. In addition, more information is available to the public at http://www.phila.gov/streets/hazardous_waste.html.

The detailed collection statistics of FY 2004 and FY 2005 are presented in the FY 2006 Stormwater Annual Report pages 56-57. Those years are summarized below in Table 2.5-12 along with the collection statistics of FY 2006 and the current FY 2007.

Table E.2.5-12 Household Hazardous Waste Collection Statistics (FY 2004 - 2007)

Collection Event		# of Attendees	Quantity Accepted (lbs)		
Location	**Date**		**HHW**	**Computers**	**Total**
FY 2004 Total		**3,365**	**284,696**	**47,593**	**284,696**
FY 2005 Total		**3,740**	**280,722**	**30,793**	**315,255**
FY 2006					
State Road and Ashburner (Thurs)	21-Jul-05	704	55,157		55,157
22nd and York	20-Aug-05	193	12,312		12,312
63rd Street	24-Sep-05	250	16,765		16,765
Lead Contaminated Debris and Propane	24-Sep-05	Special Pick-up	17,942		17,942
Delaware and Wheatsheaf	5-Nov-05	890	63,061	30,339	93,400
State Road and Ashburner (HHW)	22-Apr-06	866	75,428	17,922	93,350
Domino and Umbria	10-Jun-06	983	65,552	19,058	84,610
Propane Pick-up at Sanitation yards	3-Mar-06	NA	330		330
Propane Pick-up at Sanitation yards	Scheduled	NA	160		160
FY 2006 Total		**3,866**	**306,707**	**67,319**	**374,026**
FY 2007					
State Road and Ashburner (Thurs)	20-Jul-06	620	39,297	6,834	46,131
22nd and York	19-Aug-06	223	16,495	3,389	19,894
63rd Street	7-Oct-06	327	22,989	1,868	24,857
Delaware and Wheatsheaf	4-Nov-06	732	51,258	19,826	71,084
State Road and Ashburner (HHW)	5-May-07	691	57,372	18,212	75,584
Domino and Umbria	9-Jun-07	765	52,787	9,531	62,318
	12-Jul-06	Testing	NA		NA
Propane Pick-up at Sanitation Yards	Scheduled	Special Pick-up			
FY 2007 Total		**3,358**	**240,198**	**59,660**	**299,858**

NA Not Applicable

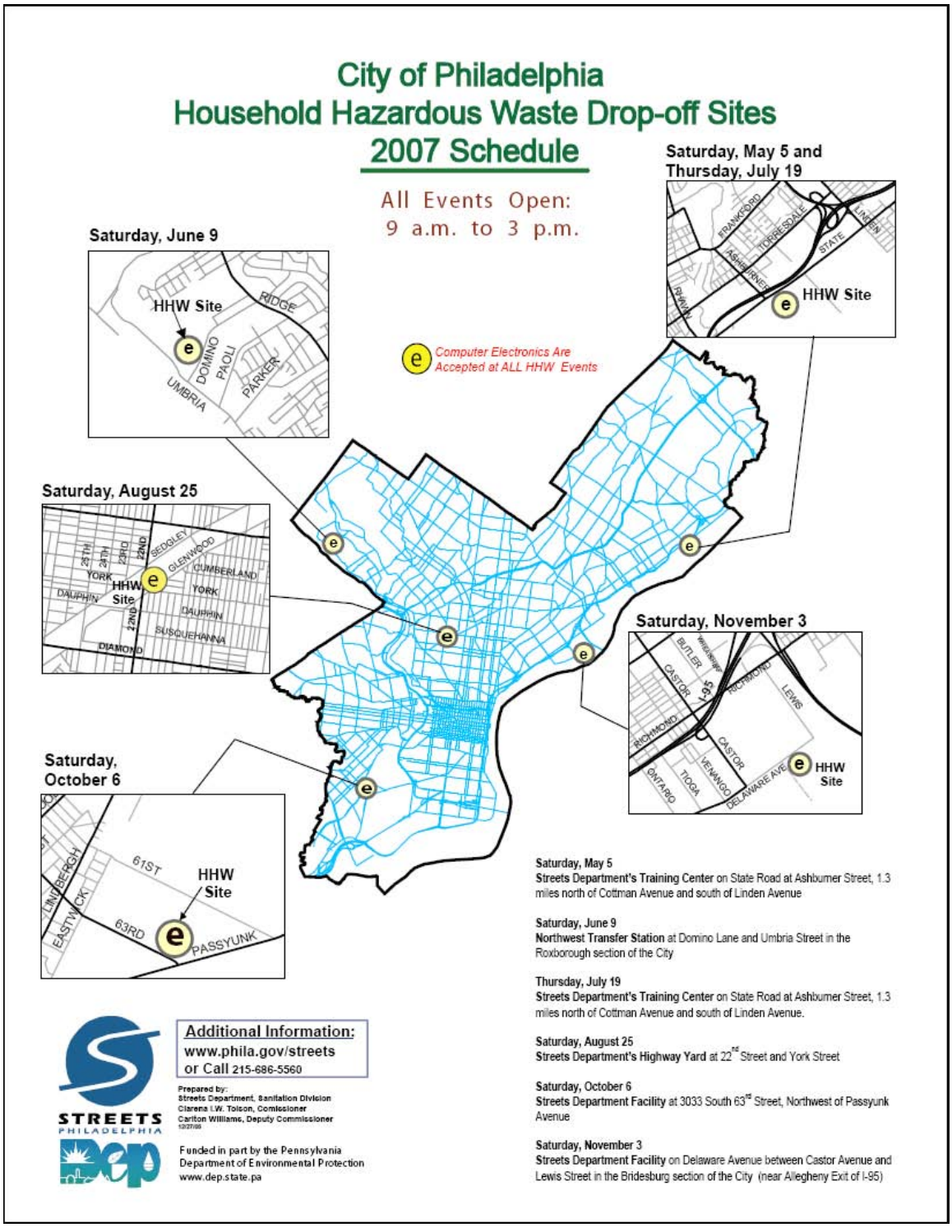


Figure E.2.5-1 Location of Household Hazardous Waste Drive Locations and Dates

E.2.5.2 Infrared Analysis in the Wissahickon Watershed

Aerial infrared (IR) imaging of all the hydrology in the Wissahickon Creek Watershed (105 miles), Cobbs Creek Watershed (24 miles) and Tacony-Frankford Creek Watershed (32 miles) was conducted for the purpose of finding thermal anomalies indicative of liquid contamination of the surface water. Possible causes of the thermal anomalies are leaking sewer lines, ground water seeps, unidentified surface or subsurface outfalls in the form of pipes or drains, storm sewers and any other detectable source of liquid that may be of interest. A detailed explanation of the imagine process and contractor hired to perform the inspections can be found in FY 2006 Stormwater Annual Report pages 57-58.

A shapefile was created showing spatial location of each thermal anomaly identified and all associated data such as suspected cause of the anomaly. Maps were created showing each of the anomalies in Philadelphia and the surrounding area and infrastructure to help better identify problems and to help in locating the point in the field. The field investigation of the thermal anomalies is ongoing. Philadelphia contained 38 locations where thermal anomalies were observed and each one of those sites has been investigated, and corrective action taken when necessary. PWD is also contacting and working with outside communities to identify and manage the sources of thermal anomalies documented in their communities.

E.2.5.3 Floatables Control

R.E. Roy Skimming Vessel

PWD's desire to improve public awareness of an individual's contribution to coastal aesthetics— notably in the Delaware and Schuylkill Rivers—and to improve water quality and aesthetics of surrounding parks and recreational areas recommended the use of a skimming vessel to remove debris from targeted reaches of the tidal portions of these two rivers.

In 2003, the PWD evaluated skimmer vessel technology types, models, and vendors, based on critical decision points such as material handling, vessel speed, mobile off-loading, seaworthiness, and O&M, and capital and life-cycle costs. The PWD determined that the Rover 12 - a 40ft, container type, debris vessel, was the vessel capable of safely and efficiently servicing these rivers.

On June 18th, 2004, the initial payment for the construction of the vessel was authorized by the PWD and the fabrication of the skimming vessel officially began. On December 17th, 2004 the PWD sent a team to Rhode Island for a vessel inspection at Hewitt Environmental's contractors manufacturing facility - Blount Boats, Inc. Fabrication continued throughout the first half of 2005 and the boat was delivered on June 28th, 2005.

The vessel completed sea trials and after a few minor modifications and was accepted by the PWD. The total cost of the vessel was $526,690.

The vessel, now known as the R. E. Roy, was operated in-house, by PWD personnel from delivery until April 2006. These personnel were trained by the vessel construction company on proper operations of the vessel. The vessel was in operation on the Schuylkill and Delaware Rivers performing general debris collection and removal. The vessel was also used to clean up for and service as a public relations highlight at events such as the Schuylkill Regatta.

The PWD went through the process of securing a contractor for the permanent operation of the skimming vessel from October 2005 through March 2006. The vendor selected through this process has become the full-time operator of the skimming vessel for a contract period of at least one year, with the option for contract renewal. The vessel is now operated five days per week, 8 months of the year.

The contract was awarded to River Associates, Inc of Philadelphia, PA in the spring of 2006. River Associates began operation in April 2006. Since that time, they have been operating the vessel and performing general debris cleanup on both the Delaware and Schuylkill Rivers. They have also participated in numerous public events including the PECO Energy Earth Day Cleanup, the Jam on the River at Penn's Landing, the Schuylkill River Sojourn, and the Godspeed Sail & Landing Party at Penn's Landing.

During the 2006-2007 period of record, the skimmer vessel was in operation in 2006 from July through November before shutting down for winter maintenance, and then began operation again in April 2007. The total amount of debris collected in FY 2007 from July 1st, 2006 to June 30th, 2007 was 39.83 tons. The weights of debris collected during each month since the R.E. Roy's first launch in April 2006 are displayed in the chart below:

Table E.2.5-2 Debris Collected by R.E. Roy Skimming Vessel

Month	Tons of Debris Collected
April 2006	2.88
May 2006	14.24
June 2006	3.43
July 2006	3.05
August 2006	8.47
September 2006	6.02
October 2006	3.5
November 2006	2.03
April 2007	5.02
May 2007	6.41
June 2007	5.33
Total	60.38

Pontoon Boat

Throughout the 2007 swimming season, PWD managed a skimming operation for floatable debris on the non-tidal Schuylkill through use of the pontoon vessel. This program was an extension of the large debris removal already occurring on the tidal portions of the Delaware and Schuylkill rivers. Due to the high visibility of the project, it received excellent public feedback throughout the season.

Once a week, a crew of three operated the office's pontoon vessel, collecting an average of 2.5 yd^3 per day. As of July 27th, 18.5 yd^3 of trash had been removed during only 8 days of operation. The chart below details the composition of the debris collected. The majority of this debris was collected along Kelly Drive each week, covering only 25% of the anticipated project area.

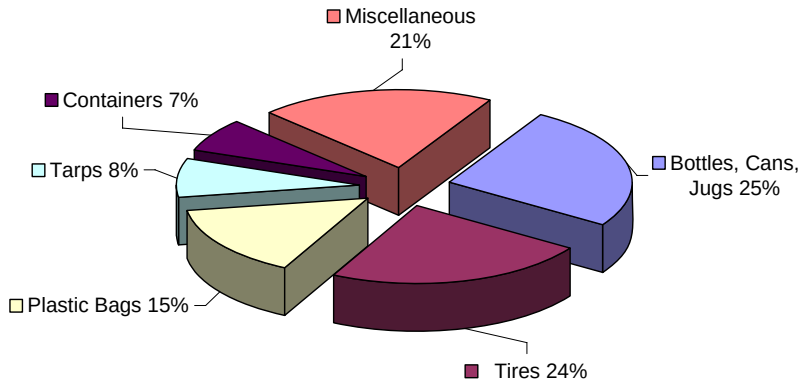


Figure E.2.5-2 Percent Composition of Recovered Debris

Adequately covering the proposed area will require a three person crew operating the pontoon boat at least twice a week throughout the swimming season. The sustainability of this project will depend on increased staffing within the Waterways Restoration Team (Section E.3.1.2) as well as future public participation.

E.2.5.4 Economic Assessment and Funding Requirements

As watershed management plans are completed for the Wissahickon, Pennypack and Poquessing watersheds each report will include an economic assessment. The assessment will detail funding requirements including identifying known and potential funding sources necessary for successful plan implementation. Subsequent annual reports will provide appropriate assessments as the Watershed Management Plans are completed.

E.2.5.4 Public Involvement

Public involvement, including education and outreach, is detailed in Section E.3.2.1 Integrated Stormwater Management Plans and Section I Miscellaneous Programs and Activities.

E.3 Step 3 – Watershed Plan Implementation and Performance Monitoring: Permit Issuance through Expiration

IWMPs are designed to meet the goals and objectives of numerous, water resources related regulations and programs. Each IWMP results in a series of implementation recommendations that utilize adaptive management approaches to achieve measurable benefits watershed-wide. Through the IWMP development process a package of implementation options is created and presented in the form of Implementation Guidelines, which introduce a long-range vision for implementation over a 20-year horizon, with the intent of meeting Targets A (Dry Weather Water Quality and Aesthetics), B (Healthy Living Resources) and C (Wet Weather Water Quality and Quantity). The Implementation Guidelines can be found within Section 8 of the TTFIWMP online at: www.PhillyRiverInfo.org . These Guidelines provide information on location and degree to which implementation needs to be accomplished in order to meet the targets.

Target A: Dry Weather Water Quality and Aesthetics

This target is designed to help achieve water quality standards in the stream during dry weather flows. The focus is on the elimination of sources of sewage discharge during dry weather, as well as trash removal and litter prevention.

Target B: Healthy Living Resources

This target is focused on improving the in-stream conditions. Implementation projects are aimed at habitat improvements as well as measures to provide the opportunity for organisms to avoid high velocities during storms. Improvements to the number, health, and diversity of the benthic invertebrate and fish species are anticipated as a result of these measures.

Target C: Wet Weather Water Quality and Quantity

This target is designed to improve water quality standards in the stream during wet weather periods. These projects are designed to reduce and improve the quality of stormwater discharges.

Broad recommendations made in the Implementation Guidelines are further evaluated and prioritized by the City of Philadelphia in order to develop a detailed Implementation Plan for the drainage area of the watershed within the City. The Implementation Plan is then developed as a detailed "blueprint" for specific implementation tasks during each five-year implementation period.

PWD has created and committed to a detailed five-year Implementation Plan for the portion of the Tookany/Tacony-Frankford Watershed within the City of Philadelphia. This plan has been designed to begin in 2006 and run through 2011.

During FY 2008 PWD will develop an Implementation Plan for the City of Philadelphia portion of the drainage area of the Wissahickon Creek Watershed. This plan will be designed to begin in 2008 and run through 2013.

E.3.1 Target A - Dry Weather Water Quality and Aesthetics

E.3.1.1 Defective Lateral Program

Over the last permit year, the City has continued to successfully operate its Defective Lateral Program. A detailed discussion of this program is provided within this report in Section F - Detection, Investigation, and Abatement of Illicit Connections and Improper Disposal.

E.3.1.2 Waterways Restoration Team

In July 2003, PWD and the Fairmount Park Commission (FPC) initiated an exciting partnership that will improve the environmental quality of the beloved city parks and streams.

The FPC has assumed responsibility for over 200 acres of land dedicated to the City for stormwater management purposes land that was, up until now, a mowing and landscaping maintenance burden for PWD. The FPC will use this land to further its vision of developing "watershed parks," creating natural connections between neighborhoods and existing park areas.

In exchange, PWD is fielding a Waterways Restoration Team (WRT) – a crew dedicated to removing large trash – cars, shopping carts, and other short dumped debris - from the 100 miles of stream systems that define our City neighborhoods. This crew will also restore eroded stream banks and stream beds around outfall pipes and remove sanitary debris at these outfalls. WRT will work in partnership with the FPC staff and the various Friends of the Parks groups to maximize resources and the positive impacts to our communities. This partnership focuses on the core strengths of our two agencies. The FPC will continue to improve landscape management of the City's parks and dedicated lands, while PWD will focus its efforts on water quality improvements, a mandate it has under its state and federal water quality related permits.

Table E.3.1-1 Waterways Restoration Team – FY 2007 Performance Measurements

		FY 2006	FY 2007
Waterways Restoration Team Progress	Debris Removed (tons)	425	441
	Cars Removed	21	41
	Tires Removed	396	1,201
	Shopping Carts Removed	161	84
	Number of Clean-up Sites	124	142

In FY 2007, WRT removed an even greater amount of trash than what was removed in FY 2006. An additional 16 tons of trash was removed this fiscal year, twenty more cars, fewer shopping carts. One of the greatest achievements is the higher number of clean-up sites visited by WRT. In FY 2007, WRT cleaned eighteen more sites than what was cleaned in FY 2006. The increased assignment and progress of the WRT exemplifies PWD's commitment to cleaning and beautifying regional water resources.

In addition to the unbelievable amounts of trash that have been eliminated from our park and stream systems, the WRT completed its third plunge pool restoration project at the Maxwell Place outfall in the Pennypack Creek and completed an interim stabilization of the park and floodplain area of the East Branch of Indian Creek, a tributary to Cobbs Creek.

E.3.1.3 Stormwater Outfall Inspections

Please reference Section F - Detection, Investigation, and Abatement of Illicit Connections and Improper Disposal for a more detailed discussion of this subject.

E.3.1.4 Dry Weather Flow Outfall Sampling

Please reference Section F - Detection, Investigation, and Abatement of Illicit Connections and Improper Disposal for a more detailed discussion of this subject.

E.3.1.5 Priority Outfall Closure Testing

Please reference Section F - Detection, Investigation, and Abatement of Illicit Connections and Improper Disposal for a more detailed discussion of this subject.

E.3.2 Target B - Healthy Living Resources

E.3.2.1 Integrated Stormwater Management Plans

The City shall continue to work with adjacent counties and municipalities to develop integrated stormwater management plans as part of the watershed planning process.

In the development of watershed partnerships, the scope and importance of each task will vary among watersheds as a result of site-specific factors such as the environmental features of the watershed, regulatory factors such as the need to revise permits or complete TMDLs for the watershed, available funding, extent of previous work, land use and size of the watershed, the nature of businesses and industry, the level of involvement and resources of other stakeholders, and numerous other factors.

Philadelphia watersheds have a diverse range of planning needs that range from those of the Delaware that has a long-standing river basin commission, and has been the focus of major monitoring and modeling studies, to its tributaries for which very little data and analysis are available. The actual scope of each task is developed and described in a work plan or similar document by each stakeholder group at the commencement of watershed planning activities. PWD has completed the watershed management plans for the Cobbs Creek sub-basin (using the Cobbs plan as a model for the entire Darby-Cobbs Watershed) and the Tookany/Tacony-Frankford Creek Watershed, which was developed in hand with the River Conservation Plan (RCP) that PWD spearheaded for the watershed. These plans will serve as templates for urban watersheds. In November 2005, the PWD launched the Wissahickon Watershed Partnership with the goal of completing this watershed management plan in 2008. In 2007, the PWD will re-initiate the Pennypack Partnership, which completed a RCP in 2005 to kick-off the IWMP development process with a goal of completing this plan by 2009.

The following is a list of typical tasks and subtasks included in most watershed planning and RCP programs.

Tookany/Tacony-Frankford Watershed

The Tookany/Tacony-Frankford Watershed drains 29 square miles, or 20,900 acres in Philadelphia and Montgomery counties. It is, for the most part, a highly urbanized watershed with a large diverse population that includes portions of the inner city as well as wealthy suburban communities. An IWMP for this watershed was completed in the winter of 2005.

This Partnership has elected a Board of Directors and has received its tax-exempt status as the first multi-municipal Watershed Partnership in the region and this year hired its first Executive Director of the organization. The Executive Director began working for

the organization in the spring of 2007. The mission of the Partnership is the implementation of the watershed management plan.

Current members of Tookany-Tacony/Frankford Partnership:

Abington Township
Awbury Arboretum
Cheltenham Township
Fairmount Park Commission
Environmental Stewardship and Education Division
Frankford Group Ministry
Friends of Tacony Creek Park
Jenkintown Borough
Melrose Park Neighbors Association
Montgomery County Commissioners
Montgomery County Conservation District
Ogontz Avenue Revitalization Corporation
PA Department of Environmental Protection
PA Environmental Council
PA Horticultural Society
Philadelphia Water Department
Rockledge Borough
Senior Environmental Corps.
US Environmental Protection Agency
US National Park Service

Tookany-Tacony/Frankford Organization/Committees

This nonprofit organization has begun to organize itself into various working committees under the direction of the Board of Directors. Thus far, the committees consist of the Executive Committee and Planning and Performance. This organization has applied for several grants and funding programs over the past year, including the National Park Service's Community Planning Grant – which funds the development of a "Communications Plan" for the group. The Partnership also applied to the USEPA's Targeted Watershed Initiative Grant for project implementation funding.

Pennypack Creek Watershed

The Pennypack Watershed covers 56 square miles and covers portions of 11 municipalities and the City of Philadelphia. The watershed is located within the lower Delaware River Basin and discharges into the Delaware River in the City of Philadelphia. PWD led an effort to develop a RCP for this watershed, which was completed in 2005. Currently, the stakeholders who participated in the RCP process are now working with the Montgomery County Planning Commission in the development of a Pennypack Greenway, one of the major recommendations of the Pennypack RCP. This partnership will be reconvened in the fall of 2007 to drive the completion of an IWMP.

In 2006, a number of public outreach and education events took place, including:

1. Project Headwaters

In early 2007, a group of watershed practitioners, including PWD, Temple/Villanova Sustainable Stormwater Initiative, Southeast Montgomery County Trout Unlimited, Montgomery County Conservation District, and Pennsylvania Environmental Council, met to discuss forming a grassroots stream conservation movement in the Pennypack watershed. The outgrowth of these discussions was the formation of Project Headwaters, a regional initiative aimed at identifying and prioritizing stream restoration, habitat improvement and stormwater management projects in the headwaters of the Pennypack Creek watershed. To date, Project Headwaters has identified several restoration projects in conjunction with developing a directed conservation strategy, and submitted grants to the National Fish and Wildlife Foundation's Delaware Estuary Watershed Grants Program and TreeVitalize to implement said projects.

2. Pennypack Greenway Partnership

The Pennypack Greenway Partnership was founded to promote land conservation and the preservation of a greenway corridor throughout the Pennypack Creek Watershed. Members of the Partnership include: Pennypack Ecological Restoration Trust, Montgomery County Land Trust, Upper Moreland Township, Philadelphia Water Department, GreenSpace Alliance, Temple University Center for Sustainable Communities, Montgomery County Planning Commission, Fairmount Park Commission, Audubon Pennsylvania, Pennsylvania Environmental Council, and Keystone Conservation Trust. The partnership has been working on their goals over the past FY 2007, which include: permanent preservation of land for a protected greenway, ecological restoration, stormwater management, stewardship, cultural and historical resource preservation, enhanced quality of life, and an increased understanding of, affinity, and commitment to natural systems. The Partnership is currently working on action plans for the implementation of their goals, as well as a Pennypack greenway map.

Poquessing Creek Watershed

Over the course of the year, the Poquessing Creek Watershed RCP Steering Committee and the RCP Team (consultants and PWD) finalized the remaining components of the planning process and the final report.

A photo contest was held in the summer of 2006 to build awareness of the beauty of the Poquessing watershed. The winning photographs from the contest were placed in the 2008 Poquessing RCP Calendar, which was developed in the fall of 2007 as an additional outreach tool. The calendar also includes the recommendation that resulted from the

RCP, along with the Executive Summary of the plan. It was distributed widely, to every RCP participant and partner in the watershed.

In October, 2006, an RCP steering committee meeting was held to finalize the recommendations and management options for the plan. Subsequently, the first draft of the plan was submitted by the consultants (Borton-Lawson Engineering & Forbes Environmental) to PWD and the steering committee.

The following spring, a number of workshops and meetings were held to continue to build awareness of the RCP. Along with the Partnership for Delaware Estuary and Friends of Poquessing, PWD co-hosted a "Property Management Workshop" at the Community College of Philadelphia. PWD and its consultant (Adam Levine) partnered with the Friends of Poquessing on a separate occasion to present Adam Levine's historical findings in the Poquessing at the Community College of Philadelphia. His presentation was titled, "A Brief History of the Poquessing Watershed." In early May, a rain barrel giveaway took place at the Friends of Poquessing Native Planting Day at Torrey Ave. & Academy Ave, near the Parkwoods community, a large residential community in the watershed. All of the workshops provided opportunities for PWD to educate local residents about the RCP and to get feedback from them on the planning process and final plan.

In July, 2007, the steering committee met for their last meeting, under the RCP process. The consultants to the RCP submitted the final report to the Steering Committee members and RCP Team.

Delaware River Direct Watershed

In September, 2006, PWD and its partners – Fairmount Park Commission, Pennsylvania Environmental Council, Philadelphia Department of Recreation, and Delaware River Basin Commission - were awarded a grant from the Department of Conservation and Natural Resources to develop a RCP in the Delaware Direct Watershed. As a result, PWD put out a bid through a Request for Proposals (RFP) for consultants on this project. In the spring of 2007, the consultants and their sub-consultants were selected - Cahill Associates and Pennsylvania Horticultural Center. By the end of June, 2007, the RCP Team (PWD and consultants) determined that a unique RCP strategy would be desirable for this watershed due to the number of planning efforts currently in place and the complexity of issues in and along Philadelphia's waterfront. As a result, the RCP Team modified the scope of the RCP in order for it to include an emphasis on the implementation of the Philadelphia Green Plan recommendations. The DCNR has approved this approach. The first phase of this project (data collection and public participation) will commence in the fall of 2007.

Wissahickon Creek Watershed

An IWMP was initiated for the Wissahickon Creek Watershed in fall, 2005. The foundation of this planning effort is the comprehensive collection of data that will prioritize pollution and impairment sources and confirm the best strategies for alleviating these impairments and restoring the watershed to one that is fishable, swimmable and enjoyable. PWD completed a watershed-wide assessment of biological, chemical and physical data (including fluvial geomorphologic analysis and modeling) in 2007, in addition to providing professional facilitation services to support the Wissahickon Creek Watershed Partnership.

Current Members of Wissahickon Watershed Partnership:

Abington Township
Ambler Wastewater Treatment Plant
Clean Water Action
Fairmount Park Commission
Friends of the Wissahickon
F X Browne, Inc.
Lansdale Borough
Lower Gwynedd Township
McNeil CSP
Merck, Inc.
Montgomery County Conservation District
Montgomery County Planning Commission
Morris Arboretum
North Wales Borough
North Wales Water Authority
PA Department of Environmental Protection
PA Environmental Council
Philadelphia University
Philadelphia Water Department
Schuylkill Center for Environmental Education
Schuylkill Riverkeeper
Senior Environmental Corps, Center in the Park
Temple University, Center for Sustainable Communities
Upper Dublin Township
Upper Gwynedd Township
US Environmental Protection Agency
Whitemarsh Township
Whitpain Township
Wissahickon Restoration Volunteers
Wissahickon Valley Watershed Association

The Wissahickon Partnership was convened a number of times over the past year as this group continues to drive the development of the IWMP for this watershed area.

Wissahickon Workshops and Projects

1. Rain Barrel Workshops for Homeowners – February 2007

The rain barrel project consists of the implementation of rain barrels as a method to reduce stormwater runoff. This implementation project will enlist members of the communities in and around Philadelphia, as well as several environmental organizations to host a rain barrel(s) on their personal property or on the property of their organization. The primary goal of this project is to implement a property-level Best Management Practice (BMP) to aid in the reduction of the volume of stormwater reaching the receiving stream or to increase the length of time it takes the stormwater to reach the receiving stream.

This project includes an educational component presented during community workshops that consists of a brief summary of the targeted watershed, instruction on the assembly and maintenance of the rain barrel, as well as the uses and benefits.

PWD's rain barrel workshops for fiscal year 2007 are listed below:

October 16, 2006: Wissahickon Watershed, sponsored by PWD; Schuylkill Center for Environmental Education (SCEE); Friends of the Wissahickon (FOW); and Wissahickon Watershed Partnership, 23 participants.

October 21, 2006: Wissahickon Watershed, sponsored by PWD; SCEE; FOW; and Wissahickon Watershed Partnership, 27 participants.

February 3, 2007: Wissahickon Watershed – Chestnut Hill, sponsored by PWD; SCEE; FOW; and Wissahickon Watershed Partnership, 99 participants.

April 21, 2007: Wissahickon Watershed – Springfield Township, sponsored by PWD; Wissahickon Watershed Partnership, and Springfield Township EAC, 64 participants.

June 9, 2007: Wissahickon Watershed – Cathedral Run, sponsored by PWD; SCEE; and Wissahickon Watershed Partnership, 23 participants.

June 13, 2007: Wissahickon Watershed – Cathedral Run, sponsored by PWD; SCEE; and Wissahickon Watershed Partnership, 13 participants.

*A total of 249 barrels were received by the participants.

2. Algae Study Workshop – June 2007

The Wissahickon Algae study is a volunteer based scientific study, guided by PWD, examining the role of algae and shade in the Wissahickon Creek. Volunteers sign out equipment provided by PWD and collect data along random points in the mainstem and tributary creeks, the data is then analyzed by PWD. This pilot study is targeted for closure in late fall of 2007, but will most likely become an annual event.

3. Wissahickon Creek Detention Basin Inventory and Retrofit Program

PWD was funded by a USEPA 104b3 grant in the amount of $60,000 to implement the Wissahickon Creek Detention Basin Inventory and Retrofit program – beginning in May of 2006 and running through September 2007. The purpose of this initiative was to develop and implement a replicable approach for generating an inventory of existing stormwater management facilities within a watershed drainage area and constructing a process by which inventoried basins could be prioritized for retrofit with structural and nonstructural stormwater best management practices aimed at enhancing groundwater recharge and water quality treatment of stormwater runoff. This initiative established a prioritized inventory of existing sites where retrofits will provide the most benefit for reducing stormwater runoff impacts to the creek and increasing stream baseflow. The pilot study for this initiative focused on dry-bottom detention basins within the chosen study area, the Wissahickon Creek Watershed. (The study area for this initiative was limited to the sub-watershed drainage areas of the tributary streams flowing to the Wissahickon Creek mainstem, excluding the mainstem drainage area.) The study was focused on the 1st and 2nd order tributary streams where implementation benefits would be maximized.

Upon completion, the final report and all associated materials will be disseminated to the public at the following web address: www.PhillyRiverInfo.org.

E.3.2.2 Natural Stream Channel Design (NSCD)

PWD is currently employing NSCD as a means to improve the health of aquatic communities in receiving waters with degraded flow and habitat alterations due to stormwater runoff. NSCD aims to restore receiving waters several ways, including the reconstruction of stream geometry for present day flows, reestablishing the stream bank to allow for improved access to the flood plain, installing in-stream energy dissipating devices, and creating low velocity nulls by using vernal pools to achieve flood attenuation and treatment. The exploration of the NSCD technique is required in Section 2, Step 3b of the City of Philadelphia MS4 NPDES permit. The permit requires the City to employ and evaluate NSCD as a viable rehabilitation option for channelized, eroded, scoured, silted, and inhospitable streams within Philadelphia County. This technique is to be deployed by PWD to work toward improving the healthy living resources of Philadelphia, including the number, health, and diversity of benthic invertebrates and fish species in watersheds impacted by stormwater. In addition to meeting permit requirements, the Marshall Road, Wise's Mill, Whitaker Avenue, Redd Rambler, and Cathedral Run projects carried out by PWD will hopefully demonstrate to neighboring communities the environmental benefits of NSCD.

Marshall Road

During FY 2007, the stream restoration site known as Marshall Road, was visually inspected throughout the year. Visual assessments are used by PWD to monitor any significant changes to the stream channel, as well as any possible impacts on PWD infrastructure. Fortunately, no significant changes were observed in the restoration reach and no maintenance was required on this NSCD demonstration project executed by PWD. For a full description of the Marshall Road project, please refer to Appendix C of this document and FY 2006 Stormwater Annual Report page 69.

Wises Mills

The Wises Mill Road stream restoration project is an exciting collaboration between the PWD's Waterways Restoration Team (WRT) and the Fairmount Park Commission (FPC) to restore and stabilize a tributary to the Wissahickon Creek. PWD hired the Harrisburg engineering firm of Skelly and Loy, which specializes in natural stream channel design and restoration, to develop an interim stabilization plan for the lowest segment of the Wises Mill Road tributary of Wissahickon Creek. This tributary was severely impacted by the 2004 tropical storms of August 1 and September 28. A small parking lot which protruded into the stream was destroyed, endangering a section of the roadway. Culverts to the confluence of the Wissahickon were completely blocked after the two storms, causing massive flooding and undermining of the roadway. Most recently, following a June 2005 storm, the lowest dam on the Wise's Mill tributary, directly above the point where the stream enters the Forbidden Drive culvert, was found to be in failure.

The long term goal for this project is the complete restoration of the Wises Mill Road tributary, including its main stem which originates on Summit Avenue and the segment of the stream which begins just below Henry Avenue. The short term stabilization plan focused on the lowest 250 foot segment of the stream, as this was the section that needed immediate attention.

The targeted reach was restored and stabilized during Summer, 2007. To date, the reach has been subjected to multiple significant storm events and required no additional modification since completion of construction. Moving forward, PWD plans to begin conceptual design on the restoration of the remaining 6,000 feet of Wises Mill located upstream of the restoration reach. This work will be designed in conjunction with a 2-acre stormwater treatment wetland that will be located at the headwaters of a tributary stream to Wises Mill Run.

Whitaker Avenue

The Tacony Creek – Whitaker Avenue stream restoration project is situated in the Tacony Creek Park located of Roosevelt Boulevard (US 1) downstream of the Whitaker Avenue Bridge and upstream of the Wyoming Avenue Bridge in northeastern Philadelphia. This project will implement a sustainable approach to stream habitat restoration that will mitigate the impacts of urban development and related hydrologic and hydraulic modifications over approximately 2,000 feet of stream length. PWD has assembled a project team to develop an approach for the restoration of Tacony Creek that encompasses the replication of natural hydrologic and ecological cycles, sustainability, enhancement to riparian and in-stream aquatic habitat, improved aesthetics, and significant cost savings over structural solutions. The results of this approach include not just stable stream bank geometry, but also long term ecological stability.

The project site involves 2 stakeholders, Fairmount Park Commission and the Scattergood Foundation, both of whom are partners in working to see this project to fruition.

Currently the project is at 65% Design and PWD has submitted necessary permit applications in February, 2007 and is currently awaiting approval from PADEP and USACE. Based on the current schedule, the project should be bid during the spring of 2008, with construction occurring during fall, 2008.

Redd Rambler

Over the years, the PWD has received numerous complaints and petitions from residents in the vicinity of Redd Rambler Run, a tributary of the Pennypack Creek (Paul's Run Watershed) located in Northeast Philadelphia, about property erosion, periodic flooding and safety concerns. PWD has since had the opportunity to evaluate and participate in natural restoration technologies – engineering and stream studies that focus on the natural characteristics of a stream and incorporate techniques such as reconnecting the stream to its floodplain, fortifying the stream's banks and floodplains with deep rooted vegetation, and installing boulders and rocks to decrease the stream's energy under storm conditions. Natural restorations enhance the existing beauty of streams while giving them back their ability to better handle higher flows. In addition, natural restoration techniques provide habitat for fish and insects, creating a "healthy" stream.

In March of 2004, PWD contracted the services of KCI Technologies, an environmental engineering design firm, to prepare final design and construction plans for the restoration of approximately 2,500 feet of Redd Rambler Run bounded by Verree Road to the north and Walley Avenue to the south.

Over the last three and a half years, PWD has worked diligently with the 89 property owners that border the stream. While this has caused significant delays in the design process, PWD also feels that these efforts have been worthwhile in ensuring the resident's confidence in its stewardship of the City and its environment.

Currently, PWD is finalizing the 65% design package and planning on the submitting for all applicable permits in September, 2007. Based on the present schedule, the project is planned to be bid during Spring, 2008, with construction occurring during Fall, 2008.

Cathedral Run

During FY 2007, PWD received the final Watershed Management Plan for the Cathedral Run watershed. Upon receipt, PWD began working with Fairmount Park Commission (FPC) to establish a prioritization of the projects and outreach efforts contained within the Plan. The first project to be tackled by PWD and FPC is the design and construction of Infiltration Area #1. This Area has been targeted to manage and infiltrate stormwater from up to 25 acres. To date, PWD and FPC have hired a consultant to begin the design process. It is a PWD goal for FY 2008 to complete the 100% Design for this facility, and perhaps move towards construction. For a full description of the Cathedral Run project, please refer to Appendix C of this document and FY 2006 Stormwater Annual Report page 73.

E.3.2.3 Monitoring Effectiveness of NSCD

As each of the five NSCD projects are constructed and mature, PWD realizes the importance of extensive monitoring and O&M that accompanies such projects. It is very rare that such projects do not require additional "tweaking" or maintenance. In addition, each project provides the opportunity to learn about what techniques do and do not work in their respective hydrologic and hydraulic regimes. In order to assess the effectiveness of the five NSCD projects, PWD will conduct post monitoring at each site that includes one or more of the following monitoring activities; the measurement of relevant biological, chemical, and physical parameters to be used in comparison to pre-construction conditions, visual assessment and surveying of channel morphology over time, and the scheduling of any operation and maintenance requirements.

During FY 2007, visual inspections of the Marshall Road site were conducted. The inspections did not identify any maintenance needs and the project is currently operating as designed. Marshall Road is the only completed NSCD project, therefore post-monitoring and evaluation of the other locations will be reported in the coming fiscal years. In FY 2008, post-monitoring of Marshall Road will continue, and inspections will begin at the Whitaker Avenue and Wise's Mill NSCD project locations.

E.3.3 Target C - Wet Weather Water Quality and Quantity

In addition to the implementation of the NSCD projects discussed above, the City also understands the need to address wet weather water quality and quantity issues prior to the flow entering its rivers and streams. In such, the City has implemented various BMP projects in which PWD has partnered with groups in each watershed. In the years to come, PWD plans to monitor each of these projects to assess their efficacy such that lessons can be learned and applied in future projects.

A comprehensive list of BMP projects are presented in Table E.3.3-1 below. The table includes projects in both MS4 as well as combined sewersheds since the projects, regardless of location within the City, present an opportunity to assess implemented technologies. The assessments can then be used to select appropriate practices for improving water quality and quantity. Additional information regarding each project can be found in Appendix C. Each project is listed by name, watershed, project stage and page number of fact sheet within Appendix C. The five project stages presented in Table E.3.3-1 are: construction complete, design complete, in construction, in design, and ongoing.

Construction Complete: The project has been fully constructed

Design Complete: The project has been fully designed and is ready for contractor bids

In Construction: The project is currently under construction in FY 2007

In Design: The project is currently being designed by PWD staff and partners in FY 2007

Ongoing: The project is still undergoing multiple stages of design or construction

Since the FY 2006 Stormwater Annual Report, great progress has been made in the construction, design, and initiation of new wet weather BMPs. Since FY 2006, seven new projects are 'in design' and two new projects are 'design complete'. In addition to new projects, of those presented in FY 2006 five have moved from 'design complete' to 'construction complete' stages and three projects have moved from 'in design' to 'design complete' stages.

Table E.3.3-1 PWD BMP Projects

Project Name	Project Stage	Shed Type
47th and Grays Ferry	Construction complete	Combined
BLS Stormwater Retrofit Phase I	Construction complete	Combined
Courtesy Stables Runoff Treatment Project	Construction complete	Separate
East Falls Parking Lot	Construction complete	Separate
Fox Chase Farms Riparian Buffer Project	Construction complete	Separate
Marshall Road Stream Restoration	Construction complete	Combined
Mill Creek Basketball Court	Construction complete	Combined
Mill Creek Farm	Construction complete	Combined
Monastery Stables Stormwater Diversion & Detention Project	Construction complete	Separate
N. 50th Street	Construction complete	Combined
Pennypack Park Wetland & Parking Lot	Construction complete	Separate
Saylor Grove Stormwater Treatment Wetland	Construction complete	Separate
School of the Future	Construction complete	Combined
West Mill Creek Infiltration Tree Trench	Construction complete	Combined
Wissahickon Charter School	Construction complete	Separate
Baxter Visitors' Parking Lot	Design complete	Separate
Clark Park	Design complete	Combined
Cliveden Park	Design complete	Combined
Jefferson Square Park	Design complete	Combined
Baltimore Avenue Streetscape	In design	Combined
BLS Stormwater Retrofit Phase II	In design	Combined
Cathedral Run	In design	Separate
Columbus Square Streetscape	In design	Combined
Liberty Lands	In design	Combined
Overbrook Environmental Education Center	In design	Combined
Redd Rambler Run	In design	Separate
Springside School	In design	Separate
Sustainable Urban Drainage at Venice Island	In design	Separate
Waterview Recreation Center	In design	Combined
Whitaker Avenue Stream Restoration	In design	Combined
W.B Saul High School Project	Ongoing	Separate
Wise's Mill	Ongoing	Separate

Please refer to Appendix C for fact sheets describing all of the above projects.

Section F
Detection, Investigation, and Abatement of Illicit Connections and Improper Disposal

F.1 Compliance with Permit Requirements

The City of Philadelphia's Defective Lateral Detection and Abatement Program was developed under the City's initial Municipal Separate Storm Sewer System (MS4) permit signed in 1995 and further refined under a Consent Order & Agreement (COA), reached with the Pennsylvania Department of Environmental Protection (PADEP) on June 30, 1998. On March 18, 2004, the COA was officially terminated. However, the City has remained faithful to the terms of that agreement and many of the COA requirements have now been incorporated into the City's new MS4 permit. As in previous years, during Fiscal Year 2007, the results of dry weather outfall and subsystem sampling were used to evaluate priorities for the Defective Lateral Detection and Abatement Program.

F.1.1 Staffing

As in prior years, the City maintains 4 crews dedicated to the identification and abatement of defective connections. Additional resources such as CCTV truck and crews are regularly assigned as needed to assist the program.

F.1.2 Funding

In addition to the staff resources dedicated to the identification and abatement of defective connections, the City funds abatement of owner-occupied, residential cross connections through the Cross Connection Repair Program. Funding for cross connection abatement and other customer assistance programs is budgeted at $2.5 million annually. During the reporting period, 78 abatements were completed under the program, at an average cost of $4,985.06, for a total cost of $388,843.75.

F.2 Prevention of Illicit Discharges

F.2.1 Sewer and Lateral Inspections

The City requires plumbing permits for connections to the municipal sewer system. The permit affords the property owner an inspection of the plumbing work performed. Corrections of defective connections are confirmed to ensure that the ultimate discharge to the receiving waters does not contain sanitary waste.

F.2.2 Abatement of Residential Cross Connections

The City maintains a Defective Lateral and Abatement Program in compliance with the MS4 permit issued by the Pennsylvania Department of Environmental Protection. The City requires abatement of all residential defective connections upon discovery. An annual funding allotment of $2.5 Million is available through customer assistance

programs in the form of City-funded cross connection abatements and HELP loans. Information on the assistance programs accompanies the homeowner's notification of defect. The City also publicizes the assistance programs through bill stuffers to ratepayers, and through public education events. The City also maintains the legal authority to take administrative action to cease the pollution condition. During the reporting period, the City funded abatement of 78 residential cross connections at an average cost of $4,985.06, for a total cost of $388,834.75.

F.2.3 Abatement of Commercial and Industrial Cross Connections

The City maintains a Defective Lateral and Abatement Program in compliance with the MS4 permit issued by the Pennsylvania Department of Environmental Protection. The City requires prompt abatement of all commercial and industrial defective connections upon discovery, and maintains the legal authority to take administrative action to cease the pollution condition. In Fiscal Year 2007, no commercial or industrial cross connections were abated.

F.3 Investigation of Illicit Discharge Sources

The City maintains a stormwater outfall monitoring system in compliance with the MS4 permit issued by the Pennsylvania Department of Environmental Protection. All 434 of City's permitted stormwater outfalls are routinely inspected such that all outfalls are inspected at least once per permit cycle. Those with dry weather discharges are sampled for fecal coliform and fluoride analysis. Outfalls are prioritized for investigative work by the Industrial Waste Unit or the Defective Lateral and Abatement Program. In addition, outfalls identified as priority outfalls under the MS4 permit are sampled quarterly.

The City also investigates all potential reports of an illicit discharge from the stormwater system through either the Industrial Waste Unit or the Sewer Maintenance Unit. The City investigates and reports all discovered illicit discharges to receiving waters. During Fiscal Year 2007, the City investigated 39 sewage discharges.

In addition to programs above, the City also has initiated a monitoring and modeling effort within the separate sanitary sewer areas to target specific areas where infiltration and/or ex-filtration may be likely. In the summer of 1999, the City initiated a portable flow-monitoring program to augment monitoring data that was collected by an existing network of permanent monitoring sites at fixed locations. Under this program, fifteen (15) American Sigma 920 portable flow monitors were purchased. These monitors have multiple sensors that use a combination of pressure transducer and ultrasonic technologies for measuring depths and Acoustic-Doppler technology for velocity measurement. Additionally, a consultant, Camp Dresser & McKee, was chosen to assist the City in the startup of this program. Data from this program is routinely analyzed

and compared to data provided from the City's extensive Stormwater Management Model (SWMM) hydraulic model.

One of the goals of the monitoring program was for the City's in-house instrument technicians to receive training and experience in the proper setup, use, maintenance, and trouble-shooting of flow monitoring equipment. Beginning with the third round of deployments in October 2000, the City's personnel began running this program completely in-house.

Another initiative started by the City is a very large undertaking to evaluate and enhance our existing sewer assessment program. The City awarded a contract for $5.7 Million over two years to the engineering firm of Hazen & Sawyer Environmental Engineers & Scientists to inspect approximately 200 miles of sewers in 9 pilot areas using CCTV equipment. Four of these areas (Manayunk, Rhawnhurst, Oak Lane, and Bustleton) are in separate storm and sewer system areas. Additionally, the consultant provided training to the City's in-house sewer inspection personnel on the standard NASSCO rating system. This consultants work was completed Fiscal Year 2006 and the City is now running the entire program in-house.

F.4 Dye Tests and Abatements

During Fiscal Year 2006, the Defective Connections Abatement staff conducted 2,448 complete tests. Of the complete tests, 129 (5.3 %) were found defective. The total cost for these 78 abatements, both residential and commercial, was $333,093.87.

F.5 Outfall Investigations

During Fiscal Year 2007, 46 outfalls not included in the Priority Outfall sampling program were inspected and 33 were sampled due to observed dry-weather flow. In addition, 46 outfalls were inspected and 41 sampled due to observed dry-weather flow under the Priority Outfall quarterly sampling program during Fiscal Year 2007. These samples are used to evaluate priorities for the Defective Lateral Detection and Abatement Program. A summary table of the progress of the Defective Lateral Detection and Abatement Program from FY 2005-FY 2007 as well as a synopsis of the work in the priority areas is provided below.

Table F.5-1 Summary of Defective Lateral Detection and Abatement Program FY 2005-FY 2007

	# Cross Connections Abated		Total Cost of Abatements
	Residential	Commercial	
FY 2005	48	5	$169,955
FY 2006	66	3	$333,094
FY 2007	78	0	$388,844
Total	**200**	**8**	**$891,893**

In the past three reporting periods, PWD has abated 200 cross connections at a cost of $891,893. Over the past three years, the current reporting period, has accomplished the greatest number of cross connection abatements.

F.5.1 T-088-01 (7th & Cheltenham Avenue)

In this priority outfall area, as of June 30, 2007, 2,828 properties have had complete tests as defined by the MS4 permit. Of these properties, 130 (4.6%) have been found to have defective laterals and been abated.

Additionally, at the end of Fiscal Year 2002, six dry weather diversion devices were installed to intercept contaminated flow within the storm system from five identified areas and redirect the flow into the sanitary system. These devises are inspected regularly by the City's Collector System Flow Control Unit. The locations of these devices, the number of inspections, blockages, and discharges found in Fiscal Year 2007 are listed below:

Table F.5.1-1 Dry Weather Diversion Device Installation Locations

Location	ID#	Inspections	Blockages	Discharges
Plymouth Street, West of Pittville Ave.	CFD-01	49	12	0
Pittville Avenue, South of Plymouth St.	CFD-02	49	13	2
Elston Street, West of Bouvier Street	CFD-03	50	11	1
Ashley Street, West of Bouvier Street	CFD-04	43	10	0
Cheltenham Ave, East of N. 19 Street	CFD-05	51	15	0
Verbena Street, South of Cheltenham Ave.	CFD-06	51	3	0

Fecal coliform sampling at this outfall continues quarterly. Results for the outfall samples are listed below:

Table F.5.1-2 T-088-01 Quarterly Fecal Coliform Sampling

Date	Outfall (Fecal Colonies per 100 ml)
9/18/06	4,400
10/25/06	3,400
3/26/07	280
5/22/07	2,500

As part of the City's efforts to improve conditions at this outfall, stream embankment repairs and elimination of the pooling area on the outfall apron were proposed. Design work for these improvements was completed and the project was bid in Fiscal Year 2003. Construction was completed in Fiscal Year 2005.

F.5.2 W-060-01 (Monastery Avenue)

In this priority outfall area, as of June 30, 2007, 610 properties have had complete tests as defined by the MS4 permit. Of these properties, 16 (2.6%) have been found to have defective laterals. All 16 have been abated.

Additionally, two dry weather diversion devices were installed to intercept contaminated flow within the storm system and redirect the flow into the sanitary system. These devises are inspected regularly by the City's Collector System Flow Control Unit. The locations of these devices and the number of inspections, blockages, and discharges in Fiscal Year 2007 are listed below:

Table F.5.2-1 W-06-01 Inspections

Location	ID#	Inspections	Blockages	Discharges
Jannette Street, West of Monastery Ave.	MFD-01	44	4	0
Green Lane, North of Lawnton Street	MFD-02	42	4	0

Fecal coliform sampling at this outfall continues quarterly. Results for the outfall samples are listed below:

Table F.5.2-2 W-06-01 Quarterly Fecal Coliform Sampling

Date	Outfall (Fecal Colonies per 100 ml)
9/18/06	310
10/25/06	150
3/26/07	290
5/16/07	410

F.5.3 Monoshone Creek Outfalls

Of the seven stormwater outfalls that discharge to the Monoshone Creek, the focus of the City's efforts is primarily just one outfall, W-068-05. This outfall is the largest in the watershed and essentially constitutes the headwaters of the creek since the historic creek

has been encapsulated into this storm system and daylights at this outfall. This outfall is also the source of the majority of the fecal contamination in the creek. For this priority outfall, as of June 30, 2007, 2,360 properties have had complete tests as defined by the MS4 permit. Of these properties, 82 (3.5%) have been found to have defective laterals and were subsequently abated.

In the spring of 2003, the City conducted CCTV sewer exams of both the storm and sanitary systems under Lincoln Drive. Given the high vehicle volume on this major artery for the City, this was a very difficult and time-consuming effort as all exams had to be done during weekends. A leak from the sanitary interceptor under Lincoln Drive, in the vicinity of Johnson Street, into the storm system was detected. The CCTV examinations showed that the integrity of the sanitary sewer was generally in excellent condition except for one area where bricks appeared to be missing in the vicinity of where the infiltration into the storm system was noted.

The City decided to move forward with a lining contract to address this situation. The contract provided for the lining of 3,160 feet of 2'-6" brick interceptor sewer under Lincoln Drive from Washington Lane (paper street only) to Arbutus Street. This scope included the entire length of sanitary sewer that is not physically lower in depth than the storm sewer system. The contract was bid, awarded, and completed in Fiscal Year 2004.

The City was also concerned about the erosion that had been occurring to the channelized section of Monoshone Creek at the W-068-05 outfall. The erosion had created a large pool at the outfall that the City believed exasperated the nuisance odors experienced and created an unsafe condition for small children that might wade in the creek. After discussion with the local community group, the Friends of the Monoshone, the City decided to make repairs to the channelized section to remove the pool and shore up the retaining walls. This work was designed as part of the sewer-lining contract above and performed at the same time.

Since that time, periodic follow up examinations of the storm system during dry weather periods have been conducted by the Industrial Waste Unit in attempts to locate additional isolated areas where fecal contamination may be occurring.

Additionally, the City of Philadelphia completed construction of a 1-acre stormwater treatment wetland this past year at outfall W-060-10. This wetland treats the dry weather flow fed by springs in this outfall as well as the wet weather runoff from the outfall's 156-acre drainage area. During and following the construction of this wetland, the City has been continuing to investigate dry weather contaminations within this outfall area.

Fecal coliform sampling at these outfalls continues quarterly. A listing of the results for the W-068-05 outfall samples in Fiscal Year 2007 are listed below:

Table F.5.3-1 W-068-05 Quarterly Fecal Coliform Sampling

Date	Outfall (Fecal Colonies per 100 ml)
9/18/06	5,200
10/25/06	3,100
3/26/07	2,000
5/16/07	2,300

F.5.4 P-090-02 (Sandy Run)

The City has previously installed a dry weather diversion device to intercept contaminated flow within the storm system and redirect the flow into the sanitary system. This devise is inspected regularly by the City's Collector System Flow Control Unit and continues to function properly. The number of inspections in Fiscal Year 2006 was 55. There were 4 blockages and 3 discharges reported in conjunction with these inspections.

F.5.5 Manayunk Canal Outfalls

Of the 13 stormwater outfalls that discharge into the Manayunk Canal, the City is focusing on 7 that have recorded dry weather flow with some amount of fecal contamination. These 7 outfalls are listed below:

- S-051-06
- S-058-01
- S-059-01
- S-059-02
- S-059-03
- S-059-04
- S-059-09

In these 7 outfalls, as of June 30, 2006, 2,444 properties have had complete tests as defined by the MS4 permit. Of these properties, 59 have been found to have defective laterals and subsequently abated.

F.6 2006 Monoshone Study

In FY 2006, PWD conducted and completed an analysis of the 82 defective lateral abatements and sewer relining work performed in the sewershed of outfall W-068-04/05 which discharges to the Monoshone Creek in the Wissahickon Creek watershed. The purpose of this analysis was to determine the water quality improvements achieved as a result of this work and to compare this improvement with the additional water quality benefits anticipated from the Saylor Grove Stormwater Wetland BMP, also located in the Monoshone. Significant reductions were achieved in fecal coliform concentrations and loadings in outfall W-068-04/05 as a result of defective lateral abatements, sewer relining, and the Saylor Grove Stormwater Wetland BMP. The entire Monoshone Creek Study can be found in FY 2006 Stormwater Annual Report, Appendix F.

F.7 End of Pipe Anti-microbial Pilot Study

In FY 2006, PWD purchased anti-microbial filtration fabric for installation in Monoshone Creek outfall W-068-05 to evaluate the effectiveness of this technology in reducing fecal coliform contributions to the Monoshone Creek from outfalls with defective laterals. The filtration fabric is surface bonded with an anti-microbial agent which kills bacteria upon contact. PWD completed an initial installation of a limited quantity of this product at the end of outfall W-068-05 in FY 2006 and collected water quality samples of the dry weather outfall flow upstream and downstream of the filtration fabric to assess product performance. The initial deployment failed to demonstrate product effectiveness in reducing fecal coliform and E. coli concentrations as was anticipated. After consulting with the manufacturer, it was decided that due the high volume of water consistently present in this outfall, more of this product should be utilized than was initially deployed. In FY 2007, more filtration fabric was deployed using a new configuration recommended by the manufacturer and sampling resumed. Final sampling and evaluation of this product will be completed in FY 2008.

Based on the results of this new product configuration, more filtration fabric may be added to the current installation or a new variation of the current product may be deployed in order to achieve the desired removal. If this technology proves effective in reducing fecal coliform concentrations in an outfall containing defective laterals, this same technology could be deployed at similar outfalls throughout the City. The deployment of this technology has the potential to safeguard and improve the integrity of in-stream water quality during the ongoing effort to locate and abate the sources of dry weather bacteria in the sewershed of a given outfall.

Section G
Monitor and Control Pollutants from Industrial Sources

G.1 Inspections

As Title III sites are identified as part of industrial site inspections the City will expand the inspection to include a review of PPC Plan, on-site visual inspection, verify proper operations and maintenance of BMPs, and review any DMRs for compliance with conditions of the individual NPDES permit.

In subsequent annual reports, any identified sites will be listed as having been subjected to the inspection described above.

G.2 Industrial Waste Inspection Forms

The City has updated its Industrial Waste Inspection Forms used during inspections which take place during enforcement activities as part of its Pretreatment program. The updated form was faxed to Jennifer Fields, Regional Manager, PADEP on March 29th, 2006.

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Section H
Monitor and Control Stormwater from Construction Activities

H.1 Introduction

As a result of extensive efforts throughout Pennsylvania to improve and protect overall watershed health the relative condition of streams and rivers has been investigated and classified. Each stream has been identified by the State as whether or not it is attaining its designated use as a swimmable, fishable waterbody. Furthermore, those streams listed as not attaining their designated use were assessed as to which primary pollutants were attributed to the impairments. The majority of stream miles throughout Philadelphia are listed as impaired due to urban runoff. Uncontrolled and untreated urban runoff presents an ongoing negative impact to the receiving streams as a result of increased impervious areas providing a greater rate and volume of runoff reaching the surface waters through the municipal separate storm sewer system.

PWD and watershed partners located within the Darby-Cobbs Creek watershed collaborated under the Act 167 Watershed Management Planning effort led by Delaware County Planning Commission and developed a comprehensive document inclusive of a stormwater Ordinance. The stormwater Ordinance expanded upon the State model Ordinance by addressing issues identified with respect to the Watershed. PWD committed to enacting the Darby-Cobbs Creek Watershed Management Plan by signing a resolution in August, 2005 followed by adoption of the Stormwater Regulations that became effective as of January 1st 2006. A copy of the resolution along with excerpts of Ordinance and Regulation language were delivered to the State in compliance with the NPDES permit on December 23rd, 2006.

Stormwater runoff is a concern both during construction and after construction. Active construction sites are the primary contributor of sediment to our waterways. The role of PWD in the plan review process has provided vastly improved oversight of site controls during earth disturbance activities and will assist in improving water quality. Additionally, post-construction stormwater management plan review now extends beyond peak rate control and encompasses water quality and water quantity technical requirements for more frequent storm events. Efforts continue to be focused on improving plan review for both E & S as well as post-construction stormwater management. The following discussion documents the progress made so far in terms of stormwater runoff from construction activities including the collaboration between City Departments as well as between the City and State agencies.

During Fiscal Year 2007 PWD performed numerous tasks in direct compliance with the NPDES Permit as well as tasks supporting continuance and improvement of a growing

stormwater management program and watershed program. Some of the fiscal year 2007 activities include the following:

- Enforced stormwater Regulations that are in compliance with the State Model Stormwater Ordinance
- Collaborated with multiple city departments to reduce barriers to low impact development
- Increased the erosion and sedimentation control inspection program
- Reviewed Stormwater Management Plans (E & S and post-construction stormwater management) for compliance with the Regulations
- Coordinated reviews with PADEP on NPDES permit applications
- Revised the Philadelphia Stormwater Management Guidance Manual
- Conducted stormwater workshops for the engineering and development community
- Updated Fact sheets and pamphlets on topics related to the changes in stormwater requirements and the development process
- Maintained and improved a website for receiving PWD project submittals online

The following discussion specifically documents progress made so far in terms of stormwater runoff from construction activities including the collaborative between City Departments as well as between the City and State agencies. A summary of all plan review activities in FY 2007 is presented in Table H.5-1 at the conclusion of this section.

H.2 Construction Site Runoff Control

PWD reviews Erosion and Sedimentation (E&S) Plans for sites disturbing between 15,000 square feet and one acre of earth while following policies and practices as provided within the PADEP E&S Control Manual. As a result of plan review and coordination with the State, scheduled site inspections as well as timely responses to active construction site complaints have been incorporated into the stormwater management program during FY 2007.

During each site visit the inspector communicates with the construction manager and requests to see a copy of the on-site E&S Plan. Photographs are taken documenting site conditions and included as part of the inspection report. The City inspection report form is adapted directly from the PADEP form. Copies of the inspection report detailing

out-of-compliance items are distributed to the site manager and maintained as part of an electronic project file.

A total of 81 E&S Control Plans were reviewed during this reporting cycle. Inspectors conducted 570 site inspections. Many sites were visited multiple times to ensure compliance with appropriate E&S controls. This value includes 86 site complaints which were typically not projects subject to PWD review. Several were coordinated visits with the PADEP designated engineer. Based upon the FY 2007 inspections, the major compliance issues continue to include improper use of silt fences, inadequate or lack of inlet protection, contractor not following the on site E&S Plan and a complete absence of E&S controls. The sites visited cover all of Philadelphia including both separate storm sewer areas and combined sewer areas as depicted in Figure H.2-1.

As the E&S Control program moves forward, scheduled inspections and responses to complaints will be addressed separately. Plan reviews will continue for projects between 15,000 square feet and one acre of earth disturbance. Coordinated site visits between PWD and PADEP will continue throughout the permit cycle as needed and documented accordingly. The documentation of site visits will be refined through improved data collection which will allow for clear representation of projects located within separate or combined sewersheds. Subsequent annual reports will include compilations and assessments of site visits and improvement in E&S compliance both for the specific reporting year as well as over the course of the permit cycle.

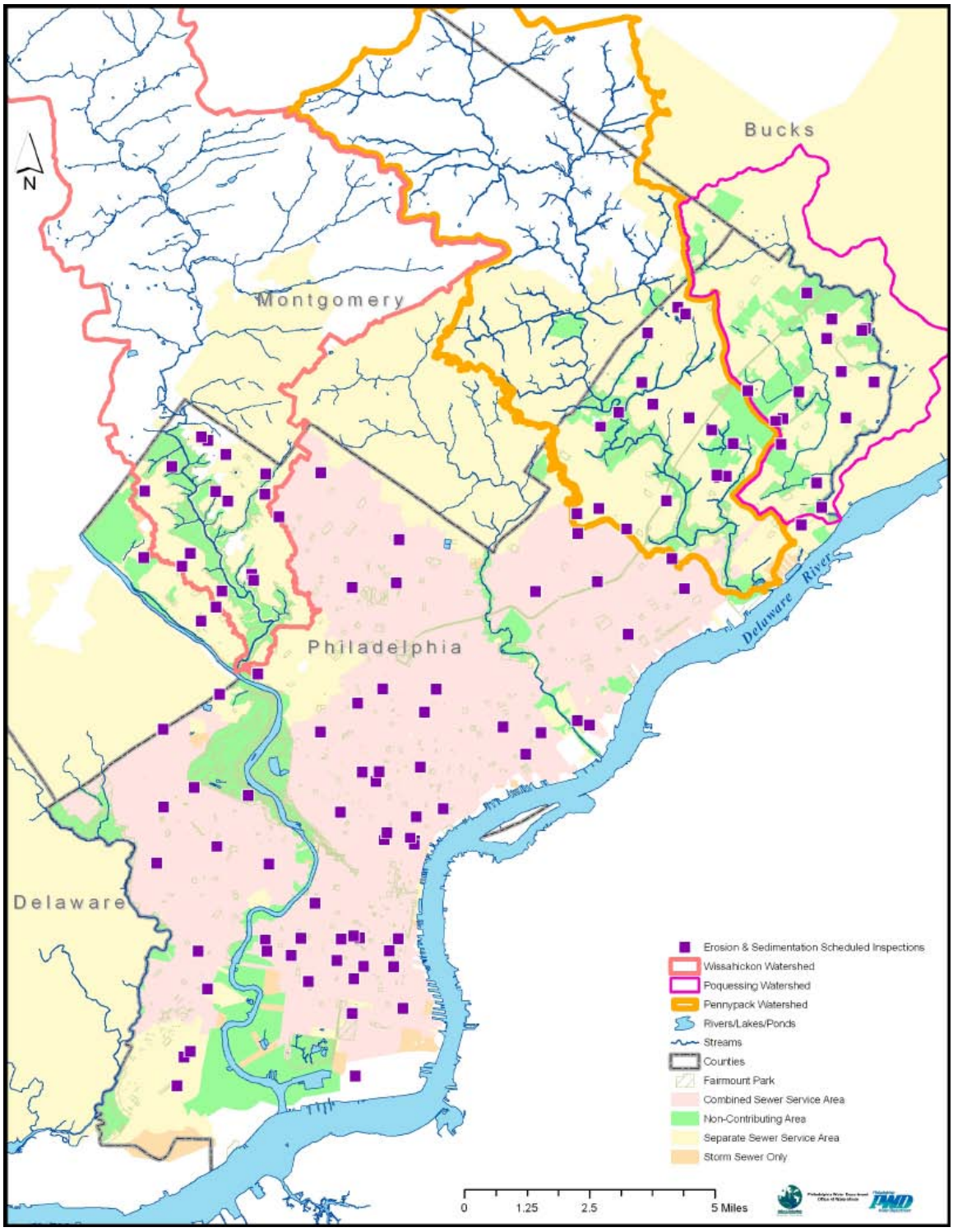


Figure H.2-1 Construction Site Inspections

H.3 Post-Construction Stormwater Management in New Development and Redevelopment

The adoption of City wide Stormwater Regulations as of January 1st 2006 enabled Philadelphia to review plans for both new and redevelopment sites ensuring that water quality and quantity are part of the management plan. The Regulations focus on the Post-Construction Stormwater Management Plan (PCSMP), which addresses more than the typical peak rate controls previously required. The role of stormwater management has been expanded to address smaller more frequent storms in terms of water quality volume and channel protection for all development projects throughout the City. The Philadelphia Stormwater Regulations are available online at www.PhillyRiverInfo.org but are also included within FY 2006 Stormwater Annual Report Appendix G.

The Stormwater Regulations have been enacted to address the following technical components:

Water quality: The 1st inch of precipitation over directly connected impervious cover must be recharged. Where recharge is not feasible or limited then any remaining volume is required to be subjected to an acceptable water quality practice.

Channel Protection: The 1-year, 24-hour storm must be detained and slowly released over a minimum of 24-hours and maximum of 72-hours.

Flood Control: Watersheds that have been part of an Act 167 planning effort are to follow the model results for flood management districts. In Philadelphia, Darby and Cobbs creeks watershed are subject to specified management districts. Projects outside of Darby-Cobbs watershed are currently treated as either a district controlling post-development peaks to pre-development peaks or are considered appropriate for direct discharge.

Non-structural Site Design: Projects are required to maximize the site potential for stormwater management through appropriate placement and integration of stormwater management practices.

In addition to the technical criteria, stormwater management requirements are clearly identified as applying to both new development and redevelopment projects. PWD in collaboration with other City departments recognized the need to appropriately insert PWD into the development process in order to inform the development community of the stormwater requirements before extensive investment into the design has been expended. Under this premise PWD divided the Stormwater Plan review into two components: the first being a conceptual review tied to the zoning permit; the second being the full technical plan review requiring approval prior to the building permit.

Conceptual plans are submitted online and must receive approval prior to obtaining a Zoning permit from Licenses and Inspections. The conceptual plan review phase enables PWD to clearly inform the applicant of stormwater management requirements applicable to their specific project. During FY 2007, the PWD online project submittal system received 271 conceptual plans for review.

Once conceptual approval has been received then the project can submit a full technical plan set addressing the stormwater regulations and other City plan requirements. PWD has received 186 full technical plan submittals during FY 2007. It should be noted that this number does not include plans re-submitted for review, some of them multiple times. The distribution of development projects that submitted post-construction stormwater management plans for review is presented in Figure H.3-1 below. Of the 186 plans, 113 are within the combined sewer areas. Of the remaining plans, 60 are located within the MS4: 19 plans within Pennypack watershed, plans within 11 Poquessing watershed and 16 within Wissahickon watershed. There were 7 sites that directly discharged to the Delaware or Schuylkill. The remaining 6 plans are located within areas considered to be non-contributing to either the MS4 or combined system.

Any project exceeding one acre of earth disturbance is required to obtain a PADEP NPDES General Permit for control of stormwater runoff during construction activities. The City may not release the building permit until the NPDES permit has been issued. As a result, a large collaborative effort has been initiated between PWD and PADEP in coordinating plan reviews between departments. Since the beginning of the year there have been 60 coordinated permit applications submitted to PADEP that are undergoing a joint stormwater management review. In Figure H.3-1 below, sites that are part of a coordinated city and state review are indicated with a blue marker.

Implementation of the Stormwater Regulations will continue to improve stormwater quality and quantity impacts as redevelopment and development continues across the City. PWD is tracking the stormwater management practices implemented by private development to address the regulations. Of particular interest are green approaches that encourage the return of rainfall back to the hydrologic cycle through evapotranspiration or distributed infiltration. As of Fiscal Year 2007 Annual Report, PWDs' records indicate that three projects are proposing use of pervious paving for a total of 19,318 square feet (0.44 acres) and 8 projects are proposing installation of green roofs at a total of 176,743 square feet (4.06 acres). As PWD works on improving the plan review process to provide greater incentives for incorporating green approaches for managing stormwater the number of green roofs and area of porous paving will see great increases throughout the permit cycle.

Quantifying the impact of the Regulations in terms of total acres developed, area removed from contributing to the combined sewer system, volume of water quality managed, volume of stormwater infiltrated, increase in management approaches (i.e.

structural basins, green roofs, porous paving, rain gardens) will be incorporated into reports in upcoming years.

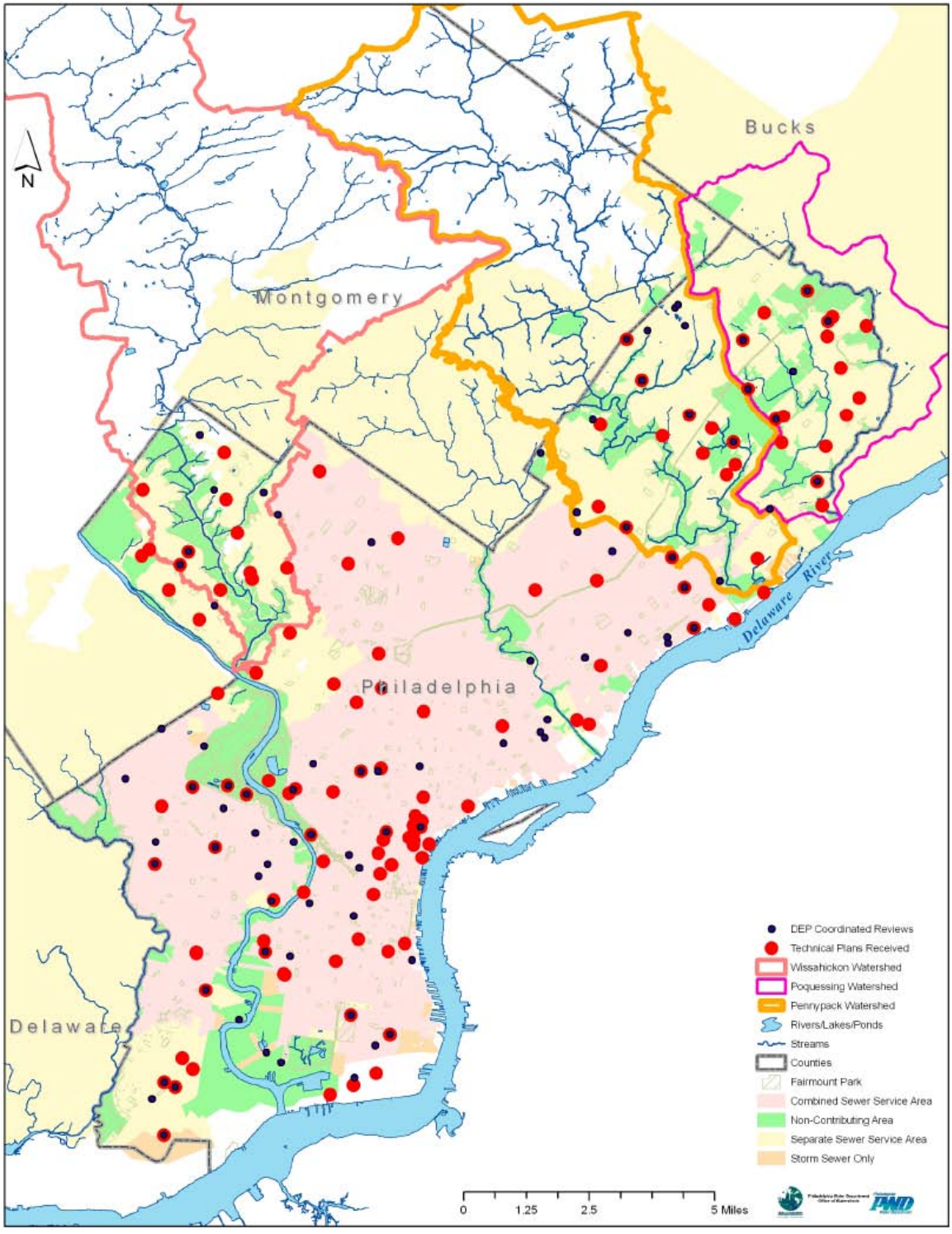


Figure H.3-1 Locations of Post-Construction Stormwater Management Plans Received

H.4 Application/Permits

PWD continues to serve as the Conservation District for the City of Philadelphia for NPDES Construction Permitting Requirements and Chapter 102 Regulations relating to Erosion Control. The City receives notifications through Act 14, Municipal Notification, by applicants applying for a permit to discharge stormwater from construction activities. The notifications are reviewed and recorded as part of the data collection process for a known development proposal.

Not only does PWD receive notifications but also coordinates review of NPDES application plan sets and calculations. Since a post-construction stormwater management plan must be submitted to both the state and the municipality for sites disturbing over one acre of earth, the City recognizes the importance of ensuring both municipal and state engineers are reviewing the same plans and are aware of each others technical requirements.

H.5 Stormwater BMP Handbook and Education Materials

PWD released the Stormwater Management Guidance Manual (Manual) in concert with the Stormwater Regulations going into effect as of the first of January 1st 2006. The Manual was created with a focus on urban stormwater management and includes Stormwater Management Practice (SMP) details, development processes in the City, calculation worksheets and supporting reference material. The Manual is intended to be a dynamic document allowing updates as needed with the most recent version available for electronic download at www.PhillyRiverInfo.org. During FY 2007, PWD worked on developing a fact sheet specifically geared towards for E&S Controls for Philadelphia. This fact sheet will be distributed during FY 2008.

Table H.5-1 Summary of Plan Review Activities Throughout FY 2007

	July '06	Aug. '06	Sept. '06	Oct. '06	Nov. '06	Dec. '06	Jan. '07	Feb. '07	Mar. '07	Apr. '07	May. '07	June '07	FY 2007 Total
CONCEPT STAGE													
Approved	20	11	17	9	19	22	18	14	17	15	12	23	**197**
Rejected	20	30	35	33	36	26	28	15	38	27	25	54	**367**
Received	56	60	58	61	71	54	39	48	63	44	65	98	**717**
Reviews	52	51	59	53	70	62	57	47	63	50	52	86	**702**
EROSION AND SEDIMENTATION STAGE													
Approved	1	2	3	4	5	2	5	2	1	2	3	3	**33**
Rejected	2	5	7	8	4	4	7	0	1	0	9	5	**52**
Defer to DEP	5	1	2	4	1	5	1	4	3	0	1	3	**30**
Received	14	18	16	20	14	18	11	7	12	6	16	12	**164**
Reviews	5	5	4	17	11	10	14	4	10	2	14	15	**111**
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN STAGE													
Approved	6	3	6	7	7	8	15	4	6	4	8	12	**86**
Rejected	13	16	28	34	27	26	25	17	16	21	35	31	**289**
Received	29	28	36	63	60	50	36	37	39	37	52	65	**532**
Screened (Total)	10	8	23	32	24	16	12	10	2	11	10	17	**175**
Reviews	21	22	38	63	54	47	44	35	29	33	52	62	**500**
COORDINATED REVIEWS													
Received	5	4	7	5	5	5	5	9	2	5	4	3	**59**
EROSION AND SEDIMENTATION INSPECTIONS													
Complaints	0	14	9	7	8	8	1	0	15	9	8	7	**86**
Scheduled Inspections	23	39	43	50	47	49	40	15	45	42	34	57	**484**
Total Inspections	23	53	52	57	55	57	41	15	60	51	42	64	**570**
Total Stop Orders	1	4	0	0	1	1	0	0	1	0	0	1	**9**

Section I
Watershed, Combined Sewer Overflow, and Source Water Protection Programs

The Philadelphia Water Department (PWD) manages and operates three waste pollution control plants, three drinking water treatment plants, and miles of underground distribution and collection infrastructure. However, PWD is not just a provider of drinking water and wastewater treatment. PWD, through the Office of Watersheds (OOW), strives to reduce the amount of point and non-point discharges entering regional waterways and improve the environmental health of the region so that all waters are fishable and swimmable. OOW appropriates the human and financial resources of PWD towards programs that aim to reduce the impact of point and non-point source pollution and contaminated runoff in a broad effort to enhance the health of the Philadelphia region's waterways. The main programs within OOW, in addition to the Stormwater Management Program (SMP), that work together to improve regional ecological health, water quality, and sustainability are: the Delaware Valley Early Warning System, Schuylkill Action Network, Combined Sewer Overflow (CSO) Management Program, Watershed Planning, Source Water Protection Program, and Wetlands Mitigation Registry. The SMP and OOW programs work in tandem when producing watershed plans, annual permit compliance reports, demonstration best management practices, and public education and outreach events. Following is a description of the Delaware Valley Early Warning System, Schuylkill Action Network, CSO Management Program, Source Water Protection Program, and the Watershed Mitigation Registry OOW programs, the achievement they have earned, and their future direction and goals. The Watershed Planning Program is presently explained in detail throughout Section E of this report.

I.1 Delaware Valley Early Warning System

I.1.1 Background

The Delaware Valley Early Warning System (EWS) is an integrated monitoring, notification, and communication system designed to provide advance warning of surface water contamination events in the Schuylkill and lower Delaware River watersheds. The EWS was developed in 2002 with funding provided by the Pennsylvania Department of Environmental Protection (PADEP) and the United States Environmental Protection Agency (USEPA) and was deployed as a fully functional system in 2004. PWD initiated the development of the EWS after identifying the need for such a system while collaborating with upstream treatment plant operators during the completion of the Source Water Assessments for the Schuylkill and Lower Delaware Rivers between 1998 and 2000. The Delaware Valley EWS covers the entire length of the

Schuylkill River as well as the Delaware River from Chester, PA (just downstream of Philadelphia) to the New York state border.

A key recommendation of the Source Water Assessments for the Delaware River was to develop a watershed-wide Early Warning Monitoring Network to provide early detection and notification of discharges to or changes in the quality of the surface water supply. PWD pursued this recommendation, and in 2002, and then developed the EWS in 2003.

The EWS is comprised of 4 principal components; the EWS Partnership, the notification system, the monitoring network, and the web-based database and portal. The EWS Partnership is comprised of stakeholders and includes representatives from both public and private drinking water treatment plants in the coverage area, industries who withdraw water from the Schuylkill and Delaware rivers for daily operations, and representatives of government agencies from both PA and NJ. The notification system includes both automated telephone notification and web-based notification capabilities. The monitoring network is comprised of on-line water quality and flow monitoring stations located at USGS sites and water treatment plant intakes throughout both watersheds. The web-site and database portal are the backbone of the EWS and are fully integrated with the notification system and monitoring network.

The telephone notification system is a powerful tool that allows a caller to initiate emergency notifications to multiple recipients through a single call. The system accepts calls from emergency responders, water utility personnel, and municipal and industrial dischargers. The system records event information provided via touch-tone responses to a standard question and answer process, and makes telephone and email notifications to affected EWS participants. This automated process reduces the burden on the emergency responders and other information providers by providing multiple and redundant calls to system participants, and also reduces the possibility that a notification could get lost or mis-routed.

The EWS website provides a dynamic and interactive user interface to the EWS database, allowing users to access and share event and water quality information via the internet. Various user interface formats are available, including forms for reporting and viewing the details of a water quality event, maps to identify the location of an event, graphs that present water quality, and a time of travel estimator. The time of travel estimator uses real-time flow data from USGS gauging stations to provide plug-flow travel time estimates for each downstream intake based on current river conditions. These tools allow PWD and the other water purveyors within the Schuylkill and Delaware River watersheds to be more informed about water quality throughout the watershed and thereby be better prepared to react to changing or emergency conditions.

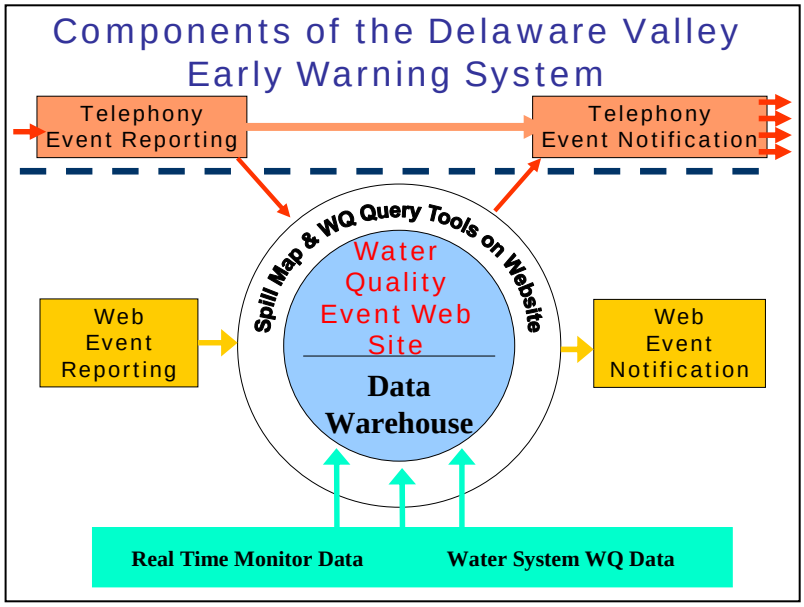
The water quality monitoring network compiles both near real-time and historic water quality data. The near real-time network utilizes continuous water quality monitors that are located at select water treatment plant intakes and USGS gauging stations and transmits data collected at those locations to the EWS server, thus making the data accessible via the website. The water quality monitoring network provides water suppliers with near real-time information about water quality upstream of their intakes so that they can anticipate changes in water quality and adjust their treatment accordingly. Real-time monitoring is currently limited to simple water quality parameters such as turbidity and pH, but the network will be expanded in future years as monitoring technologies advance and as other monitoring needs are identified. In addition to the near real-time data, utilities will submit the results of their routine operational monitoring, creating a historical database against which real-time data can be compared. The system has the potential to incorporate sophisticated monitoring equipment like gas chromatographs and bio-monitors that can detect changes in water quality that might result from major discharges or intentional contamination.

One of the unique features of the Delaware Valley EWS is that the system operates essentially unmanned. Once an event is reported via telephone or the Internet, the system will automatically perform the time-of-travel estimations, and notify downstream users. System users can then report updates and additional information on the website as the event develops.

I.1.2 Early Warning System Protocol

The EWS can be used to fulfill several different source water protection needs. First and foremost, it is a communication and notification system that emergency response personnel and water suppliers can use to share information about source water contamination events. Second, it provides access to water quality data throughout the watershed thus alerting water suppliers to a change in water quality long before it reaches their intake. In the future, dischargers will be encouraged (preferably required) to use the EWS to make downstream notifications of overflows, spills and accidental discharges. The technical features of the EWS are illustrated in Figure I.1.2-1 and described in detail below.

Figure I.1.2-1 Components of the Early Warning System



Emergency response personnel and water suppliers often observe a water quality event or are notified by the public. A water quality event can be anything from a transportation accident, to a fire, to a sewage overflow, to illegal dumping, which results in a discharge to the river or sewer system. Upon being made aware of and confirming an event the responding party can use the EWS to notify downstream users by calling the EWS telephone notification system or by reporting the event to the EWS website (www.DelawareValleyEWS.org). In reporting the event, the responding party will supply information about the time, location, risk level, cause, and result of the event. The EWS uses the location information to identify the appropriate parties to notify. The system currently determines whether the event occurred in the Schuylkill or Delaware watershed and notifies all participating water suppliers, emergency response personnel and agencies within that watershed. In the near-future, the system will use location information to identify and notify only those participants downstream of the event. Notifications are made by phone for high risk events or by email for lower risk events (additional flexibility for notifications is a future goal of the system). If a telephone notification is delivered, the notification consists of a standard message that informs the recipient that a water quality event has occurred followed by specific information about time and location of the event and, if available, a message from the reporting party. If an email notification is sent, the email message contains critical information including the time, location and description of the event, and advises the recipient to go to the web-site for additional information. The recipient of the notification will then either call the telephone system or log onto the website to receive more information. The web-site will have an event report with all of the information that the responding party provided. The web-site also has a time-of-travel estimator that uses real-time USGS flow data to

estimate the time at which the contaminant will arrive at the downstream intakes. Downstream water suppliers can also access water quality data associated with the event. The water suppliers can use the time-of-travel and water quality information to plan their response strategies. As the event progresses, the information provided on the web-site can be updated by the initiator of the report or by other participants as they learn more about the event. In this way, the water supply community can communicate and be kept abreast of the event as it unfolds. All of this occurs in a secure environment.

The EWS water quality monitoring network collects continuous water quality data from select drinking water intakes along the main stem Delaware River and transmits that information to the EWS server, thus making it available to the EWS participants via the EWS web-site. Currently, there are three water quality monitoring stations in the Delaware River watershed EWS monitoring network. In the Delaware River watershed there are fourteen participating water suppliers. Water suppliers can log on to the EWS web-site on a daily basis to see water quality information from these locations, which span from Easton, Pennsylvania to Philadelphia. This type of analysis will allow water suppliers to identify changes in water quality associated with both natural and accidental contamination events. For example, storm events and algae events are two naturally occurring events that will impact the water treatment process. Fortunately, both are easily identifiable using simple on-line monitors like turbidity and pH. A downstream utility can track changes in these parameters and know when they need to initiate a treatment process change in order to effectively treat the water. Similarly, significant accidental spills to the river may be detected in through changes in pH or conductivity. The EWS water quality monitoring network will allow water suppliers to be more proactive, rather than reactive when it comes to responding to changes in water quality.

PWD worked closely with PADEP's Emergency Response team in the development of the EWS. During this process both PWD and PADEP agreed that one of the mutual goals is to have dischargers add the EWS to their downstream notification list. In this way PWD could insure that downstream water suppliers receive information about overflows, spills and accidental discharges. Throughout FY 2007 PWD has been in the process of working with PADEP to make this happen. This will likely necessitate PADEP incorporating the EWS into the dischargers' permit requirements. If such a requirement is implemented, the discharger would call the EWS telephone system or enter the event into the EWS web-site to initiate downstream notifications. Having dischargers contact the EWS directly will increase the number and geographic diversity of downstream notifications with just a single phone call.

The Delaware Valley EWS has tremendous potential to reduce the time in which water suppliers become aware of and react to water quality events of all kinds. The system is a tool designed to help water suppliers respond to the accidental, terrorist and natural water quality events that cannot be prevented by standard source water protection

measures. In this way, the EWS is a perfect complement to a well developed source water protection program.

I.2 Schuylkill Action Network

Philadelphia is the furthest downstream city in the Schuylkill watershed, which provides a source of drinking water for Philadelphia residents. The primary source of impairment of the Schuylkill watershed is storm water, which accounts for 273 of its 1,000 total impaired stream miles. The majority of these impaired stream miles are within and just outside Philadelphia. A preliminary restoration analysis found that it would cost approximately $288 million to design and reconstruct all impaired stream miles through natural stream channel design. The Schuylkill Action Network (SAN) Storm water Workgroup, a partnership of representatives from the Philadelphia Water Department, Pennsylvania Department of Environmental Protection, conservation districts, watershed organizations, municipalities, and others groups throughout the watershed, was formed to identify a more cost effective approach through project prioritization and planning. Several projects identified through the Stormwater Workgroup will be funded through the Environmental Protection Agency's Watershed Initiative Grant Program, which awarded approximately 1.15 million dollars to the SAN for its innovative and collaborative approach to watershed management. Of the total dollar amount, approximately $300,000 will go toward storm water-related projects over a three year period.

In FY 2007, the SAN storm water group implemented many of these projects. The group worked with two priority schools in the Wissahickon watershed to design conceptual stormwater plans on their campuses. Final design of a comprehensive storm water management plan was completed at Lansdale Borough Park, located at the headwaters of the Wissahickon Creek. Implementation is planned for spring 2008. Final design of priority storm water management projects at Norristown Area School District has also been completed, with implementation planned for fall 2007. The group also spent time developing a list of priority townships in Berks County for Environmental Advisory Council (EAC) outreach. Of six townships contacted, several have formed EACs.

While the majority of storm water-related activities are conducted by the Storm water workgroup, activities of other SAN workgroups under the EPA grant are also linked with storm water. The Agriculture Workgroup spent much of FY 2007 implementing riparian buffers along streams in farm areas in Berks County. These buffers will not only filter contaminated runoff prior to its entering Schuylkill tributaries; they will also impact storm water volume and velocity. The Pathogens Workgroup spent much of FY 2007 focusing on inflow and infiltration – which are intricately linked with storm water flows -- at priority wastewater treatment plants in the watershed. The Pathogens workgroup is also setting the stage to focus on wet weather discharges in 2008. Passive treatment systems being implemented by the Abandoned Mine Drainage (AMD)

workgroup to control pH and reduce metals are complicated by storm water runoff. Storm water is typically best managed by increasing ground infiltration. AMD treatment systems, however, are generally designed to prevent infiltration of runoff in order to preclude contamination of the water through contact with metals in the ground. These systems must address increased flows during storm events through other means. Storm water also plays a role in monitoring efforts by AMD workgroup members to develop correlations between streamflow and water quality and to develop a water budget for the AMD-impacted area of the watershed.

I.3 Combined Sewer Overflow Management Program

The Combined Sewer Overflow Management Program, CSOMP, within the Office of Watersheds at the Philadelphia Water Department works to implement technically viable, cost-effective improvements and operational changes that mitigate the impacts of combined sewer overflows. The CSOMP, through a Long Term Control Plan, has established three phases of action to manage CSOs within Philadelphia County.

Phase I identifies nine minimum controls to reduce CSO impacts through low-cost and short-term actions that do not require extensive construction or engineering. The nine minimum controls are:

1. Review and improvement of on-going operation and maintenance programs

2. Measures to maximize the use of the collection system for storage

3. Review and modification of PWD's industrial pretreatment program

4. Measures to maximize flow to the wastewater treatment facilities

5. Measures to detect and eliminate dry weather overflows

6. Control of the discharge of solid and floatable materials

7. Implementation of programs to prevent generation and discharge of pollutants at the source

8. Public Notification of CSO impacts

9. Comprehensive inspection and monitoring programs to characterize and report overflows and other conditions in the combined sewer system.

Phase II of the PWD's CSO strategy is focused on technology-based capital improvements to the City's sewerage system that will further increase its ability to store and treat combined sewer flow, reduce inflow to the system, eliminate flooding due to

system surcharging, decrease CSO volumes and improve receiving water quality. The recommended capital improvement program is the result of a detailed analysis of a broad range of technology-based control alternatives. The capital improvement plan encompasses the three major areas of the City that are affected by CSOs: the Northeast, Southeast and Southwest drainage districts. Phase II plans and carries out large scale construction and engineering infrastructure projects.

Phase III of the Long Term Control Plan for the CSOMP commits the City of Philadelphia to watershed based management and planning that will identify and appropriate a long-term water quality control strategy. Phase III involves intense scrutiny of the regional water quality to identify baseline goals and means of achieving them through the reduction of combined sewer overflow pollution.

Phase III of the PWD's CSO strategy involves a substantial commitment by the City to watershed planning to identify long term improvements throughout the watershed, including additional future CSO controls that will result in further improvements in water quality and, ultimately, the attainment of water quality standards. The goal of this watershed initiative is to increase the amount physical, chemical and biological information that currently exists on the nature and causes of water quality impairments, sources of pollution, and appropriate remedial measures. Without additional planning and research, it is not possible to determine what needs to be done for additional CSO control or control of other wet weather sources throughout the watershed, especially with respect to the effects of wet weather discharges and receiving water dynamics. The PWD believes that the National CSO Policy, state and federal permitting and water quality management authorities, cities, environmental groups, and industry, recognize that effective long term water quality management can be accomplished through watershed-based planning.

The CSOMP is hard at work combating the environmental problems wrought by combined sewers through technical, scientific, planning, educational, and public outreach means. The overall goals of the CSOMP and other programs within PWD are perfectly aligned in that they all share resources and work to improve and preserve regional water quality.

I.4 Source Water Protection Program

The mission of the Source Water Protection Program within PWD's OOW is to enhance, protect, and preserve the surface waters of the Schuylkill and Delaware Rivers to ensure a high quality and sustainable source of drinking water for future generations of Philadelphia residents. The accomplishment of this mission requires a holistic watershed approach, a sense of common commitment and responsibility shared by all who work and reside in the watershed boundaries, and a respect for the interconnectedness between source water protection concerns, upstream land and water use, and the importance of maintaining a healthy aquatic ecosystem which nurtures

habitat and inspires low-impact recreation. While working to enhance the quality of our source waters and ensure adequate flows for future water needs, the Source Water Protection Program seeks to transform our rivers into regional treasures capable of sustaining multiple uses and valued as precious community resources whose protection and preservation is the common goal of all who live and work within the watershed. The Source Water Protection Program seeks to accomplish this mission under three interrelated areas of responsibility:

Source Water Quality Enhancement & Protection through Watershed Based Partner Projects: Activities that address priority source water quality concerns through watershed partnership initiatives that ensure long-term, sustainable improvements to the water quality of the Schuylkill and Delaware River watersheds.

Early Warning Notification and Event Communication: Efforts to improve notification and communication surrounding water quality events which may threaten water supply and recreational safety.

Drinking Water Treatment Support and Quantitative Sustainability Analysis: drinking water compliance assistance, local water quality improvement projects, treatment technology research and testing, and quantitative analyses to ensure sustainability of surface water supply for future generations of Philadelphia residents.

The unique role of the Source Water Protection Program is to address water quality and quantity concerns as they relate to drinking water treatment and to conduct source tracking studies and develop partnership initiatives to create innovative solutions on a local and watershed wide scale. The Source Water Protection Program not only addresses existing water quality and quantity concerns but conducts research, monitoring, and analysis to evaluate potential future concerns in order to play a proactive role in protecting and preserving our water supply.

The Source Water Protection Program began in 1998 with the responsibility of completing Source Water Assessments for 52 drinking water intakes in the Schuylkill and Delaware Rivers. This effort resulted in the identification of the primary causes of contamination in the rivers that serve as PWD's drinking water sources. The findings of the Source Water Assessment led to the development of the SAN as a regional partnership initiative to address these identified source water quality challenges through a collaboration of federal, state, and local governments, watershed organizations, conservation organizations, and various other governmental and non-governmental organizations who are concerned about water quality issues in the Schuylkill River. In 2005, EPA awarded the $1.15 million Schuylkill Watershed Initiative Grant (SWIG) for the SAN to implement restoration projects in the areas of agriculture, abandoned mind drainage, and stormwater. Between 2003 and 2007, Source Water Protection Plans were completed for the Schuylkill and Delaware Rivers identifying

strategies for addressing the water quality and quantity concerns addressed in the Source Water Assessments for both rivers. In the past 8 years since its inception, the Source Water Protection Program has implemented numerous local and watershed wide BMPs, developed partnerships to address regional water quality and quantity concerns, created an advanced water quality early warning system to support drinking water treatment operations along with an associated system for recreational water quality advisories, and conducted research, monitoring, and analysis for a broad range of issues related to drinking water treatment support and regulatory compliance. The Schuylkill and Delaware Source Water Assessments and Protection Plans can be found online at www.PhillyRiverInfo.org.

I.5 Watershed Mitigation Registry

The City of Philadelphia's Watershed Mitigation Registry (WMR) is a new and innovative OOW program initiated during FY 2007. The WMR aims to provide environmental restoration and improvement projects to offset wetland and open water losses caused by development or redevelopment throughout the Philadelphia area. Environmental improvement projects could include restored or replacement wetlands, but also can include stream and riparian corridor restoration projects. The intent of the WMR is to facilitate the matching of projects that the City of Philadelphia has determined to be high priority elements of its Integrated Watershed Management Plans (IWMPs) with those mitigation needs that arise from waterfront development and projects, transportation improvement projects, or other development and redevelopment projects. The selection process requires close coordination among the developer, the City of Philadelphia, the Pennsylvania Department of Environmental Protection (PADEP), and the US Army Corps of Engineers (USACE). An important part of the process is the development of a procedure to compare the value of the losses at the proposed development or redevelopment site with the environmental value that would be achieved at proposed mitigation projects.

As Philadelphia developed over the past 200 years, many of its streams, riparian corridors and aquatic resources have been lost or degraded. The remaining aquatic and riparian areas are critical resources to the region. Major impacts include the impairment of almost every mile of stream within Philadelphia, impediments to migratory fish passage, loss of habitat and wetlands, degraded water quality, etc. Even remaining areas of high value are threatened, such as the impacts of future degradation of the Cobbs Creek on Heinz Wildlife Refuge.

Though the past impacts have been considerable, significant opportunities to restore and improve the riparian corridors and aquatic resources within Philadelphia are available and are being strongly supported by a range of initiatives. Since 1997, the Philadelphia Water Department (PWD) and the Fairmount Park Commission (FPC) have invested millions of dollars in creating environmental resource inventories (including wetland

inventories) for the City of Philadelphia, and integrated watershed management plans for environmental and aquatic resource impact recovery. These plans are based on park master plans, source water protection plans, river conservation plans, and recent field work. Efforts by PWD and FPC parallel other City planning initiatives such as GreenPlan Philadelphia, which is the City's comprehensive open space plan. The combined result of the City's planning efforts is the identification of numerous potential restoration and enhancement projects, many of which are being compiled for the WMR for the Philadelphia Region.

A registry program utilizing these projects would help achieve greater environmental benefit at reduced cost by addressing environmental and/or regulatory requirements in an integrated fashion. Selected projects could achieve goals encompassed by FPC Master Plans, PWD's SMP, CSOMP, and water quality goals and pollutant reduction targets set by total maximum daily loads (TMDLs). These projects will also help mitigate damage to the environment caused by infrastructure improvements, create economic benefits, and improve recreational value. In addition, many of these projects are located in areas with low income and minority neighborhoods that would be enhanced by the proposed upgrades.

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Section J
Miscellaneous Programs and Activities

J.1 Pollutant Migration/Infiltration to the MS4 System

The Industrial Waste Unit (IWU) within the Philadelphia Water Department (PWD) responds to all citizen complaints of liquid, solid, or gaseous pollutants within Philadelphia. The IWU coordinates with neighboring communities in the event that a pollutant may drain into the Philadelphia MS4 system. The IWU unit uses a variety of pollution sensing, testing, and removal techniques to mitigate the impacts of spills to the MS4 system, combined system, and receiving waters. Presented in Table J.1-1 below is a list of all pollutant migration events that reached either the MS4 or combined sewer systems in FY 2007. The locations of all events are presented on the following page in Figure J.1-1.

Table J.1-1 Pollutant Migration/Infiltration to the MS4 System

Location	System	Date	Pollutant
19th and Indiana	CSO	9/14/2006	Soil
3144 Passyunk Ave	Stormwater Only	9/15/2006	Benzene
Rhawn and Cresco	Non-Contributing	9/26/2006	Motor Oil
3899 Richmond	CSO	10/26/2006	Cumene
63rd and Passyunk Ave.	MS4	11/16/2006	Mineral Oil
2360 Pennrose	CSO	11/16/2006	Motor Oil
4641 Roosevelt Blvd	CSO	12/3/2006	Heating Oil
3641 N 3rd St.	CSO	12/7/2006	Gasoline
4600 Chestnut	CSO	2/4/2007	Gasoline
1225 Fitzwater	CSO	2/5/2007	Grease
25th and Morris	CSO	2/7/2007	Motor Oil
South Broad Navy Yard	Non-Contributing	3/1/2007	Heating Oil
Fish Commission Boat Ramp	MS4	3/24/2007	Motor Oil
1953 Brown Ave Bensalem	MS4	3/26/2007	Unknown
6732 Lansdowne Ave	CSO	3/29/2007	Glycil
1953 Brown Ave Bensalem	MS4	3/30/2007	Unknown
1953 Brown Ave Bensalem	MS4	5/2/2007	Unknown
4326 Main St.	MS4	5/3/2007	Grease
Lock St. and Manayunk Canal	MS4	5/30/2007	Grease
Cecil and Webster	CSO	6/14/2007	Motor Oil
25 E. Pattison Ave.	Stormwater Only	6/28/2007	Gasoline
Bustleton and Norwalk	MS4	6/26/2007	Unknown

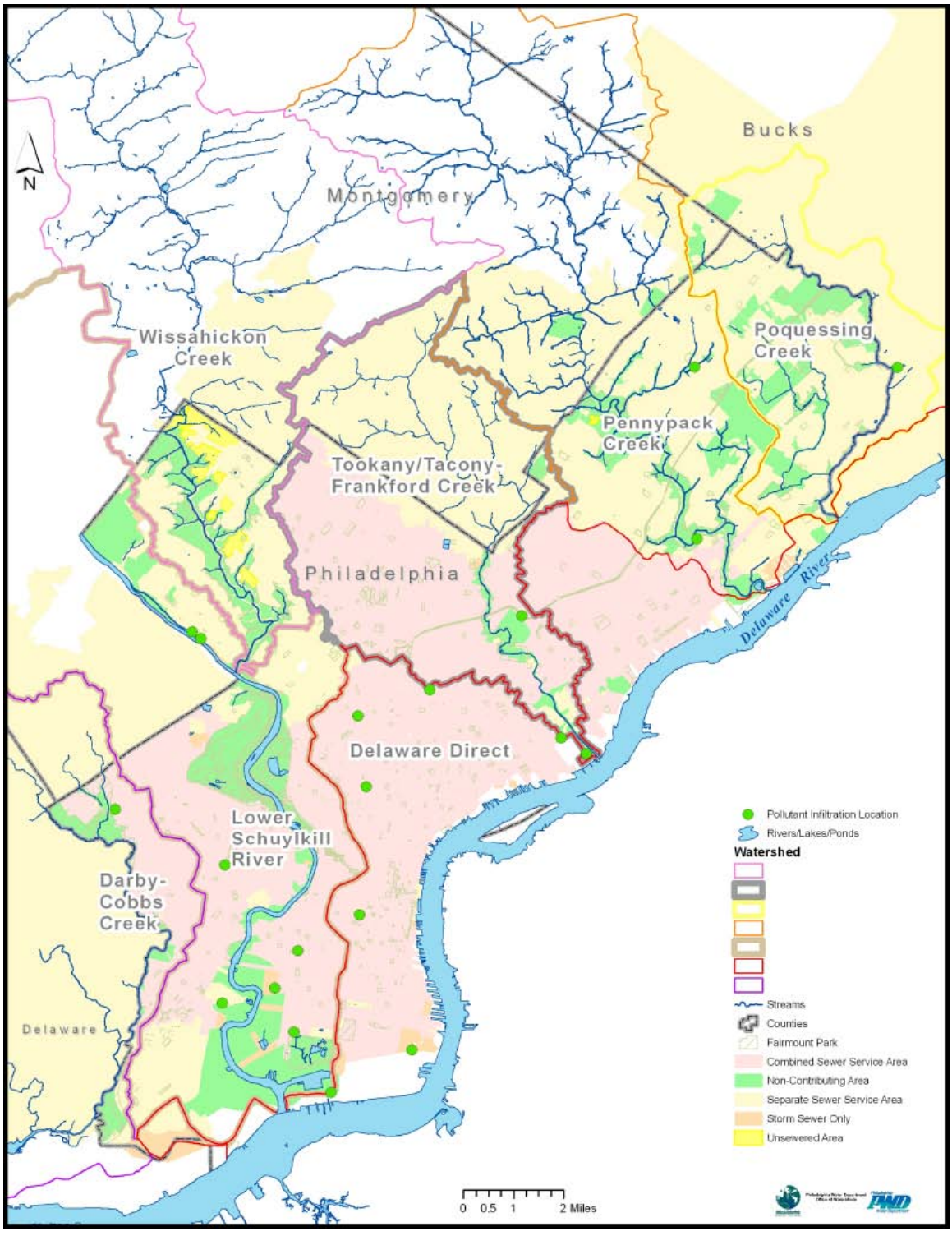

Figure J.1-1 FY 2007 Pollutant Migration/Infiltration Event Locations

J.2 Public Education and Awareness

Most of the city ordinances related to this minimum control are housekeeping practices that help to prohibit litter and debris from actually being deposited on the streets and within the watershed area. These include litter ordinances, hazardous waste collection, illegal dumping policies and enforcement, bulk refuse disposal practices, and recycling programs. If these pollutants eventually accumulate within the watershed, practices such as street sweeping and regular maintenance of catch basins can help to reduce the amount of pollutants entering the system and ultimately, the receiving waterbody. Examples of these programs are ongoing and were presented in the NMC document. PWD will continue to provide public information about the litter and stormwater inlets as part of its implementing this minimum control, as well as continue to develop the following new programs.

From the moment the City of Philadelphia began providing water to its citizens there has been a need to create partnerships to protect the water supply. In our earliest days it was through the creation of Fairmount Park. Today we comply with state and federal regulations that require citizen participation. More importantly however, PWD, through its Public Education Unit, has for more than 21 years voluntarily reached the public through an aggressive education and community outreach program that serves as a model for utilities across the country. Through these programs, PWD raises public awareness and understanding of stormwater problems and issues. Educational materials and programs are distributed and hosted at these events and at PWD's premier watershed education center – The Fairmount Water Works Interpretive Center. In addition, monthly billstuffers are included with customers' water and sewer bills, reaching over 460,000 households. And, the City continues to facilitate watershed stakeholder meetings to unify public participation in the surrounding counties and to address the issues pertaining to stormwater management on a watershed scale.

J.2.2 Billstuffers

Billstuffers are regularly produced by PWD as an educational tool for disseminating information pertaining to customer service and environmental issues. Specific billstuffers are designed on an annual basis for the CSO, Stormwater and Watershed Management programs to address the associated educational issues. These billstuffers reach over 470,000 water and wastewater customers. The environmental bill stuffers distributed in Fiscal Year '07 include:

- Waterwheel (Jan.)
- Streets Department Curbside Recycling Program (May)
- Streets Recycling (August)

- In's & Out's of Sewer Inlets (Nov.)
- Trash & Recycling Schedule (Dec.)
- Waterwheel (April)
- Streets Recycling (March)
- Streets Recycling (August)
- Ins and Outs of Sewer Inlets/Proper Disposal of Grease (Oct.)

J.2.3 Waterwheel Watershed Newsletters

Water Department's watershed newsletters are usually published on bi-annual basis and target specific information to the residents living within a particular watershed. In this manner, citizens can be kept informed of departmental water pollution control initiatives specific to the watershed they live in. Issues are sometimes published in the form of billstuffers and sometimes as a brochure (when combined with the annual drinking water quality report). Newsletters issued in FY 2007 include:

Spring/Summer '06 Edition – This issue, contained within the PWD's Annual Drinking Water Consumer Confidence Report, featured the department's Waterways Restoration Team, the crew dedicated to removing trash and other debris from our city's waterways, and the department's new Homeowner's Manual for Stormwater Management.

Winter/Spring '07 Edition - This issue, contained within the PWD's Annual Drinking Water Consumer Confidence Report, featured the projects of the Schuylkill Action Network (SAN), the department's Source Water Assessments, the Early Warning System (EWS), Rivercast, the Pennypack River Conservation Plan (RCP) and the Saylor Grove stormwater treatment wetland.

J.2.4 Comprehensive Education Materials

The following projects were initiated, completed or ongoing in FY 2007:

- Watershed educational partnerships (continued from 1999) with Bodine High School, Edison-Faira High School, Fairmount Park, Phila. Recreation Dept., Academy of Natural Sciences, Lincoln High School, Turner Middle School, Senior Environmental Corps, and the Schuylkill Center for Environmental Education.
- Implementation of the Tookany-Tacony/Frankford (TTF) Watershed Management Plan

- Implementation of the Tacony-Frankford RCP.
- Establishment of a 501c(3) TTF Partnership Entity to implement the final plan
- Completion of the Pennypack Creek RCP
- Completion of the Poquessing Creek RCP
- The creation of the Wissahickon Watershed Partnership and the initiative of a number of outreach programs
- The development of a new PWD website, www.PhillyRiverInfo.org, for the new Stormwater Regulations, BMP manuals (developer's and homeowner's versions) and all Office of Watershed programs.

J.2.5 PWD Public Education and Outreach

J.2.5.1 Fairmount Water Works Interpretive Center

Teachers and students are invited on an adventure to explore Water in Our World at the Fairmount Water Works Interpretive Center. Here, students travel through time as they learn about the role of water in Philadelphia's past, present and future.

Innovative exhibits and interactive educational programs meld the history, technology and science of providing water to a regional urban watershed. Below are short descriptions of the FWWIC programs.

Water in Our World

This general orientation to the FWWIC provides the perfect overview for the teacher focusing on a variety of water issues, past, present and future. Students will be introduced to a variety of concepts and vocabulary using activity booklets in exhibits on the natural water cycle, watersheds, the water use cycle, land use and pollution. They will also learn about their individual relationship to local, regional and global water quality issues on Planet Earth.

Land and Water: A Delicate Balance

Every day, people make choices about how they will use the land around them - often without considering how their use of land may affect the water they drink. Let your students come to understand the delicate relationship of land use to water quality through a matching card activity using the exhibits in the FWWIC. Students will also study a variety of maps to understand the development of land over time, and then plan fictional communities of their own in a way that would protect water quality.

From Street to Stream: Slow the Flow

Students will focus on stormwater runoff (one of the greatest sources of water pollution today), watersheds, and the different kinds of land pollution that affect our water quality - past and present. Students will explore, on foot, the Water Works site and surroundings as a way to better understand the concepts of point- and non-point-source pollution. The lesson will also give students a look into PWD's demonstrations of best management practices for existing and future land development.

Building as Machine: Water for the City

The Water Works is an engineering landmark. Students will learn about the design and function of this nineteenth century pumping station and why it was the most visited public place in America at that time. Learn how innovative technology for the public good and a concern for the natural environment, beauty and civic pride all came together at this unique site. Students will become apprentice engineers as they examine the pumps and gears that put the "works" in Water Works.

The Schuylkill River Watershed: A Tale of Two Settings

The Schuylkill River is a critical natural resource for the entire Philadelphia region. But can your students tell you why the river is so important? In collaboration with the Schuylkill Center for Environmental Education (SCEE), located upstream, just inside the City's northwestern boundary, the FWWIC offers a full-day program that travels to both sites to teach students about the critical connection between watershed protection and water quality. Students will explore the ecology of SCEE's unimpaired first-order stream, which is a tributary of the Schuylkill River, and will use the interactive exhibits at FWWIC to learn how communities within the Schuylkill River Watershed impact the river and have a stake in protecting them.

PWD's Public Education Unit makes presentations at area schools, organizations and community events, providing information on all topics regarding the urban and natural water cycles and watersheds. Teacher workshops and school-based programs and exhibits are also held daily at the FWWIC.

General Educational projects in 2006/2007 - A great variety of public information materials concerning the stormwater/watershed management in relation to the watershed framework were developed as a result of the watershed partnerships and RCPs, including: fact sheets, press releases, tabletop exhibits, brochures, watershed surveys, websites, watershed walks, and presentation materials.

Urban Shad Watch

The first Urban Shad Watch was held in April 2005. This event encourages visitors to observe the upstream migration of the prehistoric shad. The second annual event was held April 2006. April 2007 was cancelled due to heavy rain; however the FWWIC is looking forward to holding the fourth annual event in April 2008.

Catch of the Day – Fish paintings for children

Fish don't talk, but what do they tell us?

Aquatic biologists' presentation on how many species of fish have returned to the Schuylkill River.

What's in the River Today?

A FWWIC new exhibit featuring the endangered river otter caught on tape.

Name the Shad; Name the Otter Activity

Fish Facts

An educational activity booklet, filled to the gills with activities about fish.

Saturday Morning Family Programs at the Fairmount Water Works Interpretive Center (Spring 2007)

- The Thirsty Land! Everyone has a Watershed. Where's yours? April
- The Dirty Truth: The Scoop on Poop and Pollution – April
- An Expedition in Time: Explore water pollution now and then
- Ready? Set. Navigate! May
- A Delicate Balance: Exploring the Relationship of Land and Water during
- Choose it. Use it! …Abuse it? Lose it. – June 2007
- Travel Through Time Tours: Experience our past, examine our present, explore our future

Drinking Water Week

PWD water treatment engineers and plant managers introduce students to water treatment processes.

5th Annual 2006 Southeastern Pennsylvania Coast Day Event – September 16, 2006

Activity Books

One of PWD's most successful community publications is the student activity book (grades 3 – 8) "Let's Learn About Water." This publication develops the concepts of definition of a watershed, impact of non-point source pollution, and personal responsibility for protecting our water supply. It is in great demand by schools, communities and government officials. This book was developed with the Partnership for the Delaware Estuary and was funded in part through DEP Coastal Zone Management funds. Future editions will include descriptions and activities for various city watersheds. The curriculum has already been used in a number of middle schools to meet state required science-based credits. In 2005, the Activity Booklet was updated and made full color. The FWWIC was also highlighted in some of the activities to encourage students to visit with their families. In FY 2007, a fold out map of the Schuylkill River Watersheds was created, printed, and inserted into the activity whenever it is being used by students who live with in that watershed.

J.2.5.2 PWD and Partner Programs and Projects

Philadelphia Flower Show – PWD Exhibit: March 4-11, 2007

PWD and the Partnership for the Delaware Estuary are sponsored an exhibit at the Philadelphia Flower Show, where "Legends of Ireland" was the year's theme. The display, entitled "Soften the Urban Landscape, Improve Water Resources," featured solutions homeowners can use to prevent stormwater runoff pollution. Examples included a rain barrel, rain garden, infiltration trench and porous pavers. Over 200,000 people attend the Philadelphia Flower Show annually.

Water Quality Citizens Advisory Council (CAC)

In 2001, the Water Quality CAC was formed from a merger of the Stormwater and the Drinking Water Quality CACs. Over the past few years, source water protection had become more of a concern for drinking water quality. The Drinking Water CACs focus has been drawn naturally toward non-point source pollution, a focus traditionally undertaken by the Stormwater CAC. Finally, this merging of the two CACs complemented the PWD's, PADEP's and EPA's new approach to looking at and addressing water quality issues on a holistic basis. The Partnership for the Delaware Estuary facilitates CAC meetings. The committee consists of representatives from the following groups: Tookany Creek Watershed, Academy of Natural Sciences, Action AIDS, Bridesburg Civic Association, Bucks County Water & Sewer Authority, Center in the Park Senior Enviromental Corps, Clean Water Action, Cobbs Creek Community Environmental Education Center, Delaware River Basin Commission, Delaware Valley Regional Planning Commission, Drexel University, Eastwick PAC, Fairmount Park

Commission, Frankford Group Ministry, Friends of Fox Chase Farm, Friends of High School Park, Friends of Manayunk Canal, Friends of Pennypack Park, Friends of Poquessing Creek Park, Friends of Tacony Creek Park, MANNA, Mayor's Commission on Literacy, PA DEP Water Supply Division, Partnership for the Delaware Estuary, PA Environmental Council, PennPIRG, PA Horticultural Society, Pennypack Environmental Center, Pennypack Watershed Association, Phila. Health Department, Phila. Corp. for Aging, School District of Philadelphia, Schuylkill Center for Environmental Education, Schuylkill Navy, Schuylkill River Development Corp, Schuylkill River Heritage Corridor, Southhampton Watershed Association, Stroud Water Research Center, US EPA Region III, Wissahickon Charter School.

Annual Earth Day Service Project

Community and watershed volunteers participated in PWD and Stormwater CAC sponsored annual Earth Day service project by installing storm drain curb markers throughout the City. Volunteers used the new curbmarkers developed by PWD and PA Coastal Zone Management Project to mark the message "Yo!!! No Dumping! Drains to River!" beside a storm drain. By developing a more durable and easily applied curb marker, volunteers are able to cover more area. In spring and summer 2007, over 15 organizations participated in the storm drain marking activity. Throughout these months, approximately 2500 storm drains were decaled by the summer in the City of Philadelphia.

"Stormy Weather" Video

The video focuses on individual responsibility as a critical success factor in improving stormwater quality. The deleterious effects of stormwater pollution on the physical and biological community in aquatic systems are addressed through various anti-litter messages, such as: litter control, responsible household and pet waste management, and the proper use of inlets. The video is distributed to schools, watershed organizations and interested civics. The video has been distributed to over 300 environmental groups on an annual basis, various citizen groups, and schools, and has become a part of the environmental education curriculum for Delaware schools. The City's cable channel is showing the video twice a day.

"Clean Water Begins and Ends with You"

The Partnership for the Delaware Estuary and PWD sponsored its eighth drawing contest for Philadelphia students grades K-12 in January 7. Students were required to draw an illustration that shows how Philadelphians can help prevent stormwater runoff pollution. First prize drawings were used to promote stormwater pollution prevention messages on SEPTA buses and in the creation of a "Clean Water Begins and Ends with You" calendar. In 2007, there were over 1200 drawings entered into the contest, with

over 45 classrooms participating. This year's award ceremony was held in April 2007 at the Fairmount Water Works Interpretive Center.

Clean Water Theatre

Working in partnership with the Academy of Natural Sciences, the Partnership for the Delaware Estuary, the PWD CAC offered the Clean Water Theatre's "All Washed Up" program which uses local artists and musicians to engage public, private and parochial schools throughout the City of Philadelphia in becoming active and informed stewards of our environment. The setting of the 20 minute play is in an urban park that has a river running through it. The story is built around three characters (an old man who is the caretaker of the park and who had been a vaudeville song and dance man in his youth, and two teenagers – a boy and a girl) that explore the importance of environmental stewardship and clean water. While there were not any live performances of Clean Water Theatre in 2006, many video and DVD copies of the performance was distributed to teachers and local educators.

Senior Environmental Corps (SEC)

PWD continues to work with the Senior Environmental Corps (SEC) to address stormwater pollution problems and water quality monitoring programs for the Monoshone Creek, a tributary to the Wissahickon Creek. The SEC performs biomonitoring, collects water samples, and conducts physical assessments of the stream. The PWD assists SEC efforts through the provision of municipal services, education about stormwater runoff and the department's Defective Lateral Program, and mapping services such as GIS. Meetings are held monthly. The Corps has also partnered with PWD on its Saylor Grove Wetland Demonstration Project, assisting with public education and outreach, and providing tours to local students beginning fall 2006. The SEC, in partnership with Chestnut Hill College, also began water quality monitoring at the Saylor Grove Wetland in summer 2006 and has continued this monitoring program to the present.

Safe Boating Program

PWD has also initiated an outreach, education, and notification program for marinas and personal watercraft that may be situated near CSO outfalls on the Delaware River. PWD has held meetings with representatives from PADEP's Coastal Non-Point Pollution program, the Partnership for the Delaware Estuary and administrators of similar programs in New Jersey to develop a host of educational and environmental management measures. Marina surveys are conducted and their use profiles (personal, charter, open, closed craft, etc.) assist with developing a targeted education program. Meetings are initiated with the individual marinas to implement site-specific notification mechanisms (brochure, flags, sign, etc.) that list precautions that should be exercised by

those engaging in contact recreation within the marina and/or on the open water. In addition, information is shared on how the marina can adopt environmentally responsible operation and maintenance practices for personal and multi-purpose watercraft that are jointly supportive of safe contact recreation and the DEP Coastal Non-Point Pollution goals. Specifically, these practices address the measures identified in the Marinas and Recreational Boating section of the DEP document titled Deliverables for Results-Based Funding Coastal Non-point Pollution (CNP) Specialist.

Schuylkill Awareness Bands

Two thousand light blue awareness bands (made popular by the Lance Armstrong Foundation) were purchased for distribution at the FWWIC. The bands read "Schuylkill River" on one side and "Keep it clean!" on the other side. The bands are used as a take home reminder to visitors of the FWWIC of how they can personally make a difference in the quality of their local waterways.

Dog Waste Control Program

Through a pilot project in Delaware, the Partnership for the Delaware Estuary found that most dog-owners are completely unaware of the connection of dog waste to water pollution. Many articulated that they clean-up in public areas as a common courtesy, but were unaware that the dog waste in their yards could be a potential source of stormwater runoff pollution. A similar project has been initiated with PWD. Five thousand "Bags on Board" and educational tip cards where produced and purchased for distribution at the FWWIC and various public events. The "Bags on Board" is a roll of 15 dog waste collection bags that conveniently clips onto a dog leash. The refills are available at most local pet shops. The educational tip card that is being distributed with the units not only explains the affects of dog waste on local waterways, but also provides a list of other daily actions that can be modified slightly to reduce stormwater runoff pollution. This program was also beneficial in educating dog-owners on other sources of stormwater runoff pollution and how these non-point source pollutants affect the local waterways and the Delaware Estuary.

Workshops

The Partnership for the Delaware Estuary and PWD hosted a workshop in April 2007 at the Community College of Philadelphia to introduce communities, municipalities, and watershed organizations to the following three programs:

- **Clean Water Partners –** Clean Water Partners (CWP) is a program that educates small to medium-sized businesses about the types of best management practices that can be implemented on their sites to reduce non-point source pollution. CWP is a voluntary, non-regulatory program. With funding from Growing

Greener, the Partnership piloted CWP in West Whiteland Township in Chester County and in the Roxborough and Chinatown neighborhoods in the City of Philadelphia, involving more than 30 businesses.

- **Sense of Place** - Sense of Place demonstrates the value of conservation partnerships between nonprofits, municipalities, and schools. The project has provided a model for a watershed approach to land management by controlling invasive plants, reducing pesticide and fertilizer use, and improving wildlife habitat, thereby reducing the negative impacts of stormwater runoff on our waterways.

- **Corporate Environmental Stewardship** - The Corporate Environmental Stewardship program provides corporations and industry with the technical expertise necessary to properly manage and enhance their company's property. This program has assisted corporations in restoring wetlands, protecting fish and wildlife habitat, preserving open space, and protecting water quality.

Representatives from the School District of Philadelphia, Benjamin Rush M.S. Friends of the Poquessing, SPIN, PA DEP, Morrell Civic Association, Arch Bishop Ryan H.S., and John Hancock E.S. attended the workshop.

2007 Urban Watersheds Revitalization Conference

In the spring of 2007, PWD, along with its partners – Philadelphia University, American Water Resources Association, Villanova University, and Montgomery County Conservation District - hosted the 3rd annual Urban Watersheds Revitalization Conference. The event was held on May 3rd at Philadelphia University. The event was free of charge.

The conference targeted the urban and suburban (or mostly developed) communities in southeastern Pennsylvania. The audience was diverse – comprised of local planners, activists and engineers, among others, with an attendance of approximately 130 participants. The theme was stormwater management. Panelists, such as local, state and federal representatives, discussed recent stormwater management regulations and requirements, while panelists from the design community and local municipalities responded to the regulators with the realities behind the implementation of such regulations and requirements. Specific topics discussed at the conference included the perceptions, realities and responses to the NPDES requirements, stormwater rate structure reallocation, flood control minimization, retrofit funding mechanisms and the other programs and initiatives that aim to demonstrate the environmental, economic and social benefits that arise from sustainable watershed management. The event also included a poster session. The posters represented the projects that were awarded through the Stormwater BMP Recognition Program. Furthermore, an awards ceremony

for the Stormwater BMP Recognition Program participants took place after the panel discussion. For more information, visit: http://www.stormwaterbmp.org/conference.

J.3 Pesticides, Herbicides, and Fertilizer Controls

Golf courses comprise a major land use within the Schuylkill River watershed. Golf course management techniques, particularly with regard to pesticide application, turf management, and water use significantly impact the quality and quantity of runoff leaving a golf course and entering nearby streams and rivers. To address this concern, the PWD holds an annual Golf Course Certification workshop through the Audubon Cooperative Sanctuary Program (ACSP). The ACSP is a voluntary education and certification program whose purpose it is to educate, provide conservation assistance to and positively recognize golf course managers for improving environmental management practices and conservation efforts as they pertain to outreach and education, wildlife and habitat management, chemical use reduction and safety, water conservation, and water quality management. The annual workshop introduces golf course managers to the certification program and provides detailed information on key components of the certification process and important principles of environmentally responsible management. To date, PWD has held four annual workshops in different parts of the Schuylkill River watershed. The 5th annual workshop is being planned for the fall of 2007.

The City also adheres to the Integrated Pest Management protocol in the application of pesticides. Educational materials are made available to private pesticide users through the Department of Health inspectors. More detailed inquiries regarding application of pesticides are referred to the State Department of Agriculture.

The City in conjunction with the Clean Water Action group has developed an Integrated Pest Management (IPM) plan for residents of the City, which proposes alternatives to chemical pesticides. Included in this plan is a resolution adopted by the Board of Health for the use of IPM principles and the developing of literature for the public.

J.4 Snow Management Plan

The City of Philadelphia, like many other northeastern cities in the US, often faces winter storms that bring potentially dangerous accumulations of ice, sleet, freezing rain, and snow. Such events carry the potential to virtually paralyze the metropolitan area. In order to mitigate the impact of these storms, the Streets Department has prepared a Snow and Ice Removal Operations Plan which provides a detailed outline of the City's response to adverse winter weather conditions. A copy of this Plan has been included on the accompanying CD to this report.

J.5 Municipal/Hazardous Waste, Storage, Treatment, and Processing Facilities

Over the remaining reporting years the City will collect and assess information regarding municipal facilities (waste treatment, storage and processing) in terms of stormwater runoff. Once preliminary information has been collated priorities and procedures will be developed for inspecting and monitoring such facilities.

Section K
Best Management Practices (BMPs)

The City is charged with implementing a wide range of BMPs for improving the quality, quantity and rate of stormwater runoff entering the MS4. Within Section K, each of the Permit specified BMPs is documented with regard to their scope, level of implementation and project updates for this Annual Report year. The City will continue to evaluate the effectiveness of each BMP as it is implemented. In addition to the required list of BMPs, the City is also including discussions of BMPs implemented outside of the MS4 areas. It is in the best interest of the City to evaluate all BMPs and use that information to improve and enhance all City Program goals regardless of whether they are required by regulation. When applicable, the BMP will provide previous year data collected along with a discussion of the overall effectiveness.

K.1 Enforcement of Storm Sewer Discharge Ordinance

Water Department continues to enforce its stormwater ordinance under the authority delegated 14-1603.1 of the Philadelphia Code and Charter. Please refer to Section H for additional information.

K.2 Commercial and Residential Source Controls

K.2.1 Mingo Creek Surge Basin

The City maintains all city-owned structural controls, which presently consists of the Mingo Creek Surge Basin. Maintenance consists primarily of scheduled preventative maintenance of the pumping station to support its intended purpose of flood control.

In FY 2000, a needs-analysis was completed for the dredging of the Mingo Creek basins. Survey drawings showing the plan and elevation views of the Surge Basin, indicate minimal material deposited in the bed of the basin. In fact there was an indication of basin bed erosion. Based on these findings, dredging of the basin was not recommended. However, additional field investigations reveal pockets of deposition in the basin, suggesting the need for additional study. In June 2001 the basins were dewatered so that visual observations could be made and photos taken of existing conditions.

PWD is considering a study to assess the feasibility of retrofitting the basin to improve water quality. The study identified that better methods are needed to determine actual sediment depths within the basins, and research of suitable vegetation survivability in the basin's typical flow regime. PWD investigated a methodology to collect a bathymetric profile of the basin topology in FY 2003.

Currently, PWD is in the process of generating a comprehensive model of the entire contributing MS4 sewershed to the Mingo Creek Surge Basin in an effort to further understand this system's flow regime, potential restrictive characteristics, gauge the effect of time on the conveyance infrastructure, and identify maintenance and system enhancement locations.

K.3 Drainage Plan Review of Development

PWD and the City Planning Commission provide review of drainage plans for new development. The drainage plans addresses both flood control and potential stormwater pollutants under the authority delegated 14-1603.1 of the Philadelphia Code and Charter. Please refer to Section H for additional information.

K.4 Public Roadways BMPs

K.4.1 Deicing Practices and Salt Storage

The City monitors deicing practices in a manner consistent with its comprehensive snow emergency management procedures. A copy of the procedures was included in the FY 1996 Stormwater Annual Report. On average, the City deices 2,500 street miles per storm.

There are six municipal salt storage areas in the city, all of which have been covered to prevent precipitation from coming in contact with the salt. A listing and map of Philadelphia salt storage locations can be found in FY 2006 Stormwater Annual Report pages 113-114.

K.4.2 Street and Inlet Practices

The City promotes, develops, and implements litter reduction programs, in an effort to increase public awareness of litter as a source of stormwater pollution. During FY 2007, the Streets Department continued its street cleaning programs that target street debris and litter. With its fleet of mechanical sweepers, the department provides daily street cleaning in Center City, and on major arteries and commercial corridors throughout the city. Many residential streets are also mechanically cleaned on a weekly basis. In FY 2007, a total 88,268 miles were cleaned. There are over 1,800 litter baskets in Center City and other commercial districts. The Philadelphia More Beautiful Committee (PMBC) organizes neighborhood cleaning events citywide. In the 2007 Clean Block season, over 9,400 blocks were cleaned by nearly 90,000 volunteers. Over 1,000 tons of trash were collected and removed.

K.4.3 Maintenance of City-Owned Inlets

The Inlet Cleaning Unit of the PWD, under the direct jurisdiction of the Chief of the Collector Systems is primarily responsible for the inspection and cleaning of over 78,000 stormwater inlets within the City. This section is also charged with the responsibility for

the following areas: retrieving and installing inlet covers, installing original replacement covers that are missing, installing locking covers, unclogging choked inlet traps and outlet pipes so that inlets can take water; alleviating flooded streets and intersections when hydrants are opened, broken water mains, rain storms and other weather related problems. Inlet Cleaning is also charged with answering flood complaints at the Philadelphia Business Center. Finally, Inlet Cleaning has five (5) highway crews, whose duties are to clean high volume traffic areas during the night hours, 11 PM - 7 AM.

To insure the efficient and effective operation of the City's inlets and connecting stormwater sewers, it has been found necessary to use specialized inlet cleaning equipment to work along with the various units of the PWD as well as other government agencies and the private sector. The unit also cleans inlets on PWD properties.

The following table represents a summary of work performed by PWD/Inlet Cleaning Section from July 1, 2006 to June 30, 2007.

Table K.4.3-1 Inlet Cleaning Statistical Summary

Total Work Orders Received	89,039
Inlets Cleaned Mechanically	75,113
Inlets Cleaned Manually	1,448
Total Inlets Cleaned	76,561
No Cleaning Required (NCR)	1,022
Bad Locations (BL)	482
Parked Vehicles (PV)	10,873
Inlets Bled	11,111
Traffic	1,675
Referrals	6,656**
Missing Cover Replacement	2,559
Locking Cover Installed	2,503
None Needed (NN)	312
No Inlet (NI)	1,145
Total Job Output	98,826
Ton of Debris Disposed	16,555.86***
Total Cubic Feet of Debris	918,506.4

*** These figures have not been included in the total job output*
**** Do not include days when scale was broken*

K.5 Animal Waste and Code Enforcement

The City of Philadelphia actively enforces code which covers the regulation of animal waste. The Philadelphia Code and Charter Chapter 10.100 – Animals and Chapter 10.700 – Refuse and Littering address the proper clean-up of pet waste and applicable fines and penalties. In addition, signs advertising the said penalties are displayed city-

wide in any effort to prevent residents from violating this statute. The City of Philadelphia also provides the text of this code online at http://municipalcodes.lexisnexis.com/codes/philadelphia/.

K.6 PWD Flood Relief Project

Since the release of PWD's "Update to Interim Report on Wet Weather Basement Flooding in Philadelphia" dated March 1, 2006, there have been 2 severe rain events that have caused additional basement flooding in certain blocks within flood prone areas. The severe rain events occurred on June 3, 2006 & August 28, 2006.

The Philadelphia region has experienced an unusual number of severe rainfall events since 2004 that have caused basement flooding in several neighborhoods. PWD received many complaints of basement flooding following rain events on:

August 1, 2004

September 28, 2004 (Hurricane Ivan)

June 6, 2005

October 8, 2005

June 3, 2006

August 28, 2006

The above events rank in the top 15 out of over 1,600 rain events in the last 16 years from 1990 to 2006, based on a one-hour rain intensity. See Figure K.6-1 below for data of all rain events between 1990 and 2006, with some of the most recent severe rain events labeled.

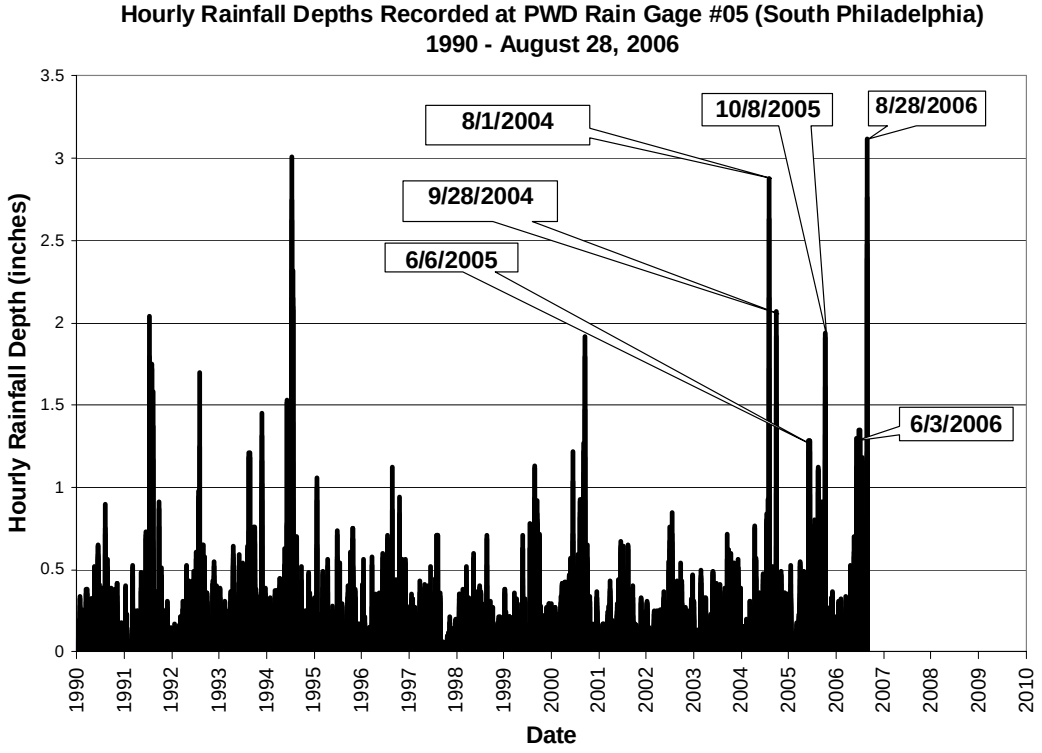

Figure K.6-1 Hourly Rainfall Data 1990-August 28, 2006

After evaluating over 1,600 rain events over the last 16 years, the following observations were made:

- The August 28, 2006 storm had the highest 1-hour rain intensity of any storm in the last 16 years, with over 3" of rain falling in a 1 hour period.
- Three of the top 4 storms based on a 1-hour rain intensity occurred in the last 2 years.
- 7 of the 15 most severe rain events in the last 16 years have occurred in the last 2 years.

This is dramatic evidence that the frequency of intense rain events has increased substantially over the last 2 years as compared to the preceding decade, and the intensities are among some of the highest in the last 16 years.

According to the National Oceanic and Atmospheric Administration's Precipitation Frequency Atlas, a rainfall event with the hourly intensity of August 1, 2004 and September 28, 2006 has the probability of occurring once every hundred years in the

Greater Philadelphia Region. In this case it has recurred in just a little over 2 years. Storms of this intensity are unmanageable forces of nature that can overwhelm both home plumbing systems as well as the municipal sewer system.

K.6.1 Update of Comprehensive Flooding & Sewer Overflow Mitigation Program

PWD has initiated a large-scale project to analyze and reduce property damage from flooding and basement backups. Since the interim report on basement flooding (9/1/05) and the 1st update (3/1/2006), PWD has been working hard on multiple fronts to both understand the causes of flooding as well as to start implementation of items that would be helpful to flood prone properties.

PWD has embarked upon a huge effort to investigate, evaluate, analyze, and look for solutions to these problems. As part of this effort, PWD has begun and will continue to:

1. Inspect sewers in flood prone areas to determine if there are any obstructions and schedule appropriate maintenance where problems are found or schedule capital projects if structural problems are observed.

2. Collect and update data from property owners impacted by flooding.

3. Analyze the sewer system by hydraulically modeling the system to determine how the sewer system responds to storm events.

4. Coordinate with other government entities and enhance the legal framework for managing stormwater.

5. Provide possible remedies/solutions based upon the modeling information, which in turn is based on all of the data collected.

K.6.2 Sewer System Analysis

PWD has made a significant investment in the latest technology in order to understand and analyze this city's infrastructure. PWD also has made a large investment in the ability to hydraulically model and analyze the sewer system and how it reacts and functions during wet weather events. In order for the hydraulic modeling results to be valid the model must be calibrated to ensure that the results reflect how the system is truly functioning. Building the computerized model of the sewer system and calibrating it is time consuming. Calibration quite often requires flow monitors to be installed in the sewers at key locations. The monitors will provide actual data of sewer flows and depths during wet weather events. This data will in turn be utilized in the hydraulic model to ensure that the model reflects the actual response of the sewer system to rainfall and that flood relief alternatives can indeed be effective.

PWD has installed temporary flow monitors in the sewer system at 26 key locations in order to obtain flow data during rain events. The monitors were installed in specific locations that would provide the most beneficial information to the modelers. In order for the information to be relevant, the monitors must be in place for several rain events, typically for several months. The information gathered is then used in conjunction with the hydraulic model to calibrate and/or verify that the model reflects what is actually taking place in the sewer system.

The modeling has been completed for the following trunk sewer systems:

Snyder/McKean Street sewershed east of Broad Street

The modeling effort in this neighborhood has shown that certain sewer system improvements could significantly improve the basement-flooding situation in the neighborhood served by this sewer system. The improvements, which are needed in addition to the existing Snyder Avenue project between Swanson & Dilworth Sts., are as follows:

1. Replace 1500 feet of existing 5′-6″ & 6′-0″ diameter sewer located in Snyder Ave, from Front St. to Fourth St. with a 4.5′x11′ box sewer.

2. Replace approximately 300 foot of existing 6′-0″ x 9′-0″ sewer, upstream of the Delaware River outfall with a 7.5′ x 12.5′ box sewer, including a new chamber.

The estimated construction cost for these sewer system improvements are approximately $ 5 million. PWD has placed this project in its capital program.

Lombard Street sewershed east of Broad Street

The modeling effort in this neighborhood has shown that certain sewer system improvements could significantly improve the basement-flooding situation in the neighborhood served by this sewer system. The improvements that are needed are as follows:

1. Construction of 2820 feet of 5 foot diameter sewer in Pine St. from Broad St.

   to 8th St.

2. Construction of 1325 feet of 6 foot diameter sewer in Pine St. from 8th St. to 5th St.

3. Construction of 1900 feet of 8′ x 7′ box sewer in Pine St. from 5th St to Front St.

The estimated construction costs for these sewer system improvements are approximately $ 8-10 million. PWD has placed this project in its capital program.

The projects are large and complicated and will take several years to design and construct. The hydraulic model indicates that these sewer system improvements greatly reduce the number of events that caused flooding and the severity, but may not be able to handle all possible rain events.

Water Department continues to be committed to hydraulically modeling the sewer system and looking for system improvements that will help mitigate the basement flooding in various neighborhoods. To that end, PWD is continuing its system analysis in the following sewer sheds.

The modeling effort is well under way for the following trunk sewer systems:

1. Passyunk Ave & Shunk Street sewersheds west of Broad Street

2. Tasker Street sewershed east of Broad Street

3. Shackamaxon St sewershed (Northern Liberties/Olde Kensington)

4. Allen St. sewershed (Northern Liberties/Olde Kensington)

The hydraulic modeling of these existing sewersheds is complete and the work of evaluating various possible solutions is currently under way. As solutions become viable they will be incorporated into PWD's Capital Program and will be included in future updates.

PWD has also increased its capital budget line item for storm flood relief projects from $4 Million to $10 Million annually and will be proposing even larger increases in future years. These funds will be used to construct flood relief projects as the analysis identifies specific system modifications/improvements that will mitigate the flooding situation.

K.6.3 Individual Property Solutions

Beginning November '06, PWD conducted a pilot Basement Protection Program, working with volunteer residents in the affected neighborhoods to install backwater valves on individual plumbing fixtures and main drains if warranted, and also to identify opportunities to disconnect the property's downspouts. The pilot program allows for the development of an anticipated and proposed scope of work for the department's contracted plumbers, and to determine related costs for this work, which involves restoring the portions of the basement or sidewalk affected by the installation of backwater valves. To date, PWD has retrofitted 12 properties while also developing a program protocol that will allows for a larger pool of customers to participate in the program which is free to eligible property owners.

The department has budgeted $3 million in FY 2008 for the implementation of this program. On July 1 2007 PWD initiated its soft launch, working through City Council offices and neighborhood organizations. The goal of soft launch is to allow the program staff and plumbers to begin protecting additional qualifying properties with backwater valve protection while not working under the duress of a rain storm which results in basement backups.

Application forms may be obtained by calling the PWD hotline (215-685-6300). To qualify for the program, the applicant must be the property owner of record; the property should be located within the identified flooding neighborhoods; and the property's water/sewer bill should be paid to date. The property owner will be required to sign a Basement Backflow Prevention Agreement. Once a scope of work has been defined for the property work may proceed.

K.7 Sanitary Infiltration Controls

The Industrial Waste Unit (IWU) within the Philadelphia Water Department (PWD) responds to all complaints of liquid, solid, or odorous sanitary pollution within Philadelphia. The IWU coordinates with neighboring communities in the event that a sanitary leak may drain into the Philadelphia MS4 system. The IWU unit uses a variety of investigative and removal techniques to mitigate the impacts of sanitary infiltration to the MS4 system, combined system, and receiving waters. Presented in Table K.7-1 below is a list of all pollutant migration events that reached either the MS4 or combined sewer systems in FY 2007.

Table K.7-1 FY 2007 Sanitary Infiltration Events

Location	System	Date
8300 Horrocks St	MS4	7/10/2006
2628 Maxwell St	MS4	8/23/2006
9000 Ashton Rd	MS4	9/9/2006
Horrocks and Strahle St.	MS4	9/20/2006
2628 Maxwell St.	MS4	10/3/2006
Dunks Ferry Rd S of Medford Rd.	MS4	12/1/2006
1235 Kater	CSO	2/5/2007
Longford St Wooden Bridge Run	MS4	2/8/2007
9200 Bustleton	MS4	5/24/2007

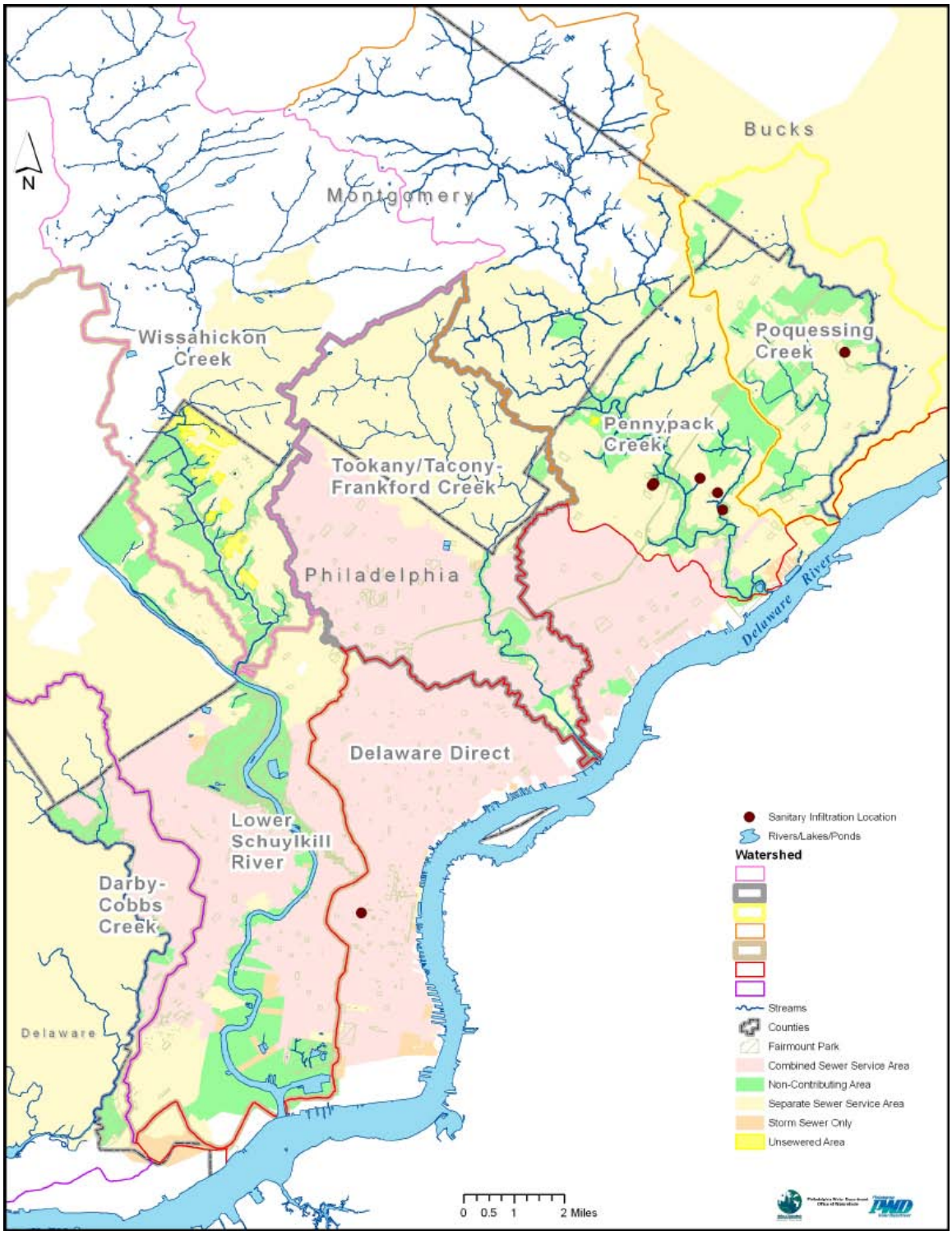

Figure K.7-1 FY 2007 Sanitary Infiltration Locations

K.8 Spill Prevention and Response

The City's response plan to respond to and contain harmful spills that may discharge to the municipal separate storm sewer system is managed by the Philadelphia Local Emergency Planning Committee. PWD is represented by the Industrial Waste Unit, whose personnel are charged with response to such events.

In order to protect the Philadelphia Water Department's structures and treatment processes, IWU personnel respond to oil and chemical spills and other incidents that have the potential to threaten the water supply or impact the sewer system, twenty-four hours per day, seven days per week. They supervise cleanup activities and assess environmental impact. The inspectors also investigate various other types of complaints. In FY 2006, there were 171 incidents that required an IWU response.

K.9 Public Reporting of Illicit Discharges, Improper Disposal

The City vigorously encourages public citizens to report the occurrence of illicit discharges that may impact the sewer system and water bodies. To facilitate the timely reporting of such events, PWD operates a 24 Hour/Day, 7 Day/Week Municipal Dispatcher to handle reports from the public. The direct numbers for the Dispatcher are (215) 686-4514 or (215) 686-4515. In addition, a customer service hotline is also operated that provides the ability to connect to the Dispatcher. This information is distributed in mailings, as well as online at http://www.phila.gov/water/contact_us.html.

Upon the reporting of such an incident, a PWD inspector is immediately dispatched to the site to investigate and determine the source of the discharge, as well as the extent of impact on the receiving water body. Each incident is logged into an electronic database that enables tracking of the details of each occurrence.

K.10 Used Oil and Toxic Material Disposal

The City continues to facilitate the proper disposal of used oil and other toxic materials. This program includes collections events, distribution of educational materials, the operation of a website, and a hotline accessible to the public. Please reference Section E.2.5.1 for a more detailed discussion of this topic.

K.11 Pennypack Creek Rock Ramp

In FY 2006, regional partners began planning to construct a rock ramp on the Pennypack Creek in order to open the waterway to diadromous fish passage. In FY 2007 PWD was invited to partner in the funding and contracting of this new BMP. This project is presented here among the other BMPs because this exciting partnership opportunity became immediately available to PWD during FY 2007 and will improve the fish habitat of the Pennypack Creek, a stormwater runoff receiving stream.

Pennypack Creek is a natural resource steeped in history that flows through one of the most densely populated areas in Pennsylvania. An opportunity exists to restore diadromous fish stocks to the watershed for the first time since colonial days. Though it may lie in an urban watershed, the stream corridor is heavily forested throughout almost the entire length and accessible to the public via Fairmount and Lorimer parks. Area residents, for a variety of outdoor recreational activities, heavily use the stream and surrounding parklands. Removal of unneeded dams, construction of devices to improve fish movement at barriers that cannot be removed, and stream and riparian habitat restoration activities will improve access and the habitat quality of the stream. The Pennsylvania Fish and Boat Commission (PFBC), in partnership with the Pennsylvania Department of Environmental Protection (PA DEP), Pennsylvania Department of Conservation and Natural Resources (PA DCNR), City of Philadelphia' s Fairmount Park Commission (FPC), Philadelphia Water Department (PWD), American Rivers, Friends of the Pennypack, Pennypack Ecological Restoration Trust, and Southeast Montgomery County Chapter of Trout Unlimited and others are undertaking efforts to restore the natural heritage of Pennypack Creek by providing fish passage at barriers, reestablishing extirpated fish populations and restoring stream and riparian habitat.

The Philadelphia Water Department's (PWD) sewer line #1 crosses Pennypack Creek between Frankford Avenue and Rhawn Street dams in Fairmount Park, and is the second upstream blockage (approximately 2.5 stream miles) from the confluence with the Delaware River. This concrete encased, active sewer line is approximately 2-ft high and 45-ft long. It spans the width of the creek creating a barrier to the migratory movements of fish and other aquatic organisms. The U.S. Fish and Wildlife Service developed conceptual plans for a rock-ramp fishway at the crossing. With additional funding from NOAA and American rivers, URS Corporation was contracted to finalize the rock-ramp design for submission to the appropriate state and federal agencies for permitting. The Philadelphia Water Department is providing funding and contracted construction of the rock-ramp, while Fairmount Park Commission contracted with URS for construction supervision. The estimated date of completion is September 2007.

In 2006, FPC, PFBC and project partners secured funding for the design and removal of Frankford Avenue and Rhawn Street dams. The installation of the rock-ramp fishway at PWD Sewer Line #1, in addition to the aforementioned projects, will provide access and enhance approximately 3.6 miles of suitable spawning and rearing habitat for migratory and resident fishes. Several other fishway and barrier removal projects are underway or planned for the remaining upstream blockages. The long-term goal is to reopen the entire main stem Pennypack to the migration of fishes including economically and ecological important diadromous species.

Section L
Assessment of Controls

The City of Philadelphia has implemented multiple best management practices (BMPs), technologies, plan review methods, and watershed planning efforts in order to achieve the goals of the NPDES Permit. The goals of the permit aim to improve the quality of stormwater runoff, and to reduce the quantity and rate of stormwater reaching the MS4 system and receiving waters.

Each section of this Annual Report presents not only the projects and activities of the Stormwater Management Program, but also the effectiveness and success of the multiple BMPs, technologies, planning efforts, and miscellaneous programs in order to track the progress of the Stormwater Management Program.

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Section M
Fiscal Resources

The Stormwater Management Program is funded from the City's Water Fund, supported by revenue from water and sewer rates. The Water and Wastewater Funds are required under the General Ordinance to be held separate and apart from all other funds and accounts of the City. The Fiscal Agent and the funds and accounts therein shall not be commingled with, loaned or transferred among themselves or to any other City funds or accounts except as expressly permitted by the General Ordinance. During the reporting period, the City provided fiscal resources needed to support operation and maintenance of the Stormwater Management Program as outlined in Table M-1 below. The table presents fiscal year budgets for both the reporting year as well as the upcoming fiscal year.

Table M-1 Fiscal Resources

Program	FY 2007 Budget	FY 2008 Budget
Office of Watersheds	$7.26 million	$9.96 million
Collector Systems Support	$1.42 million	$1.43 million
Sewer Maintenance and Flow Control	$18.6 million	$18.75 million
Inlet Cleaning	$4.38 million	$4.38 million
Abatement of Nuisances	$6.49 million	$9.4 million
Sewer Reconstruction	$22.5 million	$22.5 million
Public Affairs and Education	$4.09 million	$4.27 million
TOTAL	**$ 64.7 million**	**$70.69 million**

The conditions of the NPDES permit are able to be achieved through appropriate budget planning supporting the projects and assessments critical to a successful program. Any funding changes will be included as part of subsequent annual reports.

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Appendix A
Pollutant Minimization Plan

Philadelphia Water Department
Polychlorinated Biphenyl Pollutant Minimization Plan
First Annual Report

PCB

Pollutant Minimization Plan

First Annual Report

(For Plan Year Ending March 2007)

Table of Contents

1 PMP Achievement Executive Summary

The Philadelphia Water Department (PWD) submitted its PCB Pollutant Minimization Plan (PCB PMP) on September 30, 2005 and was issued a Completeness Determination letter on January 12, 2006. PWD initiated the actions called for in its PCB PMP on March 4, 2006.

PWD's PCB PMP set out the following approaches to achieving PCB minimization:

- Sample three Water Pollution Control Plants' effluent every two years and analyze using Method 1668a.
- Visit and inspect three hundred ninety-nine (399) sites listed by either EPA or other agencies as housing PCB-containing devices and report the number of devices that have been removed from each site, both prior to our inspection and subsequent to it.
- Visit and inspect thirty-one (31) sites listed by the Philadelphia Department of Public Health as having previously undergone some type of PCB remediation activity, and report the number of sites removed from the list as posing no threat of PCB discharge to PWD's sewer system.
- Report any reduction in PCB concentrations in the wastestreams from our three Water Treatment Plants by measuring PCBs in the ferric chloride used in the treatment process as well as reductions of PCBs in the source water (Delaware River or Schuylkill River).
- Continue the sewershed PCB trackdown sampling program for each of our three Water Pollution Control Plants.

During the first year of our five-year PCB PMP, the following tasks were performed:

- The Phase 2 Trackdown Sampling effort for the Southeast Water Pollution Control Plant (SEWPCP) took place October

17 through October 20, 2006. We are awaiting analytical results from this sampling.

- One hundred fifteen (115) of three hundred ninety-nine (399) sites listed by EPA or other agencies as housing PCB-containing devices were inspected. This effort is ahead of the schedule given in the original PMP.

- All thirty-one (31) sites listed by the Philadelphia Department of Public Health as having previously under gone some type of PCB remediation activity were inspected. This effort was completed well ahead of the schedule given in the original PMP.

- Wastewater discharge permits issued to Significant Industrial Users under the Pretreatment Program were reviewed for modification pursuant to annual inspection findings. PWD's Industrial Waste Unit modified its industrial facility inspection form to ensure that inspectors obtain information on PCBs and PCB devices that may exist at a facility.

This report offers further detail on the proposed approaches to achieving PCB minimization, as well as the actions that have been undertaken in the first year of the PMP and those that will be undertaken in subsequent years.

2 Facility and Contact Information

Facility Name and Address:	Philadelphia Water Department 1101 Market Street Philadelphia, PA 19107
Water Pollution Control Plants:	Northeast WPCP 3899 Richmond St. Philadelphia, PA 19137 Southeast WPCP 25 Pattison Ave. Philadelphia, PA 19148 Southwest WPCP 8200 Enterprise Ave. Philadelphia, PA 19153
Contact Person:	Keith D. Houck Manager, Industrial Waste Unit 1101 Market St., 4th Floor Philadelphia, PA 19107 Phone: 215-685-4910 Fax: 215-685-6207 Email: keith.houck@phila.gov
Date of Submittal of PMP:	September 30, 2005
Date of Completeness Determination:	January 12, 2006
Date of Initiation of PMP:	March 4, 2006
Reporting Period	Year 1

3 Revisions to PMP

The following revisions have been made to PWD's original PCB PMP:

- The PWD contact person for the PCB PMP is now Keith D. Houck, Manager of the Industrial Waste Unit (see Section 2 of this report, "Facility and Contact Information").

- Although originally scheduled for Quarters 2 and 3 of Year 1 of the PCB PMP, the SEWPCP Phase 2 Trackdown Sampling effort (appears on original schedule as "Sampling and Laboratory Analysis") was rescheduled to begin in Quarter 3 of Year 1 (the actual sewer sampling effort) and is still underway, as the laboratory analysis is not yet complete. The effort was rescheduled with the expectation that a rain event appropriate to the requirements of the Sampling and Analysis Plan was more likely to occur at a later time. This proved to be the case. Due to a spill of PCB to the SEWPCP sewershed that occurred in May 2006, one sample location was added to the original Sampling and Analysis Plan for this effort. (See Attachment C, specifically the sheet titled "LOCATION, TYPE, FREQUENCY OF SAMPLE FOR PCB TRACKDOWN STUDY". Sample location I.D. 14 is the additional location. Downstream sample locations were renumbered to reflect this addition.)

- The SEWPCP Phase 2 Trackdown Sampling and Analysis Plan called for the use of Method 8082. The laboratory chosen for the actual sample analysis uses a low-resolution GC/MS method for PCB congeners. The detection limit for the method is 200 pg/L (for mono-, di- and deca- congeners) and 2000 pg/L for higher congeners, using a 4-liter sample. The DRBC "short list" of fifty-eight (58) congeners was selected based on DRBC's evaluation of the Phase 1 data, which were obtained by method 1668a. The "short list" consists of congeners found to be present sixty percent (60 %) of the time at a detection limit greater than 500 pg/L.

- The original PCB PMP schedule called for inspections of the thirty-one (31) sites provided by the Philadelphia Department of Public Health beginning in Year 1 and ending in Year 3. These site inspections were completed during Year 1.

- The original PCB PMP schedule called for PWD to meet with regulators to discuss the possibility of obtaining from PECO information regarding PECO customers whose transformers or other PCB equipment is taken out of service (appears on original schedule as "Meet w/ regulators to discuss receipt of info. From Electric Comp(any)"). This was scheduled to take place during Year 1. The purpose of this was to allow PWD to know immediately when PCB equipment is no longer in service and may pose a problem due to improper handling or disposal or even vandalism. During Year 2, PWD will contact PECO in an effort to set up such a notification procedure. Should this attempt prove ineffective, PWD will speak with the appropriate regulators in order to seek a resolution.

- The original PCB PMP called for PWD to discuss with suburban townships, during Year 1, their inspection of Potential Sources within their jurisdictions that could affect the PWD sewershed. Owing to time and personnel constraints, this task has been rescheduled for Year 2.

The following revisions to PWD's original PCB PMP are contemplated:

- PWD is considering conducting training with responders from the Philadelphia Fire Department (PFD). This training would most likely focus on appropriate response measures to preclude inadvertently spilled PCBs (e.g. due to vandalism) from entering PWD's sewer system.

- PWD is considering having each permitted Significant Industrial User (SIU) regulated under PWD's pretreatment program submit a one-time certification statement to the effect that no PCBs are generated or stored on site and that there is no potential for PCBs to enter PWD's sewer system from a site.

- PWD is considering the development of a program to identify existing PCB equipment at facilities that no longer utilize the equipment and to secure such equipment (via purchase or other means) from tampering or other mishandling that could lead to discharges to PWD's sewer system.

4 Material and Process Modifications

During the first year of the PMP, there were no material or process modifications made relevant to PCB minimization.

(See also Section 5, “Measures to Address Known, Probable and Potential Sources” for the status of DuPont’s efforts with respect to reducing the PCB content of the ferric chloride supplied for use by PWD at its Water Treatment Plants.)

5 Measures to Address Known, Probable and Potential Sources

5.1 Known and Probable Sources

Two known sources of PCBs were identified in PWD's PCB PMP. These were the source water for PWD's Water Treatment Plants (Delaware and Schuylkill Rivers) and the ferric chloride supplied to PWD by DuPont and used in the water treatment process. No direct measurement of the PCB concentration of the source water was made during Year 1. With respect to the ferric chloride, DuPont's Edge Moor facility has made significant progress in capital improvements specific to the reduction of the formation of PCBs. The newly installed facilities (designated Purge Separation Project) are in the initial stages of start-up. An overall reduction of PCBs of ninety percent (90%) from 2001 TRI levels is targeted.

One probable source of PCBs was identified in PWD's PCB PMP. This source was sludge stored in lagoons at both NEWPCP and SWWPCP. The trackdown Phase 1 Sampling and Analysis Plan for each of these WPCPs calls for sampling and analysis of these sludges in order to determine whether they are sources of PCBs. These trackdown efforts are scheduled for subsequent years of the PCB PMP (NEWPCP in Year 2 and SWWPCP in Year 3).

5.2 Potential Sources

Numerous potential sources of PCBs were identified in PWD's PCP PMP. These were identified from databases supplied by EPA, the Philadelphia Fire Department, the Philadelphia Department of Public Health and others. The thirty-one (31) potential sources supplied by the Philadelphia Department of Public Health were identified as sites at which some form of prior PCB remediation had taken place. All thirty-one (31) of these sites were inspected during Year 1 (see Attachment A).

The remaining potential sources of PCBs, taken from information supplied by EPA and others, were identified as sites on which PCB devices were believed to be present. These sites were separated into three groups by sewershed (NEWPCP, SEWPCP or SWWPCP). Approximately one hundred sixty-seven (167), seventy-three (73) and one hundred fifty-seven (157) sites were listed for NEWPCP, SEWPCP and SWWPCP, respectively. During Year 1, PWD's Industrial Waste Unit inspected sixty-one (61) of the NEWPCP-related sites, fourteen (14) of the SEWPCP-related sites and forty (40) of the SWWPCP-related sites. A small number of listings were found to be duplicates, blank records or originally assigned to the wrong WPCP. These inspections found that a total of at least eight hundred fifty-four (854) PCB devices had been removed and a total of eighty-six (86) PCB devices are in the process of being removed from the one hundred fifteen (115) sites prior to having been inspected by the Industrial Waste Unit. The exact number of devices removed is uncertain due to the original listing containing no specific information on the number of devices believed to exist at some sites. The results of these inspections are summarized in the Tables, "Inspections of Potential Source Sites" (see Attachment A). The disposal records obtained for some of the sites inspected are not included with this report, but are available.

Table 1 - Known, Probable and Potential Sources and Measures to Address Sources

Source	**Source Type**			**Measure to Address Source**
	Known	*Probable*	*Potential*	
Water Supply (Delaware and Schuylkill Rivers)	X			PCB PMP and action by others
Ferric Chloride used in Water Treatment (Supplied by DuPont)	X			DuPont to reduce PCB content by 90%
Sludge Lagoons (NEWPCP and SWWPCP)		X		Trackdown for each WPCP calls for sampling and analysis
PCB Device sites in sewershed of each WPCP (see Attachment A, "Inspections of Potential Source Sites")			X	Site inspections, evaluations and followup
Significant Industrial Users			X	Modify permits as warranted
Electric Company (PECO) customers			X	Discuss w/PECO to obtain information

6. Incremental and Cumulative Changes from the Baseline Loading

6.1 Loading Baseline

PWD's PCB PMP provides the following baseline loadings (see Section 7, "Tabular Summary"):

WPCP	Baseline Loading (mg/day)
NEWPCP	11,510
SEWPCP	7,559
SWWPCP	10,970

These loadings differ from those found in the TMDL, Appendix Table 2-1 (http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf). This is because the data are from different sampling events, the PMP baseline loadings are weighted by wet versus dry weather results, the analyses are for different numbers of congeners and there is a difference in analytical methods.

6.1 Baseline Loading Reduction – Direct Measurement

No direct measurement of PCBs in the WPCPs' effluents was made during Year 1. The baseline measurements were made in 2005. The PCB PMP calls for the next measurement to be made during Year 2 (2007).

6.1 Baseline Loading Reduction – Other Measures of Progress

No actions taken under the PCB PMP during Year 1 provide any actual measure of progress toward the PCB minimization. PWD looks forward to receiving the analytical results for the SEWPCP Phase 2 Trackdown Sampling effort to determine if there is any clear pathway by which PCBs enter the SEWPCP sewershed. The ongoing removal, expected to be completed during 2007, of eighty-six (86) PCB devices from one of the Potential Source sites in the NEWPCP sewershed will provide protection against the inadvertent discharge of PCBs to PWD's sewer system.

7 Tabular Summary

Facility: Philadelphia Water Department
Date of Completeness Determination: January 12, 2006
Date of Initiation of PMP: March 4, 2006

Contact Information
Name: Keith D. Houck
Phone: 215-685-4910
Email: keith.houck@phila.gov

NPDES No(s).: PA0026689 (Northeast Water Pollution Control Plant, NEWPCP)
PA0026662 (Southeast Water Pollution Control Plant, SEWPCP)
PA0026671 (Southwest Water Pollution Control Plant, SWWPCP)

Cumulative Percent Reductions

Baseline Loading Calculations Date: 2005
Revisions Date: N/A

Year	Loading (milligrams per day)	Estimated Reductions (milligrams per day)	Cumulative Reductions (% from baseline)
TMDL Estimated Loading (to be added by DRBC)			
Discharger Computed Baseline			
NEWPCP	11,510		
SEWPCP	7,559		
SWWPCP	10,970		
1		N/A	N/A
2			
3			
4			
5			

Note: Second round of sampling from these plants to be conducted during 2007, in the second year of the PMP.

Measures

Description	Date Initiated	Date Completed	Comments/Status:
SEWPCP Phase 2 Trackdown Sampling	October 17, 2006	October 20, 2006	Awaiting analytical results
Inspections of "Potential Source" sites	March 4, 2006	Ongoing	119 of 399 Completed
Inspections of "Potential Source" sites (Phila. Health Dept. list)	October 30, 2006	March 21, 2007	31 of 31 Completed

Monitoring

Sample Location	Date of Sample Collection	Date Results Received	Total PCBs (pg/l)	Penta-PCBs (pg/l)
(SEWPCP Phase 2 Trackdown Sampling)	October 17-20, 2006	Awaiting analytical results		

Attachment A

Potential Sources and Inspection Findings

PWD #	Inspection Date	Type of PCB Equipment	Number of PCB Devices at Location	Status of PCB Equipment				Status of Facility			Comments
				In use	Out of Service	Disconnected	Off Site	Operating	Closed	Abandoned / not secure	
NE-120	05/17/06	TRANSFORMER	3				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-124	05/17/06	TRANSFORMER	2				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-125	05/17/06	TRANSFORMER	2				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-126	05/17/06	TRANSFORMER	2				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-127	05/17/06	TRANSFORMER	2				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-128	05/17/06	TRANSFORMER	2				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-129	05/17/06	TRANSFORMER	2				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-130	05/17/06	TRANSFORMER	1				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-131	05/17/06	TRANSFORMER	2				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-132	05/17/06	TRANSFORMER	2				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-133	05/17/06	TRANSFORMER	2				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-147	05/17/06	CAPACITORS	96				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)

PWD #	Inspection Date	Type of PCB Equipment	Number of PCB Devices at Location	Status of PCB Equipment				Status of Facility			Comments
				In use	Out of Service	Disconnected	Off Site	Operating	Closed	Abandoned / not secure	
NE-68	05/17/06	CAPACITORS	24				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-69	05/17/06	TRANSFORMER	1				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-80	05/17/06	TRANSFORMERS					X	X			Cardinal Health has been at this location for ~ 10 years No PCB transformers are on this site, dry transformers only.
NE-92	05/17/06	CAPACITORS	48				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-93	05/18/06	CAPACITORS	48				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-94	05/19/06	CAPACITORS	48				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-95	05/20/06	CAPACITORS	48				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-96	05/21/06	CAPACITORS	48				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-97	05/22/06	CAPACITORS	24				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-98	05/23/06	CAPACITORS	48				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-99	05/24/06	CAPACITORS	24				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-100	05/25/06	CAPACITORS	48				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)

PWD #	Inspection Date	Type of PCB Equipment	Number of PCB Devices at Location	Status of PCB Equipment				Status of Facility			Comments
				In use	Out of Service	Disconnected	Off Site	Operating	Closed	Abandoned / not secure	
NE-101	05/26/06	CAPACITORS	48				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-102	05/27/06	CAPACITORS	48				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-103	05/28/06	CAPACITORS	48				X	X			Now Golf Course with modern electrical equipment. Two original buildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-22	06/23/06	TRANSFORMERS	2		X		X	X			Document attached to Ins Report NE-23
NE-23	06/23/06	CAPACITORS	2		X		X	X			Documentation attached
NE-24	06/23/06		1				X	X			No Amtrak transformers on site. Currently there are 25 SEPTA undercars on site.
NE-25	06/23/06		1				X	X			No Amtrak transformers on site. Currently there are 25 SEPTA undercars on site.
NE-39	10/11/06	TRANSFORMER	1				X		Demolished		Site is now a shopping center
NE-10	10/23/06		2				X	X			Cooling tower #4 Transformers removed 2001. Documentation on site. List of capacitors is attached to the inspection report.
NE-119	10/23/06	TRANSFORMER	3	X				X			Certificate of destruction is attached to the inspection report.
NE-143	10/23/06	TRANSFORMERS	7	X				X			Certificate of destruction is attached to the inspection report. (5 retrofilled 2 dry)
NE-148	10/23/06	TRANSFORMERS	2	X				X			Certificate of destruction is attached to the inspection report. Replaced w/ dry (4/94)
NE-20	10/23/06		1				X	X			Cooling tower #3 Transformers removed 2004. Documentation on site.
NE-27	10/23/06		1				X	X			Cooling tower #5 Transformers removed 2001. Documentation on site.
NE-66	10/23/06	TRANSFORMER	1	X				X			Certificate of destruction is attached to the inspection report.
NE-67	10/23/06	TRANSFORMER	2	X				X			Certificate of destruction is attached to the inspection report.
NE-121	10/26/06	CAPACITORS	4	X				X			All PCB equipment retrofitted 10-15 yrs ago. Paperwork cannot be located.
NE-122	10/26/06	CAPACITORS	4	X				X			All PCB equipment retrofitted 10-15 yrs ago. Paperwork cannot be located.
NE-134	10/26/06	CAPACITORS	5	X				X			All PCB equipment retrofitted 10-15 yrs ago. Paperwork cannot be located.
NE-138	10/26/06	CAPACITORS	6	X				X			All PCB equipment retrofitted 10-15 yrs ago. Paperwork cannot be located.
NE-144	10/26/06	CAPACITORS	8	X				X			All PCB equipment retrofitted 10-15 yrs ago. Paperwork cannot be located.

PWD #	Inspection Date	Type of PCB Equipment	Number of PCB Devices at Location	Status of PCB Equipment				Status of Facility			Comments
				In use	Out of Service	Disconnected	Off Site	Operating	Closed	Abandoned / not secure	
NE-136	11/16/06	TRANSFORMERS	5				X		X		Anzon completely gone. Currently Ekard Drugs, WAWA fuel station, Applebees, CVS, Beneficial Bank, Dunkin Donuts, Cold Stone, Pizza Hut, Arby's
NE-36	11/20/06	CAPACITORS	6				X	X			All PCB equipment removed in 2006.
NE-11	01/30/07	TRANSFORMER	1	X				X			Located on side of fitness cente
NE-12	01/30/07	TRANSFORMER	1	X				X			Located behind building (store#28) in shopping center. Retrofilled to <50 ppm (Sign fading)
NE-1	02/28/07	TRANSFORMERS	86	X				X			In process of removing transformers. Inspection sheet has list and PCB removal plan attached.
NE-104	03/12/07	CAPACITORS	26				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-106	03/12/07	TRANSFORMERS	3	X				X			Located on pole labeled #4, assumed to be the 3 PCB transformers still on the pole.
NE-135	03/12/07	CAPACITORS	5				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-145	03/12/07	CAPACITORS	8				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-169	03/12/07	CAPACITOR	1				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-73	03/12/07	CAPACITORS	2				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-74	03/12/07	CAPACITORS	2				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-75	03/12/07	CAPACITORS	2				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-76	03/12/07	CAPACITORS	2				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-168	03/16/07	TRANSFORMER	1				X	X			Removerd 2000.
NE-139	Blank record						NA		NA		Blank record
NE-2	Duplicate Record		87				NA		NA		Duplicate record NE-01
NE-21	Duplicate Record		~~1~~				NA		NA		Duplicate record NE-20
NE-26	Duplicate Record		~~1~~				NA		NA		Duplicate record NE-27
NE-9	Duplicate Record		~~2~~				NA		NA		Duplicate record NE-10
NE-150	10/13/06	RETROFILLED					X	X			No PCB equipment on site
NE-5	03/28/07		2								
NE-6	Duplicate Record		2								

PWD #	Inspection Date	Type of PCB Equipment	Number of PCB Devices at Location	Status of PCB Equipment				Status of Facility			Comments
				In use	Out of Service	Disconnected	Off Site	Operating	Closed	Abandoned / not secure	
SE-19	9/8/2006	TRANSFORMER	1				X		2002		No disposal record available. Bldg. Demolished Transformers removed from site.
SE-20	9/8/2006	TRANSFORMER	1				X		2002		No disposal record available. Bldg. Demolished Transformers removed from site.
SE-21	9/8/2006	TRANSFORMER	1				X		2002		No disposal record available. Bldg. Demolished Transformers removed from site.
SE-22	9/8/2006	TRANSFORMER	1				X		2002		No disposal record available. Bldg. Demolished Transformers removed from site.
SE-23	9/8/2006	TRANSFORMER	1				X		2002		No disposal record available. Bldg. Demolished Transformers removed from site.
SE-24	9/8/2006	TRANSFORMER	1				X		2002		No disposal record available. Bldg. Demolished Transformers removed from site.
SE-25	9/8/2006	TRANSFORMER	1				X		2002		No disposal record available. Bldg. Demolished Transformers removed from site.
SE-39	9/8/2006	TRANSFORMERS	2				X		2002		No disposal record available. Bldg. Demolished Transformers removed from site.
SE-40	9/8/2006	TRANSFORMERS	2				X		2002		No disposal record available. Bldg. Demolished Transformers removed from site.
SE-41	9/8/2006	TRANSFORMERS	2				X		2002		No disposal record available. Bldg. Demolished Transformers removed from site.
SE-42	9/8/2006	TRANSFORMERS	2				X		2002		No disposal record available. Bldg. Demolished Transformers removed from site.
SE-50	10/30/2006	TRANSFORMERS	2				X		X		It appears all transformers were removed when new building for the Turf Club was constructed. Old bldg. Demolished.
SE-6	3/14/2007	TRANSFORMER	1					X	X		PECO 99460 pole @ 1020 S. 4th St. and PECO 15039 pole @ 1034 S. 4th St. It is not known whether the transofrmer @ 1020 is the one in question. It is not known if it is PCB or non-PCB.
SE-8	3/14/2007	TRANSFORMER	1				X	X			Removed 1984 replaced with dry transformers. 1 additional dry in basement.

PWD #	Inspection Date	Type of PCB Equipment	Number of PCB Devices at Location	Status of PCB Equipment				Status of Facility			Comments
				In use	Out of Service	Disconnected	Off Site	Operating	Closed	Abandoned / not secure	
SW-117	6/5/2006	CAPACITORS	5	X				X			Still in service in a ready to run status, but not used daily. In use as a back-up. Used as medical office
SW-129	6/5/2006	CAPACITORS	8	X				X			Still in service in a ready to run status, but not used daily. In use as a back-up. Labeled as PCB. Used as medical office
SW-71	6/5/2006	CAPACITORS	2	X				X			Still in service as of 5/30/06 in ready to run status, but not used daily. Labeled PCB. Used as medical office
SW-72	6/5/2006	CAPACITORS	2	X				X			Still in service as of 5/30/06 in ready to run status as a back-up, but not used daily. Checked for spill,etc. Used as medical office
SW-73	6/5/2006	CAPACITORS	2	X				X			GE Ser# E78654, still in service in a ready to run status, not used daily. Used as medical office
SW-74	6/5/2006	CAPACITORS	2	X				X			Still in service in a ready to run status, but not used daily. Checked for spill, leaks. Used as medical office
SW-75	6/5/2006	CAPACITORS	2	X				X			Still in service in a ready to run status, but not used daily. Checked for spill, leaks. Used as medical office
SW-99	6/5/2006	CAPACITORS	3	X				X			Still in service in a ready to run status, but not used daily. Checked for spill, leaks. Used as medical office
SW-111	8/7/2006	CAPACITORS	4				X	X			
SW-126	8/7/2006	TRANSFORMERS	6				X		X		Former Meridian Bank. Burned down
SW-70	8/7/2006	CAPACITORS	17				X		X		Former Meridian Bank. Burned down
SW-97	8/7/2006	CAPACITORS	20				X		X		Former Meridian Bank. Burned down
SW-98	8/7/2006	CAPACITORS	22				X		X		Former Meridian Bank. Burned down
SW-100	8/11/2006	CAPACITORS	3				X		X		
SW-23	10/4/2006	CAPACITOR	2	X				X			
SW-27	10/11/2006	TRANSFORMER	1		**2005**		X			Demolished	Removed & disposed of between 11/05 & 12/06 removal contractor Tom Ferrick Tank Services, 215-233-1600.
SW-28	10/11/2006	TRANSFORMER	1		**2005**		X			Demolished	Removed & disposed of between 11/05 & 12/06 removal contractor Tom Ferrick Tank Services, 215-233-1600.
SW-29	10/11/2006	TRANSFORMER	1		**2005**		X			Demolished	Removed & disposed of between 11/05 & 12/06 removal contractor Tom Ferrick Tank Services, 215-233-1600.
SW-30	10/11/2006	TRANSFORMER	1		**2005**		X			Demolished	Removed & disposed of between 11/05 & 12/06 removal contractor Tom Ferrick Tank Services, 215-233-1600.
SW-24	10/24/2006	TRANSFORMER	1		**2004**		X	X			PCB-Contaminated equipment removed in 2004, replaced with new air cooled unit when station was completely redone in 2004.

PWD #	Inspection Date	Type of PCB Equipment	Number of PCB Devices at Location	Status of PCB Equipment				Status of Facility			Comments
				In use	Out of Service	Disconnected	Off Site	Operating	Closed	Abandoned / not secure	
SW-131	11/16/2006	RETROFILLED	3	X				X			There are two old inactive Wagner Transformers that may be PCB. Will test them in the future.
SW-96	11/16/2006	TRANSFORMERS DRY-TYPE	2	NA				X			Dry Transformers only
SW-21	2/20/2007	Transformers	3	X				X			Located in shed, locked and secured. Secondary containment, rubber lined concrete trough. Inspected quarterly paperwork.
SW-15	2/22/2007	RETROFILLED	2	X				X			See attached spreadsheet on inspection report Non-PCB retrofilled transformers.
SW-16	2/22/2007	RETROFILLED	2	X				X			See attached spreadsheet on inspection report Non-PCB retrofilled transformers.
SW-31	2/22/2007	RETROFILLED	2	X				X			1981 PCB concentration was 290 ppm. Retrofilled 11/7/91. Retest concentration was 43 ppm.(S) AND 11 PPM (N) See attached spreadsheet on inspection report.
SW-32	2/22/2007	RETROFILLED	1	X				X			Originally contained > 500 ppm PCB. However on-line processing and retrofill occurred in 1994 and subsequent testing results showed 11 ppm so reclassed to non-PCB. See attached spreadsheet on inspection report.
SW-33	2/22/2007	RETROFILLED	1	X				X			Originally contained > 500 ppm PCB. However on-line processing and retrofill occurred in 1994 and subsequent testing results showed 26 ppm so reclassed to non-PCB. See attached spreadsheet on inspection report.
SW-34	2/22/2007	RETROFILLED	1	X				X			Originally contained > 500 ppm PCB. However on-line processing and retrofill occurred in 1994 and subsequent testing results showed 16 ppm so reclassed to non-PCB. See attached spreadsheet on inspection report.
SW-35	2/22/2007	RETROFILLED	2	X				X			1981 PCB concentration was 490 ppm. Retrofilled 9/17/85. Retest concentration was 43 ppm (S) NAD 46 PMM (N). See attached spreadsheet on inspection report.

PWD #	Inspection Date	Type of PCB Equipment	Number of PCB Devices at Location	Status of PCB Equipment				Status of Facility			Comments
				In use	Out of Service	Disconnected	Off Site	Operating	Closed	Abandoned / not secure	
SW-36	2/22/2007	RETROFILLED	1	X				X			1981 PCB concentration was 1680 ppm. Retrofilled 1993. Retest PCB concentration was 7 ppm. See attached spreadsheet on inspection report.
SW-37	2/22/2007	RETROFILLED	1	X				X			1981 PCB concentration was 620 ppm. Retrofilled 6/14/94. Retest PCB concentration was 19 ppm. See attached spreadsheet on inspection report.
SW-38	2/22/2007	RETROFILLED	1	X				X			981 conc was 524 ppm. Was retrofilled on 8/15/94. Retest concentration was 18 ppm. See attached spreadsheet on inspection report.
SW-119	3/14/2007	TRANSFORMERS (1 NOW NON-PCB)	5	X				X			1 dry transformer. All other <50 ppm.
SW-136	3/14/2007	RETROFILLED	4	X				X			<50 ppm
SW-62	3/14/2007	TRANSFORMER	1	X				X			Emergency Back up power.
SW-69	3/14/2007	CAPACITORS	16				X	X			Removed 15 years ago. 16 capacitor
SW-145	Blank Record										
SW-60	Blank Record										
SW-22	Duplicate Record		3								
SW-67	12/19/2006	Dry TRANSFORMER	1	X				X			
SW-68	12/19/2006	Dry TRANSFORMER	2	X				X			
SW-158	12/19/2006	Dry TRANSFORMER	1	X				X			There is a bank of 4 Intereen capacitors, 1.2 ga each

Philadelphia Water Department

Inspections of Potential Source Sites provided by Philadelphia Department of Public Health

All WPCPs - Year 1

WPCP	Number of Locations	Number of Locations Removed from List per Inspection Findings	Comments
NEWPCP	10	8	1 location had Phases 1 and 2 cleanup completed previously. Phase 3 cleanup to take place in 2007. Facility operator given PWD "PCB Information Sheet." 1 location has six transformers on site. Referred to Department of License and Inspection. IWU to followup. Facility operator given PWD "PCB Information Sheet."
SEWPCP	6	5	1 location has device still in use. Site operator given PWD "PCB Information Sheet."
SWWPCP	15	15	

Attachment B

City-Wide Potential Sources Inspection Report (form)

CITY-WIDE PCB POTENTIAL SOURCES INSPECTION REPORT

POTW	
PWD #	
Referral Agency	
Inspection Date	
Inspector Name	
Company Name	
Street	
Town/ City	
Zip Code	
GIS Coord.	
County	
Site Name	
Bldg Name	
Contact Name	
Contact Phone	
Official Name	
Official Title	
Address: Street	
Address: Town/ City	
Address: Zip Code	
PCB Equipment Located in Suburban Townships	
Name of Utility under Contract w/PWD	
Location or name of connection to PWD System	
For PCB Equipment Located within Philadelphia	
Name of Trunk Sewer	
Name of Intercepting Sewer	
Combined or Separate Sewer	
Regulator of Pretreatment Permit	
Pretreatment Permit Number	
Type of PCB Equipment	
Number of PCB	
Type of Aroclor	
PCB Total Concentration(PPM)	
Fluid Volume gal	
PCB Mass gal	
PCB Mass Kg	
PWD #	
Status of PCB Equipment	
In use	
Out of Service	
Disconnected	
Not on site	
Status of Facility	
Operating	
Closed	

CITY-WIDE PCB POTENTIAL SOURCES INSPECTION REPORT

Abandoned/not secure _____

Comments _____

Attachment C

SEWPCP Phase 2 Trackdown Sampling Documents

LOCATION, TYPE, FREQUENCY OF SAMPLE FOR PCB TRACKDOWN STUDY

				Approximate time of sample (0000=1 hr after rain starts - Time of first dip of the grab sample)		
Sampling location I.D.	**Location**	**Type**	**Approximate time frame of samples**	**Group A**	**Group B**	**Group C**
1	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-37 (Cumberland St.)**	2 grabs 20 min apart		0060		
2	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-38(Dyott St.)**	2 grabs 20 min apart		0120		
3	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-39 (Susquehanna St.)**	2 grabs 20 min apart		0180		
4	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-40(Berks)**	2 grabs 20 min apart		0240		
5	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-41(PalmerSt.)**	2 grabs 20 min apart		0300		
6	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-42(Columbia Ave.)**	2 grabs 20 min apart				0060
7	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-43(Marlborough St.)**	2 grabs 20 min apart				0120
8	Lower Delaware Low Level Interceptor at Delaware Ave. north of Shackamaxon St. **(Phase I #1)**	2 grabs 20 min apart	One hour after start of storm and second sample 20 minutes later	0000		
9	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-44 (Shackomoxon St.)**	2 grabs 20 min apart				0180
10	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-45(Laurel St.)**	2 grabs 20 min apart			0060	
11	Lower Delaware Low Level Interceptor at Delaware Ave. south of Laurel St **(Phase I #2)**	2 grabs 20 min apart	One hour after start of storm and second sample 20 minutes later		0000	
12	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-46(Penn St.)**	2 grabs 20 min apart			0120	

LOCATION, TYPE, FREQUENCY OF SAMPLE FOR PCB TRACKDOWN STUDY

				Approximate time of sample (0000=1 hr after rain starts - Time of first dip of the grab sample)		
Sampling location I.D.	**Location**	**Type**	**Approximate time frame of samples**	**Group A**	**Group B**	**Group C**
13	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-47(Fairmont Ave.**	2 grabs 20 min apart			0180	
14	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-48(Willow St.)**	3 grabs 20 min apart			0240	
15	Lower Delaware Low Level Interceptor at Front St. north of Arch St. **(Phase I #3)**	2 grabs 20 min apart	One hour after start of storm and second sample 20 minutes later			0000
16	Lower Delaware Low Level Interceptor at Swanson St. south of Queen St. **(Phase I #4)**	2 grabs 20 min apart				0240
17	Lower Delaware Low Level Interceptor at Oregon St. **(Phase I #C)**	2 grabs 20 min apart			0300	
18	Lower Delaware Low Level Interceptor at Pattison **(Phase I D)**	2 grabs 20 min apart				0300
????	SEWPCP Influent	8 hour composite every 30 minutes	??? plus 60 minutes and every 30 minutes thereafter			
????	SEWPCP Effluent	8 hour composite every 30 minutes	Influent plus 2 hours and every 30 minutes thereafter			
????	SE Sludge	2 grabs at both primary and WAS 3 hours apart for 4 days	Rain event day One hour after primary sludge is pumped			

LOCATION, TYPE, FREQUENCY OF SAMPLE FOR PCB TRACKDOWN STUDY

SE PCB Phase II Trackdown LIMS codes		
BLS LIMS #	**Sampling location I.D.**	**Location**
D-37--DWO	1	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-37 (Cumberland St.)**
D-38--DWO	2	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-38(Dyott St.)**
D-39--DWO	3	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-39 (Susquehanna St.)**
D-40--DWO	4	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-40(Berks)**
D-41--DWO	5	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-41(PalmerSt.)**
D-42--DWO	6	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-42(Columbia Ave.)**
D-43--DWO	7	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-43(Marlborough St.)**
SEMH1	8	Lower Delaware Low Level Interceptor at Delaware Ave. north of Shackamaxon St. **(Phase I #1)**
D-44--DWO	9	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-44 (Shackomoxon St.)**
D-45--DWO	10	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-45(Laurel St.)**
SEMH2	11	Lower Delaware Low Level Interceptor at Delaware Ave. south of Laurel St **(Phase I #2)**
D-46--DWO	12	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-46(Penn St.)**
D-47--DWO	13	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-47(Fairmont Ave.**
D-48--DWO	14	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at **D-48(Willow St.)**
SEMH3	15	Lower Delaware Low Level Interceptor at Front St. north of Arch St. **(Phase I #3)**
SEMH4	16	Lower Delaware Low Level Interceptor at Swanson St. south of Queen St. **(Phase I #4)**
SEINF	17	SEWPCP Influent
SEOUT	18	SEWPCP Effluent
SE-sludge	19	SE SludgeComposite of primary sludge & WAS {For four days}
Locations 8, 11, 15, 16, 17 & 18 already exist in LIMS		

Phase II SE PCB TRACKDOWN PROJECT

(Project Name COC—Phase II PCB Trackdown)
(Sample Program code COC—IWMISC)

LOCATION: **Loc.#8 Delaware Ave. north of Shackamaxon St. (Phase I #1)** **Sample Event Date(s):** _____

Sample Location Code-COC: **SEMH1** **Analysis-COC:** **PCB DRBC Short List & TSS**

Sampler Name: _____ **Other Onsite People:** _____

Sample Matrix Water **Sampling Method** Grab

Date /Time @ Grab #1 first dip _____ **Date /Time @ Grab #1 last dip** _____
(COC Grab #1 time)

Observations of sample: _____

Weather Observations: _____

Date /Time @ Grab #2 first dip _____ **Date /Time @ Grab #2 last dip** _____
(COC Grab #2 time)
(BLS Sample time)

Observations of sample:

Weather Observations: _____

Read & Understood

_____
Signed and Dated 04/19/07

Attachment D

PWD “PCB Information Sheet” for Facility Operators

PCB Information Sheet

What is a PCB Device?

A PCB device contains PCBs at concentrations ≥ 500 parts per million (ppm). A PCB-Contaminated device is one containing amounts ≥ 50 and ≤ 499 ppm PCBs. These devices are also subject to EPA's regulations.

Labels:

- Proper PCB identification labels must be affixed to the access to the transformers and also the transformer itself. The identification must be displayed in a place where it is easily visible.
- When analytical results identify an item's PCB concentration, the concentration should be written in permanent ink on the label. When the equipment is determined to have a concentration of less than 50-ppm PCBs, a "Non-PCB" label should be affixed to the equipment. Labeling is also required for materials that do not contain PCBs at all.
- Once a PCB item is removed from service, the PCB Article or Container should also be labeled with the date when it was removed from service.

Recordkeeping:

- Records of inspections and maintenance must be maintained.
- Annual documents and annual document logs describing the inventory and disposition of PCB Transformers and other PCB Equipment must be kept.
- **All records for inspections and annual documents must be retained for a minimum of three (3) years after the last PCB Item has been disposed of.**

Spills

- When spills with low concentrations (less than 500 ppm PCBs) and less than 454 g (1 lb.) of PCBs occur, all soil within the spill area (visible boundary plus a 1-lateral-ft buffer zone) must be excavated and backfilled with clean soil. The contaminated soil must be disposed of as hazardous waste. Solid surfaces must be double washed/rinsed. This action must be completed within 48 hours after the owner of PCBs or PCB items was notified or became aware of the spill.
- When spills with high concentrations (500 ppm or more PCBs) or more than 454 g (1 lb.) of PCBs occur, the National Response Center must be notified immediately. The spill area must be cordoned off with at least a 3-ft buffer zone. Warning signs must be clearly visible. The area of visible contamination must be documented and recorded, noting the extent and center of the visible trace areas. The cleanup of fluid from hard surfaces and the removal of contaminated soil must be initiated (not necessarily completed) within 24 hours after the Responsible Individual was notified or became aware of the spill.

If a PCB spill occurs in your facility, you must report the spill within 24 hours to the **EPA Region 3 Emergency Response Section (215-814-3255), the National Response Center (800-424-8802), and the Philadelphia Water Department Municipal Dispatcher (215-686-4514/15)**. Immediately take control measures for the spread of the spill by damming or absorbing the leak, using absorbent materials, and cordon off the area. Cleanup must be initiated within 48 hours of the spill. A licensed PCB cleanup contractor may be called to clean up the spill.

If you have any questions or comments please call Mr. Keith Houck at 215-685-4910.

References:

1. www.epa.gov/compliance/resources/publications/assistance/sectors/constructmyer,
2. www.llnl.gov/es_and_h/hsm/doc_14.14/doc14-14,
3. www.unm.edu/~sheaweb/sheamanual/envprot/PCB.htm,
4. www.epa.gov/reg3wcmd/pcbs.htm

Attachment E

Original and Revised (End of Year 1) PCB PMP Schedules

Philadelphia Water Department
PCB PMP
Original Schedule

PMP - ALL PLANTS Key Dates Item # 11																					
Tasks	Qtr 1-Yr 1	Qtr 2-Yr 1	Qtr 3-Yr 1	Qtr 4-Yr 1	Qtr 1-Yr 2	Qtr 2-Yr 2	Qtr 3-Yr 2	Qtr 4-Yr 2	Qtr 1-Yr 3	Qtr 2-Yr 3	Qtr 3-Yr 3	Qtr 4-Yr 3	Qtr 1-Yr 4	Qtr 2-Yr 4	Qtr 3-Yr 4	Qtr 4-Yr 4	Qtr 1-Yr 5	Qtr 2-Yr 5	Qtr 3-Yr 5	Qtr 4-Yr 5
Trackdown (# 6)																				
Trackdown -Southeast Plant																				
Review of Final Plans for Phase 2																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Development of Phase 3, as needed																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Development of Phase 4, as needed																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Trackdown - Northeast Plant																				
Review of Final Plans for Phase 1																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Development of Phase 2, as needed																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Development of Phase 3, as needed																				
Sampling and Laboratory Analysis																				
Trackdown - Southwest Plant																				
Review of Final Plans for Phase 1																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Development of Phase 2, as needed																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Previous Minimization Activities (# 7)																				
Review PaDEP's Act 2 Sites and assign to POTW																				
Incorporate PaDEP's List of ACT 2 Sites Into PWD's PMP																				
Number of inspections of 31 PCB sites identified by Phila. Health Dept.			1 0				1 0				1 1									
Remove a site from the list if it does not represent a threat																				
Identify activities to mitigate potential threat from remaining sites																				
Implement above activities																				
Pollutant Minimization Measures (# 9)																				
Northeast Plant - determine PCB Loading from lagoons																				
Reduce PCB loading from Lagoons, as necessary																				
Southwest Plant - determine PCB Loading from lagoons																				
Reduce PCB loading from Lagoons, as necessary																				
Reduce PCB Concentration in FeCl3 by 90% from 2001 Levels																				
Reduce PCB Concentration in Schuylkill and Delaware Rivers (by others)																				
Number of Inspections of 377 City-wide Potential Sources	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Discuss w/ Suburban Townships their inspection of Pot. Sources																				
Suburban Township Inspections and data transfer																				
Revise Pretreatment Permits if they own a Potential Source																				
Meet w/ regulators to discuss receipt of info from Electric Comp.																				
Plant Effluent PCB Analysis																				
Conduct Plant Effluent Sampling (Method 1668a) Every 2 Years																				
Reports																				
Submit an Annual Report of PMP Activities																				

Philadelphia Water Department
PCB PMP
Revised Schedule
(End of Year 1)

PMP - ALL PLANTS Key Dates Item # 11																					
Tasks	Qtr 1-Yr 1	Qtr 2-Yr 1	Qtr 3-Yr 1	Qtr 4-Yr 1	Qtr 1-Yr 2	Qtr 2-Yr 2	Qtr 3-Yr 2	Qtr 4-Yr 2	Qtr 1-Yr 3	Qtr 2-Yr 3	Qtr 3-Yr 3	Qtr 4-Yr 3	Qtr 1-Yr 4	Qtr 2-Yr 4	Qtr 3-Yr 4	Qtr 4-Yr 4	Qtr 1-Yr 5	Qtr 2-Yr 5	Qtr 3-Yr 5	Qtr 4-Yr 5
Trackdown (# 6)																				
Trackdown -Southeast Plant																				
Review of Final Plans for Phase 2																				
Sampling and Laboratory Analysis				SEE	NOTE	BELOW														
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Development of Phase 3, as needed																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Development of Phase 4, as needed																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Trackdown - Northeast Plant																				
Review of Final Plans for Phase 1																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Development of Phase 2, as needed																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Development of Phase 3, as needed																				
Sampling and Laboratory Analysis																				
Trackdown - Southwest Plant																				
Review of Final Plans for Phase 1																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Development of Phase 2, as needed																				
Sampling and Laboratory Analysis																				
Data Analysis and Further Study Determination																				
Discuss Findings with PaDEP and Others																				
Implement Agreed PCB Mitigation Procedures																				
Previous Minimization Activities (# 7)																				
Review PaDEP's Act 2 Sites and assign to POTW																				
Incorporate PaDEP's List of ACT 2 Sites Into PWD's PMP																				
Number of inspections of 31 PCB sites identified by Phila. Health Dept.	**All 31 sites inspected during Year 1**																			
Remove a site from the list if it does not represent a threat																				
Identify activities to mitigate potential threat from remaining sites																				
Implement above activities																				
Pollutant Minimization Measures (# 9)																				
Northeast Plant - determine PCB Loading from lagoons																				
Reduce PCB loading from Lagoons, as necessary																				
Southwest Plant - determine PCB Loading from lagoons																				
Reduce PCB loading from Lagoons, as necessary																				
Reduce PCB Concentration in FeCl3 by 90% from 2001 Levels																				
Reduce PCB Concentration in Schuylkill and Delaware Rivers (by others)																				
Number of Inspections of 377 City-wide Potential Sources	**115**	**of these**	**in**	**Year 1**	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Discuss w/ Suburban Townships their inspection of Pot. Sources																				
Suburban Township Inspections and data transfer																				
Revise Pretreatment Permits if they own a Potential Source																				
Meet w/ regulators to discuss receipt of info from Electric Comp.																				
Plant Effluent PCB Analysis																				
Conduct Plant Effluent Sampling (Method 1668a) Every 2 Years																				
Reports																				
Submit an Annual Report of PMP Activities																				

Tasks highlighted in yellow have been rescheduled.

SEWPCP Phase 2 Trackdown sampling complete. Awaiting analytical results.

Attachment F

EPA’s Status Report on Metal Bank Superfund Site

Metal Bank

Current Site Information

EPA Region 3 (Mid-Atlantic)

Pennsylvania
Philadelphia
next to the Delaware River

EPA ID# PAD046557096

13th Congressional District

Last Update: February 2007

Other Names

Cottman Avenue Site

Current Site Status

Settlements have been reached with the parties responsible for the cleanup of the Metal Bank Site. The U.S. Department of Justice entered three Consent Decrees on March 14, 2006 on behalf of the U.S. EPA which settle nearly 25 years of litigation related to the Metal Bank Site. The final remedy for the site that was settled upon includes certain modifications from the Record of Decision issued in 1997. These changes are detailed in a "Revised Remedial Plan" attached to one of the Consent Decrees. Under the terms and conditions of that Consent Decree, a revised remedial design was submitted to EPA for approval on April 13, 2006. The revised final design is currently under review by EPA and other regulatory agencies to ensure that it complies with the negotiated "Revised Remedial Plan". After EPA approves the revised final design, the cleanup activities at the Site will begin. Construction of the revised remedial action could begin as early as the Summer of 2007.

Site Description

The Metal Bank site occupies approximately ten acres along the Delaware River in an industrial section of northeast Philadelphia. From 1968 to 1972, Metal Bank of America, Inc. drained oil from used transformers to reclaim copper parts. Metal Bank's recycling operations lead to oil releases in various locations on the property with the majority of the contamination in the vicinity of an underground storage tank (UST). This UST was used by Metal Bank to store the used transformer oil. In 1972, the UST ruptured and a release of oil to the Delaware River was documented by the U.S. Coast Guard. The U.S. Coast Guard traced periodic oil slicks in the river to the site in 1972, and the company performed a limited cleanup to prevent further releases. However, oil continued to seep from the Site.

In 1977, new testing procedures detected polychlorinated biphenyls (PCBs), in the oil. PCBs are used as insulation in electrical transformers, and they are probable human carcinogens. A 1978 study by the Coast Guard estimated 20,000 gallons of PCB-contaminated oil still remained in groundwater and would eventually leak into the Delaware River. In the early 1980's, the owner of the property installed and operated an oil recovery system to remove the PCB contaminated oil from the groundwater. The recovery system was operational until early 1989. PCB contaminated oil is still present at the Site today in the subsurface soil, groundwater and river sediments.

A public water intake is located 2.2 miles upstream from the Site, on the Delaware River. Two million people, including the eastern half of Philadelphia, are supplied with drinking water from the Delaware River. The Site is located next to a daycare center, which operates out of St. Vincent's School, approximately 200 feet away.

Site Responsibility

Cleanup of this site is the responsibility of Federal and State governments, and parties potentially responsible for site contamination. This site is being addressed through Federal and potentially responsible parties' actions.

NPL Listing History

Our country's most serious, uncontrolled, or abandoned hazardous waste sites can be cleaned using federal money. To be eligible for federal cleanup money, a site must be put on the National Priorities List (NPL). This site was proposed to the NPL on December 30, 1982, and formally added to the list on September 8, 1983.

Threats and Contaminants

PCBs and various other hazardous substances have been detected in the surface and subsurface soils onsite and in Delaware River sediment. There is also the presence of oil on the surface of the groundwater, in subsurface soils, and mudflat sediments. The PCB-contaminated oil has moved into the Delaware River as a result of groundwater and tidal wave movements underneath the Site. PCB-contaminated sediments have been detected along the shoreline immediately adjacent to the property line. Recreational fishermen may be at risk from eating contaminated fish. Future construction workers may be at risk from the PCBs in the oil beneath the Site. Fish and animals feeding on grounds next to the Site may also be affected.

Contaminant descriptions and associated risk factors are available on the Agency for Toxic Substance and Disease Registry, an arm of the CDC, web site at http://www.atsdr.cdc.gov/hazdat.html EXIT Disclaimer

Cleanup Progress

In 1980, EPA sued the owners to clean up the Site. In 1983, the site owners agreed to construct an oil recovery system to pump out the groundwater and remove the oil. In 1989, the Site owners petitioned the court to stop the oil recovery operation because they believed all the oil had been recovered. While EPA believed that more cleanup work was

needed, the Site owner was allowed to remove and dismantle the oil-recovery system. Although the oil recovery system was dismantled, EPA continued to pursue cleanup of the Site pursuant to the federal cleanup program, or "Superfund."

In 1983, the Site was placed on the National Priorities List (NPL) for federal cleanup, since the owners had ceased the cleanup. In 1987, EPA identified another 10 potentially responsible parties (PRPs), all of which were utility companies. Under the leadership of one PRP company (PSE&G), the PRPs formed a steering committee and signed an agreement with EPA in 1991 on how to investigate the Site. The PRPs conducted an investigation of the property and evaluated different approaches of cleanup. The Site owners declined to join this group.

In 1995, EPA proposed a plan to clean up the Site by removing contaminated soils and collecting PCB-contaminated oil before it can be released into the river. Although favorable comments were received from the general public, EPA addressed 22 volumes of comments submitted on behalf on the Site owners, who argued against any cleanup.

EPA issued its formal decision (Record of Decision, or ROD) on how the Site should be cleaned up in December 1997. In addition, EPA made changes to the ROD by issuing two Explanation of Significant Differences (ESDs) in September and December 2000.

In 1998, EPA issued a unilateral order to 13 PRPs (ten utility companies and the Site owners) to begin design and construction work. The design work required by the order was completed by the utility companies in January 2003. Presently, all building and exterior grounds have been cleared of trash and debris. During the fall of 1999, the Site owners demolished all buildings onsite with the exception of one building.

However, in May 1998, the court lifted the stay on the original lawsuit, and EPA amended its complaint against the Site owners to add a claim to recover its response costs under CERCLA. The trial was phased as follows: Phase One would determine whether defendants were liable and whether response costs were incurred by the Government; Phase Two would determine whether the Government's response costs, if any, were reasonable and recoverable, as well as the scope of any further remedial action; and Phase Three would determine the liability, if any, of the third-party defendants.

On January 21, 2003, in an 84-page opinion in United States v. Union Corporation, et al., Civil Action No. 80-1589, U.S. District Judge James T. Giles ruled on Phase One of the trial that the former and current Site owners – Union Corporation, Metal Bank of America Inc., and former Metal Bank owners and officers Irving Schorsch and John Schorsch – are liable for EPA’s costs related to the cleanup of the Site, located at 7301 Milnor Street in Philadelphia. The trial for Phase II had been set for November 2004. The corporate defendants Union Corporation, Metal Bank of America, Inc., subsequently filed for bankruptcy in May 2003. EPA settled with the corporate defendants in the bankruptcy proceeding in November 2003. The November 2004 trial did not proceed as planned. Instead, the parties entered mediation in early 2004. Three consent decrees have been entered and finalized on March 13, 2006. One of the Consent Decrees require a group of utility companies to implement the remedy at the Site. Under the term and conditions of that Consent Decree, a revised final design that specified the details of the cleanup

activites was submitted to EPA for approval on April 13, 2006. EPA is currently reviewing the revised final design. The major components of the cleanup plan include:
1. Excavation of contaminated soils and placement of a soil cap in the northern portion of the
site known as the "Courtyard Area" of the Site;
2. Power washing and surface coating Building 7 in the Courtyard Area;
3. Installation of a sheet pile wall along the southwest corner of the Metal Bank property adjacent to the Delaware River;
4. Removal of the underground storage tank at the southwest corner of the Site including the
removal of associated PCB contaminated soil with concentrations of PCBs greater than 25
ppm and removal of any oil that is present;
5. Excavation of contaminated soil in several specified "hot spot" areas in the southern portion of the site and off-site disposal of those soils;
6. Excavation of near-shore sediments and capping of other sediments areas in the Delaware
River in the immediate vicinity of the property that contain PCBs greater than 1 ppm;
7. Institutional Controls; and
8. Long-term monitoring to insure the effectiveness of the remedy.

Appendix B
Monitoring Locations

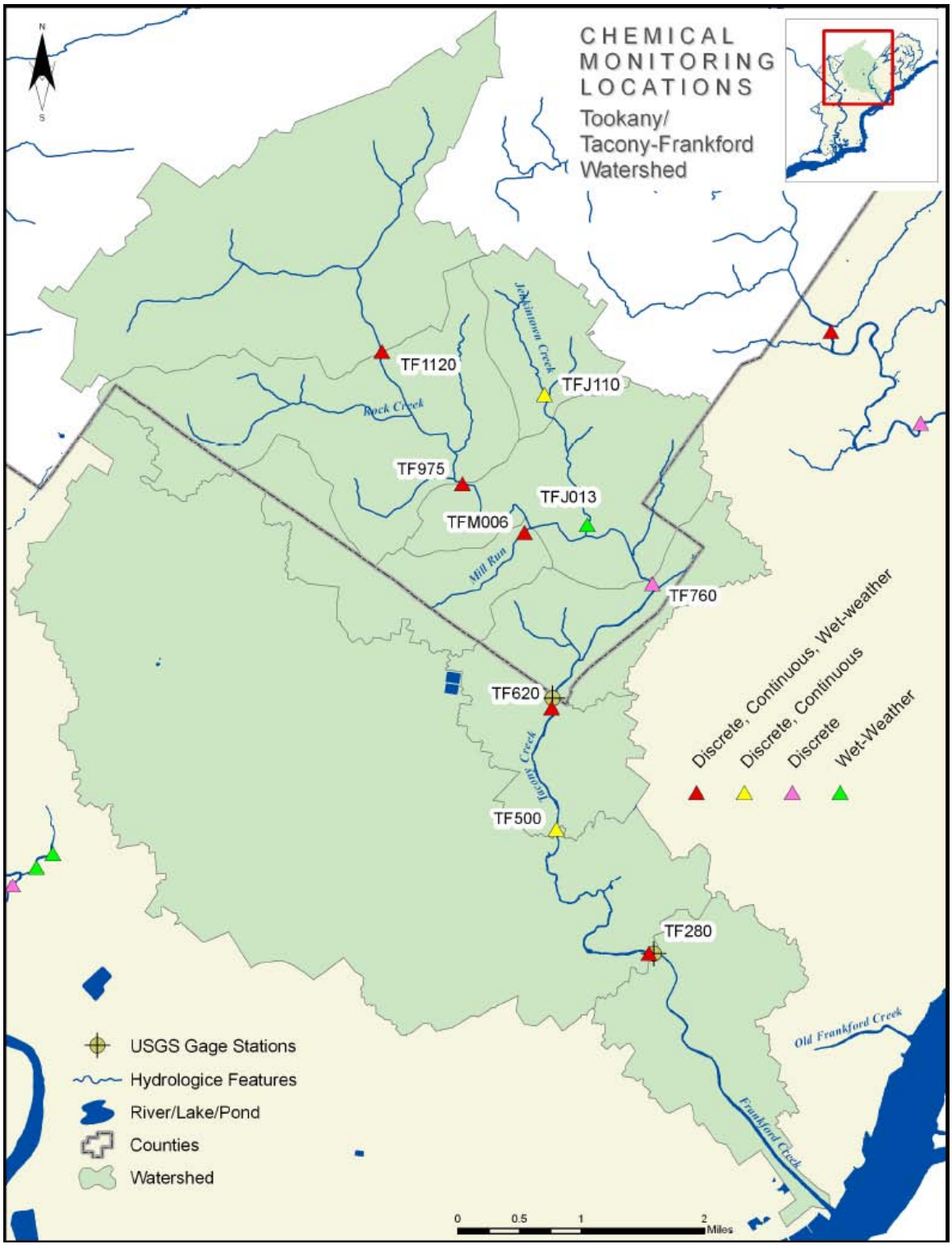

Figure B-1 Chemical monitoring locations in Tacony-Frankford Watershed.

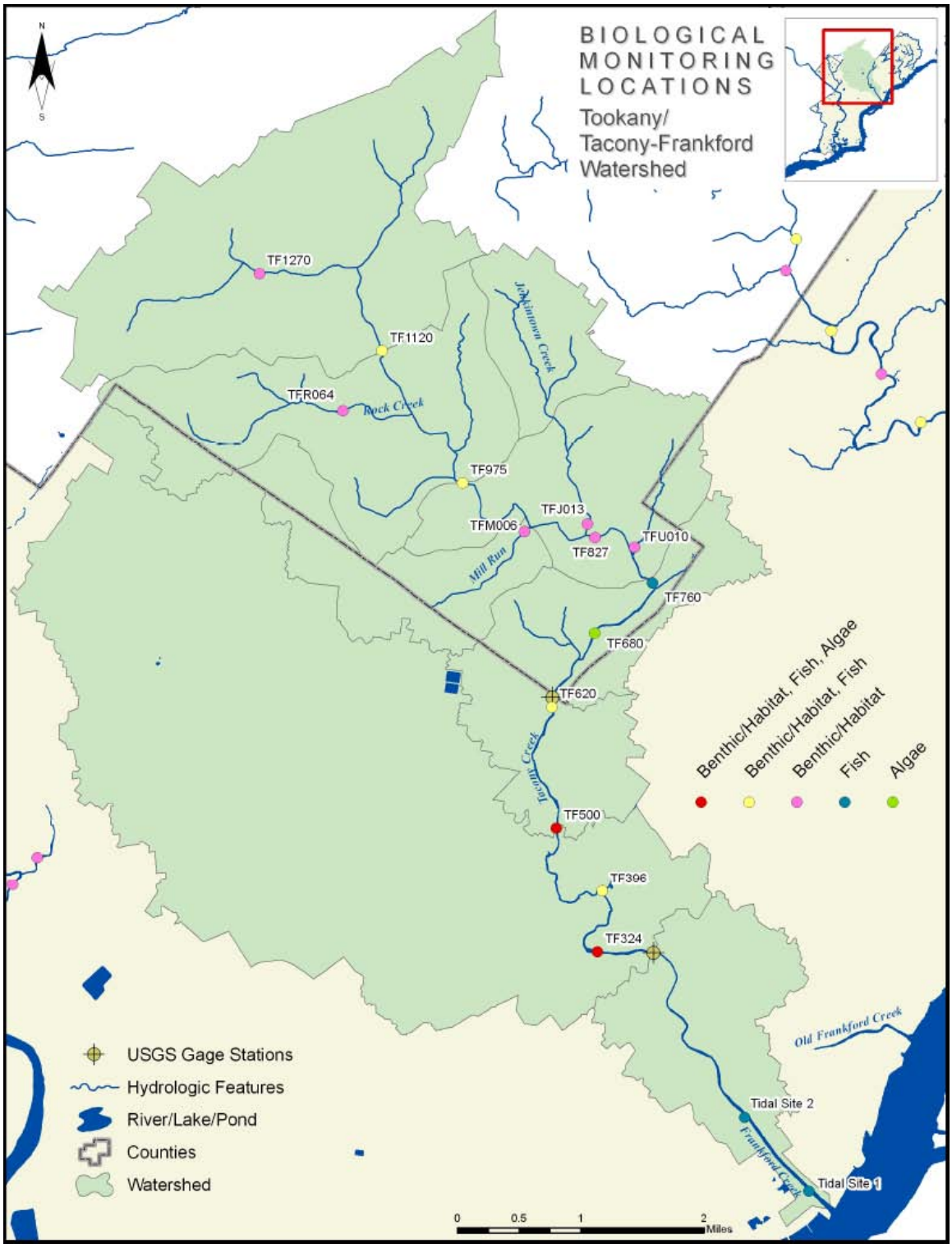

Figure B-2 Biological and physical assessment locations in Tacony-Frankford Watershed.

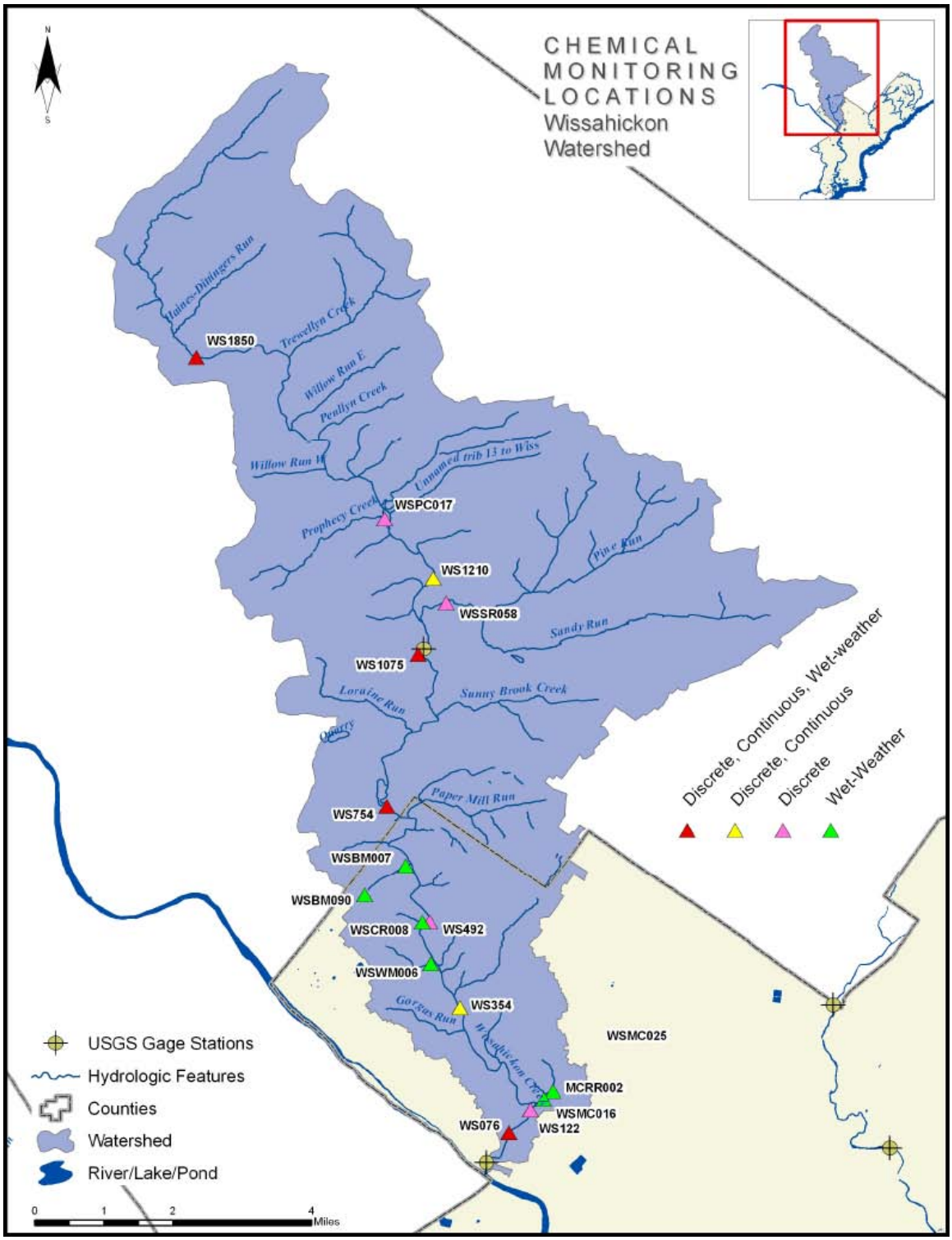

Figure B-3 Chemical monitoring locations in Wissahickon Watershed.

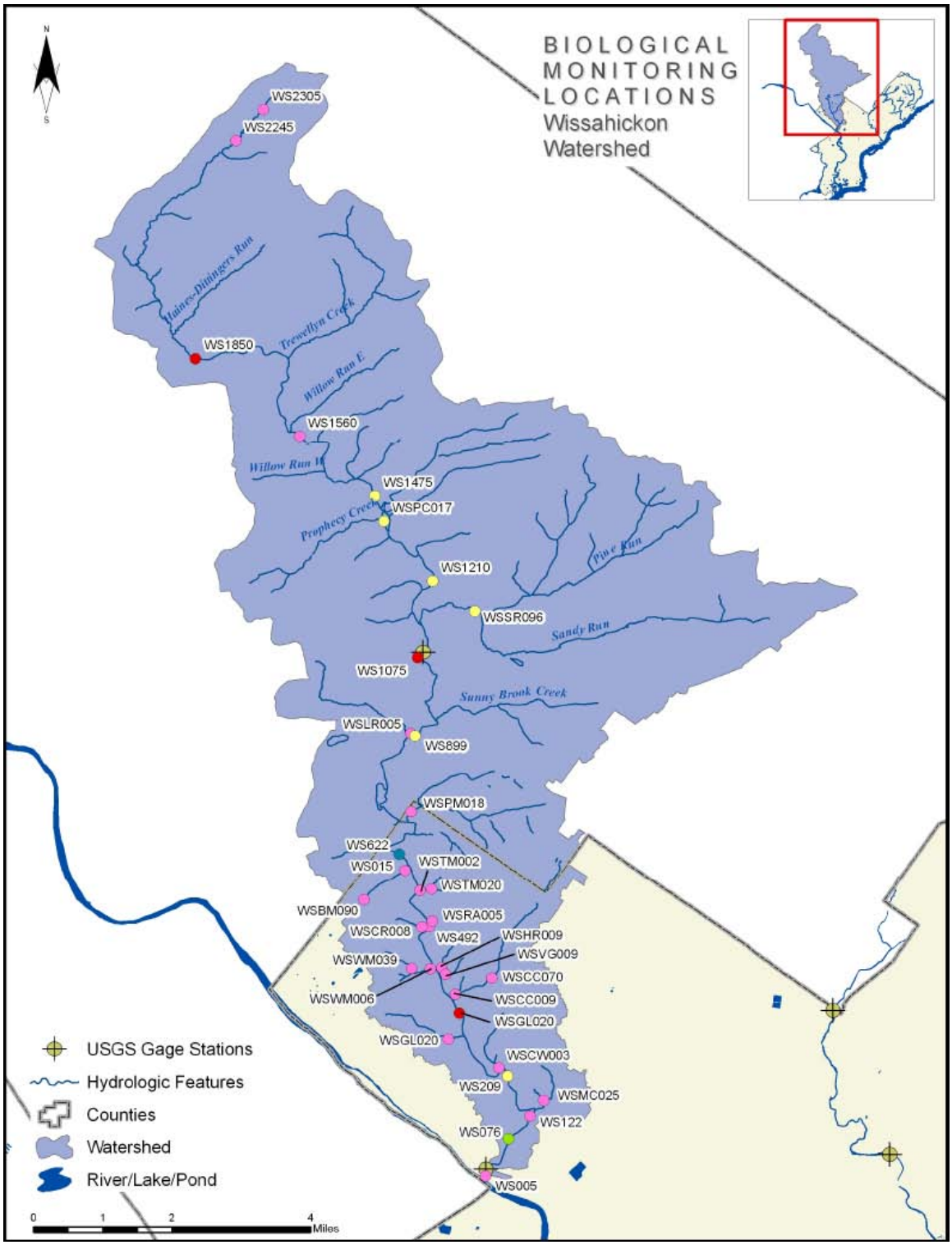

Figure B-4 Biological and physical assessment sites in Wissahickon Watershed

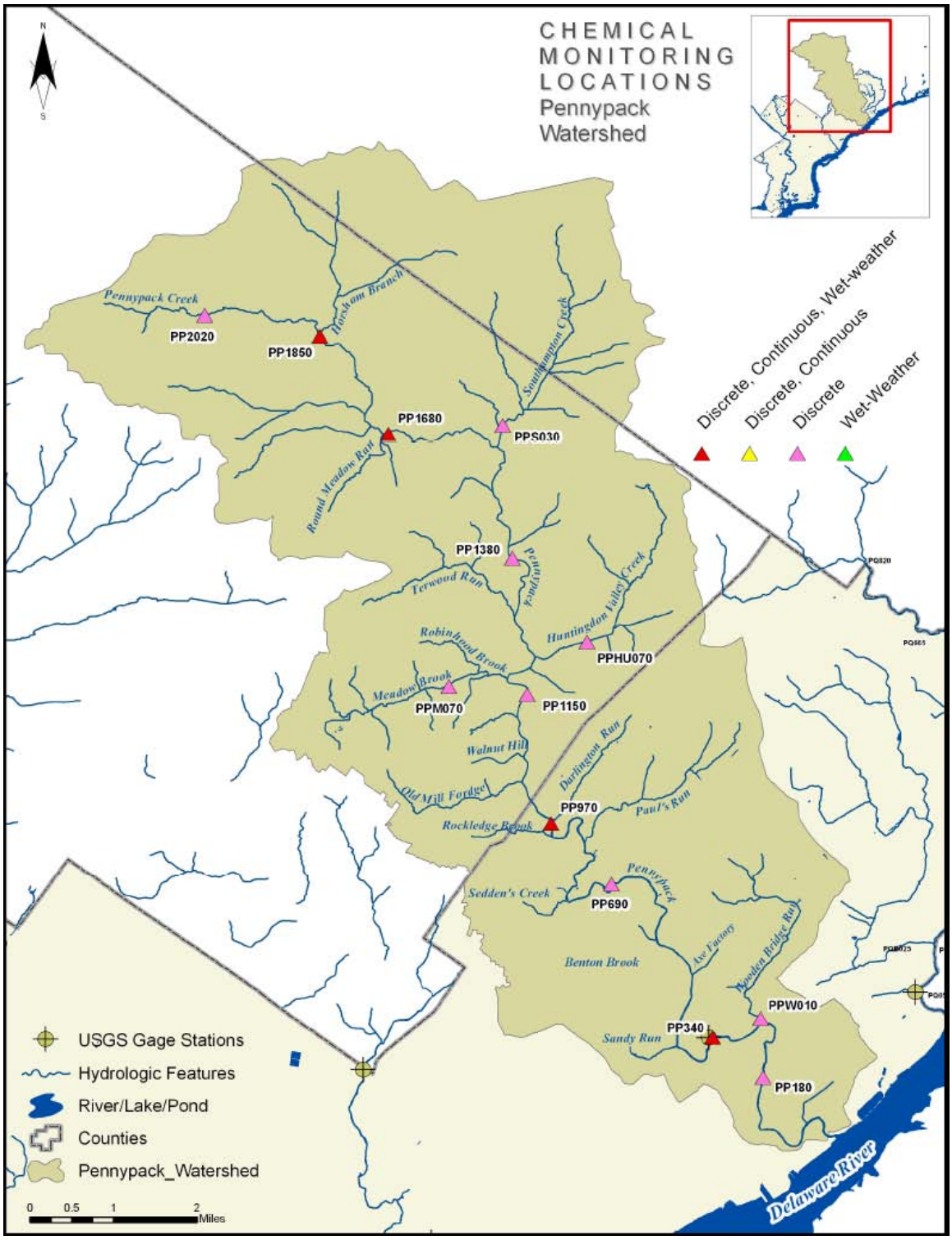

Figure B-5 Chemical monitoring locations in Pennypack Watershed

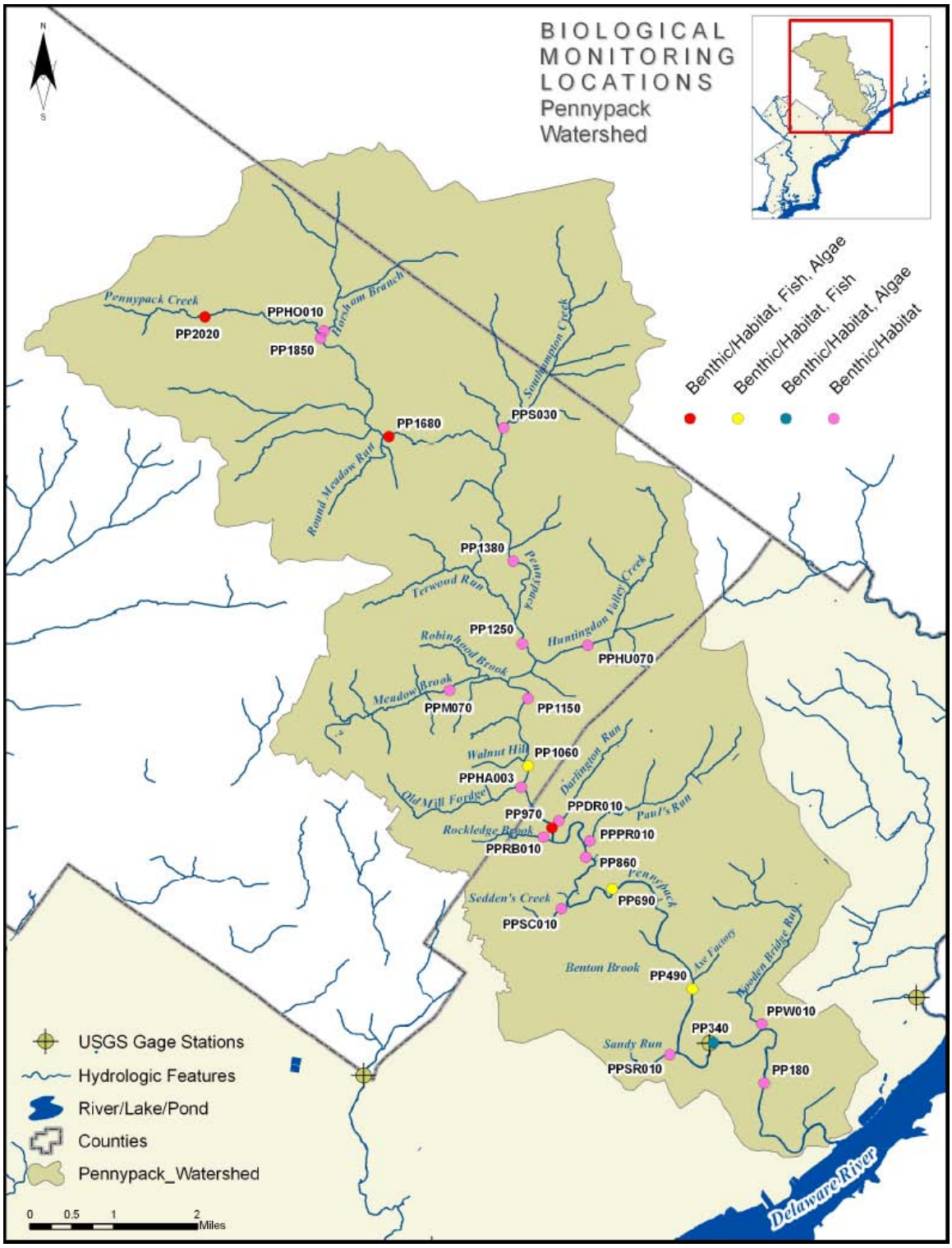

Figure B-6 Biological and physical assessment sites in Pennypack Watershed

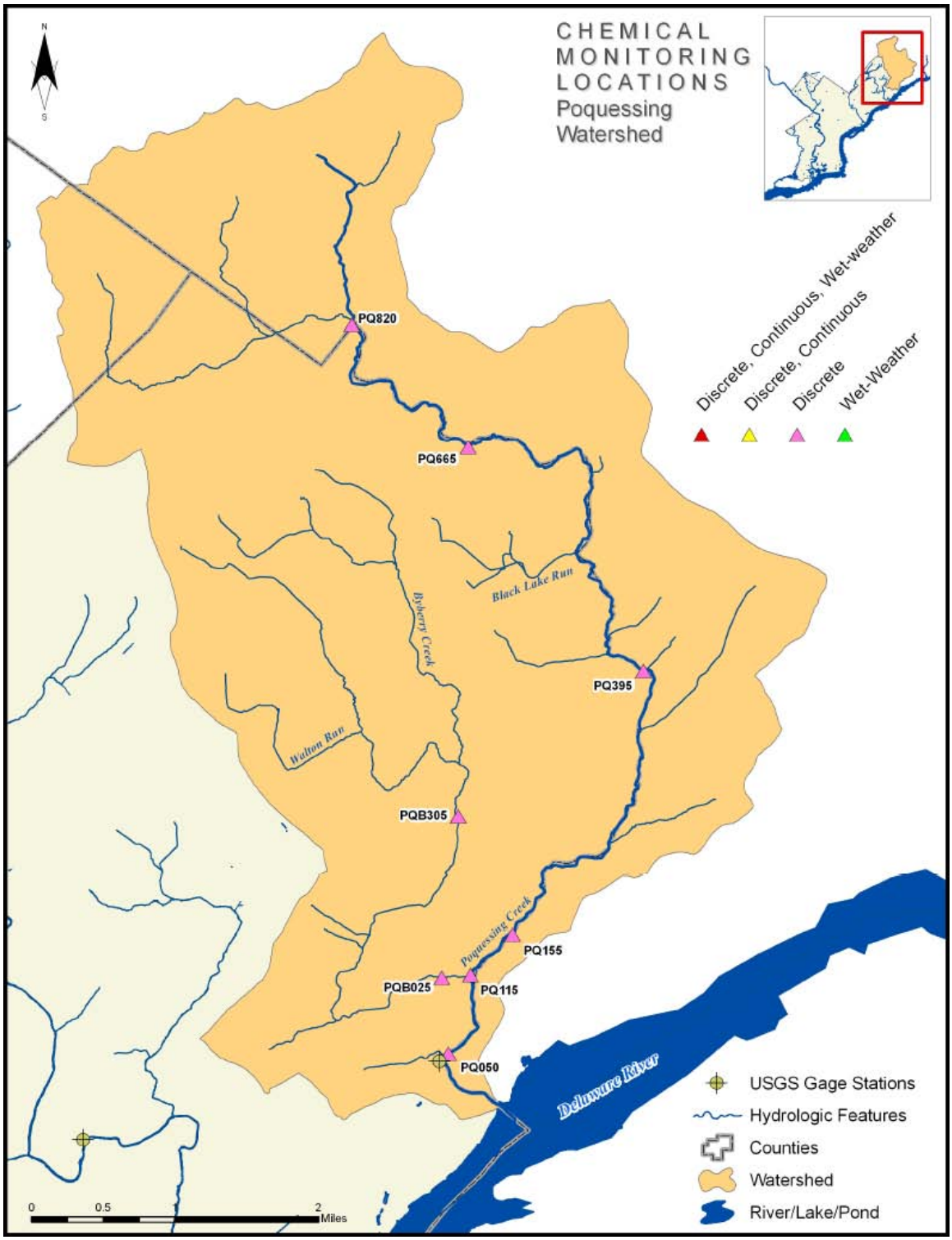

Figure B-7 Chemical monitoring locations in Poquessing-Byberry Watershed

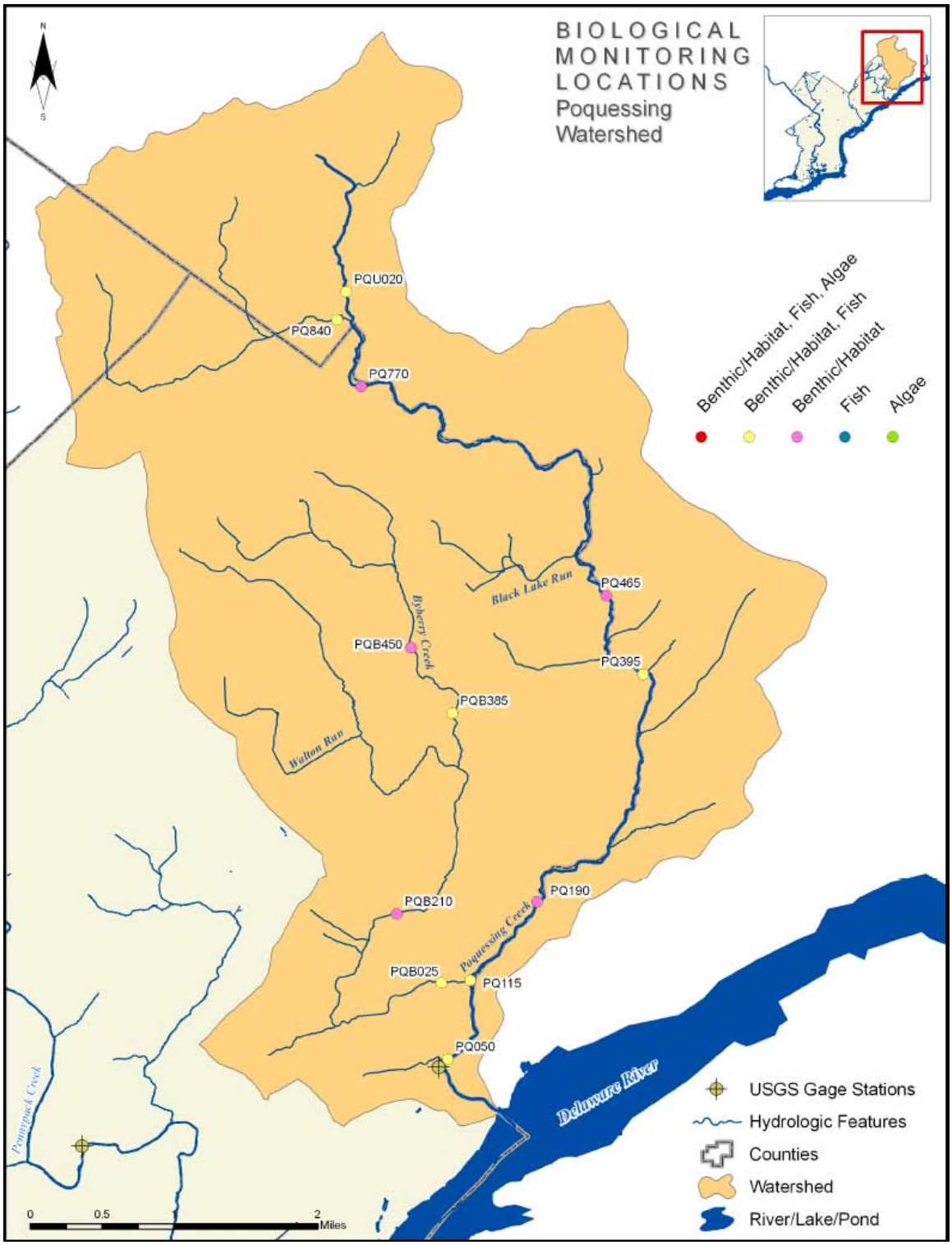

Figure B-8 Biological and physical assessment sites in Poquessing-Byberry Watershed

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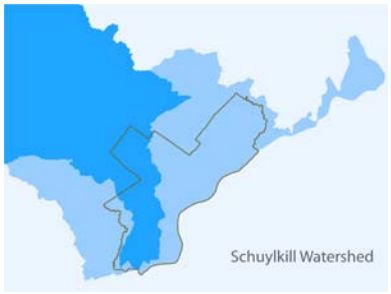
Appendix C
BMP Fact Sheets

Traffic Triangle Retrofit at 47th and Grays Ferry

Stormwater BMP Project Schuylkill Watershed



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Partners:

PA Department of Environmental Protection (DEP)
Pennsylvania Horticultural Society (PHS)
Philadelphia Streets Department
University City Green (UCG)
University of Sciences in Philadelphia (USP)

Traffic Triangle Retrofit at 47th and Grays Ferry…

Traffic triangles are often under-utilized parcels within the urban landscape. The grass covered, but un-used traffic triangle at the intersection of 47th and Grays Ferry in West Philadelphia was retrofitted with a bioinfiltration garden to provide a gateway feature for the community and nearby university while managing stormwater from the adjacent streets.
Stormwater from Paschall Street and Grays Ferry Avenue is diverted into the traffic triangle through trench drains, where it can pond and infiltrate into the soil. The gardens are planted with carefully selected trees and shrubs that will tolerate the fluctuating conditions and provide year round interest as a gateway landscape.

Benefits:

- Reduces the flow of storm water into the combined sewer system through on-site infiltration, thus reducing overflows to the river.
- Reduces non-point source pollution from storm water runoff through vegetation and bioretention.
- Reduces nuisance flooding on Paschall Street
- Provides a gateway feature for the West Shore Neighborhood and University of the Sciences.

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Office of Watersheds
Philadelphia Water Department

PWD's Bureau of Laboratory Services

Stormwater BMP Project Tacony-Frankford Watershed

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Partners:

Environmental Protection Agency (EPA)

PWD's Bureau of Laboratory Services...

The Habitat Creation and Stormwater Management Demonstration project at the Philadelphia Water Department Bureau of Laboratory Services (BLS) is divided into three sub-projects: 1) Meadow Creation; 2) Stepped Rain Garden; and 3) Porous Pavers and Vegetated Swale. Nearly 1/2 acre of turf was converted to meadow and runoff from about 28,500 square feet of parking area will be managed via vegetation and infiltration by retrofitting the existing facilities.

Benefits:

- Provides demonstration of how to retrofit a parking lot to improve stormwater management
- Provides demonstration of constructing bioretention gardens on a slope and in areas with slow infiltration rates
- Illustrates an alternative to the convention lawn, particularly for institutions and corporation

Riparian Restoration at Courtesy Stables

Restoration Project Wissahickon Creek Watershed

Contact

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Partners:

Delaware Estuary Grant from the National Fish & Wildlife Fou
Friends of the Wissahickon (FOW)
Natural Resources Conservation Service

Riparian Restoration at Courtesy Stables...

The Courtesy Stables Runoff Treatment Project's aim was to correct a suite of problems contributing to nutrient-laden stormwater that flows from the barnyard through an adjacent wetland and into a tributary of the Wissahickon Creek. Stormwater is rerouted from the barnyard and surrounding area into a grassed waterway/filter strip where nutrients and sediment are removed and a portion of the water infiltrates into the ground before reaching the wetland. Flow from a springhouse was rerouted directly to the wetland, serving as a continuous source of clean water, rather than through the riding ring, where it adsorbs nutrients and creates muddy conditions. Invasive plant species onsite were removed and replaced with Philadelphia-native trees and shrubs and educational signage was erected, linking the nutrient runoff reduction to the improvement of the Delaware Estuary.

Benefits:

- Eliminate erosion from Courtesy Stables
- Reduced sediment, nutrient, and bacteria loads on the Wissahickon
- Enhanced stormwater infiltration
- Improved surface conditions for equestrian and pedestrian use areas
- Reduce grading and enhance stabilization through planting of native trees and shrubs
- Provide education through signage on linkage between stormwater runoff and downstream water quality

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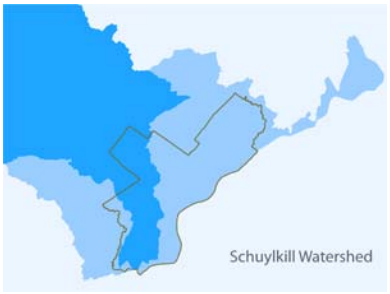
Philadelphia PWD

Parking Lot in East Falls

Stormwater BMP Project Schuylkill Watershed



Contact

Glen Abrams
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Partners:

PA Department of Environmental Protection (DEP)

Parking Lot in East Falls...

The City of Philadelphia will be constructing a 50-space parking lot to serve the East Falls commercial district and Kelly Drive recreational trail users. The lot was designed with a bioretention garden to manage all surface runoff. The soil and plants will cleanse the stormwater before it infiltrates into the ground or is discharged into the river.

Benefits:

- Provides highly visible demonstration of bioretention for parking lot runoff management
- Helps manage nonpoint source pollution in priority sourcewater area
- Acts as attractive gateway tEast Falls neighborhood

Riparian Restoration at Fox Chase Farms

Restoration Project Pennypack Watershed

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Partners:

Fairmount Park Commission (FPC)
Natural Lands Restoration and Environmental Education Progra
Philadelphia School District (PSD)

Riparian Restoration at Fox Chase Farms...

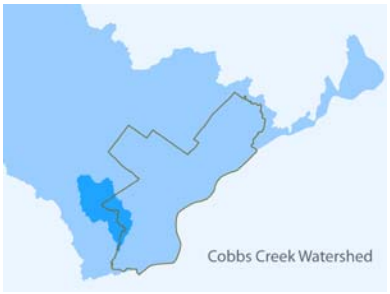
The Fox Chase Farm project involves the application of agricultural BMPs for the reduction of harmful pathogens and nutrients entering the Pennypack Creek from the farm runoff. Prior to project implementation, cows on Fox Chase Farm had free access to the tributary for drinking and cooling off and the surrounding pasture was mowed right to the tributary's edge. This combination resulted in extremely high concentrations of fecal coliform and E. Coli both within the tributary and in the Pennypack Creek downstream of the farm, in both wet and dry weather conditions. This project aims to reduce the impact of farm runoff on the Pennypack watershed through the construction of a cattle crossing over the tributary and the installation of a 1.85 acre riparian buffer along its approximately 430 yard length. In 2002, approximately 400 trees and 700 shrubs were planted on the farm, creating a 15 yard buffer on either side of the tributary for the cost of $13,000. In 2006, water lines were installed to further limit the impact of cows on the stream.

Benefits:

- Reduced concentration of nutrients and harmful pathogens from the farm entering the Pennypack Creek.
- Introduce new native plant species to the site
- Enhance biological habitat in the tributary and the Pennypack
- Create educational demonstration of agricultural best management practices for one of the nation's most reputable agricultural schools.
- Reduce temperature of water entering the Pennypack through the enhanced shading along the tributary

Stream Restoration of Cobbs Creek at Marshall Road

Restoration Project Darby-Cobbs Watershed



Contact

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Partners:

Academy of Natural Sciences
ArmyCorps of Engineers
City of Philadelphia
Cobbs Creek Community Environmental Education Center (CCCEEC
Delaware River Basin Commission (DRBC)
Fairmount Park Commission (FPC)
PA Department of Environmental Protection (DEP)
Pennsylvania Environmental Council (PEC)
US Fish and Wildlife Service (USFWS)

Stream Restoration of Cobbs Creek at Marshall Road...

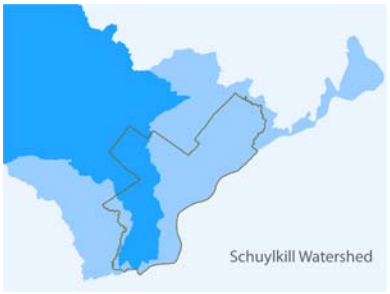
This project will implement a sustainable approach to stream habitat restoration that will mitigate the impacts of urban development and related hydrologic and hydraulic modifications. The Philadelphia Water Department has assembled a project team to develop an approach for the restoration of Cobbs Creek that encompasses the replication of natural hydrologic and ecological cycles, sustainability, enhancement to riparian and in-stream aquatic habitat, improved aesthetics, and significant cost savings over structural solutions. The results of this approach include not just stable stream bank geometry, but also long term ecological stability.

Benefits:

- A stable channel in dynamic equilibrium with it's surrounding watershed
- Stream bank stabilization measures featuring soil bioengineering and natural channel design measures that protect infrastructure and the environment
- A healthy, vegetated riparian zone to add biological diversity to the stream system.
- Enhanced, in-stream aquatic habitat
- Opportunities for the community to learn about stream ecology and morphology
- Increased habitat heterogeneity (pools, riffles, runs)

Porous Basketball Courts at Mill Creek Playground

Stormwater BMP Project Multiple Watersheds



Contact

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Partners:

Councilwoman Blackwell
Pennsylvania Department of Environmental Protection
Philadelphia Recreation Department

Porous Basketball Courts at Mill Creek Playground...

The Mill Creek Playground is heavily used by the community for sports, activities, and meetings. The site includes two basketball courts, play equipment, a recreation center, a baseball field and a swimming pool, which were all built above the streambed of the buried Mill Creek, which is now one of the largest combined sewers in Philadelphia. The basketball courts at the playground were cracked and deteriorating, with low spots that became puddles after storms. To improve the quality of the courts and reduce the volume of stormwater that flows into the combined sewer, the basketball courts were retrofitted with porous asphalt over an infiltration bed.

Benefits:

- 90 percent of the stormwater that falls on the courts infiltrates into the soil
- Opportunity for long-term monitoring and replication at other basketball courts in the City
- Courts dry immediately after rainstorm and create a better playing experience

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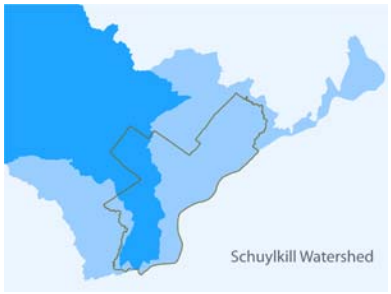
Office of Watersheds
Philadelphia PWD Water Department

Mill Creek Urban Farm

Stormwater BMP Project Schuylkill Watershed



Contact

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Partners:

A Little Taste of Everything
Pennsylvania Department of Environmental Protection
Pennsylvania Horticultural Society (PHS)
Philadelphia Water Department
Project NEAT

Mill Creek Urban Farm...

The Mill Creek Urban Farm, on Brown Street between 49th and 50th streets, has revitalized 1.5 acres (11 city lots) of once vacant land. The farm improves consumer access to nutritious food while conserving natural resources and educating the community, local school groups, and the greater Philadelphia community about urban agriculture, stormwater management, and sustainable living.

The farm manages its own runoff as well as runoff from two adjacent streets in a vegetated infiltration swale along the perimeter of the property. A green roof on the farm building manages much of the roof's runoff, with the overflow collected in a cistern for irrigation. Other sustainable practices demonstrated at the farm include graywater reuse for irrigation, a composting toilet that converts waste into fertilizer for fruit trees, and other material and energy conservation practices.

Benefits:

- Combined Sewer Overflow reduction through infiltration and evapotranspiration of stormwater
- Nutritional access and education for the community
- Education about natural resource management and sustainable living
- Waste minimization and resource conservation

Monastery Stables

Stormwater BMP Project Wissahickon Watershed

Contact

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Partners:

Boarders and Stewards of Monastery (BSM)
Fairmount Park Commission (FPC)
Friends of the Wissahickon (FOW)
Philadelphia Saddle Club (PSC)

Monastery Stables...

PWD is partnering with the FPC to address stormwater and agricultural runoff at this FPC property along the Wissahickon Creek. Lack of proper stormwater management controls, a sloping topography towards the bordering creek, and the intensity of horse activity on the site make Monastery Stables a potentially significant source of contamination to the Wissahickon Watershed. Before implementation, rainfall collected in the paddocks and discharged toward the Wissahickon through several eroded gullies, carrying sediment, nutrients, and harmful pathogens. This project introduced stormwater management controls to increase stormwater infiltration, and direct and treat stormwater runoff, reducing sediment, nutrient, and harmful pathogen loadings on the Wissahickon Creek.

Benefits:

- Reduces concentration of nutrients and harmful pathogens from the farm from entering the Wissahickon Creek.
- Enhances biological habitat in the Wissahickon Creek.
- Contaminated stormwater runoff is managed through subsurface storage tanks and vegetated swales.

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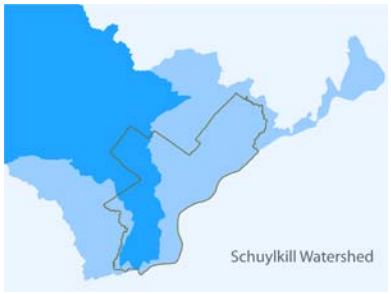
Office of Watersheds
Philadelphia PWD Water Department

Rain Barrels & Tree Program on N. 50th Street in Mill Creek Wat

Education Project Multiple Watersheds



Contact

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Rain Barrels & Tree Program on N. 50th Street in Mill Creek Watershed...

This education/implementation project demonstrated small measures homeowners can take to improve stormwater management in their neighborhood. Participating homeowners received rain barrels and street trees for their homes. The rain barrels were connected to their porch roofs and the trees were planted in new or vacant tree pits along the block.

The project also included the re-grading of vacant parcels in the middle of the block to minimize stormwater runoff and create a community green space and gardens.

Benefits:

Demonstrate better grading and management techniques for vacant land
Increase tree canopy on rowhouse block
Educate homeowners about stormwater management

ES&ED Verree Road Wetland and Parking Lot

Stormwater BMP Project Pennypack Watershed

Contact

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ES&ED Verree Road Wetland and Parking Lot...

A parking lot located in the floodplain of Pennypack Creek was removed to restore a floodplain wetland in the riparian area. The parking lot was reconstructed on the opposite side of the road, outside of the floodplain. The new parking lot is surfaced with pervious gravel paving and has a rain garden that captures any rainfall that runs off the parking lot.

Benefits:

- Expands an existing wetland
- Eliminates direct discharge of polluted runoff from parking lot
- Demonstrates pervious gravel paving technique

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Stormwater Treatment Wetland at Saylor Grove

Restoration Project Wissahickon Creek Watershed

Contact

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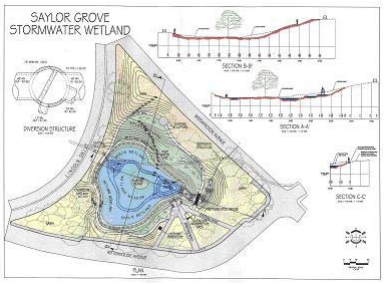
Partners:

Fairmount Park Commission (FPC)
Friends of the Monoshone (FOM)
Friends of the Wissahickon (FOW)
Natural Lands Restoration and Environmental Education Progra
PA Department of Environmental Protection (DEP)
Philadelphia Water Department - OOW
Senior Environmental Corp
Wissahickon Restoration Volunteers (WRV)



Stormwater Treatment Wetland at Saylor Grove...

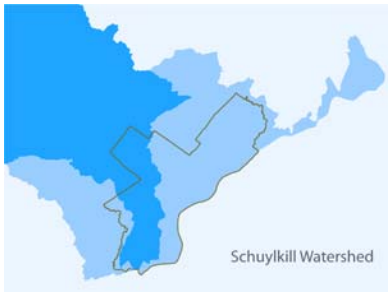
A one-acre stormwater wetland constructed in the fall of 2005 on a parcel of Fairmount Park known as Saylor Grove designed to treat a portion of the 70 million gallons of urban stormwater generated in the storm sewershed per year before it is discharged into the Monoshone Creek. The Monoshone Creek is a tributary of the Wissahickon Creek- a source of drinking water for the City of Philadelphia. The function of the wetland is to treat stormwater runoff in an effort to improve source water quality and to minimize the impacts of storm-related flows on the aquatic and structural integrity of the riparian ecosystem. This project is a highly visible Urban Stormwater BMP Retrofit in the historic Wissahickon Watershed.

Benefits:

- Filter a large portion of the 70 million gallons of stormwater per year which runs off from the shed.
- Remove approximately 13 tons of total suspended solids from the Monoshone
- Increase the total area of wetland habitat in the watershed.
- Improve the aesthetics of the Saylor Grove area.
- Improve the flow variability of storm related flows on the Monoshone Creek.
- Increase the biodiversity of the park area.
- Create two outdoor educational signs about the importance of wetlands and their functions.
- Implement actions items of the Wissahickon River Conservation Plan.

School of the Future Green Roof

Stormwater BMP Project Schuylkill Watershed



Contact

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Partners:

Delaware Valley Green Building Council (DVGBC)
Environmental Protection Agency (EPA)
Microsoft Corporation
StormCenter Communications

School of the Future Green Roof...

In 2003, the School District of Philadelphia announced an ambitious $1.5 billion capital improvement plan that includes construction of several new schools. The Delaware Valley Green Building Council and the Philadelphia Water Department worked with the District to implement environmentally sustainable building practices.

To better manage stormwater runoff, a green roof was installed over the performing arts wing. Green roofs are special roof systems that are designed to grow plants such as sedums and are useful for reducing runoff volumes. Stormwater runoff from the remainder of the school's rooftop is collected in a large holding tank (a cistern) and used to flush the toilets in the building, thus reducing the school's water demand.

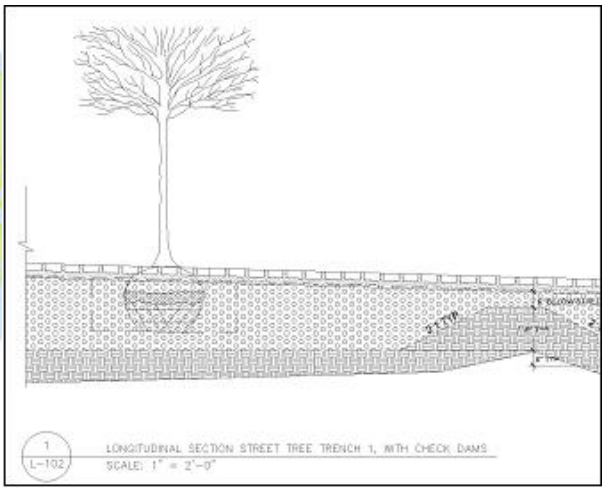
Funding for this project was provided, in part, by the U.S. Environmental Protection Agency through a grant to the Philadelphia Water Department.

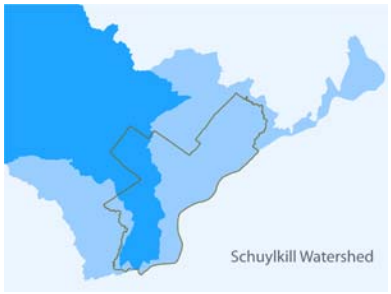
Benefits:

- Reduced stormwater runoff volumes
- Reduced demand for potable water
- Green roofs also offer other benefits including reducing energy usage for air conditioning, reducing sound reflection and transmission, providing habitat, and extending the service life of the underlying waterproofing system

West Mill Creek Infiltration Tree Trench

Stormwater BMP Project Schuylkill Watershed





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Partners:

Pennsylvania Department of Environmental Protection
Pennsylvania Horticultural Society (PHS)
Philadelphia Department of Recreation

West Mill Creek Infiltration Tree Trench...

While most people recognize the shade, beauty, and air cleansing benefits of street trees, many do not realize that trees also reduce the amount of stormwater runoff that enters the City's sewer system. Trees perform this valuable function by intercepting rain on their leaves, branches, and trunks during a storm. They also play an important role in the hydrologic cycle by returning soil moisture to the atmosphere through evapotranspiration.

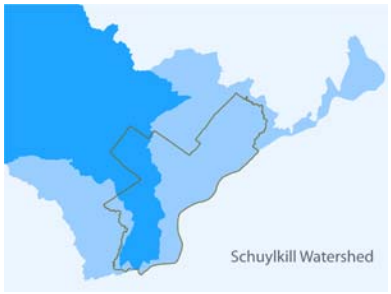
The trees at the intersection of Ogden and Ramsey Streets in West Philadelphia are planted in a way that manages even more runoff from the adjacent streets and wide sidewalks. Instead of being planted in isolated pits, the trees are planted in pockets of soil within in a continuous stone trench. The voids in the stone store stormwater until it can soak into the ground, and the continuous trench provides the tree roots with better access to air and water. Porous pavers replaced the concrete sidewalk over the trench and allow runoff from the sidewalk to flow into trench. Also, new stormwater inlets are designed to convey the street runoff directly into the trench, reducing the volume of runoff to the combined sewer system.

Benefits:

- Reduces stormwater volume, thereby reducing combined sewer overflows from the Mill Creek Sewer.
- Provides healthier conditions for urban street trees
- Adds tree canopy in a dense urban area, thereby reducing urban heat island effect and improving air quality.

Harmony Garden at Wissahickon Charter School

Education Project Schuylkill Watershed



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Partners:

Pennsylvania Department of Environmental Protection
Wissahickon Charter School (WCS)

Harmony Garden at Wissahickon Charter School…

Harmony Garden is an outdoor learning lab, recreation area, and stormwater management system at Wissahickon Charter School. Surface and subsurface infiltration basins recharge stormwater runoff from the school parking and give the students at Wissahickon Charter School an opportunity to learn and play in a natural environment at their school.

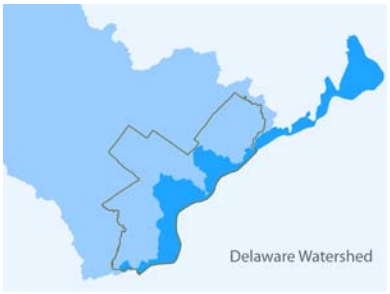
Harmony Garden was designed by PWD and CITYPLAY landscape design, and implementation was funded by DEP's Growing Greener Program. Wissahickon Charter School was constructed in 2006-2007.

Benefits:

- Provides onsite detention and infiltration of stormwater
- Reduces non-point source pollution from stormwater runoff through filtration and biological processes
- Provides opportunities for on-site environmental education for students and supports the environmental mission of Wissahickon Charter School

Baxter Treatment Plant Visitor Parking Lot

Stormwater BMP Project Delaware Watershed



Contact

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Baxter Treatment Plant Visitor Parking Lot...

Runoff from the new visitors' parking lot at Baxter Treatment Plant will be managed in a large bioinfiltration area designed to infiltrate most of the stormwater that reaches it. The bioinfiltration area will be planted with a native wildflower mix to maintain needed visibility while enhancing habitat on the plant property.

Benefits:

- Provides infiltration and volume removal of majority of stormwater from new parking lot
- Habitat restoration

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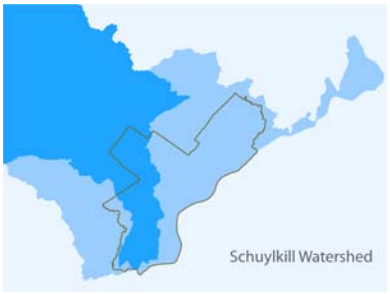
Clark Park Infiltration Bed

Stormwater BMP Project Mill Creek Watershed



Contact

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glen.abrams@phila.gov

Partners:

PA Department of Environmental Protection (DEP)
Pennsylvania Horticultural Society (PHS)
Philadelphia Department of Recreation

Clark Park Infiltration Bed...

A subsurface infiltration bed beneath a new basketball court at Clark Park will manage stormwater runoff from the basketball court, as well as from an adjacent street and parking lot. The system has been designed to capture about 1.5" of rainfall from the contributing drainage area, but with well-drained soil, it is anticipated that actual stormwater capture will be much greater.

Benefits:

- Infiltration of stormwater runoff will reduce CSO volume in one of Philadelphia's largest combined sewer
- Opportunity to monitor long-term performance of a stormwater management strategy most often selected by private developers

Cliveden Park

Stormwater BMP Project Tacony-Frankford Watershed

Contact

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amy.leib@phila.gov

Partners:

Bank of America
Friends of Cliveden Park
Pennsylvania Department of Environmental Protection
Pennsylvania Horticultural Society (PHS)
Philadelphia Water Department - OOW

Cliveden Park...

The stormwater demonstration project at Cliveden Park will capture runoff from adjacent streets and use the park's natural topography to detain stormwater before it flows into the combined sewer system. Small upland depressions will provide water quality treatment and some infiltration of stormwater, and a modified outlet structure will allow water to pond in the existing wetland before it is slowly released. The system will provide stormwater volume removal through evapotranspiration and infiltration, and will reduce the flow rate to the combined sewer system during the small, frequent storms that cause the majority of combined sewer overflows. The intent is to develop a system that meets stormwater management objectives, enhances the existing wetland in the park, and is also an amenity for the park community.

The design team is working closely with Friends of Cliveden Park to refine the design within the project constraints, which include budget limitations, permitting restrictions, community design considerations, historic and cultural landscape considerations and existing park conditions. In addition to design funds from PWD and implementation funds from the Pennsylvania DEP, Friends of Cliveden Park has received a grant from Bank of America that will be used to install a new pedestrian access and overlook to the project site. Completion of the project design is expected by early May and ground breaking is anticipated by early June 2007.

Benefits:

- Reduced combined sewer overflows through volume reduction and flow attenuation
- Stormwater filtration and water quality treatment
- Wetland and park enhancement

Jefferson Square Park

Stormwater BMP Project Delaware Watershed

Contact

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Partners:

Capital Program Office (CPO)
Pennsylvania Horticultural Society (PHS)

Jefferson Square Park...

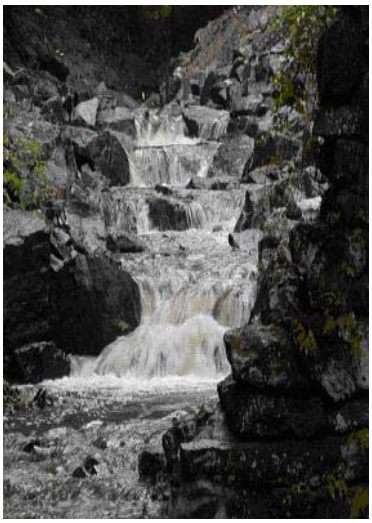
Office of Watersheds worked with the Philadelphia Capital Program Office (CPO) to incorporate stormwater management into their planned improvements at Jefferson Square Park. Stormwater management strategies included edging pedestrian walkways with pervious pavers to convey runoff to a subsurface stone bed beneath the walkways, and installation of a continuous tree trench along one edge of the park that can capture runoff from an undisturbed park walkway and the adjacent sidewalk.

Benefits:

- Reduction of stormwater runoff to the combined sewer
- Demonstration of a pervious pavement material in a public area
- Street tree planting

Wises Mill Stream Restoration Project

Restoration Project Wissahickon Creek Watershed



Contact

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Partners:

Fairmount Park Commission (FPC)
Friends of the Wissahickon (FOW)
PWD Capital Budget

Wises Mill Stream Restoration Project...

Wises Mill Run is a steep first-order tributary to the mainstem of the Wissahickon Creek. The influences of urbanization have had significant impacts on the Wises Mill watershed. These effects have been exacerbated over the last ten years during which the stream has been exposed to several rather large storm events. While the ability to reduce storm flows at their source may be limited, an opportunity to reduce flows prior to entering the southern branch of Wises Mill Run does exist. The first component of the restoration project is to reroute storm flows, so that a stormwater treatment wetland could be created thereby reducing the peak flows experienced downstream. The second component involves the restoration and stabilization of both the receiving waterways in the southern and northern branches.

Benefits:

- Storm flow reduction and treatment prior to entering Wises Mill
- Creation and enhancement of approximately 1.9 acres of wetlands
- Minimize erosion and stabilize stream banks
- Enhanced aquatic and riparian habitat
- The stabilization of several large trees along the stream bank
- The repair of the historic dam directly above Forbidden Drive

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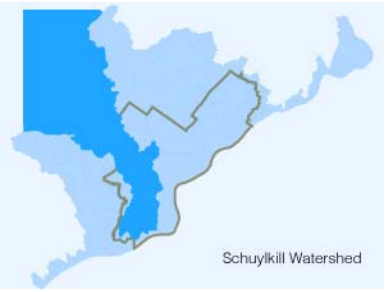
Office of Watersheds
Philadelphia PWD Water Department

Baltimore Avenue Streetscape

Stormwater BMP Project Multiple Watersheds



Contact

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Partners:

University City District (UCD)

Baltimore Avenue Streetscape…

University City District (UCD) has planned streetscape improvements for Baltimore Avenue between 45th and 50th Street, including lighting improvements and corridor greening. The Office of Watersheds is working with UCD to design streetside stormwater planters that will capture runoff from the contributing street and sidewalk areas.

Benefits:

- Reduce stormwater runoff through infiltration and evapotranspiration
- Neighborhood beautification
- Provide an example Green Street for Philadelphia

Watershed-wide Restoration Effort of Cathedral Run

Restoration Project Wissahickon Creek Watershed

Contact

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Partners:

Friends of the Wissahickon (FOW)
Schuylkill Action Network (SAN)
Wissahickon Restoration Volunteers (WRV)

Watershed-wide Restoration Effort of Cathedral Run...

Cathedral Run is a small first order tributary to Wissahickon Creek. It is deeply entrenched due to a steep grad and a high flow volumes and velocities associated with storm flows. Much of the tributary has already down cut to the bedrock layer underlying the area. Currently the tributary is in the process of over widening through excessive stream bank erosion, because the current profile cannot handle the volume and velocity of water discharged to it during wet weather events. High sediment concentration degrades instream habitat by decreasing habitat heterogeneity and filling interstitial spaces vital to various macroinvertebrate species. Restoration of the tributary would involve a detailed survey of the stream bed and installation of appropriate structures to dissipate energy and protect the eroding stream bank. These restoration activities would be in conjunction with land based BMPs to increase a supporting macroinvertebrate habitat. The restoration will also reduce sediment loads and peak velocities that can be detrimental to aquatic life.

Benefits:

- Streambank and riparian restoration and stabilization
- Improved aquatic and riparian habitat
- Reduction in sediment load to Wissahickon Creek

Columbus Square Streetscape

Stormwater BMP Project Delaware Watershed

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Partners:

Capital Program Office (CPO)

Columbus Square Streetscape...

The Philadelphia Capital Program Office (CPO) is implementing numerous improvements to Columbus Square Park in South Philadelphia, and will be reconstructing the 12th Street sidewalk between Reed and Wharton. The Office of Watersheds is working with CPO to design a series of streetside stormwater planters that will capture runoff from the contributing street and sidewalk areas.

Benefits:

- Reduce stormwater runoff through infiltration and evapotranspiration
- Neighborhood greening and beautification
- Example Green Street that can be replicated throughout Philadelphia

Liberty Lands

Stormwater BMP Project Delaware Watershed

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Partners:

Northern Liberties Neighborhood Association
Pennsylvania Department of Environmental Protection
Pennsylvania Horticultural Society (PHS)

Liberty Lands...

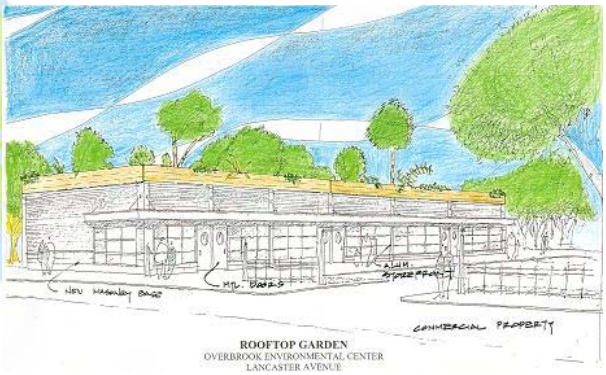
Office of Watersheds funded the development of a master plan for Liberty Lands in Northern Liberties that provides stormwater management while addressing community objectives for the park. The first portion of the plan to be designed and implemented is a performance stage backed by a vegetated stormwater management area that will be sized to capture runoff from park and surrounding streets. In the initial phase, only runoff from the park and a portion of one adjacent street will be directed to the management area. Runoff from 3rd Street will be intercepted by vegetated curb extended bumpout.

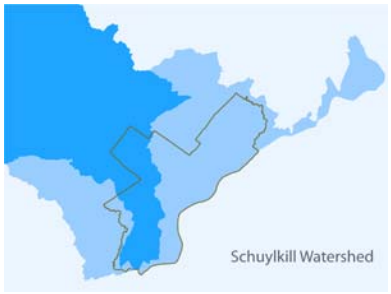
Benefits:

- Reduction of stormwater runoff to the combined sewer system in a neighborhood that suffers from flooding and basement back-ups
- Community amenity and greening
- Provide an example Green Street for Philadelphia

Overbrook Environmental Education Center

Stormwater BMP Project Multiple Watersheds





Contact

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Partners:

Overbrook High School (OHS)
PA Department of Labor (DOL)

Overbrook Environmental Education Center…

The Overbrook Environmental Education Center, complete with native plantings, outdoor biology labs, and 'green' architecture, is not located on an urban commercial corridor by design. This Center demonstrates an innovative approach to quality of life issues, linking human and environmental conservation rather than viewing them as separate and distinct. The cause and effect of a poor environment affects not only the air we breathe, how we live, and what we drink, but our economy and thereby our quality of life.

Benefits:

- The development of the Overbrook Environmental Education Center is an opportunity to promote economic revitalization through environmental and community improvements.

Springside School

Stormwater BMP Project Wissahickon Creek Watershed

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Partners:

Environmental Protection Agency (EPA)
Pennsylvania Horticultural Society (PHS)
Schuylkill Action Network (SAN)
Springside School

Springside School…

The Springside School project will install rain gardens and flow-through planter boxes to manage stormwater runoff from impervious areas at the school. The project design was funded through the Schuylkill Watershed Initiative Grant from the Environmental Protection Agency, and implementation is being undertaken by Springside School.

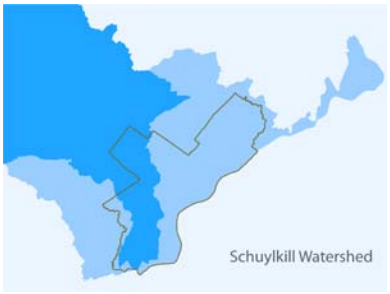
A rain garden is being created in the parking lot by removing the existing asphalt in an area that previously had a painted circle that directed traffic flow. The soil will be amended and the rain garden will be planted with native vegetation. A portion of the parking lot drains to the rain garden, where it will be able to infiltrate into the soil. As parking lot resurfacing projects are undertaken in the future, more runoff will be directed toward the rain garden. Additional projects to capture roof runoff in rain gardens and flow-through planter boxes are planned for Fall 2007.

Benefits:

- Parking lot rain garden reduces runoff volume through infiltration and evapotranspiration while providing traffic control and parking lot beautification
- Courtyard rain garden and flow-through planter boxes reduce peak rate of runoff, reduce runoff volume, and improve water quality.
- Implementation and monitoring of stormwater practices provide educational opportunities for students at Springside School

Sustainable Urban Drainage at Venice Island

Stormwater BMP Project Schuylkill Watershed



Contact

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Partners:

PA Department of Environmental Protection (DEP)

Sustainable Urban Drainage at Venice Island...

Construction of a large off-line storage facility on Venice Island will require large scale disturbance and restoration of the site, and PWD is committed to ensuring that the restoration provides a sustainable model for urban development. The pumping station for the storage facility will have a green roof and will be LEED certified; the restored parking lot will have infiltration swales and tree trenches to manage runoff; and a new performing arts center will manage runoff with rain gardens and other sustainable stormwater management practices.

Benefits:

- Reduction of stormwater volume and improvement of stormwater runoff quality to the Schuylkill River
- Demonstration of green stormwater management technologies

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Office of Watersheds
Philadelphia PWD Water Department

Waterview Recreation Center

Stormwater BMP Project Tacony-Frankford Watershed

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Partners:

Ogontz Avenue Revitalization Corporation (OARC)
Pennsylvania Horticultural Society (PHS)
Philadelphia Department of Recreation

Waterview Recreation Center…

The Office of Watersheds is working with the Pennsylvania Horticultural Society (PHS) and the Ogontz Avenue Revitalization Corporation (OARC) to incorporate stormwater management into Waterview Recreation Center's master plan in ways that can demonstrate effective stormwater management strategies while enhancing recreation programs at the site. The following initial concepts are being developed into a final design:

1. Diversion of street and sidewalk into a subsurface infiltration tree trench that will provide stormwater management while improving the appearance of the entrance to the recreation center
2. Disconnect a downspout to a cistern that can be used to irrigate a culinary arts garden.
3. Disconnect a limited number of building downspouts to flow-through planter boxes along the building foundation.

Benefits:

- Reduce stormwater runoff to Philadelphia's combined sewer system
- Provide neighborhood greening and beautification
- Enhance Waterview Recreation Center's emerging culinary arts programs
- Implement Tookany/Tacony Frankford Integrated Watershed Management Plan

Stream Restoration on Tacony Creek at Whitaker Avenue

Restoration Project Tacony-Frankford Watershed

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Partners:

Cheltenham Township (CT)
Cora L. Brooks Foundation
Delaware Estuary Program (DELEP)
Fairmount Park Commission (FPC)
Friends of Tacony Creek Park (FTC)
Natural Lands Restoration and Environmental Education Progra
PA Department of Environmental Protection (DEP)
Pennsylvania Environmental Council (PEC)

Stream Restoration on Tacony Creek at Whitaker Avenue...

This project will implement a sustainable approach to stream habitat restoration that will mitigate the impacts of urban development and related hydrologic and hydraulic modifications. The Philadelphia Water Department has assembled a project team to develop an approach for the restoration of Tacony Creek that encompasses the replication of natural hydrologic and ecological cycles, sustainability, enhancement to riparian and in-stream aquatic habitat, improved aesthetics, and significant cost savings over structural solutions. The results of this approach include not just stable stream bank geometry, but also long term ecological stability.

Benefits:

- Minimization of impacts of non-point source pollution contributed by upstream runoff.
- An integrated restoration of 1700 ft. of stream that improves the physical, chemical, and ecologic metrics of stream health.
- A stable channel in dynamic equilibrium with it's surrounding watershed
- Stream bank stabilization measures featuring soil bioengineering and natural channel design measures that protect infrastructure and the environment in a highly sustainable manner.
- A healthy, vegetated riparian zone to add biological diversity to the stream system.
- Enhanced, In-stream aquatic habitat
- Opportunities for the community to learn about stream ecology

Riparian Restoration at W.B. Saul High School

Project Wissahickon Watershed

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Partners:

City of Philadelphia
Environmental Protection Agency (EPA)
Philadelphia School District (PSD)

Riparian Restoration at W.B. Saul High School...

In FY04, PWD utilized a PADEP Growing Greener Technical Assistance Grant to complete a conceptual design to implement stormwater BMPs at this Agricultural High School in the Wissahickon Watershed. PWD is currently conducting wet weather monitoring at the project site prior to project implementation. This will allow for a quantitative assessment of the effectiveness of the BMPs upon completion of the project. The W.B. Saul High School project combines urban stormwater and agricultural BMPs to reduce the harmful impact of the school' s runoff on the water quality of the Wissahickon Creek. Prior to discharging into the sewer, which then flows to the Wissahickon, agricultural runoff from the livestock and farming practices, as well as stormwater runoff from the school's roofs and parking lots, will be captured and treated through a series of long pools connected by wetland swales. This project will add a significant educational component to the curriculum of Saul High School, already one of the nation's premier agricultural high schools, by demonstrating proper management of agricultural runoff.

Benefits:

- Prevent nutrients and harmful pathogens caused by farming practices from entering the Wissahickon
- Improve water quality of urban stormwater runoff
- Introduce new native plant species to the site
- Provide educational demonstration of the proper management of stormwater and agricultural runoff
- Create aesthetically pleasing enhancement of the school's landscape