PHILADELPHIA'S WET WEATHER MANAGEMENT PROGRAMS

COMBINED SEWER MANAGEMENT PROGRAM ANNUAL REPORT

National Pollution Discharge Elimination System (NPDES) Permits
Nos. PA0026689, PA0026662, PA0026671

STORMWATER MANAGEMENT PROGRAM ANNUAL REPORT

National Pollution Discharge Elimination System (NPDES) Permit
No. PA 0054712

Reporting Period July 1st 2008 to June 30th 2009

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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List of Abbreviations

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

Compliance Checklist

The Compliance Checklist is attached in a separate document, outside the main report in the front left pocket of report binder in order to provide better convenience.

COMBINED SEWER MANAGEMENT PROGRAM ANNUAL REPORT

I Management and Control of CSOs

This report is submitted pursuant to meeting the requirements of NPDES Permits #'s 0026662, 0026671, and 0026689; PART C, I. OTHER REQUIREMENTS, Combined Sewer Overflows (CSOs), III. IMPLEMENTATION OF THE LONG TERM CSO CONTROL PLAN, C. Watershed-Based Management, IV. Monitoring and Assessment. This section requires that the permittee submit an Annual CSO Status Report. The purpose of this report is to document the status and changes made to programs implemented by the Philadelphia Water Department (PWD), during the time period of July 1st, 2008 through June 30th, 2009, to manage and reduce the combined sewer overflows (CSOs) permitted to discharge to waters of the Commonwealth of Pennsylvania.

II Implementation of the Nine Minimum Controls

In the first phase of the PWD's CSO strategy, and in accordance with its NPDES permits, the PWD submitted to the Pennsylvania Department of Environmental Protection on September 27, 1995, "CSO Documentation: Implementation of Nine Minimum Controls". The nine minimum controls are low-cost actions or measures that can reduce CSO discharges and their effect on receiving waters, do not require significant engineering studies or major construction, and can be implemented in a relatively short time frame. In general, PWD's NMC program includes comprehensive, aggressive measures to maximize water quality improvements through the following measures:

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.

II.A Proper Operation and Regular Maintenance Programs for the Sewer System and the CSOs (NMC 1)

II.A.1 Implement a Comprehensive Geographic Information System (GIS) of the City sewer system

In 2005 the Philadelphia Water Department completed a data conversion project that resulted in the creation of GIS coverages for all of the city's water, sewer, and high pressure fire infrastructure. The conversion project consisted of extracting data from over 250,000 engineering documents that exist in digital format and have been indexed by location.

The project was executed in three phases. The Initiation Phase included a series of workshops designed to ensure that the conversion process properly utilized the 85 different types of source documents maintained by the department. It also included customization of data conversion tools to meet the project's data specifications, the development of a detailed conversion work plan, and conversion of the data for a 2-block area within the city. The Pilot Phase included further definition of the project's data dictionary and conversion tools and applied both to data from 2 of the City's 121 map tiles. The Production Phase included conversion of the remaining tiles and the establishment of links between the GIS data and legacy databases related to valves, hydrants, and storm sewer inlets.

The project was supported through the use of customized conversion tools for data collection, data scrubbing, data entry, graphical placement, and quality control. Conflicts and anomalies in the data were tracked using a web-based tool and database.

PWD expects to utilize the GIS coverages as the foundation for many of their operations including maintenance management, capital improvements, and hydraulic modeling.

To insure PWD's investment in GIS and data conversion does not go to waste, a comprehensive maintenance plan has been put into practice to ensure that the data is as accurate and up to date as possible. Edits and improvements are made on a daily basis to the data. Using a web based application, GIS editors are able to check out work and check it back in when it's complete. The application tracks all changes made out in the field that are recorded on as-built plans. Real-time kinematic (RTK) accurate GPS devices are also employed for high spatial accuracy for new construction projects.

II.A.2 Implement a Comprehensive Sewer Assessment Program (SAP)

PWD has implemented a comprehensive sewer assessment program (SAP) to provide for continued inspection and maintenance of the collection system using closed circuit television. The SAP program was developed by PWD and consultants and was finalized in March 2006. This program development encompassed 2.5 years and cost over $6 million.

The major goals of the SAP development project were to:

– Develop new sewer evaluation protocol and prioritization system that integrates with new and existing computerized databases

– Develop recommendations and schedules for an on-going sewer inspection program

– Create training tools and train PWD personnel

– Apply techniques to pilot areas in the City totaling 7% of the total collection system

A few selected highlights of the SAP project are:

– Development of unique "smart" GIS manhole numbering system

– Implementation of National Association of Sewer Service Companies (NASSCO) standard protocol for uniform evaluation of sewers called Pipeline Assessment & Certification Program (PACP)

– Development of rating and scoring system to prioritize segments for repairs or replacement.

– Development of Intranet-based viewer for digital closed circuit television (CCTV) inspection projects and structural scores with GIS front-end (SINSPECT)

– Development of Intranet-based CCTV Inspection Request and Tracking System with GIS front-end (SAPReq)

– Development of Pre-Inspection (CCTV) Program

– Creation of internal monthly sewer defect review committee (SAP Committee-5)

Any infiltration observed during the on-going CCTV sewer inspection program is coded as part of the NASSCO Pipeline Assessment and Certification Program. The infiltration is categorized based on a range of 5 levels: Weepers, Drippers, Light Runners, Heavy Runners, or Gushers. All occurrences of Heavy Runners or Gushers are reported to PWD's Water Conveyance Leak Detection Unit immediately for investigation.

The SAP is being used to guide the capital improvement program to ensure that the existing sewer systems are adequately maintained, rehabilitated, and reconstructed. For the period of July 2008 – June 2009, the length of TV inspections averaged about 4.35 miles a month for a total of over 52 inspected miles.

Table II.A-1 Monthly TV Inspections

Date	Miles Inspected
Jul-08	3.49
Aug-08	3.75
Sep-08	5.89
Oct-08	4.92
Nov-08	4.55
Dec-08	3.77
Jan-09	3.63
Feb-09	3.02
Mar-09	3.89
Apr-09	4.54
May-09	4.43
Jun-09	6.26
Average	**4.35**
Total	**52.14**

II.A.3 Other Initiatives

II.A.3.1 CSO Regulator Inspection & Maintenance Program

Annual summaries of the comprehensive and preventative maintenance activities completed in the combined sewer system over the past year are detailed in and any changes are discussed below.

In response to the CSO compliance inspection performed by DEP in November 2002, PWD has committed to demonstrating an improved follow-up response to sites experiencing a DWO. PWD has instituted a policy of next day follow-up inspection at sites that experience a DWO. PWD will conduct an evaluation of the effectiveness of twice-weekly inspections.

II.A.3.2 Tide Gate Inspection and Maintenance Program

Summaries of the tide gate inspection and maintenance completed during the past fiscal year are found in **APPENDIX A**, which documents the locations where preventative maintenance was performed on the tide gates.

II.A.3.3 Somerset Grit Chamber Cleaning

PWD regularly monitors the sediment accumulation in the grit trap at the origin of the Somerset Intercepting Sewer and in locations downstream to determine appropriate cleaning intervals for the grit trap and downstream interceptor. Driven by the monitoring program, the grit basin is cleaned periodically and debris quantities tracked to further refine the frequency of cleaning necessary to maintain adequate capacity in the Somerset Intercepting sewer.

Somerset Grit Chamber cleaning details, specifically tonnage removed and dates of cleaning during the past fiscal year are available in **APPENDIX A**.

II.B Maximum Use of the Collection System for Storage (NMC 2)

II.B.1 Continue to Institutionalize a Comprehensive Monitoring and Modeling Program

II.B.1.1 Monitoring

PWD maintains an extensive monitoring network through the combined sewer system, rain gages, pump stations and connections from all adjacent outlying communities. The following tables provide basic information on the monitoring network.

Table II.B-1 - Listing of Monitored Outlying Community Connections

Monitored Outlying Community Connections			
Site ID	**TOWNSHIP**	**LOCATION**	**Address**
MA2	Abington	Pine Road & Pennypack Creek	8700 Pine Rd
MB1	Bucks Co.	Totem Rd. & Neshaminy Cr.	
MBE1	Bensalem	Byberry Grounds	16000 Carter Rd
MBE2	Bensalem	Dunks Ferry Road	1400 Worthington
MBE5	Bensalem	Grant & James	5050 Grant Av
MBE6	Bensalem	Gravel Pike @ Poquessing Creek	4800 Byberry Rd
MBE7	Bensalem	Townsend Road @ Poquessing Creek	13000 Townsend Rd
MC1	Cheltenham	Bouvier & Cheltenham	1900 Cheltenham Av
MC2	Cheltenham	Tookany Creek & Cheltenham	194 E Cheltenham Av
MC3	Abington	Fillmore & Shelmire (Abington flow)	7400 Fillmore
MD1	Delaware Co.	DELCORA	SWWPC Plant
ML1	Lower Merion	51st Street & City Line	2490 N 51St St
ML3	Lower Merion	63rd Street & City Line	2139 N 63Rd St
ML4	Lower Merion	66th Street & City Line	6600 City Line Av
ML5	Lower Merion	73rd Street & City Line	7268 City Line Av
ML6	Lower Merion	Conshohocken & City Line	4900 City Line
ML7	Lower Merion	Presidential & City Line	3499 City Line
MLM1	Lower Moreland	Philmont & Byberry	Woodhaven
MLM2	Lower Moreland	Lower Moreland PS @ Welsh & Huntington Pk	
MP796	PIDC - PNBC	Phila. Naval Business Ctr. @ PS 796	4801 S. 13Th Street
MS2	Springfield	Northwestern & Wissahickon Cr.	9404 Northwestern
MS3	Springfield	Erdenheim & Stenton	Erdenheim & Stenton
MS6	Springfield	Woodbrook & Stenton	7601 Stenton Av
MSH1	Southhampton	Trevose Rd. & Poquessing Creek E side	Trevose Rd & Stream Ridge Ln.
MUD1-N	Upper Darby	60Th & Cobbs Creek	6001 S. Cobbs Creek Pky.
MUD1-O	Upper Darby	60Th & Cobbs Creek Overflow	6001 S. Cobbs Creek Pky.
MUD1-S	Upper Darby	60Th & Cobbs Creek	6001 S. Cobbs Creek Pky.

Table II.B-2 - Listing of Combined Sewer Monitors

Combined Sewer Monitors		
Site	**Interceptor**	**Waterbody**
C01	Cobbs Creek High Level	Cobbs
C02	Cobbs Creek High Level	Cobbs
C04	Cobbs Creek High Level	Cobbs
C04A	Cobbs Creek High Level	Cobbs
C05	Cobbs Creek High Level	Cobbs
C06	Cobbs Creek High Level	Cobbs
C07	Cobbs Creek High Level	Cobbs
C09	Cobbs Creek High Level	Cobbs
C10	Cobbs Creek High Level	Cobbs
C11	Cobbs Creek High Level	Cobbs
C12	Cobbs Creek High Level	Cobbs
C13	Cobbs Creek High Level	Cobbs
C14	Cobbs Creek High Level	Cobbs
C15	Cobbs Creek High Level	Cobbs
C16	Cobbs Creek High Level	Cobbs
C17	Cobbs Creek High Level	Cobbs
C18	Cobbs Creek High Level	Cobbs
C19	Cobbs Creek Low Level	Cobbs
C20	Cobbs Creek Low Level	Cobbs
C21	Cobbs Creek Low Level	Cobbs
C22	Cobbs Creek Low Level	Cobbs
C23	Cobbs Creek Low Level	Cobbs
C24	Cobbs Creek Low Level	Cobbs
C26	Cobbs Creek Low Level	Cobbs
C28A	Cobbs Creek Low Level	Cobbs
C29	Cobbs Creek Low Level	Cobbs
C30	Cobbs Creek Low Level	Cobbs
C31	Cobbs Creek High Level	Cobbs
C32	Cobbs Creek High Level	Cobbs
C33	Cobbs Creek High Level	Cobbs
C34	Cobbs Creek High Level	Cobbs
C35	Cobbs Creek High Level	Cobbs
C36	Cobbs Creek High Level	Cobbs
C37	Cobbs Creek High Level	Cobbs
D02	Upper Delaware Low Level	Delaware
D03	Upper Delaware Low Level	Delaware
D04	Upper Delaware Low Level	Delaware
D05	Upper Delaware Low Level	Delaware
D06	Upper Delaware Low Level	Delaware
D07	Upper Delaware Low Level	Delaware
D08	Upper Delaware Low Level	Delaware

D09	Upper Delaware Low Level	Delaware
D11	Upper Delaware Low Level	Delaware
D12	Upper Delaware Low Level	Delaware
D13	Upper Delaware Low Level	Delaware
D15	Upper Delaware Low Level	Delaware
D17	Somerset	Delaware
D18	Somerset	Delaware
D19	Somerset	Delaware
D20	Somerset	Delaware
D21	Somerset	Delaware
D22	Somerset	Delaware
D24	Somerset	Delaware
D25	Somerset	Delaware
D37	Lower Delaware Low Level	Delaware
D38	Lower Delaware Low Level	Delaware
D39	Lower Delaware Low Level	Delaware
D40	Lower Delaware Low Level	Delaware
D41	Lower Delaware Low Level	Delaware
D44	Lower Delaware Low Level	Delaware
D45	Lower Delaware Low Level	Delaware
D46	Lower Delaware Low Level	Delaware
D47	Lower Delaware Low Level	Delaware
D48	Lower Delaware Low Level	Delaware
D49	Lower Delaware Low Level	Delaware
D50	Lower Delaware Low Level	Delaware
D51	Lower Delaware Low Level	Delaware
D52	Lower Delaware Low Level	Delaware
D53	Lower Delaware Low Level	Delaware
D54	Lower Delaware Low Level	Delaware
D58	Lower Delaware Low Level	Delaware
D61	Lower Delaware Low Level	Delaware
D62	Lower Delaware Low Level	Delaware
D63	Lower Delaware Low Level	Delaware
D64	Lower Delaware Low Level	Delaware
D65	Lower Delaware Low Level	Delaware
D66	Lower Delaware Low Level	Delaware
D67	Lower Delaware Low Level	Delaware
D68	Oregon Ave.	Delaware
D69	Oregon Ave.	Delaware
D70	Oregon Ave.	Delaware
D71	Oregon Ave.	Delaware
D72	Oregon Ave.	Delaware
D73	Lower Delaware Low Level	Delaware
F03	Upper Frankford Low Level	Tacony/Frankford

F05	Upper Frankford Low Level	Tacony/Frankford
F06	Upper Frankford Low Level	Tacony/Frankford
F07	Upper Frankford Low Level	Tacony/Frankford
F08	Upper Frankford Low Level	Tacony/Frankford
F09	Upper Frankford Low Level	Tacony/Frankford
F10	Upper Frankford Low Level	Tacony/Frankford
F12	Upper Frankford Low Level	Tacony/Frankford
F13	Lower Frankford Low Level	Tacony/Frankford
F14	Lower Frankford Low Level	Tacony/Frankford
F21	Lower Frankford Low Level	Tacony/Frankford
F23	Lower Frankford Low Level	Tacony/Frankford
F24	Lower Frankford Low Level	Tacony/Frankford
F25	Lower Frankford Low Level	Tacony/Frankford
P01	PennyPack Interceptor	Pennypack
P02	PennyPack Interceptor	Pennypack
P03	PennyPack Interceptor	Pennypack
P04	PennyPack Interceptor	Pennypack
P05	PennyPack Interceptor	Pennypack
R06	Cobbs Creek High Level	Cobbs
R07	Somerset	Delaware
R12	Central Schuylkill East Side	Schulkill
R13	Lower Frankford Low Level	Tacony/Frankford
R14	Lower Frankford Low Level	Tacony/Frankford
R15	Tacony	Tacony/Frankford
R18	Tacony	Tacony/Frankford
R20	Central Schuylkill East Side	Schuylkill
R24	Cobbs Creek High Level	Cobbs
S05	Central Schuylkill East Side	Schuylkill
S06	Central Schuylkill East Side	Schuylkill
S07	Central Schuylkill East Side	Schuylkill
S08	Central Schuylkill East Side	Schuylkill
S09	Central Schuylkill East Side	Schuylkill
S10	Central Schuylkill East Side	Schuylkill
S11	Central Schuylkill West Side	Schuylkill
S12	Central Schuylkill East Side	Schuylkill
S12A	Central Schuylkill East Side	Schuylkill
S15	Central Schuylkill East Side	Schuylkill
S16	Central Schuylkill East Side	Schuylkill
S18	Central Schuylkill East Side	Schuylkill
S19	Central Schuylkill East Side	Schuylkill
S21	Central Schuylkill East Side	Schuylkill
S22	Central Schuylkill West Side	Schuylkill
S23	Central Schuylkill East Side	Schuylkill
S24	Central Schuylkill West Side	Schuylkill

S25	Central Schuylkill East Side	Schuylkill
S26	Central Schuylkill East Side	Schuylkill
S27	South West Main Gravity	Schuylkill
S28	South West Main Gravity	Schuylkill
S30	South West Main Gravity	Schuylkill
S31	Lower Schuylkill East Side	Schuylkill
S32	Lower Schuylkill West Side	Schuylkill
S33	Lower Schuylkill West Side	Schuylkill
S34	South West Main Gravity	Schuylkill
S35	Lower Schuylkill East Side	Schuylkill
S36	Lower Schuylkill East Side	Schuylkill
S36A	Lower Schuylkill East Side	Schuylkill
S37	Lower Schuylkill East Side	Schuylkill
S38	Lower Schuylkill West Side	Schuylkill
S39	South West Main Gravity	Schuylkill
S40	South West Main Gravity	Schuylkill
S42	Lower Schuylkill East Side	Schuylkill
S42A	Lower Schuylkill East Side	Schuylkill
S43	South West Main Gravity	Schuylkill
S44	Lower Schuylkill East Side	Schuylkill
S45	Lower Schuylkill West Side	Schuylkill
S46	Lower Schuylkill East Side	Schuylkill
S47	South West Main Gravity	Schuylkill
S50	South West Main Gravity	Schuylkill
S51	South West Main Gravity	Schuylkill
T01	Tacony	Tacony/Frankford
T03	Tacony	Tacony/Frankford
T04	Tacony	Tacony/Frankford
T05	Tacony	Tacony/Frankford
T06	Tacony	Tacony/Frankford
T07	Tacony	Tacony/Frankford
T08	Tacony	Tacony/Frankford
T09	Tacony	Tacony/Frankford
T10	Tacony	Tacony/Frankford
T11	Tacony	Tacony/Frankford
T12	Tacony	Tacony/Frankford
T13	Tacony	Tacony/Frankford
T14	Tacony	Tacony/Frankford
T15	Tacony	Tacony/Frankford
CCHLC07	Cobbs Creek High Level	Cobbs
CCHLC12	Cobbs Creek High Level	Cobbs
CCHLC13	Cobbs Creek High Level	Cobbs
CCHLC14	Cobbs Creek High Level	Cobbs
CCHLC17	Cobbs Creek High Level	Cobbs

CCHLC18	Cobbs Creek High Level	Cobbs
CCHLC34	Cobbs Creek High Level	Cobbs
CCHLH18	Cobbs Creek High Level	Cobbs
CCLLC19	Cobbs Creek Low Level	Cobbs
CCLLC20	Cobbs Creek Low Level	Cobbs
CCLLC22	Cobbs Creek Low Level	Cobbs
CCLLC24	Cobbs Creek Low Level	Cobbs
CCLLC26	Cobbs Creek Low Level	Cobbs
CSESS09	Central Schuylkill East Side	Schuylkill
CSESS26	Central Schuylkill East Side	Schuylkill
FHLTT08	Frankford High Level	Tacony/Frankford
FHLTT15	Frankford High Level	Tacony/Frankford
LDLLD45	Lower Delaware Low Level	Delaware
LDLLD47	Lower Delaware Low Level	Delaware
LDLLD53	Lower Delaware Low Level	Delaware
LDLLD62	Lower Delaware Low Level	Delaware
LDLLD69	Lower Delaware Low Level	Delaware
LDLLD70	Lower Delaware Low Level	Delaware
LFCH07	Lower Frankford Low Level	Tacony/Frankford
LFCH19	Lower Frankford Low Level	Tacony/Frankford
LFLLF08	Lower Frankford Low Level	Tacony/Frankford
LFLLF10	Lower Frankford Low Level	Tacony/Frankford
LSESS36	Lower Schuylkill East Side	Schuylkill
LSWSS33	Lower Schuylkill West Side	Schuylkill
LSWSS38	Lower Schuylkill West Side	Schuylkill
LSWSS45	Lower Schuylkill West Side	Schuylkill
SWMGH17	South West Main Gravity	Schuylkill
SWMGH20	South West Main Gravity	Schuylkill
SWMGS28	South West Main Gravity	Schuylkill
SWMGS34	South West Main Gravity	Schuylkill
SWMGS43	South West Main Gravity	Schuylkill
SWMGS47	South West Main Gravity	Schuylkill
SWMGS51	South West Main Gravity	Schuylkill
UDLLD08	Upper Delaware Low Level	Delaware
UDLLH04	Upper Delaware Low Level	Delaware
UDLLH07	Upper Delaware Low Level	Delaware
UDLLH14	Upper Delaware Low Level	Delaware
H02	Lower Delaware Low Level	Delaware
H09	Upper Delaware Low Level	Delaware
H13	Lower Delaware Low Level	Delaware
H16	Lower Delaware Low Level	Delaware
H21	Central Schuylkill East Side	Schuylkill

Table II.B-3 Listing of all Rain Gages

Rain Gage Network	
Rain Gage	**Percent Working**
RG_01	100%
RG_02	100%
RG_03	100%
RG_04	100%
RG_05	100%
RG_06	100%
RG_07	100%
RG_08	81%
RG_09	100%
RG_10	100%
RG_11	100%
RG_12	100%
RG_13	100%
RG_14	97%
RG_15	100%
RG_16	100%
RG_17	100%
RG_18	100%
RG_19	100%
RG_20	100%
RG_21	100%
RG_22	100%
RG_23	100%
RG_24	100%
RG_24	100%

Table II.B-4 Listing of Pumping Station Monitoring Locations

Wastewater Stations	Location	Address	Owner
BANK ST	Bank St. & Elbow Lane	15 S BANK ST.	PWD
BELFRY DRIVE	Belfry Dr. & Steeple Dr.	751 S MANATAWNA ST.	PWD
CSPS	University Ave. & 34th St. Bridge	600 UNIVERSITY AVE.	PWD
FORD ROAD	Ford Rd. across from West Park Hospital	3800 FORD AVE.	PWD
HOG ISLAND	Hog Island Rd. east of Airport control tower	#3 HOG ISLAND RD.	PWD
LINDEN AV	Linden Ave. & Milnor St.	5200 LINDEN AVE.	PWD
LOCKART ST	Lockart St. & Lockart Lane @ drainage right of way	10778 LOCART RD.	PWD
MILNOR ST	Milnor St. between Grant Ave. & Eden St.	9647 MILNOR ST.	PWD
NEILL DRIVE	Fairmount Park at Neil Drive	4000 NEILL DR.	PWD

	& Falls Road		
PNBC 796 MAIN	Philadelphia Naval Business Center	4801 S. 13th Street	PIDC
PNBC 542	Philadelphia Naval Business Center	1601 Langley Street	PIDC
PNBC 120	Philadelphia Naval Business Center	1700 Langley Street	PIDC
PNBC 603	Philadelphia Naval Business Center	2000 Langley Ave.	PIDC
POLICE ACADEMY	8501 State Rd. in the Police Academy grounds	8501 STATE RD.	Police Dept
RENNARD ST	Philmont Shopping Center grounds	11064 RENNARD ST.	PWD
SPRING LANE	Spring Lane Meadows	9021 Buttonwood Pl. 19128	PWD
42ND ST	42nd St & 43rd Street	761 S. 43RD Street	PWD
Stormwater Stations	Location	Address	Owner
BROAD & BLVD.	Underpass at Roosevelt Blvd. & Broad St.	4251 N. BROAD ST.	Penn Dot
MINGO CREEK	Schuylkill River under the Platt Bridge	7000 PENROSE AVE.	PWD
26TH AND VARE	Underpass at Vare & 26th St.	26TH AND VARE AVE.	Penn Dot

II.B.1.2 Modeling

The U.S. EPA's Storm Water Management Model (SWMM) was used to develop the watershed-scale model for the PWD combined sewer system. The components of the SWMM model used in the development of the Philadelphia watershed and wastewater conveyance model were the RUNOFF and EXTRAN modules.

The RUNOFF module was developed to simulate the quantity and quality of runoff in a drainage basin and the routing of flows and contaminants to sewers or receiving water. The program can accept an arbitrary precipitation (rainfall or snowfall) hyetograph and performs a step by step accounting of snowmelt, infiltration losses in pervious areas, surface detention, overland flow, channel flow, and water quality constituents leading to the calculation of one or more hydrographs and/or pollutagraphs at a certain geographic point such as a sewer inlet. The driving force of the RUNOFF module is precipitation, which may be a continuous record, single measured event, or artificial design event. The RUNOFF module also simulates Rainfall Dependant Inflow and Infiltration (RDI/I) in separate sanitary areas using three sets of unit hydrographs defined by R, T, and K values to represent the shape of the RDI/I hydrograph response to the input precipitation hyetograph.

The EXTRAN module was developed to simulate hydraulic flow routing for open channel and/or closed conduit systems. The EXTRAN module receives hydrograph inputs at specific nodal locations by interface file transfer from an upstream module (e.g. the RUNOFF module) and/or by direct user input. The module performs dynamic routing of stormwater and wastewater flows through drainage systems and receiving streams.

II.B.2 Continue to Operate and Maintain a Network of Permanent and Temporary Flow Monitoring Equipment

The Philadelphia Water Department continues to maintain a CSO Monitoring network and temporary monitoring programs to support planning for further CSO control projects and to minimize dry weather overflows and tidal inflows. PWD will continue to review, replace, and update network equipment in order to continue to support the above functions.

II.B.2.1 Permanent Flow Monitoring Program

In fiscal year 2008 the Department purchased and installed a new data acquisition system and RTU's (remote telemetry units) manufactured by Telog Enterprise. This new system replaces a customized solution that was unreliable and difficult to maintain and offers better communications options and system diagnostics which should allow PWD to greatly increase the data capture rate. Thus far 30 RTU's have been switched out to the new system with the balance expected to be completed in fiscal year 2010. As of the end of fiscal year 2009, the 287 remote monitoring sites are 82.1% operational.

II.B.2.2 Temporary Flow Monitoring Program

The PWD temporary flow-monitoring program was initiated in July 1999 with the deployment of portable flow meters throughout targeted Philadelphia sewershed areas to quantify wastewater flow through sanitary sewers and characterize the tributary sewersheds. The identification and quantification of rainfall dependent inflow/infiltration (RDII) into sanitary sewers contributing to the City of Philadelphia's service area is a key component in assessing potential reductions in combined sewer overflow impacts.

The data collected allows for the quantification of wet and dry weather flows in separate sanitary sewers for a specified list of sites over a given period. The flow monitoring data is subjected to rigorous QA/QC procedures resulting in consistently good data quality over the monitoring period. Further analysis of the flow monitoring data is performed using hydrograph separation techniques in order identify the primary flow components.

In 2007, the PWD temporary flow monitoring program continued to monitor and maintain 23 previously installed flow monitoring sites. 8 monitors in support of the Thomas Run Relief project, 4 monitors in support of PC30, 1 monitor in support of R20, 1 monitor on an un-metered outlying community connection, 1 monitor in support of an LTCP project, 2 monitors in support of storm flood relief, 1 monitor for CSO model calibration, and 5 in support of Flow Control projects.

In addition, PWD monitored 31 un-metered connections from outlying community service areas, 18 sites in support of PC30, model calibration and RDII identification, 4 sites in support of CSO model calibration, 1 site in support of Storm Flood Relief, 2 sites in support of Wakeling Relief project, and 1 site in support of R20 through a contract with CSL Services, Inc.

In 2008, PWD continued its temporary monitoring program until August 2008. All PWD maintained temporary monitoring sites were uninstalled by August 2008. 5 essential sites were turned over to CSL for continued monitoring through the present. 2 additional sites were added in support of a Seepage Tank at 47th and Fairmount. PWD continues its temporary flow monitoring program through a contract with CSL Services, Inc.

Table II.B-5 Listing of all Temporary Flow Monitors deployed

Deployment	Site Name	Start	End	Maintained By	Project
1	Saylors Grove	6/19/2007	5/1/2008	PWD	Flow Control
2	Cathedral Run	7/1/2007	7/3/2007	PWD	Flow Control
3	Monoshone	7/11/2007	7/19/2007	PWD	Flow Control
5	Creshiem Valley	1/28/2008	5/1/2008	PWD	Flow Control
6	Gorgas Lane	10/26/2007	12/27/2007	PWD	Flow Control
11	Main and Shurs	1/31/2001	replaced by permanent	PWD	R20
90	Southampton	10/6/2004	6/13/2008	PWD	outlying community connection
95	H09 Byberry	3/28/2007	present	PWD	PC-30
96	H09 Poquessing	3/13/2007	present	PWD	PC-30
98	Holy Family	3/13/2007	present	PWD	PC-30
99	18th and Oregon	9/9/2005	9/3/2007	PWD	Storm Flood Relief
101	16th and Passyunk	9/19/2005	3/7/2007	PWD	Storm Flood Relief
106	Lebanon and Haverford	1/24/2007	8/1/2008	PWD	CSO model calibration
107	56th and Walnut	1/30/2007	8/1/2008	PWD	Thomas Run
108	D72 North / South	4/2/2007	8/1/2008	PWD	LTCP Project
109	56th and Spruce (R3)	5/14/2007	8/1/2008	PWD	Thomas Run
110	56th and Spruce (R2)	5/7/2007	8/1/2008	PWD	Thomas Run
110	Torresdale	11/27/2007	4/17/2008	PWD	PC-30
111	56th and Cedar	4/5/2007	8/1/2008	PWD	Thomas Run
112	56th and Pine	4/3/2007	8/1/2008	PWD	Thomas Run
113	Florence and Cobbs Creek	5/16/2007	8/1/2008	PWD	Thomas Run
114	56th and Webster	5/13/2007	11/14/2007	PWD	Thomas Run
115	56th and Webster	9/23/2005	8/1/2008	PWD	Thomas Run
116	47th and Aspen	3/18/2008	present	PWD	47th Fairmount Seepage Tank
117	47th and Fairmount	4/1/2008	present	PWD	47th Fairmount Seepage Tank
Fall07	MA-1	8/27/2007	11/9/2007	CSL	outlying community

					connection
Fall07	MA-3	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MA-4	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MCX-1	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MCX-2	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MCX-3	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MCX-4	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MCX-5	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MCX-6	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MCX-7	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	ML-2	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MLM-3	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MLM-4	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MLM-5	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MLM-6	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MLM-7	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MS-1	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MS-4	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MS-5	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MS-6	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MS-7	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MS-1	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MS-4	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MS-5	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MS-7	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MS-8	8/27/2007	11/9/2007	CSL	outlying community

					connection
Fall07	MSH-2	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MSHX-1	8/27/2007	11/9/2007	CSL	outlying community connection
Fall07	MSHX-2	8/27/2007	11/9/2007	CSL	outlying community connection
Winter07	BC0010	11/16/2007	11/15/2008	CSL	PC-30
Winter07	D39-110	11/16/2007	11/15/2008	CSL	PC-30
Winter07	D-45	11/16/2007	11/15/2008	CSL	CSO model calibration
Winter07	MH-A	11/16/2007	11/15/2008	CSL	I/I
Winter07	MH-B	11/16/2007	11/15/2008	CSL	I/I
Winter07	MH-C	11/16/2007	11/15/2008	CSL	I/I
Winter07	MH-D	11/16/2007	11/15/2008	CSL	I/I
Winter07	MH-E	11/16/2007	11/15/2008	CSL	I/I
Winter07	MH-F	11/16/2007	11/15/2008	CSL	I/I
Winter07	ML-2	11/16/2007	11/15/2008	CSL	outlying community connection
Winter07	ML-3	11/16/2007	11/15/2008	CSL	outlying community connection
Winter07	BC0010	11/16/2007	11/15/2008	CSL	PC-30
Winter07	PC0045	11/16/2007	11/15/2008	CSL	PC-30
Winter07	PC0920	11/16/2007	11/15/2008	CSL	PC-30
Winter07	Q107-05-S0010	11/16/2007	11/15/2008	CSL	I/I
Winter07	Q107-06-S0010	11/16/2007	11/15/2008	CSL	I/I
Winter07	Q120-03-S0010	11/16/2007	11/15/2008	CSL	I/I
Winter07	Q120-08-S0010	11/16/2007	11/15/2008	CSL	I/I
Winter07	Q120-10-S0010	11/16/2007	11/15/2008	CSL	I/I
Winter07	Q120-11-S0010	11/16/2007	11/15/2008	CSL	I/I
Winter07	Q121-01-S0010	11/16/2007	11/15/2008	CSL	I/I
Winter07	Q121-05-S0010	11/16/2007	11/15/2008	CSL	I/I
Winter07	R13	11/16/2007	11/15/2008	CSL	Wakeling Relief
Winter07	R14	11/16/2007	11/15/2008	CSL	Wakeling Relief
Winter07	S42-130	11/16/2007	11/15/2008	CSL	Storm Flood Relief
Winter07	S45	11/16/2007	11/15/2008	CSL	CSO model calibration
Winter07	S20	11/16/2007	11/15/2008	CSL	CSO model calibration
Winter07	S27	11/16/2007	11/15/2008	CSL	CSO model calibration
Winter07	Site 47	11/16/2007	11/15/2008	CSL	R20
Spring09	C15-000018	1/1/2009	present	CSL	CSO model calibration
Spring09	C27-000010	1/2/2009	present	CSL	CSO model calibration
Spring09	C37-000010	1/3/2009	present	CSL	CSO model calibration
Spring09	D15-000020	1/4/2009	present	CSL	CSO model calibration
Spring09	D41-000010	1/5/2009	present	CSL	CSO model calibration
Spring09	S38-000015	1/6/2009	present	CSL	CSO model calibration
Spring09	T01-000015	1/7/2009	present	CSL	CSO model calibration
Spring09	T10-000010	1/8/2009	present	CSL	CSO model calibration
Spring09	T13-000015	1/9/2009	present	CSL	CSO model calibration

II.B.3 Continue to Evaluate the Collection System to Ensure Adequate Transport Capacity for Dry and Wet Weather Flow

II.B.3.1 Long Term Control Plan Update

System-wide hydrologic and hydraulic models have been developed in support of the Long Term CSO Control Plan Update (LTCPU). Model evaluations have been performed to evaluate the system performance benefits of various system improvement scenarios.

These scenarios include combinations of traditional large scale infrastructure improvement projects based on increased transmission, storage and treatment of combined sewer flows, as well as, system-wide implementation of low impact development and green infrastructure source control projects utilizing decentralized storage, infiltration, evapotranspiration, and slow release of stormwater before it enters the combined sewer system.

II.B.3.2 PC-30 Extreme Wet Weather Overflow

Modeling work was performed in support of the project to remediate Poquessing Creek Interceptor Extreme Wet Weather Overflows at manhole PC-30. Modeling was used to help design the construction and operation of a relief sewer structure to transmit extreme wet weather flows from the Poquessing Creek Interceptor sanitary sewer system to the Northeast Water Pollution Control Plant (NEWPCP).

II.B.3.3 Storm Flood Relief

The PWD has made a significant investment in detailed hydraulic modeling and analyses that were performed in order to design and evaluate Storm Flood Relief (SFR) projects in several combined sewer areas of Philadelphia. Several system improvement scenarios were proposed based on model simulations in order to effectively relieve basement backups during extreme wet weather events. Additionally, modifications to proposed SFR projects designed to increase capture and treatment of combined sewage flows during small to moderate storm events were also evaluated using system hydraulic modeling.

II.B.3.4 Real Time Control Evaluation

The PWD has proposed the installation of an inflatable dam in the Rock Run Relief Sewer and a crest gate in the trunk sewer of regulating structure T14 ("I" St. and Ramona Avenue) to reduce CSO discharges to the Tacony Creek as part of the Long-Term CSO Control Plan. These capital projects achieve reductions in CSO volumes through utilization of in-system storage in the Rock Run Relief and T14 trunk sewer in a cost-effective manner.

Modeling analyses were performed to evaluate control logics for the inflatable dam and gate that optimize storage utilization and minimize flooding impacts of the projects. Analyses were also performed to develop control logics for the projects' drain-down control gates and to size Dry Weather Outlet (DWO) pipes for the Rock Run Relief project.

System hydraulic modeling was performed to evaluate the performance benefit of Real Time Control (RTC) projects in the Southwest Drainage District (SWDD). These projects included the completed phase of raising the overflow dam height and DWO pipes size at Cobbs Creek High Level Interceptor CSO regulating chamber C17. Ongoing projects phases also evaluated using system hydraulic models include reconstruction of the triple barrel gravity sewer dispersion chamber control gates and increasing the DWO pipe size at the Lower Schuylkill West Side Interceptor regulating chamber S45 in order to deliver more wet weather flow to the Southwest Water Pollution Control Plant (NEWPCP) for treatment.

System hydraulic modeling was performed to evaluate the performance improvements realized through implementation of the Main Relief Inflatable Dam project.

II.B.3.5 Other Capital Project Support

Hydraulic modeling was performed to evaluate conveyance improvements to the Northeast Drainage District (NEDD) Frankford High Level (FHL) Interceptor system including removing transmission bottlenecks and sealing an existing out of service gravity sewer for pressurization in order to bring more wet weather flow to the NEWPCP.

II.B.4 Fully Integrate the Real-Time Control Facility into the Operations of PWD

The construction of the Collector System Real Time Control Center (RTC) building was completed in the summer of 2003. The Real Time Control Center became operational in September 2006. The center, located at the Collector System Headquarters at Fox St. and Abbottsford Rd., is currently attended to during the day shift and for major storm events. The 24 ft. by 46 ft. room incorporates a two high by three wide matrix of video projection cubes for a total video screen wall of 89.4 square feet. The ergonomically designed room and furniture layout enables large groups of people to simultaneously view the display screens.

The display screens make use of the Decision Support System that has been under development since 2002. This web-based application consolidates many of PWD's information sources into one application making real-time and static information easier for the decision maker to use. Some of the information sources currently in use are: pump station and CSO control site SCADA and alarm systems, Collector System monitoring network data, the Department's wide variety of GIS data, sewer system and equipment scanned drawings, CCTV inspections video and reports, Collector Systems work order management systems, and weather and tide predictions.

II.B.5 Operate and Maintain In-Line Collection Storage System Projects Contained within the LTCP

II.B.5.1 Main Relief

The Main Relief Inflatable Dam storage project was completed in fiscal year 2007. The Department continues to maintain and monitor this in-line collection system storage site.

In the Combined Sewer Overflow (CSO) Long-term Control Plan submitted by the Philadelphia Water Department (PWD) to the Pennsylvania DEP in 1997, one of the listed capital projects was to implement a project in the Main Relief Sewer. In PWD's NPDES permit #0026671 issued in 2007, PWD was required to complete the construction and implementation of this in-line storage project by PID+12 months or 08/15/2008. The Main Relief sewer project has been constructed and is currently in operation.

The Main Relief Sewer provides flood relief to combined sewer areas in all three of PWD's drainage districts (Northeast, Southeast and Southwest). The Main Relief Sewer discharges to the Schuylkill River at Fairmount Park, a highly visible recreational area. Previously, CSO was released into the river at the Main Relief Sewer outfalls during periods of moderate or greater rainfall. There exists within the single large (13.5′ by 13.5′ box) sewer above these outfalls a potential storage volume of approximately 4.0 million gallons and during all but the largest rainfalls most or all of this volume is available to store the overflow that otherwise discharges to the river. In order to use this storage, an inflatable dam was installed in the box sewer just above the Main Relief Sewer outfalls to the Schuylkill River. This control technology provides an additional margin of protection against dry weather overflows while still maintaining flood protection for upstream communities. The inflatable dam maintains the stored flow in the relief sewer and a new connecting sewer drains the stored flow to an existing, nearby interceptor. This project reduces the discharge of CSO into the Schuylkill River through utilization of the available in-system storage volume.

In November of 2003, the project was advertised and bid. The bid was awarded in mid-December to Ross Araco for an amount of $1,029,919. The project construction was initiated on 9/16/2004 with the issuance of the Notice to Proceed. Field work began on 12/15/2004 and was substantially completed on 11/3/2005. Following a lengthy system start up/ tune-up period, the project was closed out at a final total cost of $1,068,031 on 5/10/2007. The dam did not become fully automated until the Dauphin Street job, which used a portion of the Main Relief Sewer as a bypass during construction, was completed in the fall of 2006.

The current operational set-points for the inflatable dam are; >7 ft the bag fully inflates; at 16 ft +- 0.25″ the dam modulates to maintain 16 ft; at 24 ft the dam fully deflates in failsafe mode. All levels are measured from the invert of the trunk sewer approximately 20 feet upstream of the centerline of the dam. The designed level of 20 feet dam modulation was never achieved without failure so the level was reduced to 16 feet, which is a more realistic capture level. This 16 feet is still much higher than any other Bridgestone installation. The failures at the 20 foot dam height included surges to well over the 24 ft failsafe before the bag would react, constant stretching of the rubber resulting in bolt loosening and allowing water into the bag, and dislodging of level sensors due to the violent turbulence.

In a typical year, the operation of the dam prevents about 31 to 22 million gallons (high and low estimates) of combined from overflowing to the Schuylkill River and facilitates capture of about 47 to 34 million gallons in the Southwest drainage district.

This text also copied under “Construction and Implementation of Main Relief Sewer Storage and Real-time Control”.

II.C Review and Modification of Pretreatment Requirements to Assure CSO Impacts are Minimized (NMC 3)

II.C.1 Expand the Pretreatment Program to Include Significant Industrial Users (SIUs) Whose Facilities Contribute Runoff to the Combined Sewer System

The City of Philadelphia's Pretreatment Program permits all significant industrial users (SIUs) in its service area, which includes SIUs in both separate and combined sewer systems. These permits are site-specific and are intended to control the introduction of pollutants from the industrial users which may pass through or interfere with wastewater treatment processes.

The City has done an analysis on the issuance of general permits for industrial dischargers and concluded that there would be no additional benefit over the site-specific permits that are currently issued. These site-specific permits regulate all wastewater discharged from the facility, which includes contaminated storm water (i.e. rainfall contaminated by products, by-products, waste products, or other materials). Additionally all SIUs are required to monitor their flow to the sewer system. Due to the large amount of regulatory changes that would be necessary to enact the use of general permits, namely it would require a change to the City's Wastewater Control Regulations, the EPA's approval, and promulgation into City Law, the City would like to continue to use the site-specific permits and will continue to demonstrate that there is no detriment in using the site-specific permits over the general permits.

The Industrial Waste Unit is currently phasing in an addition to their inspection form, a section dedicated to stormwater handling. During the inspection of the facilities, inspectors note things such as potential sources of pollutants stored outside that could possibly impact stormwater, whether or not activities are performed to minimize or prevent pollutant contact with stormwater, how dike water is handled, whether or not tanks are in a contained area, and similar observations that establish if stormwater contamination is an issue at the facility.

Through the Pretreatment Program, the City inspects each of its SIUs at least once per year. These inspections provide an opportunity to give guidance on possible pollution prevention activities. Pollution prevention is reducing or eliminating waste at the source by modifying production processes, promoting the use of non-toxic or less-toxic substances, implementing conservation techniques, and re-using materials rather than putting them into the waste stream. Pollution prevention is viewed as a win-win situation for both the City and its SIUs. In such, the City intends to provide industrial stormwater BMP guidance to its SIUs and evaluate those efforts during inspections.

II.C.2 Incorporate guidance on BMPs for industrial stormwater discharges into Stormwater Management Regulations guidance .

The Stormwater Management Guidance Manual incorporates guidance on BMPs for industrial stormwater dischargers. The Stormwater Management Guidance Manual is intended to guide the developer in meeting the requirements of the Stormwater Regulations. The Manual is laid out to guide the developer through the entire site design process, beginning with initial site design considerations, through the Post-Construction Stormwater Management Plan (PCSMP) submittal elements, and ultimately PWD prerequisite approval on Building Permit approval. Tools are provided to assist in completion and submittal of a PCSMP consistent with the requirements of PWD. These tools work together to address stormwater management on the development site from concept to completion.

One of the tools in the Guidance is the Stormwater Management Practice Design Guidelines, which presents technical design guidance for managing stormwater and specifications for structural SMPs. These SMPs include technologies such as green roofs, rain barrels and cisterns, filters, bioinfiltration / bioretention, detention basins, porous pavement, etc. Each of the technologies is described and illustrated to show which applications it would be appropriate for. This assists industrial stormwater dischargers decide which BMPs are most appropriate for industrial applications.

II.C.3 Continue to Serve as a Member of the Philadelphia Inter-governmental Scrap and Tire Yard Task Force

To address numerous complaints about the operation of scrap metal and auto salvage businesses, which may cause polluted runoff to enter the City's sewers, as well as create blight in City neighborhoods, and contribute to short dumping and other environmental harms to area waterways, the City will: (1) continue to participate with the USEPA and PADEP in a multi-governmental task force to conduct random inspections of these facilities; (2) provide compliance assistance to scrap yard operators on the various relevant laws and regulations; (3) provide educational assistance on measures that can be undertaken by the industry to control runoff from storage or transport areas; and (4) where necessary, support comprehensive enforcement actions in cases where facilities are unwilling to cooperate.

The Scrap Yard Task Force (SYTF) has been reorganized and inspections restarted on September 5, 2008. Vince Dougherty from the city Commerce Department has taken over as the new head chairman of the SYTF. Inspections and meetings will be more frequent in the new SYTF, each taking place once a month rather than once every two months, in an effort to reach more scrap yards and get them into compliance. A geodatabase has been created that displays in GIS the location and outline of all scrap yard parcels in the city. The geodatabase contains information about the scrap yards that will be important in the future operation of the task force, such as: the address, owner, surface area, last inspection, and previous violations. Currently, there are 209 licensed scrap yards, 174 are auto salvage yards and 35 are junk yards. It is the intent of the SYTF to be more efficient by operating frequently, knowing the scrap yards better, and following up on the results of the inspections.

During the period from September 2008 to July 2009, the SYTF conducted inspections 9 times and inspected 41 scrap yards. Violation notices of varying types from different agencies were issued to the majority of the sites. No sites were shut down and the incidence of stolen vehicles and parts was low. One scrap yard had been operating illegally and was given the opportunity to achieve compliance in lieu of being shut down. The SYTF also performed an inspection of a large short dump site. That site is currently in court for violations. The enhanced inspection schedule has resulted in greater awareness throughout the business community with noticeable benefits. Violations are not as egregious as in previous inspections and corrective measures have been implemented by many of the facilities.

II.D Maximization of Flow to the Publicly Owned Treatment Works for Treatment (NMC 4)

II.D.1 Continue to Analyze and Implement Non-Capital Intensive Steps to Maximize the Wet Weather Flow to the POTW

II.D.1.1 Modified Regulator Plan

The basic strategy of flow maximization, or Modified Regulator Plan (MRP) was to deliver more flow to the WPCPs more frequently and enable greater pollutant removals. The results of the hydraulic modeling of the interceptor sewers under the flow maximization scenarios indicate that significantly higher rates of flow can be delivered to the WPCPs more frequently than under current conditions. To date, 100% of the projected flow increase associated with the Modified Regulator Plan has been implemented. Some additional modifications may be made in the future to prioritize certain overflows or to reflect an improved understanding of the collection system dynamics as identified throughout the ongoing modeling work, but no additional capture is expected to result on a system wide basis.

II.D.1.2 Maximization of Wet Weather Treatment in the LTCPU

Increasing the treatment capacity of the WPCPs and increasing the transmission of flows to the WPCPs is being analyzed as past of the LTCPU. Please refer to "Evaluate Stress Test Report options in the LTCPU" for more information on this analysis.

II.D.2 Continue the Program which Requires Flow Reduction Plans in Agreements to Treat Wastewater Flows from Satellite Collection Systems where Violations of Contractual Limits are Observed

PWD has encouraged three of its satellite suburban wastewater system customers to reduce peak wet weather flows to the wastewater treatment plants.

Delaware County Regional Water Quality Control Authority

The Delaware County Regional Water Quality Control Authority "DELCORA" has been advised that a new contract with PWD is contingent upon DELCORA reducing its peak flows to PWD's Southwest Water Pollution Control Plant. To that end the Authority has notified its 23 contributing municipalities of the need to identify and eliminate sources of Infiltration and Inflow. DELCORA has undertaken measures to meter flows from each community to DELCORA and is attempting to use financial incentives in an effort to reduce peak flows. PWD is satisfied with DELCORA's efforts to date. In the last year DELCORA's peak flows have diminished significantly. DELCORA has been advised that reduced flow limits under any new agreement with PWD will have to await the finalization of PWD's Long Term Control Plan.

Bucks County Water & Sewer Authority

Bensalem Township's wastewater is delivered to PWD's system under a contract assumed several years ago by the Bucks County Water & Sewer Authority (BCWSA). Under the terms of a recently negotiated agreement with PWD, BCWSA is undertaking the installation of meters at all connection points not currently monitored.

In addition, BCWSA has agreed to a timetable for the construction of a 1.8 million gallon surge tank and pump station. The terms of the agreement provide for the completion of this facility no later than September 19, 2010. This effort has been proposed by BCWSA as an effective manner in which to address high peak flows to PWD's system. BCWSA is continuing work on the surge tank and pump station in compliance with the terms of its agreement with PWD. PWD is satisfied that reasonable progress is being made on the aforementioned project.

Lower Southampton

Lower Southampton Township was notified that its peak flows were in excess of contractual limits. The Township has agreed to identify and eliminate sources of I/I which contribute to these peaks. Additionally, Lower Southampton has agreed to pay its fair share of a new sewer along State Road in the city which will mitigate peak flows which contribute to surcharging of the Poquessing Interceptor. PWD has recently met with representatives of the Township and has offered to enter a new agreement which will provide stringent financial disincentives for exceeding contractual flow limits. The Township is considering a draft of the new agreement.

Table II.D-1 Listing of Wholesale Wastewater Customer Contracts and Capacities

Customers	Average Annual Daily Flow Maximum (MGD)	Maximum Daily Flow (MGD)	Instantaneous Maximum Rate (Cubic ft./sec)	Maximum Annual BOD Loadings (000's lbs.)	Maximum Annual SS Loadings (000's lbs.)
Northeast Plant					
Abington	4.453		9.542		
Bensalem	6.133		11.740	5,340	3,734
Bucks	24.000	37.00	85.080	13,400	13,400
Cheltenham	13.380		20.750		
Lower Moreland	1.450	2.900	8.970	568	592
Lower Southampton	7.140		15.790	3,651	3,651
Southwest Plant					
Delcora	50.000	75.000	155.000		
Lower Merion	14.500		31.570	6,871	7,250
Springfield (Erden.)	3.200		4.600	1,050	1,200
Upper Darby	17.000		35.000	6,831	7,348
Southeast Plant					
Springfield (Wyndmoor)	1.000		1.930	155	200

II.D.3 Use Comprehensive Monitoring and Modeling Program to Identify Suburban Communities where Excessive Rainfall-dependant I/I Appear to be Occurring

II.D.3.1 Monitoring and Modeling

PWD is currently aware of 61 connections from outlying communities. Presently, permanent flow monitors are installed at 26 connections and 35 are unmonitored. Through temporary deployments, average flow statistics were determined. The following table lists all known connections, their location and weather or not the connection is permanently monitored.

Table II.D-2 Listing of Flow Monitors at Outlying Community Connections

Site ID	Connection Type	Township	Location	Address
MA1	STD*	Abington	Buckly Drive & Pine Rd	9650 Pine Rd.
MA2	MTR**	Abington	Pine Road & Pennypack Creek	8700 Pine Rd
MA3	STD	Abington	Shady Lane & Pine Road	8400 Pine Rd.
MA4	STD	Abington	Pine Road & Lee Lynn La.	9200 Pine Rd.
MB1	MTR	Bucks Co.	Totem Rd. & Neshaminy Cr.	

MBE1	MTR	Bensalem	Byberry Grounds	16000 Carter Rd
MBE10	STD	Bensalem	Colonial Ave	
MBE11	STD	Bensalem	Betz Laboratories	
MBE12	STD	Bensalem	Creekside Apartments North	
MBE13	-	Bensalem	Rt 1 West Side of Highway	
MBE14	-	Bensalem	Old Lincoln Hwy & Old Trevose Rd	
MBE15	-	Bensalem	Knights Rd & Poquessinng Creek	
MBE16	STD	Bensalem	Creekside Apartments South	
MBE2	MTR	Bensalem	Dunks Ferry Road	1400 Worthington
MBE3	STD	Bensalem	Emerson & Evelyn	Emerson
MBE4	STD	Bensalem	Red Lion & Frankford	490 Bristol Rd.
MBE5	MTR	Bensalem	Grant & James	5050 Grant Av
MBE6	MTR	Bensalem	Gravel Pike @ Poquessing Creek	4800 Byberry Rd
MBE7	MTR	Bensalem	Townsend Road @ Poquessing Ck.	13000 Townsend Rd
MBE8	STD	Bensalem	Bensalem Shopping Ctr.	
MBE9	STD	Bensalem	Elmwood Apartments	
MC1	MTR	Cheltenham	Bouvier & Cheltenham	1900 Cheltenham Av
MC2	MTR	Cheltenham	Tookany Creek & Cheltenham	194 E Cheltenham Av
MC3	MTR	Abington	Fillmore & Shelmire (Abington)	7400 Fillmore
MCx1	STD	Cheltenham	Cottman (Out)	
MCx2	STD	Cheltenham	County Line & Franklin (Out)	
MCx3	STD	Cheltenham	County Line & Washington (Out)	Washington & Hasbrook
MCx4	STD	Cheltenham	Kerper (Out)	Unruh & Hasbrook
MCx5	STD	Cheltenham	Passmore (Out)	
MCx6	STD	Cheltenham	Devereaux (Out)	
MCx7	STD	Cheltenham	Comly (Out)	
MD1	MTR	Delaware Co.	DELCORA	SWWPC Plant
ML1	MTR	Lower Merion	51st Street & City Line	2490 N 51St St
ML2	STD	Lower Merion	59th Street & City Line	5868 City Line
ML3	MTR	Lower Merion	63rd Street & City Line	2139 N 63Rd St
ML4	MTR	Lower Merion	66th Street & City Line	6600 City Line Av
ML5	MTR	Lower Merion	73rd Street & City Line	7268 City Line Av
ML6	MTR	Lower Merion	Conshohocken & City Line	4900 City Line
ML7	MTR	Lower Merion	Presidential & City Line	3499 City Line
MLM1	MTR	Lower Moreland	Philmont & Byberry	Woodhaven
MLM2	MTR	Lower	Lower Moreland PS @ Welsh &	

		Moreland	Hunt. Pk	
MLM3	STD	Lower Moreland	Ramage Run & City Boundry	
MLM4	STD	Lower Moreland	Moreland Rd. & Pine Rd.	
MLM5	STD	Lower Moreland	Jonathan place	
MLM6	STD	Lower Moreland	Pine & Radburn Rd	
MLM7	STD	Lower Moreland	Welsh Road and City Line	
MPNBC1	MTR	PIDC - PNBC	Phila. Naval Business Ctr. @ PS 796	4801 S. 13Th Street
MS1	STD	Springfield	Thomas & Northwestern	198 W. Northwestern
MS2	MTR	Springfield	Northwestern & Wissahickon Cr.	9404 Northwestern
MS3	MTR	Springfield	Erdenheim & Stenton	Erdenheim & Stenton
MS4	STD	Springfield	Mermaid La. & Stenton	7700 Stenton
MS5	STD	Springfield	Winston & Stenton	8200 Stenton
MS6	MTR	Springfield	Woodbrook & Stenton	7601 Stenton Av
MS7	STD	Springfield	Willow Grove	
MS8	STD	Springfield	Ridge Ave Connections	Ridge & Northwestern
MSH1	MTR	Southampton	Trevose Rd. & Poquessing Ck. East	Trevose Rd & Stream Ridge Ln.
MSH2	STD	Southampton	Lukens St. & Trevose Rd.	Trevose Rd & Lukens St.
MSHX_1	STD	Southampton	Overhill Ave & Cty. Line Rd (Out)	
MSHX_2	STD	Southampton	County Line & Trevose Rd. (Out)	
MUD1-N	MTR	Upper Darby	60Th & Cobbs Creek	6001 S. Cobbs Creek Pky.
MUD1-O	MTR	Upper Darby	60Th & Cobbs Creek Overflow	6001 S. Cobbs Creek Pky.
MUD1-S	MTR	Upper Darby	60Th & Cobbs Creek	6001 S. Cobbs Creek Pky.

*STD – temporary flow monitor

**MTR – Permanent monitor

The following temporary flow monitoring deployments were performed on outlying community connections in the past year.

Table II.D-3 Listing of Temporary Flow Monitors at Outlying Community Connections

Deployment	Site Name	Start	End	Maintained By
Fall07	MA-1	8/27/2007	11/9/2007	CSL
Fall07	MA-3	8/27/2007	11/9/2007	CSL
Fall07	MA-4	8/27/2007	11/9/2007	CSL
Fall07	MCX-1	8/27/2007	11/9/2007	CSL
Fall07	MCX-2	8/27/2007	11/9/2007	CSL
Fall07	MCX-3	8/27/2007	11/9/2007	CSL
Fall07	MCX-4	8/27/2007	11/9/2007	CSL
Fall07	MCX-5	8/27/2007	11/9/2007	CSL
Fall07	MCX-6	8/27/2007	11/9/2007	CSL
Fall07	MCX-7	8/27/2007	11/9/2007	CSL
Fall07	ML-2	8/27/2007	11/9/2007	CSL
Fall07	MLM-3	8/27/2007	11/9/2007	CSL
Fall07	MLM-4	8/27/2007	11/9/2007	CSL
Fall07	MLM-5	8/27/2007	11/9/2007	CSL
Fall07	MLM-6	8/27/2007	11/9/2007	CSL
Fall07	MLM-7	8/27/2007	11/9/2007	CSL
Fall07	MS-1	8/27/2007	11/9/2007	CSL
Fall07	MS-4	8/27/2007	11/9/2007	CSL
Fall07	MS-5	8/27/2007	11/9/2007	CSL
Fall07	MS-6	8/27/2007	11/9/2007	CSL
Fall07	MS-7	8/27/2007	11/9/2007	CSL
Fall07	MS-1	8/27/2007	11/9/2007	CSL
Fall07	MS-4	8/27/2007	11/9/2007	CSL
Fall07	MS-5	8/27/2007	11/9/2007	CSL
Fall07	MS-7	8/27/2007	11/9/2007	CSL
Fall07	MS-8	8/27/2007	11/9/2007	CSL
Fall07	MSH-2	8/27/2007	11/9/2007	CSL
Fall07	MSHX-1	8/27/2007	11/9/2007	CSL
Fall07	MSHX-2	8/27/2007	11/9/2007	CSL

The U.S. EPA's Storm Water Management Model (SWMM) was used to develop the watershed-scale model for the PWD combined sewer system. The components of the SWMM model used in the development of the Philadelphia watershed and wastewater conveyance model were the RUNOFF and EXTRAN modules. Outlying communities are modeled as separate runoff sheds that load directly to the PWD sewer network. The sheds are calibrated to flow monitoring data collected at each respective connection.

II.D.3.2 Outlying Community Contracts

PWD has developed with each outlying community a contract to accept and treat their flows. The contracts are designed to limit high wet weather flows. Contract limits are based on the permanent flow monitors where available. 32 unmonitored connections have standardized contract limits.

Table II.D-4 Listing of Outlying Community Contract Limits

Site ID	Short Term MGD *	Daily MGD	Township Total CFS	Township Total MGD
MA1				
MA2	4.973	3.784		
MA3	0.884	0.659		
MA4			9.542	4.453
MB1	54.989	24	85.08	24
MBE1	0.569	0.434		
MBE2	0.246	0.185		
MBE3	0.248	0.189		
MBE4	0.437	0.328		
MBE5	0.278	0.282		
MBE6	1.758	1.327		
MBE7	0.543	0.412		
MBE8	0.246	0.185		
MBE9	0.375	0.278		
MBE10	0.104	0.078		
MBE11	0.239	0.18		
MBE12	0.246	0.185		
MBE13				
MBE14				
MBE15	0.246	0.185		
MBE16			11.74	6.134
MC1	1.777	1.7		
MC2	11.634	11.68		
MC3				
MCx1				
MCx2				
MCx3				
MCx4				
MCx5				
MCx6				
MCx7			20.75	13.38
MD1			155	50
ML1	5.474	5.474		

ML2	0.213	0.213		
ML3	1.48	1.48		
ML4	10.264	10.264		
ML5	1.848	1.848		
ML6	0.252	0.252		
ML7	0.84	0.84	31.57	14.5
MLM1	0.268	0.173		
MLM2		67% of total	5.441	0.8
MLM3				
MLM4				
MLM5				
MLM6				
MLM7			0.675	0.282
MS1				
MS2	0.129	0.1		
MS3	2.585	2.15		
MS4				
MS5				
MS6	1.247	1		
MS7				
MS8			6.13	3.25
MSH1	10.205	7.14		
MSH2				
MSHX_1				
MSHX_2			15.79	7.14
MUD1-N	22.621	17		
MUD1-S	Combined	Combined		
MUD1-O			35	17
MPNBC1				

II.E Prohibition of CSOs during Dry Weather (NMC 5)

II.E.1 Optimize the Real-Time Control Facility to Identify and Respond to Blockages and (non-chronic) Dry Weather Discharges

Dry weather discharges at CSO outfalls can occur in any combined sewer system on either a chronic (i.e., regular or even frequent) basis or on a random basis (i.e., as a result of unusual conditions, or equipment malfunction). Random dry weather discharges can occur at virtually any CSO outfall following sudden clogging by unusual debris in the sewer, structural failure of the regulator, or hydraulic overloading by an unusual discharge of flow by a combined sewer system user. Chronic dry weather discharges can and should be prevented from occurring at all CSO outfalls. Random discharges cannot be prevented, but they can and must be promptly eliminated by cleaning repair, and/or identification and elimination of any excessive flow and/or debris sources.

Regular and reactive inspections and maintenance of the CSO regulators are performed throughout the City. These programs ensure that sediment accumulations and/or blockages are identified and corrected immediately to avoid dry weather overflows. The CSO maintenance group utilizes the remote monitoring network system daily as a tool to help identify the locations that are showing abnormal flow patterns. By using the system in this manner the crews are able to correct many partial blockages before they become a dry weather discharge. The detailed inspection report summaries are included **APPENDIX A**.

II.F Control of Solid and Floatable Materials in CSOs (NMC 6)

The control of floatables and solids in CSO discharges addresses aesthetic quality concerns of the receiving waters. The ultimate goal of NMC 6 is to reduce if not eliminate, by relatively simple means, the discharge of floatables and coarse solids from combined sewer overflows to the receiving waters where feasible. The initial phase of the NMC process has and will continue to focus on the implementation of, at a minimum, technology-based, non-capital intensive control measures.

II.F.1 Control the Discharge of Solids and Floatables by Cleaning Inlets and Catch Basins

The Inlet Cleaning Unit's primary responsibility is the inspection and cleaning of approximately 79,159 stormwater inlets throughout the City of Philadelphia. The group is also responsible for maintenance of inlet covers (retrieving, replacing and locking) and relieving choked inlet traps.

About 80% of inlet cleaning work orders are scheduled jobs, while the remaining 20% are in response to customer calls or requests from other departments. Scheduled cleaning routes for an area are created by the crew chief and assigned to the crews.

For the period of July 2008– June 2009, 76,366 inlets were cleaned and examined. 14,106 inlets were inspected only. In total 90,472 inlets were examined or cleaned and examined. This is an average of every inlet being examined or cleaned and examined 1.14 times during this period.

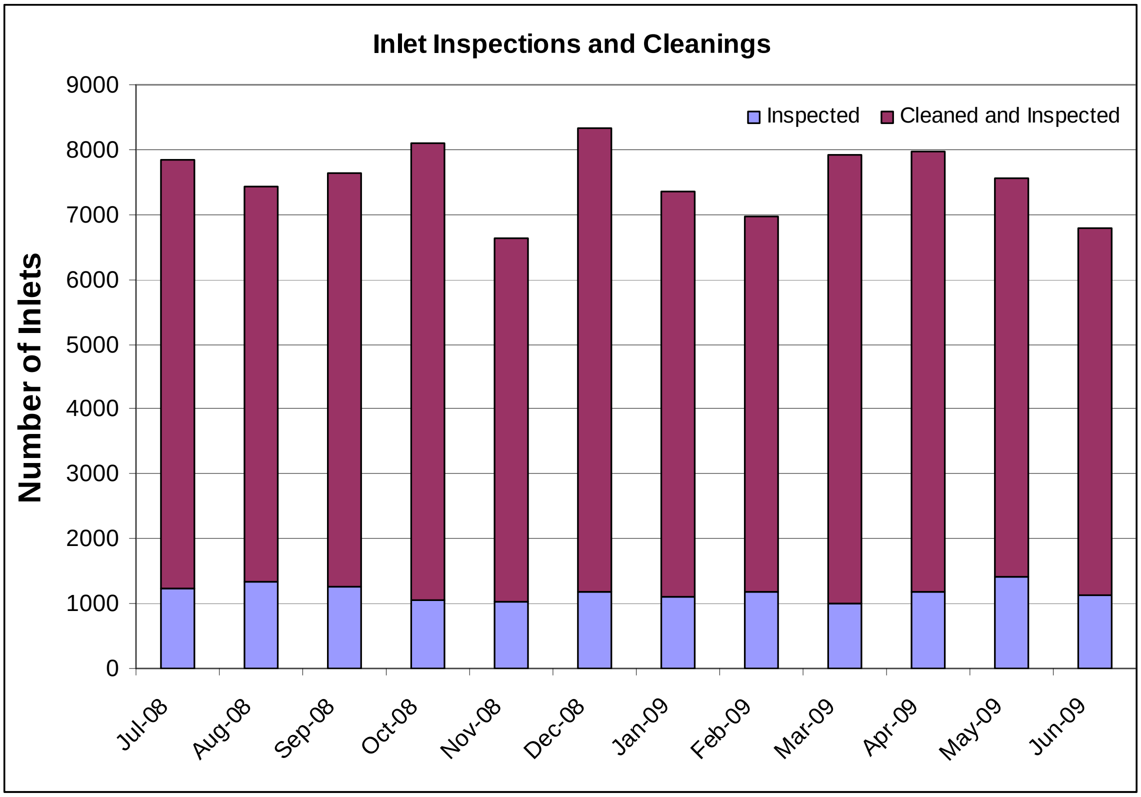


Figure II.F-1 Monthly Inlet Cleaning Statistics

II.F.2 Continue to Fund and Operate the Waterways Restoration Team (WRT)

PWD's Waterways Restoration Team (WRT) is a multi-crew force 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 also restores eroded streambanks and streambeds around outfall pipes and in tributaries as a part of PWD's goal to naturally restore our streams while meeting Clean Water Act permit requirements. The team is focused on the completion of in-stream restoration work that protects the department's sewer infrastructure in the banks and beds of our streams, while also using Natural Stream Channel Design to restore these streams to a habitat supporting waterway and a community amenity. The Waterways Restoration Team works in partnership with the FPC staff and the various Friends of the Parks groups to maximize resources and the positive impacts to our communities.

The WRT performs stream clean up work throughout the city, in the city's streams – Cobbs, Wissahickon, Tacony, Pennypack, and Poquessing creeks, and their tributaries, along the banks of the non-tidal Schuylkill River, in addition to the Manayunk Canal.

Typical tasks for the WRT include:

– Debris and trash removal - This is one of the most basic tasks of the WRT – the removal of trash and large debris from our waterways. In addition to satisfying one of the primary goals of the Clean Water Act, ensuring that our streams and rivers are clean and beautiful enhances public stewardship as people will only seek and value waterways and parks that look and smell good. Public willingness to pay for the protection of our waterways is intricately linked to the recognition that these waterways are being maintained and valued by the City. Residents care little about the quality of the water emptying into our streams if the streams are smelly eyesores. If the public does not have a desire to go to these waterways, they will not care about them.

– Watershed assessments - WRT watershed assessments include visual inspections of the banks of Cobbs, Wissahickon, Pennypack, Poquessing and Tacony Creeks and are completed once per year. This field survey work essentially involves the inspection of stream segments (upstream to downstream) to check for evidence of exposed or damaged infrastructure, chronic pollution sources, dry weather sewer overflows along Cobbs and Tacony Creek. These assessments also support the implementation of the completed watershed management plans for these stream systems.

– Sanitary discharge clean-ups - The WRT is recruited to clean up sanitary discharges to our streams or parks.

– Property restoration repair - The WRT is recruited to restore natural areas on public and private land impacted by water main breaks.

– Operation of PWD Floatables Pontoon Boat in spring/summer/fall

– Restoration projects such as plunge pool removals and stream restorations

– Inspection of intake walls

– Woody debris removal

– General maintenance - General Maintenance responsibilities include the fish ladder, PWD plunge pool and streambank restoration projects, and other PWD land-based stormwater management facilities. Currently, the WRT performs ongoing maintenance at the following habitat improvement or best management practice sites:

  - Saylor Grove stormwater treatment wetland
  - Fairmount fish ladder
  - Marshall Road streambank restoration project in Cobbs Creek
  - Wises Mill streambank restoration project in Wissahickon Creek

- West Mill Creek tree trenches

- Mill Creek urban farm street runoff diversion

- Manayunk Canal boom maintenance and algae removal

From July 2008 – June 2009, the team removed approximately 658 tons of debris from our waterways, debris which includes cars and car parts, appliances, shopping carts and tires.

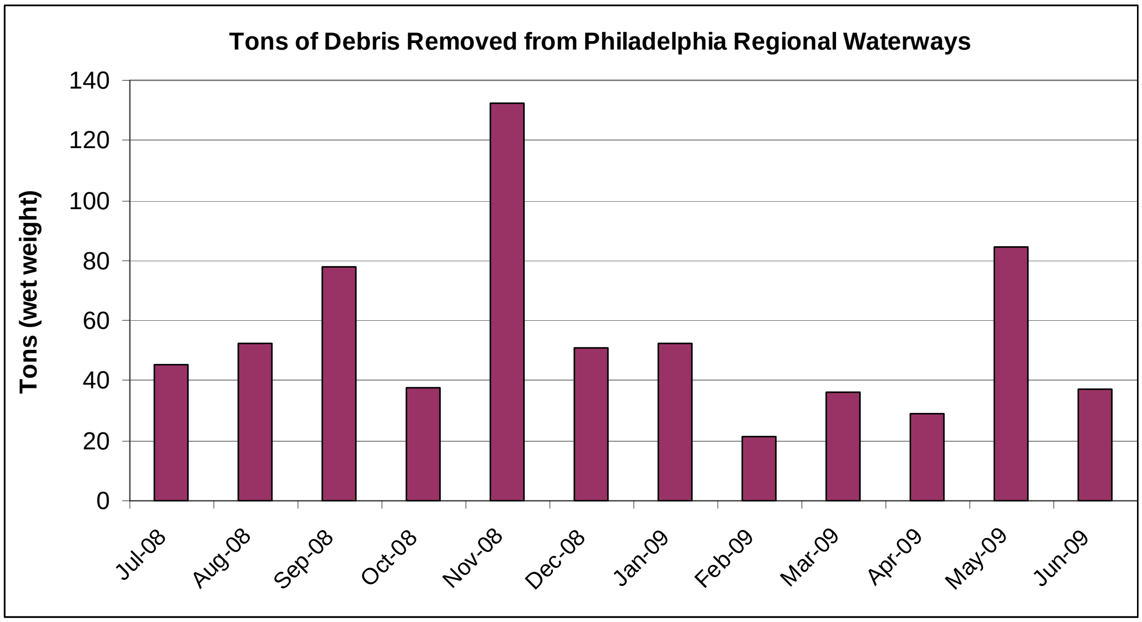


Figure II.F-2 Waterways Restoration Team Monthly Debris Removal Statistics

Table II.F-1 Summary of Waterways Restoration Team July 2008- June 2009 Debris Removal

Tons of Debris Removed	658
Cars Removed	15
Tires Removed	924
Shopping Carts Removed	268

II.F.3 Continue to Operate and Maintain a Floatables Skimming Vessel

Reduction in floatables improves both water quality and aesthetics of receiving streams. The use of a skimmer vessel also allows for a mobile control program capable of managing debris at various locations, increasing the effectiveness of this control measure. In addition, the boat will be a visible control and will increase the public awareness and education of floatables impacts.

II.F.3.1 Floatables Skimming Vessel – R.E. Roy

The Philadelphia Water Department's large skimming vessel is a 39-ft, front loading, single hull, shallow draft, debris skimming vessel with a hydraulically controlled grated bucket and a 5.6 cubic yard on-board hold equipped with a main diesel engine, Caterpillar Model 3056 205-hp.

Figure II.F-3 Floatables Skimming Vessel in operation

Construction of the floatables skimming vessel was initiated in June 2004 and the completed vessel was delivered to PWD in July 2005. The total cost of the vessel was $526,690. The vessel (Figure II.F-3), now known as the R. E. Roy, was operated in-house, by Philadelphia Water Department personnel from delivery until April 2006. During this time, PWD was in the process of securing a contractor for the permanent operation of the skimming vessel. River Associates was the contractor selected for the operations of the vessel and they have been operating it since April 2006.

The vessel is operated approximately five days per week, 8 months of the year. The vessel’s main purpose is to perform general debris collection and removal on both the

Delaware and Schuylkill Rivers. The vessel is also used to clean up for and serve as a highlight for public relations events such as the Schuylkill Regatta.

During the 2009 fiscal year, the skimmer vessel was in operation from April 2008 through November 2008 before shutting down for winter maintenance. It resumed operation again in April 2009. The total amount of debris collected in FY 2009 from July 1, 2008 to July 30, 2009 was 28.01 tons. The weight of debris collected during each month is displayed in **TABLE II.F-2**:

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

Month	**Tons of Debris Collected**
July 2008	4.76
August 2008	1.46
September 2008	6
October 2008	4.8
November 2008	1.5
December 2008	No winter service
January 2009	No winter service
February 2009	No winter service
March 2009	No winter service
April 2009	2.53
May 2009	2.39
June 2009	4.66
FY 2009 Total	**28.1**

The skimming vessel participated in two public events during FY 2009. The vessel was involved in a demo for special needs students at Bartram Gardens on 5/18/2009 and Seeing is Believing at the Water Works Information Center on 6/5/2009. It is the intention of the Water Department for the skimming vessel to continue to serve as a tool for public awareness and outreach.

II.F.3.2 Floatables Pontoon Vessel

The Philadelphia Water Department has purchased a pontoon vessel that is being used as a workboat on the Upper Schuylkill, Lower Schuylkill, and Delaware Rivers within Philadelphia. The vessel is used to retrieve floating trash and debris from the waterways within the service area. The debris is hand netted from the water surface by employees standing on the vessel deck. The hand nets are emptied into ten 44-gallon debris containers on the deck and the containers are offloaded by hand. The pontoon vessel can be utilized in the tight spaces found in marinas, among piers, and in near shore areas.

Figure II.F-4 Floatables Pontoon Vessel in operation

The pontoon vessel was acquired by PWD in June 2006. Throughout the 2008-2009 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. Thanks to the high visibility of the project, it received excellent public feedback throughout the season. The public outreach component of the pontoon skimming vessel program is one of the greatest benefits.

The operational area of the Pontoon Vessel includes:

1. The Lower Schuylkill above Fairmount Dam up to Flatrock Dam (7.2 miles)

2. The Lower Tidal Schuylkill down to the confluence with the Delaware River (8.1 miles)

3. The Delaware River from the confluence up to the Philadelphia City Boundary (18.8 miles)

During fiscal year 2009, the pontoon vessel was operated 26 times. 12 trips during the summer/fall of 2008 removed a total of 24 cubic yards of mixed trash from the non-tidal Schuylkill River. The spring /summer season saw 14 trips with a total removal of 10 cubic yards of bottles and containers and 7.5 cubic yards of mixed trash. A better separation scheme was introduced for the spring/summer 2009 season resulting in a more accurate count of the types of materials collected.

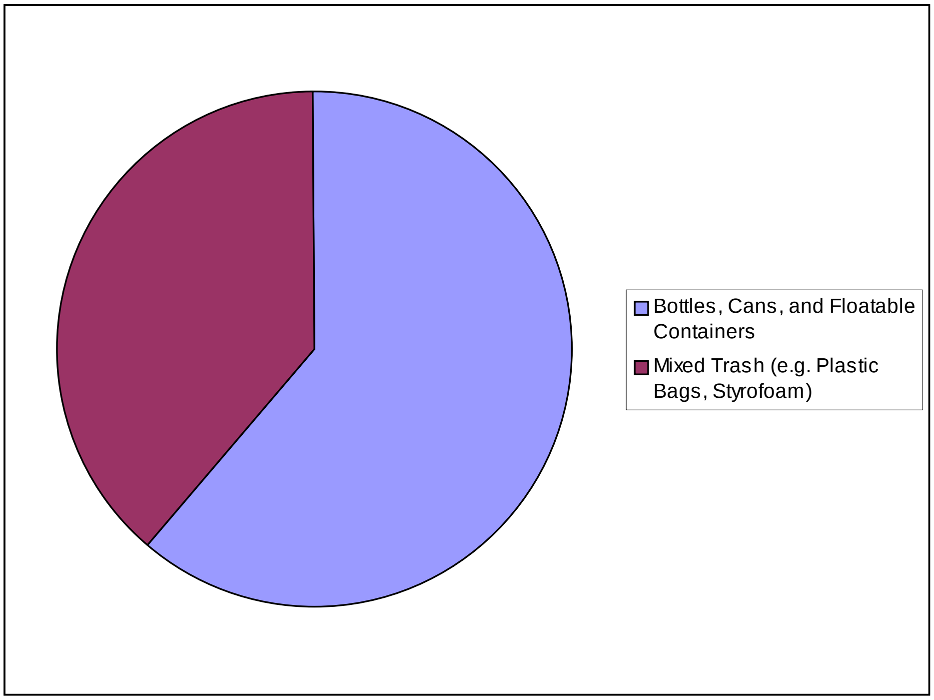


Figure II.F-5 Percent Composition of Recovered Debris Fiscal Year 09

FIGURE II.F-5 shows the respective proportions of trash distinguished by type (containers vs. mixed trash). 41.5 cubic yards of debris were retrieved from the waterways in FY 2009, 61% of which was containers and 39% of which was mixed trash.

In addition to containers and mixed trash, the following has also been removed from the river: 12 tires, 2 gasoline containers (containing gasoline), a sharps container, a large road sign, a small plastic table, an empty propane tank, several Styrofoam blocks, 2 bikes, and assorted pieces of lumber. With increased interagency coordination, the ultimate goal is the recycling of all of recyclable materials.

Adequately covering the proposed area requires 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 as well as future public cooperation. Greater cooperation with the Philadelphia Rowing Community has already resulted in less material reaching the water during regattas and other events.

II.F.4 Other Initiatives

II.F.4.1 Repair, Rehabilitation, and Expansion of Outfall Debris Grills

Debris grills are maintained regularly at sites where the tide introduces large floating debris into the outfall conduit. This debris can then become lodged in a tide gate thus causing inflow to occur. Additionally, these debris grills provide entry restriction and some degree of floatables control. The list of the debris grills receiving preventative maintenance is available in **APPENDIX A**.

II.G Pollution Prevention (NMC 7)

Most of the city ordinances related to NMC7 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. As pollutant parameters 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 combined system and ultimately, the receiving water. Examples of these programs are ongoing and are presented in the NMC document. The City will continue to provide public information about the litter and stormwater inlets as part of the implementation this minimum control as well as continue to develop the following new programs.

II.G.1 Continue to Develop and Share a Variety of Public Information Materials Concerning the CSO LTCP

The Philadelphia Water Department began the development of an extensive CSO LTCPU Public Participation Program in Spring, 2007. The program consists of the production of educational materials and events related to the LTCPU. The following components of the Public Participation Program have been completed thus far.

1. Backgrounders– The eight page backgrounders are designed for a general audience (the public) and serve to provide an introduction to the CSO LTCP, along with the history, background, and approach taken by PWD to address CSOs. The backgrounders are distributed to our partners, the CSO LTCPU advisory committee, and to the public at advisory committee meetings, public meetings, additional public events, and through the CSO LTCPU website. The asterisk denotes the Backgrounder developed during this reporting period (July 1st 2008 - June 30th 2009).

The backgrounders developed thus far, include:

Table II.G.1-1 CSO LTCPU Backgrounders

Backgrounder I	The CSO Long Term Control Plan – History & Background
Backgrounder II	The CSO Long Term Control Plan Update – Clean Water Benefits & The Balanced Approach
Backgrounder III*	Current Status of Our Waterways
* - denotes the publication was developed during this reporting period.	

2. Bill Stuffers & WaterWheels – The Bill Stuffers and WaterWheels are newsletters mailed out with the water bill to the estimated one-half million customers of the Philadelphia Water Department. The following documents have been developed under the CSO LTCPU Public Participation Program and have been distributed throughout the

City at advisory committee meetings, public meetings, and other public events, in addition to in the water bill.

Table II.G.1-2 Bill Stuffers & WaterWheels

Newsletter Title	**Newsletter Description**
Bill Stuffer I: The Combined Sewer Overflow Program: A Long Term Control Plan for Our Rivers in addition to Clean Water, Green City: Long Term Control Plan Update.	This publication covers an introduction to the CSO LTCPU and the goals of the Philadelphia Water Department in controlling CSOs.
WaterWheel I: CSO Public Notification Means You're in the Know	This publication aims to notify the public of the CSO public notification system and covers the commonly asked questions about CSO-affected waters.
WaterWheel II (in Water Quality Report): *Green Cities, Clean Waters Program*	This publication covers the history of CSOs and includes a CSO Notification Card cut-out.
WaterWheel III: Clean Waters, Green Cities – Neighborhood-Friendly Solutions*	This publication covers the Philadelphia Water Department's Green Streets Program.
WaterWheel IV: Green Cities, Clean Waters – Tookany/Tacony-Frankford Creek*	This publication covers the Integrated Watershed Management Plan for the Tookany/Tacony-Frankford Watershed.
* - denotes the publication was developed during this reporting period.	

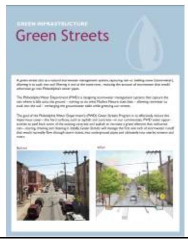
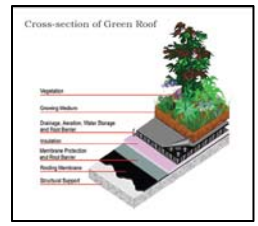
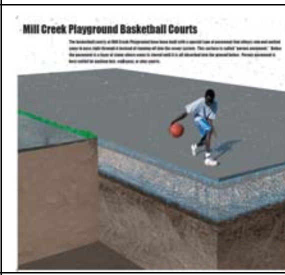
3. Fact Sheets – The fact sheets highlight projects designed and/or implemented by PWD to address CSO discharges. The fact sheets also provide information on other PWD programs. The fact sheets are distributed to our partners, the CSO LTCPU advisory committee and to the public at steering committee meetings, public meetings, additional public events, and through the CSO LTCPU website.

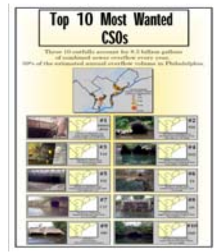
Green Cities, Clean Waters Information Fair
A Green Cities, Clean Waters Information Fair was displayed during select public meetings. The Fair included a table-top display with posters on CSO LTCPU-related projects, fact sheets on projects designed and/or implemented by PWD to address CSO discharges, other educational materials, and a demonstration rain barrel.

TABLE II.G.1-3 lists samples of the materials from the Green Cities, Clean Waters Information Fair, in addition to materials distributed at other events and meetings.

The asterisk denotes the material was developed during this reporting period (July 1st 2008 - June 30th 2009). :

Table II.G.1-3 Green Cities, Clean Waters Information Fair Materials

Green Cities, Clean Waters Information Fair Materials			
Green Stormwater Infrastructure Program Fact Sheet Series*		Illustration: Green Roof Cross-Section	
Fact Sheet: Tacony Creek Storage		llustration: Venice Island's Green Roof Pumping Station	
Fact Sheet: Waterways Restoration Team		Mill Creek Recreation Center's Porous Basketball Court –	
Fact Sheet: Real Time Control Center		Poster: Rain Barrels	
Fact Sheet: Main Relief		Fact Sheet: Marshall Road Creek Restoration	

Fact Sheet: Penn Alexander's Stormwater Management BMPs			Guide: Saylor Grove Stormwater Wetland Tour Guide	
Brochure: Floatables Skimming Vessels			Poster: Top 10 CSO's of Philadelphia	
Guide: Homeowner's Guide to Stormwater Management Manual			Poster: Philadelphia's Changing Streams	

4. Website – The following websites were designed to educate the public and to inform the public of a number of CSO- and watershed-related resources, events, and projects. The CSO LTCPU website, in particular, was created to provide the public with all updated CSO LTCPU–related information and materials, such as reports, maps, photographs, fact sheets, event dates and details, meeting minutes and background information.

PhillyRiverInfo
http://www.phillyriverinfo.org
This website offers detailed information on Philadelphia's watersheds and partnerships. The website offers resources to the public including educational material and announcements of upcoming watershed-related events and projects (**FIGURE II.G.1-1**). The PhillyRiverInfo site also allows residents of 10 counties in Southeastern Pennsylvania to find their watershed from one of the seven that flow to Philadelphia by typing in their street address.

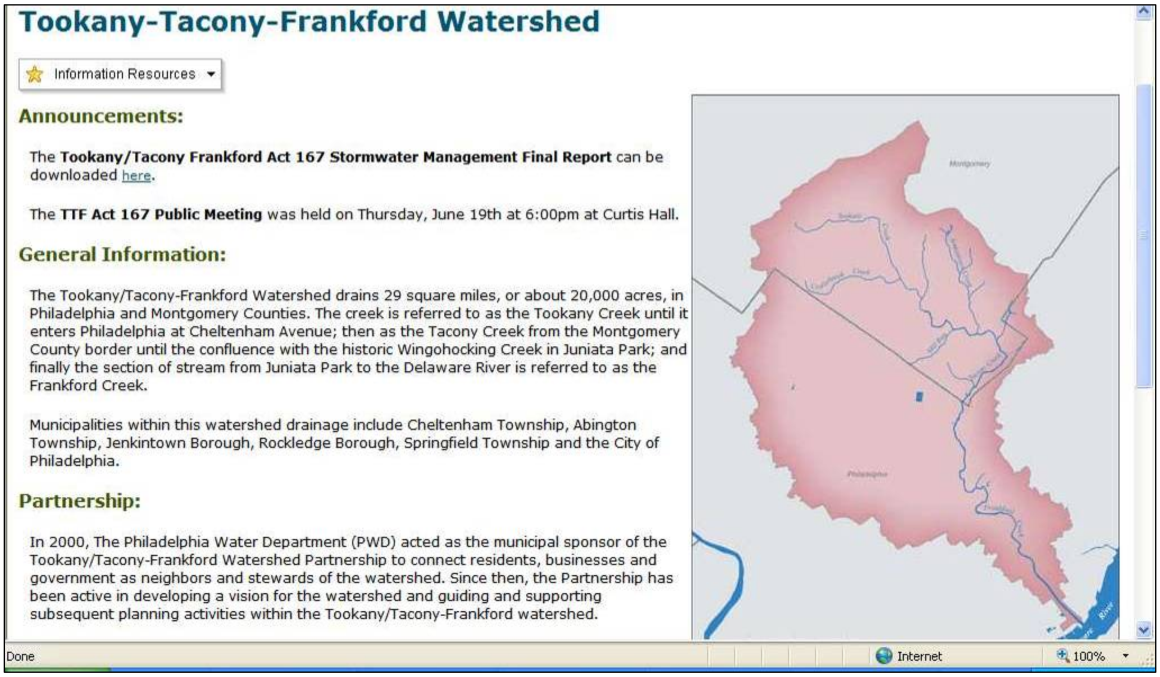


Figure II.G.1-1 Example of public information on PhillyRiverInfo

<u>*Green Cities, Clean Waters (CSO Long Term Control Plan Update)*</u>
http://www.phillyriverinfo.org/csoltcpu
An offshoot of PhillyRiverInfo, this website focuses exclusively on the Green Cities, Clean Waters Program (CSO Long Term Control Plan Update) **(FIGURE II.G.1-2)**. One can find details on the nature of CSOs, the LTCPU, the history of CSOs, and public events, among other CSO-related information.

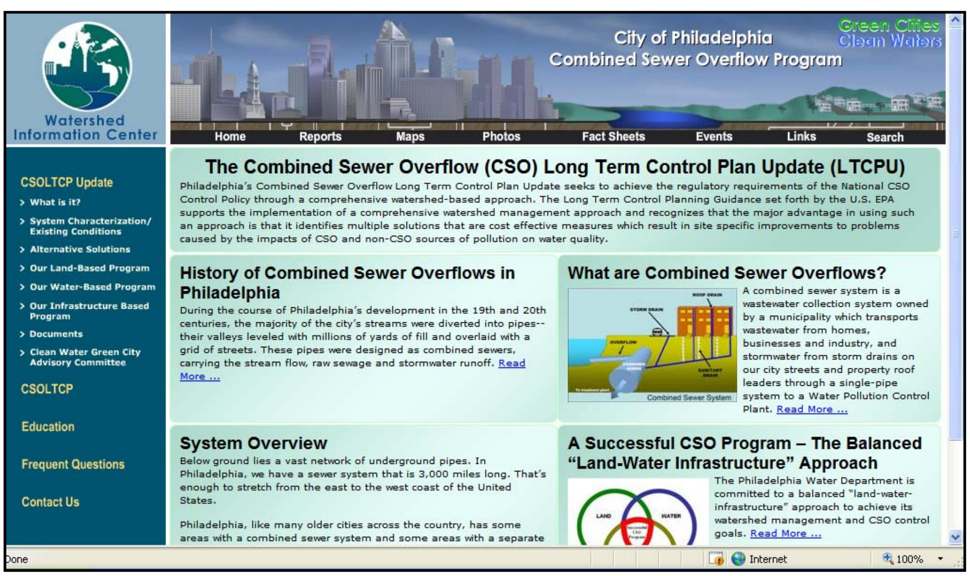


Figure II.G.1-2 Green Cities, Clean Waters (CSO LTCP Update)

RiverCast
http://www.phillyrivercast.org
The Philly RiverCast is a forecast of water quality that predicts potential levels of pathogens in the Schuylkill River between Flat Rock Dam and Fairmount Dam (*i.e.*, between Manayunk and Boathouse Row). One would visit this site to find out the daily RiverCast prediction and to learn more about water quality **(FIGURE II.G.1-3).**

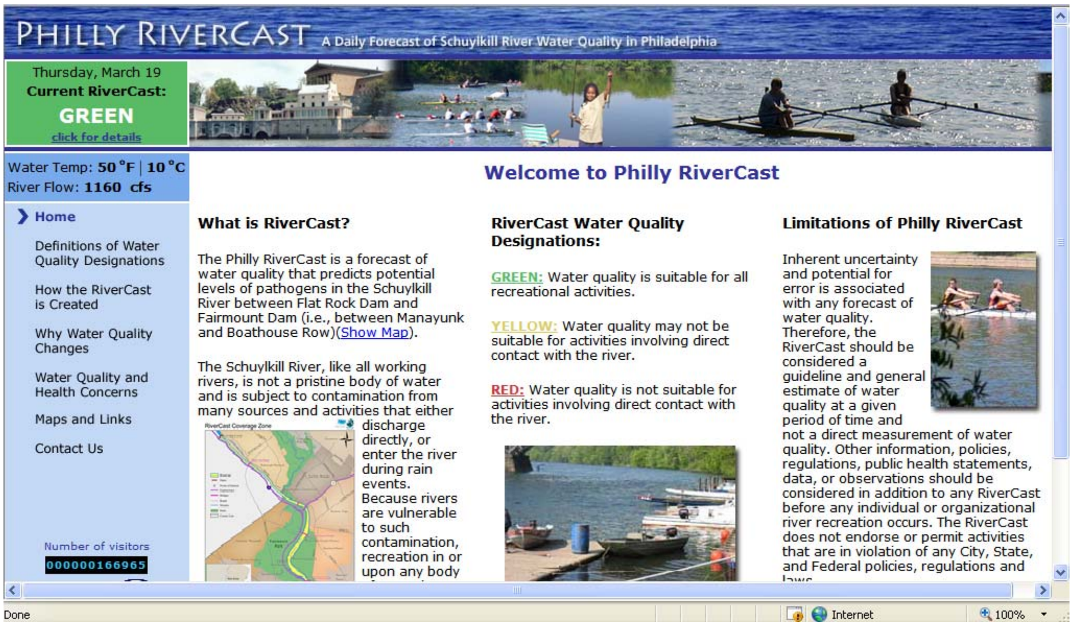


Figure II.G.1-3 RiverCast

Public Outreach & Education
http://www.phillywatersheds.org/public
This website is dedicated to promoting PWD's educational programs and opportunities **(SEE FIGURE II.G.1-4)**. Content available includes watershed partnership projects, educational materials, public meeting, and event announcements, among others.

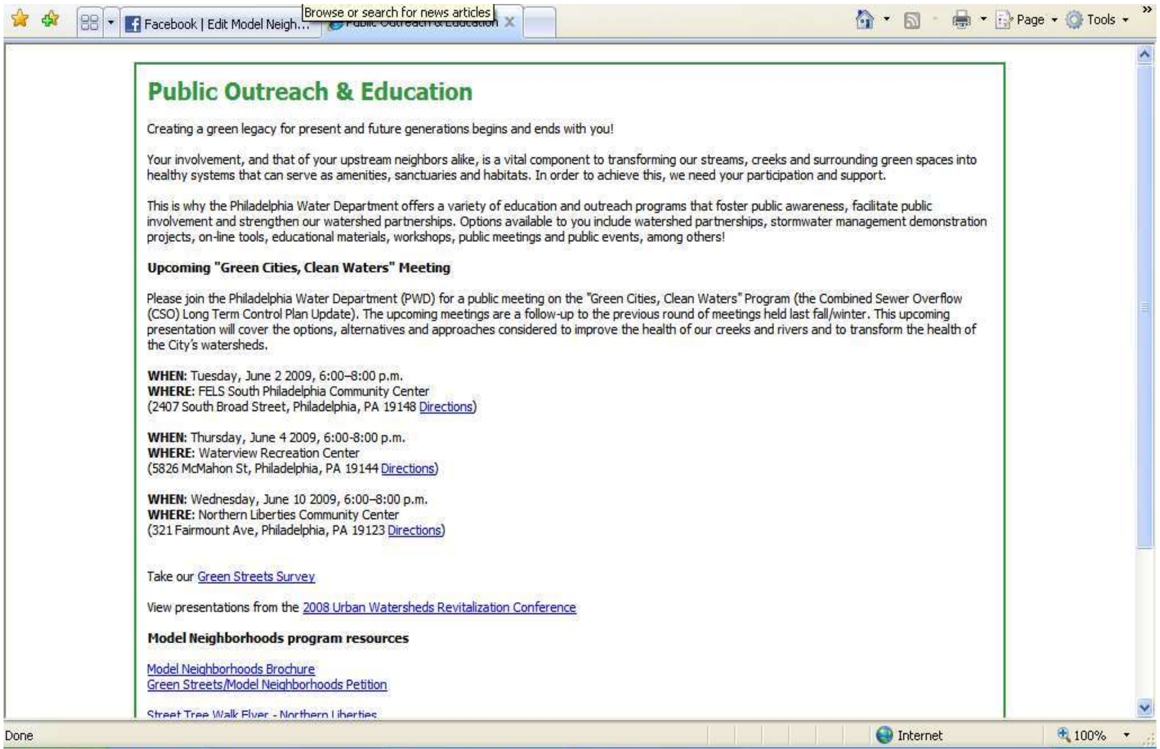


Figure II.G-4 Public Outreach and Education

<u>*CSOcast*</u>

http://www.phillywatersheds.org/csocast

The CSOcast is PWD's latest effort in demonstrating the overflow status of the City's 164 combined sewer outfalls. CSOcast informs the public whether CSOs are occurring or are suspected to have occurred within the last 24 hours **(SEE FIGURE II.G.1-5)**. It is updated twice daily with information from PWD's extensive sewer monitoring network.

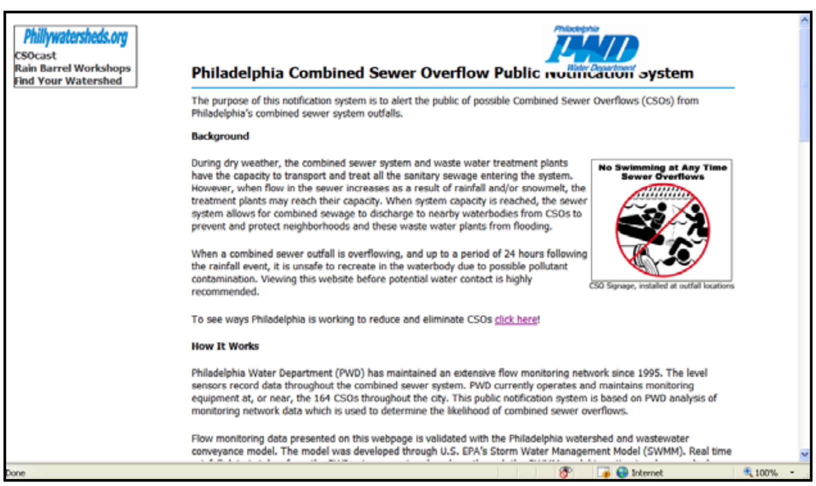


Figure II.G.1-5 CSOcast

Rain Barrel Program
The Philadelphia Water Department is providing rain barrels to residents of Philadelphia's watersheds free of charge, in order to promote the reduction of stormwater flows to our sewer system and creeks **(SEE FIGURE II.G.1-6)**. To receive a rain barrel, one must attend a rain barrel workshop to be educated on the installation and use of the rain barrel. Rain barrel workshops are held in locations around the city throughout the year. Through this website, one can view when a workshop is being held in watersheds throughout the region.

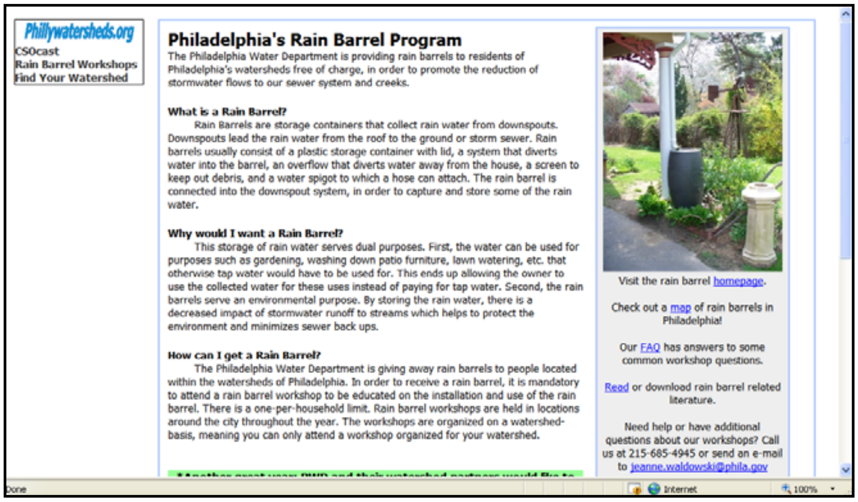


Figure II.G.1-6 Rain Barrel Program

5. Green Cities, Clean Waters Exhibit: The CSO Long Term Control Plan (LTCP) Update Public Participation Team developed a one-of-a-kind informational exhibit and art exhibit. The two elements made up the Green Cities, Clean Waters Exhibit, which were displayed at the Fairmount Water Works Interpretive Center (in Philadelphia) for approximately one month (October 10, 2008 – November 7, 2008). The purpose of the combined exhibit was to unite art with educational information on CSO controls in order to raise awareness on the CSO LTCP Update. The goal of this approach was to target a new audience and to capture the attention of the general public through art, providing a gateway to the informational displays.

While the Green Cities, Clean Waters Exhibit was on display at the Fairmount Water Works Interpretive Center, over a month-long period, roughly 992 visitors had a direct experience with the artwork and the messages portrayed through the informational displays. The exhibit also received media coverage on the local television CBS News affiliate and in local newspapers, such as the Philadelphia Inquirer and the City Paper, in addition to other media.

The artistic component of the exhibit was comprised of artwork (photography and jars) from artist and educator, Bill Kelly. Mr. Kelly specializes in depicting nature in an urban context. He was commissioned to interpret the Green Cities, Clean Waters program through an artistic eye. Bill Kelly used recycled mason jars, filled with water, plants and photography to interpret the CSO LTCPU. The unique exhibit also included photographs of the jars. His work was funded through a Coastal Non-Point Pollution Program grant through the Pennsylvania Department of Environmental Protection's Coastal Zone Management Program and the National Oceanic and Atmospheric Administration (NOAA). **(SEE FIGURE II.G.1-7 AND FIGURE II.G.1-8 FOR EXAMPLES OF BILL KELLY'S ARTWORK)**.

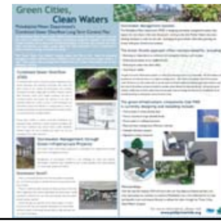
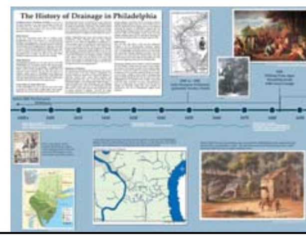
The informational component of the exhibit was made up of a variety of posters that relayed CSO-related and watershed-related information, in addition to displaying a rain barrel. The informational posters are also currently circulating throughout the City, drumming up excitement for the final round of public meetings in August, 2009 **(VIEW TABLE II.G.1-5 FOR THE TRAVELING EXHIBIT LOCATIONS). THE INFORMATIONAL POSTERS ARE LISTED IN TABLE 2-23.**

An artist reception was held on October 16, 2008, at the Fairmount Water Works Interpretive Center, to celebrate the opening of the Green Cities, Clean Waters Exhibit. The reception also gave the Public Participation Program Team an opportunity to discuss the material behind the informational posters, the CSO LTCPU, with the attendees. Approximately 77 individuals attended the artist reception.

Figure II.G.1-7 Sample of Bill Kelly Art

Figure II.G.1-8 Sample of Bill Kelly Art

Table II.G.1-4 Green Cities, Clean Waters Exhibit Informational Posters

Green Cities, Clean Waters Exhibit Information Posters	
Green Cities, Clean Waters ~ Philadelphia Water Department's Combined Sewer Overflow Long Term Control Plan (an introduction to the CSO LTCPU)	
History of Drainage in Philadelphia (historical timeline)	
What the City and its partners are doing (examples of local demonstration projects that manage stormwater through a "green" approach)	
What You Can Do (examples of projects property owners can take on to manage stormwater in environmentally-friendly manners)	

The Green Cities, Clean Waters informational posters were also on display throughout Philadelphia, in CSO-watersheds. **TABLE II.G.1-4** lists the sites the exhibit visited.

Table II.G.1-5 Green Cities, Clean Waters Traveling Exhibit

Green Cities, Clean Waters Exhibit			
Exhibit	**Date**	**Time**	**Location**
1	July 21- August 21, 2009	Tuesday – Saturday 10:00pm - 5:00pm Sunday 1:00pm – 5:pm	Fairmount Water Works Interpretive Center, Philadelphia
2	July 20 -24, 2009	Monday – Friday 10:00am - 1:00pm	Northern Liberties Community Center, Philadelphia
3	July 27-31, 2009	Monday and Wednesday 12:00pm - 8:00pm Tuesday, Thursday and Friday 10:00am – 5:00pm	Walnut Street West Library, Philadelphia
4	August 3-7, 2009	Monday – Friday 7:00am - 9:00pm	Waterview Recreation Center, Philadelphia
5	August 10-14, 2009	Monday – Friday: 9:00am - 9:00pm	Columbus Square Recreation Center, Philadelphia
6	August 17-21, 2009	Monday – Thursday: 9:00am - 9:00pm Friday: 9:00am – 6:00pm	Parkway Central Library, Philadelphia

6. Advisory Committee: The Advisory Committee is comprised of City and state environmental experts, as well as leaders of local, regional, and national environmental organizations. The committee guides the Public Participation Program, by providing input to the Public Participation Program Team on the communication strategies, public information, and products and materials developed to ensure successful public participation. After the initial kick-off meeting, held in the fall of 2007, the committee met twice per year. The asterisk denotes the meetings that took place during this reporting period (July 1st 2008 - June 30th 2009).

Green Cities, Clean Waters Advisory Committee			
Meeting:	**1**	**2**	**3***
Date:	November 13, 2007	February 20, 2008	October 8, 2008
Time:	10:00am - 12:00pm	10:00am - 12:00pm	10:00am - 12:00pm
Place:	Fairmount Water Works Interpretative Center, Philadelphia	Fairmount Water Works Interpretative Center, Philadelphia	Fairmount Water Works Interpretative Center, Philadelphia
Number of Attendees:	9	8	16
Topics Covered:	Purpose and role of the advisory committee	Purpose and role of the advisory committee	Water quality characterization
	Overview on CSOs	Feedback on the public meeting presentation	Problem analysis

	Assessment of Philadelphia's combined sewer system	Presentation on Philly RiverCast	Goals developed for each targeted watershed
	Regulatory context of the LTCPU update	Presentation on plans for Philly CSOCast	Presentation on Philly CSOCast
	Watershed management approach to CSO control		Preview of Green Cities, Clean Waters Exhibit (Refer to Section 2.2.3 for exhibit description)
	CSO-related outreach materials/projects developed to date		
	Next steps for CSO-related public outreach		
	Timeline for future meetings and meeting topics		
General Feedback:	When presenting to the public, use less technical jargon and more images; relay problems and solutions; and demonstrate to the public why they should care.	Demonstrate what individuals (public) can do to make a difference; take extra time to explain combined sewers, separate sewers and stormwater runoff and the impacts on streams.	Create incentives for commercial and residential properties to go green; ensure communication with properties that will be affected by rate allocation; provide more details on CSO Cast; tell us more about sizing gray infrastructure and tidal influences.

Green Cities, Clean Waters Advisory Committee		
Meeting:	**4***	**5***
Date:	April 9, 2009	August 5, 2009
Time:	10:00am - 12:00pm	10:00am - 12:00pm
Place:	Fairmount Water Works Interpretative Center, Philadelphia	Fairmount Water Works Interpretative Center, Philadelphia
Number of Attendees:	8	12
Topics Covered:	Public meeting presentation on CSO – control options & alternatives	How do we promote the final public meetings?
		Any final feedback to incorporate in the draft and CSO LTCPU?
General Feedback:	Use less technical jargon when presenting to the public. The presentation is too balanced regarding the green and gray infrastructures.	Promote through press and all partners. This plan is a model for all cities!

The representative organizations that serve on the Green Cities, Clean Waters Advisory Committee are listed in **TABLE II.G.1-6.**

Table II.G.1-6 Advisory Committee Organizations

Type of Group	Organization
Business	• Building Industry Association
Citizen Groups	• Northern Liberties Neighborhood Association • Passyunk Square Neighbors Association • Washington West Civic Association
Interest Groups	• Community Legal Services, Inc. • Delaware River City Corporation • Impact Services Corporation • PennFuture (Next Great City) • Pennsylvania Environmental Council • Tookany/Tacony-Frankford Watershed Partnership • Schuylkill River Development Corporation • Sierra Club
Regulatory Agencies	• Pennsylvania Department of Environmental Protection (DEP)
Local Government Agencies	• Fairmount Park Commission • Mayor's Office of Sustainability • Philadelphia Water Department

7. Public Meetings: Public meetings are held throughout the development of the LTCPU in order to keep the public apprised of the progress of the plan and to garner feedback on the plan. For the first series of public meetings, the event was held in three separate locations in Philadelphia in order to maximize the likelihood of attendance for the residents of the City. An information fair was also integrated into each meeting. The information fair included posters on CSO LTCPU-related projects, fact sheets and a rain barrel.

In order to drum up attention for the final round of public meetings, the Green Cities, Clean Waters Exhibit traveled throughout the City, educating the public and promoting the final round of public meetings. Along with the exhibit, Green Stormwater Infrastructure Program Fact Sheets were available.

The meetings and venue sites where the exhibit was hosted are listed in **TABLE II.G.1-7**.

The asterisk denotes the meetings that occurred during this reporting period (July 1st 2008 - June 30th 2009).

Table II.G.1-7 Green Cites, Clean Water Public Meetings

Green Cities, Clean Waters Public Meetings, Series #1			
Meeting:	1	2	3
Date:	April 2, 2008	April 10, 2008	April 24, 2008
Time:	10:00am - 12:00pm	10:00am - 12:00pm	10:00am - 12:00pm
Place:	Port Richmond Library, Philadelphia	FELS Community Center, Philadelphia	School of the Future, Philadelphia
Number of Attendees:	10	6	19
General Feedback:	Generally, the participants posed questions, regarding PWD's proposed tank in the area; on whether gray water systems are illegal; and provided comments on green stormwater infrastructure being a better approach and on the locations of storage tanks or diversion systems.	The participants made remarks, regarding the importance of showing specific examples of green stormwater infrastructure projects and using local project examples, so that the public can better relate to the projects.	The participants asked questions, regarding building code changes, the impacts of greening on the residential water bills, and the importance of working with neighborhood groups to maintain green stormwater infrastructure projects, in addition to the importance of educating children in school about green projects.

Green Cities, Clean Waters Public Meetings Series #2			
Meeting:	1*	2*	3*
Date:	October 23, 2008	December 4, 2008	December 10, 2008
Time:	6:30pm - 8:30pm	5:30pm - 7:30pm	6:00pm - 8:00pm
Place:	Fairmount Water Works Interpretative Center, Philadelphia	Cobbs Creek Community Environmental Education center, Philadelphia	Center in the Park, Philadelphia
Number of Attendees:	13	14	20
General Feedback:	The participants asked questions, regarding incentives for residential/commercial properties; communication with the larger parcels that will be affected by the rate reallocation; modeling gray infrastructure; and tidal influences on the drinking water intake on the Delaware River.	The participants asked questions, regarding the function of a tank; the longevity of gray infrastructure; models and maintenance of porous asphalt; stormwater regulations; and about CSO LTCPU plans in other cities.	The participants asked questions, regarding how project sites are selected; the reasons behind residents paying for stormwater impacts, and about how other CSO cities manage with their gray projects.

Green Cities, Clean Waters Public Meetings Series #3			
Meeting:	1*	2*	3*
Date:	June 2 2009	June 4 2009	June 10 2009
Time:	6:00pm - 8:00pm	6:00pm - 8:00pm	6:00pm - 8:00pm
Place:	Fels South Philadelphia Community Center, Philadelphia	Waterview Recreation Center, Philadelphia	Northern Liberties Community Center, Philadelphia
Number of Attendees:	7	9	14
General Feedback:	See Table 2-7	See Table 2-8	See Table 2-9

Green City, Clean Waters Public Meetings, Series #4				
Meeting:	1	2	3	4
Date:	August 18 2009	August 19 2009	August 20 2009	August 25 2009
Time:	6:00pm - 8:00pm	6:00pm - 8:00pm	6:00pm - 8:00pm	6:00pm - 8:00pm
Place:	Waterview Recreation Center, Philadelphia	Northern Liberties Community Center, Philadelphia	Columbus Square Recreation Center, Philadelphia	Mercy Hospital, Philadelphia
Number of Attendees:	15	34	20	25
General Feedback:	Very Positive.	Very Positive.	Very Positive.	Very Positive.

8. Model Neighborhoods - In recent months, the Philadelphia Water Department has seen the desire for green stormwater infrastructure rapidly increase in demand by residents of CSO-impacted areas. Through PWD's Model Neighborhoods initiative, PWD has received approximately 750 signatures to date (from March – July 2009), from residents petitioning for Green Streets. These residents want PWD to install green stormwater infrastructure on their block in order to serve as a model green neighborhood for the City. Currently, the demand for Green Streets is so high that it has exceeded PWD's implementation capacity. This initiative is a true testament to the overwhelmingly positive response the City is receiving from its citizens, regarding green stormwater infrastructure.

The Model Neighborhoods initiative is a new program (as of January, 2009). It is the result of PWD's partnership with Citizens for Pennsylvania's Future and the Next Great City coalition, Fairmount Park, Pennsylvania Horticultural Society and a diverse number of civic representatives, among other City department staff and environmentally-minded partners. The goal of the initiative is to transform the neighborhoods of Philadelphia into model green communities that manage stormwater in innovative ways. These neighborhoods will showcase green stormwater infrastructure elements, such as street tree trenches, sidewalk planters, and vegetated bump outs/curb extensions. The program is currently targeting 4 blocks in approximately 14 willing neighborhoods in the City of Philadelphia, helping these communities become models for green stormwater infrastructure projects. The ultimate goal is to design projects that will manage stormwater runoff on one greened acre of each participating neighborhood. Design and construction of the green stormwater infrastructure elements will take place in the first year of the program for the first three targeted neighborhoods - Northern Liberties, Passyunk Square and Awbury/Cliveden.

The Model Neighborhoods program requires a great deal of public outreach in order to generate public awareness and enthusiasm for green stormwater infrastructure components. The civic partners representing each neighborhood are pivotal to the success of each community, as they initiate the grass-roots civic engagement process that leads a neighborhood to become considered for this program. **TABLE II.G.1-8** lists the current Model Neighborhoods and partners.

Table II.G.1-8 Model Neighborhoods and Civic Partners

Location	Civic Partner
Passyunk Square	Passyunk Square Civic Association
Awbury/Cliveden	Tookany/Tacony-Frankford (TTF) Watershed Partnership
Northern Liberties	Northern Liberties Neighbors Association
Pennsport	Pennsport Civic Association
New Kensington/ Fishtown	New Kensington CDC
Point Breeze	South Philadelphia Homes, Inc./ Newbold/Redevelopment Authority (RDA)
North Philadelphia	Associación Puertorriqueños en Marcha (APM)
Manayunk	Manayunk Development Corp/ Roxborough CDC
East Falls	East Falls Development Corporation
Lower Moyamensing	Lower Moyamensing Civic Association
Cobbs	Cobbs Creek CDC
Haddington	Haddington CDC
Gray's Ferry	South of South Neighborhood Association (SOSNA)
Allegheny West	Allegheny West Civic

A number of Model Neighborhoods educational materials and programs have been developed with additional outreach tools currently in production. Fairmount Park has led a series of free walks in the Model Neighborhoods, titled "Tree Walk on Your Blocks" in Northern Liberties, Passyunk Square and Awbury/Cliveden. They have also offered a free summer environmental education program for children in Model Neighborhoods titled, H2O & You, Trees are Terrific, and Steppin into Nature. By September, 2009, these summer programs are projected to reach approximately 1,175 children, along with 91 adults, in the first three targeted Model Neighborhoods - Northern Liberties, Passyunk Square and Awbury/Cliveden. Fairmount Park has also produced a number of informational fact sheets and handouts, regarding tree care and maintenance. **TABLE II.G.1-9** lists examples of the Model Neighborhoods education materials.

PWD has developed a Model Neighborhoods overview brochure and informational handouts on trees and laterals, along with other outreach materials **(TABLE II.G.1-9)**.

Photo simulations of green stormwater infrastructure elements have been created for each of the first three neighborhoods. The photo simulations depict a street before and after the implementation of green stormwater infrastructure projects, providing strong visuals to help residents better visualize a Green Street in their neighborhood. PWD is also currently working on creating a Model Neighborhoods Kit. The kit will serve as an orientation packet for Model Neighborhoods civic partners, including an array of materials to best prepare civic leaders reaching out to residents for Model Neighborhoods support. **FIGURE II.G.1-9** illustrates an example Green Street photo simulation set.

Before

After

Figure II.G.1-9 Example of Model Neighborhoods Photo Simulation Set (3rd and Brown Streets, Northern Liberties)

Table II.G.1-9 Examples of Model Neighborhoods Educational Materials

Three Typical Stormwater Management Project		Sidewalk Trees and House Sewer Laterals	
Model Neighborhoods Brochure		Street Trees in Philadelphia Background Information	
Model Neighborhoods Tree Walk on your Block		Summer Outreach Programs for Camps	
Philadelphia Street Trees		Before and After Photo Simulation	

PENNVEST

The City of Philadelphia was approved for a $30 million loan administered by PENNVEST (Pennsylvania Infrastructure Reinvestment Authority) in April 2009. These funds are dedicated to the implementation of innovative, green stormwater infrastructure projects throughout Philadelphia. PENNVEST funds will cover the cost of the first year of Model Neighborhoods projects, along with water and sewer replacement work, in conjunction with Streets Department, and at PWD facilities.

GREEN NEIGHBORHOODS THROUGH GREEN STREETS SURVEY

"How beautiful everything is! 100% behind this effort in all ways!"

> - Response on the Philadelphia Water Department's "Green Neighborhoods through Green Streets Survey." The question asked, "*Are you in favor of greening?"*

PWD developed a qualitative survey titled, Green Neighborhoods through Green Streets. The purpose of the survey was to understand how the targeted audience (City residents) feels about green stormwater infrastructure elements, such as Green Streets (*e.g.*, likes and dislikes), and to get the survey-taker to start thinking about green stormwater infrastructure in Philadelphia neighborhoods through images. This makes the survey an educational tool, as well as serving as qualitative research. **FIGURE II.G-10** shows a sample question from the Green Neighborhoods through Green Streets Survey.

Over 92 percent of the approximately 734 survey respondents responded positively to the green stormwater infrastructure approach. A longer on-line survey was posted on City and partner websites, in addition to a Philadelphia Water Department- hosted Facebook page, partner sites and other websites. Representatives from every zip code in the City (except for one) participated in the survey. **TABLES II.G.1-10 & 11** show sample survey results (March – August, 2009).

After viewing each set of images below, are you in favor of greening in your neighborhood?

- □ Yes
- □ No

a) What do you like about the images?
b) What don't you like about the images?

Figure II.G.1-10 Green Neighborhoods through Green Streets Survey Sample Question

Table II.G.1-10 Green Neighborhoods through Green Street Survey - Typical Responses

	On-line	Hardcopy	Overall
Likes	Most respondents stated that they were in favor of greening. Popular quotes: "trees and plants add beauty to the block" and "it makes the neighborhood more safe and more inviting"	Respondents generally are in favor of greening. Popular quotes: "we want more trees" and "greening makes the block more attractive"	92% responded positively towards greening 15% specifically mentioned that greening will "beautify" the neighborhood 14% specifically stated that they "want more trees" and "liked/ loved trees"
Dislikes	Most popular comments: "who will maintain this?" and "limited space available for greening on some sidewalks"	Most popular concerns: "trash and foliage come with greening" and "damage to sidewalks, home foundations or pipes due to tree roots"	23% of the respondents are worried about maintenance-related issues 60% have concerns about greening
Total Responses	438	296	734 (Total)

Table II.G.1-11 Green Neighborhoods through Green Streets Feedback

Survey Quotes
Amazing; I think it's a no-brainer!
Bring it on... beautifying the neighborhoods, making better use of public space -- brings communities together, etc.
Greening makes the world a better, happier place.
All of it. More trees & green!
How beautiful everything is! 100% behind this effort in all ways!
I LOVE IT - what a great plan!
I love the idea! Please give us a greener Philadelphia. It would make us healthier and happier all around.
I strongly support it. In addition to what it does for storm water, it's prettier, shadier, and people are less likely to throw trash on it.
Yes, yes, a thousand times yes! We need more street trees. The corner bump-outs with trees would be WONDERFUL for overall look-and-feel in the neighborhoods (and the traffic calming benefits would be nice as well. I'm not sure where the second set of photos is, exactly, but it would be a nice improvement.
Love that there would be shade along the sidewalk, especially during the summer months when I am walking with my kids. The trees and green areas make the places seem more welcoming. And the fact that it would help with stormwater runoff is a real plus!
I LOVE THE GREEN NEIGHBORHOODS... GOOD ENERGY...A VIBRANCY... A POSITIVE FEEL!
"AFTER" images - the street views look fresher & softer; more friendly & vibrant. They indicate a community where the residents are glad to be living.
Things are prettier, more sustainable, shows community pride, [and] make the city beautiful.
Everything!!! Increase worth of home, cleaner air, calmer environment, shade in the summer.
What's not to like? It's a no-brainer.
I love plants, trees and greenery. I feel more at peace near nature.
I'm a big greening advocate do I'm totally on-board with all of these project proposals.
This work needs to be done in all neighborhoods.

FACEBOOK

The Philadelphia Water Department has a Facebook page and Facebook wall dedicated to the Green Cities, Clean Waters program **(FIGURE II.G.1-11)**. Facebook, a free-access social networking website, enables PWD to reach out to an audience that may otherwise not choose to become familiarized with its programs. Friends abound on PWD's Green Cities, Clean Waters Facebook wall, where approximately 200 members can find public meeting announcements, view images of Green Streets and where visitors can leave comments on the City's green stormwater infrastructure approach. The Facebook page also hosts the Green Neighborhoods through Green Streets survey. To access PWD's Facebook page, visit http://www.facebook.com/green.cities.clean.waters.

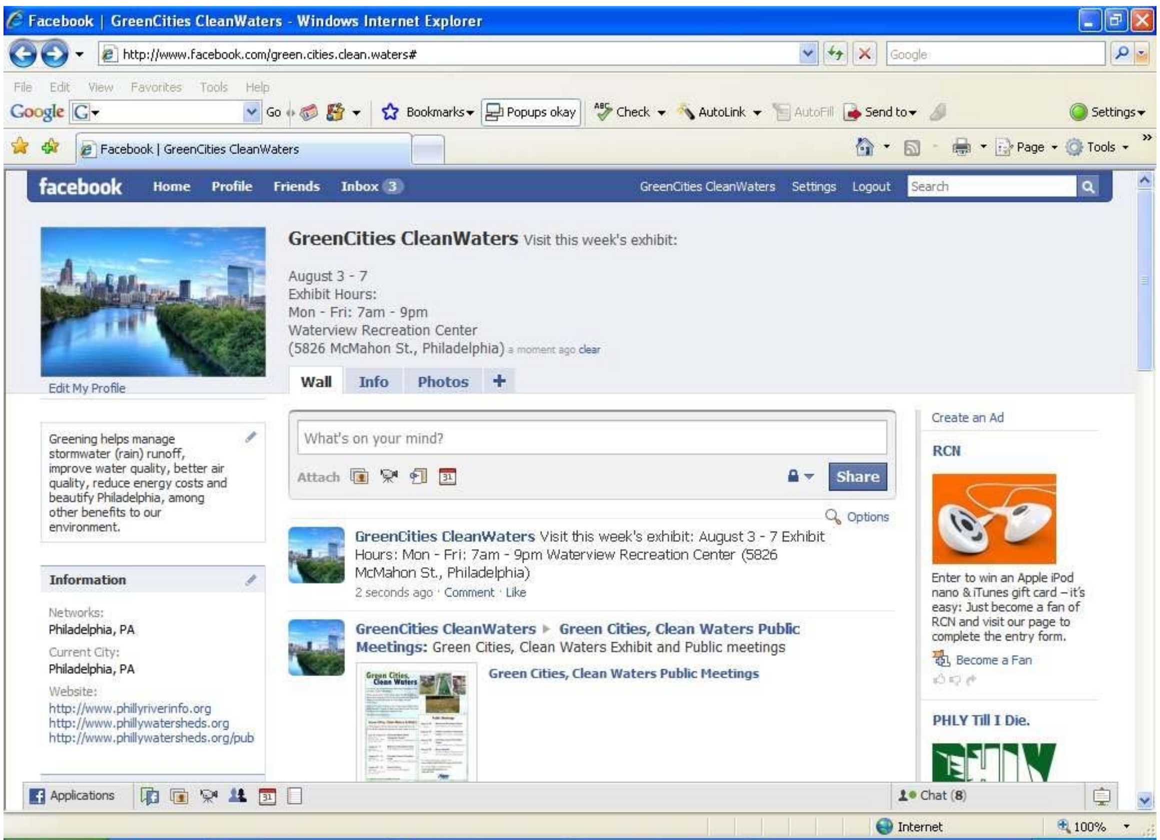


Figure II.G.1-11 Facebook Screenshot

GREEN STORMWATER INFRASTRUCTURE TOURS

The Philadelphia Water Department regularly offers tours to highlight local examples of green stormwater infrastructure. **TABLE II.G.1-12** lists the tours held in 2008 and 2009.

Table II.G.1-12 Green Stormwater Infrastructure Tours

Date	Event	Number of Attendees	Description
April 6, 2008	Historic Mill Creek Watershed Tour	35	As part of a larger tour organized for a University of Pennsylvania landscape architecture class that focused on the Mill Creek watershed, students toured the Mill Creek Farm, Mill Creek Playground, Sulzberger Outdoor Classroom, Blackwell Homes, and Penn-Alexander School.
May 3, 2008	Clean Water, Green City Tour	20	Presented with White Dog Café, a tour to highlight projects that link environmental vision with economic health, and quality of life with the sustainability of our city. Sites included Waterworks Interpretive Center, Awbury Arboretum, Saylor Grove, and Penn-Alexander School.
Sept. 10, 2008	Philadelphia Green Infrastructure Tour	10	Organized for a group from New York City Parks, Conservation District, and Dept. of Environmental Protection, sites included Wissahickon Charter School, Waterview Recreation Center, Cliveden Park, Saylor Grove, and Allens Lane Arts Center.
Oct. 3, 2008	GreenPlan Philadelphia Tour	45	Organized as part of the American Society for Landscape Architects national conference, the tour highlighted several greening and vacant land management sites that integrated stormwater management, including Liberty Lands, N. 3rd Street Corridor, and North Central Philadelphia vacant land stormwater management sites.
May 5, 2009	Historic Mill Creek Watershed Tour	35	As part of a larger tour organized for a University of Pennsylvania landscape architecture class that focused on the Mill Creek watershed, students toured the Mill Creek Farm, Mill Creek Playground, Blackwell Homes, Penn-Alexander School, and Clark Park.
June 10, 2009	EPA National Stormwater Coordinators Meeting Tour	40	As part of a national EPA meeting, the tour illustrated PWD's green infrastructure program and highlighted innovative projects and partnerships. Sites included Liberty Lands, Thin Flats, Greensgrow Farm, model neighborhoods (Northern Liberties, New Kensington, and APM), Saylor Grove, and Wise's Mill.

II.G.2 Continue to Maintain Watershed Management and Source Water Protection Partnership Websites

II.G.2.1 Phillywatersheds.org / phillyriverinfo.org

OOW is in the process of developing a new website, www.phillywatersheds.org, that will replace the existing www.Phillyriverinfo.org and act as a hub for all of the related OOW and partnership websites. The website will feature updates from all of the sub departments of OOW, educational tools, public meeting records, maps, as well as all of the existing data and reports currently available on Phillyriverinfo.org. Phillyriverinfo.org functioned as the main website for OOW through 2008 and will continue to fill that role until the new website is ready.

One new aspect of the website that is being developed is interactive mapping. These maps are based off of the freely available Google Maps API. It allows for the dynamic loading of geographically referenced data that can be viewed with a user-friendly interface. Each group within OOW will have a base map featuring selected data representative of their focus, allowing for greater disbursement of information to the public.

One of the main uses of the mapping system is the Combined Sewer Overflow Public Notification System, known as CSOcast. CSOcast shows CSO outfall overflow information that is retrieved from PWD's sewer monitoring network. The map is available 24 hours a day and displays the most up-to-date data available. A SWMM model was added to the CSOcast system to function as a check for the sewer monitoring data.

The first pilot section of the new website to launch was the rain barrel workshop site. This site allows citizens to register for PWD's rain barrel workshops and to find out more information about rain barrels. It also features a map showing the locations of the all the rain barrels that have been given out through the workshop program. The site has been used successfully for numerous workshops and has received great feedback from the community.

II.G.2.2 Rivercast

Philly Rivercast (phillyrivercast.org) is an online forecast system that predicts Schuylkill River quality in the area upstream of Fairmount Dam in Philadelphia. Rivercast has received over 200,000 hits since its release in June 2005. PWD staff checks Rivercast daily to ensure the rating is displayed correctly. PWD staff also responds to questions from Rivercast users.

II.G.2.3 Schuylkill Action Network

The Schuylkill Action Network (SAN) website has been redesigned by a web consulting firm with input from PWD and the SAN Planning and Education and Outreach committees. The new website, www.schuylkillwaters.org, includes an internal component that allows for improved communication among SAN workgroup members and to facilitate on-the-ground work. It also includes a public component that conveys SAN's message about protecting and improving the Schuylkill River to outside audiences. The SAN website, together with phillyriverinfo.org, has taken the place of the Source Water Assessment Program websites in providing data and reports from the source water assessments for the Schuylkill River.

II.G.2.4 Early Warning System

The Early Warning System (EWS) is a web and telephone system that facilitates communication among water suppliers and industrial intakes of spills and other incidents in the lower Delaware watershed. Enhancements during the reporting period included integrating industrial users with intakes into the EWS partnership, and designing an industrial user fee based on withdrawal and position in the watershed. The City of Philadelphia Office of Emergency Management (OEM) became an EWS member as part of a pilot expansion of the EWS partnership to include county OEMs. Read-only user functionality was created for OEM membership.

The Spill Model Analysis Tool environment was designed for users to create spill scenarios without generating an event. This effort included incorporating the National Hydrologic Data stream network into all EWS mapping functionality resulting in more accurate calculations of spill paths and travel times.

Other changes included creating a simplified event report, making it easier for users to supply hazard information; adding a confidentiality disclaimer to all emails generated by the EWS; and adding telephone testing to existing administrator tools and allowing users to subscribe or unsubscribe to telephone notifications generated by test events.

Applications were filed for two projects under the FY2008 Port Security Grant Program. One would support the development of a tidal spill model for the Delaware River; the other would support the programming changes required to switch the EWS GIS infrastructure to ESRI ArcGIS.

II.G.3 Continue to Provide Annual Information to City Residents about Programs via Traditional PWD Publications

II.G.3.1 Billstuffers

The bill stuffers are newsletters inserted into the water bill of the estimated one-half million customers of the Philadelphia Water Department. The below documents have been developed under the CSO LTCPU Public Participation Program and have been distributed throughout the City at advisory committee meetings, public meetings, and other public events, in addition to in the water bill.

Table II.G.3-1 Bill Stuffers

Newsletter Title	Newsletter Description
Bill Stuffer I: The Combined Sewer Overflow Program: A Long Term Control Plan for Our Rivers in addition to Clean Water, Green City: Long Term Control Plan Update.	This publication covers an introduction to the CSO LTCPU and the goals of the Philadelphia Water Department in controlling CSOs.

This text also copied under "Continue to Develop and Share a Variety of Public Information Materials Concerning the CSO LTCP".

II.G.3.2 Waterwheel Watershed Newsletters

The Water Department's watershed newsletters are usually published on a 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).

Table II.G.3-2 WaterWheel

Newsletter Title	Newsletter Description
WaterWheel I: CSO Public Notification Means You're in the Know	This publication aims to notify the public of the CSO public notification system and covers the commonly asked questions about CSO-affected waters.
WaterWheel II (in Water Quality Report): Green Cities, Clean Waters Program	This publication covers the history of CSOs and includes a CSO Notification Card cut-out.
WaterWheel III: Clean Waters, Green Cities – Neighborhood-Friendly Solutions*	This publication covers the Philadelphia Water Department's Green Streets Program.
WaterWheel IV: Green Cities, Clean Waters – Tookany/Tacony-Frankford Creek*	This publication covers the Integrated Watershed Management Plan for the Tookany/Tacony-Frankford Watershed.

This text also copied under "Continue to Develop and Share a Variety of Public Information Materials Concerning the CSO LTCP".

II.G.3.3 Additional PWD and Partner Sponsored Events

7th Annual Southeastern Pennsylvania Coast Day Event – September 20, 2008

The Philadelphia Water Department along with Partnership for the Delaware Estuary and Pennsylvania DEP Coastal Zone Management Program sponsored the 7th Annual Southeastern PA Coast Day on Saturday September 20, 2008. Due to tremendous success last year, the event was again advertised to every resident of Philadelphia through a flyer inside the monthly water bill. The same promotional piece was also placed at nearby hotels, museums and various other public places to promote the day, along with newspaper print advertising. The event was held at Penn's Landing, on the Delaware Riverfront with an estimated record breaking attendance. In all, over 25 local and regional organizations took part, providing educational and interactive displays for Coast Day visitors. Nearly 945 people participated in enough activities at the various organizations' booths to qualify for prizes in the Clean Water Challenge. The event also featured music, food, face painting, and crafts, as well as free samples of grilled Delaware Bay oysters. As an added feature this year, two 'Ride the Ducks' boats took 36 people every half hour on an adventure on the Delaware River. A total of 720 children and adults, many of whom had never been on a boat, got to experience Philadelphia from the river's perspective.

2008 Philly FUN Fishing Fest

As a result of the revitalization of our region's rivers, PWD has witnessed the return of a variety of sporting fish to the Schuylkill River and believes that this good news is worth spreading. In celebration of the improving water quality, the Philadelphia Water Department and its partners, the Fish and Boat Commission, East Falls Development Corporation and the Schuylkill River Development Corporation – hosted the 5th annual Philly FUN Fishing Fest on the banks of the Schuylkill River on Saturday, September 20th, 2008. Over 300 anglers participated and over 115 fish were caught during the tournament.

The fishing festival is open to the public - all skill levels and ages. Prizes from various local sponsors are provided to the winners of various categories. Fishing instruction is provided by volunteers, while fishing rods are on loan and bait is donated. The event does not require a fishing license and it is free of charge.

The Fishing Fest is an effective means to educate the public on the improving water quality and aquatic resources the City offers. For more information on the Philly Fun Fishing Fest, please visit: http://www.phillyriverinfo.org/fishingfest/.

"Protect our Hidden Streams" Art Contest

The Partnership for the Delaware Estuary and PWD sponsored its tenth art contest for Philadelphia public, private, and home-schooled students, grades K-12 in January 2009. This year the concept of stormwater pollution prevention was the same as previous years but the theme was changed to "Protect Our Hidden Streams". The theme was changed to help kids think of sewers as not just tubes in the ground but hidden streams

that were historically above ground and naturally flowing. Students were asked to draw an illustration that shows how Philadelphians can help prevent stormwater runoff pollution. First prize drawings were used to promote pollution prevention messages on SEPTA buses and in the creation of a calendar. In addition to the drawings, the calendar also provided monthly tips to help prevent water pollution. In 2009, there were almost 1500 drawings entered into the contest, with over 25 classrooms and several home schools participating. This year we also added the option of entering a video in the contest. We only received a handful of videos but they were excellent. They can be seen at http://www.delawareestuary.org/acivities_teachers_art_contests.asp
This year's award ceremony was held in April at the Fairmount Water Works Interpretive Center.

Stormwater Best Management Practices (BMP) Recognition Program

In 2005, PWD and partners developed the Stormwater Best Management Practices Recognition Program to recognize developers, engineers, architects, and others that are designing and implementing innovative and environmentally-friendly stormwater BMPs in southeastern Pennsylvania. Projects, such as rain gardens, green roofs, infiltration swales, and treatment wetlands - stormwater management systems based on nature's best designs are recognized to provide inspiration for future similar projects in the region. The number of submissions has grown steadily every year. Approximately 80 submissions have been received to date. The awardees are listed in **APPENDIX M, TABLE M-4.**

A certificate is distributed to each awardee to recognize their good work. Each certificate recipient is also provided with an opportunity to present their awarded project at an event, such as the Urban Watersheds Revitalization Conference. The recognized projects are promoted in the PWD Water Wheel newsletter, distributed to over a half million residents and businesses in Philadelphia and on the website (http://www.stormwaterbmp.org).

Urban Watersheds Revitalization Conference

"The conference was one of the best I've been to in 25 years. Such a wide cross-section of people but all of us focused on the same city-improving agenda. Thanks for your efforts in making it happen."

- Comment from 2008 "Greening Our Streets" conference participant

Since 2005, the PWD, along with its partners, has hosted an annual conference, titled the Urban Watersheds Revitalization Conference. The event gives PWD an opportunity to explore current watershed-related themes that are relevant to the City of Philadelphia and the suburban communities that drain to the City. The conference is held at different locations every year and it targets the urban and suburban (or mostly developed) communities in southeastern Pennsylvania. The audience is diverse – comprised of local planners, engineers, municipal representatives, community activists, among others. The event is offered at a nominal fee or it is free of charge.

Details on the conferences held in the past two years are listed in **TABLE II.G.3-3.**

Table II.G.3-3 2007 & 2008 Urban Watersheds Revitalization Conference

Urban Watersheds Revitalization Conference		
Conference Theme:	Greening Our Streets	Stormwater Management Regulations & Requirements
Date:	October 31, 2008	May 3, 2007
Time:	8:30am - 3:30pm	8:30am - 3:30pm
Location:	The Great Hall, Community College of Philadelphia, Spring Garden Street, Philadelphia	Kanbar Center, Philadelphia University, School House Lane, Philadelphia
Number of participants:	175	131
Result:	Many participants remarked on it being a very successful conference (see above quote).	Feedback from the participants was positive.
Promotional Material:	View Supplemental Volume 1	View Supplemental Volume 1

Schuylkill Action Network Website

The Schuylkill Action Network (SAN) website has been redesigned. The new website, www.schuylkillwaters.org, includes an internal component that allows for improved communication among SAN workgroup members and facilitates on-the-ground work. It also includes a public component that conveys SAN's message about protecting and improving the Schuylkill River to outside audiences. The website also allows the public to share their unique stories and experiences relating to the Schuylkill River.

Educational Publications

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. 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 book whenever it is being used by students who live within that watershed. The booklet has been reprinted several times including 20,000 copies in 2008. In addition to the Schuylkill Watershed Map, a map was created of the City of Philadelphia showing all of its sub watersheds and the schools located in those watersheds. This has also been a highly demanded piece by teachers.

Homeowner's Guide to Stormwater Management

In 2004, PWD staff developed Philadelphia's first *Homeowner's Guide to Stormwater Management*. The document targets homeowners and residents that want to take an active role in helping to transform their properties and communities into healthier components of the watershed through environmentally-friendly stormwater management. The guide lays out specific steps and actions homeowners or community residents can take to improve stormwater management on their properties and in their communities.

In 2007, PWD developed a PowerPoint presentation titled "A Homeowners' Guide to Stormwater Management" to accompany the guide. This presentation was given on September 27, 2007 at the North Wales Borough Hall (Wissahickon Watershed).

Information from this homeowner's guide was later used to create a Campus Guide to Stormwater Management. Both of these guides provide comprehensive information for property owners to reduce the amount of stormwater runoff pollution entering local waterways from their properties.

Smart Boating, Clean Waters Program

PWD initiated an outreach, education, and notification program for marinas, personal watercraft users, and boaters, titled the Smart Boating, Clean Waters Program. This program is led by the Coastal Nonpoint Pollution Program (CNPP) Specialists in the region and it is funded by the Coastal Nonpoint Pollution Program (CNPP) grant awarded by PA DEP. Most of the marinas, yacht clubs, boat launch ramps and fishing locations targeted for the program in Philadelphia are located near CSO outfalls on the Delaware River.

Various educational projects have resulted from the Smart Boating, Clean Waters Program. Projects, such as a water-proof brochure titled "A Boater's Guide to Clean Waters," and user surveys and interviews with marina and yacht club operators help to advise them how to best adopt more environmentally friendly operation and maintenance practices.

Bilge Socks

In 2005, PWD staff worked with CNPP Specialists in the region to develop a bilge sock program, developing a logo to place on the bilge sock, creating an instructional tag to attach to the sock, and distributing the socks to marinas and boaters in the region. In 2006, the bilge socks were distributed to all marinas and yacht clubs in Philadelphia. In 2007, PWD partnered with the U.S. Coast Guard in order for the Coast Guard to distribute the socks. The bilge socks were also distributed at Frankford Arsenal during Safe Boating Day in June, 2007. In 2008, PWD partnered with the Penn's Landing Corporation to also help distribute socks. The 2008 Safe Boating Day took place at Penn's Landing in June 2008, where more bilge socks were distributed.

Monofilament Line Recovery & Recycling Program
In 2007, PWD worked with CNPP Specialists in the region to develop a Monofilament Line Recovery and Recycling Program for the southeast region of Pennsylvania. In 2008, Fairmount Park received recycling bins. They were distributed throughout the park in 5 popular fishing locations in the summer of 2008.

Aquatic Invasive Species Watch Card and Posters
Aquatic Invasive Species (AIS) pose a major threat to maintaining biodiversity, particularly in Philadelphia's wetlands, streams, rivers and lakes. Pennsylvania's aquatic taxa are some of the most imperiled, with many native freshwater mussels, crayfish, and fish listed as Pennsylvania's Species of Greatest Need of Conservation. In recognition of the risk AIS pose to biodiversity, the Pennsylvania Fish and Boat Commission identified management of AIS as a priority topic.
The Philadelphia Water Department Aquatic Invasive Species program has four major tasks: 1) prevent the spread of AIS by city employees through adopted HAACP protocols, 2) train city employees to identify AIS and report observations to department heads, 3) Public education and outreach regarding AIS, and 4) establish a chain of communication for the public to report observations of AIS to the appropriate agencies.

Part of the public outreach portion of this program includes an exhibit on the topic of AIS at the Fairmount Waterworks Interpretative Center, which is free to the public. The posters and complimentary educational literature was created in 2007 and the exhibit was displayed in the summer of 2008. The complimentary literature - watch cards - will be distributed to boaters and other frequent water-way users, as well as to those visiting the Water Works Interpretive Center. The watch cards are wallet-size and water-proof. The invasive species watch cards and posters that were originally designed by Sea Grant have been updated by PWD with new text and additional logos.

Delaware Estuary Watershed Workshop for Teachers
The 13th Annual Teacher Workshop was held July 20-24, 2009 summer in conjunction with the Partnership for the Delaware Estuary, Bucks County Conservation District and Pennsylvania's DCNR. 17 teachers participated in the week-long workshop. Workshop activities included canoeing the Neshaminy Creek, visiting water quality BMP projects, performing chemical, physical, and biological analysis on a stream, learning about wetlands, staying overnight at the College of Marine Studies, planting native plants, and much more. The Philadelphia Water Department hosted the teachers for a day by providing a tour of the Fairmount Water Works Interpretive Center, and Southwest Water Pollution Control Plant. This segment of the teacher workshop provided the participants with crucial information on the local waterways as a source of their drinking water and the process undergone to return the water in an acceptable condition.

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 cleanup 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. 5,000 "Bags on Board" and educational tip cards were produced and purchased for distribution at the FWWIC and various public events in 2007. 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 effects 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. Due to the high demand in 2007 we ordered an additional 5,000 "Bags on Board" and accompanying tip cards in June of 2009.

This text also copied under the Stormwater Report **SECTION F.8.E** - "Animal Waste and Code Enforcement".

Annual Earth Day Service Project

Please refer to the Stormwater Management Annual Report **SECTION F.7.B** - "Public Education and Awareness" for information on the annual Earth Day service project.

Philadelphia Flower Show – PWD Exhibit

In January 2009 PWD sponsored an exhibit at the Philadelphia Flower Show, where the theme was "Bella Italia" paying tribute to beautiful Italy. Our exhibit has been titled "Tivoli, South Philadelphia Style" after Villa D'Esta, Tivoli one of Italy's most famous garden with water features. The exhibit, visited by over 200,000 people, was the backyard of a south Philadelphia row home demonstrating the many water quality BMPs for homeowners and gardeners, including rain barrels, porous pavement, and a green wall. Along with educational signage placed within the exhibit, a brochure with additional information was also available at the show.

Safe Boating Program

PWD initiated an outreach, education, and notification program for marinas, personal watercraft users and boaters, titled the Smart Boating, Clean Waters Program. This program is led by the CNPP Specialists in the region and it is funded by the CNPP grant awarded by PA DEP. Most of the marinas, yacht clubs, boat launch ramps, and fishing locations targeted for the program in Philadelphia are located near CSO outfalls on the Delaware River.

Various educational projects have resulted from the Smart Boating, Clean Waters Program. Projects, such as a water-proof brochure, titled "A Boater's Guide to Clean Waters," and user surveys and interviews with marina and yacht club operators to advise them on how to best adopt more environmentally friendly operation and maintenance practices, a monofilament line recycling program and most recently a marina shrink wrap recycling program.

Annual Water Quality Report

Every year the PWD publishes an annual drinking water quality report. This report is mailed to every resident in the city and contains a wealth of information regarding the source, safety, and contents of the City's drinking water. This report is also available year-round on the City's website www.phila.gov.

Green Stormwater Infrastructure Tours

The PWD regularly offers tours to highlight local examples of green stormwater infrastructure. **TABLE II.G.3-4** lists the tours held in 2008 and 2009.

Table II.G.3-4 Green Stormwater Infrastructure Tours

Date	Event	Number of Attendees	Description
April 6, 2008	Historic Mill Creek Watershed Tour	35	As part of a larger tour organized for a University of Pennsylvania landscape architecture class that focused on the Mill Creek Watershed, students toured the Mill Creek Farm, Mill Creek Playground, Sulzberger Outdoor Classroom, Blackwell Homes, and Penn-Alexander School.
May 3, 2008	Clean Water, Green City Tour	20	Presented with White Dog Café, a tour to highlight projects that link environmental vision with economic health, and quality of life with the sustainability of our City. Sites included Waterworks Interpretive Center, Awbury Arboretum, Saylor Grove, and Penn-Alexander School.
Sept. 10, 2008	Philadelphia Green Infrastructure Tour	10	Organized for a group from New York City Parks, Conservation District, and Dept. of Environmental Protection, sites included Wissahickon Charter School, Waterview Recreation Center, Cliveden Park, Saylor Grove, and Allens Lane Arts Center.
Oct. 3, 2008	GreenPlan Philadelphia Tour	45	Organized as part of the American Society for Landscape Architects national conference, the tour highlighted several greening and vacant land management sites that integrated stormwater management, including Liberty Lands, N. 3rd Street Corridor, and North Central Philadelphia vacant land stormwater management sites.
May 5, 2009	Historic Mill Creek Watershed Tour	35	As part of a larger tour organized for a University of Pennsylvania landscape architecture class that focused on the Mill Creek Watershed, students toured the Mill Creek Farm, Mill Creek Playground, Blackwell Homes, Penn-Alexander School, and Clark Park.
June 10, 2009	US EPA National Stormwater Coordinators Meeting Tour	40	As part of a national US EPA meeting, the tour illustrated PWD's green infrastructure program and highlighted innovative projects and partnerships. Sites included Liberty Lands, Thin Flats, Greensgrow Farm, model neighborhoods (Northern Liberties, New Kensington, and APM), Saylor Grove, and Wise's Mill.

Watershed Tours

The City continues to conduct watershed tours in Philadelphia's 9 watersheds (Tacony, Frankford, Poquessing, Pennypack, Wissahickon, Cobbs, Darby, Schuylkill, and Delaware) to further enhance the public's understanding and appreciation of watershed issues. Tour guides describe the watershed concept, point out natural and manmade stormwater features and infrastructure, anthropogenic impacts on receiving water quality, benthic and ichthyfaunal assessments, and watershed protection practices.

Senior Citizen Corps (SEC)

The Water Department continues to work with the Senior Citizen Corps to address stormwater pollution problems and water quality monitoring programs for the Monoshone Creek, a tributary to the Wissahickon Creek and to the Tookany Creek. The SEC performs biomonitoring, collects water samples, and conducts physical assessments of the stream. The Water Department 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. 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 since Fall 2006. The SEC, in partnership with Chestnut Hill College, also began water quality monitoring at the Saylor Grove Wetland in Summer 2006.

Rain Barrel Workshops

The Philadelphia Water Department is providing rain barrels to residents of Philadelphia's watersheds free of charge in order to promote the reduction of stormwater flows to the local sewer system and creeks. This project consists of the implementation of rain barrels as a method of reduction of stormwater runoff on resident's personal property. The primary goal of this project is to implement a property-level best management practice to aid in reducing the volume of stormwater reaching the receiving stream or to increase the length of time it takes the stormwater to reach the receiving stream.

At the workshop, residents are instructed how to install and properly use and maintain their rain barrel. They also learn about the environmental benefits of operating a rain barrel and how stormwater affects the sewer system and local waterways. After successfully completing the workshop, they receive their rain barrel. This program has been a huge success and there is great demand to continue and expand this program. Work is currently underway to expand this program in order to meet the demand of City residents. To date, over 30 workshops have been held and more than 1,500 rain barrels have been given out.

Water Quality Council (formerly 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 has 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. The merge of the two CACs into what is now referred to as the Water Quality Council complements the PWD's, PADEP's, and EPA's new approach of looking at and addressing water quality issues on a holistic basis. The Partnership for the Delaware Estuary facilitates the Water Quality Council committee meetings. The committee consists of representatives from the following groups:

+ Action AIDS
+ Bucks Co. Water & Sewer Auth.
+ Center in the Park - Sr. Environmental Corps
+ Center in the Park / EASI
+ City of Philadelphia
+ Community Legal Services of Philadelphia
+ Delaware River Basin Commission
+ Drexel Univ. - School of Public Health
+ Drexel Univ. Environmental Studies Inst.
+ DVRPC
+ Friends of High School Park
+ Friends of Historic Rittenhouse Town
+ Friends of Poquessing Creek Watershed
+ Friends of Tacony Creek Park
+ MANNA
+ New Kensington CDC
+ Overbrook Environmental Education Center
+ PA DEP
+ PA DEP Water Supply Mgmt.
+ PA Immigration and Citizenship Coalition
+ Partnership for the Delaware Estuary
+ Penn PIRG
+ Pennsylvania Horticultural Society
+ Pennypack Ecological Restoration Trust
+ Pennypack Environmental Center
+ Philadelphia Corp for Aging
+ Philadelphia Dept. of Public Health
+ School District of Philadelphia
+ Schuylkill Navy
+ Schuylkill River Development Corp.
+ Southhampton Watershed Assoc.
+ Stroud Water Research Center
+ Tookany/Tacony-Franford Watershed
+ U.S. EPA, Reg. 3 - Water Protection Div.
+ Water Res. Assn. of DRB
+ Wissahickon Charter School

II.G.4 Continue to Support the Fairmount Water Works Interpretive Center

The Fairmount Water Works Interpretive Center (FWWIC) is PWD's renowned education center, located on the banks of the Schuylkill River in Philadelphia. The Center tells the story of the Schuylkill River and its human connections throughout history. Innovative exhibits and interactive educational programs meld the history, technology and science, providing education on the many issues facing the regions' urban watersheds. PWD plans on supporting the FWWIC indefinitely into the future.

The mission of the Center is to: *"educate citizens to understand their community and environment, especially the urban watershed, know how to guide the community and environment in the future, and understand the connections between daily life and the natural environment."*

Since opening its doors in October, 2003, the FWWIC has seen over 150,000 visitors tour the center, participate in its programs, sign up for educational events and online updates.

During a typical week, the FWWIC hosts 450 visitors, three school groups (elementary or middle school classes), two independent organizations (charter school, community centers), and two special events (evening with a visiting environmental author or lecturer, weekend film preview, e.g., Liquid Assets).

In 2008, approximately 37,177 individuals visited the FWWIC. The breakdown of visitors is listed in **TABLE II.G.4-1.**

Table II.G.4-1 2008 Fairmount Water Works Interpretive Center Visitors

School Groups	113 classes, totaling 6,843 students
Teacher Trainings	3 multi-day workshops with 33 teachers
Summer Camps	24 multi-day summer camps with 851 environmental campers
Special Exhibits	6 multi-month exhibits, including the *Green City, Clean Waters* CSO Long Term Control Plan Update Exhibit
New Programs	9 events, including the World Water Day Celebration
Visiting Authors, Lecturers, Environmental Leaders	4 new education programs, including "Seeing is Believing: A Drop in the Bucket," a career- based laboratory program for high school students
Community Programs	70 community programs, reaching 4,739 individuals
General Visitors	18,985
2008 Total Visitors	**37,177**

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.

This text can also be found in the Stormwater Management Annual Report **SECTION F.7.B** - “Public Education and Awareness”.

II.H Public Notification to Ensure that the Public Receives Adequate Notification of CSO Occurrences and CSO Impacts (NMC 8)

As discussed in Section II.G.1 of this report, PWD has developed and will continue to develop a series of informational brochures and other materials about its CSO discharges and the potential affects of these discharges on the receiving waters. The brochures provide phone contacts for additional information. The opportunity to recruit citizen volunteers to check or adopt CSO outfalls in their watersheds (i.e., notifying the PWD of dry weather overflows, etc.) will be explored through the watershed partnership framework. Brochures and other educational materials discuss the detrimental affects of these overflows and request that the public report these incidences to the department. In addition, PWD has enlisted watershed organizations to assist in this endeavor. PWD will continue this focus to raise the level of citizen awareness about the function of combined and stormwater outfalls through a variety of educational mediums. The watershed partnerships will also continue to be used for this type of education.

II.H.1 Launch a Proactive Public Notification Program Using Numerous Media Sources

PWD is advancing a proactive public notification program that uses print, internet, outfall signage, and other media to distribute information on the locations of CSOs, information on hazards, and potential public actions.

Please refer to NMC7 – "Continue to Provide Annual Information to City Residents about Programs via Traditional PWD Publications" for additional information on PWD's public notification.

Please refer to "Interpretive Signage" for information on the pilot CSO signage project.

Please refer to "Continue to Maintain Watershed Management and Source Water Protection Partnership Websites" for information on the OOW website development.

Please refer to "Continue to Maintain Watershed Management and Source Water Protection Partnership Websites" for information on the web and telephone based Early Warning System for water suppliers and industrial users.

II.H.2 Expand the Internet-Based Notification System (River cast) to the Tidal Section of the Lower Schuylkill River

The Philadelphia Water Department developed a unique, web-based water quality forecasting system for the Schuylkill River called RiverCast. Based on real-time turbidity, flow, and rainfall data, it provides up-to-the-hour public service information on the estimated current fecal coliform concentrations in the river and the acceptable types of recreation based on those conditions. The system is designed to maximize accuracy while avoiding recommendations that suggest water quality is better than it is likely to be (avoidance of false positives). The Philly RiverCast is a forecast of water quality that predicts potential levels of pathogens in the Schuylkill River between Flat Rock Dam and Fairmount Dam (i.e., between Manayunk and Boathouse Row).

In order to expand RiverCast, the PWD has developed another internet-based notification system called CSOcast, which reports on the overflow status of outfalls in every CSO shed. The purpose of this notification system is to alert the public of possible CSOs from Philadelphia's combined sewer system outfalls. When a combined sewer outfall is overflowing, and up to a period of 24 hours following a rainfall event, it is unsafe to recreate in the water body due to possible pollutant contamination. The data on the website is updated daily.

Instead of using water quality parameters to forecast conditions, CSOcast relies on a network of flow sensors throughout the city to notify the public when overflows are occurring. This public notification system is based on PWD analysis of monitoring network data which is used to determine the likelihood of combined sewer overflows. The PWD has maintained an extensive permanent monitoring network since 1995 including level sensors which record data throughout the combined sewer system. PWD currently operates and maintains monitoring equipment at, or near, the 164 combined sewer outfalls throughout the city.

The Philadelphia Combined Sewer Overflow Public Notification System is a pilot program. The PWD is constantly updating and improving the notification system as well as the flow monitoring network in order to deliver the best information possible to the public.

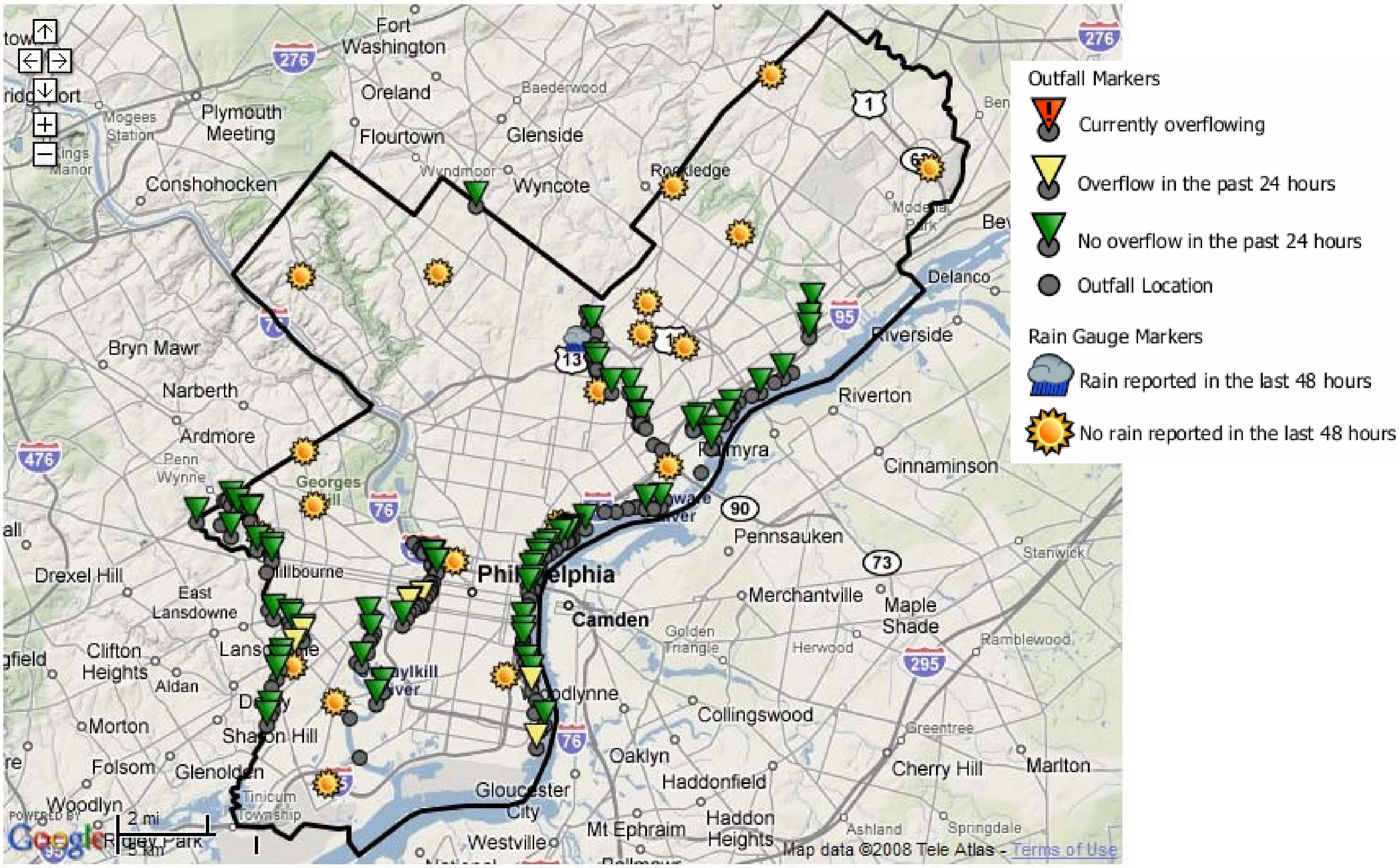


Figure II.H-1 Screen capture of the CSOcast website

The Green icon represents an outfall that has not overflowed in the last 24 hours. The Yellow icon represents an outfall that has overflowed in the last 24 hours but is not necessarily currently overflowing. The Red icon represents an outfall that is currently overflowing. The Gray icon represents an outfall where data is not currently available – for these sites, outfalls in close proximity can be referenced for an approximation of overflow status.

II.I *Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls (NMC 9)*

II.I.1 Report on the Status and Effectiveness of Each of the NMCs in the Annual CSO Status Report

The CSO Annual Status Report, combined with the Stormwater Annual Status Report, will be submitted in September of each year, documenting the previous fiscal year activities.

III Implementation of the LTCP

III.A CSO LTCP Update - Report on the progress of the LTCP Update

PWD has completed the Philadelphia Combined Sewer Overflow (CSO) Long Term Control Plan Update (LTCPU) as of Sptember 1st, 2009. The CSO LTCPU details PWD's plan to increase capture and reduce CSOs through a variety of infrastructure. The evaluation of alternative control measures was consistent with the guidance provided in Chapter 3 of the Combined Sewer Overflows: Guidance for Long-Term Control Plan, Office of Water EPA 832-B-95-002, September, 1995 ("Guidance for LTCP"). Additionally, the plan addressed the following components:

a). PWD conducted flow monitoring and assessed the performance of the CSO control alternatives and the efficacy of implemented controls with a hydrologic and hydraulic model of the collection system.

b.) Evaluated the technical applicability and feasibility of the full range of alternatives. Alternatives included projects that:

- i. Link the City's development and land management practices to achieve CSO reductions through the application of innovative storm water management regulations and low impact development and re-development practices.
- ii. Directly restore aquatic ecosystems through stream rehabilitation and wetland construction.
- iii. Expand its collection and treatment systems to increase the capture and treatment of combined sewage and ensure adequate transport capacity for dry and wet weather flows.

c.) Assessed the watershed wide reductions in pollutant loads achieved by the CSO controls and other controls as developed in the watershed management plans.

d.) Evaluated the Project Costs for each alternative or mix of alternatives.

e.) Analyzed the benefits of the additional treatment applied to wet-weather flow through its secondary treatment processes and assessed the performance of the CSO controls.

f.) The watershed partnerships were utilized for evaluation and prioritization of management alternatives including additional CSO controls.

g.) Characterization of each individual watersheds' physical, chemical, and biological components.

h.) Assessment of the financial capability to establish the burden of compliance on both ratepayers and the permitee.

i.) Schedule of implementation of the selected CSO control alternative.

The full Philadelphia Combined Sewer Overflow Long Term Control Plan Update report can be found at http://www.phillywatersheds.org/ltcpu/.

III.B Capital Improvement Projects

The Capital Improvement's phase 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 body water quality. PWD will continue to implement CSO capital improvement projects that were planned during the previous permit cycle and plan to develop, propose, and implement additional capital projects to continue to increase the capture and treatment of combined sewage.

III.B.1 On-going Capital Improvement Projects

III.B.1.1 Completion and Operation of the Real-time Control Center

The construction of the Collector System Real Time Control Center (RTC) building was completed in the summer of 2003. The Real Time Control Center became operational in September 2006. The center, located at the Collector System Headquarters at Fox St. and Abbottsford Rd., is currently attended to during the day shift and for major storm events. The 24 ft. by 46 ft. room incorporates a two high by three wide matrix of video projection cubes for a total video screen wall of 89.4 square feet. The ergonomically designed room and furniture layout enables large groups of people to simultaneously view the display screens.

The display screens make use of the Decision Support System that has been under development since 2002. This web-based application consolidates many of PWD's information sources into one application making real-time and static information easier for the decision maker to use. Some of the information sources currently in use are: pump station and CSO control site SCADA and alarm systems, Collector System monitoring network data, the Department's wide variety of GIS data, sewer system and equipment scanned drawings, CCTV inspections video and reports, Collector Systems work order management systems, and weather and tide predictions.

This text also copied under "Fully Integrate the Real-Time Control Facility into the Operations of PWD".

III.B.1.2 Rehabilitate and Maintain the Monitoring Network

The Philadelphia Water Department continues to maintain a CSO Monitoring network and temporary monitoring programs to support planning for further CSO control projects and to minimize dry weather overflows and tidal inflows. PWD will continue to review, replace, and update network equipment in order to continue to support the above functions.

In fiscal year 2008 the Department purchased and installed a new data acquisition system and RTU's (remote telemetry units) manufactured by Telog Enterprise. This new system replaces a customized solution that was unreliable and difficult to maintain and offers better communications options and system diagnostics which should allow PWD to greatly increase the data capture rate. Thus far 30 RTU's have been switched out to the new system with the balance expected to be completed in fiscal year 2010. As of the end of fiscal year 2009, the 287 remote monitoring sites are 82.1% operational.

This text also copied under "Continue to Operate and Maintain a Network of Permanent and Temporary Flow Monitoring Equipment".

III.B.1.3 WPCP Wet Weather Treatment Maximization (NE)

The plant stress-testing project established:

– Maximum and average flows that should be treated in various unit processes for current and future operations;

– Ranges of hydraulic, solids, and BOD5 loads that could be applied to the various unit processes and yet obtain maximum removal efficiencies in each unit process;

– Changes in plant processes and operations (such as increased loads, MLSS levels, changes in sludge wasting, return activated sludge ratios, detention times, etc.) that would increase removal efficiencies; and

– Magnitudes of excess capacity, if any, in each unit operation of the plant (increased flow through plant process units) that could be achieved and still meet the discharge permit requirements for each plant.

The results of stress testing allow for a determination of existing and future optimum flows, loads, and operations of the various unit processes. The identification of choke points, deficiencies and unit process capacities are provided in the stress testing summary report that has been developed for each WPCP. Specific WPCP capital improvement projects (CIP) have been identified as potential projects resulting from the findings of the stress testing which were provided as part of the summary reports. The actual need for additional CIPs, and the resulting prioritization of the CIPs and the budgeting, appropriation of monies, scheduling and actual implementation of the CIPs was accomplished within the context of the overall watershed approach to CSO abatement defined in the LTCP.

CH2MHill submitted the final reports for each of the three WPCPs on May 1, 2001. The reports provided the following information: project objectives and methodology, current performance, maximum instantaneous flow, current sustainable treatment capacity, and potential upgrades. The report also included hydraulic and treatment throughput capacities for each plant process, capacity limiting factors, and the potential operating modifications or capital projects whose purpose would be to increase plant throughput.

Recommended modifications or upgrades were prioritized and categorized into those potential projects that could be considered for either immediate implementation, resulting in enhanced treatment, or capital improvement projects that could also increase treatment capability but would require PWD expenditures. The various CIPs were also categorized by four treatment objectives including: process improvements, peak primary treatment capacity, peak secondary treatment capacity, and wet weather treatment capacity. This second categorization provided anticipated combined CIP costs for each of the treatment objectives as well as the peak treatment capacities.

Table III.B-1 Potential Upgrade Options at the NE Plant identified in the Stress Test

Option Number	Description	Priority Classification	Estimated Conceptual Cost
1	Improve mixing in mixed liquor channel to secondary clarifiers 9 through 16	A	$472,000
2	Polymer addition on Set 1 secondary clarifiers to maintain effluent quality	B	$22,000
3	Separate flow measurement of secondary effluent from sets 1 and 2	C	currently undetermined
4	Automation of step feed operation for aeration tanks	A/B	$161,000
5	Modify Set 2 secondary effluent channels to reduce hydraulic restrictions under high flow conditions	B/D	$223,000
6	Modify the existing RAS system in the secondary clarifiers	C	$2,183,000
7	Provide a second conduit to the Set 2 primary clarifiers to convey additional flow to Set 2 Primary tanks	D	$3,312,000
8	Reduce losses and increase capacity between the grit tanks and Set 1 clarifiers by installing another conduit and venturi meter	D	$707,000
9	Provide a bypass from the primary effluent channels to the chlorine contact chamber	D	$8,291,000
10	Provide separate primary sludge thickening	D	$12,254,000
11	Reuse abandoned ABCD tanks in wet weather treatment facility	C	$5.0 - 10.0 million
12	Increase raw sewage pumping and screening by:	D	-
12a	50 mgd	D	$10.0 - 20.0 million
12b	150 mgd	-	$20.0 - 24.0 million
12c	300 mgd	-	$36.0 - 40.0 million

III.B.1.3.1 Evaluate Stress Test Report options in the LTCPU

The goal of this task is to provide a forward-looking framework for the evaluation and selection of cost-effective wet-weather treatment technologies at the three existing WPCPs to support the development of a long-term wet-weather treatment strategy. The project is evaluating a range of wet-weather treatment options for each facility and providing an overall treatment strategy sufficient to support the PWD CSO LTCP Update process. The project is confined to examining treatment technologies that can be reasonably applied on the existing plant footprint and within reasonably obtainable land adjacent to the WPCPs. The project is providing baseline information that can be used for the future development of a long-term wet-weather treatment facility plan for the Northeast, Southeast, and Southwest WPCPs.

The objectives of the planning-level study are to:

1. Document existing conditions at the plants utilizing information in the existing stress test reports (dated 2001) and the NE Plant Expansion Study (March 2007) and noting capital and operational changes made to these facilitates subsequent to these reports.

2. Identify and review the range of technologies applicable to the treatment of wet-weather flows, up to the maximum limits imposed by available land.

3. Perform a preliminary screening and recommend technologies for further evaluation across a full range of criteria.

4. Short-list treatment options to carry forward for further evaluation.

5. Conduct site visits, as appropriate, for technologies selected.

6. Select preferred technologies and develop concept-level sizing and performance criteria along a range of incrementally higher flows.

7. Prepare conceptual-level design, capital, and operating cost estimates.

8. Integrate the wet-weather treatment plan into the overall LTCPU approach and plan.

Wet weather treatment capacity expansion at each of the Water Pollution Control Plants was evaluated as an option in the CSO Long Term Control Plan Update (LTCPU). Several wet weather treatment technologies were evaluated: Vortex Swirl Concentrators, Conventional Clarifiers, Chemically Enhanced Primary Treatment with Conventional Clarifiers, and Ballasted Flocculation. Section 8 option I-35 of the LTCPU summarizes the wet weather expansion capacity at each of the Water Pollution Control Plants in more detail and LTCPU Supplemental Documentation Volumes 9 through 11 are the individual full reports. Each document can be found at http://www.phillywatersheds.org/ltcpu/.

III.B.1.3.2 Implement Options 1, 2, and 4 from the Stress Test Report

Options 1, 2, and 4 from the Stress Test Report have been implemented.

Option 2 - Polymer addition on Set 1 secondary clarifiers to maintain effluent quality was completed in 2000 and has been in operation since that time.

Option 1 (Improve mixing in mixed liquor channel to secondary clarifiers 9 through 16) and Option 4 (Improve step feed modes during wet weather events by converting the manual gate operators to motor driven operators) work was done under PWD Work #71033 – General construction for aeration system rehabilitation at Northeast Water Pollution Control Plant and #71034 - Electrical work for aeration system rehabilitation at Northeast Water Pollution Control Plant. The purpose of this project was to renew the secondary treatment system which includes new air grid system and diffusers and selector technology. Course bubble diffusers were installed in both Final Sedimentation Tank - Set 2 mixed liquor channels. New motor gate operators were installed on the "A" and "C" bay inlet gates on the west side of the aeration tanks. The Mechanical work was done by C&T Associates, Inc. for a total cost of $9,483,859.31. The electrical work was done by Philips Bros. Elec. Contrs., Inc. for a total cost of $800,439.90. The Notice to Proceed for this project was issued in February 2003 and the construction was complete by January 2006.

III.B.1.3.3 Plan, Design, and Construct Options 2 & 7 of the Stress Test Report to Increase the Secondary Plant Capacity to 435 MGD

The Northeast WPCP Stress Test report, completed in 2000, included as upgrade option #2 the modification of Set 2 secondary effluent channels to reduce hydraulic restrictions under high flow conditions. This was to be accomplished through the modification or elimination of the "double decker" effluent channel in order to reduce head loss. After conducting an in-depth hydraulic analysis, including computation flow dynamic modeling, the observed head loss was determined to be attributable instead to the bulkhead and the nonsymmetrical conduit base elevations. These observed restrictions can be removed through the rerouting of the return activated sludge (RAS) piping and the construction of a new effluent conduit. This solution will address the hydraulic restriction identified in the Stress Test report but is considerably more involved than the formerly expected solution. The rerouting of the RAS and the construction of a new effluent conduit has been designed and will go out to bid in March of 2010 with construction between August and September of 2010.

Identified as upgrade option #7 (Reduce losses and increase capacity between the grit tanks and the Set 1 primary clarifiers by installing another conduit and venture meter) in the 2000 Northeast WPCP Stress Test report, the purpose of this project was to increase the hydraulic throughput capacity of the Set 1 primary clarifiers by constructing a third conduit. This conduit would be approximately 50 feet long with a depth and width of 8 ft x 8 ft and would be constructed between the Preliminary Treatment Building and the Set 1 primary clarifiers. After conducting a detailed hydraulic analysis it was determined that a single conduit would not fit into the existing hydraulic regime. Instead, four smaller 48" diameter conduits will be constructed. This upgrade has been designed and will be put out to bid in March of 2010 with an estimated completion time of July 2011.

III.B.1.3.4 Explore increasing the preliminary treatment primary treatment and final effluent disinfection treatment capacities in excess of the existing secondary treatment capacity at the WPCP

In order to increase primary treatment and final effluent disinfection treatment capacities, PWD will first significantly increase the flow into the plant by rehabbing an existing force main in the Frankford high-level sewer. A new pretreatment facility will also be designed and constructed to remove grit and screenings from the additional flow through Frankford high-level sewer. Following pretreatment, the increased flow into the plant will then enter the Set 2 clarifiers. Disinfection will be achieved in the bypass itself and in the chlorine contact chamber at the effluent of the plant. A detailed study, utilizing computation fluid dynamic modeling, has been completed for the chlorine contact chamber and the final effluent pier. The force main rehab has been designed and is currently in projects control with an anticipated completion date of March 2011. Another consultant is under contract for the design and construction of the pretreatment facility. A conceptual design has already been submitted for this facility, including a site layout plan. Due to land area constraints, additional land will be need to be acquired for this facility. After the necessary land is acquired, two years will be required for design and construction.

III.B.1.3.5 Initiate the Facility Planning and Design for the By-pass Conduit

Identified as Option 12 in the 2000 NE WPCP Stress Test report, this upgrade will include the construction of bypass conduits connecting the Set 1 and Set 2 primary effluent channels directly to the chlorine contact chamber. This upgrade will enable the bypass of secondary treatment during high flow events ensuring solids removal and disinfection. The conduits have been sited and are pending construction of the pretreatment facility. These upgrades are anticipated to be complete by December of 2017.

III.B.1.3.6 Report to the DEP the Status of these Projects in the Annual Status Reports when Major Work Elements are Completed

The CSO Annual Status Report, combined with the Stormwater Annual Status Report, will be submitted in September of each year, documenting the previous fiscal year activities.

This text also copied under "Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls (NMC 9)".

III.B.1.4 85% Capture (NE) - 85% Flow Capture Technical Report

The technical memo documenting 85% capture in the Pennypack was completed in August 2008 and submitted to the DEP on August 15, 2008. This technical memo documents the completed alterations to the CSO system and models the estimated capture using high, median, and low flow estimates. Based on the modeling results, the percent capture from the Pennypack CSOs is between 70% and 92% capture using the high and low modeling estimates. The median estimate shows approximately an 85% CSO capture in the Pennypack.

III.B.1.5 In-Line System Storage Projects (NE)

III.B.1.5.1 Construction and Implementation of Tacony Creek Park (T-14)

The T-14 trunk sewer system conveys combined sewage from the largest combined sewershed in the PWD collection system. Currently, CSO outfall T-14, a 21' by 24' sewer, discharges into the Tacony Creek during periods of moderate to heavier rainfall. T-14 has a volume of approximately 10 million gallons and to use as much of this storage as possible, a control structure is needed in the sewer. Installation of a crest gate is proposed in order to retain flow within the sewer. This gate will reduce CSO discharges to the creek by utilizing the relief sewer for in-system storage. This control technology provides an additional margin of protection against dry weather overflows while still maintaining flood protection for upstream communities. The crest gate retains the stored flow in the relief sewer and a new connector pipe drains the stored flow to an existing nearby interceptor.

This project will reduce the discharge of combined sewage into Tacony Creek, one of the more-sensitive water bodies exposed to CSO discharges in the City of Philadelphia. The gate installation at T-14, combined with the Rock Run project, will result in a reduction of roughly 600MG of CSO discharges annually. This represents a 12% reduction in the average annual volume of CSO and a significant reduction in the pollutant discharge (bacteria and organic matter from untreated wastes, litter and other solid materials in both wastewater and stormwater runoff, etc.) at this location near an area where golfing and other recreational activities frequently occur. Since this project modifies an existing structure rather than constructing a new one, it provides very cost-effective control.

The engineering firm of O'Brien & Gere completed the bid documents for this project in December of 2007. This project was bid in August 2008 with a notice to proceed issued March 31, 2009. JPC Group Inc. won the contract with a bid of $3,965,000. At the current time, the construction site has been cleared. A section of the existing sewer crown has been removed and piles have been placed for the new operations building foundation. The sewer floor and side walls are currently being prepared for the crest gate. The project is expected to be completed by summer 2010.

III.B.1.5.2 Construction and Implementation of Rock Run Relief (R-15)

The Rock Run Relief Sewer provides flood relief to combined sewer areas upstream of regulator T-8 in the Northeast Drainage District (NEDD). Currently, CSOs discharge into the Tacony Creek at the Rock Run Relief Sewer outfall – an 11' by 14' sewer - during periods of moderate or greater rainfall. Installation of an inflatable dam in the Rock Run Relief Sewer allows for utilization of approximately 2.3 million gallons of in-system storage to retain combined flows during a majority of these wet weather events. The inflatable dam stores combined flows in the relief sewer until storm inflows have subsided and capacity exists in the Tacony Interceptor for conveyance of combined flows to the Northeast Water Pollution Control Plant (NEWPCP). This control technology provides an additional margin of protection against dry weather overflows while maintaining flood protection for upstream areas.

This project will reduce the discharge of combined sewage into Tacony Creek, one of the more-sensitive water bodies exposed to CSO discharges in the City of Philadelphia. An estimated average annual reduction in CSO volume of 190 MG, from 1040 to 850 MG/year, is achieved at the Rock Run Relief Sewer outfall through use of the available in-system storage volume. This represents a reduction of roughly 20% in the average annual volume of CSO and a significant reduction in the pollutant discharge (bacteria and organic matter from untreated wastes, litter and other solid materials in both wastewater and stormwater runoff, etc.) at this location near an area where golfing and other recreational activities frequently occur. Since this project modifies an existing structure rather than constructing a new one, it provides very cost-effective control.

A design memorandum was completed that documents the expected environmental benefits of the Rock Run Relief Project, quantifies the flooding risks associated with the project, and documents the recommended control logic for the inflatable dam's operation and drain-down control. In support of this memorandum, several alternative control logics for the inflatable dam operation and drain-down gate were investigated to develop a logic that minimized the risks of flooding, increased Rock Run Relief storage utilization, and eliminated adverse affects of the project at other CSO regulators on the Tacony Creek. Hatch Mott MacDonald was the design engineer on this project.

On June 13, 2006, the project construction bid was awarded to AP Construction in the amount of $3,665,000. Authorization to start work was held until to 12/13/2006. The job was listed as substantially complete on 9/26/2008. However, due to ongoing problems with the Hydraulic Power Unit, required for the operation of the sluice gates, the air bag was not able to be put in automatic operation till 8/2009. The Flow Control Unit is conducting testing of the system before the project is turned over.

III.B.1.6 Real Time Control (RTC) and Flow Optimization for the Southeast Drainage (SE)

Since no project with this name exists, this may actually be referring to the Real Time Control (RTC) and Flow Optimization for the Southwest Drainage (SW) which will be discussed further in this report.

III.B.1.7 WPCP Wet Weather Treatment Maximization (SW)

III.B.1.7.1 Implementation of the Southwest Plant Stress Test Report Option 1

The SW Stress Test identified 7 potential upgrade options at the Southwest WPCP.

Table III.B-2 Potential upgrade options at the SW Plant as identified in the Stress Test

Option Number	Description	Priority Classification	Estimated Conceptual Cost
1	Replace caulking on secondary clarifier launders to improve flow distribution	A	$1,640,000
2	Provide preliminary treatment for the BRC centrate that is recycled in the plant	B/C	$8,585,000
3	Modify existing RAS system in the secondary clarifiers	C	$4,256,000
4	Provide primary effluent bypass to secondary clarifiers	D	$902,000
5	Provide separate facilities for primary sludge thickening	D	$9,892,000
6	Resolve hydraulic limitations between primary clarifiers and aeration basin	D	$5,429,000
7	Provide and additional effluent pump at the effluent pumping station	D	$806,000

The purpose of this project was to implement Option 1 - to inspect and repair leaking weirs and concrete surfaces in the final sedimentation tanks at the Southwest Plant. The leaking through the weirs was causing short circuiting through the tanks and thus adversely impacting solids settling. This work was done under PWD Work #73018 – SW Concrete Repairs in Final Sedimentation Tanks. The contractor for the construction was Ross Araco Corp. The Notice to Proceed was issued in August of 2000 and the project was completed by April 2002. The total cost of the project was $1,640,980.

III.B.1.7.2 Analyze wet weather treatment capacity expansion as part of LTCPU

Wet weather treatment capacity expansion at each of the Water Pollution Control Plants was evaluated as an option in the CSO Long Term Control Plan Update (LTCPU). Several wet weather treatment technologies were evaluated: Vortex Swirl Concentrators, Conventional Clarifiers, Chemically Enhanced Primary Treatment with Conventional Clarifiers, and Ballasted Flocculation. Section 8 option I-35 of the LTCPU summarizes the wet weather expansion capacity at each of the Water Pollution Control Plants in more detail and LTCPU Supplemental Documentation Volumes 9 through 11 are the individual full reports. Each document can be found at http://www.phillywatersheds.org/ltcpu/.

This text also copied under "Evaluate Stress Test Report options in the LTCPU" for more information on the analysis of the Stress Test reports in the Long-term Control Plan. Please refer to this section for additional information.

III.B.1.8 Real Time Control (RTC) and Flow Optimization for the Southwest Drainage (SW) - Implementation of Projects for Real Time Control (RTC) and Flow Optimization for the Southwest Drainage District

A number of interrelated projects in the Southwest Drainage District (SWDD) were determined to enhance the operation of the high-level and low-level collection systems and consequently maximize capture and treatment of wet-weather flows at the SWWPCP. Each of the high-level interceptor systems that discharge to the SWWPCP can influence the hydraulic capacity and treatment rate of the other high-level interceptor systems, as they compete for capacity in the Southwest Main Gravity (SWMG) into the plant. Therefore, several integrated projects were proposed to establish a protocol for prioritizing flow from each interceptor system. The RTC system will control the Triple Barrel reach of the SWMG and will control the diversion from the SWMG to the Lower Schuylkill West Side Interceptor (LSWS), thereby enabling use of the full capacities of these interconnected conduits during wet-weather.

The SWDD RTC conceptual design memorandum outlines recommendations for the modifications to the SWDD collection system in three phases. Phase I includes enlarging the DWO pipe and raising the diversion dam at the C17 regulator, modifying the operation of CSPS based on the level in the CCLL interceptor, and regulating inflows from S27 to the SWMG using a DWO sluice gate under RTC. In addition, installation of a side-overflow weir at the West Barrel at the 70th & Dicks Triple Barrel and opening the East and Center Barrels for dry weather flow is encompassed in Phase I of the RTC project. Phase II concentrates on decreasing overflows in the LSWS by enlarging the S45 DWO pipe and regulating inflows using a gate. The strategy for Phase II also incorporates closing DWO shutter gates at S43 and S47. The 3rd phase of the RTC conceptual design is enlargement of the S38 DWO pipe and regulation of flows using a computer-controlled DWO gate.

<u>Phase I</u>

C17

The contract award for this project was $1.7 million. On 8/19/05, the gate on the 66 inch reinforced concrete DWO pipe was installed and functioning to specification. On 1/9/06, the old dam and 20 inch DWO pipe upstream of the new gate & dam were sealed and removed from service. The project was closed out on September 3, 2006.

Operation changes to the Central Schuylkill Pump Station (CSPS) will be evaluated after construction is complete on the 70th and Dicks Triple Barrel.

S27

This regulator is currently operating under local control. Future modifications will be evaluated after completion of the work done on S45.

70th and Dicks Triple Barrel (Projects # 75021 & 75022)

The design for the rehabilitation of the DWO sluice gate chamber was completed with the aid of the consulting engineering firm of Gannett Fleming and was bid through

Projects Control in April of 2006. The bid was awarded to JPC Group in the amount of $1,729,530.

The three sluice gates will be replaced with new sluice gates as the current gates are not motorized. Under this contract, each gate will get a new electric actuator and become motorized. The gates will be controlled from the RTC at Flow Control, but there will also be a small electrical box installed so that the gates can be controlled locally from street level at 70th and Dicks. The box will be installed on the side lawn of 2700 South 70th St. There are also some other small items being done under this contract (i.e. new sump pumps to pump water out of the control chamber where the actuators are located, new seals and hatches to prevent sewer water from penetrating control chamber).

A construction Notice-to-Proceed was issued in November 2006. Construction was delayed somewhat because of dewatering issues. Construction work on this project was completed in January 2009.

Phase II

S45 (Project #40433)

The S45 chamber at 67th Street regulates the flow of combined sewage into the LSWS interceptor. The proposed chamber modifications include upsizing the DWO pipe from 24 to 36 inches and the installation of a manual gate to control inflows into the LSWS interceptor. Design was completed in 2008 by the consultant engineering firm of Hatch Mott MacDonald. Bid documents were forwarded to Projects Control in January 2008. This project was bid in July 2008. The low bidder was A.P. Construction at a cost of $535,000. The notice-to-proceed for construction was issued on 12/9/08. Project is currently in construction phase.

S43 & S47

Modifications to S43 and S47 will be evaluated after completion of the work done on S45.

Phase III

S38

After extensive hydrologic and hydraulic modeling, it was determined that modifications to S38 are unnecessary. The goal of maximizing flow to the SW Plant through the Lower Schuylkill West Side Interceptor can be achieved solely through modifications to the S45 regulating chamber.

III.B.1.9 RTC/Main Relief Sewer Storage (SW) - Construction and Implementation of Main Relief Sewer Storage and Real-time Control

The Main Relief Inflatable Dam storage project was completed in fiscal year 2007. The Department continues to maintain and monitor this in-line collection system storage site.

In the Combined Sewer Overflow (CSO) Long-term Control Plan submitted by the Philadelphia Water Department (PWD) to the Pennsylvania DEP in 1997, one of the listed capital projects was to implement a project in the Main Relief Sewer. In PWD's NPDES permit #0026671 issued in 2007, PWD was required to complete the construction and implementation of this in-line storage project by PID+12 months or 08/15/2008. The Main Relief sewer project has been constructed and is currently in operation.

The Main Relief Sewer provides flood relief to combined sewer areas in all three of PWD's drainage districts (Northeast, Southeast and Southwest). The Main Relief Sewer discharges to the Schuylkill River at Fairmount Park, a highly visible recreational area. Previously, CSO was released into the river at the Main Relief Sewer outfalls during periods of moderate or greater rainfall. There exists within the single large (13.5′ by 13.5′ box) sewer above these outfalls a potential storage volume of approximately 4.0 million gallons and during all but the largest rainfalls most or all of this volume is available to store the overflow that otherwise discharges to the river. In order to use this storage, an inflatable dam was installed in the box sewer just above the Main Relief Sewer outfalls to the Schuylkill River. This control technology provides an additional margin of protection against dry weather overflows while still maintaining flood protection for upstream communities. The inflatable dam maintains the stored flow in the relief sewer and a new connecting sewer drains the stored flow to an existing, nearby interceptor. This project reduces the discharge of CSO into the Schuylkill River through utilization of the available in-system storage volume.

In November of 2003, the project was advertised and bid. The bid was awarded in mid-December to Ross Araco for an amount of $1,029,919. The project construction was initiated on 9/16/2004 with the issuance of the Notice to Proceed. Field work began on 12/15/2004 and was substantially completed on 11/3/2005. Following a lengthy system start up/ tune-up period, the project was closed out at a final total cost of $1,068,031 on 5/10/2007. The dam did not become fully automated until the Dauphin Street job, which used a portion of the Main Relief Sewer as a bypass during construction, was completed in the fall of 2006.

The current operational set-points for the inflatable dam are; >7 ft the bag fully inflates; at 16 ft +- 0.25″ the dam modulates to maintain 16 ft; at 24 ft the dam fully deflates in failsafe mode. All levels are measured from the invert of the trunk sewer approximately 20 feet upstream of the centerline of the dam. The designed level of 20 feet dam modulation was never achieved without failure so the level was reduced to 16 feet, which is a more realistic capture level. This 16 feet is still much higher than any other Bridgestone installation. The failures at the 20 foot dam height included surges to well over the 24 ft failsafe before the bag would react, constant stretching of the rubber resulting in bolt loosening and allowing water into the bag, and dislodging of level sensors due to the violent turbulence.

In a typical year, the operation of the dam prevents about 31 to 22 million gallons (high and low estimates) of combined from overflowing to the Schuylkill River and facilitates capture of about 47 to 34 million gallons in the Southwest drainage district.

This text also copied under "Operate and Maintain In-Line Collection Storage System Projects Contained within the LTCP".

III.B.1.10 Eliminate CSO/Dobsons Run Project (SW) - Construction and Implementation of the Dobson's Run Project

Stokely & Roberts (R22) - Dobson's Run Phase I

This project will eliminate 2 of the City's intercepting chambers and will completely eliminate CSO overflows at R22, resulting in a 173-MG reduction in overflow volume on an average annual basis.

This project entails the reconstruction of the storm and sanitary sewer from Wissahickon Ave. to Roberts Ave. and elimination of the overflow chamber located at Stokely & Roberts (R22). The contract was awarded to A.P. Construction and construction commenced on 7/18/1996. The construction, including the elimination of the R22 chamber, was completed on 10/4/1998 at a total cost of $7,040,000. The estimated construction cost was $5.8 million.

Kelly Drive (S01T) - Dobson's Run Phase II & Phase III

Phase II of the Dobson's Run Reconstruction consists of the sewer reach from Henry Ave. to Kelly Drive and eliminates branch sewer contributions of sanitary sewage from reaching temporary CSO S01T. Phase III will eliminate all CSO discharge from occurring at S01T. In order to take advantage of economies of scale, design work for Phase II and III of Dobson's Run has been combined into one project because both phases involve tunneling.

The design engineer was the team of CMX (former Schoor DePalma) and Dawn Engineering. The project was bid on December 5th, 2006 with the low bidder being the joint venture of JPC/JAY DEE at the amount of $36.4 million. The contract was awarded in February 2007 for a bid price was $36.4 million, with a contingency that brings the limit of contract to $38.5 million.

As of July 2009, the upper-end (32nd St. ROW) tunnel excavation is complete and the majority of the tunnel lined with concrete. The contractor expects to finish the remainder of the concrete tunnel lining and concreting of the vertical shaft by the end of the summer.

The outfall work on the west side (river side) of Kelly Drive is complete. The construction of the Kelly Drive tunnel shaft is complete and approximately 60 ft of tunnel has been excavated. To increase productivity, the contractor has started using two tunneling shifts. The lower leg of the tunnel launched from Kelly Drive is tentatively scheduled to be completed by spring 2010.

III.B.1.11 Eliminate CSO/Main and Shurs Off-Line Storage (SW) - Construction and Implementation of the Main and Shurs Off-line Storage Project

The Main Interceptor Sewer, which is located along the Schuylkill River adjacent to the Manayunk Canal in the northwest section of Philadelphia, conveys sewage from collection systems which serve the northwest section of the City. During extreme wet weather events, the Main Interceptor Sewer exceeds its capacity and overflows occur at relief point R20 into a storm sewer upstream of storm water outfall S-052-5. To abate the hydraulic overload conditions in the Main Interceptor Sewer, the PWD has proposed construction of a three million gallon offline storage tank which will capture and store excess flows thereby eliminating surcharges and preventing overflow conditions at relief point R20. The 3 million gallon concrete storage tank, head house building, and a performing arts center are to be constructed on Venice Island, an artificial island between the Manayunk Canal and the Schuylkill River created when the Manayunk Canal was dug out.

The storage tank will accommodate sanitary sewer/combined sewer overflow (SSO/CSO) that currently averages approximately 10 million gallons of untreated wastewater each year and will return it to PWD's Southwest WWTP. Placed back on top of the tank after construction will be several recreation areas, a new performing arts center, and a head house building to provide public space in the Manayunk region of Philadelphia.

During the second half of 2008 and the first half of 2009, PWD staff and the design team have expended considerable effort finalizing, reviewing, and coordinating the contract documents for this challenging, multi-discipline project. The following table gives a summary of progress to date on the various drawing sets that make up this project:

Design Element	Engineering Consultant	No. of Drawings	% Complete
General	Hazen And Sawyer	4	99
Civil Land Development	Hunt Engineering	40	98
Landscaping	Andropogon	83	97
Geotechnical	NTH Consultants	11	99
Structural - CSO Basin & Head House	Hazen And Sawyer	38	99
Architectural - Head House	Hazen And Sawyer	32	99
Mechanical - CSO Basin & Head House	Hazen And Sawyer	19	99
Electrical - CSO Basin & Head	Hazen And Sawyer	17	98

House			
Instrumentation - CSO Basin & Head House	Hazen And Sawyer	5	98
HVAC - CSO Basin & Head House	Hazen And Sawyer	16	99
Plumbing - CSO Basin & Head House	Hazen And Sawyer	4	99
Performing Arts Center - Structural	Joseph Barbato Associates	14	98
Performing Arts Center - Architectural	Buell Kratzer Powell	33	98
Performing Arts Center - Rigging	Scheu Consulting Services	7	98
Performing Arts Center - Electrical	Agnelo Gomez Consulting Engineers	17	98
Performing Arts Center - Theatrical Lighting	The Lighting Practice	3	98
Perfroming Arts Center - Sound System	Metropolitan Acoustics	11	98
Performing Arts Center - HVAC	Mark Ulrick Engineers	8	98
Performing Arts Center - Plumbing	Mark Ulrick Engineers	6	98
Performing Arts Center - Fire Protection	M&S Engineering Services	4	98

Total Drawings 372

In addition to coordinating the construction bid documents, considerable effort has been applied to obtain the required permits and approvals necessary to construct this project. As of August 2009, the following permits and approvals have been obtained:

– Philadelphia Art Commission approval
– City of Philadelphia Streets Department approval
– City of Philadelphia Planning Commission approval
– City of Philadelphia Zoning approval
– Delaware River Basin Commission (DRBC) approval

Stormwater management approval for the project is expected shortly. This will allow the remainder of the permits required for this project to be processed.

III.B.2 New Capital Improvement Projects to be Included in LTCPU

III.B.2.1 Asset and Capacity Management Program - Implement a Comprehensive Geographic Information System (GIS) of the City sewer system, Implement a Comprehensive Sewer Assessment Program (SAP), and Continue to Institutionalize a Comprehensive Monitoring and Modeling Program

The PWD has begun implementation of a comprehensive asset and capacity management program. Please refer to the following sections for more information on our programs.

Please refer to NMC1 – "Implement a Comprehensive Geographic Information System (GIS) of the City sewer system".

Please refer to NMC1 – "Implement a Comprehensive Sewer Assessment Program (SAP).

Please refer to NMC2 – "Continue to Institutionalize a Comprehensive Monitoring and Modeling Program".

III.B.2.1.1 Inflow/Infiltration (I/I) Controls

Opportunities exist to reduce CSO impacts by means of reducing the entry of stormwater runoff, rainfall-derived I/I, and groundwater into the sewer system. Appropriate measures will be identified, evaluated, and implemented, where appropriate and cost-effective. There are four basic approaches to CSO control through I/I reduction:

1. Reduce the entry of stormwater runoff (including perennial stream baseflow) into the combined sewer system by diverting streamflow directly to a receiving stream.

2. Reduce the entry of groundwater to the combined sewers, interceptor sewers, and/or upstream separate sanitary sewers.

3. Reduce the entry of rainfall-derived I/I from upstream sanitary sewer systems.

4. Monitor and study the tidal inflows from river levels exceeding emergency overflow weir elevations at tide gates.

Each of the above methods enables CSO reduction by effectively increasing the capacity in the intercepting sewers and WPCPs available for the capture and treatment of combined wastewater.

Since I/I is relatively clean water that occupies conveyance and treatment capacity, eliminating it from the system frees up capacity for the more contaminated combined wastewater. This reduces CSO discharges and enables greater pollutant capture throughout the combined sewer system. An additional benefit of reduced infiltration (and diversion of any perennial streamflow) is the reduction in the operating costs associated with continuously pumping and treating these flows.

Tide Inflow

The System Inventory and Characterization Report (SIAC) identified 88 CSOs influenced by the tides. Many of these sites have openings above the tide gate. During extreme high tides inflow into the trunk sewer can occur. During these events, significant quantities of additional flow can be conveyed to the treatment plant and thus reduce capacity for storm flow, as well as increasing treatment costs. A program was previously implemented to install tide gates, or other backflow prevention structures, at regulators having an emergency overflow weir above the tide gate. This program, completed in June 1999, protects all openings up to 1.5′ City Datum and results in significant inflow reductions. PWD currently inspects and maintains the tide gates to ensure their continued performance. Please refer to "Tide Gate Inspection and Maintenance Program" for additional information.

Sewer Assessment Program

The permittee has implemented a comprehensive sewer assessment program (SAP) to provide for continued inspection and maintenance of the collection system using closed circuit television. The SAP is one of the tools used to indentify and remediate areas of I/I as well as guide the capital improvement program to ensure that the existing sewer systems are adequately maintained, rehabilitated, and reconstructed. Please refer to "Implement a Comprehensive Sewer Assessment Program (SAP)" for more information on this program.

City Wide GIS Mapping

The PWD utilizes the comprehensive Geographic Information System (GIS) of the City sewer system to target locations for inspection and potential maintenance where I/I may be a problem. Two such examples, are intake walls; locations where springs and creeks directly enter the sewer system, and creek crossings; locations where sewers travel directly under a waterbody.

Infrastructure Assessments

PWD actively conducts efforts to inventory and prioritize sewerage infrastructure potentially affected by either infiltration or exfiltration through spatial data collection for all points that either hydraulically alter the flow of the creek or infrastructure points that are affected by stream migration. These studies have identified over 300 points in the Cobbs Watershed (completed in 2002), 1000 points in the Tookany/Tacony-Frankford Watershed (2004), over 2000 points in Wissahickon Watershed (2005-2006), over 3000 points in Pennypack Watershed (2007-2008) and approximately 1200 points of infrastructure in the Poquessing Watershed (2008).

The data collected includes the spatial locations along the waterbody of all bridges, channelization, confluences, culverts, dams, manholes, outfalls, and pipes. In addition to spatial locations and depending on the type of infrastructure point, the following information is also collected: size, material type, length and height of exposed portion, condition, presence and quality of dry weather flow, bank location, level of submergence, digital photos, descriptions, and additional field notes. Corrective actions are taken when points of concern are identified.

Interceptor Relining

Planning and design is underway for the relining of the entire length of interceptor within Philadelphia in the Tacony-Frankford Watershed. For planning purposes, the interceptor was split into 5 sections approximately 1.5 miles in length, with plans to reline one section per year. The relining will take place between 2008 and 2012. The total estimated cost of this project is estimated at $20,000,000.

In prioritizing segments for relining in the Tacony-Frankford, other projects in the watershed that would run concurrently with the sewer relining were taken into consideration. The first and second sections planned for relining in the Tacony-Frankford Watershed corresponds with stream restoration and in-system storage projects. Efforts are underway to coordinate sewer relining with Cheltenham Township so the entire sewershed gets relined.

Planning and design is also underway for the relining of the entire length of interceptor within Philadelphia in the Darby-Cobbs Watershed. For planning purposes, the interceptor was split into 6 sections approximately 1.5 miles in length, with plans to reline one section per year. Two of these segments have already been relined, one in 1999 and the other in 2004 at a cost of $3,500,000. The remaining relining will take place between 2008 and 2011. The total estimated cost of this project is $11,500,000.

In prioritizing segments for relining throughout the Cobbs Watershed, other projects that would run concurrently with the sewer relining were taken into consideration. The first segment planned for relining corresponds with a stream restoration project planned for Darby-Cobbs. Efforts are underway to coordinate sewer relining with Delaware County so the entire sewershed gets relined.

Some projected benefits of sewer relining are:

– Decreased pollutant loads to surface waters by decreasing exfiltration

– Decreased flow in sewer system by decreasing Inflow/Infiltration (I/I)

– Increased efficiency of the sewer system

– Aid in achievement of Target A of the Watershed Management Plan – Dry Weather Water Quality and Aesthetics

Mill Creek Diversion Project

The PWD is working with the Philadelphia division of the United States Army Corp of Engineers (USACE) to conduct a feasibility study of stopping stream flow from entering into the Mill Creek combined sewer. The proposed project is to divert and attenuate the stream flow generated in Montgomery County from the combined sewer by constructing an alternate channel to either the Schuylkill River via City Line Avenue or to the East Branch of Indian Creek. Diverting flow from the combined sewer to the East Branch of Indian Creek will increase base flows in the Indian Creek and possibly improve habitat conditions and water quality, while decreasing the quantity of CSO discharge to the Schuylkill River during storm events.

III.B.2.1.2 Sewer Separation

Sewer separation was studied and modeled as one of the options in the LTCPU and deemed cost prohibitive. No sewer separation projects have been identified or implemented during the reporting period.

See section CSO LTCP Update – Report on the progress of the LTCP Update for additional information on the sewer separation analysis.

III.B.2.1.3 New Storage Facilities

PWD is continuing to investigate opportunities to construct off-line CSO storage facilities to maximize existing sewer treatment capacity and increase the volume of CSO captured and treated.

Venice Island Storage Tank

The Main Interceptor Sewer, which is located along the Schuylkill River adjacent to the Manayunk Canal in the northwest section of Philadelphia, conveys sewage from collection systems which serve the northwest section of the City. During extreme wet weather events, the Main Interceptor Sewer exceeds its capacity and overflows occur at relief point R20 into a storm sewer upstream of storm water outfall S-052-5. To abate the hydraulic overload conditions in the Main Interceptor Sewer, the PWD has proposed construction of a three million gallon offline storage tank which will capture and store excess flows thereby eliminating surcharges and preventing overflow conditions at relief point R20. The 3 million gallon concrete storage tank, head house building, and a performing arts center are to be constructed on Venice Island, an artificial island between the Manayunk Canal and the Schuylkill River created when the Manayunk Canal was dug out.

The storage tank will accommodate sanitary sewer/combined sewer overflow (SSO/CSO) that currently averages approximately 10 million gallons of untreated wastewater each year and will return it to PWD's Southwest WWTP. Placed back on top of the tank after construction will be several recreation areas, a new performing arts center, and a head house building to provide public space in the Manayunk region of Philadelphia.

This text also copied under "Construction and Implementation of the Main and Shurs Off-line Storage Project".

Tacony-Frankford Storage Feasibility Study

PWD is currently working with the Army Corp of Engineers on a feasibility study to identify cost-effective options for reduction of wet weather water pollution and peak flow volumes into PWD's combined sewer system within the Tacony-Frankford Watershed. Two options that this feasibility study analyzes are off-line storage facilities. The first is a 60MG storage tank located at "Logan Triangle", an area where sinking homes were demolished and the land currently remains empty. This storage facility would reduce combined sewer discharges to the Tacony Creek by 600 million gallons per year from, eliminate the need for approximately $26 million of new fill for the site, and provide a stable foundation for future redevelopment of the neighborhood.

The second tank option being considered is 13.5MG storage tank under "Old Frankford Creek". Currently there are four regulators with outfalls along Old Frankford Creek: F21, F23, F24 and F25. Collecting these outfalls in a storage tank beneath the creek would potentially reduce overflows from these outfalls by 600 MG per year.

A third, non-storage option, the dechannelization of the bottom of lower Frankford Creek is also being studied.

III.C Watershed-Based Management - Continue to Apply the Watershed Management Planning Process and Produce and Update to the Watershed Implementation Plans

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. The City of Philadelphia has embraced a comprehensive watershed characterization, planning, and management program committed to address a multitude of overlapping regulatory requirements including EPA's Combined Sewer Overflow (CSO) Control Policy, Phase I and Phase II Stormwater Regulations, Storm Water Management PA Act 167, TMDL(s), PA Act 537 Sewage Facilities Planning and drinking water source protection programs. Coordination of these different programs has been greatly facilitated by PWD's creation of the Office of Watersheds (OOW). This organization is composed of staff from the PWD's planning and research, CSO, collector systems, laboratory services, and other key functional groups, allowing the organization to combine resources to realize the common goal of watershed protection. OOW is responsible for characterization and analysis of existing conditions in local watersheds to provide a basis for long-term watershed planning and management.

The City of Philadelphia has committed to developing an Integrated Watershed Management Plan (IWMP) for each of the 5 major waterways that drain to the City of Philadelphia, including the Cobbs, Tookany/Tacony-Frankford, Wissahickon, Pennypack and Poquessing as well as Implementation Plans (IPs) for the Schuylkill and Delaware Rivers.

PWD's IWMP planning process is based on a carefully developed approach to meet the challenges of watershed management in an urban setting. It is designed to meet the goals and objectives of numerous water resources related regulations and programs, and it utilizes adaptive management approaches to prescribe implementation recommendations. 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. They are designed to meet the goals and objectives of numerous water resource related regulations and programs and draw from the similarities contained in many watershed-based planning approaches authored by the Pennsylvania Department of Environmental Protection (PADEP) and the U.S. Environmental Protection Agency (USEPA). Further, watershed planning is mandated by the CSO policy and guidance documents and also is consistent with the current Clean Water Act (CWA) and its regulations, as well as the priorities announced by EPA's Office of Water (See EPA's Watershed Approach Framework, Office of Water, June 1996).

Water bodies receiving CSO discharges in the PWD service area include the Cobbs/Darby Creeks, the Pennypack Creek, the Tacony/Frankford Creeks, the Schuylkill River and the Delaware River. Although they do not have CSO discharges, the Wissahickon and Poquessing Creeks are important waterways within the PWD service area and PWD has committed to developing integrated watershed management planning approaches for each of these watersheds through the City's Stormwater Permit. There are 164 point sources of CSO discharge from the PWD sewer system to these waterways. **TABLE III.C-1** below indicates the number of CSO point sources and the number of major separate stormwater outfalls on each waterway, as identified in the City's NPDES permits.

Table III.C-1 - CSO and Stormwater Point Source Discharges to Tributaries

Waterway	Number of CSO Point Sources	Number of Major Stormwater Outfalls
Delaware/Schuylkill Rivers (tidal)	94	30
Cobbs/Darby Creeks	34	3
Tacony/Frankford Creeks	31	35
Pennypack Creek	5	130
Schuylkill River (non-tidal)	0	32
Poquessing Creek	0	141
Wissahickon	0	63

Watershed planning includes various tasks ranging from monitoring and resources assessment to technology evaluation and public participation. PWD has established a Planning Approach for developing IWMPs that addresses requirements of each of the following programs including TMDL(s), Phase I and Phase II Stormwater Regulations, PA Act 537 Sewage Facilities Planning, Storm Water Management PA Act 167, EPA's Combined Sewer Overflow (CSO) Control Policy and drinking water source protection program. This IWMP development process is outlined below:

III.C.1 LAND: Wet-Weather Source Control

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. The City of Philadelphia has embraced a comprehensive watershed characterization, planning, and management program committed to address a multitude of overlapping regulatory requirements including EPA's Combined Sewer Overflow (CSO) Control Policy, Phase I and Phase II Stormwater Regulations, Storm Water Management PA Act 167, TMDL(s), PA Act 537 Sewage Facilities Planning and drinking water source protection programs. Coordination of these different programs has been greatly facilitated by PWD's creation of the Office of Watersheds (OOW). This organization is composed of staff from the PWD's planning and research, CSO, collector systems, laboratory services, and other key functional groups, allowing the organization to combine resources to realize the common goal of watershed protection. OOW is responsible for characterization and analysis of existing conditions in local watersheds to provide a basis for long-term watershed planning and management.

The City of Philadelphia has committed to developing an Integrated Watershed Management Plan (IWMP) for each of the 5 major waterways that drain to the City of Philadelphia, including the Cobbs, Tookany/Tacony-Frankford, Wissahickon, Pennypack and Poquessing as well as Implementation Plans (IPs) for the Schuylkill and Delaware Rivers.

Establishment of Watershed Stakeholder Partnership

Stakeholder support is critical to the success of this type of regional planning initiative. A diversity of stakeholder perspectives must be involved with the development of each stage in the planning process in order to ensure that the plan is representative of stakeholder interests. This stakeholder buy-in is most critical to ensuring ultimate implementation of the plan. Recognizing this, PWD has helped to develop stakeholder watershed partnerships for each watershed where an IWMP is being initiated. At a minimum, a Watershed Partnership should be comprised of representatives from each of the following: federal, state, and local government agencies, industries, local businesses, nonprofit organizations and watershed residents, as well as any other interested stakeholders in the watershed.

Table III.C-2 Watershed Partnerships and Status

Watershed Partnership	Status
Darby-Cobbs Watershed Partnership	Initiated in 1999; Public Education and Outreach Committee and Steering Committees convened on a quarterly basis
Tookany/Tacony-Frankford Watershed Partnership	Initiated in 2000; as of 2007 this partnership had evolved into an independent 501(c)3 nonprofit organization with a mission of implementing the Integrated Watershed Management Plan for the TTF Watershed
Pennypack Creek Watershed Partnership	Initiated in 2004 for the development of a River Conservation Plan; re-convened in 2008 for the development of an Integrated Watershed Management Plan
Wissahickon Creek Watershed Partnership	Initiated in 2005 for the development of an Integrated Watershed Management Plan
Poquessing Creek Watershed Partnership	Initiated in 2006 for the development of a River Conservation Plan; to be reconvened in 2009 for the development of an Integrated Watershed Management Plan
Delaware Direct Stakeholder Partnership	Initiated in 2007 for the development of a River Conservation Plan for the Delaware Direct drainage area of the City of Philadelphia
Schuylkill Action Network	Large-scale stakeholder initiative initiated in 2003; supported by PWD.

The Watershed Partnerships are designed to provide a forum for stakeholders to work together to develop strategies that embrace the dual focus of improving stream water quality and the quality of life within their communities. The partnership is charged with driving the process and ensuring that the process remains representative of the diversity of stakeholder perspectives. The partnerships discuss priorities and the actions necessary to make the plan successful. These actions become a part of the implementation strategy, and address the desire to improve the water and land environment through a number of avenues. The ultimate goal is to cultivate a partnership committed to implementing the plan once completed.

Tookany/Tacony-Frankford Watershed Partnership

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.

The mission of the TTF Watershed Partnership is "To increase public understanding of the importance of a clean and healthy watershed; to instill a sense of appreciation and stewardship among residents for the natural environment; and to improve and enhance our parks, streams, and surrounding communities in the Tookany/Tacony-Frankford watershed."

Current members of Tookany-Tacony/Frankford Partnership:

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

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.

The Tookany/Tacony-Frankford Watershed Partnership was convened for the following meetings and events over the past year:

September 9, 2008 – Board Meeting, Awbury Arboretum, 2-4 p.m.
December 9, 2008 – Board Meeting, Awbury Arboretum, 2-4 p.m.
April 2, 2009 – Board Meeting, Awbury Arboretum, 2-4 p.m.
June 18, 2009 – Board Meeting, Awbury Arboretum (Annual Meeting), 2-4 p.m.
May 29, 2009 – Nominations Committee Meeting, Awbury Arboretum, 9-10:30 a.m.
June 9, 2009 – Development Committee Meeting, Awbury Arboretum, 9:30-11 a.m.

Event Title:	Model Neighborhood Presentation	Date: 8/18/08
Event Title:	Belfield Block Party	Date: 8/23/08
Event Title:	Volunteer Work Day in Tacony Creek Park	Date: 8/26/08
Event Title:	Watershed Lesson, Academy for the Middle Years	Date: 08/27/08
Event Title:	Rain Barrel Workshop	Date: 09/11/08
Event Title:	Model Neighborhood Presentation	Date: 9/16/08
Event Title:	Coast Day	Date: 9/20/08
Event Title:	Model Neighborhood Presentation	Date: 9/22/08
Event Title:	Senior Environment Fair	Date: 9/26/08
Event Title:	Stream Clean Up	Date: 9/28/08
Event Title:	Neighborhood Clean Up	Date: 10/11/08

Event Title:	Neighborhood Clean Up	Date: 11/8/08
Event Title:	TOXTOUR school visits	Date: 12/3-12/7/08
Event Title:	TOXTOUR, Ethical Electronics Recycling Event	Date: 12/6/08
Event Title:	National Teach-In Expo	Date: 2/5/09
Event Title:	Rain Garden Lecture – AE Forum	Date: 2/23/09
Event Title:	Watersheds Lecture - EarthForce Kickoff	Date: 3/10/09
Event Title:	Curly the Catfish Lesson	Date: 3/12/09
Event Title:	Watersheds Lecture - EarthForce Kickoff	Date: 3/24/09
Event Title:	Model Neighborhood Meeting	Date: 3/25/09
Event Title:	TOXTOUR Table at ETE Conference	Date: 3/26-27/09
Event Title:	TOXTOUR school visits	Date: 3/26-29/09
Event Title:	TOXTOUR, Ethical Electronics Recycling Event	Date: 12/6/08
Event Title:	Rain Barrel Presentation	Date: 4/13/09
Event Title:	Invasives Removal at Glenside Elementary	Date: 4/18/09
Event Title:	Jenkintown GreenFest	Date: 4/19/09
Event Title:	Arcadia Earth Day Festival	Date: 4/22/09
Event Title:	Cheltenham Earth Day Festival	Date: 4/19/09
Event Title:	Native Planting at Glenside Elementary	Date: 4/29/09
Event Title:	Model Neighborhood Meeting	Date: 4/29/09
Event Title:	WOLBA Watersheds Lecture	Date: 4/30/09
Event Title:	Audubon Native Bird Habitat Planting	Date: 5/11/09
Event Title:	Watersheds Lesson at Widener	Date: 5/22/09
Event Title:	Native Planting at Glenside Elementary	Date: 6/3/09
Event Title:	Block Captain Meeting	Date: 6/11/09
Event Title:	Street Tree Walk w/Fairmount Park	Date: 6/13/09
Event Title:	Creek walk, Cheltenham	Date: 6/23/09
Event Title:	Creek walk, Cheltenham	Date: 6/30/09

Darby – Cobbs Watershed Partnership

In 1999, the Philadelphia Water Department initiated the Darby-Cobbs Watershed Partnership in an effort to connect residents, businesses, and government as neighbors and stewards of the watershed. Since then, the partnership has been active in developing a vision for the watershed and guiding and supporting subsequent planning activities within the watershed. The partnership functions as a consortium of proactive environmental groups, community groups, government agencies, businesses, residents and other stakeholders who have an interest in improving the Darby-Cobbs Watershed.

The mission of the Darby-Cobbs Watershed Partnership is to improve the environmental health and safe enjoyment of the Darby-Cobbs watershed by sharing resources through cooperation of the residents and other stakeholders in the watershed. The goals of the initiative are to protect, enhance, and restore the beneficial uses of the Darby-Cobbs waterways and riparian areas.

The Darby-Cobbs Watershed Partnership was convened for the following meetings and events over the past year:

July 18, 2008
Darby-Cobbs Watershed Partnership – all group mtg at Fannie Cox Center for Science, Math and Technology (Friends Central Middle School, 1101 City Avenue, Wynnewood, PA 19006).

August 5, 2008
Public Education and Outreach Committee Meeting

September 19, 2008
Public Education and Outreach conference call to discuss "Thinking like a Watershed event"

September 20, 2008
DelCo RiverRamble event

November 4, 2008
"Thinking Like a Watershed" Teacher event

February 19, 2009
10am – 12pm, Upper Darby Twp. Good Housekeeping Workshop at Upper Darby Twp.

March 26, 2009
1pm-2:30pm, Special mtg of PWD, PEC, FPC and Cobbs Creek Community Environmental Education Center (700 Cobbs Creek Parkway)

May 29, 2009
6pm-7:30pm, Rain barrel workshop in Upper Darby Twp. at Crossroads Community Church, 104 Heather Rd.

April 25, 2009
Supported Darby Creek Valley Association Watershed Wide Clean UP

June 6, 2009
6pm-7:30pm, Model Neighborhood mtg at Good Shepherd Presbyterian Church (6439 Lansdowne Avenue, Philadelphia, PA 19151)

June 16, 2009
4:30pm-6:00pm, Model Neighborhood mtg at the Achievability Haddington Cobbs Creek NAC office (35 N. 60th Street).

June 30, 2009
5:15pm – 6:30pm, Model Neighborhood mtg at the Achievability Haddington Cobbs Creek NAC office

Resources produced in the past year include:

"The Second Annual Darby-Cobbs Watershed Status Update" a public friendly publication intended to highlight some of the implementation projects initiated since the inception of the first 5-year Implementation plan for the watershed. This publication is available for download on PWD's Watershed Information Center at www.phillyriverinfo.org.

Pennypack Creek Watershed Partnership

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.

PWD reconvened the Pennypack Watershed Partnership in December 2007 to begin the development of an IWMP for this watershed. The Pennypack Partnership has been convened twice in FY08, December 11th and May 21st. PWD will continue to convene the partnership over the coming years as an Integrated Watershed Management Plan for this watershed is developed.

The Pennypack Watershed Partnership was convened for the following meetings and events over the past year:

Hatboro Eaton Park site visit with Borough officials and Conservation District to discuss riparian management practices, July 29, 2008.

Pennypack Watershed Partnership meetings

- Act 167 launch meeting on November 6, 2008 at Pennypack Ecological Restoration Trust.
- Act 167 update meeting and other Partnership issues on March 27, 2009, at Pennypack Ecological Restoration Trust.
- Comprehensive Characterization Report presentation on water quality data, May 14, 2009 at Upper Moreland Township Building.
- Comprehensive Characterization Report presentation on biological data, June 4, 2009 at Pennypack Ecological Restoration Trust.

Pennypack Greenway Partnership Meetings held on a monthly basis at Pennypack Ecological Restoration Trust and other Pennypack Watershed locations. Collaboration with Pennypack Watershed Partnership that addresses greenway, trails, stormwater, and other environmental issues (meetings held on August 19, 2008, September 25, October 22nd, November 18th, December 16th, January 6, 20009, February 10th, March 11th, April 15th, May 12, and June 10tj).

Pennypack Partnership Public Education and Outreach Committee meetings to plan education events

Meetings held on July 10, 2008 (with Pennypack Greenway Partnership) and October 29, 2008 at Pennypack Ecological Restoration Trust. Committee supported following activities:

- Rain Garden Workshop for homeowners, November 20, 2008 in Bryn Athyn Borough.
- Blair Mill Earth Day events (planting, rain garden installation, mowing to meadow education), April 25, 2009 at Blair Mill Elementary School, Horsham.
- Fairmount Park Integration into Public Outreach and Education Committee, April 8, 2009, at Pennypack Environmental Center.

Pennypack Multi-Municipal Collaboration, a series of meetings held with elected officials in the Pennypack and Tookany-Tacony/Frankford Watersheds to address stormwater management issues. Meetings held on July 30, 2008, September 23, 2008, and March 24, 2009.

Pennvest Application

Above multi-municipal collaboration process led to mullti-municipal project between Horsham Township, Hatboro, and Upper Moreland Township to pursue Pennsylvania Infrastructure Investment Authority (Pennvest) funding for Blair Mill area stormwater management projects. This tri-municipal collaborative process conducted a series of meetings and field events in the spring of 2009 that resulted in a Pennvest stormwater BMP application submitted on May 18, 2009.

Poquessing Creek Watershed Partnership

The Poquessing Watershed Partnership was reconvened in June 2009 for the purpose of guiding the development of an Integrated Watershed Management Plan for this watershed. Prior to reconvening the stakeholders, a round of what are called "Key Person Interviews" were conducted in order to gather information on stakeholder watershed issues and concerns.

The following interviews were conducted:

- PECO Energy Company, May 12, 2009 at PECO Building in Philadelphia
- Parkwood Civic Association, April 16, 2009 at Association's monthly meeting
- Lower Southampton Township, April 13, 2009 at Township building
- Franklin Mills, April 1, 2009 at Franklin Mills
- Northeast Airport, March 10, 2009 at Philadelphia International Airport
- Cranaleith Spiritual Center, March 19, 2009 at the center
- Bucks County Conservation District and Bucks County Planning Commission, March 6, 2009 at the Conservation District.
- Benjamin Rush State Park, February 11, 2009 at the park.
- Bensalem Township, February 11, 2009 at the Township building.
- Fairmount Park Commission, January 29, 2009, at the Commission.
- Friends of Poquessing, December 4, 2008 at Northeast Philadelphia Community College.

- Lower Moreland Township, May 20, 2009 by telephone
- Brandywine Realty Trust, May 18, 2009 by telephone
- Somerton Civic Association by telephone.

The Poquessing Watershed Partnership was convened for the following meetings and events over the past year:

Poquessing and Pennypack backyard buffer program workshop, January 22, 2009 at Northeast Philadelphia Community College.

Poquessing Watershed Partnership kickoff meeting, June 9, 2009 at Glen Foerd Mansion.

Delaware River Direct Watershed River Conservation Plan Steering Committee (Partnership)

In the spring of 2007, consultants formerly Cahill Associates and currently CH2M Hill, along with the Pennsylvania Horticultural Society were hired by Philadelphia Water Department to lead the Delaware Direct RCP. 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 more of an emphasis on the implementation of the Philadelphia GreenPlan recommendations. The data collection and public participation commenced in the fall of 2007. The final report is expected to be submitted in the summer of 2009.

Delaware Direct Watershed River Conservation Plan meetings and events to date:

1. Steering Committee Meeting #1
   - November 15, 2007
   - Pennsylvania Horticultural Society

2. Steering Committee Meeting #2
   - February 20, 2008
   - Pennsylvania Horticultural Society

2. Focus Group/Workshop #1: Ecology and Riverfront Design – Case Study Pulaski Park
   - April 30, 2008
   - Pennsylvania Horticultural Society

3. Focus Group/Workshop #2: The Built Environment – Advanced Parking Lot Design
   - June 4, 2008
   - Independent Seaport Museum

4. Focus Group/Workshop #3: Mobility and Connections
    - July 31, 2008
    - Penn Treaty Park

5. Focus Group/Workshop #4: Healthy Neighborhoods
    - December 3, 2008

Wissahickon Creek Watershed Partnership

The Wissahickon Watershed Partnership was convened in 2005 for the purposes of guiding the development of a watershed-wide Integrated Watershed Management Plan. Over the past 3 years it has been determined that due to the complexity of regulatory obligations facing this drainage area, PWD would move forward with developing a watershed plan for the portion of the drainage area within its' jurisdiction while the upstream portion of the watershed concludes a number of ongoing initiatives. PWD will continue to convene the Wissahickon Watershed Partnership over the coming years in hopes that the upstream portion of the watershed will come together to formulate a complimentary implantation approach in order to realize a watershed-wide restoration vision.

The Wissahickon Watershed Partnership is convened on a quarterly basis.

Wissahickon Watershed Partnership meeting attendees:

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

The Wissahickon Watershed Partnership was convened for the following meetings and events over the past year:

Wissahickon Roundtable Better Site Design
Workshops held with municipalities (Whitemarsh, Upper Dublin, Whitpain, and Springfield), developers, agencies, non-profit organizations, and other stakeholders. Workshops focused on updating site development ordinances in ways that protect environmental resources:

- Kick off meeting, September 16, 2008 at Whitpain Township Building
- Working meeting, June 3, 2009 at Whitemarsh Township Building
- Final Recommendation meeting, June 30, 2009 at Upper Dublin Township Building.

Rain garden Workshops and Plantings
Rain garden workshops held for homeowners, followed by planting events:

- Rosyln Park rain garden workshop and planting, October 4, 2009 at Roslyn Park, Abington.
- Ricciardi Park rain garden workshop and planting, October 11, 2009 at Ambler Borough Hall and Ricciardi Park.
- Jarrettown Elementary School rain garden planting for students and parents, October 12, 2009 at Jarrettown Elementary School, Upper Dublin.

Golf Course Green Turf Management summit sponsored by Wissahickon Valley Watershed Association for area golf courses and municipal public works employees, October 16, 2008 at Manufacturer's Golf Club.

Wissahickon Watershed Partnership Meeting, December 10, 2008 at Wissahickon Valley Watershed Association addressing basin retrofit, Roundtable, and Wissahickon Special Area Management Plan initiatives.

Environmental Advisory Committee watershed wide collaboration; meetings and discussions focusing on ordinance revisions and stormwater basin retrofits:

- January 21, 2009 meeting at Wissahickon Valley Watershed Association focusing on broad discussion of EAC watershed wide project opportunities.
- February 25, 2009 meeting at Wissahickon Valley Watershed Association focusing on emerging collaboration on EAC watershed wide project.
- April 15, 2009 meeting at Upper Dublin Township building focusing on selected projects of ordinance revisions and stormwater basin retrofits.

Wissahickon Watershed Public Education and Outreach Committee meeting with focusing on Project Headwaters and new Fairmount Park Commission involvement, April 29, 2009 at Wissahickon Environmental Education Center, Philadelphia.

Wissahickon Creek Detention Basin Inventory and Retrofit Program

PWD developed a replicable approach for generating an inventory of existing stormwater management facilities within a watershed and then prioritizing the facilities for retrofit with structural and nonstructural stormwater best management practices aimed at enhancing groundwater recharge and water quality treatment of stormwater runoff and implemented it in 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, specifically excluding basins draining to the mainstem. The study focused on first and second order stream locations where implementation benefits could be maximized. (Funding for this study was provided by a US EPA 104b3 grant administered by PA DEP.)

The initiative involved development of a process in which a desktop analysis of Geographic Information Systems (GIS) data layers was utilized to identify a preliminary set of basins and a field assessment protocol was developed to visit each basin to collect information relevant to retrofit priority. Data collected about each basin was fed into an evaluative matrix program where fifteen weighted criteria were applied to each basin to prioritize the 153 basins in the inventory for retrofit. A ranked output was produced at both the watershed-wide as well as the individual municipal level; basins were ranked with high, medium and lower priority for retrofit. Information about three types of basin retrofits and benefits associated with each type for a given basin size. It will be up to the implementers of each basin retrofit to evaluate the appropriate measures for implementation in a basin given the existing conditions of the basin.

For more information on this initiative, a copy of the final report and all appendices as well as downloadable GIS data, please visit www.watershedscience.info/basininventory

Wissahickon Detention Basin Retrofit and Technical Assistance Program

PWD funded a Technical Assistance Program to follow up on the recently completed Inventory of Existing Stormwater Management Facilities with Retrofit Potential within the Wissahickon Creek designed to assist watershed stakeholders (specifically municipalities) in making use of the information in moving toward implementation of basin retrofits. The Basin Inventory initiative concluded by stating that all basins considered for retrofit would require a detailed, site-specific feasibility study and engineering design in order to proceed and that existing conditions such as flooding, groundwater contamination, karst geology, proximity to drinking water intakes, groundwater wells, and many other factors must be considered in order to deem the basin appropriate for retrofit implementation. This program was intended to provide stakeholders with the tools necessary to perform such site specific feasibility studies.

Technical assistance is provided to partners in the form of site visits, conceptual and final project designs, workshops, and a brochure. Three or four municipally-owned facilities will be guided through the site assessment and design process to prepare for retrofit implementation. This Technical Assistance Program was initiated in the spring of 2008 and came to a close on June 30th, 2008. At the close of this initiative, the Pennsylvania Environmental Council secured additional funds to continue this program in the coming year and actually construct 2-3 retrofits within the Wissahickon Creek Watershed.

Progress to date on basin retrofits:

PWD/Exelon/Schuylkill River Heritage Area Basin Retrofit Program

Stormwater basin retrofit activities including training and construction-related activities, focusing on municipal basins:

- Basin Retrofit Field Training including field review of basin retrofit concepts focusing on Village Circle basin design, July 9, 2008 at Village Circle stormwater basin, Whitpain.
- Neighborhood briefing on Village Circle basin retrofit, June 26, 2008 at Village Circle stormwater basin, Whitpain.
- Public award ceremony for Exelon-Schuylkill River Heritage Area grants including basin retrofit program, August 26, 2008 at Perkiomen Conservancy in Schwenksville.
- Upper Dublin Council review of Aiden Lair Park basin retrofit project and match, fall 2008, Upper Dublin Township Building. Basin retrofit agreement signed by Township in March 2009,
- Whitpain Council review of Village Circle basin retrofit project and match, fall 2008, Whitpain Township Building. Basin retrofit agreement signed by Township on March 3, 2009.
- North Wales Borough Council review of Center Street basin retrofit project, May 2008, North Wales Borough Hall. Basin retrofit agreement signed by Borough on May 27, 2008. Landowner partnership agreement also signed in May 2008. (North Wales was pre July 2008)
- Center Street basin design review meetings held with landowners at site, with last meeting held on March 3, 2009.

Upper Wissahickon Critical Area Resource Plan/Special Area Management Plan Pilot Project

A Critical Areas Resource Plan (CARP) Pilot is being developed for the Upper Wissahickon Watershed in Montgomery County to demonstrate the critical area planning process established under Act 220 of 2002—The Pennsylvania Water Resources Planning Act—and the special area management plan process recommended through the Pennsylvania Coastal Zone Management Program. The plan's focus was on water supply but also pulled together many of the different water resource activities currently being pursued in the watershed. Though the study area for this initiative only included the Upper Wissahickon (which covered the headwaters through just below the confluence with the Sandy Run Creek tributary)

PWD supported the development of this plan. PWD provided technical data to the planning team and provided staff resources to attend multiple planning meetings and for draft plan review.

Assessment of Current Watershed Status; Identification of Problems

PWD implements a detailed monitoring program in each planning shed that includes chemical, biological and physical assessments to characterize the current state of the watershed and identify existing problems and their sources.

Data Collection, Organization, and Analysis

Development of the CCR includes the collection and organization of existing data on surface water hydrology and quality, wastewater collection and treatment, stormwater control, land use, stream habitat and biological conditions, and historic and cultural resources in order to gain an understanding of existing data, which will serve as a historic reference data set for comparison against newly collected information. Additionally, existing ordinances, regulations, and guidelines pertaining to watershed management at federal, state, basin commission, county, and municipal levels are examined for coherence and completeness in facilitating the achievement of watershed planning goals. Data are collected from various agencies and organizations in a variety of forms, ranging from reports to databases and Geographic Information System (GIS) files.

This data is then supplemented by PWD's extensive physical, chemical and biological monitoring program, which is initiated for roughly one year in each watershed. A compendium document is produced following the analysis of all collected data; this document titled the Comprehensive Characterization Report (CCR) is shared with watershed partners for comments and feedback. These CCR documents are available on the partnership website at www.phillyriverinfo.org. The CCR assessment serves to document the watershed baseline prior to implementation of any plan recommendations, allowing for the measure of progress as implementation takes place upon completion of the plan. The CCR status of each watershed is:

Darby-Cobbs	Completed 2004
Tookany/Tacony-Frankford	Completed 2005
Wissahickon	Completed 2007
Pennypack	Completed 2009
Poquessing	In production

Watershed Planning Process

Development of Plan Goals, Objective, Indicators and Options

PWD's watershed-wide goal setting process begins with the development of a "base set" of goals for the watershed – incorporating all available goal related statements captured within existing plans and reports. This base set of goals is then presented to the stakeholder group for evaluation. A facilitated discussion is held during which the partners are invited to add to this list of goals and finally to adopt this master list as the initial goal set for the watershed area.

Often times, this stakeholder insight may reveal "information gaps" not addressed by problem analysis that requires additional data collection. Ultimately, with stakeholder collaboration, a final list of goals is established that should reflect the multitude of stakeholder interests in the watershed.

The following example clarifies the difference between a goal and an objective for the purposes of the PWD Watershed Planning process:

Goal: These are to be general and not specifically measurable. Goals represent a series of "wishes" for the watershed. (e.g. Improve water quality)

Objective: Objectives translate the goal statements into measurable parameters. The objective should lead toward the establishment of a target value and could help to establish a trend over time. There can be multiple objectives for a single goal. (e.g. Meet state numeric criteria for bacteria in dry weather.)

Based on the preceding descriptions, each of the stakeholder goals is further evaluated and translated into objectives so that progress would be measurable as management options are implemented in the future.

Management Option: A management option is a technique, measure, or structural control that addresses one or more objectives (e.g., a stormwater best management practice (BMP) that is installed, an ordinance that gets passed, or an educational program that gets implemented).

Each objective is then evaluated for the identification of potential management options that could be implemented to achieve measurable progress toward the goal. This evaluative process results in a comprehensive list of potential options that will need to be individually evaluated for feasibility under the conditions of a given watershed area.

Indicator: Indicators can be used to characterize the current condition of a watershed area and can be used to measure progress toward achieving goals as management options are implemented. (e.g. Percentage of samples meeting state criteria for bacteria)

A list of indicator measures is developed to address each of the objectives so that as management options are implemented, progress can be measured toward attainment of the watershed goal.

Screening of Management Options

Clear, measurable objectives provide guidance for developing options designed to meet the watershed goals. Lists of management options are developed to meet each of the goals and objectives established for the watershed and once evaluated, only those options deemed feasible and practical are considered in the final list of management options. Options were developed and evaluated in three steps:

1. Development of a Comprehensive Options List. Virtually all options applicable in the urban environment are collected. These options are identified from a variety of sources, including other watershed plans, demonstration programs, regulatory programs, literature, and professional experience.

2. Initial Screening. Some options can be eliminated as impractical for reasons of cost, space required, or other considerations. Options that already planned and/or committed to, are mandated by another program, or are agreed upon as vital are chosen for inclusion in the final list as not needing further evaluation. The remaining options are screened for applicability to the watershed as well as for their relative cost and the degree to which they meet the project objectives. Only the most cost-effective options are considered further.

3. Detailed Evaluation of Structural Options. Structural best management practices for stormwater management are subjected to a modeling analysis as necessary to assess effects on runoff volume, peak stream velocity, and pollutant loads at various levels of coverage.

Water Quality Goal Setting Update

Planning goals were established for the Darby-Cobbs and Tookany/Tacony-Frankford Watershed Partnerships as a part of the IWMP development process. These goals are now a formal part of the IWMPs adopted by the stakeholders as representative of their long-range wishes for the watersheds. To view these goal sets, please go to www.phillyriverinfo.org and look at the Goals section of each of these completed IWMPs.

Wissahickon Creek Watershed

As documented in the FY07 Stormwater Annual Report, PWD initiated a watershed-wide goal setting process with the Wissahickon Watershed Partnership in winter/spring 2007 which resulted in a list of stakeholder goals. This list consisted of 23 stakeholder goals for the Wissahickon Creek Watershed.

As previously described, after the completion of the watershed-wide goal setting process PWD evaluated how to move forward with their planning process while the upstream portion of the watershed continues to gather data and complete a number of ongoing initiatives. PWD determined that in order to meet their own obligations and commitments that they must continue the planning process for the City of Philadelphia portion of the watershed.

PWD's stakeholder goal setting process is one that has been refined with each watershed plan undertaken. The Wissahickon Watershed Partnership established a preliminary set of 23 watershed-wide goals – of which a subset consisting of 12 goals was directly relevant to the City of Philadelphia portion of the watershed. PWD has an established a guiding set of seven "Umbrella Goals" for the IWMP process. These goals were originally established in 2002 by the Darby-Cobbs Watershed Partnership – then upheld by the Tookany/Tacony-Frankford Partnership in 2003, then adopted by the Pennypack and Poquessing River Conservation Planning processes in 2006-2008. PWD has determined that these "Umbrella Goals" because of their broadly worded nature should be utilized to guide the City's IWMP planning process, objective development and ultimately implementation commitments.

Table III.C-3 Proposed Goals and Objectives for the Philadelphia Portion of the Wissahickon Creek Integrated Watershed Management Plan

IWMP "Umbrella" Goal	Wissahickon Watershed Partnership Goal Subset for City of Philadelphia	Measurable Objectives for the City of Philadelphia to Guide Implementation Process
Water Quality and Pollutant Loads. Improve stream quality to reduce the effects on public health and aquatic life.	Protect drinking water quality	• Continue to meet requirements of the LT2ESWTR
	Protect drinking water taste and odor	• Limit geosmin concentrations to <10ng/L between April and May
	Improve and protect surface water quality	• Meet state numeric criteria for bacteria in dry weather. • Meet State Water Quality Standards for dissolved oxygen • Meet state criteria for pH at all sites and times. • Remove Wissahickon Creek from the state list of impaired waters.
	Eliminate untreated sewage discharges to Wissahickon Creek	• Eliminate cross-connections of sanitary to storm sewers. • Eliminate sanitary sewer discharges to the stream in dry weather.
Instream Flow Conditions. Reduce the impact of urbanized flow on living resources.	Improve and maintain baseflow through increased infiltration to support water quality and aquatic community health.	• Maintain average annual dry weather flow, excluding treated wastewater effluent, at a minimum average annual flow of 59 cfs at the mouth. • Reduce amount of Directly Connected Impervious Cover (DCIA) by 1%.
Streamflow and Living Resources. Improve stream habitat and integrity of aquatic life.	Restore aquatic ecosystem health	• Increase benthic quality index to 80% of reference reaches. • Increase IBI to 40 averaged at all sampling sites.
Stream Corridors. Protect and restore stream corridors, buffers, floodplains, and natural habitats including wetlands.	Reduce channel erosion and sediment loads caused by runoff	• Reduce annual sediment load from overland flow by 10%. • Reduce annual sediment load from channel erosion by 75%
	Improve aquatic habitat	• Restore X miles of stream channel and habitat such that habitat scores are X% comparable to reference conditions.
Flooding. Identify flood prone areas and decrease flooding by similar measures	Reduce the frequency and severity of damaging (out of bank) flooding	• Reduce [flooding indicator] to [value at a specific location]. • Prioritize most vulnerable areas and ensure flood mitigation planning

IWMP "Umbrella" Goal	Wissahickon Watershed Partnership Goal Subset for City of Philadelphia	Measurable Objectives for the City of Philadelphia to Guide Implementation Process
Quality of Life. Enhance community environmental quality of life.	Improve awareness of watershed issues at a local level (municipalities and stakeholders)	• Convene a watershed partnership stakeholder forum • Establish a partnership website to serve as an information resource
	Make stormwater/watershed related educational opportunities available to every stakeholder in the watershed	• Educate residents about benefits of rain barrel installation; have 10% of watershed resident install rain barrels on their homes. • Develop and implement at least 3 stormwater management/ watershed issues related workshops within each 5 year implementation planning timeline
Stewardship, Communication, and Coordination. Foster community stewardship and improve inter-municipal, inter-county, state-local, and stakeholder cooperation and coordination on a watershed basis.	Increase preparedness for natural hazards, spills, discharges and terrorism	• Obtain agreements from the 5 WWTPs and industrial users sign up as users or the Early Warning System emergency reporting phone number • Increase the amount of continuous water quality data collected from the Wissahickon Creek (Reactivation of Ft. Washington USGS gauge station) • Utilize fish biomonitoring station to assess water quality
	Increase communications within the watershed	• Create a Wissahickon Creek "event notification system" for the public

PWD will be developing an IWMP document for the City of Philadelphia portion of the Wissahickon Creek Watershed and will share this plan with the Wissahickon Watershed Partnership as a model for developing a complimentary initiative in the upstream portion of the watershed.

Pennypack Creek Watershed

In the spring of 2008, PWD initiated a watershed-wide stakeholder goal setting process for the Pennypack Creek Watershed as a part of the IWMP development process. The purpose was to derive a comprehensive watershed-wide "wish list" of goals for the watershed. These goals are not intended to be specifically measurable at this time. Upon completion of the watershed-wide goal setting process, the planning team will evaluate and translate each of them into measurable "objectives" so that progress would be assessable as management options are implemented in the future. Utilizing the input from the Pennypack Watershed Partnership, this goal setting process was designed to be inclusive of a multitude of stakeholder perspectives.

PWD staff prepared for the goal setting process by reviewing existing watershed plans and reports. Since the Pennypack Creek River Conservation Plan was recently completed (2005) and that planning initiative included a stakeholder goal setting process, the RCP goals were deemed an appropriate starting point from which stakeholders could begin evaluating for completeness. These goals along with others culled from additional existing sources such as the Pennypack Greenway Partnership's Strategic Planning process and the Pennypack stakeholder "Key Person Interviews" were synthesized into a list of broad goals and measurable objectives and shared with the watershed stakeholders for evaluation.

A diversely representative group consisting of roughly 27 stakeholders actively participated in the goal setting process. Of these, 7 participants represented municipalities within the drainage area, 2 represented nonprofit organizations, 2 represented the PADEP, 5 represented Bucks and Montgomery County agencies, 1 attended on behalf of a Pennsylvania State legislator's office, 1 represented a golf course, 2 represented local parks and 5 represented City of Philadelphia agencies. This stakeholder assemblage is currently evaluating a final "wish list" consisting of 8 broad goals for the Pennypack Creek Watershed.

Table III.C-4 Draft Pennypack Watershed Stakeholders Goals and Objectives

Habitat and Ecological Protection/Restoration • Improve Stream Habitat and Restore Aquatic Communities • Restore Ecological Integrity • Protection and enhancement of high quality sites
Stormwater Management • Improve In-stream Flow Conditions • Stormwater management planning
Improvement of Water Quality • Improve Water Quality and Reduce Pollutant Loads
Erosion Reduction • Improve and Protect Stream Corridors
Flooding • Mitigate Flooding
Open Space Preservation, Recreation and Cultural Opportunities • Enhance and Improve Recreational Opportunities • Permanently preserve land to ensure a protected greenway • Preserve cultural and historic resources • Build a Trial • Enhancement of tributary streams and mainstem of Pennypack Creek
Quality of Life • Enhance Quality of life for Watershed Residents

Stakeholders Involvement
- Improve Stewardship, Communication and Coordination among Watershed Stakeholders and Residents
- Increase understanding of, affinity for and commitment to natural systems

In the fall of 2008 the Pennypack Watershed Partnership were reconvened to approve this list of proposed goals and adopt them as representative of stakeholder goals for the watershed. These goals will be reevaluated in the winter of 2010 upon review of the PCWCCR by the watershed stakeholders. At that time goals will be prioritized and measurable objectives can be defined for each approved goal.

Poquessing Creek Watershed

The Poquessing Creek Watershed Partnership was re-convened by PWD on June 9th, 2009. At this meeting the Integrated Watershed Management Process was introduced to the stakeholders. The Partnership will be convened on the winter of 2010 in order to develop a preliminary set of stakeholder goals to guide the planning process.

Implementation Planning - Development of Target Approach for Meeting Goals and Objectives

Through PWD's experience in working with stakeholder groups in goal prioritization and option evaluation, they have learned that stakeholder priorities can at times differ from those identified by the data driven problem identification process. PWD has developed an approach that is able to address what often emerges as a set of high priority stakeholder concerns while simultaneously addressing the scientifically defined priorities. By defining three distinct "targets" to meet the overall plan objectives, priorities identified by stakeholders could be addressed simultaneously with those identified through scientific data. Two of the targets were defined so that they could be fully met through implementation of a limited set of options, while the third target would best be addressed though an adaptive management approach. In addition to the three Targets – a fourth category has been developed to capture the more programmatic implementation options related to planning, outreach, reporting, and continuation of the Watershed Partnership.

Targets are defined here as groups of objectives that each focus on a different problem related to the urban stream system. They can be thought of as different parts of the overall goal of fishable and swimmable waters through improved water quality, more natural flow patterns, and restored aquatic and riparian habitat. By defining these targets, and designing alternatives and an implementation plan to address the targets simultaneously, the plan will have a greater likelihood of success. It also will result in realizing some of the objectives within a relatively short time frame, providing positive incentive to the communities and agencies involved in the restoration, and more immediate benefits to the people living in the watershed.

PWD's IWMP planning targets are defined below:

Program Support (Planning, Outreach & Reporting)
A number of implementation options deemed appropriate for a given watershed are "programmatic" in nature. While these options may support achievement of Targets A, B, and/or C, implementation of these options alone would not result in achievement of a particular Target. These "Program Support" associated options include items such as monitoring, reporting, feasibility studies, outreach/education, and continuation of the Watershed Partnership.

Target A: Dry Weather Water Quality and Aesthetics
Streams should be aesthetically appealing (look and smell good), be accessible to the public, and be an amenity to the community. Target A was defined with a focus on trash removal and litter prevention, and the elimination of sources of sewage discharge during dry weather. Access and interaction with the stream during dry weather has the highest priority, because dry weather flows occur about 60-65% of the time during the course of a year. These are also the times when the public is most likely to be near or in contact with the stream.

Target B: Healthy Living Resources
Improvements to the number, health, and diversity of the benthic macroinvertebrate and fish species needs to focus on habitat improvement and the creation of refuges for organisms to avoid high velocities during storms. Fluvial geomorphological studies, wetland and streambank restoration/creation projects, and stream modeling should be combined with continued biological monitoring to ensure that correct procedures are implemented to increase habitat heterogeneity within the aquatic ecosystem.
Improving the ability of an urban stream to support viable habitat and fish populations focuses primarily on the elimination or remediation of the more obvious impacts of urbanization on the stream. These include loss of riparian habitat, eroding and undercut banks, scoured streambed or excessive silt deposits, channelized and armored stream sections, trash buildup, and invasive species. Thus, the primary tool to accomplish Target B is stream restoration.

Target C: Wet Weather Water Quality and Quantity
The third target is to restore water quality to meet fishable and swimmable criteria during wet weather. Improving water quality and flow conditions during and after storms is the most difficult target to meet in the urban environment. During wet weather, extreme increases in streamflow are common, accompanied by short-term changes in water quality. Target C must be approached somewhat differently from Targets A and B. Full achievement of this target means meeting all water quality standards during wet weather, as well as elimination of flood related issues. Meeting these goals will be difficult. It will be expensive and will require a long-term effort. A rational approach to achieve this target includes stepped implementation with interim goals for reducing wet weather pollutant loads and stormwater flows, along with monitoring for the efficacy of control measures.

PWD has committed to developing and executing four sequential 5-year Implementation Plans for the City of Philadelphia portion of the drainage area within each planning shed. Thus far Implementation Plans have been developed for the Cobbs and Tookany/Tacony-Frankford Watersheds (available at www.phillyriverinfo.org); the plans have matching implementation timelines, running from 2006 through 2011, and an implementation plan for the Wissahickon Creek Watershed is in development. Adaptive management will be utilized as necessary at each 5-year planning interval to ensure that progress is being achieved.

Table III.C-5 - Planning being completed in each watershed

Watershed	Preliminary Reconnaissance	Watershed Monitoring Program	River Conservation Plan	Watershed Management Plan	Implementation Commitment Status
Delaware River (tidal, non-tidal)	Monitoring Only		Initiated in 2008	Implementation plan to be developed following completion of RCP	To be developed in 2009/2010
Cobbs-Darby Creeks	2003	2003	Darby RCP completed in 2005 by Darby Creek Valley Association	Completed 2004	1st 5-year Implementation Plan developed and committed to; 2006-2011
Tacony-Frankford Creeks	2000/2001	2004	Completed in 2004	Completed 2005	1st 5-year Implementation Plan developed and committed to; 2006-2011
Pennypack Creek	2002	2007-2008	Completed in 2005	Initiated in winter 2008, to be completed by 2011	To be developed 2011
Schuylkill River (tidal, non-tidal)	Monitoring Only		Completed in 2001 by the Academy of Natural Sciences, Natural Lands Trust, and the Conservation Fund	Implementation Plan to be developed for the City of Philadelphia portion of the drainage area in 2009/2010	To be developed 2009/2010
Poquessing Creek	2001	2008-2009	Completed in 2007	To be initiated in spring 2009, scheduled for completion in 2011	To be developed 2011
Wissahickon Creek	2001	2005-2006	Completed in 2000 by FPC	Initiated in 2005, anticipated completion of planning process for City of Philadelphia portion of the watershed 2010.	1st 5-year Implementation Plan developed currently in development; it will cover time period from 2010-2015

III.C.1.1 Ordinance and Regulations Modifications - Continue to review and revise stormwater management regulations for development and redevelopment

PWD's Stormwater Management Regulations, effective January 1, 2006, provided the PWD with an opportunity to ensure development/redevelopment that protects our water resources, reduces neighborhood flooding, and improves the quality of life in our communities. The Stormwater Management Regulation is triggered by projects which involve earth disturbance 15,000 square feet or greater, infill projects which involve earth disturbance between 5,000 and 15,000 square feet, or projects which involve earth disturbance over 1 acre and require a PA DEP NPDES permit.
PWD is considering additional ways to improve and strengthen its stormwater programs during the LTCPU process by looking at reducing the minimum area to trigger the stormwater regulations to 5000 ft2

Additional incentives are being considered to further stimulate innovative stormwater designs, including:
• Fee in lieu: allowing stormwater controls to be transferred to another location if efficiency is improved
• Green permit expediting: green designs are fast tracked through the permit review process
• Evaluate the potential for linking green stormwater infrastructure to other incentives related to zoning, such as density/setback incentive bonuses for increased stormwater control beyond the minimum requirements.

Please refer to the Stormwater Management Report section "Post-Construction Stormwater Management in New Development and Redevelopment" for more information on the Stormwater Management Regulations.

III.C.1.2 Conduct workshops on LID

The Plan Review team holds weekly Plan Review walk-in hours each week on Tuesdays from 11am – 1pm. The development community is invited to discuss general and technical details about their projects. Guidance is given by PWD staff on stormwater management implementation.

III.C.1.3 Implementation of Stormwater BMPs and LID - Continue to implement best management and LID demonstration

Parcel-based Stormwater Billing

The Water Department will transition to stormwater charges among its large meter, non-residential customer base over a three year period beginning in FY 2010. This transition will result in more equitable stormwater charges that closely match the cost of managing stormwater runoff from each property. Current calculations show that the majority of large meter customers will see a reduction or otherwise minor impact on the stormwater component of their water and sewer bills. For those customers that will see noticeable increases in their stormwater fees, the department will identify opportunities on their property to decrease the amount of their impervious area and thus decrease their stormwater fees.

This text also copied under "Impervious Cover Disconnection – Evaluate the feasibility of separating the stormwater runoff from large impervious land tracts for management and direct discharge". Please refer to this section for additional information.

BMP and LID projects

Please refer to section "Target C - Wet Weather Water Quality and Quantity" of the Stormwater Report section for a listing of completed and potential BMP projects.

PWD's Land-based Program

The PWD's Land-based Program is part of a major city initiative to transform Philadelphia into one of the most sustainable cities in the country. The Land-based Program can be thought of as a series of individual programs, each targeting a different source of stormwater runoff. There are 10 key programs and associated subprograms that will be utilized to help PWD and the City of Philadelphia manage the existing impervious area.

With the development of the LTCPU, PWD will be detailing the Land-based Program and the tools that are needed to implement each program. The 10 major programs of the land-based Program are: Green Streets, Green Alleys and Driveways, Green Schools, Public Facilities, Green Parking, Public/Open Spaces, Green Homes, Green Industry, Green Businesses and Commerce, and Green Institutions.

III.C.1.4 Catch Basin Control Program - Continue to maintain the trapped inlets

The Inlet Cleaning Unit's primary responsibility is the inspection and cleaning of approximately 79,159 stormwater inlets throughout the City of Philadelphia. The group is also responsible for maintenance of inlet covers (retrieving, replacing and locking) and relieving choked inlet traps.

About 80% of inlet cleaning work orders are scheduled jobs, while the remaining 20% are in response to customer calls or requests from other departments. Scheduled cleaning routes for an area are created by the crew chief and assigned to the crews.

For the period of July 2008– June 2009, 76,366 inlets were cleaned and examined. 14,106 inlets were inspected only. In total 90,472 inlets were examined or cleaned and examined. This is an average of every inlet being examined or cleaned and examined 1.14 times during this period.

This text also copied under "Control the Discharge of Solids and Floatables by Cleaning Inlets and Catch Basins".

III.C.1.5 Impervious Cover Disconnection - Evaluate the feasibility of separating the stormwater runoff from large impervious land tracts for management and direct discharge

PWD is working to separate the stormwater runoff from large impervious land using many different approaches such as a new parcel-based stormwater billing system, plan review for development and re-development incentives, and working with PennDOT on the I95 improvements.

Parcel-based Stormwater Billing

For many years, the Water Department has recovered the costs for the operation and maintenance of its stormwater system components (pipes, storm drains, pump stations, treatment facilities, and billing) through a service charge related to our customers' water meter size. This method was considered a reasonable means to approximate the relative contribution of a property to stormwater runoff volumes since properties with larger water meters are usually larger parcels of impervious land. In 1994, the Water Department convened a diverse group of stakeholders, the Stormwater Charge Citizens Advisory Council (CAC), to make recommendations for improving the stormwater charge methodology.

The CAC recommended that the City use a formula based billing approach to more accurately calculate the relative volume of stormwater generated from a property. The CAC recommended that 80 percent of the stormwater costs be recovered based on a property's impervious area and 20 percent of the stormwater costs be based on the property's gross area. The CAC recognized that providing a detailed analysis of each of the City's 450,000 residential properties would be expensive and not provide a significant improvement in the fairness of the residential property based charge. They recommended that the City's residential properties be treated as a single parcel with total gross area and imperviousness area factors with the total cost divided among all residences. This recommendation was implemented in the FY 2002 tariff and resulted in a decrease in stormwater costs to residences and other smaller meter customers.

At the time when the FY 2002 rates were being developed, the City did not have accurate or adequate parcel information to transition from a meter based charge to a property based stormwater charge among its larger customers. Accordingly, the meter based charge was maintained to distribute the stormwater-related costs among larger customers. In early 2006, the Water Department began the process of validating the City's parcel data information with the Bureau of Revisions and Taxes (BRT) database and orthographic (impervious) information. The impervious area information was procured from the contracted flyover of the City in 2004. Water Department staff can now analyze the approximately 40,000 non-residential accounts to determine, on an individual customer basis, the stormwater runoff contribution of each large customer parcel, in order to apply the 80/20 impervious/gross area formula. This work has been completed and is available for the next rate new tariff (planned for a multi-year period beginning in FY 2010).

The Water Department will transition to stormwater charges among its large meter, non-residential customer base over a three year period beginning in FY 2010. This transition will result in more equitable stormwater charges that closely match the cost of managing stormwater runoff from each property. Current calculations show that the majority of large meter customers will see a reduction or otherwise minor impact on the stormwater component of their water and sewer bills. For those customers that will see noticeable increases in their stormwater fees, the department will identify opportunities on their property to decrease the amount of their impervious area and thus decrease their stormwater fees.

The Water Department is also evaluating properties that do not presently have a water/sewer account. These parcels generate stormwater runoff that is managed by the City and therefore should be reasonably charged for such service. Current non-customers include parking lots, utility right-of-ways, and vacant lands. Large meter customers have recognized this discrepancy and demanded these currently unbilled parcels share the cost burden of stormwater management. The Water Department is applying the same 80/20 impervious/gross area formula to these properties to identify appropriate charges. Once the identification and corresponding stormwater calculations for these parcels are complete, stormwater costs can be spread out and shared over a larger customer base, resulting in a decrease for all current customers.

The CAC also encouraged the City to provide a means for customers to ease the burden of property based stormwater charges. Customers who have the ability to decrease the amount of directly connected impervious area (hard surfaces that direct runoff to the City's sewer system) on their property may do so using any number of stormwater management practices (rain gardens, infiltration islands, porous asphalt and sidewalks, vegetated swales, green roofs). Once a property has been retrofit with any of these features, the Water Department will re-evaluate its stormwater fees based on the 80/20 impervious/gross area formula.

In addition to the data processing necessary to ensure the successful implementation of this project, PWD has ensured public outreach to potentially affected customers be made a priority. During the implementation of this project, PWD is reaching out to individual customers who will see a significant increase in the stormwater portion of their bills and offering a free site inspection and conceptual stormwater management design that, if implemented, will reduce their stormwater charge.

PWD feels that a property based stormwater management charge will result in a fair "cost of service" that provides incentives for non-residential and stormwater only customers to incorporate best management practices into their sites. In addition, all customers will be more aware of the impact they have on their environment and the importance of urban stormwater management practices.

I95 Redevelopment

PennDOT is in the midst of a long-term, multi-phase initiative to improve and rebuild I-95 in Philadelphia which includes reconstructing and widening miles of pavement, and reconfiguring most of the interchanges from I-676/Vine Street through Academy Road. The I-95 reconstruction offers an opportunity to reconfigure stormwater facilities along the Delaware River Waterfront and could play a major role in reducing stormwater volumes. Separating the highway runoff from the existing combined sewers and discharging it to the Delaware River in compliance with the stormwater regulations can effectively remove this category of impervious cover from the combined sewers. PWD is currently working with PennDOT on how they will manage the stormwater on the 5 upcoming proposed construction projects: Section CPR - Cottman Avenue - Princeton Avenue Interchange, Section BSR - Cottman Avenue through Bridge Street, Section BRI - Bridge Street Interchange through the Betsy Ross Bridge Interchange, Section AFC - Betsy Ross Bridge Interchange to Allegheny Avenue, and Section GIR - Allegheny Avenue through Girard Avenue Interchange.

Plan Review

Under Philadelphia's new stormwater management regulations, development and redevelopment is helping to significantly reduce the amount of directly-connected impervious cover.

Please refer to the Stormwater Management Annual Report section "Post-Construction Stormwater Management in New Development and Redevelopment" for more information on PWD's Plan Review work.

III.C.1.6 Reforestation - Work to implement reforestation demonstration projects to provide additional tree canopy

BMP Projects

The OOW is actively involved in numerous projects throughout the city that are increasing the urban tree canopy. These projects include planting street trees, installing stormwater management tree trenches, constructing vegetated bioswales, and other plantings. Current projects that are completed or in progress include Baltimore Avenue, Union Hill, Rittenhouse Square, Waterview Recreation Center, West Mill Creek, 47th and Gray's Ferry, and Columbus Square. Many similar projects are currently in the planning stage including Blue Bell Triangle, Liberty Lands, Passyunk and 28th, 61st, and 63rd, Queen Lane, and Belmont treatment plant.

Tree Planting

OOW has facilitated the planting of trees in the City of Philadelphia through various projects including 10 trees through Belmont Goose Project , 13 trees through Mill Creek Watershed Redevelopment Phase II, 377 trees for the Marshall Road Stream Restoration Project, 53 trees for the 7th and Cheltenham Restoration, 36 trees at Turner Middle School, and 15 trees at Mitchell Elementary School.

We have also contributed to tree planting occurring outside the City of Philadelphia but within our watershed boundaries. In the Schuylkill watershed, 320 native trees and shrubs were planted at Springford High School, 270 native trees and shrubs at Brookside Country Club, and 300 native trees and shrubs at Upper Perkiomen High School under the Targeted Watershed Grant Program.

PWD also provides support for tree plantings, such as supplying University City Green and others with 100 shovels for volunteer plantings.

One upcoming project is the development of a tree nursery. This will transform a site that covers approximately 11 city lots into an urban tree nursery. The tree nursery will use innovative stormwater management techniques to create an aesthetic and environmentally sound model that has prospects for long term care and maintenance. The vision is that matured trees are sold and planted throughout the neighborhood and along the proposed greenway or sold to city agencies/non-profits for the purposes of tree restoration in city parks.

The current city administration has adopted a goal of increasing urban tree canopy to 30% which is equal to planting an additional 1.5 million trees city wide. This is a goal the PWD supports and will facilitate as possible.

Tree Vitalize

PWD is an active partner and supporter of the Tree Vitalize program. Tree Vitalize was developed by the Pennsylvania Department of Conservation and Natural Resources to increase the tree canopy in the five county Philadelphia area. Tree Vitalize partners with numerous community groups throughout this area in order to work toward planting trees in neighborhoods lacking sufficient tree canopy.

III.C.2 WATER: Ecosystem Restoration and Aesthetics

III.C.2.1 Waterways Restoration Team - Continue the assignment of a dedicated clean-up team to remove cars, shopping carts, and other debris, from CSO receiving waters

PWD's Waterways Restoration Team (WRT) is a multi-crew force 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 also restores eroded streambanks and streambeds around outfall pipes and in tributaries as a part of

PWD's goal to naturally restore our streams while meeting Clean Water Act permit requirements. The team is focused on the completion of in-stream restoration work that protects the department's sewer infrastructure in the banks and beds of our streams, while also using Natural Stream Channel Design to restore these streams to a habitat supporting waterway and a community amenity. The Waterways Restoration Team works in partnership with the FPC staff and the various Friends of the Parks groups to maximize resources and the positive impacts to our communities. From July 2008 – June 2009, the team removed approximately 658 tons of debris from our waterways, debris which includes cars and car parts, appliances, shopping carts and tires.

This text also copied under "Continue to Fund and Operate the Waterways Restoration Team (WRT)". Please refer to this section for additional information on the Waterways Restoration Team.

III.C.2.2 Waterways Restoration Team - Evaluate the capabilities of this crew in performing minor stream bank and bed repair around outfall pipes and to remove debris at these outfalls

In addition to PWD's Waterways Restoration Team's main task of removing large debris from the city's streams, this crew works to restore eroded stream banks and streambeds around outfall pipes and in tributaries that protects the department's sewer infrastructure in the banks and beds of our streams. Types of projects that the team works on are plunge pool removals, fish passage projects, emergency stream bank restorations and interim stabilization projects. **TABLE III.C-6** shows a listing of projects that WRT has completed to date.

Please refer to "Continue to Fund and Operate the Waterways Restoration Team (WRT)" for more information on the Waterways Restoration Team.

Table III.C-6 WRT restoration projects completed or planned as of September 2009

Project	**Watershed**	**Constructed by WRU**	**Status**	**Description**
Current Projects				
PP Rock Ramp	PP	Yes	Complete	Fish passage project;
Indian Creek	CC	Yes	Complete	Interim stabilization completed by WRU; future restoration project to be completed by a contractor
Wises Mill Run	WS	Yes	Complete	Lower segment; interim stabilization
Gorgas Run	WS	Yes	Complete	Interim stabilization; infrastructure protection with boulders
Byberry Creek	PQ	No	Complete	Monitoring of Byberry at Waldermere Dr
Crescentville Outfall	TTF	Yes	Complete	Plunge pool removal and culvert restoration with boulders
Maxwell Place Outfall	PP	Yes	Complete	Plunge pool removal

Adams Ave Fish Ramp	TTF	Yes	Complete	Fish passage project
Awbury Stream Daylighting	TTF	Yes	Complete	Phase I included development of a bioswale and daylighting of a spring/stream
Bingham Street Sewer Crossing	TTF	Yes	Complete	Plunge pool removal
CC Creek 61st Street Repair	CC	Yes	Complete	Emergency streambank restoration after a sewer line rupture
Marshall Road Restoration Work	CC		Complete	Stream restoration where erosion had exposed a sanitary sewer lateral
Future Projects				
Carpenters Woods	WS	Yes	Complete	Stormwater outfall restoration; 3 outfalls discharge to one location creating severe erosion
Winchester Outfall	PP	Yes	Complete	Plunge pool removal and tributary restoration. The design is now complete and the WRU will begin work in fall 2008
Awbury Wetland	TTF	Yes (future)	In Design	Phase II will include a wetland/pond restoration
FPC Tree House	WS	Yes (future)	In Design	A number of SW BMPs will be implemented at the Andorra Education Center where a good deal of erosion is taking place on the property
Hower Creek (Formerly called Martin's Creek)	PP	Yes (future)	In Design	Outfall Restoration and additional restoration of ~300 feet of stream where there has been chronic erosion.
Kelly Drive at Strawberry Mansion "Canoe House"	SCH	Yes (future)	In Design	East Park Canoe House – installation of a deflector for the dock that will also provide fish habitat
NEC Ditman & Eden	PQ	No	Complete	Outfall Restoration and stabilization
Rex Ave	WS	No	In Design	WRU has built a rock wall along the stream to stabilize and protect it; future restoration project to be completed by a contractor
St Martin's Lane Bridge	WS	No	In Design	A bridge is in disrepair, needs stabilization.
Tustin Street Outfall Restoration	PP	No	In Design	Outfall restoration project. WRU performed interim stabilization work on exposed interceptor but further creak stabilization is to come.
George's Lane	WS	No	In Design	Culvert restoration

III.C.2.3 Stream Habitat Restoration - Propose and implement demonstration projects to address habitat degradation by engineering the stream channels to modern day flows and directly reconstructing the aquatic habitat

Cobbs Creek Stream Restoration

In 2008, PWD contracted with the joint venture team of Biohabitats and O'Brien & Gere to guide the long-term vision of aquatic ecological restoration work planned in the Cobbs Creek Watershed. Over the next 20 years, PWD intends to implement natural stream channel and wetland design work along the main stem of the Cobbs Creek within the City of Philadelphia. Anticipated benefits of this riparian corridor restoration are reduced stream bank erosion, decreased channel deposition and scour, and restoration of the natural functions of aquatic habitat and ecosystems.

The joint venture team has been contracted to implement the assessment and project feasibility phase of the plan. This phase includes a review of existing data, targeted field work, and conceptual design of approximately 1 mile of stream. Upon completion of this work in 2009, PWD expects to move forward with the full design process on this reach of stream and associated riparian corridor.

Tacony Creek Stream Restoration

In 2008, PWD contracted with the Stantec to guide the long-term vision of aquatic ecological restoration work planned in the Tacony Creek Watershed. Over the next 20 years, PWD intends to implement natural stream channel and wetland design work along the main stem of the Tacony Creek within the City of Philadelphia. Anticipated benefits of this riparian corridor restoration are reduced stream bank erosion, decreased channel deposition and scour, and restoration of the natural functions of aquatic habitat and ecosystems.

Stantec has been contracted to implement the assessment and project feasibility phase of the plan. This phase shall include a review of existing data, targeted field work, and conceptual design work resulting in approximately 20 potential projects including wetland creation, stream restoration, fish passages, and other associated water quality BMPs. Upon completion of this work in 2009, PWD expects to move forward with the full design process on those projects that are deemed to be most advantageous by the Design Team.

Other Stream Restorations

PWD is currently employing natural stream channel design (NSCD) and associated stormwater management BMPs 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 in several ways, including the reconstruction of stream geometry to accommodate present day flows, reestablishing stream 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. These techniques are being 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 stream restoration projects carried out by PWD will hopefully demonstrate to neighboring communities the environmental benefits of NSCD.

Please refer to the Stormwater Management Annual Report section "Natural Stream Channel Design (NSCD)" for more information on these stream restoration projects.

III.C.2.4 Wetland Enhancement and Construction - Propose and implement wetland enhancement and construction projects to remove pollutants, mitigate peak flow rates, reduce runoff volume, and provide considerable aesthetic, and wildlife benefits

Saylor Grove Wetland in Wissahickon Watershed

A one-acre stormwater wetland was constructed in the fall of 2005 on a parcel of Fairmount Park known as Saylor Grove. The wetland is designed to treat a portion of the 70 million gallons of stormwater generated in the 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 Wissahickon Watershed.

During the FY 2009 reporting period, PWD resurveyed the Saylor Grove to determine the amount of sedimentation taking place within the facility. Approximately 22,000 cubic feet of material accumulated within the first two and a half years since construction. In addition, invasive plant species have colonized within the facility. During the FY 2010 reporting period, PWD plans to dredge portions of the stormwater wetland to maintain full operational potential. Invasive species management will be conducted in partnership with the Fairmount Park. PWD hopes to monitor water levels in the facility during runoff events in order to develop a calibrated stormwater runoff model for Saylor Grove Wetland.

Wises Mill Wetland in Wissahickon Watershed

The Wises Mill Run watershed consists of a 92 acre southern portion and a 169 acre northern portion that merge just north of Wises Mill Road before meeting the Wissahickon Creek. Both branches are negatively affected by urbanization and large storm events. Severe entrenchment has occurred in both branches and excessive amounts of sediment have been transported to the Wissahickon Creek. This project aims to reduce flows entering the southern branch by the creation of a stormwater treatment wetland. Overall, sediment erosion will be reduced and aquatic and macroinvertebrate life will be improved.

During the FY 2009 reporting period, PWD moved toward final design plans and specifications for this project. During FY 2010, PWD expects to bid and construct the Wises Mill Wetland project pending permits from the PADEP and USACE.

Cathedral Run Stormwater Wetland

Cathedral Run is a 1st order tributary to Wissahickon Creek. The stream originates from springs downstream of Courtesy Stables near the intersection of Cathedral and Glen Campbell Roads. PWD is designing a stormwater treatment wetland just west of the current location of outfall W-076-01. The wetland will be located in a natural depression area, approximately one acre in size. The project will provide more than 94,445 cf of storage and will substantially reduce flows to an impaired reach of Cathedral Run. During dry weather, the facility will provide one acre of valuable wet meadow habitat.

Watershed Mitigation Registry

Since 1997, the City of Philadelphia has invested millions of dollars in creating watershed management plans to advance the restoration of riparian environmental resources. Planning work is also being conducted to identify stream and wetland enhancement opportunities, which are compiled into a Watershed Mitigation Registry.

Philadelphia's Watershed Mitigation Registry takes a watershed approach to aquatic resource protection by considering the entire riparian system and its ecosystems as interdependent. This approach is consistent with federal guidelines for wetlands mitigation. Implementation of projects organized within a comprehensive watershed management framework help achieve greater environmental benefit at reduced cost by addressing environmental, regulatory, and local community concerns in an integrated fashion.

The project registry is designed to function in a similar manner to wetland mitigation banks, with important differences. Unlike mitigation banks that consist of completed wetland projects ready for purchase, the mitigation registry presents conceptual plans for projects ready to be designed and constructed. These plans encompass a range of riparian corridor improvements, including new and restored aquatic habitats, streambanks, wetlands, and flood and stormwater management. Although much research has been conducted to characterize the relative effectiveness of different wetlands types at performing a range of different environmental functions, no single method provides a technique for assessing the effectiveness of riparian corridor improvements to mitigate impacted wetlands.

Presently, the registry includes over 200 targeted stream and wetland improvement locations in the Philadelphia area. These targeted areas include potential stream restoration, stream daylighting, wetland enhancement/creation, and fish passage projects.

During FY 2009, PWD worked with multiple interested parties on the implementation of projects at some of the registry locations. For the most part, these parties represented developers with wetland mitigation needs for their projects based on permit requirements imposed by USACE and PADEP. During FY 2010, PWD will continue to work with applicants in need of wetland/stream mitigation projects. In addition, PWD will investigate the potential for a more formal wetland/stream mitigation program that is recognized by USACE, PADEP, and other regulatory bodies.

Tidal Schuylkill Wetland Restoration

Historically, freshwater tidal wetlands extended from Trenton, New Jersey to Chester, Pennsylvania, but urbanization has reduced the area by 95%, with only small remnants of freshwater tidal wetlands on the Pennsylvania side of the Delaware River. Approximately 76% of the land area surrounding the tidal portion of the Schuylkill River is urban or residential. The banks along the lower reach, from the Delaware River confluence to stream mile 5, are dominated by industrial uses such as oil refineries. Continuing upstream, the River runs though Center City Philadelphia, a heavily developed area. The tidal Schuylkill is impacted by urban runoff, industrial sources, and combined sewer overflows.

Wetlands are essential habitat highly utilized by fish for foraging, nesting, spawning, and refuge from predators or environmental extremes (i.e. temperature). Particularly for migratory fish, wetlands play an important role in establishing a safe and productive migratory corridor to and from spawning grounds. Tidal freshwater wetlands are also important habitat for migratory birds and waterfowl. The Philadelphia area is within the Atlantic Flyway and important during both northbound and southbound migrations.

PWD assessed the tidal Schuylkill River for existing wetland areas and potential wetland restoration areas in October 2006. One existing wetland area (0.5 acre) and 13 wetland restoration areas (29.2 acres) were identified and mapped. The area between the Mingo Creek surge basin and the main channel of the Schuylkill River ranked first priority for wetland restoration.

The project area was surveyed in May and October 2007 in order to identify and delineate suitable planting areas. A staff gage was installed at that time and monitored during a tidal period to estimate maximum and minimum water depths. A planting plan was created based on maximum water levels and land ownership. Only the portion of the site owned by the City of Philadelphia was considered for planting. Grazing by Canadian geese was considered a barrier to a successful planting and goose exclusion fence was installed in 16ft grids in an attempt to overcome this issue.

PWD was awarded a grant from National Fish and Wildlife Foundation through the Delaware Estuary Watershed Grants Program for a sum of $21,000. The grant funded the purchase of vegetation native to the Philadelphia area as well as goose exclusion fence and other necessary supplies.

The project area was planted by PWD staff in May and June 2008. Vegetation chosen for the site includes: spatterdock (Nuphar advena/lutea), pickerelweed (Pontederia cordata), duck potato (Sagittaria latifolia), and arrow arum (Peltandra virginica). Monitoring of the area will be carried out twice a month through August 2008 and then will be reduced to once a month, during the growing season, through 2011.

During the initial monitoring period, it became evident that grazing was still a major factor influencing the early growth and establishment of the selected vegetation. A compounding stressor to plant persistence was the height of tide in the area. The plants chosen for the site were not able to thrive in the extremes of water cover in the planting area. Some species (e.g., , Spatterdock) demonstrated a weak growth form that resulted in leggy open foliage as opposed to the tight clumping growth seen in lower tidal portions of the Schuylkill and Delaware Rivers. Foliage that did not suffer from stunted growth was heavily grazed by waterfowl and perhaps fish and reptiles. This grazing occurred despite the installation of a protective fence. Another significant impediment to the establishment of an emergent plant community was the presence of flotsam carried in by the tide and during periods of high flow. This material, some of it quite large, destroyed both the protective fencing and the associated vegetation. It is noteworthy that some of the fenced areas did in fact thrive after a top cover of fishing line and string were installed over the plants. This top cover minimized the impacts from birds and assisted with the re-establishment of certain plant species prior to winter die-off.

The second phase of the suitability study was contingent upon the relative success of any remaining emergent vegetation becoming established after the first growing season. Unfortunately, the entire planting area was obliterated by flotsam that had accumulated during the winter period. The planting grids were essentially scoured away by large debris. Only a few remnant posts were left in place. All of the fence material was eliminated and a majority of the posts that held the fence were either missing or driven deeply into the substrate. Visual inspections revealed that none of the plantings persisted through the second season.

It is apparent that the persistence and stability of submersed and emergent plant communities within the tidal reaches of the Schuylkill River is highly predicated on the establishment of a stable and well-defined system of protective measures that can attenuate tidal influences, minimize wave action and deflect large heavy objects. The current study reinforces this theory that without these measures, establishment of an intertidal wetland community is not feasible.

III.C.2.5 Fish Passage Projects - Evaluate the benefits of projects that improve migratory fish passage in a manner consistent with the watershed management plans

Fish Passage on Cobbs Creek

The PWD is investigating the option of a project to create fish passage on the Cobbs Creek. The purpose of the Cobbs Creek fish passage restoration project would be to investigate, select, design, and construct the best alternative to reestablish fish passage on Cobbs Creek. Two small dams represent opportunities to improve fish passage on Cobbs Creek. The lower dam, Woodland Dam, located close to the Cobbs Creek Parkway and Woodland Avenue, is the first impediment to fish passage on Cobbs Creek. It is a low concrete structure below which the creek is tidal. The upper dam, Millbourne Dam, situated on Cobbs Creek near 65th and Race Streets, is a rock structure. Both dams are owned by the City of Philadelphia's Fairmount Park. In August 2009, PWD entered into a design agreement with USACE to develop a fish passage solution at the Woodland Dam. Over the next year, the project team will evaluate the feasibility of dam removal, partial dam removal, fish ladder, and rock ramp fish passage alternatives at the project site. Once a permitted design solution is developed, PWD hopes to enter into a construction agreement with USACE, such that this project may be brought to fruition.

PWD Sanitary Line Natural Rock Ramp Fishway

After Frankford and Rhawn St. dam remnants were removed in 2006, the downstream-most obstruction to anadromous fish passage in Pennypack Creek Watershed was a PWD sanitary sewer line approximately 450m upstream of the former Frankford Ave. dam. Because this is an active sewer line that would be expensive to relocate, a rock ramp fishway was constructed in 2007 to raise the water surface elevation and provide fish passage at this site (**FIGURE III.C-1**).

PWD has completed phase 1 of the physical monitoring activities planned for the rock ramp. A stream gage has been installed to record stream stage which will be correlated to the nearby Rhawn St. USGS gage station. A detailed post-construction survey of the rock ramp is underway in order to support a River 2D hydraulic model of the rock ramp. Preliminary work has shown that a very high spatial resolution of survey points is required to accurately model the effects of the individual boulders in the rock arches with River 2D, so additional surveys and alternative modeling approaches are being evaluated. PWD hopes to estimate velocities within the rock ramp at varying flow conditions and compare physical conditions to fish swimming capabilities.

PWD has also conducted rapid, non-quantitative fish surveys in the tidal Pennypack Creek by boat and tote barge electrofishing since 2006. While a small number of anadromous and semi-migratory fish species have been collected, there is thus far no evidence of a spawning run of Hickory shad having been established in Pennypack Creek. It is possible that Hickory shad fry stocked in Pennypack Creek have failed to "imprint" on Pennypack Creek and have joined Delaware River Runs, though thus far no otolith-tagged fish released in Pennypack Creek have been collected from either the

Delaware River or major tributaries where collection and subsequent tag verification is performed by PFBC. It is also possible that Hickory shad fry are not surviving to maturity. Hickory shad are stocked at a much earlier phase of development than American shad and thus may be more susceptible to mortality, whether due to predation, lack of appropriate food, poor water quality, or physical habitat factors.

Figure III.C-1 Photo of the Pennypack Rock Ramp

Fairmount Fish Ladder

The Fairmount Dam fishway is situated within the Philadelphia City limits on Fairmount Park property. Completed in 1979, the fish ladder was constructed on the western side of the Fairmount Dam. The fish ladder has been maintained largely by the voluntary efforts of the Friends of the Fairmount Fish Ladder. Effects of time and natural forces damaged the fish ladder and the degradations severely limited the ladder's efficiency at passing migratory fish species.

In 2002, PWD partnered with the Philadelphia District, U.S. Army Corps of Engineers, to improve and revitalize the Fairmount Dam Fishway, pursuant to Section 1135 of the Water Resources Development Act of 1986. During 2003, PWD entered into an agreement with Alden Research Laboratories to model the current hydrologic conditions within the fishway and provide model alternatives based on expertise from the United States Fish and Wildlife Service. Between 2003 and 2005, scientists and engineers from USACE completed final designs for the fishway restoration project, including the creation of an outdoor educational area adjacent to the fishway.

In March 2008, ABC Construction began staging for the preliminary construction phase of the project and on May 18th 2009, PWD and partners on the project celebrated the completion of this restoration project. Structural modifications, increased attraction flow, and real-time monitoring capabilities have been incorporated into the new design.

Moreover, an intensive biomonitoring strategy and educational outreach program have been implemented to estimate populations, assess fish passage efficiency by migratory and resident species, and to increase public involvement and awareness.

III.C.2.6 Riparian Buffer Creation and Enhancement - Continue programs for the restoration and protection of the natural lands that buffer each of the area waterways to reduce pollution, prevent erosion of the banks, provide wildlife food and cover, and shade the adjacent water, moderating temperatures for aquatic species

Environment, Stewardship & Education Division

The Philadelphia Water Department continues to support the Environment, Stewardship & Education Division of the Fairmount Park Commission, which undertakes a broad range of environmental restoration activities throughout the park system. These activities occur primarily on the 5,600 acres of natural lands in the system's seven largest watershed and estuary parks. These are Poquessing Creek, Pennypack, Tacony Creek, Wissahickon Valley, Fairmount (East/West), Cobbs Creek and Franklin Delano Roosevelt parks.

The restoration activities include:

– Controlling and removing exotic invasive plants and replacing them with species native to Philadelphia County.

– Increasing the density and diversity of native plants in riparian zones, forests and other areas.

– Converting mown lawn to meadows where the lawn is not currently used for active recreation.

– Managing meadows, including periodic mowing to control tree growth.

– Constructing new and restoring/expanding existing wetlands.

– Removing or modifying existing dams.

– Restoring eroded/degraded stream channels and stabilizing streambanks using bioengineering techniques.

– Repairing and stabilizing erosion gullies on forested slopes.

– Constructing berms, diversions, grassed waterways, infiltration trenches and filter strips to control stormflow from impervious services and mown areas.

– Controlling access to reduce trash dumping and damage by vehicles.

Riparian Buffer component of Stream Restorations

Riparian buffer enhancement will be included in all stream restorations that are completed. Typically, riparian buffer enhancement activity includes invasive species management, live-stake planting, tree and shrub planting, and native seed mix application. Invasive species management usually begins one to two years prior to construction. Once the construction of the stream restoration project is complete, the landscaping plan is implemented which includes all of the applications mentioned above.

Please refer to "Stream Habitat Restoration – Propose and implement demonstration projects to address habitat degradation by engineering the stream channels to modern day flows and directly reconstructing the aquatic habitat" for more information on stream restoration projects.

Please refer to "Wetland Enhancement and Construction – Propose and implement wetland enhancement and construction projects to remove pollutants, mitigate peak flow rates, reduce runoff volume, and provide considerable aesthetic, and wildlife benefits" for more information on how riparian buffer projects will be included in the Watershed Mitigation Registry.

WRT projects

In addition to PWD's Waterways Restoration Team's main task of removing large debris from the city's streams, this crew works to restore eroded stream banks and streambeds around outfall pipes and in tributaries that protects the department's sewer infrastructure in the banks and beds of our streams. Types of projects that the team works on are plunge pool removals, fish passage projects, emergency stream bank restorations and interim stabilization projects. Table III.B-7 shows a listing of projects that WRT has completed to date.

Please refer to section "Waterways Restoration Team - Evaluate the capabilities of this crew in performing minor stream bank and bed repair around outfall pipes and to remove debris at these outfalls" for more information on any riparian buffer component of projects the WRT is completing.

III.C.3 Other Watershed Projects

III.C.3.1 River Conservation Plan - Continue to work in partnership with local partners to complete and implement River Conservation Plans (RCPs)

Darby Creek RCP

A River Conservation Plan was completed by the Darby Creek Valley Association (DCVA) for the Darby Creek watershed drainage area in 2005.

Tacony-Frankford RCP

The Tacony-Frankford River Conservation Plan (RCP) is a holistic plan to improve the Tacony-Frankford watershed. It is developed through a collaborative process of local organizations and residents, and addresses various types of projects that will make the watershed a better place to live. It addresses history, water quality, culture, art, parks, trails, youth education, municipal education, and more.

The goal is to create a grassroots driven watershed conservation plan. The plan reflects the character of the watershed and the issues and concerns of the residents of the watershed. The planning process also creates or enhances partnership possibilities among plan participants.

The RCP was completed in July of 2004.

Pennypack RCP

The Pennypack Partnership developed a request for proposals for a consultant to lead the data collection and public outreach components of the plan, under the guidance of the RCP team. The consultant F.X. Browne, Inc. was selected to oversee both the data collection and public outreach components of the RCP and began this work in the Fall 2003. In January 2004, the first RCP Steering Committee took place and a public outreach schedule and suggested public workshops were discussed and planned for the spring. In 2005, a number of public outreach and education events took place, including:

– April 2005 Stream Restoration Workshop

– April 2005 Watershed Friendly Homeowners Workshop

– September 2005 Fish Shocking Demo on Pennypack and presentation of draft plan

– September 2005 Presentation of draft plan at Pennypack Trust Ecological Restoration Plant Sale

– October 2005 Presentation of draft plan at Montco Trout Unlimited

– October 2005 Presentation of draft plant at annual Applefest Celebration at Fox Chase Farms

The RCP Plan was completed in December 2005. Work to implement some of its recommendations will continue into the future and will act as a platform for the development of a watershed management plan.

Poquessing RCP

The final Poquessing Creek Watershed River Conservation Plan (RCP) was completed in July 2007. The final RCP report was submitted to the Department of Conservation and Natural Resources in the winter of 2007 to be considered for the Pennsylvania Rivers Registry.

Prior to the completion of the 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 subsequently placed in the 2008 Poquessing RCP Calendar, which was developed by the RCP Team in the fall of 2007 as an additional outreach tool. The calendar includes the recommendations 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.

The following public meetings/events took place in the last phase of the RCP, in the spring of 2007:

– RCP Public Meeting #2/ History of Watershed Presentation
April 5, 2007
Community College of Philadelphia, Philadelphia

– RCP Public Meeting #3/Land Management Workshop
April 25, 2007
Community College of Philadelphia, Philadelphia

– RCP Public Meeting #4/Native Plants Workshop & Rain Barrel Workshop
May 5, 2007
Academy Ave. & Torrey Road, Philadelphia

The following steering committee meetings took place in the last phase of the RCP:

– Steering Committee Meeting #7
February 7, 2007
Glen Foerd Mansion, Philadelphia

– Steering Committee Meeting #8
July 10, 2007
Glen Foerd Mansion, Philadelphia

A Backyard Buffer presentation was presented to the Friends of Poquessing on June 5, 2008 at the Community College of Philadelphia.

Delaware Direct RCP

In the spring of 2007, consultants formerly Cahill Associates and currently CH2M Hill, along with the Pennsylvania Horticultural Society were hired by Philadelphia Water Department to lead the Delaware Direct RCP. 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 more of an emphasis on the implementation of the Philadelphia GreenPlan recommendations. The data collection and public participation commenced in the fall of 2007. The final report is expected to be submitted in the summer of 2009.

Delaware Direct Watershed River Conservation Plan meetings and events to date:

Steering Committee Meeting #1
- November 15, 2007
- Pennsylvania Horticultural Society

Steering Committee Meeting #2
- February 20, 2008
- Pennsylvania Horticultural Society

Focus Group/Workshop #1: Ecology and Riverfront Design – Case Study Pulaski Park
- April 30, 2008
- Pennsylvania Horticultural Society

Focus Group/Workshop #2: The Built Environment – Advanced Parking Lot Design
- June 4, 2008
- Independent Seaport Museum

Focus Group/Workshop #3: Mobility and Connections
- July 31, 2008
- Penn Treaty Park

Focus Group/Workshop #4: Healthy Neighborhoods
- December 3, 2008
- Center for Architecture

III.C.3.2 Watershed Information Center - Create a website to serve as a Watershed Information and Technology Center

OOW is in the process of developing a new website, www.phillywatersheds.org, that will replace the existing www.Phillyriverinfo.org and act as a hub for all of the related OOW and partnership websites. The website will feature updates from all of the sub departments of OOW, educational tools, public meeting records, maps, as well as all of the existing data and reports currently available on Phillyriverinfo.org. Phillyriverinfo.org functioned as the main website for OOW through 2008 and will continue to fill that role until the new website is ready.

One new aspect of the website that is being developed is interactive mapping. These maps are based off of the freely available Google Maps API. It allows for the dynamic loading of geographically referenced data that can be viewed with a user-friendly interface. Each group within OOW will have a base map featuring selected data representative of their focus, allowing for greater disbursement of information to the public.

One of the main uses of the mapping system is the Combined Sewer Overflow Public Notification System, known as CSOcast. CSOcast shows CSO outfall overflow information that is retrieved from PWD's sewer monitoring network. The map is available 24 hours a day and displays the most up-to-date data available. A SWMM model was added to the CSOcast system to function as a check for the sewer monitoring data.

The first pilot section of the new website to launch was the Rain Barrel Workshop site. This site allows citizens to register for PWD's rain barrel workshops and to find out more information about rain barrels. It also features a map showing the locations of the all the rain barrels that have been given out through the workshop program. The site has been used successfully for numerous workshops and has received great feedback from the community.

This text also copied under "Continue to Maintain Watershed Management and Source Water Protection Partnership Websites". Please refer to this section for additional information on PWD's Watershed Information Center.

III.C.3.3 Integrated Water Use Status Networks - Pilot a communication and water quality monitoring network that supports the identification and analysis of water quality events

PWD has two communication and water quality monitoring networks. One system, Rivercast, supports the identification and analysis of water quality events to support water use status decisions (swimming, triathlons, rowing, etc.) and makes this information available in real time to the public. The other system, Early Warning System, is used to monitor water quality and notify water systems about such events as hazardous substance spills or sudden changes in water quality.

Philly Rivercast (phillyrivercast.org) is an online forecast system that predicts Schuylkill River quality in the area upstream of Fairmount Dam in Philadelphia. Rivercast has received over 200,000 hits since its release in June 2005. PWD staff checks Rivercast daily to ensure the rating is displayed correctly. PWD staff also responds to questions from Rivercast users.

The Early Warning System (EWS) is a web and telephone system that facilitates communication among water suppliers and industrial intakes of spills and other incidents in the lower Delaware watershed. Enhancements during the reporting period included integrating industrial users with intakes into the EWS partnership, and designing an industrial user fee based on withdrawal and position in the watershed. The City of Philadelphia Office of Emergency Management (OEM) became an EWS member as part of a pilot expansion of the EWS partnership to include county OEMs. Read-only user functionality was created for OEM membership.

The Spill Model Analysis Tool environment was designed for users to create spill scenarios without generating an event. This effort included incorporating the National Hydrologic Data stream network into all EWS mapping functionality resulting in more accurate calculations of spill paths and travel times.

Other changes included creating a simplified event report, making it easier for users to supply hazard information; adding a confidentiality disclaimer to all emails generated by the EWS; and adding telephone testing to existing administrator tools and allowing users to subscribe or unsubscribe to telephone notifications generated by test events.

Applications were filed for two projects under the FY2008 Port Security Grant Program. One would support the development of a tidal spill model for the Delaware River; the other would support the programming changes required to switch the EWS GIS infrastructure to ESRI ArcGIS.

This text also copied under "Continue to Maintain Watershed Management and Source Water Protection Partnership Websites".

III.C.3.4 Integrated Water Use Status Networks - Evaluate the technical and fiscal needs to expand the network into additional receiving waters where recreational uses are taking place.

In order to expand RiverCast, the PWD has developed another internet-based notification system called CSOcast, which reports on the overflow status of outfalls in every CSO shed. The purpose of this notification system is to alert the public of possible CSOs from Philadelphia's combined sewer system outfalls. When a combined sewer outfall is overflowing, and up to a period of 24 hours following a rainfall event, it is unsafe to recreate in the water body due to possible pollutant contamination. The data on the website is updated daily.

Instead of using water quality parameters to forecast conditions, CSOcast relies on a network of flow sensors throughout the city to notify the public when overflows are occurring. This public notification system is based on PWD analysis of monitoring network data which is used to determine the likelihood of combined sewer overflows. The PWD has maintained an extensive permanent monitoring network since 1995 including level sensors which record data throughout the combined sewer system. PWD currently operates and maintains monitoring equipment at, or near, the 164 combined sewer outfalls throughout the city.

The Philadelphia Combined Sewer Overflow Public Notification System is a pilot program. The PWD is constantly updating and improving the notification system as well as the flow monitoring network in order to deliver the best information possible to the public.

This text also copied under "Expand the Internet-based Notification System (Rivercast) to the Tidal Section of the Lower Schuylkill River".

III.C.3.5 Interpretive Signage - Continue to implement interpretive signage

CSO Outfall Signage

The CSO signage project was initiated to inform the public of the potential hazards of contact with the stream during combined sewer overflow events. The signs, placed at outfalls that are accessible by the public, let people know that during wet weather it is possible for polluted water to flow from the outfall and that it would be hazardous to their health to contact the water during such events. It also requests that the Water Department is informed of any overflows during dry weather and provides an emergency contact number.

The CSO signage project was a pilot project aimed at determining if outfall signage was a feasible way to accomplish public notification of combined sewer overflows. The PWD, in conjunction with the Fairmount Park Commission, installed 13 signs at CSO outfalls throughout the city. Locations for placement of these signs were selected based on factors such as high visibility, known recreational areas, and volume of the combined sewer overflow. Installation of the CSO signage was done in summer 2007 and a follow-up survey of the signage sites was completed in October 2007. During this survey, each of the CSO signage sites was visited and photos were taken to confirm the status of the signs that were installed. Survey of the sites determined that several of the signs were removed or vandalized. Of the 13 signs that were installed, 5 were vandalized or removed during the short amount of time between installation and the survey.

Although signage is seen as a simple, low-cost, visual way to raise awareness of combined sewer outfalls, this pilot project has highlighted the difficulties in using signage as a public notification system in Philadelphia due to the poor durability of the signs in the field.

In 2008, a billstuffer was included in all PWD bills on the CSO Signage Public Notification project as well as answering additional questions such as '*What is a Combined Sewer Overflow (CSO)?*', '*What is the goal of the Signage Program?*', '*Can I swim in the water near a CSO?*', '*Is it safe for my dog to drink the water near a CSO?*', and '*Can I eat the fish?*'.

CSO Identification Signage

Signage was installed at each of Philadelphia's CSO outfalls, with the exception of 8 difficult to reach sites. The CSO outfalls now have identification signs displaying their outfall ID number. These signs are very useful when the public is reporting a problem at an outfall since they are able to accurately identify the outfall. This helps to alleviate communication problems between the public and the PWD responders.

Tookany/Tacoy-Frankford Watershed Signage

The PWD and the Tookany/Tacony-Frankford Watershed Partnership have installed signs at bridge crossings throughout the Tookany/Tacony-Frankford Watershed to help residents and visitors learn the names of local streams and rivers in their neighborhood, raise awareness of local watersheds, connect residents and visitors with local waterways, and encourage them to protect water resources. A total of 10 signs have been placed on state-owned roads - one in either direction - in 5 locations throughout the watershed: Roosevelt Boulevard between F and Bingham Streets, Adams Avenue between Newtown Avenue and Crescentville Road, Whitaker Avenue between Torresdale and Hunting Park Avenues, and Torresdale Avenue between Hunting Park and Frankford Avenues. The Tookany/Tacony-Frankford Watershed drains 29 square miles in Philadelphia and Montgomery counties. The watershed has a diverse population that includes portions of the inner city as well as suburban communities.

Restoration Locations Signage

An interpretive sign was installed at the Fairmount Dam Fishway presentating the history and improvements to the ladder that the PWD completed in 2009. Additionally, a request for proposals is currently being finalized and reviewed that will call for conceptual planning and design services for a signage system providing a variety of signage options for all exisiting and future BMPs. The goal is that all major BMP installations will have accompanying interpretative signage. Signs have been installed at previous restoration sites such as the Saylor Grove Stormwater Wetland.

III.C.3.6 Interpretive Centers - Continue to support existing educational interpretive centers to educate citizens about their community and the water environment

Please refer to the Stormwater Management Annual Report section "Public Education and Awareness" for information on PWD's continued support of the Fairmount Water Works Interpretive Center.

Please refer to NMC7 – "Continue to Provide Annual Information to City Residents about Programs via Traditional PWD Publications" for information on PWD's support of existing educational centers including the Clean Water Theatre and other public outreach tools.

III.C.3.7 Basin-Specific Stormwater Management Plans (ACT 167) - Continue to support the State Act 167 Storm water Management Planning process and integrate the results of these efforts into the watershed management plans and implementation plans

Recognizing the adverse effects of excessive stormwater runoff resulting from development, the Pennsylvania General Assembly approved the Stormwater Management Act, P.L. 864, No. 167 on October 4, 1978. Act 167 provides for the regulation of land and water use for flood control and stormwater management purposes. It imposes duties, confers powers to the Department of Environmental Protection (DEP), municipalities and counties, and provides for enforcement and appropriations. All counties must, in consultation with its municipalities, prepare and adopt a stormwater management plan for each of its designated watersheds. Within six months following adoption and approval of a watershed stormwater plan, each municipality is required to adopt or amend stormwater ordinances as laid out in the plan

The City of Philadelphia is committed to supporting the development of Act 167 Stormwater Management Plans for each of the watersheds that drain to the City, including:

– Cobbs Creek,
– Darby Creek,
– Delaware River,
– Pennypack Creek,
– Poquessing Creek,
– Schuylkill River,
– Tacony/Frankford Creek, and
– Wissahickon Creek.

The City of Philadelphia signed a Phase 1 Agreement with the DEP in July, 2008 committing to the completion of a City-wide Act 167 planning process. This City-wide Act 167 will account for the City of Philadelphia Stormwater Regulations and will lay the groundwork for additional watershed-basin specific planning to follow. A Phase 2 agreement was conformed in April, 2009 which helped to outline a schedule for completing basin specific Act 167 plans over the coming 5 years.

Darby-Cobbs Creek

An Act 167 Stormwater Management Plan was completed for the Darby-Cobbs Watershed in January 2005, led by Delaware County Planning Department with Borton Lawson Engineering as technical consultant. This completed plan can be viewed at the Delaware County Planning Department's website at: www.co.delaware.pa.us/planning/watersheditems

The Darby-Cobbs watershed lies within 26 municipalities in Delaware County,2municipalities in Chester County, 2 municipalities in Montgomery County, and 1 municipality in Philadelphia County as follows:

Delaware County	Chester County
Aldan Borough	Easttown Township
Morton Borough	Tredyffrin Township
Clifton Heights Borough	Montgomery County
Newtown Township	Lower Merion Township
Collingdale Borough	Narberth Borough
Norwood Borough	Philadelphia County
Colwyn Borough	City of Philadelphia
Prospect Park Borough	
Darby Borough	
Radnor Township	
Darby Township	
Ridley Township	
East Lansdowne Borough	
Ridley Park Borough	
Folcroft Borough	
Rutledge Borough	
Glenolden Borough	
Sharon Hill Borough	
Haverford Township	
Springfield Township	
Lansdowne Borough	
Tinicum Township	
Marple Township	
Upper Darby Township	
Millbourne Borough	
Yeadon Borough	

Tookany/Tacony-Frankford Creek

The development of the Act 167 Plan for this watershed was jointly led by PWD and the Montgomery County Planning Commission; Borton Lawson Engineering was hired as technical consultant. The main objective of this stormwater management plan is to control stormwater runoff on a watershed-wide basis rather than on a site-by-site basis, taking into account how development and land cover in one part of the watershed will affect stormwater runoff in all other parts of the watershed. This plan was completed March 2008 and is currently under evaluation by PADEP and municipal partners. To view the entire TTF Act 167 Stormwater Management Plan, please visit: www.phillyriverinfo.org

The Tookany/Tacony-Frankford Watershed encompasses a total area of approximately 32.96 square miles and includes the following major tributaries: Jenkintown Creek, Rock Creek, Mill Run, and Baeder Creek.

Abington Township	Rockledge Borough
Cheltenham Township	Springfield Township
Jenkintown Borough	City of Philadelphia

Pennypack Creek

PWD has committed to developing an Act 167 Stormwater Management Plan for the Pennypack Creek Watershed. PWD will act as municipal lead for plan development, and will partner with the Montgomery County Planning Commission and Bucks County Planning Commission in order to complete the plan. A Request for Proposals will be released in July 2008 and contract will be awarded in September 2008. Upon selection of a contractor to develop the Act 167 Plan, the stakeholder Watershed Planning Advisory Committee (WPAC) will be convened in order to help guide the process. At present – the Act 167 plan is scheduled to be completed by the fall, 2010.

The Pennypack Creek Watershed is located in the southeastern corner of Pennsylvania with approximately 56.3 square miles of drainage area.

Montgomery County	**Bucks County**
Abington Township	Upper Southampton Township
Bryn Athyn Borough	Warminster Township
Hatboro Borough	
Horsham Township	**Philadelphia County**
Jenkintown Borough	City of Philadelphia
Lower Moreland Township	
Rockledge Borough	
Upper Dublin Township	
Upper Moreland Township	

Poquessing Creek

A Request for Proposals to identify a contractor to lead technical content development for the planning process was initiated by PWD in July 2009. In the of 2009, PWD plans to initiate an Act 167 Stormwater Management Plan for this watershed, in partnership with the Montgomery County and Bucks County Planning Commissions.

The Poquessing Creek Watershed is located in Pennsylvania, with portions of its drainage area in Philadelphia, Montgomery and Bucks counties. The watershed encompasses approximately 21.5 square miles of drainage area. Its designated uses are warm water fishery, migratory fishes, trout stock fishery and as a tributary to the Delaware River, the creek also serves as a source of drinking water.

Montgomery County	**Bucks County**
Lower Moreland Township	Bensalem Township
	Lower Southampton Township
Philadelphia County	
City of Philadelphia	

Wissahickon Creek

Through PWD's more recent commitment to a county-wide Act 167 planning process, they now have hopes that funding will be allocated for development of a watershed-wide Act 167 for the Wissahickon Creek Watershed. At this time, PWD anticipates that the planning process for this watershed will be initiated in Fall 2011.

Wissahickon Creek begins in Montgomery Township and flows for approximately 27 miles where it meets with the Schuylkill River at the end of Lincoln Drive. The Wissahickon Creek Watershed encompasses an area of 64 square miles, which includes 15 municipalities in Montgomery County and the City of Philadelphia.

Montgomery County	Philadelphia County
Abington Township	City of Philadelphia
Ambler Borough	
Cheltenham Township	
Horsham Township	
Lansdale Borough	
Lower Gwynedd Township	
Montgomery Township	
North Wales Borough	
Springfield Township	
Upper Dublin Township	
Upper Gwynedd Township	
Upper Moreland Township	
Whitemarsh Township	
Whitpain Township	
Worcester Township	

Schuylkill River

The portion of the Schuylkill River Watershed within the City of Philadelphia will be covered by the City of Philadelphia county-wide Act 167 and is currently covered by the City of Philadelphia Stormwater Regulations.

Delaware River

The portion of the Delaware River Watershed within the City of Philadelphia will be covered by the City of Philadelphia county-wide Act 167 and is currently covered by the City of Philadelphia Stormwater Regulations.

III.C.3.8 Sewage Facility Planning - Continue to review sewage facility planning modules and downstream sewage conveyance and treatment facilities to ensure that adequate capacity exists within these systems to accommodate flow

PWD employs a full-time state certified Sewage Enforcement Officer (Eric Ponert - Cert. No. 03590) who continues to require/review sewage facilities planning modules for new land developments within Philadelphia and, in conjunction with PWD's Office of

Watersheds and Planning and Research Department, reviews downstream sewage conveyance and treatment facilities. These reviews are conducted to ensure adequate capacity exists within the sewage systems to accommodate flow from new land developments within Philadelphia and tributary municipalities. PWD maintains a database and hard-copy files which include all submitted/reviewed modules for land developments within Philadelphia and requests for capacity certification from tributary municipalities.

III.C.4 Monitoring and Assessment

III.C.4.1 NPDES – Quarterly Special Discharge Monitoring Report

PWD is committed to submitting the Quarterly Special Discharge Monitoring Report documenting the Department's CSO discharges during the specified time periods. This report is due 45 days after the end of the each quarter, thus a report is submitted 4 times a year by February 15, May 15, August 15, and November 15.

III.C.4.2 NPDES - Annual CSO Status Report

Monitoring and characterization of CSO impacts from a combined wastewater collection and treatment system are necessary to document existing conditions and to identify water quality benefits achievable by CSO mitigation measures. The tables included in the following section represent the average annual CSO overflow statistics for period July 1 2008 – June 30 2000 as required in the NPDES Permit. The table has been reorganized to present overflows by the specific receiving water into which the CSOs from a given interceptor system discharge. In order to be consistent, the column headings are presented in the same format found in the System Hydraulic Characterization (SHC) and NMC Documentation.

a. *Annual summary of the frequency and volume of CSO discharges*

Overflow Summary 7/1/08 – 6/30/09

Outfall	**Frequency**	**Event Duration (hrs)**	**Overflow Volume (ft^3)**
D02	44	810.5	18806534
D03	41	747	5145961
D04	22	436	432013
D05	54	811.75	53322760
D06	16	234.75	652836
D07	26	382.5	16111696
D08	39	579.25	1022129
D09	5	53.25	64400
D11	17	238.75	2896249
D12	44	648	198439
D13	10	169.75	222594
D15	11	175.75	798598
D17	45	888.75	7254850

D18	46	677.5	5370773
D19	45	740.75	3999899
D20	34	472	2336880
D21	35	598.5	4759358
D22	70	859.75	27272796
D23	44	544	250097
D25	63	829	110219778
DFRW	43	634.25	18319976
F03	30	433.5	3003498
F04	65	819	7586348
F05	66	678.75	855105
F06	20	148.5	554963
F07	39	495.75	2016857
F08	37	512	1101685
F09	60	821.75	749591
F10	62	857	2569202
F11	67	810.75	13488655
F12	28	401.25	533741
F13	48	747.5	1421561
F21	62	791.75	87319880
F23	42	697.75	1496851
F24	47	608	678287
F25	10	154.5	1781600
P01	22	324.25	300943
P02	52	696.25	1523898
P03	25	370.5	609805
P04	7	140.75	2120982
P05	15	261	8974007
R15	30	483.75	5808895
R18	68	1071.75	170360150
T01	64	844.75	5627642
T03	54	673.5	2549742
T04	49	736.75	1724809
T05	34	424.5	876948
T06	35	476.25	7695821
T07	8	118.5	107225
T08	64	846.75	76050848
T09	34	430.25	650888
T10	51	734	2198805
T11	55	698.5	1318295
T12	8	128	66011
T13	58	739.25	4900177
T14	54	825.75	140576581
T15	53	791.5	6237572
D37	50	251.75	23610800
D38	43	155.5	22723312.2
D39	55	214.5	29021329.73
D40	64	255.25	1699875.13

D41	46	124	1893746.9
D42	22	22	161360.752
D43	15	18.25	109704.847
D44	49	148.5	7675540.2
D45	38	117.5	42082322.4
D46	24	29.75	493632
D47	66	374	9388061.6
D48	43	106.25	16789113.9
D49	8	6.25	51379
D50	22	23.75	262398.571
D51	64	342.5	2907556.8
D51A	58	161.75	1876700.651
D52	32	39.5	410827.795
D53	11	13	1300846
D54	22	30.75	4896080
D58	27	43.25	711323.2
D61	53	110.75	600076.462
D62	32	40	191983.859
D63	28	59.25	7838765.57
D64	29	34.25	123120.043
D65	27	47.75	4638228
D66	36	92.25	5758621
D67	29	67.75	2536722
D68	47	198.25	20934924
D69	25	50.5	3541786.09
D70	15	34.5	3941984.645
D71	50	184.75	7501530.2
D72	28	85	4722385.8
D73	41	151.5	14224126
C01	21	25.25	371223.1
C02	8	6.25	36154.3
C04A	27	61.5	4532017.914
C05	20	27	517498.1
C06	68	227.25	7281953.06
C07	32	69.25	2066549.46
C09	42	83	2205039.33
C10	18	41.25	221250.7
C11	48	186.5	16502782
C12	50	150	2765487.3
C13	42	96.5	1734283
C14	42	132.25	4400126.96
C15	27	50.5	552108.91
C16	7	6.5	60858.8
C17	56	332	72955578
C18	39	110.25	4612928.533
C19	21	23	1049159.8
C20	19	25.5	555445.64
C21	20	28.75	729414.294

C22	40	83.5	2427348.07
C23	9	23.25	305919.258
C25	26	70	3559426.8
C28A	38	56.75	429131.831
C29	57	206.25	2315739.03
C30	38	137.75	1191431.6
C31	48	116.75	1692837.71
C32	39	63.25	1584763.83
C33	27	29.25	535748.107
C34	16	18	360025.64
C35	11	14.75	144024.43
C36	9	10.25	105372
C37	21	21.5	152135.314
CFRTR	86	593	20391561.03
R07	14	11.75	388600.987
R08	25	35.5	6769007.8
R09	21	17.25	180178.5
R10	54	115	493835.832
R11	41	59.5	1181794.02
R11A	8	4.75	1933.081
R12	22	22.75	517419.8
R20	3	6.25	76176
R24	21	23.5	1723635.9
S01	46	127	11867913.94
S02	56	145.5	1102664.593
S03	17	13.25	85159.3
S04	88	456	2902795.778
S05	65	321	27656655
S06	64	310.25	13913296
S08	45	80.75	206564.031
S09	41	73	6100669.2
S10	60	183.5	2660370.19
S11	59	146.75	729173.906
S12A	49	71.25	692827.121
S13	22	17.75	271250.9
S14	63	254.5	2321616.7
S15	25	28.75	248922.319
S16	85	348.5	1605326.272
S17	25	33	540092.7
S18	66	228.5	6465852.48
S19	31	32.25	269775.511
S20	74	456	19426091.2
S21	23	23.5	138504.3
S22	49	95.75	2384826.27
S23	62	174.75	1391846.77
S24	43	97.25	811758.66
S25	48	106.5	1676695.27
S26	66	382.25	16840102.46

S30	13	9	146808.88
S31	61	176	4417149.82
S32	20	20	301368.33
S33	66	319.75	19706149.7
S36A	62	291.25	6777952.35
S37	60	204.5	2700231.33
S42	41	123.25	7114768.1
S42A	87	617.75	19905506.2
S44	42	113.25	6466083.1
S45	61	378	14063198.96
S46	31	54.75	1585968.088
S50	63	355.75	150773070

b. *Update of the CSO frequency and volume for a typical hydrologic year*

Overflow Summary Typical Year

Regulator	**Frequency**	**SWO Duration (hrs)**	**Overflow Volume (MG)**	**Percent Capture**
D37	53	286	194.5	41.13
D38	43	179.25	187.32	57.58
D39	53	250.75	245.67	72.47
D40	57	307.25	13.62	61.69
D41	44	136	15.71	72.22
D42	16	18.25	1.43	88.38
D43	22	30.25	1.3	87.92
D44	48	170	63.18	60.68
D45	37	132	346.44	83.44
D46	20	32.5	4.16	83.17
D47	68	409.25	72.99	52.16
D48	40	114.75	135.25	69.94
D49	7	5.25	0.54	91.89
D50	19	21.75	2.01	84.9
D51	67	541.5	23.9	63.8
D51A	56	207.25	13.97	82.27
D52	26	38.5	3.15	82.38
D53	8	9	11.94	92.69
D54	19	33.25	52.59	85.03
D58	27	54.5	7.28	80.25
D61	46	102.5	6.36	74.33
D62	32	46.5	2.24	79.78
D63	28	72.5	84.14	77.43
D64	28	60.5	1.51	84.2
D65	26	59.25	54.02	75.89
D66	37	105.5	62.87	71.38
D67	32	81.5	28.58	74.74
D68	49	228	205.18	58.43

D69	24	61.5	43.89	78.88
D70	20	47.25	54.19	82.25
D71	49	198.75	75.5	62.03
D72	27	99	51.1	77.08
D73	40	165.5	132.81	63.3
D02	38	164.75	111.73	57.96
D03	43	178.5	34.68	51.57
D04	15	45.25	2.67	79.92
D05	58	299.25	415.93	50.58
D06	10	22.25	2.78	88.13
D07	28	69.5	116.52	80.02
D08	43	112	5.24	71
D09	5	4	0.54	97.67
D11	12	27.5	18.41	87.62
D12	46	123.25	1.63	87.01
D13	10	12.75	1.43	94.26
D15	14	23.25	7.05	89.87
D17	48	192.5	67.32	73.65
D18	53	203.25	55.6	71.65
D19	49	210.5	39.13	74.02
D20	37	82	21.87	76.13
D21	41	124.25	44.35	71.16
D22	71	551	244.93	47.18
D23	42	75	1.6	90.3
D24	21	33.5	0.89	83.06
D25	65	424.25	941.94	47.58
F03	34	61	18.96	76.49
F04	65	283	68.76	62.29
F05	68	272	8.16	67.2
F06	20	38	5.77	53.95
F07	40	89.75	19.08	76.81
F08	39	77.5	10.43	80.31
F09	57	230.5	7.74	77.25
F10	64	325.5	26.49	51.07
F11	68	431.25	132.73	53.81
F12	29	48	5.43	76.12
F13	47	135	10.93	69.37
F14	35	66.75	3.22	72.36
F21	67	380.25	780.29	52.2
F23	44	115	12	62.68
F24	47	100.25	5.3	70.54
F25	9	21.5	21.09	89.24
P01	16	17	3.34	93.05
P02	49	117.5	10.73	86.3
P03	16	25.25	2.08	89.9
P04	4	12	4.43	84.64
P05	13	34.75	23.92	82.14
R13	41	95.25	76.14	90.94

R14	44	125.75	56.53	94.52
R_15	21	38	44.13	94.97
R_18	75	557.5	1442.36	66.03
T_01	64	267	44.28	61.33
T_03	61	155	22.77	70.97
T_04	59	149.25	15.94	63.1
T_05	42	65	7.58	78.41
T_06	35	69	55.29	77.57
T_07	9	8	1.1	92.58
T_08	71	427.5	696.25	56.5
T_09	43	68.75	5.72	79.49
T_10	62	222	20.58	54.25
T_11	55	117	9.23	70.25
T_12	8	8	0.32	93.47
T_13	62	200	34.79	63.74
T_14	63	280	1179.54	66.46
T_15	55	168	45.16	63.9
C01	15	16.75	1.92	91.31
C02	6	3.75	0.14	95.41
C04	19	26.25	2.39	87.47
C04A	15	23.75	11.36	95.6
C05	14	19.5	2.89	87.06
C06	61	193.5	40.18	59.61
C07	23	45	11.9	67
C09	32	68.5	14.76	75.98
C10	22	37	1.74	8.81
C11	41	122	96.68	68.77
C12	41	104	16.8	69.65
C13	30	70	11.12	74.05
C14	30	81	20.96	71.33
C15	18	39.5	2.53	75.27
C16	5	4.75	0.14	96.01
C17	55	265.25	280.27	68.89
C18	28	61.5	19.17	79
C19	17	21.75	4.65	92.36
C20	14	22.5	2.57	89.99
C21	16	28.25	3.6	88.32
C22	37	81.75	14.74	72.3
C23	11	24.75	1.71	20.52
C24	21	63.25	10.56	62.56
C25	22	39	7.18	84.51
C26	7	12.75	0.72	88.32
C27	10	15	1.7	92.79
C28A	38	58	2.04	89.45
C29	49	186	16.33	43.48
C30	34	126	8.93	52.98
C31	41	98.5	11.04	66.7
C32	30	61.25	10.41	78.02

C33	20	25.75	3.17	88.4
C34	13	12	1.89	92.72
C35	10	10.25	0.71	87.09
C36	8	7.5	0.53	92.04
C37	14	16.75	0.88	88.94
R01	75	344.5	12.38	60.16
R01A	80	545	107.95	49.48
R02	78	357.25	1.62	60.28
R03	52	132	0.85	81.06
R04	84	521.75	12.88	57.52
R05	80	387	3.68	66.96
R06	50	152.25	33.32	83.43
R12R	6	8.75	50.52	47.9
R24	15	17	9.64	96.14
S01	42	125	88.15	72.54
S02	49	158	7.78	68.3
S03	11	8.25	0.61	94.6
S04	78	479	20.98	65.72
S05	69	345.5	236.63	60.96
S06	69	328.5	105.14	58.84
S07	17	21.75	8.79	84.02
S08	37	81.75	1.37	81.96
S09	39	78.75	45.03	75.59
S10	56	191.25	19.97	67.37
S11	54	156.5	4.89	73.85
S12	49	84	2.11	33.25
S12A	44	68.25	3.18	85.32
S13	20	15	2.38	92.17
S14	63	271	16.71	54.92
S15	22	29	1.68	89.63
S16	78	413.25	12.36	64.05
S17	25	34.5	4.12	87.39
S18	67	245.25	50.55	73.17
S19	30	35	1.95	84.31
S20	77	491.5	144.34	39.39
S21	22	23	1.05	89.59
S22	44	96	15.79	84.73
S23	59	189.75	10.75	67.78
S24	44	110.5	6.85	64.81
S25	45	123	12.55	82.12
S26	70	426.75	134.96	55.61
S30	7	4.75	0.41	96.49
S31	59	194	33.31	72.85
S32	14	14.5	1.31	87.47
S33	69	355	136.05	21.41
S35	6	3.75	0.23	94.92
S36	30	42	1.76	70.59
S36A	65	340.75	58.65	56.72

S37	60	245.25	24.27	61.51
S38	29	51	29.33	71.77
S42	43	138	71.68	75.68
S42A	80	603.25	176.55	52.45
S44	43	124.75	59.41	67.53
S45	42	104.5	143.52	76.24
S46	27	58	14.47	81.67
S50	60	322	1051.23	16.57
S51	4	2.75	0.12	97.02

c. Summary of the in-stream impacts and effectiveness of CSO controls and restoration projects.

Discharges resulting from combined sewer overflows can have negative biological and physical impacts on streams. CSOs tend to diminish water quality decreasing both the number and diversity of fish and macro invertebrate species. In addition, the excessively high flows resulting from CSOs tend to produce degrading, incised stream channels that do not readily access the floodplain.

As CSO controls and stream restoration projects are implemented, PWD expects to demonstrate improvements of existing biological and physical stream impairments. The extent of these improvements will be measured through regular monitoring to establish the overall effectiveness of these interventions.

d. An annual summary of the information provided in the Special Discharge Monitoring report including:

i. Rainfall data - total inches (to the nearest 0.01 inch) that fell each day and month for the period of the reports.

PWD Raingage records by date:

date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
7/1/2008							0.03																	
7/2/2008							0.01	0.01									0.01							
7/4/2008		0.07	0.04	0.04		0.04	0.05	0.04	0.06	0.05	0.04	0.06	0.04	0.05	0.05	0.06	0.04	0.05	0.06	0.03	0.06	0.07	0.07	0.06
7/5/2008		2.48	1.17	1.51	0.2	0.6	1.94	1.44	0.27	0.56	1.12	0.03	1.24	1	1.28	1.13	1.55	0.82	0.64	1.03	0.65	0.26	0.12	0.38
7/6/2008		0.35	0.01	0.06		0.12	0.02	0.03	0.09		0.05	1.24	0.00	1.05	1.19	0.98	0.21	0.05	0.03	0.01	0.06	0.21	0.49	0.01
7/7/2008	0.24	0.05		0.01		0.08	0.11	0.01	0.14		0.01	0.31	0.03	0.35	0.64	0.37	0.09	0.15	0.24	0.01	0.18	0.1	0.19	
7/9/2008	0.34	0.35	0.3	0.27	0.31	0.37	0.37	0.3	0.69	0.26	0.51	0.3	0.47	0.44	0.53	0.55	0.36	0.39	0.34	0.25	0.40	1.07	0.21	0.18
7/10/2008																								0.01
7/14/2008	0.19	0.25	0.18	0.1	0.18	0.33	0.19	0.19	0.29	0.3	0.23	0.18	0.21	0.14	0.14	0.19	0.14	0.28	0.28	0.14	0.38	0.38	0.21	0.22
7/18/2008																								0.01
7/20/2008						0.08	0.01		0.05	0.05								0.02			0.01	0.05		0.01
7/21/2008							0.01																	
7/23/2008	1.52	1.78	0.83	1.3	1.45	1.67	1.19	0.95	1.7	1.07	1.04	1.46	0.84	0.96	1.26	1.13	0.83	1.30	1.26	1.44	0.88	1.72	1.51	0.62
7/24/2008	0.56	0.55	0.6	0.74	0.64	0.43	0.61	0.51	0.55	0.6	0.62	0.64	0.58	0.48	0.61	0.58	0.53	0.52	0.54	0.69	0.43	0.53	0.58	0.5
7/27/2008	0.28	0.55	0.64	0.27	1.06	0.99	0.49	0.63	0.67	0.34	0.56	1.11	0.53	0.11	0.1	0.14	0.39	0.62	0.53	0.46	0.29	0.83	0.34	0.33
7/28/2008			0.01				0.01		0.01	0.01	0.01		0.01					0.01	0.01		0.01	0.01	0.01	
7/29/2008						0.01																		
7/31/2008			0.02										0.01							0.02				
8/2/2008		0.01		0.03	0.02	0.05	0.06	0.05	0.03		0.04	0.04	0.07			0.01	0.04	0.03		0.01		0.03	0.04	
8/5/2008																								0.01
8/6/2008	0.08	0.13	0.11	0.05	0.06	0.24	0.02	0.02	0.13	0.08	0.08	0.08	0.11	0.11	0.12	0.07		0.14	0.16	0.08	0.17	0.1	0.03	0.1
8/8/2008	0.13	0.03			0.04	0.02						0.04										0.04		
8/10/2008	1.09	0.86	0.38	0.40	0.88	0.68	0.79	0.45	0.87	0.43	0.5	0.89	0.34	0.79	1.06	1.4	0.67	0.47	0.26	0.28	0.22	1.15	1.26	0.34
8/11/2008		0.01								0.01	0.01							0.01	0.01		0.01	0.01		0.01
8/14/2008	0.37	0.31	0.13	0.12	0.39	0.10	0.18	0.07	0.09	0.1	0.13	0.39	0.1	0.23	0.22	0.22	0.12	0.07	0.04	0.13	0.04	0.38	0.57	0.09
8/15/2008																				0.01				
8/19/2008										0.03														
8/21/2008			0.03	0.01																				
8/29/2008				0.01		0.09	0.02	0.02	0.02	0.04	0.04		0.01	0.02				0.04	0.03		0.08	0.03		0.04

8/30/2008	0.05	0.07	0.14	0.25	0.05	0.17	0.16	0.18	0.41	0.29	0.22	0.05	0.2	0.06	0.03	0.07	0.15	0.19	0.17	0.47	0.09	0.33	0.02	0.42
9/5/2008	0.01	0.03		0.01	0.04	0.01	0.01	0.01	0.02	0.02	0.02	0.04	0.01	0.02	0.01	0.01		0.02	0.02	0.03	0.02		0.02	0.01
9/6/2008	2.48	2.43	1.35	2.01	2.31	2.93	3.18	2.47	2.89	2.34	2.71	2.31	2.37	3.09	2.71	2.35	2.49	2.90	2.89	2.3	3.18	2.98	2.03	1.99
9/9/2008	0.43	0.61	0.38	0.51	0.61	0.19	0.64	0.79	0.56	0.79	0.81	0.61	0.63	0.74	0.53	0.56	0.51	0.40	0.25	0.53	0.51	0.33	0.32	0.75
9/10/2008				0.01																0.03				
9/12/2008	0.46	0.62	0.43	0.56	0.51	0.66	0.67	0.41	0.71	0.7	0.63	0.51	0.61	0.62	0.68	0.67	0.59	0.55	0.49	0.66	0.5	0.79	0.48	0.76
9/13/2008	0.12	0.12		0.01	0.1	0.01	0.01	0.01	0.02	0.01	0.01	0.1		0.01	0.02	0.03	0.01	0.01	0.01	0.01	0.01	0.05	0.18	0.01
9/16/2008								0.02																
9/23/2008										0.01														
9/25/2008	0.04	0.08		0.04	0.1	0.05	0.05	0.05	0.05	0.06	0.05	0.1	0.05	0.05	0.05	0.04	0.05	0.04	0.03	0.09	0.04	0.08	0.04	0.06
9/26/2008	0.104	0.08	0.18	0.22	0.14	0.07	0.12	0.18	0.08	0.33	0.16	0.14	0.29	0.16	0.1	0.09	0.19	0.10	0.09	0.26	0.11	0.08	0.07	0.16
9/27/2008	0.091	0.08	0.12	0.16	0.22	0.15	0.09	0.09	0.14	0.11	0.12	0.22	0.08	0.07	0.15	0.22	0.07	0.15	0.18	0.29	0.19	0.14	0.12	0.35
9/28/2008	0.734	0.76	0.7	0.96	0.61	1.03	0.45	0.57	0.97	1.2	0.72	0.61	0.7	0.43	0.51	0.66	0.55	1.32	1.83	1.58	1.99	1.2	0.61	1.08
9/30/2008	0.33	0.49	0.34	0.42	0.37	0.26	0.58	0.55	0.44	0.46	0.6	0.37	0.49	0.27	0.36	0.43	0.44	0.29	0.13	0.44	0.23	0.4	0.34	0.4
10/1/2008	0.18	0.22	0.08	0.14	0.13	0.13	0.29	0.23	0.29	0.09	0.17	0.13	0.16	0.18	0.21	0.28	0.25	0.15	0.06	0.15	0.13	0.26	0.08	0.08
10/2/2008					0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01		0.01	0.01		0.01	0.01		0.01	0.03	0.01	0.01
10/9/2008	0.04	0.05	0.03	0.04	0.07	0.06	0.04	0.02	0.06	0.03	0.03	0.07	0.03	0.05	0.06	0.05	0.03	0.04	0.03	0.05	0.04	0.07	0.07	0.04
10/10/2008							0.01			0.01										0.01				
10/16/2008																							0.01	
10/25/2008	0.62	0.8	0.66	0.81	0.7	1.12	0.88	0.76	1.11	0.96	0.91	0.70	0.82	0.77	0.64	0.79	0.87	1.02	0.99	0.9	1.38	1.22	0.72	0.82
10/26/2008		0.01					0.01			0.01	0.01													
10/27/2008	0.13	0.24	0.13	0.17	0.28	0.32	0.23	0.18	0.32	0.22	0.26	0.28	0.19	0.21	0.24	0.21	0.22	0.25	0.23	0.17	0.21	0.36	0.27	0.19
10/28/2008	0.95	0.96	1.11	1.45	1.15	1.45	1.46	1.56	1.45	1.72	1.69	1.15	1.32	1.23	1.22	1.24	1.46	1.43	1.39	1.8	1.37	1.48	0.85	1.65
11/2/2008																0.01						0.01		
11/3/2008							0.01										0.01							
11/4/2008		0.03				0.02	0.01		0.02					0.01	0.01	0.01		0.01	0.01		0.03	0.03	0.03	0.01
11/5/2008	0.2	0.20	0.16	0.22	0.20	0.28	0.22	0.21	0.28	0.25	0.28	0.19	0.23	0.23	0.21	0.2	0.25	0.25	0.23	0.25	0.28	0.28	0.17	0.17
11/6/2008	0.1	0.10	0.07	0.11	0.11	0.05	0.10	0.07	0.07	0.13	0.11	0.11	0.12	0.22	0.14	0.13	0.14	0.09	0.1	0.12	0.14	0.09	0.08	0.1
11/7/2008				0.01					0.01	0.01	0.01							0.01	0.01	0.01				
11/8/2008	0.16	0.16	0.1	0.16	0.17	0.17	0.12	0.09	0.19	0.15	0.17	0.17	0.16	0.19	0.16	0.17	0.16	0.13	0.11	0.22	0.11	0.21	0.18	0.16
11/9/2008			0.01	0.01						0.01	0.01			0.01							0.01			
11/13/2008	0.89	0.89	0.61	0.78	0.89	0.76	0.77	0.74	0.79	0.82	0.86	0.89	0.8	0.85	0.86	0.91	0.85	0.74	0.71	0.92	0.75	0.83	0.91	0.82

11/14/2008	0.03	0.03	0.04	0.05	0.04	0.04	0.05	0.04	0.03	0.05	0.05	0.04	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.06	0.04	0.05	0.03	0.06
11/15/2008	1.11	1.11	0.54	0.82	1.13	0.9	0.76	0.67	0.93	1.00	0.92	1.13	0.78	1.04	1.02	1.18	1.04	0.78	0.7	1.03	0.9	1.03	1.16	0.9
11/16/2008	0.06	0.06	0.07	0.08	0.06	0.07	0.07	0.07	0.06	0.08	0.07	0.06	0.08	0.07	0.07	0.07	0.08	0.06	0.06	0.08	0.07	0.06	0.06	0.08
11/20/2008			0.04	0.04		0.01	0.05	0.05	0.01	0.02	0.05		0.04	0.03	0.02		0.05	0.03	0.03	0.03	0.03	0.01		0.01
11/21/2008	0.03	0.03		0.01	0.02	0.05	0.00		0.06	0.04	0.02	0.02	0.01		0.01	0.02		0.03	0.03	0.01	0.04	0.09	0.04	0.01
11/22/2008																					0.01			
11/24/2008	0.24	0.24	0.16	0.22	0.26	0.24	0.19	0.13	0.26	0.29	0.28	0.26	0.27	0.25	0.24	0.27	0.26	0.21	0.21	0.24	0.29	0.28	0.26	0.32
11/25/2008	0.15	0.15	0.14	0.18	0.19	0.19	0.16	0.12	0.18	0.22	0.21	0.18	0.21	0.18	0.19	0.21	0.22	0.17	0.17	0.19	0.18	0.23	0.18	0.24
11/30/2008	0.87	0.86	0.57	0.77	0.88	0.81	0.89	0.88	0.77	0.9	0.93	0.88	0.9	0.92	0.90	0.92	0.9	0.78	0.72	0.85	0.76	0.89	0.73	0.6
12/1/2008	0.04	0.04	0.1	0.12	0.05	0.12	0.13	0.13	0.05	0.12	0.19	0.05	0.14	0.04	0.07	0.05	0.04	0.11	0.1	0.17	0.14	0.06	0.08	0.12
12/2/2008																					0.01			
12/3/2008					0.06							0.06			0.02	0.03								
12/4/2008	0.02	0.02	0.03	0.04	0.04	0.05	0.03	0.04	0.05	0.04	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.03	0.05	0.04	0.03
12/6/2008	0.02	0.03			0.04	0.03	0.02		0.03			0.04		0.05	0.04	0.05		0.02	0.02				0.03	
12/7/2008	0.01	0.01	0.02	0.03	0.01		0.03	0.03	0.01	0.04	0.06	0.01	0.05	0.01	0.01		0.05	0.01	0.01	0.02	0.03	0.04	0.01	0.02
12/9/2008						0.01			0.01									0.01	0.01		0.01			
12/10/2008	0.29	0.35	0.32	0.31	0.35	0.45	0.34	0.34	0.42	0.18	0.39	0.35	0.31	0.3	0.34	0.38	0.27	0.38	0.36	0.31	0.42	0.22	0.35	0.33
12/11/2008	2.91	2.94	2.6	2.61	2.87	2.47	2.88	2.86	2.7	2.1	3	2.87	2.76	2.67	2.86	3	2.82	2.46	2.27	2.5	2.07	2.7	2.42	1.56
12/12/2008	0.6	0.6	0.57	0.54	0.64	0.54	0.63	0.61	0.56	0.53	0.67	0.64	0.56	0.47	0.62	0.7	0.58	0.58	0.6	0.45	0.5	0.57	0.54	0.22
12/15/2008			0.02	0.02	0.01	0.02	0.03	0.03	0.02	0.02	0.03	0.01	0.02	0.02	0.02	0.02	0.02	0.04	0.05	0.03	0.08	0.02	0.01	0.02
12/16/2008	0.44	0.35	0.19	0.21	0.39	0.38	0.41	0.36	0.35	0.14	0.33	0.39	0.28	0.39	0.38	0.38	0.30	0.27	0.16	0.15	0.15	0.27	0.42	0.14
12/17/2008	0.39	0.46	0.62	0.62	0.46	0.5	0.59	0.60	0.56	0.4	0.61	0.46	0.61	0.51	0.52	0.5	0.61	0.58	0.59	0.67	0.62	0.66	0.34	0.44
12/19/2008	0.89	0.9	1.01	1.01	1.06	1	1.02	1.03	0.96	0.71	1.05	1.06	1.02	1.02	1.03	0.99	1.03	0.96	0.9	1.04	0.96	1.01	0.76	0.82
12/21/2008	0.15	0.11	0.28	0.28	0.36	0.27	0.01	0.14	0.3	0.15	0.31	0.36	0.28	0.06	0.33	0.21	0.27	0.13	0.08	0.31		0.31	0.29	0.02
12/22/2008					0.11							0.11												
12/24/2008	0.03	0.06	0.12	0.13	0.09	0.12	0.06	0.09	0.08	0.08	0.11	0.09	0.12	0.07	0.08	0.14	0.11	0.10	0.09	0.15	0.14	0.09	0.07	0.08
12/25/2008	0.05	0.06	0.07	0.06	0.07	0.07	0.08	0.07	0.08	0.05	0.07	0.07	0.04	0.05	0.05	0.08	0.05	0.05	0.03	0.06	0.06	0.09	0.06	0.07
12/27/2008	0.01	0.01	0.01	0.02	0.02	0.03	0.02	0.02	0.03	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.01	0.03
1/2/2009																								0.02
1/3/2009																								0.02
1/4/2009									0.01							0.01								
1/5/2009						0.01	0.01	0.01		0.04	0.01			0.01				0.01		0.03				

1/6/2009	0.11	0.05	0.02	0.02	0.08	0.01	0.01	0.01	0.01	0.01	0.02	0.08	0.01	0.02	0.16	0.02		0.02	0.02	0.02	0.01	0.11	0.18	0.02
1/7/2009	1.72	1.68	1.64	1.88	1.71	1.67	1.36	1.53	1.65	1.08	1.74	1.70	1.7	1.71	1.73	1.76	1.69	1.54	1.36	1.64	0.79	1.78	1.47	0.75
1/10/2009																							0.01	
1/11/2009	0.03	0.02		0.01	0.02	0.07	0.05	0.03	0.03	0.01		0.02	0.02	0.01	0.03		0.01	0.03	0.02			0.01	0.06	0.04
1/12/2009				0.01			0.01	0.01	0.01				0.01	0.01			0.01	0.01	0.01		0.02	0.01		0.01
1/13/2009		0.01	0.02	0.01	0.01			0.01	0.01	0.04	0.02	0.01	0.03			0.03	0.03		0.01	0.02	0.01	0.01		0.01
1/14/2009														0.01										
1/18/2009				0.01			0.01	0.01		0.01	0.01			0.01		0.01				0.01				0.02
1/19/2009	0.01	0.01		0.01	0.01	0.04	0.01	0.01	0.01			0.01	0.01	0.01	0.02	0.01	0.01			0.01			0.01	
1/20/2009										0.01								0.01	0.01					
1/22/2009									0.01	0.02			0.01				0.01		0.01		0.02	0.04		0.03
1/28/2009	0.77	0.88	0.92	1.03	0.86	0.64	0.85	0.80	0.81	0.68	0.92	0.86	0.86	0.91	0.94	0.88	0.83	0.21	0.85	0.83	0.92	0.76	0.87	0.59
1/29/2009																						0.01		
1/30/2009																						0.01		0.01
2/1/2009										0.06												0.16		0.08
2/2/2009																					0.01			
2/3/2009	0.08	0.08	0.09	0.16	0.1	0.15	0.11	0.05	0.1	0.07	0.08	0.1	0.11	0.11	0.11	0.11	0.1	0.05	0.05	0.14	0.09	0.09	0.09	0.08
2/4/2009				0.03	0.22	0.06	0.11		0.05	0.01		0.22	0.02		0.04	0.01	0.01		0.01			0.01	0.01	0.01
2/6/2009	0.02				0.05			0.04	0.01	0.01	0.01	0.05			0.01			0.01			0.01	0.01		0.03
2/7/2009		0.13	0.02	0.09	0.1	0.14	0.02	0.01	0.21	0.12	0.15	0.1	0.2	0.05	0.09		0.04	0.3	0.12	0.02	0.26	0.1		0.04
2/8/2009						0.02			0.02					0.01	0.04	0.01						0.01		
2/10/2009																						0.01		
2/11/2009	0.02	0.01	0.02	0.11	0.04	0.01	0.01		0.01	0.01	0.02	0.04	0.01	0.02	0.02	0.02	0.02		0.01	0.01	0.01	0.01	0.04	0.01
2/12/2009				0.01				0.01					0.01							0.01			0.01	
2/18/2009	0.19	0.18	0.21	0.16	0.19	0.23	0.2	0.07	0.24	0.22	0.25	0.19	0.21	0.19	0.19	0.21	0.2		0.24	0.2	0.29	0.24	0.19	0.27
2/19/2009		0.01	0.01		0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.03	0.01	0.04	0.02		0.04
2/22/2009	0.05	0.07	0.09	0.08	0.07	0.07	0.08	0.06	0.07	0.09	0.08	0.07	0.07	0.09	0.08	0.07	0.08	0.03	0.07	0.08	0.07	0.08	0.05	0.08
2/27/2009			0.03	0.01	0.01	0.02	0.02		0.01	0.02	0.03	0.01	0.02	0.01	0.01	0.01	0.03	0.01	0.02	0.03	0.01	0.01	0.01	0.05
2/28/2009								0.01					0.01							0.01				
3/1/2009	0.07	0.04	0.03	0.09	0.05	0.07	0.05	0.03	0.06	0.03	0.04	0.05	0.04	0.04		0.05	0.05	0.04	0.02	0.04	0.03	0.03	0.07	0.01
3/2/2009	0.01	0.01			0.01							0.01												
3/3/2009						0.01																		

3/4/2009		0.01		0.05		0.07	0.02	0.01	0.02		0.01		0.03			0.01		0.02			0.02	0.11		0.08
3/5/2009				0.01		0.12			0.01		0.01							0.03				0.2		0.09
3/9/2009			0.02	0.01	0.01		0.01				0.01	0.01	0.02				0.02	0.02	0.04		0.04			0.01
3/11/2009			0.01																	0.01		0.01		0.01
3/15/2009			0.01							0.01									0.01		0.01			0.01
3/16/2009					0.01	0.01						0.01	0.01											
3/19/2009	0.13	0.12	0.12	0.12	0.14	0.12	0.11	0.1	0.14	0.08	0.11	0.14	0.11	0.12	0.12	0.11	0.11	0.09	0.11	0.13	0.11	0.14	0.12	0.09
3/20/2009	0.02	0.01	0.01	0.02	0.01	0.01	0.02		0.02		0.01	0.01	0.01	0.02	0.01	0.01	0.02		0.02	0.02	0.02	0.01	0.01	0.02
3/26/2009	0.34	0.31	0.34	0.34	0.37	0.37	0.34	0.14	0.33	0.29	0.35	0.37	0.33	0.31	0.34	0.34	0.32	0.36	0.36	0.34	0.35	0.37	0.35	0.36
3/27/2009	0.01																			0.01				0.01
3/28/2009	0.23	0.26	0.22	0.28	0.28	0.24	0.24	0.2	0.24	0.19	0.22	0.28	0.21	0.25	0.25	0.27	0.23	0.23	0.19	0.23	0.19	0.25	0.24	0.18
3/29/2009	0.78	0.68	0.68	0.59	0.86	0.68	0.47	0.41	0.45	0.28	0.54	0.86	0.53	0.7	0.84	0.61	0.53	0.43	0.51	0.62	0.44	0.41	0.51	0.71
3/30/2009					0.01							0.01												
4/1/2009	0.32	0.28	0.19	0.21	0.33	0.21	0.2		0.22	0.21	0.19	0.33	0.18	0.26	0.29	0.3	0.19	0.22	0.19	0.22	0.18	0.24	0.27	0.17
4/2/2009	0.01	0.01	0.01	0.01	0.01					0.01	0.01	0.01	0.01		0.01	0.01			0.01	0.01	0.01		0.02	0.01
4/3/2009	0.53	0.61	0.65	0.53	0.61	1.03	0.58	0.24	0.79	0.87	0.69	0.61	0.6	0.46	0.55	0.69	0.5	0.94	1.13	0.6	1.16	1.02	0.57	0.71
4/6/2009	0.34	0.28	0.32	0.48	0.33	0.34	0.31	0.25	0.31	0.39	0.34	0.33	0.31	0.39	0.37	0.3	0.35	0.36	0.37	0.46	0.31	0.35	0.4	0.32
4/10/2009										0.02									0.02					0.03
4/11/2009	0.54	0.58	0.56	0.6	0.54	0.58	0.56	0.54	0.56	0.63	0.59	0.54	0.59	0.53	0.61	0.55	0.56	0.51	0.56	0.55	0.64	0.61	0.4	0.49
4/13/2009		0.01	0.01	0.01	0.01	0.03	0.01		0.02	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.02	0.01		0.03	0.03	0.01	
4/14/2009	0.81	0.79	0.64	0.72	0.84	0.75	0.66	0.51	0.73	0.74	0.68	0.84	0.7	0.8	0.87	0.89	0.65	0.73	0.71	0.6	0.74	0.84	0.72	0.54
4/15/2009	0.36	0.37	0.57	0.76	0.44	0.51	0.48	0.51	0.53	0.68	0.59	0.44	0.58	0.49	0.51	0.48	0.59	0.46	0.65	0.67	0.46	0.55	0.35	0.32
4/20/2009	0.67	0.75	0.62	0.89	0.74	0.87	0.56	0.4	0.77	0.61	0.57	0.74	0.59	0.52	0.62	0.71	0.59	0.82	0.79	0.66	0.65	0.79	0.57	0.48
4/21/2009	0.26	0.21	0.24	0.22	0.28	0.18	0.25	0.22	0.2	0.24	0.24	0.28	0.19	0.26	0.26	0.28	0.22	0.23	0.19	0.25	0.21	0.21	0.25	0.16
4/22/2009	0.03	0.04	0.15	0.14	0.07	0.05	0.19	0.07	0.15	0.13	0.1	0.07	0.13	0.09	0.13	0.19	0.13	0.2	0.04	0.07	0.04	0.09	0.02	0.06
4/23/2009					0.01	0.02	0.01		0.01			0.01		0.01	0.01	0.01	0.01	0.01				0.02		
4/29/2009	0.12	0.12	0.12	0.13	0.21	0.11	0.1	0.08	0.11	0.17	0.1	0.21	0.11	0.11	0.12	0.12	0.1	0.10	0.1	0.16	0.1	0.12	0.12	0.09
5/1/2009	0.04	0.09	0.1	0.11	0.07	0.07	0.06	0.05	0.06	0.14	0.1	0.07	0.1	0.09	0.09	0.1	0.08	0.10	0.13	0.12	0.19	0.07	0.05	0.22
5/2/2009	0.09	0.09	0.06	0.07	0.11	0.07	0.08	0.05	0.09	0.14	0.06	0.11	0.06	0.09	0.08	0.1	0.07	0.08	0.09	0.09	0.12	0.09	0.15	0.09
5/3/2009	0.49	0.66	0.52	0.57	0.52	0.69	0.7	0.46	0.66	0.73	0.67	0.52	0.56	0.54	0.56	0.71	0.61	0.68	0.73	0.54	0.77	0.77	0.45	0.64
5/4/2009	0.76	0.73	0.71	0.76	0.87	0.74	0.72	0.65	0.68	0.79	0.71	0.87	0.72	0.74	0.79	0.83	0.74	0.73	0.75	0.87	0.82	0.8	0.63	0.68
5/5/2009	0.31	0.31	0.36	0.36	0.33	0.41	0.36	0.31	0.35	0.43	0.38	0.33	0.36	0.25	0.32	0.36	0.3	0.41	0.44	0.35	0.54	0.42	0.29	0.33

5/6/2009	0.75	0.75	0.64	0.76	0.86	0.7	0.66	0.36	0.65	0.67	0.65	0.86	0.61	0.87	0.89	0.73	0.85	0.67	0.76	0.97	0.67	0.64	0.8	0.67
5/7/2009	0.42	0.43	0.42	0.40	0.5	0.54	0.48	0.34	0.64	0.68	0.43	0.50	0.38	0.56	0.67	0.6	0.41	0.73	0.97	0.31	0.98	0.72	0.44	1.02
5/8/2009																	0.01							
5/9/2009					0.01							0.01						0.01	0.01		0.01		0.01	
5/14/2009	0.42	0.43	0.33	0.36	0.43	0.54	0.39	0.25	0.61	0.55	0.4	0.43	0.4	0.27	0.39	0.57	0.33	0.44	0.39	0.36	0.52	0.7	0.34	0.56
5/15/2009	0.61	0.60	0.08	0.09	0.72	0.27	0.17	0.07	0.27	0.07	0.11	0.72	0.09	0.23	0.41	0.54	0.17	0.15	0.11	0.05	0.06	0.3	0.54	0.03
5/16/2009																					0.01		0.02	
5/17/2009	0.06	0.06	0.12	0.08	0.04	0.04	0.07	0.05	0.04	0.08	0.08	0.04	0.1		0.07	0.08	0.05	0.04	0.03	0.03	0.05	0.05	0.07	0.05
5/20/2009					0.02							0.02												
5/24/2009			0.18	0.18			0.01	0.14		0.08	0.07		0.18	0.03			0.26	0.02	0.01	0.2				0.38
5/25/2009										0.01													0.01	0.01
5/26/2009	0.01		0.05	0.05	0.01	0.03	0.03	0.01	0.01	0.05	0.04	0.01	0.04	0.04	0.02	0.02	0.04	0.03	0.04	0.07	0.05	0.02	0.03	0.03
5/27/2009	0.01	0.01				0.01			0.02						0.01	0.01		0.00	0.01		0.01	0.02	0.01	
5/28/2009										0.01	0.01										0.01			
5/29/2009	0.66	1.82	0.55	0.57	0.66	0.84	0.63	0.51	0.58	0.52	0.59	0.66	0.55	0.57	0.59	0.52	0.61	0.65	0.64	0.58	0.59	0.73	0.59	0.6
5/30/2009										0.01														
6/2/2009	0.02	0.04			0.01	0.02	0.01		0.03			0.01			0.01	0.02	0.01	0.01			0.01	0.04	0.01	
6/3/2009	0.08	0.1	0.3	0.30	0.09	0.1	0.07	0.11	0.11	0.41	0.16	0.09	0.24	0.15	0.09	0.09	0.07	0.21	0.33	0.43	0.33	0.1	0.07	0.45
6/4/2009	0.4	0.38	0.43	0.43	0.39	0.36	0.44	0.49	0.38	0.49	0.47	0.39	0.4	0.34	0.39	0.41	0.45	0.47	0.51	0.4	0.61	0.39	0.33	0.64
6/5/2009	0.72	0.83	0.84	0.84	0.78	0.93	0.85	0.8	0.83	0.96	0.87	0.78	0.83	0.74	0.81	0.84	0.8	0.88	0.9	0.82	0.88	0.91	0.62	1.19
6/9/2009	1.58	1.41	0.17	0.21	0.03	0.63	0.33	0.25	0.9	0.2	0.25	0.06	0.18	0.39	0.68	1.22	0.26	0.40	0.25	0.24	0.24	1.05	1.13	0.21
6/10/2009					0.04					0.01		0.04								0.01				
6/11/2009	0.52	0.3	0.48	0.42	0.5	0.32	0.5	0.33	0.38	0.62	0.41	0.50	0.34	0.43	0.46	0.22	0.53	0.39	0.46	0.24	0.14	0.32	0.43	0.56
6/12/2009	0.04	0.11	0.04	0.05	0.11	0.07	0.08	0.05	0.08	0.07	0.06	0.11	0.05	0.08	0.1	0.12	0.06	0.06	0.04	0.04	0.03	0.09	0.04	0.55
6/13/2009	0.07	0.07	0.73	0.64	0.08	0.23	0.22	0.23	0.09	1.09	1.05	0.08	1.32	0.13	0.09	0.17	0.28	0.38	0.6	0.31	0.43	0.1	0.19	0.55
6/14/2009	0.02	0.01	0.01	0.02	0.03	0.07	0.02	0.02	0.04	0.04	0.02	0.03	0.02	0.03	0.03	0.02	0.02	0.04	0.03	0.03	0.03	0.02	0.01	0.05
6/15/2009	0.64	0.17	0.02	0.03	0.64	0.49	0.08	0.08	0.58	0.02	0.03	0.64	0.22	0.05	0.23	0.59	0.05	0.30	0.24		0.41	0.34	0.07	
6/16/2009	0.14	0.03	0.53	0.49	0.26	0.12	0.22	0.19	0.26	0.58	0.32	0.26	0.37	0.26	0.12	0.19	0.27	0.16	0.16	0.6	0.05	0.25	0.17	0.66
6/17/2009	0.06	0.1	0.04	0.05	0.07	0.13	0.07	0.03	0.12	0.06	0.06	0.07	0.04	0.07	0.07	0.09	0.06	0.08	0.05	0.05	0.09	0.16	0.08	0.09
6/18/2009	0.74	0.87	0.74	0.74	0.76	0.78	0.76	0.4	0.76	0.63	0.76	0.76	0.71	0.63	0.75	0.88	0.8	0.67	0.66	0.72	0.63	0.8	0.67	0.45
6/20/2009	0.39	0.47	0.36	0.36	0.41	0.51	0.55	0.29	0.55	0.36	0.39	0.41	0.33	0.47	0.62	0.53	0.37	0.46	0.45	0.34	0.42	0.52	0.45	0.42
6/21/2009	0.01	0.05	0.02	0.02	0.02	0.08	0.02	0.01	0.07	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.03	0.05	0.05	0.01	0.04	0.06	0.03	

6/22/2009	0.12	0.07	0.1	0.09	0.1	0.06	0.08	0.08	0.07	0.12	0.11	0.10	0.1	0.09	0.08	0.09	0.1	0.06	0.04	0.05	0.1	0.08	0.12	
6/23/2009													0.03	0.01			0.02							
6/24/2009							0.01				0.02			0.01		0.01		0.01	0.02					
6/26/2009		0.01	0.59	0.56		0.22	0.48	0.01	0.06	0.6	0.74		0.77	0.13	0.15		0.6	0.21	0.54	0.99	0.27	0.02		0.48
6/27/2009							0.01			0.01			0.01						0.01					
6/28/2009																					0.02			

PWD Raingage records by year and Month

year	month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
08	7	3.13	6.43	3.80	4.30	3.84	4.72	5.04	4.11	4.52	3.24	4.20	5.33	4.03	4.58	5.80	5.13	4.15	4.22	3.93	4.08	3.40	5.23	3.73	2.33
08	8	1.72	1.42	0.79	0.88	1.44	1.35	1.23	0.79	1.56	0.98	1.00	1.48	0.83	1.21	1.43	1.77	0.98	0.96	0.67	0.98	0.60	2.07	1.92	1.01
08	9	4.80	5.30	3.50	4.91	5.01	5.36	5.80	5.14	5.88	6.03	5.80	5.01	5.23	5.46	5.12	5.06	4.90	5.77	5.92	6.22	6.80	6.05	4.21	5.57
08	10	1.92	2.28	2.01	2.61	2.34	3.10	2.93	2.76	3.25	3.05	3.10	2.34	2.53	2.44	2.38	2.58	2.83	2.90	2.71	3.08	3.10	3.42	2.01	2.79
08	11	3.84	3.86	2.51	3.43	3.93	3.59	3.40	3.07	3.66	3.97	4.00	3.93	3.65	4.05	3.87	4.15	4.00	3.33	3.13	4.01	3.60	4.09	3.83	3.48
08	12	5.85	5.94	5.96	5.99	6.63	6.06	6.27	6.32	6.21	4.58	6.90	6.62	6.24	5.71	6.41	6.58	6.19	5.76	5.33	5.92	5.20	6.13	5.43	3.90
09	1	2.64	2.65	2.60	2.98	2.71	2.44	2.31	2.42	2.55	1.90	2.70	2.70	2.65	2.70	2.88	2.72	2.60	1.83	2.28	2.56	1.80	2.74	2.60	1.52
09	2	0.36	0.48	0.47	0.65	0.78	0.72	0.56	0.26	0.73	0.62	0.60	0.78	0.67	0.49	0.59	0.45	0.49	0.41	0.55	0.51	0.80	0.75	0.40	0.69
09	3	1.59	1.44	1.44	1.51	1.75	1.70	1.26	0.89	1.27	0.88	1.30	1.74	1.29	1.44	1.56	1.40	1.28	1.22	1.26	1.40	1.20	1.53	1.30	1.58
09	4	3.99	4.05	4.08	4.70	4.41	4.68	3.91	2.82	4.40	4.71	4.10	4.40	4.00	3.92	4.36	4.54	3.90	4.60	4.77	4.25	4.50	4.87	3.70	3.38
09	5	4.63	5.97	4.12	4.37	5.15	4.95	4.36	3.25	4.66	4.96	4.30	5.15	4.15	4.28	4.89	5.17	4.53	4.77	5.11	4.54	5.40	5.33	4.43	5.31
09	6	5.55	5.02	5.40	5.23	4.32	5.12	4.80	3.37	5.31	6.29	5.70	4.34	5.98	4.02	4.69	5.51	4.78	4.82	5.34	5.28	4.70	5.25	4.42	6.30

ii. The total number of regulator inspections conducted during the period of the report.

The total number of regulators inspected is documented in **APPENDIX A**.

iii. A list of blockages (if any) corrected or other interceptor maintenance performed, including location, date and time corrected, and any discharges to the stream observed.

This information is documented in **APPENDIX A**.

e. Dry-weather overflows - for all dry weather overflows, indicate the location, date and time discovered, date and time corrected/ceased, and action(s) taken to prevent their re-occurrence.

Date Observed		Date Stopped		Last Inspection	Site ID	Type	Collector
6/30/2009	2:00	6/30/2009	3:00	6/26/2009	T-13	SLOT	FHL
5/11/2009	1:50	5/11/2009	3:10	4/30/2009	T-13	SLOT	FHL
4/21/2009	9:30	4/21/2009	12:30	4/20/2009	C-14	SLOT	CCHL
4/16/2009	1:50	4/16/2009	2:40	3/30/2009	T-13	SLOT	FHL
2/25/2009	9:20	2/25/2009	10:10	2/11/2009	C-31	SLOT	CCHL
2/5/2009	9:40	2/5/2009	11:00	1/29/2009	C-09	SLOT	CCHL
2/5/2009	1:50	2/5/2009	2:30	1/29/2009	S-14	B&B	CSW
1/8/2009	10:50	1/8/2009	12:00	12/29/2008	C-15	SLOT	CCHL
12/15/2008	1:00	12/15/2008	2:00	12/12/2008	F-09	WH-S	LFLL
12/2/2008	1:30	12/2/2008	5:30	11/17/2008	C-07	SLOT	CCHL
11/12/2008	1:00	11/12/2008	1:40	10/29/2008	T-13	SLOT	FHL
9/15/2008	9:20	9/15/2008	5:40	9/11/2008	F-05	WH-S	LFLL
9/8/2008	2:20	9/8/2008	3:00	8/14/2008	T-13	SLOT	FHL
8/15/2008	1:30	8/15/2008	2:50	8/14/2008	C-27	SLOT	CCLL
7/31/2008	9:00	8/1/2008	11:00	7/17/2008	T-13	SLOT	FHL
7/30/2008	12:50	7/30/2008	4:20	7/22/2008	C-27	SLOT	CCLL
7/25/2008	7:20	7/25/2008	10:50	7/17/2007	C-14	SLOT	CCHL

f. Wet-weather overflows - using calibrated models of the combined sewer system, provide a summary of the annual CSO frequency, volume, and percent capture of combined sewer flows.

See 'Annual summary of the frequency and volume of CSO discharges' table above in section *a*.

g. Chronic or continuous discharges - Provide the status and corrective actions taken at all sites identified as being chronic or continuous discharges, including an estimate of flow and duration.

The only known chronic discharges are Main and Shurs and PC-30. For information on corrective actions, please refer to 'Eliminate CSO/Main and Shurs Off-Line Storage (SW)- Construction and Implementation of the Main and Shurs Off-line Storage Project' and 'PC-30 Extreme Wet Weather Overflow'.

Main and Shurs

Event No.	Start of Overflow Date Time	Event Duration (hours)	Flow Volume (ft^3)	Flow Volume (Millions of gallons)
1	10/25/08 19:30	2.50	12,963	0.097
2	12/11/08 20:45	2.50	32,644	0.244
3	7/9/08 18:45	1.00	520	0.004
4	7/24/08 0:00	2.00	17,822	0.133
5	7/27/08 14:30	1.00	627	0.005
6	9/6/08 14:15	6.00	1,072,011	8.020

PC-30

Event No.	Start of Overflow Date Time	Event Duration (hours)	Flow Volume (ft^3)	Flow Volume (Millions of gallons)
1	12/11/08 19:47	9.13	506,366	3.788
2	12/19/08 18:10	0.37	5041	0.038
3	9/6/08 18:30	2.17	113,000	0.845

h. Documentation showing the continued implementation of the Nine Minimum Controls.

Please refer to Section II of this report 'Implementation of the Nine Minimum Controls (NMCs)'.

i. Long Term Control Plan Implementation - The permittee shall submit information that describes the efforts to update and implement the CSO LTCP. The permittee shall continue to update implementation schedules as part of the Annual CSO status report."

PWD has completed the Philadelphia Combined Sewer Overflow (CSO) Long Term Control Plan Update (LTCPU). The CSO LTCPU details PWD's plan to increase capture and reduce CSOs through a variety of infrastructure. The evaluation of alternative control measures was consistent with the guidance provided in Chapter 3 of the Combined Sewer Overflows: Guidance for Long-Term Control Plan, Office of Water EPA 832-B-95-002, September, 1995 ("Guidance for LTCP"). Additionally, the plan addressed the following components:

a). PWD conducted flow monitoring and assessed the performance of the CSO control alternatives and the efficacy of implemented controls with a hydrologic and hydraulic model of the collection system.
b.) Evaluated the technical applicability and feasibility of the full range of alternatives. Alternatives included projects that:

i. Link the City's development and land management practices to achieve CSO reductions through the application of innovative storm water management regulations and low impact development and re-development practices.
ii. Directly restore aquatic ecosystems through stream rehabilitation and wetland construction.
iii. Expand its collection and treatment systems to increase the capture and treatment of combined sewage and ensure adequate transport capacity for dry and wet weather flows.

c.) Assessed the watershed wide reductions in pollutant loads achieved by the CSO controls and other controls as developed in the watershed management plans.
d.) Evaluated the Project Costs for each alternative or mix of alternatives.
e.) Analyzed the benefits of the additional treatment applied to wet-weather flow through its secondary treatment processes and assessed the performance of the CSO controls.
f.) The watershed partnerships were utilized for evaluation and prioritization of management alternatives including additional CSO controls.
g.) Characterization of each individual watersheds' physical, chemical, and biological components.
h.) Assessment of the financial capability to establish the burden of compliance on both ratepayers and the permitee.
i.) Schedule of implementation of the selected CSO control alternative.

The full Philadelphia Combined Sewer Overflow Long Term Control Plan Update report can be found at http://www.phillywatersheds.org/ltcpu/.

The estimated average annual frequency and volume statistics for period July 1 2008 – June 30 2009 are presented in the **TABLE III.C-7.**

Table III.C-7 CSO Statistics for Period July 1 2008 – June 30 2009 by Outfall

Outfall Name	**Frequency**	**Duration**		**SWO Volume (ft^3)**	
		Min	**Max**	**Min**	**Max**
C_FRTR	148	0.5	40.75	56.93	4,043,000
C_FRA	52	0.25	11.25	1.49	493,700
C01	37	0.5	9.25	53.97	91,700
C02	12	0.25	3	33.48	11,930
C04A	47	0.5	34.5	101.50	3,593,000
C05	43	0.25	11.75	2.87	284,700
C06	93	0.25	38.5	2.81	2,225,000
C07	62	0.25	34.25	93.52	910,800
C09	54	0.25	15	48.03	580,600
C10	58	0.25	24.25	2.86	148,100
C11	85	0.25	36	1.02	5,321,000
C12	80	0.25	31.5	0.92	779,200

C13	60	0.25	27.5	13.59	611,000
C14	68	0.25	18	8.74	516,000
C15	52	0.25	15.5	3.61	109,500
C16	15	0.25	1.75	5.55	39,520
C17	70	0.75	33	346.40	12,660,000
C18	71	0.25	17.5	2.02	626,900
C19	26	0.25	2	231.70	285,200
C20	28	0.25	2.5	12.86	136,200
C21	10	0.25	2	205.90	139,700
C22	57	0.25	5.75	18.66	399,200
C23	13	0.25	2.75	1.30	47,470
C25	41	0.25	7.25	7.95	745,200
C28A	38	0.25	3	0.96	101,700
C29	77	0.25	19.25	1.23	220,800
C30	45	0.25	13	224.00	107,000
C31	77	0.25	26	7.49	517,900
C32	60	0.25	16	55.49	486,000
C33	45	0.25	10.25	2.41	126,900
C34	27	0.25	8.75	165.10	68,890
C35	12	0.25	5.5	55.52	26,170
C36	12	0.25	2.5	288.90	26,650
C37	26	0.25	8.5	2.20	28,280
D_FRW	72	0.25	25	69.90	5,898,000
D02	68	0.25	37.5	1,090.00	7,180,000
D03	65	0.25	33.25	217.60	1,889,000
D04	41	0.25	32	5.77	260,200
D05	78	0.5	35	264.30	16,400,000
D06	30	0.25	28.75	38.61	735,100
D07	40	0.5	28	180.20	9,050,000
D08	66	0.25	32.25	24.11	572,500
D09	11	0.25	1	196.00	32,840
D11	33	0.25	25	1,380.00	2,272,000
D12	69	0.25	10	2.33	19,100
D13	20	0.5	1.5	626.90	35,980
D15	24	0.25	2.75	31.54	113,300
D17	74	0.25	16.25	127.50	742,400
D18	74	0.5	20.5	357.60	578,200
D19	72	0.5	22	171.70	458,500
D20	52	0.25	7	53.06	284,900
D21	63	0.5	17.5	1,183.00	703,800
D22	129	0.25	31.5	6.25	4,736,000
D23	68	0.25	19.25	1.30	33,200
D25	107	0.75	31	693.40	21,910,000
D37	80	0.5	30.25	768.40	6,056,000

D38	67	0.75	28.25	7,564.00	7,100,000
D39	87	0.5	29	4.10	7,059,000
D40	107	0.25	30	0.01	390,600
D41	75	0.25	26.25	4.03	491,900
D42	36	0.25	6.25	0.65	31,230
D43	28	0.5	8	28.49	23,910
D44	72	0.25	27.5	15.91	1,827,000
D45	65	0.5	26.5	3,844.00	12,390,000
D46	39	0.25	16.75	412.90	151,000
D47	128	0.5	32.75	10.46	1,644,000
D48	68	0.5	24.5	3,228.00	4,081,000
D49	14	0.25	1	83.28	13,040
D50	37	0.25	9.75	68.36	55,220
D51	126	0.5	32.25	3.90	532,700
D51A	95	0.25	27.5	0.00	302,600
D52	56	0.25	12.5	3.21	81,370
D53	16	0.5	4.5	3,838.00	304,700
D54	37	0.25	15.5	1,047.00	1,528,000
D58	49	0.25	15.75	1,046.00	348,600
D61	89	0.5	22.5	0.01	251,300
D62	60	0.25	11	0.41	118,500
D63	58	0.25	17.75	538.90	2,716,000
D64	60	0.25	9.5	0.01	86,340
D65	50	0.25	17.75	873.30	1,789,000
D66	64	0.5	21.75	946.30	1,571,000
D67	59	0.25	19.25	95.62	743,900
D68	77	0.25	28.25	39.10	4,783,000
D69	42	0.5	18.75	42.95	1,315,000
D70	30	0.5	17.75	1,790.00	2,227,000
D71	80	0.25	27.75	148.80	1,597,000
D72	45	0.5	26.25	1,244.00	1,371,000
D73	71	0.5	27.25	2,264.00	3,182,000
F_FRFG	111	1	37.5	5,957.00	25,480,000
F03	51	0.25	24.5	6.48	1,347,000
F04	105	0.25	29.25	2.05	3,126,000
F05	105	0.5	27.5	5.44	317,300
F06	36	0.25	14.25	2.13	222,100
F07	64	0.25	21.25	12.63	876,900
F08	60	0.25	19.75	0.91	453,900
F09	94	0.25	26.5	4.09	272,800
F10	102	0.5	28.5	7.75	837,200
F11	110	0.5	30	9.77	4,462,000
F12	50	0.25	16	2.53	236,800
F13	87	0.25	22.75	1.18	415,500

F21	106	0.5	30.5	1,276.00	23,930,000
F23	68	0.25	9.75	228.40	170,200
F24	72	0.25	8.5	29.48	74,410
F25	11	0.5	7.25	8,298.00	509,300
P01	37	0.25	7.5	2.93	84,180
P02	79	0.25	27.5	7.31	2,051,000
P03	44	0.25	30	5.81	675,800
P04	21	0.75	29	2,179.00	3,950,000
P05	36	0.25	32.75	4.66	8,267,000
S_FRM	1	1	1	390,600.00	390,600
S01	70	0.25	27	4.96	2,897,000
S01T	110	0.25	26	2.86	4,454,000
S02	87	0.25	26.75	1.47	242,300
S03	12	0.5	1	650.50	10,990
S04	132	0.25	36.75	3.09	457,700
S05	109	0.25	31	5.35	6,491,000
S06	108	0.25	29.25	5.14	2,356,000
S07	25	0.25	8.75	284.80	344,600
S08	67	0.25	19.75	9.42	30,030
S09	59	0.25	20	183.10	1,500,000
S10	89	0.25	27	29.91	496,500
S11	50	0.5	7.75	64.57	43,330
S12A	75	0.25	22.75	1.29	144,200
S13	41	0.5	4.75	55.56	38,020
S14	106	0.25	29.75	1.69	404,400
S15	50	0.25	11.75	2.11	44,280
S16	129	0.25	31.25	1.60	267,800
S17	9	0.25	1	78.97	15,780
S18	81	0.25	28	126.60	1,258,000
S19	56	0.25	11.75	19.71	42,910
S20	109	0.25	32	4.76	2,831,000
S21	41	0.25	4.5	5.71	16,060
S22	68	0.25	22.75	2.28	375,800
S23	91	0.25	26	43.01	266,800
S24	66	0.25	23	1.02	144,400
S25	68	0.25	23.25	3.29	293,200
S26	114	0.5	33	41.30	2,901,000
S30	15	0.25	1.5	11.30	71,060
S31	91	0.25	26.5	68.48	860,700
S32	26	0.25	2	1.56	99,860
S33	107	0.25	19.75	1.36	3,971,000
S36A	100	0.5	29.75	24.20	1,186,000
S37	105	0.25	29	7.29	578,800
S38	58	0.25	17.25	8.91	1,548,000

S42	70	0.75	24.25	320.20	2,887,000
S42A	109	1	33.75	222.70	3,502,000
S44	67	0.5	23.25	135.60	1,547,000
S45	112	0.25	49.75	20.17	9,147,000
S46	50	0.5	17.75	11.20	340,800
S50	98	0.25	37.25	101.20	85,040,000
T_01	103	0.25	29	3.11	1,567,000
T_03	82	0.25	28.25	42.43	1,051,000
T_04	78	0.25	28	22.56	733,800
T_05	62	0.25	17	2.21	378,400
T_06	61	0.25	24.5	2.49	3,671,000
T_07	16	0.25	2.75	25.36	34,980
T_08	110	0.5	32.25	151.90	23,940,000
T_09	61	0.25	18.25	13.37	284,700
T_10	90	0.25	29.5	71.19	828,400
T_11	80	0.5	26.75	46.49	510,400
T_12	15	0.5	4.5	2.19	26,560
T_13	89	0.25	29.25	39.97	1,671,000
T_14	94	0.25	31	5.31	47,290,000
T_15	79	0.25	28.75	19.55	2,346,000
T_FRRR	49	0.5	14.5	82.94	1,964,000

Table III.C-8 Listing of all CSO permitted outfalls

Point Source #	Outfall Latitude	Outfall Longitude	Regulator Location	Discharges to:	Interceptor	Outfall Name
NPDES Permit #0026689 - Northeast						
2	39d 58m 50s	75d 4m 58s	Castor Ave. and Balfour St.	Delaware River	Somerset	D_17
3	39d 58m 45s	75d 5m 6s	Venango St. NW of Casper St.	Delaware River	Somerset	D_18
4	39d 58m 41s	75d 5m 15s	Tioga St. NW of Casper St.	Delaware River	Somerset	D_19
5	39d 58m 43s	75d 5m 28s	Ontario St. NW of Casper St.	Delaware River	Somerset	D_20
6	39d 58m 44s	75d 5m 41s	Westmoreland St. NW of Balfour St.	Delaware River	Somerset	D_21
7	39d 58m 42s	75d 5m 53s	Allegheny Ave. SE of Bath St.	Delaware River	Somerset	D_22
8	39d 58m 38s	75d 6m 12s	Indiana Ave. SE of Allen St.	Delaware River	Somerset	D_23
10	39d 58m 38s	75d 6m 28s	Cambria St. E of Melvale St.	Delaware River	Somerset	D_25
11	40d 1m 18s	75d 1m 44s	Cottman St. SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_02
12	40d 1m 14s	75d 2m 0s	Princeton Ave SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_03
13	40d 1m 8s	75d 2m 13s	Disston St. SE of Wissinoming St.	Delaware River	Upper Delaware Low Level	D_04
14	40d 0m 58s	75d 2m 34s	Magee St. SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_05
15	40d 0m 53s	75d 2m 46s	Levick St. SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_06
16	40d 0m 44s	75d 3m 5s	Lardner St. SE of Milnor St.	Delaware River	Upper Delaware Low	D_07

					Level	
17	40d 0m 38s	75d 3m 13s	Comly St. SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_08
18	40d 0m 34s	75d 3m 18s	Dark Run La and Milnor St.	Delaware River	Upper Delaware Low Level	D_09
19	40d 0m 21s	75d 3m 28s	Sanger St. SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_11
20	40d 0m 2s	75d 3m 43s	Bridge St. Se of Garden St.	Delaware River	Upper Delaware Low Level	D_12
21	39d 59m 53s	75d 3m 47s	Kirkbride St. and Delaware Ave.	Delaware River	Upper Delaware Low Level	D_13
22	39d 59m 24s	75d 4m 4s	Orthodox St. and Delaware Ave.	Delaware River	Upper Delaware Low Level	D_15
23	40d 2m 36s	75d 1m 15s	Frankford Avenue & Ashburner Street	Pennypack Creek	Pennypack	P_01
24	40d 2m 36s	75d 1m 16s	Frankford Avenue & Holmesburg St.	Pennypack Creek	Pennypack	P_02
25	40d 2m 13s	75d 1m 19s	Torresdale Ave. NW of Pennypack Ck.	Pennypack Creek	Pennypack	P_03
26	40d 2m 23s	75d 1m 21s	Cottage Avenue & Holmesburg Avenue	Pennypack Creek	Pennypack	P_04
27	40d 2m 2s	75d 1m 21s	Holmesburg Ave SE of Hegerman St	Pennypack Creek	Pennypack	P_05
28	40d 4m 34s	75d 9m 44s	Williams Avenue SE of Sedgewick	Tacony Creek	Frankford High Level	T_01
29	40d 2m 28s	75d 6m 56s	Complost Ave West of Tacony Creek	Tacony Creek	Frankford High Level	T_03
30	40d 2m 11s	75d 6m 48s	Rising Sun Ave East of Tacony Creek	Tacony Creek	Frankford High Level	T_04
31	40d 2m 9s	75d 6m 48s	Rising Sun Ave West of Tacony Creek	Tacony Creek	Frankford High Level	T_05
32	40d 2m 3s	75d 6m 41s	Bingham Street East of Tacony Creek	Tacony Creek	Frankford High Level	T_06

33	40d 1m 51s	75d 6m 43s	Tabor Road West of Tacony Creek	Tacony Creek	Frankford High Level	T_07
34	40d 1m 42s	75d 6m 47s	Ashdale Street West of Tacony Creek	Tacony Creek	Frankford High Level	T_08
35	40d 1m 37s	75d 6m 48s	Roosevelt Blvd. West of Tacony Creek	Tacony Creek	Frankford High Level	T_09
36	40d 1m 37s	75d 6m 47s	Roosevelt Blvd. East of Tacony Creek	Tacony Creek	Frankford High Level	T_10
37	40d 1m 29s	75d 6m 43s	Ruscomb Street East of Tacony Creek	Tacony Creek	Frankford High Level	T_11
38	40d 1m 23s	75d 6m 41s	Whitaker Avenue East of Tacony Creek	Tacony Creek	Frankford High Level	T_12
39	40d 1m 22s	75d 6m 42s	Whitaker Avenue West of Tacony Ck	Tacony Creek	Frankford High Level	T_13
40	40d 0m 59s	75d 6m 28s	I Street & Ramona Ave.	Tacony Creek	Frankford High Level	T_14
41	40d 0m 57s	75d 6m 20s	J Street & Juniata Park	Tacony Creek	Frankford High Level	T_15
42	40d 0m 57s	75d 5m 51s	Castor Avenue at Unity Street Circle	Frankford Creek	Upper Frankford Low Level	F_03
43	40d 0m 52s	75d 5m 42s	Wingohocking St East of Adams Ave	Frankford Creek	Upper Frankford Low Level	F_04
44	40d 0m 41s	75d 5m 41s	Bristol Street West of Adams Avenue	Frankford Creek	Upper Frankford Low Level	F_05
45	40d 0m 25s	75d 5m 33s	Worrel Street East of Frankford Creek	Frankford Creek	Upper Frankford Low Level	F_06
46	40d 0m 26s	75d 5m 34s	Worrel Street West of Frankford Creek	Frankford Creek	Upper Frankford Low Level	F_07
47	40d 0m 21s	75d 5m 36s	Torresdale Ave & Hunting Park Ave	Frankford Creek	Upper Frankford Low Level	F_08
48	40d 0m 19s	75d 5m 34s	Frankford Ave North of Frankford Ck	Frankford Creek	Upper Frankford Low Level	F_09
49	40d 0m 19s	75d 5m 35s	Frankford Ave South of Frankford Ck	Frankford Creek	Upper Frankford Low Level	F_10
50	40d 0m 15s	75d 5m 26s	Orchard Street South of Vandyke	Frankford Creek	Upper Frankford Low	F_11

			Creek		Level	
51	39d 59m 56s	75d 5m 14s	Sepviva Street North of Butler Street	Frankford Creek	Upper Frankford Low Level	F_12
52	39d 59m 49s	75d 5m 3s	Duncan Street Under Delaware Exp.	Frankford Creek	Lower Frankford Low Level	F_13
54	40d 0m 16s	75d 4m 15s	Wakeling Street NW of Creek Basin	Frankford Creek	Lower Frankford Low Level	F_21
55	40d 0m 19s	75d 4m 5s	Bridge Street NW of Creek Basin	Frankford Creek	Lower Frankford Low Level	F_23
56	40d 0m 18s	75d 4m 5s	Bridge Street SE of Creek Basin	Frankford Creek	Lower Frankford Low Level	F_24
57	40d 0m 15s	75d 4m 15s	Ash Street West of Creek Basin	Frankford Creek	Lower Frankford Low Level	F_25
58	40d 0m 30s	75d 3m 20s	Levick St. & Everett Ave.	Delaware River	Wakling Relief Sewer	D_FRW
59	40d 2m 16s	75d 6m 53s	Nedro Ave & 7th St.	Tacony Creek	Rock Run Flood Relief Sewer	T_FRRR
60	40d 0m 36s	75d 5m 44s	Castor Ave. & East Hunting Park Ave.	Frankford Creek	Frankford High Level Relief Sewer	F_FRFG
NPDES Permit # 0026662 – Southeast						
2	39d 58m 9s	75d 7m 19s	Dyott Street & Delaware Ave.	Delaware River	Lower Delaware Low Level	D_38
3	39d 58m 7s	75d 7m 23s	Susquehanna Ave. East of Beach Street	Delaware River	Lower Delaware Low Level	D_39
4	39d 58m 5s	75d 7m 26s	Berks Street East of Beach Street	Delaware River	Lower Delaware Low Level	D_40
5	39d 58m 3s	75d 7m 37s	Palmer Street East of Beach Street	Delaware River	Lower Delaware Low Level	D_41
6	39d 57m 54s	75d 7m 42s	Columbia Avenue East of Beach Street	Delaware River	Lower Delaware Low Level	D_42
7	39d 57m 56s	75d 7m 48s	Marlborough Street & Delaware Ave	Delaware River	Lower Delaware Low Level	D_43
8	39d 57m	75d 7m 54s	Shackamaxon St East of Delaware	Delaware River	Lower Delaware Low	D_44

	53s		Ave		Level	
9	39d 57m 48s	75d 8m 0s	Laurel Street & Delaware Avenue	Delaware River	Lower Delaware Low Level	D_45
10	39d 57m 41s	75d 8m 11s	Penn Street & Delaware Avenue	Delaware River	Lower Delaware Low Level	D_46
11	39d 57m 37s	75d 8m 9s	Fairmont Ave West of Delaware Ave	Delaware River	Lower Delaware Low Level	D_47
12	39d 57m 28s	75d 8m 13s	Willow Street West of Delaware Ave	Delaware River	Lower Delaware Low Level	D_48
13	39d 57m 24s	75d 8m 20s	Callowhill Street & Delaware Avenue	Delaware River	Lower Delaware Low Level	D_49
14	39d 57m 21s	75d 8m 13s	Delaware Avenue North of Vine Street	Delaware River	Lower Delaware Low Level	D_50
15	39d 57m 11s	75d 8m 17s	Race Street West of Delaware Avenue	Delaware River	Lower Delaware Low Level	D_51
16	39d 57m 7s	75d 8m 25s	Delaware Avenue & Arch Street	Delaware River	Lower Delaware Low Level	D_52
17	39d 56m 57s	75d 8m 23s	Market Street & Front Street	Delaware River	Lower Delaware Low Level	D_53
20	39d 56m 50s	75d 8m 24s	Front Street South of Chestnut Street	Delaware River	Lower Delaware Low Level	D_54
21	39d 56m 26s	75d 8m 32s	South Street & Delaware Avenue	Delaware River	Lower Delaware Low Level	D_58
22	39d 56m 12s	75d 8m 33s	Catharine Street East of Swanson Street	Delaware River	Lower Delaware Low Level	D_61
23	39d 56m 10s	75d 8m 32s	Queen Street East of Swanson Street	Delaware River	Lower Delaware Low Level	D_62
24	39d 56m 5s	75d 8m 33s	Christian St West of Delaware Avenue	Delaware River	Lower Delaware Low Level	D_63
25	39d 55m 59s	75d 8m 35s	Washington Ave East of Delaware Ave	Delaware River	Lower Delaware Low Level	D_64
26	39d 55m 45s	75d 8m 29s	Reed Street East of Delaware Avenue	Delaware River	Lower Delaware Low Level	D_65

27	39d 55m 37s	75d 8m 28s	Tasker Street East of Delaware Avenue	Delaware River	Lower Delaware Low Level	D_66
28	39d 55m 26s	75d 8m 21s	Moore Street East of Delaware Avenue	Delaware River	Lower Delaware Low Level	D_67
33	39d 54m 6s	75d 8m 12s	Pattison Avenue & Swanson Street	Delaware River	Lower Delaware Low Level	D_73
36	39d 58m 21s	75d 6m 58s	Cumberland St East of Richmond St	Delaware River	Lower Delaware Low Level	D_37
37	39d 57m 12s	75d 8m 24s	Race Street West of Delaware Avenue, North of D-51	Delaware River	Lower Delaware Low Level	D_51A
29	39d 55m 13s	75d 8m 20s	Snyder Avenue & Delaware Avenue	Delaware River	Oregon	D_68
30	39d 54m 60s	75d 8m 13s	Delaware Ave North of Porter Street	Delaware River	Oregon	D_69
31	39d 54m 44s	75d 8m 15s	Oregon Avenue & Delaware Avenue	Delaware River	Oregon	D_70
32	39d 54m 33s	75d 7m 59s	Bigler Street & Delaware Avenue	Delaware River	Oregon	D_71
34	39d 54m 24s	75d 8m 8s	Packer Avenue East of Delaware Ave	Delaware River	Oregon	D_72
NPDES Permit # 0026671 - Southwest						
2	39d 56m 17s	75d 12m 17s	Reed Street & Schuylkill Avenue	Schuylkill River	Lower Schuylkill East Side	S_31
3	39d 55m 54s	75d 12m 28s	35th St. and Mifflin St.	Schuylkill River	Lower Schuylkill East Side	S_36A
4	39d 55m 41s	75d 12m 38s	Vare Avenue & 29th Street	Schuylkill River	Lower Schuylkill East Side	S_37
5	39d 55m 12s	75d 12m 5s	Passyunk Avenue & 29th Street	Schuylkill River	Lower Schuylkill East Side	S_42
6	39d 55m 12s	75d 12m 5s	Passyunk Avenue & 28th Street	Schuylkill River	Lower Schuylkill East Side	S_42A
7	39d 54m 57s	75d 12m 16s	26th Street 700′ North of Hartranft St	Schuylkill River	Lower Schuylkill East Side	S_44

8	39d 53m 53s	75d 12m 39s	Penrose Avenue & 26th Street	Schuylkill River	Lower Schuylkill East Side	S_46
9	39d 57m 38s	75d 10m 50s	24th Street 155′ South of Parktown Pl	Schuylkill River	Central Schuylkill East Side	S_05
10	39d 57m 39s	75d 10m 49s	24th Street 350′ South of Parktown Pl	Schuylkill River	Central Schuylkill East Side	S_06
11	39d 57m 39s	75d 10m 50s	24th Street East of Schuylkill River	Schuylkill River	Central Schuylkill East Side	S_07
12	39d 57m 29s	75d 10m 43s	Race Street & Bonsall Street	Schuylkill River	Central Schuylkill East Side	S_08
13	39d 57m 30s	75d 10m 45s	Arch Street West of 23rd Street	Schuylkill River	Central Schuylkill East Side	S_09
14	39d 57m 16s	75d 10m 49s	Market Street 25′ East of 24th Street	Schuylkill River	Central Schuylkill East Side	S_10
15	39d 57m 11s	75d 10m 51s	24th St. N of Chestnut St. Bridge	Schuylkill River	Central Schuylkill East Side	S_12A
16	39d 57m 7s	75d 10m 52s	Sansom Street West of 24th Street	Schuylkill River	Central Schuylkill East Side	S_13
17	39d 57m 5s	75d 10m 53s	Walnut Street West of 24th Street	Schuylkill River	Central Schuylkill East Side	S_15
18	39d 57m 1s	75d 10m 56s	Locust Street & 25th Street	Schuylkill River	Central Schuylkill East Side	S_16
19	39d 56m 57s	75d 11m 0s	Spruce Street & 25th Street	Schuylkill River	Central Schuylkill East Side	S_17
20	39d 56m 52s	75d 11m 5s	Pine Street West of Taney Street	Schuylkill River	Central Schuylkill East Side	S_18
21	39d 56m 49s	75d 11m 9s	Lombard Street West of 27th Street	Schuylkill River	Central Schuylkill East Side	S_19
22	39d 56m 47s	75d 11m 12s	South Street East of 27th Street	Schuylkill River	Central Schuylkill East Side	S_21
23	39d 56m 44s	75d 11m 18s	Schuylkill Avenue & Bainbridge Street	Schuylkill River	Central Schuylkill East Side	S_23
24	39d 56m	75d 11m	Schuylkill Avenue & Christian	Schuylkill River	Central Schuylkill East	S_25

	34s	28s	Street		Side	
25	39d 56m 29s	75d 11m 35s	Ellsworth St West of Schuylkill Avenue	Schuylkill River	Central Schuylkill East Side	S_26
26	39d 58m 1s	75d 11m 17s	Mantua Avenue & West River Drive	Schuylkill River	Central Schuylkill West Side	S_01
27	39d 57m 54s	75d 11m 7s	Haverford Avenue & West River Drive	Schuylkill River	Central Schuylkill West Side	S_02
28	39d 57m 51s	75d 11m 4s	Spring Garden St W of Schuylkill Expy	Schuylkill River	Central Schuylkill West Side	S_03
29	39d 57m 53s	75d 11m 4s	Powelton Ave W of Schuylkill Expy	Schuylkill River	Central Schuylkill West Side	S_04
30	39d 57m 16s	75d 10m 53s	Market St West of Schuylkill Expy	Schuylkill River	Central Schuylkill West Side	S_11
31	39d 57m 5s	75d 10m 58s	Schuylkill Expressway & Walnut Street	Schuylkill River	Central Schuylkill West Side	S_14
32	39d 56m 51s	75d 11m 14s	440′ Northwest of South Street	Schuylkill River	Central Schuylkill West Side	S_20
33	39d 56m 46s	75d 11m 22s	660′ South of South St E of Pennfield	Schuylkill River	Central Schuylkill West Side	S_22
34	39d 56m 43s	75d 11m 26s	1060′ South of South St E of Pennfield	Schuylkill River	Central Schuylkill West Side	S_24
35	39d 56m 32s	75d 12m 27s	46th Street & Paschall Avenue	Schuylkill River	Southwest Main Gravity	S_30
36	39d 56m 36s	75d 12m 18s	43rd St. and Locust St.	Schuylkill River	Southwest Main Gravity	S_50
37	39d 56m 13s	75d 12m 23s	49th Street South of Botanic Street	Schuylkill River	Lower Schuylkill West Side	S_32
38	39d 56m 8s	75d 12m 24s	51st Street South of Botanic Street	Schuylkill River	Lower Schuylkill West Side	S_33
39	39d 55m 43s	75d 12m 45s	56th Street East of P&R Railroad	Schuylkill River	Lower Schuylkill West Side	S_38
40	39d 54m 39s	75d 12m 55s	64th St. and Buist Ave.	Schuylkill River	Lower Schuylkill West Side	S_45

41	39d 56m 10s	75d 14m 6s	60th Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek High Level	C_18
51	39d 58m 51s	75d 16m 4s	City Line Avenue & 73rd Street	Cobbs Creek	Cobbs Creek High Level	C_01
52	39d 58m 51s	75d 16m 1s	City Line Ave 100' South Side of Creek	Cobbs Creek	Cobbs Creek High Level	C_02
54	39d 58m 30s	75d 15m 26s	Lebanon Ave Southwest of 73rd Street	Cobbs Creek	Cobbs Creek High Level	C_05
55	39d 58m 31s	75d 15m 25s	Lebanon Avenue & 68th Street	Cobbs Creek	Cobbs Creek High Level	C_06
56	39d 58m 26s	75d 15m 26s	Lansdowne Avenue & 69th Street	Cobbs Creek	Cobbs Creek High Level	C_07
57	39d 57m 51s	75d 14m 56s	54th Street & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_09
58	39d 57m 50s	75d 14m 53s	Gross Street & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_10
59	39d 57m 43s	75d 14m 53s	Cobbs Creek Pky South of Market St	Cobbs Creek	Cobbs Creek High Level	C_11
60	39d 57m 27s	75d 14m 60s	Spruce Street & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_12
61	39d 56m 45s	75d 14m 58s	62nd Street & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_13
62	39d 56m 36s	75d 14m 50s	Baltimore Avenue & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_14
63	39d 56m 31s	75d 14m 26s	59th Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek High Level	C_15
64	39d 56m 26s	75d 14m 23s	Thomas Avenue & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_16
65	39d 56m 13s	75d 14m 6s	Beaumont Street & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_17
66	39d 58m 29s	75d 16m 48s	Cobbs Creek Pky S of City Line Ave	Cobbs Creek	Cobbs Creek High Level	C_31
67	39d 58m	75d 15m	Brockton Road & Farrington Road	Cobbs Creek	Cobbs Creek High Level	C_33

	12s	56s				
68	39d 58m 40s	75d 15m 44s	Woodcrest Avenue & Morris Park	Cobbs Creek	Cobbs Creek High Level	C_34
69	39d 58m 47s	75d 15m 54s	Morris Park West of 72nd Street & Sherwood Road	Cobbs Creek	Cobbs Creek High Level	C_35
70	39d 58m 49s	75d 15m 35s	Woodbine Ave South of Brentwood Rd	Cobbs Creek	Cobbs Creek High Level	C_36
71	39d 57m 55s	75d 15m 15s	Cobbs Creek Parkway South of 67th & Callowhill Streets	Cobbs Creek	Cobbs Creek High Level	C_37
72	39d 58m 22s	75d 16m 11s	Cobbs Creek Parkway & 77th Street	Cobbs Creek	Cobbs Creek High Level	C_32
82	39d 58m 38s	75d 15m 28s	Malvern Ave. and 68th St.	Cobbs Creek	Cobbs Creek High Level	C_04A
42	39d 55m 57s	75d 14m 19s	Mount Moriah Cemetary & 62nd Street	Cobbs Creek	Cobbs Creek Low Level	C_19
43	39d 55m 46s	75d 14m 39s	65th Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek Low Level	C_20
44	39d 55m 37s	75d 14m 40s	68th Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek Low Level	C_21
45	39d 55m 27s	75d 14m 46s	70th Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek Low Level	C_22
46	39d 55m 15s	75d 14m 52s	Upland Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek Low Level	C_23
47	39d 55m 1s	75d 14m 49s	Woodland Avenue East of Island Ave.	Cobbs Creek	Cobbs Creek Low Level	C_25
49	39d 54m 44s	75d 14m 56s	Claymont Street & Grays Avenue	Cobbs Creek	Cobbs Creek Low Level	C_29
50	39d 54m 34s	75d 15m 1s	77th Street West of Elmwood Avenue	Cobbs Creek	Cobbs Creek Low Level	C_30
78	39d 54m 49s	75d 14m 50s	Island Ave. Southeast of Glenmore Ave	Cobbs Creek	Cobbs Creek Low Level	C_28A
75	39d 57m 59s	75d 11m 3s	16th St. & Clearfield St.	Schuylkill River	Main Relief Sewer	S_FRM

83	39d 56m 31s	75d 14m 25s	56th St. & Locust	Cobbs Creek	Thomas Run Relief Sewer	C_FRTR
84	39d 57m 49s	75d 14m 53s	Arch Street & Cobbs Creek	Cobbs Creek	Arch Street Relief Sewer	C_FRA

III.C.4.3 Rotating Basin Approach to Watershed Monitoring - Continue to implement a rotating basin approach to watershed monitoring in CSO receiving waters in order to characterize the impact of CSO discharges and other pollutant/pollution sources and the efficacy of CSO controls and watershed restoration practices.

Comprehensive Watershed Monitoring Program: Proposed Strategy 2008-2015

Assessing the integrity of our waterways is integral to the long-term sustainability of our aquatic ecosystems. Thorough measurements of aquatic communities and infrastructure allow to us determine whether or not a particular waterbody and the lands around it are headed toward improvement or degradation. The PWD considers such assessments a top priority and is committed to monitoring sites within and beyond Philadelphia County lines.

The City of Philadelphia recognizes the potential impacts of discharges from stormwater; combined sewer overflows and other discharges and conditions that affect drinking water and other designated uses of our waterways. To date, the City maintains a monitoring program developed in coordination with the Pennsylvania Department of Environmental Protection- Southeast Regional Office, integrating biomonitoring techniques with rigorous chemical and physical assessments.

From 1999 through 2008, the Philadelphia Water Department has implemented a comprehensive assessment strategy that provides both quantitative and qualitative information regarding the aquatic integrity of the watersheds that characterize Philadelphia. To date, baseline assessments of five watersheds have been completed, with information being disseminated to state officials and to local partnerships through technical and public meetings and website development. In addition, comprehensive characterization reports have been completed for the Darby-Cobbs, Tookany/Tacony-Frankford, Wissahickon, and Pennypack Creek Watersheds. The Poquessing-Byberry Watershed Report will be completed in 2010.

PWD's "Comprehensive Watershed Monitoring Program: Proposed Strategy 2008-2015" describes a watershed monitoring strategy developed by the Philadelphia Water Department to comply with both the City's stormwater and CSO permit requirements and to assist with the Sourcewater Protection Program's objectives. This report outlines a five-year plan (*i.e.*, 2010-2015) that will address time-lines, goals and objectives for the monitoring program, changes and/or additions to the current strategy and budgetary considerations. The Philadelphia Water Department will continue to work with the Southeast Regional Office of the Department of Environmental Protection to finalize this monitoring strategy.

2008/2009 USGS/PWD Cooperative Water Quality Monitoring Program Annual Summary

PWD and the United States Geologic Survey (USGS) have constructed and/or refurbished gaging stations in 10 locations throughout Philadelphia's watersheds. USGS staff is responsible for construction and maintenance of the gage structure, stream stage monitoring instruments, data communications, maintaining and verifying stage-discharge rating curves, and pumping apparatus. PWD staff is responsible for installation and maintenance of continuous water quality instrumentation. Data collected through the PWD/USGS cooperative water quality monitoring program are disseminated through the USGS National Water Information System (NWIS) Web Interface (http://waterdata.usgs.gov/pa/nwis/nwis), as well as a website specifically dedicated to Philadelphia's watersheds(http://pa.water.usgs.gov/pwd/). Continuous data are reviewed for the previous year's Annual Report (2008 data are included in the 2009 annual report).

In accordance with the Comprehensive Watershed Monitoring Program Strategy and water quality goals identified in Integrated Watershed Management Plans, PWD has instituted a City-wide dry weather water quality monitoring program. Surface water "grab" samples are collected from ten gages in the USGS/PWD Cooperative Monitoring Program Network on a quarterly basis. Water quality data are reviewed for the previous year's Annual Report (2008 data are included in the 2009 annual report).

STORMWATER MANAGEMENT PROGRAM ANNUAL REPORT

Part I Permit Conditions

Section A Applicability And Limitations On Coverage

The City will comply with the permit language on what are authorized and what are unauthorized stormwater discharges.

Section B 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, 2008 to June 30, 2009.

Section C Effluent Limitations

Section D Sediment Total Maximum Daily Load (TMDL) for Wissahickon Creek

The City has developed and implemented a program designed to achieve 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, includes an evaluation of the outfalls and tributaries that have the greatest potential for improvement through implementation of BMPs and/or other methods.

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. Updates based on data acquired between July 1 2008 and June 30 2009 are presented in the following summary of the sediment and stream restoration feasibility study. A technical report summarizing two years of the sediment study was produced in February 2009, entitled Wissahickon Creek Watershed: TMDL Sediment Monitoring Report (**APPENDIX B**). The next data set will be collected in August 2009.

D.i. Conduct a Wissahickon Sediment TMDL Feasibility study and submit report

<u>Summary of Sediment and Stream Restoration Feasibility Study</u>

Study Objectives

- To identify stream reaches with the most degradation and the greatest potential for restoration
- To estimate sediment loads originating from streambank erosion.
- To establish stage-discharge and discharge-TSS rating curves for tributaries
- To provide an objective means of ranking the stream reaches for restoration

Study Approach

The TMDL is based on models used to estimate Total Suspended Solids (TSS) originating 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 was performed on three tributaries (Wises Mill, Cathedral and Bells Mill) to estimate runoff loads and flows from outfalls and tributaries. SWMM models were utilized to determine bankfull discharge as well as verify flood flow and flood hazard conditions.

- 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).

- 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).

Estimated Outfall Loadings and Runoff
Methods used to develop stormwater outfall flows and loads are described in detail in the Wissahickon Creek Watershed Comprehensive Characterization Report (WCWCCR). 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 **APPENDIX C - SEDIMENT TOTAL MAXIMUM DAILY LOAD (TMDL) FOR WISSAHICKON CREEK – FEASIBILITY STUDY & MONITORING PLAN.**

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, very high or extreme. Reaches not assessed with BEHI and NBS criteria were assessed with modified BEHI criteria. Modified visual assessments were meant to be rapid assessments and relied on a combination of bank angle, weighted root density, surface protection, and the best professional judgment of the PWD staff to categorize a bank as having very low, low, moderate, high, very high, or extreme erosion potential. Specific details pertaining to the modified visual assessments are included in Section 2.2 of the Wissahickon Creek Watershed: TMDL Sediment Monitoring Report (**APPENDIX B**). A combination of the aforementioned assessment types was used to predict the sediment load originating from streambank erosion (**TABLE D-1**). Predictions were based on measured streambank erosion rates in a reference stream in Colorado (Rosgen, 1996). The total sediment load predicted for 12 Wissahickon tributaries within Philadelphia County was 4.2 millions pounds per year (**TABLE D-2**).

Table D-1 Wissahickon Tributary Characteristics and Erosion Assessment Bank Lengths

Tributary	Drainage Area acres	Stream Length ft	BEHI Erosion Bank Length ft	Modified BEHI Assessment Bank Length Method 1 ft	Method 2 ft	Method 3 ft	Channelized Bank Length ft
Bells Mill	323	6,722	4,021	0	9,151	0	271
Cathedral	160	2,790	2,400	0	3,090	0	91
Creshiem	1,218	16,431	4,002	10,548	10,578	3,613	4,120
Gorgas Lane	499	2,170	1,101	3,036	0	0	203
Hillcrest	217	5,272	189	137	4,387	0	5,829
Hartwell	144	3,530	859	3,104	1,051	1,767	278
Kitchens Lane	234	7,753	2,756	0	0	11,790	958
Monoshone	1,056	6,926	414	2,444	2,500	3,792	4,700
Thomas Mill	104	4,008	1,492	0	4,933	1,590	0
Valley Green	128	2,874	582	3037	0	884	1,245
Wises Mill	446	7,056	2,456	2,475	7,991	0	1,189
Rex Ave	137	1,903	637	0	1,315	1,854	0

Table D-2 Wissahickon Tributary Streambank Erosion Estimate – Colorado Stream Based

Tributary	BEHI Erosion lb/yr	Modified Visual BEHI Assessment lb/yr	Total Erosion lb/yr	Erosion Per Foot of Eroding Stream Length lb/ft/yr
Bells Mill	290,000	310,000	590,000	110
Cathedral	61,000	300,000	360,000	130
Cresheim	130,000	740,000	870,000	94
Gorgas Lane	67,000	310,000	380,000	190
Hillcrest	28,000	160,000	190,000	59
Hartwell	820	62,000	63,000	22
Kitchens Lane	110,000	260,000	370,000	53
Monoshone	11,000	140,000	150,000	43
Thomas Mill	56,000	300,000	350,000	88
Valley Green	81,000	210,000	220,000	99
Wises Mill	100,000	310,000	410,000	65
Rex Ave	31,000	210,000	240,000	120

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 the Wissahickon Creek Watershed: TMDL Sediment Monitoring Report (**APPENDIX B**). The current bank pin installation locations can be seen in **FIGURE D-1** on the following page.

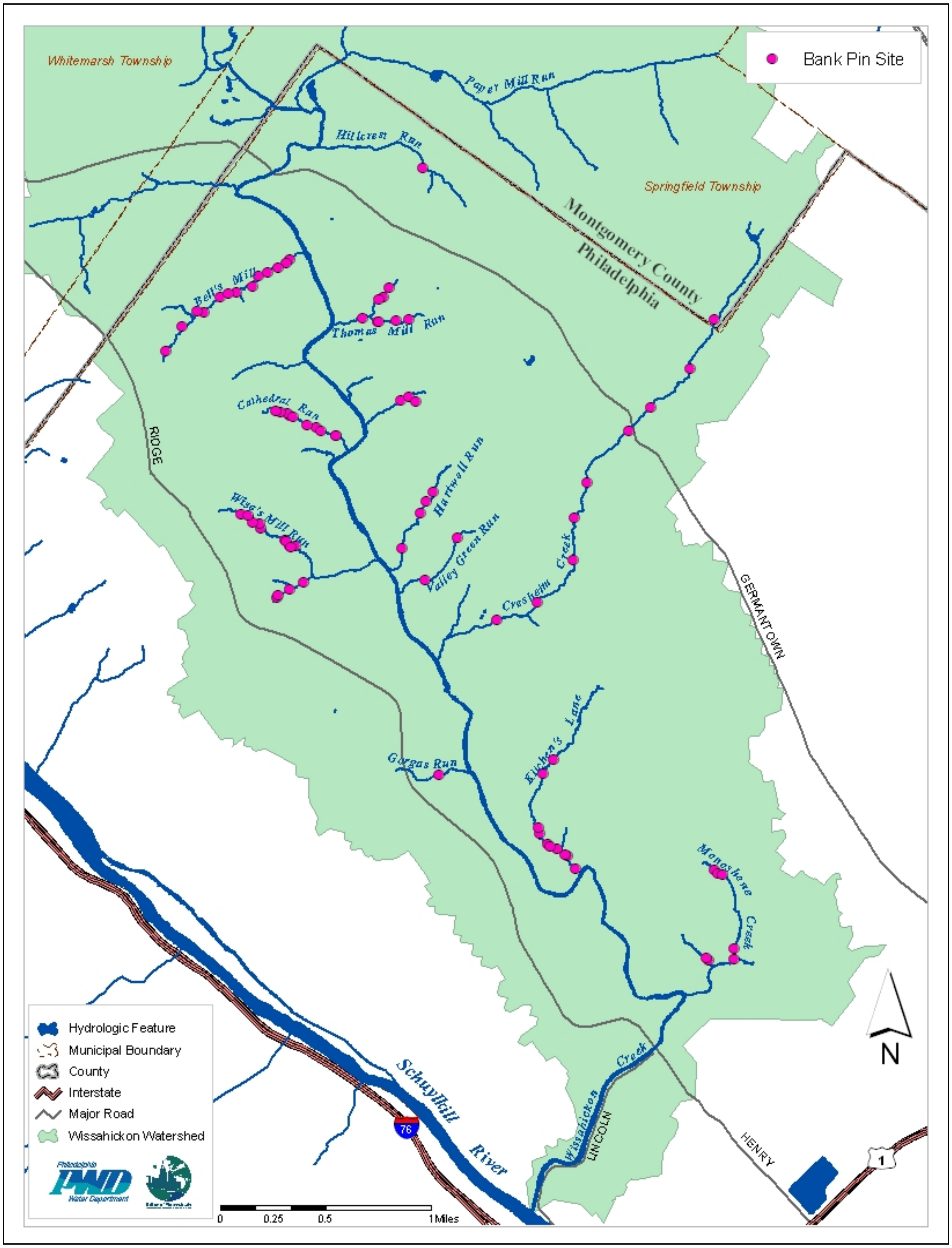


Figure D-1 Bank Pin Locations

Bank profiles at bank pin sites were measured annually to determine erosion rates (**TABLE D-3**). Erosion rates were calculated by entering the bank profile measurements into RIVERMorph 4.0 (RIVERMorph, LLC). RIVERMorph's 'Banks' module was used to estimate the lateral erosion rate for all of the bank pin locations. The estimated sediment load was then calculated (**EQUATION 1**).

Bank Erosion (lb/yr) = 96.3 (BLH) *where*:

Sediment Density = 96.3 lb/ft^3 (Rosgen, 1996)
B = Average Lateral Erosion Rate (ft/yr)
L = Bank Length (ft)
H = Bank Height (ft)

As of August 2008, the bank pin measurement program had been active for over two years. The 82 bank pin sites cover the majority of BEHI-NBS combinations assessed in the Wissahickon Creek tributaries. Wise's Mill site WM2040 was destroyed, bringing the total to 81 sites. There are 53 sites that have at least two complete years of data, 26 sites with one to two years of complete data, and an additional 2 sites with at least 6 months of useful data. These 2 sites have been active for two years; however the toe pin could not be located during a minimum of one round of measurements. Of these sites, 28 have a high or very high BEHI rating and 28 have moderate BEHI ratings. The remaining 25 sites have a low or very low BEHI rating. The present analysis relies on these 81sites.

Erosion rates for banks that were not represented by bank pin location were determined by applying the average lateral erosion rate measured at bank pin locations, as grouped by BEHI class. The calculations used to determine the extrapolated erosion estimates are discussed in detail in Section 2.6 of the Wissahickon Creek Watershed: TMDL Sediment Monitoring Report (**APPENDIX B**). Using this method, a total sediment load of 2.1 million pounds of sediment per year is estimated to originate from streambank erosion. The bank profiles are scheduled to be measured again in August 2009. Following the reevaluation of the bank profiles, the technical memo will be subsequently updated - and an updated report will be made available to the Department.

Table D-3 Wissahickon Tributary Streambank Erosion Estimate – Bank Pin Based

Tributary	Drainage Area, Acres	Stream Length, feet	Erosion Rate, lb/yr	Erosion Per Acre of Drainage Area, lb/ac/yr	Erosion Per Foot of Stream Length, lb/ft/yr
Bells Mill	323	6,722	150,000	460	22
Cathedral	160	2,790	160,000	1000	57
Cresheim	1,218	16,431	530,000	440	32
Gorgas Lane	499	2,170	160,000	320	74
Hartwell	217	3,530	28,000	130	8
Hillcrest	144	5,272	110,000	760	21
Kitchens Lane	234	7,753	170,000	730	22
Monoshone	1,056	6,926	57,000	54	8
Thomas Mill	104	4,008	170,000	1,600	42
Valley Green	128	2,874	100,000	780	35
Wises Mill	446	7,056	400,000	900	57
Rex Ave	137	1,903	100,000	730	53

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 will be generated. Stage data will be used in conjunction with the rating curves to calculate an estimated sediment load per year.

Stage data from Bells Mill, Cathedral Run, Wises Mill, Monoshone, Gorgas Lane, Kitchens Lane, and Cresheim 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.

Stage recording devices were installed in Bells Mill, Cathedral Run, Wises Mill, and Monoshone from summer 2005 to summer 2007. Stage recording devices were also installed in Gorgas Lane Run, Kitchens Lane Run and Cresheim Creek from summer 2007 to summer 2008. Stage-discharge rating curves were established in the Cathedral, Wises Mill and Bells Mill tributaries following a modified version of the USGS protocol (Buchanan and Somers 1969). These three curves were evaluated and it was determined that the stage-discharge curves did not provide any additional information for analysis in the sediment study.

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. Sediment-discharge rating curves were established in the Cathedral, Wises Mill and Bells Mill tributaries following a modified version of the USGS protocol (Buchanan and Somers 1969). These three curves were evaluated and it was determined that the sediment-discharge curves did not provide any additional information for analysis in the sediment study.

The location of installed samplers can be seen in **FIGURE D-2**.

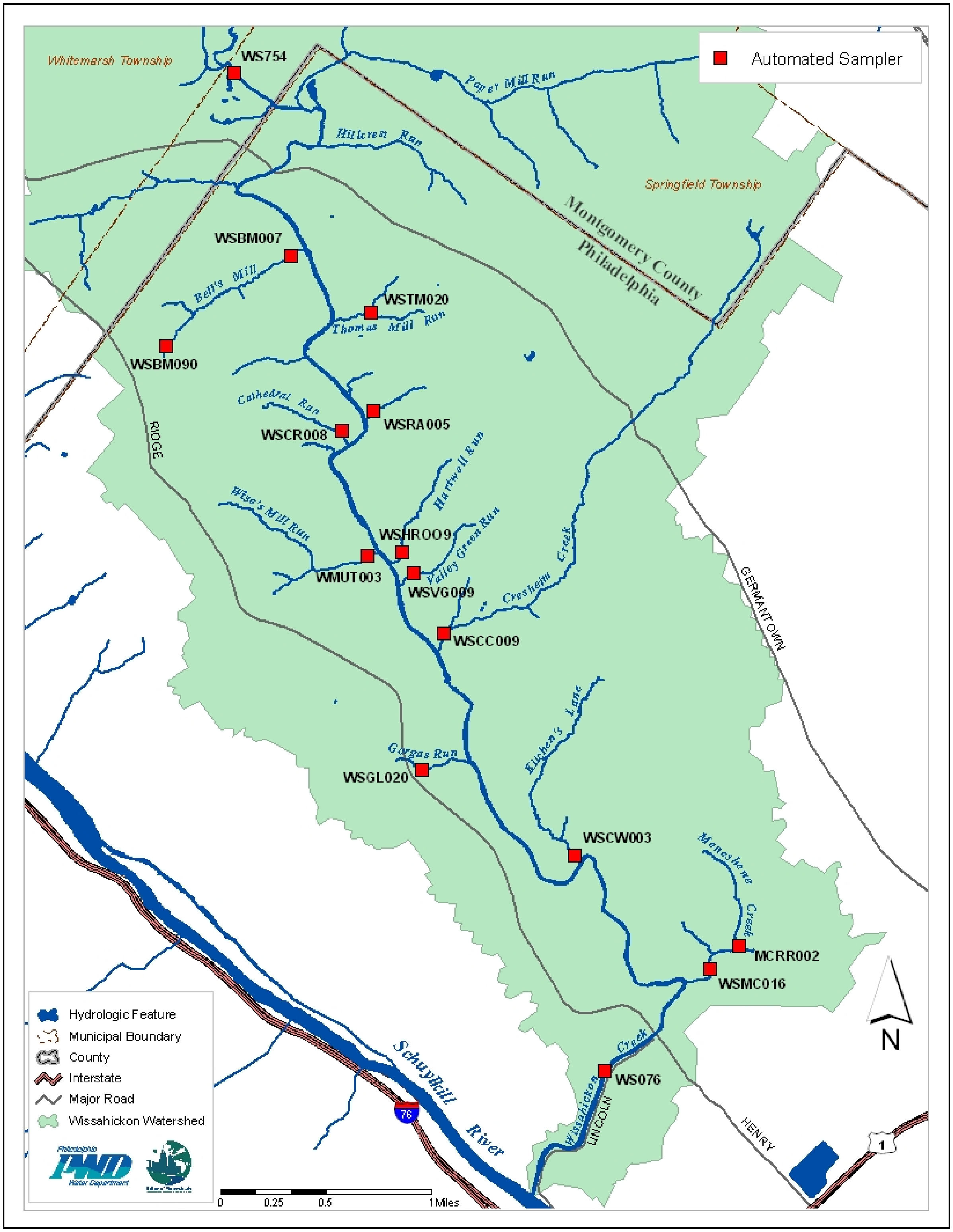


Figure D-2 Automatic Sampler Locations

<u>Tributary Restoration Potential Ranking</u>

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.

Methods used to develop tributary restoration potential ranking are described in detail in the **APPENDIX C**. EVAMIX was created as an initial ranking tool to compare the different tributaries. The sediment study has been further enhanced with the calculated sediment load estimates for each tributary to more accurately rank the tributaries. This information will be utilized in the development of the Wissahickon Creek Integrated Watershed Management Plan's (WCIWMP) implementation commitment.

Sediment Loading and Erosion Results

After the completion of the August 2008 bank pin readings, the sediment load and erosion estimates were calculated and produced in the Wissahickon Creek Watershed: TMDL Sediment Monitoring Report included as **APPENDIX B**.

D.ii. Wissahickon Sediment TMDL Monitoring plan implementation

<u>Wissahickon Sediment TMDL Monitoring plan implementation and outline submission</u>

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 is in the process of developing a long-term implementation and monitoring strategy, which will be closely associated with the Wissahickon Creek Integrated Watershed Management Plan (WCIWMP) and its associated Implementation Plan(s) that PWD is developing. PWD's IWMPs are produced with an anticipated 20 year implementation timeline addressed through four subsequent 5-year Implementation Plans. The tributary restoration approach will be driven by the WCIWMP's Implementation Plans.

Outlined within this report is an implementation strategy that will carry forth through the end of this Stormwater Permit cycle. Subsequent Stormwater Permits will reference the WCIWMP and Implementation Plans for up-to-date implementation and monitoring strategies.

Table D-4 Timeline 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 Modeling																								
Flow Monitoring																								
Discharge Rating Curve																								
Continuous Stage Recording																								
Sediment Transport Rates																								
TSS Rating Curve																								
BMP Monitoring																								
Post Construction TSS Monitoring																								
Post Construction Bank Profile																								
Measurements																								
Post Construction Stream Modeling																								

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 annually in order to calculate yearly erosion rates and sediment loads. Erosion rates and sediment loads are calculated from the bank profile measurements following the protocol outlined in the Wissahickon Creek Watershed: TMDL Sediment Monitoring Report included as **APPENDIX B**.

Continuous Stage Data

Over one year of stage data has been collected from Bells Mill, Wises Mill, Cathedral, Monoshone, Gorgas Lane, Kitchens Lane, and Cresheim Creek. Stage data was recorded at designated monitoring sites using a fixed Sigma ultrasonic sensor and/or pressure transducer. Stage data was downloaded monthly and QA/QC was performed by PWD staff.

Stage- Discharge and Sediment-Discharge Rating Curve

Stage-discharge and sediment-discharge rating curves for Bells Mill, Cathedral, and Wises Mill were completed following a modified version of the USGS protocol (Buchanan and Somers 1969). These three curves were evaluated and it was determined that the stage-discharge and sediment-discharge curves did not provide any additional information for analysis in the sediment study. Therefore, the sediment-discharge and stage-discharge rating curves were not created for the remaining tributaries with Philadelphia County city limits.

Sediment TMDL - Establish baseline data and evaluate & implement BMPs, evaluate benefits, report annually

The final objective of the TMDL monitoring program is to measure the efficacy of Best Management Practices (BMPs) and their benefit in terms of sediment reduction in the Wissahickon Creek Watershed. To meet this objective PWD will use the natural stream channel design (NSCD) monitoring methodology described in **SECTION F.2.STEP 3.B**. **SECTION F.2.STEP 3.B**. outlines the physical and biological/habitat monitoring methods that will be used to examine the functionality of BMPs in the Wissahickon Creek Watershed.

PWD is working toward achieving instream erosion load reductions using stream restoration approaches. PWD has some small-scale restoration projects that have recently been completed in the Wissahickon Watershed by the PWD's Waterways Restoration Team (WRT). We are also working on developing stream bank restoration designs for two tributaries to Wissahickon Creek, Bells Mill and Wises Mill.

Bells Mill

Bells Mill is a 2nd order tributary to Wissahickon Creek. The tributary arises from an outfall near the intersection of Lykens and Bells Mill roads. The restoration/stabilization design for Bells Mill Run will focus on specific restoration areas. Streambank stabilization will make use of standard rock vanes, "J" vanes, cross vanes, wing deflectors, root wads, grade control measures and live branch layers. These structures will allow for improved habitat and sediment transport dynamics while protecting critical sewer infrastructure.

Wises Mill Stream Restoration

Wises Mill Run is a steep first-order tributary to the mainstem of the Wissahickon Creek. The tributary consists of a northern branch, which is 3,500 feet in length, and a southern branch, which is 1,300 feet in length. The two branches merge just north of Wises Mill Road and continue for another 1,900 feet before meeting the Wissahickon Creek. PWD is looking to identify restoration strategies to reduce sediment loading, improve geomorphic stability, and enhance in-stream flows and habitat quality. There are seven recommended in-stream rehabilitation projects that will reduce streambank erosion at two severe sites, replace a failing concrete/ masonry structure with a series of step/pool structures, and enhance in-stream and riparian habitat quality with four channel segments. These structures will allow for improved habitat and sediment transport dynamics while protecting critical sewer infrastructure.

Table D-5 Small-scale Restoration Projects completed in Wissahickon by WRT

Project	Watershed	Description
Wises Mill Run	Wissahickon Creek	Lower segment; interim stabilization
Gorgas Run	Wissahickon Creek	Interim stabilization; infrastructure protection with boulders
Rex Avenue Restoration	Wissahickon Creek	Stabilization and habitat creation along the west bank of the Wissahickon Creek mainstem.
Carpenters Woods Outfalls	Wissahickon Creek	Stabilization of stormwater outfalls including stream restoration using NSCD principles.

PWD is working toward achieving overland runoff loading reductions through the use of stormwater treatment wetlands. PWD anticipates installing stormwater treatment wetlands to treat overland runoff and reduce sediment loadings to the creek. Treatment wetlands can be constructed adjacent to waterways to receive excess flows during large storm events, and pocket wetlands can be built to receive stormwater flows from adjacent sub-watershed areas. In addition, wetland habitats can be designed to accommodate diverse habitats and increase the healthy living resources of the Wissahickon Creek Watershed. Two proposed stormwater wetland creation projects in the Wissahickon Watershed include one on Wise's Mill and another on Cathedral Run.

Wise's Mill Stormwater Wetland

Wises Mill Run is a steep first-order tributary to the mainstem of the Wissahickon Creek. The southern branch of Wises Mill Run outfall number W-076-13. PWD is designing a stormwater treatment wetland just west of the current location of W-076-013. The proposed project recommends installation of a diversion structure on Wises Mill Road, roughly 450 feet upstream of outfall W-076-13. The diversion structure will discharge stormwater into an approximately four acre site. The project will provide more than 150,000 cf of storage and will substantially reduce peak flows to an already impaired stream in Wises Mill Run. During dry weather, the facility will provide 2-3 acres of valuable wet meadow habitat.

Cathedral Run Stormwater Wetland

Cathedral Run is a 1st order tributary to Wissahickon Creek. The stream originates from springs downstream of Courtesy Stables near the intersection of Cathedral and Glen Campbell Roads. PWD is designing a stormwater treatment wetland just west of the current location of outfall W-076-01. The wetland will be located in a natural depression area, approximately one acre in size. The project will provide more than 94,445 cf of storage and will substantially reduce flows to an impaired reach of Cathedral Run. During dry weather, the facility will provide one acre of valuable wet meadow habitat.

In addition, PWD has many proposed, ongoing, or completed SW BMP projects in the watershed to reduce stormwater runoff. These projects are listed in **SECTION F.2.STEP 3.C.I IMPLEMENT VARIOUS TYPES OF STORM WATER BMP PROJECTS.**

Highlights of some recently completed stormwater management demonstration projects in the Wissahickon include:

- Allens Lane Art Center Porous Basketball Court
- Courtesy Stables Runoff Treatment Project
- Fox Chase Farms Riparian Buffer Project
- Monastery Stables Stormwater Diversion & Detention Project
- Saylor Grove Stormwater Treatment Wetland
- Springside School Stormwater Improvements
- W.B. Saul High School

And finally, implementation of the City's 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. Implementation of the stormwater management regulations present the opportunity to get privately owned properties within the Wissahickon Creek Watershed to assist in achievement of the City's TMDL commitment.

PWD is in the process of developing an implementation plan through the Integrated Watershed Management Planning process, which will include PWD's commitments to addressing their Wissahickon TMDL obligations. Upon drafting this implementation plan, PWD will submit it for review by the PADEP. The goal of PWD's implementation approach is to take a multi-faceted approach to reducing the amount of sediment in the Wissahickon, both from overland runoff and from instream erosion sources. PWD would use this implementation plan to commit to sediment load reductions through implementation measures including stream restoration, land based projects and implementation of the Stormwater Regulations, with the use of adaptive management to achieve them.

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

Submit a Pollutant Minimization Plan for PCBs

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

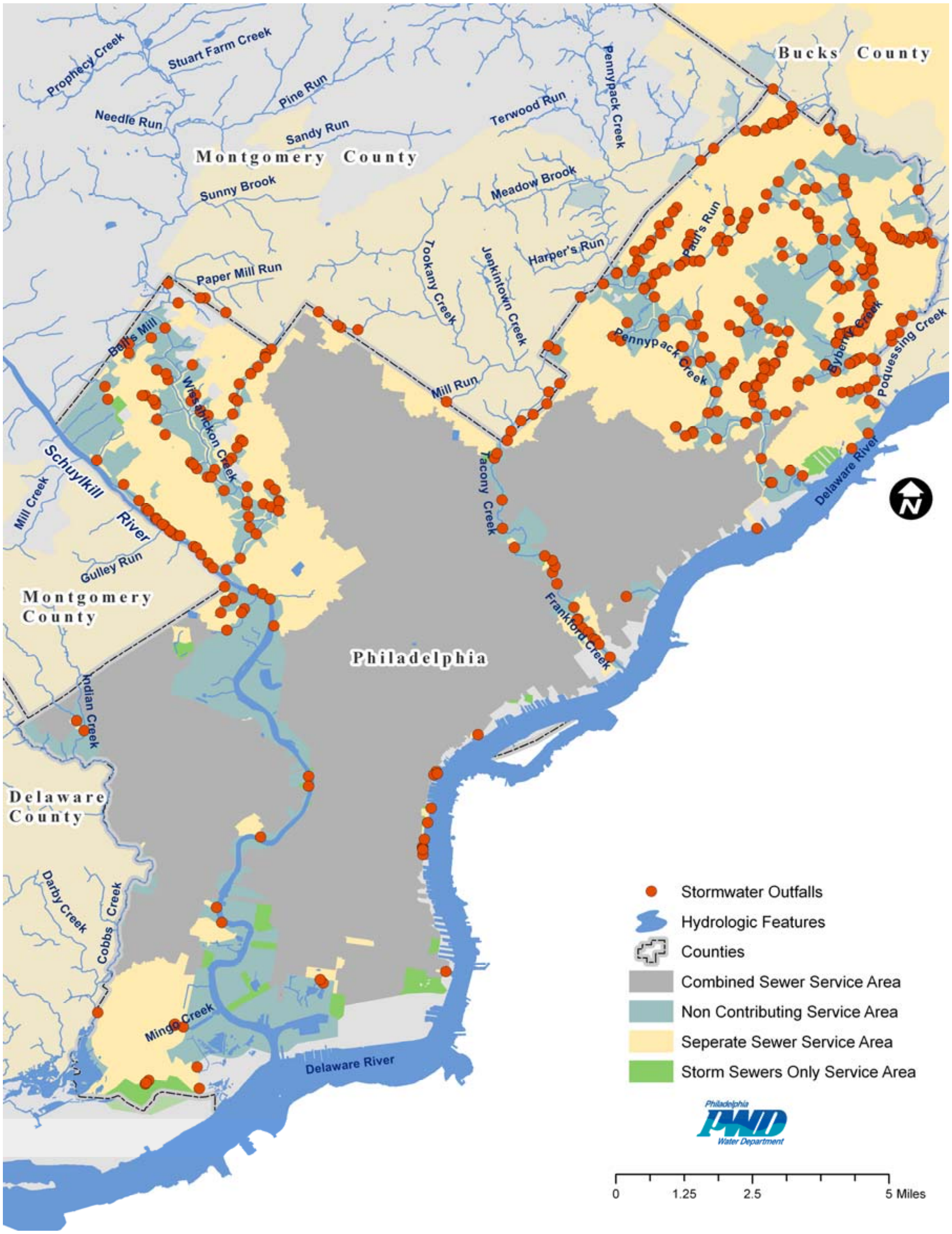
E.1 City PMP Contact Information:

Keith Houck, Manager
(215) 685 - 4910
Industrial Waste Unit
Aramark Tower, 4th Floor
1101 Market Street
Philadelphia, PA 19107

E.2 City of Philadelphia MS4 Service Area

The City's municipal sanitary separate sewer system (MS4) comprises about 40% of Philadelphia County and also accepts some water from surrounding communities. The MS4 includes the 434 permitted stormwater outfalls. A map of the MS4 service area referencing all outfalls is shown in **FIGURE E-1**.

Figure E-1 MS4 with all SW outfalls



E.3 / E.4 Known Locations of PCB Releases/Containments

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 (**APPENDIX D)**. 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.

E.5 In- stream PCB sampling

The City collected and analyzed twelve (n=12) in-stream samples for PCBs during the spring of 2009.

PCB Sampling Locations
PWD staff scientists identified six strategic PCB monitoring locations in each of the watersheds located within the City of Philadelphia. Each sampling site was stationed at the furthest downstream USGS gage station in each of the City's six watersheds (**FIGURE E-2**).

PCB Sampling Period
During the reporting period, in-stream samples were collected at the predetermined locations during dry weather conditions and immediately following a significant wet-weather event. A wet weather event was defined as any precipitation event greater than 0.5 inches of rainfall in a 24-hour period. Dry- weather and wet-weather samples were collected on April 28th and May 7th, 2009, respectively (n=12 samples). In addition to the

twelve samples collected, two additional trip blank samples were collected during both dry and wet conditions (n=4).

PCB Sampling Technique 1668A

To determine surface water concentrations of PCBs, PWD will be using the standard operating procedures and analysis techniques outlined by the United States Environmental Protection Agency's (USEPA) Method 1668A. This congener-specific method is used to determine the twelve PCBs designated as toxic by the World Health Organization plus the remaining 197 chlorinated biphenyl congeners. Method 1668A allows estimation of homolog totals by level of chlorination and estimation of total PCBs (**TABLE E-1**).

PCB Sampling Analysis

In-stream samples and trip blank samples were sent to AXYS Analytical, LTD. (Sidyney, Canada) for PCB analysis. To determine surface water concentrations of polychlorinated biphenyls (PCBs), AXYS Analytic, LTD used the standard operating procedures and analysis techniques outlined by the United States Environmental Protection Agency's (USEPA) Method 1668A. This congener-specific method was used to determine the twelve PCBs designated as toxic by the World Health Organization (WHO) plus the remaining 197 chlorinated biphenyl congeners (CBs). Moreover, this method allowed estimation of homolog totals by level of chlorination (LOC) and estimation of total CBs in a sample by summation of the concentrations of the CB congeners and congener groups.

PCB Results

On July 23rd, 2009, PWD's Office of Watersheds received all data from AXYS Analytical, LTD. pertaining to the in-stream PCB samples. Currently, staff scientists are analyzing the data and a full summary of the study will be disseminated to the Department as soon as it becomes available.

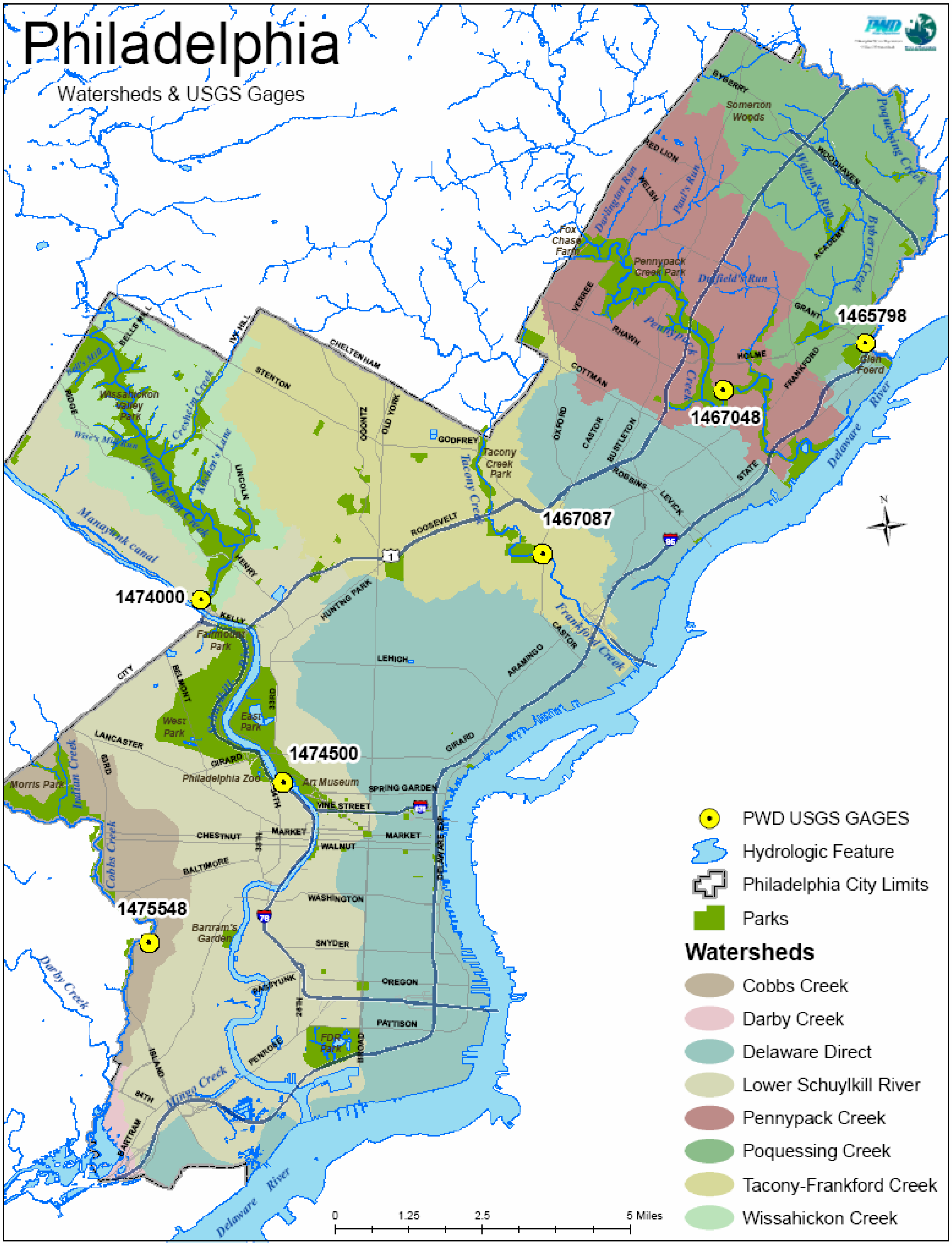


Figure E-2 PCB Sampling Locations

Table E-1 PCB Congeners Sampled in Method 1668A

Congener Number	PCB Congeners	Congener Number	PCB Congeners	Congener Number	PCB Congeners	Congener Number	PCB Congeners
1	2-MoCB	26	2,3',5-TrCB	51	2,2',4,6'-TeCB	76	2',3,4',5-TeCB
2	3-MoCB	27	2,3',6-TrCB	52	2,2',5,5'-TeCB1	77	3,3',4,4'-TeCB1,2
3	4-MoCB	28	2,4,4'-TrCB1	53	2,2',5,6'-TeCB	78	3,3',4,5-TeCB
4	2,2'-DiCB	29	2,4,5-TrCB	54	2,2',6,6'-TeCB	79	3,3',4,5'-TeCB
5	2,3-DiCB	30	2,4,6-TrCB	55	2,3,3',4'-TeCB	80	3,3',5,5'-TeCB
6	2,3'-DiCB	31	2,4',5-TrCB	56	2,3,3',4'-TeCB	81	3,4,4',5-TeCB2
7	2,4-DiCB	32	2,4',6-TrCB	57	2,3,3',5-TeCB	82	2,2',3,3',4-PeCB
8	2,4'-DiCB1	33	2',3,4-TrCB	58	2,3,3',5'-TeCB	83	2,2',3,3',5-PeCB
9	2,5-DiCB	34	2',3,5-TrCB	59	2,3,3',6-TeCB	84	2,2',3,3',6-PeCB
10	2,6-DiCB	35	3,3',4-TrCB	60	2,3,4,4'-TeCB	85	2,2',3,4,4'-PeCB
11	3,3'-DiCB	36	3,3',5-TrCB	61	2,3,4,5-TeCB	86	2,2',3,4,5-PeCB
12	3,4-DiCB	37	3,4,4'-TrCB	62	2,3,4,6-TeCB	87	2,2',3,4,5'-PeCB
13	3,4'-DiCB	38	3,4,5-TrCB	63	2,3,4',5-TeCB	88	2,2',3,4,6-PeCB
14	3,5-DiCB	39	3,4',5-TrCB	64	2,3,4',6-TeCB	89	2,2',3,4,6'-PeCB
15	4,4'-DiCB	40	2,2',3,3'-TeCB	65	2,3,5,6-TeCB	90	2,2',3,4',5-PeCB
16	2,2',3-TrCB	41	2,2',3,4-TeCB	66	2,3',4,4'-TeCB1	91	2,2',3,4',6-PeCB
17	2,2',4-TrCB	42	2,2',3,4'-TeCB	67	2,3',4,5-TeCB	92	2,2',3,5,5'-PeCB
18	2,2',5-TrCB1	43	2,2',3,5-TeCB	68	2,3',4,5'-TeCB	93	2,2',3,5,6-PeCB
19	2,2',6-TrCB	44	2,2',3,5'-TeCB1	69	2,3',4,6-TeCB	94	2,2',3,5,6'-PeCB
20	2,3,3'-TrCB	45	2,2',3,6-TeCB	70	2,3',4',5-TeCB	95	2,2',3,5',6-PeCB
21	2,3,4-TrCB	46	2,2',3,6'-TeCB	71	2,3',4',6-TeCB	96	2,2',3,6,6'-PeCB
22	2,3,4'-TrCB	47	2,2',3,4'-TeCB	72	2,3',5,5'-TeCB	97	2,2',3',4,5-PeCB
23	2,3,5-TrCB	48	2,2',4,5-TeCB	73	2,3',5',6-TeCB	98	2,2',3',4,6-PeCB
24	2,3,6-TrCB	49	2,2',4,5'-TeCB	74	2,4,4',5-TeCB	99	2,2',4,4',5-PeCB
25	2,3',4-TrCB	50	2,2',4,6-TeCB	75	2,4,4',6-TeCB	100	2,2',4,4',6-PeCB

101	2,2',4,5,5'-PeCB1	128	2,2',3,3',4,4'-HxCB1	155	2,2',4,4',6,6'-HxCB	182	2,2',3,4,4',5,6'-HpCB
102	2,2',4,5,6'-PeCB	129	2,2',3,3',4,5-HxCB	156	2,3,3',4,4',5-HxCB2	183	2,2',3,4,4',5',6-HpCB
103	2,2',4,5,6'-PeCB	130	2,2',3,3',4,5'-HxCB	157	2,3,3',4,4',5'-HxCB2	184	2,2',3,4,4',6,6'-HpCB
104	2,2',4,6,6'-PeCB	131	2,2',3,3',4,6-HxCB	158	2,3,3',4,4',6-HxCB	185	2,2',3,4,5,5',6-HpCB
105	2,3,3'4,4'-PeCB1,2	132	2,2',3,3',4,6'-HxCB	159	2,3,3',4,5,5'-HxCB	186	2,2',3,4,5,6,6'-HpCB
106	2,3,3',4,5-PeCB	133	2,2',3,3',5,5'-HxCB	160	2,3,3',4,5,6-HxCB	187	2,2',3,4,5,5',6-HpCB1
107	2,3,3',4',5-PeCB	134	2,2',3,3',5,6-HxCB	161	2,3,3',4,5',6-HxCB	188	2,2',3,4',5,6,6'-HpCB
108	2,3,3',4,5'-PeCB	135	2,2',3,3',5,6'-HxCB	162	2,3,3',4',5,5'-HxCB	189	2,3,3',4,4',5,5'-HpCB2
109	2,3,3',4,6-PeCB	136	2,2',3,3',6,6'-HxCB	163	2,3,3',4',5,6-HxCB	190	2,3,3',4,4',5,6-HpCB
110	2,3,3',4',6-PeCB	137	2,2',3,4,4',5-HxCB	164	2,3,3',4',5',6-HxCB	191	2,3,3',4,4',5',6-HpCB
111	2,3,3',5,5'-PeCB	138	2,2',3,4,4',5'-HxCB1	165	2,3,3',5,5',6-HxCB	192	2,3,3',4,5,5',6-HpCB
112	2,3,3',5,6-PeCB	139	2,2',3,4,4',6-HxCB	166	2,3,4,4',5,6-HxCB	193	2,3,3',4',5,5',6-HpCB
113	2,3,3',5',6-PeCB	140	2,2',3,4,4',6'-HxCB	167	2,3,4,4',5,5'-HxCB2	194	2,2',3,3',4,4',5,5'-OcCB
114	2,3,4,4',5-PeCB1,2	141	2,2',3,4,5,5'-HxCB	168	2,3',4,4',5',6-HxCB	195	2,2',3,3',4,4',5,6-OcCB1
115	2,3,4,4',6-PeCB	142	2,2',3,4,5,6-HxCB	169	3,3',4,4',5,5'-HxCB1,2	196	2,2',3,3',4,4',5,6'-OcCB
116	2,3,4,5,6-PeCB	143	2,2',3,4,5,6'-HxCB	170	2,2',3,3',4,4',5-HpCB1	197	2,2',3,3',4,4',6,6'-OcCB
117	2,3,4',5,6-PeCB	144	2,2',3,4,5',6-HxCB	171	2,2',3,3',4,4',6-HpCB	198	2,2',3,3',4,5,5',6-OcCB
118	2,3',4,4',5-PeCB1,2	145	2,2',3,4,6,6'-HxCB	172	2,2',3,3',4,5,5'-HpCB	199	2,2',3,3',4,5,5',6'-OcCB
119	2,3',4,4',6-PeCB	146	2,2',3,4',5,5'-HxCB	173	2,2',3,3',4,5,6-HpCB	200	2,2',3,3',4,5,6,6'-OcCB
120	2,3',4,5,5'-PeCB	147	2,2',3,4',5,6-HxCB	174	2,2',3,3',4,5,6'-HpCB	201	2,2',3,3',4,5',6,6'-OcCB
121	2,3',4,5,6-PeCB	148	2,2',3,4',5,6'-HxCB	175	2,2',3,3',4,5',6-HpCB	202	2,2',3,3',5,5',6,6'-OcCB
122	2',3,3',4,5-PeCB	149	2,2',3,4',5',6-HxCB	176	2,2',3,3',4,6,6'-HpCB	203	2,2',3,4,4',5,5',6-OcCB
123	2',3,4,4',5-PeCB2	150	2,2',3,4',6,6'-HxCB	177	2,2',3,3',4',5,6-HpCB	204	2,2',3,4,4',5,6,6'-OcCB
124	2',3,4,5,5'-PeCB	151	2,2',3,5,5',6-HxCB	178	2,2',3,3',5,5',6-HpCB	205	2,3,3',4,4',5,5',6-OcCB
125	2',3,4,5,6'-PeCB	152	2,2',3,5,6,6'-HxCB	179	2,2',3,3',5,6,6'-HpCB	206	2,2',3,3',4,4',5,5',6-NoCB1
126	3,3',4,4',5-PeCB1,2	153	2,2',4,4',5,5'-HxCB1	180	2,2',3,4,4',5,5'-HpCB1	207	2,2',3,3',4,4',5,6,6'-NoCB
127	3,3',4,5,5'-PeCB	154	2,2',4,4',5',6-HxCB	181	2,2',3,4,4',5,6-HpCB		

E.6 Develop Report on Control of PCB Discharges

The City has created a document that reports all the known PCB sources within the MS4 system that requires some control measure to reduce its discharge of PCBs. This report and plan of action is described within the PCB PMP, located in **APPENDIX E.**

E.7 Work with DRBC to Create PMP Template

As the City moves forward in implementing the 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.

E.8 Annually Document PCB PMP Compliance

During FY 2009, PWD IWU performed 38 site inspections of potential PCB sources. A list and a map of potential sources of PCB and when they were inspected can be found in **APPENDIX D**. Additional information on PCB sources including a description of known sources is provided in the PWD PCB PMP, located in **APPENDIX E.**

Section F Stormwater Management Program

F.1. 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, lengths of sanitary sewer, and lengths of stormwater sewer within Philadelphia and contributing neighboring townships. These areas are depicted in **FIGURE F-1** on the following page.

Table F-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 Only 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 F-2 Description of MS4 Infrastructure

Watershed	Miles of Pipe			MS4 Outfalls	
	Stormwater	Sanitary	Total MS4	Within City	Outside City
Darby-Cobbs	5.9	6.2	12.1	3	0
Delaware Direct	14.5	12.8	27.3	19	0
Pennypack	144.0	267.1	429.1	129	1
Poquessing	242.1	188.0	430.1	139	1
Schuylkill	144.0	145.6	289.7	52	0
Tacony	57.8	57.0	114.8	23	11
Wissahickon	95.7	126.1	221.8	61	3
Total	722.1	802.8	1524.9	425	17

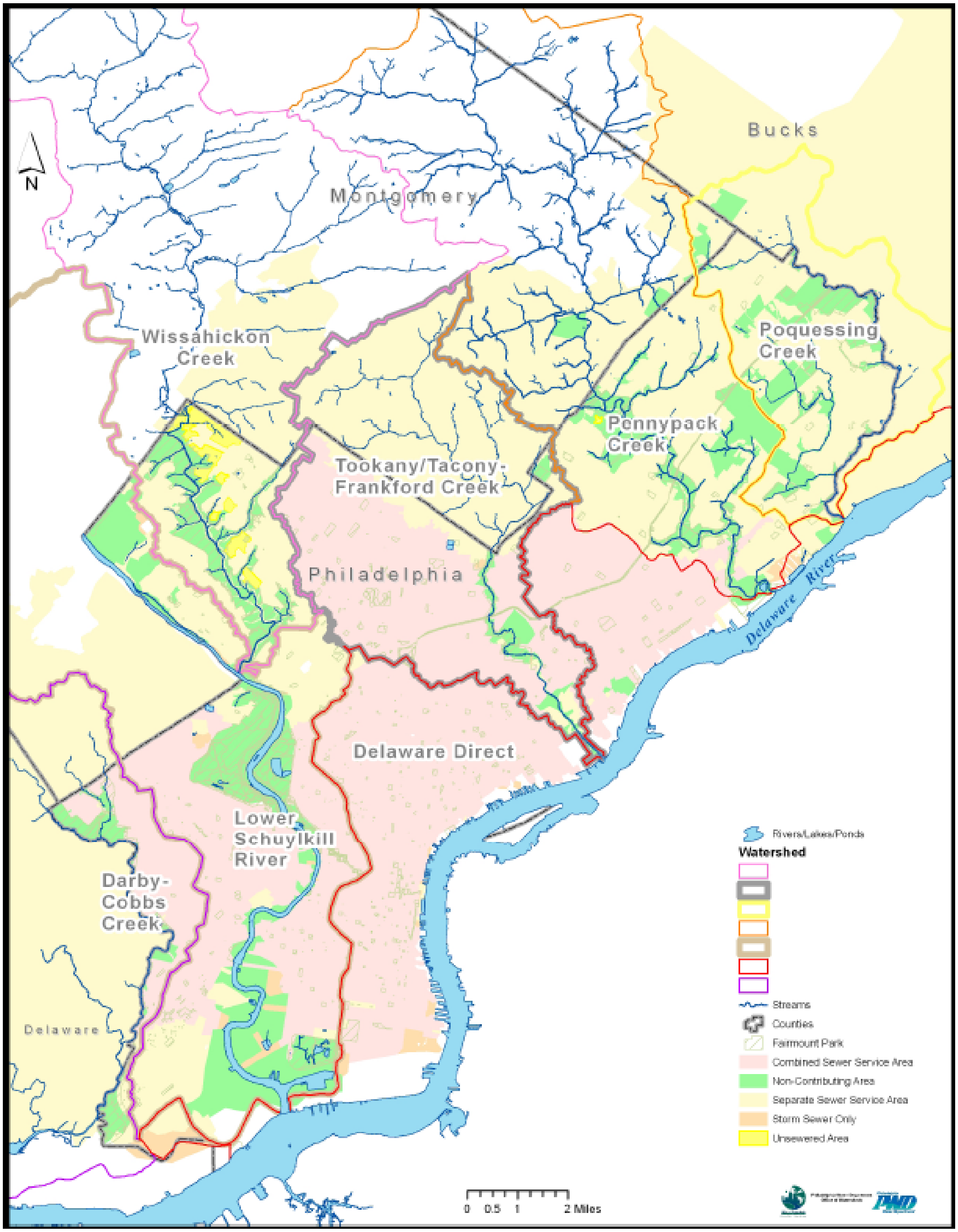


Figure F-1 Philadelphia Infrastructure System Areas

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

GIS Data Layers and Filename	
DVRPC_luphi05	Philadelphia_Sewersheds
FY09_ES_Inspection_Sites	Philadelphia Area HydroLine
FY09_IWU_Spills	Philadelphia Area HydroPoly
FY09_Spills	Poquessing_Watershed
FY09_TA_Approved_Sites	PWD Monitoring Locations
Known_Historical_PCB_Locations_2009	Wissahickon Point Sources
PermittedDischargersFY09	Wissahickon_hydroline
Philadelphia Detention Basins	Wissahickon_hydropoly
Philadelphia Population 2000 Census	Wissahickon_WS
Philadelphia_Major_Watersheds	Philadelphia BMPs Projects
Stormwater_ Outfalls	

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

DVRPC_luphi05

This layer presents land use delineated from aerial photography captured in 2005 within Philadelphia County. 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.

FY09_ES_Inspection_Sites

This layer presents the locations of erosion and sedimentation inspections carried out at construction sites within Philadelphia in FY 2009. The contents of this layer are discussed in **SECTION F.5**.

FY09_IWU_Spills

This layer presents the locations of spills documented by PWD Industrial Waste Unit within Philadelphia in FY 2009. The contents of this layer are discussed in **SECTION F.7**.

FY09_Spills

This layer presents the locations of Sewage Pollution Incidents documented by PWD within Philadelphia in FY 2009.The contents of this layer are discussed in **SECTION F.8.G**.

FY09_TA_Approved_Sites

This layer presents the locations of projects issued post construction stormwater management technical approvals by the Philadelphia Water Department in FY 2009. The contents of this layer are discussed in **SECTION F.5**.

Known_Historical_PCB_Locations_2009

This layer presents the location of all known and historical polychlorinated biphenyl (PCB) locations within Philadelphia. The contents of this layer are discussed in **SECTION E**.

PermittedDischargersFY09
This layer presents the location within Philadelphia of all permitted Dischargers FY09. The contents of this layer are discussed in **SECTION F.2.STEP 1.C.**

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

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

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 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.

Philadelphia BMPs Projects
This layer presents the locations of existing and proposed BMPs sorted by their current status (completed, in construction, in design, ongoing) within Philadelphia County and the neighboring contributing areas.

Philadelphia Area HydroLine
This layer presents the boundaries of Philadelphia County and surrounding watershed hydrology in a polyline based shapefile.

Philadelphia Area HydroPoly
This layer presents the boundaries of Philadelphia County and surrounding watershed hydrology in a polygon based shapefile.

Philadelphia Imperviousness
This layer presents percent imperviousness and the amount of impervious area in Philadelphia County.

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

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

Stormwater Outfall
This layer presents locations of all permitted stormwater outfalls within Philadelphia County and the neighboring contributing areas.

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

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

Wissahickon Point Sources

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

The City has previously submitted additional GIS data layers that will not be included this year. These layers include outfalls, manholes, inlets, and various pipe as listed in **TABLE F-4**. The reason for their removal is the City's policy to not release these data layers to the general public due to concerns over redistribution and security. These data layers would be made available for viewing by the Department, should it be necessary.

Table F-4 GIS Stormwater Data Conversion Geodatabase Layers

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

F.2. Discharge Management, Characterization, and Watershed-Based Assessment And Management Program

F.2.Step 1. Preliminary Reconnaissance: Permit Issuance Through End of Year 2

F.2.Step 1.a. Pennypack, Poquessing, Wissahickon WMP preliminary reconnaissance - Land use and resource mapping

The City has conducted extensive mapping of information relevant to stormwater management planning. Previously discussed in **SECTION F.1** 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 in **APPENDIX F – LAND USE AND RESOURCE MAPPING**, separated by watershed.

F.2.Step 1.b. Pennypack, Poquessing, Wissahickon WMP preliminary reconnaissance - Preliminary physical, chemical, and biological quality assessment

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.

Bio-assessments, 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 2009, PWD 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 published in Comprehensive Characterization Reports (CCR) and used to plan improvements to watersheds in the Southeast Region of Pennsylvania.

Background

The Philadelphia Water Department has carried out extensive sampling and monitoring programs to characterize conditions in seven local watersheds (Figure F.2.Step 1.b-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 of EPA and PADEP. The program includes hydrologic, water quality, biological, habitat, and fluvial geomorphological aspects. The Office of Watersheds is well suited to manage the program because it merges the goals of the city's stormwater, combined sewer overflow, and source water protection programs into a single unit dedicated to watershed-wide characterization and planning.

Under the provisions of the Clean Water Act, the National Pollutant 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.

EPA's Combined Sewer Overflow Control Policy, published in 1993, provides the national framework for regulation of CSOs under NPDES. The Policy guides municipalities, state and federal permitting agencies in meeting the pollution control goals of the CWA in as flexible and cost-effective a manner as possible. As part of the program, communities serviced by combined sewer systems are required to develop long-term CSO control plans (LTCPs) that will result in full compliance with the CWA in the long term, including attainment of water quality standards. PWD completed its LTCP in 1997 and is currently implementing its provisions. The strong focus of the National CSO Policy on meeting water quality standards is a main driver behind PWD's water quality sampling and monitoring program.

Regulation of stormwater outfalls under the NPDES program requires operators of medium and large municipal stormwater systems or 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, PA DEP 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 EPA's Rapid Bio-assessment Protocols (RBPs) and physical habitat assessments.

PWD's Office of Watersheds (OOW) and Bureau of Laboratory Services (BLS) are 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.

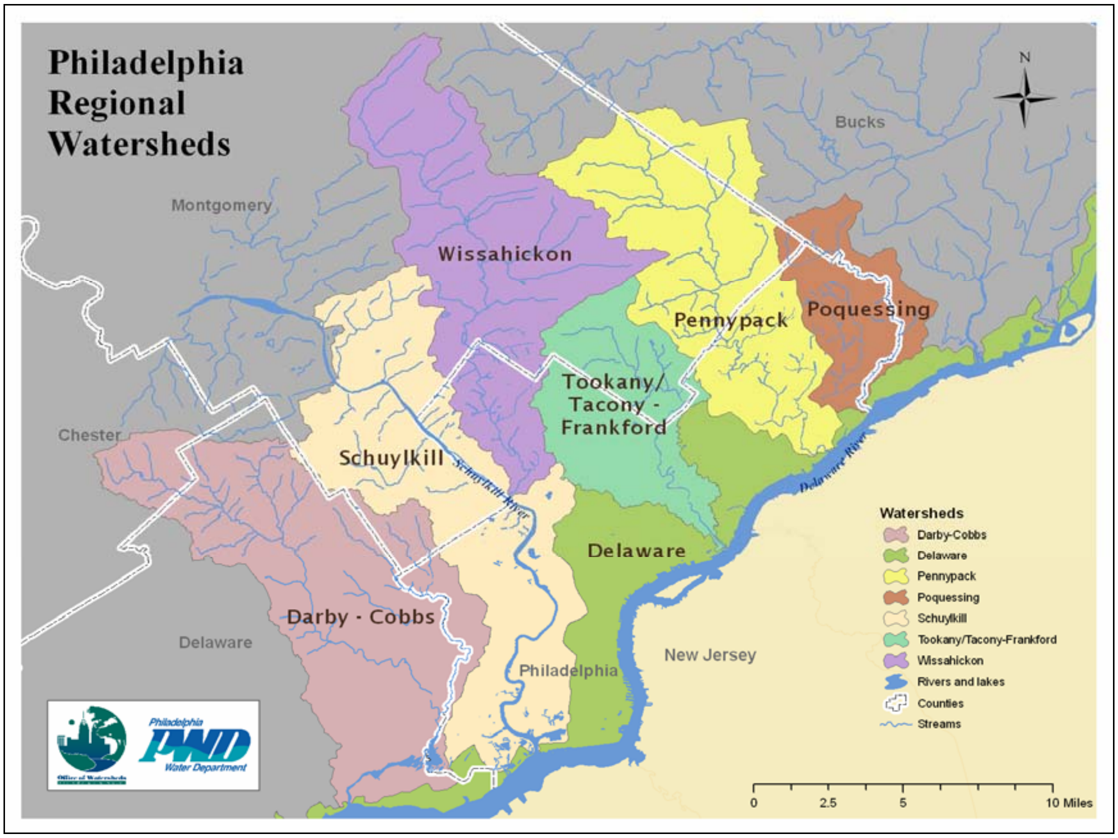


Figure F.2 Step1.b-1 Philadelphia Regional Watersheds

<u>Water Quality Sampling and Monitoring</u>

Guiding Principles of Urban Water Chemistry Assessment

PWD water chemistry assessment activities are guided by recognition of the fact that water quality changes dramatically during wet weather. Water quality assessment procedures must advance our understanding of wet weather effects on stream water quality as well as our stormwater and sewer infrastructure. PWD's water quality assessment strategy has been designed to facilitate separate analyses of dry weather (i.e., baseflow) and wet weather water quality conditions. This program has evolved over time, as personnel and technological improvements have improved our abilities to collect more data from an increasing number of sampling locations in a more efficient manner. Automated sampling, in particular, has greatly increased the temporal resolution of stormwater sampling at multiple sampling locations for a single storm event.

Discrete Water Chemistry Assessment

During the 2002-2007 assessment cycles, a series of four weekly surface water grab samples were manually collected during winter, spring and summer at several locations in each watershed (n=12 sampling events at each location). These samples were termed "discrete interval" samples as the sampling was conducted on a weekly basis regardless of weather conditions. This sampling program represented the finest watershed-wide spatial resolution of all of PWD's water quality monitoring activities. Parameters (**TABLE F.2.STEP 1.B-1**) were chosen because state water quality criteria apply to them or because they are known or suspected to be important in urban watersheds. These discrete interval water chemistry assessment data represent the most complete modern water chemistry dataset for the majority of Philadelphia's watersheds.

In 2007, PADEP published a review of statistical techniques and provided guidelines for water chemistry statistical analysis when the goal is determining whether a site is meeting its designated use or not (PADEP 2007). This document described attainment and non-attainment of water quality criteria as mutually exclusive cases, and presented a statistical framework for evaluation of the hypothesis that a stream is or is not attaining its designated use. PWD made slight modifications to the 2008 sampling regime in order to better comply with these guidelines by ensuring that a minimum of 8 samples be collected in dry weather, baseflow conditions at each monitoring station, allowing both dry weather and wet weather conditions to be evaluated with the state-recommended statistical methods. Pennypack and Poquessing-Byberry Creek watershed data have been collected according to these guidelines.

Once the Poquessing-Byberry Creek Watershed CCR is completed, there will be a reduced demand for intensive watershed-wide chemistry assessment until it is necessary to revisit and collect more data from these monitoring locations for updating indicator status for Watershed Management Plans (**SECTION F.2.STEP3.A.I**). However, PWD will continue to maintain quarterly baseflow water chemistry assessment at sites in the PWD USGS gage network. This data will be useful as a long-term record of water quality changes in the region. The first of these results are presented in **APPENDIX G – PWD QUARTERLY DRY WEATHER WATER QUALITY MONITORING PROGRAM**.

Integrated Watershed Management Plans (IWMP) for the Cobbs and Tookany/Tacony-Frankford Creek Watersheds were completed in 2004 and 2005. 5-Year Watershed Implementation Plans were completed for both watersheds in 2006. IWMPs initially recommended a five year interval for re-assessments and Indicator Status Updates, but that interval was determined to be too aggressive, at least for the initial Indicator Status Updates. The initial re-assessment monitoring interval recommendation was changed to ten years, in recognition of the fact that watershed-wide assessments are best suited to characterize macro-scale water quality and biological community health.

Allowing ten years before re-assessment will potentially allow for a greater number of IWMP and CSO LTCP projects to be completed, and allow PWD to focus monitoring efforts on evaluating the performance of stormwater BMPs and restoration projects. Re-assessment and subsequent Indicator Status Reports should complement the "adaptive management approach", and allow for the locations and methods of assessment to be changed, depending upon the number of projects implemented and their spatial distribution.

Continuous Water Quality Assessment

In addition to discrete chemical sampling, PWD incorporated automated equipment at strategic locations within each watershed as part of the 1999-2008 comprehensive monitoring strategy. Using submerged instruments (YSI Sonde 6600, 6600 EDS and 600 XLM), dissolved oxygen, temperature, pH, conductivity, depth (stage) and turbidity were logged at 15-minute intervals. The instruments were deployed for approximately two weeks, retrieved and replaced with fresh calibrated instruments in order to produce nearly seamless temporal data. Continuous water quality monitoring preliminary assessments have been completed for Darby-Cobbs, Tookany/Tacony-Frankford, Wissahickon, Pennypack, and Poquessing-Byberry Watersheds

Long-term continuous monitoring for TMDL compliance and building a long-term water quality data record for the aforementioned watersheds will be accomplished over 2008-2015 through a partnership with the USGS. Results from July 1, 2008 – June 30, 2009 are presented in **APPENDIX H – PWD/USGS COOPERATIVE WATER QUALITY MONITORING PROGRAM ANNUAL SUMMARY.** Continuous water quality instruments will also be deployed *in situ* for evaluating the performance of certain BMPs and assessing conditions in tidal portions of the Schuylkill and Delaware Rivers as well as Frankford Creek.

Wet Weather Event Sampling

The third water quality component of PWD's comprehensive monitoring strategy 1999-2008 was collecting water samples during wet weather flows. Automated samplers (Isco, Inc. models 6712, 6700) were strategically placed in locations throughout the Philadelphia's watersheds and used to collect samples during runoff producing rain events. This automated system obviated the need for staff to manually collect samples, thereby greatly increasing sampling efficiency. Automated samplers were programmed to commence sampling with a small (0.1ft.) increase in stage. Once sampling was initiated, a computer-controlled peristaltic pump and distribution system collected grab samples at 30 min. to 1 hr. intervals, the actual interval being adjusted on a site by site basis according to "flashiness". Adjustment of rising-limb hydrograph sampling interval allows optimum characterization of water quality responses to stormwater runoff and wet weather sewer overflows. Due to sample volume restrictions, fewer chemical analyses were performed on samples collected in wet weather (**TABLE F.2.STEP 1.B -1**).

The primary use of automated samplers in the 2008-2015 period is assessment of stormwater BMP performance. Automated samplers have been successfully deployed at the Saylor Grove Stormwater Treatment Wetland, and it is expected that as additional stormwater BMPs are constructed, automated samplers will be the primary means of evaluating water quality performance. As an added advantage, data which are logged from the pressure transducer that is used to initiate sampling provide the input for the water quantity/hydrologic performance evaluation.

Currently, plans are in place to construct large stormwater treatment wetlands in the Wissahickon Creek Watershed at Wise's Mill Run and Cathedral Run. Automated samplers will be used to collect samples from the influent and effluent until a sufficient number of storm events have been captured to evaluate stormwater treatment wetland performance. If this research shows a reasonable level of consistency, there may be a reduced need to monitor additional stormwater BMPs with such a complicated and expensive monitoring system.

Automated samplers were also used extensively in tributaries to Wissahickon Creek to develop relationships between turbidity and TSS. TSS and turbidity were more closely correlated in mainstem samples than in the tributaries, however, the latter correlation was still significant (Log transformed) ($r(58)=0.80$, $p<0.001$). It is likely that additional samples would strengthen this relationship, as tributaries have not been sampled during larger storm events. These strong correlations between TSS and Turbidity support the future use of turbidity as an indicator of TSS concentration. TSS monitoring is one component of The City of Philadelphia's plan for evaluation of projects which are implemented to achieve sediment TMDL goals.

Table F.2.Step 1.b -1 Chemical Analytes Collected During Chemical Monitoring Programs

Parameter	Units	Discrete	Wet Weather	Quarterly USGS gage	Continuous
Alkalinity	mg/L	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	mg/L	X			
Calcium	mg/L	X	X		
Chromium	mg/L	X	X		
Dissolved Chromium	mg/L	X			
Specific Conductance	µS/cm	X		X	X
Copper	mg/L	X	X		
Dissolved Copper	mg/L	X			
E. coli	CFU/100mL	X	X	X	
Enterococci	CFU/100mL			X	
Fecal Coliform	CFU/100mL	X	X	X	
Hardness	mg/L CaCO3	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			
Manganese	mg/L	X	X		
Dissolved Manganese	mg/L	X			
Nitrate	mg/L	X	X	X	
Nitrite	mg/L	X	X		
Orthophosphate	mg/L	X	X	X	
Dissolved Oxygen	mg/L	X		X	X
pH	pH units	X		X	X
Total Phosphorus	mg/L	X	X		
Sodium	mg/L	X			
Suspended Solids	mg/L	X	X		
Total Solids	mg/L	X	X		
Temperature	°C	X		X	X
TKN	mg/L	X	X		
Turbidity	NTU	X	X		X
Zinc	mg/L	X	X		
Dissolved Zinc	mg/L	X			

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

Macroinvertebrate Assessments

In 2007, PADEP shared a new set of protocols for Benthic Macroinvertebrate Assessments, with significant changes to field sampling, laboratory, and data analysis techniques. PWD has adopted these new sampling techniques for 2007 and 2008 monitoring activities in Pennypack Creek and Poquessing-Byberry Creek Watersheds. Sample results are compared to a series of reference metrics that are intended to be used statewide, without regard for regionalization or climate influences. Preliminary work with these metrics shows that even streams used as reference sites (e.g., French Creek) are classified as "impaired" under the new assessment method. Furthermore, because the revised method requires a sample size of 200±20% individuals, compared to the 1999-2006 data collected with minimum 100 individual sample size, randomized sub-sampling or other normalization procedures may need to be used with the data collected according to the new DEP Assessment protocol to maintain compatibility with pre-established IWMP indicators for Indicator Status Update reports.

Integrated Watershed Management Plans (IWMP) for the Cobbs and Tookany/Tacony-Frankford Creek Watersheds were completed in 2004 and 2005. 5-Year Watershed Implementation Plans were completed for both watersheds in 2006. IWMPs initially recommended a five year interval for re-assessments and Indicator Status Updates, but that interval was determined to be too aggressive, at least for the initial Indicator Status Updates. The initial re-assessment monitoring interval recommendation was changed to ten years, in recognition of the fact that watershed-wide assessments are best suited to characterize macro-scale water quality and biological community health.

Allowing ten years before re-assessment will potentially allow for a greater number of IWMPs and CSO LTCP projects to be completed. Re-assessment and subsequent Indicator Status Reports should complement the "adaptive management approach", and allow for the locations and methods of assessment to be changed, depending upon the number of projects implemented and their spatial distribution.

Other projects where macroinvertebrate surveys may be helpful in assessing BMP performance include stormwater wetland creation at Saylor Grove, Wise's Mill Run, Cathedral Run, the headwaters of Pennypack Creek and other headwaters streams targeted for intensive restoration.

Fish Assessments
From 1999 through 2008 PWD has sampled fish communities throughout each of Philadelphia's watersheds using USEPA Rapid Bio-assessment V Methods (RBP V). Results of these samples have been summarized in numerous reports, with the Pennypack Creek Watershed CCR in preparation and Poquessing-Byberry Creek Watershed CCR due in 2009.

Integrated Watershed Management Plans (IWMP) for the Cobbs and Tookany/Tacony-Frankford Creek Watersheds were completed in 2004 and 2005. 5-Year Watershed Implementation Plans were completed for both watersheds in 2006. IWMPs initially recommended a five year interval for re-assessments and Indicator Status Updates, but that interval was determined to be too aggressive, at least for the initial Indicator Status Updates. The initial re-assessment monitoring interval recommendation was changed to ten years, in recognition of the fact that watershed-wide assessments are best suited to characterize macro-scale water quality and biological community health.

Allowing ten years before re-assessment will potentially allow for a greater number of IWMPs and CSO LTCP projects to be completed. Re-assessment and subsequent Indicator Status Reports should complement the "adaptive management approach", and allow for the locations and methods of assessment to be changed, depending upon the number of projects implemented and their spatial distribution. Other projects where RBP fish surveys may be helpful in assessing BMP performance include streambank restoration projects along Tacony and Cobbs Creeks as well as fish habitat and passage improvements in Pennypack Creek.

Algae Assessments
From 2002 through 2008, PWD has collected algal periphyton samples from a small number of sites in selected watersheds using components of USEPA Rapid Bio-assessment Protocol 6.1 (laboratory-based approach). Algal periphyton are collected from natural substrates and biomass is estimated based on a quantitative chlorophyll-a and total chlorophyll analysis. Periphyton sampling is performed primarily to address the question of whether anthropogenic nutrient sources are causing eutrophication, which may result in violations of water quality criteria for dissolved oxygen, pH, and have adverse effects on aquatic food webs. Large concentrations of chlorophyll indicate excessively dense algal growth, which may help explain observed aquatic life impairments.

Physical Monitoring

Habitat Assessments
Habitat assessments are conducted at each monitoring site based on the Environmental Protection Agency'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.

In 2007, PADEP shared a new set of protocols for Physical Habitat Assessments that differ slightly from those in the RBPs. Some individual habitat metrics were split into separate categories, while others had slight changes to the condition description text. PWD adopted these new sampling techniques for 2008 monitoring activities in Poquessing-Byberry Creek Watershed. Normalization procedures may be used with the data collected according to the new DEP Assessment protocol to maintain compatibility with pre-established IWMP indicators for Indicator Status Update reports.

Habitat Suitability Index (HSI)

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 gamefish species and species of special environmental concern. To date, habitat suitability indices have applied to Darby-Cobbs, Tookany/Tacony-Frankford, and Wissahickon Creek Watersheds.

Physical Habitat Survey and Integrated Flow Modeling

PWD performed very detailed physical survey of sites (n=6) where fish were collected in Poquessing Creek Watershed in 2008. Time permitting, PWD will use a depth-averaged finite element flow model (River 2D) to assess habitat conditions under baseflow and bankfull flow conditions for the Poquessing Creek watershed Comprehensive Characterization Report in 2010. Additional research is needed in order to parameterize physical habitat suitability models for various aquatic life groups of concern.

Fluvial Geomorphologic (FGM) / Infrastructure 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.

Summary of Monitoring Locations

Biological, physical and chemical monitoring locations are based on 3 criteria: 1) appropriate habitat heterogeneity; 2) access availability; and 3) proximity to USGS stream gaging stations and 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 a two letter prefix denoting major watershed, one or more optional letters denoting a tributary stream, and a series of digits to represent the distance from the mouth of the stream in hundredths of a mile. For example, site DCC110:

"DC" stands for the Darby-Cobbs watershed.

"C" stands for Cobbs Creek.

"110" places the site 1.10 miles upstream of the mouth of Cobbs Creek, where it flows into Darby Creek.

TABLE F.2.STEP 1.B-2 explains the current number of assessment sites in each watershed relative to the various monitoring programs.

Table F.2.Step 1.b -2 Number of Monitoring Locations Relative to the Monitoring Program

	Monitoring Program								
	Biological			Chemical			Physical		
Watershed	RBP III	RBP V	Algae	Discrete	Continuous	Wet Weather	Habitat	HSI Index	FGM
Darby-Cobbs	17	9	0	9	5	5	17	9	95
Tacony-Frankford	12	7	4	9	8	6	12	7	102
Wissahickon	32	10	5	10	6	8	32	10	230
Pennypack	20	11	4	13	4	4	20	11	130
Poquessing	13	7	4	7	3	3	13	6	160
Tidal Schuylkill	N/A	4	N/A	4	2	2	N/A	N/A	N/A

N/A Not Applicable

Monitoring Time Line Strategy

Prior to the creation of a comprehensive monitoring strategy, baseline assessments were conducted in all of the Philadelphia regional watersheds to assess the degree, location and type of impairments occurring within each system. 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 (CCRs) are now accomplished on a two-year timeline (**TABLE F.2.STEP 1.B-3**)

Table F.2.Step 1.b -3 Proposed Watershed Monitoring Timeline 2008-2016

COMPREHENSIVE MONITORING

Watershed-wide assessment of chemical, biological, and physical conditions; wet weather, continuous, and discrete chemistry; and full RBPs at several monitoring stations throughout the entire watershed.

Watershed	Program Components	2008				2009				2010				2011				2012				2013				2014				2015				2016			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Darby Cobbs	Monitoring	Completed 2003-2004																																			
	Data Analysis																																				
	Comprehensive Report																																				
	Monitoring																																				
	Data Analysis																																				
	Indicator Status Update																																				
Tacony - Frankford	Monitoring	Completed 2004-2005																																			
	Data Analysis																																				
	Comprehensive Report																																				
	Monitoring																																				
	Data Analysis																																				
	Indicator Status Update																																				
Wissahickon	Monitoring	Completed 2005-2006																																			
	Data Analysis																																				
	Comprehensive Report																																				
	Monitoring																																				
	Data Analysis																																				
	Indicator Status Update																																				
Pennypack	Monitoring	Completed 2007-2009																																			
	Data Analysis																																				
	Comprehensive Report																																				
	Monitoring																																				
	Data Analysis																																				
	Indicator Status Update																																				
Poquessing - Byberry	Monitoring																																				
	Data Analysis																																				
	Comprehensive Report																																				
	Monitoring																																				
	Data Analysis																																				
	Indicator Status Update																																				

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.

Reporting

Based on the monitoring time line strategy, PWD published the Pennypack Creek Watershed Comprehensive Characterization Report (PCWCCR) detailing the biological, chemical and physical attributes of the Pennypack Creek Watershed in June 2009 (available for download from http://www.phillyriverinfo.org). PWD is in the process of completing all required comprehensive assessments and data analysis for Poquessing Creek Watershed during this permit year. The Poquessing Creek CCR is expected to be completed in summer 2010.

F.2.Step 1.c. Pennypack, Poquessing, Wissahickon WMP preliminary reconnaissance - Inventory of Point and Non-Point sources

There are 127 NPDES permitted dischargers in Philadelphia, as shown in **APPENDIX I**. This listing was downloaded from the EPA envirofacts website (http://oaspub.epa.gov/enviro/ef_home2.water). Only 50 of these dischargers are located in MS4 areas, with the remaining dischargers located in the CSO areas or areas of direct drainage to a waterway.

The City is also actively involved in developing annual and seasonal estimates of non-point source pollutants. The results of this analysis are described in the hydrologic models in section F.2.Step 2.c/d/e.

F.2.Step 1.d Pennypack, Poquessing, Wissahickon WMP preliminary reconnaissance - Preliminary problem assessment

<u>Wissahickon Creek Watershed</u>

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.

Pennypack Creek Watershed

As discussed throughout Section E.2, PWD completed a Comprehensive Characterization Report (CCR) for the Pennypack Creek Watershed in June 2009. Two copies of the Pennypack Creek Watershed CCR will be submitted to the Department along with this annual report. This report will serve as the technical framework for the Pennypack Creek Integrated Watershed Management Plan (PCIWMP) to be completed in 2010/2011. 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 Pennypack CCR is disseminated to the public through the internet at the following address: www.PhillyRiverInfo.org.

Poquessing Creek Watershed

PWD is in the process of completing all required preliminary and comprehensive assessments in the Poquessing Creek Watershed during this permit year. A comprehensive characterization report for the Poquessing-Byberry Creek Watershed, including problem statements, will be completed in 2010.

F.2.Step 2. Watershed Plan Development: Permit issuance through end of year 4

F.2.Step 2.a. Pennypack, Poquessing, Wissahickon Watershed Plan Development - Monitoring and Sampling

Current activities of the PWD center on analyzing and summarizing data collected from 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 2008 and FY 2009 is the Poquessing Creek Watershed.

OOW is developing a series of watershed management plans 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, and the Pennypack creek watershed CCR was completed in June 2009. 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 second year (data analysis and report preparation phase) of The Poquessing Creek Watershed CCR.

Water Quality Sampling and Monitoring

In order to comply with the State-regulated stormwater permit obligations, PWD worked with USGS to record continuous water quality data at eleven gage stations in the Philadelphia region during July 2008 through November 2008 and March 2009 through June 2009. Water quality grab samples were also collected at all USGS gage stations in June 2009. Water quality sampling was conducted throughout 2008 and 2009 in Poquessing Creek Watershed. A watershed-wide comprehensive water quality characterization program was completed for Pennypack Creek Watershed, while wet weather water quality sampling for sediment TMDL and BMP monitoring continued in Wissahickon Creek Watershed. The sampling and monitoring sites are presented in **APPENDIX J - MONITORING LOCATIONS**. A list of the parameters sampled during the discrete, continuous, and wet weather sampling can be found in **TABLE F.2.STEP.2.A-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.

Discrete Water Chemistry Assessment

In order to characterize conditions throughout the Philadelphia region and build a long-term record of water quality, PWD initiated a quarterly baseflow water quality sampling program at eleven USGS gage stations. This program marks a transition from focusing on one specific watershed per monitoring season to a broader regional water quality assessment approach. Each USGS/PWD cooperative monitoring gage site was sampled once during the course of a few hours, to allow for travel time and sample processing/preservation. In order to complete the dataset necessary for the Poquessing Creek Watershed CCR, PWD staff also collected surface water grab samples at seven(n=7) locations within Poquessing Creek Watershed for chemical and microbial analysis (**APPENDIX J**).

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 1/09/08, 1/17/08, 1/29/08, 2/6/08; "spring" samples collected 4/23/08, 4/30/08, 5/7/08; "summer" samples collected 7/31/08, 8/6/08, 8/14/08, 8/21/08, and 8/14/08. A total of 84 discrete samples, comprising 3276 chemical and microbial analytes, were collected during the 2008 assessment of Poquessing Creek Watershed. To add statistical power, additional discrete water quality samples from PWD's wet-weather chemical sampling program were also included in analyses when appropriate

Continuous Water Quality Assessment

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. In order to characterize conditions throughout the Philadelphia region and build a long-term record of water quality, PWD initiated a continuous water quality monitoring program at eleven USGS gage stations. This program marks a transition from focusing on one specific watershed per monitoring season to a broader regional water quality assessment approach. Each USGS/PWD cooperative monitoring gage site (site map reference) records water quality data for dissolved oxygen, temperature, flow, pH, and specific conductance. Selected locations are also instrumented for turbidity, precipitation and photosynthetically active radiation (PAR). These data are made available to the public in near real-time on the internet at http://pa.water.usgs.gov/pwd/.

In addition to monitoring water quality continuously at USGS gaging stations, PWD continued deployments of *in situ* self-contained data logging continuous water quality monitoring Sondes (YSI Inc. Models 6600, 6600 EDS, 600XLM) beginning 3/5/08 at two (n=2) additional sites within Poquessing Creek Watershed in order to collect DO, pH, temperature, conductivity and depth data. Sondes were also redeployed in Pennypack Creek Watershed in March 2008 to ensure that an entire growing season's worth of data were collected, including any early spring DO stress events.

Wet Weather Event Sampling

Automated samplers (Isco, Inc.) were used to collect samples from Poquessing Creek Watershed during runoff-producing rain events in 2008 and 2009. Samples were collected from 3 mainstem locations during wet weather events that took place 9/6/08, 10/25/08, 11/13/08, 4/1/09 and 4/20/09. In order to complete the dataset for the Pennypack Creek Watershed CCR, one wet weather event was also sampled 5/16/2008 at 4 mainstem sites in Pennypack Creek Watershed. Additional samples were collected from the Stormwater treatment wetland at Saylor Grove in the Monoshone Creek Watershed (tributary to Wissahickon Creek). Wet weather data collection in tributary sites is on-going, along with the streambank erosion component of PWD's sediment source assessment (**SECTION F.1**). These 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.

Biological Assessments

Macroinvertebrate Assessments
During March 2007, PWD conducted Rapid Bioassessment Protocols (RBP III) at fifteen (n=15) locations within Poquessing-Byberry Creek Watershed (**APPENDIX J**). Surveys were conducted at 10 mainstem locations and 5 tributary locations. Two of the 5 tributary sites are located within Philadelphia County.

Fish Assessments
Between 6/1/08 and 6/23/08, PWD biologists conducted fish assessments at six (n=6) locations within Poquessing-Byberry Creek Watershed (**APPENDIX J**). All surveys were conducted at mainstem stations using electrofishing gear as described in EPA RBP V (Barbour, et al. 1999).

Algae Assessments
Periphyton communities were sampled from Poquessing sites PQ865, PQ115, and PQB025, as well as Pennypack sites PP340, PP970, PP1680, and PP2020, chiefly to assess the role of periphyton regulating stream metabolism. Surveys were conducted at mainstem locations only, with the exception of site PQB025 on mainstem Byberry Creek. 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 2007-8 periphyton monitoring in Poquessing and Pennypack Creek Watersheds was 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.

Physical Assessments
Habitat Assessments
Immediately following benthic macroinvertebrate sampling procedures, habitat assessments were completed at twenty four (n=15) sites in Poquessing Creek Watershed (**APPENDIX J**) 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.

Habitat Suitability Index (HSI)

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 Poquessing and Pennypack Creek Watersheds 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. Poquessing Creek Watershed is not actively stocked.

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 Poquessing and Pennypack Creek Watersheds, 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 Poquessing and Pennypack Creek Watersheds, 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.

Physical Habitat Survey and Integrated Flow Modeling
PWD performed very detailed physical survey of sites (n=6) where fish were collected in Poquessing Creek Watershed in 2008. Time permitting, PWD will use a depth-averaged finite element flow model (River 2D) to assess habitat conditions under baseflow and bankfull flow conditions for the Poquessing Creek watershed Comprehensive Characterization Report in 2010. Additional research is needed in order to parameterize physical habitat suitability models for various aquatic life groups of concern.

Fluvial Geomorphologic (FGM) / Infrastructure Analysis
In FY 2008, infrastructure assessments were completed in the entire Pennypack and Poquessing Creek watershed, modeled after the effort completed in FY 2006-2007 in the Wissahickon Creek watershed. In order to document infrastructure throughout the basin, PWD staff 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. The end product of this effort is a complete GIS coverage with associated digital photographs of each feature.

FGM assessment work on the Wissahickon was furthered through the QA/QC of field data moving towards the compilation of the final report. Unfortunately, the final report's compilation was delayed by errors in bankfull identification by PWD's field team. This necessitated the re-surveying of bankfull at each of the 213 cross-sections established within the Wissahickon Creek Watershed. This process took place from November, 2007 through April, 2008. Because of the large amount of data associated with project, PWD has decided to present and discuss this data on a subwatershed scale. To create a template for future reports, the Trewellyn Creek watershed was used. This report was completed in June, 2009. Moving forward PWD will produce a similar report for the Philadelphia portion of the Wissahickon watershed.

FGM assessment work on the Pennypack was furthered through the QA/QC of field data moving towards the compilation of the final report. Unfortunately, the final report's compilation was delayed by errors in bankfull identification by PWD's field team. This necessitated the re-surveying of bankfull at each of the 128 cross-sections established within the Pennypack Creek Watershed. This process took place from April, 2008 through June, 2008. PWD plans to eventually compile this data in a report on the Philadelphia portion of the Pennypack watershed once the Wissahickon report has been completed.

In FY 2007, 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.

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.

PWD plans to eventually compile this data in a report on the Philadelphia portion of the Poquessing watershed once the Pennypack report has been completed.

Monitoring Time Line Strategy

As discussed in Section 2: Step 1 (part b) of the City's Stormwater Permit, PWD has completed nearly all data collection components of the Comprehensive Assessment of Poquessing Creek Watershed. Data processing and analysis have begun for most aspects, to culminate in publication of the Poquessing Creek Watershed Comprehensive Characterization Report in 2010. Completion of the Poquessing Creek watershed Characterization report will mark the end of a decade-long research effort to characterize conditions in Philadelphia's streams. Various planning initiatives have been based upon these technical documents and many pilot –scale BMP projects have been constructed and are being actively monitored.

As the scale of watershed stressors is so expansive and individual BMP projects so limited in size, PWD is focusing its monitoring efforts at maintaining a "sentinel" monitoring presence in each of the City's watersheds rather than dedicating monitoring efforts to individual watersheds. This regional monitoring approach has been greatly enhanced through a partnership with USGS. Continuous water quality data are collected from 11 USGS gaging stations, and quarterly baseflow water samples are analyzed for microbial and nutrient parameters of concern. PWD also continues to assess performance of stormwater BMP projects as they are constructed.

Reporting

The final version of the Pennypack Creek Watershed Comprehensive Characterization Report (PCWCCR) was completed in June 2009. 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 Poquessing-Byberry Creek Watershed Comprehensive Characterization Report will be completed in 2010.

F.2.Step 2.b. Pennypack, Poquessing, Wissahickon Watershed Plan Development - Quality Assurance/Quality Control (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 and Poquessing-Byberry 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 source water 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 .

Water Quality Criteria for Poquessing Creek Watershed

An analysis will be conducted on the water quality data collected in the Poquessing Creek watershed in 2008 and 2009. 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 **F.2.STEP 2.B-1**.

Table F.2.Step 2.b.-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	0.010 mg/L*	PA DEP
Dissolved Chromium	Aquatic Life Acute Exposure Standard	0.015 mg/L*	PA DEP
	Aquatic Life Chronic Exposure Standard	0.010 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
NH3-N	Maximum	pH and temperature dependent	PA DEP
NO2-3-N	Nitrates – Human Health Consumption for water + organisms	2.9 mg/L ***	EPA 822-B-00-019
NO2 + NO3	Maximum (Public Water Supply Intake)	10 mg/L	PA DEP
Periphyton Chl-a		Ecoregion IX – 20.35 mg/m2	EPA 822-B-00-019
pH	Acceptable Range	6.0 - 9.0	PA DEP
TDS	Maximum	750 mg/L	PA DEP
Temperature		Varies w/ season. **	PA DEP
TKN	Maximum	0.675 mg/L ***	EPA 822-B-00-019
TN	Maximum	4.91 mg/L ***	EPA 822-B-00-019
TP	Maximum	140 ug/L ***	EPA 822-B-00-019
TSS	Maximum	25 mg/L	Other US states
Turbidity	Maximum	8.05 NTU ***	EPA 822-B-00-019

* - Water quality standard requires hardness correction; value listed is water quality standard calculated at 100 mg/L CaCO3 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

F.2.Step 2.c.	**Pennypack, Poquessing, Wissahickon Watershed Plan Development - Watershed Modeling**
F.2.Step 2.d.	**Pennypack, Poquessing, Wissahickon Watershed Plan Development - Estimate of Loadings from the City's MS4 System**
F.2.Step 2.e.	**Pennypack, Poquessing, Wissahickon Watershed Plan Development - Water Body Modeling**

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 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 is a critical step in the watershed characterization process. In addition, existing rules, regulations, and guidelines pertaining to watershed management at federal, state, basin commission, county, and municipal levels 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.

PWD's extensive physical, chemical and biological monitoring program is initiated for roughly one year in each watershed. A compendium document is produced following the analysis of all collected data; this document titled the Comprehensive Characterization Report (CCR) is shared with watershed partners for comments and feedback. These CCR documents are made available on PWD's Watershed Information Center website at www.PhillyRiverInfo.org. The CCR assessment serves to document the watershed baseline prior to implementation of any plan recommendations, allowing for the measure of progress as implementation takes place upon completion of the plan.

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 those 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 reflects the conditions of the watershed. These goals and objectives are prioritized by the stakeholders based on the results of the data analysis.

Strategies, Policies and Approaches

Once a list of planning objectives is selected based on the sound scientific analysis and consensus among stakeholders, effective sets of management alternatives are developed to meet the agreed upon objectives. These alternatives are made up of a combination of implementation 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.

An Integrated Watershed Management Plan will provide a list of implementation options that have been deemed appropriate for the given watershed area. Recommended implementation options these will be presented as a watershed-wide set of "guidelines" for implementation over the 20-year horizon. The City of Philadelphia will commit to implementing packages of these recommended options in the way of 4 sequential 5-year Implementation Plans for each watershed.

Wissahickon Watershed

A detailed hydrologic model has been developed for the Wissahickon watershed using EPA's Stormwater Management Model (SWMM). The outputs of this model can be found in the Wissahickon Creek Watershed Comprehensive Characterization Report (WCWCCR) online at www.PhillyRiverInfo.org . Pollutant loads for all storm water outfalls in this watershed were estimated using NetSTORM (computer program for precipitation data assessment and rapid long-term urban runoff simulation), result of this model can be found in **APPENDIX K – STORMWATER LOAD ESTIMATES**.

Pennypack Watershed

The modeling of stormwater volumes within the Pennypack Creek watershed is currently at the data analysis stage. Cross-section data from the Pennypack Creek was collected in the summer and fall of 2007. Modeling was initiated in spring 2008 and results are presented in the Pennypack Creek Watershed Comprehensive Characterization Report (PCWCCR) and are available online at www.PhillyRiverInfo.org. Pollutant loads for all storm water outfalls in this watershed were estimated using NetSTORM (computer program for precipitation data assessment and rapid long-term urban runoff simulation), result of this model can be found in **APPENDIX K – STORMWATER LOAD ESTIMATES.**

Poquessing Watershed

An updated loading analysis of the Poquessing Creek watershed will be performed in FY 2009 as a part of the data collection and analysis process central to the development of the Poquessing Creek Comprehensive Characterization Report. Pollutant loads for all storm water outfalls in this watershed were estimated using NetSTORM (computer program for precipitation data assessment and rapid long-term urban runoff simulation), result of this model can be found in **APPENDIX K – STORMWATER LOAD ESTIMATES.**

F.2.Step 2.f. Pennypack, Poquessing, Wissahickon Watershed Plan Development - Problem Definition and Water Quality Goal Setting

Problem Definition

Wissahickon Creek Watershed

As described in the FY08 Annual Report, the extensive monitoring program initiated by PWD in the Wissahickon Creek Watershed between 2005 and 2006 culminated with the production of the WCWCCR, which 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.

At the completion of the data gathering and analysis process conducted for development of the WCWCCR, PWD began to assess additional data needs to better understand problems that exist in the Montgomery County portion of the watershed. Significant data gaps emerged necessary for understanding the needs specific to the upstream portion of the watershed, including flooding, inconsistencies in ordinances and water quality impairments. Additionally complicating the watershed-wide collaborative planning process is the status of the Wissahickon TMDL for nutrients – currently under review and potential revision. This made it difficult to bring the permitted dischargers on board with supporting the planning process as they still did not know what would be required of them in the future. It was beyond PWD's scope and available staff resources to develop comprehensive assessments of the Montgomery County specific issues, and without commitment from the upstream municipalities to assist in data collection and analysis and ultimately to implementation of recommendations, PWD was unable to commit to this undertaking.

PWD has elected to move forward with developing an IWMP that will deal specifically with the problems identified within the City of Philadelphia portion of the WCW. Over the coming years, many ongoing initiatives in the upstream portion of the watershed be completed, each of which producing data that could help to fill some of these data gaps in order to identify problems and their sources for this portion of the watershed. PWD will continue to convene the WWP over the coming years in hopes that as data gaps are filled, the WWP will take the lead in developing a complementary implementation approach for the upstream portion of the watershed.

Pennypack Creek Watershed

An extensive monitoring program was initiated by PWD in the Pennypack Creek Watershed between 2007 and 2008 which has culminated in the production of the Pennypack Creek Watershed Comprehensive Characterization Report PCWCCR (spring 2009). The PCWCCR highlighted a multitude of water quality related issues within the watershed drainage. As stated in the PCWCCR, "The watershed suffers from physical disturbance due to urbanization and excess nutrient input from municipal wastewater and stormwater runoff. These effects are evident in the comprehensive assessment of aquatic habitat, water quality, and biological communities documented in this report. Healthy aquatic ecosystems cannot thrive in physically unstable habitats or when streamflow is dominated by treated municipal wastewater that does not maintain healthy stream chemistry." This report forms a technical basis for the forthcoming Pennypack Creek Integrated Watershed Management Plan (PCIWMP), a plan for restoration and enhancement of the creek and its watershed. Please review the entire report at the following address: www.PhillyRiverInfo.org.

Poquessing Creek Watershed

Sampling was initiated in the Poquessing Creek Watershed in May/June 2008 and the sampling program will continue through July 2009. Upon completion of the data collection and analysis a Poquessing Creek Watershed Comprehensive Characterization Report will be completed – targeted for spring 2010.

Water Quality Goal Setting

Wissahickon Creek Watershed

As documented in the FY07 Stormwater Annual Report, PWD initiated a watershed-wide goal setting process with the Wissahickon Watershed Partnership in winter/spring 2007 which resulted in a list of stakeholder goals. This list consisted of 23 stakeholder goals for the Wissahickon Creek Watershed.

As previously described, after the completion of the watershed-wide goal setting process PWD evaluated how to move forward with their planning process while the upstream portion of the watershed continues to gather data and complete a number of ongoing initiatives. PWD determined that in order to meet their own obligations and commitments that they must continue the planning process for the City of Philadelphia portion of the watershed.

PWD's stakeholder goal setting process is one that has been refined with each watershed plan undertaken. The Wissahickon Watershed Partnership established a preliminary set of 23 watershed-wide goals – of which a subset consisting of 12 goals was directly relevant to the City of Philadelphia portion of the watershed. PWD has an established a guiding set of seven "Umbrella Goals" for the IWMP process (**TABLE F.2.STEP 2.F-1)**. These goals were originally established in 2002 by the Darby-Cobbs Watershed Partnership – then upheld by the Tookany/Tacony-Frankford Partnership in 2003, then adopted by the Pennypack and Poquessing River Conservation Planning processes in 2006-2008. PWD has determined that these "Umbrella Goals" because of their broadly worded nature should be utilized to guide the City's IWMP planning process, objective development and ultimately implementation commitments.

Table F.2.Step 2.f-1 Proposed Goals and Objectives for the Philadelphia Portion of the Wissahickon Creek Integrated Watershed Management Plan

IWMP "Umbrella" Goal	Wissahickon Watershed Partnership Goal Subset for City of Philadelphia	Measurable Objectives for the City of Philadelphia to Guide Implementation Process
Water Quality and Pollutant Loads. Improve stream quality to reduce the effects on public health and aquatic life.	Protect drinking water quality	• Continue to meet requirements of the LT2ESWTR
	Protect drinking water taste and odor	• Limit geosmin concentrations to <10ng/L between April and May
	Improve and protect surface water quality	• Meet state numeric criteria for bacteria in dry weather. • Meet State Water Quality Standards for dissolved oxygen • Meet state criteria for pH at all sites and times. • Remove Wissahickon Creek from the state list of impaired waters.
	Eliminate untreated sewage discharges to Wissahickon Creek	• Eliminate cross-connections of sanitary to storm sewers. • Eliminate sanitary sewer discharges to the stream in dry weather.
Instream Flow Conditions. Reduce the impact of urbanized flow on living resources.	Improve and maintain baseflow through increased infiltration to support water quality and aquatic community health.	• Maintain average annual dry weather flow, excluding treated wastewater effluent, at a minimum average annual flow of 59 cfs at the mouth. • Reduce amount of Directly Connected Impervious Cover (DCIA) by 1%.
Streamflow and Living Resources. Improve stream habitat and integrity of aquatic life.	Restore aquatic ecosystem health	• Increase benthic quality index to 80% of reference reaches. • Increase IBI to 40 averaged at all sampling sites.

IWMP "Umbrella" Goal	Wissahickon Watershed Partnership Goal Subset for City of Philadelphia	Measurable Objectives for the City of Philadelphia to Guide Implementation Process
Stream Corridors. Protect and restore stream corridors, buffers, floodplains, and natural habitats including wetlands.	Reduce channel erosion and sediment loads caused by runoff	• Reduce annual sediment load from overland flow by 10%. • Reduce annual sediment load from channel erosion by 75%
	Improve aquatic habitat	• Restore X miles of stream channel and habitat such that habitat scores are X% comparable to reference conditions.
Flooding. Identify flood prone areas and decrease flooding by similar measures	Reduce the frequency and severity of damaging (out of bank) flooding	• Reduce [flooding indicator] to [value at a specific location]. • Prioritize most vulnerable areas and ensure flood mitigation planning
Quality of Life. Enhance community environmental quality of life.	Improve awareness of watershed issues at a local level (municipalities and stakeholders)	• Convene a watershed partnership stakeholder forum • Establish a partnership website to serve as an information resource
	Make stormwater/watershed related educational opportunities available to every stakeholder in the watershed	• Educate residents about benefits of rain barrel installation; have 10% of watershed resident install rain barrels on their homes. • Develop and implement at least 3 stormwater management/ watershed issues related workshops within each 5 year implementation planning timeline

IWMP "Umbrella" Goal	Wissahickon Watershed Partnership Goal Subset for City of Philadelphia	Measurable Objectives for the City of Philadelphia to Guide Implementation Process
Stewardship, Communication, and Coordination. Foster community stewardship and improve inter-municipal, inter-county, state-local, and stakeholder cooperation and coordination on a watershed basis.	Increase preparedness for natural hazards, spills, discharges and terrorism	• Obtain agreements from the 5 WWTPs and industrial users sign up as users or the Early Warning System emergency reporting phone number • Increase the amount of continuous water quality data collected from the Wissahickon Creek (Reactivation of Ft. Washington USGS gauge station) • Utilize fish biomonitoring station to assess water quality
	Increase communications within the watershed	• Create a Wissahickon Creek "event notification system" for the public

PWD will be developing an IWMP document for the City of Philadelphia portion of the Wissahickon Creek Watershed and will share this plan with the Wissahickon Watershed Partnership as a model for developing a complimentary initiative in the upstream portion of the watershed.

Pennypack Creek Watershed

In the spring of 2008, PWD initiated a watershed-wide stakeholder goal setting process for the Pennypack Creek Watershed as a part of the IWMP development process. PWD staff prepared for the goal setting process by reviewing existing watershed plans and reports. Since the Pennypack Creek River Conservation Plan was recently completed (2005) and that planning initiative included a stakeholder goal setting process that resulted in the adoption of goals very similar to the PWD IWMP "Umbrella" Goals. These RCP goals were deemed an appropriate starting point from which stakeholders could begin evaluating for completeness. These goals along with others culled from additional existing resources such as the Pennypack Greenway Partnership's Strategic Planning process and the Pennypack stakeholder "Key Person Interviews" were synthesized into a list of broad goals and measurable objectives and shared with the watershed stakeholders for evaluation (**TABLE F.2.STEP 2.F-2)**.

A diversely representative group consisting of roughly 27 stakeholders actively participated in the goal setting process. Of these, 7 participants represented municipalities within the drainage area, 2 represented nonprofit organizations, 2 represented the PADEP, 5 represented Bucks and Montgomery County agencies, 1 attended on behalf of a Pennsylvania State legislator's office, 1 represented a golf course, 2 represented local parks and 5 represented City of Philadelphia agencies. This stakeholder assemblage is currently evaluating a final "wish list" consisting of 8 broad goals for the Pennypack Creek Watershed.

Table F.2.Step2.f-2 Draft Pennypack Watershed Stakeholders Goals and Objectives

IWMP "Umbrella" Goals	Draft Objectives as defined by PWD
Habitat and Ecological Protection and Restoration	Improve Stream Habitat and Restore Aquatic Communities Restore Ecological Integrity Protection and enhancement of high quality sites
Stormwater Management	Improve In-stream Flow Conditions Stormwater management planning
Improvement of Water Quality	Improve Water Quality and Reduce Pollutant Loads
Erosion Reduction	Improve and Protect Stream Corridors
Flooding	Mitigate Flooding
Open Space Preservation, Recreation and Cultural Opportunities	Enhance and Improve Recreational Opportunities Permanently preserve land to ensure a protected greenway Preserve cultural and historic resources Build a Trial Enhancement of tributary streams and mainstem of Pennypack Creek
Quality of Life	Enhance Quality of life for Watershed Residents
Stakeholders Involvement	Improve Stewardship, Communication and Coordination among Watershed Stakeholders and Residents Increase understanding of, affinity for and commitment to natural systems

In the fall of 2008 the Pennypack Watershed Partnership was reconvened to approve this list of proposed goals and adopt them as representative of stakeholder goals for the watershed. These goals will be reevaluated in the winter of 2010 upon review of the PCWCCR by the watershed stakeholders. At that time goals will be prioritized and measurable objectives can be defined for each approved goal

Poquessing Creek Watershed

The Poquessing Creek Watershed Partnership was re-convened by PWD on June 9th, 2009. At this meeting the Integrated Watershed Management Process was introduced to the stakeholders. The Partnership will be convened on the winter of 2010 in order to develop a preliminary set of stakeholder goals to guide the planning process.

F.2.Step 2.g. Pennypack, Poquessing, Wissahickon Watershed Plan Development - 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 F.8.**

PWD is committed to a balanced "land-water-infrastructure" approach to achieve its watershed management goals. This method includes infrastructure-based approaches where appropriate, but relies on a range of land-based stormwater management techniques and physical reconstruction of aquatic habitats where appropriate.

Below is a list of the land-based options (source controls) that are being considered for implementation and the associated category that each option is in.

+ Flow reduction: Catch basin modifications
+ Flow reduction: Sump pump disconnect
+ Flow reduction: Catch basin and storm inlet maintenance
+ Flow reduction: Illicit connection control
+ Flow reduction: Roof leader disconnect program
+ Flow reduction: Street storage (catch basin inlet control)
+ Flow reduction: Offload groundwater pumpage
+ Flow reduction: Stream diversion
+ Flow reduction: Groundwater infiltration reduction
+ Flow reduction: Reduction of contractual flow
+ Low impact development/ re-development/retrofit: Require existing resources inventory, sketch plan, initial meeting
+ Low impact development/ re-development/retrofit: Require integrated site design
+ Low impact development/ re-development/retrofit: Require post-construction stormwater management

+ Low impact development/ re-development/retrofit: Post-construction inspection and enforcement
+ Low impact development/ re-development/retrofit: Demonstration Projects on Public Lands
+ Low impact development/ re-development/retrofit: Large-Scale Implementation on Public Lands
+ Low impact development/ re-development/retrofit: Street Trees and Street Greening
+ Low impact development/ re-development/retrofit: Revise Stormwater Rate Structure
+ Low impact development/ re-development/retrofit: Stormwater Management Incentives for Retrofit
+ Public education: Water Efficiency
+ Public education: Catch Basin Stenciling
+ Public education: Community Cleanup and Volunteer Programs
+ Public education: Pet Waste Education
+ Public education: Public Notification and Signage
+ Public education: Litter and Dumping Education
+ Public education: School-Based Education
+ Good housekeeping: Loading, Unloading, and Storage of Materials
+ Good housekeeping: Spill Prevention and Response
+ Good housekeeping: Street Sweeping Programs
+ Good housekeeping: Vehicle & Equipment Management
+ Good housekeeping: Private Scrapyard Inspection and Enforcement
+ Good housekeeping: Employee training
+ Good housekeeping: Record keeping and reporting
+ Good housekeeping: Flow diversion and exposure minimization structures
+ Good housekeeping: Responsible landscaping practices on public lands
+ Good housekeeping: Responsible bridge and roadway maintenance
+ Pollution prevention: Require industrial pretreatment
+ Pollution prevention: On-lot disposal (septic system) management
+ Pollution prevention: Household hazardous waste collection

+ Pollution prevention: Oil/water separator/WQ inlets
+ Pollution prevention: Industrial stormwater pollution prevention
+ Pollution prevention: Litter and illegal dumping enforcement
+ Pollution prevention: Require construction-phase stormwater/E&S controls

Many of the water-based options focus on improving aquatic habitats including water quality. Below is a list of the water-based options that are being considered for implementation and the associated category that each option is in.

+ Instream: Dam modification/removal
+ Instream: Daylight orphaned storm sewers
+ Instream: Stream cleanup and maintenance
+ Instream: Channel stabilization and habitat restoration
+ Instream: Channel realignment and relocation
+ Instream: Plunge pool removal
+ Instream: Improvement of fish passage
+ Instream: Instream aeration
+ Instream: Sidestream aeration
+ Riparian: Constructed wetlands along stream corridors
+ Riparian: Wetland restoration along tidal rivers
+ Riparian: Enhance stream corridor recreational and cultural resources
+ Riparian: Wetland improvement
+ Riparian: Invasive species management
+ Riparian: Reforestation

Below is a list of the infrastructure-based options that are being considered for implementation and the associated category that each option is in.

+ Nine Minimum Controls: Nine Minimum Controls
+ Operation and Maintenance: Inspection and Cleaning of Combined Sewers
+ Operation and Maintenance: Combined Sewer Rehabilitation
+ Operation and Maintenance: Regulator/Pump Station Inspection/Maintenance/Repairs

+ Operation and Maintenance: Outfall Maintenance Program
+ Operation and Maintenance: House Lateral Repairs
+ Sewer Separation: Permitted Discharge to Receiving Water for Waterfront Properties
+ Sewer Separation: Separation of Sanitary Sewage and Stormwater on Development Sites
+ Sewer Separation: Separate Street Runoff from Combined System
+ Sewer Separation: Complete Separation into Sanitary and Storm Sewer Systems
+ Sewer Separation: Permitted Discharge to Receiving Water for Waterfront Interstate Highways
+ Outfall Consolidation/Elimination: Outfall and Regulator Consolidation
+ Storage: Instream Storage Technologies
+ Storage: In-Line Storage in Interceptor or Trunk Sewer
+ Storage: Earthen Basins
+ Storage: Offline Covered Storage Basins
+ Storage: Offline Open Storage Basins
+ Storage/Transmission: Deep Tunnels
+ Storage/Transmission: Real Time Control
+ Transmission: Parallel Interceptors
+ Transmission: Remove Flow Bottlenecks
+ Transmission: Diversion of Trunk Flow Directly to WPCP
+ Treatment at Discharge Point: Vortex Separators
+ Treatment at Discharge Point: Swirl Concentrators

Household Hazardous Waste Collections

During FY 2009, the City of Philadelphia held 7 Household Hazardous Waste Collection events, during which hazardous waste and computer material were collected and disposed of properly. These materials include oil, paint, and other toxic household substances. In addition, recycled materials were collected from residents of the City of Philadelphia as well as composting leaves. A summary of the collections over the last 5 fiscal years is provided below in **TABLE F.2.STEP 2.G-1**. Unfortunately, FY2009 statistics were not available at time of reporting. In addition, more information is available to the public at http://www.phila.gov/streets/hazardous_waste.html.

Table F.2.Step 2. g-1 Household Hazardous Waste Collection Statistics (FY 2004 - 2008)

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 Total		3,866	306,707	67,319	374,026
FY 2007 Total		3,358	240,198	59,660	299,858
FY 2008 Total		3,372	254,055	136,249	390,304

Infrared Analysis

Aerial infrared (IR) imaging of all 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 surface water. Possible causes of thermal anomalies are leaking sewer lines, groundwater 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.

Davis Aviation of Beryl, Ohio was contracted to conduct the imaging and report the results. The cost was $115 per mile plus a ferry/deployment fee of $1324. All 161 miles of the above mentioned creeks were imaged at a cost of $19,839. The deliverables consisted of DVD+R's with raw IR video imagery, CD-ROM's with captured digital IR images of suspected anomalies, digital topography map segments showing the location of each anomaly, a comma delimited text file of WGS-84 geo-coordinates and anomaly number for each anomaly noted on the maps, and a short report describing the conditions of the flight and listing each anomaly by number with a short description of the suspected nature of the anomaly.This information allows the Water Department to easily locate and investigate the exact nature of each thermal anomaly so that appropriate decisions can be made regarding remediation of surface water contamination problems.

A shapefile was created showing spatial location of each thermal anomaly and all associated data such as suspected cause of the anomaly. Maps were created showing each of the anomalies within the City along with the surrounding infrastructure in order to help find the source of the anomaly. 38 thermal anomalies were observed within Philadelphia and each one has been investigated and corrective action taken as necessary. PWD is also contacting and working with outside communities to identify and manage the sources of thermal anomalies documented in their communities. Field investigation of the thermal anomalies is ongoing. There are plans to conduct a follow-up survey during the winter of 2009, similar to original analysis to identify the changes in the site.

<u>Floatables Control</u>
R.E. Roy Skimming Vessel

This text below is also copied under the CSO section of the annual report in **SECTION II.F.**

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 2008-2009 period of record, the skimmer vessel was in operation in 2008 from July through November before shutting down for winter maintenance, and then began operation again in April 2009. The total amount of debris collected in FY 2009 from July 1st, 2008 to June 30th, 2009 was 28.1 tons. The weights of debris collected during each month during Fiscal Year 2009 are displayed in the chart below:

Table F.2.Step 2.g-2 Debris Collected by R.E. Roy Skimming Vessel

Month	Tons of Debris Collected
July 2008	4.76
August 2008	1.46
September 2008	6
October 2008	4.8
November 2008	1.5
December 2008	No winter service
January 2009	No winter service
February 2009	No winter service
March 2009	No winter service
April 2009	2.53
May 2009	2.39

Pontoon Boat

During the 2008 and 2009 swimming seasons (i.e., May 1st through September 30th), PWD's Office of Watersheds managed a skimming operation for floatable debris on the non-tidal reach of the Schuylkill River. This program is an extension of the large debris removal program already occurring on the tidal portions of the Delaware and Schuylkill rivers and has received excellent public feedback throughout the two swimming seasons. In addition to increased effort, PWD has also demonstrated increased efficiency and productivity through modifications to the floatables control plan's standard operating procedures (SOPs) and with our continued partnership with the City's Department of Parks and Recreation. Operational modifications include changes in trash receptacles, expedited transference of debris from boat to trash vehicle and increased accuracy in material speciation. In addition, PWD has increased its operations from once a week to two times per week, ranging to about 6-8 trips/month.

During Fiscal Year 2009, the pontoon vessel was operated 26 times. The Summer/Fall of 2008 represents 12 trips removing a total of 24 cubic yards of mixed trash from the non-tidal Schuylkill River. The spring/summer 2009 season introduced a better separation scheme and the relative amounts of material are more accurate. The spring /summer season saw 14 trips with a total removal of 10 cubic yards of bottles and containers and 7.5 cubic yards of mixed trash. Mixed trash is an accumulation of plastic, styrofoam, plastic bags, and various household items etc. In addition, there were several containers of gasoline and oil, and 12 tires retrieved in spring/summer 2009. With increased interagency coordination, the ultimate goal is the recycling of all of appropriate materials. The new trash receptacle system has allowed for a tighter packing of the material and seemingly lower counts. Additionally, there was an extended period when there were only 7 cans available allowing for a total of 1.54 cubic yards of material per trip. Haul per unit effort is also decreasing somewhat, likely due to a combination of factors. Moreover, greater cooperation with the Philadelphia Rowing Community has resulted in less material reaching the water during regattas and other events.

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 F.2. STEP 3. A.II**) as well as future public participation.

F.2.Step 2.h. Pennypack, Poquessing, Wissahickon Watershed Plan Development - Economic Assessment and Funding Requirements

As watershed management plans are completed for the Wissahickon, Pennypack and Poquessing watersheds each report will include an assessment of implementation funding needs over the 20 year implementation horizon as well as the PWD implementation funding commitment for each watershed. The assessment will also detail funding requirements including identification of known and potential funding sources necessary for successful plan implementation. As watershed plans are completed, the funding commitments made by PWD will be detailed in subsequent annual reports.

F.2.Step 2.i. Pennypack, Poquessing, Wissahickon Watershed Plan Development - Public involvement

Public involvement, including education and outreach, is detailed in **SECTION F.2.STEP 3 INTEGRATED STORMWATER MANAGEMENT PLANS** and **SECTION F.8L MISCELLANEOUS PROGRAMS AND ACTIVITIES.**

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.

F.2.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 PWD's experience in working with stakeholder groups in goal prioritization and option evaluation, they have learned that stakeholder priorities can at times differ from those identified by the data driven problem identification process. This could present a challenge in development and approval of a management alternative for watershed implementation. PWD has developed an approach that is able to address what often emerges as a set of high priority stakeholder concerns while simultaneously addressing the scientifically defined priorities.

By defining three distinct "targets" to meet the overall plan objectives, priorities identified by stakeholders could be addressed simultaneously with those identified through scientific data. Two of the targets were defined so that they could be fully met through implementation of a limited set of options, while the third target would best be addressed though an adaptive management approach. In addition to the three Targets – a fourth category has been developed to capture the more programmatic implementation options related to planning, outreach, reporting, and continuation of the Watershed Partnership.

Targets are defined here as groups of objectives that each focus on a different problem related to the urban stream system. They can be thought of as different parts of the overall goal of fishable and swimmable waters through improved water quality, more natural flow patterns, and restored aquatic and riparian habitat. Targets are specifically designed to help focus plan implementation. By defining these targets, and designing alternatives and an implementation plan to address the targets simultaneously, the plan will have a greater likelihood of success. It also will result in realizing some of the objectives within a relatively short time frame, providing positive incentive to the communities and agencies involved in the restoration, and more immediate benefits to the people living in the watershed.

PWD's IWMP planning targets are defined below:

<u>Program Support (Planning, Outreach & Reporting)</u>

A number of implementation options deemed appropriate for a given watershed are "programmatic" in nature. While these options may support achievement of Targets A, B, and/or C, implementation of these options alone would not result in achievement of a particular Target. These "Program Support" associated options include items such as monitoring, reporting, feasibility studies, outreach/education, and continuation of the Watershed Partnership.

Target A: Dry Weather Water Quality and Aesthetics

Streams should be aesthetically appealing (look and smell good), be accessible to the public, and be an amenity to the community. Target A was defined with a focus on trash removal and litter prevention, and the elimination of sources of sewage discharge during dry weather. Access and interaction with the stream during dry weather has the highest priority, because dry weather flows occur about 60-65% of the time during the course of a year. These are also the times when the public is most likely to be near or in contact with the stream. The water quality of the stream in dry weather, particularly with respect to bacteria, should be similar to background concentrations in groundwater.

Target B: Healthy Living Resources

Improvements to the number, health, and diversity of the benthic macroinvertebrate and fish species needs to focus on habitat improvement and the creation of refuges for organisms to avoid high velocities during storms. Fluvial geomorphological studies, wetland and streambank restoration/creation projects, and stream modeling should be combined with continued biological monitoring to ensure that correct procedures are implemented to increase habitat heterogeneity within the aquatic ecosystem.

Improving the ability of an urban stream to support viable habitat and fish populations focuses primarily on the elimination or remediation of the more obvious impacts of urbanization on the stream. These include loss of riparian habitat, eroding and undercut banks, scoured streambed or excessive silt deposits, channelized and armored stream sections, trash buildup, and invasive species. Thus, the primary tool to accomplish Target B is stream restoration.

Target C: Wet Weather Water Quality and Quantity

The third target is to restore water quality to meet fishable and swimmable criteria during wet weather. Improving water quality and flow conditions during and after storms is the most difficult target to meet in the urban environment. During wet weather, extreme increases in streamflow are common, accompanied by short-term changes in water quality. Where water quality and quantity problems exist, options may be identified that address both. Any BMP that increases infiltration or detains flow will help decrease the frequency of damaging floods; however, the size of such structures may need to be increased in areas where flooding is a major concern. (Reductions in the frequency of erosive flows and velocities also will help protect the investment in stream restoration made as part of the Target B.)

Target C must be approached somewhat differently from Targets A and B. Full achievement of this target means meeting all water quality standards during wet weather, as well as elimination of flood related issues. Meeting these goals will be difficult. It will be expensive and will require a long-term effort. A rational approach to achieve this target includes stepped implementation with interim goals for reducing wet weather pollutant loads and stormwater flows, along with monitoring for the efficacy of control measures.

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.

In 2009, PWD will develop an Implementation Plan for the City of Philadelphia portion of the drainage area of the Wissahickon Creek Watershed with a focus on addressing PWD's obligations under the Wissahickon Total Maximum Daily Load for Siltation. This plan will be designed to begin in 2010 and run through 2015, though many commitments are currently in place and will be initiated before that time.

F.2.Step 3.a. Pennypack, Poquessing, Wissahickon - Watershed Plan Implementation and Performance Monitoring - Dry Weather Water Quality and Aesthetics

F.2.Step 3.a.i. Operate the 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.3 - DETECTION, INVESTIGATION, AND ABATEMENT OF ILLICIT CONNECTIONS AND IMPROPER DISPOSAL**.

F.2.Step 3.a.ii. Debris removal from waterways impacted by storm water discharges

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 F.2.Step3.a.ii-1 Waterways Restoration Team – FY 2009 Performance Measurements

Waste Removed	FY 2006	FY 2007	FY 2008	FY 2009
Debris Removed (tons)	425	441	326	657
Cars Removed	21	41	80	15
Tires Removed	396	1,201	861	924
Shopping Carts Removed	161	84	72	268
Number of Clean-up Sites	124	142	178	375

In FY 2009, WRT removed the greatest volume of trash than what was removed in three previous fiscal years (i.e., FY 2006-FY 2008). A total of 657 tons of debris, including 15 vehicles, 924 tires and 268 shopping carts, were removed from the City's waterways (Table E.3.2-1) In FY 2009, WRT cleaned one hundred ninety seven more sites than what was cleaned in FY 2008.

In addition to the unbelievable amounts of trash that have been eliminated from our park and stream systems, the WRT also completes restoration projects. The WRT has finished plunge pool work at the Winchester outfall in the Pennypack Watershed. The WRT has completed stream bank restoration, stream bank stabilization and riparian buffer restoration at three sites in the Wissahickon Watershed. This would include two on Wissahickon Creek at Rex Ave. and one on a Wissahickon tributary at Carpenters Woods. A full listing of all the recent WRT restoration projects can be found in the CSO section of the report at **III.C.2.2 - WATERWAYS RESTORATION TEAM.**

F.2.Step 3.a.iii. Lincoln Drive sewer relining

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.

F.2.Step 3.a.iv. Stormwater outfall dry weather flow inspections

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. The results of these samples are reported on a quarterly basis and summarized in this annual report.

Please reference **SECTION F.3 - DETECTION, INVESTIGATION, AND ABATEMENT OF ILLICIT CONNECTIONS AND IMPROPER DISPOSAL** for a more detailed discussion of this subject.

F.2.Step 3.a.v. Defective Lateral Program priority outfalls sampling

Outfalls are prioritized for investigative work by the Defective Lateral and Abatement Program. In addition, outfalls identified as priority outfalls under the MS4 permit are sampled quarterly and summarized annually.

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.

Please reference Section F.3 - Detection, Investigation, and Abatement of Illicit Connections and Improper Disposal for a more detailed discussion of this subject

F.2.Step 3.a.vi. Priority Outfall Closure Testing

Investigation will continue within each particular outfall area (sewershed) until the City believes that the outfall area may be closed. Closure of the defective laterals effort in a certain outfall area shall be as provided in the "Framework for Screening, Finding, and Abating Stormwater Pollution." During FY09, no outfalls were removed from the priority area designation therefore no priority outfall closure testing was conducted.

Please reference **SECTION F.3 - DETECTION, INVESTIGATION, AND ABATEMENT OF ILLICIT CONNECTIONS AND IMPROPER DISPOSAL** for a more detailed discussion of this subject.

F.2.Step 3.b. Healthy Living Resources

F.2.Step 3.b.i. Develop integrated storm water management plans

The City shall continue to work with adjacent counties and municipalities to develop integrated watershed management plans as well as Act 167 Stormwater Management Plans for each of the watersheds that drain to the City, including:

- Darby/Cobbs Creeks,
- Delaware River,
- Pennypack Creek,
- Poquessing Creek,
- Schuylkill River,
- Tacony/Frankford Creek, and
- Wissahickon Creek.

As previously described, PWD has already been initiating Watershed Partnerships and Integrated Watershed Management Plans within these watersheds – dating back to 1999. PWD has determined that Act 167 Stormwater Management Plans provide a valuable tool for soliciting watershed-wide participation in the planning process. It seems that having an Act 167 developed alongside the planning process lends legitimacy to the integrated watershed management planning process – and therefore brings about more diversified upstream municipal participation in the process. As such, PWD has proposed aligning the integrated watershed management plan development with the Act 167 development schedules for the remaining watersheds – including the Pennypack, Poquessing, and a re-invigoration of the Wissahickon. The following descriptions provide a status update of Integrated Watershed Management Planning and Act 167 planning progress to date.

Darby-Cobbs Creek

The Darby-Cobbs watershed lies within twenty-six (26) municipalities in Delaware County, two (2) municipalities in Chester County, two (2) municipalities in Montgomery County, and (1) municipality in Philadelphia County as listed in **TABLE F.2.STEP 3.B.I-1**.

Table F.2.Step 3.b.i-1 Municipalities within Darby-Cobbs Watershed

Delaware County	**Chester County**
Aldan Borough	Easttown Township
Morton Borough	Tredyffrin Township
Clifton Heights Borough	Montgomery County
Newtown Township	Lower Merion Township
Collingdale Borough	Narberth Borough
Norwood Borough	
Colwyn Borough	**Philadelphia County**
Prospect Park Borough	City of Philadelphia
Darby Borough	
Radnor Township	
Darby Township	
Ridley Township	
East Lansdowne Borough	
Ridley Park Borough	
Folcroft Borough	
Rutledge Borough	
Glenolden Borough	
Sharon Hill Borough	
Haverford Township	
Springfield Township	
Lansdowne Borough	
Tinicum Township	
Marple Township	
Upper Darby Township	
Millbourne Borough	
Yeadon Borough	

The Cobbs Creek Integrated Watershed Management Plan was completed in 2004 with the City of Philadelphia making a roughly $16M commitment to implementation projects for the first five years. The City of Philadelphia additionally supported the Delaware County Planning Department in the development of the Darby-Cobbs Act 167 Stormwater Management Plan, completed in January 2005. (Plan available online: http://www.co.delaware.pa.us/planning/watersheditems.html)

This Stormwater Management Plan was developed for the Darby and Cobbs Creeks Watershed in Delaware, Chester, Montgomery and Philadelphia Counties. In order to properly address stormwater management in the Darby Creek Watershed below the confluence of Cobbs and Darby Creeks, it was determined that both watersheds needed to be hydrologically evaluated. One Act 167 plan was, therefore, developed encompassing the two watersheds, thus satisfying the Act 167 planning requirements for both watersheds.

Tookany/Tacony-Frankford Creek

The Tookany/Tacony-Frankford Watershed encompasses a total area of approximately 32.96 square miles and includes the following major tributaries: Jenkintown Creek, Rock Creek, Mill Run, and Baeder Creek.

Table F.2.Step 3.b.i-2 Municipalities within Tookany/Tacony-Frankford Watershed

Montgomery County	
Abington Township	Rockledge Borough
Cheltenham	Springfield Township
Township	
Jenkintown Borough	
Philadelphia County	
City of Philadelphia	

The Tookany/Tacony-Frankford Integrated Watershed Management Plan was completed in 2005 with the City of Philadelphia making a roughly $18M commitment to implementation projects for the first five years. The City of Philadelphia additionally led the development of the TTF Act 167 in partnership with Montgomery County Planning Commission with Borton Lawson Engineering as technical consultant. The plan was completed in March 2008 and is currently under evaluation of the PADEP and municipal partners. (The full plan is available online at: www.phillyriverinfo.org)

Pennypack Creek

The Pennypack Creek Watershed is located in the southeastern corner of Pennsylvania with approximately 56.3 square miles of drainage area.

Table F.2.Step 3.b.i-3 Municipalities within Pennypack Creek Watershed

Montgomery County	**Bucks County**
Abington Township	Upper Southampton Township
Bryn Athyn Borough	Warminster Township
Hatboro Borough	
Horsham Township	**Philadelphia County**
Jenkintown Borough	City of Philadelphia
Lower Moreland Township	
Rockledge Borough	
Upper Dublin Township	
Upper Moreland Township	

An Integrated Watershed Management Plan and Act 167 Stormwater Management Plan were both initiated in this watershed in 2008. As previously described, a comprehensive characterization report has recently been completed for this watershed (Spring 2009), which has identified a number of problems and sources from which the management plan and implementation plan will be guided. The completion of the integrated watershed management plan will be held until after the Act 167 planning process has concluded so that maximum watershed-wide participation can be garnered. At present – the Act 167 plan is scheduled to be completed by the fall, 2010. At that time, PWD will begin to develop an implementation commitment for the City of Philadelphia portion of the watershed and will share this with our upstream partners as a model.

Poquessing Creek

The Poquessing Creek Watershed is located in Pennsylvania, with portions of its drainage area in Philadelphia, Montgomery and Bucks counties. The watershed encompasses approximately 21.5 square miles of drainage area. Its designated uses are warm water fishery, migratory fishes, trout stock fishery and as a tributary to the Delaware River, the creek also serves as a source of drinking water.

Table F.2.Step 3.b.i-4 Municipalities within Poquessing Creek Watershed

Montgomery County	**Bucks County**
Lower Moreland Township	Bensalem Township
	Lower Southampton Township
Philadelphia County	
City of Philadelphia	

The Poquessing Watershed Partnership was reconvened in June, 2009 for the purpose of guiding the development of an Integrated Watershed Management Plan for this watershed. In the fall of 2009, PWD plans to initiate an Act 167 Stormwater Management Plan for this watershed as well, in partnership with the Montgomery County and Bucks County Planning Commissions. A comprehensive characterization report is currently in development for this watershed.

The completion of the integrated watershed management plan will be held until after the Act 167 planning process has concluded so that maximum watershed-wide participation can be garnered. At present – the Act 167 plan is scheduled to be completed by the fall, 2011. At that time, PWD will begin to develop an implementation commitment for the City of Philadelphia portion of the watershed and will share this with our upstream partners as a model.

Wissahickon Creek

Wissahickon Creek begins in Montgomery Township and flows for approximately 27 miles where it meets with the Schuylkill River at the end of Lincoln Drive. The Wissahickon Creek Watershed encompasses an area of 64 square miles, which includes 15 municipalities in Montgomery County and the City of Philadelphia (**TABLE F.2.STEP 3.B.I-5**).

Table F.2.Step 3.b.i-5 Municipalities within Wissahickon Creek Watershed

Montgomery County	Philadelphia County
Abington Township	City of Philadelphia
Ambler Borough	
Cheltenham Township	
Horsham Township	
Lansdale Borough	
Lower Gwynedd Township	
Montgomery Township	
North Wales Borough	
Springfield Township	
Upper Dublin Township	
Upper Gwynedd Township	
Upper Moreland Township	
Whitemarsh Township	
Whitpain Township	
Worcester Township	

As previously described, an integrated watershed management plan for the Wissahickon Creek Watershed was initiated in 2005, but in 2007 PWD decided that there was not enough watershed-wide data and/or support to continue with development of a watershed-wide plan so PWD altered their approach slightly to continue working with a watershed-wide partnership while upstream planning and projects are completed – but to move forward with development of an implementation approach for the City of Philadelphia portion of the watershed.

Through PWD's more recent commitment to a county-wide Act 167 planning process, they now have hopes that funding will be allocated for development of a watershed-wide Act 167 for the Wissahickon Creek Watershed. At this time, PWD anticipates that the planning process for this watershed in the fall of 2011. The City of Philadelphia will already have an implementation commitment in place while this plan is developed, but hopes that this provides the impetus for a watershed-wide implementation commitment.

Schuylkill and Delaware Rivers

PWD has recently decided to undertake a watershed-based planning process for the City of Philadelphia portions of the Schuylkill and Delaware River Watersheds in order to cover each of the seven drainage basins within the City with a watershed-based implementation approach. The planning processes for these watersheds will be somewhat different from the five smaller tributary watersheds in a few ways. First, the stakeholder driven process will be focused on in-city partners only, and second, a comprehensive characterization report will not be completed for these watersheds, though ongoing water quality data are collected for these sheds and will be analyzed. These plans will be developed over the course of 2009/2010.

The portions of the Schuylkill and Delaware River Watersheds within the City of Philadelphia will be covered by the county-wide Act 167.

F.2.Step 3.b.ii. Assess the benefits of implementing a Natural Stream Channel Design (NSCD)

PWD is currently employing NSCD and associated stormwater management BMPs 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 in 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. These techniques are 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 Bell's Mill projects carried out by PWD will hopefully demonstrate to neighboring communities the environmental benefits of NSCD.

Marshall Road

During the FY 2009 monitoring period, PWD implemented its full NSCD Physical/Biological/Habitat monitoring protocol to comprehensively assess the performance of this natural stream channel design project. This effort, conducted in June, 2009, is summarized in a comprehensive monitoring report which is available upon request.

Wises Mills

Picking up on the restoration work on the 250 foot reach constructed by PWD's Waterways Restoration Team, during FY 2008, PWD commenced the design of a stormwater treatment wetland on a 2-acre area of Fairmount Park. The wetland will infiltrate, detain, and treat a portion of stormwater from a 90-acre watershed prior to discharging to the headwaters of Wises Mill's lower branch. In addition, this effort aims to restore and stabilize areas of Wises Mill Run that have been significantly undermined by stormwater infrastructure and dams on this stream. These efforts will target several hundred feet of stream along the 6,800 foot long tributary to Wissahickon Creek.

During the FY 2009 reporting period, PWD moved toward final design plans and specifications for this project. The stream restoration component of this project will focus on seven project locations along the Wises Mill tributary. Five of the seven sites are located on City of Philadelphia land, while two sites are on private property. Those sites located on private property will require some negotiation with the land owner and mostly likely will be removed from the final bid package and constructed as a separate project. During FY 2010, PWD expects to bid and construct the Wises Mill Stream and Wetland project pending permits from the PADEP and USACE.

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.

During FY 2009, PWD finally received joint permit approval from PADEP and USACE. In addition, final plans and specifications were completed. While PWD has planned to bid and construct this project during the fall of 2009, a potential joint venture with the USACE – Philadelphia District may slightly delay this schedule. PWD and USACE are presently working on an agreement which would result in a cost share between USACE and PWD, where USACE would oversee and manage the construction of this project. This agreement has not been finalized at present, but should be by September, 2009. During FY 2010, PWD anticipates that this project will be constructed assuming no unforeseen developments.

Redd Rambler

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

At this time last year, PWD was dealing will property owners along the stream corridor to get the necessary level of project buy-in. Unfortunately, due to the significant land ownership issues associated with this project, there have significant delays that may actually affect the feasibility of this project. PWD has continued to work with the residents adjacent to Redd Rambler to obtain Temporary Construction Access agreements along the entire project area. While we have received more than 60% of the necessary agreements, the remaining residents have been hesitant to provide PWD with permission to perform work in all areas. In addition, PWD will still require legislation to be passed in City Council to extend Right-of-Way in some areas to assure that PWD can continue to operate and maintain this project in the future. Each of the issues has indefinite time frames associated with them. During FY 2010, PWD will continue to work with the Redd Rambler Run property owners.

Bell's Mill

In FY 2008, PWD started the design process on restoring approximately 6,000 feet of impaired stream of Bell's Mill Run, a tributary in the Wissahickon Creek Watershed that flows directly into Wissahickon Creek. During FY 2009, PWD continued the design process on this stream. To date, PWD has completed the 60% Design and has submitted to PADEP for permitting. During FY 2010, PWD plans to complete the design phase of this project.

F.2.Step 3.b.iii. Assess the effectiveness of the NSCD restoration approach

As each of PWD's NSCD projects are constructed, 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 these NSCD projects, PWD will conduct post implementation monitoring at each site that will include the measurement of relevant biological, habitat, and physical parameters to be used in comparison to pre-construction conditions.

NSCD Physical Monitoring

The physical monitoring component of PWD's NSCD monitoring program will be modeled after those methods specifically described in River Assessment and Monitoring or RAM (Rosgen, 2008). The RAM manual provides the framework for a comprehensive monitoring protocol that allows for a replicable dataset to be created allowing for independent valuation of a project's performance over time.

Specifically, the method will include the following data collection efforts:

- Establishment & Survey of permanent cross-sections at riffles, runs, pools, and glides
- Survey of Longitudinal profile along the entire project reach
- Individual pebble counts at riffles, runs, pools, glides
- Bar Sample/Pavement-Sub Pavement sampling
- BEHI/NBS Assessment
- Establishment of and occupation of permanent photo points

This dataset will allow for further data analysis and the completion of an annual monitoring report that will include:

- Narrative Report
- Sketch Map
- Stream Classification
- River reach summary and dimensionless ratios
- Velocity computation form
- Cross-section data & graphs
- Longitudinal profile data and graph
- Pebble Count data and graph
- Stream Stability Indices
- BEHI & NBS worksheets and Stream Erosion Predictions
- Bar Sample data and graph
- Stream Sediment Competency Assessment
- Photos from established photo points

NSCD Biological/Habitat Monitoring

The Biological and Habitat monitoring component of PWD's NSCD monitoring program will be modeled after components of the PADEP Instream Comprehensive Evaluation (ICE) found in Appendix A of the 2006 PADEP Bureau of Water Standards and Facility Regulation Instream Comprehensive Evaluation Surveys. Specifically, PWD will perform qualitative habitat assessments and collect benthic macroinvertebrates according to the "wadeable freestone" and "riffle run" protocols (Appendices A, B, H, of the aforementioned document). Monitoring will be conducted in early spring at five year intervals following project construction. At sites that support native fish communities or propagation and passage of migratory fish, PWD will periodically sample fish populations and fish habitat at the discretion of the PA Fish and Boat Commission.

In addition to the benthic macroinvertebrate metrics described in PADEP 2006 Appendix H, PWD will collect benthic macroinvertebrates from regional reference sites representative of the best attainable biological condition in order to continue with the assessment methods and address indicators established in Integrated Watershed Management Plans.

F.2.Step 3. c. Wet Weather Water Quality and Quantity

F.2.Step 3.c.i Implement various types of storm water BMP projects

Implement several BMP projects

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.

A comprehensive list of BMP projects are presented in **TABLES F.2.STEP 3.C.I-1** and **F.2.STEP 3.C.I -2** below. The tables include 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 L**. Completed projects are presented in **TABLE F.2.STEP 3.C.I -1** and potential projects are listed by name, watershed, and project stage in **TABLE F.2.STEP 3.C.I -2**. The five project stages presented in **F.2.STEP 3.C.I 2** 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 2009
In Design: The project is currently being designed by PWD staff and partners in FY 2009
Ongoing: The project is still undergoing multiple stages of design or construction

In addition, a map of BMP locations are shown in **FIGURE F.2. STEP 3.C.I -1** with current statuses.

Since the FY 2008 Stormwater Annual Report, great progress has been made in the construction, design, and initiation of new wet weather BMPs. Since FY 2008, sixteen new projects have been added to the 'in design' stage, one new project has been added to the 'ongoing' stage, one new project has been added the 'in construction' stage, and three new projects are 'construction complete'. In addition to new projects, of those presented in FY 2008 one has moved from 'design complete' to 'construction complete' stage, and six projects have moved from 'in design' to 'design complete' stages. Two projects presented in FY 2008 have been removed from the 'in design' list as they were determined to not be feasible

Table F.2.Step 3.c.i-1 PWD Completed Stormwater BMP Projects

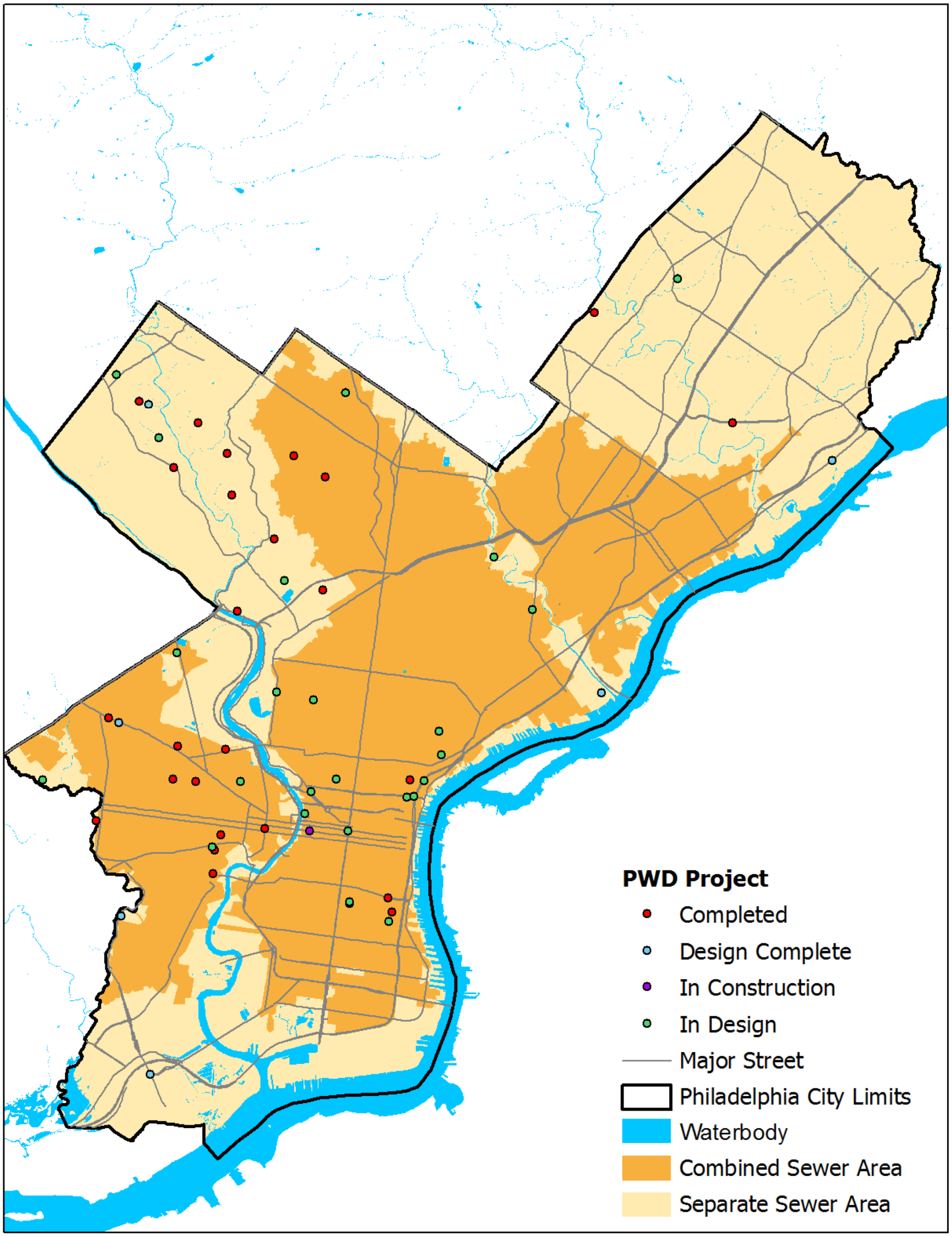
Project Name	Watershed	Shed Type
47th & Grays Ferry Rain Garden	Schuylkill	Combined
Allens Lane Art Center Porous Basketball Court	Wissahickon	Separate
BLS Meadow	Tacony-Frankford	Combined
Clark Park Infiltration Project	Schuylkill	Combined
Cliveden Park Stormwater Project	Tacony-Frankford	Combined
Courtesy Stables Runoff Treatment Project	Wissahickon	Separate
East Falls Parking Lot Bio-retention	Schuylkill	Separate
Fox Chase Farms Riparian Buffer Project	Wissahickon	Separate
Herron Playground Porous Basketball Court	Delaware	Combined
Jefferson Square Raingarden	Delaware	Combined
Liberty Lands Stormwater Project	Delaware	Combined
Marshall Road Stream Restoration	Cobbs	Combined
Mill Creek Playground Porous Basketball Court	Schuylkill	Combined
Mill Creek Farm	Schuylkill	Combined
Monastery Stables Stormwater Diversion & Detention Project	Wissahickon	Separate
N. 50th St. Retrofit (Tree Planting, Garden, & Rain Barrels)	Schuylkill	Combined
Overbrook Environmental Education Center	Schuylkill	Combined
Penn Alexander School (Porous Paving & Raingarden)	Schuylkill	Combined
Pennypack Park Wetland & Pervious Parking Lot	Pennypack	Separate
Saylor Grove Stormwater Treatment Wetland	Wissahickon	Separate
School of the Future (Green Roof & Cistern)	Schuylkill	Combined
Springside School Stormwater Improvements	Wissahickon	Separate
Waterview Recreation Center Streetscape	Tacony-Frankford	Combined
W.B. Saul High School	Wissahickon	Separate
West Mill Creek Infiltration Tree Trench	Schuylkill	Combined
Wissahickon Charter School Rain Garden	Schuylkill	Separate

Table F.2.Step3.c.i-2 PWD Potential Stormwater BMP Projects

Project Name	Project Stage	Watershed	Shed Type
Greenfield Elementary School	In Construction	Schuylkill	Combined
Baxter Visitor's Parking Lot	Design complete	Delaware	Separate
Blue Bell Tavern Park Stormwater Improvements	Design complete	Cobbs	Combined
Cathedral Run Watershed Restoration	Design complete	Wissahickon	Separate
Columbus Square Streetscape	Design complete	Delaware	Combined
Delaware Ave Extension Bioretention Swales	Design complete	Delaware	Separate
Lancaster Ave. Streetscape (59th -63rd)	Design complete	Schuylkill	Combined
Passyunk Ave. Stormwater Improvements	Design complete	Schuylkill	Combined
39th and Olive Recreation Center Improvements	In design	Schuylkill	Combined
BLS Streetscape – stormwater planters & tree trenches	In design	TTF	Combined
Barry Playground Stormwater Improvements	In design	Schuylkill	Combined
Bells Mill Stream Restoration	In design	Wissahickon	Separate
Belmont WTP Streetscapes	In design	Schuylkill	Separate
Ben Franklin Blvd Streetscaping	In design	Schuylkill	Combined
Cherry Street Connector	In design	Schuylkill	Combined
Clark Park Permeable Sidewalk and Infiltration Trench	In design	Schuylkill	Combined
Clemente Park Infiltration Tree Trenches	In design	Schuylkill	Combined
Columbus Square Raingarden	In design	Delaware	Combined
Darby Cobbs Stream Restoration	In design	Cobbs	Separate
Dickinson Square Streetscaping	In design	Delaware	Combined
Gathers Recreation Center	In design	Delaware	Combined
Germantown Avenue Streetscaping	In design	Delaware	Combined
Madison Memorial Park	In design	Delaware	Combined
Mander Recreation Center	In design	Schuylkill	Combined
Queen Lane Streetscape	In design	Schuylkill	Separate
Redd Rambler Run Stream Restoration	In design	Pennypack	Separate
Schissler Recreation Center – Big Green Block	In design	Delaware	Combined
Spring Garden Greenway	In design	Delaware	Combined
Tacony Creek Whitaker Ave. Stream Restoration	In design	TTF	Combined
Thompson and Columbia Bumpouts	In design	Delaware	Combined
Model Neighborhoods – Phase 1 Streets	Ongoing	Multiple	Combined
Wise's Mill Watershed Restoration	Ongoing	Wissahickon	Separate

Please refer to **APPENDIX L** for fact sheets describing all of the above projects.

Figure F.2.Step 3.c.i -1 BMP Locations & Project Stage



In addition to wet weather BMPs in 2003 PWD created the Waterways Restoration Team (WRT), which consists of crews devoted to removing trash and large debris (*e.g.*, cars, shopping carts and appliances) from the streams and tributaries within the City. The team also performs restoration work around PWD's storm and combined sewer outfalls, eliminating plunge pools and streambanks eroded around outfall headwalls. The team works in partnership with Fairmount Park staff and the various "Friends of the Parks" groups to maximize resources and the positive impacts to our communities. The team performs stream clean up work in the City's streams – Cobbs, Wissahickon, Tacony, Pennypack, and Poquessing Creeks, and their tributaries, in addition to the Manayunk Canal. Detail information on the status and description of the restoration and stabilization projects implemented by the WRT since their inception in 2003 can be found in the Combined Sewer Management section the report in **SECTION III C.2.2**.

Monitor three demonstration BMPs

In addition to implementing various types of BMP as described above, the City is interested in observing overall BMP performance by monitoring the efficacy of different kinds of BMPs. Thus far the operation of the Saylor Grove Wetland has been a success. The wetland was 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. During the FY 2009 reporting period, PWD resurveyed the Saylor Grove to determine the amount of sedimentation taking place within the facility. Approximately 22,000 cubic feet of material was accumulated within the facility over its first two and a half years of performance. In addition, some invasive species have colonized within the facility. During the FY 2010 reporting period, PWD plans to dredge portions of the facility to maintain its full operational potential. In addition, invasive species management will be conducted in partnership with the Fairmount Park. Lastly, PWD hopes to monitor water levels in the facility during runoff events such that a calibrated stormwater runoff model can be developed for the Saylor Grove Wetland. Additional information on the Saylor Grove Wetland can be located in Combined Sewer Management portion of the report in **SECTION III.C.2.4**. PWD will work to monitor additional stormwater BMPs as they are implemented. Reporting on this monitoring will occur in the next Stormwater Annual Report.

Work with Partners

Program Support (Planning, Outreach & Reporting) - Continue to Support Watershed Partnerships

The text below can also be found in the CSO portion of the annual report in **SECTION II.G.**

Tookany/Tacony-Frankford Watershed Partnership

In 2000, the PWD launched the Tookany/Tacony-Frankford Watershed Partnership (TTF) with its partners, as an effort to connect diverse stakeholders as neighbors and stewards of the watershed. The partnership was integral in developing the Tookany/Tacony-Frankford Integrated Watershed Management Plan (TTF IWMP).

In 2005, the TTF Partnership formally incorporated as an independent non-profit, composed of environmental organizations, community groups, government entities, and other watershed stakeholders. Now the Partnership has embarked on implementing the TTF IWMP and advancing a wide range of initiatives for the good of the watershed.

The mission of the TTF Watershed Partnership is:

"To increase public understanding of the importance of a clean and healthy watershed; to instill a sense of appreciation and stewardship among residents for the natural environment; and to improve and enhance our parks, streams, and surrounding communities in the Tookany/Tacony-Frankford Watershed."

A range of public education and outreach activities and events have resulted from the watershed planning approach in the Tookany/Tacony-Frankford Watershed. Please refer to **APPENDIX M – WATERSHED OUTREACH ACTIVITIES & EVENTS** for a description of the watershed-related events and activities that took place in 2008.

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.

A range of public education and outreach activities and events have resulted from the watershed planning approach in the Pennypack Watershed. Please refer to the following list for a description of the watershed-related events and activities that took place in 2008 and 2009.

Hatboro Eaton Park site visit with Borough officials and Conservation District to discuss riparian management practices, July 29, 2008.

Pennypack Watershed Partnership meetings

Act 167 launch meeting on November 6, 2008 at Pennypack Ecological Restoration Trust.

Act 167 update meeting and other Partnership issues on March 27, 2009, at Pennypack Ecological Restoration Trust.

Comprehensive Characterization Report presentation on water quality data, May 14, 2009 at Upper Moreland Township Building.

Comprehensive Characterization Report presentation on biological data, June 4, 2009 at Pennypack Ecological Restoration Trust.

Pennypack Greenway Partnership Meetings held on a monthly basis at Pennypack Ecological Restoration Trust and other Pennypack Watershed locations. Collaboration with Pennypack Watershed Partnership that addresses greenway, trails, stormwater, and other environmental issues (meetings held on August 19, 2008, September 25, October 22nd, November 18th, December 16th, January 6, 20009, February 10th, March 11th, April 15th, May 12, and June 10tj).

Pennypack Partnership Public Education and Outreach Committee meetings to plan education events. Meetings held on July 10, 2008 (with Pennypack Greenway Partnership) and October 29, 2008 at Pennypack Ecological Restoration Trust. Committee supported following activities:

Rain Garden Workshop for homeowners, November 20, 2008 in Bryn Athyn Borough.

Blair Mill Earth Day events (planting, rain garden installation, mowing to meadow education), April 25, 2009 at Blair Mill Elementary School, Horsham.

Fairmount Park Integration into Public Outreach and Education Committee, April 8, 2009, at Pennypack Environmental Center.

Pennypack Multi-Municipal Collaboration, a series of meetings held with elected officials in the Pennypack and Tookany-Tacony/Frankford Watersheds to address stormwater management issues. Meetings held on July 30, 2008, September 23, 2008, and March 24, 2009.

Pennvest Application. Above multi-municipal collaboration process led to mullti-municipal project between Horsham Township, Hatboro, and Upper Moreland Township to pursue Pennsylvania Infrastructure Investment Authority (Pennvest) funding for Blair Mill area stormwater management projects. This tri-municipal collaborative process conducted a series of meetings and field events in the spring of 2009 that resulted in a Pennvest stormwater BMP application submitted on May 18, 2009.

Poquessing Creek Watershed

The final Poquessing Creek Watershed River Conservation Plan (RCP) was completed in July, 2007. The final RCP report was submitted to the Department of Conservation and Natural Resources in the winter of 2007 to be considered for the Pennsylvania Rivers Registry.

Prior to the completion of the 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 subsequently placed in the 2008 Poquessing RCP Calendar, which was developed by the RCP Team in the fall of 2007 as an additional outreach tool. The calendar includes the recommendations 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.

A range of public education and outreach activities and events have resulted from the watershed planning approach in the Poquessing Watershed. Please refer to the following list for a description of the watershed-related events and activities that took place in 2008 and 2009.

Key Person Interviews to gather information on stakeholder watershed issues and concerns. Following interviews conducted:

- PECO Energy Company, May 12, 2009 at PECO Building in Philadelphia
- Parkwood Civic Association, April 16, 2009 at Association's monthly meeting
- Lower Southampton Township, April 13, 2009 at Township building
- Franklin Mills, April 1, 2009 at Franklin Mills
- Northeast Airport, March 10, 2009 at Philadelphia International Airport
- Cranaleith Spiritual Center, March 19, 2009 at the center
- Bucks County Conservation District and Bucks County Planning Commission, March 6, 2009 at the Conservation District.
- Benjamin Rush State Park, February 11, 2009 at the park.
- Bensalem Township, February 11, 2009 at the Township building.
- Fairmount Park Commission, January 29, 2009, at the Commission.
- Friends of Poquessing, December 4, 2008 at Northeast Philadelphia Community College.
- Lower Moreland Township, May 20, 2009 by telephone
- Brandywine Realty Trust, May 18, 2009 by telephone
- Somerton Civic Association by telephone.

Poquessing and Pennypack backyard buffer program workshop, January 22, 2009 at Northeast Philadelphia Community College.

Poquessing Watershed Partnership kickoff meeting, June 9, 2009 at Glen Foerd Mansion.

Delaware Direct Watershed Partnership

The Delaware Direct Watershed Partnership was formed in the fall of 2007 to support the River Conservation planning process for the Delaware Direct River Conservation Plan. A myriad of stakeholders are involved– non-profits, state and local government, in addition to community representatives. Each of the stakeholders represents a current planning initiative, such as the GreenPlan Philadelphia, the Central Delaware Master Plan, and the DRBC Water Resources Plan, among others. Through the Partnership, the representatives come together in a coordinated manner to communicate the best possible method to achieve protection of the natural resources and their sustainability in the urbanized Delaware Direct Watershed.

Please refer to **APPENDIX M** for a list for a description of the watershed-related events and activities that took place in the Delaware Direct Watershed in 2008 and 2009.

Wissahickon Creek Watershed

An IWMP was initiated for the Wissahickon Creek Watershed in the fall, 2005. The Wissahickon Watershed Partnership developed shortly after the IWMP was initiated. The Wissahickon Watershed Partnership drives the development of the IWMP for this watershed area.

Wissahickon Watershed Partners:

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 Education and Outreach Committee of the Wissahickon Watershed Partnership continues to meet and develop materials and programs.

From 2007 – 2008, the Wissahickon Watershed Education and Outreach Committee developed the below products and organized the following events:

Wissahickon Watershed Stormwater Best Management Practices (BMP) Bus Tour
Wonders of the Wissahickon Watershed Brochure
Wonders of the Wissahickon Watershed Brochure Celebration
Municipal Yard Make-Over Contest (Rain Garden Program), leading to the design and implementation of three rain gardens in the Wissahickon Watershed
Municipal Rain Garden Workshop (with accompanying PowerPoint)
Homeowners' Rain Garden Workshop
Pennsylvania Rain Garden Brochure
Stormwater Basin-Retrofit Program
Stormwater Bain Retrofit Workshop
Rain Barrel Workshops

Upper Wissahickon Critical Area Resource Plan/Special Area Management Plan Pilot Project

A Critical Areas Resource Plan (CARP) Pilot is being developed for the Upper Wissahickon Watershed in Montgomery County to demonstrate the critical area planning process established under Act 220 of 2002—The Pennsylvania Water Resources Planning Act—and the special area management plan process recommended through the Pennsylvania Coastal Zone Management Program. The plan's focus was on water supply but also pulled together many of the different water resource activities currently being pursued in the watershed. Though the study area for this initiative only included the Upper Wissahickon (which covered the headwaters through just below the confluence with the Sandy Run Creek tributary) PWD supported the development of this plan. PWD provided technical data to the planning team and provided staff resources to attend multiple planning meetings and for draft plan review.

The following list describes watershed-related events and activities that took place in the Wissahickon Watershed in 2008 and 2009:

PWD/Exelon/Schuylkill River Heritage Area Basin Retrofit Program. Stormwater basin retrofit activities including training and construction-related activities, focusing on municipal basins:

Basin Retrofit Field Training including field review of basin retrofit concepts focusing on Village Circle basin design, July 9, 2008 at Village Circle stormwater basin, Whitpain.

Neighborhood briefing on Village Circle basin retrofit, June 26, 2008 at Village Circle stormwater basin, Whitpain.

Public award ceremony for Exelon-Schuylkill River Heritage Area grants including basin retrofit program, August 26, 2008 at Perkiomen Conservancy in Schwenksville.

Upper Dublin Council review of Aiden Lair Park basin retrofit project and match, fall 2008, Upper Dublin Township Building. Basin retrofit agreement signed by Township in March 2009,

Whitpain Council review of Village Circle basin retrofit project and match, fall 2008, Whitpain Township Building. Basin retrofit agreement signed by Township on March 3, 2009.

North Wales Borough Council review of Center Street basin retrofit project, May 2008, North Wales Borough Hall. Basin retrofit agreement signed by Borough on May 27, 2008. Landowner partnership agreement also signed in May 2008. (North Wales was pre July 2008)

Center Street basin design review meetings held with landowners at site, with last meeting held on March 3, 2009.

Wissahickon Roundtable Better Site Design. Workshops held with municipalities (Whitemarsh, Upper Dublin, Whitpain, and Springfield), developers, agencies, non-profit organizations, and other stakeholders. Workshops focused on updating site development ordinances in ways that protect environmental resources:

Kick off meeting, September 16, 2008 at Whitpain Township Building

Working meeting, June 3, 2009 at Whitemarsh Township Building

Final Recommendation meeting, June 30, 2009 at Upper Dublin Township Building.

Rain garden Workshops and Plantings. Rain garden workshops held for homeowners, followed by planting events:

Rosyln Park rain garden workshop and planting, October 4, 2009 at Roslyn Park, Abington.

Ricciardi Park rain garden workshop and planting, October 11, 2009 at Ambler Borough Hall and Ricciardi Park.

Jarrettown Elementary School rain garden planting for students and parents, October 12, 2009 at Jarrettown Elementary School, Upper Dublin.

Golf Course Green Turf Management summit sponsored by Wissahickon Valley Watershed Association for area golf courses and municipal public works employees, October 16, 2008 at Manufacturer's Golf Club.

Wissahickon Watershed Partnership Meeting, December 10, 2008 at Wissahickon Valley Watershed Association addressing basin retrofit, Roundtable, and Wissahickon Special Area Management Plan initiatives.

Environmental Advisory Committee watershed wide collaboration; meetings and discussions focusing on ordinance revisions and stormwater basin retrofits:

January 21, 2009 meeting at Wissahickon Valley Watershed Association focusing on broad discussion of EAC watershed wide project opportunities.

February 25, 2009 meeting at Wissahickon Valley Watershed Association focusing on emerging collaboration on EAC watershed wide project.

April 15, 2009 meeting at Upper Dublin Township building focusing on selected projects of ordinance revisions and stormwater basin retrofits.

Wissahickon Watershed Public Education and Outreach Committee meeting with focusing on Project Headwaters and new Fairmount Park Commission involvement, April 29, 2009 at Wissahickon Environmental Education Center, Philadelphia.

Darby Cobbs Watershed Partnership

In 1999, the Darby Cobbs Watershed Partnership (DCWP) was initiated in an effort to connect residents, businesses, and government as neighbors and stewards within the vast drainage area. Over the course of the last nine years, this partnership has provided a driving force for stakeholder planning and implementation of the Darby Cobbs Integrated Watershed Management Plan (DC IWMP).

The Darby Cobbs Watershed Partnership (DCWP) mission is:

"To improve the environmental health and safe enjoyment of the Darby Cobbs Watershed by sharing resources through cooperation of the residents and other stakeholders in the Watershed.

The goals of the initiative are to protect, enhance, and restore the beneficial uses of the Darby-Cobbs waterways and riparian areas."

A range of public education and outreach activities and events have resulted from the watershed planning approach in the Darby Cobbs Watershed.

Please refer to **APPENDIX M** for activities and events that cover components of "watershed management" in the Darby Cobbs Watershed:

F.3. DETECTION, INVESTIGATION, AND ABATEMENT OF ILLICIT CONNECTIONS AND IMPROPER DISPOSAL

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 FY 09, the results of dry weather outfall and subsystem sampling were used to evaluate priorities for the Defective Lateral Detection and Abatement Program.

Staffing

As in prior years, the City maintains up to 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.

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, 101 abatements were completed under the program, at an average cost of $3,913.35, for a total cost of $395,249.

F.3.a. Prevention of Illicit Discharges

F.3.a.i. 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.3.b. Investigation of Illicit Discharge Sources

F.3.b.i. Rank the MS4 outfalls according to their priority for corrective actions

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 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 FY 09, the City investigated 42 reported 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 consultant's work was completed FY 06 and the City is now running the entire program in-house.

F.3.b.ii. Investigate dry weather flow to identify sewer lateral defects

During FY 09 the Defective Connections Abatement staff, performed 2,827 tests. Of these tests, 2,098 were new connections tested and the remaining were revisited because of the need for additional testing. Of the confirmed connections, 55 (2.6 %) were found defective. The total cost for the 103 abatements performed in FY 09, both residential and commercial, was $395,249. Results of this fiscal year's program can be observed in **TABLE F.3.B.II-1**.

Table F.3.b.ii-1 Cross Connection Repair Program

Quarter	2008-3	2008-4	2009-1	2009-2	FY '09 Total
Date Coverage	Jul08-Sep08	Oct08-Dec08	Jan09-Mar09	Apr09-Jun09	
Completed Tests *	963	689	542	633	2827
Confirmed Connections	927	448	128	595	2098
Cross Connection Identified	9	14	20	12	55
% of Defective Connections	0.97%	3.1%	15.6%	2.0%	2.6%
Abatements **	26	15	34	28	103
Average # of days to abate	30	14	15	17	25

*Completed Tests includes revists of connections
**Cross connections abated my have been identified in the prior fiscal year

Outfall Investigations

During FY 09, 56 outfalls were inspected and 56 were sampled due to observed dry-weather flow under the Permit Inspection Program. In addition, 8 outfalls were inspected and 8 sampled due to observed dry-weather flow under the Priority Outfall quarterly sampling program during FY 09. 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 05-FY 09 as well as a synopsis of the work in the priority areas is provided below.

Table F.3.bii-2 Summary of Defective Lateral Detection and Abatement Program FY 2005-FY 2009

	# 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
FY 2008	45	8	$ 187,539
FY 2009	88	13	$395,249
Total	325	29	$ 1,079,432

In the past four reporting periods, PWD has abated 354 cross connections at a cost of $1,474,681.

T-088-01 (7th & Cheltenham Avenue)

In this priority outfall area, as of June 30, 2009, 2,829 properties have had complete tests as defined by the MS4 permit. Of these properties, 132 (4.7%) have been found to have defective laterals and all but one have 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 FY 09 are listed below:

Table F.3.b.ii-3 Dry Weather Diversion Device Installation Locations

Location	ID#	Inspections	Blockages	Discharges
Plymouth Street, West of Pittville Ave.	CFD-01	58	6	0
Pittville Avenue, South of Plymouth St.	CFD-02	55	12	0
Elston Street, West of Bouvier Street	CFD-03	54	2	0
Ashley Street, West of Bouvier Street	CFD-04	46	1	0
Cheltenham Ave, East of N. 19 Street	CFD-05	49	3	0
Verbena Street, South of Cheltenham Ave.	CFD-06	43	0	0

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

Table F.3.b.ii-4 T-088-01 Quarterly Fecal Coliform Sampling

Date	Outfall (Fecal Colonies per 100 ml)
9/17/08	20,000
10/22/08	21,000
2/11/09	2,100
6/24/09	2,700

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.

W-060-01 (Monastery Avenue)

In this priority outfall area, as of June 30, 2009, 611 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 FY 09 are listed below:

Table F.3.b.ii-5 W-06-01 Inspections

Location	ID#	Inspections	Blockages	Discharges
Jannette Street, West of Monastery Ave.	MFD-01	48	0	0
Green Lane, North of Lawnton Street	MFD-02	48	1	0

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

Table F.3.b.ii-6 W-06-01 Quarterly Fecal Coliform Sampling

Date	Outfall (Fecal Colonies per 100 ml)
9/15/08	2,100
12/03/08	220
3/30/09	135
6/24/09	400

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, 2009, 2,742 properties have had complete tests as defined by the MS4 permit. Of these properties, 92 (3.4%) have been found to have defective laterals and all have been abated.

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 FY 09 are listed below:

Table F.3.b.ii-7 W-068-05 Quarterly Fecal Coliform Sampling

Date	Outfall (Fecal Colonies per 100 ml)
9/15/08	138,000
12/03/08	191,000
3/30/09	1,500
6/24/09	4,800

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 2009 was 23. There were 1 blockage and 0 discharges reported in conjunction with these inspections.

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 outfalls and the results of fecal sampling are listed below:

Table F.3.b.ii-8 Manayunk Canal Outfall Fecal Sampling Results

Outfall	Outfall Fecal Colonies per 100 mL			
	8/16/08	11/04/08	3/25/09	6/22/09
S-058-01	800	73	10	200
S-059-01	2,300	2,500	580	136,000
S-059-02	7,300	8,800	430	15,000
S-059-03	4,500	570 (12/09/08)	250	800
S-059-04	200	2,600	91	1,600
S-059-05	100	718	10	4,300
S-059-09	<200	280	73	360

In these 7 outfalls, as of June 30, 2009, 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.

<u>2006 Monoshone Study</u>

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 **APPENDIX N**.

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.

Following sampling conducted in FY 08, PWD has decided to discontinue the pilot study of anti-microbial fabric. Sampling conducted during FY 07 and FY 08 did not identify a reduction in fecal coliform and E. coli concentrations at W-068-05 due to the anti-microbial properties of the filtration fabric. Upon review of the data and consultation with the manufacturer, the technology was determined to be unsuitable for the intended use at W-068-05.

F.3.b.iii. Update the SOP for illicit connections detection and identification is updated as necessary

The Standard Operating Procedure/Methods (SOP) for illicit connection detection and identification required no updates during FY09.

F.3.c. Definitions used in this section

F.3.d. Abatements

F.3.d.i. Written notice about sewer lateral defects

Cross connections that are identified by the investigation program described above are referred to the City's Plumbing Repair Programs (PRP) unit for abatement. The PRP unit handles all correspondence and communications with the property owner.

F.3.d.ii. Residential Properties Cross Connections abatement

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 FY 09 reporting period, the City funded abatement of 88 residential cross connections at an average cost of $4,479.99, for a total cost of $394,239.30.

F.3.d.iii. Commercial and industrial properties Cross Connections abatement

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. During the FY 09 reporting period, the City funded abatement of 13 commercial cross connections at an average cost of $79.69, for a total cost of 1,010.00.

F.3.d.iv. Residential Properties Cross Connections abatement schedule

When the City goes out to a property to perform a dye test, in which a cross connection result is found, this information (location, date, and site description) will be entered into an electronic database which will generate reports and letters to notify the property owner, Notice of Defect. If the defect is an external connection (internal connection must repaired at the property owner's expense and inspected within the 120 days of notice) then the Plumbing repair unit will be notified within a week of Notice of Defect and will schedule the property for repair. The electronic database is used to keep track of the case specification, the cost for the repair, who and when the repair was done to ensure that all defects are abated within the 120 day timeframe.

F.3.d.v. Cross Connections abatement confirmation testing

Following a completed cross connection abatement, a subsequent test must be performed in order to confirm that that cross connection has been properly mitigated. If the abatement is conducted by PWD personnel, the confirmation dye test is normally performed by an experienced PWD inspector immediately following abatement completion (that same day). If the abatement is conducted by a private company, property owner must contact PWD after abatement was performed such that a PWD inspector can perform confirmation testing.

F.3.e. Defective Connection Program Reporting

F.3.e.i. Illicit connection program quarterly report

Results of the Defective Lateral Connection Program are submitted four times a year to Andrew Sinclair at the Pennsylvania Department of Environmental Protection (PADEP) as part of the reporting requirements of the City of Philadelphia NPDES Storm Water Management Permit No. PA 0054712. The report covers three-month periods staring in January, April, July, and October which are submitted no later than 45 days from the end of the reporting period. The Quarterly reports were submitted as required during FY09.

F.3.e.ii. Illicit connection program quarterly report contents

The following information is included in the quarterly report: Details of significant work performed during the previous quarter on all MS4 outfalls, including the following: Summary information about source investigation efforts through dye testing, inspections, field screening, etc. This should include a numerical summary of properties determined to be properly connected, and properties with defects, as determined during the reporting period. The outfall areas in which work was conducted during the reporting period should be identified; Summary information, including a numerical summary of source corrections (abatements) achieved through homeowner notification, enforcement, or City sponsored construction; For those outfalls (sewersheds) that have been identified as "priority" outfalls, include a progress assessment and other comments as appropriate; Results of all outfall sampling and inspections performed during the reporting period; A summary of all sewer chokes, or other problems not related to defective laterals, that resulted in the discharge of sanitary sewage directly or indirectly to a stream; A discussion of the City's goals for the upcoming quarter.

F.4. Monitor and Control Pollutants from Industrial Sources

F.4.a. Applications/Permits

The City obtains NPDES permits/discharge information from industries if they contribute significant amounts stormwater into the City's sewer system. Industries that contribute stormwater directly into a waterway or discharge non-industrial waste into the system usually coordinate directly with the Department. A list of NPDES permits that involve stormwater associated with industrial activities in the City were obtained from the Department's website and are listed in **APPENDIX I – NPDES PERMITTED DISCHARGERS**..

F.4.b. Inspections

F.4.b.i. Industrial inspections

The Philadelphia Local Emergency Planning Committee (PLEPC) is the entity tasked with meeting the responsibilities of SARA Title III. Under PLEPC, the Fire Department representative is the individual that carries out the inspections. IWU regulates about 150 "Significant" Industrial Users that discharge to the sanitary system.

F.4.b.ii. Update 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. A copy of the Industrial Waste Inspection Forms can be found in **APPENDIX O**.

F.4.c. Monitoring/Enforcement

F.4.c.i. Industrial DMR submission

When necessary, the City shall request DMRs or additional sampling from the Department for surrounding industries to ensure compliance with NPDES effluent limitations.

F.4.c.ii. NPDES permits enforcement

Should City personnel observe a violation of NPDES permit terms and conditions, the City will report the violation immediately and notify the interested and downstream parties, including the Department.

F.5. MONITOR AND CONTROL STORM WATER FROM CONSTRUCTION ACTIVITIES

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 2009 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 2009 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
- Held weekly open walk-in meetings which provide the development community with an opportunity to discuss stormwater management designs and ask stormwater policy questions, among other items.
- Updated Fact sheets and pamphlets on topics related to the changes in stormwater policies.
- 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 2009 is presented in **TABLE F.5-1** at the conclusion of this section

Table F.5-1 Summary of Plan Review Activities throughout FY 2009

	July '08	Aug. '08	Sept. '08	Oct. '08	Nov. '08	Dec. '08	Jan. '09	Feb. '09	Mar. '09	Apr. '09	May '09	June '09	FY 09 Total
Conceptual Review Stage													
Approvals	18	14	16	7	16	19	19	5	6	10	9	6	145
Rejections	47	27	39	41	19	28	21	20	37	23	16	14	332
Reviews	65	41	55	48	35	47	40	25	43	33	25	20	477
New Project Submittals	14	16	15	21	5	9	15	15	30	15	13	13	181
Average Review Time (days)	2.2	2.9	2.8	3.8	2.6	2.9	2.2	2.6	3.1	3.1	2.2	2.2	2.8
Erosion and Sedimentation Plan Review													
Approvals	6	5	5	5	2	3	1	7	2	4	6	3	49
Rejections	11	9	7	15	7	14	13	11	19	4	6	12	128
Not Applicable	3	3	6	5	2	8	3	6	14	4	3	5	62
Review Deferred to DEP	3	3	5	2	1	1	0	1	1	7	1	1	26
Post Construction Stormwater Management Plan Review Stage													
Administrative Screenings	20	11	12	13	21	14	7	8	9	10	7	16	148
Technical Approvals Issued	8	4	10	7	4	6	7	6	6	7	9	7	81
Rejections	31	25	18	27	17	32	25	22	26	14	24	22	283
Full Technical Reviews	42	34	30	38	21	39	32	30	34	22	36	29	387
New Project Submittals Received	6	11	3	11	5	13	5	8	6	8	7	8	91
Average Number of Reviews per Approval	4.6	2.5	3.7	4.9	4.5	3.2	4.6	4.0	5.3	3.9	3.9	3.9	4.1
Average Approval Time (days)	200	81	105	156	183	76	163	84	213	92	165	169	142
Acres of Earth Disturbance Approved	8.9	4.2	27.4	21.2	5.1	19.1	27.5	9.6	23.9	17.9	73.8	11.0	249.5
Acres of Green Roofs Approved	0.0	0.7	0.0	1.7	0.0	0.0	0.2	0.0	0.5	0.2	0.2	0.1	3.6
Acres of Porous Pavement Approved	0.5	0.4	2.3	0.1	0.3	0.7	2.5	0.0	1.1	0.2	0.6	0.2	9.0
DEP Reviews													
New Coordinated Reviews	4	6	4	4	3	3	6	3	3	10	8	4	58
Erosion and Sedimentation Inspections													
New Sites Inspected	2	4	6	1	6	4	5	5	5	8	3	5	54
Complaint Driven Inspections	0	2	1	0	1	1	0	1	2	0	0	2	10
Total Inspections	**105**	**78**	**93**	**76**	**83**	**74**	**72**	**80**	**96**	**104**	**107**	**121**	**1089**
Inspections at Project Sites with MS4 Sewers	48	37	39	28	29	31	29	29	45	52	62	60	489
Inspections at Project Sites with Combined Sewer	52	37	45	44	49	40	39	46	48	48	38	57	543

Please note: In FY09, PWD changed the Technical Screening to more of an administrative check to better mirror the DEP's administrative check. PWD Screenings are no longer included in the Technical Review count.

F.5.a. 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 continued as part of the stormwater management program during FY 2009.

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. Failure to adhere to the recommendations of the inspection reports can result in a 7 Day Notice and ultimately a Stop Work Order. A 7 Day Notice gives the construction manager seven days to correct an E&S problem on site. If the problem is not correct in seven days, PWD will issue a Stop Work Order which forces all construction activities to cease until the E&S problem has been corrected.

E&S Inspections were conducted as part of an established inspection regimen and as scheduled meetings, meeting follow-ups, responses to complaints and coordinated visits with the PADEP designated engineer. Based upon the FY 2009 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 F.5.A-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.

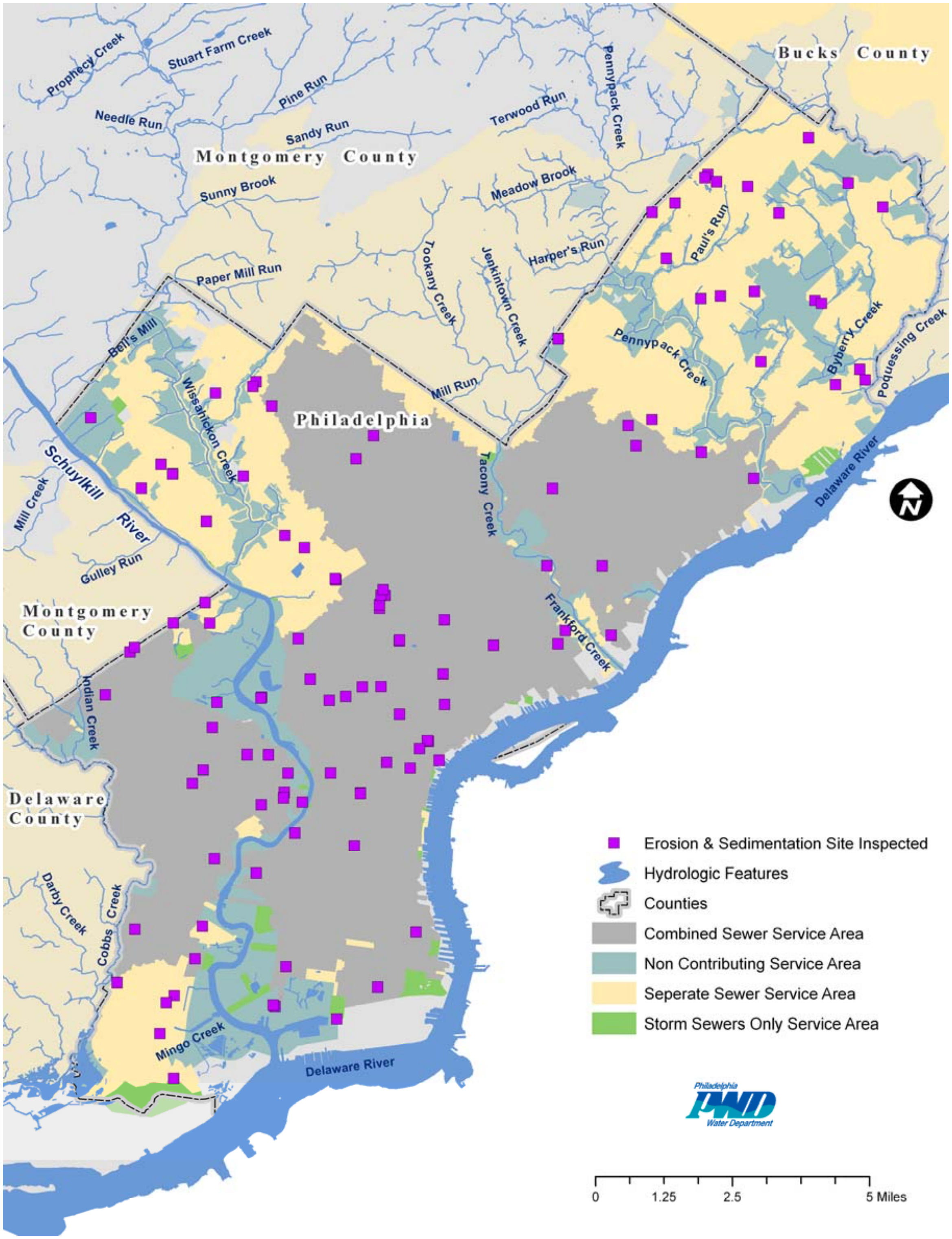


Figure F.5.a-1 Erosion and Sedimentation Site Inspections

F.5.b. 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 **APPENDIX P**.

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.

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.

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 2009 Annual Report, PWD's records indicate that projects are proposing use of pervious paving for a total of 23.2 acres and installation of green roofs at a total of 11.8 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.

F.5.c. Applications/Permits

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 2009, 183 unique projects were submitted to PWD for conceptual review through the program’s website.

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 approved 81 full technical plans during FY 2009. 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 F.5.C-1, TABLE F.5.C-1 & 2.**

Since the beginning of the year there have been 58 coordinated permit applications submitted to PADEP that are undergoing a joint stormwater management review as shown in **TABLE F.5-1**.

Table F.5.c-1 Approved Stormwater Plan Location Summary by Contributing Area

Drainage Type	**Number of Locations**
Combined Sewer Area	41
Non-Contributing Area	14
Separate Sewer Area	26
Total	81

Table F.5.c-2 Approved Stormwater Plan Location Summary by Watershed

Drainage Watershed	Number of Locations
Cobbs Creek	1
Delaware River	22
Poquessing Creek	7
Pennypack Creek	2
Schuylkill River	35
Tacony/Frankford Creek	6
Wissahickon Creek	8
Total	81

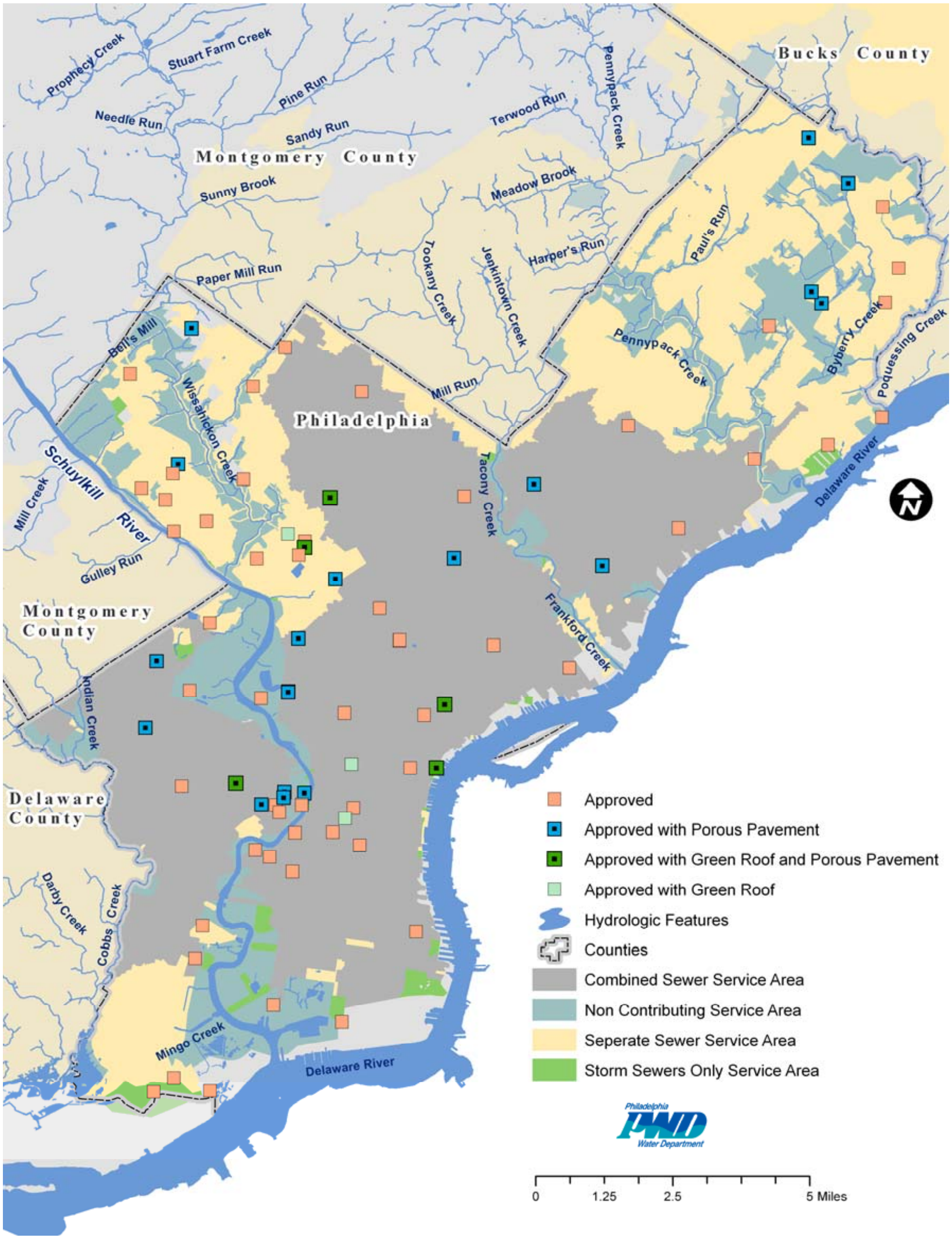


Figure F.5.c-1 Locations of Approved Post-Construction Stormwater Management Plans

F.5.d. Inspections

A total of 49 E&S Control Plans were reviewed during this reporting cycle. Inspectors conducted 1089 site inspections. Many sites were visited multiple times to ensure compliance with appropriate E&S controls (**TABLE F.5.D-1**).

Table F.5.d-1 Erosion and Sedimentation Inspection Site Location Summary

Drainage Type	Number of Locations
Combined Sewer Area	60
Non-Contributing Area	10
Separate Sewer Area	46
Total Locations	116

This value includes 10 site complaints which were typically not projects subject to PWD review.

F.5.e. Monitoring/Enforcement

In FY09, PWD issued a total of five 7-Day Notices for E&S violations on three construction sites. Only one site was issued a Stop Work Order for E&S violations.

F.5.f. NPDES Permit Requests

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.

F.5.g. Storm Water BMP handbook and Construction Site BMP Sediment & Erosion Control Checklist

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 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. The Manual provides guidance for the entire site design process, beginning with initial site design considerations, through the post-construction stormwater management plan submittal elements, and ultimately the acquisition of stormwater plan approval. Tools are provided to assist in completion and submittal of a stormwater management plan consistent with the intent of the City. They include flowcharts to guide the developer through the process, worksheets to assist with calculations, and checklists to ensure the plan is complete. The tools work together to address stormwater management on the development site from concept to completion.

F.6. Watershed, Combined Sewer Overflow (CSO), 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 F.2 of this report.

Delaware Valley Early Warning System

Background

The Delaware Valley Early Warning System (EWS) is an integrated monitoring, notification, and communication system designed to provide advanced 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 the Delaware Water Gap to just below Wilmington, Delaware.

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. The recent integration of the CodeRED emergency notification system allows outgoing calls to be completed in less than four minutes. 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.

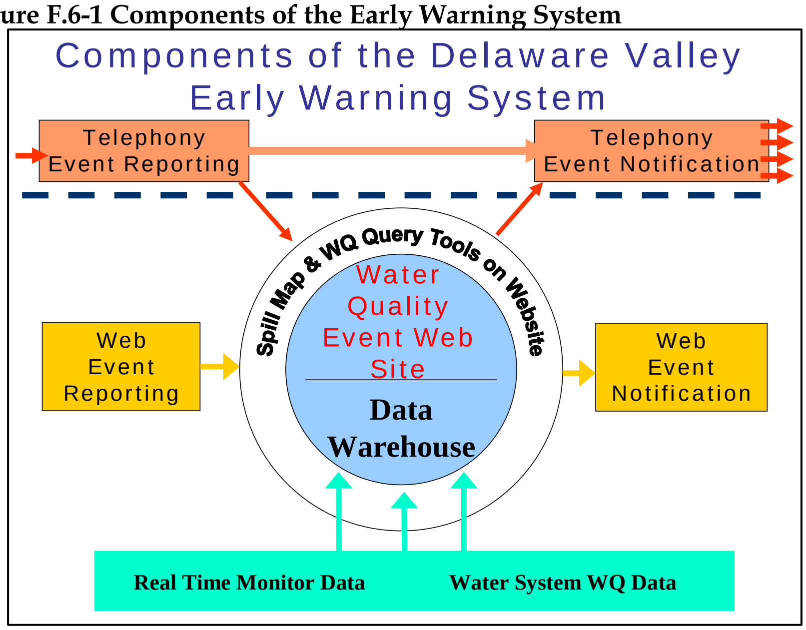
The water quality monitoring network compiles both near real-time and historic water quality data. The near real-time network utilizes continuous water quality monitors that are located at select water treatment plant intakes and USGS gauging stations and transmits data collected at those locations to 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.

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 F.6-1** and described in detail below.

Figure F.6-1 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 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. PWD has been in the process of working with PADEP to make this happen, and may eventually 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.

Schuylkill Action Network

Philadelphia is the furthest downstream city in the Schuylkill River watershed, which provides a source of drinking water for Philadelphia residents. The primary source of impairment of the Schuylkill watershed is stormwater, 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) Stormwater Workgroup, is 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. The Stormwater Workgroup was formed to identify a cost-effective approach to stormwater management through project prioritization and planning. The SAN Stormwater workgroup's goal is to maximize reduction and/or prevention of stormwater runoff pollution.

Publicly owned lands (including schools, parks and golf courses) represent an important potential resource for addressing stormwater in the Schuylkill watershed, and are a significant focus for the SAN Stormwater workgroup. The SAN Stormwater workgroup identified the largest landowners in the Schuylkill watershed in order to reach the most people and make the biggest impact. These landowners include 61 school districts, each with several campuses, and golf courses with lands comprising 11,600 total acres located along 43 stream miles. As of 2009, with the help of a 1.15 million grant from EPA, the workgroup implemented best stormwater management practices at seven of these priority lands while raising several hundred thousand dollars of additional funds for continued action on priority lands.

One of the key tasks of the SAN Stormwater Workgroup has been to help municipalities collaboratively address stormwater issues by targeting municipalities located in Berks, Montgomery and Chester counties – areas with significantly impaired streams due to stormwater. The workgroup assisted these municipalities in adopting consistent stormwater ordinances, developing Environmental Advisory Committees and conducting other activities beyond what is required by current regulations.

Other accomplishments of the workgroup include:

Using maps showing MS4 areas, PA Act 167 plan development status, and stream impairments due to stormwater contributions to identify priorities, and to coordinate a strategy for MS4 outreach to municipalities with the Education/Outreach Team.

Working closely with Villanova University to develop and implement the Stormwater Symposium, presented in September 2005 at Villanova University. Through the municipal outreach prioritization process, partnerships between workgroup members have been forged/strengthened and the group has begun to explore new ways to potentially improve/coordinate stormwater management in the watershed, such as through watershed-wide Act 167 planning and/or the development of stormwater authorities.

Working closely with PADEP to investigate the feasibility of a watershed-wide Act 167 plan, to review and provide input on DEPs new stormwater model ordinance, and to develop ideas for a collection of demonstration BMPs for the watershed for the SAN website.

Working closely with PADEP to provide assistance and support for MS4 program administration and BMP education.

Providing support and input for EAC development in key municipalities in the watershed.

Providing input into the Environmental Finance Center‟s efforts to cultivate new stormwater financing solutions.

Developing outreach to Homeowners Associations and municipalities regarding stormwater management.

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. Please refer to the first section of this document for additional information regarding the CSOMP.

Source Water Protection Program

Philadelphia Water Department's Source Water Protection Program, together with treatment technology, embodies the department's multi-barrier approach to ensuring the safety and quality of its drinking water whose source consists of working rivers. Philadelphia's Source Water Program staff work closely with the department's treatment plant managers and operators to anticipate and respond to emergencies and challenges to conventional treatment techniques. Program staff have a thorough understanding of Philadelphia's water supply including ambient water quality conditions, major sources of actual and potential contamination, water availability, flow patterns and management policies, and tidal and reservoir impacts. The program gauges the impact of future influences on the water supply system such as climate change, natural gas extraction and carbon sequestration. The program establishes short-term and long-term water quality and quantity standards for Philadelphia's source waters. The program employs research, regional partnerships, outreach and education, lobbying, advanced technologies, on-the-ground implementation, monitoring and other tools to achieve set source water standards. Finally, the program assesses alternatives to current sources and/or treatment measures when standards cannot be met using available source water protection techniques or current conventional treatment technology.

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.

Watershed Mitigation Registry

The City of Philadelphia's Watershed Mitigation Registry (WMR) is an innovative OOW program initiated in 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. This procedure has been completed and is awaiting comments.

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 areas targeted for restoration and enhancement, many of which are now listed in the WMR for the Philadelphia Region. Thus far the WMR compiles 272 targeted areas identified in the aforementioned inventories and management plans. Targeted areas are categorized as wetland creation (72), wetland enhancement (88), wetland enhancement - invasive management (24), tidal mudflat - wetland restoration (33), stream restoration (41), stream daylighting (2), pond buffer (2), and wetland preservation (4). The WMR functions as a straightforward way to search for a project by watershed, project type, project size, and a variety of other variables. Reports, which include pictures and a potential project description, are automatically generated based on queries allowing information to be disseminated to interested parties in a timely fashion.

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.

During FY 2009, PWD worked with multiple interested parties on the implementation of projects at some of the registry locations. For the most part, these parties represented developers with wetland mitigation needs for their projects based on permit requirements imposed by USACE and PADEP. During FY 2010, PWD will continue to work with applicants in need of wetland/stream mitigation. In addition, PWD will investigate the potential for a more formal wetland/stream mitigation program that is recognized by USACE, PADEP, and other regulating bodies.

Some information this section is a duplicate from **SECTION III.C.2.4**: Wetland Enhancement and Construction.

F.7. MISCELLANEOUS PROGRAMS AND ACTIVITIES

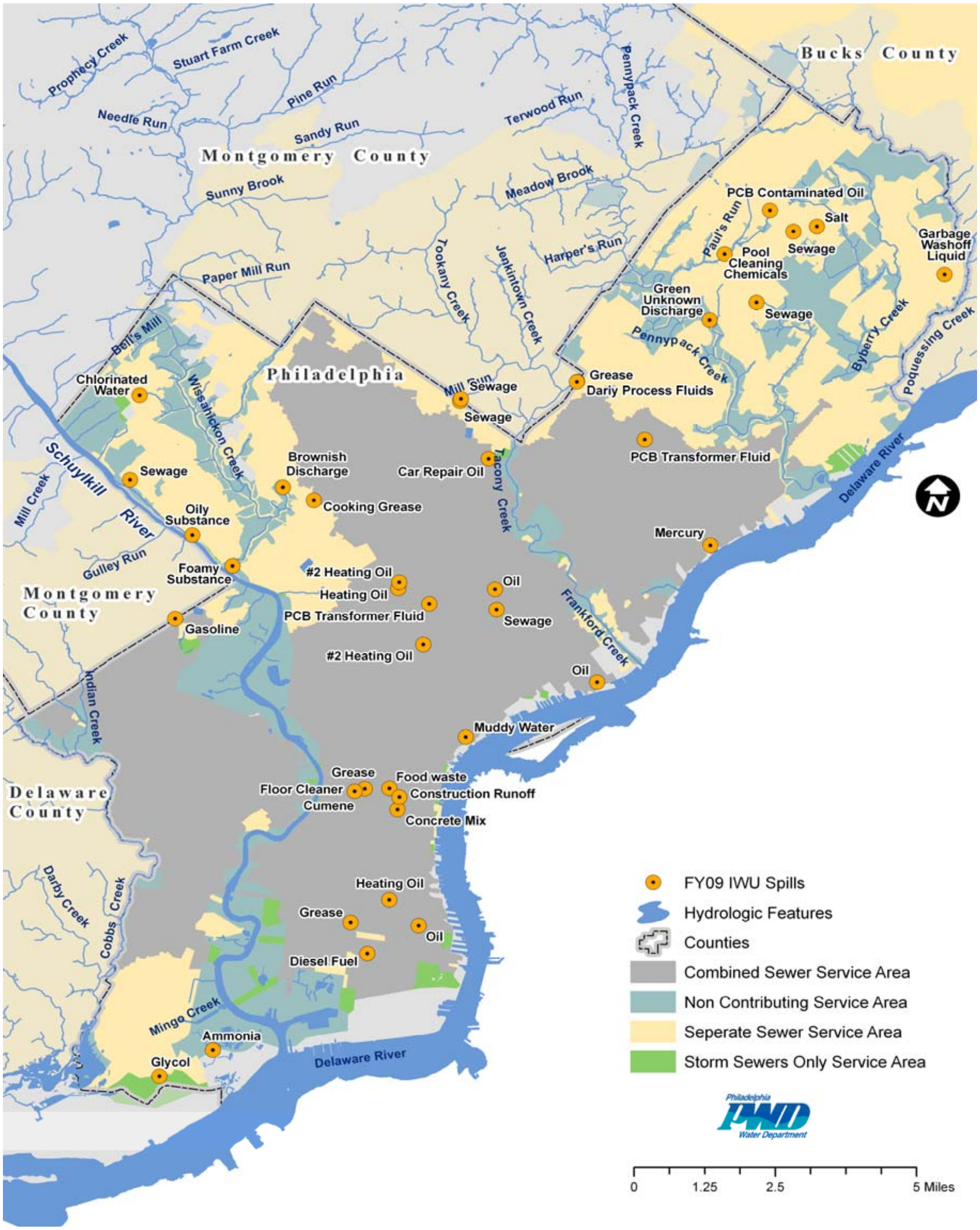
F.7.a. Pollutant Migration/Infiltration to the MS4 System

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 F.7.A-1** below is a list of all pollutant migration events in FY 2009. The locations of all events are presented on the following page in **FIGURE F.7.A-1**.

Table F.7.a-1 Pollutant Migration/Infiltration to the MS4 System

Date	Location	Pollutant	Drainage Type
7/1/08	1701 John F Kennedy Blvd	Floor Cleaner and dirt	CSO
7/10/08	11000 Roosevelt Blvd	Salt	MS4
7/15/08	9710 Walley Ave	Pool Cleaning Chemicals	MS4
7/16/08	Cherry & Alder Sts	Food waste	CSO
7/21/08	1701 John F Kennedy Blvd	Cumene	CSO
7/29/08	7th & Ontario Streets	PCB Transformer Fluid	CSO
7/30/08	Lock and Main Streets	Oily Substance	MS4
7/30/08	Broad St. & Erie Ave	#2 Heating Oil	CSO
8/7/08	Broad & Venango Sts	Heating Oil	CSO
8/14/08	Wise Mill Rd. & Henry Ave	Chlorinated Water	MS4
8/19/08	7th & Cheltenham	Sewage	MS4
8/25/08	8th & Sansom	Concrete Mix	CSO
8/29/08	85 Franklin Mills Blvd	Garbage Washoff Liquid	MS4
9/9/08	Philadelphia International Airport	Glycol	Non-Contributing
9/9/08	8th & Filbert Sts	Construction Runoff	CSO
9/16/08	7th & Lehigh	#2 Heating Oil	CSO
10/3/08	Franklin St. & Hasbrook Ave.	Grease	MS4
10/9/08	2510 S Broad St	Grease	CSO
10/20/08	D Street	Oil	CSO
10/30/08	Marlborough & Richmond Sts	Muddy Water	CSO
10/31/08	Franklin St. & Hasbrook Ave.	Dariy Process Fluids	MS4
11/4/08	Umbria St & Domino Ln.	Sewage	MS4
11/20/08	Ritner & Water Sts.	Oil	CSO
11/25/08	6000 block of N. Front St.	Car Repair Oil	CSO
12/9/08	8200 Enterprise Ave	Ammonia	Non-Contributing
12/15/08	Wayne Ave & W Chelten Ave	Cooking Grease	MS4
12/27/08	7th & Hoffman	Heating Oil	CSO
1/8/09	10th & Packer	Diesel Fuel	CSO
2/2/09	Wilbur St.	Sewage	MS4
2/19/09	Milnor Street & Levick Street	Mercury	CSO
3/5/09	Conshohocken State Rd	Gasoline	MS4
3/17/09	Grant Ave. & Roosevelt Blvd.	Sewage	MS4
3/18/09	SW outfall off Bustleton Ave	Green Unknown Discharge	MS4
3/30/09	3400 block of Hartville St	Sewage	CSO
4/6/09	Transformer on Tyson Ave	PCB Transformer Fluid	CSO
4/16/09	3601 N Delaware Ave	Oil	Non-Contributing
5/1/09	15th & Arch Sts	Grease	CSO
5/3/09	Wissahickon Creek at Ridge Ave.	Foamy Substance	Non-Contributing
5/12/09	Outfall W-068-5	Brownish Discharge	MS4
6/3/09	Outfall T-088-1	Sewage	MS4
6/3/09	10175 Northeast Ave	PCB Contaminated Oil	MS4

Figure F.7.a-1 FY 2009 Pollutant Migration/Infiltration Event Locations



F.7.b. Public Education and Awareness

The text below can also be found in the CSO portion of the annual report in **SECTION II.G.**

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 presented in the Section II of the CSO portion of this 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.

Fairmount Water Works Interpretive Center

The Fairmount Water Works Interpretive Center (FWWIC) is PWD’s renowned education center, located on the banks of the Schuylkill River in Philadelphia. The Center tells the story of the Schuylkill River and its human connections throughout history. Innovative exhibits and interactive educational programs meld the history, technology and science, providing education on the many issues facing the regions’ urban watersheds.

The mission of the Center is to: “educate citizens to understand their community and environment, especially the urban watershed, know how to guide the community and environment in the future, and understand the connections between daily life and the natural environment.”

Teachers and students are invited on an adventure to explore Water in Our World at the Fairmount Water Works Interpretive Center. 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. Short descriptions of some of the FWWIC programs follow.

The Art of Diatoms: So Small, So Significant
Diatoms are a key biological component to understanding our rivers. These microscopic algae have been used to help determine the environmental conditions of our rivers for many years. Students will focus on the study of diatoms through the use of a microscope, drawings and history. Students will gain an understanding that all life forms are made up of cells, and that there is a direct relationship that exists between organisms and within an environment.

History of Manayunk Canal: Industrial Revolution --Environmental Devolution
The industrial history of a neighborhood can often reveal what led to the devastating impact of industrialization on the drinking water source in the City of Philadelphia, namely a public health crisis. In this lesson students will experience through a walking tour outside and examination of historical documents the one hundred year rise and fall of a section of the city of Philadelphia and its relationship to the Schuylkill River - an area that once thrived as an industrial manufacturing center and at the same time led to an environmental catastrophe that affected the citizen's drinking water supply.

Clean it Up: Treating Dirty Water
There are 9 steps in the water treatment process to make source water into finished drinking water for over 1.5 million Philadelphians. This lab experiment will introduce students to filtration, one of the important steps in this process since the Water Department began treating water in the early 1900's. Using a pre-made mixture of dirty water, students will observe and record its various properties.

The Rain Drain: Stop Trash in its Tracks
One of the greatest threats to the quality of our region's rivers and creeks is stormwater runoff pollution. This occurs when rainwater washes over the land and collects pollutants, such as motor oil, dog wastes, pesticides and litter. Too often, these get carried into storm drains, or directly into streams and rivers. In this lesson, students will discover the connection between the storm drain on or the or near the corner, the nearby creek, pollution and drinking water.

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.

Wetlands: Wildlife, Water and Weather
Wetlands clean stormwater, replenish ground water, reduce flooding risks, and provide a home for wildlife. In this lesson, campers and their chaperones learn how Philadelphia has created a model project to treat both water pollution and flooding issues by creating a wetland in an urban environment. Using household supplies, campers discovered how wetlands, capture, store and release water.

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.

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

Since opening its doors in October, 2003, the FWWIC has seen over 150,000 visitors tour the center, participate in its programs, sign up for educational events and online updates.

During a typical week, the FWWIC hosts 450 visitors, three school groups (elementary or middle school classes), two independent organizations (charter school, community centers), and two special events (evening with a visiting environmental author or lecturer, weekend film preview, e.g., Liquid Assets).

In 2008, approximately 37,177 individuals visited the FWWIC. The breakdown of visitors is listed in **TABLE F.7.B-1**.

Table F.7.b-1 2008 Fairmount Water Works Interpretive Center Visitors

2008 Fairmount Water Works Interpretative Center Visitors	
School Groups	113 classes, totaling 6,843 students
Teacher Trainings	3 multi-day workshops with 33 teachers
Summer Camps	24 multi-day summer camps with 851 environmental campers
Special Exhibits	6 multi-month exhibits, including the Green City, Clean Waters CSO Long Term Control Plan Update Exhibit
New Programs	9 events, including the World Water Day Celebration
Visiting Authors, Lecturers, Environmental Leaders	4 new education programs, including "Seeing is Believing: A Drop in the Bucket," a career- based laboratory program for high school students
Community Programs	70 community programs, reaching 4,739 individuals
General Visitors	18,985
2008 Total Visitors	**37,177**

A breakdown of the 2008 programs follows.

Teacher Trainings:

- Aquatic Invasive Species
- Zebra/Quagga Mussels
- Global Passport to Clean Water

Special Exhibits:

- Delaware Estuary Calendar Art Exhibit
- Black History Month Exhibit
- Women in Science and Engineering Exhibit
- Green Cartoons – Tony Auth Exhibit
- Green Cities, Clean Water/CSOLTCP Exhibit
- Traveling Mercies Exhibition

Special Events:

- Energy Coordinating Agency Fundraiser

- Women's International League for Peace and Freedom meeting
- Philadelphia Global Water Initiative Reception
- World Water Day Celebration
- Urban Shad Watch
- Pennsylvania Environmental Council Fundraiser
- H2O – Help to Others – global water presentation
- Mountaintop to Tap: 6 City Kids, 6 Country Kids, 3 weeks, 200 miles, documentary and presentation about where New Yorkers get their drinking water
- Earth Charter Global Summit – 30 cities from around the globe linked via web connection to discuss climate change

New Programs:

- Seeing Is Believing: A Drop in the Bucket - career base science education program for high school students
- History of Manayunk Canal: Industrial Revolution, Environmental Devolution - day long lesson highlighting 19th century industrialization in Manayunk and the impact on drinking water supply
- Land and Water Connection: We Drink the River – two-day educational program for Environmental Conservation classes at Community College of Philadelphia
- What's in the River – 90 minute art activity/environmental stewardship lesson for pre-school children

Visiting Authors, Lecturers:

- Ed Snodgrass, author of "Green Roof Plants"
- Professor John B. Osbourne, lecturer on Cholera Pandemic of 1832
- Gerard Koeppel, author of "Water for Gotham"
- Professor Kevin Bone, author of "Water Works"
- Daniel J. Boyne, author of "Kelly: A Father, A Son, A American Quest"

- Donna Ann Harris, author of “New Solutions for House Museums”
- Thomas Keels, author of “Forgotten Philadelphia”
- Atkin Olshin Shade Architects – Art Museum Expansion presentation
- Suraya Pakzad, recipient of the International Women of Courage Award
- Stephanie Ayanian, producer/director of documentary “Liquid Assets”

7th Annual Southeastern Pennsylvania Coast Day Event – September 20, 2008

The Philadelphia Water Department along with Partnership for the Delaware Estuary and Pennsylvania DEP Coastal Zone Management Program sponsored the 7th Annual Southeastern PA Coast Day on Saturday September 20, 2008. Due to the tremendous success last year, the event was again advertised to every resident of Philadelphia through a flyer inside the monthly water bill. The same promotional piece was also placed at nearby hotels, museums and various other public places to promote the day, along with newspaper print advertising. The event was held at Penn’s Landing, on the Delaware Riverfront with an estimated record breaking attendance. In all, over 25 local and regional organizations took part, providing educational and interactive displays for Coast Day visitors. Nearly 945 people participated in enough activities at the various organizations’ booths to qualify for prizes in the Clean Water Challenge. The event also featured music, food, face painting, and crafts, as well as free samples of grilled Delaware Bay oysters. As an added feature this year, two Ride the Ducks took 36 people every half hour on an adventure on the Delaware River. A total of 720 children and adults, most of which had never been on a boat, got to experience Philadelphia from the River’s perspective.

2008 Philly FUN Fishing Fest

As a result of the revitalization of our region’s rivers, PWD has witnessed the return of a variety of sporting fish to the Schuylkill River and believes that this good news is worth spreading. In celebration of the improving water quality, the Philadelphia Water Department and its partners, the Fish and Boat Commission, East Falls Development Corporation and the Schuylkill River Development Corporation – hosted the 5th annual Philly FUN Fishing Fest on the banks of the Schuylkill River on Saturday, September 20th, 2008. Over 300 anglers participated and over 115 fish were caught during the tournament.

The fishing festival is open to the public - all skill levels and ages. Prizes from various local sponsors are provided to the winners of various categories. Fishing instruction is provided by volunteers, while fishing rods are on loan and bait is donated. The event does not require a fishing license and it is free of charge.

The Fishing Fest is an effective means to educate the public on the improving water quality and aquatic resources the City offers. For more information on the Philly Fun Fishing Fest, please visit: http://www.phillyriverinfo.org/fishingfest/.

"Protect our Hidden Streams" Art Contest

The Partnership for the Delaware Estuary and PWD sponsored its tenth art contest for Philadelphia public, private and home-schooled students, grades K-12 in January 2009. This year the concept of stormwater pollution prevention was still the same but the theme was changed to "Protect Our Hidden Streams". We changed the theme to make kids think of sewers as not just tubes in the ground but hidden streams that were historically above ground and naturally flowing. Students were required to draw an illustration that shows how Philadelphians can help prevent stormwater runoff pollution. First prize drawings were used to promote pollution prevention messages on SEPTA buses and in the creation of a calendar. Along with the drawings, the calendar also provided monthly tips to help prevent water pollution. In 2009, there were almost 1500 drawings entered into the contest, with over 25 classrooms and several home schools participating. This year we also added the option of entering a video in the contest. We only received a handful of videos but they were excellent. They can be seen at http://www.delawareestuary.org/acivities_teachers_art_contests.asp

This year's award ceremony was held in April at the Fairmount Water Works Interpretive Center.

Stormwater Best Management Practices (BMP) Recognition Program

In 2005, PWD and partners developed the Stormwater Best Management Practices (BMP) Recognition Program to recognize developers, engineers, architects, and others that are designing and implementing innovative and environmentally-friendly stormwater Best Management Practices (BMPs) in southeastern Pennsylvania. Projects, such as rain gardens, green roofs, infiltration swales, and treatment wetlands - stormwater management systems based on nature's best designs are recognized to provide inspiration for future similar projects in the region. The number of submissions has grown steadily every year. Approximately eighty submissions have been received to date. The awaredees are listed in **APPENDIX L - TABLE L-4 –STORMWATER BMP RECOGNITION PROGRAM AWARDS**.

A certificate is distributed to each awardee to recognize their good work. Each certificate recipient is also provided with an opportunity to present their awarded project at an event, such as the Urban Watersheds Revitalization Conference. The recognized projects are also promoted in the PWD Water Wheel (newsletter), distributed to over a half million residents and businesses in Philadelphia and on the website (http://www.stormwaterbmp.org).

Urban Watersheds Revitalization Conference

"The conference was one of the best I've been to in 25 years. Such a wide cross-section of people but all of us focused on the same city-improving agenda. Thanks for your efforts in making it happen."

- Comment from 2008 "Greening Our Streets" Conference participant

Since 2005, the PWD, along with its partners, has hosted an annual conference, titled the Urban Watersheds Revitalization Conference. The event gives PWD an opportunity to explore current watershed-related themes that are relevant to the City of Philadelphia and the suburban communities that drain to the City. The conference is held at different locations every year and it targets the urban and suburban (or mostly developed) communities in southeastern Pennsylvania. The audience is diverse – comprised of local planners, engineers, municipal representatives, community activists, among others. The event is offered at a nominal fee or it is free of charge.

Details on the conferences held in the past two years are listed in **TABLE F.7.B-2**.

Table F.7.b-2 2007 & 2008 Urban Watersheds Revitalization Conference

Urban Watersheds Revitalization Conference		
Conference Theme:	Greening Our Streets	Stormwater Management Regulations & Requirements
Date:	October 31, 2008	May 3, 2007
Time:	8:30am - 3:30pm	8:30am - 3:30pm
Location:	The Great Hall, Community College of Philadelphia, Spring Garden Street, Philadelphia	Kanbar Center, Philadelphia University, School House Lane, Philadelphia
# of participants:	175	131
Result:	Many participants remarked on it being a very successful conference.	Feedback from the participants was positive.
Promotional Material:	View Supplemental Volume 1	View Supplemental Volume 1

Educational Publications

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. 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 book whenever it is being used by students who live within that watershed. The booklet has been reprinted several times including 20,000 in 2008. In addition to the Schuylkill Watershed Map, a map was created of the City of Philadelphia showing all of its sub watersheds and the schools located in those watersheds. This has also been a highly demanded piece by teachers.

Homeowner's Guide to Stormwater Management

In 2004, PWD staff developed Philadelphia's first *Homeowner's Guide to Stormwater Management*. The document targets homeowners and residents that want to take an active role in helping to transform their properties and communities into healthier components of the watershed through environmentally-friendly stormwater management. The guide lays out specific steps and actions homeowners or community residents can take to improve stormwater management on their properties and in their communities.

In 2007, PWD developed a PowerPoint presentation, titled "A Homeowners' Guide to Stormwater Management" to accompany the guide. This presentation was given on September 27, 2007 at the North Wales Borough Hall (Wissahickon Watershed).

Information from this homeowner's guide was later used to create a Campus Guide to Stormwater Management. Both of these guides provide comprehensive information for property owners to reduce the amount of stormwater runoff pollution entering local waterways from their properties.

We have estimated that approximately 10,000 guides have been distributed to date.

Smart Boating, Clean Waters Program

PWD initiated an outreach, education, and notification program for marinas, personal watercraft users and boaters, titled the Smart Boating, Clean Waters Program. This program is led by the Coastal Nonpoint Pollution Program (CNPP) Specialists in the region and it is funded by the Coastal Nonpoint Pollution Program (CNPP) grant awarded by PA DEP. Most of the marinas, yacht clubs, boat launch ramps and fishing locations targeted for the program in Philadelphia are located near CSO outfalls on the Delaware River.

Various educational projects have resulted from the Smart Boating, Clean Waters Program. Projects, such as a water-proof brochure, titled "A Boater's Guide to Clean Waters," and user surveys and interviews with marina and yacht club operators to advise them on how to best adopt more environmentally friendly operation and maintenance practices, a monofilament line recycling program and most recently a marina shrink wrap recycling program.

Bilge Socks
In 2005, PWD staff worked with CNPP Specialists in the region to develop a bilge sock program, developing a logo to place on the bilge sock, creating an instructional tag to attach to the sock and distributing the socks to marinas and boaters in the region. In 2006, the bilge socks were distributed to all marinas and yacht clubs in Philadelphia. In 2007, PWD partnered with the U.S. Coast Guard in order for the Coast Guard to distribute the socks. The bilge socks were also distributed at Frankford Arsenal during Safe Boating Day in June, 2007. In 2008, PWD partnered with the Penn's Landing Corporation to also help distribute socks. The 2008 Safe Boating Day took place at Penn's Landing in June, 2008, where more bilge socks were distributed.

Monofilament Line Recovery & Recycling Program
In 2007, PWD worked with CNPP Specialists in the region to develop a Monofilament Line Recovery and Recycling Program for the southeast region of Pennsylvania. In 2008, Fairmount Park received recycling bins. They will be distributed throughout the park in five popular fishing locations in the summer of 2008.

Aquatic Invasive Species Watch Card and Posters
Aquatic Invasive Species (AIS) pose a major threat to maintaining biodiversity, particularly in Philadelphia's wetlands, streams, rivers and lakes. Pennsylvania's aquatic taxa are some of the most imperiled, with many native freshwater mussels, crayfish, and fish listed as Pennsylvania's Species of Greatest Need of Conservation. In recognition of the risk AIS pose to biodiversity, the Pennsylvania Fish and Boat Commission (PFBC) identified management of AIS as a priority topic.

The Philadelphia Water Department Aquatic Invasive Species (AIS) program has four major tasks: 1) prevent the spread of AIS by city employees through adopted HAACP protocols, 2) train city employees to identify AIS and report observations to department heads, 3) Public education and outreach regarding AIS, and 4) establish a chain of communication for the public to report observations of AIS to the appropriate agencies.

Part of the public outreach portion of this program includes an exhibit on the topic of AIS at the Fairmount Waterworks Interpretative Center, which is free to the public. The posters and complimentary educational literature was created in 2007, however the exhibit will be displayed in the summer of 2008. The complimentary literature - watch cards - will be distributed to boaters and other frequent water-way users, as well as to those visiting the Water Works Interpretive Center. The watch cards are wallet-size and water-proof. The invasive species watch cards and posters that were originally designed by Sea Grant have been updated by PWD with new text and additional logos.

Delaware Estuary Watershed Workshop for Teachers
The 13th Annual Teacher Workshop was held July 20-24 this summer in conjunction with the Partnership for the Delaware Estuary, Bucks County Conservation District and Pennsylvania's DCNR. Seventeen teachers participated in the week-long workshop. Workshop activities included canoeing the Neshaminy, visiting water quality BMP projects, performing chemical, physical and biological analysis on a stream, learning

about wetlands, staying overnight at the College of Marine Studies, planting native plants, and much more. The Philadelphia Water Department hosted the teachers for a day by providing a tour of the Fairmount Water Works Interpretive Center, and Southwest Water Pollution Control Plant. This segment of the teacher workshop provided the participants with crucial information on the local waterways as a source of their drinking water and the process undergone to return the water in an acceptable condition.

Philadelphia Flower Show – PWD Exhibit

In January 2009 PWD sponsored an exhibit at the Philadelphia Flower Show, where the theme was "Bella Italia" paying tribute to beautiful Italy. Our exhibit has been titled "Tivoli, South Philadelphia Style" after Villa D'Esta, Tivoli one of Italy's most famous garden with water features. The exhibit, visited by over 200,000 was the backyard of a south Philadelphia row home with many water quality BMPs for homeowners and gardeners, including rain barrels, porous pavement, and a green wall. Along with educational signage placed within the exhibit, a brochure with additional information was also available at the show.

Annual Water Quality Report

Every year PWD publishes an annual drinking water quality report. This report is mailed to every resident in the city and contains a wealth of information regarding the source, safety, and contents of the City's drinking water. This report is also available year-round on the City's website: www.phila.gov.

Green Stormwater Infrastructure Tours

The PWD regularly offers tours to highlight local examples of green stormwater infrastructure. **TABLE F.7.B-3** lists the tours held in 2008 and 2009.

Table F.7.b-3 Green Stormwater Infrastructure Tours

Date	Event	Number of Attendees	Description
April 6, 2008	Historic Mill Creek Watershed Tour	35	As part of a larger tour organized for a University of Pennsylvania landscape architecture class that focused on the Mill Creek Watershed, students toured the Mill Creek Farm, Mill Creek Playground, Sulzberger Outdoor Classroom, Blackwell Homes, and Penn-Alexander School.
May 3, 2008	Clean Water, Green City Tour	20	Presented with White Dog Café, a tour to highlight projects that link environmental vision with economic health, and quality of life with the sustainability of our City. Sites included Waterworks Interpretive Center, Awbury Arboretum, Saylor Grove, and Penn-Alexander School.
Sept. 10, 2008	Philadelphia Green Infrastructure	10	Organized for a group from New York City Parks, Conservation District, and Dept. of Environmental Protection, sites included Wissahickon Charter

	Tour		School, Waterview Recreation Center, Cliveden Park, Saylor Grove, and Allens Lane Arts Center.
Oct. 3, 2008	GreenPlan Philadelphia Tour	45	Organized as part of the American Society for Landscape Architects national conference, the tour highlighted several greening and vacant land management sites that integrated stormwater management, including Liberty Lands, N. 3rd Street Corridor, and North Central Philadelphia vacant land stormwater management sites.
May 5, 2009	Historic Mill Creek Watershed Tour	35	As part of a larger tour organized for a University of Pennsylvania landscape architecture class that focused on the Mill Creek Watershed, students toured the Mill Creek Farm, Mill Creek Playground, Blackwell Homes, Penn-Alexander School, and Clark Park.
June 10, 2009	US EPA National Stormwater Coordinators Meeting Tour	40	As part of a national US EPA meeting, the tour illustrated PWD's green infrastructure program and highlighted innovative projects and partnerships. Sites included Liberty Lands, Thin Flats, Greensgrow Farm, model neighborhoods (Northern Liberties, New Kensington, and APM), Saylor Grove, and Wise's Mill.

Watershed Tours

The City continues to conduct watershed tours in Philadelphia's nine (9) watersheds (Tacony, Frankford, Poquessing, Pennypack, Wissahickon, Cobbs, Darby, Schuylkill, and Delaware) to further enhance the public's understanding and appreciation of watershed issues. Tour guides describe the watershed concept, point out natural and manmade stormwater features and infrastructure, anthropogenic impacts on receiving water quality, benthic and ichthyfaunal assessments, and watershed protection practices.

Senior Citizen Corps (SEC)

The Water Department continues to work with the Senior Citizen Corps to address stormwater pollution problems and water quality monitoring programs for the Monoshone Creek, a tributary to the Wissahickon Creek and to the Tookany Creek. The SEC performs biomonitoring, collects water samples, and conducts physical assessments of the stream. The Water Department 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. 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.

Rain Barrel Workshops

The Philadelphia Water Department is providing rain barrels to residents of Philadelphia's watersheds free of charge in order to promote the reduction of stormwater flows to the local sewer system and creeks. This project consists of the implementation of rain barrels as a method of reduction of stormwater runoff on resident's personal property. The primary goal of this project is to implement a property-level best management practice to aid in reducing the volume of stormwater reaching the receiving stream or to increase the length of time it takes the stormwater to reach the receiving stream.

At the workshop, residents are instructed how to install and properly use and maintain their rain barrel. They also learn about the environmental benefits of operating a rain barrel and how stormwater affects the sewer system and local waterways. After successfully completing the workshop, they receive their rain barrel. This program has been a huge success and there is great demand to continue and expand this program. Work is currently underway to expand this program in order to meet the demand of City residents. To date, over 30 workshops have been held and more than 1,500 rain barrels have been given out.

Water Quality Council (formerly 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 what is now referred to as the Water Quality Council meetings. The committee consists of representatives from the following groups:

- Action AIDS
- Bucks Co. Water & Sewer Auth.
- Center in the Park - Sr. Env. Corps
- Center in the Park / EASI
- City of Philadelphia
- Community Legal Services of Philadelphia
- Delaware River Basin Commission
- Drexel Univ. - School of Public Health
- Drexel Univ. Environmental Studies Inst.
- DVRPC
- Friends of High School Park
- Friends of Historic Rittenhouse Town
- Friends of Poquessing Creek Watershed
- Friends of Tacony Creek Park
- MANNA
- New Kensington CDC
- Overbrook Environmental Education Center
- PA DEP
- PA DEP Water Supply Mgmt.

- PA Immigration and Citizenship Coalition
- Partnership for the Delaware Estuary
- Penn PIRG
- Pennsylvania Horticultural Society
- Pennypack Ecological Restoration Trust
- Pennypack Environmental Center
- Philadelphia Corp for Aging
- Philadelphia Dept. of Public Health
- School District of Philadelphia
- Schuylkill Navy
- Schuylkill River Development Corp.
- Southampton Watershed Assoc.
- Stroud Water Research Center
- Tookany/Tacony-Frankford Watershed
- U.S. EPA, Reg. 3 - Water Protection Div.
- Water Res. Assn. of DRB
- Wissahickon Charter School

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.

Schuylkill Watershed Initiative "Stories"

Schuylkill Action Network and Schuylkill Watershed Initiative Grant (SWIG) Stories Project were completed in June 2008. This project consists of a 2-pocket folder that tells both the Schuylkill Action Network (SAN) and SWIG stories on the interior flaps. The folder can be used alone or in combination with the 20 story sheets about local Schuylkill Watershed Initiative projects. Most of these projects address water quality issues by directly reducing abandoned mine drainage, agricultural runoff and stormwater management challenges. Others focus on public education and outreach, helping to make the land-water connection for thousands of watershed residents.

SAN Website

The Schuylkill Action Network (SAN) website has been redesigned. The new website, www.schuylkillwaters.org, includes an internal component that allows for improved communication among SAN workgroup members and to facilitate on-the-ground work. It also includes a public component that conveys SAN's message about protecting and improving the Schuylkill River to outside audiences. The website also allows the public to share their own unique stories and experiences relating to the Schuylkill River. "

Stormwater Management for Small Businesses

In the spring of 2008, PWD created a PowerPoint presentation, titled "Stormwater Management for Small Businesses." The presentation provides guidance to small business owners on actions they can take on their property to better manage stormwater. PWD staff presented this presentation to Rotary Club members, who comprise of business leaders. These meetings took place in two sections of the Tookany/Tacony Frankford Watershed, where main streets and small businesses are prevalent and where the presentation is applicable.

Public Education Unit

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 2008/2009 - A great variety of public information materials concerning stormwater/watershed management were developed as a result of the watershed partnerships, including: fact sheets, press releases, tabletop exhibits, brochures, watershed surveys, websites, watershed walks, and presentation materials.

F.7.b.i. Public Education Literature

Bill Stuffers & Waterwheels

The bill stuffers and Waterwheels are newsletters inserted into the water bill of the estimated one-half million customers of the Philadelphia Water Department. The below documents have been developed under the CSO LTCPU Public Participation Program and have been distributed throughout the City at advisory committee meetings, public meetings, and other public events, in addition to in the water bill. The asterisk denotes the Backgrounder developed during this reporting period (July 1st 2008 - June 30th 2009).

Table F.7.b.i-1 Bill Stuffers & Waterwheels

Newsletter Title	Newsletter Description
Bill Stuffer I: The Combined Sewer Overflow Program: A Long Term Control Plan for Our Rivers in addition to Clean Water, Green City: Long Term Control Plan Update.	This publication covers an introduction to the CSO LTCPU and the goals of the Philadelphia Water Department in controlling CSOs.
Waterwheel I: CSO Public Notification Means You're in the Know	This publication aims to notify the public of the CSO public notification system and covers the commonly asked questions about CSO-affected waters.
Waterwheel II (in Water Quality Report): Green Cities, Clean Waters Program	This publication covers the history of CSOs and includes a CSO Notification Card cut-out.
Waterwheel III: Clean Waters, Green Cities – Neighborhood-Friendly Solutions*	This publication covers the Philadelphia Water Department's Green Streets Program.

Waterwheel IV: Green Cities, Clean Waters – Tookany/Tacony-Frankford Creek*	This publication covers the Integrated Watershed Management Plan for the Tookany/Tacony-Frankford Watershed.

F.7.c. Pesticides, Herbicides, and Fertilizer Controls

F.7.c.i. Integrated Pest Management protocol

The City currently does not practice the Integrated Pest Management (IPM) protocol with respect to the application of pesticides to agriculture, due to the fact that the City does not use pesticides or conduct any practices that require the use of the IPM protocol. The City is currently focusing on invasive plant management through the use of herbicide to remove invasive plants.

The Vector Control unit of the Philadelphia Health Department uses larvicides, Bacillus Sphaericus (brand name Vectolex) and Methoprene (brand name Altosid), to prevent mosquito breeding. The larvicides are approved for use in the stormwater catch basins and are applied as such. The Integrated Pest Management protocol is followed when using the larvicides by inspecting the catch basins before treatments, using the least toxic or non-toxic product, and submitting a request for repairs when necessary. The Integrated Pest Management protocol is adhered to with the use of these larvicides as no oils or organo-phosphate products are used.

All of the Vector Control field staff are certified pest control applicators in accordance with Pa Department of Agriculture. In order to maintain this certification, on-going training is required. The Philadelphia Health Department holds several on-site trainings per year for staff.

F.7.c.ii. Education materials to private pesticide users

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 five annual workshops in different parts of the Schuylkill River watershed. The 5th annual workshop was held at Bala Golf Course in Philadelphia in the April 2008. Twenty golf courses from around the region sent representatives to participate in workshop. A sixth workshop is currently in the planning phase.

F.7.d. 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 is included in **APPENDIX R**.

F.7.e. Municipal/hazardous Waste, Storage, Treatment, and Processing Facilities

The City plans to 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.

F.8. 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 F.8**, 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.

F.8.a. Storm Sewer Discharge Ordinance

In May of 2005 the City signed a resolution for the Darby and Cobbs Creeks Watershed Stormwater Management Plan as part of the Stormwater Management Act 167 planning effort. Under the Watershed Plan a detailed stormwater ordinance was developed that exceeded requirements set forth by the State Model Stormwater Ordinance under the National Pollution Discharge Elimination System (NPDES) Phase II requirements. Philadelphia recognized the importance of implementing city-wide policy that uniformly addresses stormwater management and adopted Stormwater Regulations on September 5th 2005 that was effective on January 1st, 2006. The authority to adopt stormwater regulations is found within Title 14 Zoning and Planning Code under §14-1603.1 Stormwater Management Controls as referred to in the Storm Water Management Control Plans (6.)(c.)(1.) section.

F.8.a.i. Submit storm sewer discharge ordinance

The Storm Sewer Discharge Ordinance was submitted during the first year of the permit and there are several methods in place to ensure compliance with Philadelphia's storm sewer discharge policies. To begin with integration into the already existing development process for Philadelphia was a critical component for complying with stormwater policy. Key staff members have been consistently serving on the Water Departments development review committee to represent stormwater requirements from a technical perspective. Follow up associated with the committee meeting includes communication with engineers, review of submitted plans and ultimate approval or disapproval of stormwater management plans. Outside of the Water Department, discussions with Licenses and Inspections (L & I) along with City Planning have allowed the addition of water department approvals, which include stormwater issues, being required before critical steps of the development process.

Inspections and enforcement actions provide an additional component to ensuring compliance. The Industrial Waste Unit continues to be the lead organization for inspecting and enforcing pollution discharges to the separate storm sewer system. As we move into the New Year extensive efforts to coordinate with industrial waste staff will assist in addressing a portion of our compliance needs. Also, an Erosion and Sedimentation Inspector is in place at the Water Department who is actively reviewing plans, visiting sites and preparing inspection reports. For sites that remain out of compliance after several notifications and enforcement actions through L & I the City will turn to the State for more stringent penalties and enforcement actions. The coordinated plan review efforts between the Water Department and Southeast Regional Office of the Pennsylvania Department of Environmental Protection in terms of erosion and sedimentation control plans and post-construction stormwater management plans is another avenue where compliance is being strengthened.

In support of the policy change the Water Department has added documentation and notifications to a website (www.PhillyRiverInfo.org) in order to provide the development community a means of accessing the most recent stormwater management information. Part of this website includes notifications of upcoming workshops and stormwater update sessions which aim to update the development community on stormwater standards for plan submittals. The workshop venue has provided opportunity to inform the engineers, architects, developers, owners and so forth, about additional technical criteria that will be required as well as present approaches to meeting the technical requirements

F.8.b. Commercial and Residential Source Controls

F.8.b.i. Mingo Creek Surge Basin

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.

PWD's generation of a comprehensive model of the contributing MS4 to the Mingo Creek Surge Basin has been temporarily interrupted due to the loss of critical personnel. Generation of this model is planned to resume upon replenishment of staffing, since further understanding of this system's flow regime, potential restrictive characteristics, and conveyance infrastructure longevity, are critical components in identifying possible maintenance and system enhancement locations.

PWD is currently working with the Philadelphia International Airport (PHL), as part of the Green Airport Committee, to enhance the water quality of the stormwater discharges generated from the 28% of the Mingo Creek Surge Basin drainage area owned by PHL. As part of this committee, PWD is involved in early stage planning of stormwater quality management and stormwater conveyance system capacity enhancements associated within the airport restructuring projects.

During August of 2009, the Basin was dewatered to inspect the sediment levels. The basin sediment appears to have not changed since previous inspections; therefore no further accumulation has been occurring. Pictures of silt accumulation from this inspection can be observed in **APPENDIX Q.**

F.8.b.ii. Existing privately owned structural controls

Stormwater Basins Inspection Program

PWD embarked on an inspection program to visually assess privately owned stormwater management basins installed through 2005. These basins were originally inventoried and inspected in 1998/1999. The Inspection Team completed the physical inspection of the basins between March – June 2009. In all, approximately 172 above-ground privately owned stormwater management basins were inspected. The 15 sub-surface basins were not inspected as part of this inspection process. Since the inspections have been completed, PWD has been in the process of reviewing the data and checking it for errors. We are also working with our Law Department to create a sound procedure in dealing with deficient stormwater management basins. Once the post-inspection procedure is finalized, we intend on communicating with the property owners and informing them of the status of their stormwater management basins.

The next step in this inspection process will be to follow up with the property owners on their inspection reports. The objective will be to have any deficiencies corrected or fixed.

Finally, we will begin to look at BMPs installed between 2005 and 2008, under the new Stormwater regulations.

Wissahickon Creek Detention Basin Inventory and Retrofit Program

PWD developed a replicable approach for generating an inventory of existing stormwater management facilities within a watershed and then prioritizing the facilities for retrofit with structural and nonstructural stormwater best management practices aimed at enhancing groundwater recharge and water quality treatment of stormwater runoff and implemented it in 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, specifically excluding basins draining to the mainstem. The study focused on first and second order stream locations where implementation benefits could be maximized. (Funding for this study was provided by a US EPA 104b3 grant administered by PA DEP.)

The initiative involved development of a process in which a desktop analysis of Geographic Information Systems (GIS) data layers was utilized to identify a preliminary set of basins and a field assessment protocol was developed to visit each basin to collect information relevant to retrofit priority. Data collected about each basin was fed into an evaluative matrix program where fifteen weighted criteria were applied to each basin to prioritize the 153 basins in the inventory for retrofit. A ranked output was produced at both the watershed-wide as well as the individual municipal level; basins were ranked with high, medium and lower priority for retrofit. Information about three types of basin retrofits and benefits associated with each type for a given basin size. It will be up to the implementers of each basin retrofit to evaluate the appropriate measures for implementation in a basin given the existing conditions of the basin.

For more information on this initiative, a copy of the final report and all appendices as well as downloadable GIS data, please visit: www.watershedscience.info/basininventory

Wissahickon Detention Basin Retrofit and Technical Assistance Program

PWD funded a Technical Assistance Program to follow up on the recently completed Inventory of Existing Stormwater Management Facilities with Retrofit Potential within the Wissahickon Creek designed to assist watershed stakeholders (specifically municipalities) in making use of the information in moving toward implementation of basin retrofits. The Basin Inventory initiative concluded by stating that all basins considered for retrofit would require a detailed, site-specific feasibility study and engineering design in order to proceed and that existing conditions such as flooding, groundwater contamination, karst geology, proximity to drinking water intakes, groundwater wells, and many other factors must be considered in order to deem the basin appropriate for retrofit implementation. This program was intended to provide stakeholders with the tools necessary to perform such site specific feasibility studies.

Technical assistance is provided to partners in the form of site visits, conceptual and final project designs, workshops, and a brochure. Three or four municipally-owned facilities will be guided through the site assessment and design process to prepare for retrofit implementation. This Technical Assistance Program was initiated in the spring of 2008 and came to a close on June 30th, 2008. At the close of this initiative, the Pennsylvania Environmental Council secured additional funds to continue this program in the coming year and actually construct 2-3 retrofits within the Wissahickon Creek Watershed.

F.8.b.iii. Structural controls impact

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. More detailed information about the Mingo Creek Surge Basin can be found in **SECTION F.8.B.I MINGO CREEK SURGE BASIN**.

F.8.c. Development plans review

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 F.5** for additional information.

F.8.d. Operate and maintain public roadways

F.8.d.i. Deicing Practices and Salt Storage

The Streets Department has an established snow category system that defines the response to winter storms based on severity and accumulations. There are 5 snow categories, ranging from an event of sleet and freezing rain to an event of 12 inches of snow or more. Depending on the event, the response can include brine application, salting of roadways (with a mix of salt and anti-skid material), plowing, and snow-lifting operations that include storage of snow on city property or melting of snow at storm water inlet locations pre-arranged with the Water Department. Details of the snow response can be found in the Streets Department document entitled "Snow and Ice Operations Plan." A copy of this plan can be found in the **APPENDIX R**.

F.8.d.ii. Street and Inlet Cleaning Practices

Require weekly cleaning of commercial, conduct annual cleaning of residential streets and inlets

During FY 2009, 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 2009, a total 72,770 miles were cleaned.

Public awareness of litter

The City promotes, develops, and implements litter reduction programs, in an effort to increase public awareness of litter as a source of stormwater pollution. There are 500 solar-powered, compaction litter receptacles in Center City, and over 700 standard litter baskets in other commercial districts throughout the city. The Philadelphia More Beautiful Committee organizes neighborhood cleaning events citywide. In the 2009 Clean Block season, over 7,000 blocks were cleaned by nearly 50,000 volunteers. Over 700 tons of trash were collected and removed.

F.8.d.iii. Maintain all city-owned storm sewer 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 nearly 79,160 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.

About 80% of inlet cleaning work orders are scheduled jobs, while the remaining 20% are in response to customer calls or requests from other departments. Scheduled cleaning routes for an area are created by the crew chief and assigned to the crews.

For the period of July 2008– June 2009, 76,366 inlets were cleaned and examined. 14,106 inlets were inspected only. In total 90,472 inlets were examined or cleaned and examined. This is an average of every inlet being examined or cleaned and examined 1.14 times during this period.

F.8.e. Animal Waste and Code Enforcement

F.8.e.i. Educational material regarding control of animal waste

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/.

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 cleanup 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 were produced and purchased for distribution at the FWWIC and various public events in 2007. 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 effects 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. Due to the high demand in 2007 we ordered an additional 5000 "Bags on Board" and accompanying tip cards in June of 2009. In 2008, approximately 37,177 individuals visited the FWWIC.

PWD has developed the *Homeowner's Guide to Stormwater Management*. This Guide has a section on dealing with Pet Waste. It talks about how pet waste negatively affects our waterways and what pet owners can do to clean up the waste and dispose of it. We have estimated that approximately 10,000 guides have been distributed to date.

F.8.f. Flood Management and Flood Control Devices

Although the summers of 2007 and 2008 were not characterized by intense rain storms that resulted in basement backups or property damage, the summer of 2009 saw a return to the intense rain storm patterns the City and region experienced between 2004 and 2006. Rain storms on the following dates resulted in a number of calls regarding basement backups in sections of South Philadelphia (CSO neighborhoods) and stormwater flooding of basements due to street flooding or overflow of backyard streams in separate sewered areas:

July 31, 2009
August 2, 2009
August 9, 2009
August 21, 2009
August 22, 2009

PWD is continuing to move forward with its Storm Flood Relief (SFR) Sewer Designs for combined sewer neighborhoods in Northern Liberties, Washington Square West and neighborhoods in South Philadelphia. The original SFR project that was slated for Pine

Street has been relocated to Washington Avenue. The Washington Ave. SFR will provide additional storm flow capacity to the Lombard system, which serves Washington Square West, and the Reed Street system, which serves portions of South Philadelphia. Community meetings concerning the design and construction of this system have taken place since April 2009 with a number of diverse civic associations whose neighborhoods will be impacted by this construction.

PWD is also in the midst of investigating storm sewer modifications and source control opportunities for the separate sewer neighborhoods that were impacted by this summer's intense rainstorms. Sections of the City including Chestnut Hill, East Falls, Andorra, Roxborough and E. Germantown experienced street and property flooding.

As an interim practice to protect properties in CSO neighborhoods against basement backups while awaiting the construction of the SFR projects, PWD created the Basement Protection Program (info at www.phila.gov/water) which provides interested customers a plumbing inspection and the installation of backwater valves on sewer laterals or plumbing fixtures. Since the program's inception in 2007, 162 properties have participated in the department's program (39 properties in 2009 to date).

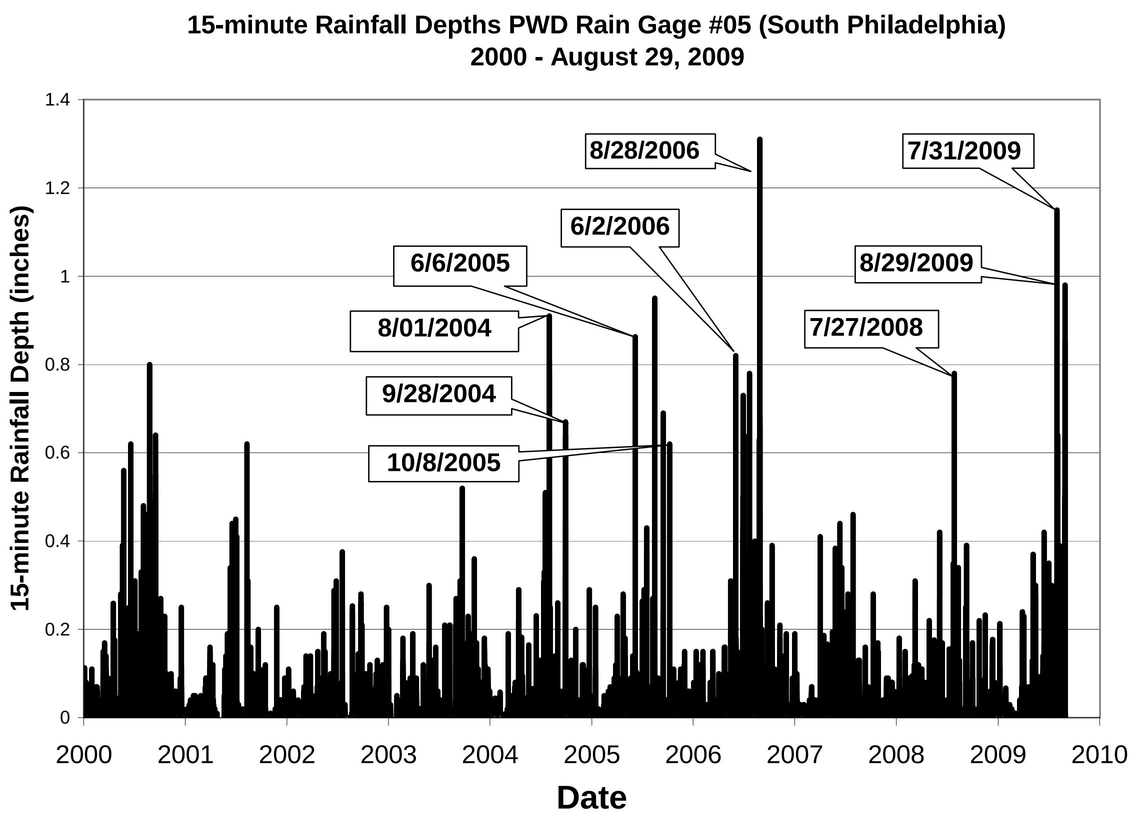


Figure F.8.f-1 Hourly Rainfall Data 2000-August 30, 2009

After evaluating over 1,500 rain events over the last 10 years, the following observations were made:

- The August 28, 2006 storm had the highest 1-hour rain intensity of any storm in the last 10 years, with over 3" of rain falling in a 1 hour period.

- Three of the top 4 storms based on one-hour rain intensity occurred in the last 3 years.

This is dramatic evidence that the frequency of intense rain events has increased substantially over the last 10 years as compared to the preceding decade, and the intensities are among some of the highest in the last 18 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 August 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.

F.8.f.i. Structures built within the floodplain

All buildings within or close to the 100 Year Flood Plain area which requires a Zoning Permit or a Building Permit or both should be reviewed to determine if Floodplain Regulations applies. The City's Licensees and Inspection department will send all applicants with properties located in or close to the 100 Year Flood Plain to the Philadelphia City Planning Commission (PCPC) for review. If the property is determined to be within the Floodway or Floodway Fringe, structures built on the allowable property will be built at least one-foot above the Base Flood Elevation (BFE) or floodproofed such that plan complies to 14-1606 and any special Building code requirements.

F.8.f.ii. Evaluate new and existing structural drainage controls

<u>Update of Comprehensive Flooding & Sewer Overflow Mitigation Program</u>

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 (9/1/2005) 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.

6. Initiate a Basement Back-up Protection Program

Sewer System Inspection and Maintenance

PWD routinely send maintenance crews to inspect sewers in blocks that have experienced and reported flooding, in order to look for blockages, obstructions, or other defects that may have contributed to flooding.

To date, PWD has inspected multiple sewers and identified no obstructions or accumulation of debris that would result in basement flooding. The small amounts of debris that were observed in a few isolated blocks have been cleaned. As part of this investigation, PWD identified two blocks that have structurally failing sewers. These locations have been added to the PWD sewer reconstruction capital program and given a high priority.

Property Data Collection

Input from neighborhoods and individual customers are essential in defining the extent and cause of the problem. In order to better understand the extent and severity of backups, PWD has modified its customer complaint system to allow for basement backup data to be collected in a more useful way. As it is impossible for PWD to observe conditions in every home, it is critically important that residents work with their civic leaders to accurately record, and communicate information about the date, time, depth, and duration of basement backups. It is also important to characterize the type and elevation (height from basement floor) of each basement plumbing fixture from which the backup has been observed. This information is needed to hydraulically model the storm event, evaluate the sewer system response to the rainfall, and identify measure to resolve backups.

PWD met with several community groups to discuss the flooding issue and has attempted to obtain more information from affected property owners. To facilitate information gathering, PWD generated a flooding questionnaire to help standardize data collection. The information gathered has been vital in helping PWD understand the limits of the affected areas as well as calibrating and verifying the hydraulic modeling of the sewer system. The questionnaire has been distributed at all community meetings on the subject as well as given to community group leaders for distribution to individuals who may have been unable to attend the public meetings.

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 many 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 St. sewershed east of Broad St. (South Philadelphia)
- Lombard St. sewershed east of Broad St. (Washington Square West)
- Laurel St. sewershed (Northern Liberties/Old Kensington)
- Tasker and Reed St. sewersheds (South Philadelphia)
- Shunk St., Porter St., Wolf St. sewersheds east of Broad St. (South Philadelphia)
- Passyunk Ave. and Shunk St. sewersheds west of Broad St. (South Philadelphia)

Many individual projects have subsequently been identified that are required to increase the capacity of these trunk sewer systems in order to handle intense rain events. A detailed list of sewer construction projects in each of the above sewersheds is presented in Table F.8.f.ii-1. The information in Table F.8.f.ii-1 represents approximately $200 million in sewer construction costs. These projects are being incorporated into the PWD Capital Program. As PWD designs and ultimately constructs the sewer improvement projects, modifications to the size and location of new sewers may arise from the design process. PWD engineering staff continues to re-evaluate these projects to determine if there are better, less disruptive, or more efficient ways of achieving the required results. This list will be periodically modified to reflect any changes.

The projects are large and complicated and will take several years to design and construct. Based upon conservative assumptions, the hydraulic model indicates that the sewer systems improvements will eliminate or greatly reduce the potential for flooding based upon historical storm events. 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. PWD is sensitive to the fact that the improvement projects are disruptive to the community, and will do everything it can to minimize residential discomfort.

Table F.8.f.ii-1 Flood Relief Program Sewer Improvement Projects

Laurel St Sewershed (Northern Liberties)			
Street	From	To	Size
Laurel St.	Del. River	Columbus Blvd.	(3) 11' X 11' Box
Laurel St.	Chamber	Chamber	
Laurel St.	Columbus Blvd.	Columbus Blvd.	(1) 11' X 11' Box
Laurel St.	Columbus Blvd.	Germantown Ave.	(1) 10' X 15' Box
Germantown Ave.	Laurel St.	Wildey St.	(1) 10' X 15' Box
Germantown Ave.	Wildey St.	2nd St.	(1) 10' X 8' Box
Germantown Ave.	2nd St.	Girard	(1) 10' X 8' Box
Germantown Ave.	Thompson St.	Master St.	(1) 9' X 10' Box
Master St.	Germantown Ave.	Randolph St.	(1) 9' X 10' Box
Lombard St. Sewershed East of Broad St. (Washington Square West)			
Street	**From**	**To**	**Size**
Pine St.	Front St.	2nd St.	8' X 7' Box
Pine St.	2nd St.	6th St.	78" RCP
Pine St.	6th ST.	12th St.	72" RCP
Pine St.	12th St.	13th St.	60" RCP
Pine St.	13th St.	Juniper St.	54" RCP
Pine St.	Juniper St	Broad St.	48" RCP
3rd St	Delancy ST.	Cypress St.	24" RCP
Moore St. Sewershed			
Street	**From**	**To**	**Size**
Moore St.	Chamber	Chamber	
Moore St.	Del. River	1000' Upstream	8' X 7' Box
Tasker St. & Reed St. Sewersheds (Reed St. Option)			
Street	**From**	**To**	**Size**
Reed St Outfall	River	New Chamber	(1) 7' X 14' Box
Reed St.	Chamber	Chamber	Chamber
Reed St	Chamber	Water St.	(1) 7' X 14' Box
Water St.	Reed St	Dickinson St.	(1) 7' X 14' Box
Dickinson St.	Water St.	8th St.	(1) 7' X 14' Box
Dickinson St.	8th ST.	13th St.	(1) 7' X 14' Box
Dickinson St.	13th St.	Broad St.	(1) 5' X 7' Box
9th St	Reed St	40' N. of Reed St.	48" RCP
13th St	Dickinson St.	Reed St.	4' X 8' Box
13th St	Reed St.	Wharton	4' X 6' Box
13th St	Wharton St.	Federal St.	60 " RCP
Wharton St.	13th St.	15th St.	60 " RCP
15th St.	Wharton St.	Federal St.	48 " RCP
Front St.	112' N. of Reed St	Federal St.	42 " RCP
Tasker St Gunite	Chamber	Water St.	6" Gunite
Clarion St.	Wharton St.	Federal St.	48" RCP

12th St.	Tasker St.	Morris St.	36" RCP
4th St.	Federal St	130' N. of Fed. St.	18" RCP
Federal St.	9th St.	10th St.	36" RCP
13th St	Morris St.	Moore St.	36" RCP
13th St	Dickinson St.	Morris St.	4' X 6' Box
Morris St	13th St.	Broad St.	42" RCP
Tasker St.	Broad St.	15th St.	36" RCP
Snyder/McKean/ Sewersheds			
Street	**From**	**To**	**Size**
Weccacoe St.	Snyder Ave.	Wolf St.	6'-0" X 8'-0" Box
Snyder Ave.	Front St.	4th St.	5'-0" X 11'-0" Box
Snyder Ave.	4th St.	6th St.	5'-0" X 11'-0" Box
Snyder Ave.	8th St.	10th St,	5'-0" X 10'-0" Box
3rd St. (Reverse flow)	Snyder Ave.	Jackson St.	36" RCP
3rd St. (Reverse flow)	Wolf St.	Jackson St.	36" RCP
4th St.(Reverse Flow)	Wolf St.	Snyder Ave.	36" RCP
Front St	McKean St.	Mifflin St.	36" RCP
			Chamber
Wolf St. Sewershed			
Street	**From**	**To**	**Size**
Oregon Ave	River	Weccacoe St.	6'-6" X 15'-0" Box
Weccacoe St.	Oregon Ave.	Wolf St.	6'-6" X 15'-0" Box
Wolf St.	Weccacoe St.	Vandalia St.	6'-6" X 13'-6" Box
Wolf St.	8th St.	12th St.	6'-0" X 8'-0" Box
Wolf St.	13th St.	Broad St	36" RCP
			Chamber
Oregon Ave./Shunk St./Porter St. Sewershed East of Broad St.			
Street	**From**	**To**	**Size**
Oregon Ave.	River	Front St	6' X 20' Box
Oregon Ave.	Front St.	8th St.	6' X 20' Box
8th St	Oregon Ave.	Shunk St.	6' X 20' Box
8th St	Shunk St.	Porter St.	6' X 16' Box
8th St	Porter St.	Wolf St.	6' X 14' Box
8th St	Wolf St.	Snyder Ave.	6' X 6' Box
8th St	Snyder Ave.	McKean St.	5' X 10' Box
Porter St	10th St.	Moyamensing Ave	5' X 6' Box
Porter St	Moyamensing	13th St.	42" RCP
Porter St	13th ST.	Broad St.	36" RCP
Moyamensing Ave.	Porter St.	Shunk St.	4' X 5' Box
Shunk St.	Moyamensing Ave.	Broad St.	48" RCP
Broad St.	Oregon Ave.	Oregon Ave.	36" RCP
3rd St.	30' S. of Shunk ST.	290 ' S. of Shunk St.	36" RCP
Oregon Ave.	5th St.	100' E. of 5th St.	36" RCP

5th St.	Shunk St.	Oregon Ave.	36" RCP
Passyunk Ave./Shunk St Sewersheds West of Broad St. (South of Shunk)			
Street	**From**	**To**	**Size**
Moyamensing	Junction Chamber	20th St	5'-0" X 12'-0" Box
Penrose Ave.	Pattison Ave.	20th St	5'-0" X 10'-0" Box
20th St.	Moyamensing	Oregon Ave.	5'-0" X 6'-0" Box
Oregon Ave	20th St.	18th St	5'-0" X 6'-0" Box
18th St	Oregon Ave.	Shunk St.	48" RCP
Moyamensing	20th St.	18th St	5'-0" X 7'-0" Box
Shunk St.	18th St.	15th St.	48" RCP
Pollock St.	Moyamensing	17th	66" RCP
17th St.	Pollock St.	Bigler St.	48" RCP
Bigler St.	17th St.	15th St.	48" RCP
Pollock St.	17th St.	Carlisle St.	48" RCP
15th St.	Bigler St.	Moyamensing	36" RCP
18th St	Moyamensing	Stocker St.	36" RCP
Stocker St.	18th St.	17th St.	24" RCP
Barbara St.	18th St.	Moyamensing	24" RCP
16th St.	Moyamensing	Oregon Ave.	30" RCP
*The size and/or location of the proposed sewers may change during the design process as more information becomes available or more efficient, less disruptive solutions are identified.			

Government and Regulatory Initiatives

PWD is sensitive to the impact stormwater, particularly urban runoff, has on the combined sewer system. Regulations requiring modern stormwater management practices in Philadelphia became effective January 1, 2006, and are described in detail in Section F.5. The stormwater regulations aim to prevent worsening of basement flooding, and ultimately reduce stormwater runoff even as Philadelphia re-develops.

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.

PWD has budgeted $3 million in FY 2009 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. Backwater valves require regular maintenance in order to keep them clean and functioning properly. In properties experiencing basement backups, basement fixtures can be elevated, plugged, individually retrofitted with a backwater valve, or eliminated. Homeowners can also have a licensed engineer or registered plumber evaluates the feasibility of installing a backwater valve and or ejector pump.

Flood Relief Project Summary

PWD understands the hardships caused by basement flooding, and therefore the solution to this issue is one of the highest priorities for PWD. This complex problem will require time and resources to implement targeted solution. PWD has budgeted $3 million in FY 2009 for the installation of back water valves on individual property laterals and other solutions that prevent back ups. PWD has worked diligently to analyze and identify sewer system improvements, and is now beginning to implement solutions. PWD identified approximately $200 million in sewer system projects to improve the conveyance of stormwater from intense rain events more efficiently, and ultimately reduce the potential for basement flooding. PWD's capital budget has also been increased to fund the sewer improvement projects. PWD will continue to modify the size and location of projects based upon knowledge gained through the design process in order to optimize the results of each project while minimizing disruption to the community during construction.

F.8.f.iii. Streambank Restoration and Wetland Enhancement

In FY 09, the City has continued to work on projects that reduces stream bank erosion and enhances wetlands in parks and other areas as a means of mitigating the effects of stormwater runoff.

Bells Mill

Bells Mill is a 2nd order tributary to Wissahickon Creek. The tributary arises from an outfall near the intersection of Lykens and Bells Mill roads. The restoration/stabilization design for Bells Mill Run will focus on specific restoration areas. Streambank stabilization will make use of standard rock vanes, "J" vanes, cross vanes, wing deflectors, root wads, grade control measures and live branch layers. These structures will allow for improved habitat and sediment transport dynamics while protecting critical sewer infrastructure.

Wises Mill Stream Restoration

Wises Mill Run is a steep first-order tributary to the mainstem of the Wissahickon Creek. The tributary consists of a northern branch, which is 3,500 feet in length, and a southern branch, which is 1,300 feet in length. The two branches merge just north of Wises Mill Road and continue for another 1,900 feet before meeting the Wissahickon Creek. PWD is looking to identify restoration strategies to reduce sediment loading, improve geomorphic stability, and enhance in-stream flows and habitat quality. There are seven recommended in-stream rehabilitation projects that will reduce streambank erosion at two severe sites, replace a failing concrete/ masonry structure with a series of step/pool structures, and enhance in-stream and riparian habitat quality with four channel segments. These structures will allow for improved habitat and sediment transport dynamics while protecting critical sewer infrastructure.

Wise's Mill Stormwater Wetland

Wises Mill Run is a steep first-order tributary to the mainstem of the Wissahickon Creek. The southern branch of Wises Mill Run outfall number W-076-13. PWD is designing a stormwater treatment wetland just west of the current location of W-076-013. The proposed project recommends installation of a diversion structure on Wises Mill Road, roughly 450 feet upstream of outfall W-076-13. The diversion structure will discharge stormwater into an approximately four acre site. The project will provide more than 150,000 cf of storage and will substantially reduce peak flows to an already impaired stream in Wises Mill Run. During dry weather, the facility will provide 2-3 acres of valuable wet meadow habitat.

Additional information on the Wises Mill Run project can be located **SECTION F.2.STEP 3.B.II.**

Cathedral Run Stormwater Wetland

Cathedral Run is a 1st order tributary to Wissahickon Creek. The stream originates from springs downstream of Courtesy Stables near the intersection of Cathedral and Glen Campbell Roads. PWD is designing a stormwater treatment wetland just west of the current location of outfall W-076-01. The wetland will be located in a natural depression area, approximately one acre in size. The project will provide more than 94,445 cf of storage and will substantially reduce flows to an impaired reach of Cathedral Run. During dry weather, the facility will provide one acre of valuable wet meadow habitat.

For a full description of the Cathedral Run project, please refer to **SECTION F.2.STEP 3.B.II.**

<u>Whitaker Avenue Stream Restoration</u>

The City of Philadelphia Water Department (PWD) has contracted KCI Technologies, Inc. (KCI) to develop a natural stream channel design for the restoration of a section of Tacony Creek within the City of Philadelphia. The project area includes a 2200-foot reach of Tacony Creek located south of Roosevelt Boulevard (US 1), downstream of the Whitaker Avenue Bridge and upstream of the Wyoming Avenue Bridge in northeastern

Philadelphia. The project area exists within portions of Tacony Creek Park, owned by the Fairmount Park Commission (FPC), Friends Hospital Grounds, owned by the Scattergood Foundation, and Right-Of-Way bordering a former railroad crossing, owned by PECO. Project objectives/goals include providing a natural channel design that protects existing PWD infrastructure, stabilizes eroding stream banks, addresses the impacts of urban hydrology, enhances aquatic and riparian habitat; and provides cost savings over structural solutions.

The project reach is impacted by a flashy hydrologic regime common to many urban stream systems. Abandoned railroad abutments constrict floodplain access in the upper portion of the site. Several outer meander bends are experiencing severe bank erosion and evidence of lateral channel migration. Erosive processes have exposed existing PWD infrastructure including a pair of sanitary manholes. Sedimentation and loss of aquatic habitat are evident throughout the project reach. Aesthetically, the channel is scattered with trash and debris including several abandoned automobiles.

Under the proposed restoration approach, the two existing, abandoned railroad abutments and adjacent segments of stone retaining wall will be removed to eliminate associated hydraulic impacts and reestablish a more stable channel dimension. Eroded meander bends will be realigned with a more stable radius of curvature and reestablished using stone toe protection in conjunction with bioengineered bank stabilization treatments. Rock vane structures will be installed in the channel at meander bends within the project reach to redirect flows away from outside stream banks and adjacent sanitary infrastructure to improve aquatic habitat. A portion of the existing stream, currently impacted by a cut-off channel, will be restored to a single channel to improve sediment transport. Boulder clusters will be placed in the channel to improve flow diversity and in-stream habitat. Over five acres of invasive Japanese Knotweed will be managed at the site and replaced with native riparian vegetation. Riparian plantings will consist of native tree and shrub species common to the area. In total, more than 3,000 trees and shrubs will be planted, as well as 8,000 live stakes to create a healthy vegetated riparian corridor.

Cobbs Creek Stream Restoration

In 2008, PWD contracted with the Joint Venture Team of Biohabitats and O'Brien & Gere to guide the long-term vision of aquatic ecological restoration work planned in the Cobbs Creek Watershed. Over the next 20 years, PWD intends to implement natural stream channel and wetland design work along the main stem of the Cobbs Creek within the City of Philadelphia. The anticipated benefits of this riparian corridor work will include reduced stream bank erosion, channel deposition and scour and restoring the natural functions of aquatic habitat and ecosystems to the greatest degree possible.

The Joint Venture Team has been contracted to implement the assessment and project feasibility phase of the plan. This phase shall include a review of existing data, targeted field work, and conceptual design of approximately 1 mile of stream. Upon completion of this work in 2009, PWD expects to move forward with the full design process on this reach of stream and associated riparian corridor.

Tacony Creek Stream Restoration

In 2008, PWD contracted with the Stantec to guide the long-term vision of aquatic ecological restoration work planned in the Tacony Creek Watershed. Over the next 20 years, PWD intends to implement natural stream channel and wetland design work along the main stem of the Tacony Creek within the City of Philadelphia. The anticipated benefits of this riparian corridor work will include reduced stream bank erosion, channel deposition and scour and restoring the natural functions of aquatic habitat and ecosystems to the greatest degree possible.

Stantec has been contracted to implement the assessment and project feasibility phase of the plan. This phase shall include a review of existing data, targeted field work, and conceptual design work. PWD expects have design concepts for approximately 20 projects including wetland creation, stream restoration, fish passage, and other associated water quality BMPs. Upon completion of this work in 2009, PWD expects to move forward with the full design process on those projects that are deemed to be most advantageous by the Design Team.

Saylor Grove Wetland in Wissahickon Watershed

A one-acre stormwater wetland was constructed in the fall of 2005 on a parcel of Fairmount Park known as Saylor Grove. The wetland is 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.

For a full description of the Saylor Grove Wetland project, please refer to **SECTION III.C.2.4.**

F.8.g. Sanitary Infiltration Controls

F.8.g.i. Limit sanitary infiltration

Improper disposal of liquid wastes can result in the microbiological and chemical contamination of the drinking water supply, potential for disease, vector breeding, degradation of air quality, hazards to wildlife, degradation of recreational resources, creation of public nuisances, and economic distress to the community. This program is of major concern as it impacts the health of both the City of Philadelphia and appertaining communities and requires interrelationships among federal, state and local agencies, as well as industry.

Based upon these concerns, interventions will be employed that prevent the degradation of surface and groundwater by the inadequate treatment of sewage or site runoff, provide oversight for the construction and operation of individual On-Lot Sewage Disposal Systems (OLDS), and provide an immediate response to all reports of unintentional spills, to prevent their entrance into surface or ground water. Inspection, education and consultative services as well as a review of citizen reports of degraded water quality issues will be managed.

F.8.g.ii. Inspection and remediation of on-lot septic/disposal systems

The On-lot Sewage Disposal System program allows for the supervision of the design and installation of new systems to prevent sewage from being discharged onto the ground and also entails the identification, evaluation and recommendation of remedial actions which are available to homeowners with malfunctioning systems. This program also enables permitting and monitoring of storage tanks and portable toilets.

Educational materials emphasizing water conservation and On-Lot Sewage Disposal System maintenance requirements are provided with each permit application to inform the homeowner of the importance of preventing a malfunction. A liaison is maintained with the PA DEP, Philadelphia Water Department and City Planning Commission concerning the prevalence of malfunctions within certain geographical areas in the City. An extension of the municipal sewerage system is recommended to the Philadelphia Water Department for those areas where homes are experiencing malfunctions and no practical means are available for their correction.

Activities:

- Review plans, observe tests, issue permits and observe the installation of all new On-Lot Sewage Disposal Systems to assure their conformance with PA Acts 537 and 149 and the PA DEP regulations.

- Respond to complaints or reports of malfunctioning On-Lot Sewage Disposal Systems within 24 hours of receipt of this notice.

- Evaluate malfunctioning On-Lot Sewage Disposal Systems and provide a notification to the homeowner, which includes recommendations on abatement actions.

- Where appropriate, initiate enforcement action when non-compliance persists, by issuing notices, conducting administrative hearings or conferences, or requesting court action.

- Provide the training opportunities needed to maintain PA DEP certification as a Sewage Enforcement Officer for each employee actively engaged in the On-Lot Sewage Disposal System permitting program.

- Conduct evaluation of On-Lot Systems in selected geographic areas to determine the necessity for extensions of the Philadelphia sewer system.

Achieved:

- During the 2009 fiscal year, from 7/1/08 to 6/30/09, 3 applications were received for the installation of on-lot sewage disposal systems and 2 permits were issued.

- Staff members routinely attend training mandated by the PA DEP to maintain their Sewage Enforcement Officer certification.

F.8.g.iii. Investigate, remediate, and report sanitary infiltration

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 Collector Systems maintains and manages a database called the Sewage Pollution Incident & Location Log (SPILL) which reports information about unintentional sanitary discharges which includes date reported, problem location, spill type, description, and abatement date. Presented in **TABLE F.8.G.III-1** below is the information /output found on the SPILL database of reported sewage pollution incidents in FY 2009.

Table F.8.g.iii-1 FY 2009 Sanitary Infiltration Events

Report Date	Reported By	Problem Location	Type Spill	Spill Destination	Effected Outfall	Discharge (GPM)	Abatement Date
6/16/2009	PLUMBER	7820 CEDARBROOK AVE	CHOKED SEWER	OUTFALL TO STREAM	T-097-02	5 GPM	6/16/2009
6/16/2009	CUSTOMER SERVICE	6725 RIDGE AVE	CHOKED SEWER	OUTFALL TO STREAM	W-067-01	5 GPM	6/16/2009
5/18/2009	HOMEOWNER	10381 DECATUR RD	CHOKED SEWER	BASEMENT	Q-110-03	2 GPM	5/18/2009
5/13/2009	PLUMBER	2229 SOLLY AVE	CHOKED SEWER	OUTFALL TO STREAM	P-091-06	2 GPM	5/13/2009
4/28/2009	HOMEOWNER	15201 WAYSIDE RD	CHOKED SEWER	BASEMENT	Q-121-01	4 GPM	4/28/2009
4/17/2009	FLOW CONTROL	9020 BUTTONWOOD DR	CHOKED SEWER	SOIL PONDING	NO OUTFALL EFFECTED	0.25 GPM	4/17/2009
4/4/2009	CUSTOMER SERVICE	2723 COUNTRY CLUB RD	CHOKED SEWER	OUTFALL TO STREAM	S-046-02	1 GPM	4/4/2009
4/2/2009	PLUMBER	3705 COUNTRY CLUB RD	CHOKED SEWER	OUTFALL TO STREAM	S-046-02	0.5 GPM	4/2/2009
3/24/2009	DEPUTY COMMINSIONER	1100 W CHELTENHAM AVE	CHOKED SEWER	OUTFALL TO STREAM	T-088-01	0.5 GPM	3/24/2009
3/17/2009	SERVICE WORKER	COBBS CREEK AND ASHLAND	DEFECTIVE SEWER PIPE	OVER LAND TO STREAM	NO OUTFALL EFFECTED	0.5 GPM	3/17/2009
3/16/2009	INDUSTRIAL WASTE	1209 NORWALK RD	CHOKED SEWER	OUTFALL TO STREAM	P-109-01	3 GPM	3/16/2009
3/13/2009	INDUSTRIAL WASTE	9970 SANDY RD	CHOKED SEWER	OUTFALL TO STREAM	P-105-13A	1.5 GPM	3/13/2009
3/4/2009	SEPTA'S MANAGEMENT	SCHUYLER ST.DRW THUR SEPTA'S DEPOT	CHOKED SEWER	SOIL PONDING	NO OUTFALL EFFECTED	4 GPM	3/5/2009

2/27/2009	CITIZEN	12000 SALINA RD	CHOKED SEWER	OUTFALL TO STREAM	Q-110-12	0.5 GPM	2/27/2009
2/25/2009	CITIZEN/C OMPLAINT	4300 POTTER ST	CHOKED SEWER	OUTFALL TO STREAM	T-063-06	< 1 GPM	2/25/2009
2/21/2009	CITIZEN	NEILL DRIVE FORCE MAIN	DEFECTIV E SEWER PIPE	SOIL PONDING	NO OUTFALL EFFECTED	0.2 GPM	2/21/2009
2/13/2009	DEP	WISSAHICKON & RITTENHOUSE/ SAYLOR'S GROVE	CHOKED SEWER	OUTFALL TO STREAM	W-060-10	0.1 GPM	2/13/2009
2/10/2009	DEP	7TH & CHELTENHAM	CHOKED SEWER	OUTFALL TO STREAM	T-088-01	10 GPM	2/10/2009
2/2/2009	INDUSTRIA L WASTE	10105 WILBUR ST	CHOKED SEWER	OUTFALL TO STREAM	Q-109-07	TRACES OF SEWAGE	2/2/2009
1/14/2009	FACILITIES MANAGEM ENT@ UNIVERSITY OF PENNA.	UNIVERSITY AND WOODLAND	CHOKED SEWER	OVER LAND TO STREAM	S-024-01	2 GPM	1/14/2009
12/28/2008	FLOW CONTROL	RENNARD ST PUMPING STATION	PUMP STATION SSO	OVER LAND TO STREAM	N/A	1466 GALLON S X 14.5 HOURS = 21,257 GALLON S	12/30/2008
12/9/2008	CUSTOMER SERVICE CLAIMS ADJUSTOR	4317 O ST	CHOKED SEWER	OUTFALL TO STREAM	R-18	TRACES OF SEWAGE	12/9/2008
12/5/2008	CREW CHIEF	3328 GURLEY RD	CHOKED SEWER	OUTFALL TO STREAM	Q-115-14	1 GPM	12/5/2008
11/4/2008	INDUSTRIA L WASTE	4700 BLK. UMBRIA	CHOKED SEWER	OUTFALL TO STREAM	S-059-03	2 GPM	11/4/2008
8/20/2008	CITIZEN	4517 WILDE	CHOKED SEWER	OUTFALL TO STREAM	S-059-09.	TRACES OF SEWAGE	8/20/2008
8/12/2008	UPS MANAGER	Non-Sewer Spill - HOG ISLAND RD	OTHER	SOIL PONDING	N/A	100 GAL	8/12/2008
7/3/2008	Plumber	8584 OLD LINE RD	CHOKED SEWER	OUTFALL TO STREAM	W-076-01	4 GPM	7/3/2008

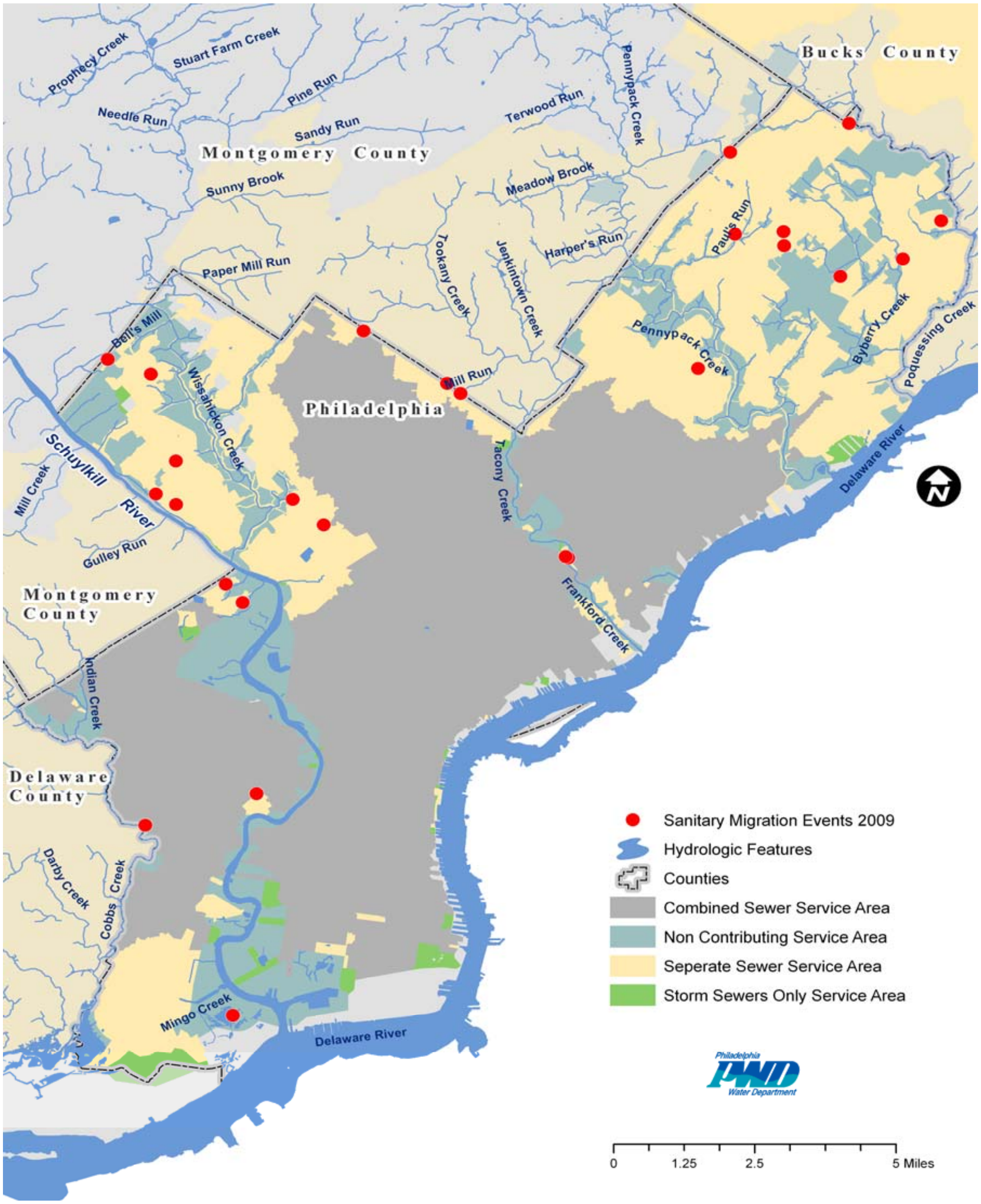


Figure F.8.g.iii-1 FY 2009 Sanitary Infiltration Locations

F.8.h. 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. The plan for spill response in Philadelphia is the Citywide Hazmat Response Plan - Annex F to the City's Emergency Operations Plan, found in **APPENDIX S**.

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. Please refer to **SECTIONS F.7.A AND F.8.J** for information regarding the nature of IWU responses during FY 2009.

F.8.i. 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.

F.8.j. 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.

F.8.k. Storm Water Inlet Labeling/Stenciling

Community and watershed volunteers participated in PWD and Water Quality Council sponsored annual Earth Day service project by installing storm drain curb markers throughout the City. A volunteer solicitation including every day tips for reducing the amount of nonpoint source water pollution was sent to every resident in the City of Philadelphia in the water bill. To keep a consistent message, participating volunteers used the same medallion as previous years, developed by PWD, Partnership for the Delaware Estuary, and PA Coastal Zone Management to mark the message "Yo!!! No Dumping! Drains to River!" in front of storm drains. Due to the success of the bill stuffer in spring and summer 2008, over 300 volunteers registered to participate in the storm drain marking activity. Throughout these months, approximately 10,000 storm drains were decaled in the City of Philadelphia. In addition to the 10,000 storm drains marked an estimated 30,000 educational tip-cards were distributed to households near where the drains were marked.

F.8.l. Other

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.

Please refer **SECTION III.C.2.5** of the Combined Sewer Section of the Annual Report for more detailed explanation of the design and current status of the Pennypack Creek Rock Ramp.

Section G Assessment of Controls

Annually estimate pollutant loadings & reductions from stormwater management plan

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.

Section H Fiscal Resources

H.1 Maintain adequate program funding

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 H-1** below. The table presents fiscal year budgets for both the reporting year as well as the upcoming fiscal year.

Table H-1 Fiscal Resources

Program	**FY 2009 Budget**	**FY 2010 Budget**
Office of Watersheds	$9.758 Million	$9.585 Million
Collector Systems Support	$1.593 Million	$1.184 Million
Sewer Maintenance and Flow Control	$21.02 Million	$22.758 Million
Inlet Cleaning	$4.484 Million	$4.568 Million
Abatement of Nuisances	$6.4 Million	$6.916 Million
Sewer Reconstruction	$22.5 Million	$22.5 Million
Public Affairs and Education	$4.787 Million	$5.099 Million
Total	70.542 Million	$72.61 Million

H.2 Annually submit fiscal analysis

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.

APPENDIX A – 2009 FLOW CONTROL ANNUAL REPORT

PWD FLOW CONTROL UNIT

COMBINED SEWER OVERFLOW MAINTENANCE

FISCAL YEAR 2009

PART 1	PHILADELPHIA WATER DEPARTMENT	Section 1
DRY WEATHER STATUS	WASTE AND STORM WATER COLLECTION	
REPORT	FLOW CONTROL UNIT	FY 2009

COLLECTOR	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Totals
UPPER PENNYPACK - 5 UNITS													
INSPECTIONS	16	11	10	6	11	12	14	15	10	11	14	16	146
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	0	0	0	0	0	0	1	0	0	2	1	0	4
UPPER DELAWARE LOW LEVEL - 12 UNITS													
INSPECTIONS	28	30	28	33	19	31	37	32	28	27	31	37	361
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	0	0	1	3	2	3	2	1	2	6	8	6	34
LOWER FRANKFORD CREEK - 6 UNITS													
INSPECTIONS	19	14	15	26	9	12	6	13	12	12	13	13	164
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	5	0	1	3	0	2	1	2	2	5	4	2	27
LOWER FRANKFORD LOW LEVEL - 10 UNITS													
INSPECTIONS	17	16	27	18	17	31	13	18	24	27	20	25	253
DISCHARGES	0	0	1	0	0	1	0	0	0	0	0	0	2
BLOCKS CLEARED	0	0	1	0	3	1	0	0	1	0	0	0	6
FRANKFORD HIGH LEVEL - 14 UNITS													
INSPECTIONS	21	25	19	37	28	29	25	20	42	34	33	35	348
DISCHARGES	1	0	1	0	1	0	0	0	0	1	1	1	6
BLOCKS CLEARED	0	0	0	0	1	0	2	0	1	0	0	2	6
SOMERSET - 9 UNITS													
INSPECTIONS	28	21	29	20	23	31	25	27	30	21	22	20	297
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	0	0	1	0	0	0	0	0	0	0	0	0	1
LOWER DELAWARE LOW LEVEL - 33 UNITS													
INSPECTIONS	89	79	85	87	56	105	81	73	67	92	75	90	979
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	0	0	0	2	1	0	0	1	1	0	0	6	11
CENTRAL SCHUYLKILL EAST - 18 UNITS													
INSPECTIONS	62	45	39	75	43	65	66	57	58	61	64	64	699
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	4	5	1	2	3	1	2	3	2	6	6	2	37
LOWER SCHUYLKILL EAST - 9 UNITS													
INSPECTIONS	25	20	27	31	27	21	25	17	18	16	23	24	274
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	4	2	3	2	2	2	0	1	0	0	0	2	18
CENTRAL SCHUYLKILL WEST - 9 UNITS													
INSPECTIONS	26	21	35	33	26	39	28	24	24	38	22	34	350
DISCHARGES	0	0	0	0	0	0	0	1	0	0	0	0	1
BLOCKS CLEARED	1	0	1	2	1	1	2	2	2	0	3	1	16
SOUTHWEST MAIN GRAVITY - 10 UNITS													
INSPECTIONS	33	32	43	38	32	51	42	28	34	42	30	51	456
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	3	5	4	1	2	4	3	0	2	1	4	7	36
LOWER SCHUYLKILL WEST - 4 UNITS													
INSPECTIONS	30	20	29	28	29	20	31	20	19	17	20	27	290
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	4	2	2	5	5	3	0	0	0	0	0	1	22
COBBS CREEK HIGH LEVEL - 23 UNITS													
INSPECTIONS	59	61	59	85	54	84	72	70	32	59	56	77	768
DISCHARGES	1	0	0	0	0	1	1	2	0	1	0	0	6
BLOCKS CLEARED	5	1	1	5	6	5	5	2	3	5	6	4	48
COBBS CREEK LOW LEVEL - 13 UNITS													
INSPECTIONS	37	31	38	41	30	39	30	28	35	29	40	28	406
DISCHARGES	1	1	0	0	0	0	0	0	0	0	0	0	2
BLOCKS CLEARED	1	5	6	3	5	0	2	3	1	5	6	0	37
RELIEF SEWERS - 26 UNITS													
INSPECTIONS	65	60	49	62	67	84	78	90	49	48	48	62	762
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	0	0	0	0	0	0	0	0	0	0	0	1	1
TOTALS / MONTH for 201 REGULATOR UNITS													Totals
TOTAL INSPECTIONS	555	486	532	620	471	654	573	532	482	534	511	603	6553
TOTAL DISCHARGES	3	1	2	0	1	2	1	3	0	2	1	1	17
TOTAL BLOCKS CLEARED	27	20	22	28	31	22	20	15	17	30	38	34	304
AVER. # of INSP. / BC	21	24	24	22	15	30	29	35	28	18	13	18	23
DISC / 100 INSPECTIONS	0.5	0.2	0.4	0.0	0.2	0.3	0.2	0.6	0.0	0.4	0.2	0.2	0.3

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL	AVER	DTR
UPPER PENNYPACK 5 NEWPC UNITS															
P01	3	2	2	2	2	2	2	3	2	2	5	3	30	2.5	12.2
P02	3	2	2	1	2	2	2	3	2	2	2	2	25	2.1	14.6
P03	3	2	2	1	2	2	4	3	2	2	2	3	28	2.3	13.0
P04	4	3	2	1	3	4	4	4	3	3	2	4	37	3.1	9.9
P05	3	2	2	1	2	2	2	2	1	2	3	4	26	2.2	14.0
UPPER DELAWARE LOW LEVEL 12 NEWPC UNITS															
D02	5	3	2	2	3	3	3	4	3	2	6	4	40	3.3	9.1
D03	3	2	2	6	5	3	3	4	2	2	3	4	39	3.3	9.4
D04	4	3	3	3	2	3	4	4	4	4	2	4	40	3.3	9.1
D05	3	2	3	2	1	1	5	4	3	3	4	3	34	2.8	10.7
D06	2	2	2	2	1	2	3	2	2	2	2	3	25	2.1	14.6
D07	2	2	2	4	1	2	3	2	2	2	2	3	27	2.3	13.5
D08	2	2	2	2	1	2	4	2	2	2	2	3	26	2.2	14.0
D09	2	3	2	2	1	2	3	2	2	2	2	2	25	2.1	14.6
D11	2	3	3	2	1	5	3	2	2	2	2	2	29	2.4	12.6
D12	1	3	2	2	1	2	2	2	2	2	2	2	23	1.9	15.9
D13	1	2	2	2	1	2	2	2	2	2	2	2	22	1.8	16.6
D15	1	3	3	4	1	4	2	2	2	2	2	5	31	2.6	11.8
LOWER FRANKFORD CREEK 6 NEWPC UNITS															
F13	2	2	2	2	1	2	1	2	2	2	1	2	21	1.8	17.4
F14	2	1	2	2	1	2	1	2	2	2	2	2	21	1.8	17.4
F21	2	1	1	1	1	2	1	2	2	2	4	2	21	1.8	17.4
F23	3	6	8	19	4	2	1	2	2	2	2	3	54	4.5	6.8
F24	4	2	1	1	1	2	1	2	2	2	2	2	22	1.8	16.6
F25	6	2	1	1	1	2	1	3	2	2	2	2	25	2.1	14.6
LOWER FRANKFORD LOW LEVEL 10 NEWPC UNITS															
F03	2	1	1	1	1	2	1	2	2	3	2	2	20	1.7	18.2
F04	2	1	2	1	1	2	1	2	2	2	2	2	20	1.7	18.2
F05	4	2	10	7	4	4	2	3	4	4	2	4	50	4.2	7.3
F06	1	3	3	1	2	3	1	2	3	3	2	3	27	2.3	13.5
F07	1	2	2	1	1	2	1	1	2	2	2	2	19	1.6	19.2
F08	1	1	1	1	1	2	1	1	2	2	2	2	17	1.4	21.5
F09	2	3	3	3	3	9	2	2	3	4	2	3	39	3.3	9.4
F10	1	1	1	1	1	2	1	2	2	2	2	2	18	1.5	20.3
F11	1	1	2	1	1	2	1	1	1	2	2	2	17	1.4	21.5
F12	2	1	2	1	2	3	2	2	3	3	2	3	26	2.2	14.0
FRANKFORD HIGH LEVEL 14 NEWPC UNITS															
T01	1	2	1	2	2	2	1	1	1	3	7	2	25	2.1	14.6
T03	2	3	1	2	3	2	2	2	2	3	2	3	27	2.3	13.5
T04	3	3	1	3	3	2	1	2	1	2	3	3	27	2.3	13.5
T05	2	1	1	2	2	2	1	1	1	2	2	2	19	1.6	19.2
T06	1	1	1	2	2	1	1	1	1	2	2	2	17	1.4	21.5
T07	1	1	1	2	2	2	1	1	1	2	2	2	18	1.5	20.3
T08	1	1	1	2	2	2	1	1	16	3	2	3	35	2.9	10.4
T09	1	1	1	2	2	1	2	1	1	2	2	2	18	1.5	20.3
T10	1	2	2	3	1	4	3	2	5	3	2	3	31	2.6	11.8
T11	1	2	1	4	1	2	3	2	3	3	1	2	25	2.1	14.6
T12	1	1	1	3	2	2	4	1	3	3	1	3	25	2.1	14.6
T13	2	5	5	6	4	3	3	3	4	3	1	4	43	3.6	8.5
T14	2	1	1	2	1	2	1	1	2	2	4	2	21	1.8	17.4
T15	2	1	1	2	1	2	1	1	1	1	2	2	17	1.4	21.5

8 TOTAL DISCHARGES FOR NE & SE DISTRICTS

0.7 AVERAGE DISCHARGES PER MONTH

14.1 AVER. DAYS BEFORE RETURNING TO SITE

3.5 AVER. INSPECTIONS PER DAY PER CREW

DTR = DAYS TO RETURN TO SITE

I/D/C = INSPECTIONS PER DAY PER CREW

I/D = INSPECTIONS PER DISCHARGE

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL	AVER	DTR
SOMERSET LOW LEVEL 9 NEWPC UNITS															
D17	3	2	4	2	3	2	2	3	4	2	2	4	33	2.8	11.1
D18	3	2	2	2	3	2	5	3	3	2	2	2	31	2.6	11.8
D19	3	2	5	2	4	5	2	3	3	3	2	3	37	3.1	9.9
D20	4	2	5	2	4	5	2	3	4	3	2	2	38	3.2	9.6
D21	3	2	2	2	1	3	2	3	2	2	3	1	26	2.2	14.0
D22	3	2	2	2	2	2	2	3	3	2	2	1	26	2.2	14.0
D23	3	3	3	2	3	3	2	3	5	2	3	2	34	2.8	10.7
D24	3	3	2	2	2	4	3	3	3	3	3	1	32	2.7	11.4
D25	3	3	4	4	1	5	5	3	3	2	3	4	40	3.3	9.1
LOWER DELAWARE LOW LEVEL 33 SEWPC UNITS															
D37	4	5	3	2	2	5	3	5	3	3	1	3	39	3.3	9.4
D38	3	7	5	4	5	6	3	3	3	3	3	4	49	4.1	7.4
D39	4	2	5	4	3	7	5	3	5	4	3	4	49	4.1	7.4
D40	2	2	1	2	1	5	3	2	3	2	6	2	31	2.6	11.8
D41	2	3	1	4	2	3	3	2	3	3	3	2	31	2.6	11.8
D42	3	2	1	2	2	3	3	2	3	1	3	2	27	2.3	13.5
D43	2	3	1	2	2	3	3	2	3	1	3	2	27	2.3	13.5
D44	2	3	3	3	3	6	3	2	4	2	3	4	38	3.2	9.6
D45	5	5	5	6	3	8	3	3	3	3	3	4	51	4.3	7.2
D46	3	3	3	3	1	2	3	2	2	2	3	3	30	2.5	12.2
D47	3	2	3	3	1	2	3	2	2	3	3	2	29	2.4	12.6
D48	10	5	8	5	3	6	3	3	4	6	3	8	64	5.3	5.7
D49	3	1	2	2	2	3	2	2	2	3	2	3	27	2.3	13.5
D50	3	2	2	3	2	2	3	2	2	3	2	4	30	2.5	12.2
D51	3	2	2	3	1	2	2	2	2	3	2	3	27	2.3	13.5
D52	3	2	3	3	1	2	2	2	2	3	2	3	28	2.3	13.0
D53	3	2	2	2	2	3	2	3	1	3	2	2	27	2.3	13.5
D54	3	2	2	2	1	2	2	2	1	3	2	3	25	2.1	14.6
D58	3	3	3	2	2	2	3	3	2	4	2	3	32	2.7	11.4
D61	2	2	2	2	2	2	2	2	1	3	4	2	26	2.2	14.0
D62	2	2	2	2	1	2	2	2	2	3	2	2	24	2.0	15.2
D63	2	2	2	3	1	2	2	2	1	3	2	5	27	2.3	13.5
D64	3	2	2	2	1	2	2	2	2	3	2	2	25	2.1	14.6
D65	2	2	2	2	1	2	2	2	1	3	2	2	23	1.9	15.9
D66	2	2	2	2	1	2	3	2	1	3	2	2	24	2.0	15.2
D67	2	2	2	2	1	3	2	2	1	3	2	1	23	1.9	15.9
D68	1	2	2	2	2	6	2	2	1	4	2	1	27	2.3	13.5
D69	2	1	4	3	2	2	2	2	2	3	2	1	26	2.2	14.0
D70	2	1	2	3	2	3	2	2	2	2	1	2	24	2.0	15.2
D71	2	1	4	3	1	2	2	2	1	4	1	7	30	2.5	12.2
D72	1	1	2	2	1	3	2	2	1	1	1	1	18	1.5	20.3
D73	2	3	2	2	1	2	2	2	1	2	1	1	21	1.8	17.4
D75	0												0	0.0	
TOTAL	218	196	213	227	163	251	201	198	213	224	208	236	2548		
I /D/C	3.6	3.2	3.5	3.7	2.7	4.1	3.3	3.3	3.5	3.7	3.4	3.9			
UP	16	11	10	6	11	12	14	15	10	11	14	16	146	2.4	12.7
UDLL	28	30	28	33	19	31	37	32	28	27	31	37	361	2.5	12.7
LFC	19	14	15	26	9	12	6	13	12	12	13	13	164	2.3	15.0
LFLL	17	16	27	18	17	31	13	18	24	27	20	25	253	2.1	16.3
FHL	21	25	19	37	28	29	25	20	42	34	33	35	348	2.1	15.8
SLL	28	21	29	20	23	31	25	27	30	21	22	20	297	2.8	11.3
LDLL	89	79	85	87	56	105	81	73	67	92	75	90	979	2.5	12.8

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
UPPER PENNYPACK 5 NEWPC UNITS													
P01													0
P02													0
P03													0
P04													0
P05													0
UPPER DELAWARE LOW LEVEL 12 NEWPC UNITS													
D02													0
D03													0
D04													0
D05													0
D06													0
D07													0
D08													0
D09													0
D11													0
D12													0
D13													0
D15													0
LOWER FRANKFORD CREEK 6 NEWPC UNITS													
F13													0
F14													0
F21													0
F23													0
F24													0
F25													0
LOWER FRANKFORD LOW LEVEL 10 NEWPC UNITS													
F03													0
F04													0
F05			1										1
F06													0
F07													0
F08													0
F09						1							1
F10													0
F11													0
F12													0
FRANKFORD HIGH LEVEL 14 NEWPC UNITS													
T01													0
T03													0
T04													0
T05													0
T06													0
T07													0
T08													0
T09													0
T10													0
T11													0
T12													0
T13	1		1		1					1	1	1	6
T14													0
T15													0
													TOTAL
UP	0	0	0	0	0	0	0	0	0	0	0	0	0
UDLL	0	0	0	0	0	0	0	0	0	0	0	0	0
LFC	0	0	0	0	0	0	0	0	0	0	0	0	0
LFLL	0	0	1	0	0	1	0	0	0	0	0	0	2
FHL	1	0	1	0	1	0	0	0	0	1	1	1	6
SLL	0	0	0	0	0	0	0	0	0	0	0	0	0
LDLL	0	0	0	0	0	0	0	0	0	0	0	0	0

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
SOMERSET LOW LEVEL 9 NEWPC UNITS													
D17													0
D18													0
D19													0
D20													0
D21													0
D22													0
D23													0
D24													0
D25													0
LOWER DELAWARE LOW LEVEL 33 SEWPC UNITS													
D37													0
D38													0
D39													0
D40													0
D41													0
D42													0
D43													0
D44													0
D45													0
D46													0
D47													0
D48													0
D49													0
D50													0
D51													0
D52													0
D53													0
D54													0
D58													0
D61													0
D62													0
D63													0
D64													0
D65													0
D66													0
D67													0
D68													0
D69													0
D70													0
D71													0
D72													0
D73													0
D75													0
													TOTAL DISC
	1	0	2	0	1	1	0	0	0	1	1	1	8
NO OF UNITS IN DISTRICT BLOCKED													TOTAL
UP	0	0	0	0	0	0	0	0	0	0	0	0	0
UDLL	0	0	0	0	0	0	0	0	0	0	0	0	0
LFC	0	0	0	0	0	0	0	0	0	0	0	0	0
LFLL	0	0	1	0	0	1	0	0	0	0	0	0	2
FHL	1	0	1	0	1	0	0	0	0	1	1	1	6
SLL	0	0	0	0	0	0	0	0	0	0	0	0	0
LDLL	0	0	0	0	0	0	0	0	0	0	0	0	0

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
UPPER PENNYPACK 5 NEWPC UNITS													
P01													0
P02													0
P03							1			2	1		4
P04													0
P05													0
UPPER DELAWARE LOW LEVEL 12 NEWPC UNITS													
D02								1					1
D03				3	2						1	1	7
D04										1	1	1	3
D05													0
D06						1	1			1	2		5
D07													0
D08			1			1	1		1		1	1	6
D09													0
D11										1	1		2
D12										1	1		2
D13													0
D15						1			1	2	1	3	8
LOWER FRANKFORD CREEK 6 NEWPC UNITS													
F13				1					1	2	2	1	7
F14	1		1			1	1	1		2	1	1	9
F21									1				1
F23	2			1				1		1	1		6
F24	1					1							2
F25	1			1									2
LOWER FRANKFORD LOW LEVEL 10 NEWPC UNITS													
F03													0
F04									1				1
F05					1	1							2
F06			1		1								2
F07													0
F08													0
F09					1								1
F10													0
F11													0
F12													0
FRANKFORD HIGH LEVEL 14 NEWPC UNITS													
T01													0
T03													0
T04													0
T05													0
T06													0
T07					1								1
T08													0
T09													0
T10							1						1
T11													0
T12									1			1	2
T13							1					1	2
T14													0
T15													0

7.417 AVERAGE BLOCKAGES PER MONTH

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
SOMERSET LOW LEVEL 9 NEWPC UNITS													
D17													0
D18													0
D19													0
D20			1										1
D21													0
D22													0
D23													0
D24													0
D25													0
LOWER DELAWARE LOW LEVEL 33 SEWPC UNITS													
D37													0
D38													0
D39													0
D40													0
D41													0
D42													0
D43													0
D44													0
D45													0
D46													0
D47													0
D48													0
D49					1								1
D50												1	1
D51													0
D52													0
D53								1					1
D54													0
D58													0
D61													0
D62												1	1
D63												1	1
D64				1					1				2
D65													0
D66													0
D67													0
D68													0
D69				1								1	2
D70													0
D71												2	2
D72													0
D73													0
D75													0
													TOTAL
	5	0	4	8	7	6	6	4	7	13	13	16	89
UP	0	0	0	0	0	0	1	0	0	2	1	0	4
UDLL	0	0	1	3	2	3	2	1	2	6	8	6	34
LFC	5	0	1	3	0	2	1	2	2	5	4	2	27
LFLL	0	0	1	0	3	1	0	0	1	0	0	0	6
FHL	0	0	0	0	1	0	2	0	1	0	0	2	6
SLL	0	0	1	0	0	0	0	0	0	0	0	0	1
LDLL	0	0	0	2	1	0	0	1	1	0	0	6	11

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL	AVER	DTR
CENTRAL SCHUYLKILL EAST SIDE 18 SWWPC UNITS															
S05	4	3	2	5	4	9	4	4	3	5	3	5	51	4.3	7.2
S06	4	3	2	3	3	2	4	4	3	4	3	4	39	3.3	9.4
S07	4	3	3	5	4	4	4	4	4	4	3	4	46	3.8	7.9
S08	4	3	3	3	1	3	5	3	4	4	3	4	40	3.3	9.1
S09	4	2	2	3	1	3	3	4	3	4	3	3	35	2.9	10.4
S10	4	2	2	3	1	2	3	4	3	3	3	3	33	2.8	11.1
S12	5	3	2	6	3	4	4	4	4	5	3	4	47	3.9	7.8
S12A	5	3	2	6	2	3	4	4	4	4	3	4	44	3.7	8.3
S13	4	2	2	5	2	3	4	4	4	3	3	4	40	3.3	9.1
S15	5	3	3	4	3	4	4	3	5	2	3	3	42	3.5	8.7
S16	3	2	2	5	2	4	3	3	4	3	3	3	37	3.1	9.9
S17	3	2	1	4	2	3	3	2	3	3	2	3	31	2.6	11.8
S18	2	2	1	3	2	2	3	2	2	2	2	3	26	2.2	14.0
S19	3	3	2	4	3	5	4	3	3	4	2	4	40	3.3	9.1
S21	2	3	3	4	2	3	4	3	3	4	3	4	38	3.2	9.6
S23	2	2	2	4	3	6	3	2	2	2	3	3	34	2.8	10.7
S25	2	2	4	4	3	2	3	2	2	3	3	3	33	2.8	11.1
S26	2	2	1	4	2	3	4	2	2	2	16	3	43	3.6	8.5
LOWER SCHUYLKILL EAST SIDE 9 SWWPC UNITS															
S31	5	3	4	6	4	3	5	2	3	4	2	5	46	3.8	7.9
S35	3	3	4	5	4	3	4	2	4	2	4	3	41	3.4	8.9
S36	1	1	2	2	1	2	1	2	1	1	4	2	20	1.7	18.2
S36A	3	3	3	5	4	2	3	2	4	2	2	3	36	3.0	10.1
S37	1	1	2	3	1	2	1	2	1	1	3	2	20	1.7	18.2
S42	4	2	3	3	4	2	2	2	1	2	2	2	29	2.4	12.6
S42A	4	3	4	3	4	2	3	2	2	2	2	3	34	2.8	10.7
S44	1	1	2	1	1	2	1	1	1	1	2	2	16	1.3	22.8
S46	3	3	3	3	4	3	5	2	1	1	2	2	32	2.7	11.4
CENTRAL SCHUYLKILL WEST 9 SWWPC UNITS															
S01	11	5	5	5	3	5	3	4	3	4	3	6	57	4.8	6.4
S02	2	2	5	5	4	5	3	2	2	4	2	5	41	3.4	8.9
S03	1	2	5	4	3	4	3	3	2	4	2	4	37	3.1	9.9
S04	2	2	2	3	2	4	3	2	3	4	2	3	32	2.7	11.4
S11	2	2	2	3	2	3	4	2	2	3	3	3	31	2.6	11.8
S14	2	2	2	5	3	4	3	5	2	6	1	3	38	3.2	9.6
S20	2	2	2	2	2	2	3	2	2	3	2	3	27	2.3	13.5
S22	2	2	5	3	3	6	3	2	4	5	2	3	40	3.3	9.1
S24	2	2	7	3	4	6	3	2	4	5	5	4	47	3.9	7.8
SOUTHWEST MAIN GRAVITY 10 SWWPC UNITS															
S27	1	2	2	3	2	4	3	2	2	4	2	3	30	2.5	12.2
S28	1	2	2	2	2	3	3	2	2	3	2	3	27	2.3	13.5
S30	1	2	6	2	2	3	3	2	2	3	2	3	31	2.6	11.8
S34	1	2	2	3	2	4	3	2	3	4	2	3	31	2.6	11.8
S39	1	2	2	3	1	4	2	2	3	3	2	4	29	2.4	12.6
S40	2	2	2	2	1	2	2	2	2	3	2	3	25	2.1	14.6
S43	1	2	2	3	1	3	2	2	4	5	2	3	30	2.5	12.2
S47	1	2	2	3	1	3	2	2	3	5	3	3	30	2.5	12.2
S50	13	9	12	9	10	14	12	6	7	7	2	18	119	9.9	3.1
S51	11	7	11	8	10	11	10	6	6	5	11	8	104	8.7	3.5
LOWER SCHUYLKILL WEST SIDE 4 SWWPC UNITS															
S32	9	5	8	7	8	5	8	6	2	4	2	8	72	6.0	5.1
S33	8	5	7	7	8	5	8	5	6	4	6	8	77	6.4	4.7
S38	7	5	7	7	7	5	7	4	6	4	7	7	73	6.1	5.0
S45	6	5	7	7	6	5	8	5	5	5	5	4	68	5.7	5.4

9 TOTAL DISCHARGES IN SW DISTRICT DTR = DAYS TO RETURN TO SITE

0.8 AVERAGE DISCHARGES PER MONTH I/D/C = INSPECTIONS PER DAY PER CREW

10.3 AVER. DAYS BEFORE RETURNING TO SITE I/D = INSPECTIONS PER DISCHARGE

3.0 AVER. INSPECTIONS PER DAY PER CREW

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL	AVER	DTR
COBBS CREEK HIGH LEVEL 23 SWWPC UNITS															
C01	2	3	3	3	2	4	3	3	1	2	2	3	31	2.6	11.8
C02	2	3	3	3	2	4	3	3	1	2	2	3	31	2.6	11.8
C04	2	3	3	3	2	3	3	3	1	2	2	3	30	2.5	12.2
C04A	2	3	3	3	3	3	3	3	1	2	2	3	31	2.6	11.8
C05	3	2	3	4	2	3	3	3	1	2	2	3	31	2.6	11.8
C06	3	3	3	4	4	4	4	4	2	3	2	5	41	3.4	8.9
C07	3	2	2	3	3	6	4	4	1	3	2	4	37	3.1	9.9
C09	3	3	3	4	3	5	4	6	3	3	2	4	43	3.6	8.5
C10	3	2	2	3	2	3	3	3	1	3	2	3	30	2.5	12.2
C11	1	2	2	4	2	3	3	3	1	2	2	3	28	2.3	13.0
C12	2	2	2	3	2	2	3	3	1	2	2	3	27	2.3	13.5
C13	2	2	2	3	2	2	3	2	1	2	2	2	25	2.1	14.6
C14	6	2	2	3	2	3	3	2	1	6	2	3	35	2.9	10.4
C15	4	2	2	3	2	3	5	2	2	3	3	6	37	3.1	9.9
C16	3	2	2	3	2	3	3	2	2	3	3	3	31	2.6	11.8
C17	3	2	2	3	2	3	2	2	3	2	3	3	30	2.5	12.2
C31	2	4	3	5	4	4	3	4	2	3	3	4	41	3.4	8.9
C32	2	3	2	5	2	4	3	3	2	3	3	3	35	2.9	10.4
C33	2	4	3	6	2	5	3	3	1	3	3	3	38	3.2	9.6
C34	2	4	3	5	2	5	3	3	1	2	3	4	37	3.1	9.9
C35	2	3	3	4	2	4	3	3	1	2	3	3	33	2.8	11.1
C36	2	3	3	4	3	4	3	3	1	2	3	3	34	2.8	10.7
C37	3	2	3	4	2	4	2	3	1	2	3	3	32	2.7	11.4
COBBS CREEK LOW LEVEL 13 SWWPC UNITS															
C18	4	2	2	4	2	3	2	2	3	2	2	3	31	2.6	11.8
C19	4	2	2	3	2	3	2	2	3	2	3	3	31	2.6	11.8
C20	4	2	2	3	3	3	2	3	3	2	3	2	32	2.7	11.4
C21	3	2	2	2	2	3	2	2	3	2	3	2	28	2.3	13.0
C22	4	3	2	2	2	3	2	2	2	2	3	2	29	2.4	12.6
C23	2	2	2	2	2	3	2	2	3	2	3	2	27	2.3	13.5
C24	4	2	3	4	2	3	2	2	3	2	3	2	32	2.7	11.4
C25	3	2	4	5	3	3	4	3	4	3	3	3	40	3.3	9.1
C26	2	2	3	3	3	3	2	2	3	3	4	2	32	2.7	11.4
C27	4	9	10	5	3	3	4	2	3	3	3	3	52	4.3	7.0
C28A	1	1	2	3	2	3	2	2	1	2	4	2	25	2.1	14.6
C29	1	1	2	3	2	3	2	2	2	2	3	1	24	2.0	15.2
C30	1	1	2	2	2	3	2	2	2	2	3	1	23	1.9	15.9
TOTAL	272	230	270	331	241	319	294	244	220	262	255	305	3243		
I/D/C	3.0	2.5	3.0	3.6	2.6	3.5	3.2	2.7	2.4	2.9	2.8	3.3			
CSES	62	45	39	75	43	65	66	57	58	61	64	64	699	3.2	9.6
LSES	25	20	27	31	27	21	25	17	18	16	23	24	274	2.5	13.4
CSW	26	21	35	33	26	39	28	24	24	38	22	34	350	3.2	9.8
SWMG	33	32	43	38	32	51	42	28	34	42	30	51	456	3.8	10.7
LSW	30	20	29	28	29	20	31	20	19	17	20	27	290	6.0	5.0
CCHL	59	61	59	85	54	84	72	70	32	59	56	77	768	2.8	11.1
CCLL	37	31	38	41	30	39	30	28	35	29	40	28	406	2.6	12.2

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
CENTRAL SCHUYLKILL EAST SIDE 18 SWWPC UNITS													
S05													0
S06													0
S07													0
S08													0
S09													0
S10													0
S12													0
S12A													0
S13													0
S15													0
S16													0
S17													0
S18													0
S19													0
S21													0
S23													0
S25													0
S26													0
LOWER SCHUYLKILL EAST SIDE 9 SWWPC UNITS													
S31													0
S35													0
S36													0
S36A													0
S37													0
S42													0
S42A													0
S44													0
S46													0
CENTRAL SCHUYLKILL WEST 9 SWWPC UNITS													
S01													0
S02													0
S03													0
S04													0
S11													0
S14								1					1
S20													0
S22													0
S24													0
SOUTHWEST MAIN GRAVITY 10 SWWPC UNITS													
S27													0
S28													0
S30													0
S34													0
S39													0
S40													0
S43													0
S47													0
S50													0
S51													0
LOWER SCHUYLKILL WEST SIDE 4 SWWPC UNITS													
S32													0
S33													0
S38													0
S45													0

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
COBBS CREEK HIGH LEVEL 23 SWWPC UNITS													
C01													0
C02													0
C04													0
C04A													0
C05													0
C06													0
C07						1							1
C09								1					1
C10													0
C11													0
C12													0
C13													0
C14	1									1			2
C15							1						1
C16													0
C17													0
C31								1					1
C32													0
C33													0
C34													0
C35													0
C36													0
C37													0
COBBS CREEK LOW LEVEL 13 SWWPC UNITS													
C18													0
C19													0
C20													0
C21													0
C22													0
C23													0
C24													0
C25													0
C26													0
C27	1	1											2
C28A													0
C29													0
C30													0
													TOTAL DISC
	2	1	0	0	0	1	1	3	0	1	0	0	9
	NO OF UNITS IN DISTRICT BLOCKED												**TOTAL**
CSE	0	0	0	0	0	0	0	0	0	0	0	0	0
LSE	0	0	0	0	0	0	0	0	0	0	0	0	0
CSW	0	0	0	0	0	0	0	1	0	0	0	0	1
SWG	0	0	0	0	0	0	0	0	0	0	0	0	0
LSW	0	0	0	0	0	0	0	0	0	0	0	0	0
CCHL	1	0	0	0	0	1	1	2	0	1	0	0	6
CCLL	1	1	0	0	0	0	0	0	0	0	0	0	2
	NO OF DISCHARGES IN DISTRICT												**TOTAL**
CSE	0	0	0	0	0	0	0	0	0	0	0	0	0
LSE	0	0	0	0	0	0	0	0	0	0	0	0	0
CSW	0	0	0	0	0	0	0	1	0	0	0	0	1
SWG	0	0	0	0	0	0	0	0	0	0	0	0	0
LSW	0	0	0	0	0	0	0	0	0	0	0	0	0
CCHL	1	0	0	0	0	1	1	2	0	1	0	0	6
CCLL	1	1	0	0	0	0	0	0	0	0	0	0	2

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
CENTRAL SCHUYLKILL EAST SIDE 18 SWWPC UNITS													
S05					1								1
S06													0
S07	2	3	1		1			2		1	1		11
S08	1						1			2	2		6
S09													0
S10													0
S12										1	1		2
S12A										1	1		2
S13										1	1		2
S15					1								1
S16	1					1							2
S17				1									1
S18													0
S19													0
S21													0
S23		1		1			1	1				1	5
S25		1							2				3
S26												1	1
LOWER SCHUYLKILL EAST SIDE 9 SWWPC UNITS													
S31	3		1	1		1							6
S35													0
S36													0
S36A												1	1
S37								1					1
S42		1											1
S42A	1	1	1	1	2	1						1	8
S44													0
S46			1										1
CENTRAL SCHUYLKILL WEST 9 SWWPC UNITS													
S01	1												1
S02													0
S03				1									1
S04											1		1
S11							1					1	2
S14			1	1	1			1					4
S20													0
S22						1		1	2		1		5
S24							1				1		2
SOUTHWEST MAIN GRAVITY 10 SWWPC UNITS													
S27	1												1
S28					1	1	1			1	1		5
S30			1			1						1	3
S34		1	1				1						3
S39						2						1	3
S40													0
S43		1											1
S47													0
S50	2	3	2	1	1		1		2		3	5	20
S51													0
LOWER SCHUYLKILL WEST SIDE 4 SWWPC UNITS													
S32				1									1
S33				1	1							1	3
S38	2	1	1	2	2	2							10
S45	2	1	1	1	2	1							8

17.83 AVERAGE BLOCKAGES PER MONTH

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
COBBS CREEK HIGH LEVEL 23 SWWPC UNITS													
C01				1			1			1	1		4
C02							1						1
C04	1			1	1	1		1	1				6
C04A													0
C05										1	1		2
C06						1							1
C07					1	1							2
C09										1	1		2
C10	1									1	1		3
C11													0
C12													0
C13									1				1
C14				1	1				1				3
C15												3	3
C16							1						1
C17													0
C31								1			1		2
C32													0
C33	1		1		2	2	1			1	1		9
C34		1											1
C35							1						1
C36	1			1	1							1	4
C37	1			1									2
COBBS CREEK LOW LEVEL 13 SWWPC UNITS													
C18													0
C19							1			1	1		3
C20				2	1						1		4
C21											1		1
C22		2								2	1		5
C23		1											1
C24		1	1					1					3
C25					1		1		1	1	1		5
C26				1	2			1					4
C27	1	1	5							1	1		9
C28A													0
C29					1			1					2
C30													0
TOTAL	22	20	18	20	24	16	14	11	10	17	25	17	214

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
CSE	4	5	1	2	3	1	2	3	2	6	6	2	37
LSE	4	2	3	2	2	2	0	1	0	0	0	2	18
CSW	1	0	1	2	1	1	2	2	2	0	3	1	16
SWG	3	5	4	1	2	4	3	0	2	1	4	7	36
LSW	4	2	2	5	5	3	0	0	0	0	0	1	22
CCHL	5	1	1	5	6	5	5	2	3	5	6	4	48
CCLL	1	5	6	3	5	0	2	3	1	5	6	0	37

June 2009 RELIEF SEWER MONTHLY INSPECTION

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
THOMAS RUN RELIEF SEWER													
R01	3	4	2	4	4	3	3	3	2	2	2	3	35
R02	3	3	2	4	3	3	3	3	2	2	2	3	33
R03	3	3	2	4	3	3	3	3	2	2	2	3	33
R04	3	3	2	3	1	3	3	3	2	2	2	3	30
R05	3	3	2	3	1	3	3	3	1	2	2	2	28
R06	3	3	2	3	1	3	3	3	1	2	2	3	29
MAIN RELIEF SEWER													
R07	4	3	2	3	3	3	3	3	2	2	2	4	34
R08	3	3	2	3	3	3	3	3	3	2	2	2	32
R09	3	3	2	3	3	3	3	3	3	2	2	2	32
R10	2	3	2	3	3	3	3	3	3	2	2	2	31
R11	2	3	2	3	2	3	3	3	2	2	2	2	29
R11A	2	2	2	3	2	3	3	3	2	2	2	2	28
R12	1	2	2	3	2	3	3	3	2	2	2	2	27
WAKLING RELIEF SEWER													
R13	3	2	2	3	4	5	4	5	1	2	2	3	36
R14	3	2	1	3	4	4	4	5	1	3	2	3	35
ROCK RUN STORM FLOOD RELIEF SEWER													
R15	3	2	2	2	4	5	4	6	2	2	2	3	37
OREGON AVE RELIEF SEWER													
R16	2	1	1	1	1	2	1	1	4	1	2	1	18
R17	2	1	1	1	1	2	1	1	4	1	2	1	18
FRANKFORD HIGH LEVEL RELIEF SEWER													
R18	3	3	2	2	4	4	4	6	2	2	2	3	37
32ND ST RELIEF SEWER													
R19	1	3	3	2	5	5	4	6	2	2	2	3	38
MAIN STREET RELIEF SEWER													
R20	3	1	3	1	3	4	4	6	1	2	2	3	33
SOMERSET SYSTEM DIVERSION CHAMBER													
R21													0
TEMPORARY REGULATOR CHAMBER													
R22													
R23	3	1	2	1	4	4	4	6	2	2	1	3	33
ARCH ST RELIEF SEWER													
R24	2	2	3	1	2	3	3	3	1	2	1	2	25
16TH & SNYDER													
R25	2	3	2	2	3	4	3	3	1	1	2	2	28
GRANT & STATE RD. RELIEF													
R26	3	1	1	1	1	3	3	3	1	2	2	2	23
TOTAL	65	60	49	62	67	84	78	90	49	48	48	62	762
AVER	2.4	2.2	1.8	2.3	2.5	3.1	2.9	3.3	1.8	1.8	1.8	2.3	2.4

RELIEF SEWER MONTHLY DISCHARGE

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
THOMAS RUN RELIEF SEWER													
R01													0
R02													0
R03													0
R04													0
R05													0
R06													0
MAIN RELIEF SEWER													
R07													0
R08													0
R09													0
R10													0
R11													0
R11A													0
R12													0
WAKLING RELIEF SEWER													
R13													0
R14													0
ROCK RUN STORM FLOOD RELIEF SEWER													
R15													0
OREGON AVE RELIEF SEWER													
R16													0
R17													0
FRANKFORD HIGH LEVEL RELIEF SEWER													
R18													0
32ND ST RELIEF SEWER													
R19													0
MAIN STREET RELIEF SEWER													
R20													0
SOMERSET SYSTEM DIVERSION CHAMBER													
R21													0
TEMPORARY REGULATOR CHAMBER													
R22													0
R23													0
ARCH ST RELIEF SEWER													
R24													0
16TH & SNYDER													
R25													0
GRANT & STATE RD. RELIEF													
R26													0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0
UNITS	0	0	0	0	0	0	0	0	0	0	0	0	

June 2009 RELIEF SEWER MONTHLY BLOCKS CLEARED

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
THOMAS RUN RELIEF SEWER													
R01													0
R02													0
R03													0
R04													0
R05													0
R06													0
MAIN RELIEF SEWER													
R07													0
R08													0
R09													0
R10													0
R11													0
R11A													0
R12													0
WAKLING RELIEF SEWER													
R13													0
R14													0
ROCK RUN STORM FLOOD RELIEF SEWER													
R15													0
OREGON AVE RELIEF SEWER													
R16													0
R17													0
FRANKFORD HIGH LEVEL RELIEF SEWER													
R18													0
32ND ST RELIEF SEWER													
R19													0
MAIN STREET RELIEF SEWER													
R20													0
SOMERSET SYSTEM DIVERSION CHAMBER													
R21													0
TEMPORARY REGULATOR CHAMBER													
R22													0
R23													0
ARCH ST RELIEF SEWER													
R24													0
16TH & SNYDER													
R25												1	1
GRANT & STATE RD. RELIEF													
R26													0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	1	1
AVER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

FY2009 CSO Dry Weather Discharges

Discharge Observed		Discharge Stopped		Last Inspection						
DateDO	TimeDO	DateDS	TimeDS	DateLI	TimeLI	SiteID	Collector	TypeUnit	Location	Comment
07/25/08	07:20 AM	07/25/08	10:50 AM	07/17/07	11:30 AM	C-14	CCHL	SLOT	Baltimore Ave. & Cobbs Creek	THE CONNECTING PIPE WAS BLOCK WITH A SMALL LOG.
07/30/08	12:50 PM	07/30/08	04:20 PM	07/22/08	01:10 PM	C-27	CCLL	SLOT	Paschall Ave. & Island Ave.	SLOT AND CONNECTING PIPE BLOCKED WITH CANS, RAGS AND STICKS.
07/31/08	09:00 AM	08/01/08	11:00 AM	07/17/08	02:10 PM	T-13	FHL	SLOT	Whitaker Ave. W of Tacony Creek	ROCK AND DEBRIS BLOCKING DWO PIPE.
08/15/08	01:30 PM	08/15/08	02:50 PM	08/14/08	09:20 AM	C-27	CCLL	SLOT	Paschall Ave. & Island Ave.	DWO PIPE BLOCKED WITH ROCKS AND DEBRIS.
09/08/08	02:20 PM	09/08/08	03:00 PM	08/14/08	01:50 PM	T-13	FHL	SLOT	Whitaker Ave. W of Tacony Creek	TREE STUMP IN SLOT.
09/15/08	09:20 AM	09/15/08	05:40 PM	09/11/08	01:20 PM	F-05	LFLL	WH-S	Bristol St. W of Adams Ave.	CONTRACTOR DISLODGED MANHOLE FRAME ALLOWING BRICKS AND DEBRIS FROM TORN DOWN BUILDING TO BLOCK DWO PIPE.
11/12/08	01:00 PM	11/12/08	01:40 PM	10/29/08	02:30 PM	T-13	FHL	SLOT	Whitaker Ave. W of Tacony Creek	STICKS AND DEBRIS CAUGHT ON LOOSE SENSOR WIRE BLOCKED THE DWO PIPE.
12/02/08	01:30 PM	12/02/08	05:30 PM	11/17/08	12:00 PM	C-07	CCHL	SLOT	Lansdowne Ave. & 69th St.	DWO PIPE BLOCKED WITH GRIT AND DEBRIS.
12/15/08	01:00 PM	12/15/08	02:00 PM	12/12/08	11:10 AM	F-09	LFLL	WH-S	Frankford Ave. N or Frankford Creek	WOOD AND TREE BRANCHES BLOCKING REGULATOR INLET.
01/08/09	10:50 AM	01/08/09	12:00 PM	12/29/08	01:30 PM	C-15	CCHL	SLOT	59th St. & Cobbs Creek Parkway	SLOT BOX FULL OF GRIT BLOCKING OUTGOING PIPE.
02/05/09	09:40 AM	02/05/09	11:00 AM	01/29/09	11:10 AM	C-09	CCHL	SLOT	64th St. & Cobbs Creek	THE CONNECTING PIPE WAS BLOCKED WITH DEBRIS.
02/05/09	01:50 PM	02/05/09	02:30 PM	01/29/09	10:10 AM	S-14	CSW	B & B	Schuylkill Expressway Under Walnut St.Bridge	UNIT BLOCKED WITH DEBRIS
02/25/09	09:20 AM	02/25/09	10:10 AM	02/11/09	01:40 PM	C-31	CCHL	SLOT	Cobbs Creek Park S of City Line Ave.	SLOT WAS BLOCK WITH RAGS,STICKS,TRASHBAG AND DEBRIS HOLDING SLOT PLATE CLOSED
04/16/09	01:50 PM	04/16/09	02:40 PM	03/30/09	11:00 AM	T-13	FHL	SLOT	Whitaker Ave. W of Tacony Creek	TREE BRANCHES AND DEBRIS IN SLOT.
04/21/09	09:30 AM	04/21/09	12:30 PM	04/20/09	09:30 AM	C-14	CCHL	SLOT	Baltimore Ave. & Cobbs Creek	SMALL LOG IN SLOT.
05/11/09	01:50 PM	05/11/09	03:10 PM	04/30/09	02:10 PM	T-13	FHL	SLOT	Whitaker Ave. W of Tacony Creek	SLOT AND DWO OUTLET PIPE BLOCKED WITH DEBRIS.
06/30/09	02:00 PM	06/30/09	03:00 PM	06/26/09	11:50 AM	T-13	FHL	SLOT	Whitaker Ave. W of Tacony Creek	SLOT BLOCKED WITH PLASTIC JUG AND DEBRIS.

Collector System - Flow Control Unit - Miscellaneous Major Maintenance - FY 2009

SOMERSET GRIT CHAMBER - GRIT REMOVAL REMOVAL

DATE	TONS
1/21/2009	50.0 EST
5/6/2009	50.0 EST
6/25/2009	50.0 EST

CSO B&B REGULATOR PREVENTATIVE MAINTENANCE

SITE	DATE
S-45	2/2/2009
S-33	2/19/2009
S-50	2/19/2009
D-65	2/19/2009
D-18	2/24/2009
S-22	2/25/2009
S-44	2/25/2009
D-47	3/17/2009
D-48	3/17/2009
S-34	3/17/2009
D-52	3/18/2009
D-19	3/19/2009
S-47	3/20/2009
D-4	3/23/2009
D-41	3/23/2009
D-44	3/23/2009
S-6	3/23/2009
S-7	3/23/2009
S-33	3/23/2009
D-62	3/24/2009
S-9	3/24/2009
S-38	3/25/2009
S-33	7/20/2009
S-50	7/20/2009
D-61	7/22/2009
D-66	7/22/2009
S-16	7/23/2009
S-18	7/23/2009
S-23	7/23/2009
S-47	7/23/2009
D-66	7/27/2009
D-72	7/28/2009
D-19	7/29/2009
S-38	8/7/2009

CSO TIDE GATE PREVENTATIVE MAINTENANCE

SITE	DATE
D-41	10/15/2008
D-39	11/19/2008
S-7	11/19/2008
D-38	11/20/2008
S-45	11/20/2008
S-33	3/17/2009
D-47	3/17/2009
D-48	3/17/2009
D-52	3/18/2009

COMPUTER CONTROL CHAMBER PREVENTATIVE MAINTENANCE

SITE	DATE
D-9	8/25/2008
D-11	8/25/2008
D-15	8/25/2008
D-3	8/26/2008
D-5	8/26/2008
D-7	8/26/2008
D-2	8/27/2008
F-25	8/27/2008
D-9	9/17/2008
D-11	9/17/2008
D-15	9/17/2008
D-3	9/18/2008
D-5	9/18/2008
D-7	9/18/2008
D-2	9/19/2008
F-25	9/19/2008
D-2	10/15/2008
D-3	10/15/2008
D-5	10/15/2008
D-7	10/16/2008
D-9	10/16/2008
D-11	10/16/2008
D-15	10/17/2008
F-25	10/17/2008
D-2	11/18/2008
D-3	11/18/2008
D-9	11/18/2008
D-7	11/19/2008
D-11	11/19/2008
D-15	11/20/2008
F-25	11/20/2008
D-2	12/8/2008
D-3	12/8/2008
D-5	12/8/2008
D-7	12/9/2008
D-9	12/9/2008
D-11	12/9/2008
D-15	12/10/2008
F-25	12/10/2008
D-7	1/9/2009
D-11	1/9/2009
F-25	1/9/2009
D-2	1/21/2009
D-3	1/21/2009
D-5	1/21/2009
D-9	1/22/2009
D-15	1/22/2009
D-3	2/9/2009
D-2	2/10/2009
D-5	2/10/2009
D-9	2/17/2009
D-11	2/17/2009
D15	2/17/2009
D-7	2/18/2009
F-25	2/18/2009
D-11	3/13/2009
D-15	3/13/2009
F-25	3/13/2009
D-7	3/18/2009
D-9	3/18/2009
D-2	3/19/2009
D-3	3/19/2009
D-5	3/19/2009
D-11	4/14/2009
D-15	4/14/2009
D-7	4/20/2009
D-9	4/20/2009
D-2	4/21/2009
D-3	4/21/2009
D-5	4/21/2009
F-25	4/27/2009
D-2	5/18/2009
D-3	5/18/2009
D-11	5/18/2009
D-5	5/19/2009
D-7	5/19/2009
D-9	5/19/2009
D-15	5/20/2009
F-25	5/20/2009
D-9	7/27/2009
D-11	7/27/2009
D-7	7/29/2009
D-15	7/29/2009
F-25	7/29/2009
D-2	7/30/2009
D-3	7/30/2009
D-5	7/30/2009
D-5	11/19/2208

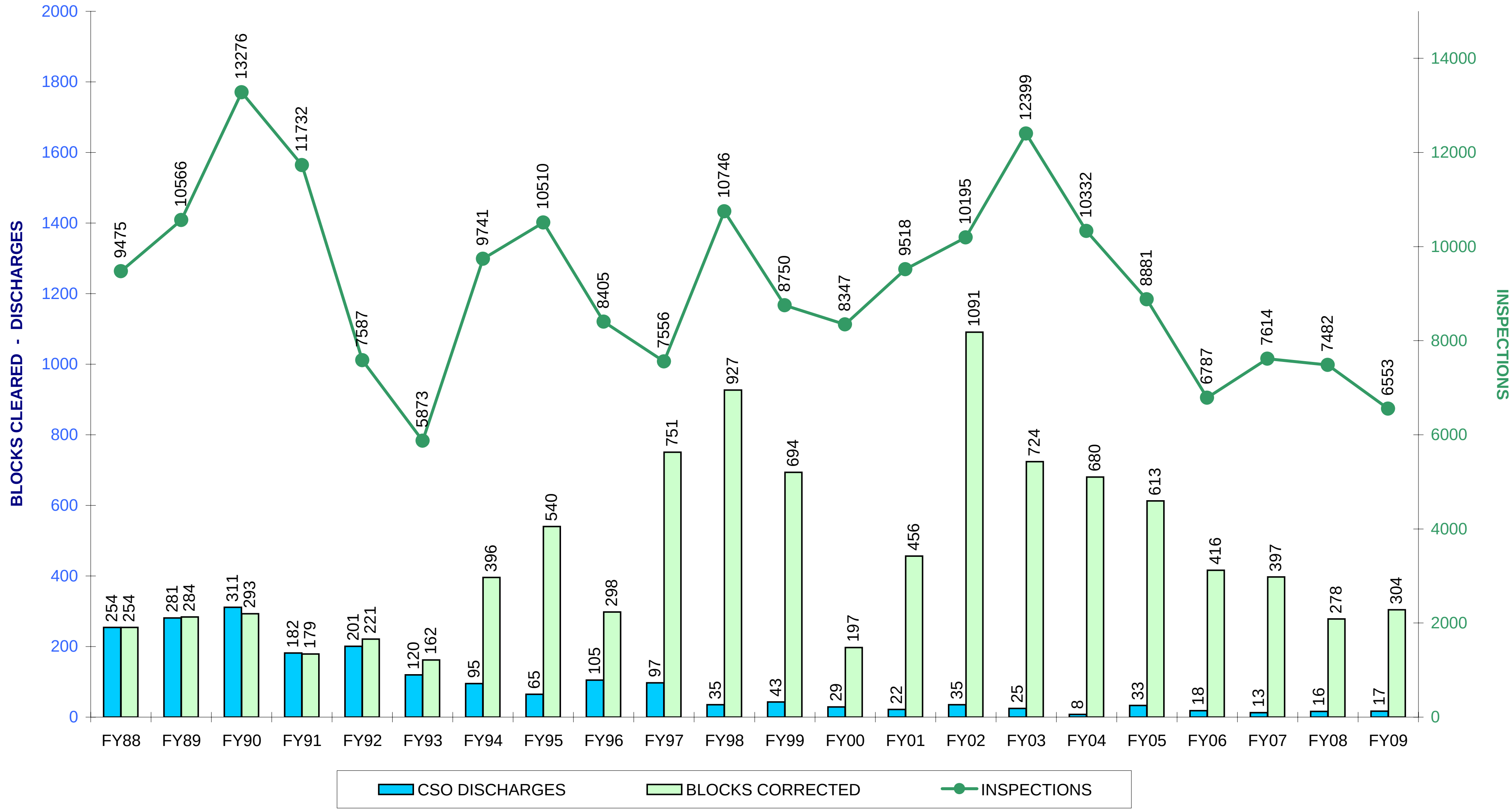
CSO OUTFALL - DEBRIS GRILL PREVENTATIVE MAINTENANCE

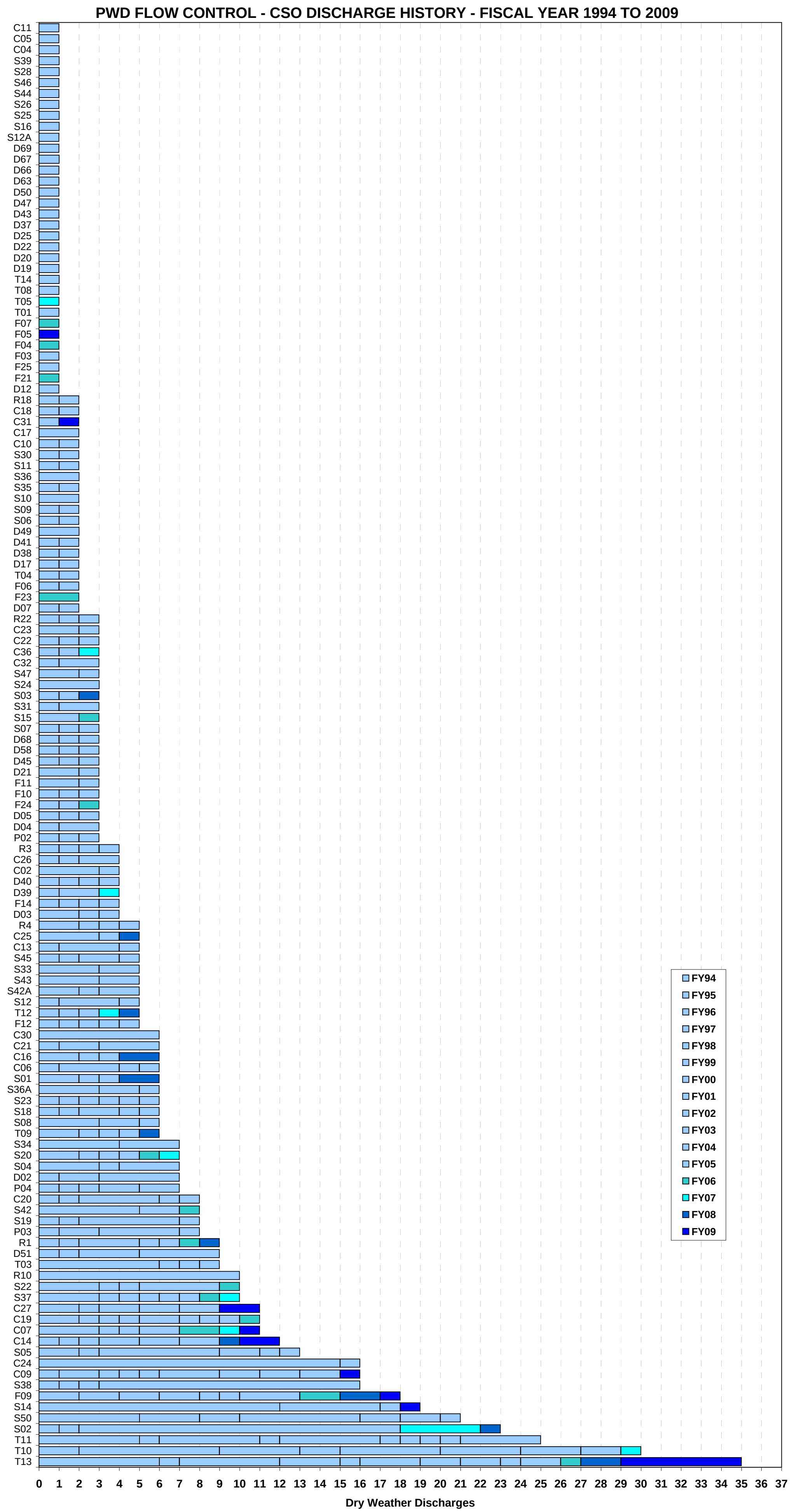
SITE	DATE
F-05	7/10/2008
T-08	7/16/2008
Sandy Run	7/18/2008
F-05	7/29/2008
F-05	8/12/2008
Sandy Run	8/21/2008
F-05	9/11/2008
T-08	9/17/2008
F-05	9/18/2008
Sandy Run	10/15/2008
F-05	10/16/2008
T-08	10/23/2008
Sandy Run	10/24/2008
F-05	10/29/2008
Sandy Run	11/20/2008
F-05	12/9/2008
Sandy Run	12/17/2008
F-05	12/26/2008
T-08	12/31/2008
F-05	2/10/2009
T-08	2/17/2009
F-05	3/9/2009
Sandy Run	3/13/2009
F-05	3/13/2009
F-05	4/13/2009
F-05	4/27/2009
F-05	5/8/2009
T-08	5/14/2009
T-08	5/29/2009
F-05	6/9/2009
T-08	6/9/2009
Sandy Run	6/11/2009
F-05	6/22/2009
T-08	6/25/2009
Sandy Run	6/26/2009
F-05	7/8/2009
Sandy Run	7/14/2009
T-08	7/15/2009
Sandy Run	7/23/2009
T-08	8/18/2009
Sandy Run	8/20/2009

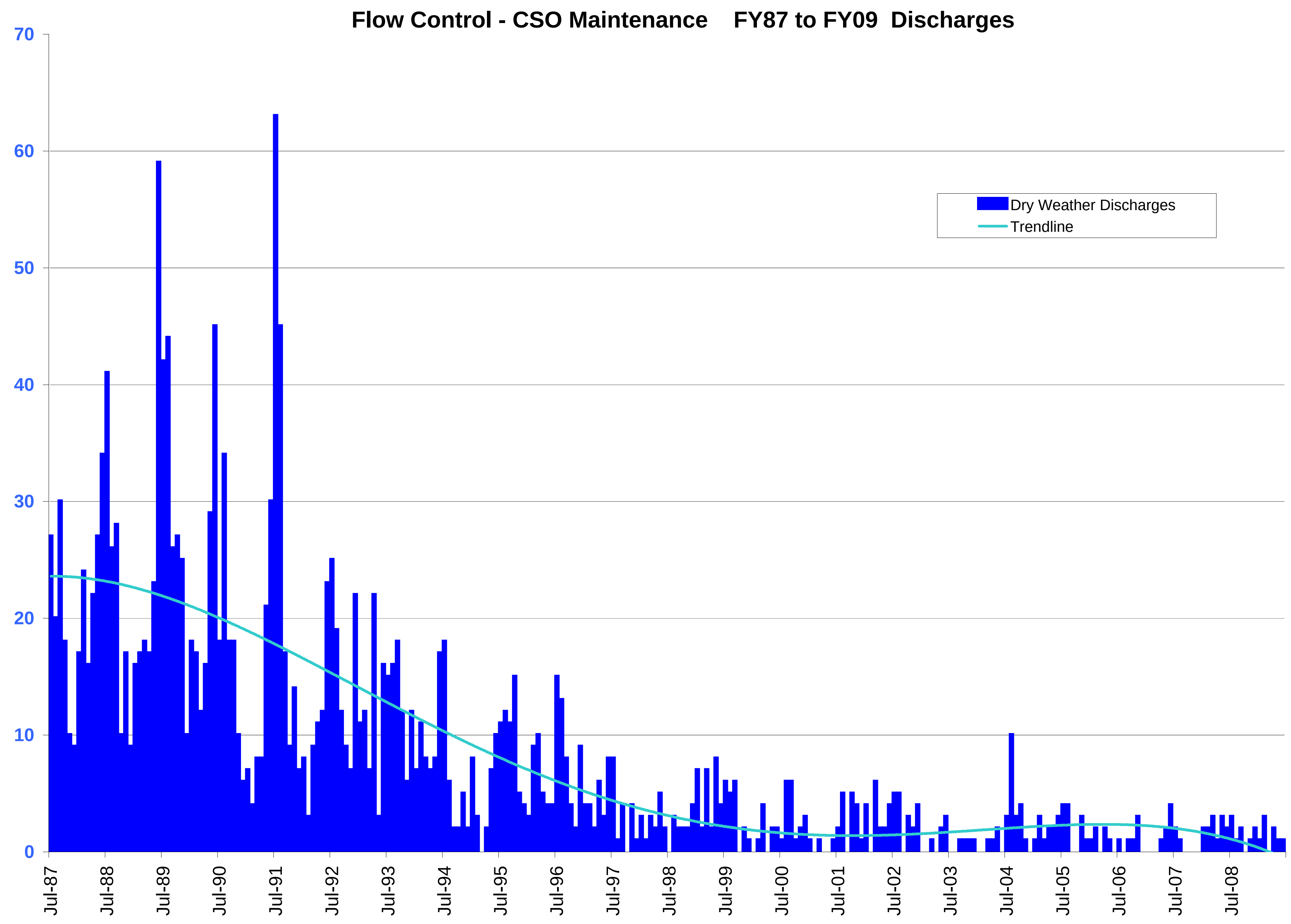
T-04 DEBRIS NET FLOATABLES REMOVAL

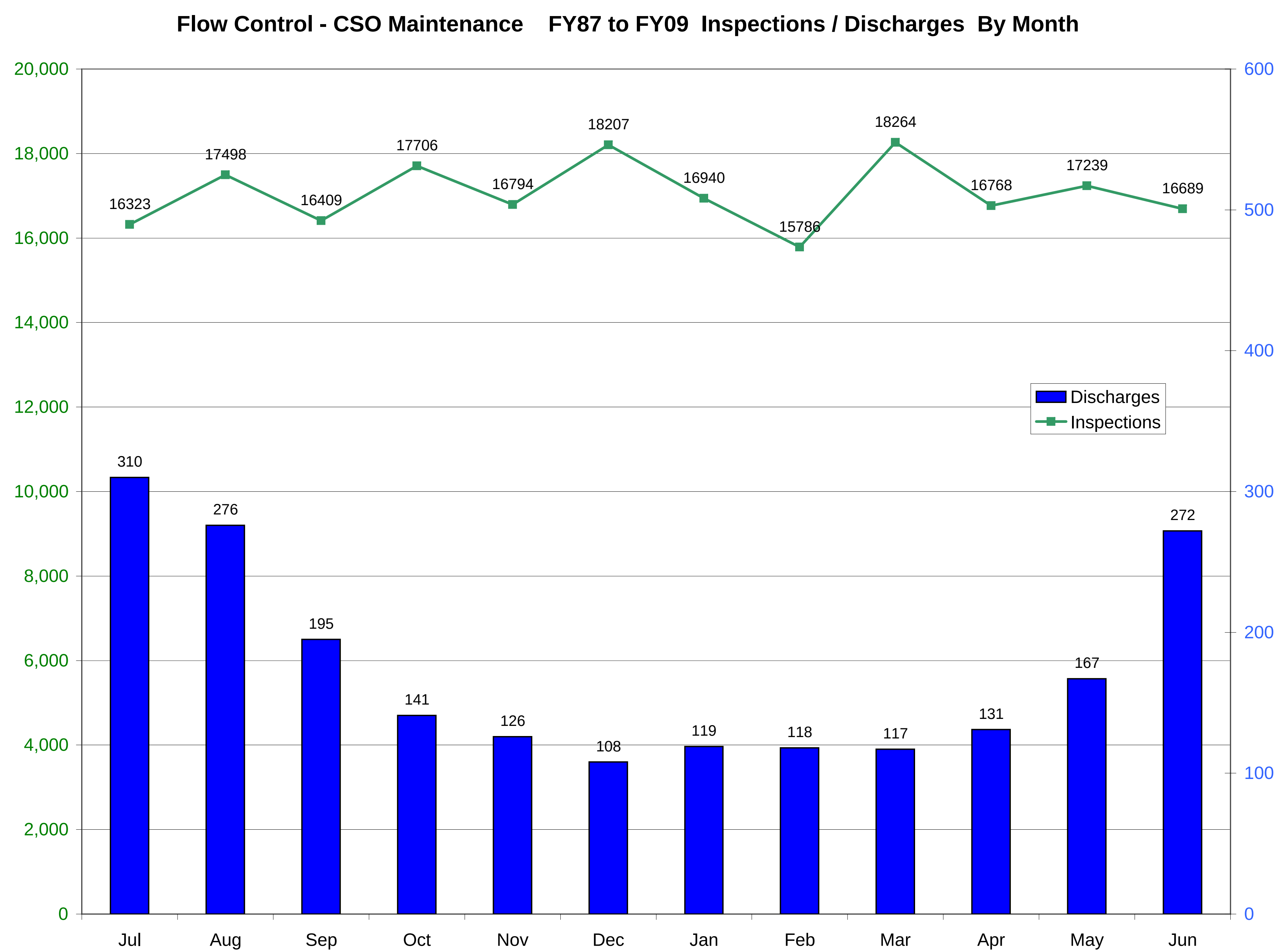
DATE	TOTAL WEIGHT
9/8/2008	81
12/13/2008	97
8/4/2009	57

FISCAL YEAR 2009
- ANNUAL REPORT FLOW CONTROL UNIT - CSO BLOCKAGES - DISCHARGES - INSPECTIONS




PWD FLOW CONTROL - CSO DISCHARGE HISTORY - FISCAL YEAR 1994 TO 2009
Dry Weather Discharges
FY94
FY95
FY96
FY97
FY98
FY99
FY00
FY01
FY02
FY03
FY04
FY05
FY06
FY07
FY08
FY09


Flow Control - CSO Maintenance FY87 to FY09 Discharges
70
60
50
40
30
20
10
0
Jul-87
Jul-88
Jul-89
Jul-90
Jul-91
Jul-92
Jul-93
Jul-94
Jul-95
Jul-96
Jul-97
Jul-98
Jul-99
Jul-00
Jul-01
Jul-02
Jul-03
Jul-04
Jul-05
Jul-06
Jul-07
Jul-08
Dry Weather Discharges
Trendline



Flow Control - CSO Maintenance FY87 to FY09 Inspections / Discharges By Month
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
600
500
400
300
200
100
0
16323
17498
16409
17706
16794
18207
16940
15786
18264
16768
17239
16689
310
276
195
141
126
108
119
118
117
131
167
272
Discharges
Inspections
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun

APPENDIX B – WISSAHICKON CREEK WATERSHED: TOTAL MAXIMUM DAILY LOAD (TMDL) SEDIMENT MONITORING REPORT

Wissahickon Creek Watershed:
Total Maximum Daily Load (TMDL)
Sediment Monitoring Report

Prepared By:

Philadelphia Water Department
Office of Watersheds
2/10/09

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LIST OF FIGURES

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Appendix B - Bank Pin Photos and Bank Profiles

Appendix C – Number of Bank Pin Sites Rationale

Appendix D – Bank Pin Monitoring Interval

Section 1: Introduction

The Wissahickon Total Maximum Daily Load (TMDL) for Siltation was established in 2003 under the direction of the United States Environmental Protection Agency (US EPA). Because the Wissahickon Creek watershed is considered an "urbanized" area subject to coverage by MS4 stormwater permits, all sources of siltation to Wissahickon Creek and tributaries (i.e., overland flow and stream bank erosion) are considered by EPA as point sources (USEPA, 2003). The Philadelphia Water Department (PWD) has developed and implemented a program designed to achieve the first goal of the Wissahickon TMDL for Siltation, which requires PWD "to establish baseline data on Philadelphia's contribution of sediment loading and flow variations". PWD conducted a study to identify 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 continued through August 2008, included an evaluation of the tributaries that have the greatest potential for improvement through implementation of BMPs and/or other methods. The stream assessment techniques used to estimate sediment load originating from stream bank erosion are discussed in this report. The following provides a summary of the major elements, actions, and findings of the sediment load study of Wissahickon tributaries.

Section 2: Methods

2.1 BEHI and NBS Assessments

PWD employed the Bank Assessment for Non-point source Consequences of Sediment (BANCS) Model as defined by Rosgen (1996) to predict erosion rates and classify tributary erosion potential of the tributaries. The BANCS method utilizes two bank erosion estimation tools: the Bank Erosion Hazard Index (BEHI) and Near Bank Stress (NBS). The BEHI is an assessment tool that allows the erosion potential of a stream bank to be quantified. The NBS method evaluates the amount of shear stress along the stream bank. BEHI and NBS methods were used to assess 368 stream segments in 12 tributaries to the Wissahickon Creek. Stream segments were determined by grouping like BEHI characteristics into individual segments. Paper Mill Run was included in the BEHI and NBS evaluation but was not included in any other aspects of the study. Paper Mill Run is a tributary located in the northern portion of Philadelphia County and only a small portion of this tributary is contained within Philadelphia County. Reaches were assessed based on visual inspection of obvious signs of erosion.

At each assessment location, a specific value and index score were assigned to the bank for the five different BEHI categories. The five categories included in the BEHI Rating Guide are Bank Height to Bankfull Height ratio, Root Depth to Bank Height ratio, Root Density, Bank Angle and Surface Protection (Worksheet 5-8 in Appendix A). Bankfull stage has been defined in many ways, but the commonly accepted definition provided here by Dunne and Leopold (1978) was used for this study:

"*The bankfull stage corresponds to the discharge at which channel maintenance is the most effective, that is, the discharge at which moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work that results in the average morphologic characteristics of channels*."

The field identification of the bankfull stage was defined by the location of the incipient elevation on the bank where flooding begins (Rosgen, 1996). The bankfull stage is used to calculate the bankfull height by subtracting the reference elevation at bank toe from the bankfull stage (Rosgen, 2006). The five categories were summed, a bank material adjustment was applied, and the final total score was classified as very low, low, moderate, high, very high or extreme (BEHI rating).

In conjunction with the BEHI assessment, the banks were also assessed with the Near Bank Stress method. For the purposes of this study, Methods 1 and 5 were used most frequently (Worksheet 5-9 in Appendix A). Method 1 consisted of field reconnaissance to observe the presence or lack of presence of transverse bars, chute cutoffs and extensive deposition (Rosgen, 2006). Method 5 calculated the near-bank maximum bankfull depth to mean depth from a riffle cross-section (Rosgen, 2006). Methods 1 and 5 were chosen because these methods were both easily measured in the field and time efficient.

After the BEHI and NBS evaluations were completed, the total length of stream bank assessed was compared to the total tributary length within Philadelphia city limits.

2.2 Visual Assessment

In order to more accurately estimate a sediment load from the Wissahickon tributaries, PWD performed a modified visual BEHI assessment of the remaining length of tributaries within Philadelphia city limits. Only a small percentage (16%) of total tributary length was assigned BEHI and NBS scores. The majority of the tributaries (70%) was evaluated with the visual assessment, or not assessed (14%) due to manmade channelization (Figure 2.2.1). Modified visual assessments were meant to be rapid assessments and relied on a combination of bank angle, weighted root density, surface protection, and the best professional judgment of the PWD staff to categorize a bank as having very low, low, moderate, high, very high, or extreme erosion potential. Modified visual assessments incorporated both field and desktop evaluation components.

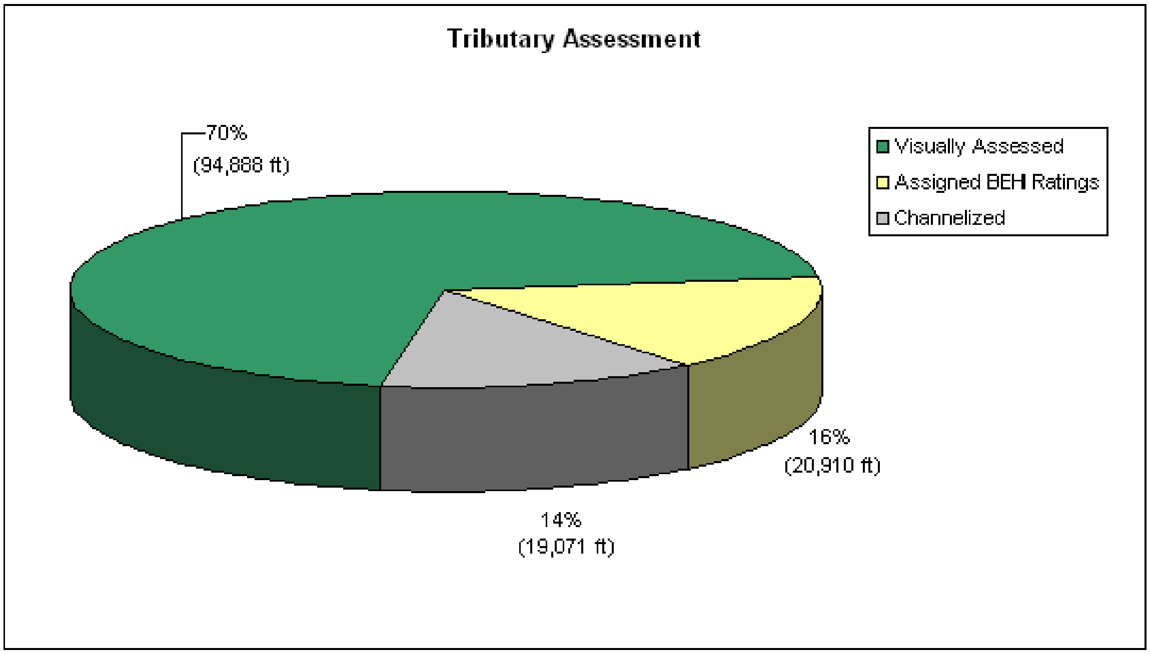

Figure 2.2.1: Relative proportion of tributary stream miles assessed with BEHI and NBS methods, visual assessment, or not assessed due to channelization

Table 2.2.1: Wissahickon Creek tributary stream length assessed with BEHI and NBS method, visual assessment, or not assessed due to channelization

Tributary	Drainage Area acres	Stream Length ft	BEHI Erosion Bank Length ft	Modified BEHI Assessment Bank Length Method 1 ft	Method 2 ft	Method 3 ft	Channelized Bank Length ft
Bells Mill	323	6,722	4,021	0	9,151	0	271
Cathedral	160	2,790	2,400	0	3,090	0	91
Creshiem	1,218	16,431	4,002	10,548	10,578	3,613	4,120
Gorgas Lane	499	2,170	1,101	3,036	0	0	203
Hillcrest	217	5,272	189	137	4,387	0	5,829
Hartwell	144	3,530	859	3,104	1,051	1,767	278
Kitchens Lane	234	7,753	2,756	0	0	11,790	958
Monoshone	1,056	6,926	414	2,444	2,500	3,792	4,700
Thomas Mill	104	4,008	1,492	0	4,933	1,590	0
Valley Green	128	2,874	582	3037	0	884	1,245
Wises Mill	446	7,056	2,456	2,475	7,991	0	1,189
Rex Ave	137	1,903	637	0	1,315	1,854	0

Three different methods were used to perform the modified visual assessments. Method 1 included a field evaluation by PWD staff. Method 2 relied partially on a visual assessment and partially on a desktop evaluation of the site. Method 3 consisted strictly of a desktop evaluation of the site. The specific process for the visual BEHI assessment is described below. Banks were assigned low, moderate, high, or very high erosion potential categories based on Bank Erosion Hazard Index (BEHI) criteria (Rosgen 1996). A combination of bank angle, weighted root density, surface protection, and best professional judgment of the field crew were used to categorize a bank. Bank Height to Bankfull Height ratio was not considered feasible to assess. The modified visual BEHI assessment is described below:

Low Stream Bank Erosion Potential
A bank was categorized as low erosion potential if it fit any of the following 3 criteria:

Table 2.2.2: Low stream bank erosion potential criteria

Low Stream Bank Erosion Potential			
Criteria	**1**	**2**	**3**
Bank Angle	<20˚	<60˚	60-85˚
Weighted Root Density	>30%	>55%	>80%
Surface Protection	>30%	>55%	>80%

Surface protection and root density both dampen the erosive forces of streamflow on the stream bank. For the purpose of visually assessing the banks, these two criteria were assumed to compensate for each other. The following pictures are examples of banks that were assessed using BEHI methods described in Rosgen (1996). The low BEHI ranking that the bank received was the same ranking the bank would receive using the visual assessment method (Table 2.2.3).

Figure 2.2.2: BM414

Figure 2.2.3: BM422

Table 2.2.3: BEHI category and visual assessment category comparison for banks with "Low" erosion potential

Bank ID	Tributary	BEHI Category	Bank Angle Category	Weighted Root Density Category	Surface Protection Category	Visual Assessment Category
BM414	Bells Mill	Low	Low	Low	Low	Low
BM422	Bells Mill	Low	Low	Low	Low	Low
MN963	Monoshone	Low	Low	Low	Low	Low
TM512	Thomas Mill	Low	Low	Very Low	Very Low	Low
TM518	Thomas Mill	Low	Low	Low	Low	Low
WM637	Wises Mill	Low	Low	Very Low	Very Low	Low

Moderate Stream Bank Erosion Potential
Banks that did not fall into the low, high or very high stream bank erosion potential categories were determined to have moderate stream bank erosion potential.

The following pictures are examples of banks that were assessed using BEHI methods described in Rosgen (1996). The moderate BEHI ranking that the bank received was the same ranking the bank would receive using the visual assessment method (Table 2.2.4).

Figure 2.2.4: BM18

Figure 2.2.5: BM20

Table 2.2.4: BEHI category and visual assessment category comparison for banks with "Moderate" erosion potential

Bank ID	Tributary	BEHI Category	Bank Angle Category	Weighted Root Density Category	Surface Protection Category	Visual Assessment Category
BM18	Bells Mill	Moderate	High	Moderate	Low	Moderate
BM20	Bells Mill	Moderate	Moderate	Moderate	Moderate	Moderate
BM27	Bells Mill	Moderate	Moderate	Moderate	Low	Moderate
CC21	Cresheim	Moderate	High	Low	Low	Moderate
CC29	Cresheim	Moderate	High	Moderate	Low	Moderate

High Stream Bank Erosion Potential
A bank with a low bank angle was categorized as high erosion potential if it fit any of the following 4 criteria:

Table 2.2.5: High stream bank erosion potential criteria– low bank angle

High Stream Bank Erosion Potential				
Low Bank Angle				
Criteria	**1**	**2**	**3**	**4**
Bank Angle	<60˚	<60˚	<60˚	<60˚
Weighted Root Density	>5%	>55%	>15%	<30%
Surface Protection	<55%	<10%	<30%	<15%

A bank with a moderate/high bank angle was categorized as high erosion potential if it fit any of the following 5 criteria:

Table 2.2.6: High stream bank erosion potential criteria – moderate to high bank angle

High Stream Bank Erosion Potential					
Moderate to High Bank Angle					
Criteria	**1**	**2**	**3**	**4**	**5**
Bank Angle	>60˚	>60˚	>60˚	>60˚	>80˚
Weighted Root Density	<30%	<30%	<30%	30-55%	30-55%
Surface Protection	<30%	<30%	30-55%	<30%	30-55%

A bank with a very high bank angle was categorized as high erosion potential if it fit any of the following 3 criteria:

Table 2.2.7: High stream bank erosion potential criteria – very high bank angle

High Stream Bank Erosion Potential			
Very High Bank Angle			
Criteria	**1**	**2**	**3**
Bank Angle	>90˚	>90˚	>90˚
Weighted Root Density	30-55%	30-55%	15-30%
Surface Protection	30-55%	15-30%	30-55%

Additionally, any reach displaying high Near Bank Stress (NBS) (Rosgen 1996) characteristics may be designated as high bank erosion potential even if it does not meet aforementioned criteria. This designation was left to the best professional judgment of the field crew.

The following pictures are examples of banks that were assessed using BEHI methods described in Rosgen (1996). The high BEHI ranking that the bank received was the same ranking the bank would receive using the visual assessment method (Table 2.2.8).

Figure 2.2.6: BM16

Figure 2.2.7: BM31

Table 2.2.8: BEHI category and visual assessment category comparison for banks with "High" erosion potential

Bank ID	Tributary	BEHI Category	Bank Angle Category	Weighted Root Density Category	Surface Protection Category	Visual Assessment Category
BM16	Bells Mill	High	Moderate	Very High	Moderate	High
BM31	Bells Mill	High	High	High	Moderate	High
BM32	Bells Mill	High	Moderate	Very High	High	High
BM39	Bells Mill	High	Moderate	High	High	High
BM40	Bells Mill	High	High	High	High	High
CC19	Cresheim	High	Moderate	Extreme	High	High
CC20	Cresheim	High	Moderate	High	Moderate	High

Very High Stream Bank Erosion Potential

A bank was categorized as very high erosion potential if it fit any of the following 4 criteria

Table 2.2.9: Very high stream bank erosion potential criteria

Very High Bank Erosion Potential				
Criteria	**1**	**2**	**3**	**4**
Bank Angle	>60˚	>80˚	>90˚	>90˚
Weighted Root Density	>5%	<15%	15-30%	<15%
Surface Protection	<10%	<15%	<15%	<30%

The following pictures are examples of banks that were assessed using BEHI methods described in Rosgen (1996). The "very high" BEHI ranking that the bank received was the same ranking the bank would receive using the visual assessment method (Table 2.2.10).

Figure 2.2.8: CC9

Figure 2.2.9: CC23

Table 2.2.10: BEHI category and visual assessment category comparison for banks with "Very High" erosion potential

Bank ID	Tributary	BEHI Category	Bank Angle Category	Weighted Root Density Category	Surface Protection Category	Visual Assessment Category
CC9	Cresheim	Very High	Moderate	Extreme	Extreme	Very High
CC23	Cresheim	Very High	Moderate	Extreme	Extreme	Very High
TO6	Rex Avenue	Very High	Moderate	Extreme	Extreme	Very High

2.3 Comparison of BEHI and NBS Scores within Wissahickon Tributaries to Observed Erosion Rates in Colorado Streams

Predicted stream bank erosion rates for the Wissahickon tributaries were calculated based on a relationship between these BEHI and NBS scores and measured stream bank erosion rates from streams in Colorado (Rosgen, 1996). The predicted rate was multiplied by the bank height and length as well as a conversion factor to get a sediment load in tons per year.

A combination of the aforementioned assessment types was used to predict the sediment load originating from stream bank erosion (Appendix A).

2.4 Bank Profile Measurements

To field verify predictions made by the BANCS model, bank pins (18″ lengths of ½″ or 5/8″ iron rebar) were driven horizontally into the stream bank normal to the curve of the bank at the location where radius of curvature was minimized (most severe bend). At least one bank pin was installed below field-estimated bankfull elevation. Depending on bank height, one or two additional pins were installed, spaced no closer than 1 ft apart, such that the total number of bank pins at a site ranged from one to three (Figure 2.4.3). In order to enable measurement of lateral erosion, toe pins (12″ lengths of 5/8″ rebar) were also installed at each site. Toe pins were driven vertically into the stream bed at the toe of slope inline with the bank pins along a line normal to the curve in the bank (Figure 2.4.5). Toe pin locations were captured using GPS (Xplore technologies model iX140C2 tablet PC with GPS module) and yellow plastic survey caps were installed. To further assist field teams in re-locating bank pin sites, orange spray paint was applied to bank pins and survey flagging was hung from nearby vegetation.

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 stream bank erosion at selected sites within these tributaries. Photos of each bank pin site are included in Appendix B. A total of 82 bank pin sites were chosen to reflect varying BEHI and NBS scores in order to validate and calibrate an erosion rate prediction model (Appendix C). Bank pins were installed at 22 sites during fall 2005 and 60 sites during summer 2006 (Figure 2.4.1).

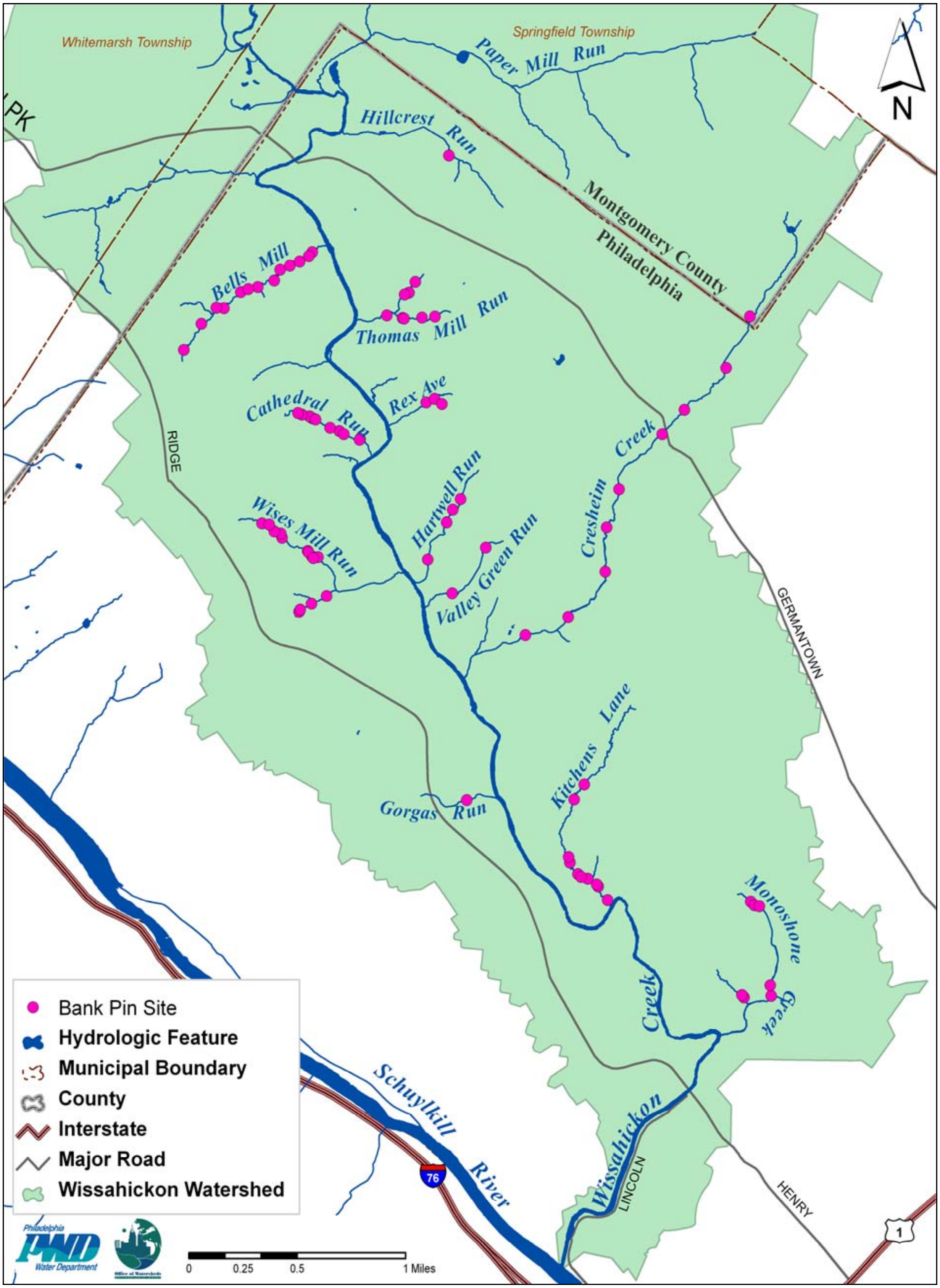

Figure 2.4.1: Bank pin locations

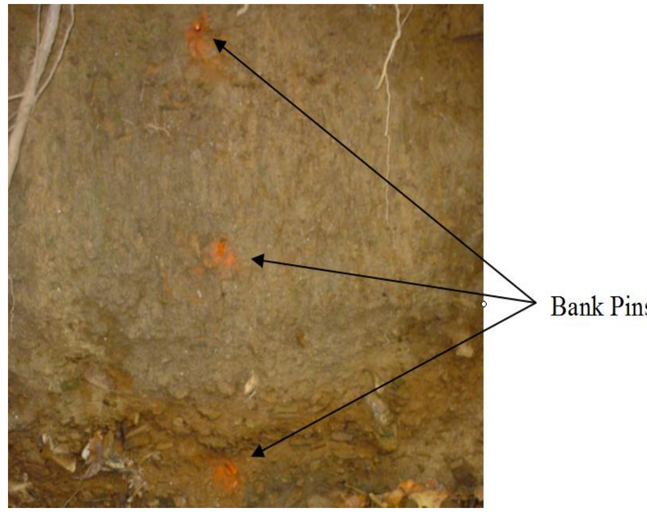

Figure 2.4.2: PWD Staff installing bank pin at site WM3, Wises Mill

Figure 2.4.3: Stream bank at site WM13 showing typical bank pin setup

Measurements were made using a survey rod (CRAIN, SFR Series Leveling Rod), a flexible "pocket rod" (Keson, Inc.) and two small cylindrical spirit levels. The survey rod was placed on the edge of the toe pin and held vertical using a level. The pocket rod was placed over the bank pin up against the bank and leveled with the second level. The distance from the bank to the edge of the survey rod closest to the bank was recorded on the field data sheet. Lateral erosion or aggradation of the stream bank was determined by measuring changes in bank pin distance from a line extending vertically from the toe pin (Figure 2.4.2). In order to obtain a better measurement of bank profile, a series of vertical reference points were measured in addition to the bank pins for several of the bank pin sites. These vertical reference points were measured at predetermined vertical points on the survey rod.

The measurement frequency for the bank pins varied throughout the duration of the study. Originally, the bank pins were measured quarterly to capture any seasonal effects. The frequency of measurements was then reduced to twice a year.

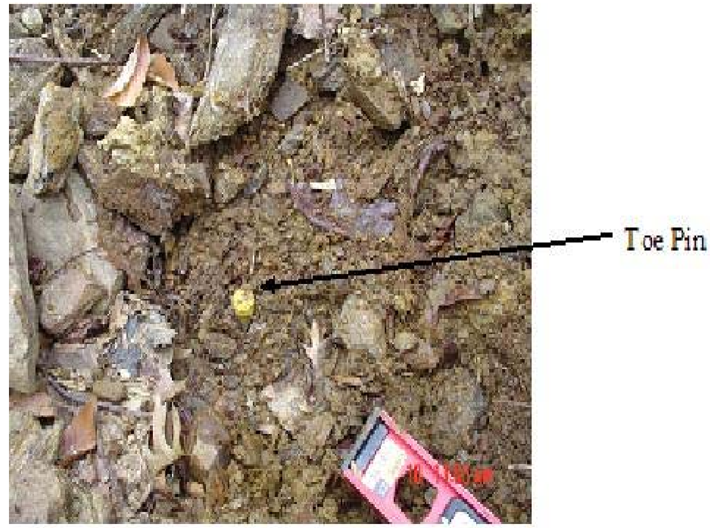

Figure 2.4.4: The survey rod measures the amount of exposed pin and the amount of lateral erosion upon re-survey

Figure 2.4.5: The toe pin is a permanent reference point for determining lateral erosion

2.5 Lateral Erosion Rate Calculations

Bank profiles at bank pin sites were measured semi-annually to determine erosion rates. Erosion rates were calculated by entering the bank profile measurements into RIVERMorph 4.0 (RIVERMorph, LLC). RIVERMorph's 'Banks' module was used to estimate the lateral erosion rate for all of the bank pin locations. The estimated sediment load was then calculated (Equation 1).

Bank Erosion (lb/yr) = 96.3 (BLH) *where*: **(eq. 1)**

Sediment Density = 96.3 lb/ft^3 (Rosgen, 1996)
B = Average Lateral Erosion Rate (ft/yr)
L = Bank Length (ft)
H = Bank Height (ft)

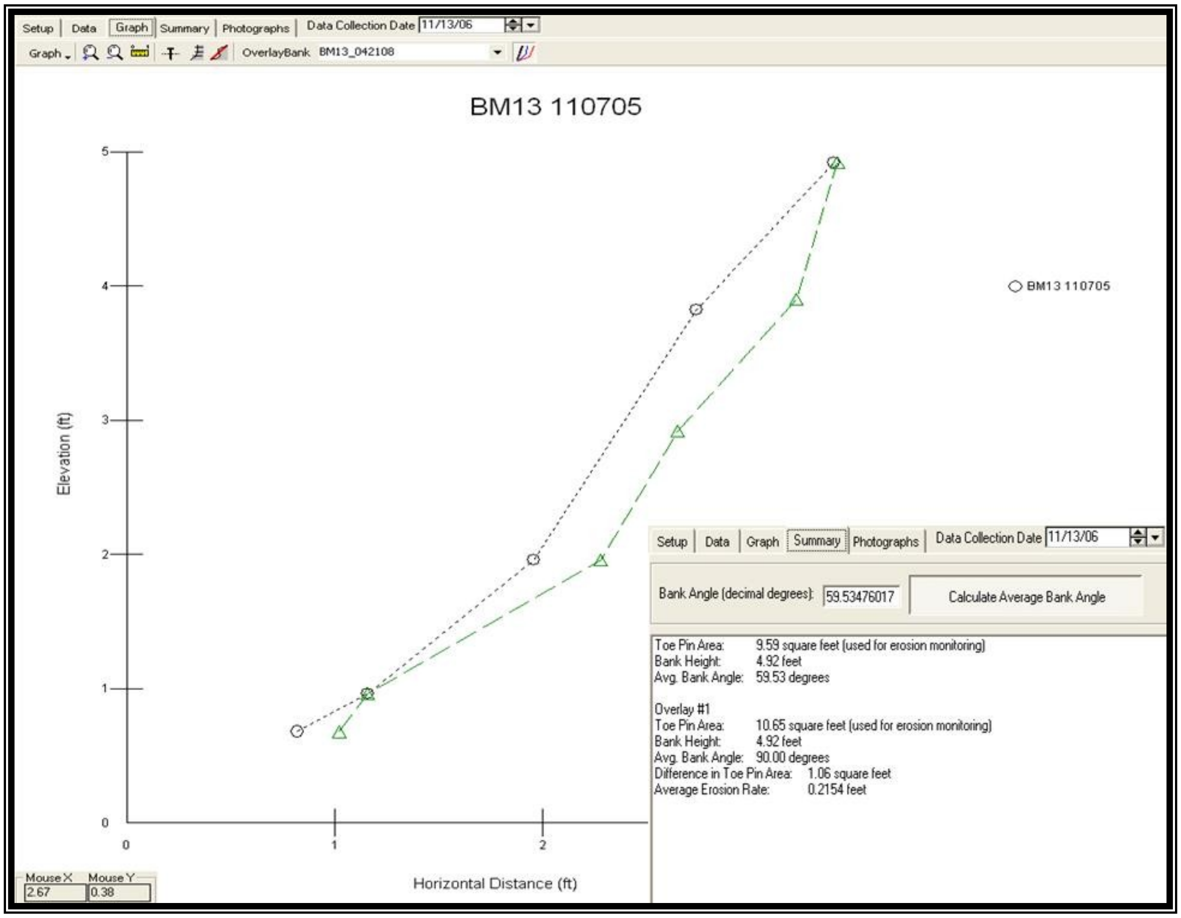

Figure 2.5.1: RIVERMorph screenshot of bank profile overlay

Figure 2.5.1 displays a screenshot from RIVERMorph showing a bank overlay of two rounds of measurements from bank pin location BM13. The lower right-hand corner of Figure 2.5.1 shows the bank pin calculations automatically produced in RIVERMorph. Bank profiles for each bank pin location are included in Appendix B.

2.6 Extrapolated Erosion Estimate

The BANCS model contains an underlying assumption that bank pin locations rated using the BEHI scale represent distinct individual populations. Erosion rates for banks that were not represented by bank pin location were determined by applying the average lateral erosion rate measured at bank pin locations, as grouped by BEHI class. Bank pin monitoring locations were initially distributed among three groups: Low, Moderate, and High. The Low group included the Very Low and Low BEHI bank pin locations. The Moderate group included the Moderate BEHI bank pin locations. The High group included the High and Very High BEHI bank pin locations. Basic descriptive statistics were determined (Mean, Median, Variance, Standard Deviation, Standard Error, Skewness, Kurtosis). To test the validity of the individual subpopulations as determined by BEHI class assumption, the dataset was assessed using Kruskal-Wallis ANOVA and the Median Test.

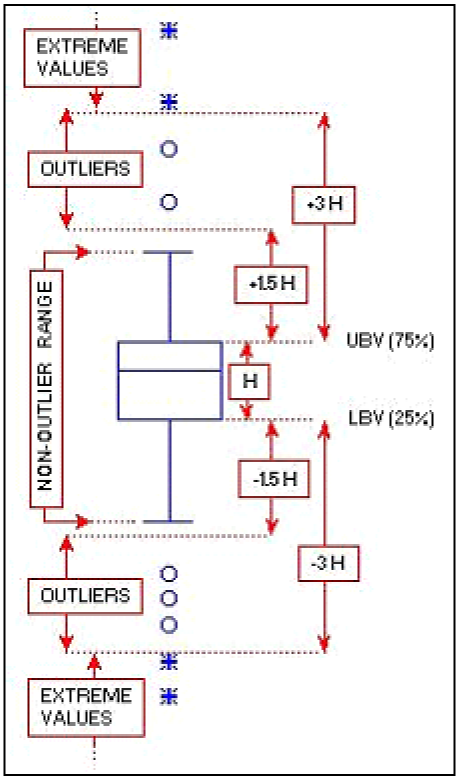

Figure 2.6.1: Statistical outliers

All group pairings were evaluated using Kruskal-Wallis ANOVA and the Median Test (Low-Moderate, Moderate-High, Low-High) to confirm population independence at the 90% confidence level in either the Kruskal-Wallis or Median test. For each group, outliers were identified and removed. Outliers have been defined using various assumptions and techniques. For the purposes of this study, an outlier was defined as a value that was outside the interquartile range (H) by more than one and half times the interquartile range. An extreme value was defined as a value that was outside the interquartile range (H) by three times the interquartile range (Figure 2.6.1). After outliers were removed, the average lateral erosion rate and associated 90% confidence interval were calculated for each group. The average lateral erosion rate for each group was applied to all stream banks in determining the bank erosion loading (Equation 1). Total bank erosion was obtained by summing the loading of each group.

Section 3: Results

3.1 Predicted Stream Bank Erosion Rates

The BEHI and NBS scores of Wissahickon tributary sites were used with a relationship established with Colorado Reference Stream data (Rosgen 1996) to predict the sediment load originating from stream bank erosion (Table 3.1.1). The total sediment load predicted for 12 Wissahickon tributaries within Philadelphia County was 4.2 millions pounds per year.

Table 3.1.1: Wissahickon tributary stream bank erosion loading estimated via Colorado reference stream relationship

Tributary	BEHI Erosion lb/yr	Modified Visual BEHI Assessment lb/yr	Total Erosion lb/yr	Erosion Per Foot of Eroding Stream Length lb/ft/yr
Bells Mill	290,000	310,000	590,000	110
Cathedral	61,000	300,000	360,000	130
Cresheim	130,000	740,000	870,000	94
Gorgas Lane	67,000	310,000	380,000	190
Hillcrest	28,000	160,000	190,000	59
Hartwell	820	62,000	63,000	22
Kitchens Lane	110,000	260,000	370,000	53
Monoshone	11,000	140,000	150,000	43
Thomas Mill	56,000	300,000	350,000	88
Valley Green	81,000	210,000	220,000	99
Wises Mill	100,000	310,000	410,000	65
Rex Ave	31,000	210,000	240,000	120

3.2 Bank Erosion Loading Estimates

Bank pins were installed in 82 locations to measure erosion at varying BEHI and NBS combinations. Wise's Mill site WM2040 was destroyed, bringing the total to 81 sites. By August 2008, each bank pin site had been installed for a minimum of two years. A toe pin could not be located during at least one round of measurements for 21 different sites. The longest monitoring interval measured at each bank pin location is listed in Appendix D.

The sample (n=81) did not exhibit characteristics emblematic of a normally distributed population (Skewness = -5.60, Kurtosis = 43.29). Kruskal-Wallis and the Median Test confirmed that both the Moderate-High (p=0.2130, p=0.0398) and the Low-High (p=0.0460, 0.0398) pairings represented valid independent groups. However, the Low-Moderate grouping was not determined to be independent by Kruskal-Wallis (0.4984) or the Median Test (p=0.6855). Extrapolated erosion estimates were conducted using reclassified groupings of 'Low' (n=53), which contained both of the original Low and Moderate groups, and 'High' (n=28), which contained the original High group. Outlier analysis revealed four outliers in the 'Low' group (WM2160, CC64, HW177, BM25) and three outliers in the 'High' group (WM13, CC11, BM35) (Figure 3.2.1).

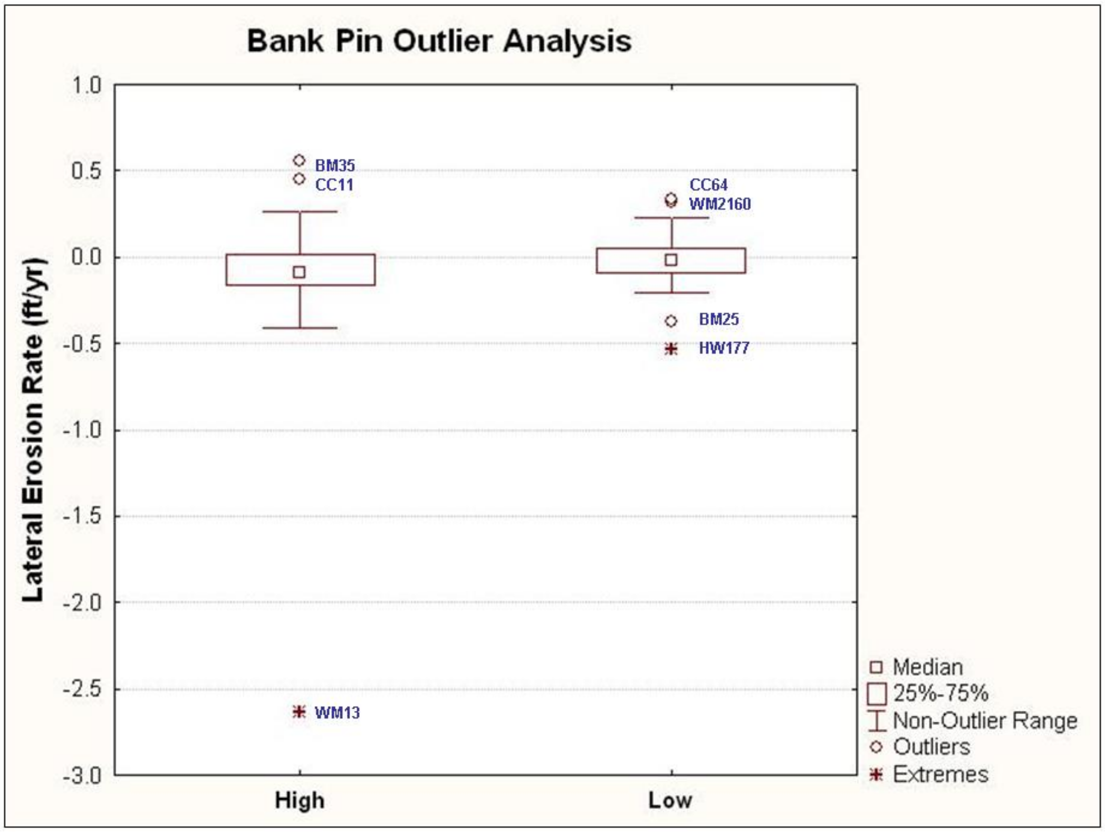

Figure 3.2.1: Bank pin outlier analysis

The individual 'Low' and 'High' groups gave average lateral erosion rates of -0.018 ft (+/-0.024 ft/yr) and -0.092 ft/yr (+/- 0.077 ft/yr) respectively (Table 3.2.1). The extrapolated erosion produced an annual loading of 2.1 million pounds per year (+/- 1.7 million pounds per year) (Table 3.2.2).

Table 3.2.1 - Average lateral erosion rates grouped by BEHI

Group	n	Outliers	Average Lateral Erosion Rate (ft/yr)	95% Confidence Interval (ft/yr)
Low	49	4	-0.018	+/- 0.024
High	25	3	-0.092	+/- 0.077

Table 3.2.2: Wissahickon tributary stream bank erosion estimate – BEHI grouping estimate

Tributary	BEHI Erosion lb/yr	Modified BEHI Assessment Erosion lb/yr	Total Erosion lb/yr
Bells Mill	48,000	110,000	150,000
Cathedral	84,000	71,000	160,000
Cresheim	77,000	450,000	530,000
Gorgas Lane	42,000	120,000	160,000
Hillcrest	1,900	27,000	28,000
Hartwell	19,000	88,000	110,000
Kitchens Lane	55,000	120,000	170,000
Monoshone	8,000	49,000	57,000
Thomas Mill	34,000	130,000	170,000
Valley Green	9,800	92,000	100,000
Wises Mill	280,000	120,000	400,000
Rex Ave	22,000	80,000	100,000
Total	**680,000**	**1,500,000**	**2,100,000 +/- 1,700,000**

In order to assess the normalized erosion potential of each tributary, the erosion rate per acre of drainage area per year and the erosion per foot of stream length per year were calculated (Table 3.2.3). This allowed direct comparison between each of the tributaries. For example, Cresheim Creek had the highest total erosion at 450,000 pounds of sediment per year simply because it was the longest tributary within Philadelphia County. After the erosion per foot of stream length was calculated, Cresheim Creek ranked seventh out of the twelve tributaries.

Table 3.2.3: Erosion per drainage area and stream length

Tributary	Drainage Area, Acres	Stream Length, feet	Erosion Rate, lb/yr	Erosion Per Acre of Drainage Area, lb/ac/yr	Erosion Per Foot of Stream Length, lb/ft/yr
Bells Mill	323	6,722	150,000	460	22
Cathedral	160	2,790	160,000	1000	57
Cresheim	1,218	16,431	530,000	440	32
Gorgas Lane	499	2,170	160,000	320	74
Hartwell	217	3,530	28,000	130	8
Hillcrest	144	5,272	110,000	760	21
Kitchens Lane	234	7,753	170,000	730	22
Monoshone	1,056	6,926	57,000	54	8
Thomas Mill	104	4,008	170,000	1,600	42
Valley Green	128	2,874	100,000	780	35
Wises Mill	446	7,056	400,000	900	57
Rex Ave	137	1,903	100,000	730	53

Figure 3.2.2 and Figure 3.2.3 illustrate the erosion per acre of drainage area per year and the erosion per foot of stream length per year.

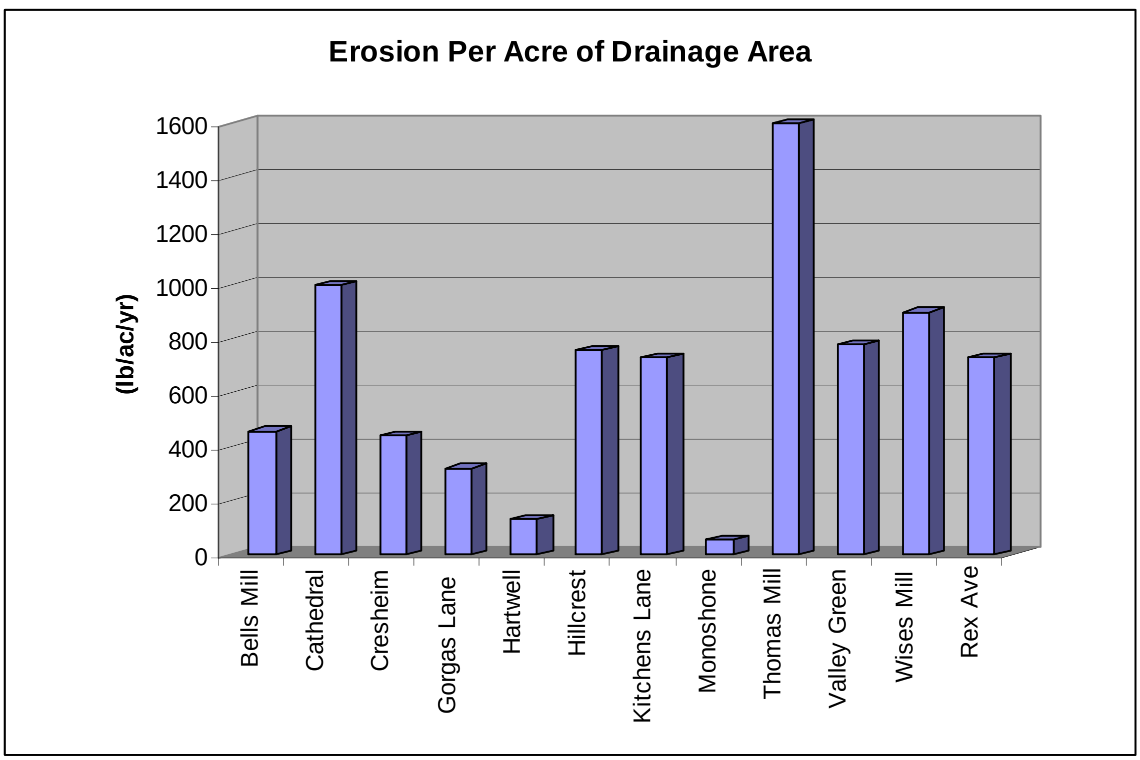

Figure 3.2.2: Erosion per acre of drainage area

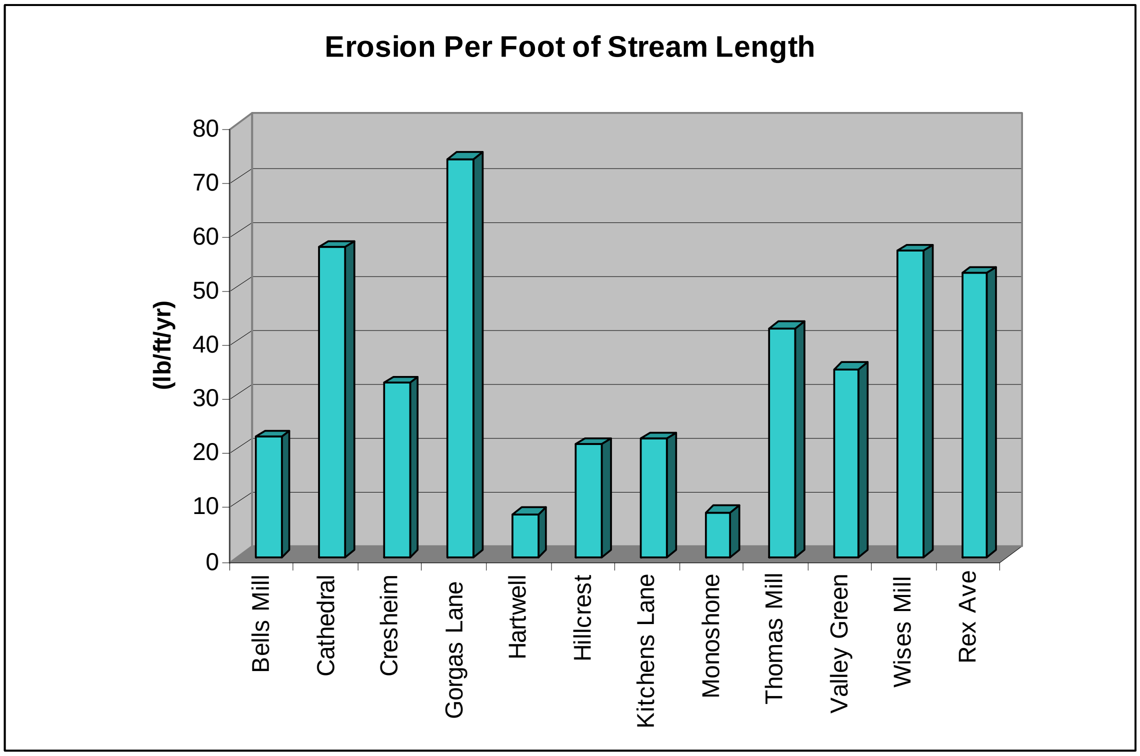

Figure 3.2.3: Erosion per foot of stream length

Section 4: Discussion

The average annual estimate of 2.1 million pounds per year of erosion represents a large loading of sediment that could migrate from the tributaries in Philadelphia County to the mainstem of Wissahickon Creek. This study represents the most accurate sediment load estimate to date, with methods being implemented based on standardized field assessments and empirical data collected over a two year period (August, 2006 to August, 2008). The Philadelphia Water Department (PWD) plans to continue its field measurements and refine its loading estimates during the preliminary phase of the study in addition to the post-BMP implementation phase of the program.

Based on the initial loading estimates, PWD has adopted an aggressive stream restoration strategy designed at targeting subwatersheds to the Wissahickon Creek within the County of Philadelphia. The guiding tenet of this strategy is that the City can mitigate the effects of stormwater through natural stream channel design (NSCD) and land-based best management practices (BMPs) within its MS4 system. PWD has determined that through the implementation of stream restoration and wetland creation projects, a significant reduction of sediment load from stream bank erosion could be achieved.

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APPENDIX A

WARSSS WORKSHEETS AND ROSGEN FIGURES

Worksheet 5-8. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating (Rosgen, 1996, 2001a). Use **Figure 5-19** with BEHI variables to determine BEHI score.

Stream:		Location:
Station:		Observers:
Date:	Stream Type:	Valley Type:

BEHI Score (Fig. 5-19)

Study Bank Height / Bankfull Height (C)

Study Bank Height (ft) =	(A)	**Bankfull Height** (ft) =	(B)	(A) / (B) =	(C)	

Root Depth / Study Bank Height (E)

Root Depth (ft) =	(D)	**Study Bank Height** (ft) =	(A)	(D) / (A) =	(E)	

Weighted Root Density (G)

Root Density as % =	(F)	(F) x (E) =	(G)	

Bank Angle (H)

Bank Angle as *Degrees* =	(H)	

Surface Protection (I)

Surface Protection as % =	(I)	

Bank Material Adjustment:

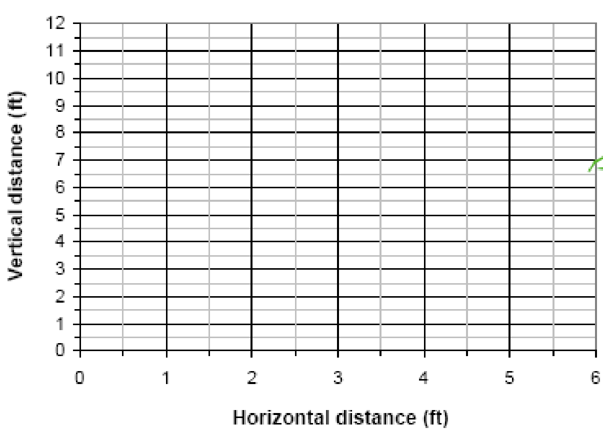
- Bedrock (Overall Very Low BEHI)
- Boulders (Overall Low BEHI)
- Cobble (Subtract 10 points if uniform medium to large cobble)
- Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand)
- Sand (Add 10 points)
- Silt/Clay (no adjustment)

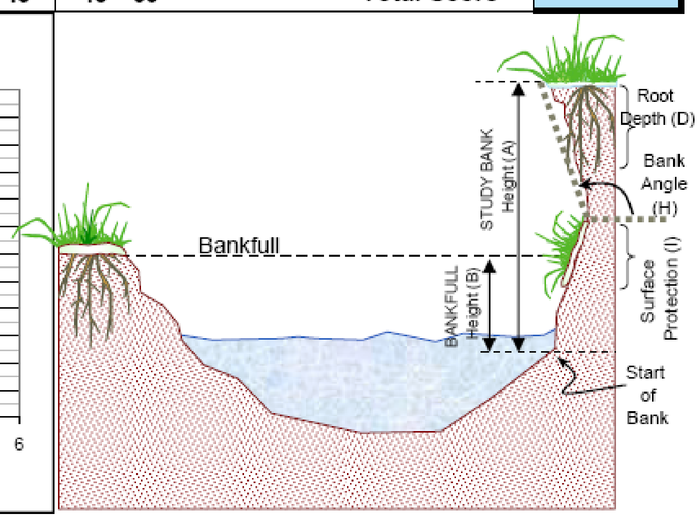
Bank Material Adjustment

Stratification Adjustment
Add 5–10 points, depending on position of unstable layers in relation to bankfull stage

Very Low	Low	Moderate	High	Very High	Extreme	**Adjective Rating and Total Score**
5 – 9.5	10 – 19.5	20 – 29.5	30 – 39.5	40 – 45	46 – 50	

Bank Sketch





Worksheet 5-9. Various field methods of estimating Near-Bank Stress (NBS) risk ratings to calculate erosion rate.

Estimating Near-Bank Stress (NBS)

Stream:	Location:	
Station:	Stream Type:	Valley Type:
Observers:		Date:

Methods for estimating Near-Bank Stress (NBS)

(1) Channel pattern, transverse bar or split channel/central bar creating NBS..........	Level I	Reconaissance
(2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf})...	Level II	General prediction
(3) Ratio of pool slope to average water surface slope (S_p / S)..	Level II	General prediction
(4) Ratio of pool slope to riffle slope (S_p / S_{rif})...	Level II	General prediction
(5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf})......................	Level III	Detailed prediction
(6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf})...........................	Level III	Detailed prediction
(7) Velocity profiles / Isovels / Velocity gradient..	Level IV	Validation

Level I

(1)
- Transverse and/or central bars-short and/or discontinuous.......... ....NBS = High / Very High
- Extensive deposition (continuous, cross-channel)... ....NBS = Extreme
- Chute cutoffs, down-valley meander migration, converging flow.......................................NBS = Extreme

Level II

(2)	Radius of Curvature R_c (ft)	Bankfull Width W_{bkf} (ft)	*Ratio* R_c / W_{bkf}	Near-Bank Stress (NBS)

(3)	Pool Slope S_p	Average Slope S	*Ratio* S_p / S	Near-Bank Stress (NBS)

(4)	Pool Slope S_p	Riffle Slope S_{rif}	*Ratio* S_p / S_{rif}	Near-Bank Stress (NBS)

Dominant Near-Bank Stress

Level III

(5)	Near-Bank Max Depth d_{nb} (ft)	Mean Depth d_{bkf} (ft)	*Ratio* d_{nb} / d_{bkf}	Near-Bank Stress (NBS)

(6)	Near-Bank Max Depth d_{nb} (ft)	Near-Bank Slope S_{nb}	Near-Bank Shear Stress τ_{nb} (lb/ft^2)	Mean Depth d_{bkf} (ft)	Average Slope S	Bankfull Shear Stress τ_{bkf} (lb/ft^2)	Ratio τ_{nb} / τ_{bkf}	Near-Bank Stress (NBS)

Level IV

(7)	Velocity Gradient (ft / sec / ft)	Near-Bank Stress (NBS)

Converting values to a Near-Bank Stress (NBS) rating

Near-Bank Stress (NBS) ratings	Method number (1)	(2)	(3)	(4)	(5)	(6)	(7)
Very Low	N / A	> 3.00	< 0.20	< 0.40	< 1.00	< 0.80	< 0.50
Low	N / A	2.21 – 3.00	0.20 – 0.40	0.41 – 0.60	1.00 – 1.50	0.80 – 1.05	0.50 – 1.00
Moderate	N / A	2.01 – 2.20	0.41 – 0.60	0.61 – 0.80	1.51 – 1.80	1.06 – 1.14	1.01 – 1.60
High	See	1.81 – 2.00	0.61 – 0.80	0.81 – 1.00	1.81 – 2.50	1.15 – 1.19	1.61 – 2.00
Very High	(1)	1.50 – 1.80	0.81 – 1.00	1.01 – 1.20	2.51 – 3.00	1.20 – 1.60	2.01 – 2.40
Extreme	Above	< 1.50	> 1.00	> 1.20	> 3.00	> 1.60	> 2.40

Overall Near-Bank Stress (NBS) rating	

Worksheet 5-10. Summary form of annual streambank erosion estimates for various study reaches.

Stream:				Location:		
Graph Used:		Stream Type:		Total Bank Length (ft):		
Observers:			Valley Type:		Date:	
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Station (ft)	**BEHI rating (Worksheet 5-8) (adjective)**	**NBS rating (Worksheet 5-9) (adjective)**	**Bank erosion rate (Figure 5-38 or 5-39) (ft/yr)**	**Length of bank (ft)**	**Study bank height (ft)**	**Erosion subtotal [(4)X(5)X(6)] (ft^3/yr)**
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
Sum erosion subtotals in Column (7) for each BEHI/NBS combination					**Total erosion (ft^3/yr)**	
Convert erosion in ft^3/yr to yds^3/yr {divide Total erosion (ft^3/yr) by 27}					**Total erosion (yds^3/yr)**	
Convert erosion in yds^3/yr to tons/yr {multiply Total erosion (yds^3/yr) by 1.3}					**Total erosion (tons/yr)**	
Calculate erosion per unit length of channel {divide Total erosion (tons/yr) by total length of stream (ft) surveyed}					**Total erosion (tons/yr/ft)**	

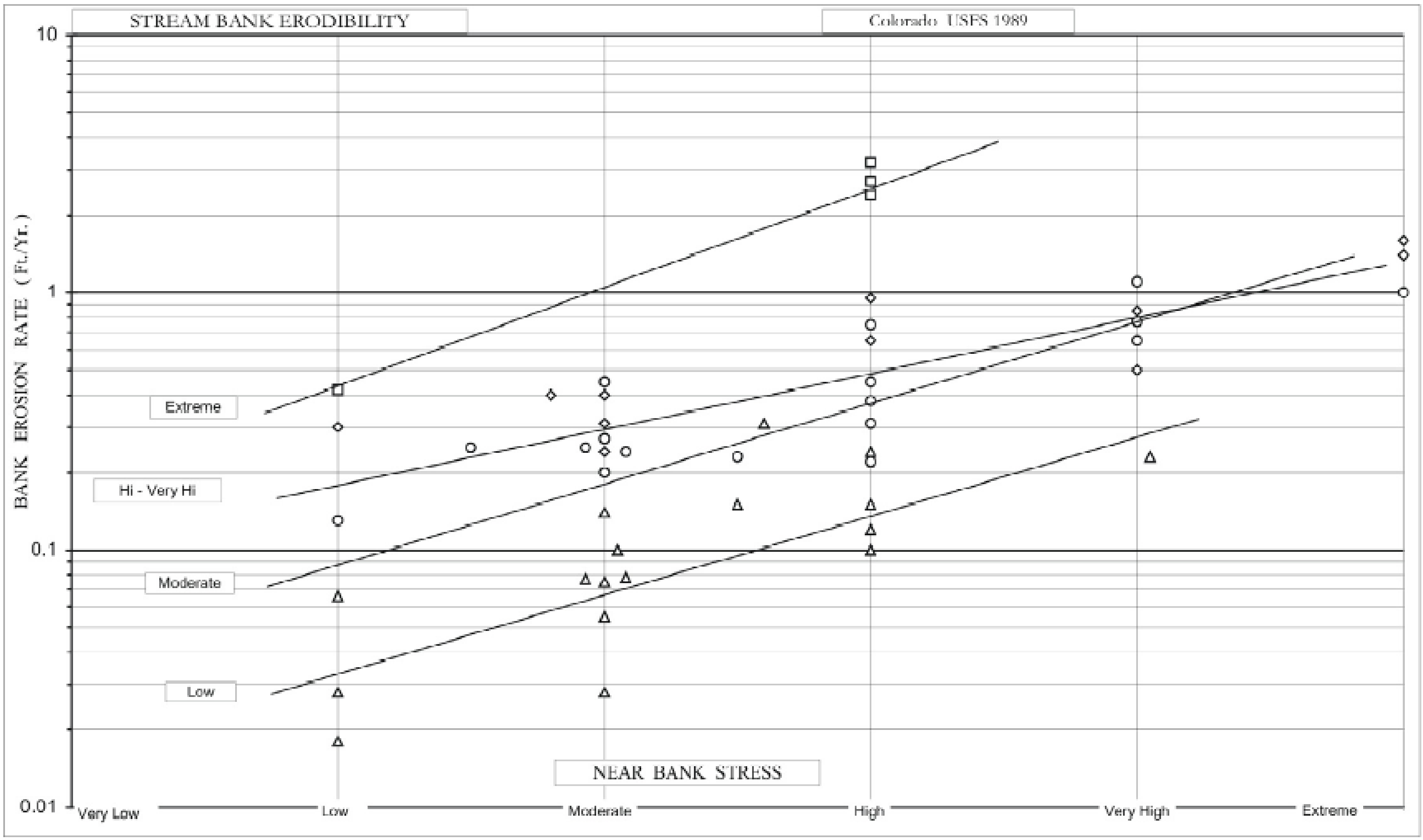


Figure 115. Relationship of BEHI and NBS to predict annual streambank erosion rates, Colorado data, 1989 (Rosgen 1996, 2001a).

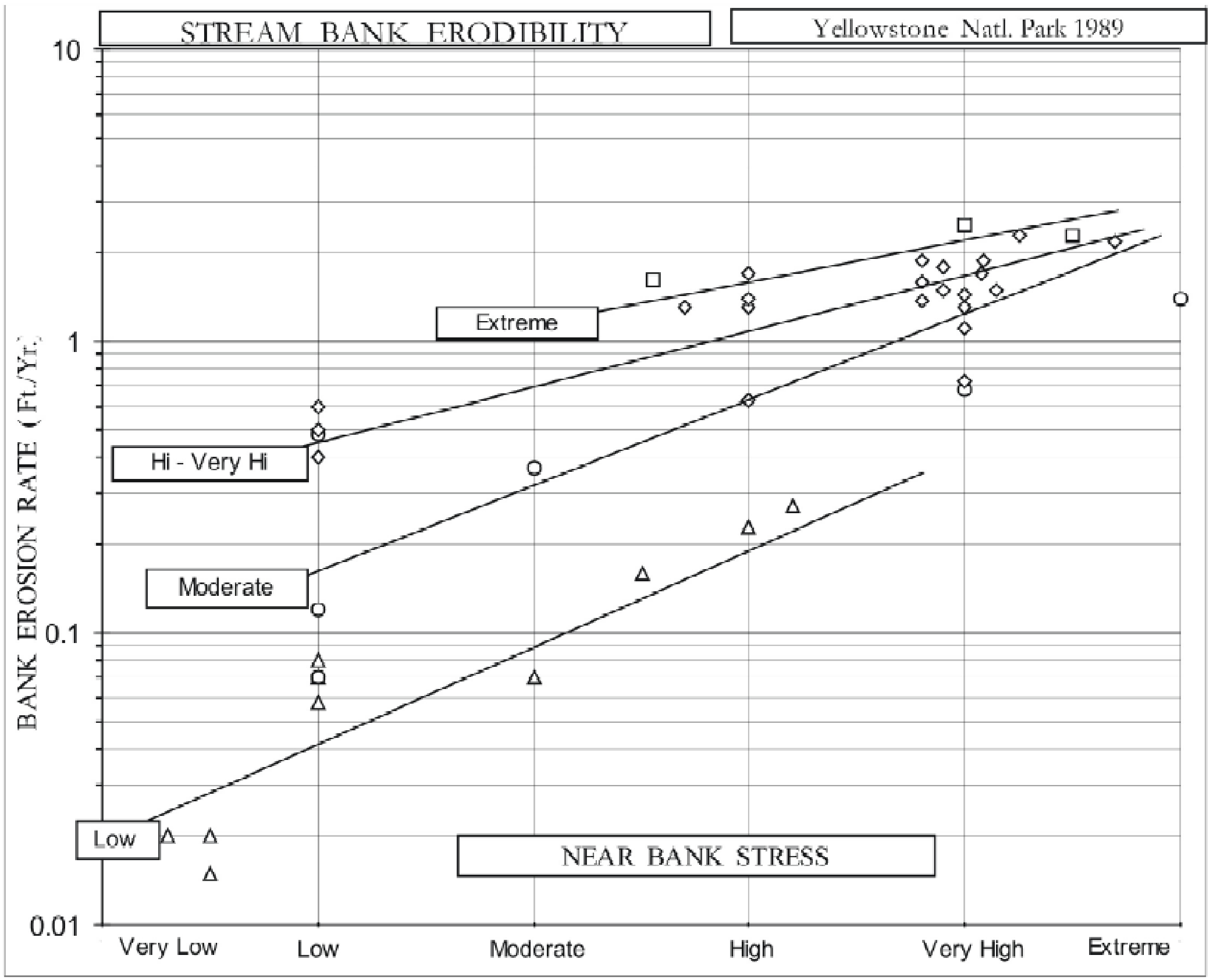


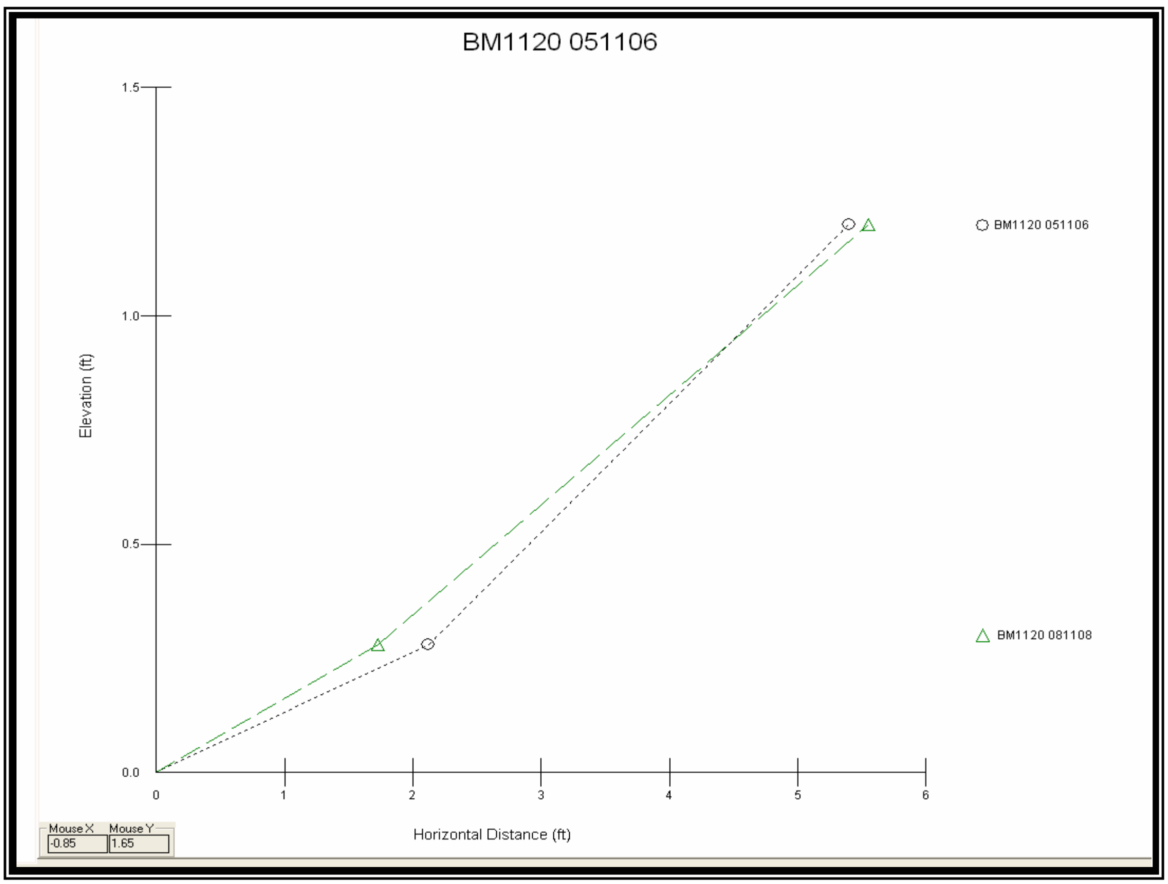
Figure 116. Relationship of BEHI and NBS to predict annual streambank erosion rates, Yellowstone National Park data, 1989 (Rosgen 1996, 2001a).

APPENDIX B

BANK PIN PHOTOS AND BANK PROFILES

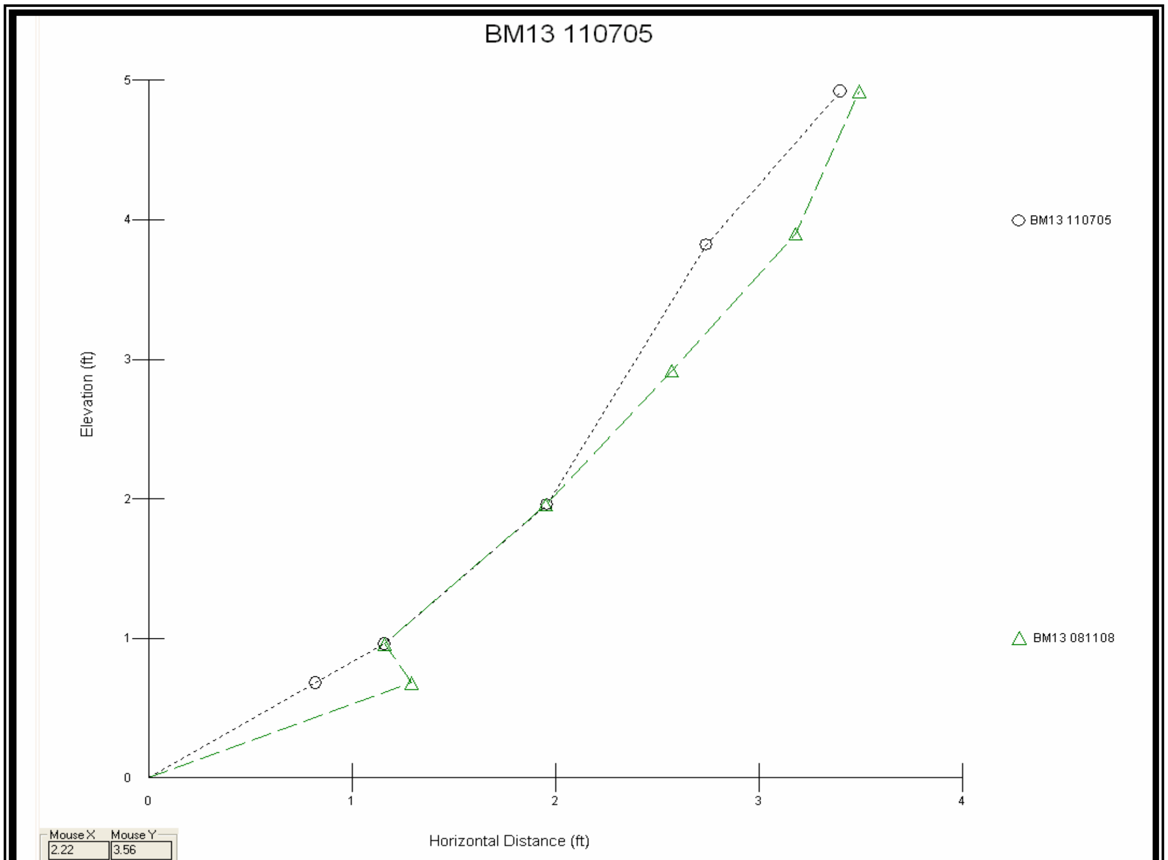
BM1120

BEHI = Moderate   Erosion Rate = 0.063 ft/yr



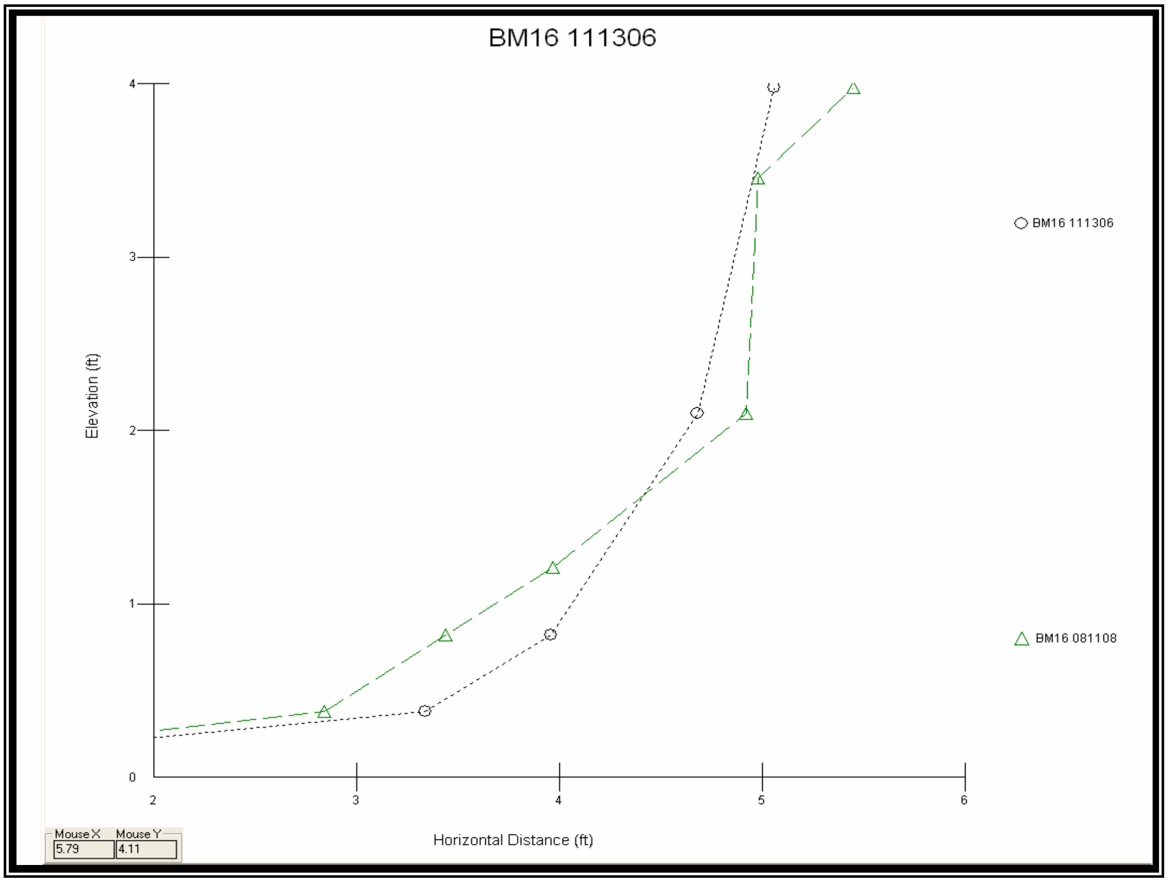
BM13

BEHI = High   Erosion Rate = -0.064 ft/yr



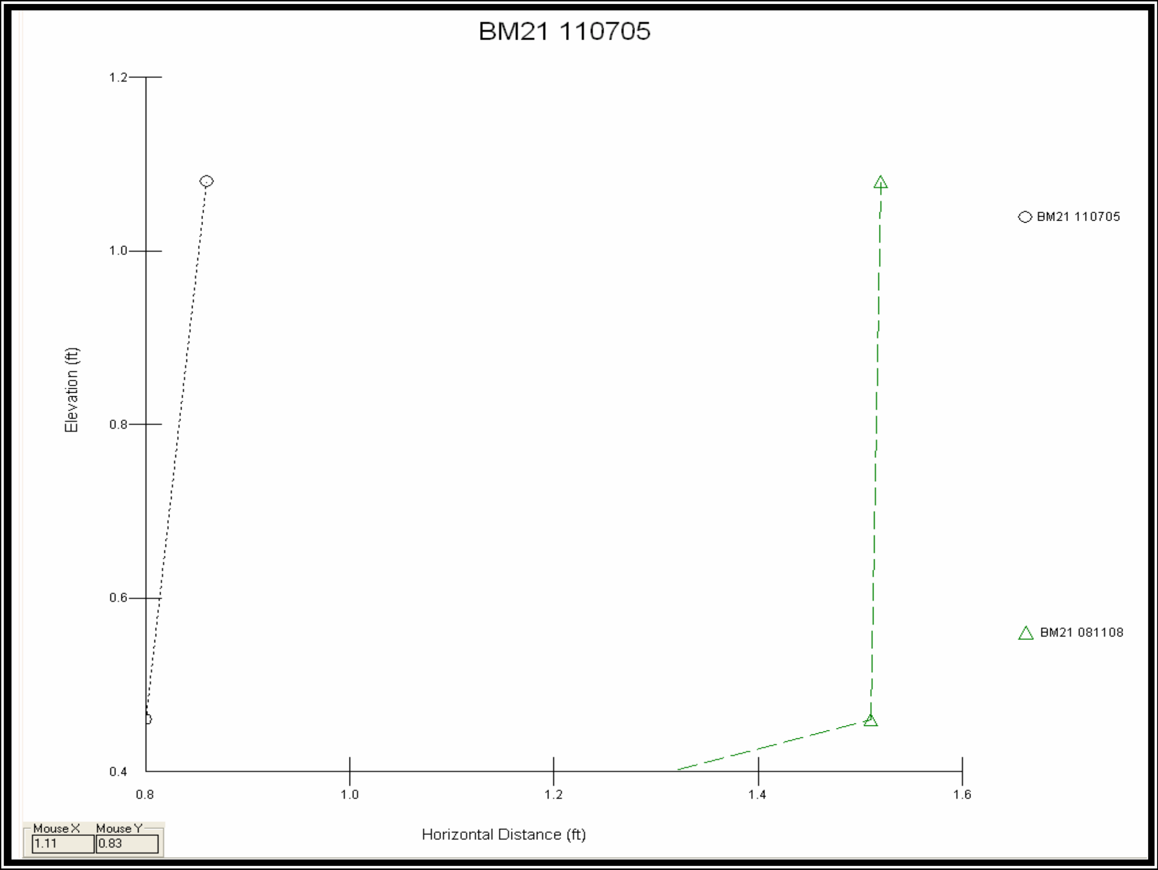
BM16

BEHI = High   Erosion Rate = 0.023 ft/yr



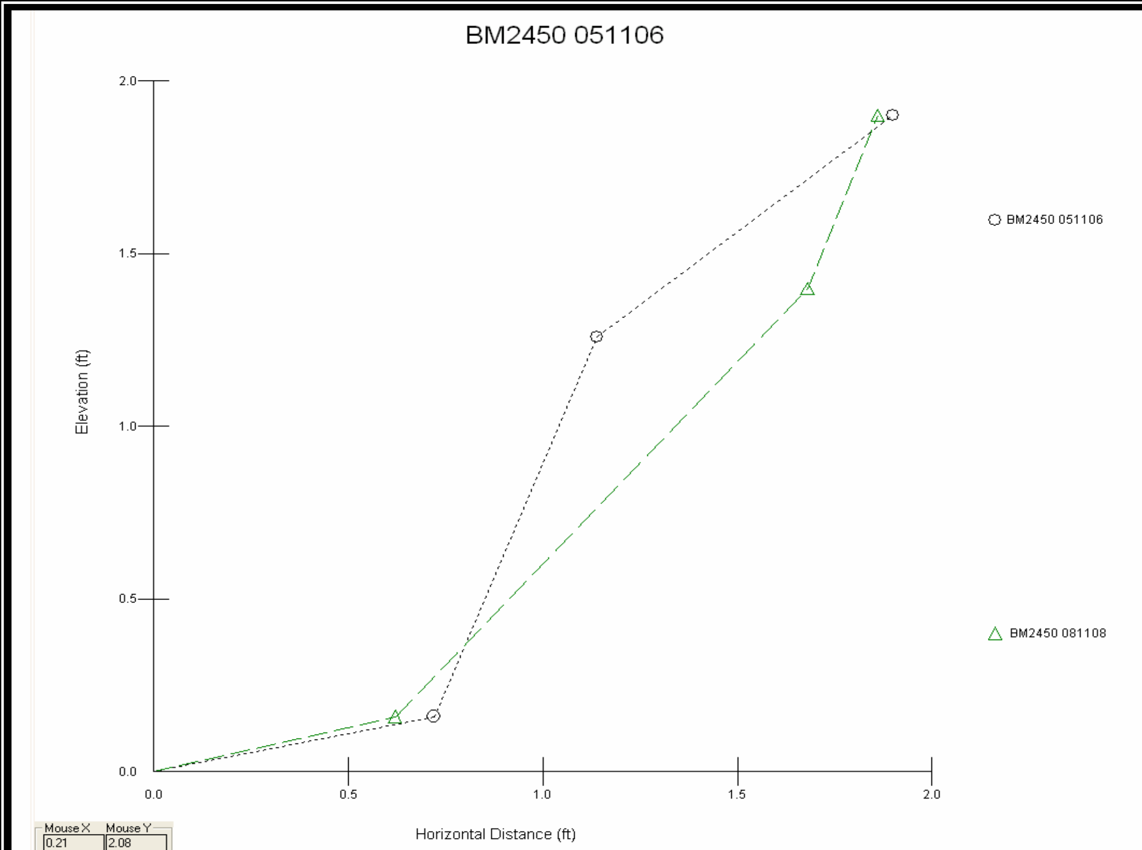
BM21

BEHI = Moderate   Erosion Rate = -0.20 ft/yr



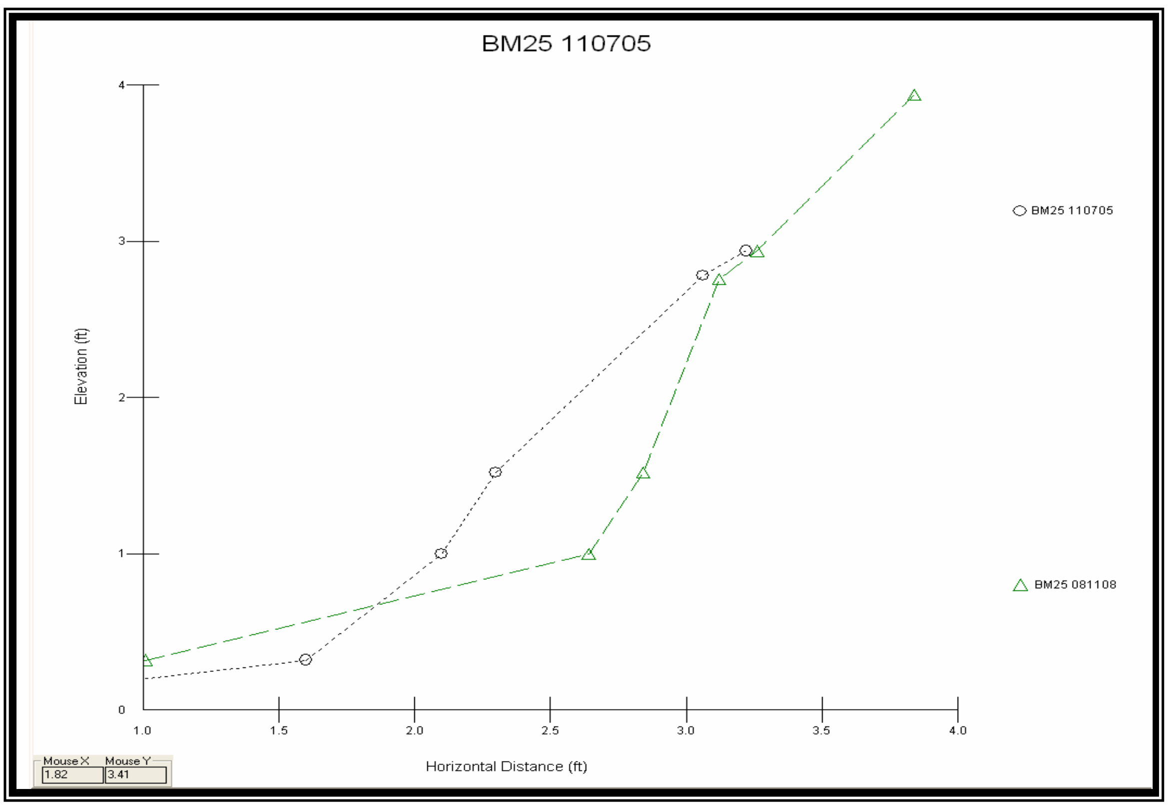
BM2450

BEHI = Moderate   Erosion Rate = -0.072 ft/yr



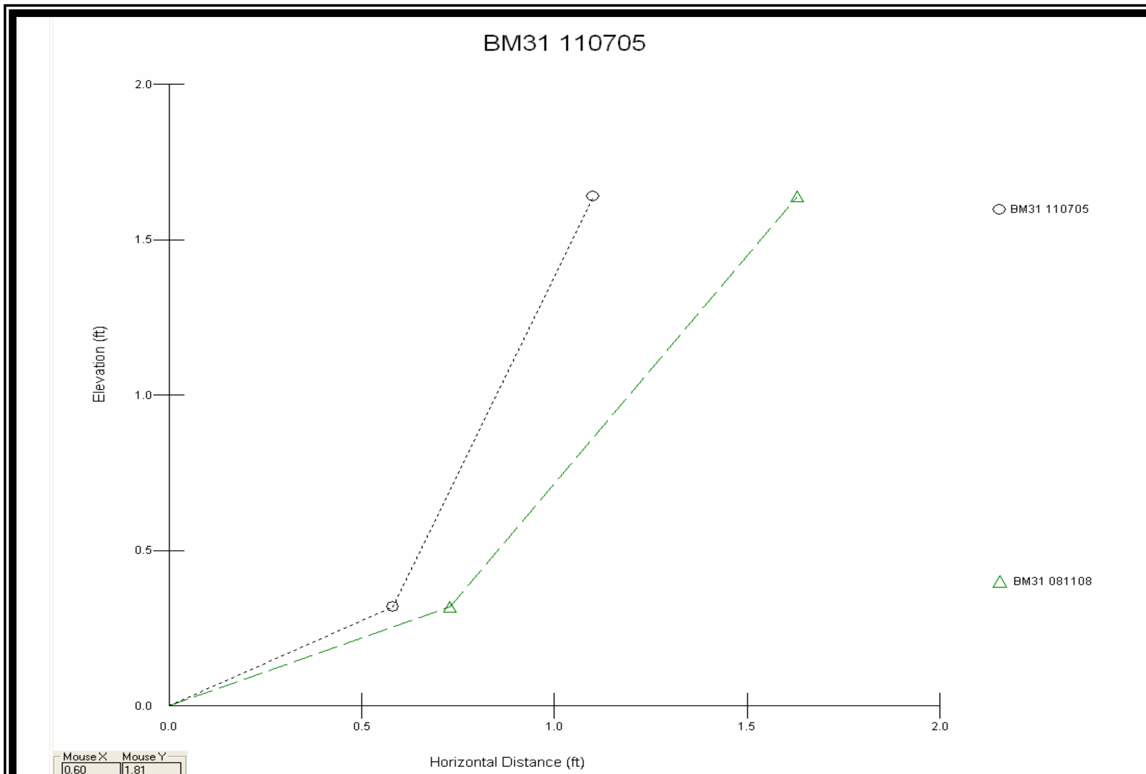
BM25

BEHI = Moderate   Erosion Rate = -0.38 ft/yr



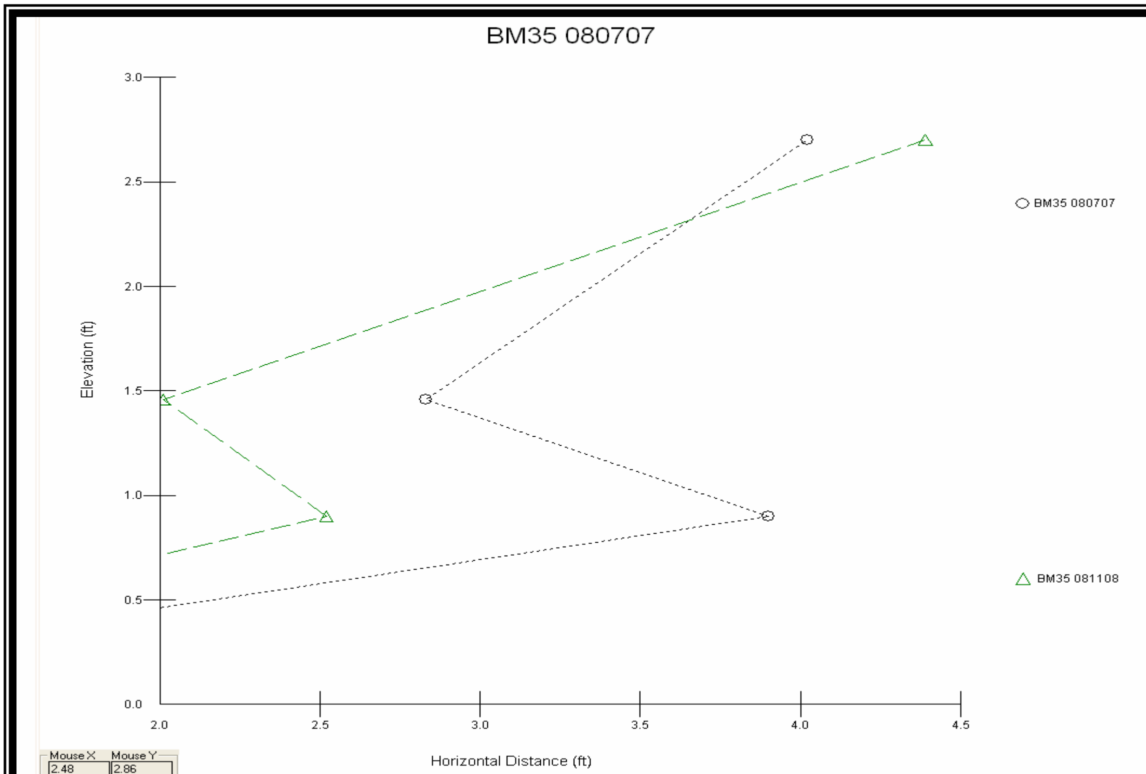
BM31

BEHI = High   Erosion Rate = -0.10 ft/yr



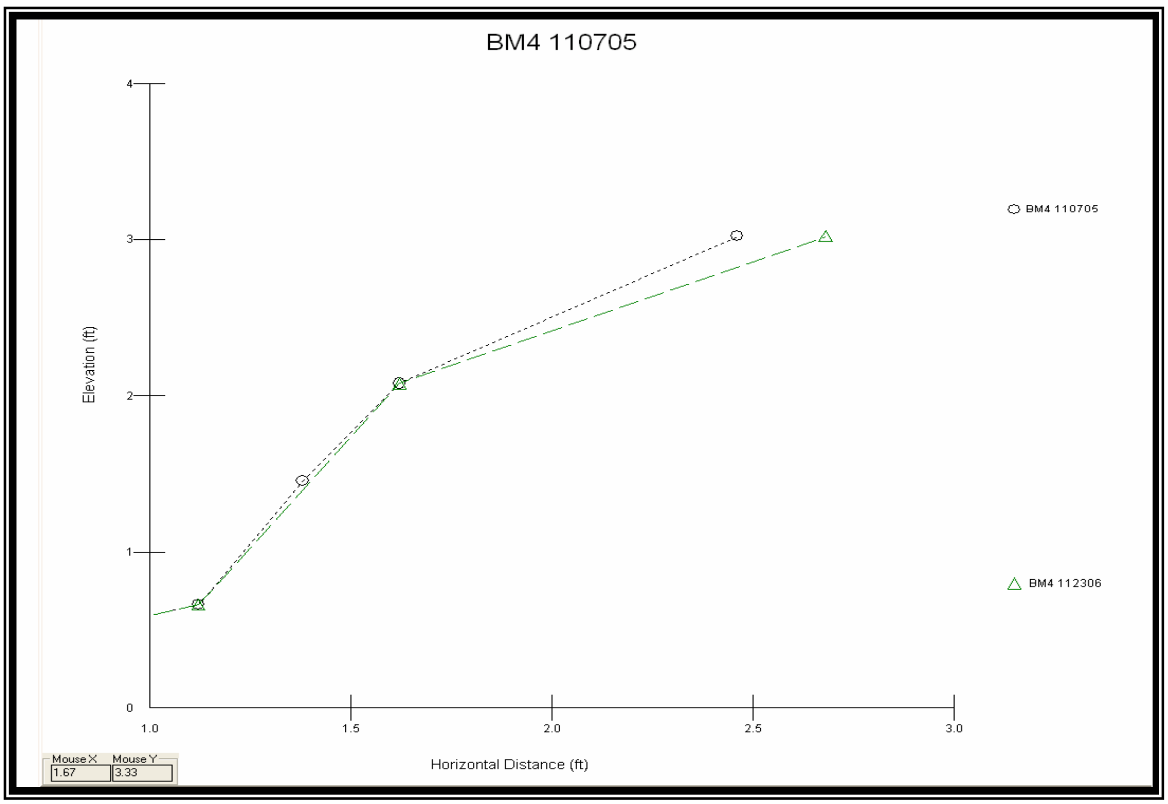
BM35

BEHI = High   Erosion Rate = 0.56 ft/yr



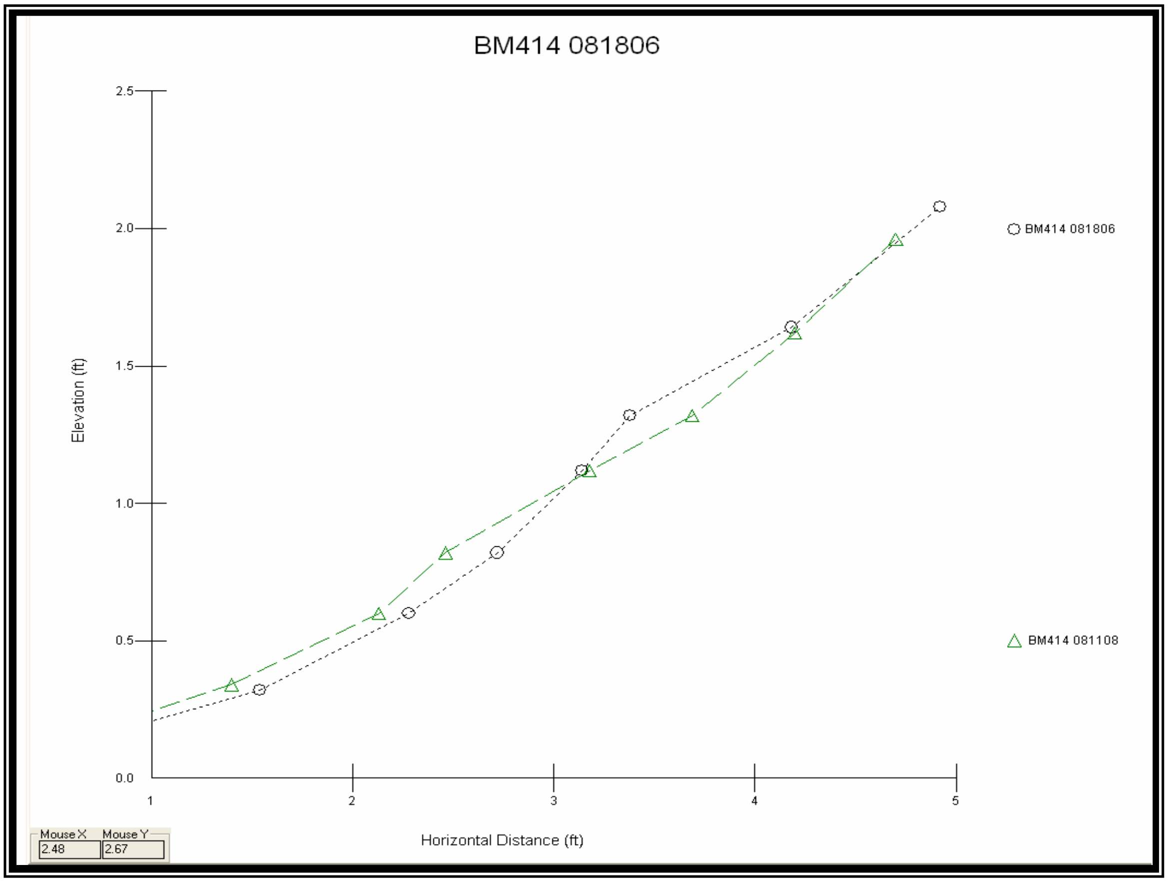
BM4

BEHI = Moderate   Erosion Rate = -0.039 ft/yr



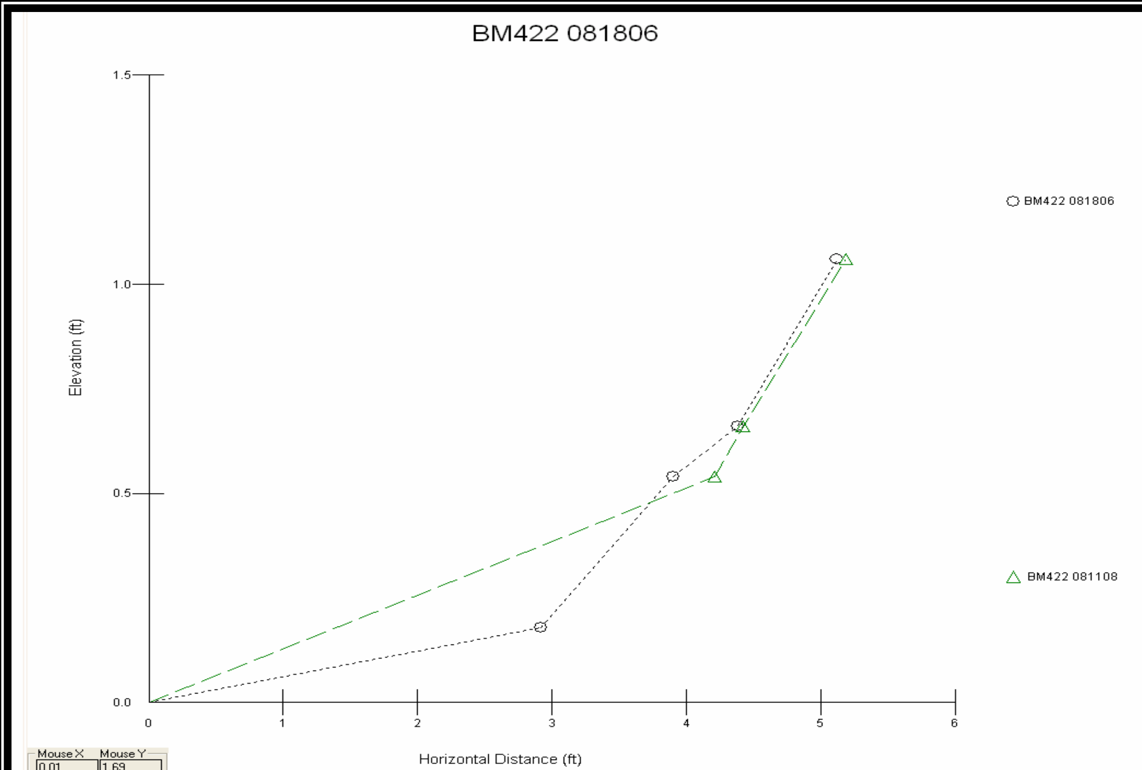
BM414

BEHI = Low   Erosion Rate = 0.16 ft/yr



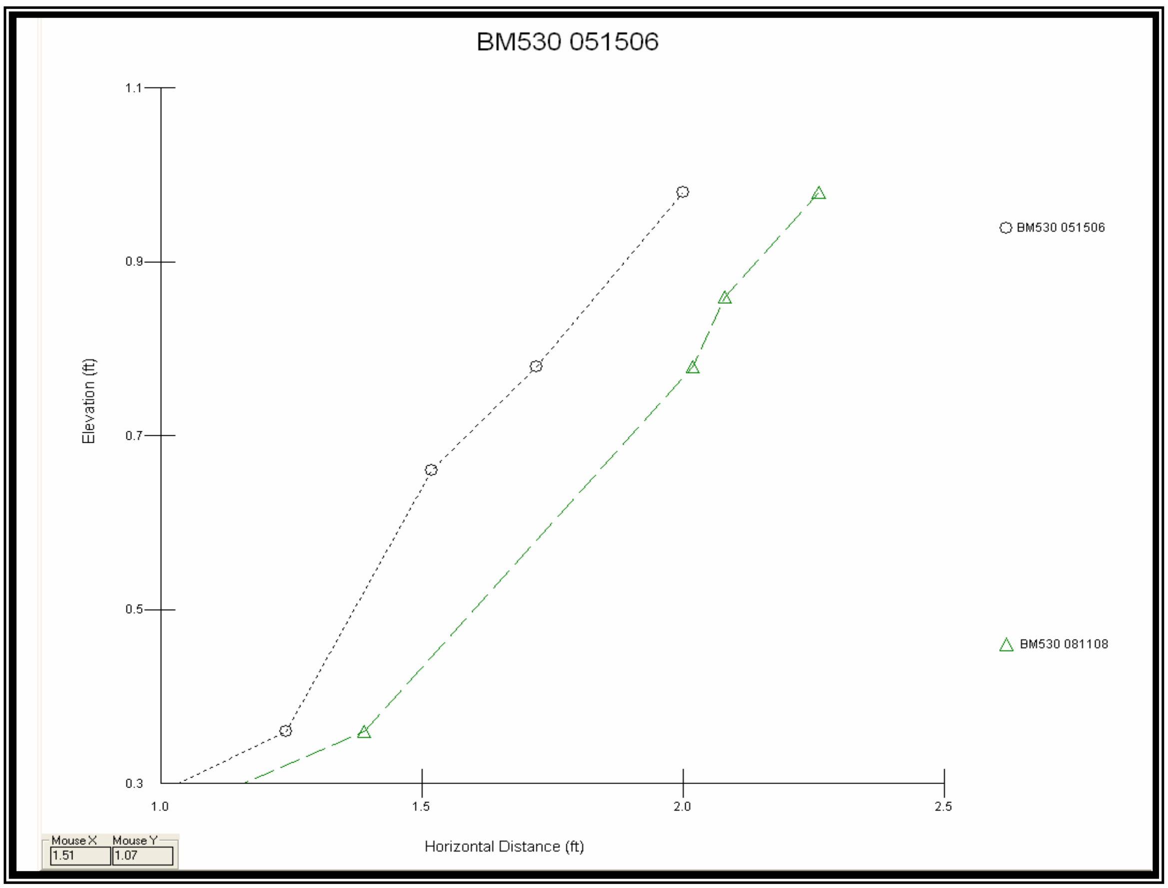
BM422

BEHI = Low   Erosion Rate = 0.15 ft/yr



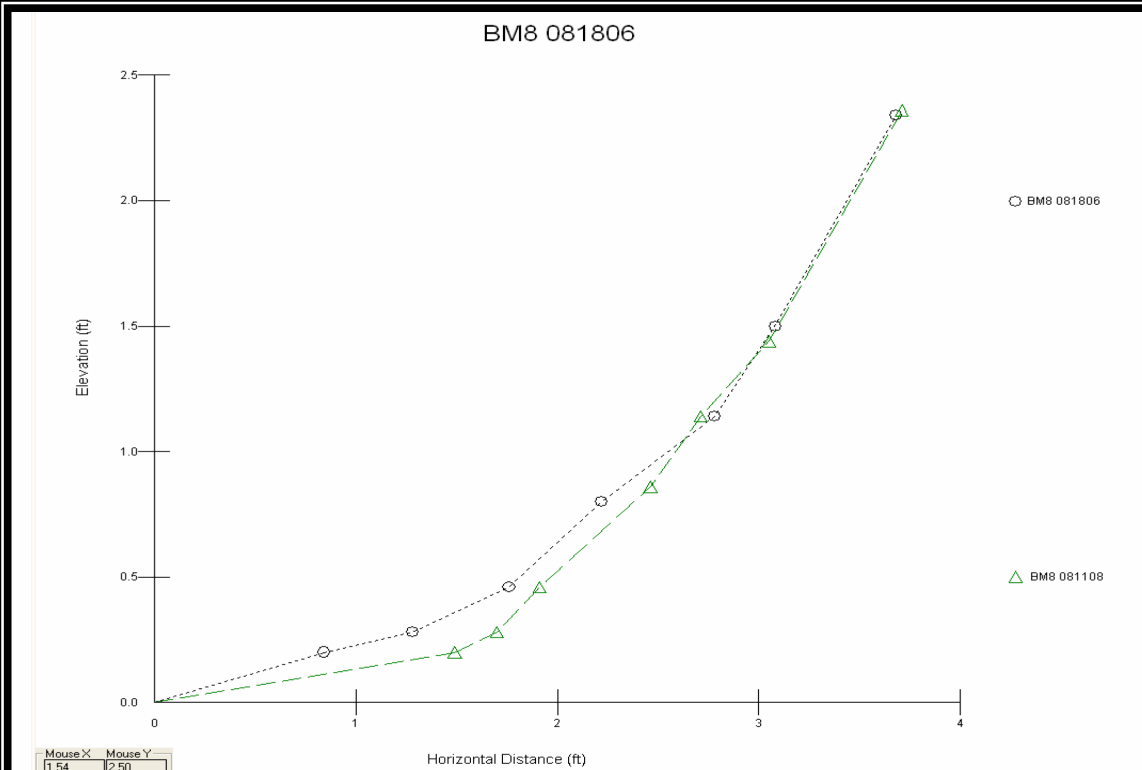
BM530

BEHI = Low   Erosion Rate = -0.086 ft/yr



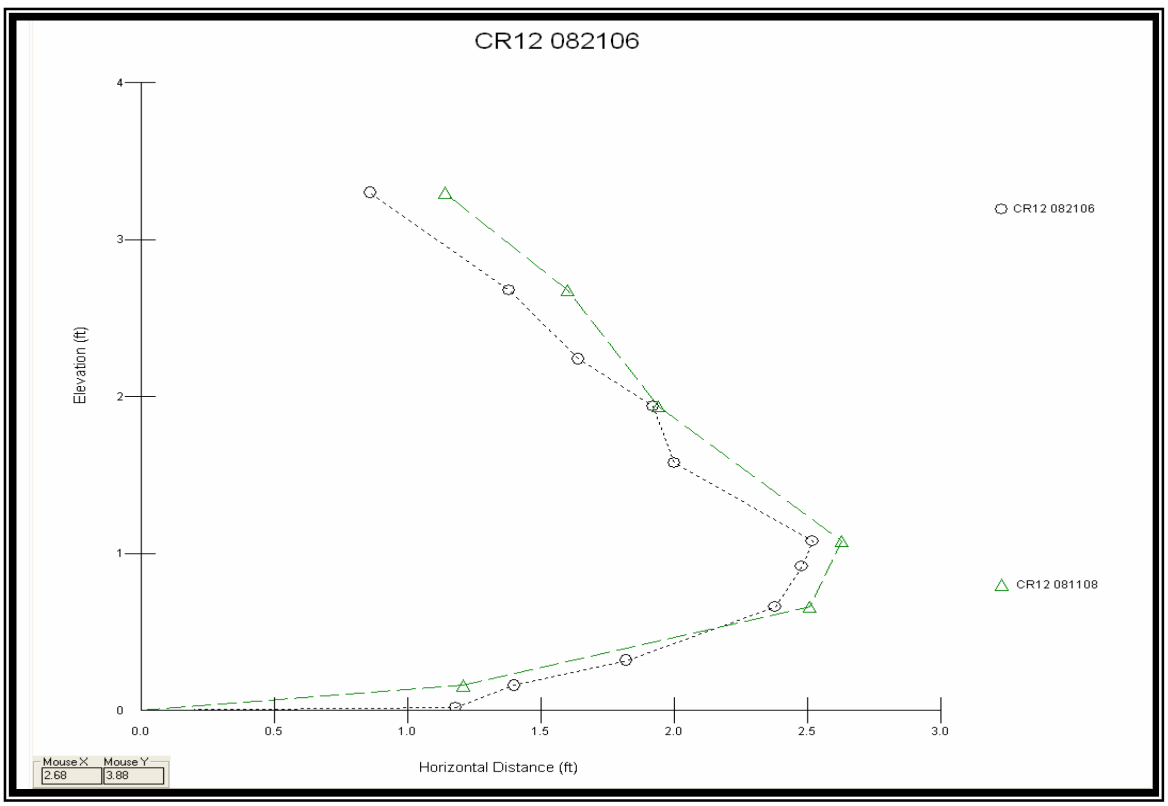
BM8

BEHI = High   Erosion Rate = -0.066 ft/yr



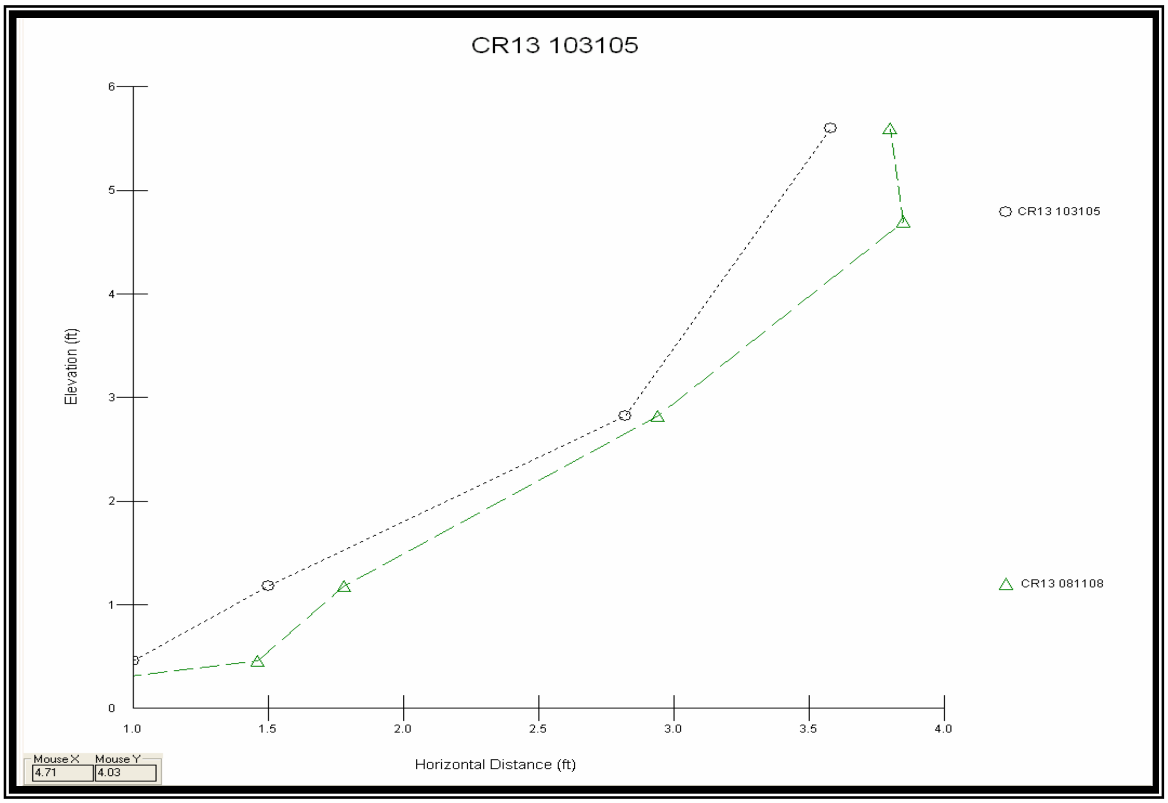
CR12

BEHI = Moderate   Erosion Rate = -0.048 ft/yr



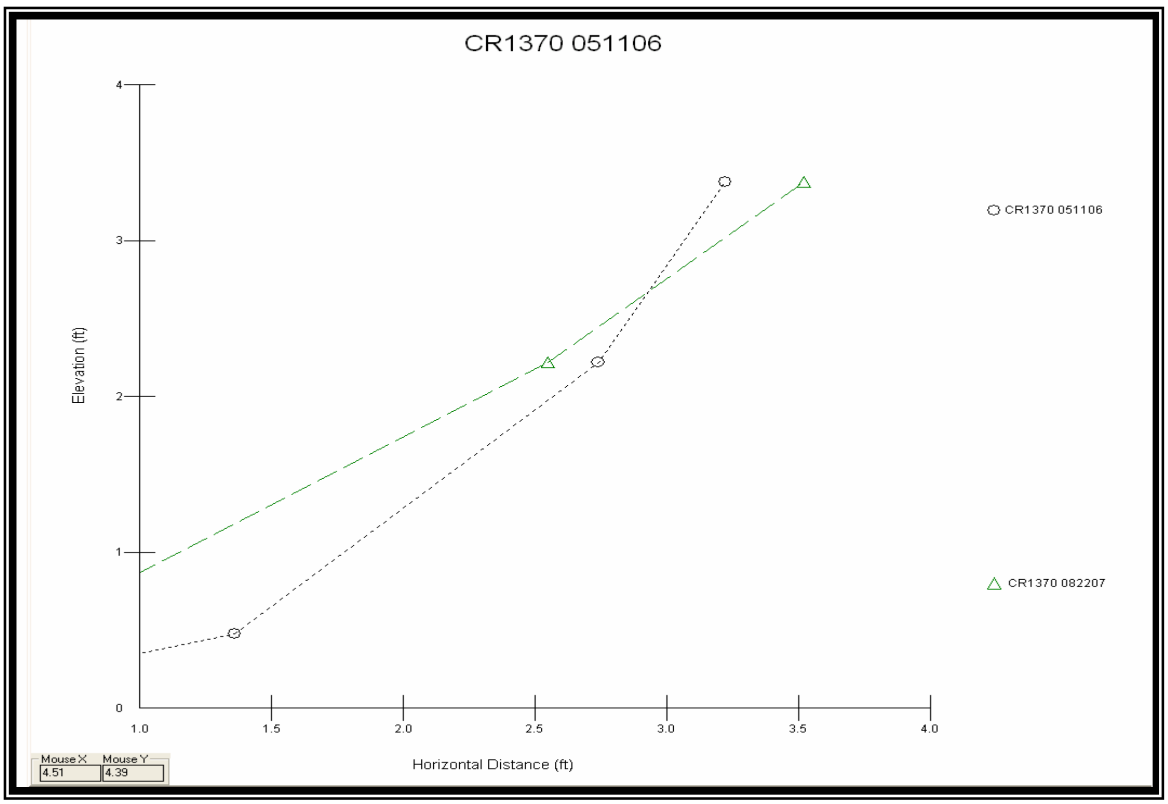
CR13

BEHI = High   Erosion Rate = -0.10 ft/yr



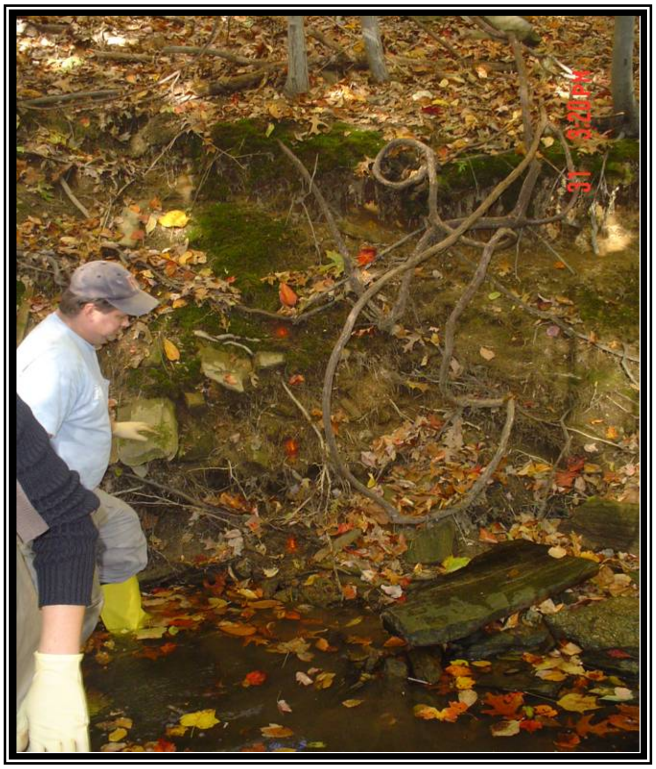
CR1370

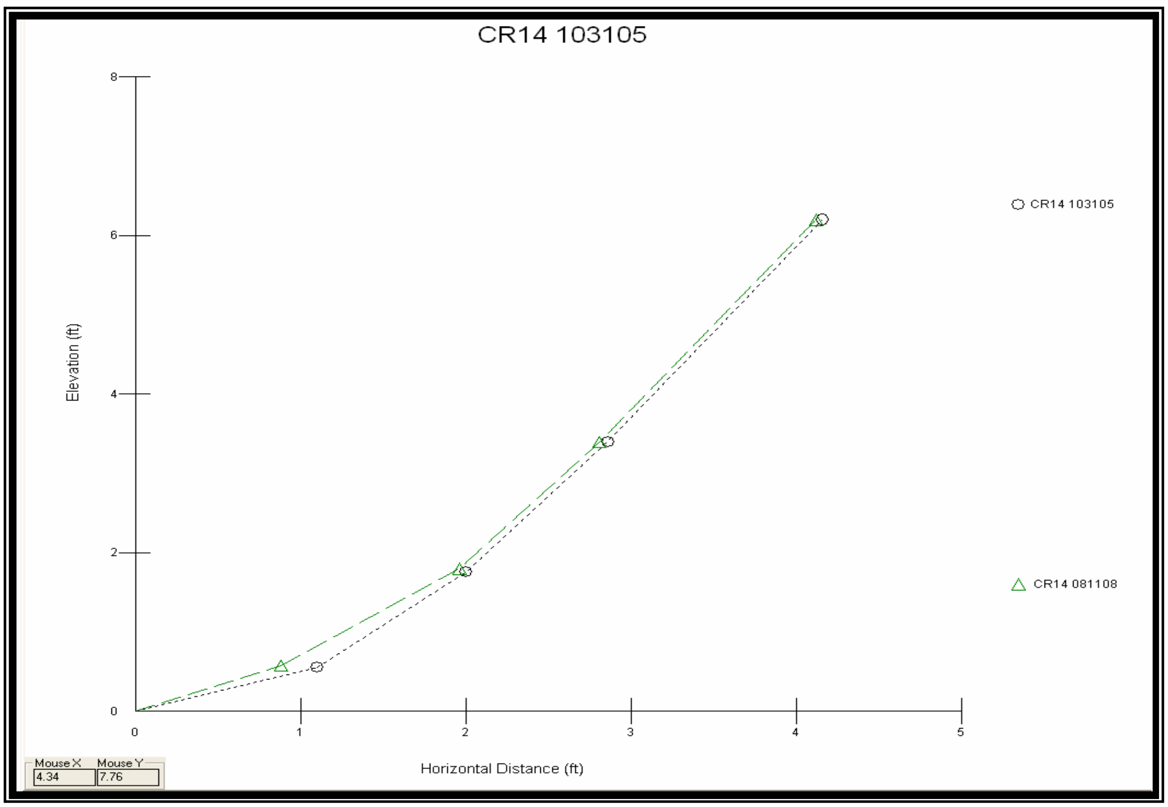
BEHI = Moderate Erosion Rate = 0.23 ft/yr



CR14

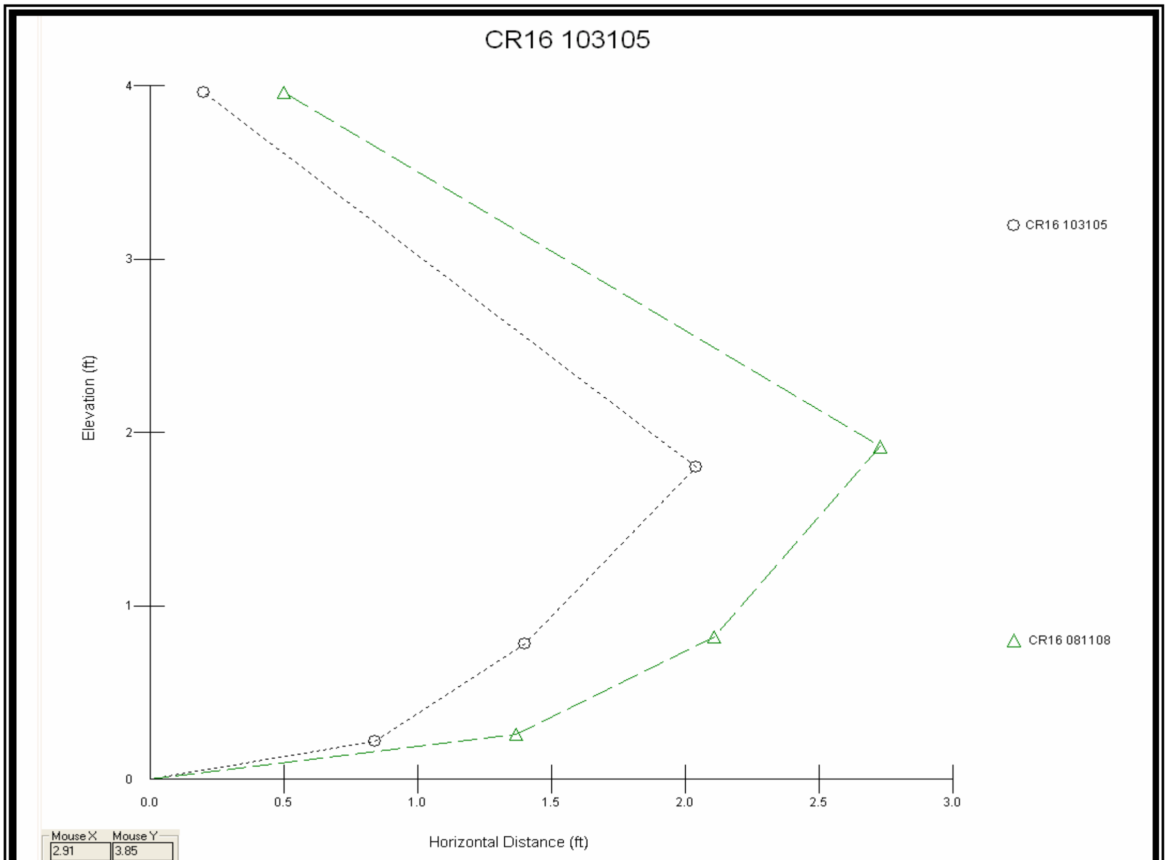
BEHI = Moderate   Erosion Rate = 0.027 ft/yr





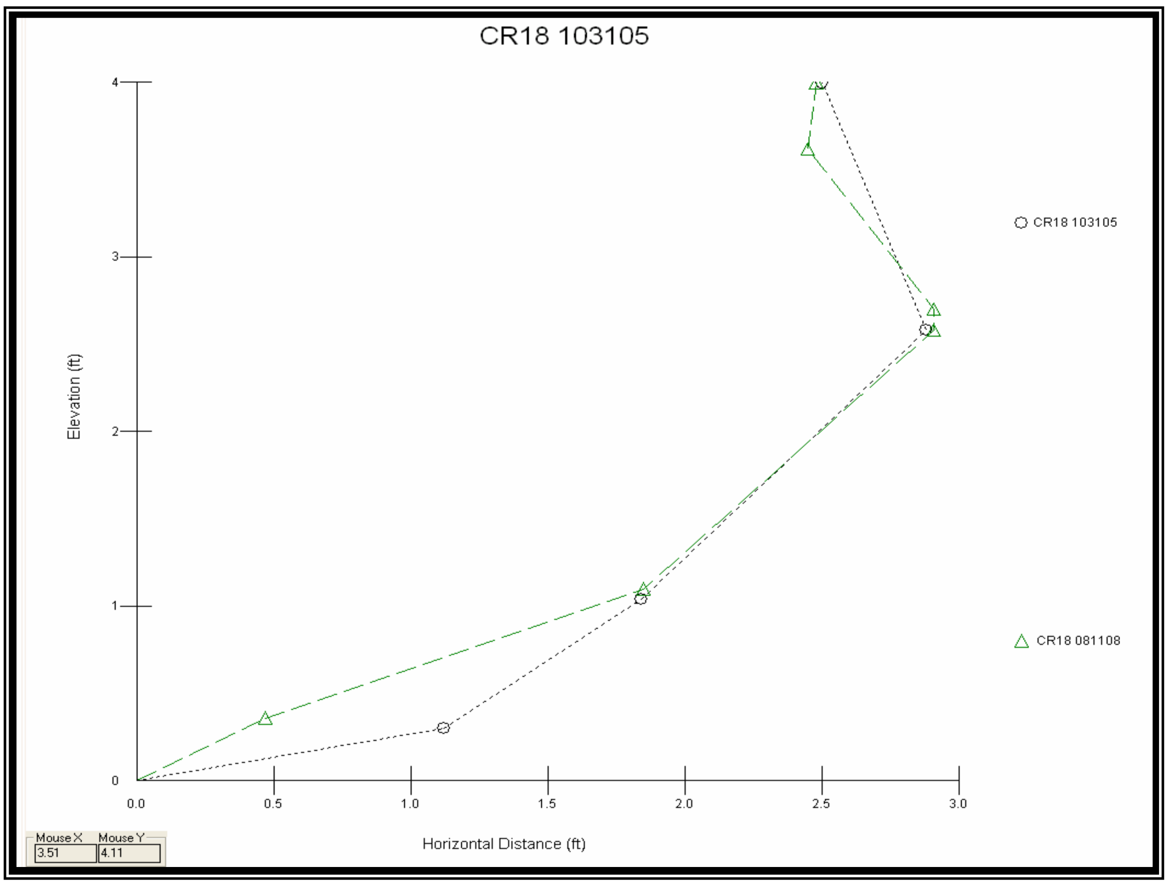
CR16

BEHI = Moderate   Erosion Rate = -0.20 ft/yr



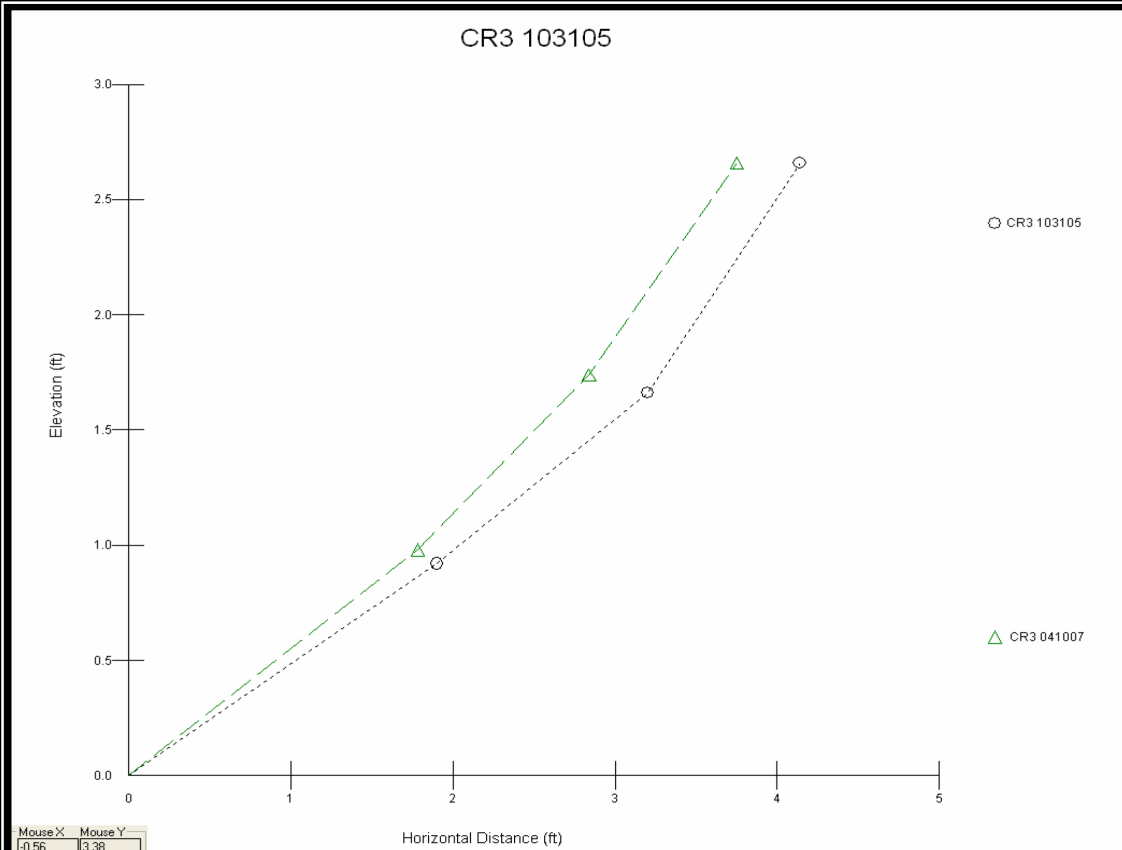
CR18

BEHI = Moderate   Erosion Rate = 0.045 ft/yr



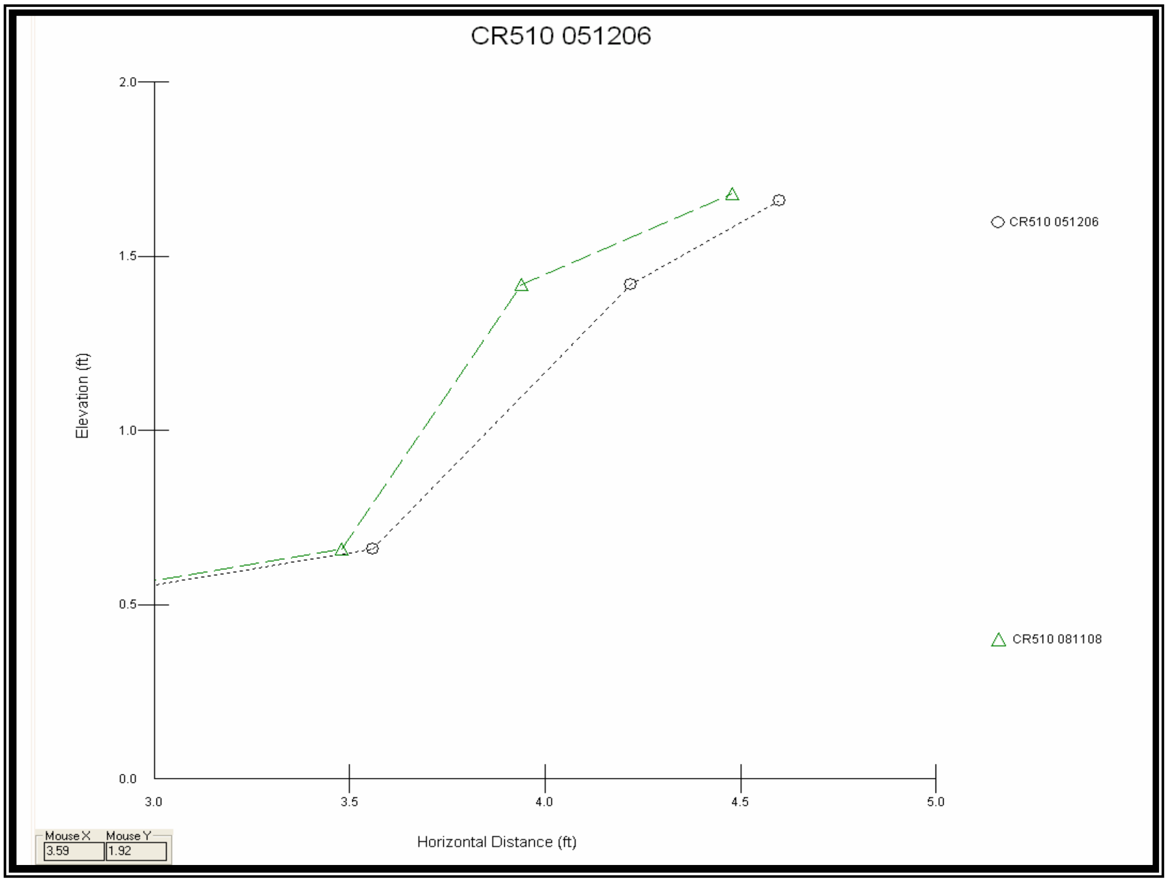
CR3

BEHI = High   Erosion Rate = 0.017 ft/yr



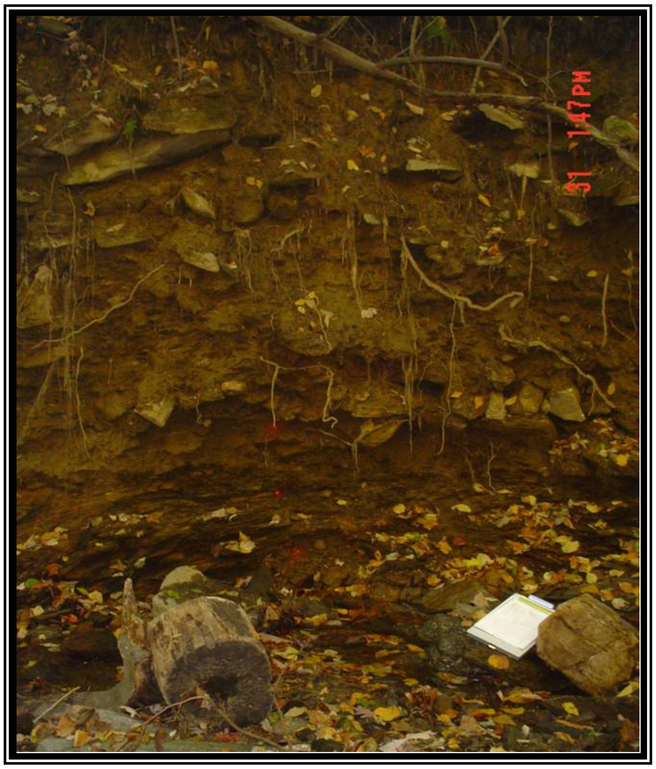
CR510

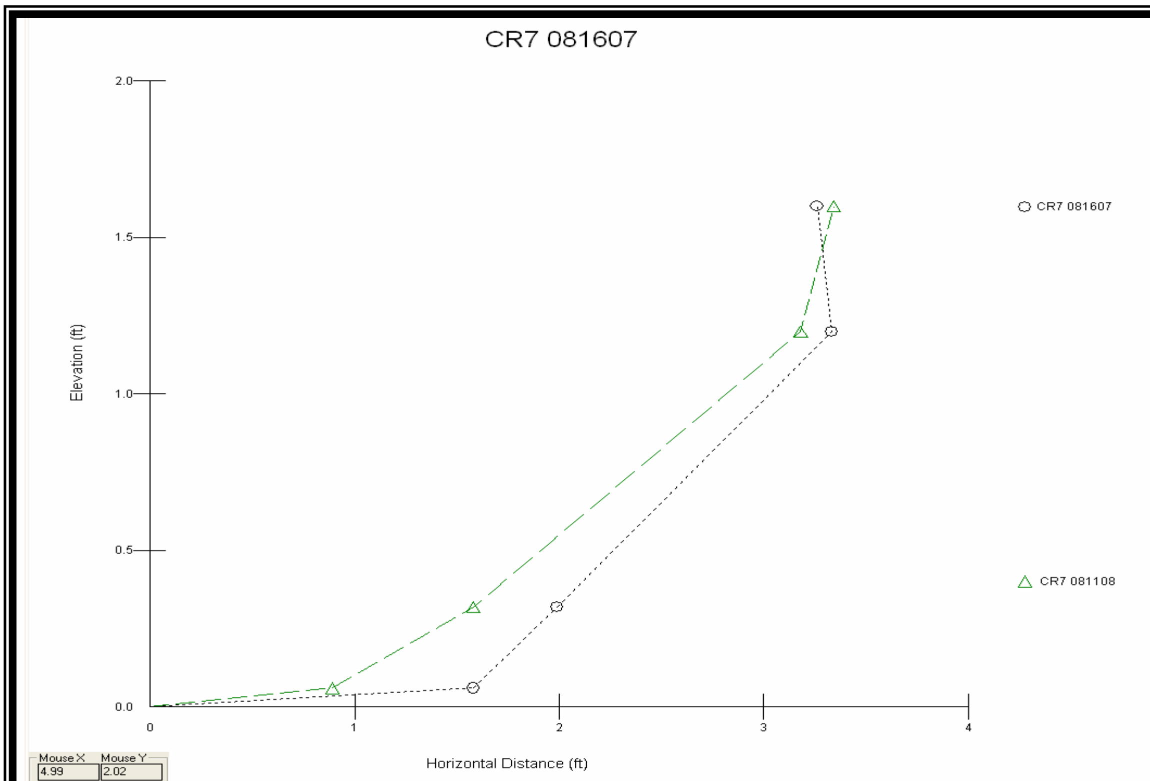
BEHI = Moderate   Erosion Rate = 0.035 ft/yr



CR7

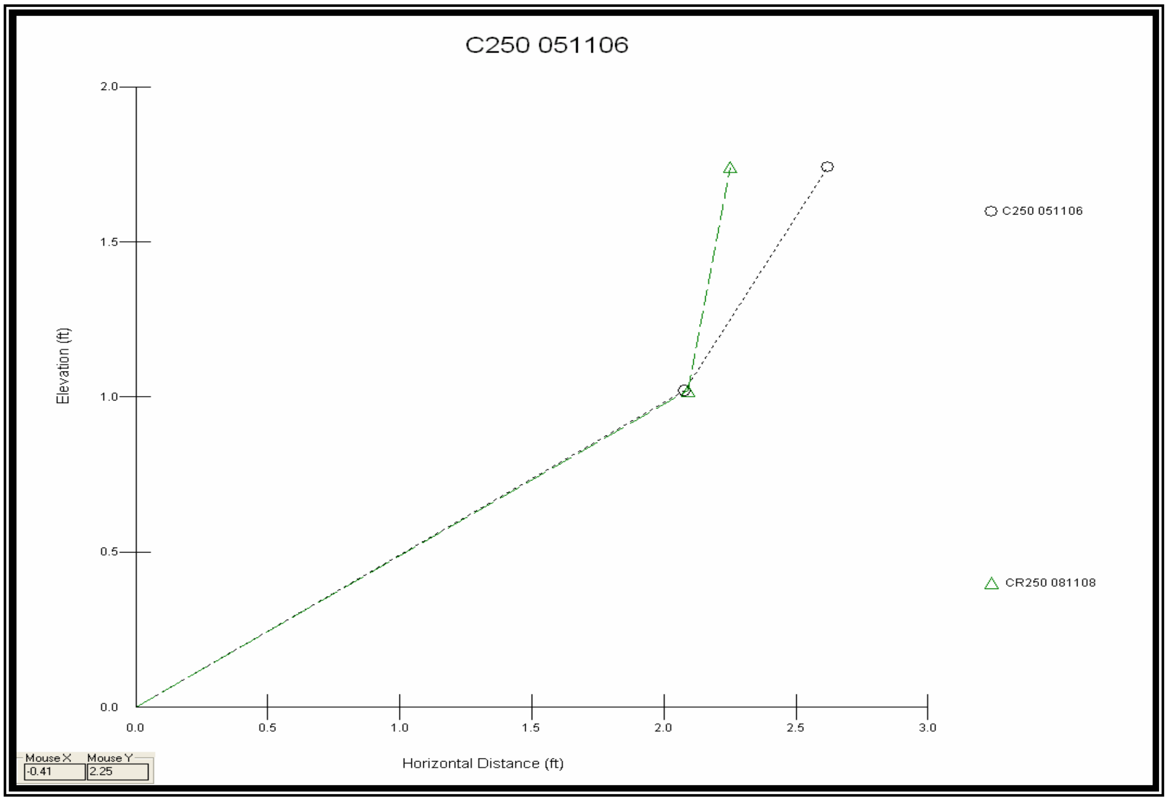
BEHI = High   Erosion Rate = 0.27 ft/yr





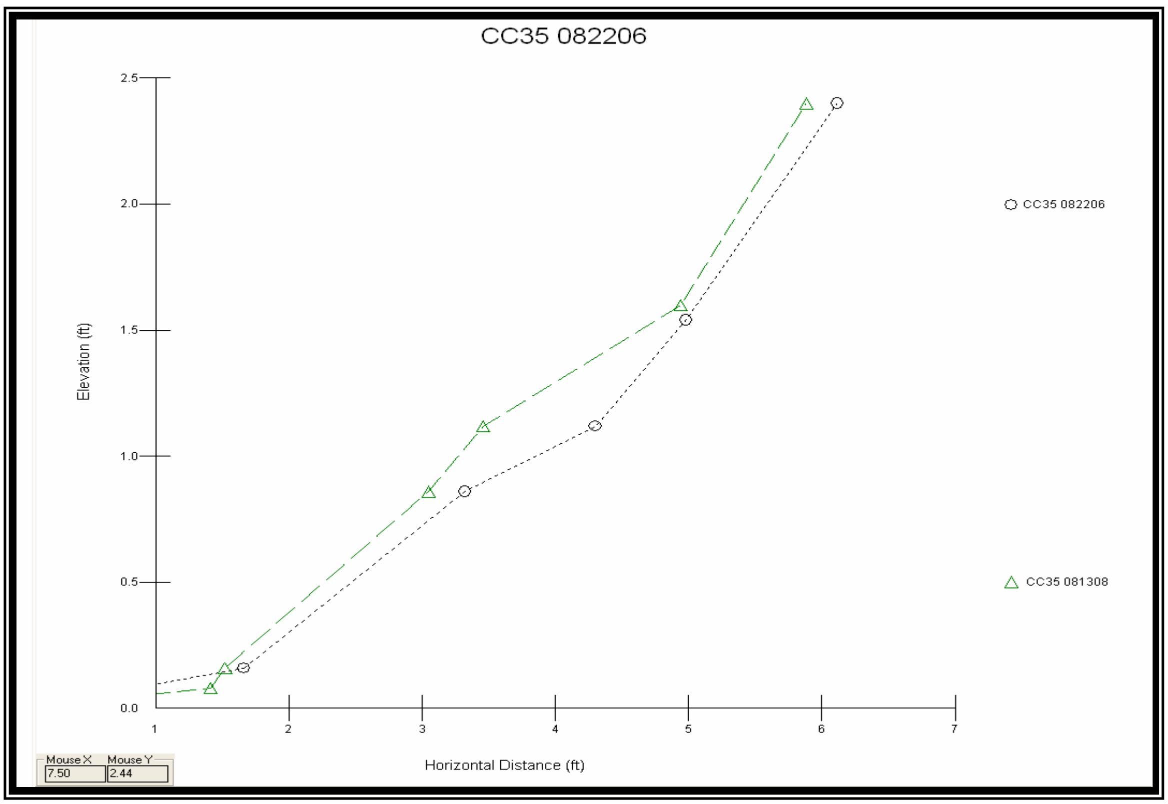
CR250

BEHI = Moderate   Erosion Rate = 0.031 ft/yr



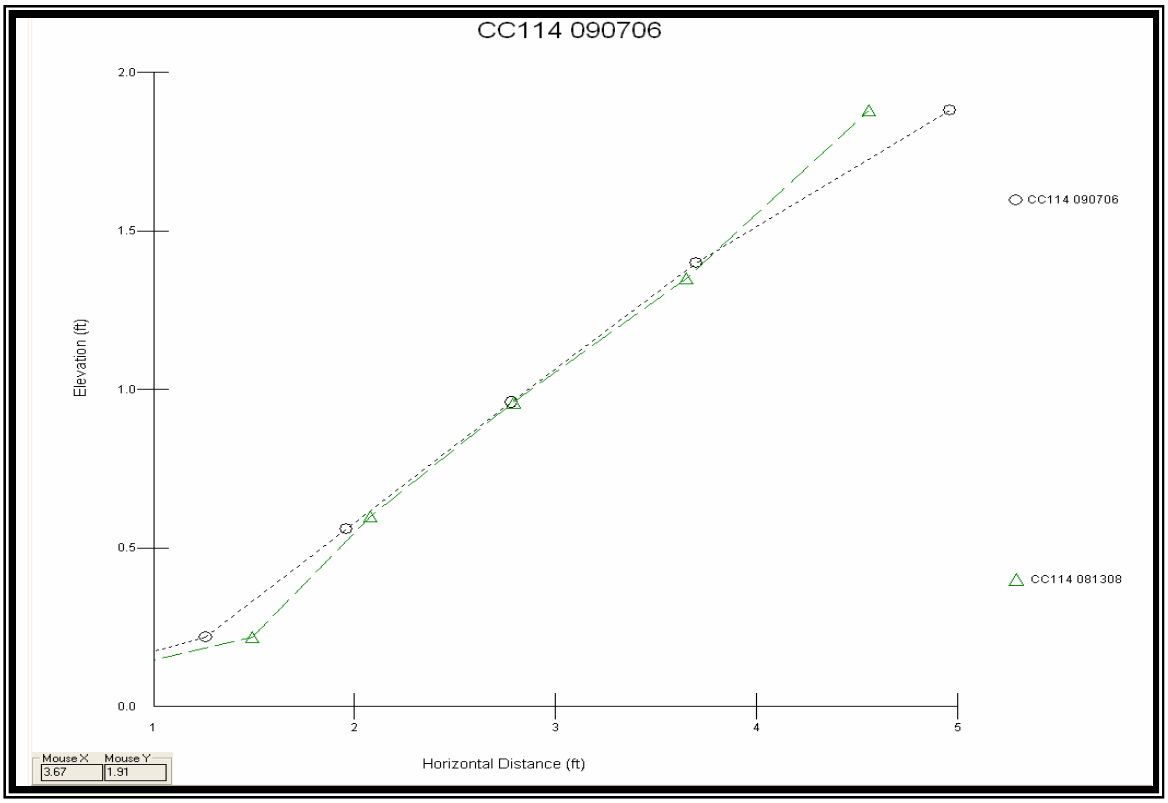
CC35

BEHI = Moderate   Erosion Rate = 0.13 ft/yr



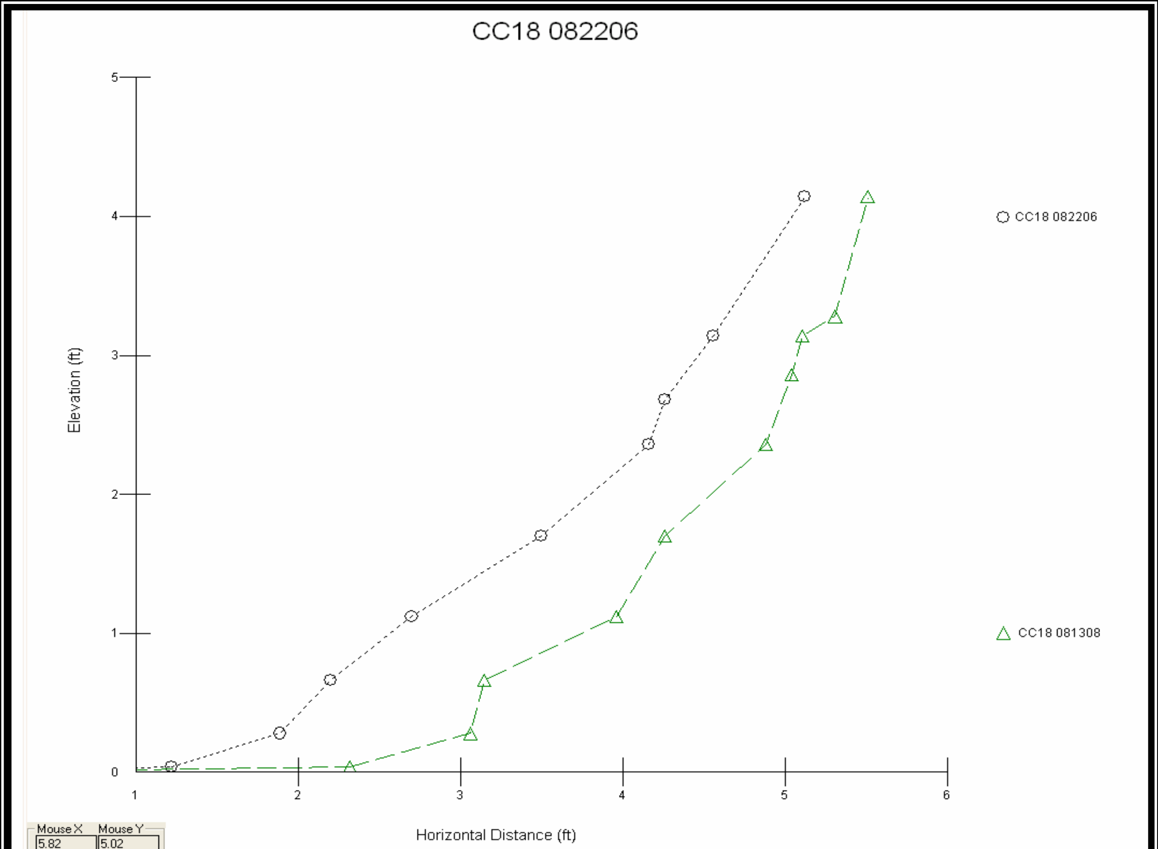
CC114

BEHI = Low   Erosion Rate = -0.0027 ft/yr



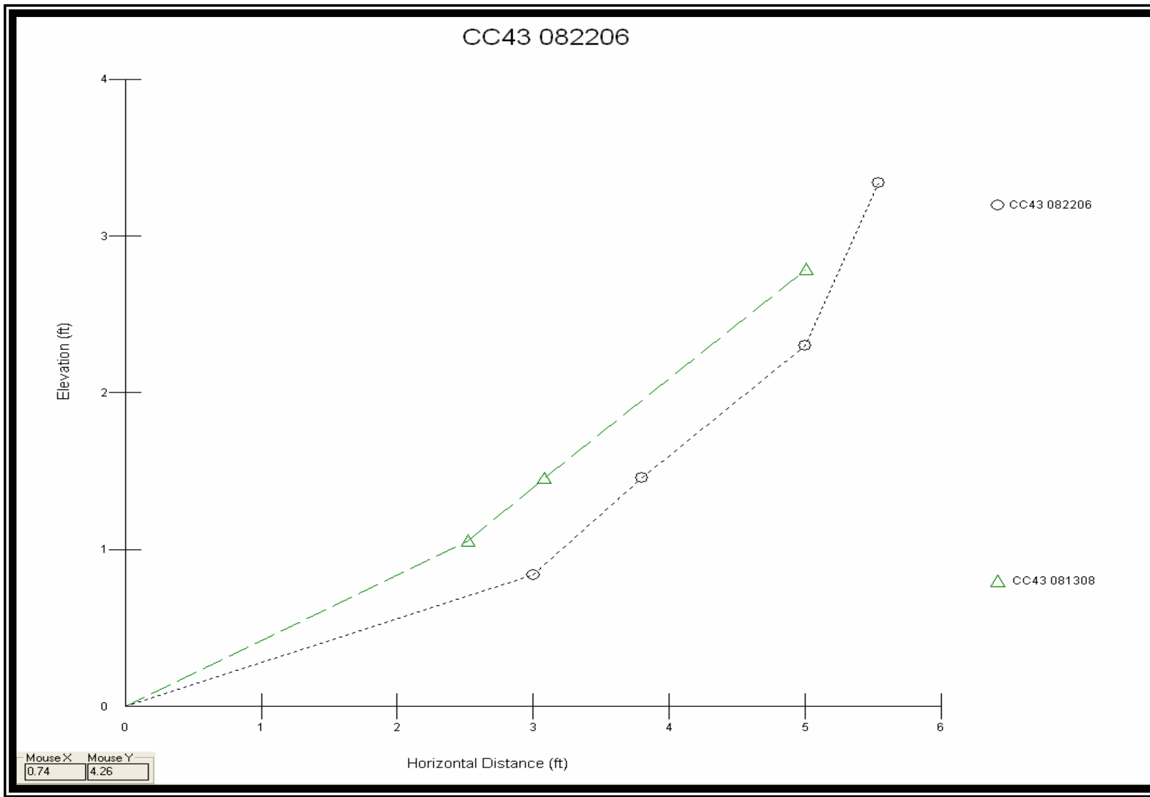
CC18

BEHI = High   Erosion Rate = -0.41 ft/yr



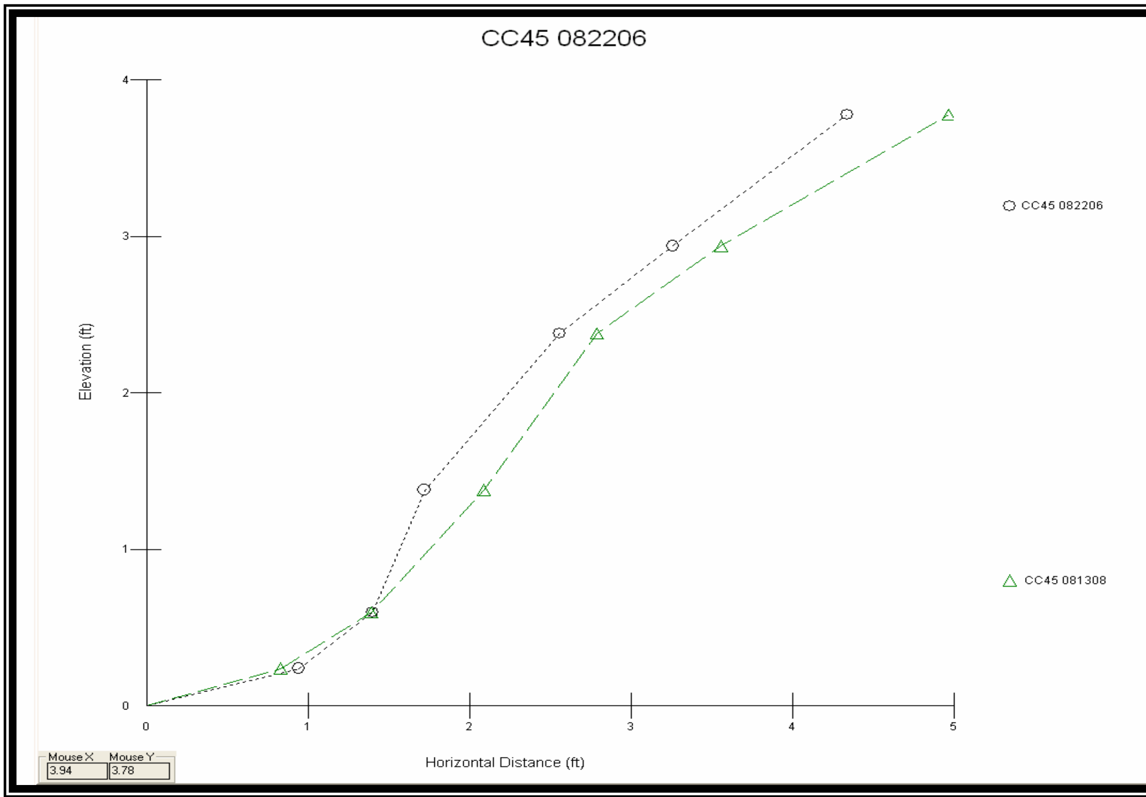
CC43

BEHI = High   Erosion Rate = 0.074 ft/yr



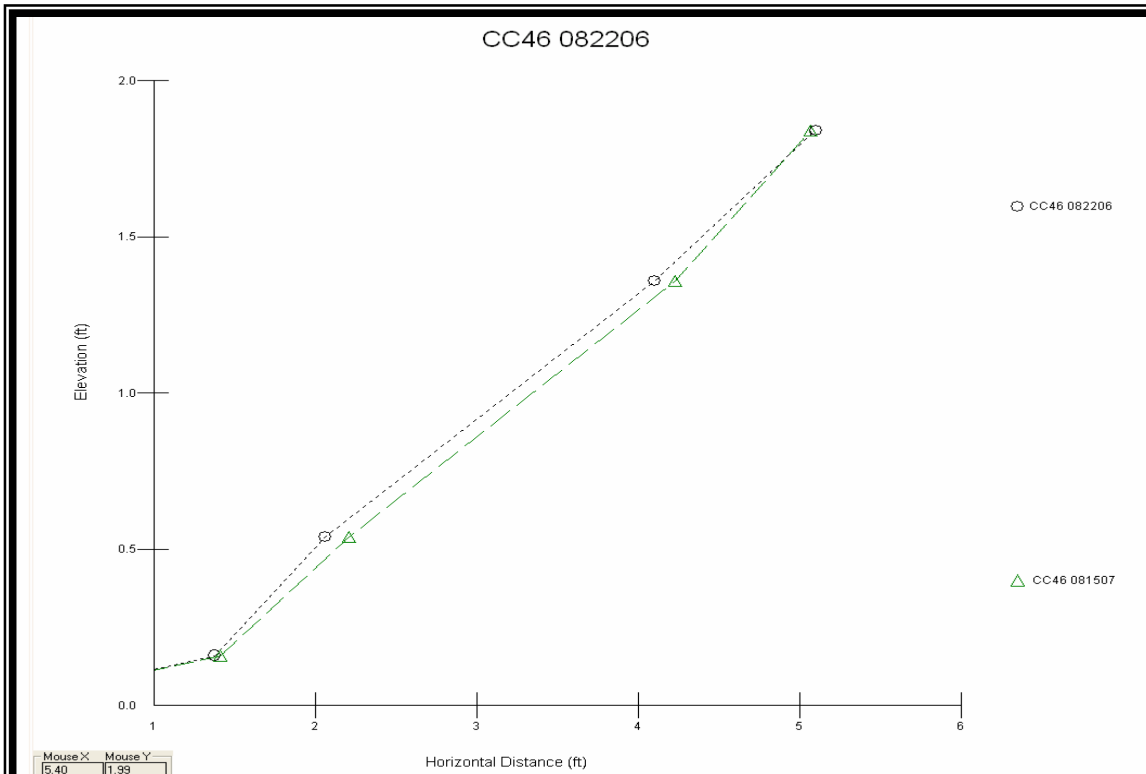
CC45

BEHI = High   Erosion Rate = -0.13 ft/yr



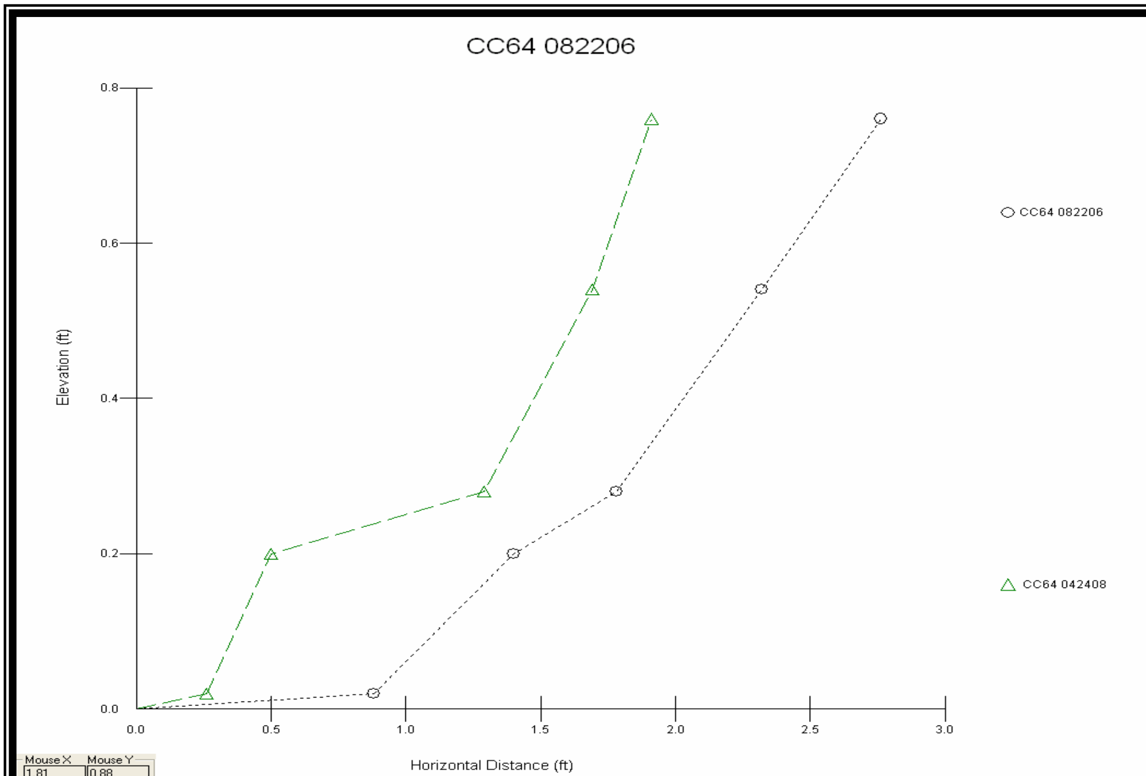
CC46

BEHI = High   Erosion Rate = -0.094 ft/yr



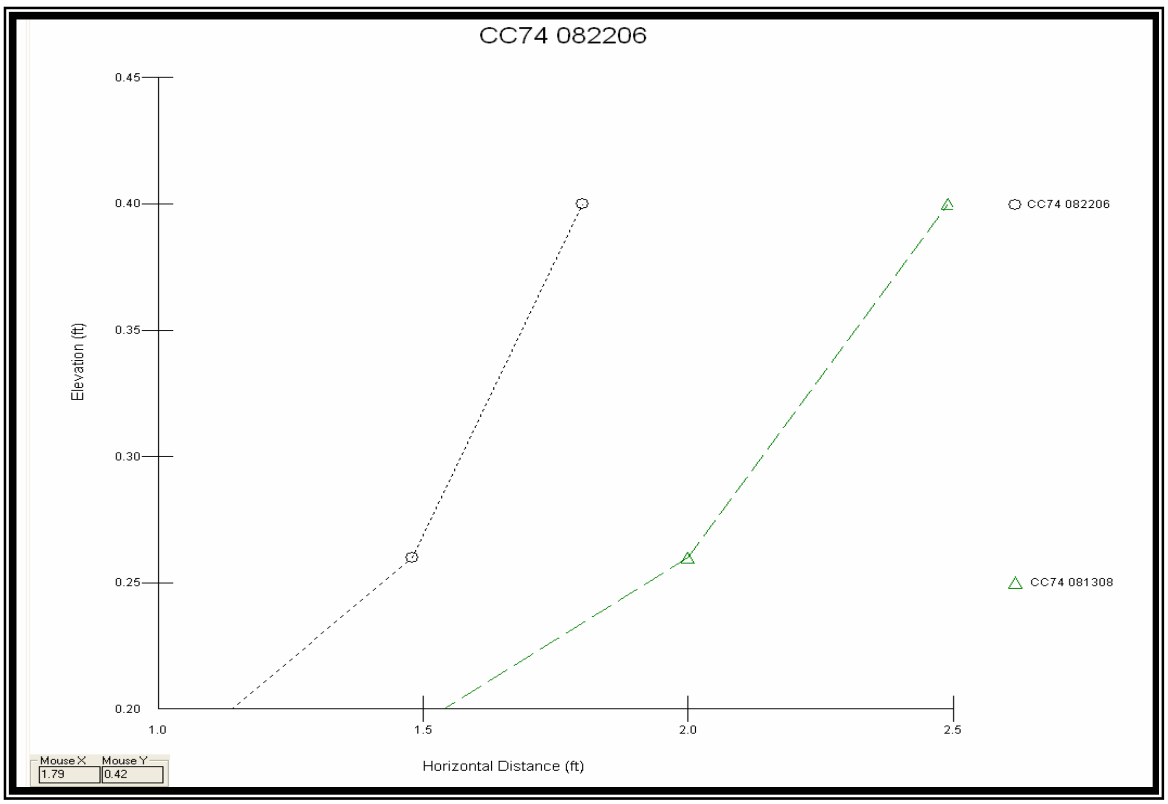
CC64

BEHI = Low   Erosion Rate = 0.33 ft/yr



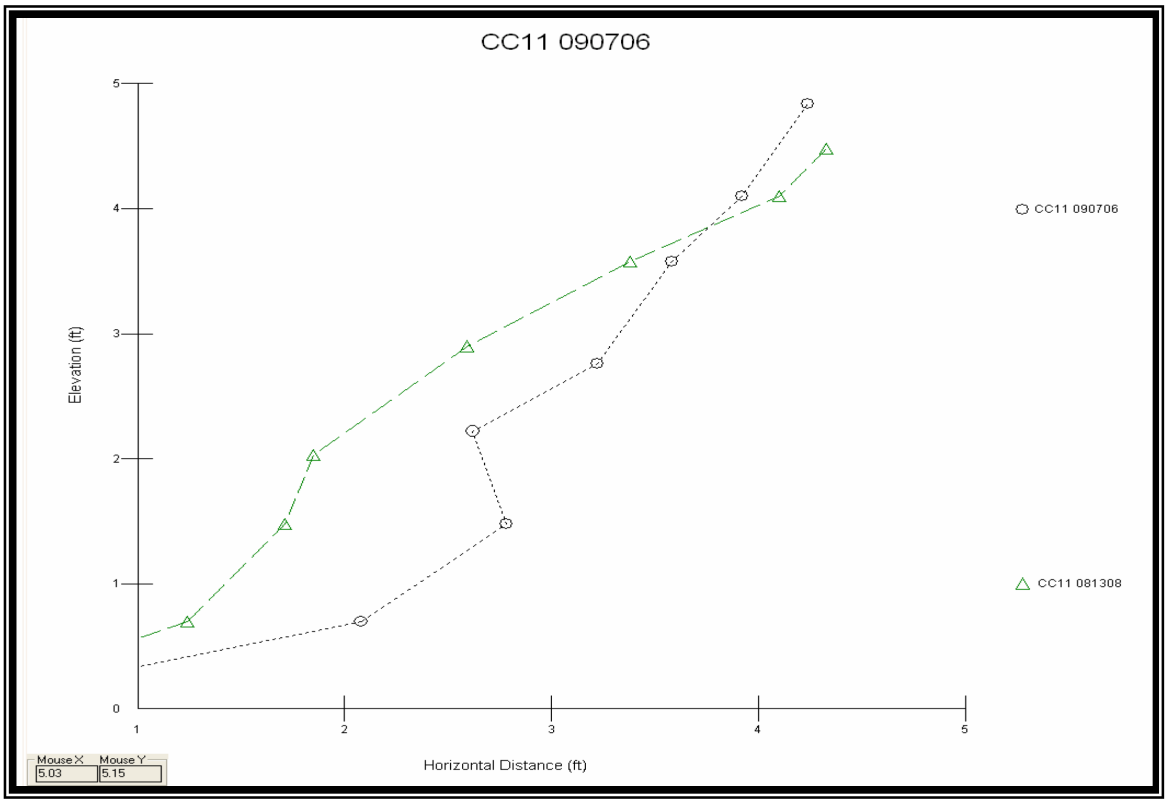
CC74

BEHI = Low   Erosion Rate = -0.19 ft/yr



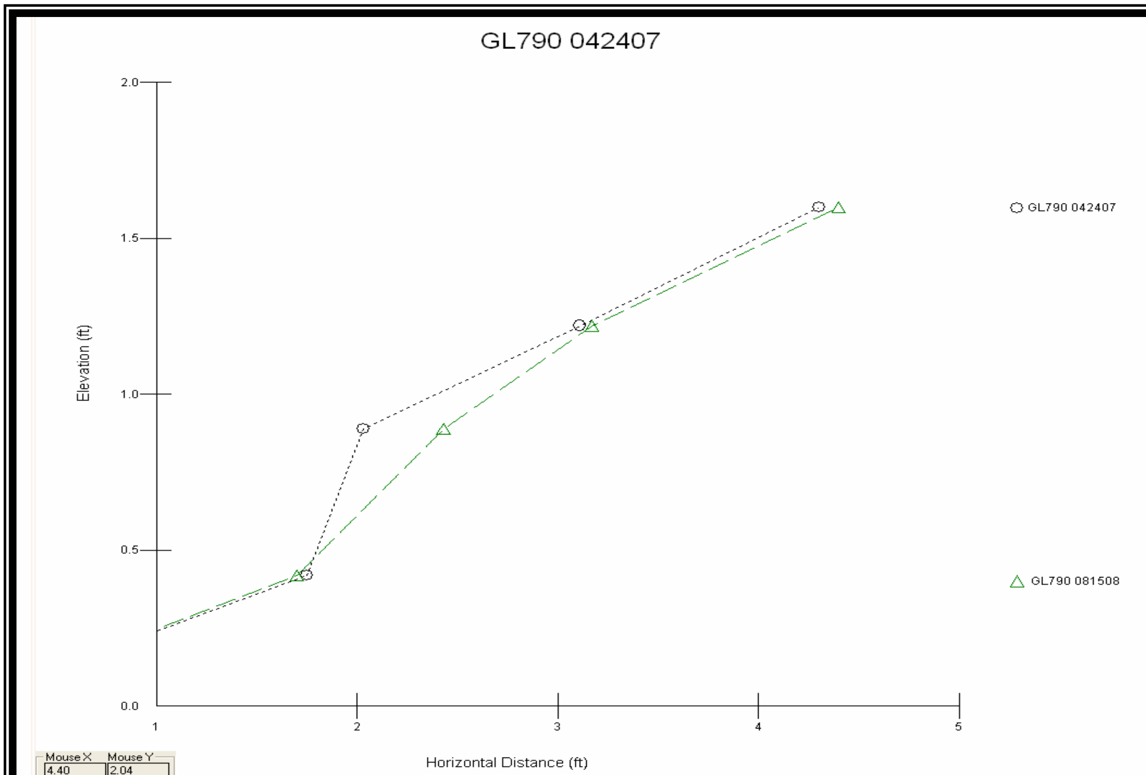
CC11

BEHI = High   Erosion Rate = 0.45 ft/yr



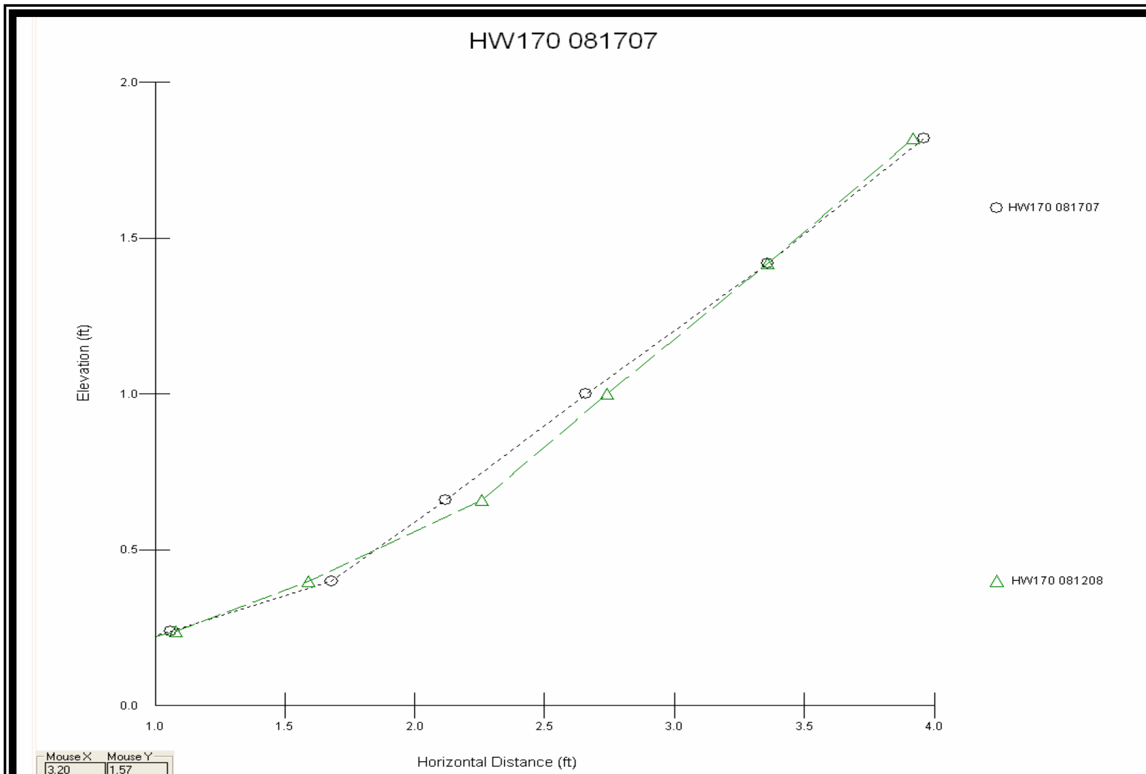
GL790

BEHI = Low   Erosion Rate = -0.086 ft/yr



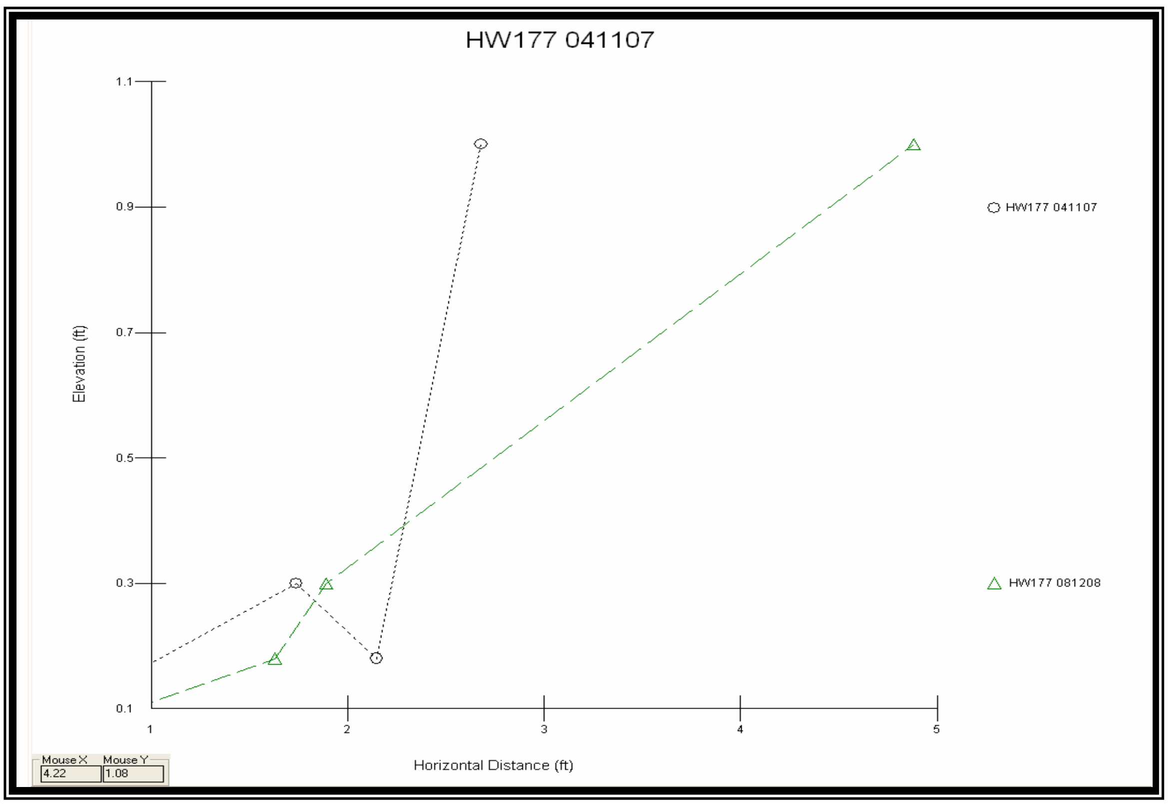
HW170

BEHI = Low   Erosion Rate = -0.028 ft/yr



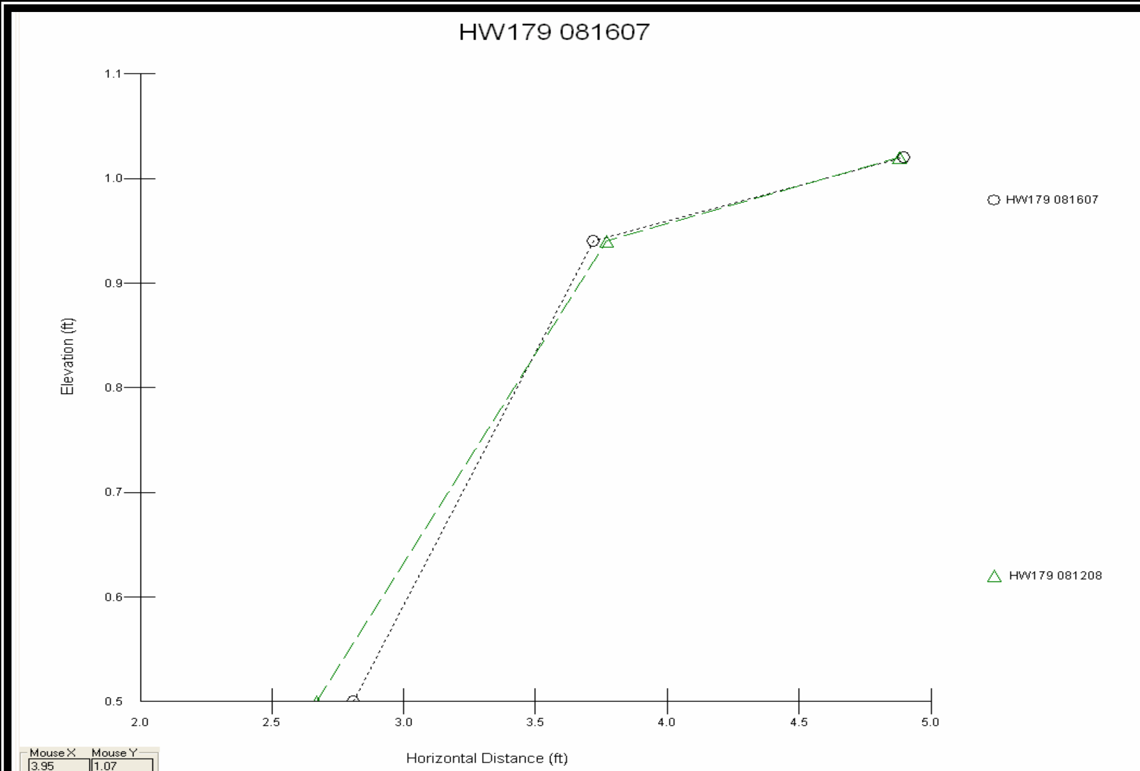
HW177

BEHI = Moderate   Erosion Rate = -0.54 ft/yr



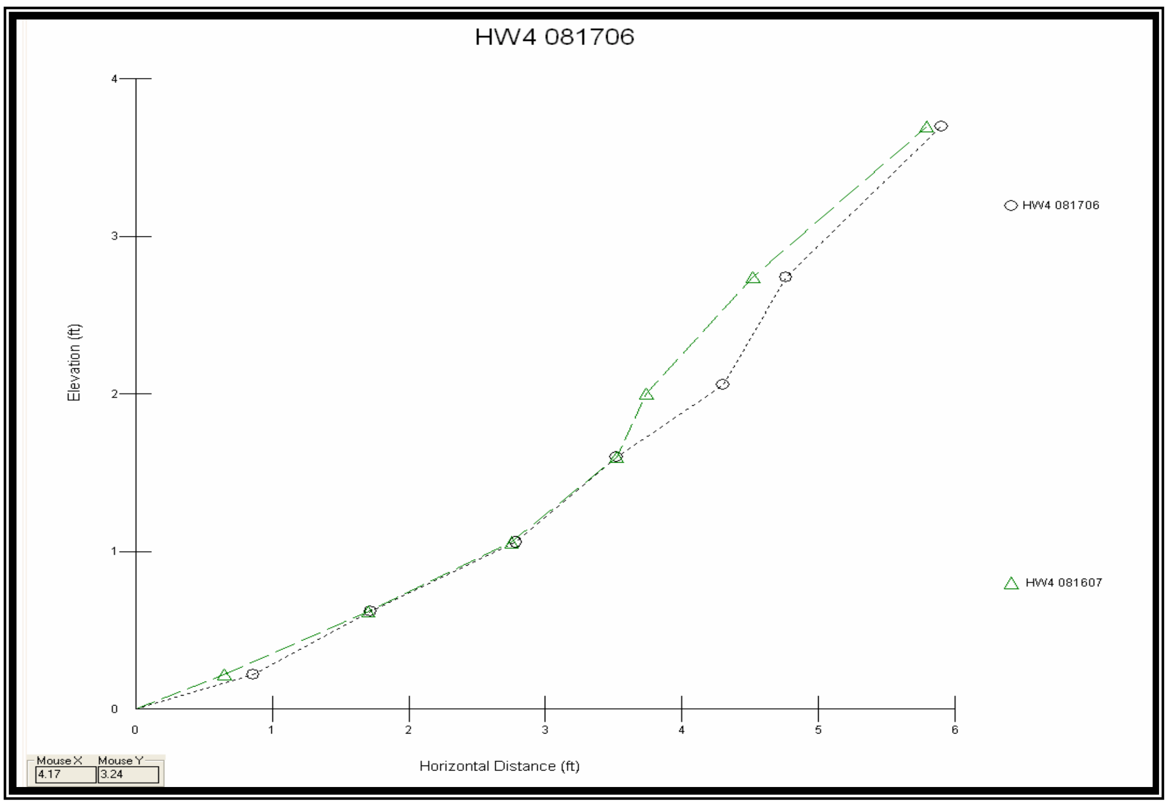
HW179

BEHI = Low   Erosion Rate = 0.049 ft/yr



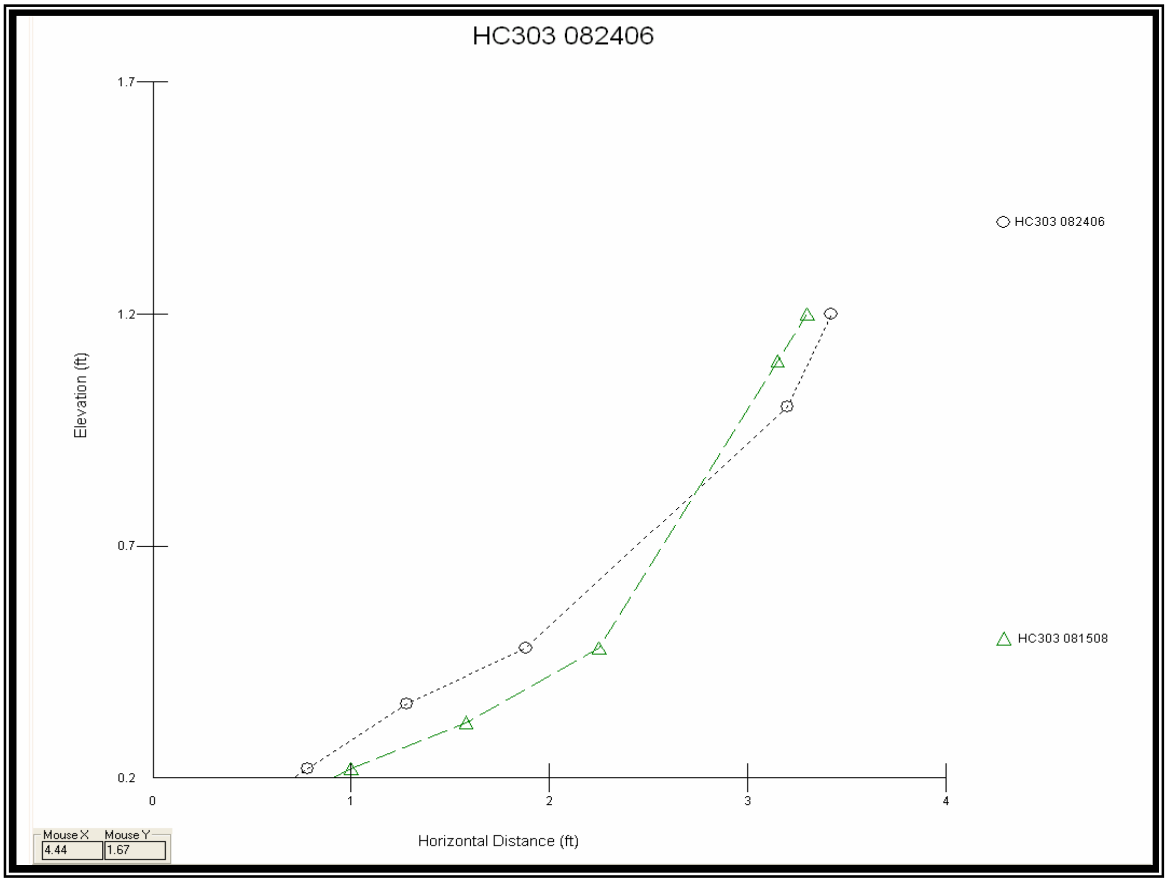
HW4

BEHI = Very High   Erosion Rate = 0.17 ft/yr



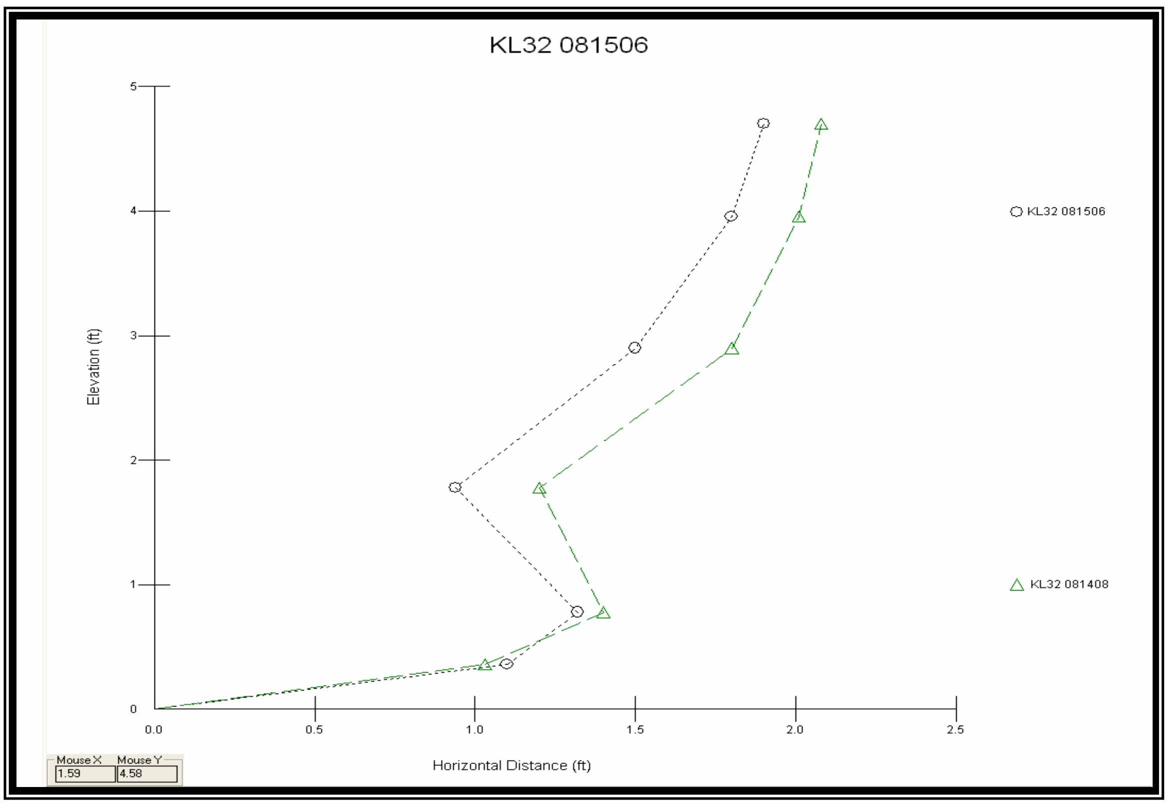
HC303

BEHI = Low   Erosion Rate = -0.058 ft/yr



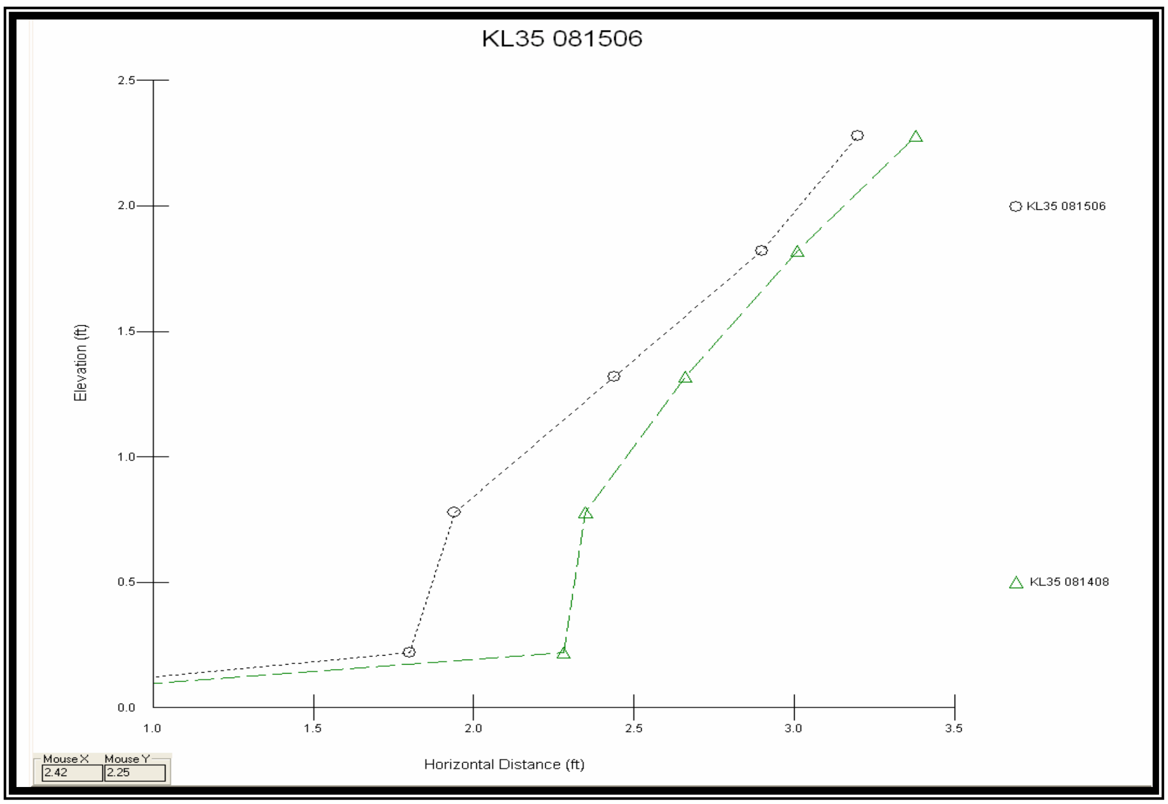
KL32

BEHI = High   Erosion Rate = -0.095 ft/yr



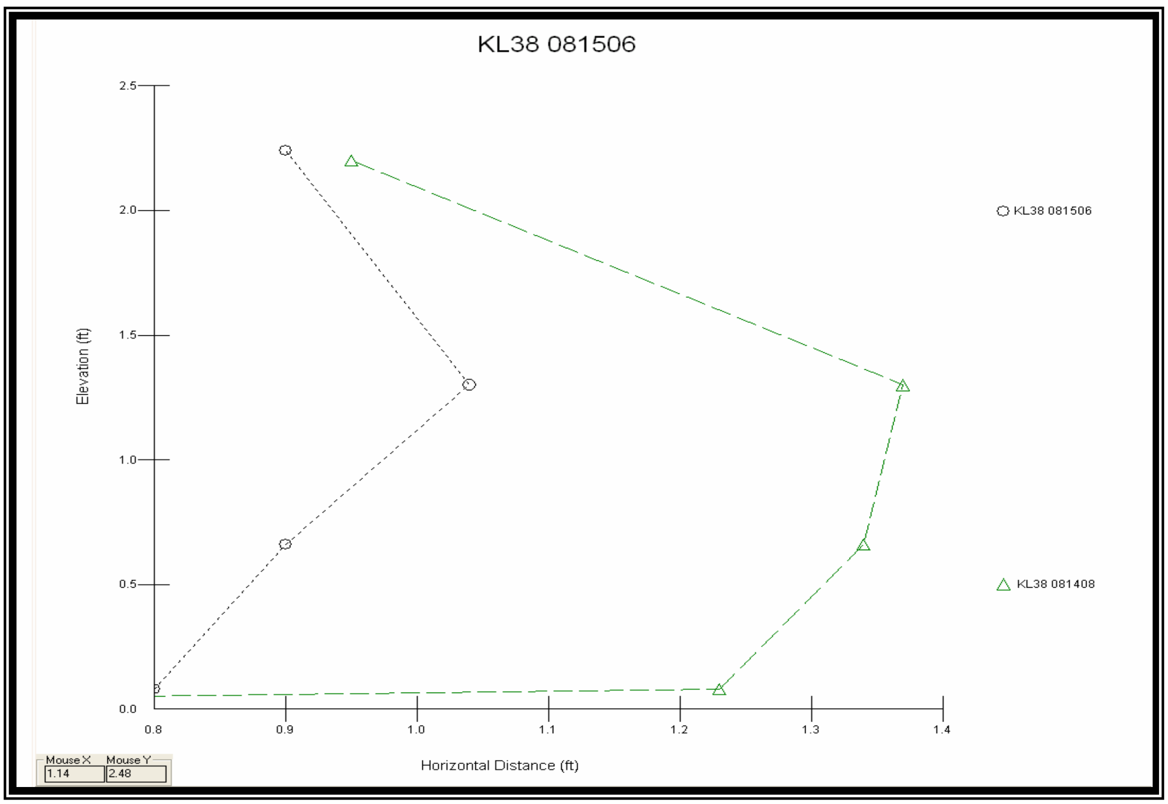
KL35

BEHI = Very High   Erosion Rate = -0.14 ft/yr



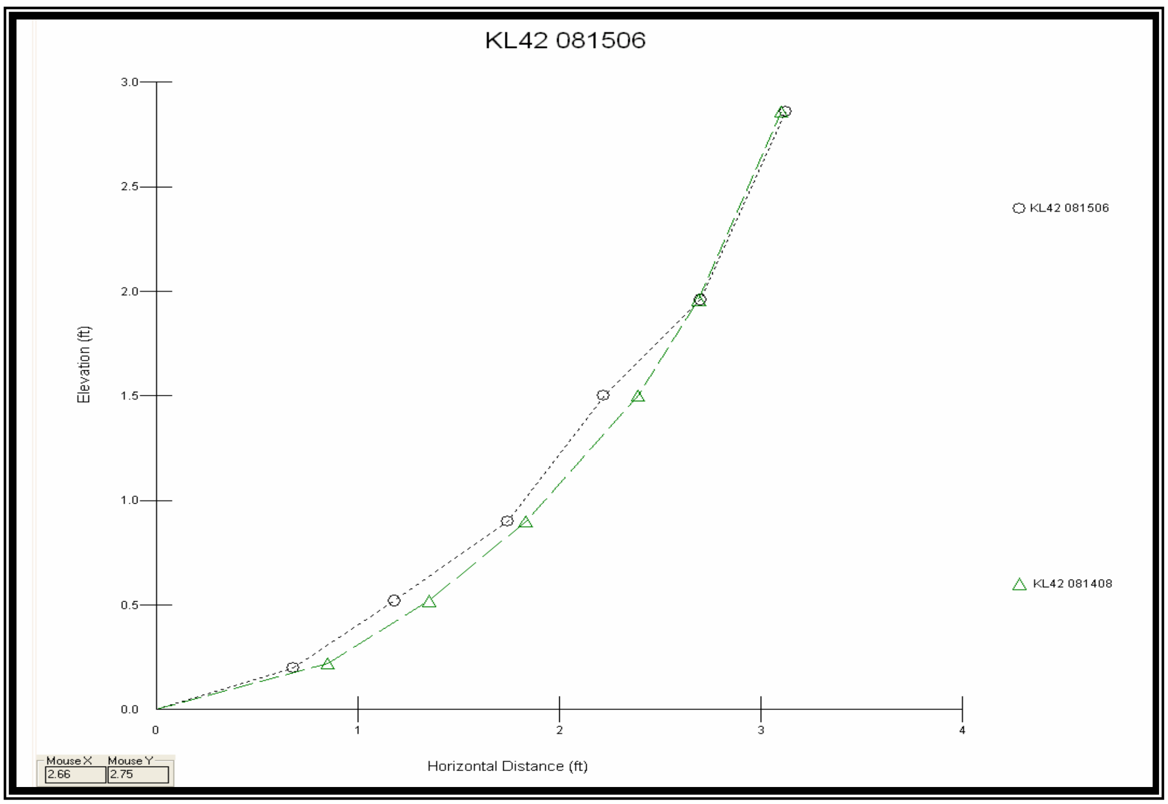
KL38

BEHI = High   Erosion Rate = -0.15 ft/yr



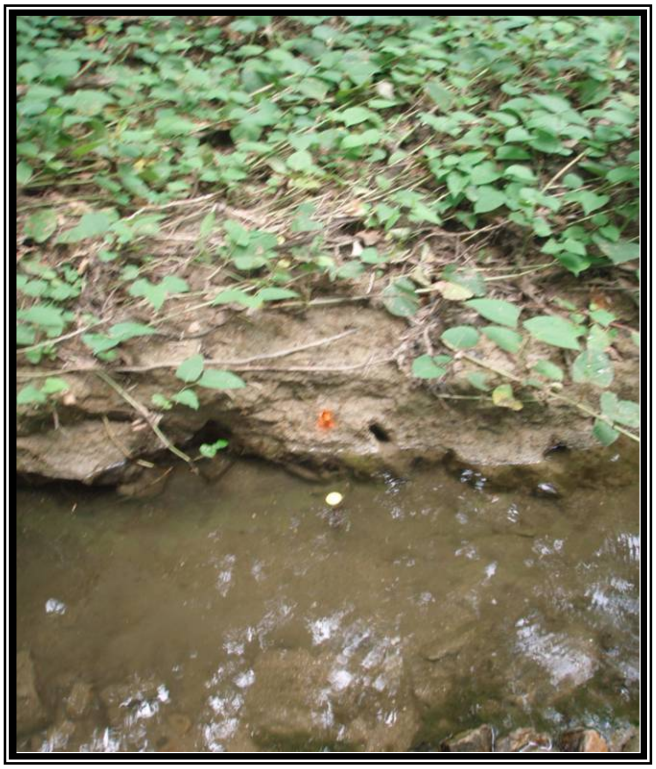
KL42

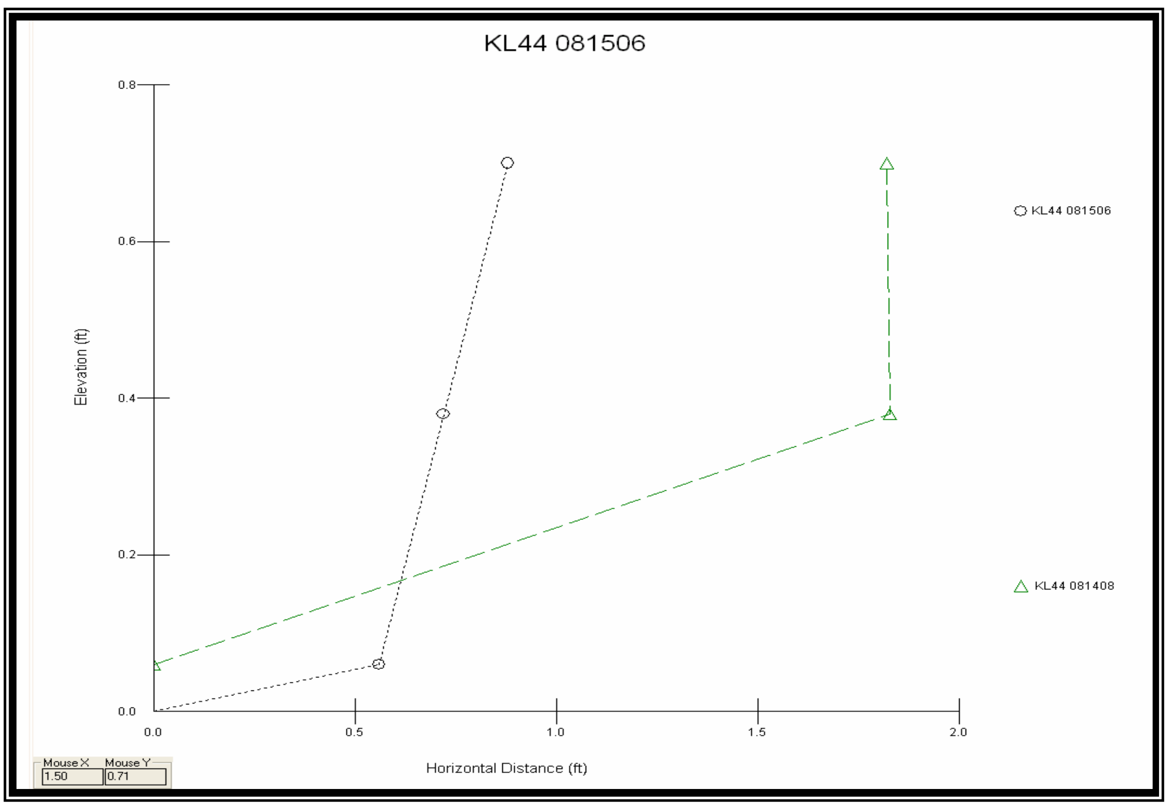
BEHI = Very High   Erosion Rate = -0.037 ft/yr



KL44

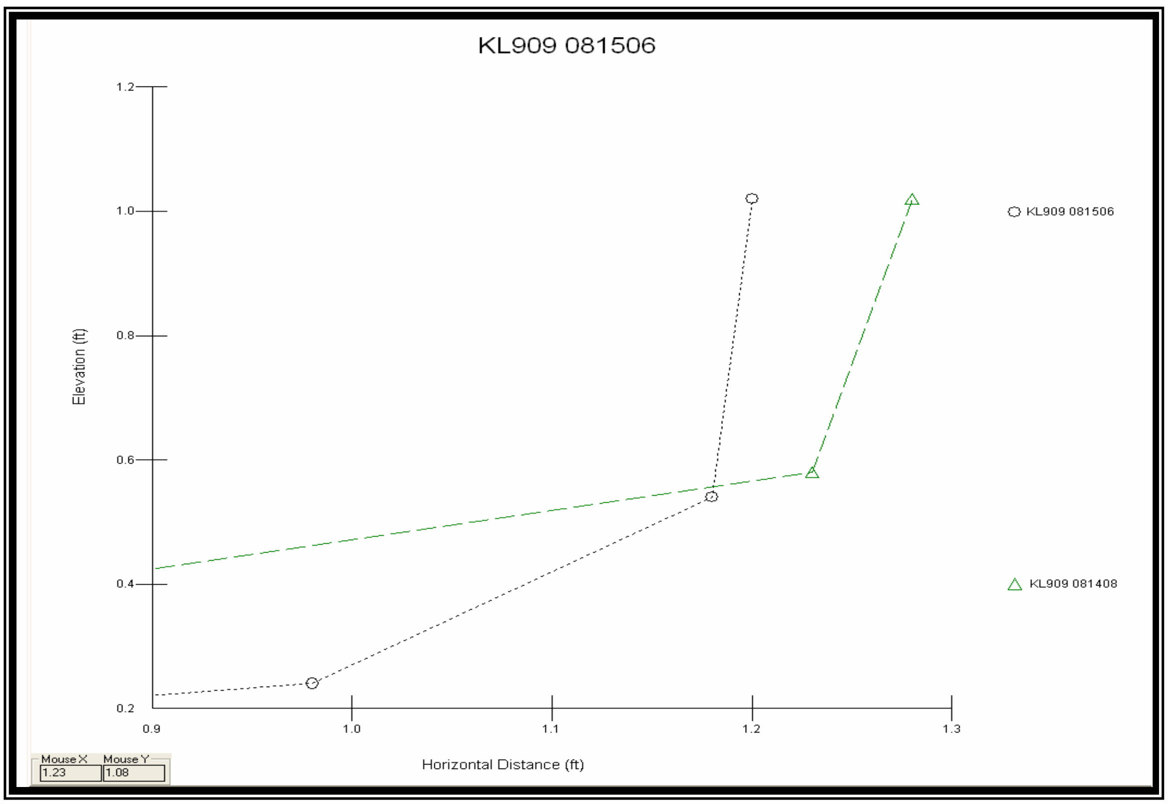
BEHI = High   Erosion Rate = -0.29 ft/yr





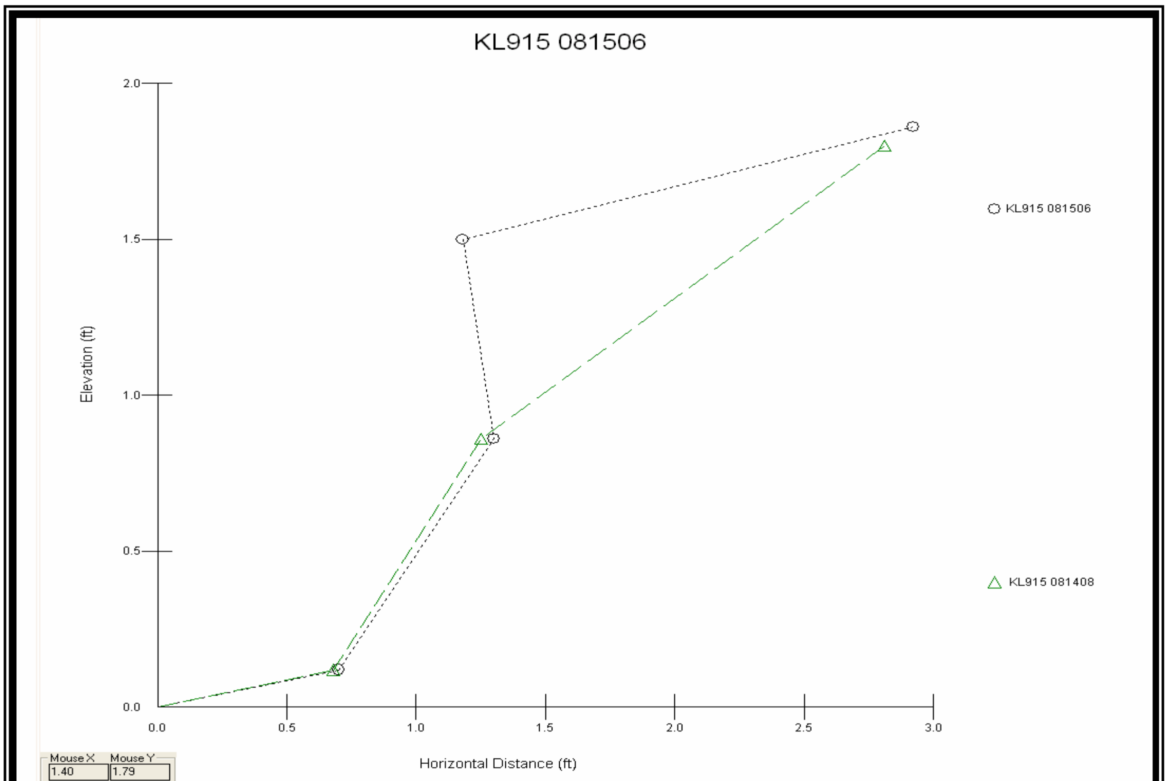
KL909

BEHI = Low   Erosion Rate = 0.049 ft/yr



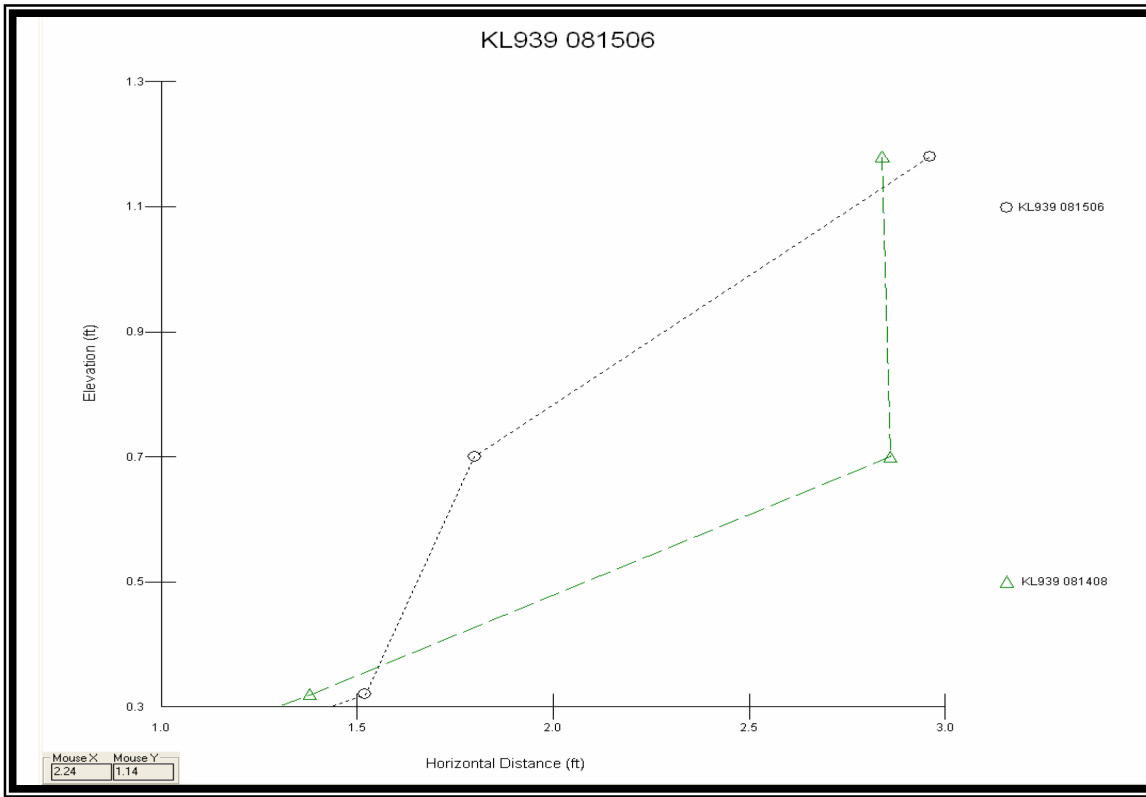
KL915

BEHI = Moderate   Erosion Rate = -0.097 ft/yr



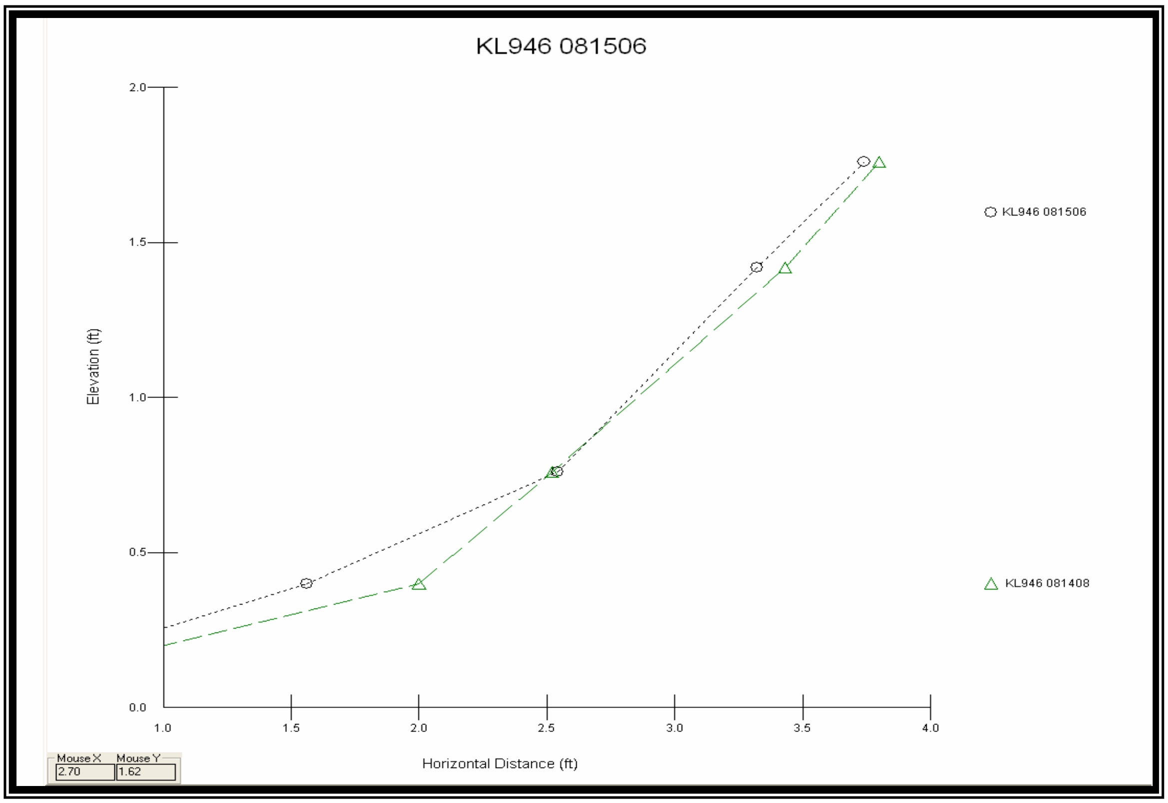
KL939

BEHI = Low   Erosion Rate = -0.16 ft/yr



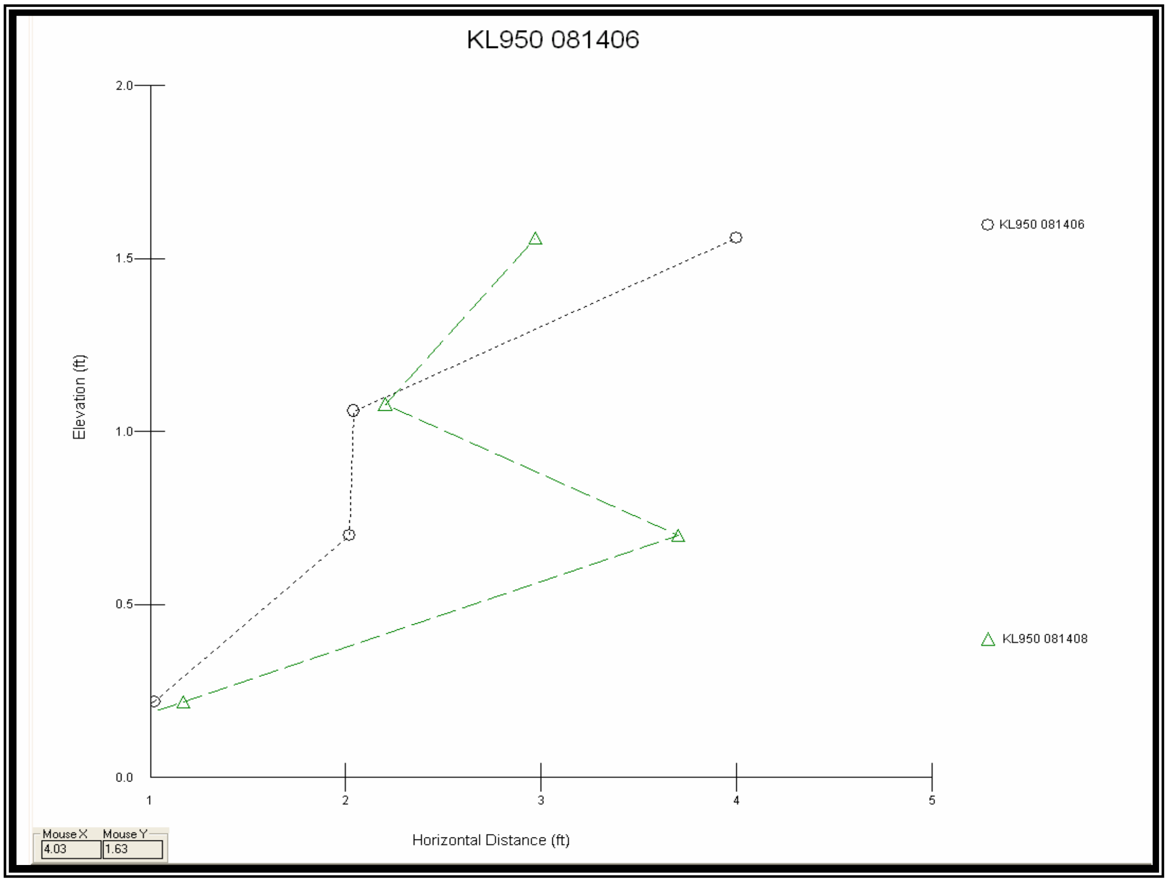
KL946

BEHI = Low   Erosion Rate = -0.065 ft/yr



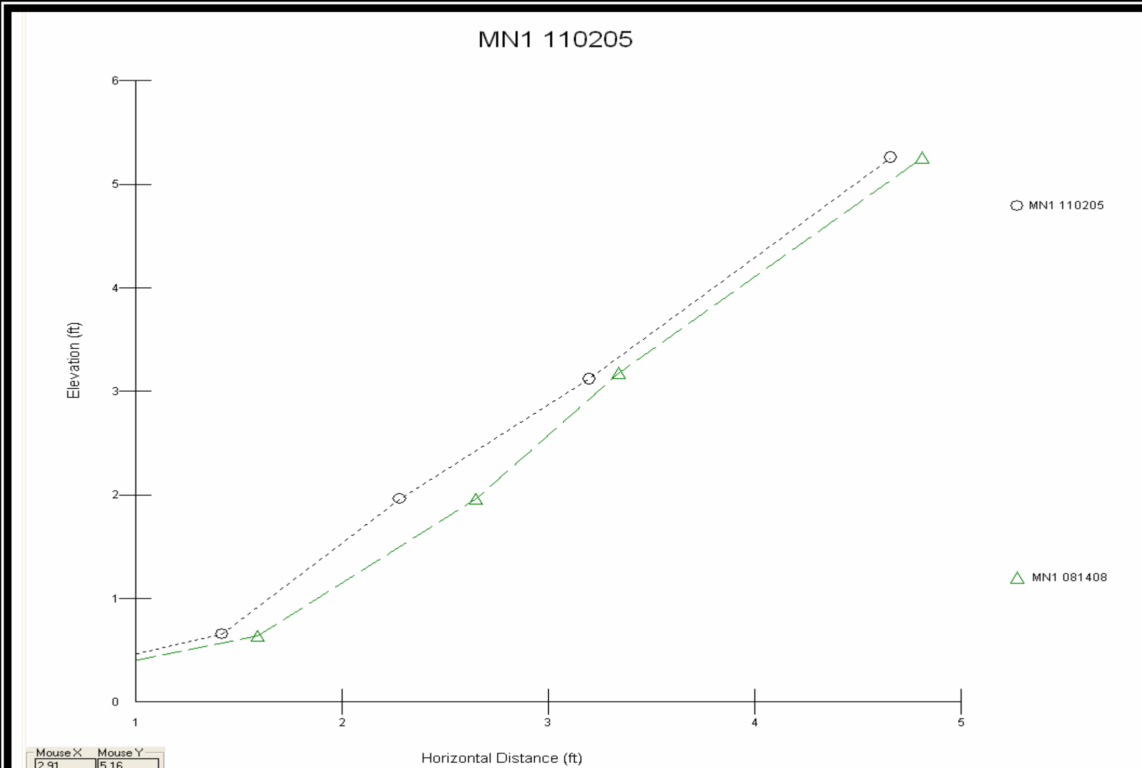
KL950

BEHI = Low   Erosion Rate = -0.19 ft/yr



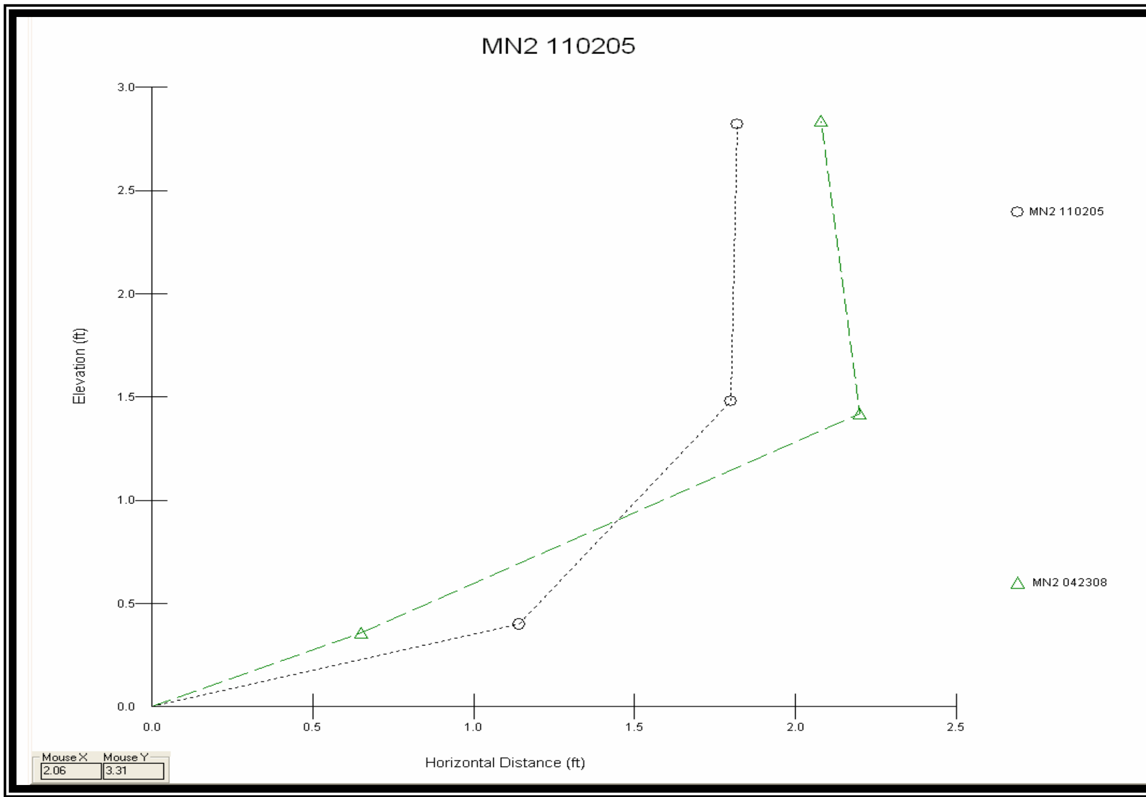
MN1

BEHI = Moderate   Erosion Rate = -0.067 ft/yr



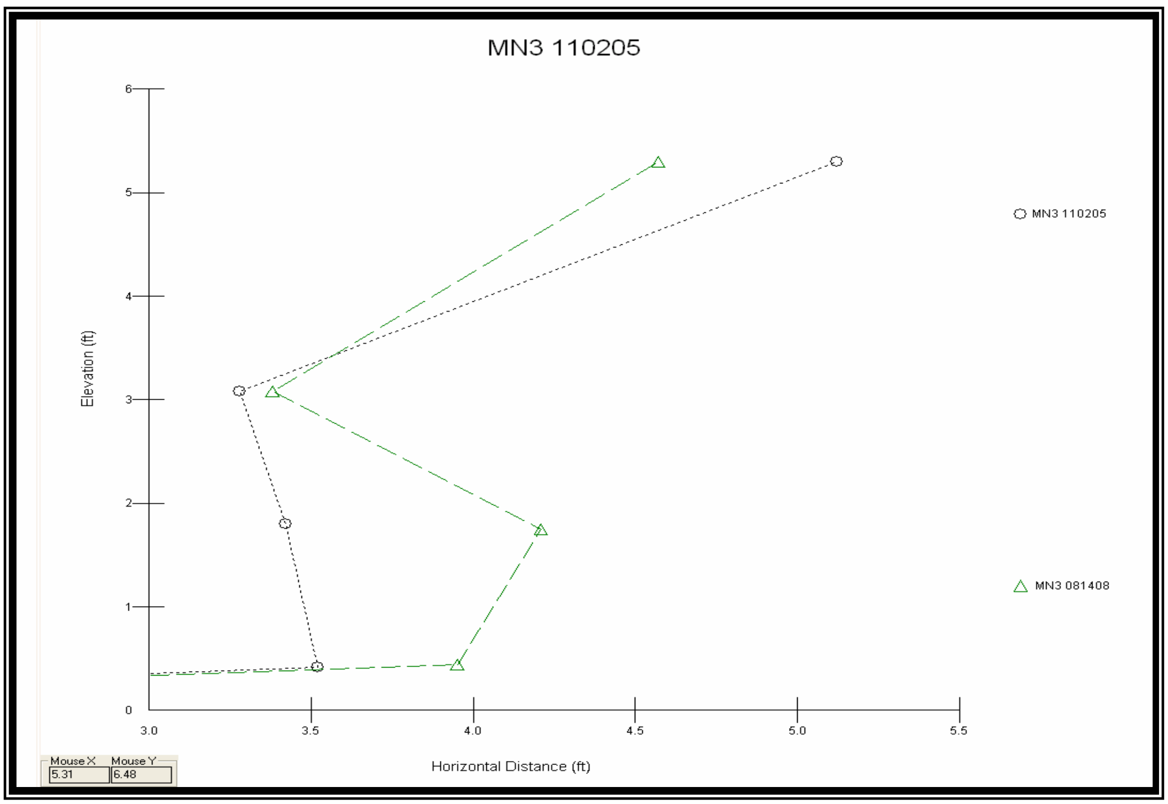
MN2

BEHI = Moderate   Erosion Rate = -0.12 ft/yr



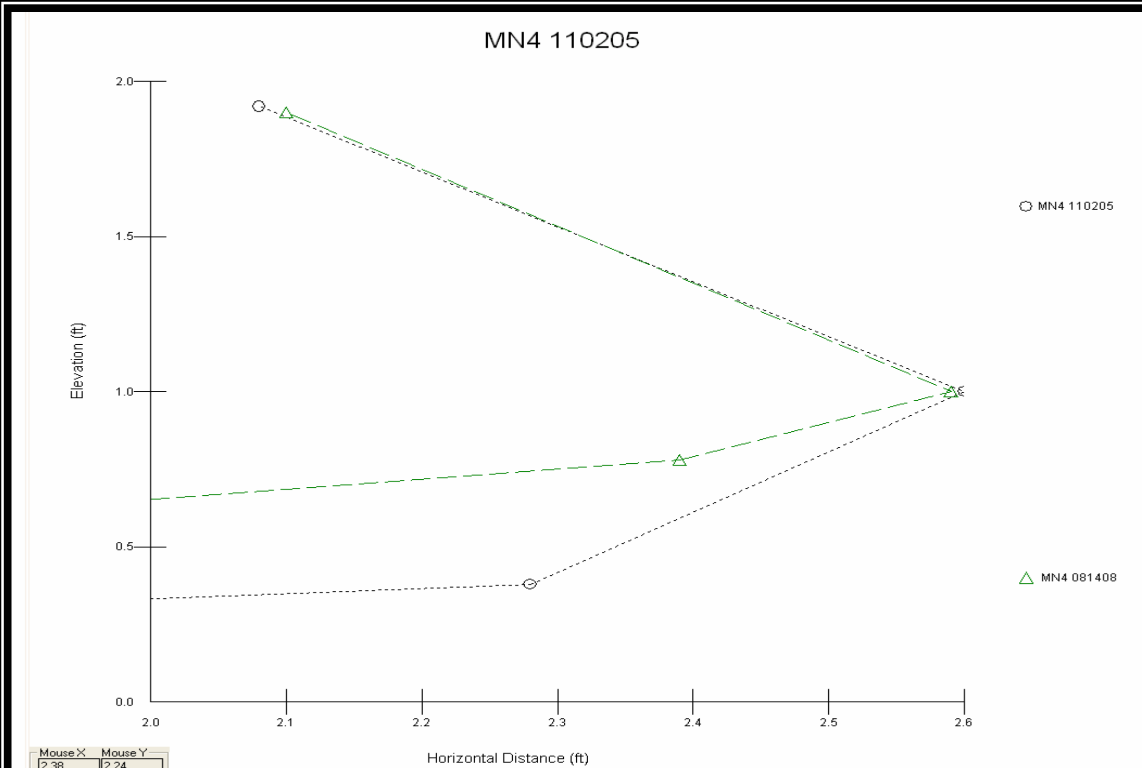
MN3

BEHI = High   Erosion Rate = -0.064 ft/yr



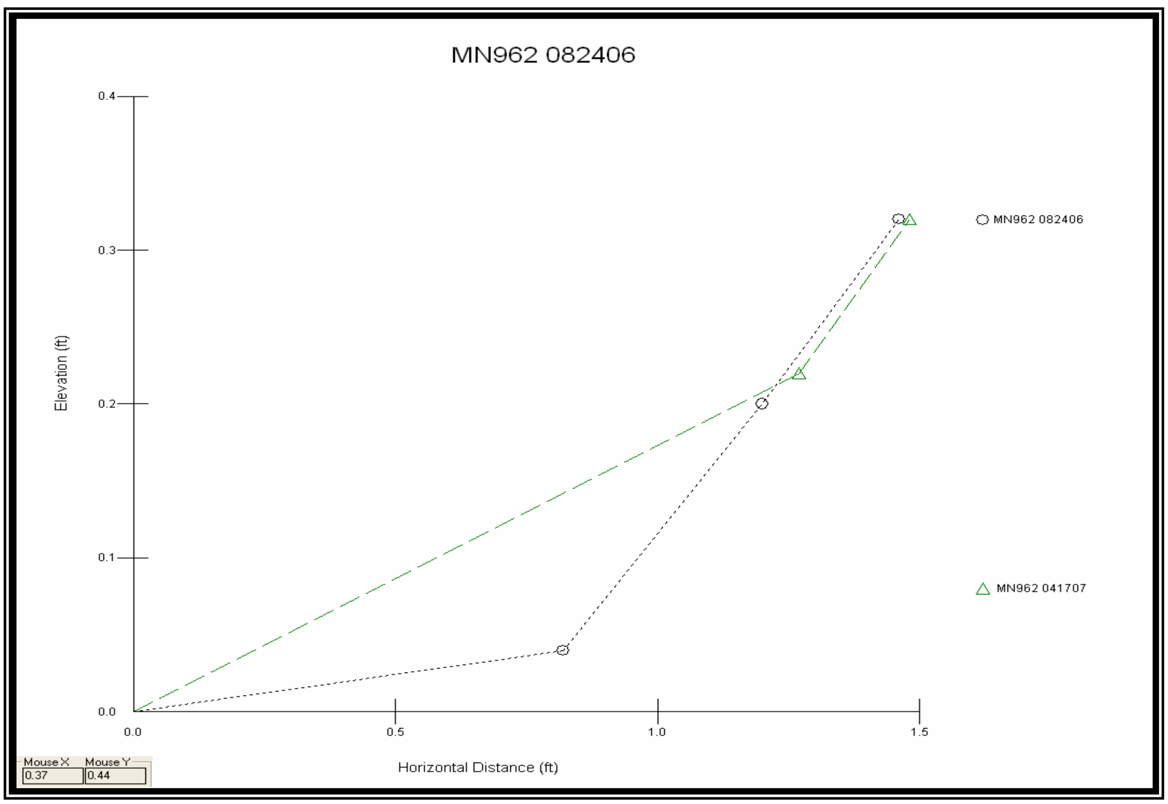
MN4

BEHI = Moderate   Erosion Rate = 0.096 ft/yr



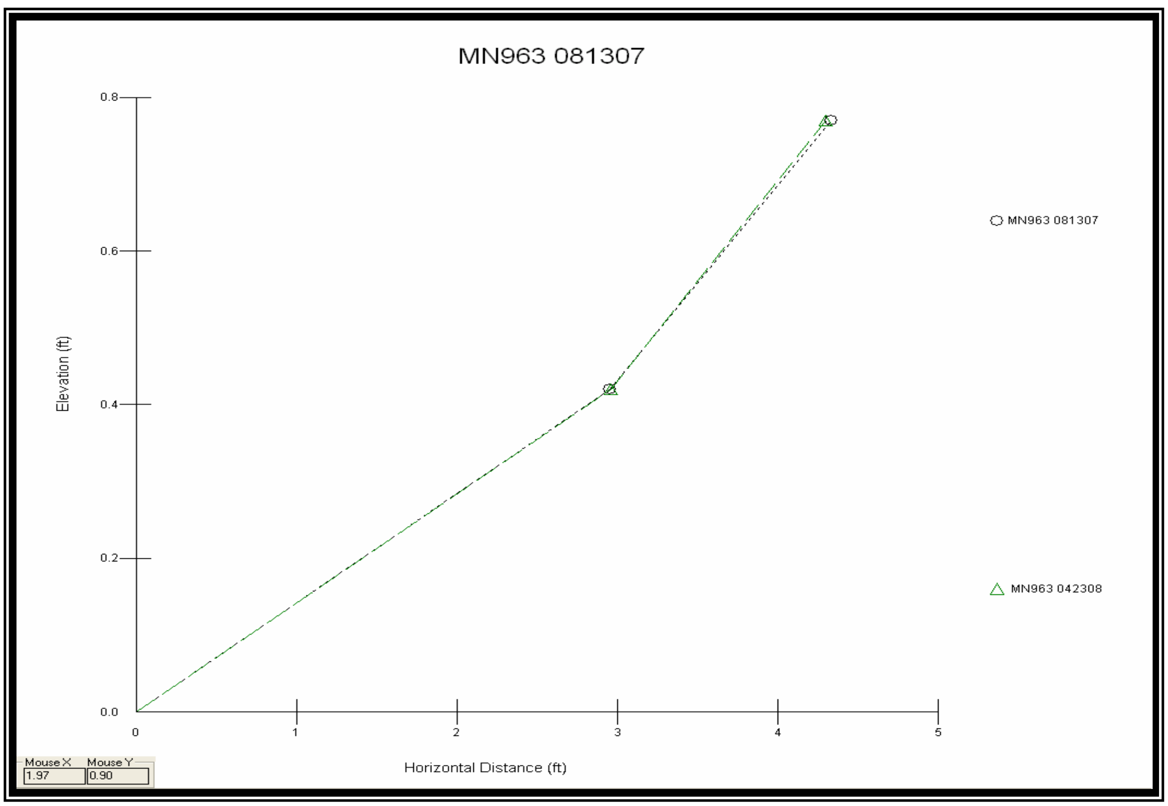
MN962

BEHI = Low   Erosion Rate = 0.095 ft/yr



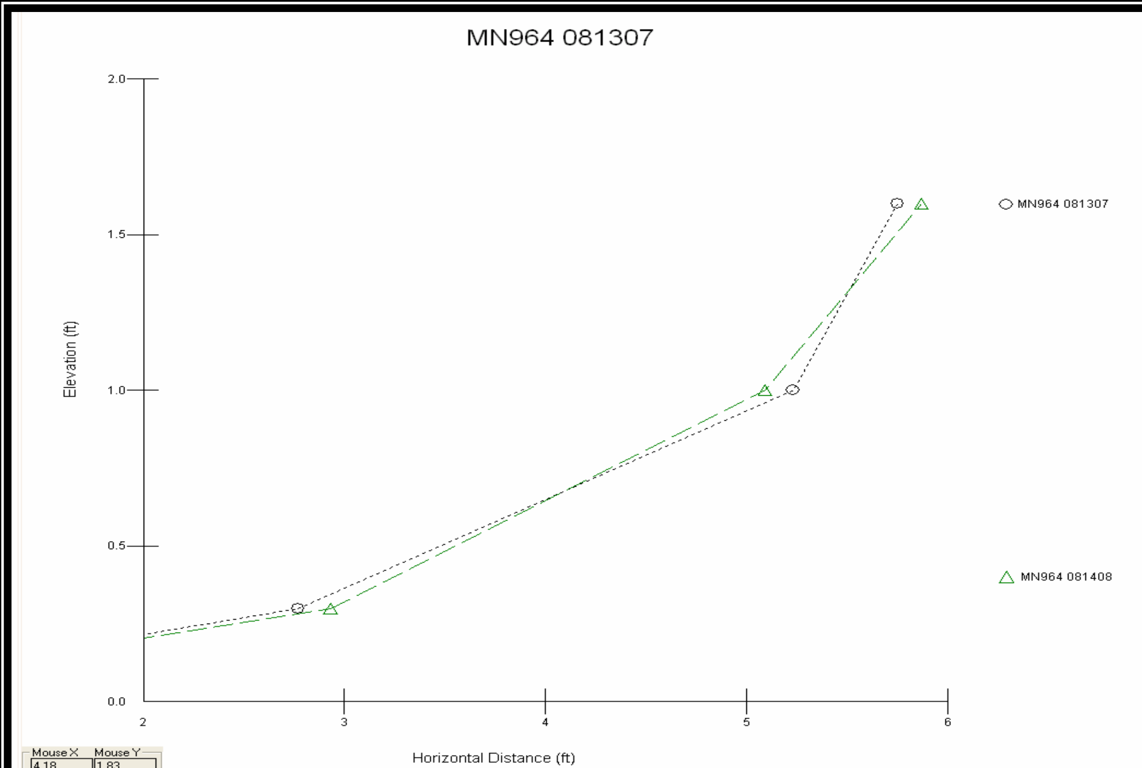
MN963

BEHI = Low   Erosion Rate = 0 ft/yr



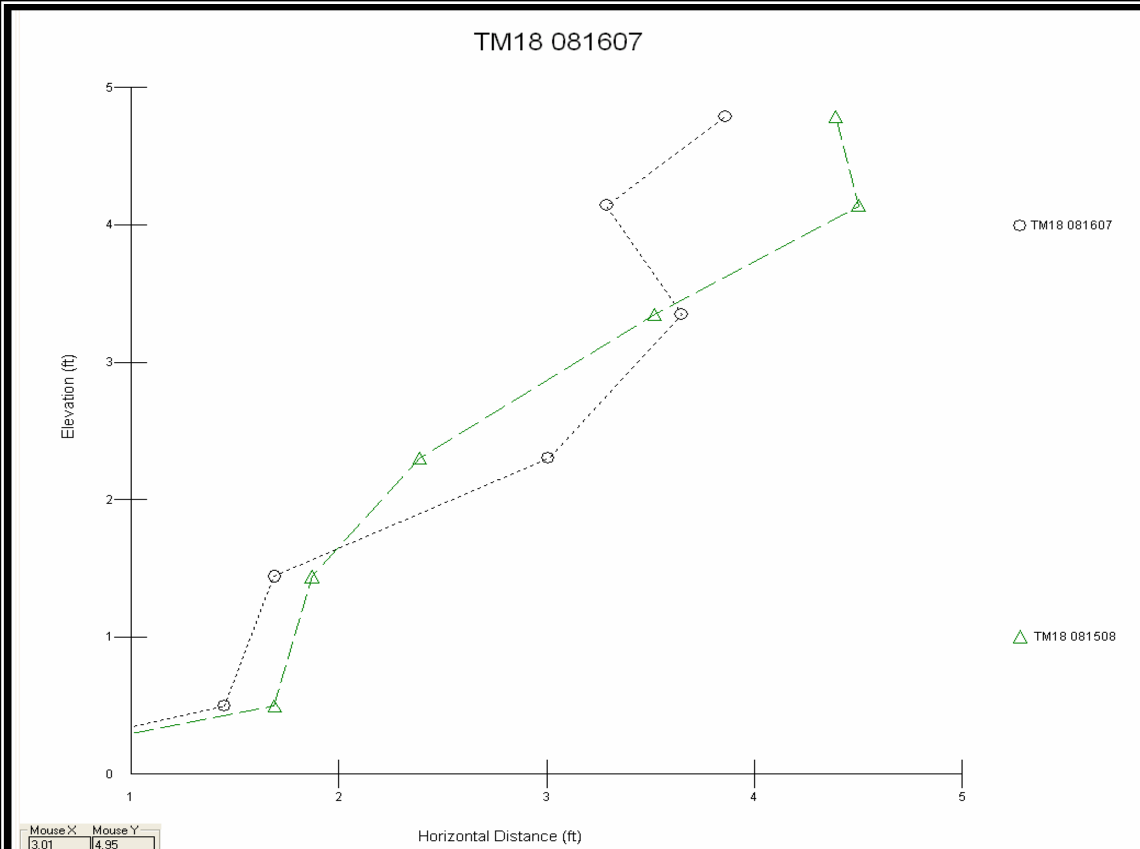
MN964

BEHI = Low   Erosion Rate = -0.012 ft/yr



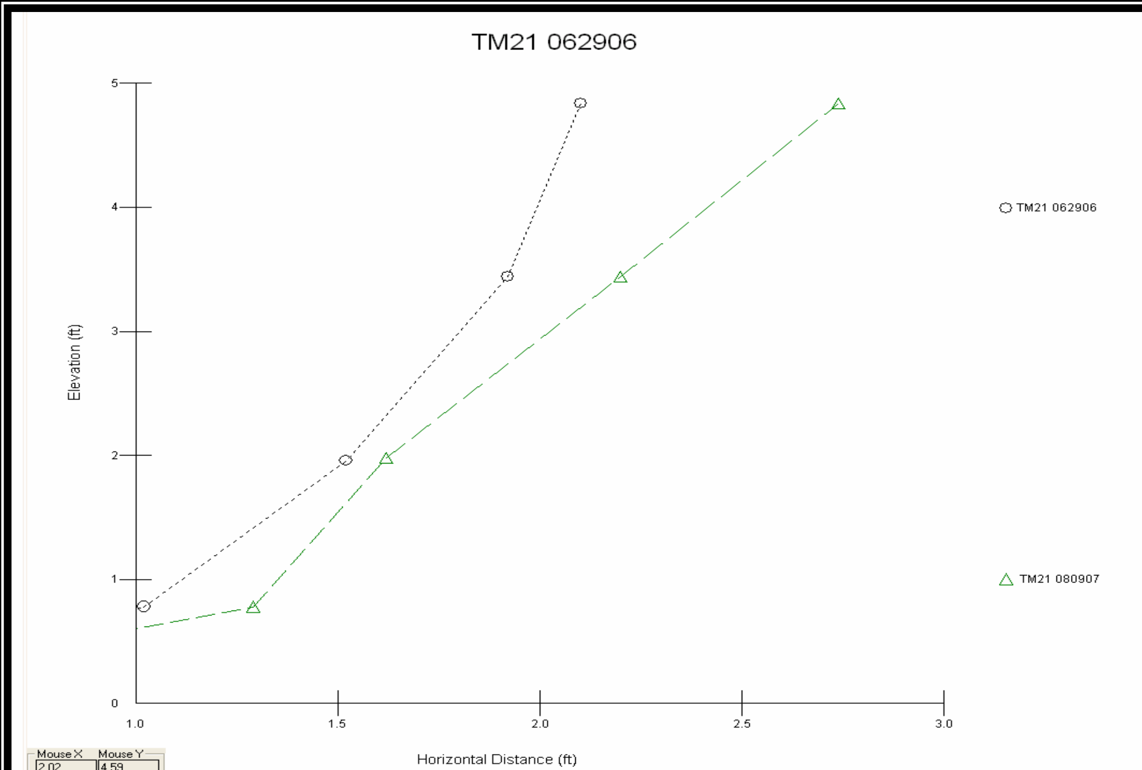
TM18

BEHI = Moderate   Erosion Rate = -0.14 ft/yr



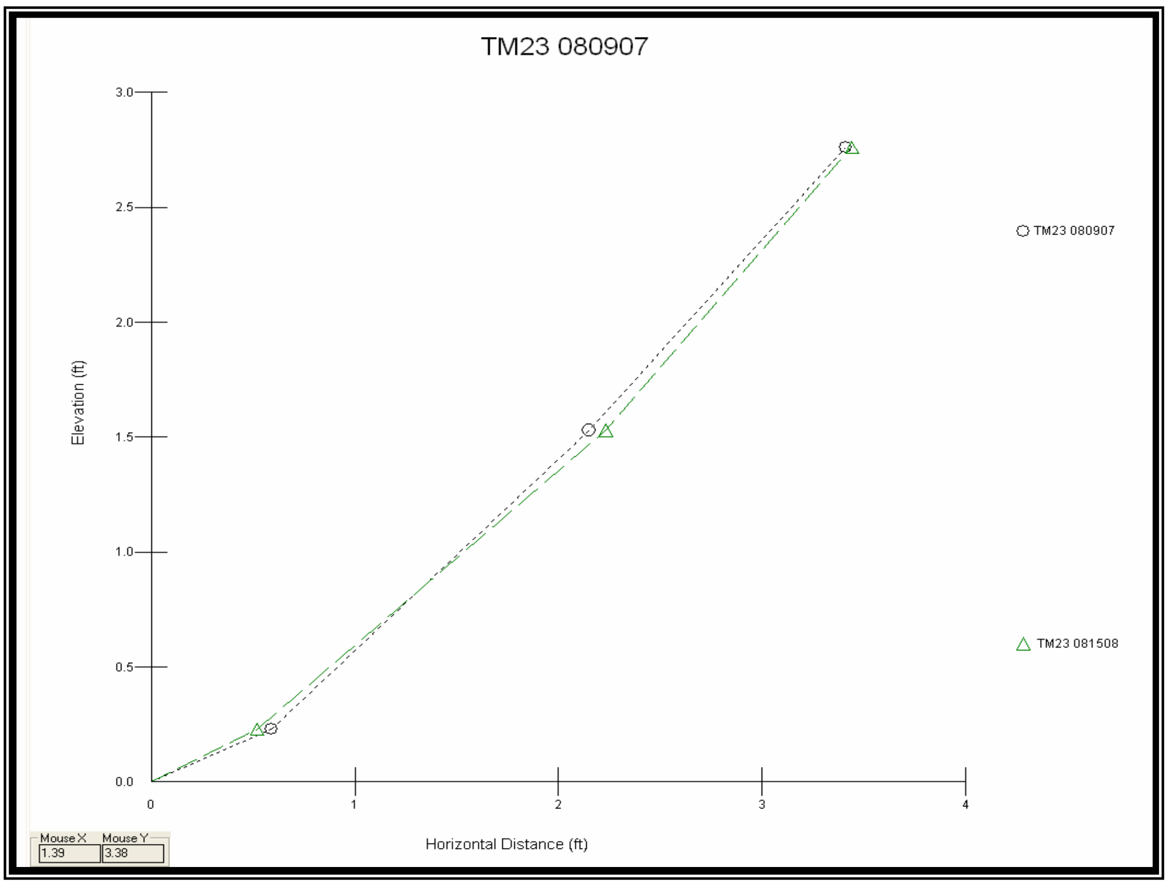
TM21

BEHI = Very High   Erosion Rate = -0.23 ft/yr



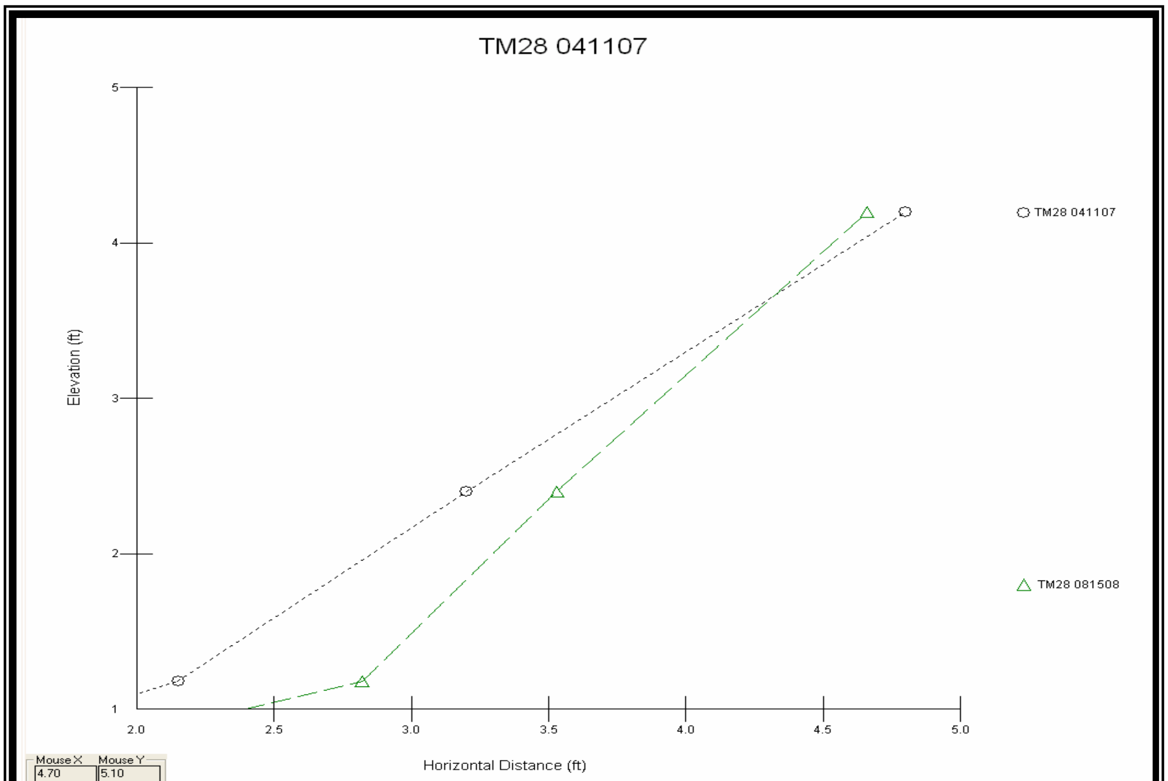
TM23

BEHI = Moderate   Erosion Rate = -0.021 ft/yr



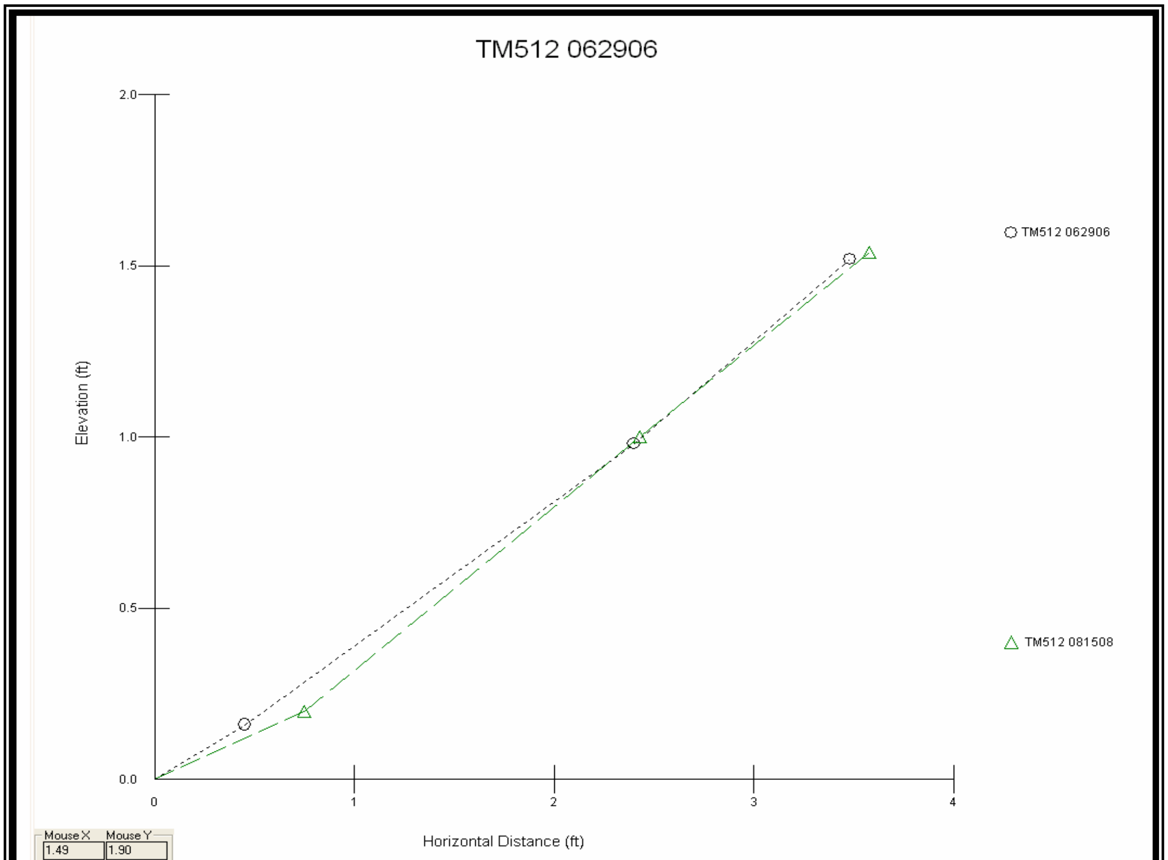
TM28

BEHI = Moderate   Erosion Rate = -0.21 ft/yr



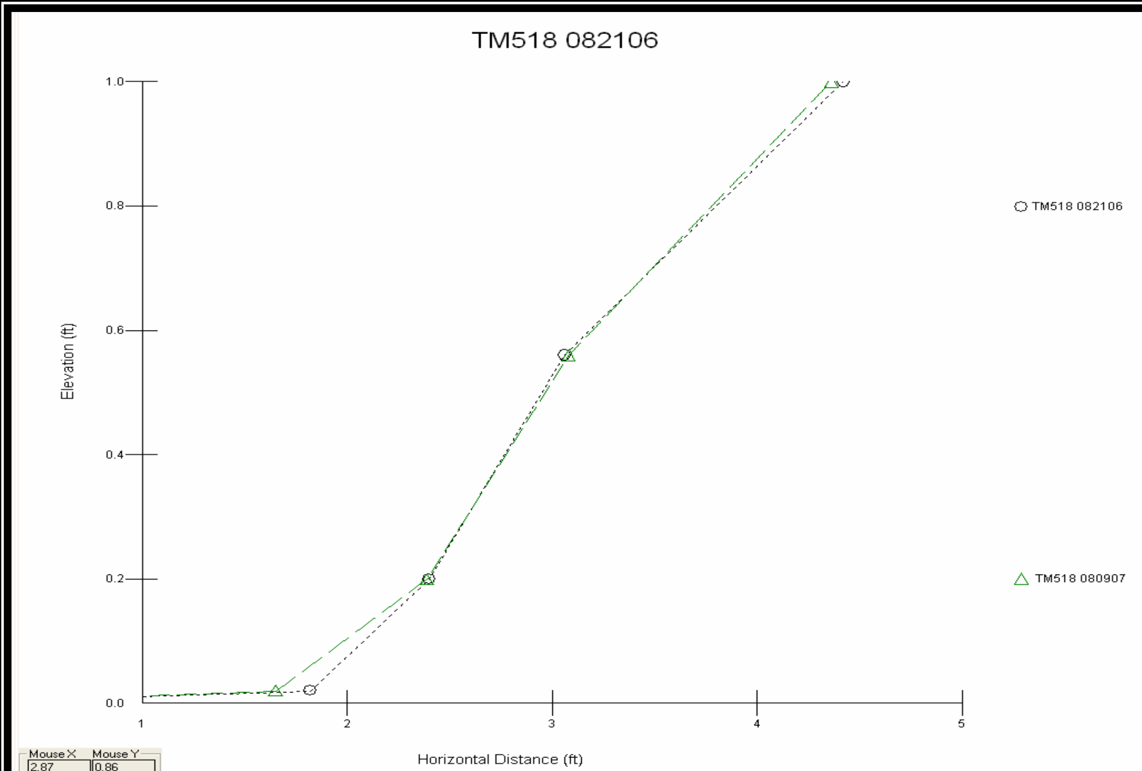
TM512

BEHI = Low   Erosion Rate = -0.055 ft/yr



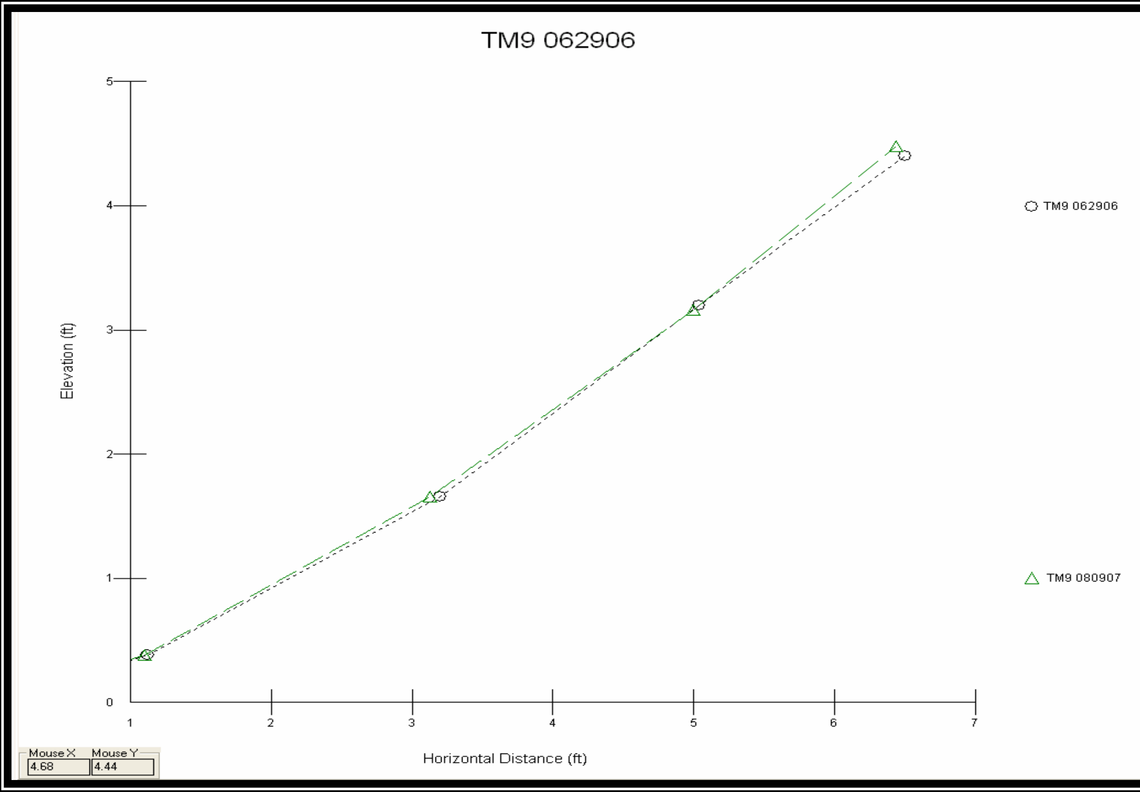
TM518

BEHI = Low   Erosion Rate = 0.052 ft/yr



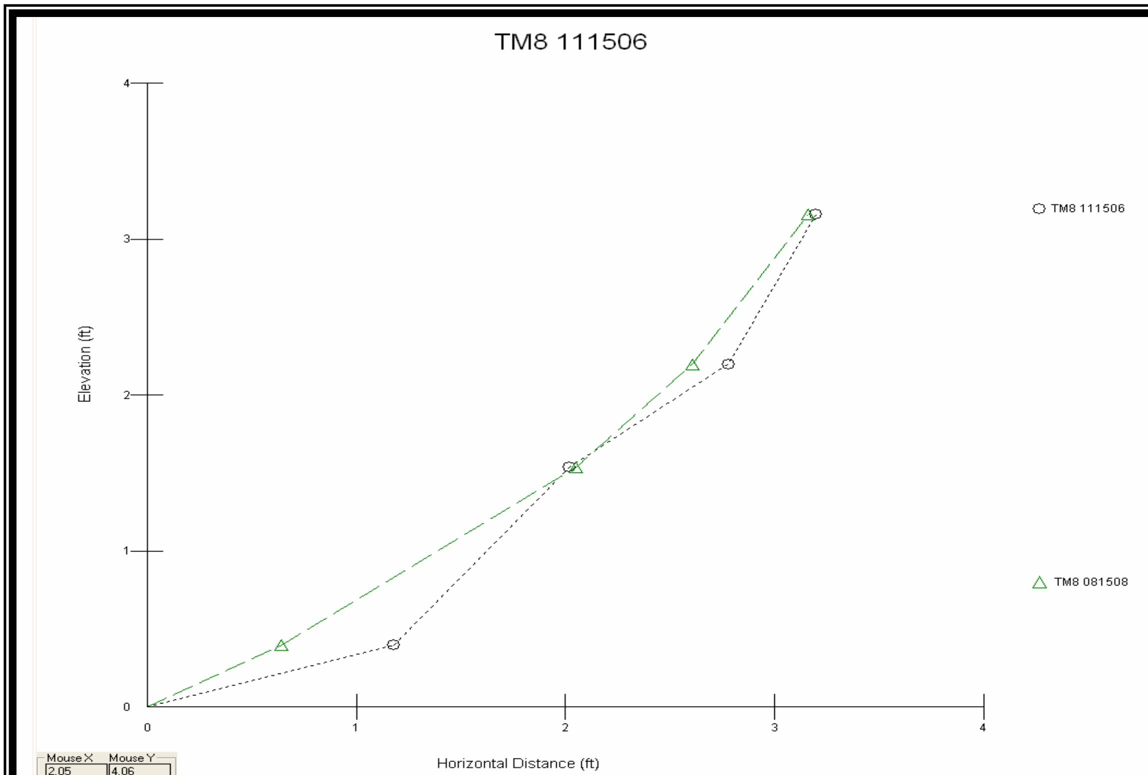
TM9

BEHI = Moderate   Erosion Rate = -0.062 ft/yr



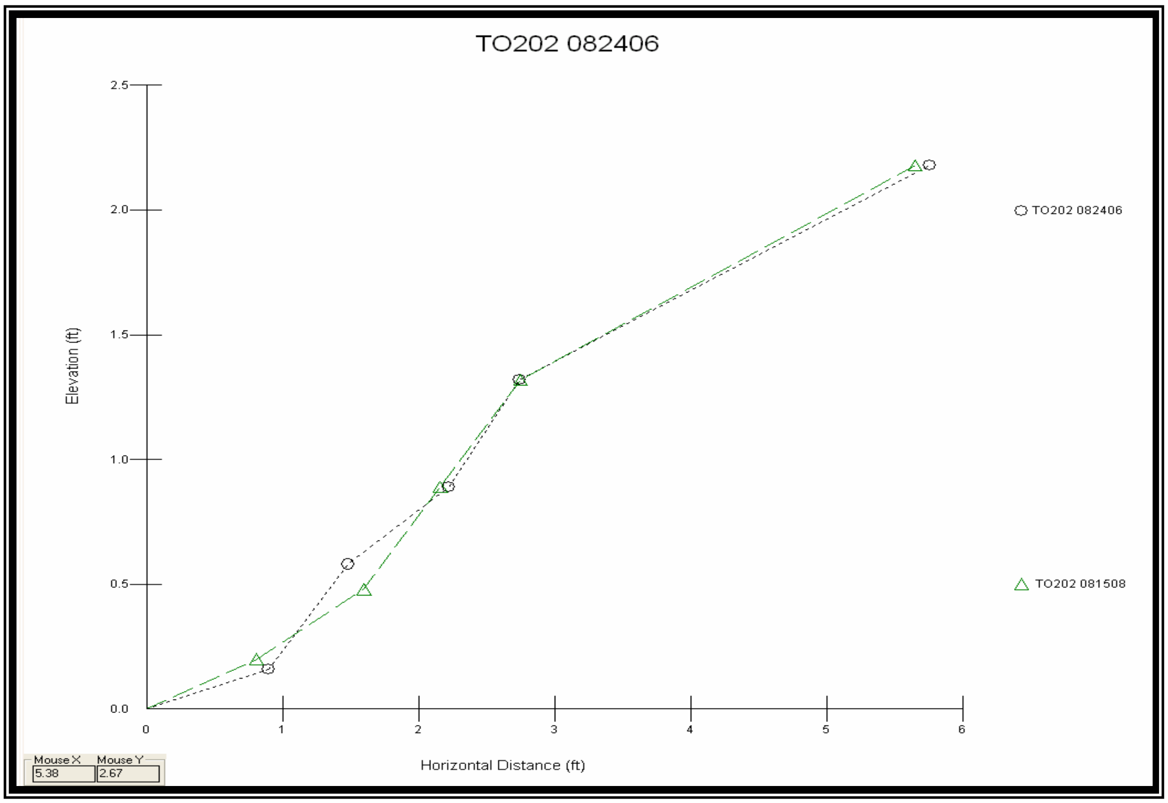
TM8

BEHI = Moderate   Erosion Rate = 0.098 ft/yr



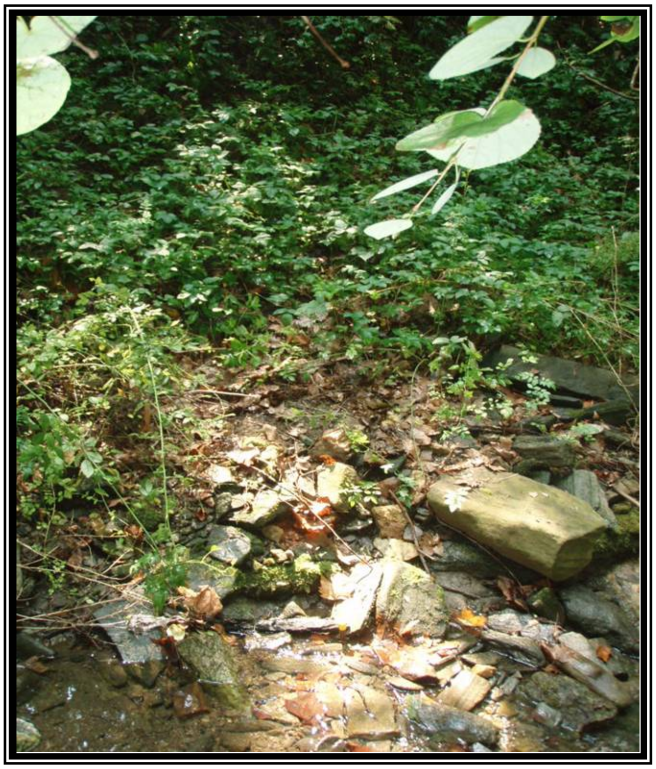
TO202

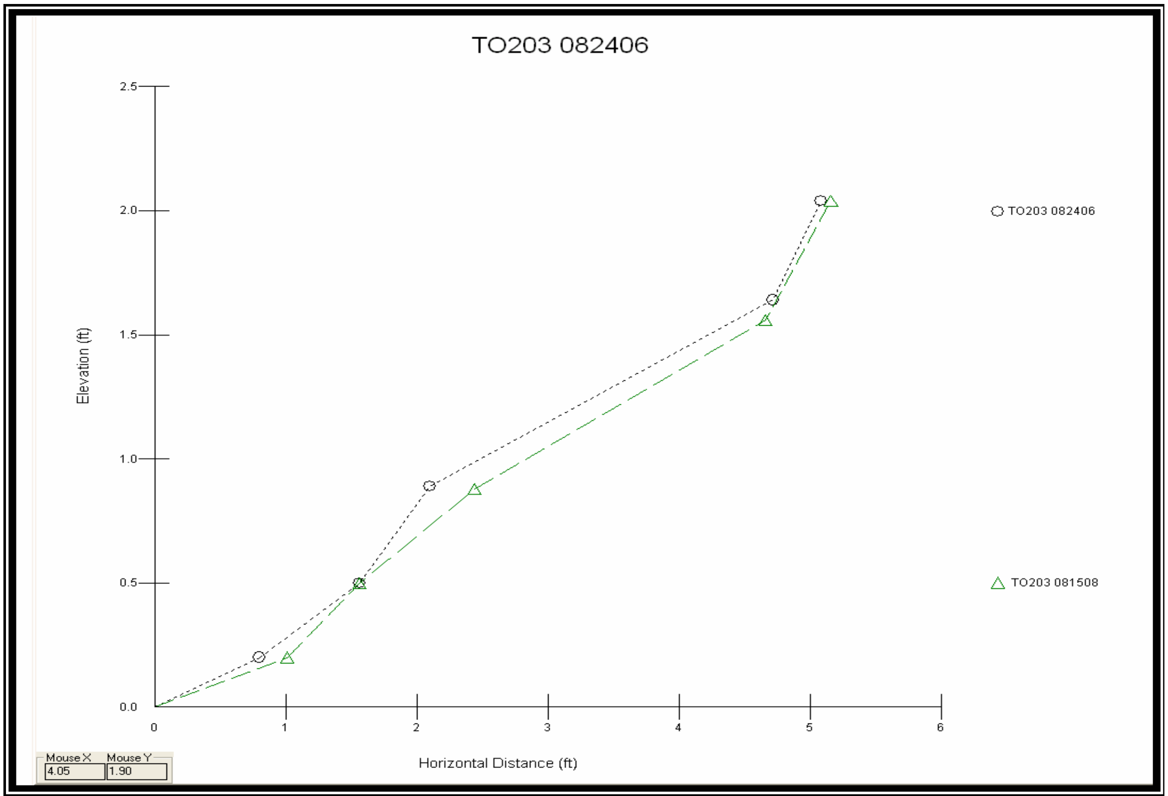
BEHI = Moderate   Erosion Rate = 0.0023 ft/yr



TO203

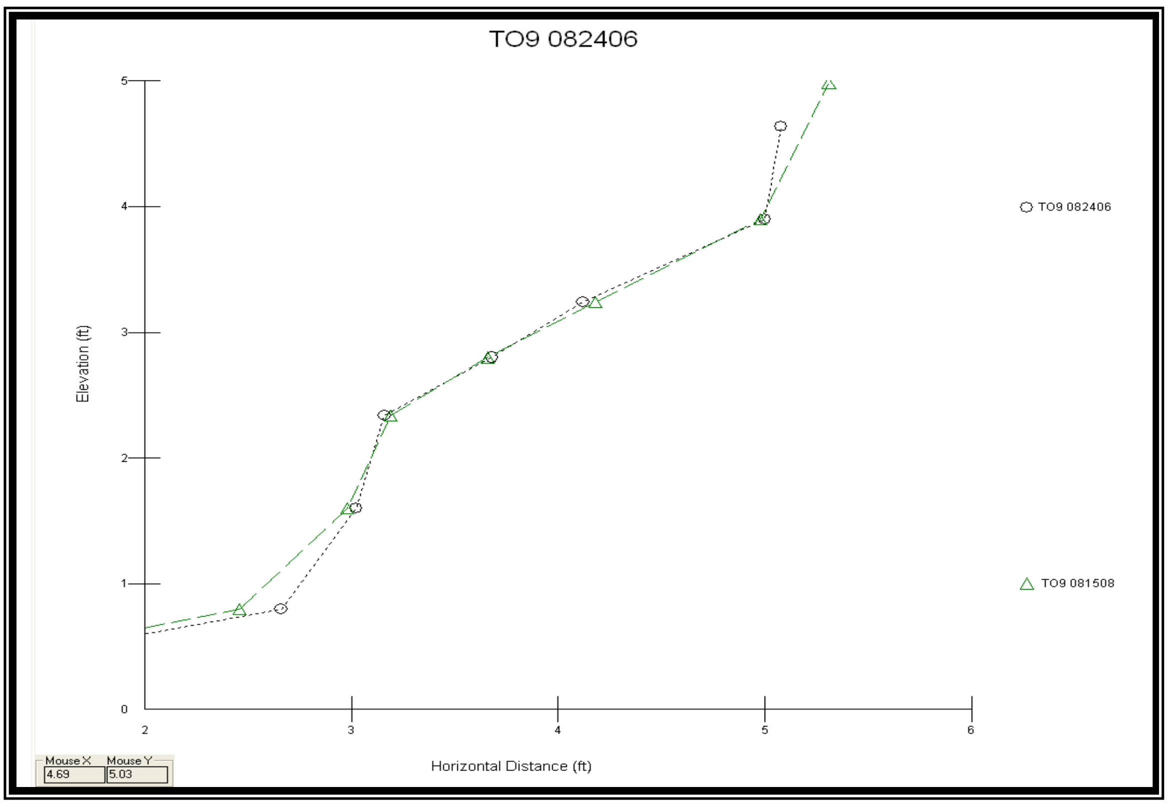
BEHI = Low   Erosion Rate = -0.087 ft/yr





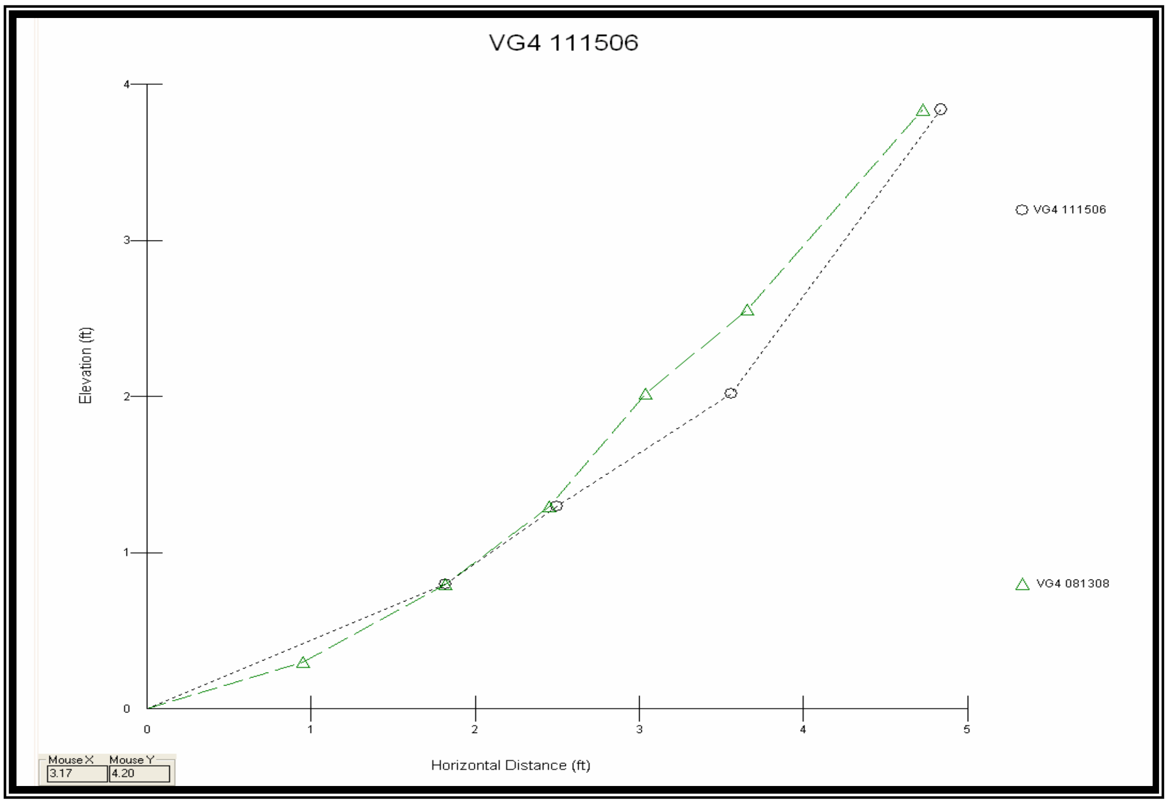
TO9

BEHI = High   Erosion Rate = -0.17 ft/yr



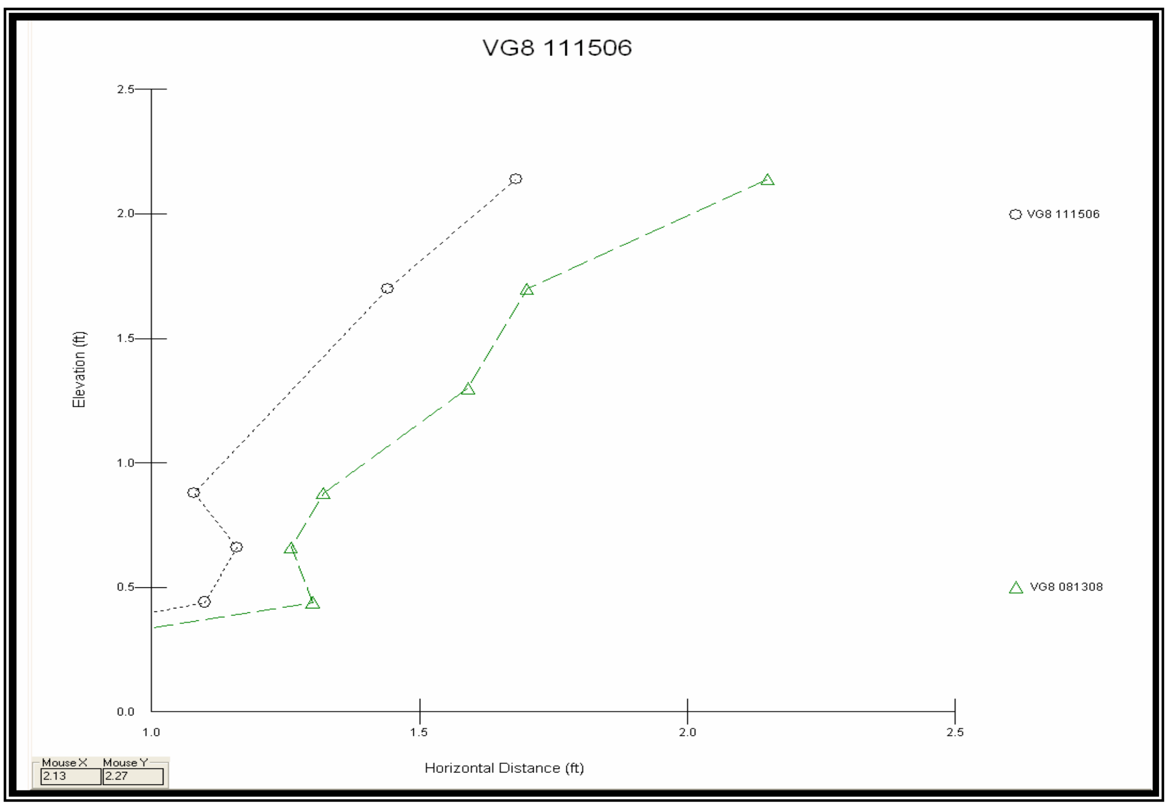
VG4

BEHI = High   Erosion Rate = 0.085 ft/yr



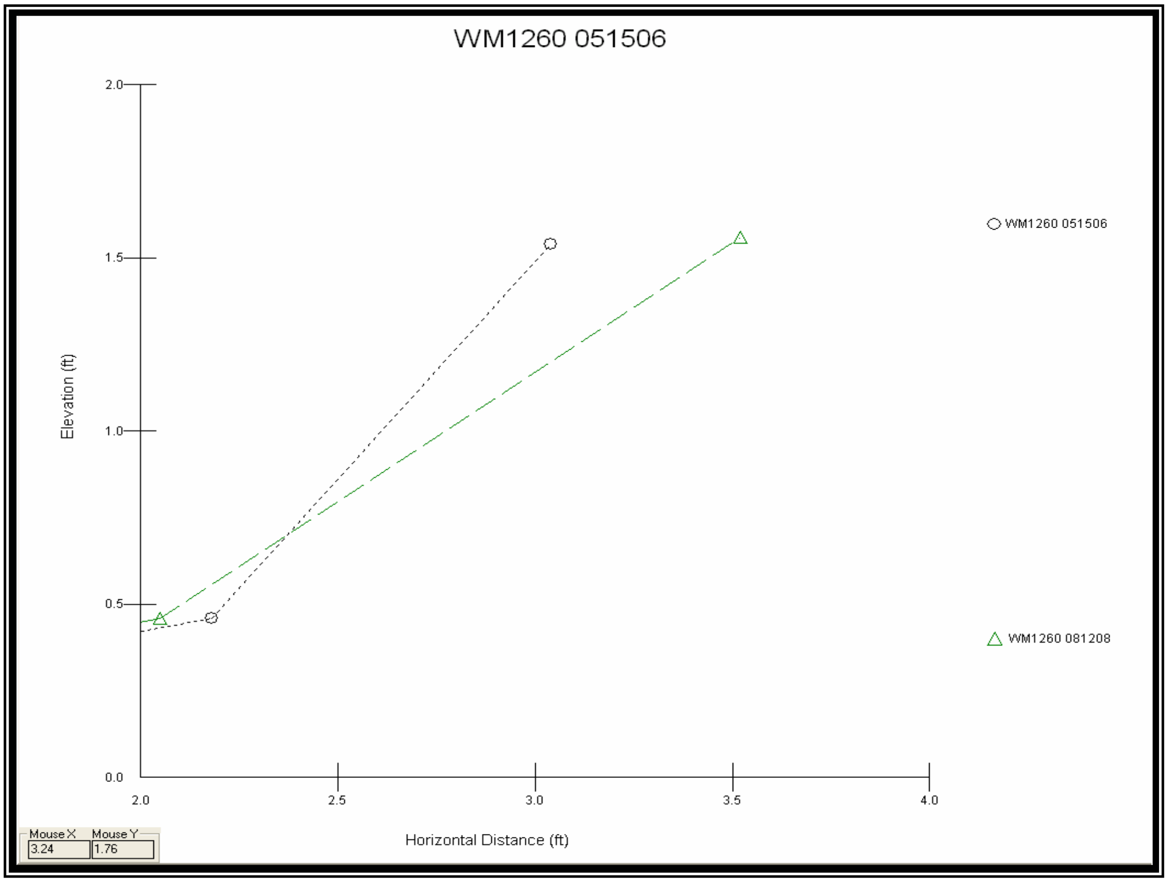
VG8

BEHI = High   Erosion Rate = -0.14 ft/yr



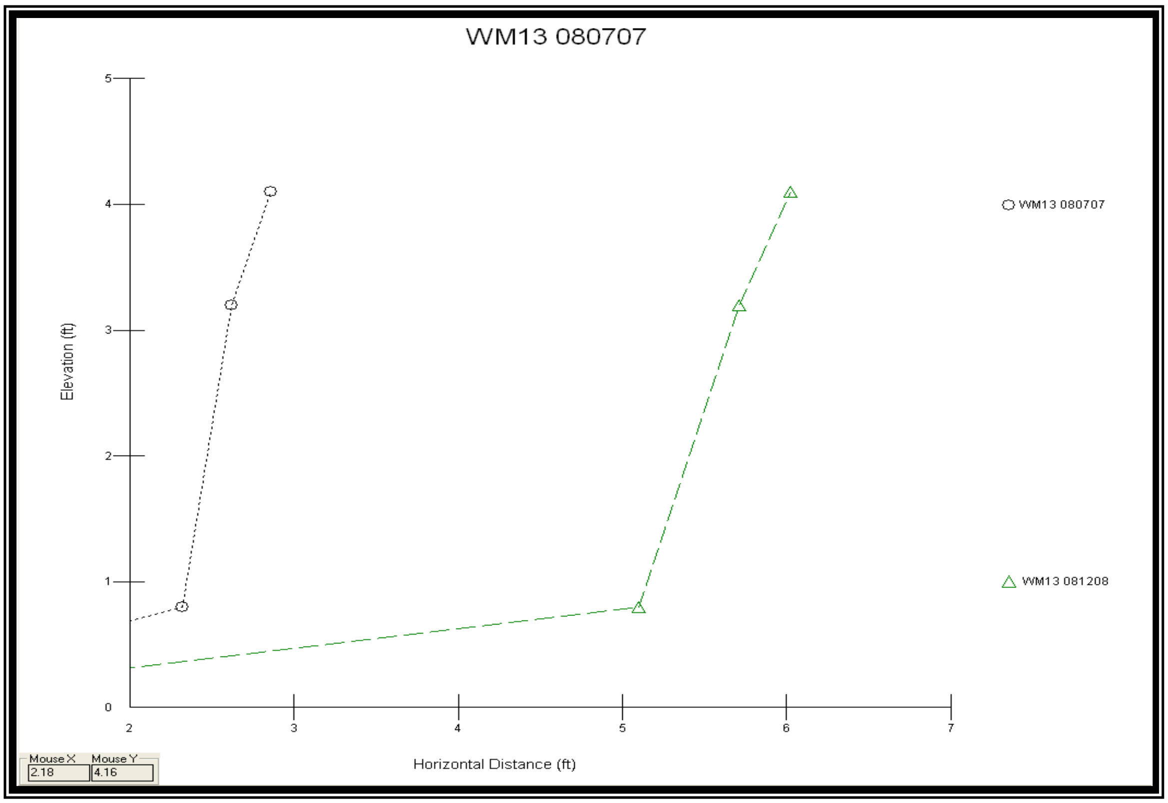
WM1260

BEHI = Moderate   Erosion Rate = -0.060 ft/yr



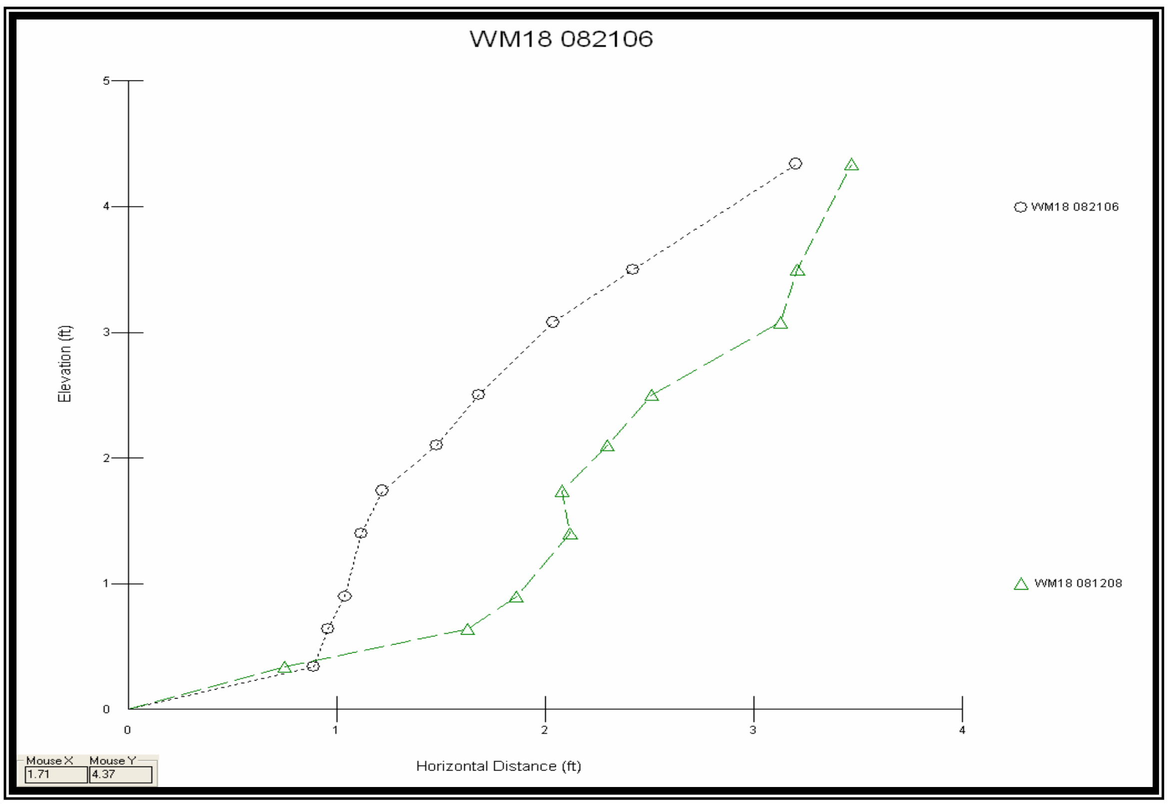
WM13

BEHI = High   Erosion Rate = -2.6 ft/yr



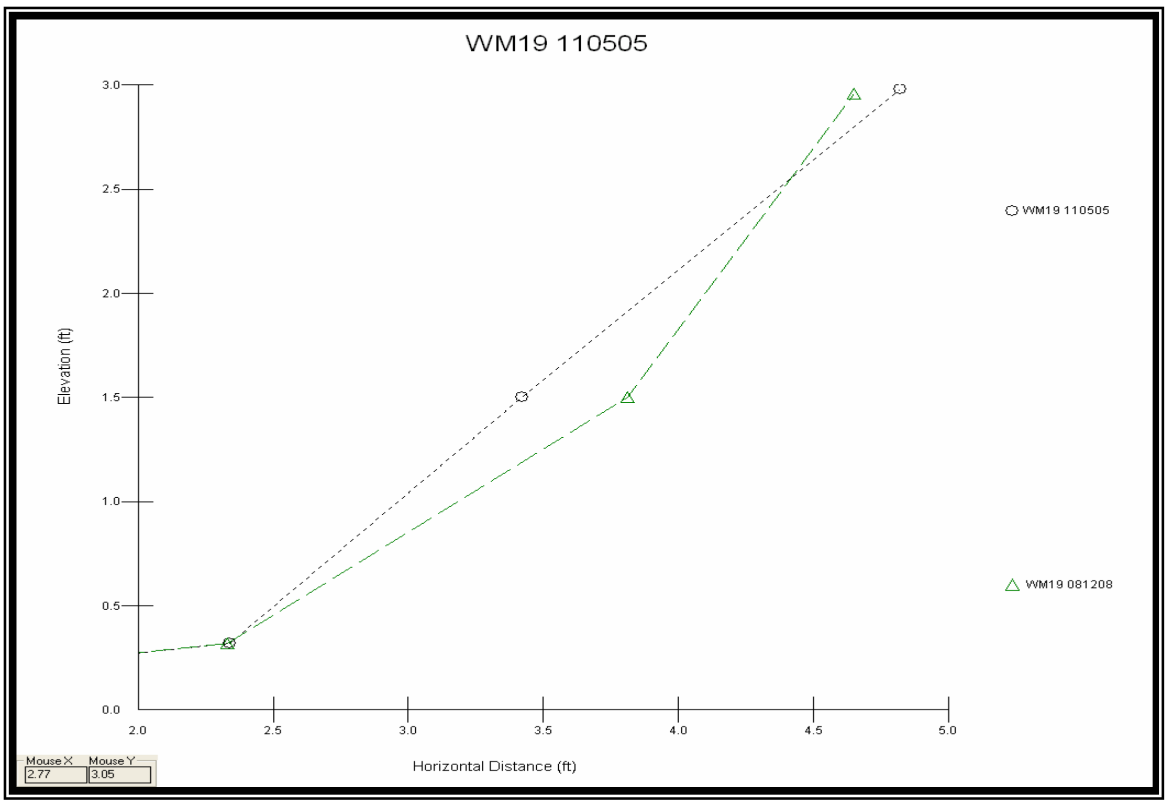
WM18

BEHI = High   Erosion Rate = -0.36 ft/yr



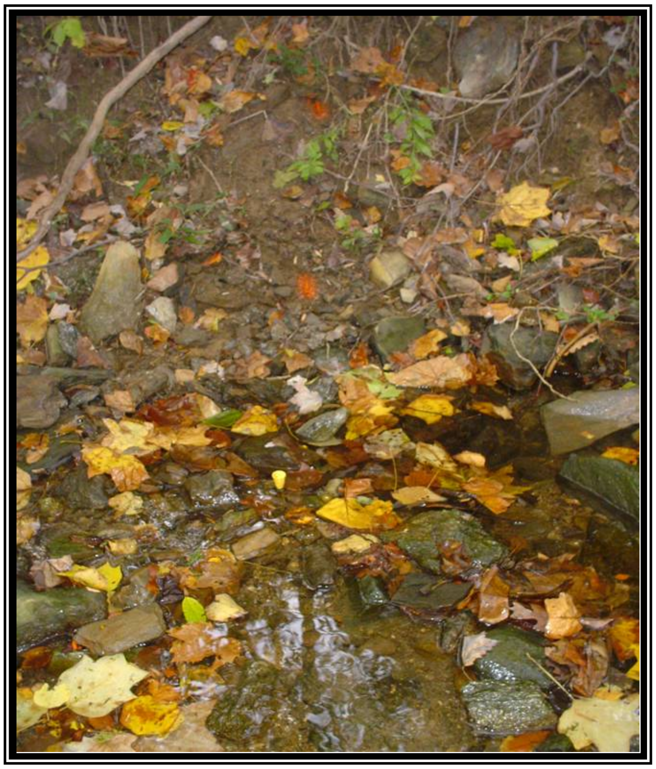
WM19

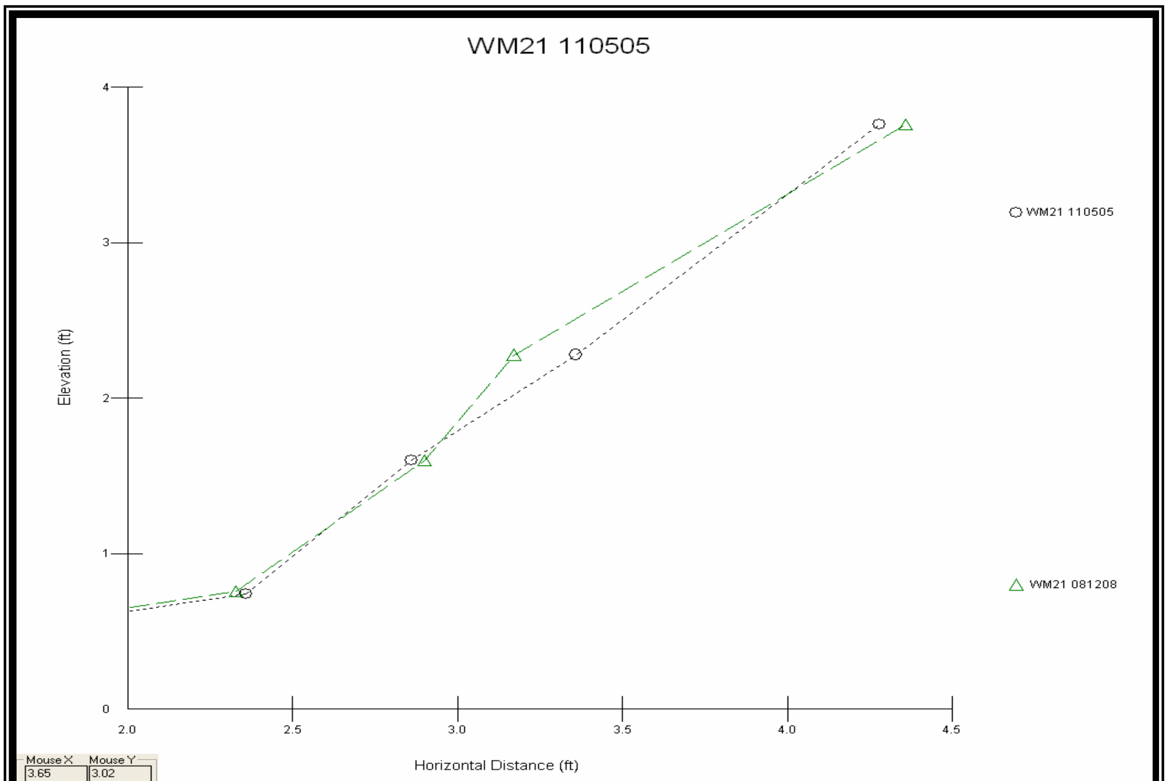
BEHI = High   Erosion Rate = -0.037 ft/yr



WM21

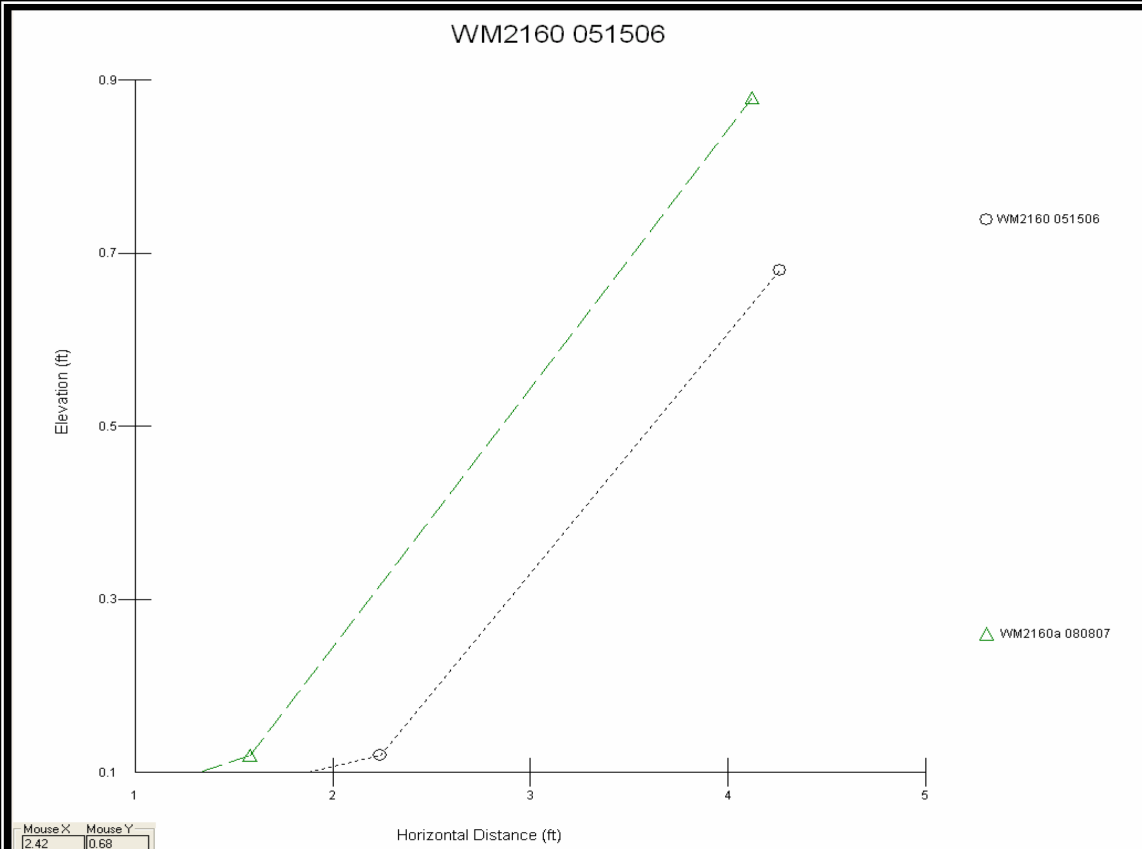
BEHI = Moderate   Erosion Rate = 0.016 ft/yr





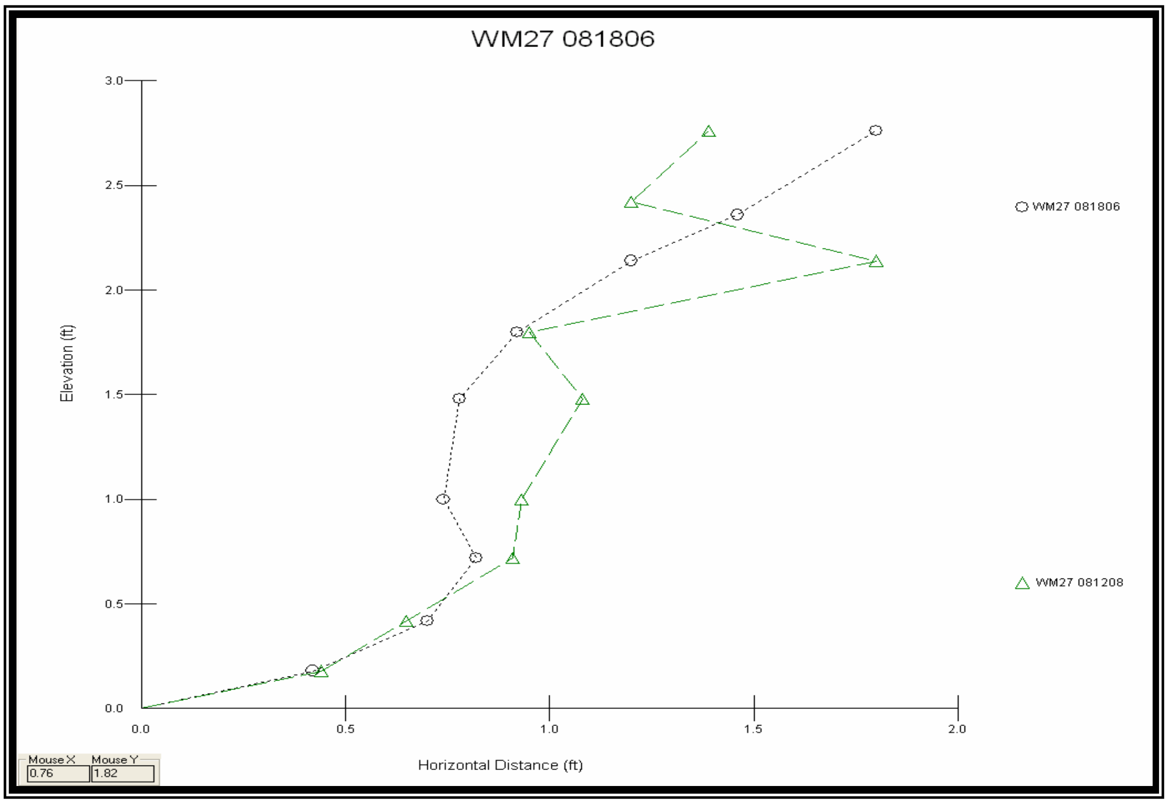
WM2160

BEHI = Low   Erosion Rate = 0.31 ft/yr



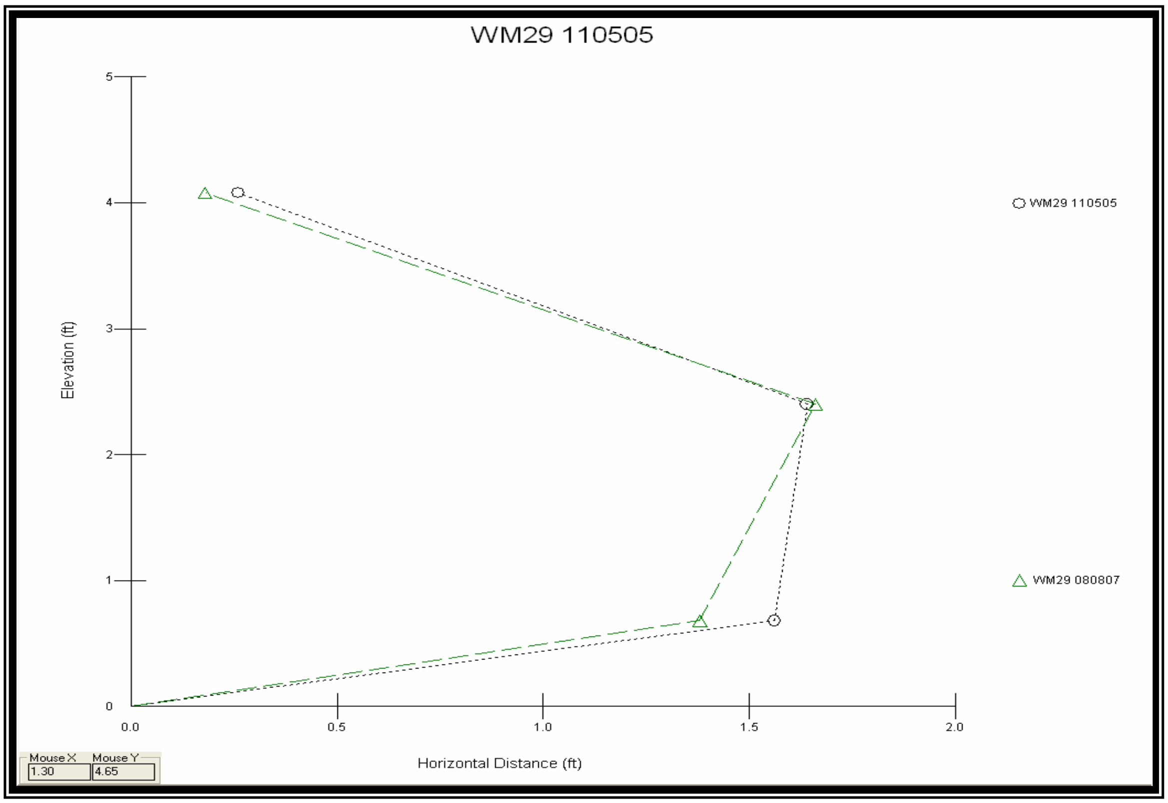
WM27

BEHI = Low   Erosion Rate = -0.044 ft/yr



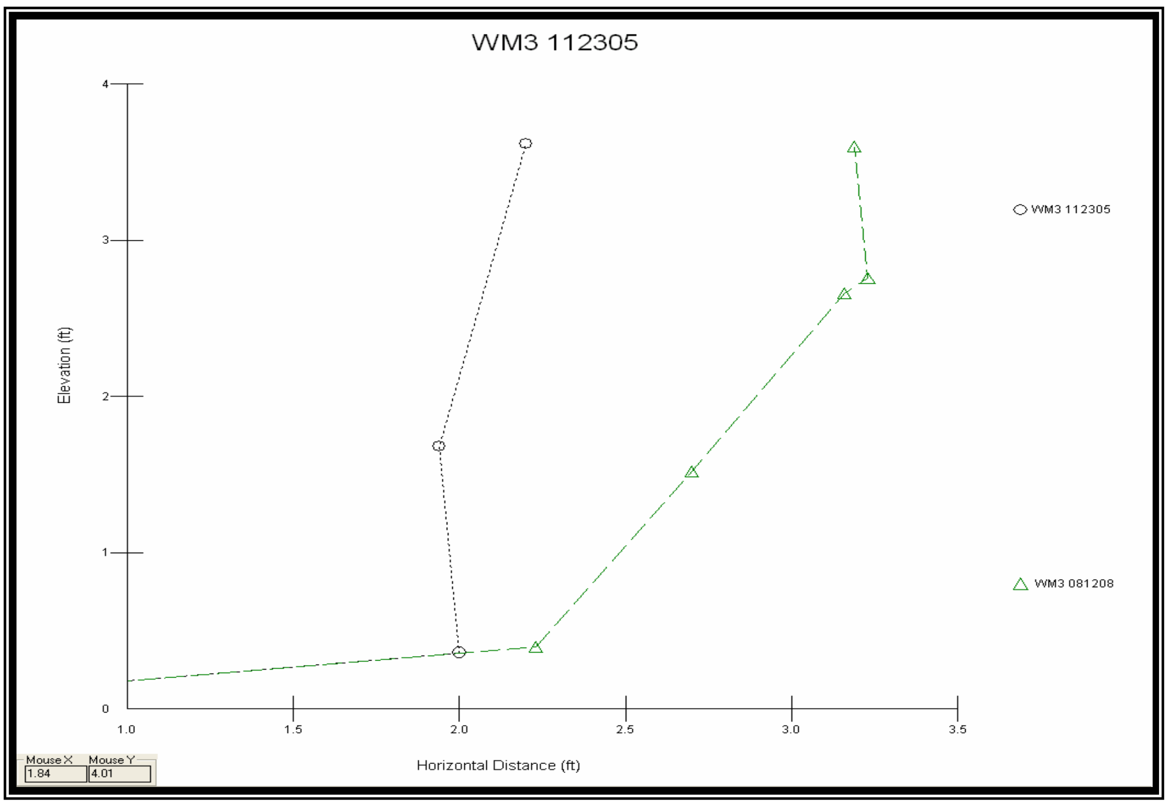
WM29

BEHI = Moderate   Erosion Rate = 0.035 ft/yr



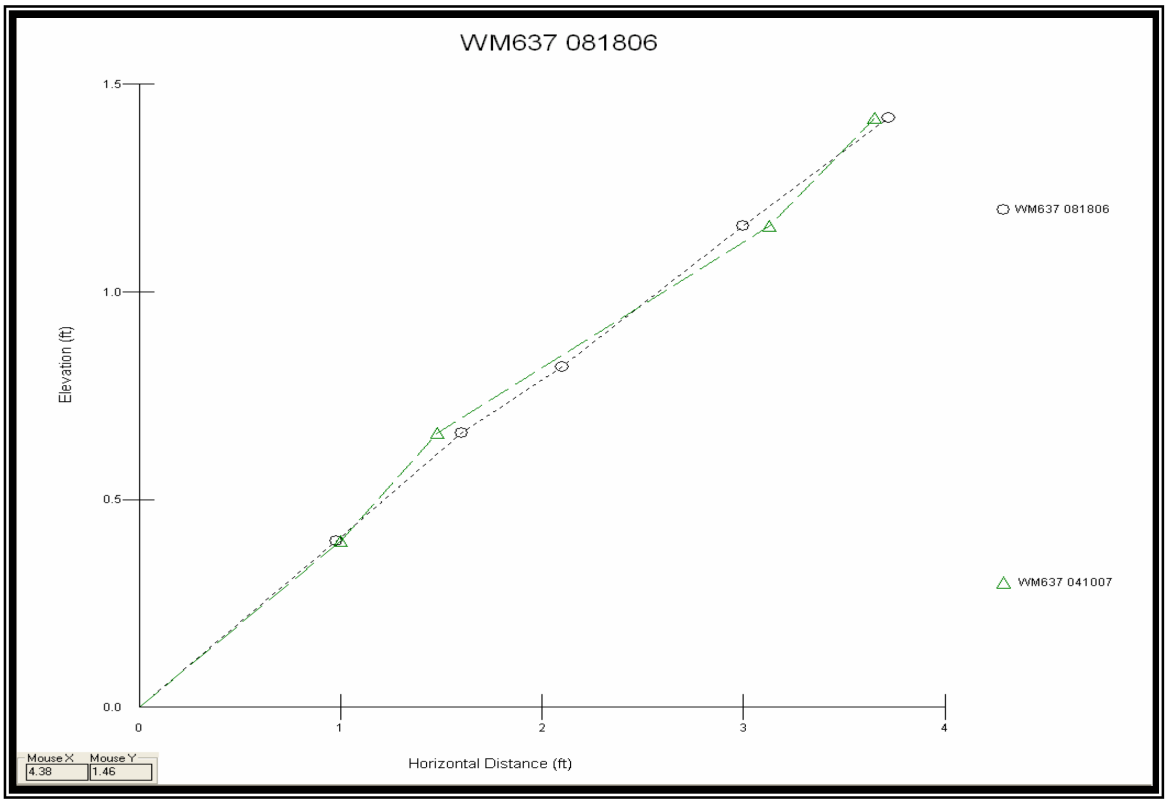
WM3

BEHI = High   Erosion Rate = -0.26 ft/yr



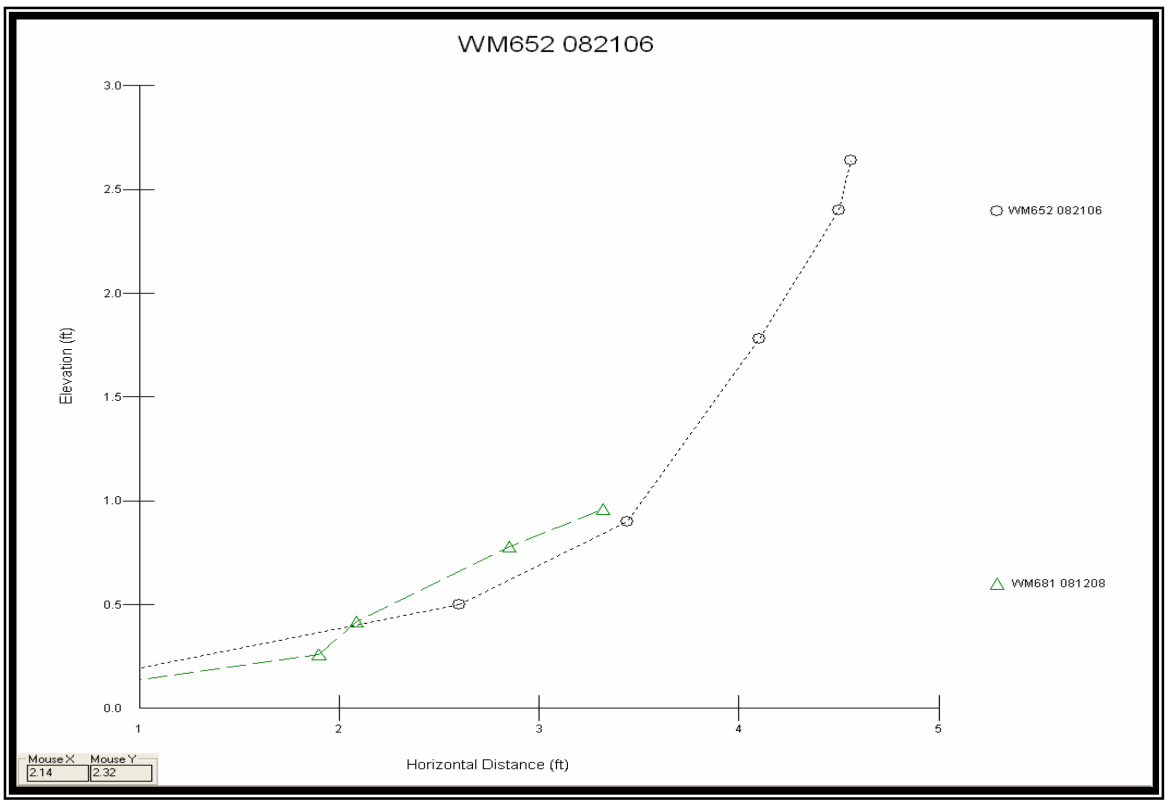
WM637

BEHI = Low   Erosion Rate = 0.011 ft/yr



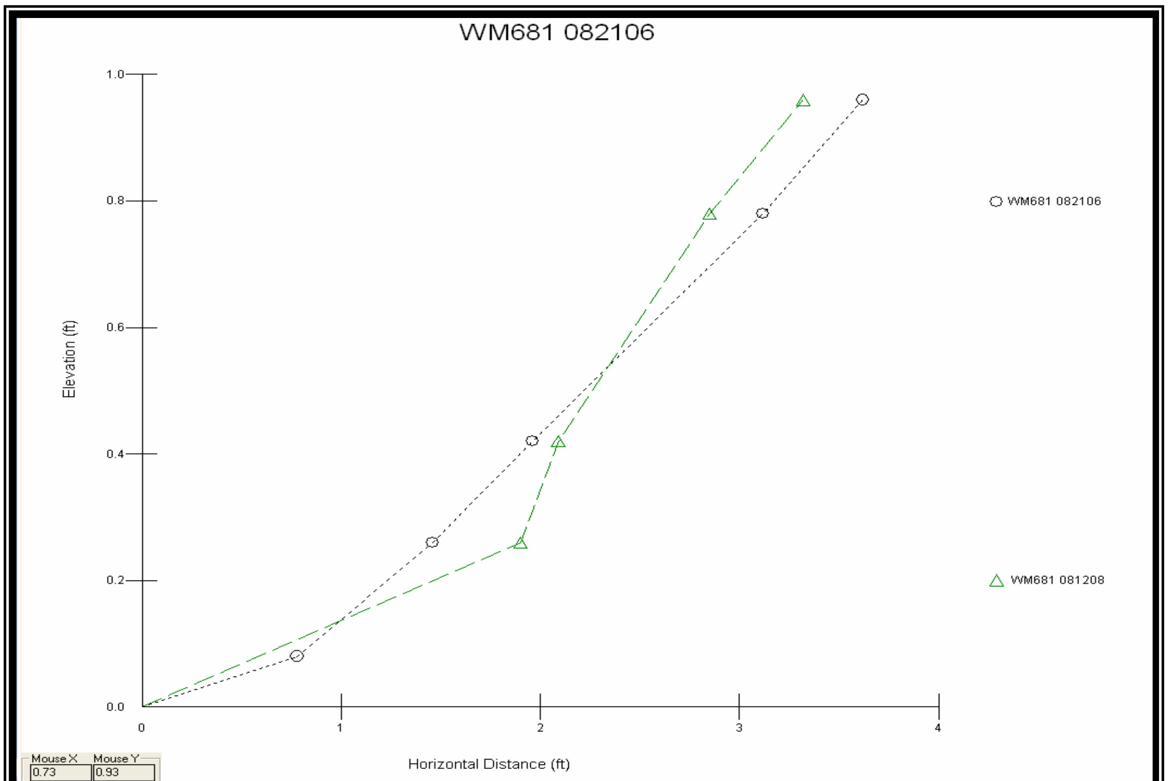
WM652

BEHI = Low   Erosion Rate = -0.042 ft/yr



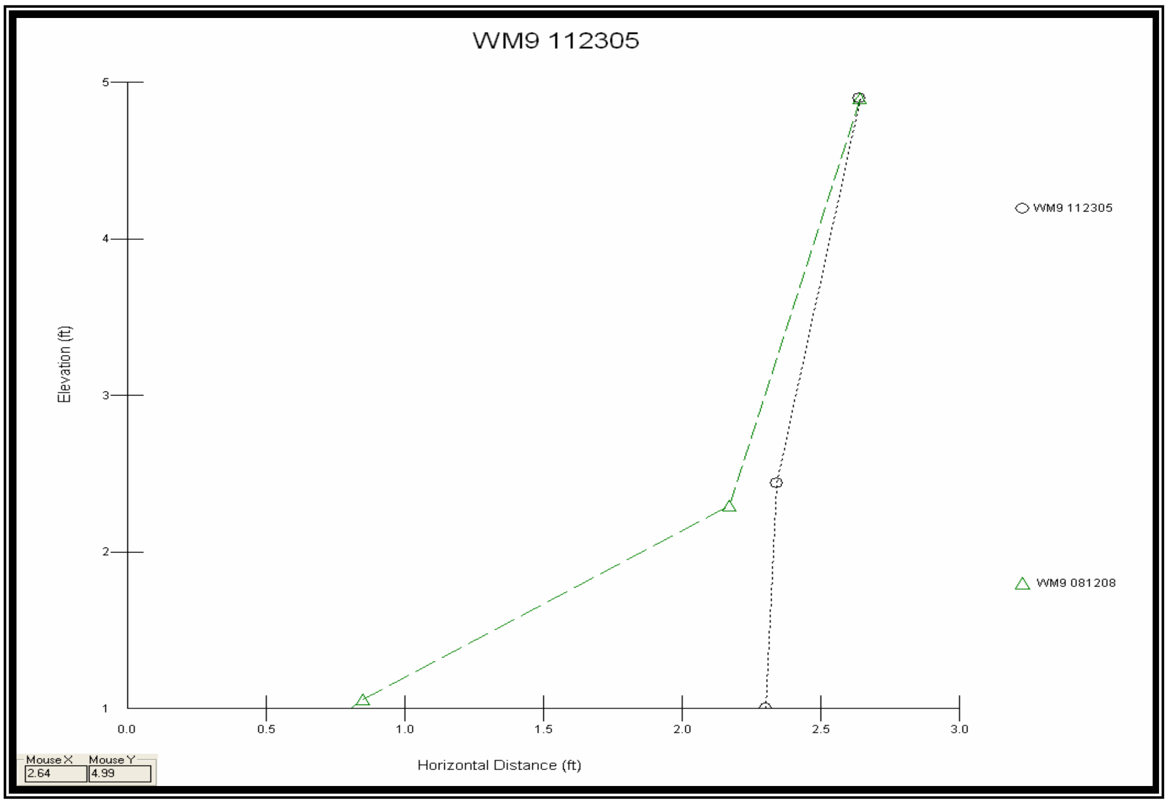
WM681

BEHI = Very Low   Erosion Rate = 0.011 ft/yr



WM9

BEHI = Moderate   Erosion Rate = 0.15 ft/yr



APPENDIX C

NUMBER OF BANK PIN SITES RATIONALE

NUMBER OF SITES

The number of sites needed can be estimated based on observed variability in measurements and the acceptable uncertainty in the estimate:

$$n = \frac{z_{\alpha}^2 \sigma^2}{L^2}$$

where n = sample size (number of sites, rounded up to nearest integer)
z = standard normal cumulative probability for a 2-tailed 95% confidence interval = 1.96
σ = standard deviation of measured erosion rates so far = 0.0439 ton/yr/ft
L = acceptable uncertainty, 1/2 width of confidence interval (ton/yr/ft)

The number of BEHI sites for each rating, required to achieve a given confidence interval, are listed in Appendix C, Table 1 (erosion measured from top bank pin) and Appendix C, Table 2 (erosion measured from top of bank). Low and Moderate BEHI sites were assigned the standard deviation measured at Moderate BEHI sites. High BEHI sites were assigned the standard deviation measured at High BEHI sites. The results suggest that a sampling program to achieve a confidence interval of 100 ton/yr/sq.mi. or less may not be feasible. However, it is important to note that the standard deviations are based on a very small sample size. Collecting more samples may result in a lower estimate of standard deviation. Even if a statistically meaningful measure of error cannot be established, additional sites will allow better management decisions.

Appendix C, Table 1 - The number of sites required to achieve a given Confidence Interval

	St. Dev.	1/2 C.I. (ton/yr/sq.mi.)				
BEHI	(ton/yr/ft)	10	50	100	150	200
Low/Moderate	0.012	1,320	53	14	6	4
High	0.065	38,717	1,549	388	173	97
Total		40,037	1,602	402	179	101

Based on erosion to top bank pin

Appendix C, Table 2 - The number of sites required to achieve a given Confidence Interval

	St. Dev.	1/2 C.I. (ton/yr/sq.mi.)				
BEHI	(ton/yr/ft)	10	50	100	150	200
Low/Moderate	0.032	9,384	376	94	42	24
High	0.161	237,530	9,502	2,376	1,056	594
Total		246,914	9,878	2,470	1,098	618

Based on erosion to top of bank

PWD planned to establish approximately 100 new sites to better estimate the true standard deviations. If these are lower than current estimates, the number of sites needed for a statistically meaningful estimate will also decrease. Due to time constraints, a total of 82 bank pin sites were installed within the Wissahickon tributaries.

APPENDIX D

BANK PIN MONITORING INTERVAL

Longest Monitoring Interval Measured at Each Bank Pin Location

	Baseline Reading	Most Recent Reading
Cresheim Creek		
CC35	8/22/2006	8/13/2008
CC114	9/7/2006	8/13/2008
CC18	8/22/2006	8/13/2008
CC43	8/22/2006	8/13/2008
CC45	8/22/2006	8/13/2008
CC46	8/22/2006	8/15/2007
CC64	8/22/2006	4/23/2008
CC74	8/22/2006	8/13/2008
CC11	9/7/2006	8/13/2008
Gorgas		
GO790	4/24/2007	8/15/2008
Hillcrest		
HC303	8/24/2006	8/15/2008
Hartwell Run		
HW170	8/17/2007	8/12/2008
HW177	4/11/2007	8/12/2008
HW179	8/16/2007	8/12/2008
HW4	8/17/2006	8/16/2007
Kitchens Lane		
KL32	8/15/2006	8/14/2008
KL35	8/15/2006	8/14/2008
KL38	8/15/2006	8/14/2008
KL42	8/15/2006	8/14/2008
KL44	8/15/2006	8/14/2008
KL909	8/15/2006	8/14/2008
KL915	8/15/2006	8/14/2008
KL939	8/15/2006	8/14/2008
KL946	8/15/2006	8/14/2008
KL950	8/14/2006	8/14/2008
Monoshone Creek		
MN1	11/2/2005	8/14/2008
MN2	11/2/2005	8/14/2008
MN3	11/2/2005	8/14/2008
MN4	11/2/2005	8/14/2008
MN962	8/24/2006	8/14/2008
MN963	8/13/2007	4/23/2008
MN964	8/13/2007	8/14/2008
Thomas Mill		
TM18	8/16/2007	8/15/2008
TM21	6/29/2006	8/9/2007
TM23	8/9/2007	8/15/2008
TM28	4/11/2007	8/15/2008
TM512	6/29/2006	8/15/2008
TM518	8/21/2006	8/9/2007
TM9	6/29/2006	8/9/2007
TM8	11/15/2006	8/15/2008
Rex Avenue Trib		
TO202	8/24/2006	8/15/2008
TO203	8/24/2006	8/15/2008
TO9	8/24/2006	8/15/2008

	Baseline Reading	Most Recent Reading
Valley Green Run		
VG4	11/15/2006	8/13/2008
VG8	11/15/2006	8/13/2008
Bells Mill		
BM1120	5/11/2006	8/11/2008
BM13	11/7/2005	8/11/2008
BM16	11/13/2006	8/11/2008
BM21	11/7/2005	8/11/2008
BM2450	5/11/2006	8/11/2008
BM25	11/7/2005	8/11/2008
BM31	11/7/2005	8/11/2008
BM35	8/7/2007	8/11/2008
BM4	11/7/2005	11/13/2006
BM414	8/18/2006	8/11/2008
BM422	8/18/2006	8/11/2008
BM530	5/15/2006	8/11/2008
BM8	8/18/2006	8/11/2008
Wise's Mill		
WM1260	5/15/2006	8/12/2008
WM13	8/7/2007	8/12/2008
WM18	8/21/2006	8/12/2008
WM19	11/5/2005	8/12/2008
WM21	11/5/2005	8/12/2008
WM2160	5/15/2006	8/8/2007
WM27	8/18/2006	8/12/2008
WM29	11/5/2005	8/8/2007
WM3	11/23/2005	8/12/2008
WM637	8/18/2006	4/10/2007
WM652	8/21/2006	8/12/2008
WM681	8/21/2006	8/12/2008
WM9	11/23/2005	8/12/2008
Cathedral Run		
CR12	8/21/2006	8/11/2008
CR13	10/31/2005	8/11/2008
CR1370	5/11/2006	8/22/2007
CR14	10/31/2005	8/11/2008
CR16	10/31/2005	8/11/2008
CR18	10/31/2005	8/11/2008
CR3	10/31/2005	4/10/2007
CR510	5/21/2006	8/11/2008
CR7	8/16/2007	8/11/2008
CR250	5/11/2006	8/11/2008

APPENDIX C – SEDIMENT TOTAL MAXIMUM DAILY LOAD (TMDL) FOR WISSAHICKON CREEK – FEASIBILITY STUDY & MONITORING PLAN

1. STORMWATER FLOW AND LOAD ESTIMATES BY OUTFALL

Methods used to develop stormwater outfall flows and loads are described in detail in the Wissahickon Comprehensive Characterization Report. In Appendix C, Table 1 drainage area and estimated mean annual runoff volume are reported for each outfall. In Appendix C, Table 2 estimated mean annual pollutant loads are reported for each outfall. A summary of the total number of outfalls per tributary is reported in Appendix C, Table 3 along with a summary of discharge and estimated loads for all of the outfalls found in each tributary.

Appendix C, Table 1 - Philadelphia Stormwater Outfall Runoff

Outfall	Tributary/Stream	Drainage Area (acres)	Runoff 4/93-3/01 (in/yr)
W-084-01	Bells Mill	62.8	7.74
W-084-02	Bells Mill	106	9.26
W-084-03	Bells Mill	4.94	10.4
W-084-04	Bells Mill	12.2	11.9
W-076-01	Cathedral Road Run	90.3	6.01
W-076-02	Cathedral Road Run	38.3	6.12
W-076-08	Cresheim Creek	5.94	12.4
W-076-11	Cresheim Creek	10.6	7.31
W-076-12	Cresheim Creek	47.5	9.97
W-077-01	Cresheim Creek	46.2	8.93
W-077-02	Cresheim Creek	239	10.0
W-086-01	Cresheim Creek	270	14.8
W-086-02	Cresheim Creek	76.7	12.6
W-086-03	Cresheim Creek	35.3	13.2
W-086-04	Cresheim Creek	31.6	18.8
W-086-05	Cresheim Creek	47.7	11.7
W-086-06	Cresheim Creek	85.3	11.6
W-086-07	Cresheim Creek	23.6	17.2
W-067-01	Gorgas Run	392	12.2
W-067-02	Gorgas Run	41.3	14.9
W-067-03	Gorgas Run	29.5	13.3
W-076-07	Hartwell Run	48.0	9.30
W-076-14	Hartwell Run	67.6	10.4
W-095-01	Hill Crest Run	99.7	11.3
W-095-03	Hill Crest Run	51.3	12.4
W-068-01	Kitchen's Lane	16.0	12.2
W-068-02	Kitchen's Lane	10.7	15.7
W-068-03	Kitchen's Lane	4.07	13.0
W-068-06	Kitchen's Lane	23.2	10.3
W-068-08E	Kitchen's Lane	25.9	9.38
W-068-08W	Kitchen's Lane	33.8	9.85

W-060-04	Monoshone Creek	12.7	4.83
W-060-08	Monoshone Creek	16.3	6.43
W-060-09	Monoshone Creek	17.0	4.65
W-060-10	Monoshone Creek	163	6.28
W-060-11	Monoshone Creek	39.2	4.35
W-068-04	Monoshone Creek	628	5.26
W-068-05	Monoshone Creek	76.4	5.72
W-095-02	Paper Mill Run	6.07	9.10
W-095-04	Paper Mill Run	6.82	15.4
W-095-05	Paper Mill Run, Trib B	20.7	14.8
W-076-09	Valley Green Run	62.8	9.96
W-076-10	Valley Green Run	46.0	10.7
W-075-01	Wise's Mill Run	154	14.5
W-075-02	Wise's Mill Run	9.88	8.18
W-076-04	Wise's Mill Run	9.02	8.40
W-076-05	Wise's Mill Run	3.82	10.4
W-076-06	Wise's Mill Run	9.62	11.5
W-076-13	Wise's Mill Run	92.0	13.2
W-076-X	Wise's Mill Run	9.47	1.72
W-052-01	Wissahickon Creek	12.4	11.3
W-052-02	Wissahickon Creek	15.5	12.8
W-060-01	Wissahickon Creek	111	12.5
W-060-02	Wissahickon Creek	25.5	14.0
W-060-03	Wissahickon Creek	63.2	13.8
W-060-05	Wissahickon Creek	96.7	8.39
W-060-06	Wissahickon Creek	2.58	16.7
W-060-07	Wissahickon Creek	22.0	12.4
W-067-04	Wissahickon Creek	23.8	13.9
W-067-05	Wissahickon Creek	10.0	14.1
W-067-06	Wissahickon Creek	41.5	10.8
W-068-07	Wissahickon Creek	24.9	9.39
W-076-03	Wissahickon Creek	9.21	11.7
W-085-01	Wissahickon Creek	83.9	12.3
W-085-02	Wissahickon Creek, Trib I	57.4	11.4

Appendix C, Table 2 - Wissahickon Outfall Load Summary

Outfall	Tributary/Stream	BOD5 (lbs/yr)	TSS (lbs/yr)	COD (lbs/yr)	TP (lbs/yr)	Cu (lbs/yr)	Zn (lbs/yr)	Fe (lbs/yr)	TN (lbs/yr)	Fecal (#/yr)	Pb (lbs/yr)
W-084-01	Bells Mill	892	7,395	5,397	29.2	1.51	11.5	129	198	2.92E+12	1.86
W-084-02	Bells Mill	1,759	14,084	10,743	57.3	2.99	22.9	262	385	5.77E+12	3.70
W-084-03	Bells Mill	104	731	653	3.29	0.177	1.39	17.0	21.6	3.41E+11	0.222
W-084-04	Bells Mill	297	2,123	1,989	9.36	0.549	4.18	55.4	57.4	9.34E+11	0.656
W-076-01	Cathedral Road Run	985	8,370	6,030	32.4	1.71	12.8	146	217	3.19E+12	2.07
W-076-02	Cathedral Road Run	490	3,247	3,123	15.4	0.834	6.62	83.2	100	1.61E+12	1.06
W-076-08	Cresheim Creek	141	1,084	872	4.56	0.240	1.86	21.8	30.4	4.64E+11	0.299
W-076-11	Cresheim Creek	134	1,221	791	4.49	0.228	1.69	17.8	31.0	4.39E+11	0.276
W-076-12	Cresheim Creek	975	6,648	6,180	30.8	1.66	13.1	163	201	3.20E+12	2.10
W-077-01	Cresheim Creek	665	6,819	3,861	22.8	1.16	8.27	81.6	159	2.15E+12	1.35
W-077-02	Cresheim Creek	4,632	35,467	29,705	149	8.25	62.8	778	955	1.48E+13	10.0
W-086-01	Cresheim Creek	7,939	58,607	51,631	253	14.2	109	1,384	1,602	2.54E+13	17.3
W-086-02	Cresheim Creek	1,411	16,888	7,885	50.4	2.51	17.0	146	358	4.50E+12	2.79
W-086-03	Cresheim Creek	953	6,595	6,120	30.1	1.66	12.9	163	193	3.10E+12	2.06
W-086-04	Cresheim Creek	1,163	9,531	8,702	36.9	2.54	18.0	265	196	3.29E+12	2.71
W-086-05	Cresheim Creek	1,143	7,876	7,235	36.1	1.95	15.3	190	236	3.75E+12	2.46
W-086-06	Cresheim Creek	1,482	16,878	8,242	52.4	2.56	17.8	154	374	4.80E+12	2.93
W-086-07	Cresheim Creek	739	7,133	5,998	23.9	1.84	12.2	191	112	1.87E+12	1.79
W-067-01	Gorgas Run	8,705	74,863	55,682	285	16.0	118	1,421	1,833	2.74E+13	18.7
W-067-02	Gorgas Run	1,280	8,604	8,141	40.3	2.18	17.3	216	262	4.20E+12	2.76
W-067-03	Gorgas Run	774	5,849	5,049	24.7	1.40	10.6	135	156	2.46E+12	1.68
W-076-07	Hartwell Run	803	6,882	4,820	26.5	1.36	10.3	113	181	2.63E+12	1.67
W-076-14	Hartwell Run	1,088	11,798	6,249	37.9	1.91	13.4	127	265	3.49E+12	2.19
W-095-01	Hill Crest Run	2,029	17,529	12,447	66.9	3.55	26.5	300	447	6.55E+12	4.26
W-095-03	Hill Crest Run	1,191	9,722	7,658	38.6	2.17	16.2	199	247	3.77E+12	2.57
W-068-01	Kitchen's Lane	395	2,771	2,490	12.5	0.672	5.28	64.8	82.2	1.30E+12	0.848
W-068-02	Kitchen's Lane	334	2,403	2,089	10.6	0.567	4.44	53.8	70.1	1.10E+12	0.713
W-068-03	Kitchen's Lane	101	785	620	3.26	0.171	1.32	15.4	21.8	3.31E+11	0.213
W-068-06	Kitchen's Lane	491	3,397	3,099	15.5	0.835	6.57	81.1	102	1.61E+12	1.05
W-068-08E	Kitchen's Lane	426	3,802	2,528	14.2	0.723	5.40	57.6	97.6	1.40E+12	0.879
W-068-08W	Kitchen's Lane	676	4,711	4,267	21.4	1.15	9.05	111	140	2.22E+12	1.45
W-060-04	Monoshone Creek	100	1,017	602	3.40	0.181	1.28	13.6	22.9	3.14E+11	0.206
W-060-08	Monoshone Creek	213	1,486	1,342	6.74	0.362	2.85	35.0	44.2	6.99E+11	0.457
W-060-09	Monoshone Creek	144	1,214	865	4.73	0.244	1.85	20.4	32.1	4.71E+11	0.299
W-060-10	Monoshone Creek	1,910	16,134	12,860	62.0	3.71	27.0	350	377	5.83E+12	4.21
W-060-11	Monoshone Creek	304	2,656	1,838	10.1	0.524	3.92	43.3	68.1	9.89E+11	0.634
W-068-04	Monoshone Creek	6,613	47,570	42,041	210	11.5	89.1	1,102	1,365	2.15E+13	14.2
W-068-05	Monoshone Creek	854	6,523	5,559	27.3	1.55	11.7	148	173	2.71E+12	1.86
W-095-02	Paper Mill Run	77.1	970	403	2.81	0.130	0.877	6.18	20.8	2.52E+11	0.147
W-095-04	Paper Mill Run	208	1,539	1,335	6.63	0.367	2.82	35.2	42.6	6.69E+11	0.449
W-095-05	Paper Mill Run, Trib B	635	4,452	4,334	19.9	1.19	9.08	123	120	1.98E+12	1.42
W-076-09	Valley Green Run	800	11,580	4,291	30.2	1.49	9.27	64.1	218	2.48E+12	1.53

W-076-10	Valley Green Run	989	7,079	6,199	31.5	1.68	13.2	160	207	3.25E+12	2.11
W-075-01	Wise's Mill Run	4,086	36,479	28,767	133	8.50	59.9	813	768	1.19E+13	9.19
W-075-02	Wise's Mill Run	139	1,279	817	4.66	0.236	1.75	18.2	32.3	4.55E+11	0.285
W-076-04	Wise's Mill Run	137	1,162	826	4.52	0.233	1.76	19.5	30.7	4.50E+11	0.286
W-076-05	Wise's Mill Run	83.0	554	531	2.60	0.142	1.12	14.2	16.8	2.72E+11	0.180
W-076-06	Wise's Mill Run	224	1,621	1,472	7.09	0.405	3.10	40.1	44.4	7.11E+11	0.490
W-076-13	Wise's Mill Run	2,436	18,295	16,673	77.2	4.68	34.9	471	462	7.50E+12	5.43
W-076-X	Wise's Mill Run	20.9	295	103	0.790	0.035	0.227	1.20	5.99	6.83E+10	0.039
W-052-01	Wissahickon Creek	201	2,517	1,220	7.21	0.397	2.59	25.8	48.0	6.05E+11	0.412
W-052-02	Wissahickon Creek	341	3,411	2,433	11.3	0.744	5.05	68.3	64.4	9.62E+11	0.768
W-060-01	Wissahickon Creek	2,376	22,846	15,121	79.7	4.49	31.9	374	513	7.35E+12	5.06
W-060-02	Wissahickon Creek	705	5,161	4,401	22.5	1.20	9.35	112	149	2.32E+12	1.50
W-060-03	Wissahickon Creek	1,456	14,497	9,260	49.2	2.78	19.5	227	317	4.48E+12	3.09
W-060-05	Wissahickon Creek	1,202	13,898	6,518	42.7	2.04	14.1	115	310	3.93E+12	2.35
W-060-06	Wissahickon Creek	46.4	829	195	1.90	0.078	0.439	0.00	15.2	1.50E+11	0.078
W-060-07	Wissahickon Creek	397	4,906	2,472	14.1	0.802	5.22	55.0	91.9	1.17E+12	0.824
W-067-04	Wissahickon Creek	605	5,233	3,963	19.8	1.14	8.34	104	124	1.87E+12	1.31
W-067-05	Wissahickon Creek	265	2,209	1,756	8.61	0.503	3.69	47.0	53.5	8.22E+11	0.580
W-067-06	Wissahickon Creek	808	6,903	4,851	26.7	1.37	10.4	114	182	2.65E+12	1.68
W-068-07	Wissahickon Creek	477	3,295	3,016	15.1	0.812	6.40	79.0	98.6	1.57E+12	1.03
W-076-03	Wissahickon Creek	214	1,548	1,336	6.81	0.363	2.84	34.3	45.0	7.01E+11	0.456
W-085-01	Wissahickon Creek	1,741	16,604	10,267	58.8	3.00	22.0	228	405	5.66E+12	3.57
W-085-02	Wissahickon Creek, Trib I	1,289	9,638	8,237	41.2	2.27	17.4	216	266	4.16E+12	2.78

Appendix C, Table 3 - Wissahickon Tributary Load Summary

Tributary/Stream	Outfalls	Total Discharge (cfs)	BOD5 (lbs/yr)	TSS (lbs/yr)	COD (lbs/yr)	TP (lbs/yr)	Cu (lbs/yr)	Zn (lbs/yr)	Fe (lbs/yr)	TN (lbs/yr)	Fecal (#/yr)	Pb (lbs/yr)
Bells Mill	4	0.060	3,051	2.43E+04	1.88E+04	99.2	5.23	40.0	463	662	9.97E+12	6.44
Cathedral Road Run	2	0.028	1,475	1.16E+04	9.15E+03	47.8	2.54	19.4	229	317	4.80E+12	3.13
Cresheim Creek	12	0.523	21,378	1.75E+05	1.37E+05	694	38.8	290	3,554	4,448	6.78E+13	46.0
Gorgas Run	3	0.255	10,759	8.93E+04	6.89E+04	350	19.6	146	1,772	2,251	3.41E+13	23.1
Hartwell Run	2	0.028	1,891	1.87E+04	1.11E+04	64.4	3.28	23.7	240	446	6.13E+12	3.86
Hill Crest Run	2	0.053	3,220	2.73E+04	2.01E+04	106	5.72	42.6	499	694	1.03E+13	6.83
Kitchen's Lane	6	0.038	2,423	1.79E+04	1.51E+04	77.6	4.12	32.1	384	513	7.95E+12	5.16
Monoshone Creek	7	0.259	10,136	7.66E+04	6.51E+04	324	18.0	138	1,713	2,082	3.25E+13	21.9
Paper Mill Run	3	0.020	920	6.96E+03	6.07E+03	29.3	1.69	12.8	165	183	2.90E+12	2.01
Valley Green Run	2	0.030	1,789	1.87E+04	1.05E+04	61.6	3.17	22.4	224	425	5.73E+12	3.64
Wise's Mill Run	7	0.195	7,126	5.97E+04	4.92E+04	230	14.2	103	1,378	1,361	2.14E+13	15.9
Wissahickon Creek	14	0.250	10,835	1.04E+05	6.68E+04	365	19.7	142	1,582	2,416	3.42E+13	22.7
Wissahickon Creek Trib 1	1	0.021	1,289	9.64E+03	8.24E+03	41.2	2.27	17.4	216	266	4.16E+12	2.78

2. STREAMBANK EROSION LOAD FIELD METHODS

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 the transport of sediment and/or streambank 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 streambanks. The second estimates the total sediment load being carried by the stream. Data collection is ongoing for both parts.

i. BEHI/NBS ASSESSMENTS

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. An example of bank erosion can be seen in Figure Appendix C, Figure 1 where much of a bank pin is exposed. Three hundred and sixty eight reaches in 13 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. Table 4 summarizes the portion of each tributary that was assessed using the BEHI/NBS method.

Appendix C, Figure 1 - PWD staff digging out eroded bank sediment in order to accurately measure bank pin exposure

Appendix C, Table 4 - Portion of Each Tributary Assessed Using BEHI/NBS Method

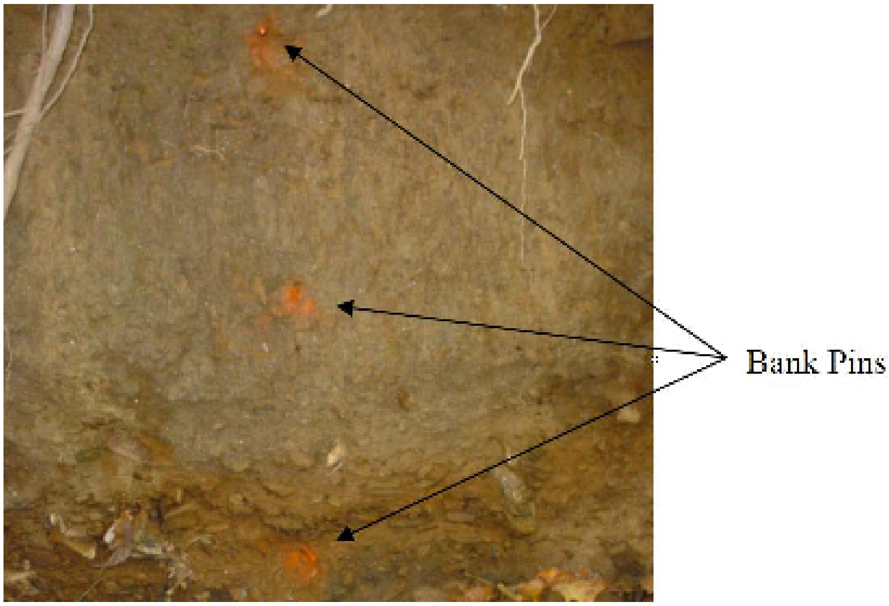
Site	BEHI/NBS Assessed (ft)	Channelized (ft)	Visually Assessed - Low Erosion (ft)
Monoshone	147	3,074	9,537
Kitchens Ln	1,250	0.00	12,946
Cresheim	1,835	1,062	29,143
Valley Green Run	270	277	3,859
Hartwell	340	0.00	6,358
Rex Ave	270	0.00	2,982
Thomas Mill	625	0.00	6,895
Hill Crest	75.0	2,128	6,929
Paper Mill	2,640	8,576	48,298
Gorgas Ln	350	325	3,261
Wises Mill	1,042	1,057	11,301
Cathedral	1,135	0.00	4,227
Bells Mill	1,759	0.00	7,781

ii. Bank Profile Measurements

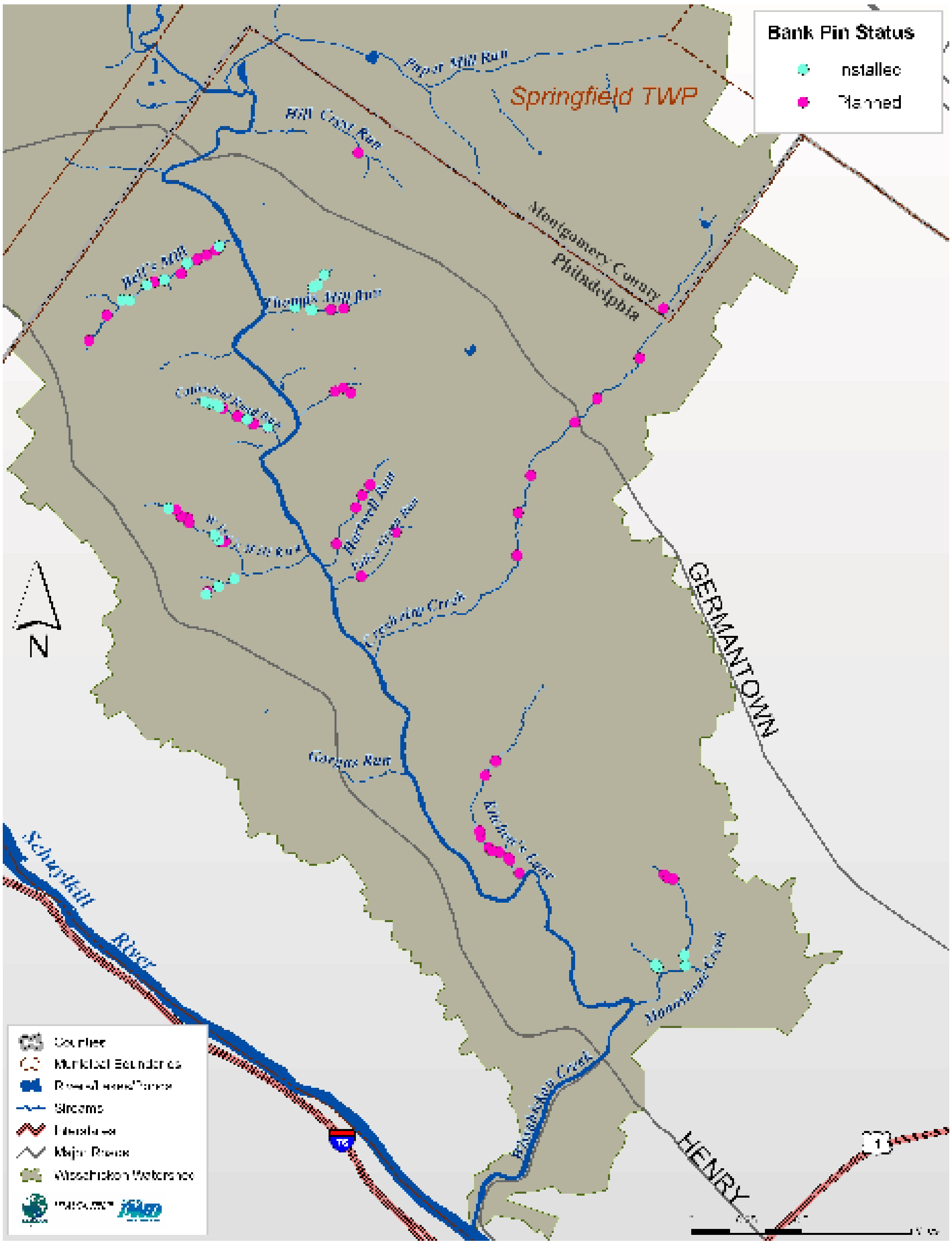
Bank pins were installed in Bells Mill, Cathedral Run, Wises Mill and Monoshone tributaries in October and November 2005. Nine bank pin sites were chosen in each of the tributaries listed with the exception of Monoshone. Only four bank pin sites were chosen in Monoshone because much of the tributary is channelized. Bank pins were installed in reaches with varying BEHI and NBS scores in order to validate and calibrate the prediction model. Three of the 9 sites were in reaches visually assessed to have low erosion rates. Additional bank pin sites in these tributaries and others are planned for the future. The current bank pin installation locations and planned bank pin installation locations can be seen on the map in Appendix C, Figure 4.

Bank pins were installed where the bend in the bank was greatest. At least one bank pin was put in below bankfull height and they were spaced no closer than 1 ft. The number of bank pins at a site was dependent on bank height and ranged from one to three. An example of bank pin installation can be seen in Appendix C, Figure 2, and an example of bank pin spacing can be seen in Appendix C, Figure 3.

Appendix C, Figure 2 - PWD staff installing a bank pin into the bank along the Wises Mill tributary. Bank pins are driven horizontally into streambanks at positions corresponding to bank erosion locations.

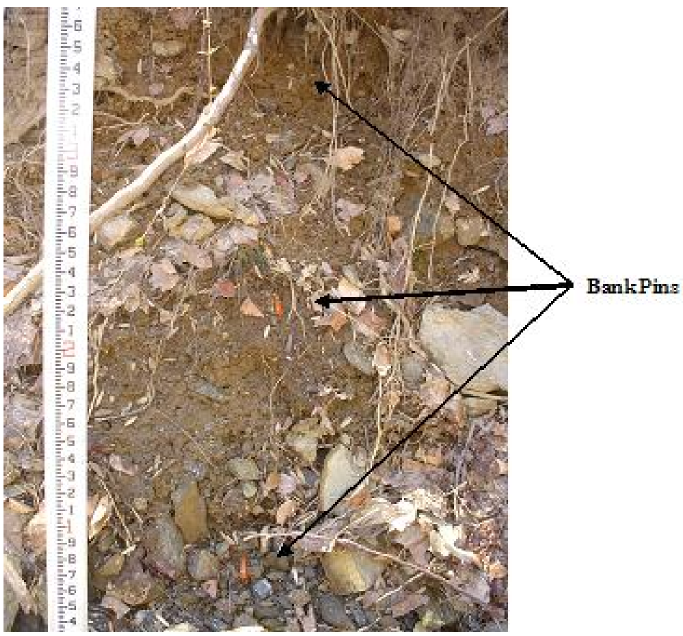


Appendix C, Figure 3 - After bank pin installation, the exposed ends were spray painted to make more visible



Appendix C, Figure 4 - Current and Planned Bank Pin Locations

Measurements were made using a survey rod, a Keson pocket rod and two levels. The survey rod was placed on the edge of the toe pin and kept straight using a level. The pocket rod was placed over the bank pin up against the bank and kept straight by a level. The distance from the bank to the edge of the survey rod closest to the bank was recorded on the field data sheet. Toe pins are bank offset pins driven vertically into the bed surface in order to "profile" the streambank with vertical measurements from the survey rod to the bank. The toe pin offers a permanent location with which to determine lateral erosion per unit time between surveys. The survey rod can be seen in Appendix C, Figure 5 where the bank pins are being measured in relation to the toe pin position. Lateral erosion or aggrading of the streambank is determined by measuring changes in bank pin distance from the toe pin (Appendix C, Figure 6).



Appendix C, Figure 5 - The survey rod measures the amount of exposed pin as the amount of lateral erosion upon re-survey.

Appendix C, Figure 6 - The toe pin is a permanent reference point for determining lateral erosion.

iii. Channel Stability

Bar samples, sub-pavement samples and pebble counts were collected at 9 sites in 5 tributaries to Wissahickon Creek in order to gather information on channel stability. Bar and sub-pavement samples as well as pebble counts were collected following methods described on EPA's Watershed Assessment of River Stability and Sediment Supply (WARSSS) website. An example of bar sampling is depicted in Figures 7 and 8. Additionally, Riffle Stability Index (RSI) Assessments and pebble counts were completed at 14 sites in the same 5 tributaries. RSI methods are described in Kappesser (1994). RSI assessments were done in place of bar samples in cases where sediment bars were not prominent due to high slope. In some cases RSI assessments were done in close proximity to bar or sub-pavement samples in order to compare results from the two methods. All samples were collected in April and May 2006.

Appendix C, Figure 8 - PWD staff draining water from the bar sample.

Appendix C, Figure 7 - PWD staff collected a bar sample representing the size gradation of bedload at the bankfull stage.

iv. Total Suspended Sediment Load

Automated water collection devices (ISCO model no. 6712) were used to collect water samples during wet weather events in the Wissahickon Creek tributaries. An example of the automated sampler being set up by PWD staff is shown in Appendix C, Figure 9. 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 10.

Total suspended sediment samples were collected from Monoshone Creek (5/20/2005 and 7/8/2005), Wises Mill (11/16/2005), Cathedral Run (11/10/2005 and 11/16/2005) and Bells Mill (9/15/2005, 9/26/2005 and 10/8/2005). Samples were collected using an ISCO automated sampler and followed methods described in wet weather monitoring. Water level is recorded during the sample period allowing a sediment discharge rating curve to be established. Additional sample collections are planned for these 4 tributaries as well as other tributaries.

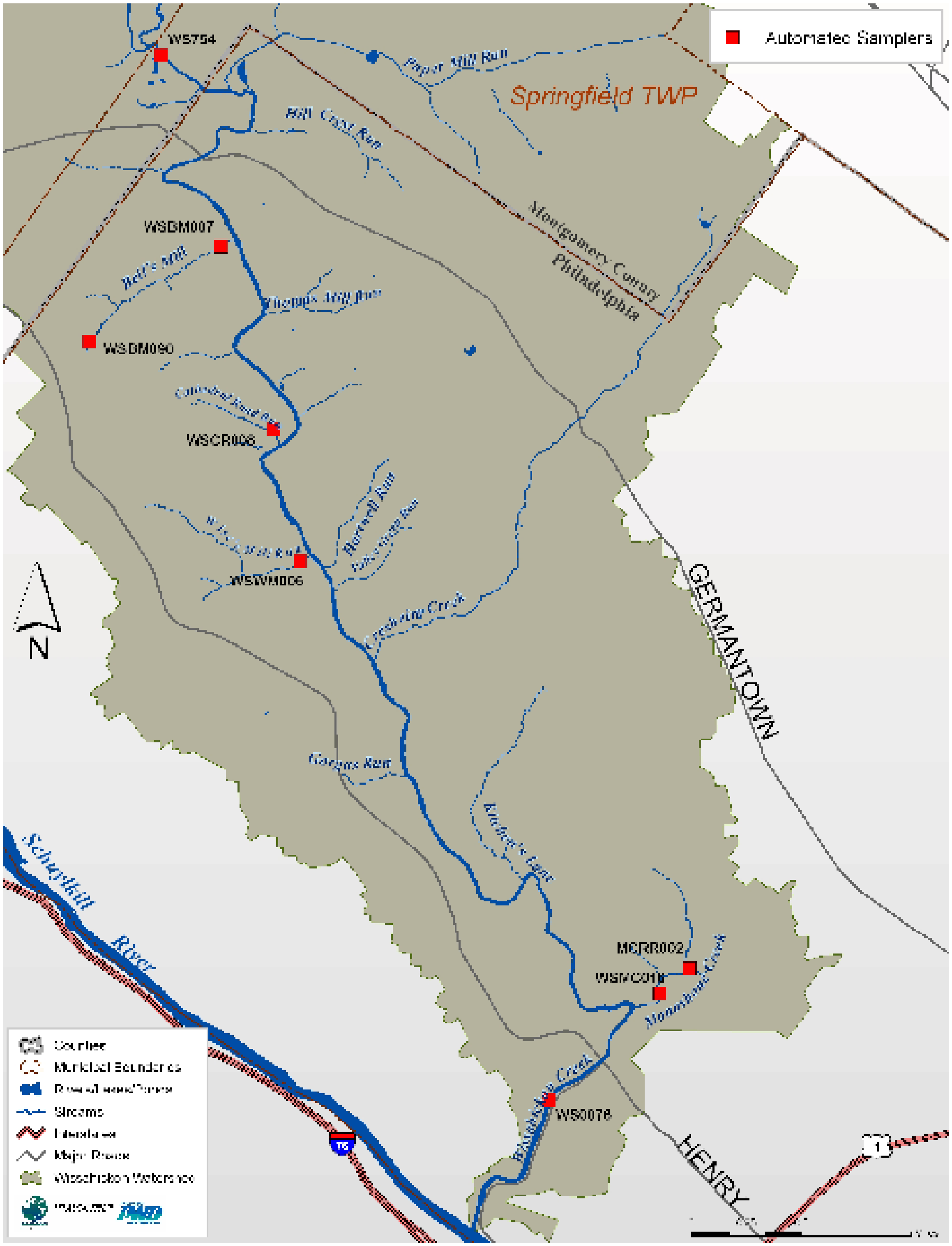
Appendix C, Figure 9 - PWD staff setting up the automated water sampler for wet weather monitoring

Stage data from Bells Mill, Cathedral Run, Wises Mill and Monoshone 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. The ultrasonic down-looking sensor and pressure transducer are shown in Figures 11 and 12. 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 are May 2005, September 2005 and August 2005 respectively. Pressure transducers were installed in Monoshone in July 2005 and Bells Mill in November 2005. Stage data will continue to be recorded at these sites and additional sites will be added.

Appendix C, Figure 10 - An ultrasonic down-looking acoustic water level sensor for water level measurement as it was installed above the Cathedral Run tributary

Appendix C, Figure 11 - A pressure transducer for redundant water level measurement as it was installed in the Cathedral Run tributary.



Appendix C, Figure 12 - Automatic Sampler Locations

v. Stage-Discharge Rating Curves

Staff gages were installed in Monoshone, Wises Mill and Bells Mill concurrent with ultrasonic downlooker or pressure transducer installation. Staff gauges are located next to the stage recording device in culverts with concrete floors to ensure that the cross section will not change over time. The staff gage along with the ultrasonic down-looking sensor and pressure transducer are shown in Appendix C, Figure 13.

Discharge rating curves were established in Monoshone, Wises Mill and Bells Mill 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.

Appendix C, Figure 13 - Staff Gage for the Bells Mill tributary pictured with a pressure transducer and ultrasonic down-looking sensor.

3. PRELIMINARY STREAMBANK EROSION LOAD ESTIMATES

Results of preliminary BEHI, NBS, erosion rate measurements at a reference site, and sediment-flow correlations were analyzed to produce several independent estimates of sediment load in the system. These results are useful for long-term planning but may change substantially as more data are collected and analyzed in the future. Appendix C, Table 5 includes useful summary information for the watershed. Appendix C, Table 6 through Appendix C, Table 8 include estimates of sediment load. The various methods and references used to derive these estimates are discussed below.

Appendix C, Table 5 - Wissahickon Watershed Information

System		
Philadelphia tributary stream length =	81,964	ft
Philadelphia main stem stream length =	40,712	ft
Philadelphia Trib Drainage Area =	4,963	ac
Philadelphia Drainage Area =	6,711	ac

Appendix C, Table 6 - Streambank Erosion Estimates

System	Streambank TSS Load (lb/yr)	Streambank TSS Load (ton/sq. mi/yr)	Streambank TSS Load (lb/ft/yr)	Calculation Method
Philadelphia Tributaries Only	3,142,358	203	38.3	BEHI/NBS Analysis with Colorado Reference Stream
Philadelphia Tributaries and Main Stem	3,685,717	176	30.0	Instream TSS-Flow Regression

Appendix C, Table 7 - Total Sediment Load from Historical Studies

Study	Total Sediment Load (lb/yr)	Total Sediment Load (ton/sq. mi/yr)
RSRI, 1973	8,388,391	400
USGS, 1985	3,271,472	156

Appendix C, Table 8 - Estimated Tributary Loads based on BEHI/NBS and Colorado Reference Stream

System	Drainage Area (acres)	Stream Length (ft)	Total TSS Load (lb/yr)	Total TSS Load (lb/acre/yr)
Bells Mill	323	4,770	414,592	1,285
Cathedral	160	2,681	332,015	2,073
Creshiem	1,218	16,020	731,882	601
Gorgas Lane	499	1,968	183,082	367
Hill Crest	217	4,860	77,581	358
Hartwell	144	3,350	166,226	1,157
Kitchens Lane	234	7,098	279,594	1,194
Monoshone	1,056	6,379	246,101	233
Paper Mill Run	297	29,757	931,999	3,142
Thomas Mill	104	3,760	188,382	1,804
Tributary I	137	1,626	94,361	688
Wises Mill	446	6,980	351,120	788
Valley Green	128	2,203	77,423	604

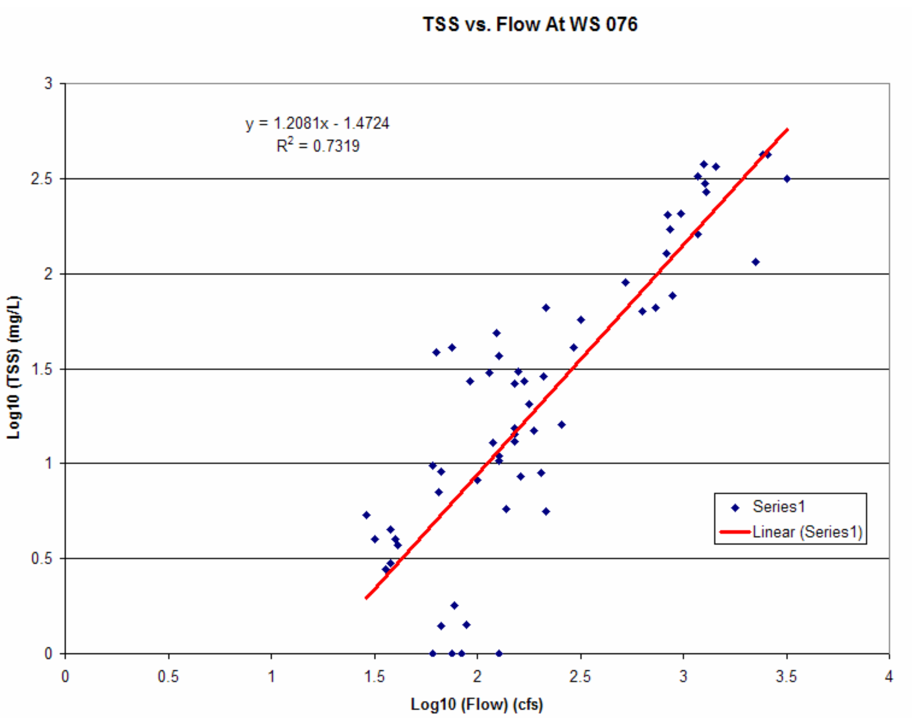
i. BEHI/NBS AND OBSERVED EROSION IN COLORADO REFERENCE STREAM

Predicted streambank erosion rates were calculated based on a relationship between these scores and measured streambank erosion rates in a reference stream in Colorado (Rosgen, 1996). The predicted rate is multiplied by the bank height and length as well as a conversion factor to get a sediment load in tons/year.

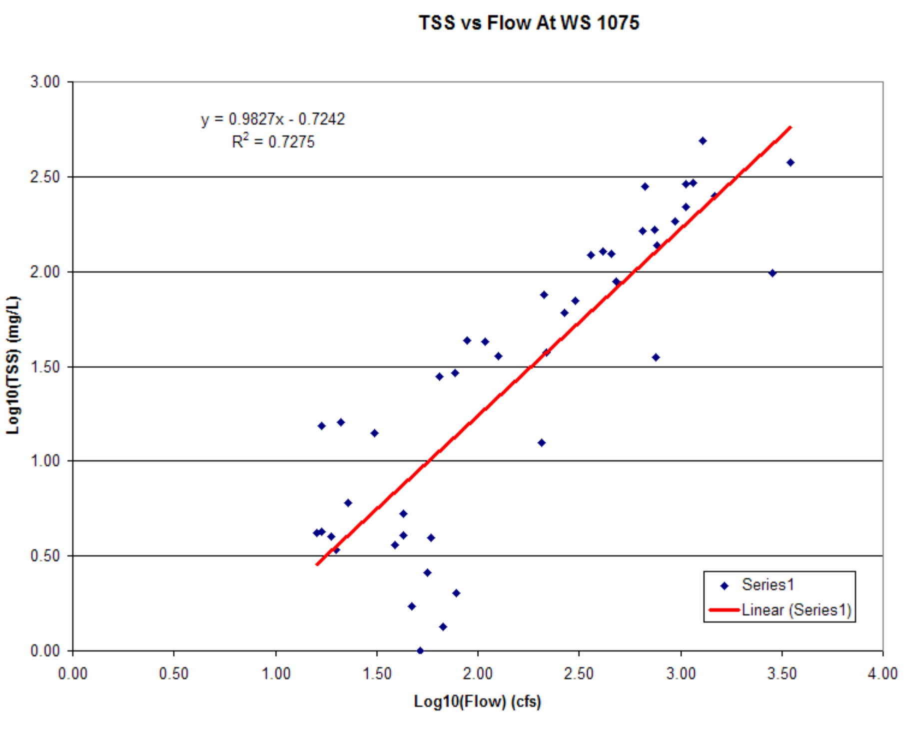
Streambank erosion estimates were determined using the data from the methods discussed above. For streambanks that were visually assessed to be low-erosion, a background erosion rate was applied. This rate corresponds to a low BEHI and low NBS score. These banks were assumed to have a bank height of the average of that particular tributary. For planning purposes, these low BEHI/NBS erosion rates are assumed to represent relatively stable conditions.

ii. INSTREAM TSS-FLOW REGRESSION

A TSS-flow regression was performed by matching instream TSS measurements at or near USGS gauging stations to the flow recorded closest to sampling time. The USGS gage located near the mouth of the main stem provided results for the regression shown in Appendix C, Figure 14. Similarly, a gage located in Fort Washington provided data for the regression in Appendix C, Figure 15. Once the regression was created for the two sites on the main stem, Fort Washington and the mouth at Philadelphia, an annual load could be determined by area weighting measured sediment loads at each station and estimating sediment input between stations. Regression results were not extrapolated to estimate TSS concentrations at flows outside the range used for the regression. Instead, TSS concentration corresponding to the maximum measured flow was applied to all flows greater than the maximum. For the gage station at Philadelphia, this concentration was 572.3 mg/L and for Fort Washington this concentration was calculated at 570.3 mg/L. The streambank portion of this total sediment load was then estimated by removing estimated runoff sediment load. An estimated 3,685,717 lb/yr of streambank sediment load is contributed by the city of Philadelphia based on this load estimation method.



Appendix C, Figure 14 - TSS-Flow Regression at USGS Gage 01474000 (mouth at Philadelphia) using WS076 TSS data



Appendix C, Figure 15 - TSS-Flow Regression at USGS Gage 01473900 (Fort Washington) using WS1075 TSS data

iii. ENVIRONMENTAL STUDY OF THE WISSAHICKON WATERSHED WITHIN THE CITY OF PHILADELPHIA

A study performed by the Regional Science Research Institute (RSRI) in 1973 estimated a sediment load for the Wissahickon watershed (Appendix C, Table 7). The city of Philadelphia contributes an estimated 8,388,391 lb/yr of sediment based on this study. This amount represents a total sediment load, but the report does not distinguish between the proportion of the load contributed by streambank erosion and stormwater runoff. This study is important because it provides an independent estimate to compare with estimates based on PWD and USGS monitoring.

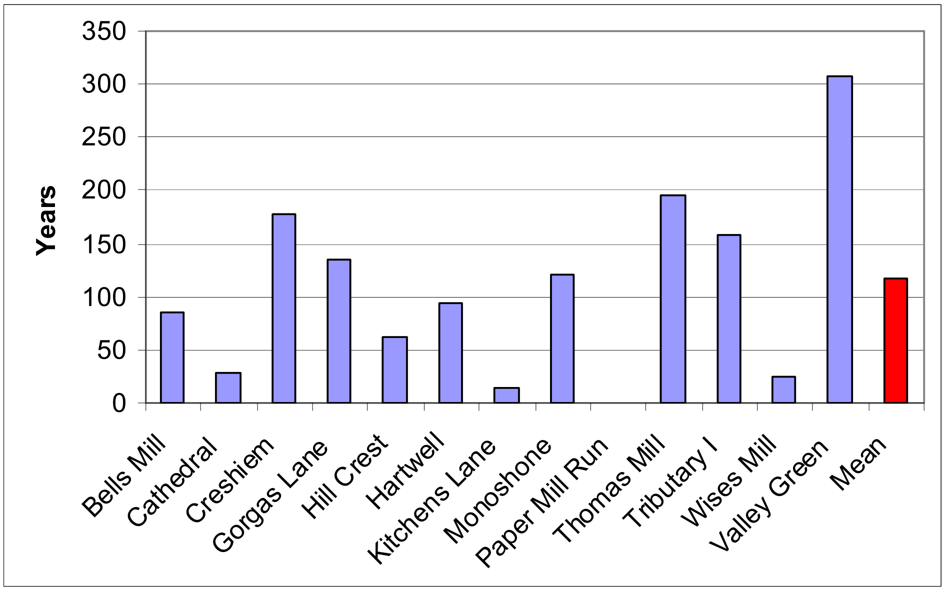
iv. EFFECTS OF LOW LEVEL DAMS ON THE DISTRIBUTION OF SEDIMENT, METALS, AND ORGANIC SUBSTANCES IN THE LOWER SCHUYLKILL RIVER BASIN, PENNSYLVANIA

A study performed by the United States Geologic Survey (USGS) in 1985 also estimated a total sediment load for the Wissahickon watershed (Appendix C, Table 7). The city of Philadelphia contributes an estimated 3,271,472 lb/yr of sediment based on this study. Similar to the RSRI study, no distinction between runoff and streambank load was provided. Again, this study is important because it provides another independent estimate to compare with estimated sediment loads based on PWD monitoring data.

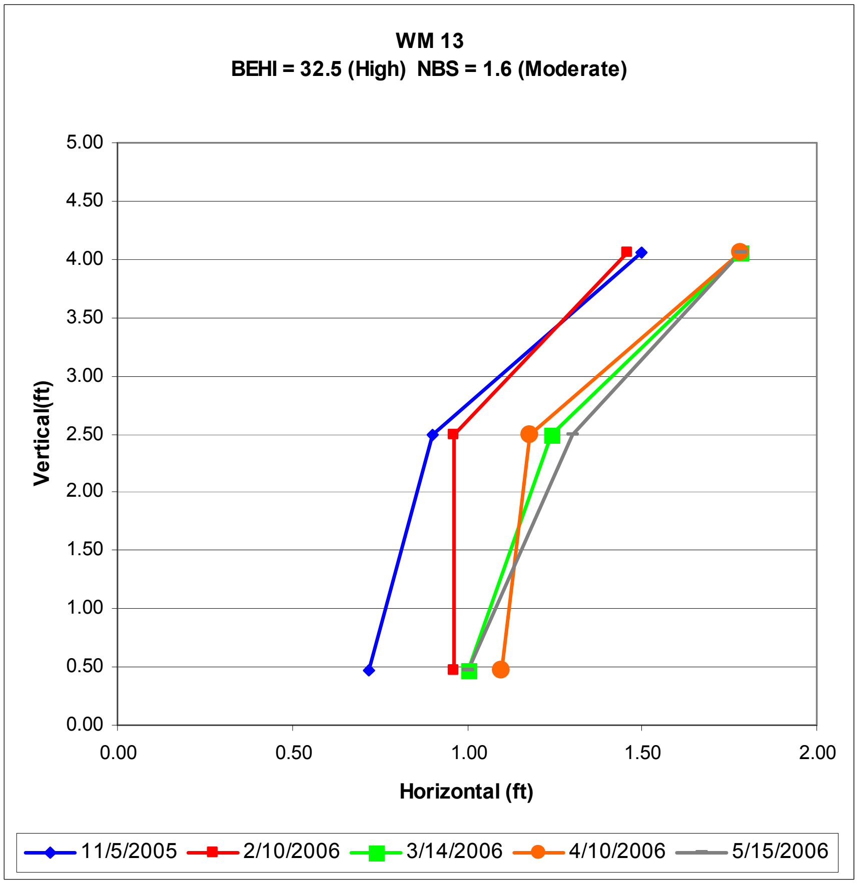
v. VERIFICATION AND COMPARISON STUDIES

Two additional analyses were performed to verify that preliminary estimates are within a reasonable range. The first method involved determining the amount of time it would take for erosion to produce present stream cross sections, using estimated erosion rates based on BEHI/NBS and the Colorado reference stream. Estimates ranged from 14 to 307 years with a mean of 120 years for individual tributaries, and a mean of 155 years using the total tributary loads and rates (Appendix C, Figure 16). This period of time is reasonable considering the history of natural, agricultural, and urban uses in the watershed.

The other method used to verify BEHI erosion prediction methods was installation of bank pins to measure erosion rates. As of September 2006, data collected so far are insufficient to draw conclusions. The bank pin program is being expanded significantly as discussed in a later section. An example of bank profile measurements at one site over several dates is shown in Appendix C, Figure 17.



Appendix C, Figure 16 - Estimated erosion rate based on BEHI/NBS from current cross section data.



Appendix C, Figure 17 - Example of Bank Pin Measurement

4. Tributary Restoration Potential Ranking

i. Multi-Criteria Evaluation (EVAMIX)

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.

EVAMIX makes a pair by pair comparison of all options under evaluation across all evaluation criteria, resulting in thousands of computations. The computations eventually result in an overall appraisal score. This is a single number, attached to a single alternative, and represents the overall worth of that alternative relative to the other alternatives based on the criteria selected, and the weights attached to the criteria. This number is used to determine the final ranking of alternatives from best to worst, or most important to least important.

EVAMIX offers several important advantages when used in planning studies:
- The alternatives under consideration are clearly defined
- The criteria used in evaluating the alternatives are explicit and measurable
- The algorithm can handle both quantitative and qualitative data, utilizing all available data to the highest degree of measurability possible
- The priorities underlying the evaluation are made explicit, and can be flexibly applied to highlight the effect that weighting has on the final ranking
- The technique is flexible enough to handle new data as it becomes available
- The technique is applied using widely available software (Excel spreadsheets)

The use of EVAMIX requires the development of a two dimensional matrix consisting of the options to be evaluated (columns) and a set of evaluation criteria (rows). For every combination of options and criteria, a score is assigned. The choice of the criteria is governed, in part, by the need for the scoring to be as objective as possible. By objective, we mean that the scores should represent impartial data and information useful in making decisions. The criteria must be clear and unambiguously defined, and can be set up as either quantitative criteria (e.g. threshold concentration in percent, time of travel in hours), or qualitative criteria (e.g. discharge frequency, location, etc.).

The other input variable required for the evaluation procedure is the selection of weighting factors for each of the criteria. While the scoring process strives to be as objective as possible and is carried out by the project team, the selection of weights is inherently subjective and should be done by the decision-makers, planner, or stakeholders. Unlike the matrix of scores, numerous possible weight sets are possible, and all are equally “valid”.

Criteria chosen to evaluate restoration potential are summarized in Appendix C, Table 9 and discussed in more detail below.

Appendix C, Table 9 - Ranking Criteria

		Need for Restoration				Potential for Restoration	
Criterion	Unit	Sediment Reduction	Habitat	Riparian	Infrastructure	Channel	Riparian
estimated streambank 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

ESTIMATED STREAMBANK EROSION LOAD
Units: lb/ft/yr
Derivation: Sediment loads due to streambank erosion have been estimated using the Rosgen BEHI/NBS method and Colorado reference stream.

- The reach containing each BEHI/NBS assessment site was identified.
- The sediment load contributed by the BEHI/NBS site (and associated length) was estimates. Details of these calculations are discussed earlier in this document.
- Sediment load contributed by the portion of the reach not assessed using the BEHI/NBS method was not considered in the ranking.

HABITAT INDEX
Units: % of reference condition
Derivation: Habitat monitoring was conducted by USEPA in 2005. For each reach, the nearest habitat monitoring site was determined. The habitat quality score assigned by EPA at the nearest site was assigned to the reach. Habitat assessments are discussed in detail in the Comprehensive Characterization Report.

BENTHIC MACROINVERTEBRATE INDEX (TAXA RICHNESS)
Units: number of species present
Derivation: Benthic macroinvertebrate monitoring was conducted by USEPA in 2005. For each reach, the nearest macroinvertebrate monitoring site was determined. The species richness score assigned by EPA at the nearest site was assigned to the reach. Macroinvertebrate assessments are discussed in detail in the Comprehensive Characterization Report.

CONSTRUCTION DIFFICULTY AND DISTURBANCE
Units: qualitative (low/medium/high)

Derivation: Factors were not determined quantitatively. Instead, PWD staff with extensive field experience in the Philadelphia portion of the watershed were asked to provide their impressions.

DEFINITION OF LOW DIFFICULTY/DISTURBANCE (INCLUDING MAIN STEM)
- low-slope stream channel and corridor
- wide stream channel can accommodate heavy equipment
- wide paths or low-slope grassy areas suitable for heavy equipment (e.g., Forbidden Drive)
- public ownership (e.g., Fairmount Park)

DEFINITION OF MEDIUM DIFFICULTY/DISTURBANCE

- channel and corridor slope intermediate between Low and High
- some access but not ideal for heavy equipment, some disturbance to forest
- small number of receptive institutional or private owners
- combination of low and high factors

DEFINITION OF HIGH DIFFICULTY/DISTURBANCE

- stream channel and corridor are steep
- stream channel is too small for heavy equipment
- forested riparian area with no paths or low-slope grassy areas for heavy equipment
- multiple private residential/commercial owners

FAIRMOUNT PARK PROJECTS

Units: number of projects in vicinity of each reach
Derivation: Fairmount Park's ES&ED division provided a spreadsheet showing medium and high priority projects. For a small number of projects, the location was not clear from the spreadsheet; these projects were not included in the analysis. For other projects, a point was placed in a GIS layer using the best judgment of GIS staff.

IDENTIFIED SANITARY SEWER PROBLEMS

Units: number of problems identified along each reach
Derivation: A sanitary infrastructure problem was defined as follows:

- The infrastructure feature may be leaking sanitary sewage to the stream, or high stream flows may be infiltrating the infrastructure feature.
- The feature is in good condition, but is exposed in the channel or bank and subject to damage by high flows.

DETERMINATION OF CONDITION OF MANHOLES AND PIPES

- Condition was noted as "poor" by the field team (no instances identified).
- The photo taken by the field team shows at least one of the following:
  - The feature is broken, cracked, leaking, or has exposed joints.
  - The feature is exposed in the channel or bank and subject to high flows.

DETERMINATION OF CONDITION OF DAMS

- If sanitary infrastructure is visible in the photo taken by the field team, the checklist for manholes and pipes above was followed.

USE OF THERMAL IMAGING STUDY RESULTS (NO INSTANCES IDENTIFIED)

- The point was noted as a "suspected leak" by the thermal imaging team.
- Ground truthing notes indicate that the point is associated with sanitary infrastructure (not a stormwater outfall) and that evidence of sewage is present.

RESTORATION PRIORITY RESULTS

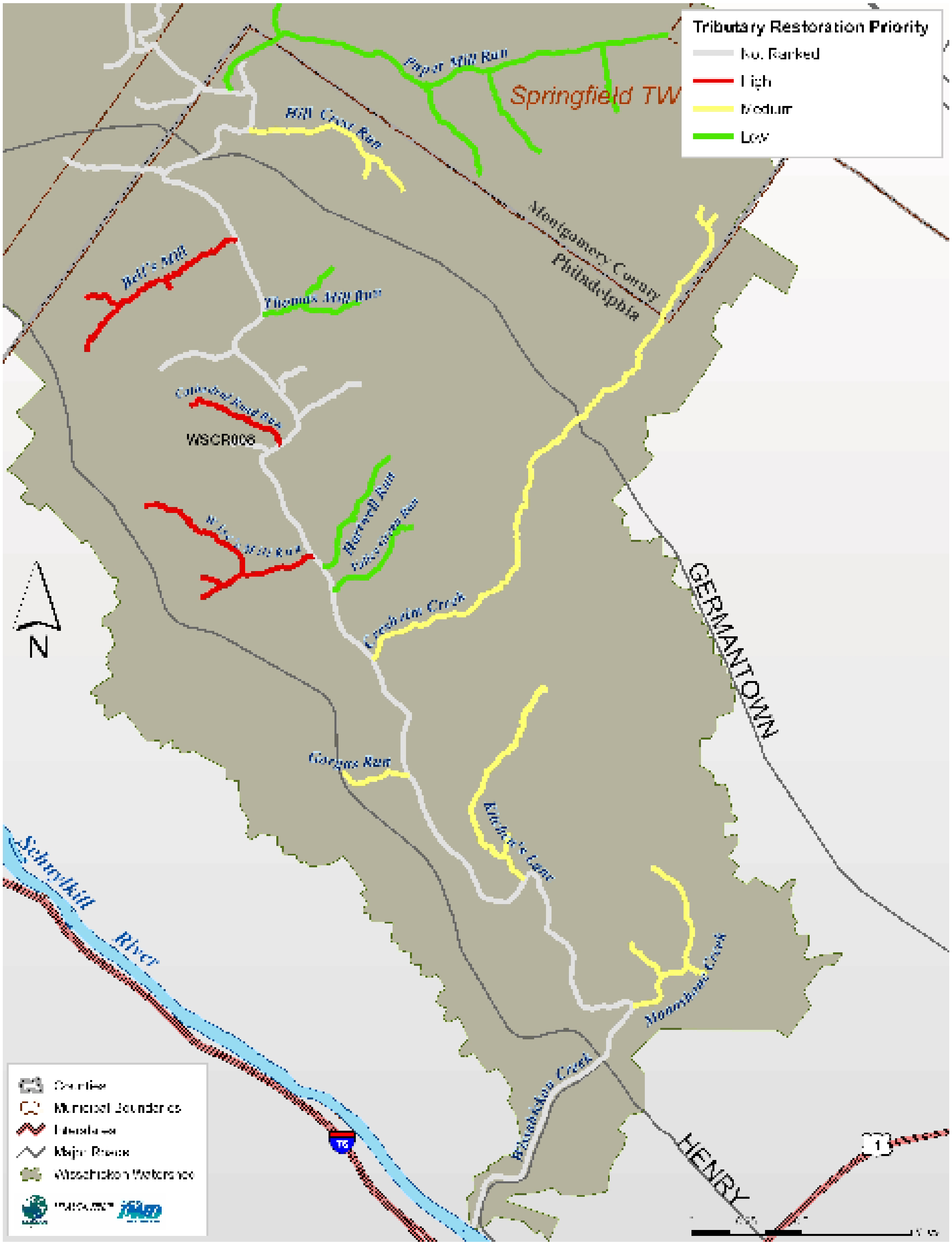
Ranking analyses were performed with several sets of criteria weights. One set of weights for the restoration project are shown in Appendix C, Table 10. The results obtained with that weight set are presented in Appendix C, Table 11. Also shown in Appendix C, Table 11 is the sum of all the reach lengths for each category identified as low, medium, and high priority within each tributary. The tributary restoration ranking is graphically represented in Appendix C, Figure 18; and reach restoration ranking is graphically represented in Appendix C, Figure 19.

Appendix C, Table 10 – Criteria Weights

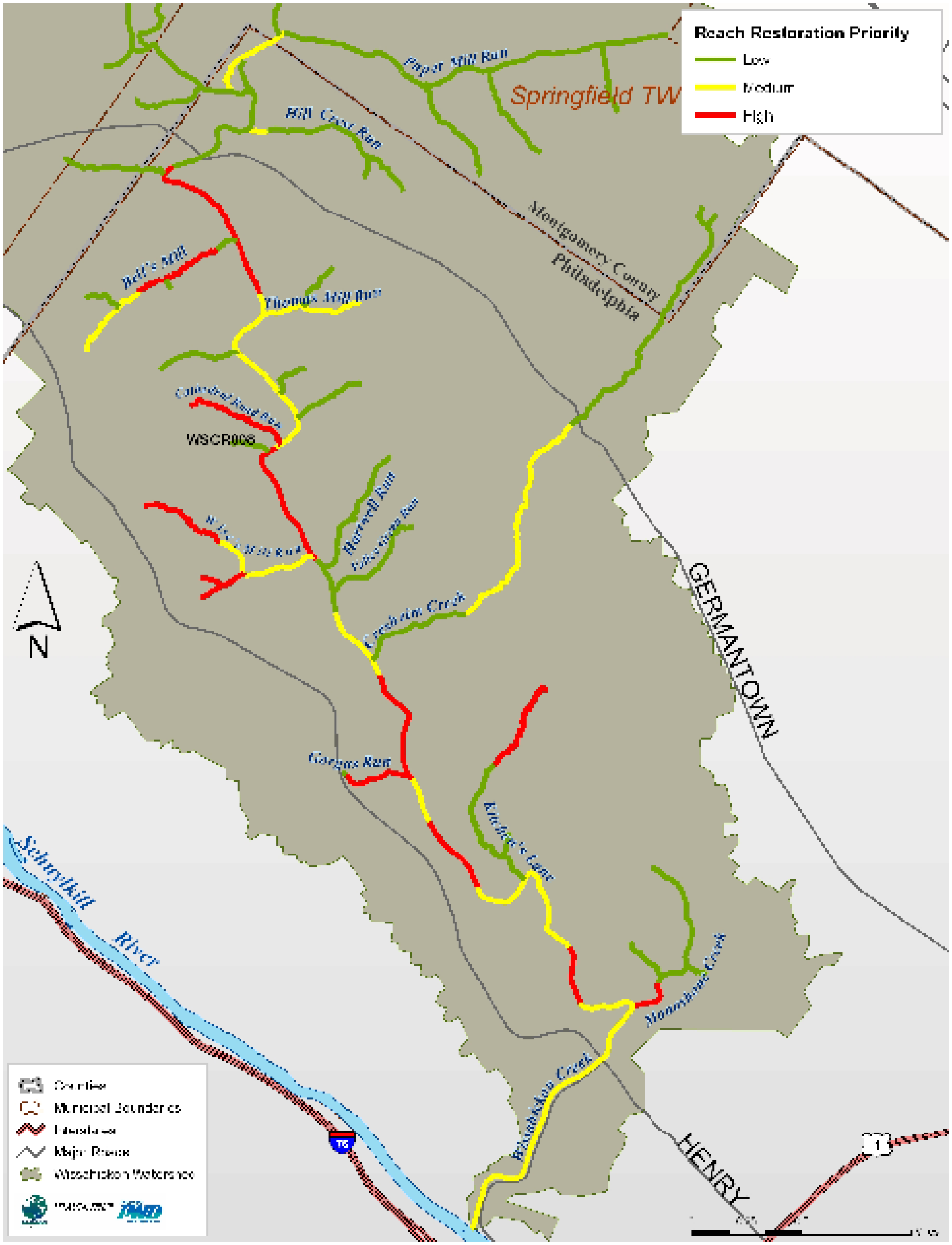
	Weight
Criteria	**0<wt<1**
estimated streambank erosion load	0.300
habitat index	0.100
benthic macroinvertebrate index	0.100
Fairmount Park projects	0.100
identified sanitary sewer problems	0.100
construction difficulty/disturbance index	0.300

Appendix C, Table 11 – Tributary Ranking Results

			Total Reach Length (ft)		
Options	Ranking	Mean Rank	low	medium	high
Cathedral Road Run	High	1.0	0	0	2771
Bell's Mill	High	3.0	1834	1078	1846
Wise's Mill	High	4.0	0	1507	4052
Cresheim Creek	Medium	5.0	9997	5383	0
Gorgas Run	Medium	5.5	0	0	1750
Hill Crest Run	Medium	5.5	2035	1781	0
Monoshone Creek	Medium	6.0	3236	0	1658
Kitchen's Lane	Medium	8.5	4720	0	2019
Paper Mill Run	Low	8.5	788	4653	0
Valley Green Run	Low	10.5	2868	0	0
Thomas Mill Run	Low	11.0	0	2689	0
Hartwell Run	Low	11.5	3423	0	0



Appendix C, Figure 18 – Tributary Restoration Ranking

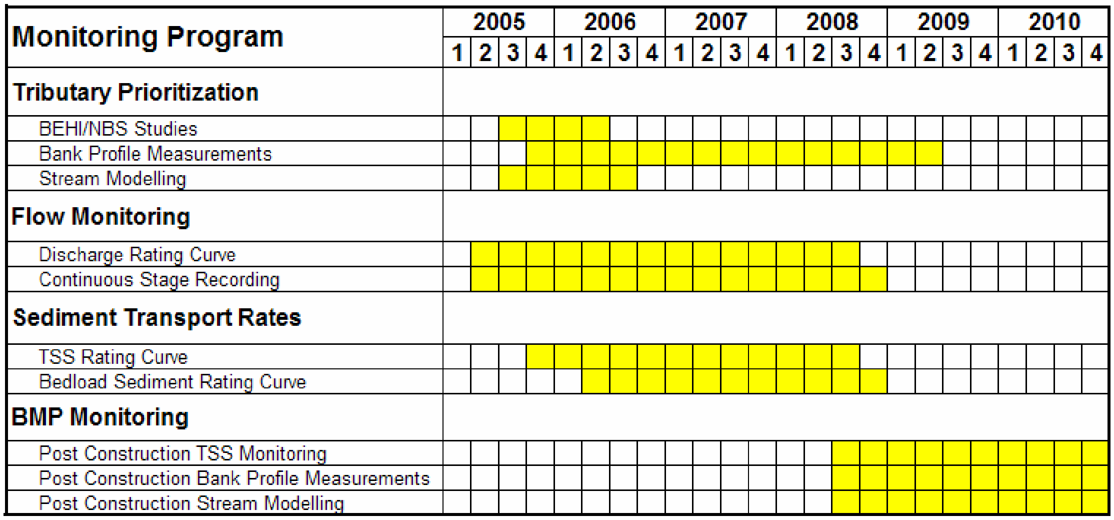


Appendix C, Figure 19 – Reach Restoration Ranking

5. 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 (Appendix C, Table 12).

Appendix C, Table 12 - Time Line Strategy for Monitoring Components of the Wissahickon TMDL.



i. Expanded Bank Pin Program

The program of installing bank pins to measure actual erosion rates is being greatly expanded. The objective of this program is to define a local relationship between measured streambank erosion and qualitative streambank erosion (using Rosgen's BEHI/NBS method).

Sampling Design

The sampling design below is recommended based on EPA (2002).

- stratified sampling design: stream length broken up into categories (strata), each representing one combination of BEHI and NBS score observed in Wissahickon.
- total number of sampling sites allocated in each strata according to the estimated load contributed by each BEHI/NBS combination (Appendix C, Table 13)
- total number of sampling sites determined by acceptable margin of error and available budget/staff (more discussion below)
- random site selection within each stratum

As of April 2006, bank pins were installed at 21 sites, and erosion was measured at 11 of these. The most recent measurements included in this study were taken April 24, 2006. Mean erosion rates at the 11 sites with measured erosion are shown in Appendix C, Table 13. A summary of the BEHI ratings are shown in Appendix C, Table 14. The fraction of total load contributed by reaches with each combination of BEHI and NBS score are shown in Appendix C, Table 15. Shown in Appendix C, Figure 20 is a comparison of high and moderate BEHI from local study results. No trend is apparent from data collected so far, but it is hoped a trend will emerge in the future as more data points are added.

Appendix C, Table 13 - Preliminary Bank Pin Data

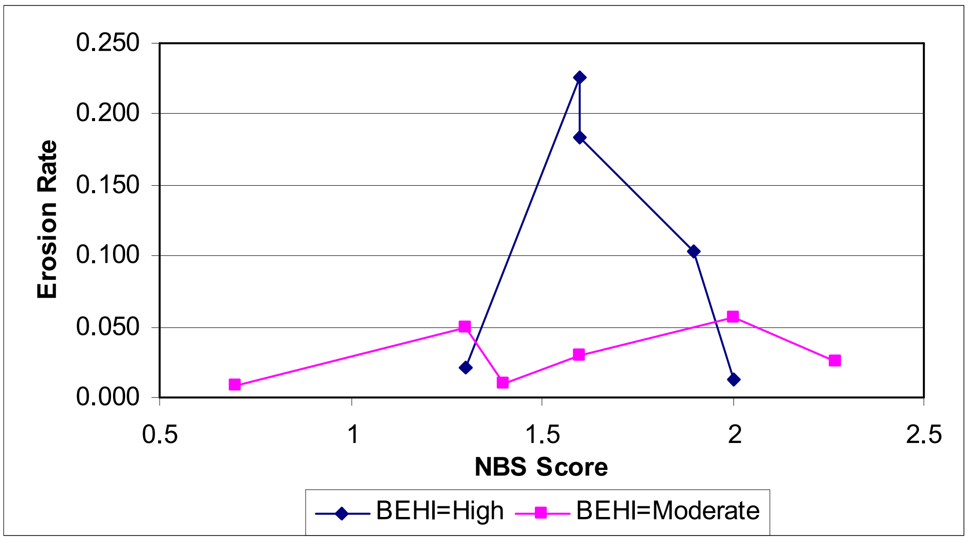
Site	First	Last	Days Monitored	BEHI Rating	NBS Rating	Measured Erosion to top bank pin (ton/ft/yr)	Measured Erosion to top of bank (ton/ft/yr)
MN1	11/2/2005	4/24/2006	173	Moderate	Very Low	0.006	0.016
MN4	11/2/2005	4/24/2006	173	Moderate	Low	0.004	0.009
WM29	11/5/2005	4/24/2006	170	Moderate	Low	0.022	0.074
BM25	11/7/2005	4/24/2006	168	Moderate	Moderate	0.020	0.046
BM21	11/7/2005	4/24/2006	168	Moderate	High	0.012	0.040
CR16	10/31/2005	4/24/2006	175	Moderate	High	0.036	0.090
CR13	10/31/2005	4/24/2006	175	High	Low	0.014	0.041
BM35	11/7/2005	4/24/2006	168	High	Moderate	0.154	0.379
WM13	11/5/2005	4/24/2006	170	High	Moderate	0.122	0.326
MN3	11/2/2005	4/24/2006	173	High	High	0.066	0.275
CR7	10/31/2005	4/24/2006	175	High	High	0.008	0.042

Appendix C, Table 14 - Bank Pin Erosion Summary

		To Top Bank Pin		To Top of Bank	
BEHI Rating	No. Sites	Mean (ton/ft/yr)	St. Deviation (ton/ft/yr)	Mean (ton/ft/yr)	St. Deviation (ton/ft/yr)
Moderate	6	0.017	0.012	0.046	0.032
High	5	0.073	0.065	0.213	0.161

Appendix C, Table 15 - Fraction of Load Contributed by each BEHI/NBS Combination

BEHI	NBS	Sites	Erosion (ton/yr/ft)	Length (ft)	Erosion (ton/yr)	Erosion (% of total)	New Bank Pin Sites
Low	Low	Unassessed*	0.009	153,552	1,367	68.4	60
Low	High	1	0.043	30	1.30	0.065	1
Moderate	Very Low	17	0.020	647	12.9	0.645	1
Moderate	Low	96	0.025	3,008	74.6	3.73	4
Moderate	Moderate	11	0.042	379	15.8	0.791	1
Moderate	High	9	0.056	341	19.1	0.956	1
Moderate	Very High	2	0.096	75	7.21	0.361	1
High	Very Low	15	0.045	370	16.5	0.824	1
High	Low	136	0.059	5,040	299	15.0	15
High	Moderate	9	0.133	388	51.6	2.59	3
High	High	12	0.134	566	75.7	3.79	4
High	Very High	1	0.143	15	2.15	0.107	1
High	Extreme	1	0.107	25	2.68	0.134	1
Very High	Very Low	5	0.069	160	11.0	0.550	1
Very High	Low	21	0.067	455	30.6	1.53	2
Very High	Moderate	1	0.062	10	0.616	0.031	1
Very High	High	1	0.144	20	2.89	0.145	1
Extreme	Low	1	0.289	25	7.22	0.362	1
All Measurements		339		165,106	1997	100	100



Appendix C, Figure 20 - BEHI/NBS Local Study Results

<u>NUMBER OF SITES</u>

The number of sites needed can be estimated based on observed variability in measurements and the acceptable uncertainty in the estimate:

$$n = \frac{z_{\alpha}^{2}\sigma^{2}}{L^{2}}$$

where
n = sample size (number of sites, rounded up to nearest integer)
z = standard normal cumulative probability for a 2-tailed 95% confidence interval = 1.96
σ = standard deviation of measured erosion rates so far = 0.0439 ton/yr/ft
L = acceptable uncertainty, 1/2 width of confidence interval (ton/yr/ft)

The number of BEHI sites for each rating, required to achieve a given confidence interval, are listed in Appendix C, Table 16 (erosion measured from top bank pin) and Appendix C, Table 17 (erosion measured from top of bank). Low and Moderate BEHI sites were assigned the standard deviation measured at Moderate BEHI sites. High BEHI sites were assigned the standard deviation measured at High BEHI sites. The results suggest that a sampling program to achieve a confidence interval of 100 ton/yr/sq.mi. or less may not be feasible. However, it is important to note that the standard deviations are based on a very small sample size. Collecting more samples may result in a lower estimate of standard deviation. Even if a statistically meaningful measure of error cannot be established, additional sites will allow better management decisions.

Appendix C, Table 16 - The number of sites required to achieve a given Confidence Interval

	St. Dev.	1/2 C.I. (ton/yr/sq.mi.)				
BEHI	(ton/yr/ft)	10	50	100	150	200
Low/Moderate	0.012	1,320	53	14	6	4
High	0.065	38,717	1,549	388	173	97
Total		40,037	1,602	402	179	101

Based on erosion to top bank pin

Appendix C, Table 17 - The number of sites required to achieve a given Confidence Interval

	St. Dev.	1/2 C.I. (ton/yr/sq.mi.)				
BEHI	(ton/yr/ft)	10	50	100	150	200
Low/Moderate	0.032	9,384	376	94	42	24
High	0.161	237,530	9,502	2,376	1,056	594
Total		246,914	9,878	2,470	1,098	618

Based on erosion to top of bank

NEXT STEPS

PWD plans to establish approximately 100 new sites to better estimate the true standard deviations. If these are lower than current estimates, the number of sites needed for a statistically meaningful estimate will also decrease.

ii. BANK EROSION HAZARD INDEX AND NEAR BANK STRESS

Total sediment yields are composed of sediment derived from overland runoff and from that originating in the creek. To determine the relative importance of these two components, PWD is conducting an expanded Bank Erosion Hazard Index (BEHI) and Near Bank Stress (NBS) study as defined by Rosgen (1996) to predict streambank erosion rates.

Additional reaches of the thirteen tributaries (Appendix C, Figure 19) within Philadelphia will be assessed by PWD staff and sections of streambank will be scored based on the BEHI and NBS criteria. This study will be combined with the expanded bank pin program to develop a local relationship between these indices and measured erosion.

iii. Bank Erosion Hazard Index and Near Bank Stress

Additional discharge rating curves will be established and existing ones will be refined as necessary for the tributaries within Philadelphia County limits following a modified version of the USGS protocol (Buchanan and Somers 1969). Currently, discharge rating curves have been completed on three tributaries (Bells Mill, Monoshone, and Wises Mill). Discharge will be measured using a SonTek Flowtraker during low and medium flow events and a Gurley pygmy meter during high flow events.

iv. Continuous Stage Recording

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 the designated monitoring site 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.

v. TSS Rating Curve

Automated water collection devices (ISCO model no. 6712) will be used to collect water samples during additional wet weather events as needed in the Wissahickon Creek tributaries. In the attempt to characterize an entire storm event, automated samplers are triggered by a 0.2 ft elevation change in stream height and will continue to collect samples every 20 minutes for the first hour. Following this step, samples are then collected every 2-4 hours until discharge has 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. To date, two wet weather events have been captured on Monoshone Creek, Wises Mill and Cathedral Run, and three runoff producing events have been captured on Bells Mill. Wet weather monitoring will continue through 2006-2007 in attempt to characterize TSS in relation to discharge.

vi. Bedload Sediment Rating Curve

In order to estimate a total sediment load, bedload sediment samples will be collected in addition to suspended sediment samples. Bedload sediment samples will be collected at different stages according to a modified version of USGS protocol (Edwards and Glysson 1999). Samples will be collected using a Helley-Smith handheld sampler with a 15cm orifice. Samples will be dried, sieved and weighed in order to determine a rate of transport as well as a particle size distribution.

vii. POST-CONSTRUCTION MONIITORING

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. In 2005, PWD conducted extensive wet-weather monitoring on three tributaries where various stormwater BMPs have been proposed or are currently under construction.

APPENDIX D – POTENTIAL PCB LOCATIONS & INSPECTIONS

Table 1 PCB Inspection Summary

	# sites NE	# sites SE	# sites SW		# sites Separate	# sites Combined	# sites Storm Only	# sites Non-Contributing	# sites Outside City (-)
All Records	171	73	160	404	100	253	10	16	17
Duplicate Records	14	2	7	23					
Blank Records	2	2	4	8					
Actual Records	155	69	149	373	99	239	10	16	9
City-wide Records	146	69	144	356					
Outside City Records	9	0	5	17					
Inspections Completed	115	45	76	236	64	133	10	12	9
Remaining inspections	56	28	84	168	36	120	0	4	8

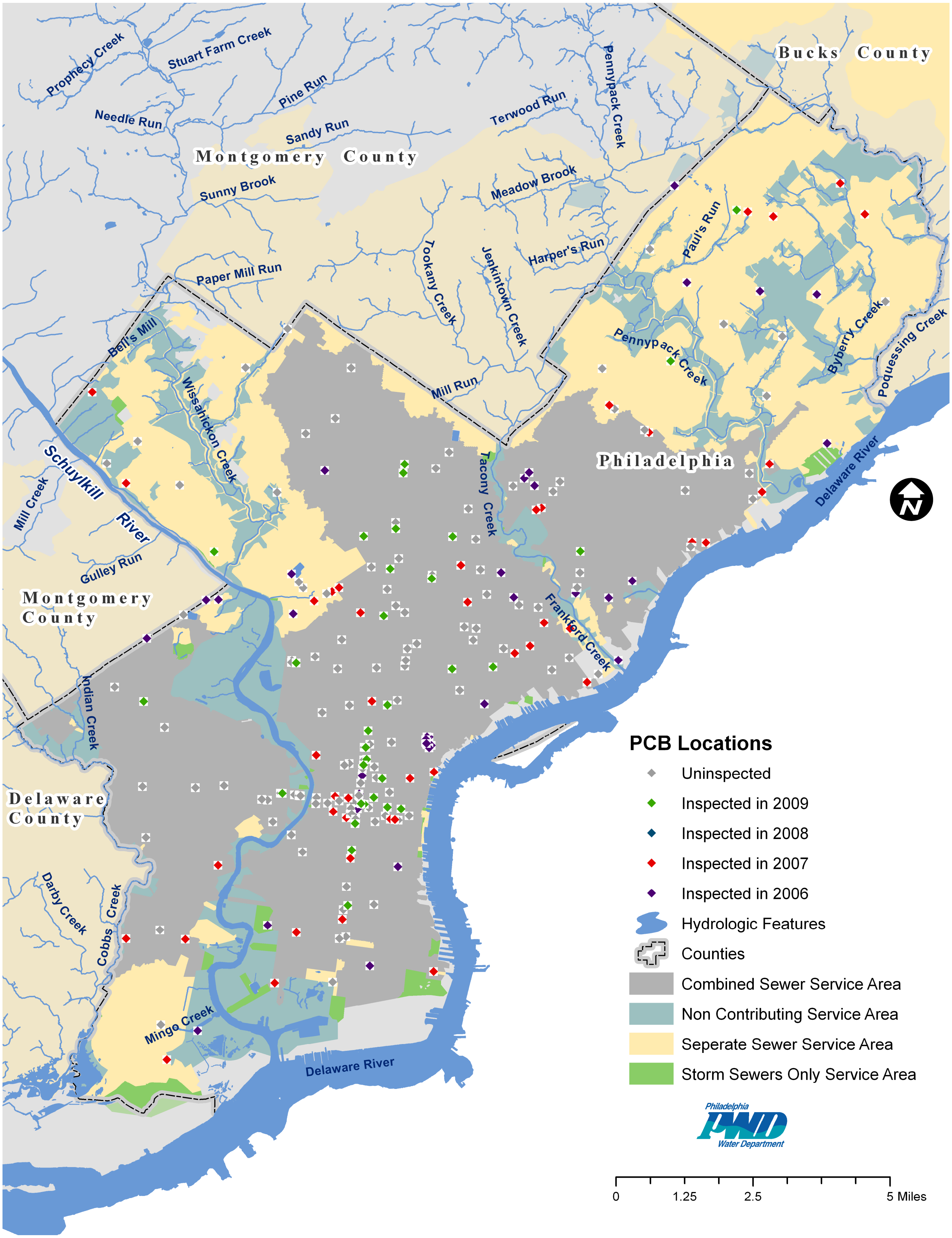


Figure 1: PCB Inspection Sites

Table 2 Potential PCB Sources Inspection List

PWD #	Referral Agency	Completed	Inspection Date	Company Name	Street	Town/ City	Type of PCB Equipment	# of Devices @ Location	Status of PCB Equipment:				Status of Facility:			Comments
									In use	Out of Service	Dis-connected	Off Site	Operating	Closed	Abandoned/ not secure	
NE-1	USEPA Megarule	2006-4	02/28/07	Arsenal Business Center	5301 Tacony St.	Philadelphia	Transformers	86	X				X			In process of removing transformers. Inspection sheet has list and PCB removal plan attached.
NE-2	USEPA Megarule	2006-4	Duplicate	Arsenal Associates	5301 Tacony St.	Philadelphia		87				NA		NA		Duplicate record NE-01
NE-3	USEPA Megarule			The School District of Philadelphia	7300 Glendale Avenue	Philadelphia		6								
NE-4	USEPA Megarule			The School District of Philadelphia	7300 Glendale Avenue	Philadelphia		6								
NE-5	USEPA Megarule	2007-1	03/28/07	Community Education Partners	4224 N. Front Street	Philadelphia		2	X				X			Room labeled PCB containing but the equipment is not labeled.
NE-6	USEPA Megarule	2007-1	Duplicate	Community Education Partners	4224 N. Front Street	Philadelphia		2								
NE-7	USEPA Megarule			The School District of Philadelphia	1400 West Olney Avenue	Philadelphia		4								
NE-8	USEPA Megarule			The School District of Philadelphia	1400 West Olney Avenue	Philadelphia		4								
NE-9	USEPA Megarule	2006-3	Duplicate	Sunoco Chemicals Frankford Plant	Cooling Tower 4	Philadelphia		2				NA		NA		Duplicate record NE-10
NE-10	USEPA Megarule	2006-3	10/23/06	Sunoco Chemicals Frankford Plant	Margeret and Bermuda Sts	Philadelphia	(2 removed)	0				X	X			Cooling tower #4 Transformers removed 2001. Documentation on site. List of capacitors is attached to the inspection report.
NE-11	USEPA Megarule	2006-4	01/30/07	Posel Corporation	9381 Krewstown Road	Philadelphia	Transformer	1	X				X			Located on side of fitness center

NE-12	USEPA Megarule	2006-4	01/30/07	Posel Corporation	9381 Krewstown Road	Philadelphia	Transformer	1	X				X			Located behind building (store#28) in shopping center. Retrofilled to <50 ppm (Sign fading)
NE-13	USEPA Megarule			The School District of Philadelphia	10159 Bustleton Avenue	Philadelphia		2								
NE-14	USEPA Megarule	2009-2	Duplicate	The School District of Philadelphia	10159 Bustleton Avenue	Philadelphia		2								
NE-15	USEPA Megarule			Peco Energy Company	Walnut & Fourth Street	Green Lane		2								
NE-16	USEPA Megarule	2008-1	Duplicate	Peco Energy Company	Walnut & Fourth Street	Green Lane		2								
NE-17	USEPA Megarule			SEPTA	1410 W. Loudon Street	Philadelphia		2								
NE-18	USEPA Megarule	2009-2	Duplicate	The School District of Philadelphia	5701 Oxford Street	Philadelphia		3								
NE-19	USEPA Megarule			The School District of Philadelphia	5701 Oxford Street	Philadelphia		3								
NE-20	USEPA Megarule	2006-3	10/23/06	Sunoco Chemicals Frankford Plant	Margeret and Bermuda Sts	Philadelphia	(1 removed)	0				X	X			Cooling tower #3 Transformers removed 2004. Documentation on site.
NE-21	USEPA Megarule	2006-2	Duplicate	Sunoco Chemicals , Frankford Plant	Cooling Tower 3	Philadelphia		~~1~~				NA		NA		Duplicate record NE-20
NE-22	USEPA Megarule	2006-2	06/23/06	General Electric International, Inc. (GEII)	1040 East Erie Avenue	Philadelphia	Transformer	2		X		X	X			Document attached to Ins Report NE-23
NE-23	USEPA Megarule	2006-2	06/23/06	General Electric International, Inc. (GEII)		Philadelphia	CAPACITORS	2		X		X	X			Documentation attached
NE-24	USEPA Megarule	2006-2	06/23/06	SEPTA-General Electric Service Shop		Philadelphia	Undercars	26		**See	Note*		X			No Amtrak transformers on site. Currently there are 25 SEPTA undercars on site.

NE-25	USEPA Megarule	2006-2	06/23/06	SEPTA - General Electric Service Shop		Philadelphia	(1 removed)	0		**See	Note*		X			No Amtrak transformers on site. Currently there are 25 SEPTA undercars on site.
NE-26	USEPA Megarule	2006-2	Duplicate	Sunoco Chemicals Frankford Plant	Cooling Tower 5	Philadelphia		~~1~~				NA		NA		Duplicate record NE-27
NE-27	USEPA Megarule	2006-3	10/23/06	Sunoco Chemicals Frankford Plant	Margeret and Bermuda Sts	Philadelphia		1				X	X			Cooling tower #5 Transformers removed 2001. Documentation on site.
NE-28	USEPA Megarule	2009-2	Duplicate Record	PECO Energy Co.	Legrande Avenue	Penndel		1								
NE-29	USEPA Megarule	2009-2	Duplicate Record	PECO Energy Co.	Legrande Avenue	Penndel		1								
NE-30	USEPA Megarule			Peco Energy Company	900 Big Oak Road	Morrisville		1								
NE-31	USEPA Megarule	2009-2	Duplicate Record	Peco Energy Company	900 Big Oak Road	Morrisville		1								
NE-32	USEPA Megarule			Peco Energy Company	2860 Trenton Avenue	Philadelphia		1								
NE-33	USEPA Megarule	2009-2	Duplicate Record	Peco Energy Company	2860 Trenton Avenue	Philadelphia		1								
NE-34	USEPA Megarule			Peco Energy Company	Betharyes Road & 2nd St Pike	Betharyes		1								
NE-35	USEPA Megarule	2009-2	Duplicate Record	Peco Energy Company	Betharyes Road & 2nd St Pike	Betharyes		1								
NE-36	Phila. Water Dept	2006-3	11/20/06	PHILA WATER DEPT	9001 STATE RD	Philadelphia	CAPACITORS	6		X	X		X			All PCB equipment removed in 2006.
NE-37	USEPA Megarule			The Philadelphia District of Schools	3939 N. 5th Street	Philadelphia		2								
NE-38	USEPA Megarule	2009-2	Duplicate Record	The Philadelphia District of Schools	3939 N. 5th Street	Philadelphia		2								
NE-39	Phila. Fire Dept	2006-3	10/11/06	AFTER SIX INC	G & HUNTING PARK	Philadelphia	Transformer	1				X		**Dem olis hed**		Site is now a shopping center.

NE-40	Phila. Fire Dept	2007-2	10/01/07	Wymex Beauty	3621 B ST.	Philadelphia	Transformer	1	X				X			Not labeled as PCB. Secure in a locked room. Concrete floor broken, could be a source for soil/groundwater contamination if PCBs leak. Labeled with PMI sticker 609-695-1170
NE-41	Phila. Fire Dept	2007-1	06/08/07	BUDD CO	FOX & HUNTING PK	Philadelphia	Transformer	1		X			X			Old Budd site. Replaced with dry transformer. Could not access roof. Sent letter 6/14/2007. In file.
NE-42	Phila. Fire Dept	2007-2	07/23/07	DODGE FOUNDRY	6501 STATE RD	Philadelphia	Transformer	1		X	X	X		X	Demolished	Location is an empty field. All buildings demolished
NE-43	Phila. Fire Dept	2007-2	07/23/07	DODGE FOUNDRY	6501 STATE RD	Philadelphia	Transformer	1		X	X	X		X	Demolished	Location is an empty field. All buildings demolished
NE-44	Phila. Fire Dept			GEN ELECT CO	401 E HUNTING PK	Philadelphia	Transformer	1								
NE-45	Phila. Fire Dept			MUTUAL INDUS.	707 W. GRANGE	Philadelphia	Transformer	1								
NE-46	Phila. Fire Dept			NE SHOPPING CTR	9173 ROOSEVELT BLVD	Philadelphia	Transformer	1								
NE-47	Phila. Fire Dept			NE SHOPPING CTR	9173 ROOSEVELT BLVD	Philadelphia	Transformer	1								
NE-48	Phila. Fire Dept			NORTHERN ASSOCIATES	7777 STATE RD.	Philadelphia	Transformer	1								
NE-49	Phila. Fire Dept	2007-1	04/27/07	PHILA PRISONS	8215 TORRESDALE	Philadelphia	Transformer	1	X				X			
NE-50	Phila. Fire Dept			PHILA SCHOOL BOARD	5TH & LUZERNE	Philadelphia	Transformer	1								
NE-51	Phila. Fire Dept			PHILA SCHOOL BOARD	B & WYOMING	Philadelphia	Transformer	1								
NE-52	Phila. Fire Dept			PHILA SCHOOL BOARD	HEDGE & UNITY (STEARNE)	Philadelphia	Transformer	1								
NE-53	Phila. Fire Dept			SCHOOL BOARD	KNIGHTS & CHALFONT	Philadelphia	Transformer	1								

NE-54	Phila. Fire Dept			PHILA SCHOOL BOARD	SHARON & ALICIA	Philadelphia	Transformer	1								
NE-55	Phila. Fire Dept	2007-1	04/24/07	PHILA STATE HOSPITAL	14000 ROOSEVELT BLVD	Philadelphia	Transformer	~~1~~				X	X			Facility operating as Self-Help Movement, old PCB transformer had been replaced years ago.
NE-56	Phila. Fire Dept	2007-1	04/24/07	PHILA STATE HOSPITAL		Philadelphia	Transformer	~~1~~				X			Demolished	Transformer had been removed prior to demolition.
NE-57	Phila. Fire Dept	2007-1	04/24/07	PHILA STATE HOSPITAL		Philadelphia	Transformer	~~1~~				X			Demolished	Transformer had been removed prior to demolition.
NE-58	Phila. Fire Dept	2007-1	04/24/07	PHILA STATE HOSPITAL		Philadelphia	Transformer	~~1~~				X			Demolished	Transformer had been removed prior to demolition.
NE-59	Phila. Fire Dept	2007-2	08/15/07	S.D. RICHMAN INC	2435 WHEATSHEAF	Philadelphia	Transformer	1	X				X			Transformer retrofitted. Disposal manifests available and attached to report.
NE-60	Phila. Fire Dept	2007-1	09/04/07	Preit	4820 LANGDON ST	Philadelphia	Transformer	1		X	X	X		X		Building demolished
NE-61	Phila. Fire Dept	2009-1	03/07/09	SEPTA	4701 GRISCOM ST	Philadelphia	Transformer	1		X	X	X				5 transformers all dry, no PCBs at this location
NE-62	Phila. Fire Dept	2009-1	03/07/09	SEPTA	8365 CASTOR AVE	Philadelphia	Transformer	1		X	X	X				2 transformers on site, 1 dry(25KVA), 1 non pcb liquid (1130 KVA)
NE-63	Phila. Fire Dept	2007-2	10/01/07	Wymex Beauty (TL Tan LLC)	3621 B ST	Philadelphia	Transformer	1	X				X			Transformer in service not labeled as containing PCB. Transformer not is service is labeled as dry. Equipment is secure in a locked room and has secondary containment. PMI tag 609-695-1170
NE-64		2006-4	Blank Record	-												
NE-65	Phila. Fire Dept	2007-2	07/19/07	Specialty Engine Rebuilding	5201 UNRUH	Philadelphia	Transformer	1	X				X			Transformer in a secure fenced area with secondary containment
NE-66	Phila. Fire Dept	2006-3	10/23/06	THALHEIMER BROS	5550 WHITAKER AVE	Philadelphia	Transformer	1	X				X			Certificate of destruction is attached to the inspection report.

NE-67	Phila. Fire Dept	2006-3	10/23/06	THALHEIMER BROS	700 E GODFREY AVE	Philadelphia	Transformer	2	X				X			Certificate of destruction is attached to the inspection report.
NE-68	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,	1 RED LION RD	Philadelphia	Transformer	0				X	X			Now Golf Course with modern electrical equipment. Two original biuildings remainand have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-69	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club	1 RED LION RD	Philadelphia	Transformer	0				X	X			
NE-70	Phila. Fire Dept			Menasha	601-21 E ERIE	Philadelphia	Transformer	1								
NE-71	Phila. Fire Dept			FAIRMOUNT PARK (BANDSTAND)	OLD YORK RD. & HUNTING PARK AVE	Philadelphia	Transformer	1								
NE-72	Phila. Fire Dept	2009-1	04/27/09	SEPTA	WINDRIM & GERMANTOWN	Philadelphia	Transformer	10		X	X	X	X			10 transformers, all non-PCB liquid cooled.
NE-73	Phila. Fire Dept	2006-4	03/12/07	Delaware Ave. LLC	HEDLEY & DELAWARE RIVER - 4301 Delaware Ave.	Philadelphia	CAPACITOR	2				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-74	Phila. Fire Dept	2006-4	03/12/07	Delaware Ave. LLC		Philadelphia	CAPACITORS	2				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-75	Phila. Fire Dept	2006-4	03/12/07	Delaware Ave. LLC		Philadelphia	CAPACITORS	2				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-76	Phila. Fire Dept	2006-4	03/12/07	Delaware Ave. LLC		Philadelphia	CAPACITORS	2				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-77	Phila. Fire Dept			ANCHOR CONTAINER	4219 TORRESDALE	Philadelphia	Transformer	2								
NE-78	Phila. Fire Dept			BARRIT CORP	CASTOR & SEDGELY	Philadelphia	Transformer	2								
NE-79	Phila. Fire Dept	2007-1	06/09/07	BUDD CO	2501 HUNTING PK	Philadelphia	Transformer	2		X			X			Old Budd site. Replaced with dry transformer. 4 blue labeled non-PCB capacitors found on site

NE-80	Phila. Fire Dept	2006-1	05/17/06	Cardinal Health: Formerly DEVON APPAREL	3001 RED LION RD	Philadelphia	Transformer	0				X	X			Cardoinal Health has been at thi slocation for ~ 10 years. No PCB transformers are on this site, dry transformers only.
NE-81	Phila. Fire Dept			FOX TRUST BLDG	3634 N BROAD	Philadelphia	Transformer	2								
NE-82	Phila. Fire Dept			FRANKLIN SMELTING	CASTOR & RICHMOND	Philadelphia	Transformer	2								
NE-83	Phila. Fire Dept			JOHN F. KENNEDY MEMORIAL HOSPITAL	5600 LANGDON ST.	Philadelphia	Transformer	2								
NE-84	Phila. Fire Dept	2007-2	08/17/07	Wolf Investments	1771 TOMLINSON	Philadelphia	Transformer	2		X	X	X	X			PCB Transformers removed prior to current ownership.
NE-85	Phila. Fire Dept			SEARS & ROEBUCK	4640 ROOSEVELT BLVD	Philadelphia	Transformer	2								
NE-86	Phila. Fire Dept	2009-1	03/07/09	SEPTA	1823 E. LETTERLY	Philadelphia	Transformer	2		X	X	X	X			6 transformers all dry type
NE-87	Phila. Fire Dept	2009-1	04/27/09	SEPTA	200 W WYOMING	Philadelphia	Transformer	2		X	X	X		X		Station is not longer in service. All PCBs have been removed.
NE-88	Phila. Fire Dept	2009-1	04/27/09	SEPTA	4000 N BROAD	Philadelphia	Transformer	2		X	X	X		X		Location is closed all PCBs have been removed. AKA Erie Substation.
NE-89	Phila. Fire Dept	2009-1	04/27/09	SEPTA	BROAD & OLNEY	Philadelphia	Transformer	2		X	X	X	X			All PCBs removed from Olney station.
NE-90	Phila. Fire Dept	2007-2	07/24/07	STERNS	7300 BUSELTON AVE	Philadelphia	Transformer	2		X	X	X	X		Dem olish ed	Sterns demolished. A new sears and strip mall were built. No PCB equipment located on exterior.
NE-91	Phila. Fire Dept	2007-1	04/30/07	Sterling Paper	2155 E CASTOR	Philadelphia	Transformer	2	X				X			
NE-92	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club, Formerly: TRANSIT AMERICA	1 RED LION RD	Philadelphia	Transformer	0				X	X			Now Golf Course with modern electrical equipment. Two original biuildings remain and have been refurbished with no PCB equipment on site.
NE-93	Phila. Fire Dept	2006-1	05/18/06	Island Green Country Club,		Philadelphia	Transformer	0				X	X			

NE-94	Phila. Fire Dept	2006-1	05/19/06	Island Green Country Club,	1 RED LION RD	Philadelphia	Transformer	0				X	X			Now Golf Course with modern electrical equipment. Two original buiildings remain and have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-95	Phila. Fire Dept	2006-1	05/20/06	Island Green Country Club,		Philadelphia	Transformer	0				X	X			
NE-96	Phila. Fire Dept	2006-1	05/21/06	Island Green Country Club,		Philadelphia	Transformer	0				X	X			
NE-97	Phila. Fire Dept	2006-1	05/22/06	Island Green Country Club,		Philadelphia	Transformer	0				X	X			
NE-98	Phila. Fire Dept	2006-1	05/23/06	Island Green Country Club,		Philadelphia	Transformer	0				X	X			
NE-99	Phila. Fire Dept	2006-1	05/24/06	Island Green Country Club,		Philadelphia	Transformer	0				X	X			
NE-100	Phila. Fire Dept	2006-1	05/25/06	Island Green Country Club,		Philadelphia	Transformer	0				X	X			
NE-101	Phila. Fire Dept	2006-1	05/26/06	Island Green Country Club,		Philadelphia	CAPACITORS	0				X	X			
NE-102	Phila. Fire Dept	2006-1	05/27/06	Island Green Country Club,		Philadelphia	CAPACITORS	0				X	X			
NE-103	Phila. Fire Dept	2006-1	05/28/06	Island Green Country Club,		Philadelphia	CAPACITORS	0				X	X			
NE-104	Phila. Fire Dept	2006-4	03/12/07	Delaware Ave. LLC	HEDLEY & DELAWARE RIVER - 4301 Delaware Ave.	Philadelphia	CAPACITORS	26				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-105	Phila. Fire Dept	2007-1	05/29/07	SEARS & ROEBUCK	5540 ALGON STST	Philadelphia	Transformer	3		X	X	X	X			PCB equipment replaced with dry transformers
NE-106	Phila. Fire Dept	2006-4	03/12/07	Delaware Ave. LLC	HEDLEY & DELAWARE RIVER - 4301 Delaware Ave.	Philadelphia	Transformer	3	X				X			Located on pole labeled #4, assumed to be the 3 PCB transformers still on the pole.
NE-107	Phila. Fire Dept	2007-1	06/07/07	BUDD CO	2501 HUNTING PK	Philadelphia	Transformer	3	??				X			Old Budd site.Old oil filled transformers found on site.Sent letter for an accurate account of transformmers.Sent letter 6/14/2007. In file.
NE-108	Phila. Fire Dept	2007-2	07/26/07	Northwest Human Services	2900 SOUTHHAMPTON	Philadelphia	Transformer	3	X				X			All transformers located outside on concrete pads. All labeled appropiately. No secondary containment.
NE-109	Phila. Fire Dept			PHILA ELECTRIC CO	3300 N 10TH STREET	Philadelphia	Transformer	3								

NE-110	Phila. Fire Dept	2007-1	04/27/07	PHILA PRISONS	8001 STATE RD.	Philadelphia	Transformer	3	X				X			
NE-111	Phila. Fire Dept			PHILA SCHOOL BOARD	BROAD & OLNEY (WIDNER)	Philadelphia	Transformer	3								
NE-112	Phila. Fire Dept			PHILA SCHOOL BOARD	FRONT & DUNCANNON (OLNEY)	Philadelphia	Transformer	3								
NE-113	Phila. Fire Dept			PHILA SCHOOL BOARD	OLD YORK RD. & ONTARIO (BETHUNE)	Philadelphia	Transformer	3								
NE-114	Phila. Fire Dept	2007-2	08/17/07	Active Reality (Black red white furniture/ PBM	10175 NORTHEAST AVE	Philadelphia	Transformer	3		X	X	X	X			PCB transformers removed prior to current ownership.
NE-115	Phila. Fire Dept	2007-1	09/04/07	Preit	4640 ROOSEVELT BLVD	Philadelphia	Transformer	3		X	X	X		X		Sears was demolished all PCB equipment was removed prior to demolition.
NE-116	Phila. Fire Dept	2007-1	09/04/07	Preit	4640 ROOSEVELT BLVD	Philadelphia	Transformer	3		X	X	X		X		Sears was demolished all PCB equipment was removed prior to demolition.
NE-117	Phila. Fire Dept	2009-1	04/27/09	SEPTA	BROAD & ALLGEHENY	Philadelphia	Transformer	3		X	X	X	X			All PCB equipment removed from Allegheny station.
NE-118	Phila. Fire Dept	2009-1	04/27/09	SEPTA	BROAD & WYOMING	Philadelphia	Transformer	3		X	X	X	X	X		All PCB equipment removed from Wyoming Station
NE-119	Phila. Fire Dept	2006-3	10/23/06	THALHEIMER BROS.	5601 TABOR AVE.	Philadelphia	Transformer	3	X				X			Certificate of destruction is attached to the inspection report.
NE-120	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club, Formerly: TRANSIT AMERICA	1 RED LION RD	Philadelphia	Transformer	0				X	X			Now Golf Course with modern electrical equipment. Two original biuildings remainand have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-121	Phila. Fire Dept	2006-3	10/26/06	ALLEGHENY SCRAP	ADAMS & TACONY	Philadelphia	CAPACITORS	4	X				X			All PCB equipment retrofitted 10-15 yrs ago. Paperwork cannot be located.
NE-122	Phila. Fire Dept	2006-3	10/26/06	ALLEGHENY SCRAP	ADAMS & TACONY	Philadelphia	CAPACITORS	4	X				X			All PCB equipment retrofitted 10-15 yrs ago. Paperwork cannot be located.

NE-123	Phila. Fire Dept			PHILA SCHOOL BOARD	18 & HUNTING PARK (GRATZ)	Philadelphia	Transformer	4								
NE-124	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,	1 RED LION RD	Philadelphia						X	X			Now Golf Course with modern electrical equipment. Two original biuildings remainand have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-125	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,		Philadelphia						X	X			
NE-126	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,		Philadelphia						X	X			
NE-127	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,		Philadelphia						X	X			
NE-128	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,		Philadelphia						X	X			
NE-129	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,		Philadelphia						X	X			
NE-130	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,		Philadelphia						X	X			
NE-131	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,		Philadelphia						X	X			
NE-132	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,		Philadelphia						X	X			
NE-133	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,		Philadelphia						X	X			
NE-134	Phila. Fire Dept	2006-3	10/26/06	ALLEGHENY SCRAP	ADAMS & TACONY	Philadelphia	CAPACITORS	5	X				X			All PCB equipment retrofitted 10-15 yrs ago. Paperwork cannot be located.
NE-135	Phila. Fire Dept	2006-4	03/12/07	Delaware Ave. LLC	HEDLEY & DELAWARE RIVER - 4301 Delaware Ave.	Philadelphia	CAPACITORS	5				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-136	Phila. Fire Dept	2006-3	11/16/06	ANZON	2545 ARAMINGO AVE.	Philadelphia	Transformer	~~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-137	Phila. Fire Dept			PHILA ELECTRIC CO	7735 GERMANTOWN AVE	Philadelphia	Transformer	5								
NE-138	Phila. Fire Dept	2006-3	10/26/06	ALLEGHENY SCRAP	ADAMS & TACONY	Philadelphia	CAPACITORS	6	X				X			All PCB equipment retrofitted 10-15 yrs ago. Paperwork cannot be located.

NE-139		2006-2	Blank record									NA		NA		Blank record
NE-140	Phila. Fire Dept			PHILA ELECTRIC CO	3901 N DELAWARE AVE	Philadelphia	Transformer	6								
NE-141	Phila. Fire Dept			PHILA ELECTRIC CO	4125 LONGSHORE ST	Philadelphia	Transformer	6								
NE-142	Phila. Fire Dept			PHILA ELECTRIC CO	7549 THOURON ST	Philadelphia	Transformer	6								
NE-143	Phila. Fire Dept	2006-3	10/23/06	THALHEIMER BROS	700 E GODFREY AVE	Philadelphia	Transformer	7 (5 retrofilled 2 dry)	X				X			Certificate of destruction is attached to the inspection report.
NE-144	Phila. Fire Dept	2006-3	10/26/06	ALLEGHENY SCRAP	ADAMS & TACONY	Philadelphia	CAPACITORS	8	X				X			All PCB equipment retrofitted 10-15 yrs ago. Paperwork cannot be located.
NE-145	Phila. Fire Dept	2006-4	03/12/07	Delaware Ave. LLC	HEDLEY & DELAWARE RIVER - 4301 Delaware Ave.	Philadelphia	CAPACITORS	8				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-146	Phila. Fire Dept	2009-1	02/28/09	SEPTA	BROAD & GRANGE	Philadelphia	Transformer	8		X	X	X	X			All PCB equipment has been removed from Grange substation
NE-147	Phila. Fire Dept	2006-1	05/17/06	Island Green Country Club,	1 RED LION RD	Philadelphia	CAPACITORS	0				X	X			Now Golf Course with modern electrical equipment. Two original biuildings remainand have been refurbished with no PCB equipment on site. (Believed to have been removed by former owners.)
NE-148	Phila. Fire Dept	2006-3	10/23/06	ALUMINIUM FINISHING	700 E GODFREY	Philadelphia	Transformers	~~2~~ Replaced w/ dry (4/94)	X				X			Certificate of destruction is attached to the inspection report.
NE-149	Phila. Fire Dept	2007-3	07/18/07	PHILA STREETS	DELAWARE & WHEATSHEAF	Philadelphia	RETROFILLED				X			X		In process of removing transformers. Bldg. Will be demolished.
NE-150	Phila. Fire Dept	2006-3	10/13/06	Philly Self Service	335 E PRICE	Philadelphia	RETROFILLED					X	X			No PCB equipment on site
NE-151	Phila. Fire Dept			JOHN F. KENNEDY HOSPITAL	CHELTENHAM AVE. & LANGDON ST.	Philadelphia	TRANSFORMERS	2								

NE-152	Phila. Fire Dept			PHILA SCHOOL BOARD	D & ALLEGHENY (ELKIN)	Philadelphia	UNKNOWN									
NE-153	Exelon			PECO Energy	6106 N 5th Street	Philadelphia	Regulator									
NE-154	Exelon			PECO Energy	5031 Elbridge Street	Philadelphia	PCB Capacitors									
NE-155	Exelon			PECO Energy	3440 Richmond Street	Philadelphia	Light & Power									
NE-156	Exelon			PECO Energy		Philadelphia	Regulator									
NE-157	Exelon			PECO Energy		Philadelphia	Regulator									
NE-158	Exelon			PECO Energy	7735 Gremanton Avenue	Philadelphia	Regulator									
NE-159	Exelon			PECO Energy		Philadelphia	Regulator									
NE-160	Exelon			PECO Energy		Philadelphia	Regulator									
NE-161	Exelon			PECO Energy		Philadelphia	Regulator									
NE-162	Exelon			PECO Energy	Pennypack Street	Philadelphia	Cable Compartment									
NE-163	Exelon			PECO Energy	1100 Ivy Hill Road	Philadelphia	PCB Capacitors									
NE-164	Exelon			PECO Energy	651 Foulkrod Street	Philadelphia	PCB Capacitors									
NE-165	Exelon			PECO Energy	7738 Tabor Road	Philadelphia	PCB Capacitors									
NE-166	Exelon			PECO Energy	4601 Rhawn Street	Philadelphia	PCB Capacitors									
NE-167	Exelon			PECO Energy	LeGrande Avenue	Langhorne	Light & Power									
NE-168	Phila. Fire Dept	2006-4	03/16/07	STONE CONTAINER	9820 BLUE GRASS RD	Philadelphia	Transformer	~~1~~				X	X			Removerd 2000.
NE-169	Phila. Fire Dept	2006-4	03/12/07	Delaware Ave. LLC	HEDLEY & DELAWARE RIVER - 4301 Delaware Ave.	Philadelphia	CAPACITOR	1				X	X			All electrical services (seven in all) are new with the last one being activated in Feb., 2007.
NE-200	Phila. Fire Dept	2007-1	06/10/07	BUDD CO	2401 HUNTING PK	Philadelphia	Transformers	1 REMOV ED, NOW 4	??			X				Old Budd site. Could not located transformers. Letter sent 6/14/2007. In file.
NE-201	Phila. Fire Dept	2007-1	04/25/07	Pioneer Leimel	2250 E ONTARIO ST	Philadelphia	Transformer	1	X				X			
SE-1	USEPA Megarule			SEPTA	816 Sansom Street	Philadelphia		2								

SE-2	USEPA Megarule	2009-1	3/7/2009	SEPTA	1327 Mount Vernon Street	Philadelphia	Transformer	3		X	X	X	X			All transformers converted to dry type 2 1100KVA & 2 1125 KVA
SE-3	USEPA Megarule			The School District of Philadelphia	1700 N. 11th Street	Philadelphia		1								
SE-4	USEPA Megarule	2009-2	Duplicate Record	The School District of Philadelphia	1700 N. 11th Street	Philadelphia		1								Duplicate
SE-5	USEPA Megarule			Southeastern Pennsylvania Transportation Aut	Broad & Pattison Streets	Philadelphia		2								
SE-6	Phila. Fire Dept	2006-3	3/14/2007	SOUTHWARK PLAZA (PHA)	1024 S. 4TH. ST.	Philadelphia	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-7		2006-4	Blank record													
SE-8	Phila. Fire Dept	2006-4	3/14/2007	BROAD & LOCUST ASSOCIATES	230 S. BROAD ST.	Philadelphia	Transformer	1				X	X			Removed 1984 replaced with dry transformers. 1 additional dry in basement.
SE-9	Phila. Fire Dept			FOUR FREEDOMS	6101 W MORRIS ST	Philadelphia	Transformer	1								
SE-10	Phila. Fire Dept	2007-1	5/10/2007	PACKER MARINE TERMINAL	DELAWARE & PACKER	Philadelphia	Transformer	1				X	X			Removed in 1995 and replaced with dry
SE-11	Phila. Fire Dept			PHILA ELECT CO	2646 S 13TH ST	Philadelphia	Transformer	1								
SE-12	Phila. Fire Dept			PHILA ELECTRIC CO	456 E INDIANNA AVE	Philadelphia	Transformer	1								Duplicate
SE-13	Phila. Fire Dept	2009-2	Duplicate Record	PHILA SCHOOL BOARD	11 & C. B. MOORE (WANAMAKER)	Philadelphia	Transformer	1								
SE-14	Phila. Fire Dept			PHILA SCHOOL BOARD	8TH & MIFFLIN (BOK)	Philadelphia	Transformer	1								

SE-15	Phila. Fire Dept			PHILA SCHOOL BOARD	B & ALLEGEHENT (STETSON)	Philadelphia	Transformer	1								
SE-16	Phila. Fire Dept			PHILA SCHOOL BOARD	E.YORK & TRENTON (HACKETT)	Philadelphia	Transformer	1								
SE-17	Phila. Fire Dept			PHILA SCHOOL BOARD	FKD & CLEMINTINE	Philadelphia	Transformer	1								
SE-18		2007-1	Blank record													
SE-19	Phila. Fire Dept	2006-2	9/8/2006	SCHMIDTS INC	1097 GERMANTOWN	Philadelphia	Transformer	~~1~~				X		200 2		No disposal record available. Bldg. Demolished. Transformers removed from site.
SE-20	Phila. Fire Dept	2006-2	9/8/2006	SCHMIDTS INC	1097 GERMANTOWN	Philadelphia	Transformer	~~1~~				X		200 2		No disposal record available. Bldg. Demolished. Transformers removed from site.
SE-21	Phila. Fire Dept	2006-2	9/8/2006	SCHMIDTS INC	1135 N 2ND	Philadelphia	Transformer	~~1~~				X		200 2		No disposal record available. Bldg. Demolished. Transformers removed from site.
SE-22	Phila. Fire Dept	2006-2	9/8/2006	SCHMIDTS INC	128 W. VAN HORN	Philadelphia	Transformer	~~1~~				X		200 2		No disposal record available. Bldg. Demolished. Transformers removed from site.
SE-23	Phila. Fire Dept	2006-2	9/8/2006	SCHMIDTS INC	145 W. WILDEY	Philadelphia	Transformer	~~1~~				X		200 2		No disposal record available. Bldg. Demolished. Transformers removed from site.
SE-24	Phila. Fire Dept	2006-2	9/8/2006	SCHMIDTS INC	162 W. GIRARD	Philadelphia	Transformer	~~1~~				X		200 2		No disposal record available. Bldg. Demolished. Transformers removed from site.
SE-25	Phila. Fire Dept	2006-2	9/8/2006	SCHMIDTS INC	188 W. GIRARD	Philadelphia	Transformer	~~1~~				X		200 2		No disposal record available. Bldg. Demolished. Transformers removed from site.
SE-26	Phila. Fire Dept			SCHNEIDER BROS	1317 BROWN	Philadelphia	Transformer	1								

SE-27	Phila. Fire Dept	2009-1	4/28/2009	SEPTA	BROAD & FAIRMOUNT	Philadelphia	Transformer	1		X	X	X	X			all PCB equipment removed from fairmount station
SE-28	Phila. Fire Dept	2009-1	4/28/2009	SEPTA	BROAD & FAIRMOUNT	Philadelphia	Transformer	1		X	X	X	X			all PCB equipment removed from fairmount station
SE-29	Phila. Fire Dept	2009-1	4/28/2009	SEPTA	BROAD & GIRARD	Philadelphia	Transformer	1		X	X	X	X			all PCB equipment removed from girard station
SE-30	Phila. Fire Dept	2009-1	4/28/2009	SEPTA	BROAD & GIRARD	Philadelphia	Transformer	1		X	X	X	X			all PCB equipment removed from girard station
SE-31	Phila. Fire Dept	2009-1	4/28/2009	SEPTA	MC KEAN & JUNIPER	Philadelphia	Transformer	1		X	X	X	X			all PCB equipment removed from McKean Substation
SE-32	Phila. Fire Dept			ZEIGLER & SONS	6215 ARDLEIGH ST	Philadelphia	Transformer	1								
SE-33	Phila. Fire Dept			PHILA ELECTRIC CO	267 E JOHNSON ST	Philadelphia	Transformer	11								
SE-34	Phila. Fire Dept			PGW	1800 N. 9TH. ST.	Philadelphia	Capacitors	2 (6 Transformers Removed)								
SE-35	Phila. Fire Dept			METRO HOSP	201 N 8TH ST	Philadelphia	Transformer	2								
SE-36	Phila. Fire Dept	2007-1	5/10/2007	PACKER MARINE TERMINAL	DELAWARE & PACKER	Philadelphia	Transformer	2				X	X			Removed in 1995 and replaced with dry
SE-37	Phila. Fire Dept			PHILA SCHOOL BOARD	2400 N. 8TH (HARTRANFT REC. CENTER)	Philadelphia	Transformer	2								
SE-38	Phila. Fire Dept	2007-2	8/29/2007	PSFS	7TH & WALNUT	Philadelphia	Transformer	2		X			X			5 old PCB transformers in basement electrical rm, PECO owned and out of service, unknown schedule
SE-39	Phila. Fire Dept	2006-2	9/8/2006	SCHMIDTS INC	1147 N 2ND	Philadelphia	Transformer	~~2~~				X		**2002**		No disposal record available. Bldg. Demolished. Transformers removed from site.
SE-40	Phila. Fire Dept	2006-2	9/8/2006	SCHMIDTS INC	1157 SOPHIA	Philadelphia	Transformer	~~2~~				X		**2002**		No disposal record available. Bldg. Demolished. Transformers removed from site.
SE-41	Phila. Fire Dept	2006-2	9/8/2006	SCHMIDTS INC	119 EDWARD	Philadelphia	Transformer	~~2~~				X		**2002**		No disposal record available. Bldg. Demolished. Transformers removed

SE-42	Phila. Fire Dept	2006-2	9/8/2006	SCHMIDTS INC	121 EDWARD	Philadelphia	Transformer	~~2~~				X		200 2		No disposal record available. Bldg. Demolished. Transformers removed from site.
SE-43	Phila. Fire Dept	2009-1	4/28/2009	SEPTA	8TH & RIDGE	Philadelphia	Transformer	2		X	X	X	X			all PCB equipment removed from 8th st. ridge spur station
SE-44	Phila. Fire Dept	2009-1	4/28/2009	SEPTA	BROAD & SPRING GARDEN	Philadelphia	Transformer	2		X	X	X	X			all PCB equipment removed from Spring Garden Station
SE-45	Phila. Fire Dept	2009-1	4/28/2009	SEPTA	MARKET & 13TH	Philadelphia	Transformer	2		X	X	X	X			all PCB equipment removed from 13th station
SE-46	Phila. Fire Dept	2009-1	4/29/2009	SEPTA	MARKET & 5TH	Philadelphia	Transformer	2		X	X	X	X			All PCB equipment removed from 5th St. Station
SE-47	Phila. Fire Dept	2009-1	4/29/2009	SEPTA	MARKET & 8TH	Philadelphia	Transformer	2		X	X	X	X			All PCB equipment removed from 8th st. station.
SE-48	Phila. Fire Dept	2009-1	4/29/2009	SEPTA	MARKET & JUNIPER	Philadelphia	Transformer	2		X	X	X	X			All PCB equipment removed from 13th & Juniper station.
SE-49	Phila. Fire Dept	2007-2	8/27/2007	SHOE CTR PHILA [Loft Condos]	436-54 N 4TH ST	Philadelphia	Transformer	2				X	X			New oil filled transformers. All inseide transformers dry.
SE-50	Phila. Fire Dept	2006-3	10/30/2006	Philadelphia Turf Club	700 PACKER AVE	Philadelphia	Transformer	2				X		X		It appears all transformers were removed when new building for the Turf Club was constructed. Old bldg. Demolished.
SE-51	Phila. Fire Dept			JEFFERSON HOSPITAL	1020 LOCUST ST	Philadelphia	CAPACITORS	3								
SE-52	Phila. Fire Dept			METRO HOSP	201 N 8TH ST	Philadelphia	Transformer	3								
SE-53	Phila. Fire Dept			PHILA ELECTRIC CO	2726 W. GORDON ST	Philadelphia	Transformer	3								
SE-54	Phila. Fire Dept			PHILA SCHOOL BOARD	8 & CUMBERLAND (HARTRANFT)	Philadelphia	Transformer	3								
SE-55	Phila. Fire Dept	2009-1	Does not exist	SEPTA	1117 ARCH ST	Philadelphia	Transformer	3								Location does not exist. Septa has no knowledge of this location.
SE-56	Phila. Fire Dept	2009-1	4/29/2009	SEPTA	BROAD & MANNING	Philadelphia	Transformer	3		X	X	X	X			All PCB equipment removed from LocustStation
SE-57	Phila. Fire Dept	2009-1	4/29/2009	SEPTA	RIDGE & CALLOWHILL	Philadelphia	Transformer	3		X	X	X	X			All PCB equipment removed from Ridge spur Callowhill st pump room.

SE-58	Phila. Fire Dept	2007-2	8/27/2007	US GOVT (GSA) [Social Security Admin. Bldg.)	300 SPRING GARDEN	Philadelphia	Transformer	4				X	X			All transformers replaced 8 yrs ago All dry
SE-59	Phila. Fire Dept	2007-2	8/28/2007	US GOVT (GSA) [Social Security Admin. Bldg.)	300 SPRING GARDEN	Philadelphia	Transformer	4				X	X			All transformers replaced 8 yrs ago All dry
SE-60	Phila. Fire Dept			QUAKER STORAGE	901 POPLAR ST	Philadelphia	Transformer	5								
SE-61	Phila. Fire Dept			PENN MUTUAL	530 WALNUT ST.	Philadelphia	Transformer	6								
SE-62	Phila. Fire Dept	2007-2	8/30/2007	US GOVT (GSA)	BROAD & WASHINGTON	Philadelphia	Transformer	9				X	X			7 total transformers 3 PECO nonPECB A bldg; 3 PECO NonPCB B bldg; 1 nonPCB C Bldg
SE-63	Phila. Fire Dept			1401 ARCH ST. BUILDING	1401 ARCH ST.	Philadelphia	REMOVED/ REPLACED (5)									
SE-64	Phila. Fire Dept	2007-2	8/29/2007	CURTIS CTR	601 WALNUT ST	Philadelphia	RETROFILLED	[2]		X			X			2 large retrofilled transformers <50 ppm
SE-65	Phila. Fire Dept			KEYSTONE SHIPPING	313 CHESTNUT ST	Philadelphia	RETROFILLED									
SE-66	Phila. Fire Dept			KEYSTONE SHIPPING	313 CHESTNUT ST	Philadelphia	RETROFILLED									
SE-67				PHILA GIRARD SQ	21 S. 12TH ST	Philadelphia	RETROFILLED									
SE-68	Phila. Fire Dept	2007-1	6/19/2007	PHILA STREETS : EAST CENTRAL INCINERATOR	DELAWARE & SPRING GARDEN	Philadelphia	RETROFILLED					X		X		Empty Lot
SE-69	Phila. Fire Dept	2007-1	6/19/2007		DELAWARE & SPRING GARDEN	Philadelphia	RETROFILLED					X		X		Empty Lot
SE-70	Phila. Fire Dept	2007-1	6/19/2007		DELAWARE & SPRING GARDEN	Philadelphia	RETROFILLED					X		X		Empty Lot
SE-71	Phila. Fire Dept	2007-2	8/31/2007	WANAMAKER	1300 MARKET ST	Philadelphia	RETROFILLED					X	X			All dry transformers
SE-72	Phila. Fire Dept			PHILA SCHOOL BOARD	2800 N. 6TH ST (FAIRHILL)	Philadelphia	UNKNOWN									

SE-73	Exelon			PECO	1121 W. Callowhill St.	Philadelphia	PCB Capacitors									
SW-1	USEPA Megarule			Southeastern Pennsylvania Transporting Autho	33rd & Market St; Subway Surface	Philadelphia		3								
SW-2	USEPA Megarule			The School District of Philadelphia	1400 Green Street	Philadelphia		2								
SW-3	USEPA Megarule			The School District of Philadelphia	1400 Green Street	Philadelphia		2								
SW-4	USEPA Megarule			Southeastern Pennsylvania Transporting Autho	2034 Ranstead Street	Philadelphia		3								
SW-5	USEPA Megarule			The School District of Philadelphia	6450 Ridge Avenue	Philadelphia		4								
SW-6	USEPA Megarule			The School District of Philadelphia	6450 Ridge Avenue	Philadelphia		4								
SW-7	USEPA Megarule			Peco Energy Company	West Chester Pike & Ashton Rd	Havertown		1								
SW-8	USEPA Megarule			Peco Energy Company	West Chester Pike & Ashton Rd	Havertown		1								
SW-9	USEPA Megarule			PECO Energy Co.	E. Wynnewood Road, SW/O Lancaster Pike	Wynnewood		1								
SW-10	USEPA Megarule	2008-1	Duplicate Record	PECO Energy Co.	E. Wynnewood Road, SW/O Lancaster Pike	Wynnewood		1								Duplicate record SW-9
SW-11	USEPA Megarule			The School District of Philadelphia	2200 N. 31st Street	Philadelphia		2								
SW-12	USEPA Megarule	2009-2	Duplicate record	The School District of Philadelphia	2200 N. 31st Street	Philadelphia		2								
SW-13	USEPA Megarule			Peco Energy Company	2800 Christian Street	Philadelphia		2								

SW-14	USEPA Megarule	2009-2	Duplicate Record	Peco Energy Company	2800 Christian Street	Philadelphia		2								
SW-15	USEPA Megarule	2006-4	2/22/2007	Sunoco, Inc. (R&M) Philadelphia Refinery	3144 PASSYUNK AVE	Philadelphia	RETROFILLED	~~3~~ 2	X				X			See attached spreadsheet on inspection report. Non-PCB retrofilled transformers.
SW-16	USEPA Megarule	2006-4	2/22/2007	Sunoco, Inc. (R&M) Philadelphia Refinery	3144 PASSYUNK AVE	Philadelphia	RETROFILLED	~~3~~ 2	X				X			See attached spreadsheet on inspection report. Non-PCB retrofilled transformers.
SW-17	USEPA Megarule			Peco Energy Company	2131 N 62nd Street	Philadelphia		1								
SW-18	USEPA Megarule			Peco Energy Company	2131 N 62nd Street	Philadelphia		1								
SW-19	USEPA Megarule			PECO Energy Co.	380 Long Lane	Upper Darby		1								
SW-20	USEPA Megarule	2008-1	Duplicate Record	PECO Energy Co.	380 Long Lane	Upper Darby		1								
SW-21	USEPA Megarule	2006-4	2/20/2007	Goebelwood Ind. Inc,	100 Sycamore Ave.	Folsom	Transformers	3	X				X			Located in shed, locked and secured. Secondary containment, rubber lined concrete trough. Inspected quarterly paperwork.
SW-22	USEPA Megarule	2006-4	Duplicate Record	Goebelwood Ind. Inc,	100 Sycamore Ave.	Folsom		3								Duplicate record SW-21
SW-23	Phila. Water Dept	2006-2	10/4/2006	PHILA WATER DEPT	7000 Penrose Ave	Philadelphia	CAPACITOR	2	X				X			
SW-24	Phila.Water Dept	2006-2	10/24/2006	PHILA WATER DEPT	NEIL DR & WINDING RD	Philadelphia	Transformers	1		**2004**		X	X			PCB-Contaminated equipment removed in 2004, replaced with new air cooled unit when station was completely redone in 2004.
SW-25	Phila. Fire Dept	2007-4	1/25/2008	PASCHALL APARTMENTS (PHA)	7212 WOODLAND AVE	Philadelphia		1			X		X			Installed 1965 5200 Volts. No cables attached
SW-26	Phila. Fire Dept			1500 WALNUT BLDG	15TH WALNUT ST	Philadelphia	Transformers	1								

SW-27	Phila. Fire Dept	2006-3	10/11/2006	ADAMS MARK HOTEL	CITY & MONUMENT	Philadelphia	Transformers	1		**2005**		**X**			Demolished	Removed & disposed of between 11/05 & 12/06,
SW-28	Phila. Fire Dept	2006-3	10/11/2006	ADAMS MARK HOTEL	CITY & MONUMENT	Philadelphia	Transformers	1		**2005**		**X**			Demolished	Removed & disposed of between 11/05 & 12/06, removal contractor Tom Ferrick Tank Services, 215-233-1600.
SW-29	Phila. Fire Dept	2006-3	10/11/2006	ADAMS MARK HOTEL	CITY & MONUMENT	Philadelphia	Transformers	1		**2005**		**X**			Demolished	Removed & disposed of between 11/05 & 12/06, removal contractor Tom Ferrick Tank Services, 215-233-1600.
SW-30	Phila. Fire Dept	2006-3	10/11/2006	ADAMS MARK HOTEL	CITY & MONUMENT	Philadelphia	Transformers	1		**2005**		**X**			Demolished	Removed & disposed of between 11/05 & 12/06, removal contractor Tom Ferrick Tank Services, 215-233-1600.
SW-31	Phila. Fire Dept	2006-4	2/22/2007	Sunoco, Inc. (R&M) Philadelphia Refinery	3144 PASSYUNK AVE	Philadelphia	RETROFILLED	~~1~~ 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	Phila. Fire Dept	2006-4	2/22/2007			Philadelphia	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	Phila. Fire Dept	2006-4	2/22/2007			Philadelphia	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	Phila. Fire Dept	2006-4	2/22/2007			Philadelphia	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	Phila. Fire Dept	2006-4	2/22/2007	Sunoco, Inc. (R&M) Philadelphia Refinery	3144 PASSYUNK AVE	Philadelphia	RETROFILLED	~~1~~ 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.
SW-36	Phila. Fire Dept	2006-4	2/22/2007			Philadelphia	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	Phila. Fire Dept	2006-4	2/22/2007			Philadelphia	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	Phila. Fire Dept	2006-4	2/22/2007			Philadelphia	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-39	Phila. Fire Dept	2007-4	1/22/2008	CARBONATOR RENTAL	6500 EASTWICK	Philadelphia	Transformers	1	X				X			Transformer Room No drains. Niagra Transformer
SW-40	Phila. Fire Dept			DREXEL UNIV	3330 MARKET ST	Philadelphia	Transformers	1								
SW-41	Phila. Fire Dept			DREXEL UNIV	3330 MARKET ST	Philadelphia	Transformers	1								
SW-42	Phila. Fire Dept			EASTERN PENNSYLVANI A PSYCHIATRIC HOSPITAL (EPPI)	3200 HENRY AVE.	Philadelphia	Transformers	1								
SW-43	Phila. Fire Dept	2007-4	1/18/2008	Lane's Borough	1601 Locust St.	Philadelphia	Transformers	1	X				X			3 Non-PCB transformers operated by PECO
SW-44	Phila. Fire Dept			PHILA COMMERCE	PIA LONGTERM PKNG	Philadelphia	Transformers	1								
SW-45	Phila. Fire Dept			PHILA COMMERCE	PIA SCOTT PAPER	Philadelphia	Transformers	1								
SW-46	Phila. Fire Dept			PHILA COMMERCE	PIA UAL FLT KITCH	Philadelphia	Transformers	1								
SW-47	Phila. Fire Dept			PHILA ELECT CO	523 N 18TH ST	Philadelphia	Transformers	1								
SW-48	Phila. Fire Dept			PHILA ELECTRIC CO	2600 HUNTING PARK AVE	Philadelphia	Transformers	1								
SW-49	Phila. Fire Dept			PHILA SCHOOL BOARD	22ND & SUSQUEHANNA	Philadelphia	Transformers	1								
SW-50	Phila. Fire Dept			PHILA SCHOOL BOARD	23 & CHESTNUT (GREENFIELD)	Philadelphia	Transformers	1								
SW-51	Phila. Fire Dept			PHILA SCHOOL BOARD	32 & LEHIGH (E. ALLEN)	Philadelphia	Transformers	1								
SW-52	Phila. Fire Dept			PHILA SCHOOL BOARD	32ND & RIDGE	Philadelphia	Transformers	1								
SW-53	Phila. Fire Dept			PHILA SCHOOL BOARD	58TH & WALNUT (SAYRE)	Philadelphia	Transformers	1								
SW-54	Phila. Fire Dept			PHILA SCHOOL BOARD	67TH & ELMWOOD	Philadelphia	Transformers	1								

SW-55	Phila. Fire Dept			PHILA SCHOOL BOARD	734 SCHYKILL AVE	Philadelphia	Transformers	1								
SW-56	Phila. Fire Dept			PHILA SCHOOL BOARD	734 SCHYKILL AVE	Philadelphia	Transformers	1								
SW-57	Phila. Fire Dept			PHILA SCHOOL BOARD	734 SCHYKILL AVE	Philadelphia	Transformers	1								
SW-58	Phila. Fire Dept			PHILA SCHOOL BOARD	HENRY & ROBERTS (RANDOLPH)	Philadelphia	Transformers	1								
SW-59	Phila. Fire Dept			PHILA UNTD INS	4500 CITY AVE	Philadelphia	Transformers	1								
SW-60		2006-2	Blank Record													
SW-61	Phila. Fire Dept			PHOENIX MUTUAL	1508 WALNUT	Philadelphia	Transformers	1								
SW-62	Phila. Fire Dept	2006-4	3/14/2007	RICH. I. RUBIN CO	230 S BROAD ST	Philadelphia	Transformers	1	X				X			Emergency Back up power.
SW-63	Phila. Fire Dept			SEPTA	37TH & SANSOM	Philadelphia	Transformers	1								
SW-64	Phila. Fire Dept	2007-2	7/30/2007	SPC CORP	26TH & PENROSE	Philadelphia	Transformers	1				X	X			Removed--Replaced 2 years ago after arson fire. Blue non-PCB label in place
SW-65	Phila. Fire Dept	2007-2	7/30/2007	SPC CORP	26TH & PENROSE	Philadelphia	Transformers	1				X	X			Removed--Replaced 2 years ago after arson fire. Blue non-PCB label in place
SW-66		2006-4	Blank Record													
SW-67	Phila. Fire Dept	2006-4	12/19/2006	SUN CHEMICAL	3301 HUNTING PARK	Philadelphia	Dry TRANSFORMER	1	X				X			
SW-68	Phila. Fire Dept	2006-4	12/19/2006	SUN CHEMICAL	3301 HUNTING PARK	Philadelphia	Dry TRANSFORMER	~~1~~ 2	X				X			
SW-69	Phila. Fire Dept	2006-3	3/14/2007	ATLANTIC BLDG	260 S BROAD ST	Philadelphia	CAPACITORS	~~16~~				X	X			Removed 15 years ago. 16 capacitors
SW-70	Phila. Fire Dept	2006-2	8/7/2006	MELLON BANK	Broad & Chestnut Streets	Philadelphia	CAPACITORS	~~17~~				X		X		Former Meridian Bank. Burned down.

SW-71	Phila. Fire Dept	2006-2	6/5/2006	MCP	3300 HENRY AVE.	Philadelphia	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	Phila. Fire Dept	2006-2	6/5/2006			Philadelphia	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	Phila. Fire Dept	2006-2	6/5/2006			Philadelphia	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	Phila. Fire Dept	2006-2	6/5/2006			Philadelphia	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	Phila. Fire Dept	2006-2	6/5/2006			Philadelphia	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-76	Phila. Fire Dept			1500 WALNUT BLDG	15TH WALNUT ST	Philadelphia	Transformers	2								
SW-77	Phila. Fire Dept			HOLIDAY INN	1800 MARKET	Philadelphia	Transformers	2								
SW-78	Phila. Fire Dept	2007-4	1/22/2008	Shoprite Store	2301 OREGON AVE	Philadelphia	Transformers	2				X	X			Removed dry transformers in place
SW-79	Phila. Fire Dept			PHILA COMMERCE	PIA CTRL UTIL BLDG	Philadelphia	Transformers	2								
SW-80	Phila. Fire Dept			PHILA COMMERCE	PIA S. APRON	Philadelphia	Transformers	2								
SW-81	Phila. Fire Dept			PHILA SCHOOL BOARD	24 & MASTER (VAUX)	Philadelphia	Transformers	2								
SW-82	Phila. Fire Dept			PHILA SCHOOL BOARD	32 & SUSQUEHANNA (STRAWBERRY MANSION)	Philadelphia	Transformers	2								
SW-83	Phila. Fire Dept			PHILA SCHOOL BOARD	49 & CHESTNUT (MYA PARKWAY)	Philadelphia	Transformers	2								

SW-84	Phila. Fire Dept			SEPTA	36TH & SANSOM	Philadelphia	Transformers	2								
SW-85	Phila. Fire Dept			SEPTA	37TH & SANSOM	Philadelphia	Transformers	2								
SW-86	Phila. Fire Dept			SEPTA	BROAD & CHANCELLOR	Philadelphia	Transformers	2								
SW-87	Phila. Fire Dept			SEPTA	BROAD & DAUPHIN	Philadelphia	Transformers	2								
SW-88	Phila. Fire Dept			SEPTA	BROAD & MARKET	Philadelphia	Transformers	2								
SW-89	Phila. Fire Dept			SEPTA	BROAD & OREGON	Philadelphia	Transformers	2								
SW-90	Phila. Fire Dept			SEPTA	BROAD & SNYDER	Philadelphia	Transformers	2								
SW-91	Phila. Fire Dept			SEPTA	BROAD & TASKER	Philadelphia	Transformers	2								
SW-92	Phila. Fire Dept			SEPTA	MARKET & 30TH	Philadelphia	Transformers	2								
SW-93	Phila. Fire Dept			SEPTA	RIDGE & FAIRMOUNT	Philadelphia	Transformers	2								
SW-94	Phila. Fire Dept			SEPTA	RIDGE & SPRING GARDEN	Philadelphia	Transformers	2								
SW-95	Phila. Fire Dept	2007-4	1/24/2008	Leacoras Center & Shops	1724 N BROAD ST	Philadelphia	Transformers	2				X		X		New bldg. On site
SW-96	Phila. Fire Dept	2006-3	11/16/2006	112 N. BROAD ST.	112 N. BROAD ST.	Philadelphia	Transformers DRY-TYPE	2	NA				X			Dry Transformers only
SW-97	Phila. Fire Dept	2006-2	8/7/2006	MELLON BANK	Broad & Chestnut Streets	Philadelphia	CAPACITORS	~~20~~				X		X		Former Meridian Bank. Burned down.
SW-98	Phila. Fire Dept	2006-2	8/7/2006	MELLON BANK	Broad & Chestnut Streets	Philadelphia	CAPACITORS	~~22~~				X		X		Former Meridian Bank. Burned down.
SW-99	Phila. Fire Dept	2006-2	6/5/2006	MCP	3300 HENRY AVE.	Philadelphia	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-100	Phila. Fire Dept	2006-2	8/11/2006	St.Joes Dormitory	5320 CITY AVE	Philadelphia	CAPACITORS	~~3~~				X		X		
SW-101	Phila. Fire Dept			EASTERN PENN. PSYCHIATRIC HOSPITAL (EPPI)	3200 HENRY AVE.	Philadelphia	Transformers	3	X				X			New non-PCB label installed after letter from JC

SW-102	Phila. Fire Dept	2007-4	1/24/2008	Devon Self Storage	19TH & ALLEGHENY	Philadelphia	Transformers	3				X		X		Removed 2004 1831 W. Allegheny is the only Industrial Bldg. Still standing at the intersection 19th & Allegheny Ave.
SW-103	Phila. Fire Dept	2009-1	Duplicate record	SEPTA	33RD. & MARKET	Philadelphia	Transformers	3								Duplicate of SW-1
SW-104	Phila. Fire Dept			SEPTA	MARKET & 15TH	Philadelphia	Transformers	3								
SW-105	Phila. Fire Dept			SEPTA	MARKET & 25TH	Philadelphia	Transformers	3								
SW-106	Phila. Fire Dept			SEPTA	MARKET & 31ST	Philadelphia	Transformers	3								
SW-107	Phila. Fire Dept			SEPTA	MARKET & 44TH	Philadelphia	Transformers	3								
SW-108	Phila. Fire Dept	2007-2	8/8/2007	THE PHILADELPHIAN	2401 PENNSYLVANIA AVE.	Philadelphia	Transformers	3			X		X			Dry transformers
SW-109	Phila. Fire Dept	2007-2	8/8/2007	THE PHILADELPHIAN	2401 PENNSYLVANIA AVE.	Philadelphia	Transformers	3								
SW-110	Phila. Fire Dept			PHILA COMMERCE	PIA MAIN TERM	Philadelphia	CAPACITORS	33								
SW-111	Phila. Fire Dept	2006-2	8/7/2006	Ritz Carlton	Broad & Chestnut Streets	Philadelphia	CAPACITORS	4				X	X			
SW-112	Phila. Fire Dept	2007-4	1/22/2008	Shoprite Store	2301 OREGON AVE	Philadelphia	CAPACITORS	4			X				X	Electrical contractor 856-939-4235 Owner Bruce Noble 856-218-8611
SW-113	Phila. Fire Dept			1530 BLDG	1530 CHESTNUT	Philadelphia	Transformers	4								
SW-114	Phila. Fire Dept	2007-3	11/23/2007	GOLDMAN PAPER	2201 E ALLEGHENY	Philadelphia	Transformers	4				X		X		Building tore down
SW-115	Phila. Fire Dept	2007-4	1/25/2008	METHODIST HOSP	2301 S BROAD	Philadelphia	Transformers	4				X	X			Replaced 7 years with mineral oil filled transformers
SW-116	Phila. Fire Dept	2007-4	1/25/2008	METHODIST HOSP	2301 S BROAD	Philadelphia	Transformers	4				X	X			Replaced 7 years with mineral oil filled transformers
SW-117	Phila. Fire Dept	2006-2	6/5/2006	MCP	3300 HENRY AVE.	Philadelphia	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-118	Phila. Fire Dept			PHILA ELECTRIC CO	1835 OXFORD STA	Philadelphia	Transformers	5								
SW-119	Phila. Fire Dept	2006-4	3/14/2007	ATLANTIC BLDG	260 S BROAD ST	Philadelphia	Transformers(1 NOW NON-PCB)	5	X				X			1 dry transformer. All other <50 ppm.
SW-120		2009-2	Blank Record													
SW-121	Phila. Fire Dept	2007-2	7/11/2007	EASTERN PENNSYLVANIA PSYCHIATRIC HOSPITAL (EPPI)	3200 HENRY AVE.	Philadelphia	Transformers	6								
SW-122	Phila. Fire Dept	2007-2	7/11/2007	EASTERN PENNSYLVANIA PSYCHIATRIC HOSPITAL (EPPI)	3200 HENRY AVE.	Philadelphia	Transformers	6								
SW-123	Phila. Fire Dept	2007-2	7/11/2007	EASTERN PENNSYLVANIA PSYCHIATRIC HOSPITAL (EPPI)	3200 HENRY AVE.	Philadelphia	Transformers	6								
SW-124	Phila. Fire Dept	2007-2	7/11/2007	EASTERN PENNSYLVANIA PSYCHIATRIC HOSPITAL (EPPI)	3200 HENRY AVE.	Philadelphia	Transformers	6								
SW-125	Phila. Fire Dept			FIRST PA BANK	3020 MARKET	Philadelphia	Transformers	6								
SW-126	Phila. Fire Dept	2006-2	8/7/2006	~~MELLON BANK~~	Broad & Chestnut Streets	Philadelphia	Transformers	~~6~~				X		X		Former Meridian Bank. Burned down.
SW-127	Phila. Fire Dept			PHILA SCHOOL BOARD	17 & SPRING GARDEN (MASTERMAN)	Philadelphia	Transformers	6								
SW-128	Phila. Fire Dept			PHILA SCHOOL BOARD	22ND & LEHIGH (DOBBINS)	Philadelphia	Transformers	7								

SW-129	Phila. Fire Dept	2006-2	6/5/2006	MCP	3300 HENRY AVE.	Philadelphia	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-130	Phila. Fire Dept	2007-2	8/18/2007	RITTENHOUSE PLAZA	19TH & WALNUT	Philadelphia	RETROFILLED	[4]	X				X			4 Oil filled <50 ppm (2/14/89)
SW-131	Phila. Fire Dept	2006-3	11/16/2006	Commerce Bldg.	401 N BROAD ST	Philadelphia	RETROFILLED	3	X				X			There are two old inactive Wagner Transformers that may be PCB. Will test them in the future.
SW-132	Phila. Fire Dept			CHILDRENS HOSPITAL	34TH & CIVIC CTR BLVD	Philadelphia	RETROFILLED									
SW-133	Phila. Fire Dept			CHILDRENS HOSPITAL	34TH & CIVIC CTR BLVD	Philadelphia	RETROFILLED									
SW-134	Phila. Fire Dept	2007-4	1/18/2008	KENNEDY HOUSE[Condos]	1901 JFK BLVD	Philadelphia	RETROFILLED		X				X			2 < 50 ppm 30th floo5; 2 non-PCB garage 7th level and switch gear garage
SW-136	Phila. Fire Dept	2006-4	3/14/2007	LAND TITLE BLDG	100 S BROAD ST	Philadelphia	RETROFILLED	4	X				X			<50 ppm
SW-135	Phila. Fire Dept	2007-4	Duplicate Record	KENNEDY HOUSE	1901 JFK BLVD	Philadelphia	RETROFILLED									
SW-137	Phila. Fire Dept	2007-2	7/11/2007	MELRATH GASKET	2901 HUNTING PK	Philadelphia	RETROFILLED	0	X				X			4 transformers @ 165 gal. @ 13 KVA rating have all been retrofilled previously and are classified as Non-PCB.
SW-138	Phila. Fire Dept	2007-4	1/18/2008	Suburban Station	1617 J.F. KENNEDY BLVD.	Philadelphia	RETROFILLED	[3]	X				X			3 large 1932 retrofilled to <50 ppm 3 capacitors out of servece and disconnected. Initial ins 12/11/06
SW-139	Phila. Fire Dept			PHILA COMMERCE	NEA ASPLUNDH HANGER	Philadelphia	RETROFILLED									
SW-140	Phila. Fire Dept			PHILA COMMERCE	PIA ATLANTIC AVIATION	Philadelphia	RETROFILLED									
SW-141	Phila. Fire Dept			PHILA COMMERCE	PIA BAGGAGE CLAIM	Philadelphia	RETROFILLED									
SW-142	Phila. Fire Dept			PHILA PARKING AUTH.	PIA PARKING GARAGE C	Philadelphia	RETROFILLED									
SW-143	Phila. Fire Dept				PIA PARKING GARAGE D	Philadelphia	RETROFILLED									

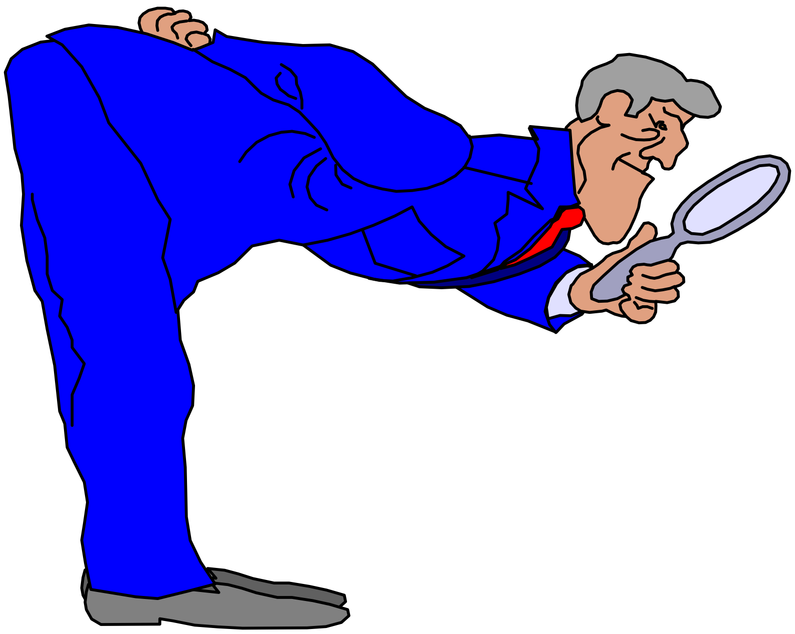
SW-144	Phila. Fire Dept	2007-4	1/23/2008	PHILA STREETS (BARTRAM TRANSFER STATION)	51 & GRAYS	Philadelphia	RETROFILLED				X			X		In process of being removed.
SW-145		2006-2	Blank Record													
SW-146	Phila. Fire Dept	2007-1	5/11/2007	PHILADELPHIA AIRPORT HILTON	4509 ISLAND AVE	Philadelphia	RETROFILLED			X			X			Retrofilled in 1992, 2 units still in service (mains coming in from PECO)
SW-147	Phila. Fire Dept	2007-1	5/22/2007	STREETS (NORTHWEST INCINERATOR	DOMINO & UMBRIA	Philadelphia	RETROFILLED					X	X			Removed 2003
SW-148	Phila. Fire Dept			PHILA COMMERCE	PIA TWA HANGER	Philadelphia	RETROFILLED #30257 CERTIFICATION									
SW-149	Phila. Fire Dept			PHILA COMMERCE	PIA TERM E	Philadelphia	RETROFILLED #30276 & 30277 CERTIFICATION									
SW-150	Phila. Fire Dept			PHILA COMMERCE	PIA PAVILION E	Philadelphia	RETROFILLED #30278 & 30279 CERTIFICATION									
SW-151	Phila. Fire Dept			PHILA COMMERCE	PIA TERM D	Philadelphia	RETROFILLED #30281 & 30281 CERTIFICATION									
SW-152	Phila. Fire Dept			PHILA SCHOOL BOARD	54 & MASTER (HESTON)	Philadelphia	UNKNOWN									
SW-153	Phila. Fire Dept			PHILA ELECT CO	1122 SEDGELY AVE	Philadelphia	Transformers	1								
SW-154	Phila. Fire Dept			PHILA SCHOOL BOARD	8 & LEHIGH (BILINGUAL MIDDLE MAGNET)	Philadelphia	Transformers	2								

SW-155	Exelon			PECO	24th & Washington Avenue	Philadelphia	Transformer									
SW-156	Exelon			PECO	7515 Ridge Avenue	Philadelphia	Transformer (Tap Changer)									
SW-156a	Exelon			PECO	1155 S. 57th Street	Philadelphia	Regulator									
SW-157	Exelon			PECO	7200 N. Umbria Street	Philadelphia	PCB Capacitors									
SW-157a	Exelon			PECO	2230 Township Line Road	Philadelphia	Regulator									
SW-158	Phila. Fire Dept	2006-4	12/19/2006	SUN CHEMICAL	3301 HUNTING PARK	Philadelphia	Dry Transformer	1	X				X			There is a bank of 4 Intereen capacitors, 1.2 gal each

APPENDIX E –PCB POLLUTANT MINIMIZATION PLAN (PMP)

PCB

Pollutant Minimization Plan



Philadelphia
PWD
Water Department

C I T Y O F P H I L A D E L P H I A

Bernard Brunwasser
Water Commissioner

W A T E R D E P A R T M E N T
1101 Market Street, 5tth floor
Philadelphia, Pa 19107 - 2994
4th floor

September 30, 2005

Ms. Carol Collier
Executive Director
Delaware River Basin Commission
PO Box 7360
25 State Police Drive
West Trenton, New Jersey 08628-0360

Subject: Pollutant Minimization Plan for Polychlorinated Biphenyls
NPDES Permit Nos. PA00266689, PA0026671, PA0026662

Dear Ms. Collier:

In accordance with Section 4.30.9.A.2 of the DRBC regulations and your letter to the Philadelphia Water Department on June 30, 2005, we submit the attached report entitled *"PCB Pollutant Minimization Plan, Philadelphia Water Department"*.

Sincerely,

Bruce S. Aptowicz
Deputy Director of Operations

cc: Commissioner Bernard Brunwasser
Deputy Commissioner David Katz
Deputy Commissioner Debra McCarty
William McKeon, Chief of Wastewater Treatment
Robert Lendzinski, Manager, Northeast Plant
Leonard Gipson, Manager, Southeast Plant
Christopher Harris, Manager, Southwest Plant

PMP
Northeast Plant
Summary

Known Sources

Two known sources of PCBs entering the Northeast Plant sewer shed have been identified as the intake of Delaware River water and the addition of ferric chloride as a treatment coagulant into the Baxter Water Treatment Plant and the resultant discharge of most of the plant's process wastes into the sewer.

The intake of Delaware River water into the plant occurs about river mile 111. It is estimated that approximately 2,280 mg/day of PCBs from the Delaware River loading influent to the Baxter Plant is discharged into the Northeast Plant sewer shed.

The second known source is discharge of spent ferric chloride, which contains PCBs in the delivered product, from the Baxter Plant into the sewer. The Baxter Plant uses ferric chloride as a water treatment chemical to coagulate and flocculate fine particle solids from the river water. It is estimated that approximately 15.6 mg/day of PCBs from the ferric chloride source is discharged into the Northeast Plant sewer shed.

Potential Sources

Identification of potential sources of PCB focused first on those sources which stored PCBs in equipment. In addition to PWD's inventory of PCB containing equipment, information from the following agencies: Philadelphia Fire Department, Philadelphia Department of Public Health, USEPA, PaDEP, DRBC, Partnership for the Delaware Estuary and PECO produced a listing of 167 sites potentially housing PCB devices with many sites containing several devices.

Pollution Minimization Measures

The Northeast Plant has one probable on-site source of PCBs – the Northeast Plant Lagoons. As part of the Northeast Plant trackdown program, PWD will sample and analyze for PCBs in order to quantify their impact upon the plant.

Two known sources of PCBs were reported in the collection system. The transmission of PCBs from the Delaware River into sewer via treatment processes of the Baxter Water Treatment Plant will require a reduction in its ambient river PCB concentration by others. The second known source of PCBs is the water treatment coagulant used at the Baxter Water Treatment Plant. The producer, the DuPont Company, has reported its commitment to implement a $15+million project in 2007 to reduce PCB generation by approximately 90% from the 2001 PCB levels in ferric chloride.

PWD believes that the release of potential sources of PCBs into the environment represents a significant threat to the consistent reduction of PCB concentrations in the nearby rivers and streams. We will visit all current, known owners of PCB equipment and will attempt to collect and record forty (40) descriptors for each source. Additionally, we will identify vulnerable PCB sources and seek measures, in concert with the regulatory agencies, which would minimize those risks.

The Philadelphia Department of Public Health provided PWD with 10 historical sites of past PCB spills. PWD will inspect all sites to determine their current status and recommend additional risk reduction measures when appropriate.

Source Prioritization

Potential sources were prioritized on the basis of weight of contained PCBs. The reduction of PCBs in ferric chloride was prioritized among the known sources.

PMP
Southeast Plant
Summary

Known Sources

Two known sources of PCBs entering the Southeast Plant sewer shed have been identified as the intake of Schuylkill River water and the addition of ferric chloride as a treatment coagulant into the Queen Lane Water Treatment Plant and the resultant discharge of most of the plant's process wastes into the sewer.

The intake of Schuylkill River water into the plant occurs at a location which is significantly influenced by the Wissahickon Creek. It is estimated that approximately 381 mg/day of PCBs from the Schuylkill River loading influent to the Queen Lane Plant is discharged into the Southeast Plant sewer shed.

The second known source is discharge of spent ferric chloride, which contains PCBs in the delivered product, from the Queen Lane Plant into the sewer. The Queen Lane Plant uses ferric chloride as a water treatment chemical to coagulate and flocculate fine particle solids from the river water. It is estimated that approximately 17.27 mg/day of PCBs from the ferric chloride source is discharged into the Southeast Plant sewer shed.

Potential Sources

Identification of potential sources of PCB focused first on those sources which stored PCBs in equipment. In addition to PWD's inventory of PCB containing equipment, information from the following agencies: Philadelphia Fire Department, Philadelphia Department of Public Health, USEPA, PaDEP, DRBC, Partnership for the Delaware Estuary and PECO produced a listing of 73 sites potentially housing PCB devices with many sites containing several devices.

Pollution Minimization Measures

Two known sources of PCBs were reported in the collection system. The transmission of PCBs from the Schuylkill River into sewer via treatment processes of the Queen Lane Water Treatment Plant will require a reduction in its ambient river PCB concentration by others. The second known source of PCBs is the water treatment coagulant used at the Queen Lane Water Treatment Plant. The producer, the DuPont Company, has reported its commitment to implement a $15+million project in 2007 to reduce PCB generation by approximately 90% from the 2001 PCB levels in ferric chloride.

PWD believes that the release of potential sources of PCBs into the environment represents a significant threat to the consistent reduction of PCB concentrations in the nearby rivers and streams. We will visit all current, known owners of PCB equipment and will attempt to collect and record forty (40) descriptors for each source. Additionally, we will identify vulnerable PCB sources and seek measures, in concert with the regulatory agencies, which would minimize those risks.

The Philadelphia Department of Public Health provided PWD with 6 historical sites of past PCB spills. PWD will inspect all sites to determine their current status and recommend additional risk reduction measures when appropriate.

Source Prioritization

Potential sources were prioritized on the basis of weight of contained PCBs. The reduction of PCBs in ferric chloride was prioritized among the known sources.

PMP
Southwest Plant
Summary

Known Sources

Two known sources of PCBs entering the Southwest Plant sewer shed have been identified as the intake of Schuylkill River water and the addition of ferric chloride as a treatment coagulant into the Belmont Water Treatment Plant and the resultant discharge of most of the plant's process wastes into the sewer.

The intake of Schuylkill River water into the plant occurs at a location which is located above the Fairmont Dam. It is estimated that approximately 306 mg/day of PCBs from the Schuylkill River loading influent to the Belmont Plant is discharged into the Southwest Plant sewer shed.

The second known source is discharge of spent ferric chloride, which contains PCBs in the delivered product, from the Belmont Plant into the sewer. The Belmont Plant uses ferric chloride as a water treatment chemical to coagulate and flocculate fine particle solids from the river water. It is estimated that approximately 10.6 mg/day of PCBs from the ferric chloride source is discharged into the Southwest Plant sewer shed.

Potential Sources

Identification of potential sources of PCB focused first on those sources which stored PCBs in equipment. In addition to PWD's inventory of PCB containing equipment, information from the following agencies: Philadelphia Fire Department, Philadelphia Department of Public Health, USEPA, PaDEP, DRBC, Partnership for the Delaware Estuary and PECO produced a listing of 157 sites potentially housing PCB devices with many sites containing several devices.

Pollution Minimization Measures

The Southwest Plant has one probable on-site source of PCBs – the Southwest Plant Lagoons. As part of the Southwest Plant trackdown program, PWD will sample and analyze for PCBs in order to quantify their impact upon the plant.

Two known sources of PCBs were reported in the collection system. The transmission of PCBs from the Schuylkill River into sewer via treatment processes of the Belmont Water Treatment Plant will require a reduction in its ambient river PCB concentration by others. The second known source of PCBs is the water treatment coagulant used at the Belmont Water Treatment Plant. The producer, the DuPont Company, has reported its commitment to implement a $15+million project in 2007 to reduce PCB generation by approximately 90% from the 2001 PCB levels in ferric chloride.

PWD believes that the release of potential sources of PCBs into the environment represents a significant threat to the consistent reduction of PCB concentrations in the nearby rivers and streams. We will visit all current, known owners of PCB equipment and will attempt to collect and record forty (40) descriptors for each source. Additionally, we will identify vulnerable PCB sources and seek measures, in concert with the regulatory agencies, which would minimize those risks.

The Philadelphia Department of Public Health provided PWD with 15 historical sites of past PCB spills. PWD will inspect all sites to determine their current status and recommend additional risk reduction measures when appropriate.

Source Prioritization

Potential sources were prioritized on the basis of weight of contained PCBs. The reduction of PCBs in ferric chloride was prioritized among the known sources.

Item 1
Good Faith Commitment

The Philadelphia Water Department makes a good faith commitment to reducing discharges of Polychlorinated Biphenyls (PCBs) from the

Northeast Water Pollution Control Plant
Southeast Water Pollution Control Plant
Southwest Water Pollution Control Plant

to the Delaware Estuary through the Pollutant Minimization Plan (PMP) process in accordance with the Delaware River Basin Commission PMP Rule 4.30.9.

____ ____________________

David Katz, Deputy Commissioner date
Philadelphia Water Department

Item 2
Name of Facility Contact

The individual who will serve as the contact for information concerning this PMP is:

Bruce S. Aptowicz
Deputy Director of Operations
Philadelphia Water Dept.
1101 Market Street
4th floor
Philadelphia, PA 19107
(Tel.) 215.685.6205
(FAX) 215.685.6207
bruce.aptowicz@phila.gov.

Mr. Aptowicz will coordinate the project.

Working with Mr. Aptowicz on this project will be Mr. Keith Houck, Industrial Waste Unit, Dr. Christopher Crockett, Office of Watersheds, Mr. William McKeon, Wastewater Treatment Plants, Mr. Drew Mihocko, Collector Systems, Mr. Earl Peterkin, Organics Laboratory, Bureau of Laboratory Services, and Mr. Roy Romano, all of the Philadelphia Water Department.

Mr. Houck's responsibility will be to manage the effort of the Industrial Waste Unit's inspectors who will conduct the planned field visits to potential and known PCB sites as well as collect samples involved in the trackdown investigations.

Mr. McKeon's responsibility will be to provide assistance regarding all tasks associated with the wastewater treatment plants.

Dr. Crockett's responsibility will be to provide input regarding the collector system flow analysis

Mr. Mihocko's responsibility will be to provide input regarding the details of the physical collector system.

Mr. Peterkin's responsibility will be to manage all required sample analyses.

Mr. Romano's responsibility will be to review and interpret all analytical data emanating from this project.

PMP
Northeast Plant
Facility Description
Item 3

3.a. Facility Name and Address

Northeast Water Pollution Control Plant
3895 Richmond Street
Philadelphia, PA 19137-1415
PaDEP Site ID #: 451994
NPDES Permit No. PA 0026671

3.b. Facility Description and Map

The Northeast Water Pollution Control Plant, located on a 160-acre site in the Richmond section of Philadelphia, treats wastewater from the Northeast section of the city and adjacent suburban areas.

The original treatment plant began operation in 1923, with the capacity to treat 60 million gallons per day (MGD) of wastewater. Facilities included barscreen, grit channel, a pumping station, Imhoff tanks and sludge lagoons.

In 1952, a high rate (modified aeration) activated sludge plant was placed into service. The grit chamber and pumping station from the original plant were kept in service with primary sedimentation tanks, aeration tanks, air blowers, final clarifiers, sludge heaters and anaerobic digesters added. The additions were designed for a flow of 25 m.g.d. with 75% suspended solids (SS) and biochemical oxygen demand (BOD) removal.

In 1962, the secondary facilities were expanded to treat a flow of 175 m.g.d. New aeration tanks were added and half the existing tanks were modified to allow the use of contact stabilization and step aeration mode of treatment. Additional clarifiers were constructed and blower capacity was increased. The mechanical equipment in the grit chamber was also replaced at this time. With the additional facilities, the capacity of the new plant was 175 MGD with 75% SS and BOD removal.

During this period, the Northeast Water Pollution Control Plant was the only secondary treatment plant serving the City of Philadelphia.

The Clean Water Act of 1972 required that all publicly owned treatment facilities provide secondary treatment and set levels of plant performance. To meet this challenge, the Philadelphia Water Department committed itself to an expansion program. Plant operations personnel were consulted extensively during the design of the expanded plant, and considerable time was spent converting operating experience into engineering data and plans.

Construction at Northeast started in 1978 and by 1986 the major equipment items and systems were complete. Most of the major construction elements were in service and being operated by plant personnel. The N.E.W.P.C.P. uses a supervisory digital computer system. The digital system logs data and alarms, changes set point on controllers and displays unit process data in real-time at each of the Operation and Control Stations (OCS).

The Process Control Center (PCC) is located in the Administration Building with the digital computer and the operator interface equipment.

In November of 1986, the Northeast Plant met the Consent Decree's secondary effluent quality limitation of 30 p.p.m of suspended solids (SS) and biochemical oxygen demand (BOD) at 90% removal for design flow of 210 m.g.d.

The Northeast Water Pollution Control Plant includes the following structures:

1. **PRELIMINARY TREATMENT BUILDING (PTB)**

   Approximately 70% of the influent wastewater flow must be lifted from low-level sewers to the plant headworks. The Influent Pumping Station uses six single stage, variable speed drive pumps. Each pump is rated at 59000 g.p.m. at 45 feet total dynamic head. Screenings and grit are removed from the wastestream, transported to Southwest, limed then ultimately disposed at a landfill. Screenings, removed by eight Mensch screens with ¾ inch (1.9 cm) clear openings are deposited into a 5 cubic yard dumpster for transport. Grit, settled and collected in four 55-foot (16.8 m) square detritor basins, is dewatered by cyclone separators and classifiers, and discharged onto belt conveyors which transport the grit to storage bins. From the grit storage bins, belt conveyors transport the grit to a 20 cubic yard trailer before being hauled to the Southwest WPC Plant.

2. **PRIMARY SEDIMENTATION**

   Twelve primary sedimentation tanks are divided into two batteries. The first battery contains eight tanks with a total volume of 9.35 million gallons (36,000 m^3) with a total surface area of 125,000 square feet (12,000 m^2). Each of the eight setting tanks includes a flight and chain sludge collection system, sludge pumps and scum removal system. The second battery contains four tanks with a total volume of 9.35 million gallons (36,000 m^3) and a total surface area of 125,000 square feet (12,000 m^2). Each of the four settling tanks includes a flight and chain sludge collection system, sludge pumps and scum removal system.

3. **AERATION TANKS**

   The secondary system contains seven aeration tanks, each containing four bays with a total volume of 23 million gallons (87,055 m^3). Process air is supplied from the blower building which houses six variable vane centrifugal blowers, four of which are rated at 51,000 SCFM and two at 39,000 SCFM. Process air is supplied through 12,000 dome diffusers at the bottom of each tank. The first bay (A pass) of each tank receives activated sludge from final tanks. Typically, the return sludge is re-aerated in the 280 ft. long pass. Primary effluent from Set 2 Primary Tanks is then introduced at the end of the A pass and the beginning of the B pass under anaerobic conditions (unaerated feed zone). The mixed liquor is then aerated. At the end of the B pass and the beginning of the C pass, effluent from Set 1 Primary Tanks is introduced under anaerobic conditions. The mixed liquor is then aerated for the remainder of the C pass and the D pass. The airflow into the aeration tank is controlled by a programmable logic controller (PLC) based on a dissolved oxygen concentration setpoint or by an airflow setpoint.

4. FINAL SEDIMENTATION TANK

Sixteen rectangular final sedimentation tanks are divided into two batteries. Each set has an operating gallery which contains a return sludge pumping station and metering system and other related equipment. The mixed liquor from the aeration tanks is settled in the final clarifiers, collected the influent and effluent ends of the tank by chain and flight longitudinal collectors to a cross collector located at mid-tank. The cross collector moves the sludge to a sump from which the sludge is withdrawn and returned to the Aeration Tanks. Excess solids are wasted from the system. A scum removal system at both ends of the aeration tank removes floating materials. The total volume of the two sets of tanks is 23.2 million gallons (87,812 m^3) with a total surface area of 258,400 square feet (24,006 m^2).

5. DISINFECTION

The final tank effluent is conveyed to chlorine contact tanks. Sodium hypochlorite is delivered in Flash mechanical mixers at the influent to the contact tanks ensure good mixing at the initial contact point of the chlorine solution with the effluent. Effluent flows through two contact tanks with a volume of over four million gallons (16,000 m^3) and the total surface area of 50,400 square feet (5,000 m^2). Three effluent water pumps are provided to supply plant water throughout the plant for various uses.

6. SLUDGE THICKENER BUILDING

Excess waste activated sludge (WAS) from the final sedimentation tank is thickened by dissolved air floatation in the 12 thickener tanks. Thickened WAS is combined with Primary Sludge in a mixing chamber before distribution to the Sludge Digestion Tanks. The total volume of the thickener tanks is 1.95 million gallons (7,400 m^3) with a total surface area of 21,600 square feet (2,000 m^2). The building also houses dual fuel (Sludge gas or fuel oil) heating plants that provided heat for the sludge digestion heat exchangers and for most of the plant building. This is accomplished through a heated glycol which is circulated through the system.

7. SLUDGE DIGESTION TANKS

Each of the eight anaerobic digesters is a circular tank with a fixed cover, with a total interval volume of 18 million gallons (68,130 m^3). External heat exchangers are used to maintain proper sludge temperatures. To ensure adequate mixing, each digestion tank has a circulating pump and a recirculated gas mixing system. Digested sludge is transferred from the digesters to a Transfer Station and then to barges at the docking facilities. The sludge is then barged to a dewatering facility adjacent to the Southwest Water Pollution Control Plant.

8. SLUDGE TRANSFER STATION

The digested sludge is barged to Sludge Processing and Distribution Center for dewatering and composting.

9. SLUDGE GAS FACILITY

Sludge gas collection at low pressure from the sludge digestion tanks is compressed by two rotary, positive displacement gas compressors (rated capacity 2,250 SCFM at 7#PSIG) for distribution throughout the Plant. A 50,000 cubic foot (1,400 m^3) low pressure sludge gas storage tank receives the sludge gas from the anaerobic digesters and feed the compressors.

10. SCUM DISPOSAL FACILITY

Scum and grease from the primary and secondary sedimentation tanks is pumped to Scum Concentration Tanks.

11. ELECTRICAL BUILDING

Electricity is the principal source of energy used in the Northeast Plant. Electrical power is supplied by Philadelphia Electric Company (PECO) through two 13,200 volt (13 KV) cables to the 13 KV switchgear in Electrical Building. A distribution system which is split into two parallel networks distributes electrical power to plant equipment through intermediate step-down substation transformers.

12. ADMINISTRATION BUILDING

The Administration Building contains the general services offices, engineering offices and laboratory. The laboratory houses the necessary equipment used to evaluate the biological and chemical processes to determine efficient operation and to produce the data required to generate the regulatory agencies' reports.

13. SERVICES BUILDING

The work areas, tools, instrumentation, machinery and personnel necessary for the maintenance and repair of the process equipment are housed in the Service Building

14. **WARHOUSE**

The warehouse provides storage area for spare parts, lubricants, tools, and equipment required to maintain the treatment process equipment.

Please find the following attached maps and diagrams:

1. PMP Plant Process Diagrams –NE
2. PMP Facility Plan Drawing – NE
3. PMP Stormwater Drainage Plan - NE

3.c. Description and Maps of Collection System

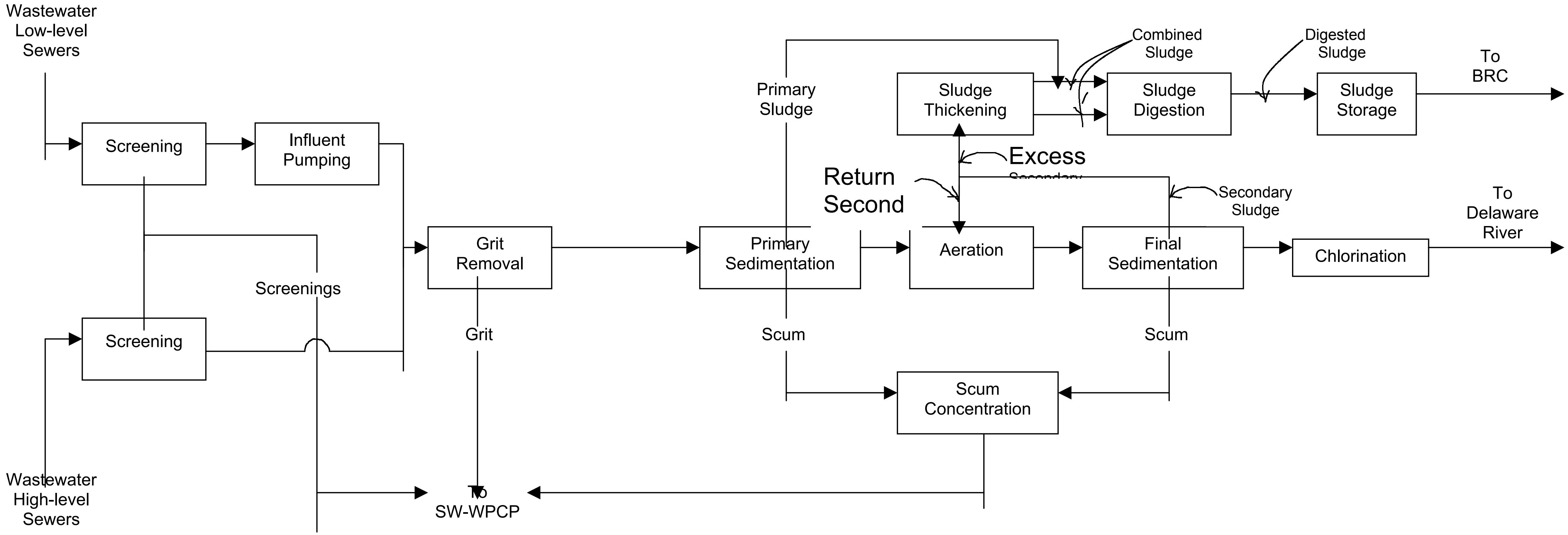
The PWD service area is divided into three drainage districts: Northeast, Southeast, and Southwest. Each of these drainage districts conveys flow to the respective WPCP of the same name. These three drainage basins are hydraulically independent except during conditions of high flow, when cross connections in the trunk sewer system allow conveyance of some flow between the Northeast and Southeast drainage districts. The service areas are itemized in Table 1 by collection system type.

Table 1 Wastewater Service Areas by Drainage District and Collection System Type

	SE (ac)	SW (ac)	NE (ac)	Total (ac)	%
Combined	8,475	12,741	19,934	41,150	19%
Separate	31	9,732	15,737	25,500	12%
Suburban Sanitary	300	76,600	70,800	147,700	69%
			Total	**214,350**	

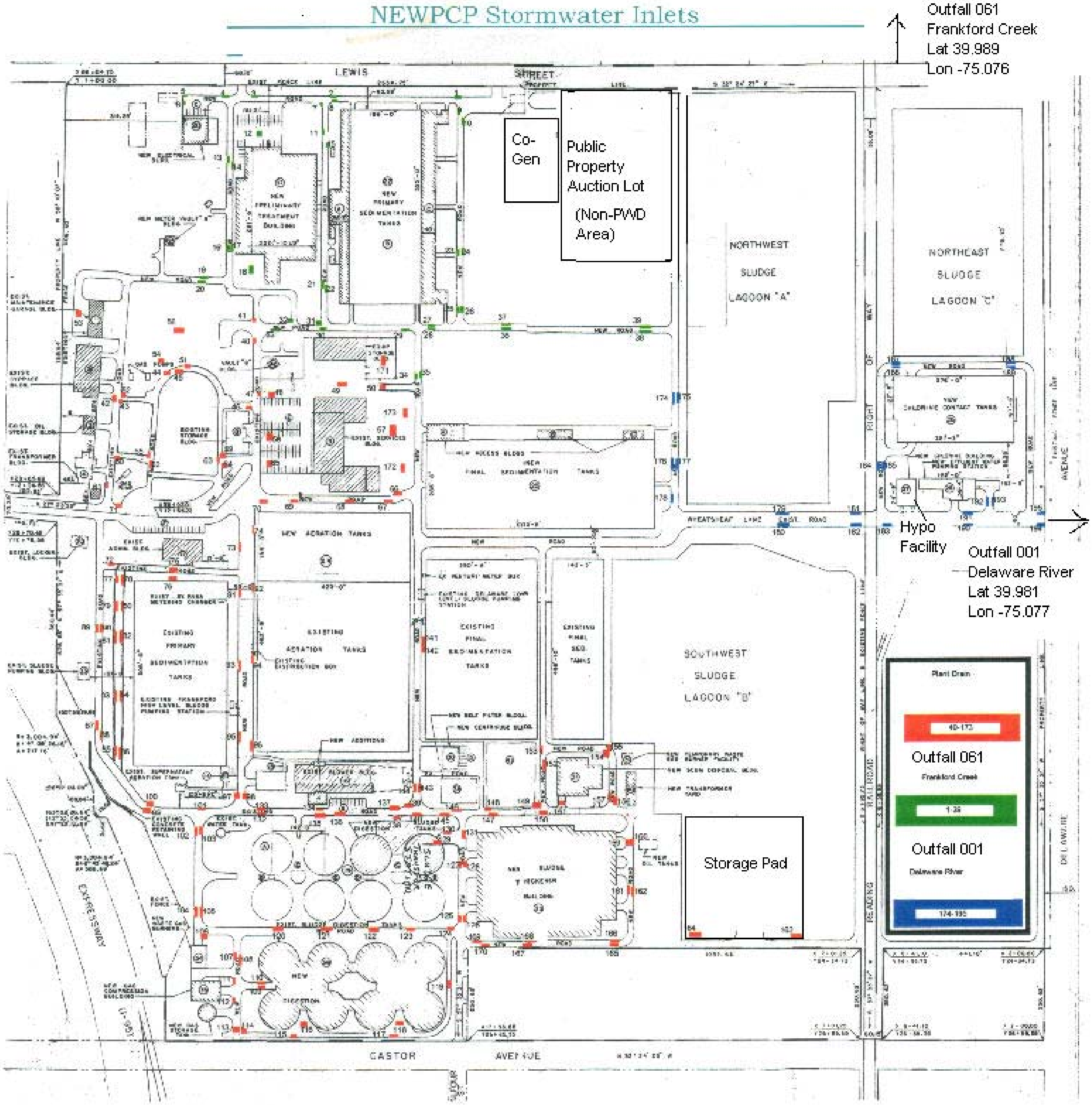
Each drainage district contains a network of branch sewers, trunk sewers, combined sewer interceptors, separate sanitary interceptors, and storm relief sewers as shown on Figure 1. Branch sewers collect wastewater from catch basins and lateral connections from drainage areas. The branch sewers convey flow to the trunk sewers, which are larger arterial sewers that convey wastewater to regulating chambers. Combined sewer interceptors convey flow from regulating chambers and separate sanitary interceptors to the WPCPs. Storm relief sewers convey flow from storm relief diversion chambers to the receiving waters during extreme high flow conditions. This network of sewers has been subdivided into 17 interceptor systems and 10 storm relief sewer systems. Table 2 identifies each of the interceptor systems. Table 3 identifies the storm relief sewers systems. Table 4 identifies the major separate sanitary sewer interceptors that are tributary to combined sewer interceptors. Table 5 identifies contributing communities and their associated interceptor systems.

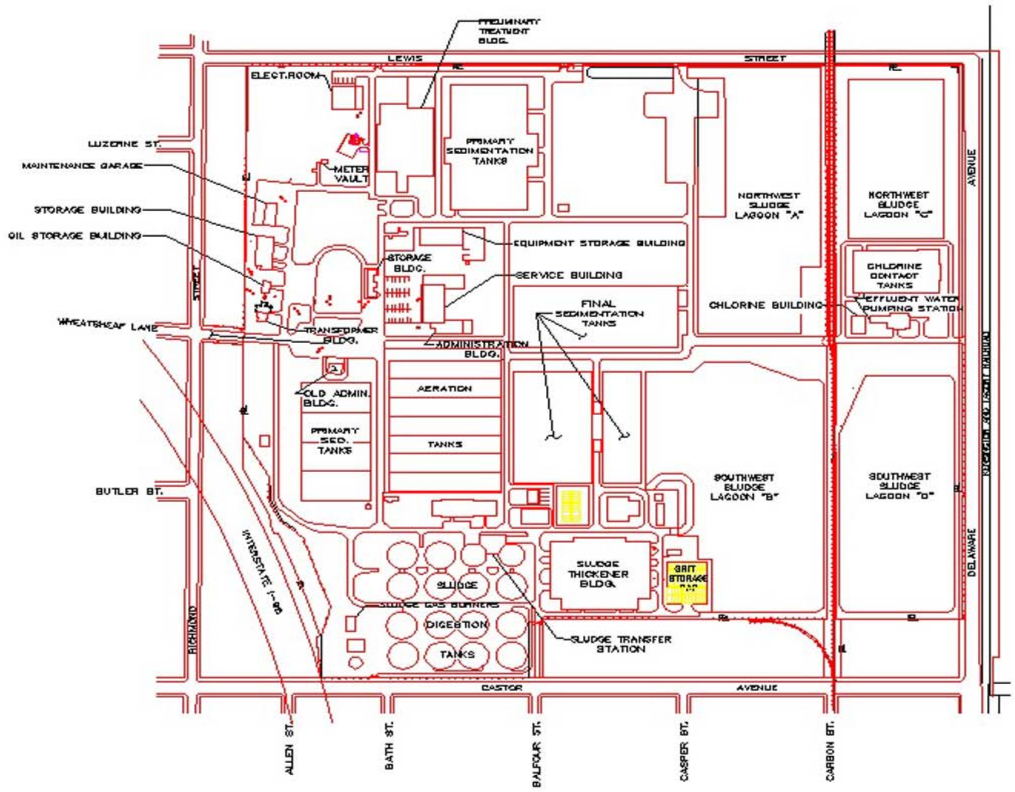
Figure 2-1-3



Process Plan Diagram

NEWPCP Stormwater Inlets




PRELIMINARY TREATMENT BLDG.
LEWIS
STREET
AVENUE
ELECT.ROOM
LUZERNE ST.
MAINTENANCE GARAGE
METER VAULT
PRIMARY SEDIMENTATION TANKS
NORTHWEST SLUDGE LAGOON "A"
NORTHWEST SLUDGE LAGOON "C"
STORAGE BUILDING
OIL STORAGE BUILDING
EQUIPMENT STORAGE BUILDING
STORAGE BLDG.
SERVICE BUILDING
CHLORINE CONTACT TANKS
STREET
FINAL SEDIMENTATION TANKS
CHLORINE BUILDING
EFFLUENT WATER PUMPING STATION
WHEATSHEAF LANE
TRANSFORMER BLDG.
ADMINISTRATION BLDG.
OLD ADMIN. BLDG.
AERATION
TANKS
PRIMARY SED. TANKS
SOUTHWEST SLUDGE LAGOON "B"
SOUTHWEST SLUDGE LAGOON "D"
BUTLER ST.
INTERSTATE I-95
SLUDGE THICKENER BLDG.
GRIT STORAGE
SLUDGE
SLUDGE GAS BURNERS
DELAWARE
DIGESTION
TANKS
SLUDGE TRANSFER STATION
RICHMOND
CASTOR
AVENUE
ALLEN ST.
BATH ST.
BALFOUR ST.
CASPER ST.
CARBON ST.

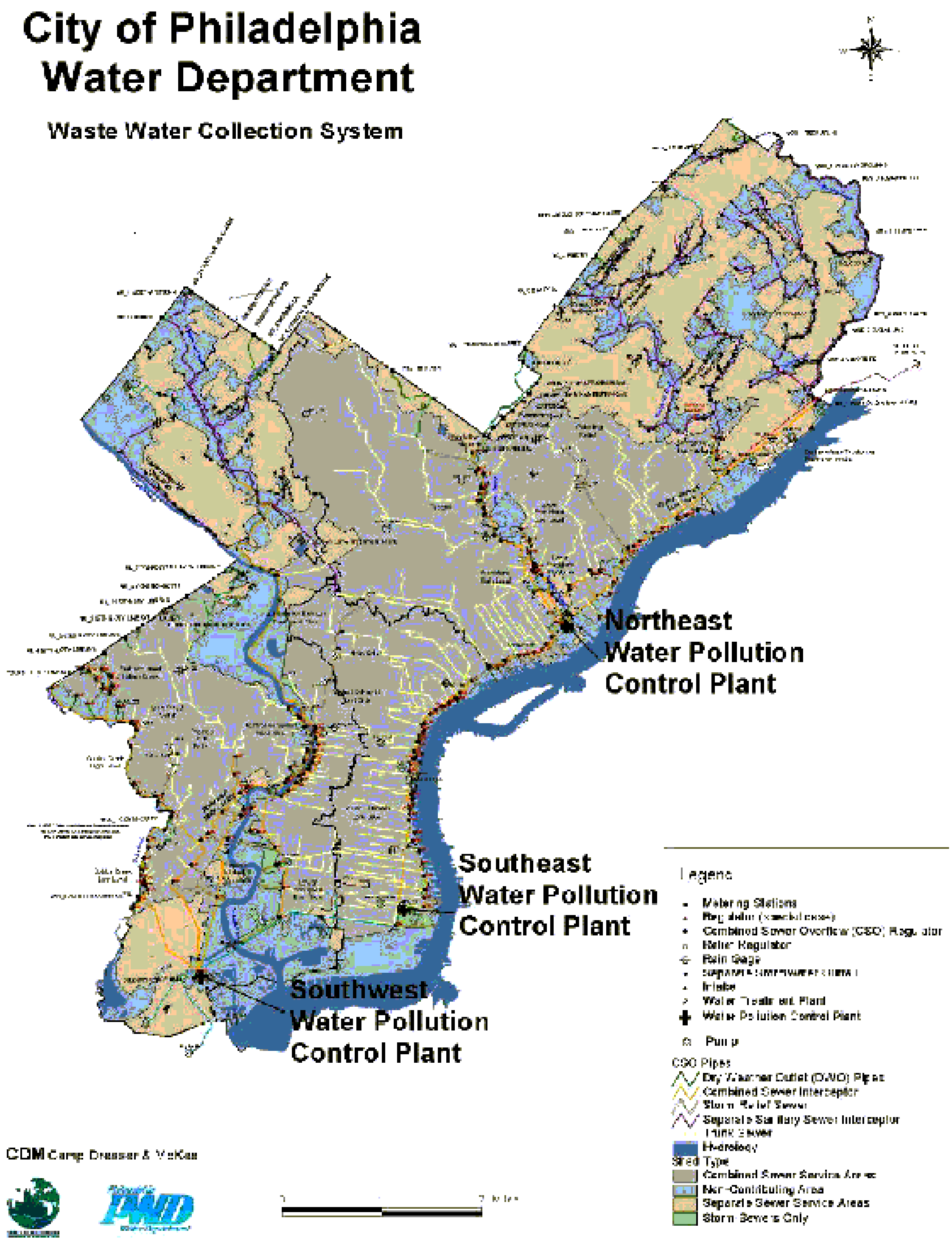


Figure 1 - PWD wastewater collection System

Table 2 Combined Sewer Interceptor Systems in the NE Service Areas

Combined Sewer Interceptor	Abbreviation	Drainage District
Frankford High Level	FHL	Northeast
Lower Frankford Creek	LFC	Northeast
Lower Frankford Low Level	LFLL	Northeast
Upper Frankford Low Level	UFLL	Northeast
Pennypack	P	Northeast
Somerset	S	Northeast
Tacony	T	Northeast
Upper Delaware Low Level	UDLL	Northeast

Table 3 Storm Relief Systems in the NE Service Areas

Storm Relief System	Abbreviation	Drainage District
Frankford High Level Relief Sewer	FR_F	Northeast
Rock Run Relief Sewer	FR_RR	Northeast
State Road Relief Sewer	FR_ST	Northeast
Wakeling Relief Sewer	FR_W	Northeast

Table 4 Separate Sanitary Interceptors Tributary to Combined Interceptors

Separate Sanitary Interceptor	Abbreviation	Receiving Interceptor	Drainage District
Pennypack Creek	S-P	UDLL	Northeast
Wooden Bridge Run	S-WB	UDLL	Northeast
Poquessing Creek	S-PQ	UDLL	Northeast
Byberry Creek	S-BY	UDLL	Northeast
Walton's Run	S-WAL	UDLL	Northeast

Table 5 Summary of Contributing Communities to the PWD Collection System

Municipality/Authority	Drainage District	Intercepting System
Bensalem Township	NE	UDLL
Bucks County Water and Sewer Authority	NE	UDLL
Lower Southampton Municipal Authority	NE	UDLL
Township of Abington	NE	PP
Township of Cheltenham	NE	FHL
Township of Lower Moreland and the Lower Moreland Township Authority	NE	PP

A brief description of the collection system for the drainage district is as follows.

Northeast Drainage District

Figure 2 shows the collection system for the Northeast drainage district. This figure depicts the combined sewer interceptors and the major separate sewer interceptors, as well as, the location of the CSO regulators, storm relief chambers, and major hydraulic control points. Regulators and storm relief chambers are described in Section 1.1.4; major hydraulic control points are described in Section 1.1.5. Suburban communities served by the Northeast WPCP include:

- Abington Township
- Bensalem Township
- Bucks County
- Cheltenham Township
- Lower Moreland Township
- Lower Southhampton Township

The combined sewer system in the Northeast drainage district conveys flows to two hydraulically independent interceptor systems. The low level system includes the Upper Delaware Low Level (UDLL), Upper Frankford Low Level (UFLL), Lower Frankford Low Level (LFLL), Pennypack (P), and Somerset Low Level (S). These interceptors convey wastewater and stormwater to the WPCP where it is pumped into to preliminary treatment building. The Pennypack and Lower Frankford Low Level interceptors are tributary to the Upper Delaware, which conveys flow to the Northeast WPCP. The Somerset and Upper Frankford Low Level interceptors combine outside of the WPCP at Diversion Chamber A, at which point flows are conveyed to the preliminary treatment building to be pumped. The high level interceptor system consists of the Tacony (T) interceptor and the Frankford High Level (FHL) interceptor. The Tacony interceptor conveys flows to the Frankford High Level interceptor. The Frankford High Level conveys flows into the WPCP by gravity. Table 6 lists ranges of interceptor sewer diameters in the Northeast Drainage district by interceptor system.

Table 6 Interceptor Sewer Systems in the Northeast Drainage District

Interceptor System	Length (miles)	Size Range (ft)
Upper Delaware Low Level	7.0	4 - 12.25
Pennypack Low Level	3.0	1.67 - 6
Lower Frankford Low Level	1.0	1 - 5
Somerset Low Level	2.1	4 by 4 - 5 by 5.5
Upper Frankford Low Level	2.5	1.67 - 4.5
Tacony High Level	3.5	3 - 8.5
Frankford High Level	3.0	5.5 - 11 by 8.5

Upper Delaware Low Level: The UDLL interceptor originates in the northern most sections of Philadelphia, near the confluence of the Poquessing Creek and the Delaware River. Several small interceptors contribute flow here, and metered flow from Bensalem, Southampton, and Lower Moreland also enter the PWD system here. Wastewater flow from Bucks County enters the UDLL interceptor just upstream of Pennypack Creek through a 42 inch force main. The interceptor flows southwest, parallel to the Delaware River until it reaches the NE WPCP.

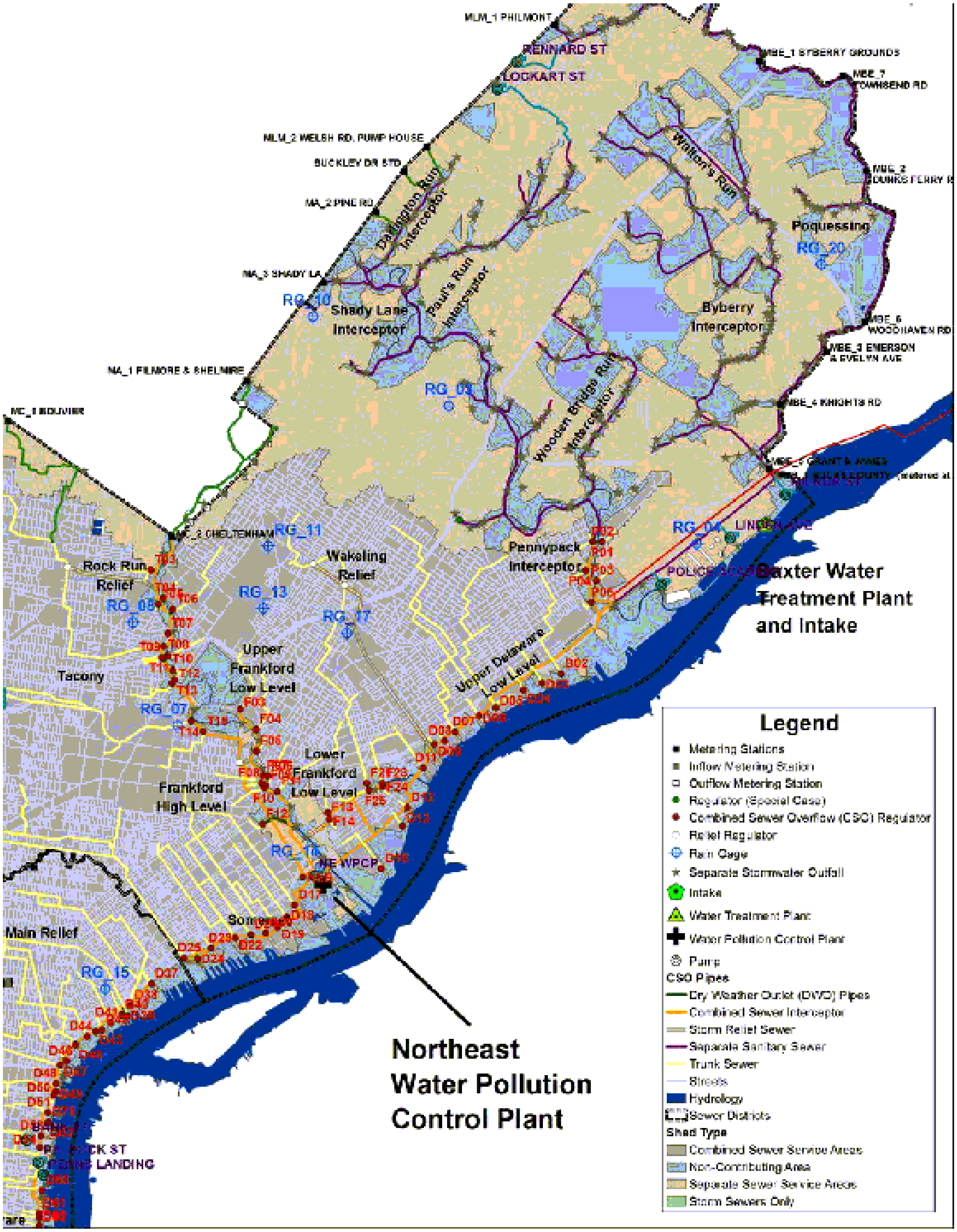
The Pennypack (P) interceptor conveys flows from Holmes Avenue in northeast Philadelphia to the UDLL interceptor on the south side of Pennypack Creek. The Pennypack interceptor receives sanitary flows from several small interceptor systems and metered flow from Abington.

The Lower Frankford Low Level (LFLL) lies between the Delaware Expressway and the UDLL interceptor. It conveys flows from Church Street on the southwest and Bridget Street on the northeast to the junction with the UDLL near Margaret and Garden Streets.

Somerset/Upper Frankford Low Level: The Somerset Low Level (S) interceptor originates near Somerset Street and conveys flow along the Delaware River northeast into the NE WPCP. The UFLL interceptor begins near Wyoming and Castor Streets, and conveys flows southeasterly toward the WPCP, parallel to New Frankford Creek. The UFLL interceptor combines with the Somerset interceptor near Luzerne and Richmond Streets at Diversion Chamber A.

Tacony/Frankford High Level: The Tacony (T) and FHL interceptors combine to convey flows from near Cheltenham Township southeasterly along the Tacony and New Frankford Creeks to the NE WPCP. The Tacony interceptor runs along the Tacony Creek to where the FHL interceptor begins at the Frankford Grit Overflow Chamber (R_18) located near Hunting Park Avenue and Castor Street. From here, the FHL interceptor conveys flow to the "O" Street and Erie Avenue Dispersion Chamber (H_22), where flows split into parallel sewers. The parallel sewers convey wastewater and stormwater along New Frankford Creek to the NE WPCP.

Figure 2 Northeast Drainage District



3.d. Description of Wastes Accepted from Outside Collection System

The Northeast Plant receives no wastes from outside its collection system.

3.e. Map and Description of Point and Non-Point Source Releases From Facility

As described below, the Northeast Plant contains sludge impoundments which, as indicated in the chart entitled *"March 2000 Northeast Sludge Samples",* has PCBs contained in some samples of the sludge. Although we believe that it is unlikely that the limited runoff from these impoundments which is directed into the headworks of the Northeast Plant represents a significant PCB contribution to the facility's overall load, we have included below a description of the impoundments together with available PCB information. As part of the Northeast Plant trackdown study, we intend to sample the impoundment runoff and analyze for PCBs.

Philadelphia Water Department Northeast WPCP Sludge Impoundments

The Philadelphia Water Department owns sludge impoundments at the Northeast Water Pollution Control Plant (3899 Richmond St). These impoundments were used to store treated sludge during the 1950's and 60's, and have been inactive since. There are four impoundments that are unlined, except for the natural clay layer beneath, which covers almost 40 acres (see attached maps). The sludge is between 8-10 feet deep and totals approximately 580,000 cubic yards. In preparation for closing this site under the PA Recycling and Environmental Remediation Standards Act (Act 2), a Site Characterization Study and a Remedial Investigation/Baseline Risk Assessment Reports were generated. These reports were developed by our consultant RETTEW Associates, and their findings are summarized below.

A groundwater well network comprised of 12 wells was developed around the perimeter of the impoundments with four rounds of quarterly sampling analyzed for a wide range of parameters. Analytical method 8082 (arochlor) was used for PCB testing with a detection limit of 0.5 ppb. The results are presented in the attached table entitled *"Northeast Groundwater Samples"*. All of the samples analyzed were below the detection limit.

Five sludge samples were collected from three different depths within each impoundment. A similar arochlor method was employed for analyzing these samples, with varying detection limits based upon the moisture content of the sample. There was only one reported value over the detection limit for PCB-1254 (10,000 ug/kg), with several measurable values for PCB-1260. (ranging from 4,000 – 500,000 ug/kg) Attached is a table which details these results.

The nature and composition of the sludge explains why measurable quantities of PCBs were not found in the groundwater. The sludge is composed of organic waste solids that have very high carbon content and a very low permeability. Combine this with the fact that PCB compounds have an affinity for solids, (e.g. 1260 migrates in the sludge 2,500,000 times slower than water) explains the groundwater results.

Any runoff from these impoundments is returned to the plant. Any overflow from impoundments B and D drain into a line that returns to the plant influent stream. Impoundment

C drains into impoundment A, which is pumped when needed into the Primary Tanks. This ensures that nothing leaves the site without treatment.

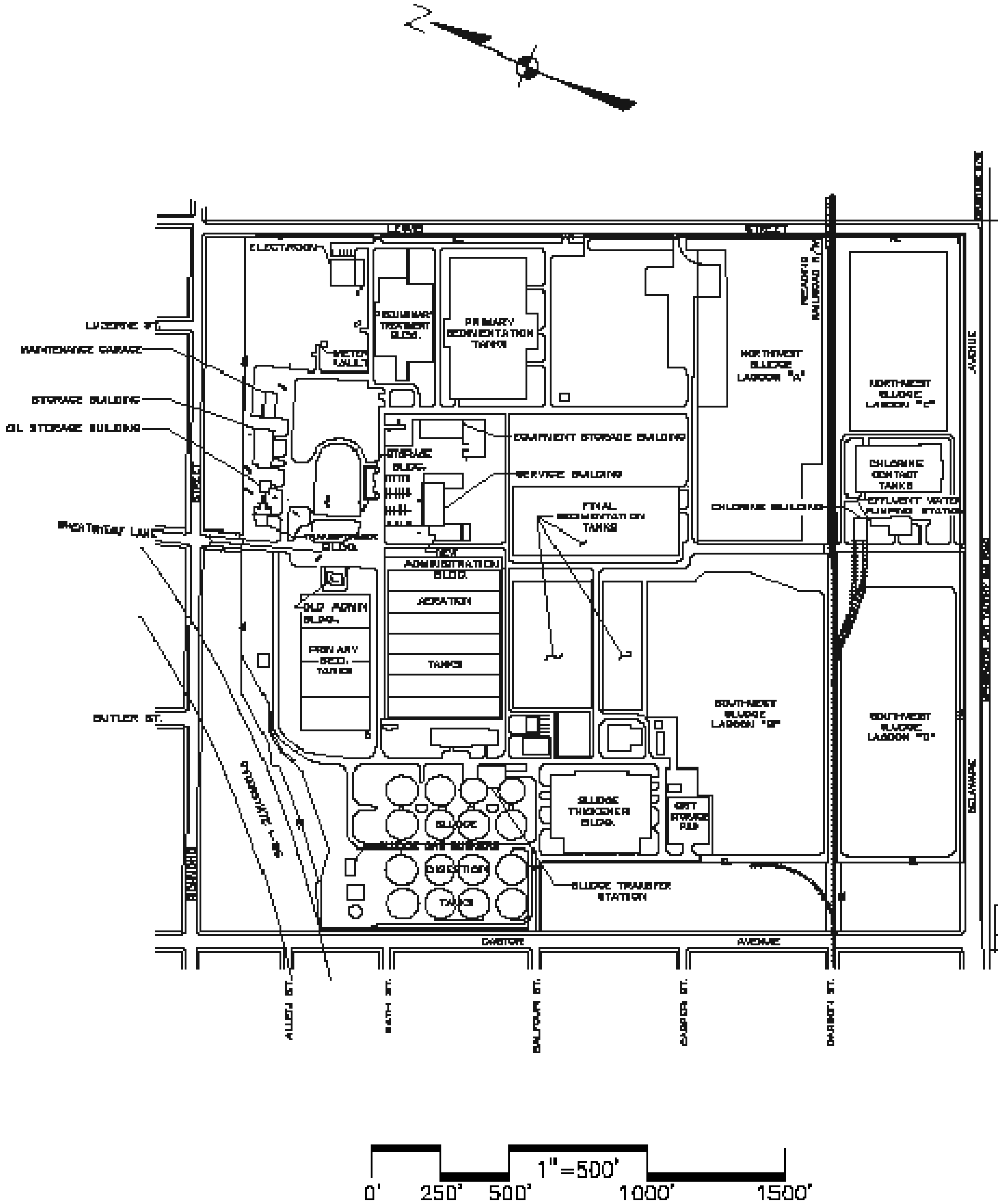


FIGURE 2

H:\02\02159701\CADD\GEOSCI\Site Plan.dwg

SITE MAP FOR PWD-NEWPCP SLUDGE IMPOUNDMENTS	RETTEW	DRAWN BY: T.A.B.
	RETTEW Associates, Inc.	DATE: 9/28/04
		SCALE: 1"=500'
		DWG. NO. 02-01597-001

Northeast WPCP Impoundments

NORTHEAST GROUNDWATER SAMPLES

Location:		NEMW-1	NEMW-DD	NEMW-FS	NEMW-FD	NEMW-CD	NEMW-BS	NEMW-BD	NEMW-5	NEMW-4	NEMW-ED	NEMW-ES	NEMW-CS
Sample type:		grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab
Mar-00													
PCB-1016	ug/L	< 0.55	< 0.48	< 11	< 0.48	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.51	< 9.6
PCB-1221	ug/L	< 0.55	< 0.48	< 11	< 0.48	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.51	< 9.6
PCB-1232	ug/L	< 0.55	< 0.48	< 11	< 0.48	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.51	< 9.6
PCB-1242	ug/L	< 0.55	< 0.48	< 11	< 0.48	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.51	< 9.6
PCB-1248	ug/L	< 0.55	< 0.48	< 11	< 0.48	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.51	< 9.6
PCB-1254	ug/L	< 0.55	< 0.48	< 11	< 0.48	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.51	< 9.6
PCB-1260	ug/L	< 0.55	< 0.48	< 11	< 0.48	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.51	< 9.6
Jun-00													
PCB-1016	ug/L	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48	< 0.47	< 0.47	< 0.48	< 4.7
PCB-1221	ug/L	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48	< 0.47	< 0.47	< 0.48	< 4.7
PCB-1232	ug/L	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48	< 0.47	< 0.47	< 0.48	< 4.7
PCB-1242	ug/L	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48	< 0.47	< 0.47	< 0.48	< 4.7
PCB-1248	ug/L	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48	< 0.47	< 0.47	< 0.48	< 4.7
PCB-1254	ug/L	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48	< 0.47	< 0.47	< 0.48	< 4.7
PCB-1260	ug/L	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48	< 0.47	< 0.47	< 0.48	< 4.7
Sep-00													
PCB-1016	ug/L	< 0.5	< 0.48	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.47
PCB-1221	ug/L	< 0.5	< 0.48	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.47
PCB-1232	ug/L	< 0.5	< 0.48	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.47
PCB-1242	ug/L	< 0.5	< 0.48	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.47
PCB-1248	ug/L	< 0.5	< 0.48	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.47
PCB-1254	ug/L	< 0.5	< 0.48	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.47
PCB-1260	ug/L	< 0.5	< 0.48	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.49	< 0.48	< 0.47	< 0.48	< 0.47
Dec-00													
PCB-1016	ug/L	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47
PCB-1221	ug/L	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47
PCB-1232	ug/L	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47
PCB-1242	ug/L	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47
PCB-1248	ug/L	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47
PCB-1254	ug/L	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47
PCB-1260	ug/L	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47

MARCH 2000 NORTHEAST SLUDGE SAMPLES

Location:		NELAGA1S	NELAGA1M	NELAGA1D	NELAGA2S	NELAGA2M	NELAGA2D	NELAGA3S	NELAGA3M	NELAGA3D	NELAGA4S	NELAGA4M	NELAGA5S	NELAGA5M	NELAGA5D
Sample type:		grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab
PCB-1016	ug/kg	< 46000	< 23000	< 440000	< 24000	< 210000	< 27000	< 230000	< 22000	< 22000	< 21000	< 23000	< 23000	< 23000	< 22000
PCB-1221	ug/kg	< 46000	< 23000	< 440000	< 24000	< 210000	< 27000	< 230000	< 22000	< 22000	< 21000	< 23000	< 23000	< 23000	< 22000
PCB-1232	ug/kg	< 46000	< 23000	< 440000	< 24000	< 210000	< 27000	< 230000	< 22000	< 22000	< 21000	< 23000	< 23000	< 23000	< 22000
PCB-1242	ug/kg	< 46000	< 23000	< 440000	< 24000	< 210000	< 27000	< 230000	< 22000	< 22000	< 21000	< 23000	< 23000	< 23000	< 22000
PCB-1248	ug/kg	< 46000	< 23000	< 440000	< 24000	< 210000	< 27000	< 230000	< 22000	< 22000	< 21000	< 23000	< 23000	< 23000	< 22000
PCB-1254	ug/kg	< 46000	< 23000	< 440000	< 24000	< 210000	< 27000	< 230000	< 22000	< 22000	< 21000	< 23000	< 23000	< 23000	< 22000
PCB-1260	ug/kg	< 46000	< 23000	< 440000	< 24000	< 210000	< 27000	< 230000	< 22000	< 22000	< 21000	< 23000	< 23000	< 23000	< 22000

		NELAGB1S	NELAGB1M	NELAGB1D	NELAGB2S	NELAGB2M	NELAGB2D	NELAGB3S	NELAGB3M	NELAGB3D	NELAGB4S	NELAGB4M	NELAGB4D	NELAGB5S	NELAGB5M	NELAGB5D
PCB-1016	ug/kg	< 270000	< 360000	< 250000	< 3800	< 45000	< 38000	< 6200	< 57000	< 56000	< 3800	< 53000	< 54000	< 35000	< 45000	< 43000
PCB-1221	ug/kg	< 270000	< 360000	< 250000	< 3800	< 45000	< 38000	< 6200	< 57000	< 56000	< 3800	< 53000	< 54000	< 35000	< 45000	< 43000
PCB-1232	ug/kg	< 270000	< 360000	< 250000	< 3800	< 45000	< 38000	< 6200	< 57000	< 56000	< 3800	< 53000	< 54000	< 35000	< 45000	< 43000
PCB-1242	ug/kg	< 270000	< 360000	< 250000	< 3800	< 45000	< 38000	< 6200	< 57000	< 56000	< 3800	< 53000	< 54000	< 35000	< 45000	< 43000
PCB-1248	ug/kg	< 270000	< 360000	< 250000	< 3800	< 45000	< 38000	< 6200	< 57000	< 56000	< 3800	< 53000	< 54000	< 35000	< 45000	< 43000
PCB-1254	ug/kg	< 270000	< 360000	< 250000	< 3800	< 45000	< 38000	< 6200	< 57000	< 56000	10100	< 53000	< 54000	< 35000	< 45000	< 43000
PCB-1260	ug/kg	< 270000	< 360000	< 250000	3900	< 45000	121000	< 6200	< 57000	< 56000	13400	< 53000	< 54000	< 35000	< 45000	61000

		NELAGC1S	NELAGC1M	NELAGC1D	NELAGC2S	NELAGC2M	NELAGC2D	NELAGC3S	NELAGC3M	NELAGC3D	NELAGC4S	NELAGC4M	NELAGC4D	NELAGC5S	NELAGC5M	NELAGC5D
PCB-1016	ug/kg	< 420000	< 440000	< 480000	< 29000	< 290000	< 320000	< 30000	< 300000	< 450000	< 430000	< 490000	< 430000	< 410000	< 31000	< 340000
PCB-1221	ug/kg	< 420000	< 440000	< 480000	< 29000	< 290000	< 320000	< 30000	< 300000	< 450000	< 430000	< 490000	< 430000	< 410000	< 31000	< 340000
PCB-1232	ug/kg	< 420000	< 440000	< 480000	< 29000	< 290000	< 320000	< 30000	< 300000	< 450000	< 430000	< 490000	< 430000	< 410000	< 31000	< 340000
PCB-1242	ug/kg	< 420000	< 440000	< 480000	< 29000	< 290000	< 320000	< 30000	< 300000	< 450000	< 430000	< 490000	< 430000	< 410000	< 31000	< 340000
PCB-1248	ug/kg	< 420000	< 440000	< 480000	< 29000	< 290000	< 320000	< 30000	< 300000	< 450000	< 430000	< 490000	< 430000	< 410000	< 31000	< 340000
PCB-1254	ug/kg	< 420000	< 440000	< 480000	< 29000	< 290000	< 320000	< 30000	< 300000	< 450000	< 430000	< 490000	< 430000	< 410000	< 31000	< 340000
PCB-1260	ug/kg	< 420000	< 440000	< 480000	< 29000	< 290000	< 320000	< 30000	< 300000	< 450000	< 430000	< 490000	< 430000	< 410000	< 31000	< 340000

		NELAGD1S	NELAGD1M	NELAGD1D	NELAGD2S	NELAGD2M	NELAGD2D	NELAGD3S	NELAGD3M	NELAGD3D	NELAGD4S	NELAGD4M	NELAGD4D	NELAGD5S	NELAGD5M	NELAGD5D
PCB-1016	ug/kg	< 3600	< 41000	< 41000	< 5700	< 47000	< 47000	< 40000	< 500000	< 260000	< 560000	< 540000	< 460000	< 35000	< 500000	< 490000
PCB-1221	ug/kg	< 3600	< 41000	< 41000	< 5700	< 47000	< 47000	< 40000	< 500000	< 260000	< 560000	< 540000	< 460000	< 35000	< 500000	< 490000
PCB-1232	ug/kg	< 3600	< 41000	< 41000	< 5700	< 47000	< 47000	< 40000	< 500000	< 260000	< 560000	< 540000	< 460000	< 35000	< 500000	< 490000
PCB-1242	ug/kg	< 3600	< 41000	< 41000	< 5700	< 47000	< 47000	< 40000	< 500000	< 260000	< 560000	< 540000	< 460000	< 35000	< 500000	< 490000
PCB-1248	ug/kg	< 3600	< 41000	< 41000	< 5700	< 47000	< 47000	< 40000	< 500000	< 260000	< 560000	< 540000	< 460000	< 35000	< 500000	< 490000
PCB-1254	ug/kg	< 3600	< 41000	< 41000	< 5700	< 47000	< 47000	< 40000	< 500000	< 260000	< 560000	< 540000	< 460000	< 35000	< 500000	< 490000

3.f. Facility State and Federal Permit Numbers

PaDEP Site ID #: 451953
NPDES Permit No. PA 0026689

3.g. Name of Receiving Stream Including River Mile

The discharge of the Northeast Plant is received by the Delaware River at mile point 104.03

3.f. List of all known industrial users of the collection System and permit numbers

List of Industrial Dischargers in the Northeast Sewershed

FACILITY NAME	STREET ADDRESS	CITY	STATE	ZIP	PRETREATMENT PERMIT NO.
Lustrik, Inc.	4317 Paul St.	Philadelphia	PA	19124	LUST00020842WS
Frankford Plating, Inc.	2505 Orthodox St.	Philadelphia	PA	19137	FRAN00030892WS
Abaco	1814 E. Russell St.	Philadelphia	PA	19134	ABAC00010802WS
J.P. Cerini Technologies, Inc.	4600 N. Fairhill St.	Philadelphia	PA	19140	CCLC00010898WS
Lannett Co. Inc.	9000 State Road	Philadelphia	PA	19136	LANN00010862OM
McNeil Consumer Products Co.	7050 Camp Hill Road	Fort Washington	PA	19034	MCNE00011028BD
Brite Clean, Inc	1000 Imperial Road	Bensalem	PA	19020	MATL00010833OM
Lannett Co. Inc (Torresdale)	9001 Torresdale Ave.	Philadelphia	PA	19136	LANN00021129OM
Model Finishing Co., Inc.	4949 Cottman Ave.	Philadelphia	PA	19135	MODE00050877WS
Harvey M. Stern & Co.	6350 Germantown Ave.	Philadelphia	PA	19144	HARV00010911WS
SPD Technologies	13500 Roosevelt Blvd.	Philadelphia	PA	19116	SPDT00010817WS
Aeco, Inc.	4925 Arendell St.	Philadelphia	PA	19114	AECO00010856WS
Computer Components Corporation	2751 Southampton Rd.	Philadelphia	PA	19116	COMP00011059WS
CW Industries	130 James Way	Southampton	PA	18966	CWIN00010922WS
Automotive Rebuilders, Inc.	1670 B Winchester Rd.	Bensalem	PA	19020	AUTO00020993ND
Premier Medical Division of Premier Dental	10090 Sandmeyer La.	Philadelphia	PA	19116-3506	PREM00010971WS
Vibroplating, Inc.	353 Camer Dr.	Bensalem	PA	19020	VIBRO00010991WS
Q Tech Corporation	Building 8C Headley Pl.	Fallsington	PA	19054	QTEC00010974FP
Pennway Corporation	623 Center Ave.	Bensalem	PA	19020	PENN00031132ND
Adelphia Steel Equipment, Inc.	7372 State Rd.	Philadelphia	PA	19136	ADEL00011024BD
DGM Custom Polishing & Finishing Corporation	8301 Torresdale Avenue	Philadelphia	PA	19136	DGMC00011064WS
Metal Improvements	400 Winks Lane	Bensalem	PA	19020	BREN00110791WS
Custom Powder Coatings	4831 Ashburner Street	Philadelphia	PA	19136	CUST00011080FP
Metlab/Potero	1000 E. Mermaid Lane	Wyndmor	PA	19038-8093	METL00011087WS
Augusta Aerospace Corporation	3050 Red Lion Road	Philadelphia	PA	19114	AGUS00011094FP
Medical Products Laboratories	9990 Global Road	Philadelphia	PA	19115	MEDI00011095BD
Gill Powder Coating	1384 Byberry Road	Bensalem	PA	19020	GILL00011097WS
AJ Daw Ink Printing Co	1705 Winchester Rd	Bensalem	PA	19020	DAWI00011125ND
Woodbine Industries					WOOD00011133ND
SPS Technologies	Highland & Mt. Carmel Aves.	Jenkintown	PA	19046	SPST00010857WS
Hillock Anodizing, Inc.	5101 Comly St.	Philadelphia	PA	19135	HILL00020880WS
Mutual Pharmaceutical Company	1100 Orthodox St.	Philadelphia	PA	19124	MUTU00010966OM
Newman and Comapnay Paper	6101 Tacony St.	Philadelphia	PA	19135	NEWM00010361OM
Cardone Industries	5660 Rising Sun Ave.	Philadelphia	PA	19120	CARD00050925WS
Gryphin Company	3501 Richmond St.	Philadelphia	PA	19134	GRYP00010930OM
Max Levy Autograph, Inc.	220 W. Roberts Ave..	Philadelphia	PA	19144-4298	MAXL00010982FP
Delavau, LLC	10101 Roosevelt Blvd.	Philadelphia	PA	19154	JWSD00021054OM
Advanced Technologies	2925 E. Ontario St	Philadelphia	PA	19134	ADVA00011128OM
Garfield Refining Company	810 E. Cayuga Street	Philadelphia	PA	19124	GARF00021136ND
Cardinal Health Clinical Services	10381 Decatur Road	Philadelphia	PA	19114	CARD00011145MS
James Abbott, Inc.	2105-11 E. Wishart Street	Philadelphia	PA	19134	JAME00050808WS
Action Manufacturing Co.	100 E. Erie Avenue	Philadelphia	PA	19134	ACTI00050979WS
Abington Metal Refinery	4924 Wellington Street	Philadelphia	PA	19135	ABIN00011023BD

Purolite, Ltd.	3620 G Street	Philadelphia	PA	19134	PURO00010150BD
Allied Tube & Conduit, Inc.	11350 Norcum Road	Philadelphia	PA	19154	ALLI00040840WS
Philadelphia Rustproof	2086 E. Willard Street	Philadelphia	PA	19134	PHIL00880830WS
Curtiss Labs	2538 State Road	Bensalem	PA	19020	CURT00010928BD
Henshell Corporation	2922 N. 19th Street	Philadelphia	PA	19132	HENS00010884WS
United Color Manufacturing	2940 E. Tioga Street	Philadelphia	PA	19134	UNIT00111007WS
United Chemical Technologies	2731 Bartrum Road	Bristol	PA	19007	UNIT00110989WS
Roto Die Company, Inc.	2850-78 Comly Road	Philadelphia	PA	19154	ROTO00011061WS
Sunoco, Inc., Frankford Plt.	Margaret & Bermuda Streets	Philadelphia	PA	19137	SUNO00060380DS
Rohm & Haas	5000 Richmond Street	Philadelphia	PA	19137	ROHM00010464DS
Martin/F. Weber	2727 Southampton Road	Philadelphia	PA	19154	MART00011104WS
Economy Service & Sales	4252 Whitaker Avenue	Philadelphia	PA	19124	ESSC00011101ZD
Polysat, Inc.	7240 State Road	Philadelphia	PA	19135	POLY00011110ND
NEL Metal Restoration	2127-35 Margaret Street	Philadelphia	PA	19124	NELM00011131ND
I. Rice	11500D Roosevelt Blvd.	Philadelphia	PA	19116	not permitted
Fresh Made	810-820 Bleigh Avenue	Philadelphia	PA	19111	not permitted
Ben Franklin Foods, Inc.	2729 E. Butler St	Philadelphia	PA	19137	not permitted
Perfection Foods Co. Inc.	3901 Old York Road	Philadelphia	PA	19140	not permitted
Colorado Beef / Mid Atlantic Foods	2060 E. Tioga St.	Philadelphia	PA	19134	not permitted
Krispy Kreme	2327 Cottman Avenue	Philadelphia	PA	19149	not permitted
Wyszynski	5419 N. Mascher St.	Philadelphia	PA	19120	not permitted
Irene's Bakery	10085-B Sandmeyer Lane	Philadelphia	PA	19116	not permitted
Cardone Industries	321 E. Chew St.	Philadelphia	PA		not permitted
Lensco	2917 E. Hedley St.	Philadelphia	PA	19137	not permitted
Lever Dies	73 Dunks Ferry Rd.	Bensalem	PA	19020	not permitted
Superior Tool & Die Co.	3170 Tucker Rd.	Bensalem	PA	19021	not permitted
Specialty Ring Products, Inc.	2374 State Rd.	Bensalem	PA	19022	not permitted
Northeast Philadlephia Airport	9800 Ashton Rd.	Philadelphia	PA	19114	not permitted
Blendco Systems	1 Pearl Buck Court	Bristol	PA	19007	not permitted
Northern Liberty Foods	5419 Mascher St.	Philadelphia	PA	19120	not permitted
Court Record Services, Inc.	5301 Tacony St. Bldg 210-3	Philadelphia	PA	19135	not permitted
International Chemical Company	2628-48 N. Mascher St.	Philadelphia	PA	19133	not permitted
Para Chem Southern Inc.	Ontario & Rover Sts.	Philadelphia	PA	19134	PARA00010390OM
Pepsi Cola Metro Bot. Co.	E. Roosevelt Blvd. & Comly Rd.	Philadelphia	PA	19116	PEPS00030304OM
Philadelphia Baking Co.	9088 Blue grass Road	Philadelphia	PA	19114	PHIL00140151OM
Smurfit-Stone West Plant	9820 Blue Grass Rd.	Philadelphia	PA	19114	STON00020367OM
Cutler Dairy Products	612 W. Sedgley	Philadelphia	PA	19140	CUTL00010200OM
Dietz and Watson	05701 Tacony St.	Philadelphia	PA	19135	DIET00010028OM
Micheles Family Bakery	5698 Rising Sun Ave.	Philadelphia	PA	19120	MLDE00010152OM
Kraft Foods NA Nabisco-Phila. Bakery	12000 Roosevelt Blvd.	Philadelphia	PA	19115	NATI00020155OM
Penn Maid/Crowley Foods, Inc.	10975 Dutton Rd.	Philadelphia	PA	19154	READ00020089OM
Interstate Brands Corp./Continental Baking	9801 Bluegrass Rd.	Philadelphia	PA	19114	CONT00030148OM
Philadelphia Coca Cola Bottling Co.	E. Erie Avenue & "G" Streets	Philadelphia	PA	19134	PHIL00010302OM
Degussa Flavors and Fruit Systems	Tomlinson Rd. & Jamison Ave.	Philadelphia	PA	19116	SANO00010111OM
Clean Rental Services, Inc.	4352 N. American Street	Philadelphia	PA	19140	CLEA00020952OM
O'Neill Industries, Inc.	5101 Unit I Comly St.	Philadelphia	PA	19135	ONEI00011005FP

Luithlen Dye Corp.	J & Tioga Sts.	Philadelphia	PA	19134	LUIT00010330OM
Caledonian Dye Works	3300 Emerald St.	Philadelphia	PA	19134	CALE00021021OM
Northeast Donut Shops Management Corp.	5201-11 Darrah Street	Philadelphia	PA	19124	NORT00011048OM
Philadelphia Cooked Steak Company	124 W. Venango St.	Philadelphia	PA	19140	PHIL01051060OM
David Michael Company, Inc.	10801 Decatur Rd.	Philadelphia	PA	19154	DMIC00011057OM
Smurfit-Stone East Plant	Tulip & Decauter Streets	Philadelphia	PA	19136	STON00010947OM
Domestic Uniform	4100 Frankford Ave.	Philadelphia	PA	19124	DOME00030964OM
Philadelphia Gas Works - Venango	3100 Venango Street	Philadelphia	PA	19134	PHIL00860949OM
Schutte & Koering	2233 State Road	Bensalem	PA	19020	SCHU00010944OM
Arbill Industries, Inc.	2207 West Glenwood Ave.	Philadelphia	PA	19132	ARBI00010953OM
Philadelphia Cheesesteak Co.	520 E. Hunting Park Avenue	Philadelphia	PA	19124	ORGI00011072OM
Bethayres Reclamation Corp.	2310 Terwood Drive	Huntington Valley	PA	19006	BETH00011055QR
GE Betz	4636 Somerton Rd	Trevose	PA	19053	GEBE00011120OM
Perfecseal	9800 Bustleton Ave.	Philadelphia	PA	19115	PAPE00010366OM
Abbey Color & Chemical, Inc.	400 E. Tioga St.	Philadelphia	PA	19134	ABBE00010926BD
Fleetwash, Inc.	744 Walnut Ave., Walnut Commons Unit 3A	Bensalem	PA	19020	FLEE00011004WS
Columbia Silk Dyeing Co., Inc.	1726 N. Howard St.	Philadelphia	PA	19122	COLUOOO20996OM
United States Filter Corporation	95 Lower Morrisville Rd.	Fallsington	PA	19054	USFI00011010OM
Concord Cleaning	1729 Griffith Street	Philadelphia	PA	19111	CONC001113BD
HMMT Environmental	725 Wicker Avenue	Bensalem	PA	19020	HMMT00011096OM
Fishtown Fleet Wash	2709 Livingston Street	Philadelphia	PA	19125	FISH00011103OM
Regal International Leathers, Ltd	3795 Speviva Street	Philadelphia	PA	19137	REGA0020165WS
Neatsfoot Oil Corp.	2925 E. Ontario St.	Philadelphia	PA	19134	NEAT00010552OM
Globe Dye Works	4550 Worth St.	Philadelphia	PA	19124	GLOB00030975OM
Cintas Corporation	10080 Sandmeyer Lane	Philadelphia	PA	19116	CINT00010955OM
Arway Apron and Uniform Rental	1696 Foulkrod St.	Philadelphia	PA	19124	ARWA00010988OM
Kinder-Morgan Liquid Terminals, LLC	Delaware River & Allegheny Ave.	Philadelphia	PA	19134	KMEP00010936BD
Tanner Industries, Inc.	5811 Tacony St.	Philadelphia	PA	19135	TANN00011100WS
GE International Inc.	1040 E. Erie Avenue	Philadelphia	PA	19124	GENE00010973OM
N. Jonas & Co.	1301 Adams Road	Bensalem	PA	19020	NJON00011115WS
Dickler Chemical Laboratories, Inc.	4201 Torresdale Avenue	Philadelphia	PA	19124	DICK00011119OM

PMP
Northeast Plant
Known Sources
Item 4

Two known sources of PCBs entering the Northeast Plant sewer shed are the intake of Delaware River water and the addition of ferric chloride as a treatment coagulant into the Baxter Water Treatment Plant and the resultant discharge of most of the plant's process wastes into the sewer. The remaining wastes are stored onsite in the plant's raw water basin which is periodically dredged to containers which are then removed from the site and the sewer shed.

The intake of Delaware River water into the plant occurs about river mile 111 which approximately where two ambient water samples were taken and analyzed for PCBs in September, 2001 and October, 2002. The results were 3.902 and 5.607 ng/l, respectfully, for an average concentration of 4.75 ng/l. An average intake flow of 160 MGD into the plant results in an intake of PCBs of 2,877 mg/day. Based upon an approximate solids balance, we estimate 99 percent of the influent loading is captured within the treatment processes. Ten percent of that captured loading immediately settles in the raw water basin and another ten percent is captured by the filtering process which is subsequently cleaned and flushed into the same raw water basin. Therefore, we estimate that approximately 79 percent, or 2,280 mg/day, of the Delaware River loading influent to the Baxter Plant is discharged into the Northeast Plant sewer shed.

The second source is discharge of spent ferric chloride, which contains PCBs in the delivered product, from the Baxter Plant into the sewer. The Baxter Plant uses ferric chloride as a water treatment chemical to coagulate and flocculate fine particle solids from the river water. PWD currently purchases ferric chloride from Kemiron. In 2001 PWD was informed by Eaglebrook (now Kemiron) that low levels of polychlorinated biphenyls were detected in the ferric chloride. The source of the ferric chloride is from the DuPont Edge Moor plant that produces ferric chloride as a by-product. The DuPont Company has analyzed their ferric chloride product for PCBs and estimates that the current concentration is 0.00055 mg/l. Based on the average dosage of ferric chloride and the average plant flow, the average contribution of PCBs to the plant is 17.51 mg/day. However, as described above, we estimate that the plant captures approximately 99 percent of the solids produced as a result of the chemical addition and ten percent of those captured solids are, due the filtering process, directed into the raw water basin and not into the sewer. Therefore, we estimate that approximately 89 percent, or 15.6 mg/day, of the PCBs from ferric chloride source is discharged into the Northeast Plant sewer shed.

The DuPont Company has already undertaken measures to reduce the concentration of PCBs in the ferric chloride produced from their Edge Moor Plant and has committed to further reductions. Their previous actions will be presented in *Section 7. Previous Minimization Activities* of this report. Their future plans will be presented in *Section 9. Pollutant Minimization Measures*.

PMP
Northeast Plant
Potential Sources
Item 5

Identification of potential sources of PCB focused first on those sources which stored PCBs in equipment. In addition to PWD's inventory of PCB containing equipment, we requested identification of such equipment from the following agencies:

1. Philadelphia Fire Department
2. Philadelphia Department of Public Health
3. USEPA (including the Mega Rule's database)
4. PaDEP
5. DRBC
6. Partnership for the Delaware Estuary
7. PECO

Copies of our original letter requesting the information from the above agencies other than those that are part of City of Philadelphia government, together with their responses, are attached to this section. **I bring to your attention the request for business confidentiality by Exelon**. Note that these attachments also serve the Southeast Plant and the Southwest Plant submissions.

The following pages of the spreadsheet entitled *"List of Potential Sources, Item 5, Northeast Plant"* contain a complete listing of equipment containing PCBs resulting from the above request. PWD believes that considerable information concerning each source should be gathered and maintained in order to both understand the characteristics of the particular source as well as identify the owner who is responsible for its proper operation and ultimate disposal. PWD intends to gather the following information regarding each potential source:

1. Name of POTW in whose drainage shed the equipment is located
2. PWD identification #
3. Name of agency referring PCB source to PWD
4. Date of last inspection of equipment by PWD or its agent
5. Name of inspector
6. Name of company which owns equipment
7. Street address of facility where source is located
8. Township address of facility where source is located
9. Zip Code address of facility where source is located
10. GIS coordinates of facility where source is located
11. County address of facility where source is located
12. Name of site or complex where source is located
13. Name of building where source is located
14. Name of contact at site who maintains PCB equipment
15. Phone number of contact at site who maintains PCB equipment

16. Name of company official responsible for management of PCB equipment
17. Title of company official responsible for management of PCB equipment
18. Street address of company official responsible for management of PCB equipment
19. Township address of company official responsible for management of PCB equipment
20. State address of company official responsible for management of PCB equipment
21. Zip Code address of company official responsible for management of PCB equipment

    (For PCB sources located in suburban townships which discharge into the PWD collection system)
22. Name of suburban utility under contract w/PWD
23. Location or name of connection to PWD System

    For PCB sources located within Philadelphia
24. Name of Trunk Sewer connected to site
25. Name of Intercepting Sewer connected to site
26. Is the site in a combined or separate sewer district?
27. Name of agency responsible for management of pretreatment permit
28. Identification of pretreatment permit number
29. Type of PCB source/equipment
30. Number of identical PCB sources at location
31. Type of Aroclor contained in equipment
32. Total PCB concentration
33. Fluid volume (gal)
32. PCB mass (lbs)
33. PCB mass (kg)
    Status of PCB equipment
34. In use
35. Out of service
36. Disconnected
    Status of building housing PCB equipment
37. Operating
38. Closed
39. Abandoned/not secure
40. Comments including any past spills from source, or company plans regarding future of source, etc

The electronic copy of this spreadsheet contains columns to allow recording of the above information. All information currently available regarding each source has been incorporated into the spreadsheet. For ease of printing, only some of the columns have been identified in the printed version of this PMP.

Please see attached spreadsheet PCB Devices

C I T Y   O F   P H I L A D E L P H I A

Bernard Brunwasser
Water Commissioner

W A T E R   D E P A R T M E N T
1101 Market Street, 5th floor
Philadelphia, Pa 19107

June 10, 2005

Re: Request for PCB Information in
Compliance with PMP Rule

Executive Director
Delaware River Basin Commission
25 State Police Drive
P.O. Box 7360
West Trenton, New Jersey 08628-0360

Dear Carol:

On May 18, 2005, the Delaware River Basin Commission (DRBC) passed a resolution adopting the Pollution Minimization Plan (PMP) rule. The rule directs dischargers, including the Philadelphia Water Department (PWD) by reason of its three POTWs:

Northeast Water Pollution Control Plant, NPDES Permit No. PA0026689
Southeast Water Pollution Control Plant, NPDES Permit No. PA0026661
Southwest Water Pollution Control Plant, NPDES Permit No. PA0026671

to develop and submit its PMP for PCBs within 90 days of receipt of notice from the Executive Director of DRBC.

In compliance with the rule, PWD requests your agency's assistance in obtaining information, if any, regarding of the existence of PCBs in PWD's sewersheds. PWD has already received such information from both the Philadelphia Fire Department as well as the Philadelphia Department of Public Health and, of course, gleaned the records of its own Industrial Waste Unit. We are now reaching out to other agencies which might possess useful information. The agencies to whom we are inquiring include:

USEPA
(including information from CERCLA, TSCA and RCRA databases)

PaDEP
DRBC
Delaware Estuary Program
PECO (Excelon) -electric service provider

If you have knowledge of other agencies, which could provide useful information regarding PCB sources affecting PWD, we would appreciate your sharing that information

The PMP rule, in part, requires that the discharger include, in its PMP submission for PCBs, the following information:

(4.30.9 E.) 4. <u>Description and Map of Known Sources</u>

a. Description of all materials, equipment, process, soil area or sediment area within a facility, site or service area, from which PCBs are released directly or indirectly into a wastewater treatment system, sewage collection system, stormwater collection system, stream or river, including a description of the pathways, if known
b. Site map or collection system map showing location of known sources and pathways

5. <u>List of Potential Sources</u>

b. Identify any material, equipment, process, soil area or sediment area or facility that is part of the collection system or that is within the service area and known to contain PCBs, but that is not deemed a source because no pathway to surface water or groundwater exists. Provide estimate of the mass of PCBs, if known.

7. <u>Previous, Ongoing or Planned Minimization Activities Undertaken Voluntarily or Required by Other Regulatory Programs</u>

Previous, ongoing or planned PCB minimization activities underway or to be undertaken voluntarily or in accordance with a federal or state requirement including the level of PCB reduction attained, level of PCB reduction targeted, measures completed, measures underway, and the schedule for planned activities

8. <u>Recommendations for Action Under Other Regulatory Programs</u>

Based on information known at the time of PMP submission or identified during implementation of the PMP, recommendations for remedial activities to be undertaken under the auspices of other local, state or federal regulatory agencies or programs

The collection area to be considered for the purpose of this PCB PMP includes not only the land within the boundaries of the City of Philadelphia, but also includes the areas of our suburban townships which discharge, under a service contract, sewage into the PWD sewershed. I have identified the various zip codes associated with suburban discharge into each of our three (3) POTWs and they are as follows:

<u>Northeast Water Pollution Control Plant</u>

City of Philadelphia:

Zip Code	County	Township
18940	Bucks	Northampton & Newtown Township & Newtown Borough
18954	Bucks	Northampton
18966	Bucks	Southampton
19001	Montgomery	Abington
19006	Montgomery	Lower Southampton
19007	Bucks	Bristol Township
19020	Bucks	Bensalem
19046	Montgomery	Jenkintown
19047	Bucks	Hulmeville Borough & Langhorne Borough
19053	Bucks	Lower Southampton
19056	Bucks	Middleton Township
19054	Bucks	Levittown
19075	Montgomery	Oreland
19090	Montgomery	Willow Grove
19067	Bucks	Lower Makefield

<u>Southeast Water Pollution Control Plant</u>

City of Philadelphia:

Zip Code	County	Township
19038	Montgomery	Glenside
19095	Montgomery	Wyncote

<u>Southwest Water Pollution Control Plant</u>

City of Philadelphia:

Zip Code	County	Township
19003	Delaware	Ardmore
19008	Delaware	Broomall
19018	Delaware	Clifton Hts.
19023	Delaware	Darby
19026	Delaware	Drexel Hill
19029	Delaware	Essington
19032	Delaware	Folcroft
19033	Delaware	Folsom
19036	Delaware	Glenolden
19041	Delaware	Haverford
19043	Delaware	Holmes
19050	Delaware	Lansdowne
19057	Delaware	Wayne

19066	Montgomery	Lower Merion
19070	Delaware	Morton
19073	Delaware	Newtown Sq.
19074	Delaware	Norwood
19076	Delaware	Prospect Park
19078	Delaware	Ridley Park
19079	Delaware	Sharon Hill
19082	Delaware	Upper Darby
19083	Delaware	Upper Darby
19085	Delaware	Villanova
19087	Delaware	Wayne
19004	Montgomery	Bala Cynwyd
19010	Delaware	Bryn Mawr
19017	Delaware	Chester Heights
19035	Montgomery	Gladwyne
19096	Montgomery	Wynnewood
19444	Montgomery	Lafayette Hill

If you prefer a method of describing the collection area other than the use of zip codes, please advise me with your proposal.

With respect to responding to the PMP requirement regarding information on potential sources, it is PWD's objective to create a comprehensive database of all known potential sources of PCBs within each facility's service area and collection system and to provide the following information, as available, for each source location:

3. Company's name
4. Name of site, if any
   (Address of facility where source resides including)
5. Street
6. Township
7. Zip Code
8. County
9. GIS coordinates
10. Name of company's official responsible for management of PCB source
11. Phone number of official
    (Address of company's official responsible for management of source, if different than above)
12. Street
13. Township
14. Zip Code
15. State
    (For PCB sources located in suburban townships which discharge into the PWD collection system)
16. Name of entity under whose contract with PWD the source's company is permitted to discharge its waste into PWD's collection system*

17. Location or name of connection through which waste from source's company enters PWD's collection system*
    (For PCB sources located within the City of Philadelphia's collection system)
18. Name of the trunk sewer which transports the wastes of the source company*
19. Name of the intercepting sewer which transports the wastes of the source company*
20. Identification of pretreatment permit numbers, if any*
21. Agency responsible for management of pretreatment permit*
22. Location (within company's facility) or other identification of PCB source
23. Type of PCB source/device
24. Number of devices at location
25. Type of Aroclor
26. PCB concentration
27. Fluid volume
26. PCB mass
27. Name of agency that initially identified the PCB source*
28. Comments including any past spills from source, or company plans regarding future of source, etc

28. Status of PCB source (in use, out of service, disconnected)*
29. Status of facility (in operation, closed, abandoned/not secure)*

* Denotes information most readily provided by PWD.

Information your agency may process which could assist PWD in populating this database would be appreciated as well as providing information pertinent to responding to PMP section numbers: 4.30.9 E 4
4.30.9 E 7
4.30.9 E 8
as identified above. Thank you.

Sincerely yours,

Bruce S. Aptowicz
Deputy Director of Operations
Philadelphia Water Department

1101 Market Street, 4th floor
Philadelphia, PA 19107

(215) 685-6205
Bruce.Aptowicz@phila.gov

cc: Commissioner Bernard Brunswasser
Deputy Commissioner David Katz
Deputy Commissioner Debra McCarty

Exelon Business Services Company

Legal Department

Telephone 215.841.5544
www.exeloncorp.com

Exelon Business Services Company
2301 Market Street
P.O.Box 8699
Philadelphia, PA 19101

August 22, 2005

Mr. Bruce S. Aptowicz
Deputy Director of Operations
Philadelphia Water Department
1101 Market Street, 4th Floor
Philadelphia, PA 19107

Re: Exelon Corporation response to City of Philadelphia Water Department (PWD) letter, dated 6/10/05, requesting PCB information from Exelon to support PWD compliance with the Delaware River Basin Commission (DRBC) Pollutant Minimization Plan (PMP) rule.

Dear Mr. Aptowicz:

The purpose of this letter, and its appendix, is to respond to your June 10, 2005 letter requesting PCB information from Exelon. We are pleased to respond to your inquiry but do request that you treat this information as business confidential. First, we are concerned that disclosure of information related to Exelon's electrical system infrastructure beyond the PWD could have Homeland Security implications. Second, while Exelon operates in compliance with federal and state regulations governing PCBs, we are concerned that any disclosure of our information to third parties beyond the PWD could be subject to misinterpretation by members of the public unfamiliar with current environmental laws and regulations. We therefore, again, request that the PWD treat the supplied information on a "business confidential" basis.

In developing this response, we have reviewed our databases with regard to PECO Energy and Exelon Power facilities. These are the only two Exelon business units that have physical infrastructure operations within the City of Philadelphia. With regard to these fossil generation plants, Exelon Power has determined that, with the exception of domestic sewage hookups with the PWD, its plants within the City limits discharge directly to either the Schuylkill or Delaware Rivers under existing NPDES permits. Therefore, Exelon Power has no information to report to the PWD. The balance of this letter will therefore focus on providing information related to PECO Energy's operations (hereafter referred to as PECO).

Operating Practices

PECO complies with the Toxic Substance Control Act (TSCA) regulations for PCBs (40 CFR 761). While these regulations banned the manufacture and sale of PCBs in the late 1970s, they specifically authorize the continued use of PCBs in electrical equipment, provided that the equipment is not leaking and that certain other steps are taken, depending on equipment size, concentration and location. These other steps include actions such as periodic inspections, labeling and recordkeeping.

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PCB Reduction Activities

As part of a plan instituted almost a decade ago, PECO is continuing the phase-out of equipment containing PCBs. In 2004, PECO removed 288 PCB capacitors from substations, disposing of all PCB fluid in accordance with the TSCA requirements. PECO has now removed or replaced almost all PCB sources from its system, including all known PCB transformers in commercial buildings, all known PCB distribution equipment outside of substations, and 68 percent of all PCB capacitors in PECO substations. When compared to its total inventory of all electrical equipment, a limited number of PCB transformers and PCB capacitors remain in service on the system. This equipment is monitored and periodically reviewed for replacement or retrofill.

Potential Sources of PCBs

The vast majority of PECO's current distribution equipment in service on the system are filled with mineral or silicon oil and do not contain PCBs. Testing of this equipment that are taken out of service verifies this observation. Since the mid-1980s, manufacturers have labeled all distribution transformers purchased by PECO as being non-PCB (blue sticker).

However, currently, and historically, pole top, pad mount, underground distribution transformers, and certain smaller substation oil filled equipment purchased by PECO, are totally enclosed and sealed units. These types of equipment are not equipped with oil drain ports to allow oil samples to be taken for testing purposes. Therefore, the PCB concentrations in this equipment manufactured prior to 1980 are unknown. Essentially, testing equipment that does not have drain ports would destroy the equipment. PECO does not have a regulatory requirement to test the oil of this type of in-service equipment for PCB content. However, per regulations, any oil filled electrical equipment whose oil is untested is assumed to be PCB contaminated until proven otherwise.

PECO is responsible for the operation and maintenance of its electrical equipment. Any failure of the equipment resulting in the release of oil from the equipment into the environment is the responsibility of PECO and is responded to in accordance with applicable regulations. These regulations require PECO to report spills and releases and to complete remediation of the spilled oil.

PECO has in place spill reporting procedures and has the capability to remediate spills using both internal resources and external contractors. Under PECO's procedures, any oil reaching a storm drain is reported to the appropriate regulatory agencies, including notification to the PWD if the occurrence is in Philadelphia. Although there are limited number of transformers and capacitors located at PECO substations containing PCBs ≥50 ppm, PECO's spill control plans and procedures should prevent the release of PCBs from electrical equipment to the PWD system in all but the most extreme cases.

While we question whether PECO's substation equipment should be considered a "potential source" to the PWD for PMP purposes, the attached appendix contains a listing of our latest information regarding PECO Energy substation transformers and capacitors that contain ≥50 ppm PCBs that are located within the City limits. With regard to potential sources of PCB

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outside of Philadelphia, PECO has contacted the townships listed in your letter to determine if they have combined sewers that discharge to the PWD sewer system. All of the townships, except for Lower Merion and Darby Borough, provided a response indicating that they do not have combined sewers that are connected to the PWD sewer system. Based on this information, PECO was able to identify one PCB contaminated regulator located in Upper Darby that may be a potential source of PCB and it is included in the appendix.

We believe the information contained in this letter responds to your request for information, as we have interpreted your request. However, we would be glad to meet with you, and the relevant PWD staff, at any time to discuss the content and extent of the information provided. Should you have any questions, please feel free to contact me at 215-841-6855.

Sincerely,

H. Alfred Ryan
Assistant General Counsel
Exelon Business Services Co.

cc (via e-mail): Bruce Alexander

Business Confidential

APPENDIX

Substation Name	Address	Zip Code	Equipment Type	Equipment	Gallons	SerialNumber	PCB Result (ppm)
ANGORA	1155 S. 57th Street	19143	Regulator	14MT Regulator	290	D554369	605
SPENCER	6106 N. 5th Street	19120	Regulator	#9 Regulator	88	B672304	649
LANGHORNE	LeGrande Avenue	19047	Light & Power	#1 L&P	28	Langh #1 LP	553
SALMON	3440 Richmond Street	19134	Light & Power	#5 L&P	28	8803119	78
CHESTNUT-HILL	7735 Germantown Avenue	19138	Regulator	CHEST 039A REG	69	C714933	377
CHESTNUT-HILL	7735 Germantown Avenue		Regulator	CHEST 039B REG	69	C714937	452
CHESTNUT-HILL	7735 Germantown Avenue		Regulator	CHEST 039C REG	69	C714940	382
CHESTNUT-HILL	7735 Germantown Avenue		Regulator	CHEST 037A REG	115	D570509	171
CHESTNUT-HILL	7735 Germantown Avenue		Regulator	CHEST 037B REG	115	D270507	116
CHESTNUT-HILL	7735 Germantown Avenue		Regulator	CHEST 037C REG	115	D570506	292
STATE	Pennypack St	19136	Cable Compartment	STATE 4 CC	65	3116072	55
TAYLOR	24th & Washington Avenue	19146	Transformer	TAYLO 2 TRN	1365	6535906	318
WIGARD	7515 Ridge Avenue	19128	Transformer (Tap Changer)	WIGAR 2 TC	180	C658161	181
CALLOWHILL	1121 W. Callowhill Street	19123	PCB Capacitors	350 cans	*		Pure PCB
CEDARBROOK	1100 Ivy Hill Road	19150	PCB Capacitors	360 Cans	*		Pure PCB
CRESCENTVILLE	651 Foulkrod Street	19120	PCB Capacitors	260 Cans	*		Pure PCB
FOX CHASE	7738 Tabor Road	19111	PCB Capacitors	90 Cans	*		Pure PCB
HOLMESBURG	4601 Rhawn Street	19136	PCB Capacitors	130 Cans	*		Pure PCB
ROXBOROUGH	7200 N. Umbria Street	19128	PCB Capacitors	180 Cans	*		Pure PCB
TACONY	5031 Elbridge Street	19135	PCB Capacitors	130 Cans	*		Pure PCB
OUTSIDE OF PHILADELPHIA							
Upper Darby	2230 Township Line Rd.	19082	Regulator	Llane 005P REG	?	8049997	390

*Oil Replaced, resample scheduled during next outage to confirm PCB results

* Capacitor cans contain 3 gallons of oil

Delaware River Basin Commission
DELAWARE • NEW JERSEY
PENNSYLVANIA • NEW YORK
UNITED STATES OF AMERICA

Delaware River Basin Commission
25 State Police Drive
PO Box 7360
West Trenton, New Jersey
08628-0360
Phone: (609) 883-9500 Fax: (609) 883-9522
Web Site: http://www.drbc.net

Carol R. Collier
Executive Director

Robert Tudor
Deputy Executive Director

July 19, 2005

City of Philadelphia, Philadelphia Water Department
The Aramark Tower
1101 Market Street, 4th Floor, PWD
Philadelphia, PA 19107-2994

Attention: Bruce Aptowicz

Subject: PCB information for Pollution Minimization Plans

Dear Mr. Aptowicz:

This is in response to your letter of June 10, 2005 to Carol Collier, Executive Director of the Delaware River Basin Commission, regarding information on PCB sources, which could impact the Philadelphia Water Department (PWD) Wastewater Treatment Plants. We commend your efforts in complying with the Commission recently passed resolution No. 2005-9 which requires PWD to develop and submit a pollutant minimization plan (PMP) for PCBs. The Commission is continuing its efforts to obtain information regarding the locations of known and potential sources of PCBs as part of our TMDL efforts. At this time and in response to your request, we have undertaken the following analysis utilizing the information provided in your letter:

1. Input the information provided in your letter into a spreadsheet format.
2. Queried EPA's transformer database, available at http://www.epa.gov/pcb/data.html
3. Compared all known locations of PCB containing transformers in the EPA database, by zip code, to the townships which supply waste water to the three City of Philadelphia Water Pollution Control Plants
4. Identifying hazardous waste sites with PCB contribution to the Delaware Basin via Delaware Toxic Reduction Program (DELTRIP). This program is in its early stages and information will be provided in annual reports.

Results are given in Table 1. Information regarding transformer locations, number of transformers, amount of dielectric fluid, company name, and contact person are provided.

In support of your and others efforts, the Commission is also continuing to explore available information regarding PCB sources. We have requested EPA's PCB Activity Database (PADS) and upon receipt will conduct additional analyses to provide further information to assist in PMP efforts. However, available databases are limited in their scope, and should not be considered to be without omissions.

Therefore, we suggest that you contact the municipal officials, fire departments of the township identified in your letter and inquire as to the availability of additional information regarding sources of PCBs.

Pollutant minimization plans by their nature are long-term endeavors and we wish you success in your efforts. We look forward to the status report on PWD's track-down study at the next TMDL IAC Meeting.

Sincerely,

Gregory J. Cavallo

Gregory J. Cavallo, PG

c: CRC

Table 1.

Known locations of PCB containing transformers in watersheds which supply waste water to the City of Philadelphia Waste Water Treatment Plants

Waste Water Treatment Plant	Zip Code	Company Name	Contact Name	Contact Phone Number	Street Address of Transformer Location	Weight of Transformer Dielectric Fluid	Number of Transformers
Southwest WPCP	19033	Goebelwood Ind. Inc,	Ronald Goebel	(610) 532-4644	100 Sycamore Ave.	52	3
Southwest WPCP	19082	PECO Energy Co.	David Mobraaten	215-841-5679	380 Long Lane	57	1
Southwest WPCP	19096	PECO Energy Co.	David Mobraaten	215-841-5679	E. Wynnewood Road, SW/O Lancaster Pike	3686	1
Northeast WPCP	19047	PECO Energy Co.	David Mobraaten	215-841-5679	Legrande Avenue	3806	1
Southwest WPCP	19082	Peco Energy Company	John McMenamin	610-970-2228	2131 N 62nd Street	460	1
Northeast WPCP	19067	Peco Energy Company	John McMenamin	610-970-2228	900 Big Oak Road	3806	1
Northeast WPCP	19054	Peco Energy Company	John McMenamin	610-970-2228	Walnut & Fourth Street	7612	2
Southwest WPCP	19083	Peco Energy Company	John McMenamin	610-970-2228	WesterChester Pike & Ashton Rd	3806	1
Northeast WPCP	19006	Peco Energy Company	John McMenamin	610-970-2228	Betharyes Road & 2nd St Pike	68	1

SOURCE: PROVIDED BY DRBC 7/05

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Bruce S. Aptowicz
Deputy Director of Operations
Philadelphia Water Department
1101 Market Street, 4th Floor
Philadelphia, PA 19107

JUL 20 2005

Re: Freedom of Information Act Request: 03-RIN-01213-05

Dear Mr. Aptowicz:

This is in response to your Freedom of Information Act Request regarding PCB information in compliance with the Pollution Minimization Plan Rule.

A search of the records of the Waste & Chemicals Management Division (WCMD), encompassing the City of Philadelphia and the various suburban zip codes identified in your request, revealed three facilities that reported the discharge of PCBs into POTWs for the reporting years 1989 and 2003. We are enclosing reports from our Toxics Release Inventory System for each of these facilities, namely:

Rohm & Haas Co., Old Route 13 and Route 413, Bristol, PA 19007
PPM, Inc., 4105 Whitaker Avenue, Philadelphia, PA 19124
GE Co. Re-Entry System, 3198 Chestnut Street, Philadelphia, PA 19101

In addition, in February 2002, WCMD provided information directly to the Delaware River Basin Commission (DRBC) regarding Item 5 of your request. Specifically the information given to DRBC was a GIS map and corresponding list of the locations of PCB transformers in the Delaware River Basin. Since DRBC already has this information, we have not included it again in this response.

If you have any questions, feel free to contact Mildred Oruska, a member of my staff, at (215) 814-3405.

Sincerely,

Jeffrey A. Pike

Jeffrey A. Pike
Senior Program Manager
Waste & Chemicals Management Division

Enclosures
cc: R. Vanholt (3CG00)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Mr. Bruce S. Aptowicz
Deputy Director of Operations
Philadelphia Water Department
1101 Market Street, 4th Floor
Philadelphia, PA 19107

Dear Mr.Aptowicz:

This is in response to your Freedom of Information Act request received on June 14, 2005.

Request Identification No. : 03-RIN-01213-05 Cost: $-0-

( ) Positive Determination (Material Enclosed).

(X) The Office of Municipal Assistance, Water Protection Division has no information related to this FOIA. If you have any questions, please do not hesitate to contact me at 215-814-5790.

( ) Your request of [date received] modified per discussion with [discussed with] (Remarks Attached)

( ) Fee Waiver under $14.00

( ) Processing Request: Partial information included. If there is remaining information, it will be provided after next review by requester.

( ) Processing Request:

( ) Please see attached bill. Make check payable to U.S. Environmental Protection Agency. Include the Request Identification Number (RIN) on check and mail to EPA-Region III, P.O. Box #360515, Pittsburgh, PA 15251-6515.

Sincerely,

John Lovell
Pretreatment Coordinator

cc: Laura Shields (3PM30)
Richard Van Holt, FOIA Coordinator (3CG10)

Customer Service Hotline: 1-800-438-2474

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

July 12, 2005

SUBJECT: 3RIN-1213-05

TO: Richard VanHolt (3CG00)
Freedom of Information Officer

FROM: Helen DuTeau, Chief (3HS52)
Community Involvement and
Outreach Branch

We wish to advise you that after a search of our CERCLIS database the PCBs- PWDs Sewer sheds, located in the City of Philadelphia, Pennsylvania,, was not found. Therefore, the Superfund Program Office has no records responsive to this request. Although this response is not a denial, if the requester considers this response to be a denial, the requester may appeal it by addressing their written appeal to the U. S. Environmental Protection Agency, Office of Environmental Information, Records, FOIA and Privacy Branch, (2822T), 1200 Pennsylvania Avenue, N. W. Washington, DC 20460.

If you have any questions regarding this matter please contact Henrietta Woodard (Environmental Protection Assistant) at 215-814-3164.

TRI FORM R REPORTS

PART I. FACILITY IDENTIFICATION INFORMATION *(FORM R)*

DOCUMENT CONTROL NUMBER: 1303201672591

more info Facility Registry System ID: 110000740342

Section 1. Reporting Year

Reporting Year: 2003

Section 2. Trade Secret Information

2.1 Trade Secret: NO

2.2 Sanitized Copy: Unsanitized

Section 3. Certification

CERTIFYING OFFICIAL'S NAME	CERTIFYING OFFICIAL'S TITLE	CERTIFYING OFFICIAL'S SIGNATURE	DATE SIGNED
TIMOTHY MONTGOMERY	PLANT MANAGER	Original	30-JUN-04

Section 4. Facility Identification

TRI Facility ID: 19007RHMNDOLDRT

4.1 Facility Name and Address.

Facility Information

NAME	STREET	CITY	COUNTY	STATE	ZIP CODE
ROHM & HAAS CO	200 RT 413	BRISTOL	BUCKS	PA	19007

Mailing Information

NAME	STREET	CITY	COUNTY	STATE	ZIP CODE

ROHM & HAAS CO	200 RT 413	BRISTOL		PA	19007

PROVINCE	COUNTRY (NON - US)
NO DATA	NO DATA

4.2 Facility Classification

ENTIRE FACILITY	PARTIAL FACILITY	FEDERAL FACILITY	GOCO FACILITY
YES	NO	NO	NO

4.3 Technical Contact

NAME	PHONE	PHONE EXT.	EMAIL
LLOYD DAVIS	2157858871		LLOYDDAVIS@ROHMHAAS.COM

4.4 Public Contact

NAME	PHONE
RICHARD WILLIAMS	2157858828

4.5 SIC Codes

SIC CODE	SIC CODE DESCRIPTION
2821	PLASTICS MATERIALS, SYNTHETIC RESINS, AND NONVULCANIZABLE ELASTOMERS
2869	INDUSTRIAL ORGANIC CHEMICALS, NOT ELSEWHERE CLASSIFIED

4.6 Location

LATITUDE	LONGITUDE
040-05-42	074-52-05

4.7 Dun & Bradstreet Numbers

DUNS NUMBER
002292043
NA

4.8 RCRA ID Numbers

RCRA ID NUMBER

NA
PAD002292068

4.9 NPDES Permit Numbers

NPDES PERMIT NUMBER
NA
PA0012769

4.10 Underground Injection Well Code (UIC) ID Number

UIC ID NUMBER
NA

5 Parent Company Information

Parent Company Name: ROHM & HAAS CO

Parent Company DUNS Number: 002292043

PART II. CHEMICAL - SPECIFIC INFORMATION

DOCUMENT CONTROL NUMBER: 1303201672591

Section 1. Toxic Chemical Identity

1.1 CAS Number: 001336363

1.2 Toxic Chemical or Chemical Category Name: POLYCHLORINATED BIPHENYLS

1.3 Generic Chemical Name: NA

1.4 Distribution of Each Member of the Dioxin and Dioxin like Compounds Category

NA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
NO																	

Section 2. Mixture Component Identity

2.1 Supplier Provided Generic Chemical Name: NA

Section 3. Activities and Uses of the Toxic Chemical

3.1 Manufacture the Toxic Chemical:

Produce: NO Import: NO On-Site Use/Processing: NO
Sale/Distribution: NO Byproduct: NO Impurity: NO

3.2 Process the Toxic Chemical:
Reactant: NO Formulation Component: NO Article Component: NO Repackaging: NO Impurity: YES

3.3 Otherwise Use the Toxic Chemical:
Chemical Processing Aid: NO Manufacturing Aid: NO Ancillary or Other Use: NO

Section 4. Maximum Amount of the Toxic Chemical Onsite During the Calendar Year

Maximum Chemical Amount: 1,000 - 9,999 pounds

Section 5. Quantity of the Toxic Chemical Entering each Environmental Medium Onsite

5.1 Fugitive or Non-Point Air Emissions

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
NO	0	Pounds	O - Other Approaches

5.2 Stack or Point Air Emissions

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
NO	0	Pounds	O - Other Approaches

5.3 Discharges to Receiving Streams or Water Bodies

STREAM/WATER BODY NAME	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	% FROM STORMWATER
NA				

5.4.1 Underground Injection Onsite to Class I Wells.

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.4.2 Underground Injection Onsite to Class II-V Wells.

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5 Disposal to Land Onsite

5.5.1A RCRA Subtitle C Landfills

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5.1B Other Landfills

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5.2 Land Treatment/Application Farming

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5.3A RCRA Subtitle C Surface Impoundments

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5.3B Other Surface Impoundments

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5.4 Other Disposal

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

Section 6. Transfers of the Toxic Chemical in Wastes to Off-Site Locations

6.1 Discharges to Publicly Owned Treatment Works (POTWs)

6.1.A Total Quantity Transfered to POTWs and Basis of Estimate

6.1.A.	TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
1	NO DATA		NO DATA

6.1.B POTW Locations

6.1.B.	POTW NAME	ADDRESS	CITY	STATE	COUNTY	ZIP CODE
1	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA

6.2 Transfers to other Off-Site Locations

RCRA Number: NA	Parent Company Controlled:
Name: NA	Address:
City:	State:
County:	Zip Code:
Country Code (Non - US):	Province:

TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	WASTE MANAGEMENT TYPE
NO DATA		NO DATA	NO DATA

Section 7A. On-Site Waste Treatment Methods and Efficiency

7A.1a. Waste Stream: NA

7A.1b.	WASTE TREATMENT METHOD(S) SEQUENCE
1	NO DATA

7A.1c. Range of Influent Concentration:

7A.1d. Waste Treatment Efficiency Estimate:

7A.1e. Based on Operating Data?:

Section 7B. On-Site Energy Recovery Processes

ON SITE ENERGY RECOVERY PROCESSES
NA

Section 7C. On-Site Recycling Processes

ON SITE RECYCLING PROCESSES
NA

Section 8. Source Reduction and Recycling Activities

SECTION	TYPE OF QUANTITY	UNITS	PRIOR YEAR	CURRENT REPORTING YEAR	FOLLOWING YEAR	SECOND FOLLOWING YEAR
8.1a	Total on-site disposal to Class I Underground Injection Wells, RCRA Subtitle C landfills, and other landfills		NA	NA	NA	NA

8.1b	Total other on-site disposal or other releases	Pounds	0	0	0	0
8.1c	Total off-site disposal to Class I Underground Injection Wells, RCRA Subtitle C landfills, and other landfills		NA	NA	NA	NA
8.1d	Total other off-site disposal or other releases		NA	NA	NA	NA
8.2	Quantity Used for Energy Recovery Onsite		NA	NA	NA	NA
8.3	Quantity Used for Energy Recovery Offsite		NA	NA	NA	NA
8.4	Quantity Recycled Onsite		NA	NA	NA	NA
8.5	Quantity Recycled Offsite		NA	NA	NA	NA
8.6	Quantity Treated Onsite		NA	NA	NA	NA
8.7	Quantity Treated Offsite		NA	NA	NA	NA

8.8 **One-Time Event Release:**

8.9 Production Ratio: 0

8.10 **Source Reduction Activities**

SOURCE REDUCTION ACTIVITIES	METHOD 1	METHOD 2	METHOD 3
NA			

8.11 Additional Data Indicator: NO

TRI FORM R REPORTS

PART I. FACILITY IDENTIFICATION INFORMATION *(FORM R)*

DOCUMENT CONTROL NUMBER: 1389035481264

more info Facility Registry System ID: 110011481146

Section 1. Reporting Year

Reporting Year: 1989

Section 2. Trade Secret Information

2.1 Trade Secret: NO

2.2 Sanitized Copy: Unsanitized

Section 3. Certification

CERTIFYING OFFICIAL'S NAME	CERTIFYING OFFICIAL'S TITLE	CERTIFYING OFFICIAL'S SIGNATURE	DATE SIGNED
STEVE HANDWERK	FACILITY MANAGER	Original	29-JUN-90

Section 4. Facility Identification

TRI Facility ID: 19124PPMNC4105W

4.1 Facility Name and Address.

Facility Information

NAME	STREET	CITY	COUNTY	STATE	ZIP CODE
PPM INC.	4105 WHITAKER AVE.	PHILADELPHIA	PHILADELPHIA	PA	19124

Mailing Information

NAME	STREET	CITY	COUNTY	STATE	ZIP CODE

PPM INC.	4105 WHITAKER AVE.	PHILADELPHIA		PA	19124

PROVINCE	COUNTRY (NON - US)
NO DATA	NO DATA

4.2 Facility Classification

ENTIRE FACILITY	PARTIAL FACILITY	FEDERAL FACILITY	GOCO FACILITY
YES	NO	NO	No Data

4.3 Technical Contact

NAME	PHONE	PHONE EXT.	EMAIL
BRETT MORTON	4049340902		

4.4 Public Contact

NAME	PHONE
BRETT MORTON	4049340902

4.5 SIC Codes

SIC CODE	SIC CODE DESCRIPTION
4511	
INVA	
NA	

4.6 Location

LATITUDE	LONGITUDE
040-00-38	075-07-13

4.7 Dun & Bradstreet Numbers

DUNS NUMBER
069277549

4.8 RCRA ID Numbers

RCRA ID NUMBER
PAD981113749

4.9 NPDES Permit Numbers

NPDES PERMIT NUMBER
NO DATA

4.10 Underground Injection Well Code (UIC) ID Number

UIC ID NUMBER
NO DATA

5 Parent Company Information

Parent Company Name: UNION PACIFIC CORP.

Parent Company DUNS Number: 048341283

PART II. CHEMICAL - SPECIFIC INFORMATION

DOCUMENT CONTROL NUMBER: 1389035481264

Section 1. Toxic Chemical Identity

1.1 CAS Number: 001336363

1.2 Toxic Chemical or Chemical Category Name: POLYCHLORINATED BIPHENYLS

1.3 Generic Chemical Name: NA

1.4 Distribution of Each Member of the Dioxin and Dioxin like Compounds Category

NA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
NO																	

Section 2. Mixture Component Identity

2.1 Supplier Provided Generic Chemical Name: NA

Section 3. Activities and Uses of the Toxic Chemical

3.1 Manufacture the Toxic Chemical:
Produce: NO Import: NO On-Site Use/Processing: NO
Sale/Distribution: NO Byproduct: NO Impurity: NO

3.2 Process the Toxic Chemical:

Reactant: YES Formulation Component: NO Article Component: NO Repackaging: YES Impurity: NO

3.3 Otherwise Use the Toxic Chemical:
Chemical Processing Aid: NO Manufacturing Aid: NO Ancillary or Other Use: NO

Section 4. Maximum Amount of the Toxic Chemical Onsite During the Calendar Year

Maximum Chemical Amount:

Section 5. Quantity of the Toxic Chemical Entering each Environmental Medium Onsite

5.1 Fugitive or Non-Point Air Emissions

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
NO	0	Pounds	O - Other Approaches

5.2 Stack or Point Air Emissions

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
NO	0	Pounds	O - Other Approaches

5.3 Discharges to Receiving Streams or Water Bodies

STREAM/WATER BODY NAME	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	% FROM STORMWATER
NA				
NA				
NA				
NA				
NA				
NA				

5.4 Underground Injection On Site 87-95

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.4.1 Underground Injection Onsite to Class I Wells.

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
NO			

5.4.2 Underground Injection Onsite to Class II-V Wells.

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
NO			

5.5 Disposal to Land Onsite

5.5.1 On Site Landfill

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5.2 Land Treatment/Application Farming

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5.3 Surface Impoundment

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5.4 Other Disposal

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

Section 6. Transfers of the Toxic Chemical in Wastes to Off-Site Locations

6.1 Discharges to Publicly Owned Treatment Works (POTWs)

6.1.A Total Quantity Transfered to POTWs and Basis of Estimate

6.1.A.	TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
1	NO DATA		NO DATA

6.1.B POTW Locations

6.1.B.	POTW NAME	ADDRESS	CITY	STATE	COUNTY	ZIP CODE
1	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA

6.2 Transfers to other Off-Site Locations

RCRA Number: UTD991301748
Parent Company Controlled: YES
Name: USPCI/GRAYBACK MOUNTAIN
Address: 3 MILES E. 7 MILES N. EXIT 41, I80
City: CLIVE
State: UT
County: TOOELE
Zip Code:
Country Code (Non - US):
Province:

TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	WASTE MANAGEMENT TYPE
1 - 499	Pounds	O - Other Approaches	M72 - Landfill/Disposal Surface Impoundment

RCRA Number: TXD055141378
Parent Company Controlled: NO
Name: ROLLINS ENVIRONMENTAL SERVICES
Address: 2027 BATTLEGROUND RD.
City: DEER PARK
State: TX
County: HARRIS
Zip Code: 77536
Country Code (Non - US):
Province:

TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	WASTE MANAGEMENT TYPE
444000	Pounds	M - Data Monitoring Or Measurements	M50 - Incineration/Thermal Treatment

RCRA Number: ARD069748192
Parent Company Controlled: NO
Name: ENSCO
Address: 47TH. AVE. & SMITH
City: EL DORADO
State: AR
County: UNION
Zip Code: 71730
Country Code (Non - US):
Province:

TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	WASTE MANAGEMENT TYPE
314000	Pounds	M - Data Monitoring Or Measurements	M50 - Incineration/Thermal Treatment

RCRA Number: MOD981506611
Parent Company Controlled: NO
Name: TIPTON ENVIRONMENTAL TECH., INC.
Address: 1 MILE EAST HWY. 50
City: TIPTON
State: MO
County: MONITEAU
Zip Code: 65081
Country Code (Non - US):
Province:

TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	WASTE MANAGEMENT TYPE
		M - Data Monitoring Or	M50 - Incineration/Thermal

444000	Pounds	Measurements	Treatment

RCRA Number: KSD980964993 Parent Company Controlled: NO
Name: APTUS Address: HWY. 169 NORTH
City: COFFEYVILLE State: KS
County: MONTGOMERY Zip Code: 67337
Country Code (Non - US): Province:

TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	WASTE MANAGEMENT TYPE
34650	Pounds	M - Data Monitoring Or Measurements	M50 - Incineration/Thermal Treatment

RCRA Number: GAD980839187 Parent Company Controlled: YES
Name: PPM INC. Address: 1875 FORGE ST.
City: TUCKER State: GA
County: DE KALB Zip Code: 30084
Country Code (Non - US): Province:

TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	WASTE MANAGEMENT TYPE
20000	Pounds	M - Data Monitoring Or Measurements	M72 - Landfill/Disposal Surface Impoundment

RCRA Number: MOD06927754 Parent Company Controlled: YES
Name: PPM INC. Address: 1628 WEST 9TH. ST.
City: KANSAS CITY State: MO
County: JACKSON Zip Code: 64101
Country Code (Non - US): Province:

TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	WASTE MANAGEMENT TYPE
6000	Pounds	M - Data Monitoring Or Measurements	M72 - Landfill/Disposal Surface Impoundment

RCRA Number: MOD06927754 Parent Company Controlled: YES
Name: PPM INC. Address: 1628 WEST 9TH. ST.
City: KANSAS CITY State: MO
County: JACKSON Zip Code: 64101
Country Code (Non - US): Province:

TOTAL TRANSFERS	UNIT OF		WASTE MANAGEMENT

(per year)	MEASURE	BASIS OF ESTIMATE	TYPE
2000	Pounds	M - Data Monitoring Or Measurements	M50 - Incineration/Thermal Treatment

Section 7A. On-Site Waste Treatment Methods and Efficiency

7A.1a. Waste Stream:

7A.1b.	WASTE TREATMENT METHOD(S) SEQUENCE
1	NA

7A.1c. Range of Influent Concentration:

7A.1d. Waste Treatment Efficiency Estimate:

7A.1e. Based on Operating Data?:

Section 7B. On-Site Energy Recovery Processes

ON SITE ENERGY RECOVERY PROCESSES
NO DATA

Section 7C. On-Site Recycling Processes

ON SITE RECYCLING PROCESSES
NO DATA

Section 8. Source Reduction and Recycling Activities

SECTION	TYPE OF QUANTITY	UNITS	PRIOR YEAR	CURRENT REPORTING YEAR	FOLLOWING YEAR	SECOND FOLLOWING YEAR
8.1	Quantity Released					
8.2	Quantity Used for Energy Recovery Onsite					
8.3	Quantity Used for Energy Recovery Offsite					
8.4	Quantity Recycled Onsite					
8.5	Quantity Recycled Offsite					

8.6	Quantity Treated Onsite					
8.7	Quantity Treated Offsite					

8.8 One-Time Event Release:

8.9 Production Ratio:

8.10 Source Reduction Activities

SOURCE REDUCTION ACTIVITIES	METHOD 1	METHOD 2	METHOD 3
NO DATA	NO DATA	NO DATA	NO DATA

8.11 Additional Data Indicator: NO

TRI FORM R REPORTS

PART I. FACILITY IDENTIFICATION INFORMATION *(FORM R)*

DOCUMENT CONTROL NUMBER: 1389035551252

more info Facility Registry System ID: 110002096286

Section 1. Reporting Year

Reporting Year: 1989

Section 2. Trade Secret Information

2.1 Trade Secret: NO

2.2 Sanitized Copy: Unsanitized

Section 3. Certification

CERTIFYING OFFICIAL'S NAME	CERTIFYING OFFICIAL'S TITLE	CERTIFYING OFFICIAL'S SIGNATURE	DATE SIGNED
CHARLES B. CHILTON	MANAGER	Original	22-JUN-90

Section 4. Facility Identification

TRI Facility ID: 19101GNRLL3198C

4.1 Facility Name and Address.

Facility Information

NAME	STREET	CITY	COUNTY	STATE	ZIP CODE
GE CO. RE-ENTRY SYS. DEPARTMENT	3198 CHESTNUT ST.	PHILADELPHIA	PHILADELPHIA	PA	19101

Mailing Information

NAME	STREET	CITY	COUNTY	STATE	ZIP CODE
GE CO. RE-ENTRY SYS. DEPARTMENT	3198 CHESTNUT ST.	PHILADELPHIA		PA	19101

PROVINCE	COUNTRY (NON - US)
NO DATA	NO DATA

1.2 Facility Classification

ENTIRE FACILITY	PARTIAL FACILITY	FEDERAL FACILITY	GOCO FACILITY
NO	NO	NO	No Data

1.3 Technical Contact

NAME	PHONE	PHONE EXT.	EMAIL
CHARLES B. CHILTON	2153544570		

1.4 Public Contact

NAME	PHONE
KRIS MCLAUGHLIN	2158232697

1.5 SIC Codes

SIC CODE	SIC CODE DESCRIPTION
3769	GUIDED MISSILE AND SPACE VEHICLE PARTS AND AUXILIARY EQUIPMENT, NOT ELSEWHERE CLASSIFIED

1.6 Location

LATITUDE	LONGITUDE
039-57-11	075-11-06

1.7 Dun & Bradstreet Numbers

DUNS NUMBER
001680719

1.8 RCRA ID Numbers

RCRA ID NUMBER
PAD002316305

4.9 NPDES Permit Numbers

NPDES PERMIT NUMBER
NO DATA

4.10 Underground Injection Well Code (UIC) ID Number

UIC ID NUMBER
NO DATA

5 Parent Company Information

Parent Company Name: GE CO.

Parent Company DUNS Number: 001367960

PART II. CHEMICAL - SPECIFIC INFORMATION

DOCUMENT CONTROL NUMBER: 1389035551252

Section 1. Toxic Chemical Identity

1.1 CAS Number: 001336363

1.2 Toxic Chemical or Chemical Category Name: POLYCHLORINATED BIPHENYLS

1.3 Generic Chemical Name: NA

1.4 Distribution of Each Member of the Dioxin and Dioxin like Compounds Category

NA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
NO																	

Section 2. Mixture Component Identity

2.1 Supplier Provided Generic Chemical Name: NA

Section 3. Activities and Uses of the Toxic Chemical

3.1 Manufacture the Toxic Chemical:

Produce: NO Import: NO On-Site Use/Processing: NO
Sale/Distribution: NO Byproduct: NO Impurity: NO

3.2 Process the Toxic Chemical:
Reactant: NO Formulation Component: NO Article Component: NO Repackaging: NO Impurity: NO

3.3 Otherwise Use the Toxic Chemical:
Chemical Processing Aid: NO Manufacturing Aid: NO Ancillary or Other Use: YES

Section 4. Maximum Amount of the Toxic Chemical Onsite During the Calendar Year

Maximum Chemical Amount:

Section 5. Quantity of the Toxic Chemical Entering each Environmental Medium Onsite

5.1 Fugitive or Non-Point Air Emissions

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.2 Stack or Point Air Emissions

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.3 Discharges to Receiving Streams or Water Bodies

STREAM/WATER BODY NAME	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	% FROM STORMWATER
NA				
NA				
NA				

5.4 Underground Injection On Site 87-95

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.4.1 Underground Injection Onsite to Class I Wells.

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
NO			

5.4.2 Underground Injection Onsite to Class II-V Wells.

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
NO			

5.5 Disposal to Land Onsite

5.5.1 On Site Landfill

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5.2 Land Treatment/Application Farming

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5.3 Surface Impoundment

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

5.5.4 Other Disposal

NA	TOTAL RELEASE (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
YES			

Section 6. Transfers of the Toxic Chemical in Wastes to Off-Site Locations

6.1 Discharges to Publicly Owned Treatment Works (POTWs)

6.1.A Total Quantity Transfered to POTWs and Basis of Estimate

6.1.A.	TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE
1	NO DATA		NO DATA

6.1.B POTW Locations

6.1.B.	POTW NAME	ADDRESS	CITY	STATE	COUNTY	ZIP CODE
1	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA

6.2 Transfers to other Off-Site Locations

RCRA Number: PAD043583848 Parent Company Controlled: YES
Name: GE CO. Address: 1040 EAST ERIE AVE.
City: PHILADELPHIA State: PA
County: PHILADELPHIA Zip Code: 19124
Country Code (Non - US): Province:

TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	WASTE MANAGEMENT TYPE
1 - 499	Pounds	O - Other Approaches	M10 - Storage Only

RCRA Number: Parent Company Controlled:
Name: NA Address:
City: State:
County: Zip Code:
Country Code (Non - US): Province:

TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	WASTE MANAGEMENT TYPE
NO DATA		NO DATA	NO DATA

RCRA Number: Parent Company Controlled:
Name: NA Address:
City: State:
County: Zip Code:
Country Code (Non - US): Province:

TOTAL TRANSFERS (per year)	UNIT OF MEASURE	BASIS OF ESTIMATE	WASTE MANAGEMENT TYPE
NO DATA		NO DATA	NO DATA

Section 7A. On-Site Waste Treatment Methods and Efficiency

7A.1a. Waste Stream:

7A.1b.	WASTE TREATMENT METHOD(S) SEQUENCE
1	NA

7A.1c. Range of Influent Concentration:
7A.1d. Waste Treatment Efficiency Estimate:
7A.1e. Based on Operating Data?:

Section 7B. On-Site Energy Recovery Processes

ON SITE ENERGY RECOVERY PROCESSES
NO DATA

Section 7C. On-Site Recycling Processes

ON SITE RECYCLING PROCESSES
NO DATA

Section 8. Source Reduction and Recycling Activities

SECTION	TYPE OF QUANTITY	UNITS	PRIOR YEAR	CURRENT REPORTING YEAR	FOLLOWING YEAR	SECOND FOLLOWING YEAR
8.1	Quantity Released					
8.2	Quantity Used for Energy Recovery Onsite					
8.3	Quantity Used for Energy Recovery Offsite					
8.4	Quantity Recycled Onsite					
8.5	Quantity Recycled Offsite					
8.6	Quantity Treated Onsite					
8.7	Quantity Treated Offsite					

8.8 One-Time Event Release:

8.9 Production Ratio:

8.10 Source Reduction Activities

SOURCE REDUCTION ACTIVITIES	METHOD 1	METHOD 2	METHOD 3
NO DATA	NO DATA	NO DATA	NO DATA

8.11 Additional Data Indicator: NO

PMP
Northeast Plant
Strategy for Identifying Unknown Sources
(Trackdown)
Item 6

As discussed in the Item 3.c., description and map or schematic of the collection system, the influent to the Northeast Plant consists of the following major collectors:

1. Frankford Creek High Level
2. Frankford Creek Low Level
3. Somerset Low Level
4. Delaware Low Level Collector

In addition to these collectors and as further described in item 3.e, the Northeast Plant contains on its site sludge impoundment basins whose runoff is directed into the plant for treatment. There are two runoff connections into the plant:

1. South Lagoons Runoff
2. North Lagoons Runoff

Due the nature of the influent connections to the plant which do not provide reasonable, continuous access to all collectors on the plant site, the NPDES permit which governs the operation of the plant, allows for the representation of influent quality to be determined from samples taken at the following three locations:

1. Primary Settling Tanks Influent Set 1 North
2. Primary Settling Tanks Influent Set 1 South
3. Primary Settling Tanks Influent Set 2 at Pit B

The plant effluent is represented by a single composite sample:

1. Plant Effluent

In addition to the above sample locations and due to the size of their individual sewersheds, the following sites will also be sampled in order to trackdown PCB within the sheds:

1. Delaware Low Level Collector at Comly and Milnor Streets
2. Delaware Low Level Collector at Princeton Street, East of State Road
3. Delaware Low Level Collector at Grant Ave., West of State Road
4. Frankford Creek High Level at Romona Street

All of the above locations will be sampled and analyzed for PCBs and suspended solids. This plan encompasses the Northeast Plant Phase 1 Trackdown study.

A diagram, entitled *"Northeast Water Pollution Control Plant, PCB Trackdown Program, Phase 1",* depicting the interceptors, lagoon runoff sewers and the planned sampling locations is attached to this section.

A description of the proposed sampling and analytical methods planned for the Phase 1 project are identified in the following package entitled "*Sampling and Analysis Plan for Polychlorinated Biphenly Congener Trackdown, Phase 1, Northeast Water Pollution Control Plant".*

It is PWD's expectations that we will conduct the Phase 1 sampling effort in 2007. Any further investigations, i.e. Phase 2, will be dependent upon the results of the Phase 1 program.

PWD's objective in conducting this trackdown program is to identify significant sources of PCBs in the sewer shed and to implement reasonable cost effective measures to mitigate the source. Since we are at the initial stage in the investigation, it is unclear as to what sources may be uncovered and, therefore, what might the nature of each source. Clearly, the nature of a source is relevant in considering what legal and physical options are available to PWD in achieving our goal. However, PWD will consult with PaDEP and other regulators in making this determination.

SAMPLING AND ANALYSIS PLAN FOR POLYCHLORINATED BIPHENYL CONGENER TRACKDOWN PHASE 1 NORTHEAST WATER POLLUTION CONTROL PLANT

Revised September 30, 2005

PHILADELPHIA WATER DEPARTMENT

Project Manager: **Bruce Aptowicz** ____________________________

TABLE OF CONTENTS

1 INTRODUCTION

The Pennsylvania Department of Environmental Protection requires, as a component of a PCB Pollutant Minimization Plan (PCB PMP) that large POTWs discharging to the Delaware River engage in a sewershed PCB trackdown study to locate significant PCB sources. To that end, a PCB trackdown committee has been formed to carry out this objective. This Sampling and Analysis Plan addresses the Phase 1 activities of the trackdown for PWD's Northeast Water Pollution Control Plant (NEWPCP) sewershed.

All samples will be submitted to the contract lab for Method 8082 PCB congener analysis and for total suspended solids using method 160.2. An attempt will be made to estimate the flow at each sampling point to calculate mass loadings at those sampling locations.

Since the direction of this program is dependent upon preceding results, we will conduct this effort in phases, with the details of each phase dependent upon the results of the prior phase. The first phase will consist of wet weather samplings. Wet Weather sampling has been selected for the first phase because dry weather samplings at the PWD's POTW effluents demonstrated very low amounts of PCBs present.

Regarding the analytical methodology, we will be using DRBC's analytical protocol described on their web site.

2 PROJECT MANAGEMENT

The project management structure is indicated in Table 1.

Table 1. Roles and Responsibilities of Key Project Personnel

Key individual	Title	Phone	Responsibility
Bruce Aptowicz	Deputy Director Operations Division	215- 685-6205	Provide overall project coordination
Keith Houck	Assistant Manager, Industrial Waste Unit	215-685-4910	Verify the proper collection of wastewater samples, verify proper post sampling activities
Earl Peterkin	Manager, Trace Organics Lab Bureau of Laboratory Services	215-685-1439	Oversee cleaning of all equipment, sample receipt, preservation, proper storage and shipping of all samples to the contract laboratory. Review field logs
William McKeon	Manager, Wastewater Treatment Plants	215-685-6258	Oversee all sampling from within the wastewater plants. Interpret significance of plant sample results
Chris Crockett	Manager, Office of Watersheds	215-685-6334	Oversee all input regarding collector system flow analysis. Interpret data from collection system samples.
Drew Mihocko	Manager, Collection System	215-685-6203	Provide input regarding physical details of the collection system.

3 SAMPLING ACTIVITIES

3.1 SAMPLING LOCATIONS

3.1.1 PRIMARY LOCATIONS

Four locations in the Upper Delaware Low Level Interceptor, two locations in the Frankford High Level Interceptor, one location in the Frankford Low Level Interceptor and one location in the Somerset Low Level Interceptor will be sampled. Six locations within the NEWPCP will be sampled. Table 2 lists these locations.

3.2 DRY WEATHER SAMPLING (RESERVED)

3.3 WET WEATHER SAMPLING

3.3.1 SCHEME

A sample run start will be confined to a qualifying rain event that only occurs as a frontal system. A qualifying rain event is one which equals or exceeds 0.1 inch and whose duration is at least one hour and where there has bee no preceding rainfall within 72 hours of 0.01 inches or greater.

Sampling shall begin at the locations described in Table 2 immediately upon the above criteria being achieved. Two grab samples shall be taken 20 minutes apart at each location to catch the rising hydrograph that is occurring in the sewer. Before samplings are composited and submitted for analysis, there shall be a determination of the rising hydrograph at the NEWPCP influent made and adjusted for the travel time for each location. This confirmation assures that the samples taken at each of the14 locations occur on a rising hydrograph of the storm event. Sampling will start at the top of the system so as to follow the same sewerage down the collector as it picks up additional flows from the trunked sewers. The two grabs from the interceptor (and the plant influent) locations will be combined in equal proportions with one another at the PWD's Bureau of Laboratory Services (BLS) at Hunting Park and Castor Avenues, Philadelphia.

3.3.2 SAMPLING DETAIL

- The PWD industrial waste unit (IWU) will conduct sampling. All sampling procedures will be conducted in accordance with the protocols detailed in this section.
- Dedicated, precleaned equipment will be used for each sampling location. Each sample container will consist of a food grade pint mason jar that has undergone an ultra cleaning at our central laboratory. The samplings will be transferred immediately to I-chem ultraclean bottle. No mason jars will be reused.
- Personnel handling the samples will wear a new pair of disposable powder-free surgical gloves with each sample collected.
- Sewage will be retrieved from the interceptors at manholes using nylon twine affixed to a new, precleaned one-pint mason jar. For those interceptor samples, a dedicated precleaned mason jar will be lowered

by nylon twine from the top of the manhole to the top of the sewage flow several times to retrieve sufficient volume to fill one liter ultraclean I-chem bottle. The filled I-chem bottle will be stored in a cooler, which will contain ice.

- A second one liter ultraclean I-chem bottle will be filled 20 minutes after the collection of the first sample, using the same sampling technique.
- A separate sample for total suspended solids (TSS) will be collected at each location sampled. Each sample will consist of a one-liter sample at the locations listed above.
- The PWD Bureau of Laboratory Services (BLS) will provide all clean glassware, store samples and undertake shipment when a contract laboratory purchase order is in place. BLS will conduct analyses for TSS.
- The contract laboratory will undertake all analyses except TSS. They will supply deionized water, ice coolers and shipping to and from BLS. This water shall be used for all blanks. One liter blank will be collected at each sample location from the rinseates of the mason jar used to retrieve that sample. One of the blanks will be sent on to the contract laboratory. All other blanks will be stored at BLS and their disposition will be dependent on the results of all samples.
- All samples will be transported to the central lab under ice. For each location, BLS will combine the two grab samples. The two grab samples will be combined by gently shaking/swirling the contents of each, and then immediately pour the contents of each into a laboratory prepared sample container. The combined sample will be identified as the respective manhole/plant sample.

Table 2. Location, timing and types of samples to be taken

Sampling location I.D.	Location	Approximate time of sample*	Type	Ratio of combining samples
1	Delaware Low Level at Grant Avenue west of State Road	tbd*	2 grab samples	1 to 1
2	Delaware Low Level at Princeton Street east of State Road	tbd*	2 grab samples	1 to 1
3	Delaware Low Level at Comly and Milnor Streets	tbd*	2 grab samples	1 to 1
4	Delaware Low Level at monitoring well north of Junction Chamber A	tbd*	2 grab samples	1 to 1
5	Frankford High Level IFO 926 Ramona Street	tbd*	2 grab samples	1 to 1
6	Frankford High Level at NEWPCP front gate	tbd*	2 grab samples	1 to 1
7	Frankford Low Level at Luzerne and Richmond Streets	tbd*	2 grab samples	1 to 1
8	Somerset Low Level at NEWPCP south gate (Balfour Street)	tbd*	2 grab samples	1 to 1
9	NEWPCP PST Influent Set 1 North	tbd*	8-hour composite (every 20 minutes)	automatic composite
10	NEWPCP Influent Set 1 South	tbd*	8-hour composite (every 20 minutes)	automatic composite
11	NEWPCP Influent Set 2 at Pit B	tbd*	8-hour composite (every 20 minutes)	automatic composite
12	NEWPCP Effluent	tbd*	8-hour composite (every 20 minutes)	automatic composite
13	NEWPCP South Lagoons Runoff	tbd*	1 grab sample	N/A
14	NEWPCP North Lagoons Runoff	tbd*	1 grab sample	N/A

* To be determined

3.4 EQUIPMENT AND MATERIALS

- 60 unused food grade two part metal top one pint mason jar
- 2 large volume glass jugs
- 18 liter I-CHEM series 300 amber bottles
- Disposable surgical gloves
- glass funnels (wide mouth for narrow mouth 1 liter bottle)
- Ice
- 30 gallon polyethylene bags
- Nylon twine spool
- Ice coolers and shipping (to be provided by contract lab)
- hexane
- methanol
- 3 isco composite samplers w Teflon lined tubing
- deionized water from contract lab
- non-phosphate detergent

3.5 EQUIPMENT CLEANING

Trace level PCB detection limits needed for this program warrant clean sampling procedures to minimize contamination during sample collection. Dedicated equipment will be used whenever possible. Field sampling equipment, if reused, will be cleaned as follows:

- non-phosphate detergent wash
- tap water rinse
- distilled/deionized water rinse
- hexane rinse (pesticide quality or better)
- air dry
- distilled/deionized water rinse.

3.6 QC REQUIREMENTS

3.6.1 BLANKS

One equipment blank that consists of the rinseate from the mason jar supply will be collected and submitted for analysis with the investigative samples.

Deionized water supplied by the contract laboratory will be used as a field equipment rinseate blank.

3.6.2 SAMPLE CUSTODY AND DOCUMENT CONTROL

3.6.2.1 FIELD LOG BOOK

In the field, the sampler will record the following information in the field log book (bound) for each sample collected:

- sample matrix
- name of sampler
- sample source
- time and date
- pertinent data
- analysis to be conducted
- sampling method
- appearance of each sample (i.e., color)
- preservation added
- number of sample bottles collected
- pertinent weather data
- precipitation and hydrographic flow data for rain events
- any other significant observations.

Each field logbook page will be signed by the sampler. BLS will review field logbooks for completeness.

3.6.2.2 SAMPLE LABELS

A unique sample numbering system will be used to identify each collected sample. See table 2.0. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. Samples will be described/labeled as:
NEWPCP Collector-DRBC/EPA PCB TRACKDOWN AND MANHOLE LOCATION
Monitoring-date and time: Example for NEWPCP sample. NE-PCB-trackdown-wet Weather- May X, 2006 1300-A,B,C………………..
The time is that of the second of the two grabs at the location.

3.6.2.3 CHAIN-OF-CUSTODY FORMS

PWD-BLS laboratory services/Laboratory request form # 79-771 (chain of custody form) will be completed for all samples collected during the program. Additionally, chain of custody from the contract laboratory will be used to document sample handling from BLS to the contract laboratory. See Attachment for sample chain of custody form used by PWD.

4 SAMPLE ANALYSIS

4.1 SAMPLE PREPARATION BY BUREAU OF LABORATORY SERVICES (BLS)

The two grabs will be combined 50/50 by volume as follows: gently mix/swirl the contents of each 1liter I-chem jar to insure the sample is homogenized.

Using dedicated pre-cleaned glass funnels transfer the appropriate sample from the 1-liter I-chem bottles to the appropriate 1-liter, I-Chem series 300 amber glass bottle as follows
:

1- 1 liter each of sewage at locations 1 through 8

1-1 liter of field/equipment rinseate blank,
1-1 liter of reagent blank (to be stored indefinitely)

Samples will be stored between 0 and 4^{o} C.

Samples will be logged into LIMS and assigned LIMS numbers.

4.2 ANALYTICAL METHODS

All samples will be analyzed by the contract lab using EPA Method 8082– Polychlorinated Biphenyls by Gas Chromatography. Additionally, all samples will be analyzed for Total Suspended Solids using EPA Method 160.2.

5 DATA ANALYSIS

The PCB monitoring data may provide us with a valuable tool in targeting potential sources within the Northeast WPCP drainage district. The PCB source contribution from each of the drainage areas feeding the interceptor between monitoring points will be determined by examining the data
This evaluation will enable us to identify any potential large influx of PCBs. Also the results of the PCB monitoring will be graphically represented by percentage of homolog group found at each monitoring location as well as by congener type. This interpretation hopefully will assist us in trying to fingerprint any mass produced PCB source. In addition, a mass balance analysis of solids and PCBs will be performed on a system wide basis. This will involve using estimated flows and solids concentration data from the sewers leading to Northeast.

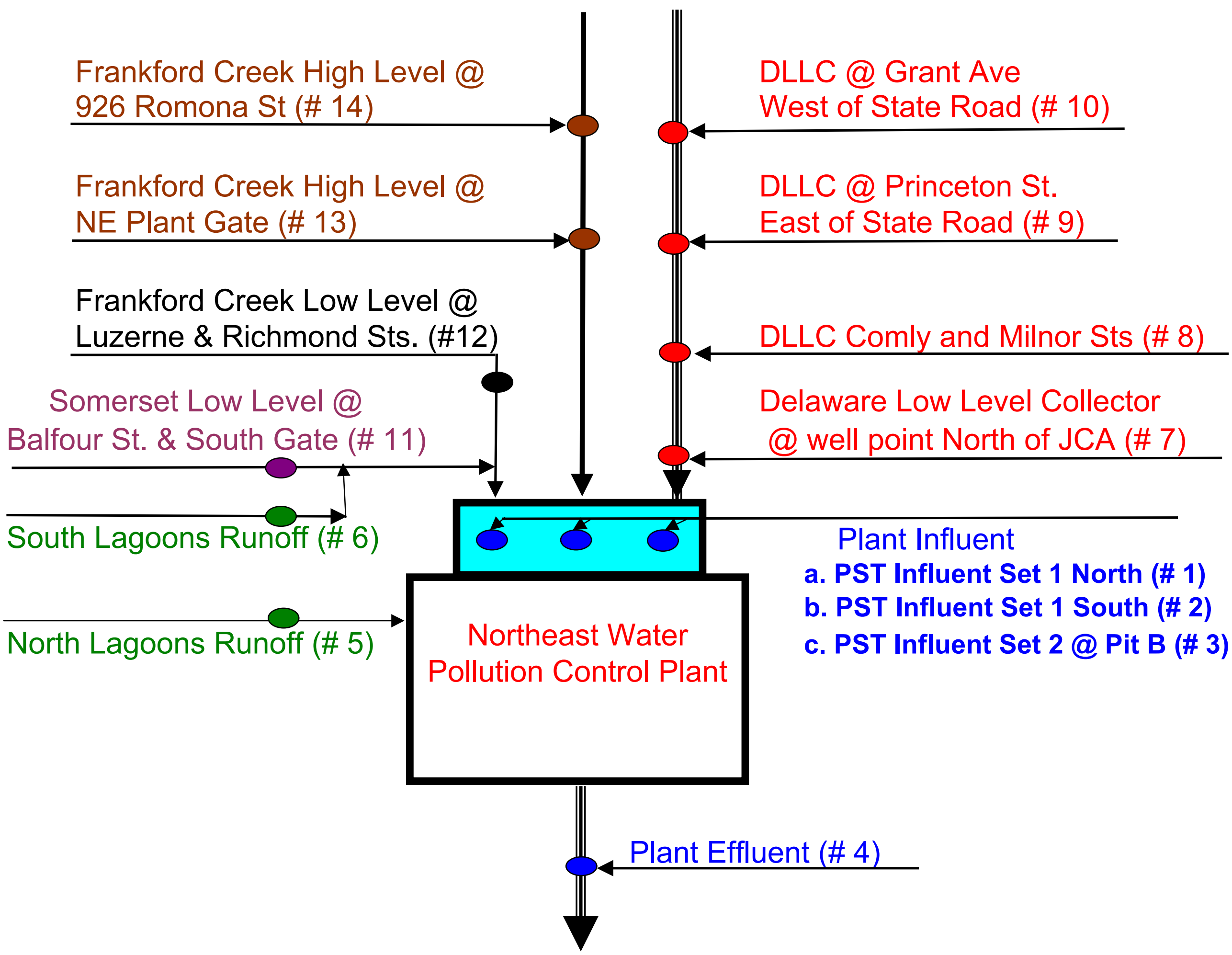
TSS data will be used to characterize the sample as representative of wet weather influenced sewage and to perform a mass solids (TSS) balance on in-sewer loadings as compared to influent loadings as measured at the plant influent.

APPENDIXES

Map of sampling sites for Northeast Water Pollution Control Plant sewershed

Sample BLS chain of custody form

Northeast Water Pollution Control Plant
PCB Trackdown Program
Phase 1



PMP
Northeast Plant
Previous Minimization Activities
Item 7

As described in Section 4. Known Sources, the water treatment coagulant used at the Baxter Water Treatment Plant is produced by the DuPont Company. This product contains PCBs, most of which are captured by the water treatment processes and discharged into the Northeast Plant sewer shed. The Dupont Company reports the following activities to reduce the PCB concentrations in their ferric chloride.

In the spring of 2001 DuPont analyzed the ferric chloride by-product and found approximately 1.49 ppb of PCBs in the ferric chloride by-product. DuPont promptly launched a program to determine how PCBs are incidentally manufactured in the TIO2 process. The objective of the program is the virtual elimination of PCBs as technology becomes available with a focus on source reduction versus end of pipe treatment. The DuPont technical team developed several short terms process modification to reduce incidental manufacturing of PCBs and 15 long term options that could possibly reduce PCB generation by 90% from the 2001 levels.

The short term reduction effort was quickly implemented in 2002. The effort consisted of a change in raw material use (oil used to keep ore dust down), additional process controls, and installation of settling tanks. These actions reduced PCBs generation by approximately a 60%.

In order to obtain information regarding previous, ongoing or planned pollutant minimization activities, PWD wrote to a number of agencies who may have knowledge of such programs in the PWD sewer sheds as explained in this PMP report under Section 5. Northeast Plant, Potential Sources. The following activities were reported to us from those agencies.

The USEPA has an ongoing PCB minimization effort occurring at the Metal Bank Superfund Site located at 7301 Milnor Street, Philadelphia. PWD was contacted by the USEPA in regards to the receipt of the proposed discharge of treated wastewater from the site. After consultation and agreement with PaDEP, DRBC and USEPA, PWD agreed that it would issue a discharge permit into the Northeast sewer shed with a PCB discharge limit of 0.11 gm/day. It is expected that following the completion of this multi-year PCB mitigation project, the resulting inflow of PCBs from the site and into the Delaware River will have significantly diminished. It was the Federal and State regulatory position that the short term intake of additional, but limited PCBs into PWD's sewers would result in a far greater, long term benefit to the environment.

The following document represents the commitment PWD has made towards this cleanup process. It is a letter from PWD to USEPA offering a proposed discharge permit for the site treatment project. This agreement, by PWD, to accept the treated site discharge has been incorporated in the agreement in the United States District Court for the Eastern District of Pennsylvania by all parties.

The Philadelphia Department of Public Heath provided PWD with several locations of historical PCB spill sites within the boundaries of the City of Philadelphia. These are listed in the following spreadsheet entitled *"PMP- NE PCB Sites – Health Dept"*. Many of these sites date back in time several decades and were quite small in nature, however they continue to be listed as PCB sites by the Health Dept. PWD's Industrial Waste Unit's inspectors will attempt to investigate the current environmental status of each of these sites over the first two years of this PMP. Sites which are believed to represent no further threat to the environment will be eliminated from the listing. Sites which continue to represent a threat will be characterized in future annuals reports together with any plans to further minimize the sources.

The PaDEP reports that they have a number of sites located within the Northeast sewer shed which are ACT 2 PCB Sites and should be reported in the PMP as possible sites for which previous minimization activities have occurred. A meeting, on September 5, 2005 was held between PWD and state officials, in response to PWD's letter, to discuss this inventory which is currently located on a rather large PaDEP Southeast Region database. The outcome of the meeting was that PWD would forward a set of possible descriptors for each site. PaDEP would use the descriptors to produce a listing of Act 2 sites. It was recognized that considerable effort on the part of PaDEP would be required to produce the listing and that the time required to complete the task might go beyond the window of time which we have to incorporate the results into our PMP. That is the current situation, PWD will incorporate the complete list of sites into our first annual report. Attached is a copy of the email entitled *"PMP – Identification of Known Sources, by Bruce Aptowicz"* which lists PWD's criteria.

It was agreed by all parties that this 5 year PMP would not require a site visit by PWD personnel as other PCB sources have higher priorities. However, should the trackdown effort result in the detection of a significant unknown source in a specific part of the Northeast sewer shed, we look examine PaDEP's ACT 2 listing for any nearby sites and inspect those sites as the potential sources of the unknown loading.

C I T Y O F P H I L A D E L P H I
A

Bernard Brunwasser
NT
Water Commissioner

W A T E R D E P A R T M E

1101 Market Street, 5th floor
Philadelphia, Pa 19107

November 4, 2004

Linda Dietz
Remedial Project Manager
U.S. EPA Region III
1650 Arch Street
Philadelphia, PA

Via Fax:

Re: Permitted Discharges from the Metal Bank Site

Dear Linda:

Attached please find a proposed permit from the City of Philadelphia Water Department for the discharges from the Metal Bank Site. The City is pleased that the site remediation contractor will be able to comply with permit limits that should minimize the impact of pollutants to the City's facilities and to the environment. Provided these limits are met, the Water Department does not believe there will be a measurable impact on the Delaware Low Level Intercepting Sewer or on the Northeast Water Pollution Control Plant. There may, however, be an impact on the Dry Weather Overflow (DWO) sewer pipe.

The permit requires that the discharge be made into the DWO rather than at a point that could result in a contaminated discharge from a combined sewer overflow. As an additional precaution, discharges are prohibited during wet weather.

We know that the DWO currently has sediment deposits. These sediments may contain PCBs. Because certain capital improvements are necessary for cleaning this sewer, the City will not be able to remove the sediment before the planned discharge. Therefore, prior to the commencement of the Metal Bank discharges, the Water Department will sample the sediment and test it for PCBs. If the sediment exceeds 50 Parts Per Million (PPM), the contractor will not be responsible for costs of removal and disposal of the sediment.   If the sediment is less than 50 PPM prior to commencement, and remains below that level at the completion of the project, the contractor will not be responsible for costs of removal and disposal. However, if the sediment is below 50 PPM prior to commencement of discharges and exceeds that level at the completion of the project, the contractor will be responsible for costs of sediment removal and disposal.

Please review the proposed permit with the contractor. If you any questions, please do not hesitate to call me.

Very truly yours.

Bruce S. Aptowicz
Deputy Director of Operations
Philadelphia Water Department

Cc: Jennifer Fields, DEP
David A. Katz, Deputy Water Commissioner
Darlene Heep, Philadelphia Law Department
Patrick O' Neill, Philadelphia Law Department
J. Barry Davis, Philadelphia Law Department
Thomas Healey, Philadelphia Water Department
Thomas Fikslin, Delaware River Basin Commission

Attachment

PHILADELPHIA WATER DEPARTMENT

WASTEWATER DISCHARGE PERMIT

PERMITTEE:

MAILIING ADDRESS:

is hereby authorized to discharge wastewater from to the City of Philadelphia sanitary sewer system in accordance with the City of Philadelphia Water Department Regulations (PWDR), any applicable federal, state or local law or regulation and the terms and conditions set forth herein. All discharges authorized herein shall be consistent with the terms and conditions of this Permit. The discharge of any pollutant identified in this Permit more frequently than or at a level in excess of that authorized, as well as failure to fulfill any other term or condition of this Permit, shall constitute a violation of this Permit.

This Permit shall become effective on and shall expire at midnight on
.

By: ___________________________
Thomas F. Healey
Manager, Industrial Waste Unit
Philadelphia Water Department

Permit Conditions

- Monitoring will be required for metals and PCBs. Sampling and analysis for metals will be required weekly. This frequency may be reduced if approved in writing by PWD. Sampling and analysis for PCBs and dioxin (2,3,7,8-TCDD) will be required daily for the first two weeks of discharge, then every three days, if this reduction is approved in writing by PWD. Samples shall be composite samples, with aliquots taken once per hour during a discharge day, using an automatic sampling machine with a single sample container. PCB and dioxin results must be available on a three-day turnaround basis. Analytical methods shall be as follows:

  Metals - Refer to 40 CFR 136

  PCBs - Method 8082

Dioxin - Method 613

- Discharge limits for metals will be those found in the Philadelphia Water Department Regulations (PWDR); they are listed below. Discharge limit for PCB will be 0.11 grams per day (0.11 g/day). Discharge limit for dioxin will be 6.0 milligrams per day (6.0 mg/day).

Metal	Daily Maximum (mg/L)	Monthly Average (mg/L)
Arsenic	0.01	0.005
Cadmium	0.2	0.1
Copper	4.5	2.7
Lead	0.69	0.43
Mercury	0.01	0.005
Nickel	4.1	2.6
Silver	0.43	0.24
Chromium (total)	7.0	4.0
Zinc	4.2	2.6
Selenium	0.2	0.1

- Initial analytical results for metals, PCBs and dioxin must be submitted before any discharge is made. Notice must be given at least twenty-four hours before the initial discharge begins. Initial results and initial discharge notice must be made by email to

  Evan Schofield evan.schofield@phila.gov

  Keith Houck keith.houck@phila.gov

  Thomas Healey thomas.healey@phila.gov

- All analytical data must be submitted, as soon as they become available, by email to all addresses indicated above. This reporting frequency may be reduced if approved in writing by PWD.
- Each January and July during the course of the operation, the permittee shall submit to PWD, in writing, a report including all flow and analytical data and a general statement as to the status of the operation with respect to compliance with this Permit. Each such report shall cover the preceding six months of the operation. The CEO of the permittee or his designee must sign each such report.
- Flow (gpd) data shall be submitted weekly by email to all addresses indicated above. This reporting frequency may be reduced if approved in writing by PWD. A wastewater charge of $14.36 per thousand cubic feet ($14.36/Mcf), subject to change, shall be assessed at the end of the project.
- PWD has the option of stopping any discharge in the event of an exceedance.

- All discharges must be made into the dry weather overflow (DWO) pipe (return line) of CSO outfall D-02 at a location to be specified by PWD.
- Discharge is to occur during dry weather only.
- A permit application fee of five hundred dollars ($500.00), as required by the PWDR, must be submitted before the Discharge Permit will become effective. The permit will be in effect for a period of no more than five years.
- The document titled "Construction Water Management", submitted by AMEC and dated March 6, 2001, will be attached to the Discharge Permit as Exhibit A.
- Prior to the start of the permittee's operation, PWD will take a representative sample of the sediment in the DWO. If the total PCB concentration is found to be greater than 50 mg/L by PWD's analysis, PWD will be responsible for the cleaning and disposal of sediment at the conclusion of the permittee's operation. If the total PCB concentration is found to be less than 50 mg/L by PWD's analysis, then PWD shall inspect the DWO pipe for sediment at the conclusion of the permittee's operation. If sediment is present, then a representative sample of the sediment will be taken by PWD and a portion of the sample (split sample) shall be made available to the permittee. If the total PCB concentration is found to be greater than 50 mg/L by PWD's analysis, PWD will notify the permittee in writing to remove and dispose of all sediment within 60 days of such notice. Disposal must be made at a facility permitted for such material.

PMP - NE PCB Sites - Health Dept

WPCP	Location	Date	Amount	Comments
NE	Cottman Ave & Delaware River	1980		PCB dump/ 3 hr clean-up
NE	3100 E. Ontario	10/16/80		PCB spill/ 1/2 hr clean-up
NE	Knights Rd. Shopping Center	3/15/83	3 55-gal drums	
NE	3500 Block Palethorpe	05/24/79	11.6 - 18.9ppm PCB	Spill from transformer
NE	Palethorpe & Tioga	05/25/79		PCB contaminated soil
NE	JF Joyce Co. - 2710 LeFevre St.	07/30/85	> 50 ppm	Leaking transformer
NE	2465 Wheatsheaf Lane	07/15/?		PCB transformer on fire in junkyard
NE	Wayne Junction - Windrim & Germantown Ave.	03/27/84		PCB spill
NE	SEPTA - Roberts Ave Railyard	10/27/88	< 10 gal	Potential hazards of PCB getting to Schuylkill River via storm drain system
NE	5900 Devon Place	06/20/91		PCB contaminated oil leak

Bruce Aptowicz

09/06/2005 01:18 PM

To: jefields@state.pa.us
cc: jnewbold@state.pa.us
Subject: PMP - Identification of Known Sources

Jennifer:

It was productive for us to meet with Bob, Jim and you, yesterday, as we create the PCB - PMP program for PWD. As we discussed, PaDEP will review your database of ACT 2 PCB sites and provide me with an electronic spreadsheet according to the following conditions:

The inventory of PCB sites will include all known sites within the boundaries of the City of Philadelphia

The inventory of PCB sites will also include all known sites within the boundaries of the townships which have combined sewer systems. It was our expectation that PCBs leaving a contaminated site would be caused by storm runoff and therefore be transported by the storm system, not the sanitary system. Therefore, PCBs discharging from a site in a suburban township which has separate systems would be the responsibility of the suburban township, not PWD. Unfortunately, we are not positive as which of our suburban township customers have combined sewers. It is our best understanding that none of the townships listed below have combined sewer systems. If PaDEP has information to the contrary, then please include the Act 2 sites located in those townships.

Jim suggested that very large sources of PCBs in any of our suburban customers should also be included since a release from such a site might also reach the sanitary sewers. The following list represents all of PWD's suburban township customers:

Northeast Water Pollution Control Plant

City of Philadelphia:

Zip Code	County	Township
18940	Bucks	Northampton & Newtown Township & Newtown Borough
18954	Bucks	Northampton
18966	Bucks	Southampton
19001	Montgomery	Abington
19006	Montgomery	Lower Southampton
19007	Bucks	Bristol Township
19020	Bucks	Bensalem
19046	Montgomery	Jenkintown
19047	Bucks	Hulmeville Borough & Langhorne Borough
19053	Bucks	Lower Southampton
19056	Bucks	Middleton Township
19054	Bucks	Levittown
19075	Montgomery	Oreland
19090	Montgomery	Willow Grove
19067	Bucks	Lower Makefield

Southeast Water Pollution Control Plant

City of Philadelphia:

Zip Code	County	Township
19038	Montgomery	Glenside
19095	Montgomery	Wyncote

Southwest Water Pollution Control Plant
City of Philadelphia:

Zip Code	County	Township
19038	Montgomery	Glenside
19008	Delaware	Broomall
19018	Delaware	Clifton Hts.
19023	Delaware	Darby
19026	Delaware	Drexel Hill
19029	Delaware	Essington
19032	Delaware	Folcroft
19033	Delaware	Folsom
19036	Delaware	Glenolden
19041	Delaware	Haverford
19043	Delaware	Holmes
19050	Delaware	Lansdowne
19057	Delaware	Wayne
19066	Montgomery	Lower Merion
19070	Delaware	Morton
19073	Delaware	Newtown Sq.
19074	Delaware	Norwood
19076	Delaware	Prospect Park
19078	Delaware	Ridley Park
19079	Delaware	Sharon Hill
19082	Delaware	Upper Darby
19083	Delaware	Upper Darby
19085	Delaware	Villanova
19087	Delaware	Wayne
19004	Montgomery	Bala Cynwyd
19010	Delaware	Bryn Mawr
19017	Delaware	Chester Heights
19035	Montgomery	Gladwyne
19096	Montgomery	Wynnewood
19444	Montgomery	Lafayette Hill

4. If information that is available to you in the database permits you to believe that the site was essentiall all cleaned to background levels, do not include that site.
5. We all concluded that the proper place within the PMP submission to list these sites was Section 7: *Previous, Ongoing or Planned Minimization Activities Voluntarily or Required by Other Regulatory Programs.* That section requests that the discharger provide the following information with each site listing. Please determine if your database can provide me with information:
   - the level of pollutant reduction attained
   - the level of pollutant reduction targeted
   - measures completed
   - measures underway
   - the schedule for planned activities
6. Additionally, I would suggest that the following information be provided for each site, if available via your database
   - Name of site, if any,
   - Company's name, if any

Street
Township
County
Zip Code
GIS coordinates
Whether the site met site specific standards or state health standards

7. PWD would then add the following information to characterize each site:
   Name of POTW which might be affected by site
   (For PCB sites located in suburban townships which discharge into the PWD collection system)
   Name of entity under whose contract with PWD permits wastewater in the vicinity of the site to discharge wastewater into PWD's collection system
   Location or name of downstream connection to the PWD's collection system
   (For PCB sites located within the City of Philadelphia's collection system)
   Name of the trunk sewer which transports wastes in the vicinity of the site
   Name of the intercepting sewer which transports the wastes in the vicinity of the site
   Name of stormwater outfall which transports the stormwater in the vicinity of the site
8. Additionally, we all concluded that this submission of the 5 year PMP would not require a site visit by PWD personnel as other PCB sources, and specially, the potential sources, have higher priorities.

As I mentioned yesterday, if you are able to gather the requested information and transmit it to me in about a week or two, I should be able to incorporate it into our submission. If your effort takes more time, I will simply reference this task in the PMP submission and incorporate the information into the PMP when it arrives.

Thanks.

Bruce

PMP
Northeast Plant
Recommendations for Action Under Other Regulatory Programs
Item 8

At this point in the PMP process, PWD does not envision the need for other regulatory authorities to take further actions in the mitigation of the currently listed known sources beyond the continued reduction of PCB concentrations in ambient sources waters.

However, should the trackdown effort result in the identification of a PCB source which is not in violation of the Department's Pretreatment Regulations, it is expected that PWD will request a meeting with the appropriate regulatory agencies to determine a proper course of action.

With respect to potential sources, we have identified two instances in Section 5 – Potential Sources in which the involvement of other regulatory agencies is recommended.

PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards requiring the electric service provider, to any facility which operates a PCB transformer, to notify PWD whenever one the referenced facilities requests that their high tension electrical power be shut down for an indeterminate period. If such an arrangement can be accomplished, upon notification, PWD will visit the facility and inquire as to the facility's plans for the transformer and provide information regarding the proper disposal of PCB equipment.

Secondly, upon identifying a facility, containing PCB equipment, which is closed or not secured, PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards minimizing the potential of PCBs from that equipment becoming released into the environment.

PMP
Northeast Plant
Pollutant Minimization Measures
Item 9

1. On-Site Known or Probable Sources

As reported in Section 3 of this report, the Northeast Plant has one probable on-site source of PCBs – the Northeast Plant Lagoons. Included in that section is some evidence to suggest that these lagoons are likely not a source of PCBs into the plant. However, as part of the Northeast Plant trackdown program, PWD will sample and analyze for PCBs in order to quantify their impact upon the plant. Should we determine that the lagoons represent a known source, we will consider employing appropriate filtering measures to the runoff – such as hay bales – to reduce the conveyed load of solids and PCBs into the plant

2. Collection System Known Sources

As described in Section 4. Known Sources, two known sources of PCBs were reported at this time. PaDEP has preliminarily identified additional ACT 2 sites – under past or current mitigation actions for PCBs - that may be the source of PCBs into the environment, but requires additional time to develop an appropriate spreadsheet to characterize each site. PWD will incorporate the PaDEP's list of ACT 2 sites into this PMP in the first annual report. However, should an outcome of the trackdown program result in the identification of an ACT 2 site as being the source of a significant release of PCBs into the sewer shed, PWD will request a meeting of all appropriate regulatory parties to determine a future course of action.

The first reported known source affecting the Northeast sewer shed is the transmission of PCBs from the Delaware River into sewer via treatment processes of the Baxter Water Treatment Plant. The Delaware River has been listed by the State of Pennsylvania as impaired due the presence of PCBs. As a result of this listing, state and federal agencies are working towards the development of a plan which will, upon implementation, result in a reduction in its ambient PCB concentration. PWD recognizes that this effort will, in all likelihood, take decades to demonstrate significant results. During the intervening time, the Baxter Plant, under direction from both the PaDEP and the USEPA, will continue to maximize the removal of solids from its drinking water supply - recognizing that such removal effectiveness also increases the capture of PCBs and their discharge into the sewer. PWD's economic analysis also indicates that the sewering of the Baxter Plant's settling basin waste solids – thereby utilizing the existing Northeast Plant's infrastructure to convey, separate, thicken, dewater and ultimately, dispose of the water plant's commingled solids – continues to remain the only economically feasible option.

The second known source of PCBs in the collection system is the water treatment coagulant used at the Baxter Water Treatment Plant which is produced by the DuPont Company. This product contains PCBs, most of which are captured by the water treatment processes and discharged into the Northeast Plant sewer shed. The Dupont Company reports the following future activities to reduce the PCB concentrations in their ferric chloride.

Since 2002, DuPont completed its evaluation of the long term options to reduce PCB at the source and is committed to implement a $15+million project in 2007. The project will consist of modifications to the industrial process. DuPont anticipates this project will reduce PCB generation by approximately 90% from the 2001 PCB levels in ferric chloride.

3. Potential Sources

PWD believes that the release of potential sources of PCBs into the environment represents a significant threat to the consistent reduction of PCB concentrations in the nearby rivers and streams. Indeed, in September of 1994, PWD was the victim of an illegal discharge of approximately 1000 pounds of PCBs into the Southeast sewer shed. The consequences of the discharge was overwhelming to our biosolids recycling program and undoubtedly resulted in significant quantities of PCBs being conveyed into the Delaware River.

However, PWD recognizes that it is the policy of this country not to require the removal of PCB containing devices (potential sources) when they used and maintained in a responsible manner.

Therefore, PWD believes that the most effective, but reasonable, manner to prevent a release of a stored quantity of PCBs from being illegally released into the environment is to take existing, but limited, federal programs of identification of PCB potential sources to a higher level.

Section 5 - Potential Sources of this plan identifies a plan to visit all current owners of PCB equipment and collect and record forty (40) descriptors for each source. The following tasks are proposed identify and control potential sources:

1. PWD will make a reasonable effort to obtain the requested information from the owners of the equipment. All gathered information will be incorporated into the referenced spreadsheet.
2. Inspectors from the Industrial Waste Unit will visit all listed sites either within the City of Philadelphia or sites located in the sewer sheds of those suburban townships that wholesale discharge sewerage into PWD's collection system for which PWD manages their pretreatment permit.
3. All such listed sites will be visited during this five year plan
4. PWD will attempt to enlist either the suburban community's wastewater utility or its fire code enforcement organization to visit the remaining suburban township sites and provide PWD with the requested information.
5. On the occasion of a visit to a site, PWD will disseminate information to the site contact individual regarding their obligations for proper disposal of the PCB equipment. We will request that the site contact individual notify PWD of any change in status of the PCB equipment.
6. If the site containing the PCB equipment has an industrial waste pretreatment permit with PWD, we will, on the occasion of their next permit renewal, insert language into the pretreatment permit which obligated the permittee to notify PWD if the status changes of the PCB equipment and to follow proper procedures when disposing of the equipment.
7. PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards requiring the electric service provider, to any facility which operates a PCB transformer, to notify PWD whenever one the referenced facilities requests that their high tension electrical power be shut down for an indeterminate period. If such an arrangement can be accomplished, upon notification, PWD will visit the facility and inquire as to the facility's plans for the transformer and provide information regarding the proper disposal of PCB equipment.

8. Upon identifying a facility, containing PCB equipment, which is closed or not secured, PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards minimizing the potential of PCBs from that equipment becoming released into the environment.

PMP
Northeast Plant
Source Prioritization
Item 10

Identified potential sources of PCBs have been prioritized in accordance with their decreasing weights of contained PCBs. Data used to compare PCB weights was limited, as only the USEPA and Philadelphia Water Department records contained information regarding the weight of PCBs contained within the devices. The files provided in Item 5 Potential Sources display the prioritized sites.

PWD will follow this prioritization in the scheduling of site inspections unless geographical convenience or scheduled inspections for the purpose of pretreatment inspections allows us to efficiently inspect sites in addition to those at the top of the list.

Two known PCB sites have been identified in Section 4 of this report. PWD will prioritize PCBs contained in ferric chloride used in the water treatment process.

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 21	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 Activitiess (# 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.			10				10				11									
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	2
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																				

PMP
Northeast Plant
Measuring, Demonstrating and Reporting Progress
Item 12

12.1 Sampling and Analytical Approaches

PWD intends to utilize several different approaches to demonstrate progress towards achieving PCB minimization resulting from the implementation of our PMP.

As required by the PMP, we will sample the effluent of the plant once every two years and will analyze the sample for PCBs using Method 1668A. Reductions in the total PCB concentration over time may be an indicator program success. However, as the DRBC has correctly pointed out in their document entitled "*Recommended Outline for Pollutant Minimization Plans for Polychlorinated Biphenyls in the Delaware Estuary, Municipal Waste Water Treatment Plants and Publicly Owned Treatment Works",* analytical uncertainties may mask effluent reductions. Furthermore, wet weather samples will be collected and their PCB concentrations used in the analysis. However, the data indicates that there is far greater variability in the PCB concentrations of wet weather samples versus dry weather samples. Although there can be a number of causes of this variability, it is likely that the characteristics of each storm event (rainfall intensity, duration, etc) are significant factors. Since future wet weather sampling will cover a range of types of storm events (as long as each meets the requirements of a qualifying storm event), it is likely that the resulting PCB concentrations will contain significant variability due solely to the nature of each rain event.

Therefore, alternative approaches will be included in our annual reports to demonstrate progress.

As provided in the list of PCB potential sources, Item 5, there may be as many 167 sites in the Northeast Plant sewer shed housing PCB contained devices. Additionally, a number of these sites are reported to hold more than one PCB device. At this stage in the program, PWD is uncertain of the current existence of all of the reported devices, but we know that they were reported by the authorities to have existed in the not distant past and there is no reported knowledge on the part of those agencies that they have been removed. PWD will visit each site during the term of this plan and will report the number of devices that have been removed. If the institutional knowledge can provide us with the weight of the removed PCBs, we will report that value also.

Furthermore, PWD has stated concerns over the potential release of PCBs from vulnerable devices – i.e. those located at sites which are closed or abandoned or devices which have been deenergized or moved into storage. We have recommended that, upon identification of such devices, the regulators and ourselves discuss and implement procedures to minimize the risk of these PCBs from being released into the environment. At such, we will separately report the removal of any vulnerable devices.

PWD has reported two known sources. Both sources are discharged into the sewer shed from the Baxter Water Treatment Plant. We will report any reduction in PCB concentrations in the waste streams from the water plant by both measuring the PCBs in the ferric chloride product as well as, using available DRBC ambient data, PCB reductions in the plant's source (Delaware River) water.

PWD has identified a number of sites from the Philadelphia Dept. of Public Health which, we believe, have undergone some form of prior remediation. PWD will inspect each site to either remove it as a potential liability for future PCB release or to recommend activities to reduce the potential risk. We will report the number of sites removed from the list or sites where further remedial action has been recommended or completed.

PWD's objective in conducting its trackdown program is to identify significant sources of PCBs discharged into our sewer shed and then, in cooperation with our regulators, determine and implement procedures to minimize or eliminate those discharges. PWD will report each reduction of PCB load into the shed.

However, as reported in *Item 7, Previous Minimization Activities*, the Northeast Plant is expecting to receive an increased PCB loading, up to 0.11 gms per day, from the Metal Bank Superfund site. However, the acceptance of this load was at the request of the EPA and, after significant discussion with the State and DRBC, was supported by all regulatory parties. Their recommendation to accept this new load was based upon the facts that the discharge into our sewer would occur for only several years, but would permit extensive cleanup of the site with significant environmental benefits to the Delaware River. PWD will report the PCB loading from this temporary discharge into our sewer together with the reported status of the Metal Bank site clean up effort. An estimate of the reduction of PCBs into the environment from the remediation project at Metal Bank will be included.

12.2 Estimated Load

An estimate of the annual baseline load from the Northeast Plant has been determined by calculating the average wet and dry weather PCB concentrations in the plant effluent and then determining the flow for a typical year.

PWD recommends using the typical year flows for future year comparisons and calculations. By doing so, we remove, from the analysis, the variability in annual PCB loads caused by the variation in annual rainfall. Secondly, it is clear that the Northeast Plant will discharge a greater PCB annual loading if it increases its capture of stormwater and thereby increases its flows during wet weather. However, by accomplishing this goal, the environment will receive an overall benefit since the volume of untreated CSO discharge will be reduced. Of course, PWD has been directed, via its NPDES permit, to implement plans to minimize CSO discharge and is well on its way towards accomplishing this long term requirement. By using a typical year plant flow for the annual PMP analysis, we can properly focus our attention on progress towards reducing PCB concentrations in the plant effluent.

The following chart entitled *"Northeast Plant, Baseline PCB Plant Effluent Concentration (pg/l)"* provides our methodology for determining the baseline PCB concentration. PWD uses the PCB data collected in 2001 as the basis for its baseline concentration since that was the time frame in which PWD began to focus attention on reducing PCBs affecting its sewer shed. However, the analytical procedures employed to analyze that data set focused on only 85 congeners while more recent data (2005) required data from 209 congeners. In order to make the 2001 data reflect all 209 congeners, a procedure was employed to estimate the concentrations of the unanalyzed congeners in the 2001 data set by developing a ratio between the total concentration in the 85 congeners to the total concentration of the 209 congeners in the 2005 data set. That ratio was then applied to the 2001 data and an estimate of the concentration from 209 congeners was derived. It is estimated that the average baseline PCB concentration during wet weather is 23,028 pg/l while the average dry weather concentration is 10,426 pg/l.

In order to estimate plant flow for a typical year, PWD examined the annual rainfall patterns for the past 103 years and determined that the year 2000 exhibited close to the average annual rainfall while also providing relevant plant flow data, which were also near long term averages. The plant flow data was examined to identify flows consistent with rainfall events. The attached graph entitled *"NE WPCP Average Daily Flows – 2000"* identifies wet weather days. The average flow for wet weather days and dry weather days were then calculated together with the number of days in each category. Thus, in a typical year, the Northeast Plant experiences 141 wet weather days and 224 dry weather days, while the average plant flow in wet weather is 215 MGD and is 177 MGD in dry weather.

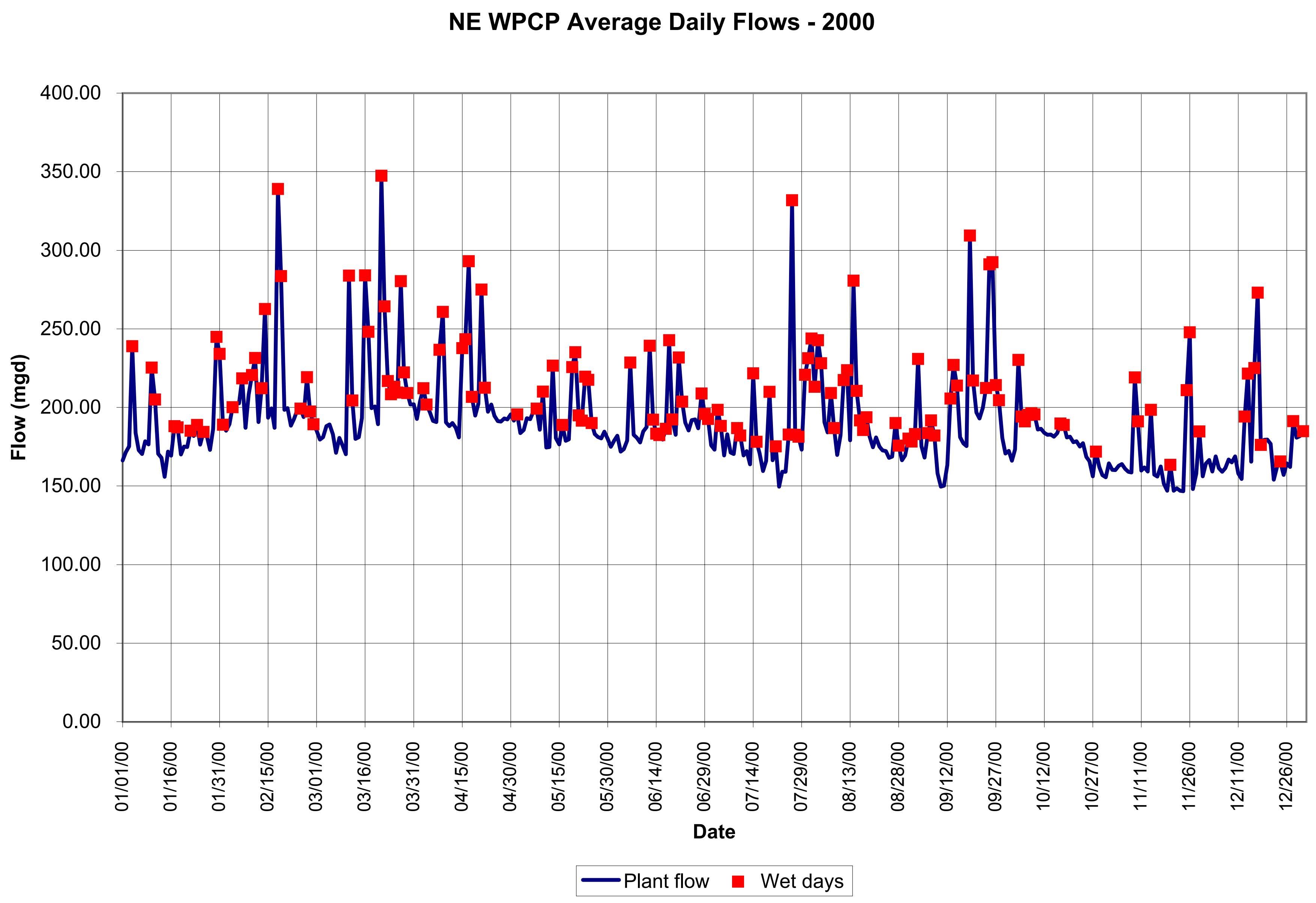
The attached chart entitled *"Northeast Plant, Baseline PCB Plant Effluent Loading (gm/yr)"* displays this data and calculates the baseline annual loading to be **4,201 gm/year**.

12.3 Anticipated Reductions to Baseline Load

Currently, PWD has committed to a reduction in the PCB concentration in the ferric chloride product utilized in its Baxter Water Treatment Plant and which is then discharged into the sewer. We expect to experience a 90 percent reduction in concentration by the end of the third year of the program. Beyond that known source, PWD is uncertain as to the expected success of its ability to identify and, subsequently, minimize other sources and therefore cannot, with any degree of confidence, anticipate further reductions to baseline load. PWD is committed, however, to making every reasonable effort to achieve success of this program and is hopeful that its labors will result in significant load reductions.

12.4 Continuing Assessment

PWD will report progress towards PCB minimization in an annual report starting one year after the commencement of this PMP. Commencement of the PMP will start within 60 days of the receipt of a determination of completeness from the DRBC.


NE WPCP Average Daily Flows - 2000
Flow (mgd)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
01/01/00
01/16/00
01/31/00
02/15/00
03/01/00
03/16/00
03/31/00
04/15/00
04/30/00
05/15/00
05/30/00
06/14/00
06/29/00
07/14/00
07/29/00
08/13/00
08/28/00
09/12/00
09/27/00
10/12/00
10/27/00
11/11/00
11/26/00
12/11/00
12/26/00
Date
Plant flow
Wet days

Measuring, Demonstrating and Reporting Progress
Item # 12
Northeast Plant

Baseline PCB Plant Effluent Concentration (pg/l)

			Wet Weather				Dry Weather			
Line	**Year Samples Taken**	**Data**	**Sample # 1**	**Sample # 2**	**Sample # 3**	**Average**	**Sample # 1**	**Sample # 2**	**Sample # 3**	**Average**
1	**2005**	**Total of all 209 congener concentrations with positive values plus 1/2 detection level for all congeners with non-detections**	**6,002**	**17,641**	**9,781**	**11,141**	**3,259**	**4,924**	**5,811**	**4,665**
2	**2005**	**Using only the 85 (2001) congeners, total concentrations with positive values plus 1/2 detection level for all congeners with non-detections**	3361	10148	5628	**6,379**	1847	2860	3203	**2,637**
3		**ratio of Line 1 to Line 2**	1.79	1.74	1.74	**1.75**	1.76	1.72	1.81	**1.77**
4	**2001**	**Total of 85 congener concentrations with positive values plus 1/2 detection level for all congeners with non-detections**	14023	11721	13808	**13,184**	5365	7476	4838	**5,893**
5	**2001**	**Estimate of total concentration assuming analysis of 209 congeners (Line 3 multiplied by Line 4)**	25,043	20,376	23,998	**23,028**	9,467	12,870	8,778	**10,426**

All reported PCB concentrations **include** 'J' values, and 1/2 the detection limit for those cogeners reported as non-detect ('U')
In 2001, only 85 congeners were analyzed, while 209 were analyzed for in 2005

Item # 12
Northeast Plant

Baseline PCB Plant Effluent Loading (gm/yr)

		Wet Weather		Dry Weather		Total
Baseline Flows (MGD)		215		177		
Baseline Flow Days per Year		141		224		
Baseline PCB Concentration (pg/l)		23,028		10,426		
Baseline PCB Loading (gm/year)		2,639		1,563		**4,201**

PMP
Southeast Plant
Facility Description
Item 3

3.a. Facility Name and Address

Southeast Water Pollution Control Plant
25 Pattison Avenue
Philadelphia, PA 19148-5121

PaDEP Site ID #: 451994
NPDES Permit No. PA 0026671

3.b. Facility Description and Map

The SEWPCP provides full secondary treatment of wastewater for a design flow of 112 million gallons per day (MGD) from an approximately 20 square mile area of the city.

The SEWPCP treats incoming wastewater using five basic unit processes: 1) influent pumping, 2) preliminary treatment, 3) primary treatment, 4) secondary treatment, 5) effluent pumping and disinfection. Processes used for solids handling are located at the Southwest Water Pollution Control Plant (SWWPCP). The Primary and Secondary sludge from the SEWPCP is pumped via a five mile force main to the SWWPCP for thickening and digestion.

The purpose of the influent pumping process is to lift wastewater to the operating level of the plant. The wastewater is lifted by six influent pumps from a low-level interceptor. There are two large bar racks which collect trash and large debris before it can reach the influent pumps.

The purpose of preliminary treatment is to remove smaller objects, debris, grit and other inert material from wastewater to prevent clogging or machinery breakdown due to blockage or abrasion. The preliminary treatment process consists of catenary bar screens and grit channels. The six catenary bar screens remove objects larger than 1 inch in diameter from the wastewater using bar screens and a mechanically operated rake. The six grit channels remove grit and other inert material from the wastewater. These materials are mixed and transported to the SWWPCP for eventual landfill disposal.

The purpose of primary treatment is to remove readily settleable solids and floatables that will separate from the wastewater under quiescent flow conditions. The process is augmented by the use of flocculation channels. Flocculation promotes formation of larger floc particles and the separation of floatables, while providing oxygen to reduce septic conditions. The thickened sludge is sent to the digesters while the floatables are sent to the SWWPCP for disposal.

The purpose of secondary treatment is to remove colloidal and soluble Biochemical Oxygen Demand from the wastewater using biomass and air. In the aeration tanks, dissolved organic compounds and fine solids are metabolized by a concentrated mass of microorganisms called activated sludge. The biomass is separated from the wastewater in the final settling tanks, where quiescent flow conditions allow the activated sludge to settle to the bottom of the tank. The thickened solids collected at the bottom of the tanks while excess sludge is pumped to the SWWPCP for thickening and the remainder returned to the head of the Aeration Tanks.

The purpose of the effluent pumping and disinfection is to pump the plant effluent to the Delaware River under high tide or high flow conditions and to disinfect the effluent before its discharge into the Delaware River. All plant effluent is disinfected using an injected solution of Sodium Hypochlorite. After approximately a thirty-minute travel through the outfall conduit, the wastewater is discharged into the Delaware River.

Please find the following attached maps and diagrams:

1. PMP Plant Process Diagrams –SE
2. PMP Facility Plan Drawing – SE
3. PMP Stormwater Drainage Plan - SE

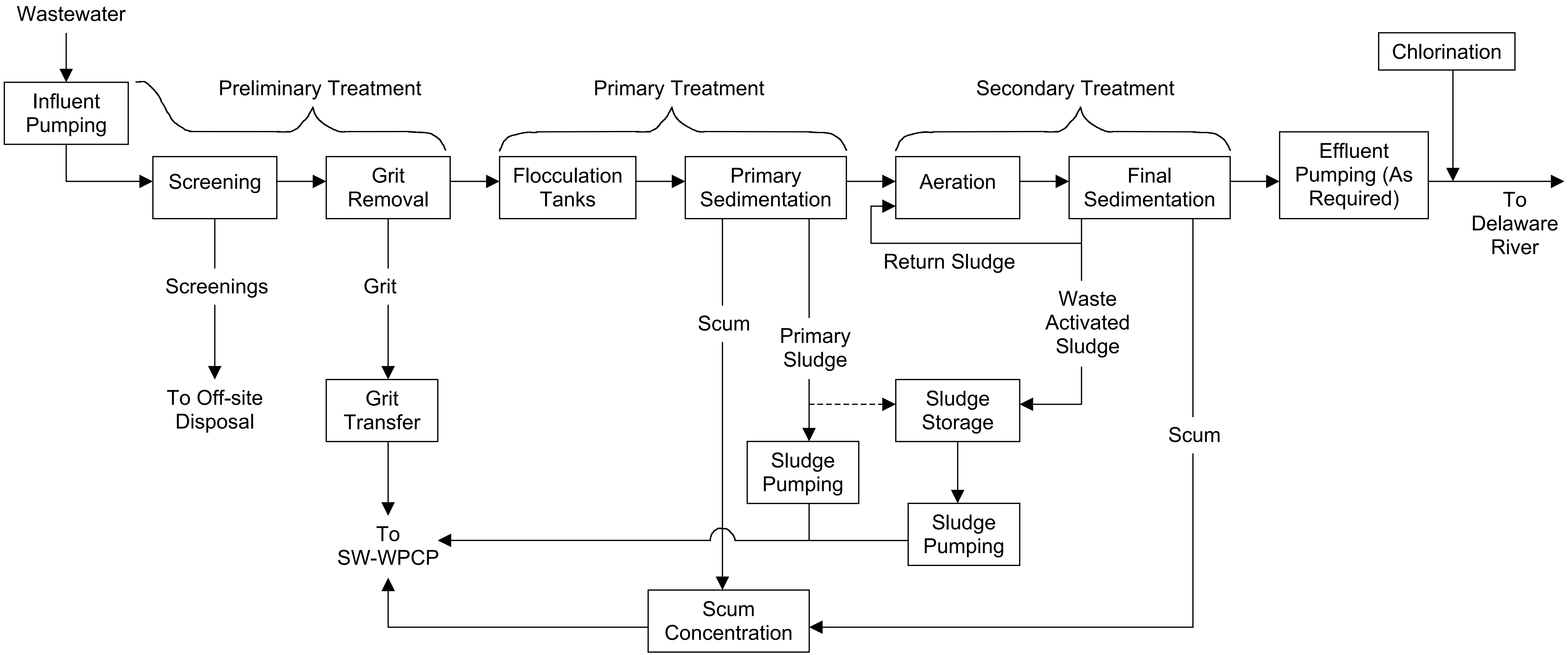
3.c. Description and Maps of Collection System

The PWD service area is divided into three drainage districts: Northeast, Southeast, and Southwest. Each of these drainage districts conveys flow to the respective WPCP of the same name. These three drainage basins are hydraulically independent except during conditions of high flow, when cross connections in the trunk sewer system allow conveyance of some flow between the Northeast and Southeast drainage districts. The service areas are itemized in Table 1 by collection system type.

Table 1 Wastewater Service Areas by Drainage District and Collection System Type

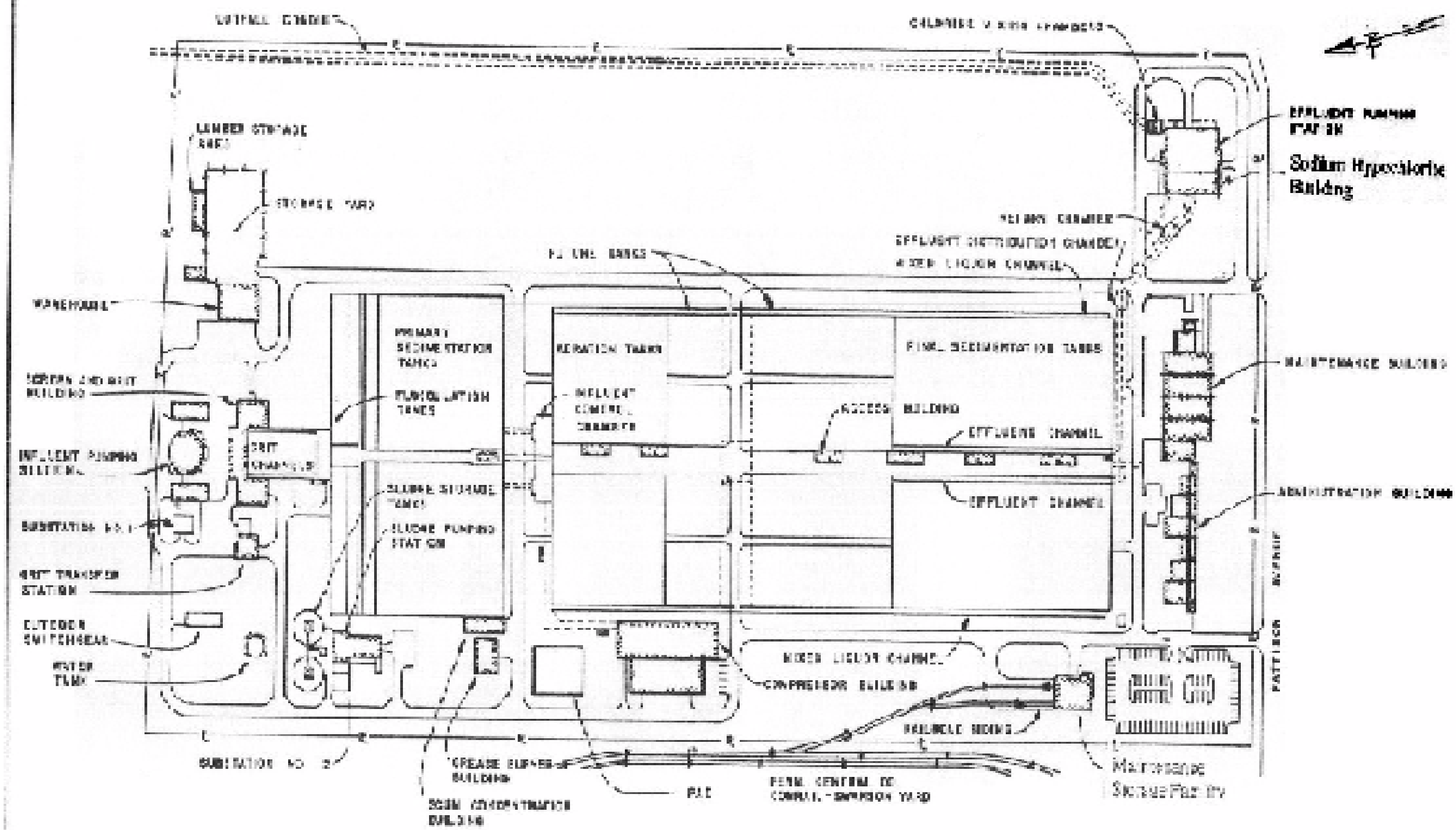
	SE (ac)	SW (ac)	NE (ac)	Total (ac)	%
Combined	8,475	12,741	19,934	41,150	19%
Separate	31	9,732	15,737	25,500	12%
Suburban Sanitary	300	76,600	70,800	147,700	69%
			Total	**214,350**	

Each drainage district contains a network of branch sewers, trunk sewers, combined sewer interceptors, separate sanitary interceptors, and storm relief sewers as shown on Figure 1. Branch sewers collect wastewater from catch basins and lateral connections from drainage areas. The branch sewers convey flow to the trunk sewers, which are larger arterial sewers that convey wastewater to regulating chambers. Combined sewer interceptors convey flow from regulating chambers and separate sanitary interceptors to the WPCPs. Storm relief sewers convey flow from storm relief diversion chambers to the receiving waters during extreme high flow conditions. This network of sewers has been subdivided into 17 interceptor systems and 10 storm relief sewer systems. Table 2 identifies each of the interceptor systems. Table 3 identifies the storm relief sewers systems. Table 4 identifies the major separate sanitary sewer interceptors that are tributary to combined sewer interceptors. Table 5 identifies contributing communities and their associated interceptor systems.



Process Plan Diagram – Wastewater Treatment Processes

FIGURE 2-1

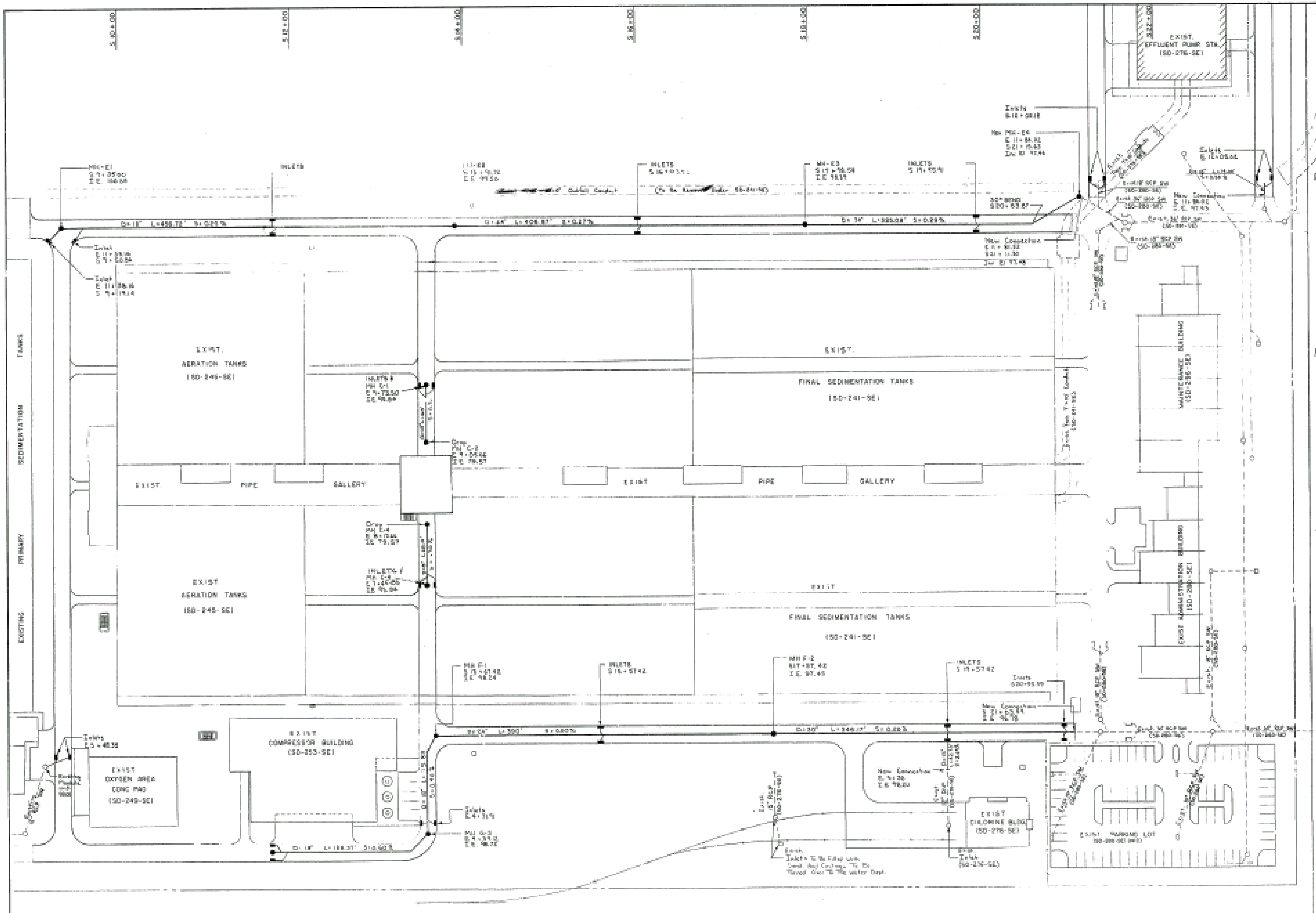


FACILITY PLAN

GREELEY AND HANSEN ENGINEERS

CITY OF PHILADELPHIA WATER DEPARTMENT
SOUTHEAST WATER POLLUTION CONTROL PLANT
OPERATION AND MAINTENANCE MANUAL

Revised 1/11/2005



CITY OF PHILADELPHIA WATER DEPARTMENT	APPROVED	SCALE	WATER POLLUTION CONTROL PROJECT SOUTHEAST WATER POLLUTION CONTROL PLANT GRADING, PAVING, DRAINAGE, LANDSCAPING & YARD PIPING (PHASE 2)	SCALE 1" = 40'

STORMWATER DRAINAGE GENERAL PLAN	DRAWING NO. 3-G-3052
DRAWN BY Bookmiller · CHECKED BY Lawson · SUPERVISOR Arnold Freedman · DATE May 1984	SHEET NO. 2 of 13 WORK NUMBER SD-294-SE

27-2-605

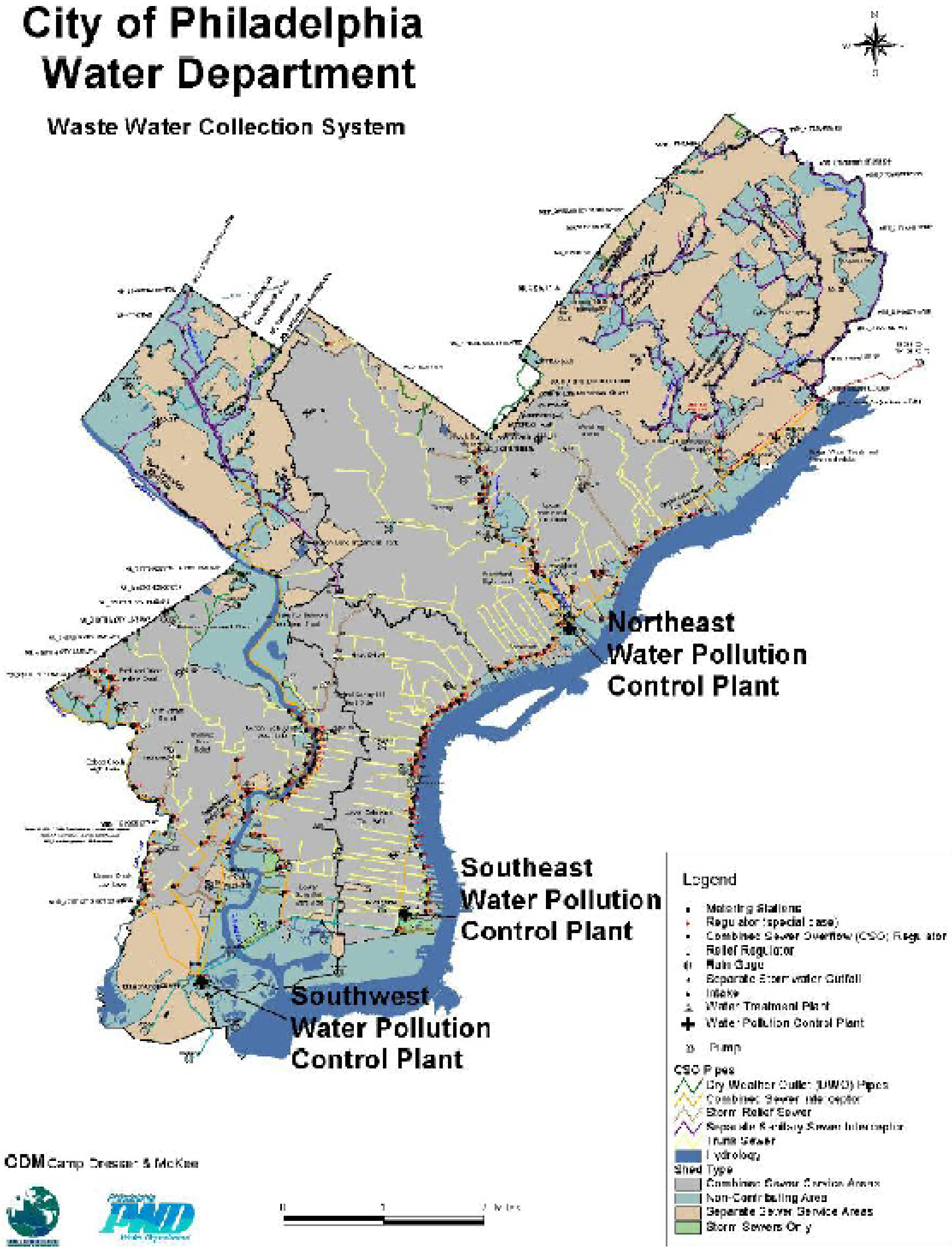


Figure 1 - PWD wastewater collection System

Table 2 Combined Sewer Interceptor Systems in the PWD Service Areas

Combined Sewer Interceptor	Abbreviation	Drainage District
Lower Delaware Low Level	LDLL	Southeast
Oregon Avenue	O	Southeast

Table 3 Storm Relief Systems in the PWD Service Areas

Storm Relief System	Abbreviation	Drainage District
Oregon Ave. Relief Sewer	FR_O	Southeast

Table 4 Separate Sanitary Interceptors Tributary to Combined Interceptors

Separate Sanitary Interceptor	Abbreviation	Receiving Interceptor	Drainage District
Wissahickon High Level	S-WHL	LDLL	Southeast
Cresheim Valley Bridge	S-CVB	LDLL	Southeast
Monoshone Branch	S-MON	LDLL	Southeast

Table 5 Summary of Contributing Communities to the PWD Collection System

Municipality/Authority	Drainage District	Intercepting System
Township of Springfield, Montgomery County *	SE/SW	LDLL/CSES

Source: "Act 537 Plan Volume 1"; BCM, May 1993. * Flows are split between the SE and SW districts.

A brief description of the collection system for this drainage district is as follows.

Southeast Drainage District

Figure 3 shows the collection system for the Southeast drainage district. This figure depicts the combined sewer interceptors and the major separate sewer interceptors, as well as, the location of the CSO regulators, storm relief chambers, and major hydraulic control points. Regulators and relief chambers are described in Section 1.1.4; major hydraulic control points are described in Section 1.1.5. The only suburban community served by the Southeast WPCP is Springfield Township.

The combined sewer interceptors in the Southeast drainage district include the Lower Delaware Low Level (LDLL) and Oregon Avenue (O). The Oregon Avenue Interceptor combines with the LDLL upstream from the Southeast WPCP pumping station, which lifts the wastewater from both interceptors into the preliminary treatment building.

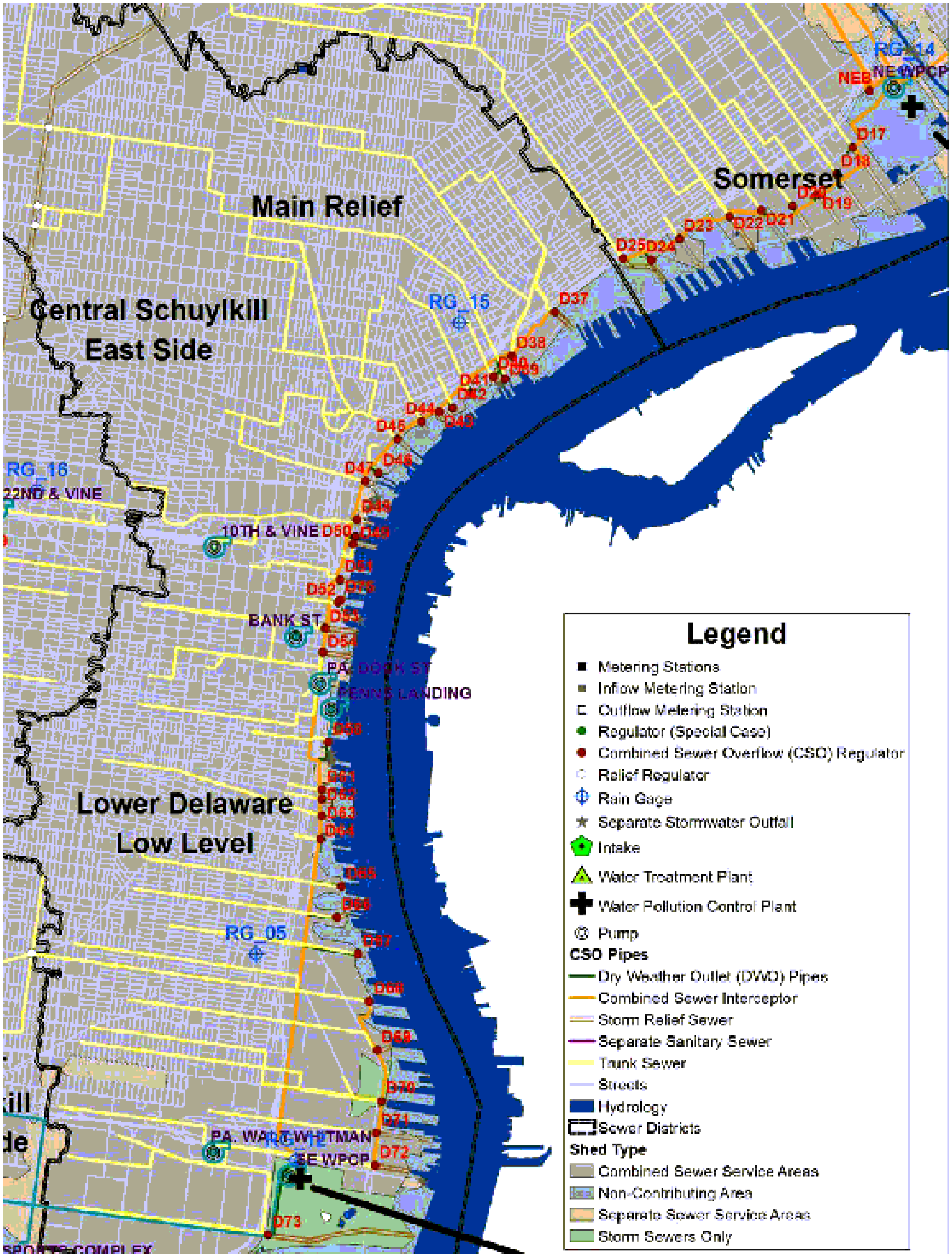
Lower Delaware Low Level: The LDLL interceptor begins in central Philadelphia at the intersection of Dyott St. and Delaware Avenue. The LDLL heads south along the Delaware River and combines with the Oregon Avenue interceptor at Oregon Avenue and Swanson Street. Separate sanitary wastewater flows from the Wissahickon High Level, Monoshone and Cresheim Valley interceptors, including flow from areas outside the City, are collected by the LDLL. Table 1-11 lists the combined sewer regulators on the LDLL.

Oregon Avenue: The Oregon Avenue interceptor runs on Delaware Avenue from Snyder Avenue to Packer Avenue, with a portion between Jackson St. and Snyder Avenue on River St. Wastewater flows to the intersection of Oregon and Delaware Avenues where it heads west along Oregon Avenue to Swanson Street and feeds into the LDLL. Table 1-11 lists the combined sewer regulators on the Oregon Ave. Interceptor.
Table 7 lists ranges of interceptor sewer diameters in the Southeast Drainage district by interceptor system.

Table 7 Interceptor Sewer Systems in the Southeast Drainage District

Interceptor System	Length (miles)	Size Range (ft)
Lower Delaware Low Level	5.0	3 - 11
Oregon Avenue	1.5	2.5 – 4

Figure 3 SE WPCP Interceptor System



3.d. Description of Wastes Accepted from Outside Collection System

The Southeast Plant receives no wastes from outside its collection system.

3.e. Map and Description of Point and Non-Point Source Releases From Facility

There are no known sources of PCBs at the Southeast Plant

3.f. Facility State and Federal Permit Numbers

PaDEP Site ID #: 451992
NPDES Permit No. PA 0026662

3.g. Name of Receiving Stream Including River Mile

The discharge of the Southeast Plant is received by the Delaware River at mile point 96.7

3.f. List of all known industrial users of the collection System and permit numbers

SEWPCP - Known Industrial Users of Collection System

List of Industrial Dischargers in the Southeast Sewershed

FACILITY NAME	STREET ADDRESS	CITY	STATE	ZIP	PRETREATMENT PERMIT NO.
Trio Silversmiths Inc.	729 Sansom St.	Philadelphia	PA	19106	TRIO00011029FP
Murray Green & Son	740 Sanson St., Suite 402	Philadelphia	PA	19106	MURR02001109ND
Phillip Tierstein Polishers	740 Sansom St., Room 306	Philadelphia	PA	19106	PHIL02001107ND
Stephen L. Blum	733 Sansom St., 2nd Floor	Philadelphia	PA	19106	STEP00021108ND
AppTec Laboratory Services	Phila. Naval Business Center - 5001 S. Broad St.	Philadelphia	PA	19112	TEMP
A &R Transport	8 E. Oregon Avenue	Philadelphia	PA	19148	ART00011146WS
V&S Philadelphia Galvanizing LLC	2520 E. Hagert St.	Philadelphia	PA	19125	CATT00010819WS
Wade Technology, Inc.	445 N. 11th St.	Philadelphia	PA	19123	WADE00010864FP
Jaws, Inc.	2148 E. Tucker St.	Philadelphia	PA	19125	JAWS00010829WS
Simons Brothers	2424-38 Sergeant Street	Philadelphia	PA	19125	SIMO00011114WS
Department of the Treasury, U.S. Mint	5TH & Arch Streets	Philadelphia	PA	19106	USTR00010913WS
Ashland Chemical Company	2801 Christopher Columbus Blvd.	Philadelphia	PA	19148	ASHL00010470BD
Inolex Chemical Company	Jackson & Swnason Streets	Philadelphia	PA	19148	INOL00010298WS
Cantol Specialty Chemicals	2211 N. American Street	Philadelphia	PA	19133	CANT00011105OM
PECO Oregon Shop	2610 S. Christopher Columbus Blvd.	Philadelphia	PA	19148	PECO00011148MS
Naval Foundry & Propeller	1701 Kitty Hawk Ave.	Philadelphia	PA	19122	NAVA00011147MS
George L. Wells Meat Co.	982 N. Delaware Avenue	Philadelphia	PA	19123	not permitted
Philadelphia Poultry Inc.	346 N. Front St.	Philadelphia	PA	19106	not permitted
Charles Jacquin's	2633 Trenton Avenue	Philadelphia	PA	19125	not permitted
Metropolitan Bakery	1036 Marlborough St.	Philadelphia	PA	19125	not permitted
Dubin Paper Company	1910 S. Delaware Ave.	Philadelphia	PA	19148	not permitted
Cooper's Cooperage	320 Brown St.	Philadelphia	PA	19123	COOP00020851OM
Kohler Freda LLC	1334 S. Front Street	Philadelphia	PA	19147	GVFR00010019OM
Leatex	2722 N. Hancock St.	Philadelphia	PA	19133	LEAT00011039OM
National Chemical Laboratories	401 N. 10th St.	Philadelphia	PA	19123	NATI00050995OM
Yee Tung	10 Queen St.	Philadelphia	PA	19147	YEET00011031OM
Cambria Container, LLC	2900 N. 18th Street	Philadelphia	PA	19132	CAMB00011130MS

PMP
Southeast Plant
Known Sources
Item 4

Two known sources of PCBs entering the Southeast Plant sewer shed are the intake of Schuylkill River water and the addition of ferric chloride as a treatment coagulant into the Queen Lane Water Treatment Plant and the resultant discharge of most of the plant's process wastes into the sewer. The remaining wastes are stored onsite in the plant's raw water basin which is periodically dredged. The wastes produced from the dredging operation are not sewered.

The intake of Schuylkill River water into the plant occurs at a location which is significantly influenced by the Wissahickon Creek. Two ambient water samples were taken above the tidal dam and analyzed for PCBs in March, 2002 and October, 2002. The results were 1.636 and 1.857 ng/l, respectfully, for and average concentration of 1.75 ng/l. We do not have PCB data to represent the Wissahickon Creek and assume its concentration of PCBs is similar to that of the Schuylkill River. An average intake flow of 78 MGD into the plant results in an intake of PCBs of 428 mg/day. Based upon an approximate solids balance, we estimate 99 percent of the influent loading is captured within the treatment processes. Ten percent of that captured loading immediately settles in the raw water basin. Therefore, we estimate that approximately 89 percent, or 381 mg/day, of the Schuylkill River loading influent to the Queen Lane Plant is discharged into the Southeast Plant sewer shed.

The second source is discharge of spent ferric chloride, which contains PCBs in the delivered product, from the Queen Lane Plant into the sewer. The Queen Lane Plant uses ferric chloride as a water treatment chemical to coagulate and flocculate fine particle solids from the river water. PWD currently purchases ferric chloride from Kemiron. In 2001 PWD was informed by Eaglebrook (now Kemiron) that low levels of polychlorinated biphenyls were detected in the ferric chloride. The source of the ferric chloride is from the DuPont Edge Moor plant that produces ferric chloride as a by-product. The DuPont Company has analyzed their ferric chloride product for PCBs and estimates that the current concentration is 0.00055 mg/l. Based on the average dosage of ferric chloride and the average plant flow, the average contribution of PCBs to the plant is 17.44 mg/day. However, as described above, we estimate that the plant captures approximately 99 percent of the solids produced as a result of the chemical addition and all is discharged into the sewer. Therefore, we estimate that approximately 99 percent, or 17.27 mg/day, of the PCBs from the ferric chloride source is discharged into the Southeast Plant sewer shed.

The DuPont Company has already undertaken measures to reduce the concentration of PCBs in the ferric chloride produced from their Edge Moor Plant and has committed to further reductions. Their previous actions will be presented in *Section 7. Previous Minimization Activities* of this report. Their future plans will be presented in *Section 9. Pollutant Minimization Measures*.

PMP
Southeast Plant
Potential Sources
Item 5

Identification of potential sources of PCB focused first on those sources which stored PCBs in equipment. In addition to PWD's inventory of PCB containing equipment, we requested identification of such equipment from the following agencies:

1. Philadelphia Fire Department
2. Philadelphia Department of Public Health
3. USEPA (including the Mega Rule's database)
4. PaDEP
5. DRBC
6. Partnership for the Delaware Estuary
7. PECO

The following pages of the spreadsheet entitled *"List of Potential Sources, Item 5, Southeast Plant"* contain a complete listing of equipment containing PCBs resulting from the above request. PWD believes that considerable information concerning each source should be gathered and maintained in order to both understand the characteristics of the particular source as well as identify the owner who is responsible for its proper operation and ultimate disposal. PWD intends to gather the following information regarding each potential source:

1. Name of POTW in whose drainage shed the equipment is located
2. PWD identification #
3. Name of agency referring PCB source to PWD
4. Date of last inspection of equipment by PWD or its agent
5. Name of inspector
6. Name of company which owns equipment
7. Street address of facility where source is located
8. Township address of facility where source is located
9. Zip Code address of facility where source is located
10. GIS coordinates of facility where source is located
11. County address of facility where source is located
12. Name of site or complex where source is located
13. Name of building where source is located
14. Name of contact at site who maintains PCB equipment
15. Phone number of contact at site who maintains PCB equipment
16. Name of company official responsible for management of PCB equipment
17. Title of company official responsible for management of PCB equipment
18. Street address of company official responsible for management of PCB equipment

19. Township address of company official responsible for management of PCB equipment
20. State address of company official responsible for management of PCB equipment
21. Zip Code address of company official responsible for management of PCB equipment

    (For PCB sources located in suburban townships which discharge into the PWD collection system)
22. Name of suburban utility under contract w/PWD
23. Location or name of connection to PWD System

    For PCB sources located within Philadelphia
24. Name of Trunk Sewer connected to site
25. Name of Intercepting Sewer connected to site
26. Is the site in a combined or separate sewer district?
27. Name of agency responsible for management of pretreatment permit
28. Identification of pretreatment permit number
29. Type of PCB source/equipment
30. Number of identical PCB sources at location
31. Type of Aroclor contained in equipment
32. Total PCB concentration
33. Fluid volume (gal)
32. PCB mass (lbs)
33. PCB mass (kg)
    Status of PCB equipment
34. In use
35. Out of service
36. Disconnected
    Status of building housing PCB equipment
37. Operating
38. Closed
39. Abandoned/not secure
40. Comments including any past spills from source, or company plans regarding future of source, etc

The electronic copy of this spreadsheet contains columns to allow recording of the above information. All information currently available regarding each source has been incorporated into the spreadsheet. For ease of printing, only some of the columns have been identified in the printed version of this PMP.

Please see attached spreadsheet PCB Devices

PMP
Southeast Plant
Strategy for Identifying Unknown Sources
(Trackdown)
Item 6

Prior Trackdown Studies

In 2001/2002, PWD developed and conducted an initial trackdown of PCBs in the Southeast Plant sewershed. The plan called for the sampling of all sewers entering the plant as well as a number of samples taken at strategic locations in the sewershed. The project and its results placed on a Powerpoint presentation called *"Philadelphia's Experiences with the Pollutant Minimization Plan Requirements"* and is attached to this section.

Additionally, the total PCB concentration values together with the estimated sewer flows for each location at the time of sampling can be found on the following chart entitled *"PMP, Trackdown, Southeast Plant, Phase 1, Data Results"*.

A description of the sampling and analytical methods used for the Phase 1 project are identified in the following package entitled "*Sampling and Analysis Plan for Polychlorinated Biphenly Congener Trackdown, Phase 1, Southeast Water Pollution Control Plant".*

Philadelphia's Experiences with the Pollutant Minimization Plan Requirements

By
Bruce S. Aptowicz P.E.
Deputy Director of Operations
Philadelphia Water Department

PWD's Experiences and Plans Regarding Sewershed Trackdown

- In 2001, each plant effluent was sampled for PCBs - 3 times in dry and 3 times in wet weather
  - results from the 9 dry weather samples were 1 congener just above detection in 1 sample
  - results* from wet weather samples averaged
    - 6,313 picrograms per liter for Northeast Plant
    - 10,773 picrograms per liter for Southeast Plant
    - 3,023 picrograms per liter for Southwest Plant

* non-detected congeners were computed as zero

Sewershed Trackdown
(cont'd)

- In 2005, each plant effluent is being sampled for PCBs - 3 times in dry and 3 times in wet weather
- number of congeners reported increased and detection level decreased
- Available results to date are as follows

Total Average PCBs
(in pg/l)
(Incomplete data set)

	2001		2005	
	Dry	Wet	Dry	Wet
Northeast	-	6,313	3,037	11,000
Southeast	-	10,773	2,024	13,500
Southwest	-	3,023	3,205	7,918

Sewershed Trackdown
(cont'd)

- In 2001/2002, PWD, as well as CCMUA, supported by the USEPA, PaDEP and DRBC, developed and conducted an initial trackdown of a sewershed
- Methodology:
  - Southeast Plant was selected due to highest wet weather PCB levels and simpler influent configuration
  - All sampling in wet weather (3/4 inch of rain event)

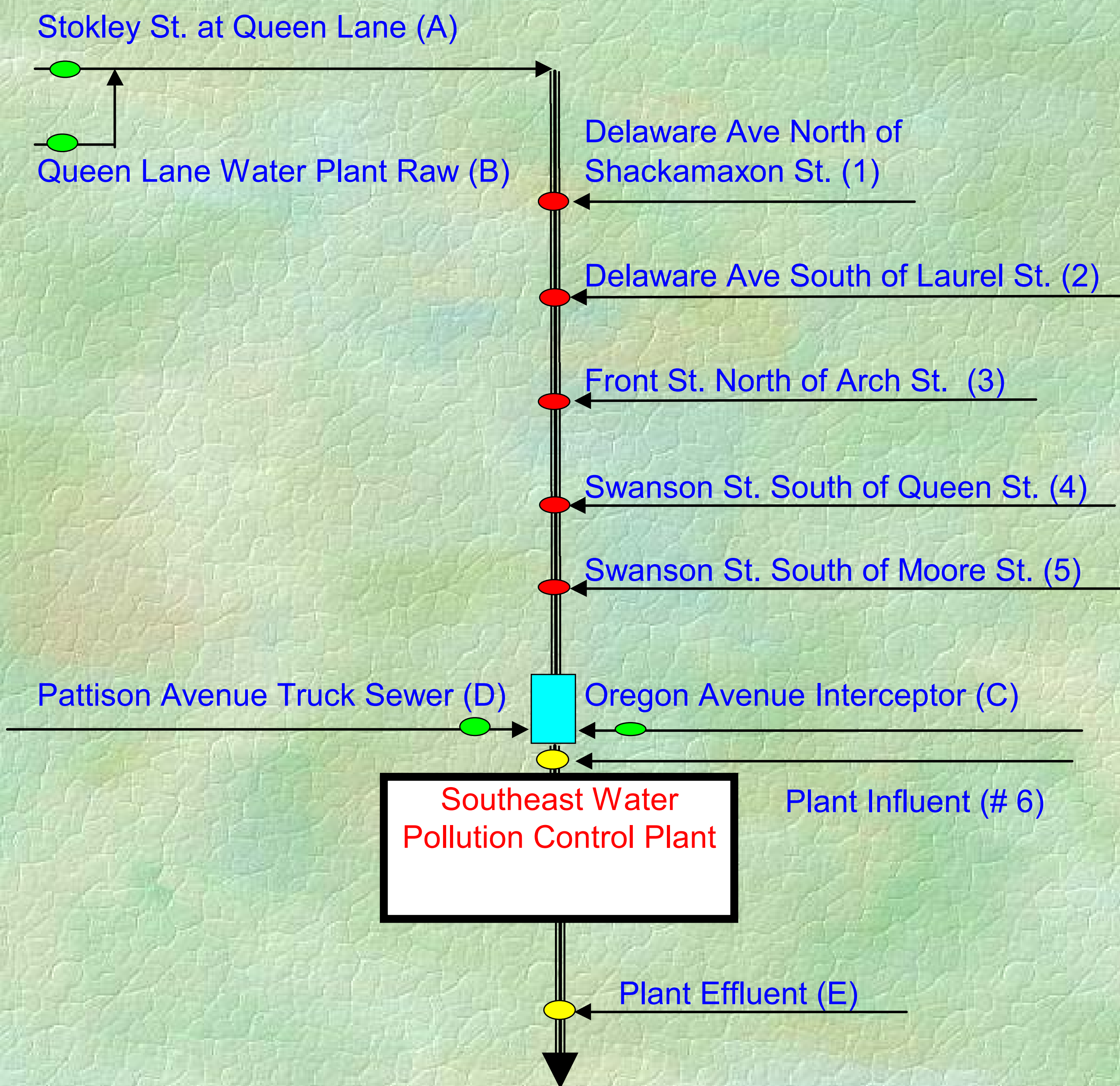
Sewershed Trackdown
(cont'd)

- Samples taken at various locations in interceptor since numerous individual trunk sewer sampling was deemed too costly
- All sewer samples consisted of a composite of 2 grab samples taken 20 minutes apart
- Initial sample taken at head of interceptor and at one hour post storm start

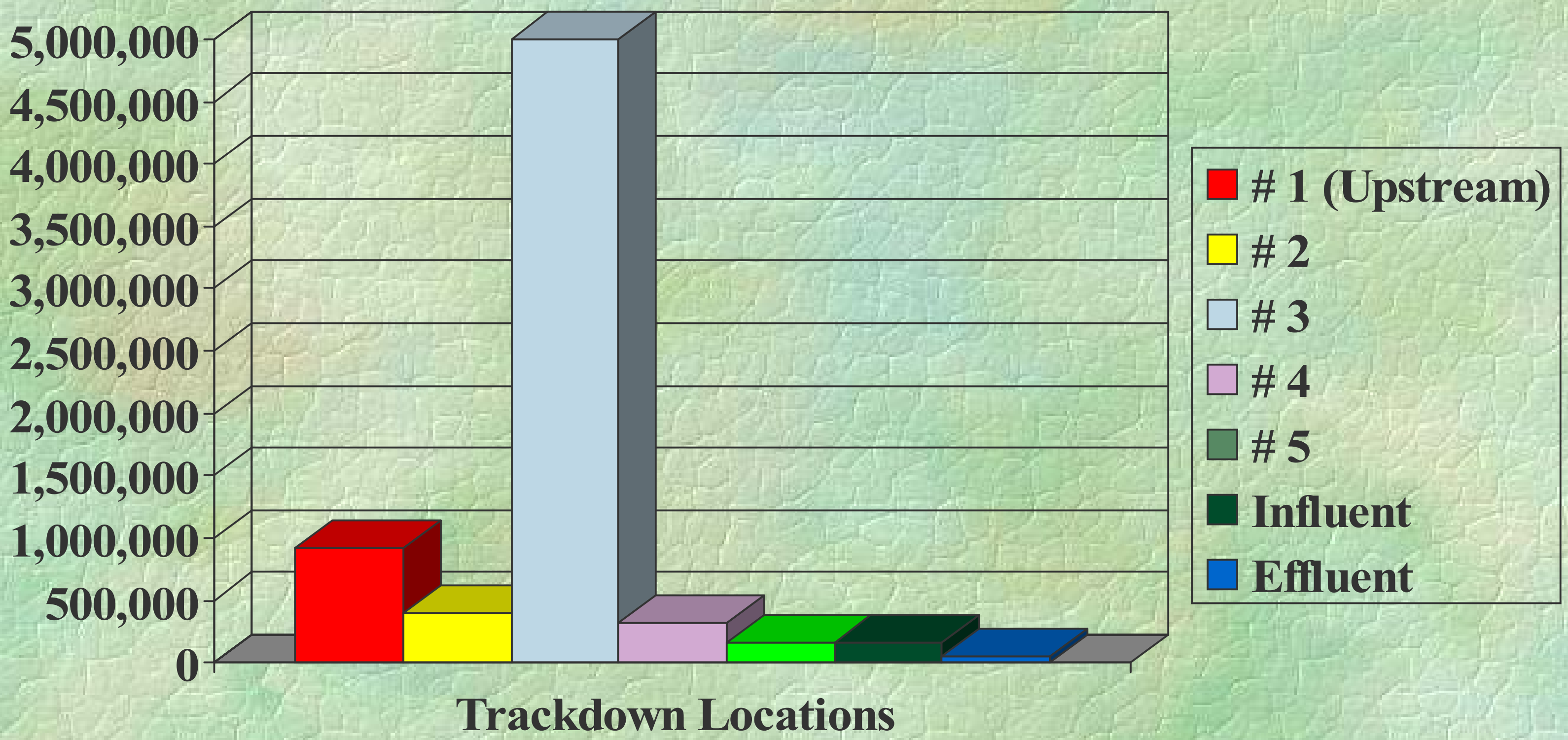
Sewershed Trackdown
(cont'd)

- Interceptor time of travel was estimated and downstream samples taken accordingly
- Plant influent sample was an ISCO 30 minute composite, starting at estimated time of arrival at plant and for eight hours
- Plant effluent sample was similar to influent sample but with a two hour delay
- IWU employed 3 crews of two persons to conduct sampling

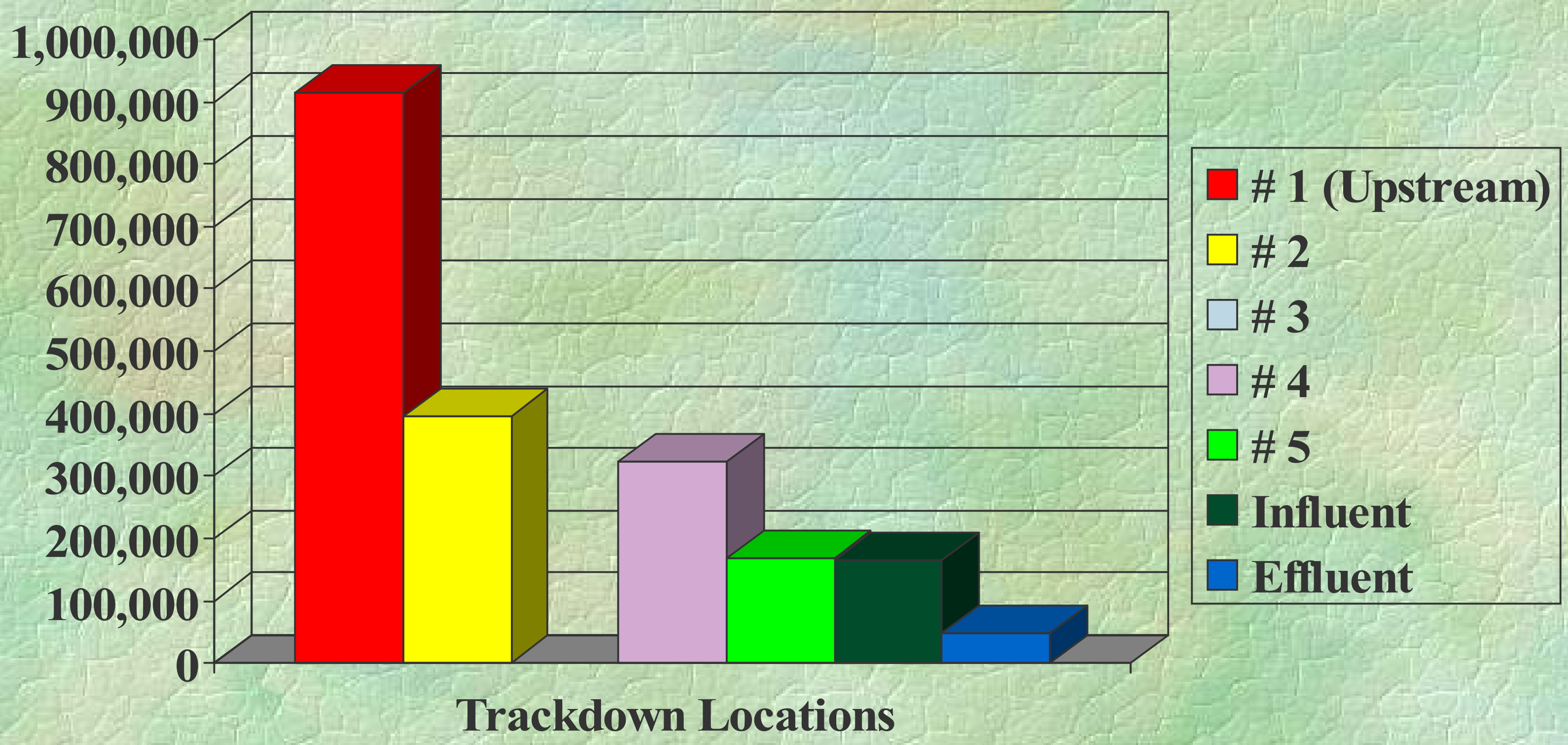

Stickley St. at Queen Lane
Queen Lane Filter Plant
Lower Delaware Interceptor at Delaware Ave. North of Shackamaxon St.
Lower Delaware Interceptor at Delaware Ave. South of Laurel St.
Lower Delaware Interceptor at Front St. North of Arch St.
Lower Delaware Interceptor at Swanson St. South of Queen St.
Oregon Avenue Interceptor
SEWPCP Influent
SEWPCP Effluent
Pattison Ave Trunk Sewer
SWMM5 Output (Links and Nodes) with Track Down Sampling Locations
SWMM5 Output
Junction
Outfall
Storage
SWMM5 Output
Link
Track Down Sampling Site
Sewershed Type
Combined Sewer Area
Separate Sewer Area
Storm Sewer Only
Non-Contributing Area
Hydrologic Feature
N
PWD
March 2004
CDM


Stokley St. at Queen Lane (A)
Queen Lane Water Plant Raw (B)
Delaware Ave North of Shackamaxon St. (1)
Delaware Ave South of Laurel St. (2)
Front St. North of Arch St. (3)
Swanson St. South of Queen St. (4)
Swanson St. South of Moore St. (5)
Pattison Avenue Truck Sewer (D)
Oregon Avenue Interceptor (C)
Southeast Water Pollution Control Plant
Plant Influent (# 6)
Plant Effluent (E)

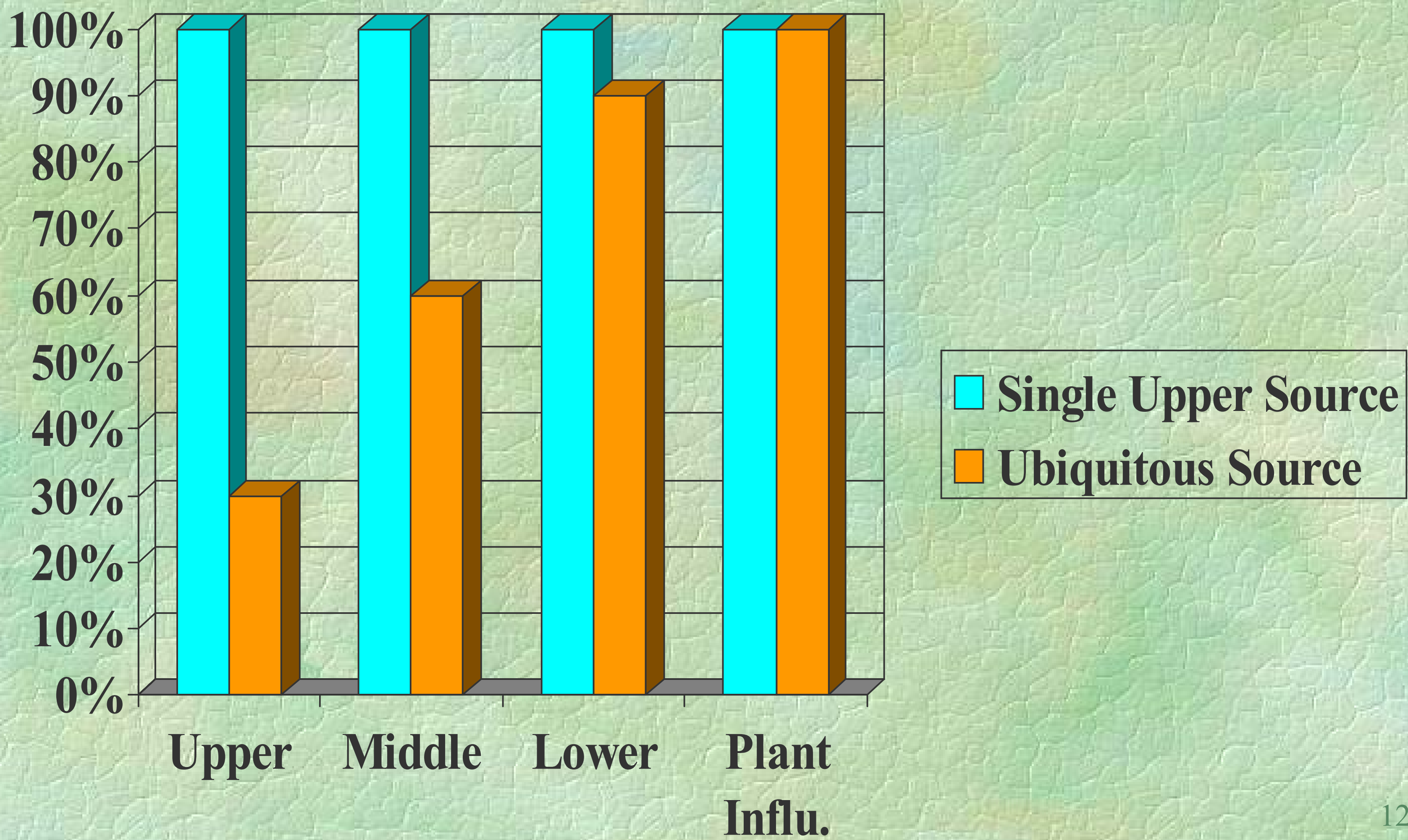
PCB Concentrations in samples in pg/l



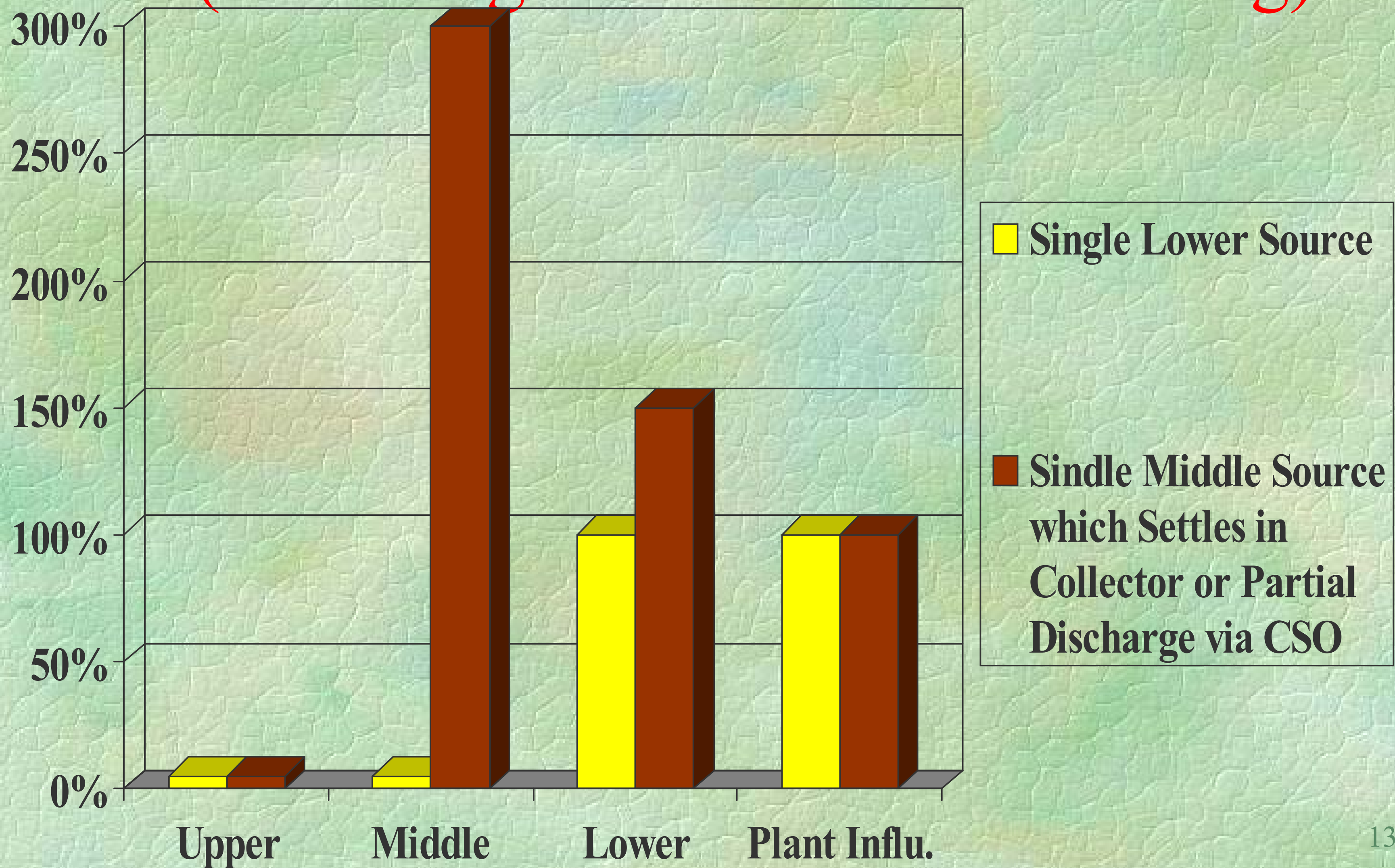
PCB Concentrations in samples in pg/l without # 3



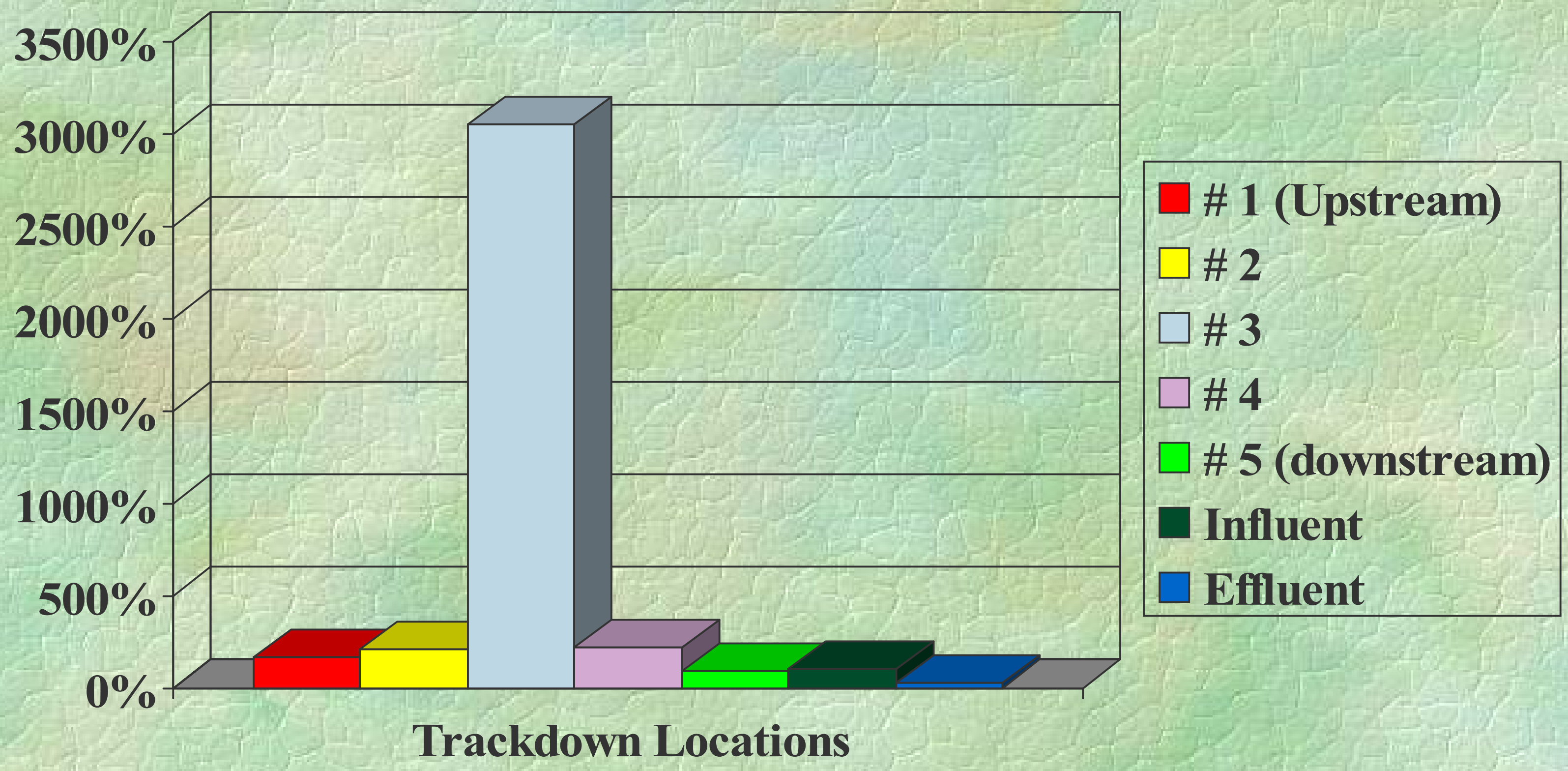
Theoretical Graphs for Various Loadings (Percentage of Plant Influ. Loading)



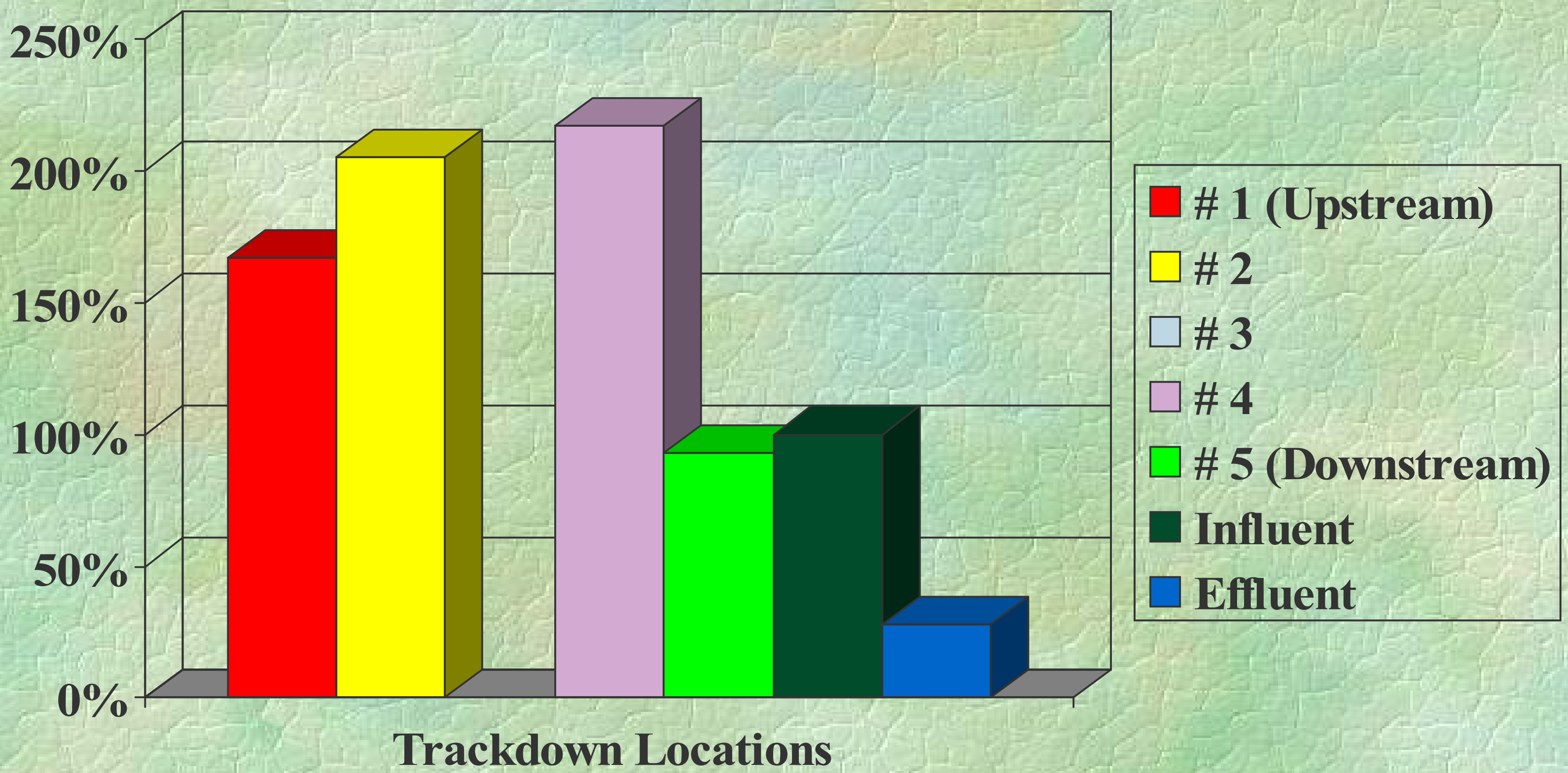
Theoretical Graphs for Various Loadings (Percentage of Plant Influ. Loading)



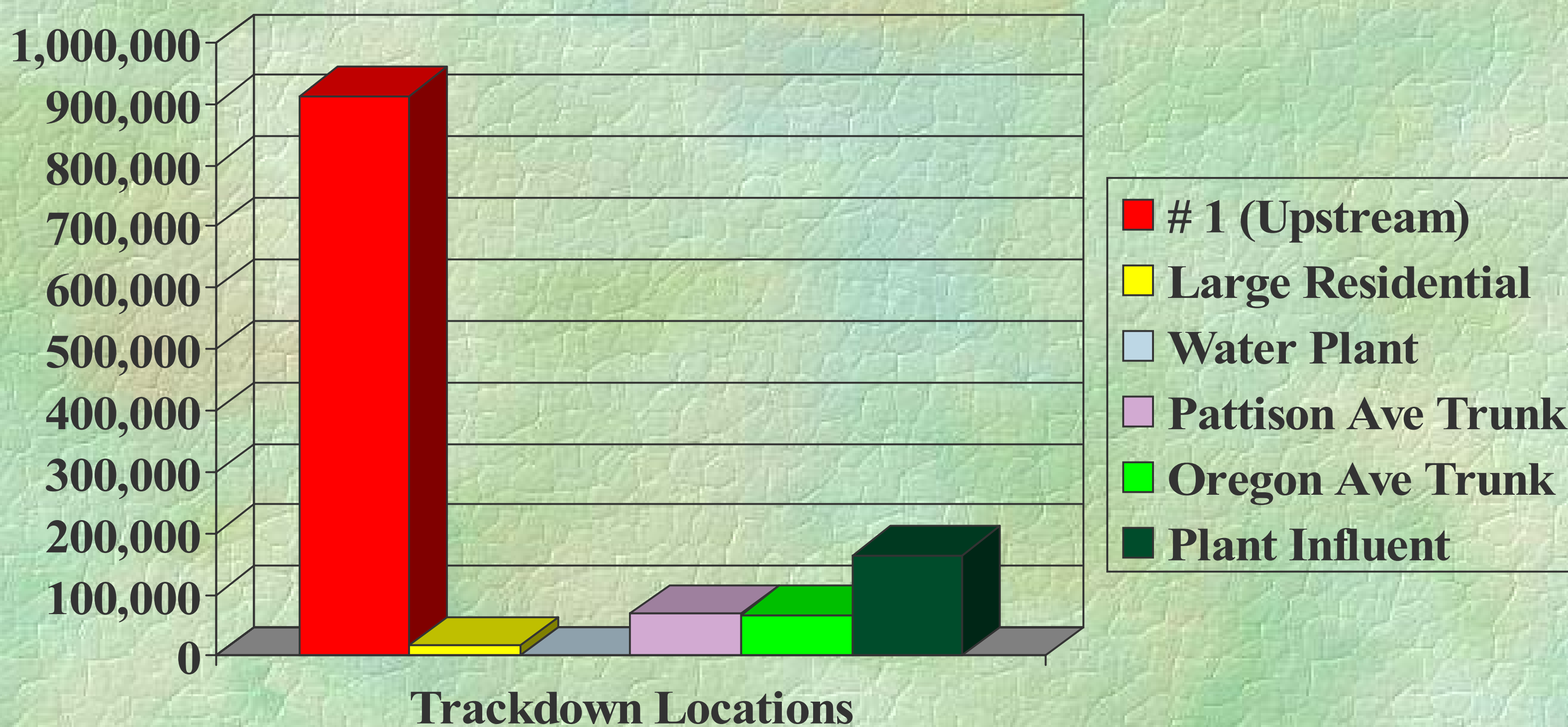
PCB Loadings in Shed as a % age of Plant Influent Load



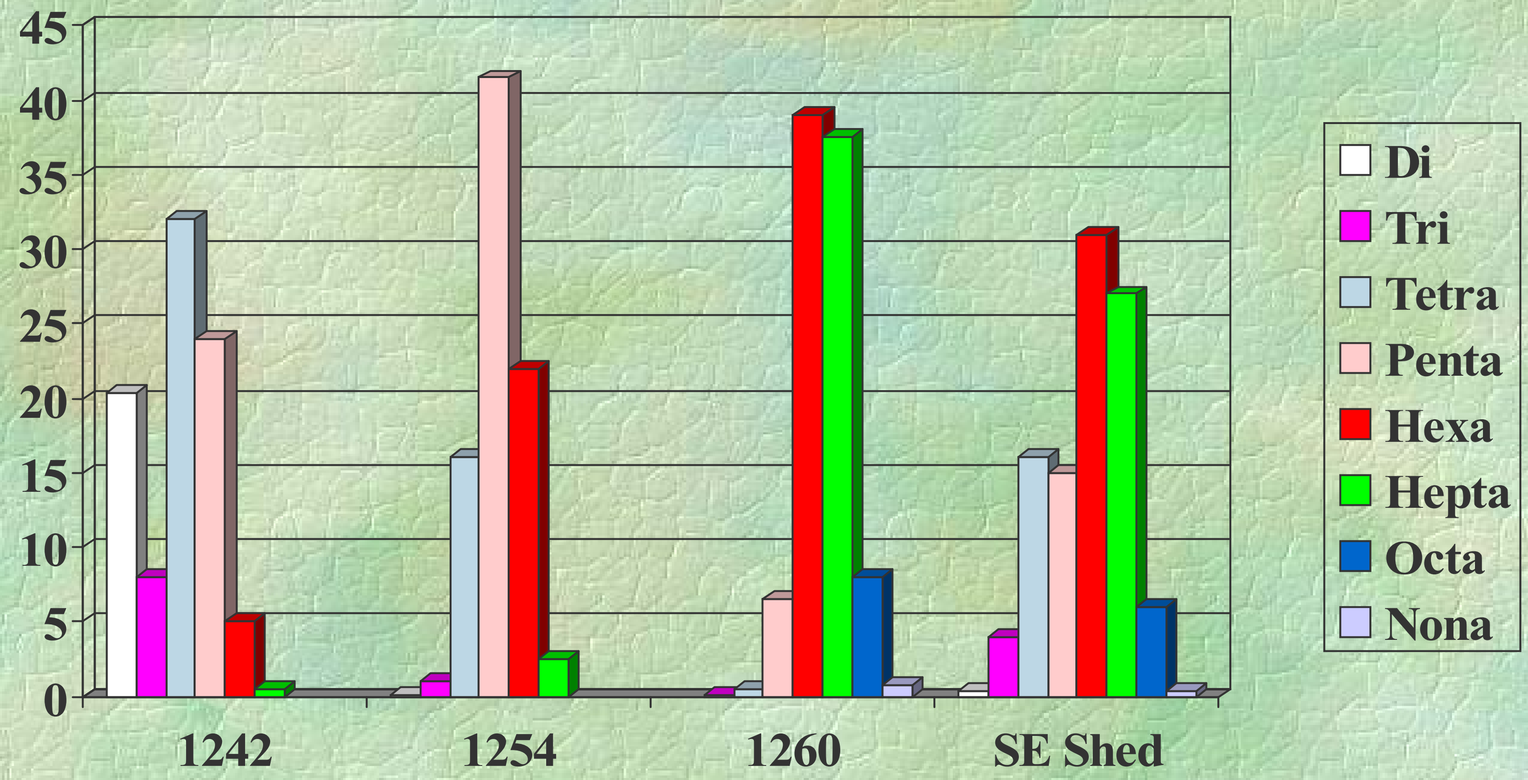
PCB Loadings in Shed as a % age of Plant Infl. Load w/o # 3



PCB Concentrations (pg/l) at other locations within Sewershed



Aroclor Comparison
% for each Homolog



Sewershed Trackdown
(cont'd)

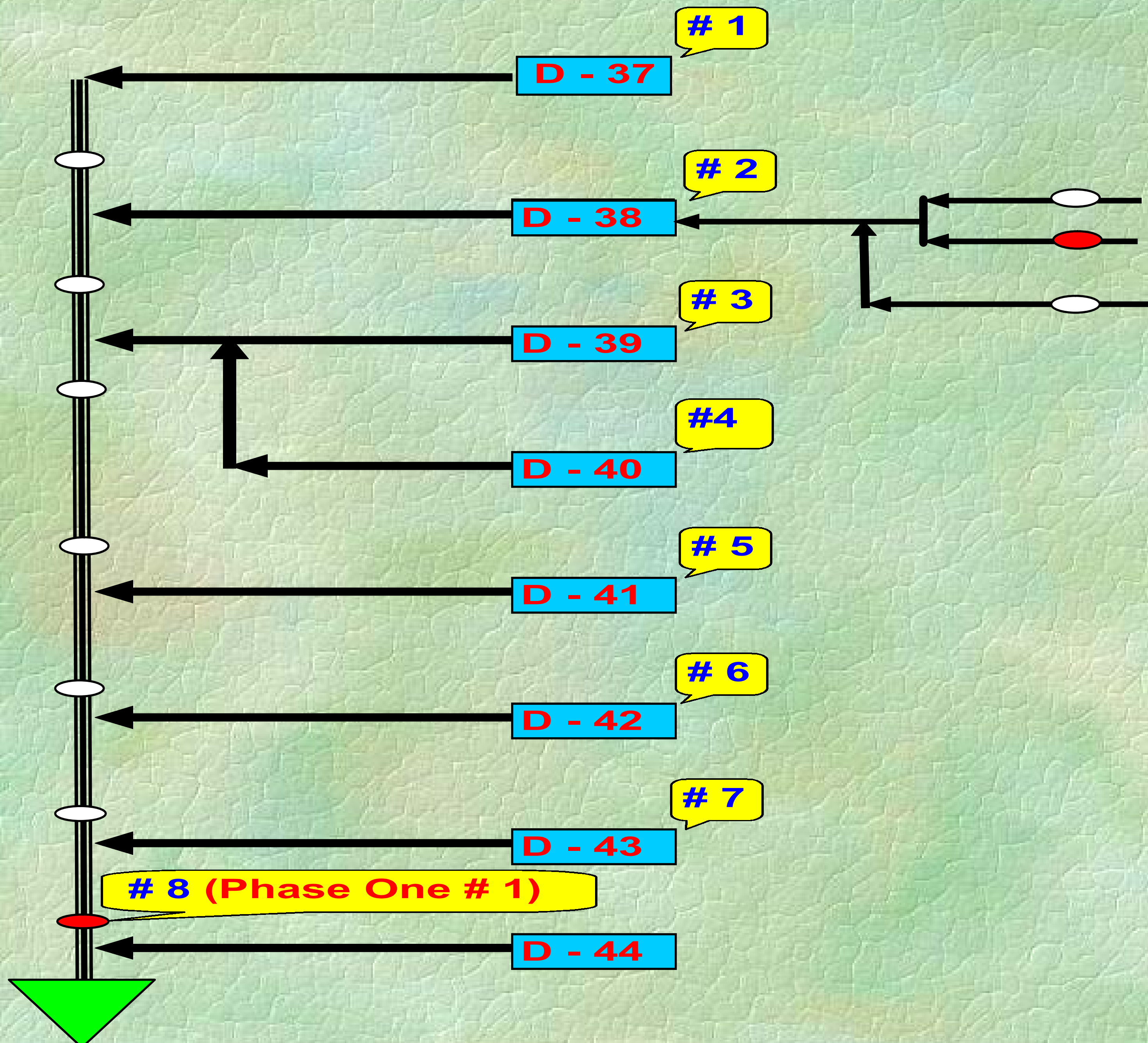
- Observations/Comments
  - Schuylkill River (at average flow) is not a significant PCB contributor to shed via water plant
  - Two minor interceptors located near Southeast Plant are not significant PCB contributors
  - Large residential/retail shed is not a significant PCB contributor

Sewershed Trackdown
(cont'd)

- Over 150 percent of plant influent PCB load appears to originate from source(s) affecting sample location # 1 - a distance of five miles from Southeast Plant
- The 1994 illegal discharge was upstream of sample location # 1
- Aroclor type at sample location # 1 is similar to 1994 discharge

Sewershed Trackdown
(cont'd)

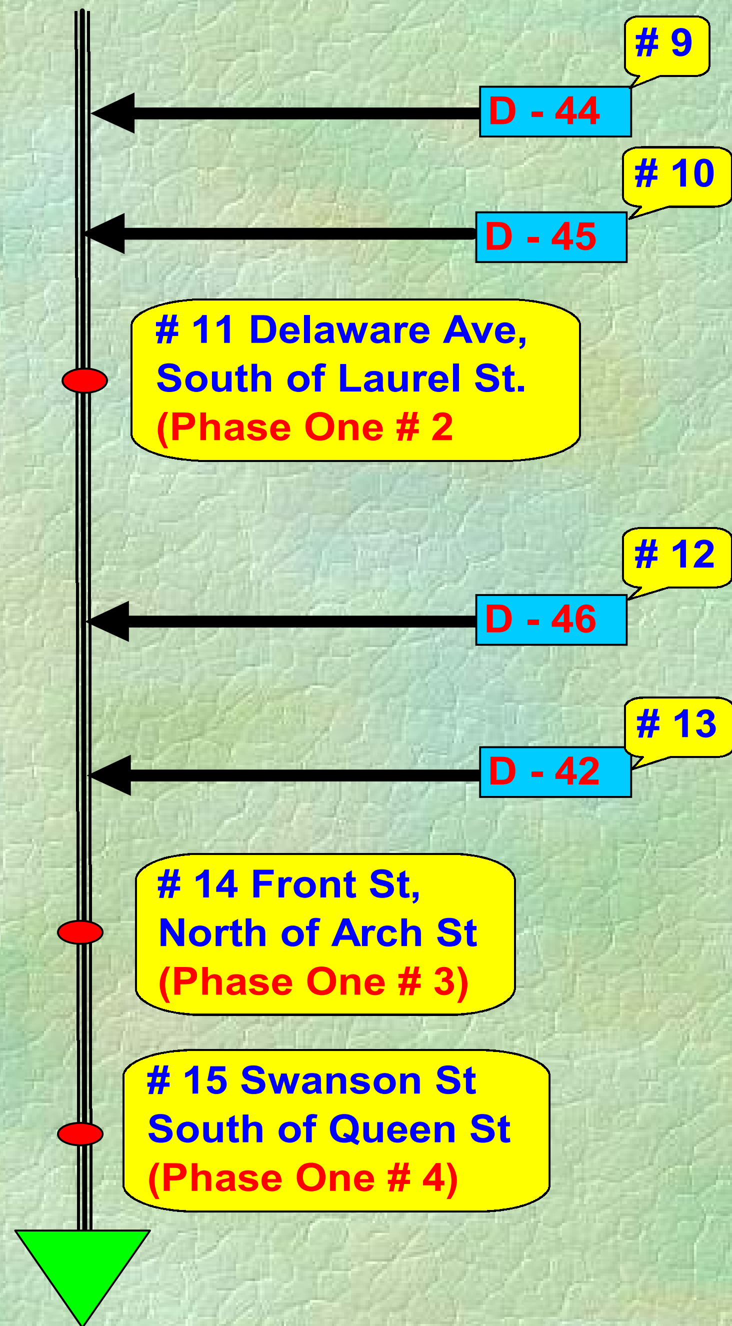
- Initial upstream sampling site (# 1) needs further study (Phase 2)
  - Determine if PCB source is from 1 or more trunk sewers contributing flow ahead of site # 1 or from the sediment in the intercepting sewer
  - Sample during a storm event
  - Use analytical method 8082



1
D - 37
2
D - 38
3
D - 39
#4
D - 40
5
D - 41
6
D - 42
7
D - 43
8 (Phase One # 1)
D - 44

Sewershed Trackdown
(cont'd)

- High PCB concentration near Arch Street nears further study (Phase 2)
  - Conc. increases 5 fold from upstream sample
  - But then immediately decreases 6 fold in next downstream sample
  - Sample may be an aberration or may be due to some resuspension/resettling of sewer sediment phenomena or ??
  - Ultimate importance of site as a significant contributor to plant influent loading is not certain
  - Resample during a storm event using analytical method 8082



9
D - 44
10
D - 45
11 Delaware Ave,
South of Laurel St.
(Phase One # 2
12
D - 46
13
D - 42
14 Front St,
North of Arch St
(Phase One # 3)
15 Swanson St
South of Queen St
(Phase One # 4)

Analytical Methods

	1668a	8082
Sensitivity (per congener)	10 to 100 pg/l	100 to 1000 pg/l
Accuracy	+/- 25 %	+/- 50 %
Contamination	Often below	Often above
	Background levels	
Cost per sample (approx.)	$ 1500	$ 300

Sewershed Trackdown
(cont'd)

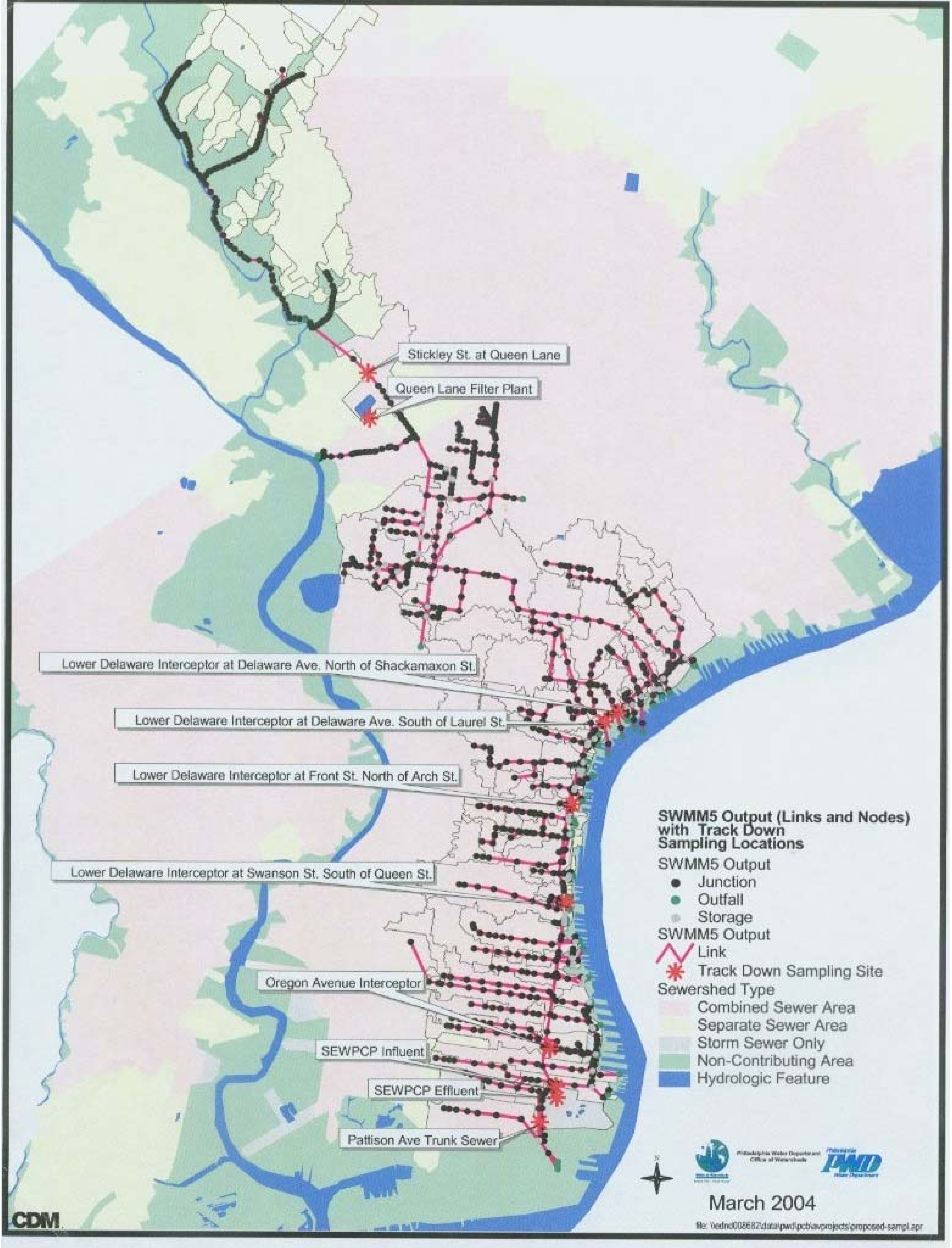
- Sources identified via sewer trackdown
  - Assign GIS coordinates
  - IWU to visit sites and attempt to obtain information regarding source of PCBs
  - Identify potential minimization strategies
  - Confer with regulatory agencies regarding future strategy

Sewershed Trackdown
(cont'd)

- Known spills and contaminated sites
  - Develop list from requested agencies
  - Assign GIS coordinates
  - Populate a database with available information
  - IWU to visit sites and determine if there is any reason to expect that site may be an significant source
  - If so, consider taking samples of runoff or soil and analyze for PCBs
  - Confer with regulatory agencies regarding future strategy

PMP Trackdown Southeast Plant Phase 1 Data Results

Location	Tot PCB Concentration (pg/l)	Estimated Flow at Time of Sampling (MGD)
Stokley Street above Queen Lane Plant	16,914	
Queen Lane Plant Discharge	1,418	
Delaware Avenue North of Shackamaxon Street	913,510	72
Delaware Avenue South of Laurel Street	395,270	205
Front Street North of Arch Street	5,018,911	240
Swanson Street South of Queen Street	323,000	265
Swanson Street South of Moore	167,405	220
SEWPCF Influent	165,252	240
SEWPCF Effluent	47,611	240
Oregon Ave. Interceptor	66,935	
Pattison Ave. Trunk Sewer	68,517	


Stickley St. at Queen Lane
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Lower Delaware Interceptor at Swanson St. South of Queen St.
Oregon Avenue Interceptor
SEWPCP Influent
SEWPCP Effluent
Pattison Ave Trunk Sewer
SWMM5 Output (Links and Nodes) with Track Down Sampling Locations
SWMM5 Output
Junction
Outfall
Storage
SWMM5 Output
Link
Track Down Sampling Site
Sewershed Type
Combined Sewer Area
Separate Sewer Area
Storm Sewer Only
Non-Contributing Area
Hydrologic Feature
Philadelphia Water Department
Office of Watersheds
PWD
March 2004
CDM

SAMPLING AND ANALYSIS PLAN FOR POLYCHLORINATED BIPHENYL CONGENER TRACKDOWN PHASE 1 SOUTHEAST WATER POLLUTION CONTROL PLANT

Revised August 8, 2002

PHILADELPHIA WATER DEPARTMENT

Project Manager: Bruce Aptowicz ______________________________

Quality Assurance Officer: Thomas Healey

____

Date of Request:

Date of Project Duration:

TABLE OF CONTENTS

Map of sampling points in the SEWPCP drainage shed

BLS sample chain of custody form

1 INTRODUCTION

The Delaware River Basin Commission and the Environmental Protection Agency requested that large POTWs discharging to the Delaware River participate in a sewershed PCB trackdown study to find significant sources of 141 congeners in the PCB family. To that end, a PCB trackdown committee has been formed to carry out this objective. For Philadelphia Water Department's (PWD) part, we have selected our Southeast Water Pollution Control Plant (SEWPCP) sewershed and sampling points within two major interceptors so as to narrow future trunk sewer investigative work. All samples will be submitted to the contract lab for 1668a PCB congener analysis and for total suspended solids using method 160.2. While results will be expressed on a concentration basis, an attempt will be made to derive an estimate of the flow at each sampling point to calculate mass loadings at those sampling locations.

Since the direction of this program is dependent upon preceding results, we will conduct this effort in phases, with the details of each phase dependent upon the results of the prior phase. The first phase will consist of wet weather samplings using grab sample techniques. Wet Weather sampling has been selected for the first phase because dry weather samplings at the PWD's POTW effluents has demonstrated no measurable amounts of PCBs present. Current biosolids data, together with plant effluent data, leads us to conclude that the bulk of the spilled PCBs have been flushed out (or physically removed by contract) of the sewer system. Therefore, loadings into the plant during dry weather are insufficient to result in detectable concentrations in the effluent. Since it is reasonable to assume that wet weather samples will contain the dry weather loading, the potential to track down the dry weather loading from wet weather samples exists. After reviewing the wet weather data, if having dry weather samples would be important to the cause, they can be done as part of phase 2.

Details regarding the analytical methodology are provided in the document titled "Quality Assurance Project Plan, Polychlorinated Biphenyl Congener Characterization" which was prepared for the Coalition of Industrial and Municipal Dischargers. A copy of this plan is located in the Philadelphia Water Department's Industrial Waste Unit offices, which are at 1101 Market Street, 4th Floor, Philadelphia, PA 19107.

2 PROJECT MANAGEMENT

The project management structure is indicated in Table 1.

Table 1. Roles and Responsibilities of Key Project Individuals

Key individual	Title	Phone	Responsibility
Bruce Aptowicz Philadelphia Water Dept.	Deputy Director Operations Division	215- 685-6205	Provide overall pro- ject coordination
Thomas Healey Philadelphia Water Dept.	Manager, Industrial Waste Unit Operations Division	215-685-6233	Verify the proper collection of wastewater samples, verify proper post sampling activities
Earl Peterkin Philadelphia Water Dept.	Manager, Trace Organics Lab Bureau of Laboratory Services	215-685-1439	Oversees cleaning of all equipment, sample receipt, preservation, proper storage and shipping of all samples to the contract laboratory. Reviews field logs
Dennis Blair Philadelphia Water Dept	Manager, Planning and Engineering Unit Engineering Division	215-685-6139	Oversee all data interpretation, estimate mass loadings from point to point,provide estimates of flow at each location

3 SAMPLING ACTIVITIES

3.1 SAMPLING LOCATIONS

3.1.1 PRIMARY LOCATIONS

Six locations in the Lower Delaware Low Level Interceptor will be sampled. Two other locations: the Oregon Avenue interceptor (which contains several discrete trunk sewer systems) and the Pattison Avenue trunk sewer system will be sampled in a similar fashion to the six main interceptor locations. The combined locations represent 100% of the flow being received at SEWPCP. Table 2 contains these locations

3.1.2 SECONDARY LOCATIONS

Other sampling locations will include sewage passing the Stokley St and Queen Lane intersection. Also, a sample of Schuylkill River solids entering the chemical treatment process at PWD's Queen Lane Filter Plant while operating under high turbid river conditions. High turbid conditions are defined as when the turbidity at the raw water basin effluent exceeds 8 ntus.

A SEWPCP influent and effluent composite type sample will be collected

3.2 DRY WEATHER SAMPLING (RESERVED)

3.3 WET WEATHER SAMPLING

3.3.1 SCHEME

A sample run start will be confined to a qualifying rain event that only occurs as a frontal system. A qualifying rain event is one which equal or exceeds .1 inch and whose duration is at least one hour and where there has bee no preceding rainfall within 72 hours of .01 inches or greater.

Sampling shall begin at the locations described in Table 2 immediately upon the above criteria being achieved. Two grab samples shall be taken 20 minutes apart at each location to catch the rising hydrograph that is occurring in the sewer. Before samplings are composited and submitted for analysis, there shall be a determination of the rising hydrograph at the SEWPCP influent made and adjusted for the travel time for each location. This confirmation assures that the grabs taken at each of the 6 locations occur on a rising hydrograph of the storm event. Sampling will start at the top of the system so as to follow the same sewerage down the collector as it picks up additional flows from the trunked sewers. The two grabs from the interceptor (and the plant influent) locations will be combined in equal proportions with one another at the PWD's Bureau of Laboratory Services (BLS) at Hunting Park and Castor Avenue, Philadelphia

3.3.2 SAMPLING DETAIL

- The PWD industrial waste unit (IWU) will conduct sampling. All sampling procedures will be conducted in accordance with the protocols detailed in this section.
- Dedicated, precleaned equipment will be used for each sampling location. Each sample container will consist of a food grade pint mason jar that has undergone an ultra cleaning at our central laboratory. The samplings will be transferred immediately to I-chem ultraclean bottle. No mason jars will be reused.
- Personnel handling the samples will wear a new pair of disposable powder-free surgical gloves with each sample collected.
- Sewage will be retrieved from the interceptors at manholes using nylon twine affixed to a new, precleaned one-pint mason jar. For those interceptor samples, a dedicated precleaned mason jar will be lowered by nylon twine from the top of the manhole to the top of the sewage flow several times to retrieve sufficient volume to fill one liter ultraclean I-chem bottle. The filled I-chem bottle will be stored in a cooler, which will contain ice.
- The Mason jar samples will be poured off into one liter I-chem bottles provided by the central laboratory and composited at the central laboratory.
- A separate sample for total suspended solids (TSS) will be collected at each location sampled. Each sample will consist of a one-liter sample at the locations listed above.
- The influent, effluent and Queen Lane Filter Plant raw water basin effluent samples will consist of two one liter samples so as to perform both total PCB congener analysis and a suspended solids analysis.
- The PWD Bureau of Laboratory Services (BLS) will provide all clean glassware, store samples and undertake shipment

when a contract laboratory purchase order is in place. BLS will conduct analyses for TSS.

- The contract laboratory will undertake all analyses except TSS. They will supply deionized water, ice coolers and shipping to and from BLS. This water shall be used for all blanks. One liter blank will be collected at each sample location from the rinseates of the mason jar used to retrieve that sample. One of the blanks will be sent on to the contract laboratory. All other blanks will be stored at BLS and their disposition will be dependent on the results of all samples.
- All samples will be transported to the central lab under ice. For each location, BLS will combine the two grab samples. The two grab samples will be combined by gently shaking/swirling the contents of each, and then immediately pour the contents of each into a laboratory prepared sample container. The combined sample will be identified as the respective manhole/plant sample.

Table 2. Location, type and frequency of samples to be taken

Sampling location I.D.	Location	Approximate time of sample	Type	Ratio of combining sample
1	Delaware Ave. north of Shackamaxon St.	One hour after start of storm and second sample 20 minutes later	grab	1 to 1
2	Delaware Ave. south of Laurel St.	Loc. 1 plus 30 minutes and second sample 20 minutes later	grab	1 to 1
3	Front St. north of Arch St.	Loc. 2 plus 30 minutes and second sample 20 minutes later	grab	1 to 1

4	Swanson St. south of Queen St.	Loc. 3 plus 30 minutes and second sample 20 minutes later	grab	1 to 1
5	Swanson St. south of Moore	Loc. 4 plus 30 minutes and second sample 20 minutes later	grab	1 to 1
6	SEWPCP Influent	Loc. 5 plus 30 minutes and every 30 minutes thereafter	8 hour composite every 30 minutes	
A	Stokley At. (at Queen Lane)	At the onset of a significant rain	grab	One grab
B	Queen Lane Filter Plant raw water basin effluent (QLFP)	during high turbidity(>,= 8 ntus)	8 hour composite every 30 minutes	
C	Oregon Ave. Interceptor on Oregon Ave. east of Swanson St.	Simultaneous to Loc. 5 and second sample 20 minutes later	grab	1 to 1
D	Pattison Ave. trunk sewer return line along the plant fenceline	Simultaneous to Loc. 5 and second sample 20 minutes later	grab	1 to 1
E	SEWPCP Effluent	Location 6 plus 2 hours and every 30 minutes thereafter	8 hour composite every 30 minutes	

3.4 EQUIPMENT AND MATERIALS

- 60 unused food grade two part metal top one pint mason jar
- 2 large volume glass jugs
- 18 liter I-CHEM series 300 amber bottles
- Disposable surgical gloves
- glass funnels (wide mouth for narrow mouth 1 liter bottle)
- Ice
- 30 gallon polyethylene bags
- Nylon twine spool
- Ice coolers and shipping (to be provided by contract lab)
- hexane
- methanol
- 3 isco composite samplers w Teflon lined tubing
- deionized water from contract lab
- non-phosphate detergent

3.5 EQUIPMENT CLEANING

Trace level PCB detection limits needed for this program warrant clean sampling procedures to minimize contamination during sample collection. Dedicated equipment will be used whenever possible. Field sampling equipment, if reused, will be cleaned as follows:

- non-phosphate detergent wash
- tap water rinse
- distilled/deionized water rinse
- hexane rinse (pesticide quality or better)
- air dry
- distilled/deionized water rinse.

3.6 QC REQUIREMENTS

3.6.1 BLANKS

One equipment blank that consists of the rinseate from the mason jar supply will be collected and submitted for analysis with the investigative samples.

Deionized water supplied by the contract laboratory will be used as a field equipment rinseate blank.

3.6.2 SAMPLE CUSTODY AND DOCUMENT CONTROL

3.6.2.1 FIELD LOG BOOK

In the field, the sampler will record the following information in the field log book (bound) for each sample collected:

- sample matrix
- name of sampler
- sample source
- time and date
- pertinent data
- analysis to be conducted
- sampling method
- appearance of each sample (i.e., color)
- preservation added
- number of sample bottles collected
- pertinent weather data
- precipitation and hydrographic flow data for rain events
- any other significant observations.

Each field logbook page will be signed by the sampler. BLS will review field logbooks for completeness.

3.6.2.2 SAMPLE LABELS

A unique sample numbering system will be used to identify each collected sample. See table 2.0. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. Samples will be described/labeled as:

SEWPCP Collector-DRBC/EPA PCB TRACKDOWN AND MANHOLE LOCATION

Monitoring-date and time: Example for SEWPCP sample. SE-PCB-trackdown-wet Weather- May X, 2002 1300-A,B,C………………..

The time is that of the second of the two grabs at the location.

3.6.2.3 CHAIN-OF-CUSTODY FORMS

PWD-BLS laboratory services/Laboratory request form # 79-771 (chain of custody form) will be completed for all samples collected during the program. Additionally, chain of custody from the contract laboratory will be used to document sample handling from BLS to the contract laboratory. See Attachment for sample chain of custody form used by PWD.

4 SAMPLE ANALYSIS

4.1 SAMPLE PREPARATION BY BUREAU OF LABORATORY SERVICES (BLS)

The two grabs will be combined 50/50 by volume as follows: gently mix/swirl the contents of each 1liter I-chem jar to insure the sample is homogenized except for the larger volume SEWPCP influent, effluent and QL raw water basin composite samples.

Using dedicated pre-cleaned glass funnels transfer the appropriate sample from the 1-liter I-chem bottles to the appropriate 1-liter, I-Chem series 300 amber glass bottle as follows
:

1- 1 liter each of sewage at locations C,D, 1,2,3,4, and 5

2-1liter plant <u>effluent sample(location E)</u>

2-1 liter plant <u>influent sample(location 6)</u>

2-1 liter raw water basin sample (location B)

1-1 liter of field/equipment rinseate blank,
1-1 liter of <u>reagent blank</u>(to be stored indefinitely)

Samples will be stored between 0 and 4^{o} C.

Samples will be logged into LIMS and assigned LIMS numbers.

4.2 ANALYTICAL METHODS

All samples collected will be sent to a contract lab chosen by the DRBC.

All samples will be analyzed by the contract lab using the more sensitive DRAFT EPA Method 1668a – Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by High Resolution Gas Chromatography/High Resolution Mass Spectrometry. Additionally, all samples will be analyzed for Total Suspended Solids using EPA Method 160.2.

5 DATA ANALYSIS

The PCB monitoring data may provide us with a valuable tool in targeting potential sources within the Southeast WPCP drainage district. The PCB source contribution from each of the drainage areas feeding the interceptor between monitoring points will be determined by examining the data

This evaluation will enable us to identify any potential large influx of PCBs. Also the results of the PCB monitoring will be graphically represented by percentage of homolog group found at each monitoring location as well as by congener type. This interpretation hopefully will assist us in trying to fingerprint any mass produced PCB source. In addition, a mass balance analysis of solids and PCBs will be performed on a system wide basis. This will involve using estimated flows and solids concentration data from the sewers leading to Southeast.

TSS data will be used to characterize the sample as representative of wet weather influenced sewage and to perform a mass solids (TSS) balance on in-sewer loadings as compared to influent loadings as measured at the plant influent.

APPENDIXES

Map of sampling sites for Southeast Water Pollution Plant sewershed.

Sample BLS chain of custody form

Proposed Trackdown Studies

As discussed in the referenced PowerPoint presentation, a Phase 2 trackdown study is recommended to attempt determine the cause of elevated levels of PCBs at two locations sampled in Phase 1.

The first location is called the Lower Delaware Interceptor at Delaware Ave, North of Shackamaxon Street. The results from the PCB analysis at this location was deemed significant since the total PCB loading at this location was about 150% of the plant's influent loading. However, the sample location was about five miles upstream from the plant. There are seven trunk sewers which enter the Lower Delaware Interceptor above the Delaware Ave North of Shackamaxon Street sampling location. In Phase 2, the plan calls for the sampling of each trunk sewer, as each passes through a combined overflow chamber. Additionally, we intend to resample the original sampling location in the interceptor itself. A diagram, entitled *"Southeast Water Pollution Control Plant, PCB Trackdown Program, Phase 2.a",* depicting the interceptor, trunk sewers and the planned sampling locations is attached to this section

The second location is called Lower Delaware Interceptor at Front Street, North of Arch Street. The results from the PCB analysis at this location was deemed significant since the total PCB concentration at this location was about ten times higher than the total PCB concentration at the nearest upstream sampling location at Delaware Ave., South of Laurel St. There are two trunk sewers which enter the Lower Delaware Interceptor between the original sampling points at Delaware Ave., South of Laurel St. and Front Street, North of Arch Street. In Phase 2, the plan calls for the sampling of each trunk sewer, as each passes through a combined overflow chamber. Additionally, we intend to resample the two original sampling locations in the interceptor itself as well as the next downstream Phase 1 sampling location at Swanson Street, South of Queen St. In order to complete the sampling of all trunk sewers in the area, we will also sample the remaining two unsampled trunk sewers upstream of Delaware Ave., South of Laurel St. It was noted, as an outcome of the Phase 1 review, that the total PCB concentration in the interceptor dropped back to below upstream concentrations once the sewerage passed the Arch Street location, so the overall impact on the environment of the dramatic concentration increase is unclear. However, we believe that the conditions merit further investigation. A diagram, entitled *"Southeast Water Pollution Control Plant, PCB Trackdown Program, Phase 2.b",* depicting the interceptor, trunk sewers and the planned sampling locations is attached to this section.

A description of the proposed sampling and analytical methods planned for the Phase 2 project are identified in the following package entitled "*Sampling and Analysis Plan for Polychlorinated Biphenly Congener Trackdown, Phase 2, Southeast Water Pollution Control Plant"*.

It is PWD's expectations that, assuming approval of the PMP before the Spring of 2006, we will conduct the Phase 2 sampling effort in 2006. Any further investigations, i.e. Phase 3, will be dependent upon the results of the Phase 2 program.

PWD's objective in conducting this trackdown program is to identify significant sources of PCBs in the sewer shed and to implement reasonable cost effective measures to mitigate the source. Since we are at the initial stage in the investigation, it is unclear as to what sources may be uncovered and, therefore, what might the nature of each source. Clearly, the nature of a source is relevant in considering what legal and physical options are available to PWD in achieving our goal. However, PWD will consult with PaDEP and other regulators in making this determination.

SAMPLING AND ANALYSIS PLAN FOR POLYCHLORINATED BIPHENYL CONGENER TRACKDOWN
PHASE 2
SOUTHEAST WATER POLLUTION CONTROL PLANT

Revised September 30, 2005

PHILADELPHIA WATER DEPARTMENT

Project Manager: **Bruce Aptowicz** ____________________________

TABLE OF CONTENTS

Map of sampling points in the SEWPCP drainage shed

BLS sample chain of custody form

1 INTRODUCTION

The Pennsylvania Department of Environmental Protection requires, as a component of a PCB Pollutant Minimization Plan (PCB PMP) that large POTWs discharging to the Delaware River engage in a sewershed PCB trackdown study to find significant sources of 209 congeners in the PCB family. To that end, a PCB trackdown committee has been formed to carry out this objective. This Sampling and Analysis Plan addresses the Phase 2 activities of the trackdown for PWD's Southeast Water Pollution Control Plant (SEWPCP) sewershed.

All samples will be submitted to the contract lab for Method 8082 PCB congener analysis and for total suspended solids using method 160.2. An attempt will be made to estimate the flow at each sampling point to calculate mass loadings at those sampling locations.

Phase 1 of this trackdown consisted of wet weather samplings using grab sample techniques. Wet Weather sampling was selected for the first phase because dry weather samplings at the PWD's POTW effluents had demonstrated very low amounts of PCBs present. Current biosolids data, together with plant effluent data, leads us to conclude that the bulk of the spilled PCBs have been flushed out (or physically removed by contract) of the sewer system. Therefore, loadings into the plant during dry weather are insufficient to result in detectable concentrations in the effluent. Since it is reasonable to assume that wet weather samples will contain the dry weather loading, the potential to track down the dry weather loading from wet weather samples exists. Phase 2 sampling will also consist of wet weather sampling using grab sample techniques.

Phase 2 will attempt to determine the cause of elevated levels of PCBs at two locations sampled in Phase 1. The first location is called the Lower Delaware Low Level Interceptor at Delaware Avenue north of Shackamaxon Street. The results from the PCB analysis at this location were deemed significant since the total PCB loading at this location was about 150% of the plant's influent loading. However, the sample location was about five miles upstream from the plant. The second location is called Lower Delaware Interceptor at Front Street North of Arch Street. The results from the PCB analysis at this location were deemed significant since the total PCB concentration at this location was about ten times higher than the total PCB concentration at the nearest upstream sampling location.

Regarding the analytical methodology, we will be using DRBC's analytical protocol described on their web site.

2 PROJECT MANAGEMENT

The project management structure is indicated in Table 1.

Table 1. Roles and Responsibilities of Key Project Personnel

Key individual	Title	Phone	Responsibility
Bruce Aptowicz	Deputy Director Operations Division	215- 685-6205	Provide overall project coordination
Keith Houck	Assistant Manager, Industrial Waste Unit	215-685-4910	Verify the proper collection of wastewater samples, verify proper post sampling activities
Earl Peterkin	Manager, Trace Organics Lab Bureau of Laboratory Services	215-685-1439	Oversee cleaning of all equipment, sample receipt, preservation, proper storage and shipping of all samples to the contract laboratory. Review field logs
William McKeon	Manager, Wastewater Treatment Plants	215-685-6258	Oversee all sampling from within the wastewater plants. Interpret significance of plant sample results
Chris Crockett	Manager, Office of Watersheds	215-685-6334	Oversee all input regarding collector system flow analysis. Interpret data from collection system samples.
Drew Mihocko	Manager, Collection System	215-685-6203	Provide input regarding physical details of the collection system.

3 SAMPLING ACTIVITIES

3.1 SAMPLING LOCATIONS

3.1.1 PRIMARY LOCATIONS

Fifteen locations in the Lower Delaware Low Level Interceptor will be sampled. Table 2 lists these locations.

3.2 DRY WEATHER SAMPLING (RESERVED)

3.3 WET WEATHER SAMPLING

3.3.1 SCHEME

A sample run start will be confined to a qualifying rain event that only occurs as a frontal system. A qualifying rain event is one which equal or exceeds 0.1 inch and whose duration is at least one hour and where there has been no preceding rainfall within 72 hours of 0.01 inches or greater.

Before sampling occurs, there shall be an estimate of the travel time for each location. By attempting to collect the downstream samples according to their estimated time of travel, we will increase the likelihood that the grabs taken at each of the 15 locations occur on a rising hydrograph of the storm event.

Sampling shall begin at the locations described in Table 2 immediately upon the above criteria being achieved. Two grab samples shall be taken 20 minutes apart at each location to catch the rising hydrograph that is occurring in the sewer. Sampling will start at the top of the system so as to follow the same sewerage down the collector as it picks up additional flows from the trunked sewers. The two grabs from the interceptor (and the plant influent) locations will be combined in equal proportions with one another at the PWD's Bureau of Laboratory Services (BLS) at Hunting Park and Castor Avenues, Philadelphia.

3.3.2 SAMPLING DETAIL

- The PWD industrial waste unit (IWU) will conduct sampling. All sampling procedures will be conducted in accordance with the protocols detailed in this section.
- Dedicated, precleaned equipment will be used for each sampling location. Each sample container will consist of a food grade pint mason jar that has undergone an ultra cleaning at our central laboratory. The samplings will be transferred immediately to I-chem ultraclean bottle. No mason jars will be reused.
- Personnel handling the samples will wear a new pair of disposable powder-free surgical gloves with each sample collected.
- Sewage will be retrieved from the interceptors at manholes using nylon twine affixed to a new, precleaned one-pint mason jar. For those interceptor samples, a dedicated precleaned mason jar will be lowered by nylon twine from the top of the manhole to the top of the sewage flow several times to retrieve sufficient volume to fill one liter ultraclean I-chem bottle. The filled I-chem bottle will be stored in a cooler, which will contain ice.
- A second one liter ultraclean I-chem bottle will be filled 20 minutes after the collection of the first sample, using the same sampling technique. The filled I-chem bottle will be stored in a cooler, which will contain ice.
- A separate sample for total suspended solids (TSS) will be collected at each location sampled. Each sample will consist of a one-liter sample at the locations listed above.

- The PWD Bureau of Laboratory Services (BLS) will provide all clean glassware, store samples and undertake shipment when a contract laboratory purchase order is in place. BLS will conduct analyses for TSS.
- The contract laboratory will undertake all analyses except TSS. They will supply deionized water, ice coolers and shipping to and from BLS. This water shall be used for all blanks. One liter blank will be collected at each sample location from the rinseates of the mason jar used to retrieve that sample. One of the blanks will be sent on to the contract laboratory. All other blanks will be stored at BLS and their disposition will be dependent on the results of all samples.
- All samples will be transported to the central lab under ice. For each location, BLS will combine the two grab samples. The two grab samples will be combined by gently shaking/swirling the contents of each, and then immediately pour the contents of each into a laboratory prepared sample container. The combined sample will be identified as the respective manhole/plant sample.

Table 2. Location, timing and types of samples to be taken

Sampling location I.D.	Location	Approximate time of sample*	Type	Ratio of combining samples
1	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at D-37	tbd*	2 grab samples	1 to 1
2	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at D-38	tbd	2 grab samples	1 to 1
3	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at D-39	tbd	2 grab samples	1 to 1
4	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at D-40	tbd	2 grab samples	1 to 1
5	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at D-41	tbd	2 grab samples	1 to 1
6	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at D-42	tbd	2 grab samples	1 to 1
7	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at D-43	tbd	2 grab samples	1 to 1
8	Lower Delaware Low Level Interceptor at Delaware Ave. north of Shackamaxon St.	tbd	2 grab samples	1 to 1
9	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at D-44	tbd	2 grab samples	1 to 1
10	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at D-45	tbd	2 grab samples	1 to 1
11	Lower Delaware Low Level Interceptor at Delaware Ave. south of Laurel St.	tbd	2 grab	1 to 1
12	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at D-46	tbd	2 grab samples	1 to 1
13	Dry Weather Overflow Pipe in the Combined Sewer Overflow Chamber at D-47	tbd	2 grab samples	1 to 1
14	Lower Delaware Low Level Interceptor at Front St. north of Arch St.	tbd	2 grab samples	1 to 1
15	Lower Delaware Low Level Interceptor at Swanson St. south of Queen St.	tbd	2 grab samples	1 to 1

* To be determined

3.4 EQUIPMENT AND MATERIALS

- 60 unused food grade two part metal top one pint mason jar
- 2 large volume glass jugs
- 18 liter I-CHEM series 300 amber bottles
- Disposable surgical gloves
- glass funnels (wide mouth for narrow mouth 1 liter bottle)
- Ice
- 30 gallon polyethylene bags
- Nylon twine spool
- Ice coolers and shipping (to be provided by contract lab)
- hexane
- methanol
- 3 isco composite samplers w Teflon lined tubing
- deionized water from contract lab
- non-phosphate detergent

3.5 EQUIPMENT CLEANING

Trace level PCB detection limits needed for this program warrant clean sampling procedures to minimize contamination during sample collection. Dedicated equipment will be used whenever possible. Field sampling equipment, if reused, will be cleaned as follows:

- non-phosphate detergent wash
- tap water rinse
- distilled/deionized water rinse
- hexane rinse (pesticide quality or better)
- air dry
- distilled/deionized water rinse.

3.6 QC REQUIREMENTS

3.6.1 BLANKS

One equipment blank that consists of the rinseate from the mason jar supply will be collected and submitted for analysis with the investigative samples.

Deionized water supplied by the contract laboratory will be used as a field equipment rinseate blank.

3.6.2 SAMPLE CUSTODY AND DOCUMENT CONTROL

3.6.2.1 FIELD LOG BOOK

In the field, the sampler will record the following information in the field log book (bound) for each sample collected:

- sample matrix
- name of sampler
- sample source
- time and date
- pertinent data
- analysis to be conducted
- sampling method
- appearance of each sample (i.e., color)
- preservation added
- number of sample bottles collected
- pertinent weather data
- precipitation and hydrographic flow data for rain events
- any other significant observations.

Each field logbook page will be signed by the sampler. BLS will review field logbooks for completeness.

3.6.2.2 SAMPLE LABELS

A unique sample numbering system will be used to identify each collected sample. See table 2.0. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. Samples will be described/labeled as:

SEWPCP PHASE 2 Collector-DRBC/EPA PCB TRACKDOWN AND MANHOLE LOCATION

Monitoring-date and time: Example for SEWPCP sample. SE-PCB-trackdown-wet Weather- May X, 2006 1300-A,B,C………………..

The time is that of the second of the two grabs at the location.

3.6.2.3 CHAIN-OF-CUSTODY FORMS

PWD-BLS laboratory services/Laboratory request form # 79-771 (chain of custody form) will be completed for all samples collected during the program. Additionally, chain of custody from the contract laboratory will be used to document sample handling from BLS to the contract laboratory. See Attachment for sample chain of custody form used by PWD.

4 SAMPLE ANALYSIS

4.1 SAMPLE PREPARATION BY BUREAU OF LABORATORY SERVICES (BLS)

The two grabs will be combined 50/50 by volume as follows: gently mix/swirl the contents of each 1liter I-chem jar to insure the sample is homogenized.

Using dedicated pre-cleaned glass funnels transfer the appropriate sample from the 1-liter I-chem bottles to the appropriate 1-liter, I-Chem series 300 amber glass bottle as follows:

1- 1 liter each of sewage at locations 1 to 15
1-1 liter of field/equipment rinseate blank,
1-1 liter of reagent blank (to be stored indefinitely)

Samples will be stored between 0 and 4^{o} C.

Samples will be logged into LIMS and assigned LIMS numbers.

4.2 ANALYTICAL METHODS

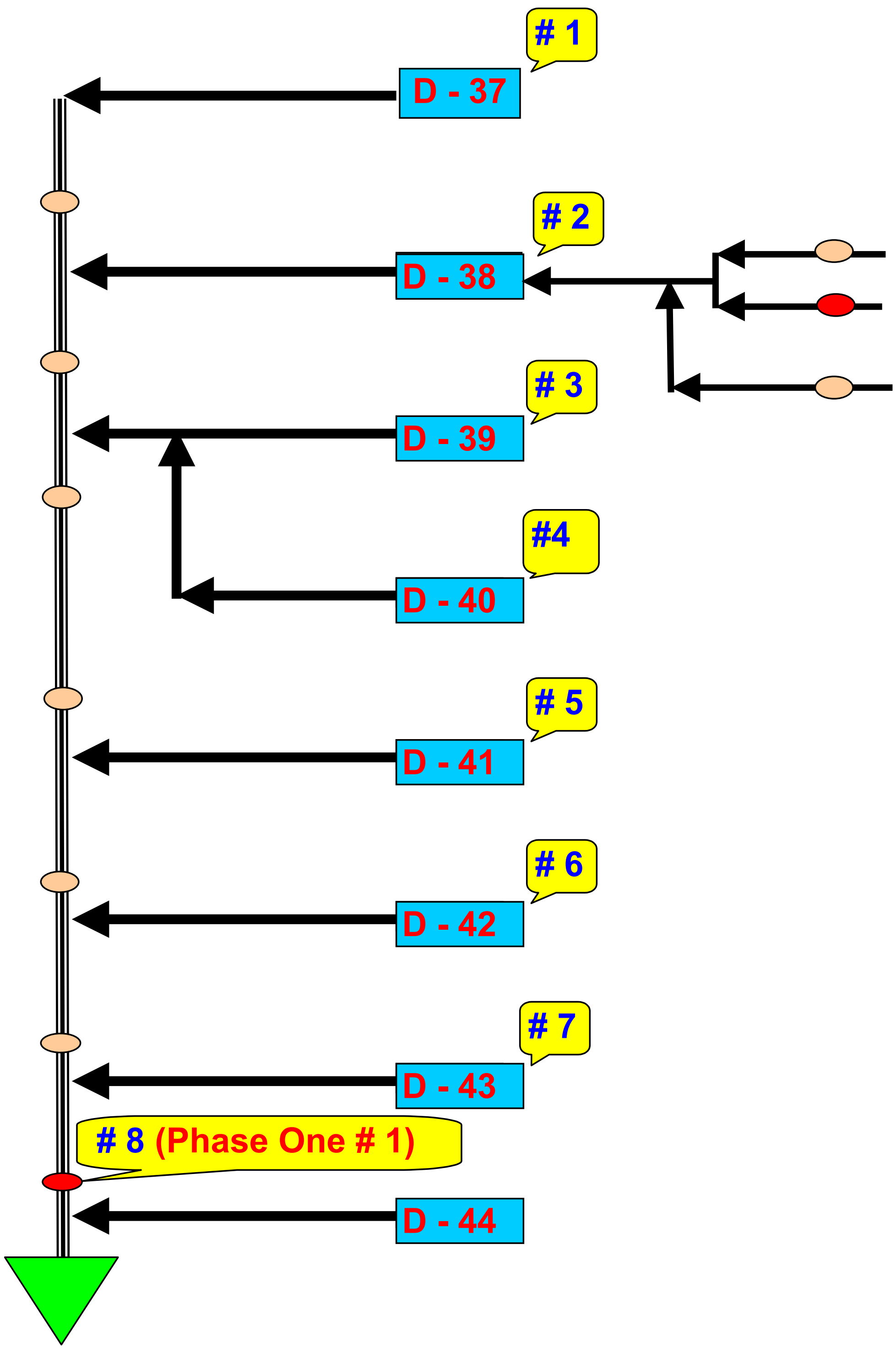
All samples will be analyzed by the contract lab using EPA Method 8082 – Polychlorinated Biphenyls by Gas Chromatography. Additionally, all samples will be analyzed for Total Suspended Solids using EPA Method 160.2.

5 DATA ANALYSIS

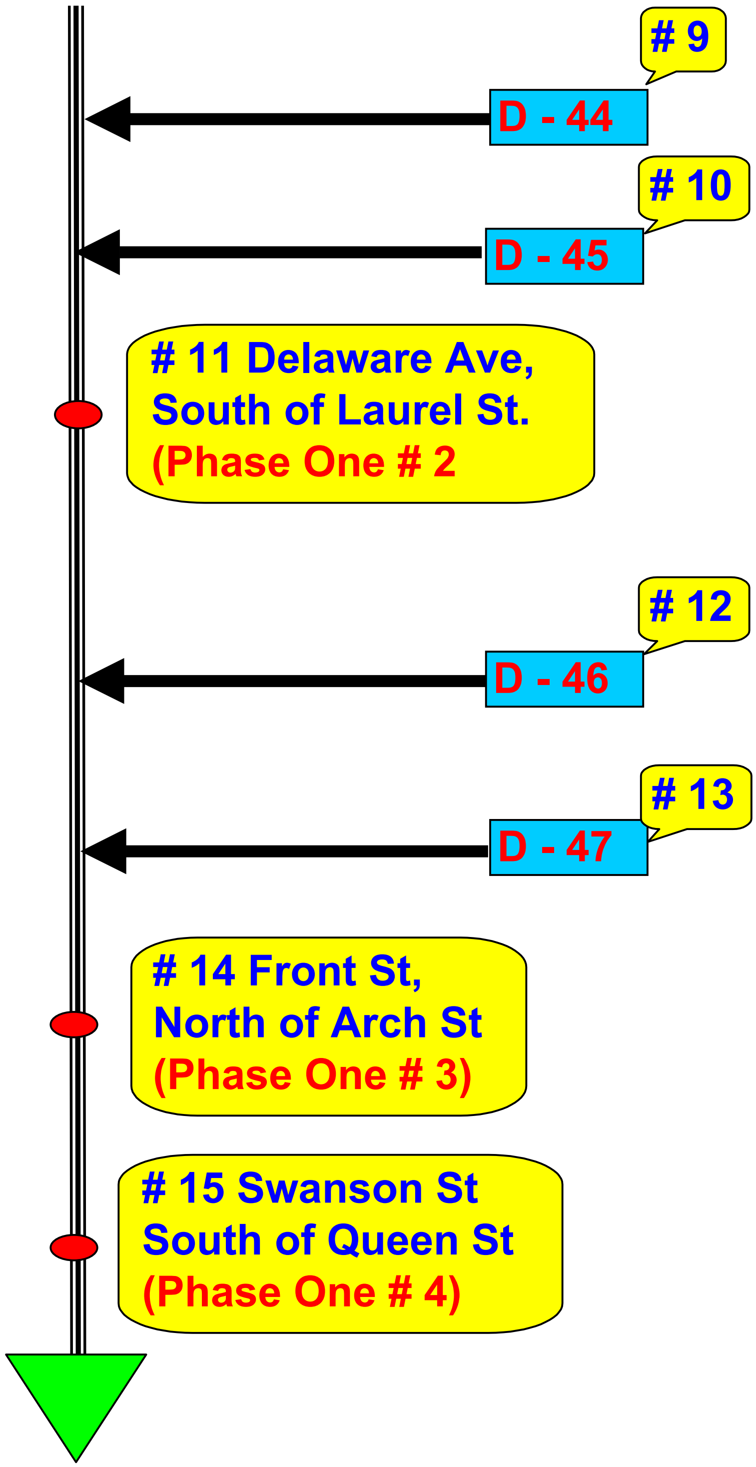
This evaluation will enable us to identify any potential large influx of PCBs. Also the results of the PCB monitoring will be graphically represented by percentage of homolog group found at each monitoring location as well as by congener type. This interpretation should assist us in trying to locate and identify PCB sources.

TSS data will be used to characterize the sample as representative of wet weather influenced sewage and to perform a mass solids (TSS) balance on in-sewer loadings as compared to influent loadings as measured at the plant influent.

PCB Trackdown Program
Phase 2.a



Southeast Water Pollution Control Plant
PCB Trackdown Program
Phase 2.b



PMP

Southeast Plant
Previous Minimization Activities
Item 7

As described in Section 4. Known Sources, the water treatment coagulant used at the Queen Lane Water Treatment Plant is produced by the DuPont Company. This product contains PCBs, most of which are captured by the water treatment processes and discharged into the Southeast Plant sewer shed. The Dupont Company reports the following activities to reduce the PCB concentrations in their ferric chloride.

In the spring of 2001 DuPont analyzed the ferric chloride by-product and found approximately 1.49 ppb of PCBs in the ferric chloride by-product. DuPont promptly launched a program to determine how PCBs are incidentally manufactured in the TIO2 process. The objective of the program is the virtual elimination of PCBs as technology becomes available with a focus on source reduction versus end of pipe treatment. The DuPont technical team developed several short terms process modification to reduce incidental manufacturing of PCBs and 15 long term options that could possibly reduce PCB generation by 90% from the 2001 levels.

The short term reduction effort was quickly implemented in 2002. The effort consisted of a change in raw material use (oil used to keep ore dust down), additional process controls, and installation of settling tanks. These actions reduced PCBs generation by approximately a 60%.

In order to obtain information regarding previous, ongoing or planned pollutant minimization activities, PWD wrote to a number of agencies who may have knowledge of such programs in the PWD sewer sheds as explained in this PMP report under Section 5. Northeast Plant, Potential Sources. The following activities were reported to us from those agencies.

The Philadelphia Department of Public Heath provided PWD with several locations of historical PCB spill sites within the boundaries of the City of Philadelphia. These are listed in the following spreadsheet entitled *"PMP- SE PCB Sites – Health Dept"*. Many of these sites date back in time several decades and were quite small in nature, however they continue to be listed as PCB sites by the Health Dept. PWD's Industrial Waste Unit's inspectors will attempt to investigate the current environmental status of each of these sites over the first two years of this PMP. Sites which are believed to represent no further threat to the environment will be eliminated from the listing. Sites which continue to represent a threat will be characterized in future annuals reports together with any plans to further minimize the sources.

The PaDEP reports that they have a number of sites located within the Southeast sewer shed which are ACT 2 PCB Sites and should be reported in the PMP as possible sites for which previous minimization activities have occurred. A meeting, on September 5, 2005 was held between PWD and state officials, in response to PWD's letter, to discuss this inventory which is currently located on a rather large PaDEP Southeast Region database. The outcome of the meeting was that PWD would forward a set of possible descriptors for each site. PaDEP would use the descriptors to produce a listing of

Act 2 sites. It was recognized that considerable effort on the part of PaDEP would be required to produce the listing and that the time required to complete the task might go beyond the window of time which we have to incorporate the results into our PMP. That is the current situation, PWD will incorporate the complete list of sites into our first annual report. Attached is a copy of the email entitled *"PMP – Identification of Known Sources, by Bruce Aptowicz"* which lists PWD's criteria.

It was agreed by all parties that this 5 year PMP would not require a site visit by PWD personnel as other PCB sources have higher priorities. However, should the trackdown effort result in the detection of a significant unknown source in a specific part of the Southeast sewer shed, we look examine PaDEP's ACT 2 listing for any nearby sites and inspect those sites as the potential sources of the unknown loading.

PMP - SE PCB Sites - Health Dept

WPCP	Location	Date	Amount	Comments
SE	9th & Columbia	1980		6 hr clean-up
SE	200 S.Broad Street	06/19/87	~1 gal	Transformaer leak at Bellvue
SE	3650 S. Galloway	05/22/86	65 ppm	Transformer oil in manhole
SE	Pier 14 - Powerhouse Transformer	03/06/84		PCB spill
SE	Hancock paper CO.- 434 Brown Street	06/07/84		PCBs stored, liquid discharged from building to street
SE	Jackfrost Sugar Refinery - 1037 N. Delaware Ave.	09/09/85		Leaked PCB transformer

Bruce Aptowicz

09/06/2005 01:18 PM

To: jefields@state.pa.us
cc: jnewbold@state.pa.us
Subject: PMP - Identification of Known Sources

Jennifer:

It was productive for us to meet with Bob, Jim and you, yesterday, as we create the PCB - PMP program for PWD. As we discussed, PaDEP will review your database of ACT 2 PCB sites and provide me with an electronic spreadsheet according to the following conditions:

The inventory of PCB sites will include all known sites within the boundaries of the City of Philadelphia

The inventory of PCB sites will also include all known sites within the boundaries of the townships which have combined sewer systems. It was our expectation that PCBs leaving a contaminated site would be caused by storm runoff and therefore be transported by the storm system, not the sanitary system. Therefore, PCBs discharging from a site in a suburban township which has separate systems would be the responsibility of the suburban township, not PWD. Unfortunately, we are not positive as which of our suburban township customers have combined sewers. It is our best understanding that none of the townships listed below have combined sewer systems. If PaDEP has information to the contrary, then please include the Act 2 sites located in those townships.

Jim suggested that very large sources of PCBs in any of our suburban customers should also be included since a release from such a site might also reach the sanitary sewers. The following list represents all of PWD's suburban township customers:

Northeast Water Pollution Control Plant

City of Philadelphia:

Zip Code	County	Township
18940	Bucks	Northampton & Newtown Township & Newtown Borough
18954	Bucks	Northampton
18966	Bucks	Southampton
19001	Montgomery	Abington
19006	Montgomery	Lower Southampton
19007	Bucks	Bristol Township
19020	Bucks	Bensalem
19046	Montgomery	Jenkintown
19047	Bucks	Hulmeville Borough & Langhorne Borough
19053	Bucks	Lower Southampton
19056	Bucks	Middleton Township
19054	Bucks	Levittown
19075	Montgomery	Oreland
19090	Montgomery	Willow Grove
19067	Bucks	Lower Makefield

Southeast Water Pollution Control Plant

City of Philadelphia:

Zip Code	County	Township
19038	Montgomery	Glenside
19095	Montgomery	Wyncote

Southwest Water Pollution Control Plant
City of Philadelphia:

Zip Code	County	Township
19038	Montgomery	Glenside
19008	Delaware	Broomall
19018	Delaware	Clifton Hts.
19023	Delaware	Darby
19026	Delaware	Drexel Hill
19029	Delaware	Essington
19032	Delaware	Folcroft
19033	Delaware	Folsom
19036	Delaware	Glenolden
19041	Delaware	Haverford
19043	Delaware	Holmes
19050	Delaware	Lansdowne
19057	Delaware	Wayne
19066	Montgomery	Lower Merion
19070	Delaware	Morton
19073	Delaware	Newtown Sq.
19074	Delaware	Norwood
19076	Delaware	Prospect Park
19078	Delaware	Ridley Park
19079	Delaware	Sharon Hill
19082	Delaware	Upper Darby
19083	Delaware	Upper Darby
19085	Delaware	Villanova
19087	Delaware	Wayne
19004	Montgomery	Bala Cynwyd
19010	Delaware	Bryn Mawr
19017	Delaware	Chester Heights
19035	Montgomery	Gladwyne
19096	Montgomery	Wynnewood
19444	Montgomery	Lafayette Hill

4. If information that is available to you in the database permits you to believe that the site was essentiall all cleaned to background levels, do not include that site.
5. We all concluded that the proper place within the PMP submission to list these sites was Section 7: *Previous, Ongoing or Planned Minimization Activities Voluntarily or Required by Other Regulatory Programs.* That section requests that the discharger provide the following information with each site listing. Please determine if your database can provide me with information:
   - the level of pollutant reduction attained
   - the level of pollutant reduction targeted
   - measures completed
   - measures underway
   - the schedule for planned activities
6. Additionally, I would suggest that the following information be provided for each site, if available via your database
   - Name of site, if any,
   - Company's name, if any

Street
Township
County
Zip Code
GIS coordinates
Whether the site met site specific standards or state health standards

7. PWD would then add the following information to characterize each site:
   Name of POTW which might be affected by site

(For PCB sites located in suburban townships which discharge into the PWD collection system)
   Name of entity under whose contract with PWD permits wastewater in the vicinity of the site to discharge wastewater into PWD's collection system
   Location or name of downstream connection to the PWD's collection system

(For PCB sites located within the City of Philadelphia's collection system)
   Name of the trunk sewer which transports wastes in the vicinity of the site
   Name of the intercepting sewer which transports the wastes in the vicinity of the site
   Name of stormwater outfall which transports the stormwater in the vicinity of the site

8. Additionally, we all concluded that this submission of the 5 year PMP would not require a site visit by PWD personnel as other PCB sources, and specially, the potential sources, have higher priorities.

As I mentioned yesterday, if you are able to gather the requested information and transmit it to me in about a week or two, I should be able to incorporate it into our submission. If your effort takes more time, I will simply reference this task in the PMP submission and incorporate the information into the PMP when it arrives.

Thanks.

Bruce

PMP
Southeast Plant
Recommendations for Action Under Other Regulatory Programs
Item 8

At this point in the PMP process, PWD does not envision the need for other regulatory authorities to take further actions in the mitigation of the currently listed known sources beyond the continued reduction of PCB concentrations in ambient sources waters.

However, should the trackdown effort result in the identification of a PCB source which is not in violation of the Department's Pretreatment Regulations, it is expected that PWD will request a meeting with the appropriate regulatory agencies to determine a proper course of action.

With respect to potential sources, we have identified two instances in Section 5 – Potential Sources in which the involvement of other regulatory agencies is recommended.

PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards requiring the electric service provider, to any facility which operates a PCB transformer, to notify PWD whenever one the referenced facilities requests that their high tension electrical power be shut down for an indeterminate period. If such an arrangement can be accomplished, upon notification, PWD will visit the facility and inquire as to the facility's plans for the transformer and provide information regarding the proper disposal of PCB equipment.

Secondly, upon identifying a facility, containing PCB equipment, which is closed or not secured, PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards minimizing the potential of PCBs from that equipment becoming released into the environment.

PMP
Southeast Plant
Pollutant Minimization Measures
Item 9

1. On-Site Known or Probable Sources

As reported in Section 3 of this report, the Southeast Plant has no known or probable on-site sources of PCBs.

2. Collection System Known Sources

As described in Section 4. Known Sources, two known sources of PCBs were reported at this time. PaDEP has preliminarily identified additional ACT 2 sites – under past or current mitigation actions for PCBs - that may be the source of PCBs into the environment, but requires additional time to develop an appropriate spreadsheet to characterize each site. PWD will incorporate the PaDEP's list of ACT 2 sites into this PMP in the first annual report. However, should an outcome of the trackdown program result in the identification of an ACT 2 site as being the source of a significant release of PCBs into the sewer shed, PWD will request a meeting of all appropriate regulatory parties to determine a future course of action.

The first reported known source affecting the Southeast sewer shed is the transmission of PCBs from the Schuylkill River into sewer via treatment processes of the Queen Lane Water Treatment Plant. The Schuylkill River has been listed by the State of Pennsylvania as impaired due the presence of PCBs. As a result of this listing, state and federal agencies are working towards the development of a plan which will, upon implementation, result in a reduction in its ambient PCB concentration. PWD recognizes that this effort will, in all likelihood, take decades to demonstrate significant results. During the intervening time, the Queen Lane Plant, under direction from both the PaDEP and the USEPA, will continue to maximize the removal of solids from its drinking water supply - recognizing that such removal effectiveness also increases the capture of PCBs and their discharge into the sewer. PWD's economic analysis also indicates that the sewering of the Queen Lane Plant's waste solids – thereby utilizing the existing Southeast Plant's infrastructure to convey, separate, thicken, dewater and ultimately, dispose of the water plant's commingled solids – continues to remain the only economically feasible option.

The second known source of PCBs in the collection system is the water treatment coagulant used at the Queen Lane Water Treatment Plant which is produced by the DuPont Company. This product contains PCBs, most of which are captured by the water treatment processes and discharged into the Southeast Plant sewer shed. The Dupont Company reports the following future activities to reduce the PCB concentrations in their ferric chloride.

Since 2002, DuPont completed its evaluation of the long term options to reduce PCB at the source and is committed to implement a $15+million project in 2007. The project will consist of modifications to the industrial process. DuPont anticipates this project will reduce PCB generation by approximately 90% from the 2001 PCB levels in ferric chloride.

3. Potential Sources

PWD believes that the release of potential sources of PCBs into the environment represents a significant threat to the consistent reduction of PCB concentrations in the nearby rivers and streams. Indeed, in September of 1994, PWD was the victim of an illegal discharge of approximately 1000 pounds of PCBs into the Southeast sewer shed. The consequences of the discharge was overwhelming to our biosolids recycling program and undoubtedly resulted in significant quantities of PCBs being conveyed into the Delaware River.

However, PWD recognizes that it is the policy of this country not to require the removal of PCB containing devices (potential sources) when they used and maintained in a responsible manner.

Therefore, PWD believes that the most effective, but reasonable, manner to prevent a release of a stored quantity of PCBs from being illegally released into the environment is to take existing, but limited, federal programs of identification of PCB potential sources to a higher level.

Section 5 - Potential Sources of this plan identifies a plan to visit all current owners of PCB equipment and collect and record forty (40) descriptors for each source. The following tasks are proposed identify and control potential sources:

1. PWD will make a reasonable effort to obtain the requested information from the owners of the equipment. All gathered information will be incorporated into the referenced spreadsheet.
2. Inspectors from the Industrial Waste Unit will visit all listed sites either within the City of Philadelphia or sites located in the sewer sheds of those suburban townships that wholesale discharge sewerage into PWD's collection system for which PWD manages their pretreatment permit.
3. All such listed sites will be visited during this five year plan
4. PWD will attempt to enlist either the suburban community's wastewater utility or its fire code enforcement organization to visit the remaining suburban township sites and provide PWD with the requested information.
5. On the occasion of a visit to a site, PWD will disseminate information to the site contact individual regarding their obligations for proper disposal of the PCB equipment. We will request that the site contact individual notify PWD of any change in status of the PCB equipment.
6. If the site containing the PCB equipment has an industrial waste pretreatment permit with PWD, we will, on the occasion of their next permit renewal, insert language into the pretreatment permit which obligated the permittee to notify PWD if the status changes of the PCB equipment and to follow proper procedures when disposing of the equipment.
7. PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards requiring the electric service provider, to any facility which operates a PCB transformer, to notify PWD whenever one the referenced facilities requests that their high tension electrical power be

shut down for an indeterminate period. If such an arrangement can be accomplished, upon notification, PWD will visit the facility and inquire as to the facility's plans for the transformer and provide information regarding the proper disposal of PCB equipment.

8. Upon identifying a facility, containing PCB equipment, which is closed or not secured, PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards minimizing the potential of PCBs from that equipment becoming released into the environment.

PMP
Southeast Plant
Source Prioritization
Item 10

Identified potential sources of PCBs have been prioritized in accordance with their decreasing weights of contained PCBs. Data used to compare PCB weights was limited, as only the USEPA and Philadelphia Water Department records contained information regarding the weight of PCBs contained within the devices. The files provided in Item 5 Potential Sources display the prioritized sites.

PWD will follow this prioritization in the scheduling of site inspections unless geographical convenience or scheduled inspections for the purpose of pretreatment inspections allows us to efficiently inspect sites in addition to those at the top of the list.

Two known PCB sites have been identified in Section 4 of this report. PWD will prioritize PCBs contained in ferric chloride used in the water treatment process.

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 21	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 Activitiess (# 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.			10				10				11									
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	2
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																				

PMP
Southeast Plant
Measuring, Demonstrating and Reporting Progress
Item 12

12.1 Sampling and Analytical Approaches

PWD intends to utilize several different approaches to demonstrate progress towards achieving PCB minimization resulting from the implementation of our PMP.

As required by the PMP, we will sample the effluent of the plant once every two years and will analyze the sample for PCBs using Method 1668A. Reductions in the total PCB concentration over time may be an indicator program success. However, as the DRBC has correctly pointed out in their document entitled "*Recommended Outline for Pollutant Minimization Plans for Polychlorinated Biphenyls in the Delaware Estuary, Municipal Waste Water Treatment Plants and Publicly Owned Treatment Works",* analytical uncertainties may mask effluent reductions. Furthermore, wet weather samples will be collected and their PCB concentrations used in the analysis. However, the data indicates that there is far greater variability in the PCB concentrations of wet weather samples versus dry weather samples. Although there can be a number of causes of this variability, it is likely that the characteristics of each storm event (rainfall intensity, duration, etc) are significant factors. Since future wet weather sampling will cover a range of types of storm events (as long as each meets the requirements of a qualifying storm event), it is likely that the resulting PCB concentrations will contain significant variability due solely to the nature of each rain event.

Therefore, alternative approaches will be included in our annual reports to demonstrate progress.

As provided in the list of PCB potential sources, Item 5, there may be as many 73 sites in the Southeast Plant sewer shed housing PCB contained devices. Additionally, a number of these sites are reported to hold more than one PCB device. At this stage in the program, PWD is uncertain of the current existence of all of the reported devices, but we know that they were reported by the authorities to have existed in the not distant past and there is no reported knowledge on the part of those agencies that they have been removed. PWD will visit each site during the term of this plan and will report the number of devices that have been removed. If the institutional knowledge can provide us with the weight of the removed PCBs, we will report that value also.

Furthermore, PWD has stated concerns over the potential release of PCBs from vulnerable devices – i.e. those located at sites which are closed or abandoned or devices which have been deenergized or moved into storage. We have recommended that, upon identification of such devices, the regulators and ourselves discuss and implement procedures to minimize the risk of these PCBs from being released into the environment. At such, we will separately report the removal of any vulnerable devices.

PWD has reported two known sources. Both sources are discharged into the sewer shed from the Queen Lane Water Treatment Plant. We will report any reduction in PCB concentrations in the waste streams from the water plant by both measuring the PCBs in the ferric chloride product as well as, using available DRBC ambient data, PCB reductions in the plant's source (Schuylkill River) water.

PWD has identified a number of sites from the Philadelphia Dept. of Public Health which, we believe, have undergone some form of prior remediation. PWD will inspect each site to either remove it as a potential liability for future PCB release or to recommend activities to reduce the potential risk. We will report the number of sites removed from the list or sites where further remedial action has been recommended or completed.

PWD's objective in conducting its trackdown program is to identify significant sources of PCBs discharged into our sewer shed and then, in cooperation with our regulators, determine and implement procedures to minimize or eliminate those discharges. PWD will report each reduction of PCB load into the shed.

12.2 Estimated Load

An estimate of the annual baseline load from the Southeast Plant has been determined by calculating the average wet and dry weather PCB concentrations in the plant effluent and then determining the flow for a typical year.

PWD recommends using the typical year flows for future year comparisons and calculations. By doing so, we remove, from the analysis, the variability in annual PCB loads caused by the variation in annual rainfall. Secondly, it is clear that the Southeast Plant will discharge a greater PCB annual loading if it increases its capture of stormwater and thereby increases its flows during wet weather. However, by accomplishing this goal, the environment will receive an overall benefit since the volume of untreated CSO discharge will be reduced. Of course, PWD has been directed, via its NPDES permit, to implement plans to minimize CSO discharge and is well on its way towards accomplishing this long term requirement. By using a typical year plant flow for the annual PMP analysis, we can properly focus our attention on progress towards reducing PCB concentrations in the plant effluent.

The following chart entitled *"Southeast Plant, Baseline PCB Plant Effluent Concentration (pg/l)"* provides our methodology for determining the baseline PCB concentration. PWD uses the PCB data collected in 2001 as the basis for its baseline concentration since that was the time frame in which PWD began to focus attention on reducing PCBs affecting its sewer shed. However, the analytical procedures employed to analyze that data set focused on only 85 congeners while more recent data (2005) required data from 209 congeners. In order to make the 2001 data reflect all 209 congeners, a procedure was employed to estimate the concentrations of the unanalyzed congeners in the 2001 data set by developing a ratio between the total concentration in the 85 congeners to the total concentration of the 209 congeners in the 2005 data set. That ratio was then applied to the 2001 data and an estimate of the concentration from 209 congeners was derived. It is estimated that the average baseline PCB concentration during wet weather is 32,442 pg/l while the average dry weather concentration is 12,653 pg/l.

In order to estimate plant flow for a typical year, PWD examined the annual rainfall patterns for the past 103 years and determined that the year 2000 exhibited close to the average annual rainfall while also providing relevant plant flow data, which were also near long term averages. The plant flow data was examined to identify flows consistent with rainfall events. The attached graph entitled *"SE WPCP Average Daily Flows – 2000"* identifies wet weather days. The average flow for wet weather days and dry weather days were then calculated together with the number of days in each category. Thus, in a typical year, the Southeast Plant experiences 142 wet weather days and 223 dry weather days, while the average plant flow in wet weather is 107 MGD and is 84 MGD in dry weather.

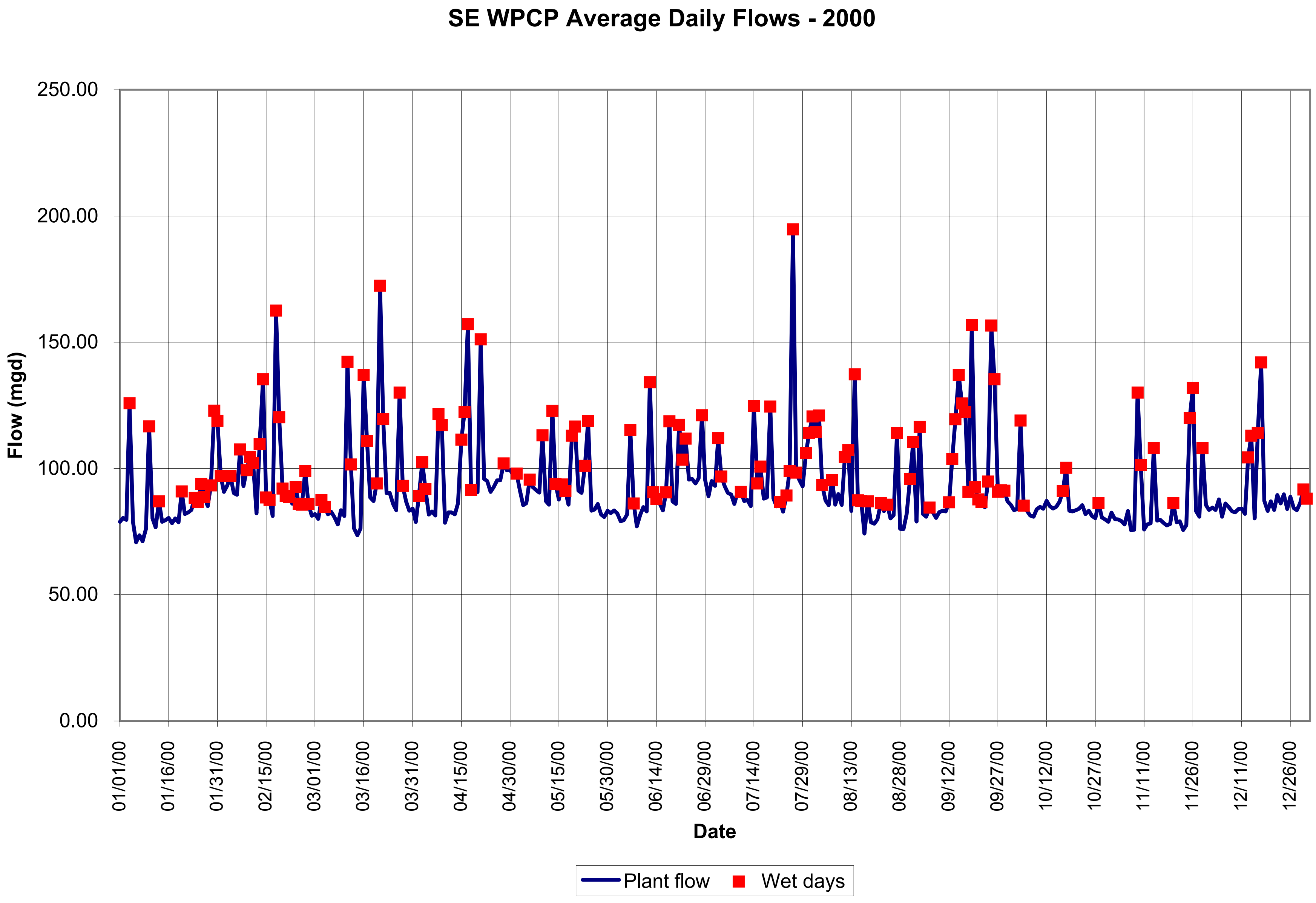
The attached chart entitled *"Southeast Plant, Baseline PCB Plant Effluent Loading (gm/yr)"* displays this data and calculates the baseline annual loading to be 2,758 gm/year.

12.3 Anticipated Reductions to Baseline Load

Currently, PWD has committed to a reduction in the PCB concentration in the ferric chloride product utilized in its Queen Lane Water Treatment Plant and which is then discharged into the sewer. We expect to experience a 90 percent reduction in concentration by the end of the third year of the program. Beyond that known source, PWD is uncertain as to the expected success of its ability to identify and, subsequently, minimize other sources and therefore cannot, with any degree of confidence, anticipate further reductions to baseline load. PWD is committed, however, to making every reasonable effort to achieve success of this program and is hopeful that its labors will result in significant load reductions.

12.4 Continuing Assessment

PWD will report progress towards PCB minimization in an annual report starting one year after the commencement of this PMP. Commencement of the PMP will start within 60 days of the receipt of a determination of completeness from the DRBC.



SE WPCP Average Daily Flows - 2000
Flow (mgd)
250.00
200.00
150.00
100.00
50.00
0.00
01/01/00
01/16/00
01/31/00
02/15/00
03/01/00
03/16/00
03/31/00
04/15/00
04/30/00
05/15/00
05/30/00
06/14/00
06/29/00
07/14/00
07/29/00
08/13/00
08/28/00
09/12/00
09/27/00
10/12/00
10/27/00
11/11/00
11/26/00
12/11/00
12/26/00
Date
Plant flow
Wet days

Measuring, Demonstrating and Reporting Progress
Item # 12
Southeast Plant

Baseline PCB Plant Effluent Concentration (pg/l)

			Wet Weather				Dry Weather			
Line	**Year Samples Taken**	**Data**	**Sample # 1**	**Sample # 2**	**Sample # 3**	**Average**	**Sample # 1**	**Sample # 2**	**Sample # 3**	**Average**
1	**2005**	**Total of all 209 congener concentrations with positive values plus 1/2 detection level for all congeners with non-detections**	**18,357**	**8,733**		**13,545**	**2,125**	**1,857**	**2,457**	**2,147**
2	**2005**	**Using only the 85 (2001) congeners, total concentrations with positive values plus 1/2 detection level for all congeners with non-detections**	11,026	4,877		**7,952**	871	741	1,047	**887**
3		**ratio of Line 1 to Line 2**	1.66	1.79		**1.70**	2.44	2.51	2.35	**2.42**
4	**2001**	**Total of 85 congener concentrations with positive values plus 1/2 detection level for all congeners with non-detections**	14,960	20,095	22,081	**19,045**	3,801	7,041	4,834	**5,225**
5	**2001**	**Estimate of total concentration assuming analysis of 209 congeners (Line 3 multiplied by Line 4)**	24,907	35,980	-	**32,442**	9,278	17,638	11,340	**12,653**

All reported PCB concentrations **include** 'J' values, and 1/2 the detection limit for those cogeners reported as non-detect ('U')
In 2001, only 85 congeners were analyzed, while 209 were analyzed for in 2005

Measuring, Demonstrating and Reporting Progress
Item # 12
Southeast Plant

Baseline PCB Plant Effluent Loading (gm/yr)

		Wet Weather		Dry Weather		Total
Baseline Flows (MGD)		107		84		
Baseline Flow Days per Year		142		223		
Baseline PCB Concentration (pg/l)		32,442		12,653		
Baseline PCB Loading (gm/year)		1,863		896		**2,759**

PMP
Southwest Plant
Facility Description
Item 3

3.a. Facility Name and Address

Southwest Water Pollution Control Plant
8200 Enterprise Avenue
Philadelphia, PA 19153-3813

PaDEP Site ID #: 451994
NPDES Permit No. PA 0026671

3.b. Facility Description and Map

The SWWPCP provides full secondary treatment of wastewater for a design flow of 200 million gallons per day (MGD). SWWPCP also provides thickening and digestion of sludge for both the SWWPCP and Southeast Water Pollution Control Plant (SEWPCP). Digested sludge is then sent to BRC for dewatering and composting operations.

The SWWPCP treats incoming wastewater using five basic unit processes: 1) influent pumping, 2) preliminary treatment, 3) primary treatment, 4) secondary treatment, 5)effluent pumping and disinfection. Additional processes are used for solids handling. These processes included sludge thickening and digestion.

The purpose of the influent pumping process is to lift wastewater to the operating level of the plant. The wastewater is lifted by three two-stage screw pumps from a low level interceptor. Influent pumps are required for approximately 10 % of the incoming wastewater. High-level interceptor delivers the rest of the wastewater, from both Philadelphia and Delaware Counties by gravity.

The purpose of preliminary treatment is to remove large objects, rags, debris, grit and other inert material from wastewater to prevent clogging or machinery breakdown due to blockage and overloading. The preliminary treatment process consists of catenary bar screens and grit basins. The six catenary bar screens remove large objects, rags and debris from the wastewater using bar screens and a mechanically operated rake. The four grit basins remove grit and other inert material from the wastewater. These materials are mixed and stored on the grit pad located next to the north digesters for eventual landfill disposal. Disposal at a landfill is handled through contract services.

The purpose of primary treatment is to remove readily settleable solids and floatables that will separate from the wastewater under quiescent flow conditions. The process is augmented by the use of flocculation channels. Flocculation promotes formation of larger floc particles and the separation of floatables, while providing oxygen to reduce septicity. The thickened sludge is sent to the digesters while the floatables are disposed of through contract services.

The purpose of secondary treatment is to remove colloidal and soluble pollutants (termed as biochemical oxygen demand) from the wastewater using biomass and pure oxygen. In the aeration tanks, dissolved organic compounds and fine solids are metabolized by a concentrated mass of microorganisms called activated

sludge. The biomass is separated from the wastewater in the final settling tanks, where quiescent flow conditions allow the activated sludge to settle to the bottom of the tank. The thickened solids collected at the bottom of the tanks are either wasted to Dissolved Air Flotation Thickeners or returned to the head of the Aeration Tanks.
The purpose of the effluent pumping and disinfection is to pump the plant effluent to the Delaware River under high tide or high flow conditions and to disinfect the effluent before its discharge into the Delaware River. All plant effluent is disinfected using an injected solution of Sodium Hypochlorite (10% chlorine, wt.). After approximately a thirty-minute travel through the outfall conduit, the wastewater is discharged into the Delaware River (See Figure 2).

The purpose of solids handling is to remove and digest waste activated and primary sludge from the plant. The digested product is pumped to the Biosolids Recycling Center (BRC) for further processing. The solids handling process includes the Dissolved Air Flotation system and the digesters. Waste activated sludge from the Final Tanks and from SEWPCP is thickened at the Dissolved Air Floatation Tanks. This thickened sludge is mixed with both SWWPCP and SEWPCP primary sludge and then fed to the digesters. Twelve anaerobic digesters partially decompose organic matter to sludge gas that is used as fuel in boilers located in the Sludge Thickener Building, Maintenance Building and in electric generators located in an on-site cogeneration facility.

Please find the following attached maps and diagrams:

1. PMP Plant Process Diagrams –SW
2. PMP Facility Plan Drawing – SW
3. PMP Stormwater Drainage Plan - SW

3.c. Description and Maps of Collection System

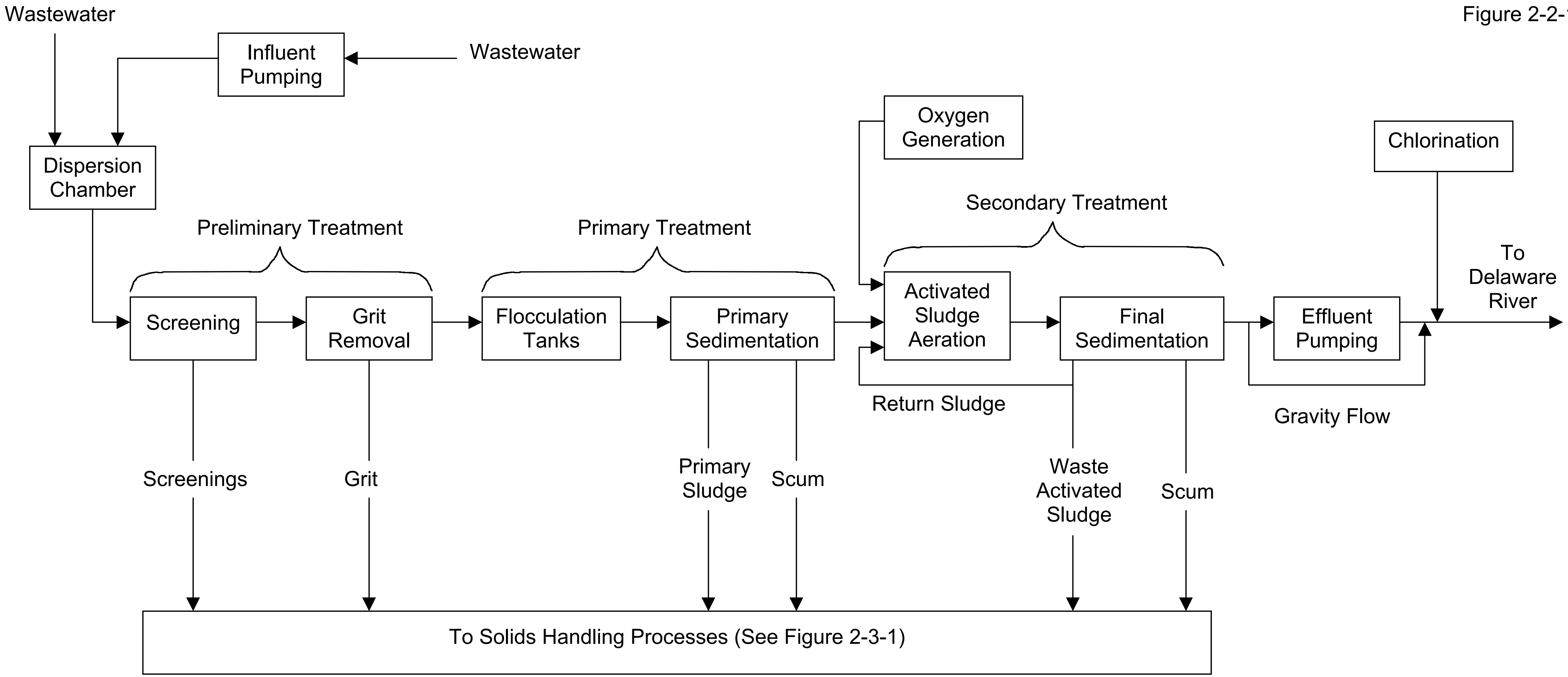
The PWD service area is divided into three drainage districts: Northeast, Southeast, and Southwest. Each of these drainage districts conveys flow to the respective WPCP of the same name. These three drainage basins are hydraulically independent except during conditions of high flow, when cross connections in the trunk sewer system allow conveyance of some flow between the Northeast and Southeast drainage districts. The service areas are itemized in Table 1 by collection system type.

Table 1 Wastewater Service Areas by Drainage District and Collection System Type

	SE (ac)	SW (ac)	NE (ac)	Total (ac)	%
Combined	8,475	12,741	19,934	41,150	19%
Separate	31	9,732	15,737	25,500	12%
Suburban Sanitary	300	76,600	70,800	147,700	69%
			Total	**214,350**	

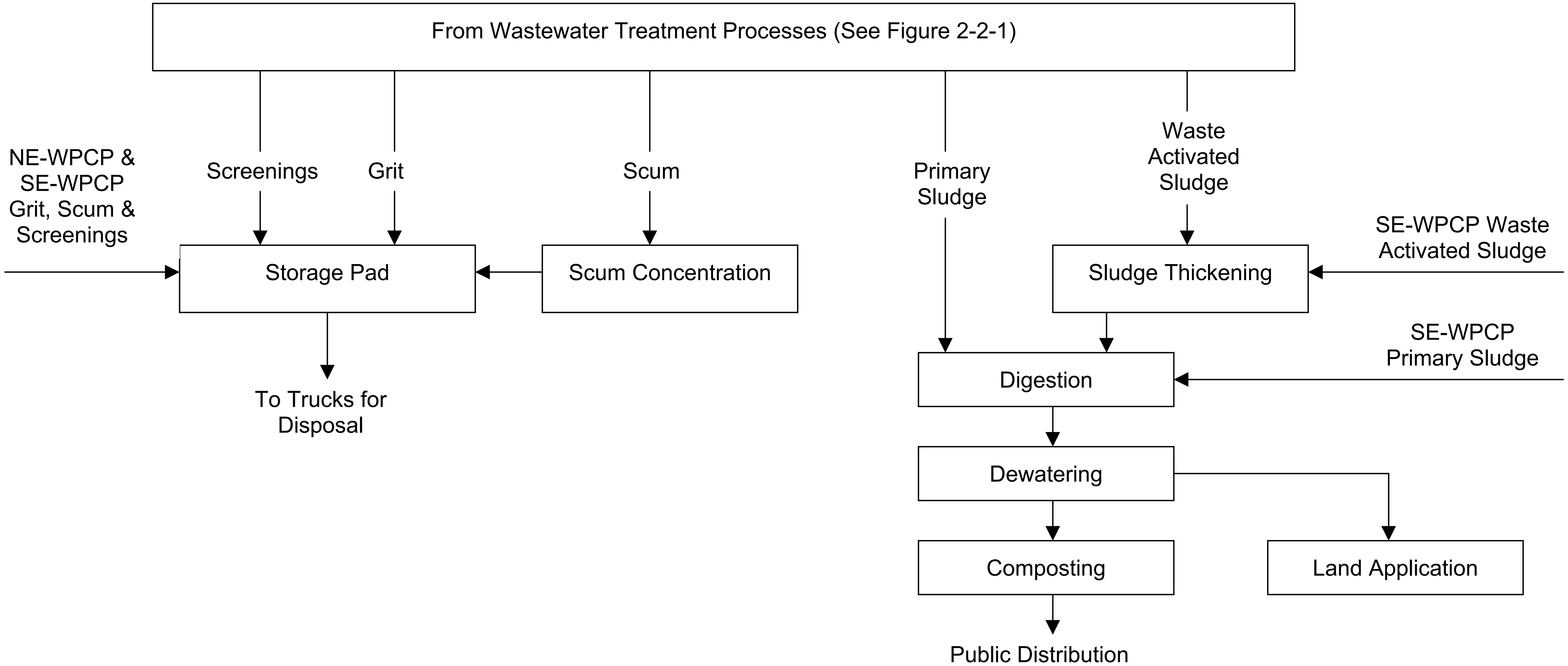
Each drainage district contains a network of branch sewers, trunk sewers, combined sewer interceptors, separate sanitary interceptors, and storm relief sewers as shown on Figure 1. Branch sewers collect wastewater from catch basins and lateral connections from drainage areas. The branch sewers convey flow to the trunk sewers, which are larger arterial sewers that convey wastewater to regulating chambers. Combined sewer interceptors convey flow from regulating chambers and separate sanitary interceptors to the WPCPs. Storm relief sewers convey flow from storm relief diversion chambers to the receiving waters during extreme high flow conditions. This network of sewers has been subdivided into 17 interceptor systems and 10 storm relief sewer systems. Table 2 identifies each of the interceptor systems. Table 3 identifies the storm relief sewers systems. Table 4 identifies the major separate sanitary sewer interceptors that are tributary to combined sewer interceptors. Table 5 identifies contributing communities and their associated interceptor systems.

Figure 2-2-1



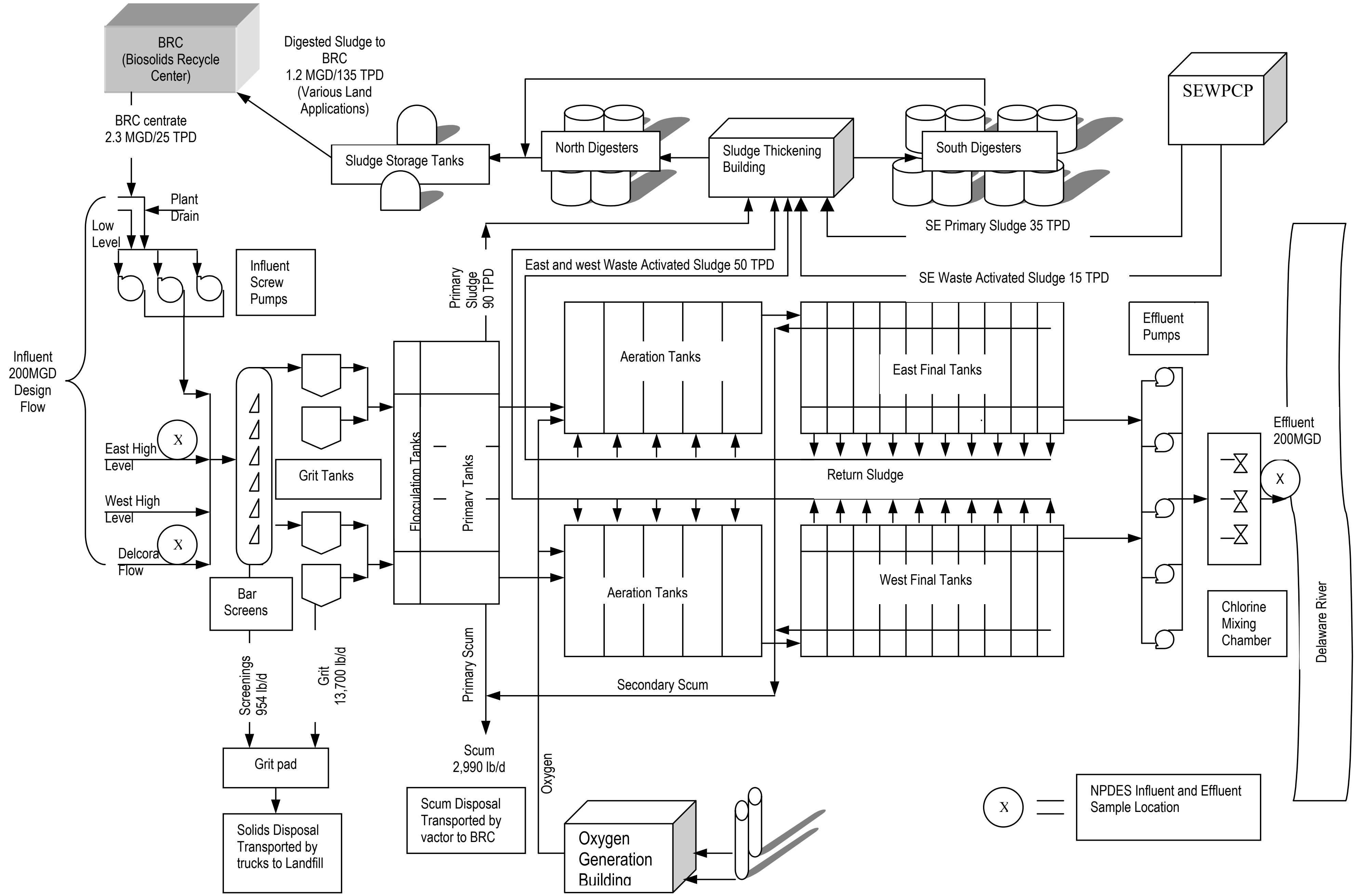
Process Plan Diagram – Wastewater Treatment Processes

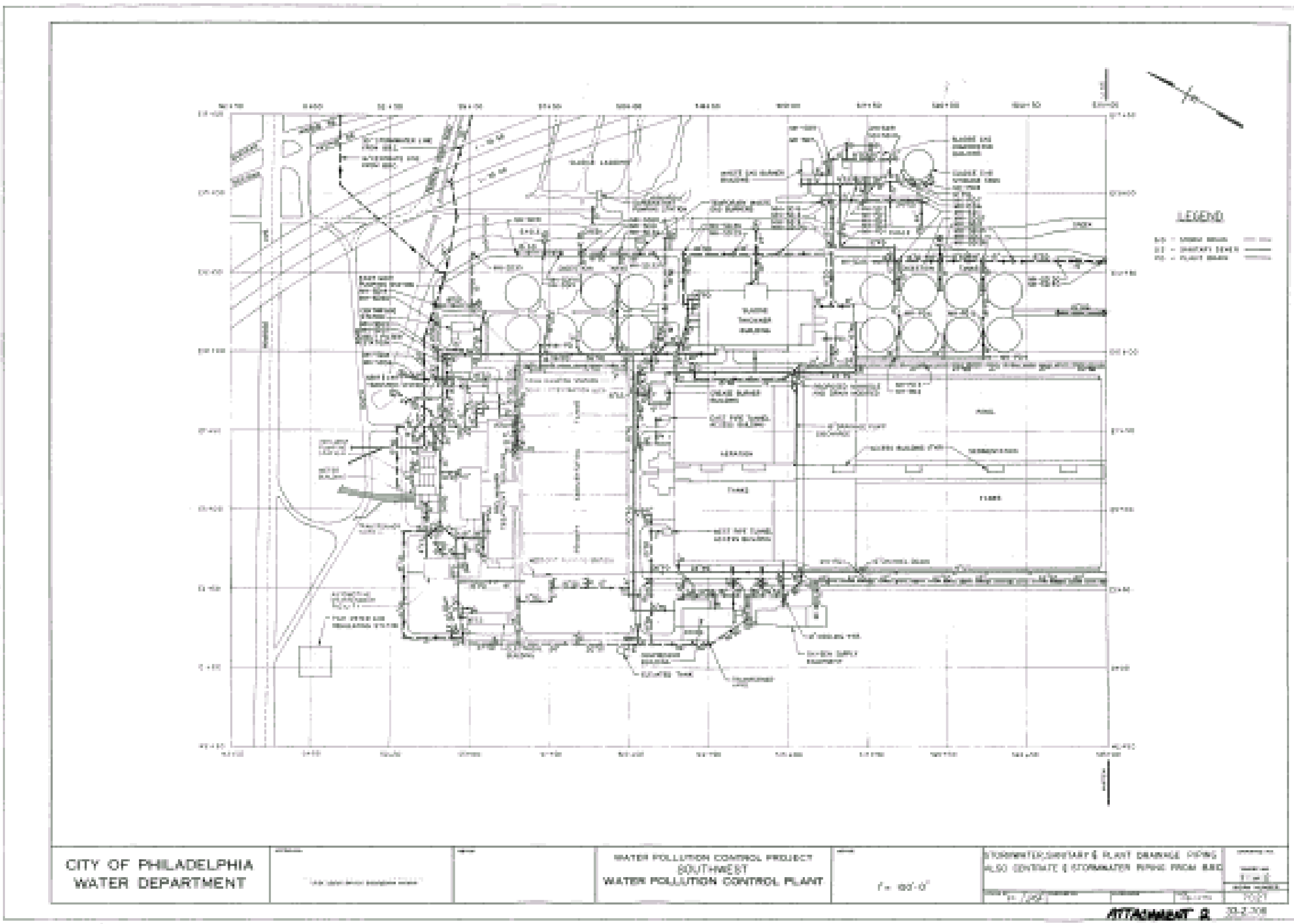
Figure 2-3-1



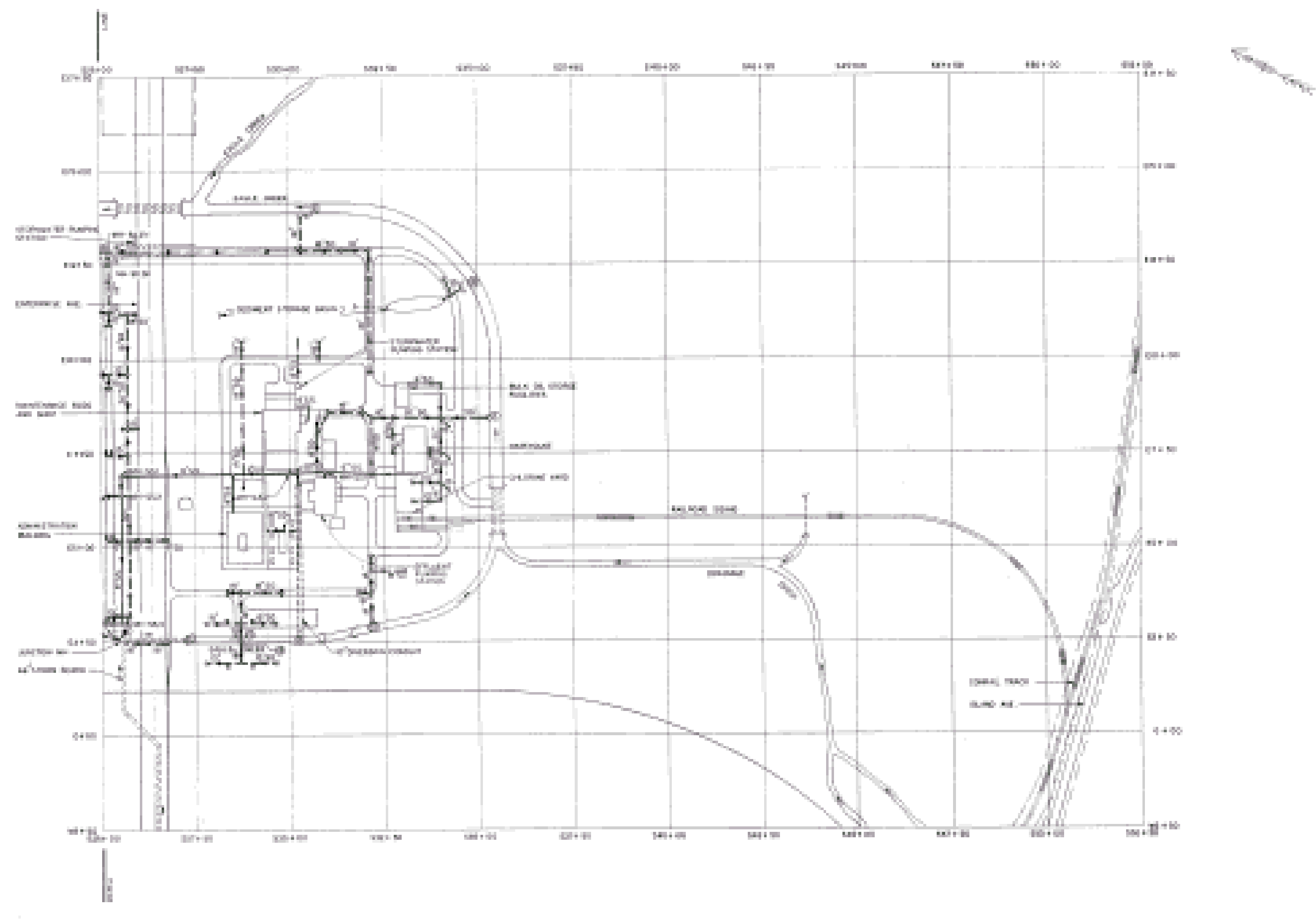
Process Plan Diagram – Sludge and Other Solids Treatment Processes

SOUTHWEST WPCP
OUTFALL NUMBER 001
SCHEMATIC OF WASTEWATER TREATMENT





ATTACHMENT 2



CITY OF PHILADELPHIA WATER DEPARTMENT			WATER POLLUTION CONTROL PROJECT SOUTHWEST WATER POLLUTION CONTROL PLANT	1" = 100'-0"	STORMWATER SANITARY & PLANT DRAINAGE PIPING SLED CENTRATE & STORMWATER PIPING FROM BRC	7387

ATTACHMENT 2

SS-2-7387

PMP - SW Plant
Plant Stormwater Discharge IDs

Outfall Number (PA DEP #)	(Site #)	Total Area Drained (sq. feet)
85	1	104,000
86	2	268,000
87	3	22,500
88	4	120,000
89	5	61,500
90	6	201,000
91	7	200,000
92	8	288,000
93	9	205,000
94	10	385,000
95	11	185,000
96	12	95,500
97	13	63,000
98	14	56,000
99	15	56,000
100	16	1,100,000
101	17	95,000
102	18	5,000

See site map: Stormwater, Sanitary &
Plant Drainage Piping (Work #73027) (2 sheets)

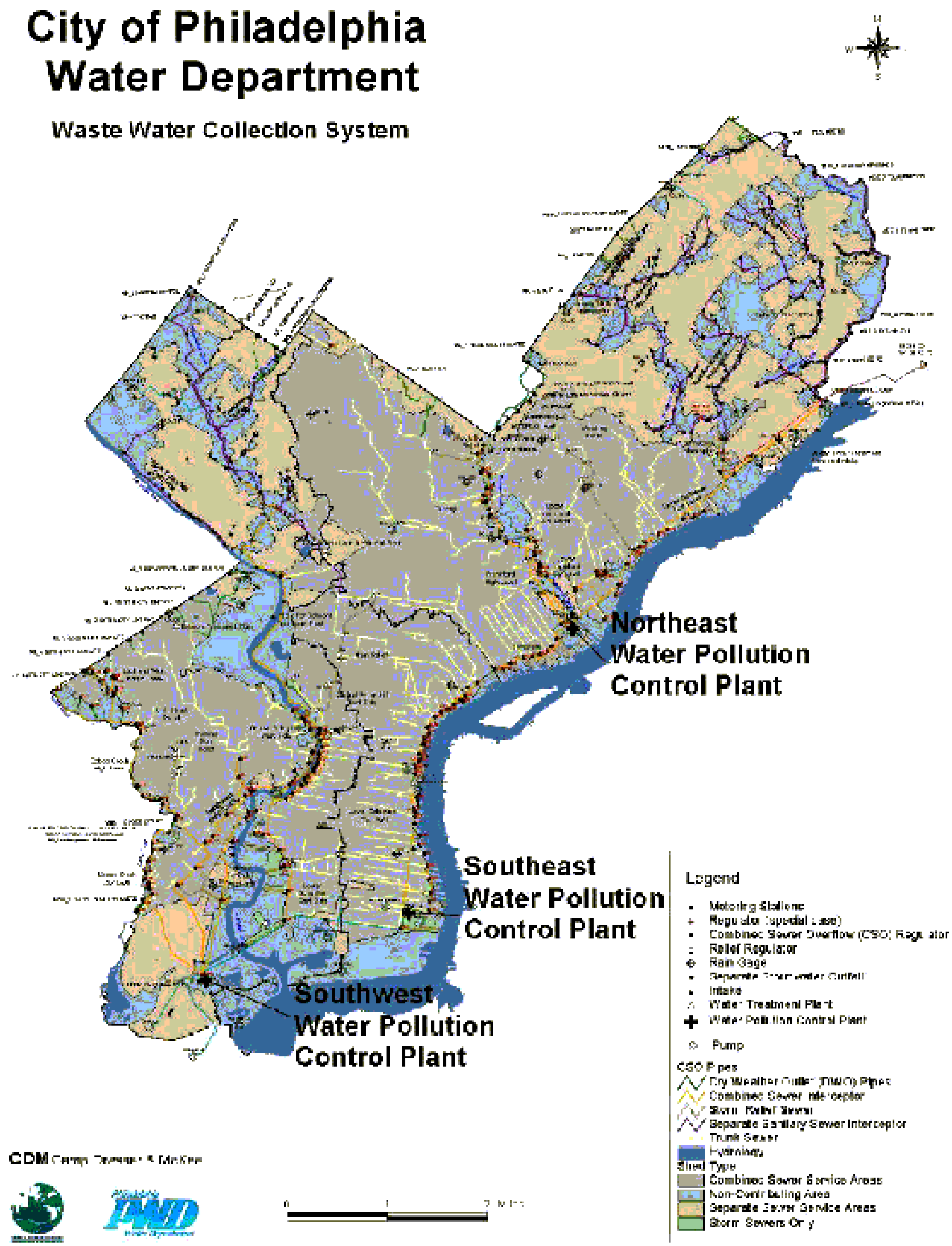


Figure 1 - PWD wastewater collection System

Table 2 Combined Sewer Interceptor Systems in the PWD Service Areas

Combined Sewer Interceptor	Abbreviation	Drainage District
Central Schuylkill East Side	CSES	Southwest
Central Schuylkill West Side	CSWS	Southwest
Cobbs Creek High Level	CCHL	Southwest
Cobbs Creek Low Level	CCLL	Southwest
Lower Schuylkill East Side	LSES	Southwest
Lower Schuylkill West Side	LSWS	Southwest
Southwest Main Gravity	SWMG	Southwest

Table 3 Storm Relief Systems in the PWD Service Areas

Storm Relief System	Abbreviation	Drainage District
32nd St. Relief Sewer	FR_32	Southwest
Arch St. Relief Sewer	FR_A	Southwest
Main Relief Sewer	FR_M	Southwest
Main Street Relief Sewer	FR_MS	Southwest
Thomas Run Relief Sewer	FR_TR	Southwest

Table 4 Separate Sanitary Interceptors Tributary to Combined Interceptors

Separate Sanitary Interceptor	Abbreviation	Receiving Interceptor	Drainage District
Upper Schuylkill Low Level	S-USLL	CSES	Southwest
Wissahickon Low Level	S-WLL	CSES	Southwest

Table 5 Summary of Contributing Communities to the PWD Collection System

Municipality/Authority	Drainage District	Intercepting System
Township of Springfield, Montgomery County *	SE/SW	LDLL/CSES
Delaware County Regional Water Quality Control Authority (DELCORA)	SW	SE WPCP
Township of Lower Merion	SW	SWMG
Upper Darby Township	SW	CCHL

Source: "Act 537 Plan Volume 1"; BCM, May 1993. * Flows are split between the SE and SW districts.

A brief description of the collection system for this drainage district is as follows.

Southwest Drainage District

Figure 1-5 shows the collection system for the Southwest drainage district. This figure depicts the combined sewer interceptors and the major separate sewer interceptors, as well as, the location of the CSO regulators, storm relief chambers, and major hydraulic control points. Regulators and relief chambers are described in Section 1.1.4; major hydraulic control points are described in Section 1.1.5.

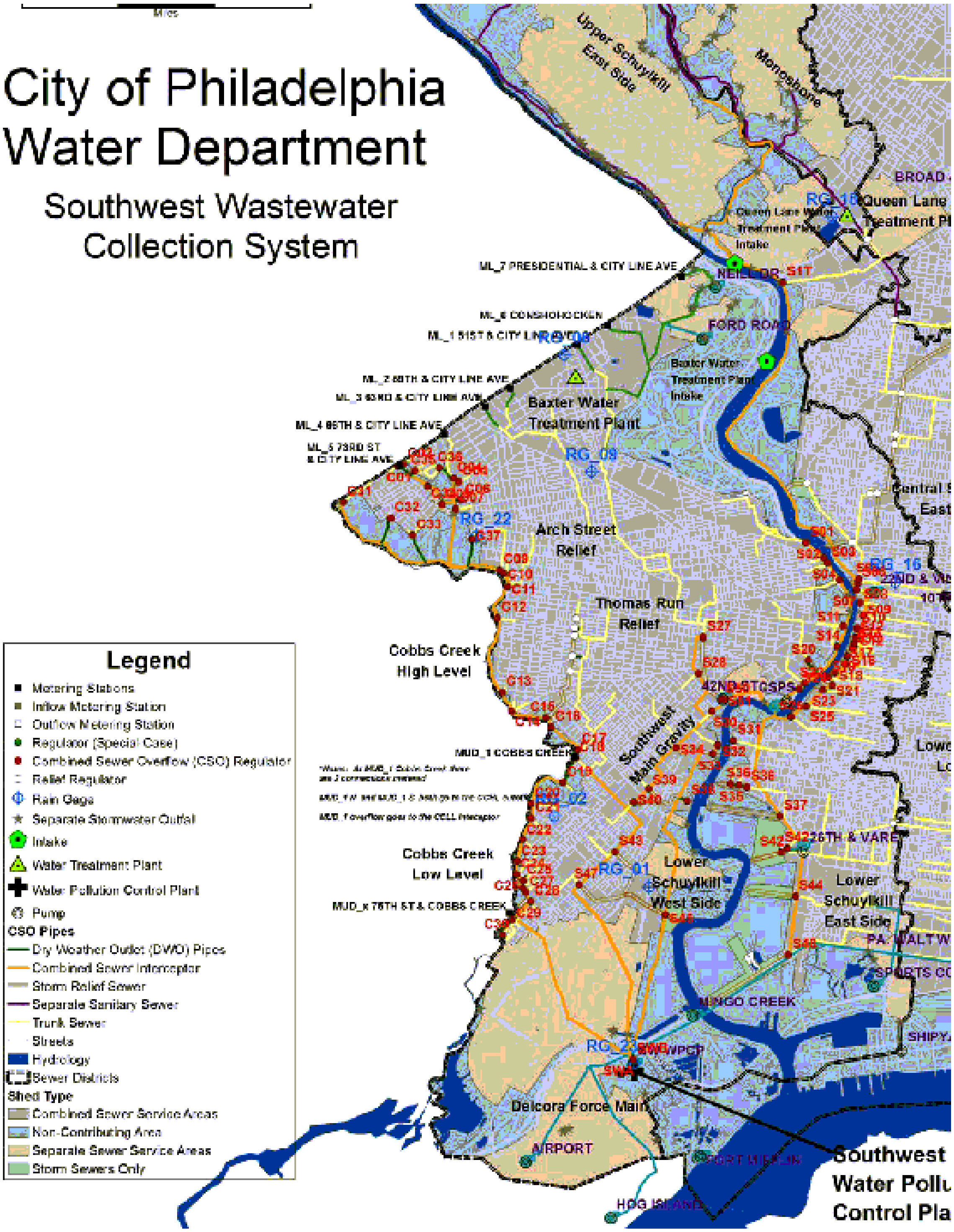
The combined sewer interceptors in the Southwest drainage district include the Central Schuylkill East Side (CSES), Central Schuylkill West Side (CSWS), Lower Schuylkill East Side (LSES), Southwest Main Gravity (SWMG), Cobbs Creek High Level (CCHL), and Cobbs Creek Low Level (CCLL). The CSES, CSWS, and LSWS interceptors are all tributary to the Central Schuylkill Pumping Station, which pumps to the upstream end of the SWMG. The CCHL is also tributary to the SWMG, which conveys flow by gravity to the Southwest treatment plant. The CCLL and LSWS interceptors combine upstream from the Southwest WPCP pumping station, which lifts the wastewater from these interceptors into the preliminary treatment building to be combined with the flow from SWMG and the DELCORA force main. The Southwest Drainage District collects separate sanitary wastewater flows from the Wissahickon Low Level and Upper Schuylkill interceptors, including large areas outside the City. The suburban communities served by the Southwest WPCP are:

- DELCORA
- Lower Merion Township.
- Springfield Township.
- Upper Darby Township.

Cobbs Creek High Level: The CCHL interceptor begins in the westernmost sections of Philadelphia along Cobbs and Indian Creeks. Several small interceptors consolidate to form the main interceptor that runs parallel to Cobbs Creek. This interceptor, which once continued south along Cobbs Creek, heads east in the Cobbs Creek High Level Cutoff sewer along 60th Street until it combines with the SWMG interceptor.

Southwest Main Gravity: The SWMG interceptor begins at the force main from the Central Schuylkill Pumping Station and continues south to the Southwest WPCP. A tributary interceptor, which conveys flow from the Mill Creek drainage basin, enters the main SWMG interceptor at 47th Street and Grays Ferry Avenue. Wastewater from the DWOs of regulators S_50 and S_51 are pumped to the SWMG interceptor by the 42nd Street pumping station. The CCHL interceptor combines with the SWMG at 60th Street and Grays Avenue. Near the intersection of 70th Street and Dicks Avenue, the SWMG interceptor enters a dispersion chamber and becomes a triple barrel parallel sewer, which conveys the wastewater directly into the Southwest WPCP without additional inflows. There are gates on each of the three pipes at this dispersion chamber and currently the middle barrel is closed.

Figure 4 SW WPCP Interceptor System



3.d. Description of Wastes Accepted from Outside Collection System

The Southwest Plant receives wastes from outside its collection system from two (2) sources – septage and Tinicum Township Sludge. A description of each is as follows:

Septage

Trucked septage wastes are permitted to discharge their contents at the Southwest Plant under permit. Approximately 0.5 MG per year is received at SWWPCP.
Only sanitary sewage wastes may be discharged to the plant. This includes sanitary sewage wastes from septic tanks, septic holding tanks and chemical toilets. Commercial or industrial waste, other than sanitary sewage waste, may not be discharged.

It is prohibited to discharge wastes with any of the following characteristics:

- pH lower than 6 or higher than 9
- Containing in excess of 100 mg/L of non-polar fat, oil and grease, or any substances which may solidify or become viscous in the temperature range of 32 to 140 degrees Fahrenheit
- Containing gasoline, benzene, naphtha, fuel oil or other flammable or explosive liquids, solids or gases
- Containing any sludges, liquids or other substances originating from public or private water or wastewater treatment plants
- Containing any material considered to be a RCRA hazardous waste
- Having a temperature higher than 104 degrees Fahrenheit
- Containing any ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, paunch, manure or any other solids or viscous substances capable of causing obstructions or other interferences with the proper operation of the wastewater treatment plant

Tinicum Township POTW Sludge

Tinicum Township, under contact with PWD, periodically delivers thickened sludge from their POTW to the Southwest Plant. Approximately 0.34-million gallons at a dry weight of 52 tons per year are discharged to the Southwest Plant's mixing chamber # 2. This mixing chamber is the feed source to the twelve anaerobic digesters operated at the Southwest Plant. Combined flows to the mixing chamber also include primary and thickened, waste activated sludges from both the Southwest and Southeast plants. The Southeast and Southwest waste activated sludges combine in mixing chamber #1 prior to thickening via Dissolved Air Flotation Tanks.

The volume of sludge received from Tinicum Township comprises less than 0.1% of the total sludge volume handled at the Southwest Plant on an annual basis. The daily contribution is less than 1.0%. The water department's Industrial Waste Unit does require annual sludge analyses of the Tinicum

Township sludge. Among the list of required parameters are Aroclors 1221, 1017, 1232, 1242, 1248, 1254, 1260.

The analytical results from the 2004 and 2005 annual samples of the Tinicum sludge samples are as follows:

Tinicum Township POTW Sludge

Year	Aroclor 1221 ug/kg-dry	Aroclor 1017 ug/kg-dry	Aroclor 1232 ug/kg-dry	Aroclor 1242 ug/kg-dry	Aroclor 1248 ug/kg-dry	Aroclor 1254 ug/kg-dry	Aroclor 1260 ug/kg-dry
2004	<360	<360	<360	<360	<360	<360	<360
2005	<1000	<1000	<1000	<1000	<1000	<1000	<1000

3.e. Map and Description of Point and Non-Point Source Releases From Facility

As described below, the Southwest Plant contains sludge impoundments which, as indicated in the chart entitled *"Southwest October 2001 Sludge Samples",* has PCBs contained in some samples of the sludge. Although we believe that it is unlikely that the limited runoff from these impoundments which is directed into the headworks of the Southwest Plant represents a significant PCB contribution to the facility's overall load, we have included below a description of the impoundments together with available PCB information. As part of the Southwest Plant trackdown study, we intend to sample the impoundment runoff and analyze for PCBs.

Philadelphia Water Department Southwest WPCP Sludge Impoundment

The Philadelphia Water Department owns sludge impoundments at the Southwest Water Pollution Control Plant (8200 Enterprise Ave). These impoundments were used to store treated sludge during the 1950's and 60's, and have been inactive since. There are seven impoundments that are unlined, except for the natural clay layer beneath, which covers about 80 acres (see attached maps). The sludge is between 8-10 feet deep and totals approximately 1,100,000 cubic yards. In preparation for closing this site under the PA Recycling and Environmental Remediation Standards Act (Act 2), a Site Characterization Study was performed, and a Remedial Investigation/Baseline Risk Assessment Report is currently being generated. These reports are prepared by our consultant RETTEW Associates, and their findings are summarized below.

A groundwater well network comprised of 16 wells was developed around the perimeter of the impoundments with four rounds of quarterly sampling analyzed for a wide range of parameters. Analytical method 8082 (arochlor) was used for PCB testing with a detection limit of 0.5 ppb. The results are presented in the attached table. All of the samples analyzed were below the detection limit.

Three sludge samples were collected from three different depths within each impoundment. A similar arochlor method was employed for analyzing these samples, with varying detection limits based upon the moisture content of the sample. Numerous samples had measurable values above the detection limit for PCB 1248, 1254, and 1260. Results ranged from 2000 – 70,000 ug/kg. Attached is a table which details these results.

The nature and composition of the sludge explains why measurable quantities of PCBs were not found in the groundwater. The sludge is composed of organic waste solids that have very high carbon content and a very low permeability. Combine this with the fact that PCB compounds have an affinity for solids, (eg 1260 migrates in the sludge 2,500,000 times slower than water) explains the groundwater results.

When the surface water elevation in Lagoon B rises to specified levels, the water is pumped into a retention basin on the Biosolids Recycling Center property. This basin drains into the headworks of the Southwest WPCP for treatment. The configuration of the remaining impoundments allows for internal drainage so that no overflows occur from this area.

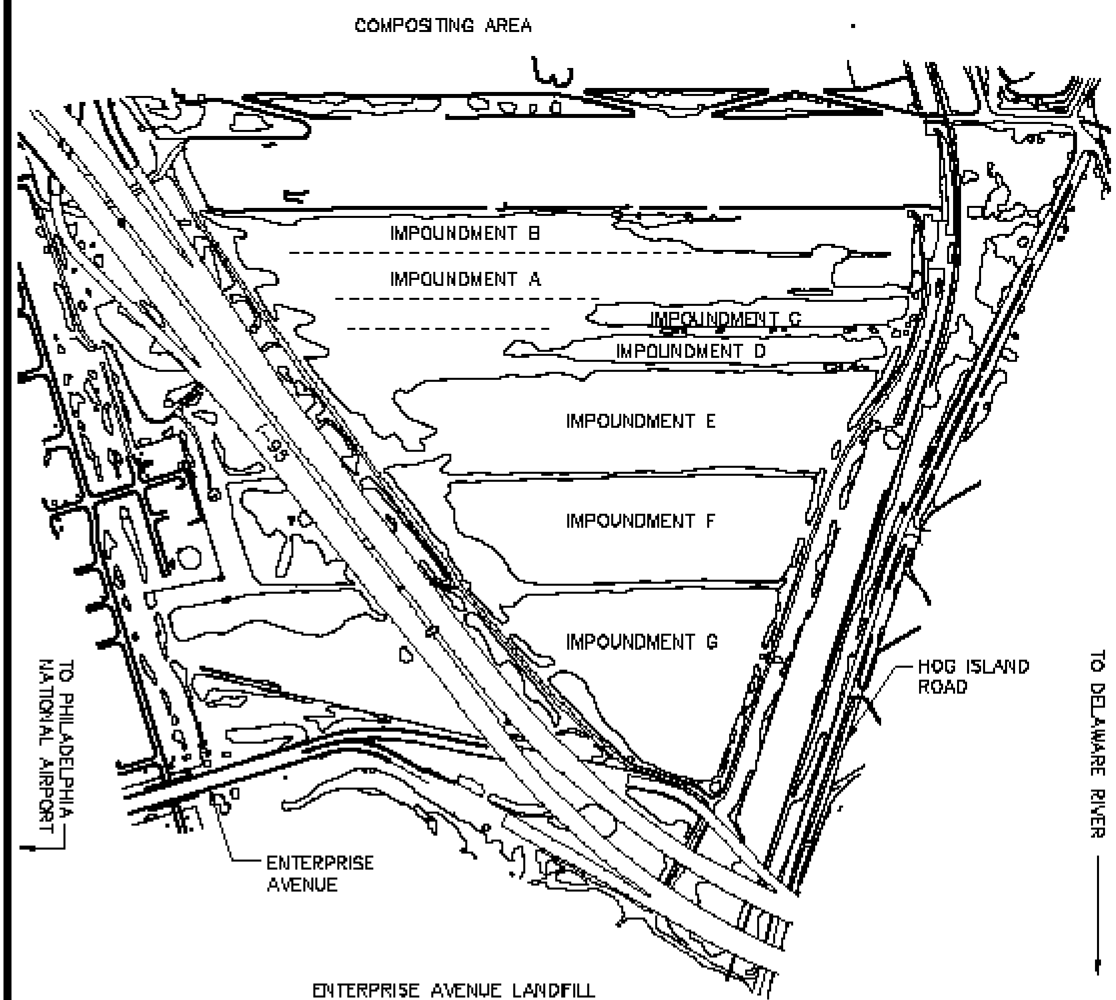


FIGURE 2

SCALE: 1"=500'	**PWD - SWWPCP CLOSURE PLAN** PROJECT NO: 981597-01	
	SITE MAP	RETTEW ASSOCIATES, INC.

H: \98\98159701\CADD\SWWPCP\FINAL REPORT FIGURES\98159701-FIGURES 2-4-6-7.DWG

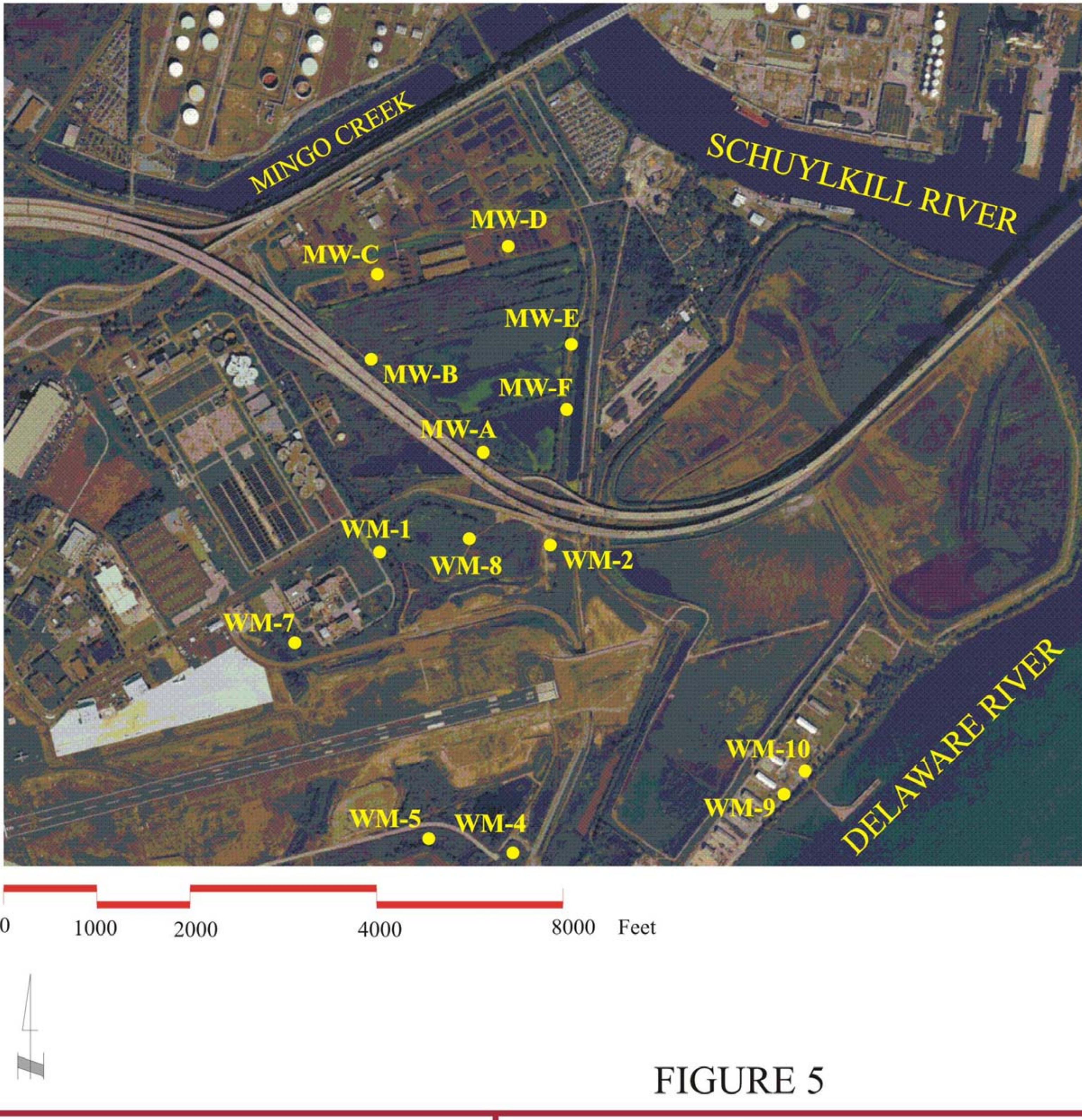


FIGURE 5

LEGEND

WM-4 Monitor Well

PWD - SWWPCP CLOSURE PLAN

PROJECT NO: 981597-01

Location of Regional Monitor Well Network

RETTEW ASSOCIATES INC.

SOUTHWEST GROUNDWATER SAMPLES

Location:		SWMW-AS	SWMW-AD	SWMW-BS	SWMW-BD	SWMW-CS	SWMW-CD	SWMW-DS	SWMW-DD	SWMW-ES	SWMW-ED	SWMW-FS	SWMW-FD	SWMW-1D	SWMW-1M	SWMW-2D	SWMW-2M
Sample type:		grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab
Jul-01																	
PCB-1016	ug/L	< 0.49	< 0.48	< 0.48	< 0.47	< 0.49	< 0.47	< 0.47	< 0.47	< 0.49	< 0.49	< 0.47	< 0.49	< 0.47	< 0.48	< 0.49	< 0.47
PCB-1221	ug/L	< 0.49	< 0.48	< 0.48	< 0.47	< 0.49	< 0.47	< 0.47	< 0.47	< 0.49	< 0.49	< 0.47	< 0.49	< 0.94	< 1	< 1	< 0.94
PCB-1232	ug/L	< 0.49	< 0.48	< 0.48	< 0.47	< 0.49	< 0.47	< 0.47	< 0.47	< 0.49	< 0.49	< 0.47	< 0.49	< 0.47	< 0.48	< 0.49	< 0.47
PCB-1242	ug/L	< 0.49	< 0.48	< 0.48	< 0.47	< 0.49	< 0.47	< 0.47	< 0.47	< 0.49	< 0.49	< 0.47	< 0.49	< 0.47	< 0.48	< 0.49	< 0.47
PCB-1248	ug/L	< 0.49	< 0.48	< 0.48	< 0.47	< 0.49	< 0.47	< 0.47	< 0.47	< 0.49	< 0.49	< 0.47	< 0.49	< 0.47	< 0.48	< 0.49	< 0.47
PCB-1254	ug/L	< 0.49	< 0.48	< 0.48	< 0.47	< 0.49	< 0.47	< 0.47	< 0.47	< 0.49	< 0.49	< 0.47	< 0.49	< 0.47	< 0.48	< 0.49	< 0.47
PCB-1260	ug/L	< 0.49	< 0.48	< 0.48	< 0.47	< 0.49	< 0.47	< 0.47	< 0.47	< 0.49	< 0.49	< 0.47	< 0.49	< 0.47	< 0.48	< 0.49	< 0.47
Oct-01																	
PCB-1016	ug/L	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 9.5	< 0.47	< 0.47	< 0.48	< 0.49	< 0.48	< 0.48	< 0.47	< 0.48	< 0.49	< 0.51
PCB-1221	ug/L	< 0.95	< 1	< 1	< 0.94	< 0.95	< 19	< 0.95	< 0.95	< 1	< 1	< 1	< 1	< 0.95	< 1	< 1	< 1
PCB-1232	ug/L	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 9.5	< 0.47	< 0.47	< 0.48	< 0.49	< 0.48	< 0.48	< 0.47	< 0.48	< 0.49	< 0.51
PCB-1242	ug/L	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 9.5	< 0.47	< 0.47	< 0.48	< 0.49	< 0.48	< 0.48	< 0.47	< 0.48	< 0.49	< 0.51
PCB-1248	ug/L	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 9.5	< 0.47	< 0.47	< 0.48	< 0.49	< 0.48	< 0.48	< 0.47	< 0.48	< 0.49	< 0.51
PCB-1254	ug/L	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 9.5	< 0.47	< 0.47	< 0.48	< 0.49	< 0.48	< 0.48	< 0.47	< 0.48	< 0.49	< 0.51
PCB-1260	ug/L	< 0.47	< 0.5	< 0.48	< 0.47	< 0.47	< 9.5	< 0.47	< 0.47	< 0.48	< 0.49	< 0.48	< 0.48	< 0.47	< 0.48	< 0.49	< 0.51
Jan-02																	
PCB-1016	ug/L	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.5	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47	< 0.5	< 0.47
PCB-1221	ug/L	< 0.94	< 1	< 0.95	< 0.94	< 0.95	< 1	< 1	< 0.94	< 1	< 0.94	< 1	< 1	< 0.95	< 0.95	< 1	< 0.95
PCB-1232	ug/L	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.5	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47	< 0.5	< 0.47
PCB-1242	ug/L	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.5	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47	< 0.5	< 0.47
PCB-1248	ug/L	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.5	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47	< 0.5	< 0.47
PCB-1254	ug/L	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.5	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47	< 0.5	< 0.47
PCB-1260	ug/L	< 0.47	< 0.48	< 0.47	< 0.47	< 0.47	< 0.5	< 0.48	< 0.47	< 0.5	< 0.47	< 0.48	< 0.48	< 0.47	< 0.47	< 0.5	< 0.47
Apr-02																	
PCB-1016	ug/L	< 0.5	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48
PCB-1221	ug/L	< 1	< 0.95	< 0.95	< 0.95	< 0.95	< 1	< 0.95	< 1	< 1	< 0.95	< 1	< 0.95	< 1	< 1	< 1	< 1
PCB-1232	ug/L	< 0.5	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48
PCB-1242	ug/L	< 0.5	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48
PCB-1248	ug/L	< 0.5	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48
PCB-1254	ug/L	< 0.5	< 0.47	< 0.47	< 0.47	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.47	< 0.48	< 0.47	< 0.48	< 0.48	< 0.48	< 0.48

SOUTHWEST OCTOBER 2001 SLUDGE SAMPLES

Location:		SW LAGA1D	SW LAGA1M	SW LAGA1S	SW LAGA2	SW LAGA2M	SW LAGA2S	SW LAGA3D	SW LAGA3M	SW LAGA3S
Sample type:		grab	grab	grab	grab	grab	grab	grab	grab	grab
PCB-1016	ug/kg	< 8000.	< 4800.	< 5600.	< 5200.	< 7100.	< 5700.	< 7200.	< 7400.	< 6000.
PCB-1221	ug/kg	< 8000.	< 4800.	< 5600.	< 5200.	< 7100.	< 5700.	< 7200.	< 7400.	< 6000.
PCB-1232	ug/kg	< 8000.	< 4800.	< 5600.	< 5200.	< 7100.	< 5700.	< 7200.	< 7400.	< 6000.
PCB-1242	ug/kg	< 8000.	< 4800.	< 5600.	< 5200.	< 7100.	< 5700.	< 7200.	< 7400.	< 6000.
PCB-1248	ug/kg	13000.	6900.	7600.	24000.	14000.	10000.	15000.	15000.	9400.
PCB-1254	ug/kg	11000.	< 4800.	< 5600.	14000.	12000.	< 5700.	12000.	12000.	< 6000.
PCB-1260	ug/kg	10000.	14000.	7300.	8700.	9800.	13000.	10000.	12000.	8600.

		SW LAGB1D	SW LAGB1M	SW LAGB1S	SW LAGB2D	SW LAGB2M	SW LAGB2S	SW LAGB3D	SW LAGB3M	SW LAGB3S
PCB-1016	ug/kg	< 660.	< 690.	< 630.	< 740.	< 760.	< 620.	< 550.	< 590.	< 520.
PCB-1221	ug/kg	< 660.	< 690.	< 630.	< 740.	< 760.	< 620.	< 550.	< 590.	< 520.
PCB-1232	ug/kg	< 660.	< 690.	< 630.	< 740.	< 760.	< 620.	< 550.	< 590.	< 520.
PCB-1242	ug/kg	< 660.	< 690.	< 630.	< 740.	< 760.	< 620.	< 550.	< 590.	< 520.
PCB-1248	ug/kg	5500.	5000.	4000.	4500.	1400.	< 620.	5900.	4500.	3300.
PCB-1254	ug/kg	3700.	3700.	2000.	3400.	< 760.	< 620.	3700.	2900.	1900.
PCB-1260	ug/kg	6600.	4100.	2400.	2800.	1400.	< 620.	5800.	4500.	3800.

		SW LAGC1D	SW LAGC1M	SW LAGC1S	SW LAGC2D	SW LAGC2M	SW LAGC2S	SW LAGC3D	SW LAGC3M	SW LAGC3S
PCB-1016	ug/kg	< 6500.	< 6200.	< 6600.	< 5900.	< 6100.	< 6200.	< 7000.	< 7200.	< 5800.
PCB-1221	ug/kg	< 6500.	< 6200.	< 6600.	< 5900.	< 6100.	< 6200.	< 7000.	< 7200.	< 5800.
PCB-1232	ug/kg	< 6500.	< 6200.	< 6600.	< 5900.	< 6100.	< 6200.	< 7000.	< 7200.	< 5800.
PCB-1242	ug/kg	< 6500.	< 6200.	< 6600.	< 5900.	< 6100.	< 6200.	< 7000.	< 7200.	< 5800.
PCB-1248	ug/kg	18000.	< 6200.	15000.	< 5900.	< 6100.	< 6200.	< 7000.	< 7200.	< 5800.
PCB-1254	ug/kg	14000.	< 6200.	11000.	12000.	12000.	16000.	33000.	17000.	< 5800.
PCB-1260	ug/kg	16000.	15000.	14000.	11000.	11000.	14000.	33000.	16000.	9200.

		SW LAGD1D	SW LAGD1M	SW LAGD1S	SW LAGD2D	SW LAGD2M	SW LAGD2S	SW LAGD3D	SW LAGD3M	SW LAGD3S
PCB-1016	ug/kg	< 7200.	< 7400.	< 5400.	< 6500.	< 6600.	< 7700.	< 6000.	< 4900.	< 5600.
PCB-1221	ug/kg	< 7200.	< 7400.	< 5400.	< 6500.	< 6600.	< 7700.	< 6000.	< 4900.	< 5600.
PCB-1232	ug/kg	< 7200.	< 7400.	< 5400.	< 6500.	< 6600.	< 7700.	< 6000.	< 4900.	< 5600.
PCB-1242	ug/kg	< 7200.	< 7400.	< 5400	< 6500.	< 6600.	< 7700.	< 6000.	< 4900.	< 5600.
PCB-1248	ug/kg	< 7200.	< 7400.	< 5400.	< 6500.	< 6600.	< 7700.	< 6000.	< 4900.	16000.
PCB-1254	ug/kg	12000.	11000.	< 5400.	11000.	14000.	< 7700.	10000.	12000.	13000.
PCB-1260	ug/kg	12000.	14000.	17000.	12000.	15000.	17000.	9500.	13000.	21000.

		SW LAGE1D	SW LAGE1M	SW LAGE1S	SW LAGE2D	SW LAGE2M	SW LAGE2S	SW LAGE3D	SW LAGE3M	SW LAGE3S
PCB-1016	ug/kg	< 7500.	< 6200.	< 6100.	< 6300.	< 7600	< 5000.	< 6100.	< 7300.	< 790.
PCB-1221	ug/kg	< 7500.	< 6200.	< 6100.	< 6300.	< 7600	< 5000.	< 6100.	< 7300.	< 790.
PCB-1232	ug/kg	< 7500.	< 6200.	< 6100.	< 6300.	< 7600	< 5000.	< 6100.	< 7300.	< 790.
PCB-1242	ug/kg	< 7500.	< 6200.	< 6100.	< 6300.	< 7600	< 5000.	< 6100.	< 7300.	< 790.
PCB-1248	ug/kg	37000.	13000.	8500.	11000.	21000	22000.	26000.	21000.	2100.
PCB-1254	ug/kg	28000.	< 6200.	< 6100.	< 6300.	< 7600	< 5000.	18000.	< 7300.	< 790.
PCB-1260	ug/kg	18000.	17000.	8600.	15000.	32000	26000.	18000.	21000.	4000.

		SW LAGF1D	SW LAGF1M	SW LAGF1S	SW LAGF2D	SW LAGF2M	SW LAGF2S	SW LAGF3D	SW LAGF3M	SW LAGF3S
PCB-1016	ug/kg	< 7200.	< 7500.	< 7600.	< 6300.	< 7300.	< 5200.	< 7100.	< 7500	< 8400.
PCB-1221	ug/kg	< 7200.	< 7500.	< 7600.	< 6300.	< 7300.	< 5200.	< 7100.	< 7500	< 8400.
PCB-1232	ug/kg	< 7200.	< 7500.	< 7600.	< 6300.	< 7300.	< 5200.	< 7100.	< 7500	< 8400.
PCB-1242	ug/kg	< 7200.	< 7500.	< 7600.	< 6300.	< 7300.	< 5200.	< 7100.	< 7500	< 8400.
PCB-1248	ug/kg	25000.	26000.	15000.	22000.	19000.	16000.	25000.	31000	26000.
PCB-1254	ug/kg	< 7200.	< 7500.	< 7600.	< 6300.	< 7300.	< 5200.	< 7100.	< 7500	< 8400.
PCB-1260	ug/kg	64000.	30000.	25000.	33000.	34000.	26000.	59000.	73000	57000.

3.f. Facility tate and Federal Permit Numbers

PaDEP Site ID #: 451994
NPDES Permit No. PA 0026671

3.g. Name of Receiving Stream Including River Mile

The discharge of the Southwest Plant is received by the Delaware River at mile point 90.7

3.f. All Known Industrial Users of the Collection System and Permit Numbers

List of Industrial Dischargers in the Southwest Sewershed

FACILITY NAME	STREET ADDRESS	CITY	ZIP	STATE	PRETREATMENT PERMIT NO.
La France	8425 Executive Ave.	Philadelphia	19153	PA	LAFR00010843WS
ST Services	3400 S. 67th Street	Philadelphia	19153	PA	MARI00010987WS
Source Interlink	2001 W. Erie Ave.	Philadelphia	19140	PA	YEAG00010886WS
Sun Chemical	3301 Hunting Park Ave.	Philadelphia	19132	PA	SUNC00011138ND
Trigen Philadelphia Thermal Energy Corp.	2600 Christian Street	Philadelphia	19146	PA	PHIL01860929OM
Jefferson Smurfit Corporation	5000 Flat Rock Road	Philadelphia	19127	PA	CONT00020359WS
Penn Fishing Tackle Mfg. Co.	3028 West Hunting Park Avenue	Philadelphia	19132	PA	PENN00130821WS
Starlite Industries, Inc.	1111 Lancaster Avenue	Rosemont	19010	PA	STAR00011053WS
Manayunk Brewing Co.	4120 Main Street	Philadelphia	19127	PA	not permitted
Yard's Brewing Company	2439 Amber Street	Philadelphia	19125	PA	not permitted
Ottens Flavors	7800 Holstein Ave.	Philadelphia	19153	PA	not permitted
Procacci Bros	3655 S.Lawrence St.	Philadelphia	19148	PA	not permitted
Thomas Colace Co	19 E. Oregon Avenue	Philadelphia	19148	PA	not permitted
Amoroso Baking Company	845 S. 55th St.	Philadelphia	19143	PA	not permitted
Vincent Giordano	2600 Washington Ave.	Philadelphia	19146	PA	not permitted
Kissin Fresh Meats	140 E.Rrichmond St.	Philadelphia	19125	PA	not permitted
Exceptional Foods Inc.	210 E. Allen St.	Philadelphia	19125	PA	not permitted
Chemson	7825 Holstein Ave.	Philadelphia	19153	PA	not permitted
Frankford Candy	2101 Washington Ave.	Philadelphia	19146	PA	not permitted
M. Buono	3650 S.Third St.	Philadelphia	19148	PA	not permitted
Richards Apex	4204 Main St.	Philadelphia	19127	PA	RICH00010497OM
Philadelphia Gas Works - Passyunk	3100 Passyunk Ave.	Philadelphia	19145	PA	PHIL00070948
Marshall Laboratories (DUPONT)	3500 Grays Ferry Ave.	Philadelphia	19146	PA	EIDU00030950
Coyne Textile Services	4825 Brown St.	Philadelphia	19139	PA	COYN00010963
A. C. Kissling Co	161 E. Allen Street	Philadelphia	19125	PA	ACKI00011049OM
Gate Gourmet	8350 Executive Avenue	Philadelphia	19153	PA	DOBB00011082OM
LSG Sky Chefs	8401 Escort Avenue	Philadelphia	19153	PA	LSG00011081OM
G.J. Littlewood & Son, Inc.	4044 Main St.	Philadelphia	19127	PA	LITT00011052OM
Tasty Baking Co.	2801 W. Hunting Park Ave.	Philadelphia	19129	PA	TAST00010145OM
Sun Co. Schuylkill River Tank Farm	70th St. & Essington Ave.	Philadelphia	19145	PA	SUNC00031027OM
Mrs. Resslers	8400 Executive Ave	Philadelphia	19153	PA	MRSR00021121OM
City of Philadelphia Dept. of Commerce	Deicing Facility	Philadelphia	19153	PA	PHIL02911122TD

United Parcel Service	1 Hog Island Rd.	Tinicum	19153	PA	UNIT00121123TD
Precious Metals Plating., Inc.	21 South Chester Pike	Glenolden	19036	PA	205-M19
Multiflex Plating Company	109 Willows Avenue	Collingdale	19023	PA	2DC03-01
Bullen Chemical Company	1640 Delmar Drive	Folcroft	19032	PA	2DC-07-02
Hydrol Chemical	520 Commerce Drive	Yeadon	19050	PA	2DC-13-01
Keystone Silversmiths	100 Mill Street Suite #3	Clifton Heights	19018	PA	2DC-02-01
Kozmer Technologies, Ltd	20 Roberts Avenue	Collingdale	19023	PA	2DC-03-02
Penn Panel & Box Company	100 Willows Avenue	Collingdale	19023	PA	2DC 03-03
Sun Co. Darby Creek Tank Farm	Calcon Hook and Hook Roads	Darby	19023	PA	2DC-06-01
Lyondell Chemical Company	3801 West Chester Pike	Newtown	19073	PA	202-D30

Facilities in shaded area are DELCORA facilities.

PMP
Southwest Plant
Known Sources
Item 4

Two known sources of PCBs entering the Southwest Plant sewer shed are the intake of Schuylkill River water and the addition of ferric chloride as a treatment coagulant into the Belmont Water Treatment Plant and the resultant discharge of most of the plant's process wastes into the sewer. The remaining wastes are stored onsite in the plant's raw water basin which is periodically dredged. The wastes produced from the dredging operation are not sewered.

The intake of Schuylkill River water into the plant is best represented two ambient water samples were taken above the tidal dam and analyzed for PCBs in March, 2002 and October, 2002. The results were 1.636 and 1.857 ng/l, respectfully, for and average concentration of 1.75 ng/l. An average intake flow of 52 MGD into the plant results in an intake of PCBs of 344 mg/day. Based upon an approximate solids balance, we estimate 99 percent of the influent loading is captured within the treatment processes. Ten percent of that captured loading immediately settles in the raw water basin. Therefore, we estimate that approximately 89 percent, or 306 mg/day, of the Schuylkill River loading influent to the Belmont Plant is discharged into the Southwest Plant sewer shed.

The second source is discharge of spent ferric chloride, which contains PCBs in the delivered product, from the Belmont Plant into the sewer. The Belmont Plant uses ferric chloride as a water treatment chemical to coagulate and flocculate fine particle solids from the river water. PWD currently purchases ferric chloride from Kemiron. In 2001 PWD was informed by Eaglebrook (now Kemiron) that low levels of polychlorinated biphenyls were detected in the ferric chloride. The source of the ferric chloride is from the DuPont Edge Moor plant that produces ferric chloride as a by-product. The DuPont Company has analyzed their ferric chloride product for PCBs and estimates that the current concentration is 0.00055 mg/l. Based on the average dosage of ferric chloride and the average plant flow, the average contribution of PCBs to the plant is 10.68 mg/day. However, as described above, we estimate that the plant captures approximately 99 percent of the solids produced as a result of the chemical addition and all is discharged into the sewer. Therefore, we estimate that approximately 99 percent, or 10.6 mg/day, of the PCBs from the ferric chloride source is discharged into the Southwest Plant sewer shed.

The DuPont Company has already undertaken measures to reduce the concentration of PCBs in the ferric chloride produced from their Edge Moor Plant and has committed to further reductions. Their previous actions will be presented in *Section 7. Previous Minimization Activities* of this report. Their future plans will be presented in *Section 9. Pollutant Minimization Measures*.

PMP
Southwest Plant
Potential Sources
Item 5

Identification of potential sources of PCB focused first on those sources which stored PCBs in equipment. In addition to PWD's inventory of PCB containing equipment, we requested identification of such equipment from the following agencies:

1. Philadelphia Fire Department
2. Philadelphia Department of Public Health
3. USEPA (including the Mega Rule's database)
4. PaDEP
5. DRBC
6. Partnership for the Delaware Estuary
7. PECO

The following pages of the spreadsheet entitled *"List of Potential Sources, Item 5, Southwest Plant"* contain a complete listing of equipment containing PCBs resulting from the above request. PWD believes that considerable information concerning each source should be gathered and maintained in order to both understand the characteristics of the particular source as well as identify the owner who is responsible for its proper operation and ultimate disposal. PWD intends to gather the following information regarding each potential source:

1. Name of POTW in whose drainage shed the equipment is located
2. PWD identification #
3. Name of agency referring PCB source to PWD
4. Date of last inspection of equipment by PWD or its agent
5. Name of inspector
6. Name of company which owns equipment
7. Street address of facility where source is located
8. Township address of facility where source is located
9. Zip Code address of facility where source is located
10. GIS coordinates of facility where source is located
11. County address of facility where source is located
12. Name of site or complex where source is located
13. Name of building where source is located
14. Name of contact at site who maintains PCB equipment
15. Phone number of contact at site who maintains PCB equipment
16. Name of company official responsible for management of PCB equipment
17. Title of company official responsible for management of PCB equipment

18. Street address of company official responsible for management of PCB equipment
19. Township address of company official responsible for management of PCB equipment
20. State address of company official responsible for management of PCB equipment
21. Zip Code address of company official responsible for management of PCB equipment

(For PCB sources located in suburban townships which discharge into the PWD collection system)

22. Name of suburban utility under contract w/PWD
23. Location or name of connection to PWD System

For PCB sources located within Philadelphia

24. Name of Trunk Sewer connected to site
25. Name of Intercepting Sewer connected to site
26. Is the site in a combined or separate sewer district?
27. Name of agency responsible for management of pretreatment permit
28. Identification of pretreatment permit number
29. Type of PCB source/equipment
30. Number of identical PCB sources at location
31. Type of Aroclor contained in equipment
32. Total PCB concentration
33. Fluid volume (gal)
32. PCB mass (lbs)
33. PCB mass (kg)

Status of PCB equipment

34. In use
35. Out of service
36. Disconnected

Status of building housing PCB equipment

37. Operating
38. Closed
39. Abandoned/not secure
40. Comments including any past spills from source, or company plans regarding future of source, etc

The electronic copy of this spreadsheet contains columns to allow recording of the above information. All information currently available regarding each source has been incorporated into the spreadsheet. For ease of printing, only some of the columns have been identified in the printed version of this PMP.

Please see attached spreadsheet PCB Devices

PMP
Southwest Plant
Strategy for Identifying Unknown Sources
(Trackdown)
Item 6

As discussed in the Item 3.c., description and map or schematic of the collection system, the influent to the Southwest Plant consists of the following major collectors:

1. Southwest Main Gravity
2. Delcora Force Main
3. Southwest Low Level

Sampling of the Delcora Force Main will occur at the same location as directed by the NPDES permit which governs the operation of the plant.

NPDES sampling to represent the Southwest Main Gravity occurs near the confluence of that stream and the plant's pumped influent stream. There is some degree of uncertainly regarding the potential influence of the pumped influent at this sample location. Therefore, a new, single sample location has been chosen to represent the Southwest Main Gravity – near one the three influent main's flow metering station. The design of the chamber which causes the diversion of the Southwest Main Gravity flow into two or more of three gravity mains supplying the plant insures that all mains are representative of the flow. The proposed sampling location near the metering device is sufficiently distant form the connection with the pumping flow so that the sample will be representative of only the Southwest Main Gravity. If this new sample location proves to be successful, PWD will consider adopting it for future NPDES sampling.

Due the nature of the Southwest Low Level influent connection to the plant which does not provide reasonable, continuous access to an independent sample, the NPDES permit allows for the representation of influent quality to be determined by the sample from the Southwest Main Gravity. However, since the PCB trackdown effort is a special sampling program, PWD will make an effort to collect a sample which represents that stream. Towards that goal, PWD has been attempting to locate access manholes as near to the plant as possible. To date, we have not met with success and may be forced to sample up-stream in the collector. This may require us to take samples at several locations to insure that no influent stream is unrepresented by a sample. PWD will continue to evaluate the best sampling protocol to represent the Southwest Low Level and will define the locations prior to the start of sampling.

In addition to these collectors and as further described in item 3.e, the Northeast Plant contains on its site sludge impoundment basins whose runoff is directed into the plant for treatment. There is one runoff connection into the plant:

1. Lagoons Runoff

Additionally, all PWD biosolids produced from its three (3) wastewater treatment plants are directed to BRC for processing. All waste streams from BRC are directed to Southwest Plant for treatment. These waste streams include centrate from the dewatering process, liquid removed from the biosolids as part of the composting process and site runoff. There is one BRC discharge connection into the plant:

1. BRC Discharge

Furthermore, it is recognized that the waste activated sludge from the Southeast Plant is pumped directed into the Southwest Plant for thickening and digestion. The underflow from the dissolved air floatable (DAF) process is directed into the process stream of the Southwest Plant. As such, this represents a potential source of PCBs outside of the Southwest Plant collection system and should be sampled. However, the waste activated sludge from both the Southeast and Southwest Plants are commingled prior to entering the DAF process. A sample will be taken from the commingled process underflow. The results of the PCB analysis will compared to other plant influent sources and is expected to confirm that this source is significant.

1. Southeast/Southwest Commingled DAF Underflow

The plant effluent is represented by a single composite sample:

1. Plant Effluent

In addition to the above sample locations and due to the size of the Southwest Main Gravity sewer shed, the following sites will also be sampled in order to trackdown PCB within the sheds:

1. Southwest Main Gravity at Central Schuykill West Side
2. Southwest Main Gravity at Central Schuykill Pumping Station

All of the above locations will be sampled and analyzed for PCBs and suspended solids. This plan encompasses the Southwest Plant Phase 1 Trackdown study.

A diagram, entitled *"Southwest Water Pollution Control Plant, PCB Trackdown Program, Phase 1",* depicting the interceptors, lagoon runoff sewers and the planned sampling locations is attached to this section.

A description of the proposed sampling and analytical methods planned for the Phase 1 project are identified in the following package entitled "*Sampling and Analysis Plan for Polychlorinated Biphenly Congener Trackdown, Phase 1, Southwest Water Pollution Control Plant".*

It is PWD's expectations that we will conduct the Phase 1 sampling effort in 2008. Any further investigations, i.e. Phase 2, will be dependent upon the results of the Phase 1 program.

PWD's objective in conducting this trackdown program is to identify significant sources of PCBs in the sewer shed and to implement reasonable cost effective measures to mitigate the source. Since we are at the initial stage in the investigation, it is unclear as to what sources may be uncovered and, therefore, what might the nature of each source. Clearly, the nature of a source is relevant in considering what legal and physical options are available to PWD in achieving our goal. However, PWD will consult with PaDEP and other regulators in making this determination.

SAMPLING AND ANALYSIS PLAN FOR POLYCHLORINATED BIPHENYL CONGENER TRACKDOWN
PHASE 1
SOUTHWEST WATER POLLUTION CONTROL PLANT

Revised September 30, 2005

PHILADELPHIA WATER DEPARTMENT

Project Manager: **Bruce Aptowicz** ____________________________

TABLE OF CONTENTS

SECTION PAGE NO.

1 INTRODUCTION

The Pennsylvania Department of Environmental Protection requires, as a component of a PCB Pollutant Minimization Plan (PCB PMP) that large POTWs discharging to the Delaware River engage in a sewershed PCB trackdown study to locate significant PCB sources. To that end, a PCB trackdown committee has been formed to carry out this objective. This Sampling and Analysis Plan addresses the Phase 1 activities of the trackdown for PWD's Southwest Water Pollution Control Plant (SWWPCP) sewershed.

All samples will be submitted to the contract lab for Method 8082 PCB congener analysis and for total suspended solids using method 160.2. An attempt will be made to estimate the flow at each sampling point to calculate mass loadings at those sampling locations.

Since the direction of this program is dependent upon preceding results, we will conduct this effort in phases, with the details of each phase dependent upon the results of the prior phase. The first phase will consist of wet weather samplings. Wet Weather sampling has been selected for the first phase because dry weather samplings at the PWD's POTW effluents demonstrated very low amounts of PCBs present.

Regarding the analytical methodology, we will be using DRBC's analytical protocol described on their web site.

2 PROJECT MANAGEMENT

The project management structure is indicated in Table 1.

Table 1. Roles and Responsibilities of Key Project Personnel

Key individual	Title	Phone	Responsibility
Bruce Aptowicz	Deputy Director Operations Division	215- 685-6205	Provide overall project coordination
Keith Houck	Assistant Manager, Industrial Waste Unit	215-685-4910	Verify the proper collection of wastewater samples, verify proper post sampling activities
Earl Peterkin	Manager, Trace Organics Lab Bureau of Laboratory Services	215-685-1439	Oversee cleaning of all equipment, sample receipt, preservation, proper storage and shipping of all samples to the contract laboratory. Review field logs
William McKeon	Manager, Wastewater Treatment Plants	215-685-6258	Oversee all sampling from within the wastewater plants. Interpret significance of plant sample results
Chris Crockett	Manager, Office of Watersheds	215-685-6334	Oversee all input regarding collector system flow analysis. Interpret data from collection system samples.
Drew Mihocko	Manager, Collection System	215-685-6203	Provide input regarding physical details of the collection system.

3 SAMPLING ACTIVITIES

3.1 SAMPLING LOCATIONS

3.1.1 PRIMARY LOCATIONS

Two locations in the Southwest Low Level system, three locations in the Southwest Main Gravity system, one location in the DELCORA Force Main, one location in the Biosolids Recycling Center (BRC) centrate line and one location in the sludge lagoons runoff will be sampled. Two locations within in the SWWPCP will be sampled. Table 2 lists these locations.

3.2 DRY WEATHER SAMPLING (RESERVED)

3.3 WET WEATHER SAMPLING

3.3.1 SCHEME

A sample run start will be confined to a qualifying rain event that only occurs as a frontal system. A qualifying rain event is one which equals or exceeds 0.1 inch and whose duration is at least one hour and where there has bee no preceding rainfall within 72 hours of 0.01 inches or greater.

Sampling shall begin at the locations described in Table 2 immediately upon the above criteria being achieved. Two grab samples shall be taken 20 minutes apart at each location to catch the rising hydrograph that is occurring in the sewer. Before samplings are composited and submitted for analysis, there shall be a determination of the rising hydrograph at the SWWPCP influent made and adjusted for the travel time for each location. This confirmation assures that the samples taken at each of the 10 locations occur on a rising hydrograph of the storm event. Sampling will start at the top of the system so as to follow the same sewerage down the collector as it picks up additional flows from the trunked sewers. The two grabs from the interceptor (and the plant influent) locations will be combined in equal proportions with one another at the PWD's Bureau of Laboratory Services (BLS) at Hunting Park and Castor Avenues, Philadelphia.

3.3.2 SAMPLING DETAIL

- The PWD industrial waste unit (IWU) will conduct sampling. All sampling procedures will be conducted in accordance with the protocols detailed in this section.
- Dedicated, precleaned equipment will be used for each sampling location. Each sample container will consist of a food grade pint mason jar that has undergone an ultra cleaning at our central laboratory. The samplings will be transferred immediately to I-chem ultraclean bottle. No mason jars will be reused.
- Personnel handling the samples will wear a new pair of disposable powder-free surgical gloves with each sample collected.
- Sewage will be retrieved from the interceptors at manholes using nylon twine affixed to a new, precleaned one-pint mason jar. For those interceptor samples, a dedicated precleaned mason jar will be lowered

by nylon twine from the top of the manhole to the top of the sewage flow several times to retrieve sufficient volume to fill one liter ultraclean I-chem bottle. The filled I-chem bottle will be stored in a cooler, which will contain ice.

- A second one liter ultraclean I-chem bottle will be filled 20 minutes after the collection of the first sample, using the same sampling technique.
- A separate sample for total suspended solids (TSS) will be collected at each location sampled. Each sample will consist of a one-liter sample at the locations listed above.
- The PWD Bureau of Laboratory Services (BLS) will provide all clean glassware, store samples and undertake shipment when a contract laboratory purchase order is in place. BLS will conduct analyses for TSS.
- The contract laboratory will undertake all analyses except TSS. They will supply deionized water, ice coolers and shipping to and from BLS. This water shall be used for all blanks. One liter blank will be collected at each sample location from the rinseates of the mason jar used to retrieve that sample. One of the blanks will be sent on to the contract laboratory. All other blanks will be stored at BLS and their disposition will be dependent on the results of all samples.
- All samples will be transported to the central lab under ice. For each location, BLS will combine the two grab samples. The two grab samples will be combined by gently shaking/swirling the contents of each, and then immediately pour the contents of each into a laboratory prepared sample container. The combined sample will be identified as the respective manhole/plant sample.

Table 2. Location, timing and types of samples to be taken

Sampling location I.D.	Location	Approximate time of sample*	Type	Ratio of combining samples
1	Southwest Low Level @ Lower Schuylkill West Side	tbd*	2 grab samples	1 to 1
2	Southwest Low Level at 80th St. and Bartram Ave.	tbd*	2 grab samples	1 to 1
3	Southwest Main Gravity at Schuylkill West Side	tbd*	2 grab samples	1 to 1
4	Southwest Main Gravity at Central Schuylkill Pumping Station	tbd*	2 grab samples	1 to 1
5	Southwest Main Gravity at 69th St. and Buist Ave.	tbd*	2 grab samples	1 to 1
6	Delcora Force Main	tbd*	8-hour composite (every 20 minutes)	automatic composite
7	BRC Centrate Line	tbd*	8-hour composite (every 20 minutes)	automatic composite
8	SWWPCP Lagoon Runoff	tbd*	1 grab sample	N/A
9	SWWPCP DAF Underflow (SEWPCP WAS)	tbd*	1 grab sample	1 grab sample
10	SWWPCP Effluent	tbd*	8-hour composite (every 20 minutes)	automatic composite

* To be determined

3.4 EQUIPMENT AND MATERIALS

- 60 unused food grade two part metal top one pint mason jar
- 2 large volume glass jugs
- 18 liter I-CHEM series 300 amber bottles
- Disposable surgical gloves
- glass funnels (wide mouth for narrow mouth 1 liter bottle)
- Ice
- 30 gallon polyethylene bags
- Nylon twine spool
- Ice coolers and shipping (to be provided by contract lab)
- hexane
- methanol
- 3 isco composite samplers w Teflon lined tubing
- deionized water from contract lab
- non-phosphate detergent

3.5 EQUIPMENT CLEANING

Trace level PCB detection limits needed for this program warrant clean sampling procedures to minimize contamination during sample collection. Dedicated equipment will be used whenever possible. Field sampling equipment, if reused, will be cleaned as follows:

- non-phosphate detergent wash
- tap water rinse
- distilled/deionized water rinse
- hexane rinse (pesticide quality or better)
- air dry
- distilled/deionized water rinse.

3.6 QC REQUIREMENTS

3.6.1 BLANKS

One equipment blank that consists of the rinseate from the mason jar supply will be collected and submitted for analysis with the investigative samples.

Deionized water supplied by the contract laboratory will be used as a field equipment rinseate blank.

3.6.2 SAMPLE CUSTODY AND DOCUMENT CONTROL

3.6.2.1 FIELD LOG BOOK

In the field, the sampler will record the following information in the field log book (bound) for each sample collected:

- sample matrix
- name of sampler
- sample source
- time and date
- pertinent data
- analysis to be conducted
- sampling method
- appearance of each sample (i.e., color)
- preservation added
- number of sample bottles collected
- pertinent weather data
- precipitation and hydrographic flow data for rain events
- any other significant observations.

Each field logbook page will be signed by the sampler. BLS will review field logbooks for completeness.

3.6.2.2 SAMPLE LABELS

A unique sample numbering system will be used to identify each collected sample. See table 2.0. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. Samples will be described/labeled as:
SWWPCP Collector-DRBC/EPA PCB TRACKDOWN AND MANHOLE LOCATION
Monitoring-date and time: Example for SWWPCP sample. SW-PCB-trackdown-wet Weather- May X, 2006 1300-A,B,C………………..
The time is that of the second of the two grabs at the location.

3.6.2.3 CHAIN-OF-CUSTODY FORMS

PWD-BLS laboratory services/Laboratory request form # 79-771 (chain of custody form) will be completed for all samples collected during the program. Additionally, chain of custody from the contract laboratory will be used to document sample handling from BLS to the contract laboratory. See Attachment for sample chain of custody form used by PWD.

4 SAMPLE ANALYSIS

4.1 SAMPLE PREPARATION BY BUREAU OF LABORATORY SERVICES (BLS)

The two grabs will be combined 50/50 by volume as follows: gently mix/swirl the contents of each 1liter I-chem jar to insure the sample is homogenized except for the larger volume SEWPCP influent, effluent and QL raw water basin composite samples.

Using dedicated pre-cleaned glass funnels transfer the appropriate sample from the 1-liter I-chem bottles to the appropriate 1-liter, I-Chem series 300 amber glass bottle as follows
:

1- 1 liter each of sewage at locations 1 through 5 and 9

1-1 liter of field/equipment rinseate blank,
1-1 liter of reagent blank(to be stored indefinitely)

Samples will be stored between 0 and 4^{o} C.

Samples will be logged into LIMS and assigned LIMS numbers.

4.2 ANALYTICAL METHODS

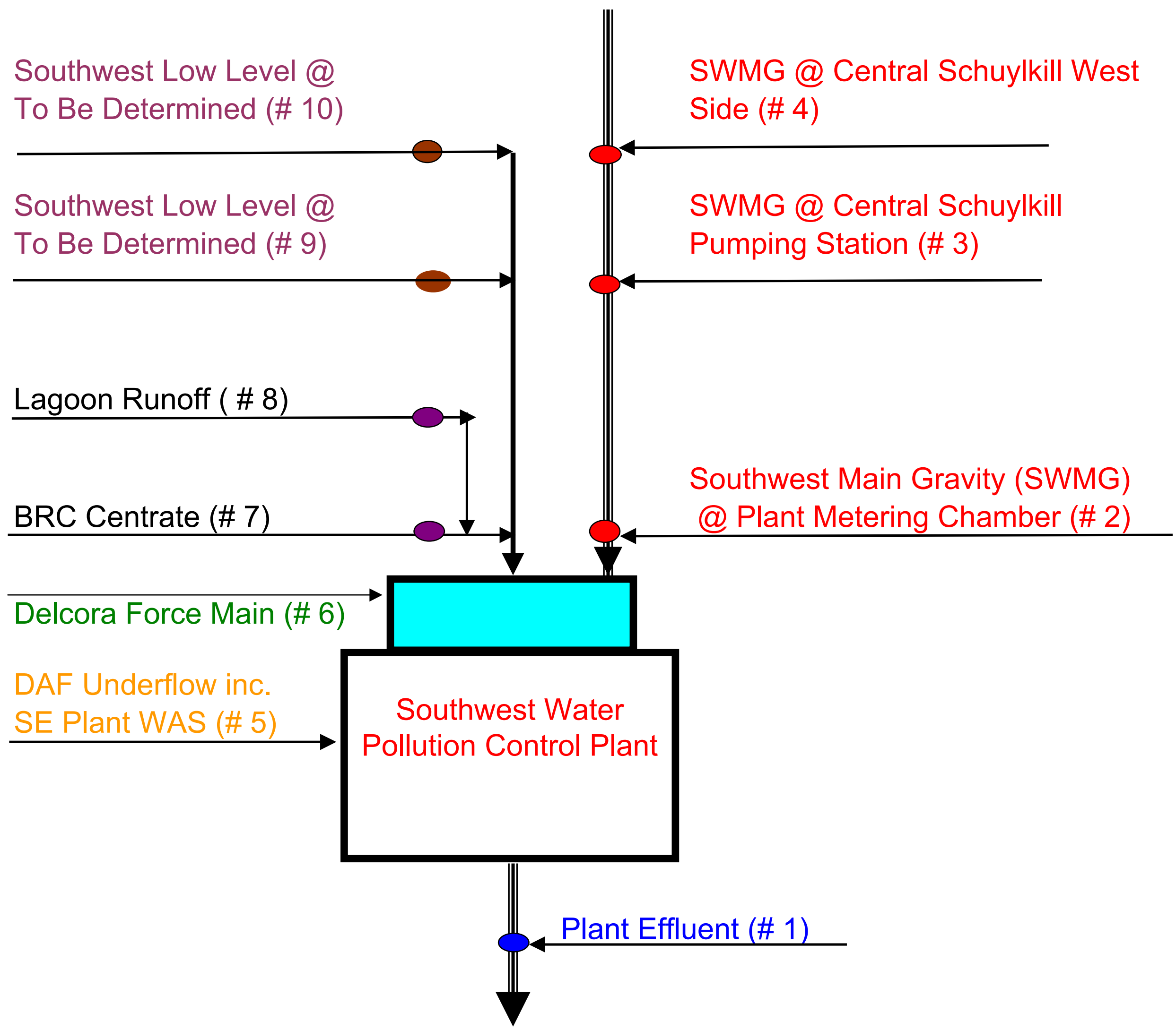
All samples will be analyzed by the contract lab using EPA Method 8082– Polychlorinated Biphenyls by Gas Chromatography. Additionally, all samples will be analyzed for Total Suspended Solids using EPA Method 160.2.

5 DATA ANALYSIS

The PCB monitoring data may provide us with a valuable tool in targeting potential sources within the Southwest WPCP drainage district. The PCB source contribution from each of the drainage areas feeding the interceptor between monitoring points will be determined by examining the data
This evaluation will enable us to identify any potential large influx of PCBs. Also the results of the PCB monitoring will be graphically represented by percentage of homolog group found at each monitoring location as well as by congener type. This interpretation hopefully will assist us in trying to fingerprint any mass produced PCB source. In addition, a mass balance analysis of solids and PCBs will be performed on a system wide basis. This will involve using estimated flows and solids concentration data from the sewers leading to Southwest.

TSS data will be used to characterize the sample as representative of wet weather influenced sewage and to perform a mass solids (TSS) balance on in-sewer loadings as compared to influent loadings as measured at the plant influent.

Southwest Water Pollution Control Plant
PCB Trackdown Program
Phase 1



PMP
Southwest Plant
Previous Minimization Activities
Item 7

As described in Section 4. Known Sources, the water treatment coagulant used at the Belmont Water Treatment Plant is produced by the DuPont Company. This product contains PCBs, most of which are captured by the water treatment processes and discharged into the Southwest Plant sewer shed. The Dupont Company reports the following activities to reduce the PCB concentrations in their ferric chloride.

In the spring of 2001 DuPont analyzed the ferric chloride by-product and found approximately 1.49 ppb of PCBs in the ferric chloride by-product. DuPont promptly launched a program to determine how PCBs are incidentally manufactured in the TIO2 process. The objective of the program is the virtual elimination of PCBs as technology becomes available with a focus on source reduction versus end of pipe treatment. The DuPont technical team developed several short terms process modification to reduce incidental manufacturing of PCBs and 15 long term options that could possibly reduce PCB generation by 90% from the 2001 levels.

The short term reduction effort was quickly implemented in 2002. The effort consisted of a change in raw material use (oil used to keep ore dust down), additional process controls, and installation of settling tanks. These actions reduced PCBs generation by approximately a 60%.

In order to obtain information regarding previous, ongoing or planned pollutant minimization activities, PWD wrote to a number of agencies who may have knowledge of such programs in the PWD sewer sheds as explained in this PMP report under Section 5. Northeast Plant, Potential Sources. The following activities were reported to us from those agencies.

In order to obtain information regarding previous, ongoing or planned pollutant minimization activities, PWD wrote to a number of agencies who may have knowledge of such programs in the PWD sewer sheds as explained in this PMP report under Section 5. Northeast Plant, Potential Sources. The following activities were reported to us from those agencies.

The Philadelphia Department of Public Heath provided PWD with several locations of historical PCB spill sites within the boundaries of the City of Philadelphia. These are listed in the following spreadsheet entitled *"PMP- SW PCB Sites – Health Dept"*. Many of these sites date back in time several decades and were quite small in nature, however they continue to be listed as PCB sites by the Health Dept. PWD's Industrial Waste Unit's inspectors will attempt to investigate the current environmental status of each of these sites over the first two years of this PMP. Sites which are believed to represent no further threat to the environment will be eliminated from the listing. Sites which continue to represent a threat will be characterized in future annuals reports together with any plans to further minimize the sources.

The PaDEP reports that they have a number of sites located within the Southwest sewer shed which are ACT 2 PCB Sites and should be reported in the PMP as possible sites for which previous minimization activities have occurred. A meeting, on September 5, 2005 was held between PWD and state officials, in response to PWD's letter, to discuss this inventory which is currently located on a rather large PaDEP Southeast Region database. The outcome of the meeting was that PWD would forward a set of possible descriptors for each site. PaDEP would use the descriptors to produce a listing of Act 2 sites. It was recognized that considerable effort on the part of PaDEP would be required to produce the listing and that the time required to complete the task might go beyond the window of time which we have to incorporate the results into our PMP. That is the current situation, PWD will incorporate the complete list of sites into our first annual report. Attached is a copy of the email entitled *"PMP – Identification of Known Sources, by Bruce Aptowicz"* which lists PWD's criteria.

It was agreed by all parties that this 5 year PMP would not require a site visit by PWD personnel as other PCB sources have higher priorities. However, should the trackdown effort result in the detection of a significant unknown source in a specific part of the Southwest sewer shed, we look examine PaDEP's ACT 2 listing for any nearby sites and inspect those sites as the potential sources of the unknown loading.

PMP - SW PCB Sites - Health Dept

WPCP	Location	Date	Amount
SW	67th & Linmore	1980	
SW	City Hall Annex	1980	
SW	Roxborough St.	05/22/89	
SW	Dupont Street above Henry Ave.	5/17/89	
SW	Surburban Station	10/1981	8,000 ppm - 279,000ppm
SW	18th & Callowhill	7/31/84	
SW	5101 Grays Ave.	1/21/91	30 gal
SW	16th & Arch Street	01/09/85	
			4 small spills between
SW	Powelton Railyard	10/27/88	1984 - 88
	Eastern Electric - 126		
SW	S. 30th St.	09/27/90	
SW	Cargo City Sub Station	02/14/89	1 qt
SW	River Rd. & Delaware	05/07/84	
SW	Zoo Tower Amtrak- 38th & Pengrove	11/30/84	
	VA Hospital & Medical Center -		
SW	University & Woodland Aves.	10/16/90	50 - 100gal (500,000) ppm
SW	Family Court - 1801 Vine St.	03/02/89	

Bruce Aptowicz

09/06/2005 01:18 PM

To: jefields@state.pa.us
cc: jnewbold@state.pa.us
Subject: PMP - Identification of Known Sources

Jennifer:

It was productive for us to meet with Bob, Jim and you, yesterday, as we create the PCB - PMP program for PWD. As we discussed, PaDEP will review your database of ACT 2 PCB sites and provide me with an electronic spreadsheet according to the following conditions:

The inventory of PCB sites will include all known sites within the boundaries of the City of Philadelphia

The inventory of PCB sites will also include all known sites within the boundaries of the townships which have combined sewer systems. It was our expectation that PCBs leaving a contaminated site would be caused by storm runoff and therefore be transported by the storm system, not the sanitary system. Therefore, PCBs discharging from a site in a suburban township which has separate systems would be the responsibility of the suburban township, not PWD. Unfortunately, we are not positive as which of our suburban township customers have combined sewers. It is our best understanding that none of the townships listed below have combined sewer systems. If PaDEP has information to the contrary, then please include the Act 2 sites located in those townships.

Jim suggested that very large sources of PCBs in any of our suburban customers should also be included since a release from such a site might also reach the sanitary sewers. The following list represents all of PWD's suburban township customers:

<u>Northeast Water Pollution Control Plant</u>

City of Philadelphia:

Zip Code	County	Township
18940	Bucks	Northampton & Newtown Township & Newtown Borough
18954	Bucks	Northampton
18966	Bucks	Southampton
19001	Montgomery	Abington
19006	Montgomery	Lower Southampton
19007	Bucks	Bristol Township
19020	Bucks	Bensalem
19046	Montgomery	Jenkintown
19047	Bucks	Hulmeville Borough & Langhorne Borough
19053	Bucks	Lower Southampton
19056	Bucks	Middleton Township
19054	Bucks	Levittown
19075	Montgomery	Oreland
19090	Montgomery	Willow Grove
19067	Bucks	Lower Makefield

<u>Southeast Water Pollution Control Plant</u>

City of Philadelphia:

Zip Code	County	Township
19038	Montgomery	Glenside
19095	Montgomery	Wyncote

Southwest Water Pollution Control Plant
City of Philadelphia:

Zip Code	County	Township
19038	Montgomery	Glenside
19008	Delaware	Broomall
19018	Delaware	Clifton Hts.
19023	Delaware	Darby
19026	Delaware	Drexel Hill
19029	Delaware	Essington
19032	Delaware	Folcroft
19033	Delaware	Folsom
19036	Delaware	Glenolden
19041	Delaware	Haverford
19043	Delaware	Holmes
19050	Delaware	Lansdowne
19057	Delaware	Wayne
19066	Montgomery	Lower Merion
19070	Delaware	Morton
19073	Delaware	Newtown Sq.
19074	Delaware	Norwood
19076	Delaware	Prospect Park
19078	Delaware	Ridley Park
19079	Delaware	Sharon Hill
19082	Delaware	Upper Darby
19083	Delaware	Upper Darby
19085	Delaware	Villanova
19087	Delaware	Wayne
19004	Montgomery	Bala Cynwyd
19010	Delaware	Bryn Mawr
19017	Delaware	Chester Heights
19035	Montgomery	Gladwyne
19096	Montgomery	Wynnewood
19444	Montgomery	Lafayette Hill

4. If information that is available to you in the database permits you to believe that the site was essentiall all cleaned to background levels, do not include that site.
5. We all concluded that the proper place within the PMP submission to list these sites was Section 7: *Previous, Ongoing or Planned Minimization Activities Voluntarily or Required by Other Regulatory Programs.*That section requests that the discharger provide the following information with each site listing. Please determine if your database can provide me with information:

   the level of pollutant reduction attained
   the level of pollutant reduction targeted
   measures completed
   measures underway
   the schedule for planned activities

6. Additionally, I would suggest that the following information be provided for each site, if available via your database

   Name of site, if any,
   Company's name, if any

Street
Township
County
Zip Code
GIS coordinates
Whether the site met site specific standards or state health standards

7. PWD would then add the following information to characterize each site:
   Name of POTW which might be affected by site
   (For PCB sites located in suburban townships which discharge into the PWD collection system)
   Name of entity under whose contract with PWD permits wastewater in the vicinity of the site to discharge wastewater into PWD's collection system
   Location or name of downstream connection to the PWD's collection system
   (For PCB sites located within the City of Philadelphia's collection system)
   Name of the trunk sewer which transports wastes in the vicinity of the site
   Name of the intercepting sewer which transports the wastes in the vicinity of the site
   Name of stormwater outfall which transports the stormwater in the vicinity of the site
8. Additionally, we all concluded that this submission of the 5 year PMP would not require a site visit by PWD personnel as other PCB sources, and specially, the potential sources, have higher priorities.

As I mentioned yesterday, if you are able to gather the requested information and transmit it to me in about a week or two, I should be able to incorporate it into our submission. If your effort takes more time, I will simply reference this task in the PMP submission and incorporate the information into the PMP when it arrives.

Thanks.

Bruce

PMP
Southwest Plant
Recommendations for Action Under Other Regulatory Programs
Item 8

At this point in the PMP process, PWD does not envision the need for other regulatory authorities to take further actions in the mitigation of the currently listed known sources beyond the continued reduction of PCB concentrations in ambient sources waters.

However, should the trackdown effort result in the identification of a PCB source which is not in violation of the Department's Pretreatment Regulations, it is expected that PWD will request a meeting with the appropriate regulatory agencies to determine a proper course of action.

With respect to potential sources, we have identified two instances in Section 5 – Potential Sources in which the involvement of other regulatory agencies is recommended.

PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards requiring the electric service provider, to any facility which operates a PCB transformer, to notify PWD whenever one the referenced facilities requests that their high tension electrical power be shut down for an indeterminate period. If such an arrangement can be accomplished, upon notification, PWD will visit the facility and inquire as to the facility's plans for the transformer and provide information regarding the proper disposal of PCB equipment.

Secondly, upon identifying a facility, containing PCB equipment, which is closed or not secured, PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards minimizing the potential of PCBs from that equipment becoming released into the environment.

PMP
Southwest Plant
Pollutant Minimization Measures
Item 9

1. On-Site Known or Probable Sources

As reported in Section 3 of this report, the Southwest Plant has one probable on-site source of PCBs – the Southwest Plant Lagoons. Included in that section is some evidence to suggest that these lagoons are likely not a source of PCBs into the plant. However, as part of the Southwest Plant trackdown program, PWD will sample and analyze for PCBs in order to quantify their impact upon the plant. Should we determine that the lagoons represent a known source, we will consider employing appropriate filtering measures to the runoff – such as hay bales – to reduce the conveyed load of solids and PCBs into the plant

2. Collection System Known Sources

As described in Section 4. Known Sources, two known sources of PCBs were reported at this time. PaDEP has preliminarily identified additional ACT 2 sites – under past or current mitigation actions for PCBs - that may be the source of PCBs into the environment, but requires additional time to develop an appropriate spreadsheet to characterize each site. PWD will incorporate the PaDEP's list of ACT 2 sites into this PMP in the first annual report. However, should an outcome of the trackdown program result in the identification of an ACT 2 site as being the source of a significant release of PCBs into the sewer shed, PWD will request a meeting of all appropriate regulatory parties to determine a future course of action.

The first reported known source affecting the Southwest sewer shed is the transmission of PCBs from the Schuylkill River into sewer via treatment processes of the Belmont Water Treatment Plant. The Schuylkill River has been listed by the State of Pennsylvania as impaired due the presence of PCBs. As a result of this listing, state and federal agencies are working towards the development of a plan which will, upon implementation, result in a reduction in its ambient PCB concentration. PWD recognizes that this effort will, in all likelihood, take decades to demonstrate significant results. During the intervening time, the Belmont Plant, under direction from both the PaDEP and the USEPA, will continue to maximize the removal of solids from its drinking water supply - recognizing that such removal effectiveness also increases the capture of PCBs and their discharge into the sewer. PWD's economic analysis also indicates that the sewering of the Belmont Plant's waste solids – thereby utilizing the existing Southwest Plant's infrastructure to convey, separate, thicken, dewater and ultimately, dispose of the water plant's commingled solids – continues to remain the only economically feasible option.

The second known source of PCBs in the collection system is the water treatment coagulant used at the Belmont Water Treatment Plant which is produced by the DuPont Company. This product contains PCBs, most of which are captured by the water treatment processes and discharged into the Southeast Plant sewer shed. The Dupont Company reports the following future activities to reduce the PCB concentrations in their ferric chloride.

Since 2002, DuPont completed its evaluation of the long term options to reduce PCB at the source and is committed to implement a $15+million project in 2007. The project will consist of modifications to the industrial process. DuPont anticipates this project will reduce PCB generation by approximately 90% from the 2001 PCB levels in ferric chloride.

3. Potential Sources

PWD believes that the release of potential sources of PCBs into the environment represents a significant threat to the consistent reduction of PCB concentrations in the nearby rivers and streams. Indeed, in September of 1994, PWD was the victim of an illegal discharge of approximately 1000 pounds of PCBs into the Southeast sewer shed. The consequences of the discharge was overwhelming to our biosolids recycling program and undoubtedly resulted in significant quantities of PCBs being conveyed into the Delaware River.

However, PWD recognizes that it is the policy of this country not to require the removal of PCB containing devices (potential sources) when they used and maintained in a responsible manner.

Therefore, PWD believes that the most effective, but reasonable, manner to prevent a release of a stored quantity of PCBs from being illegally released into the environment is to take existing, but limited, federal programs of identification of PCB potential sources to a higher level.

Section 5 - Potential Sources of this plan identifies a plan to visit all current owners of PCB equipment and collect and record forty (40) descriptors for each source. The following tasks are proposed identify and control potential sources:

1. PWD will make a reasonable effort to obtain the requested information from the owners of the equipment. All gathered information will be incorporated into the referenced spreadsheet.
2. Inspectors from the Industrial Waste Unit will visit all listed sites either within the City of Philadelphia or sites located in the sewer sheds of those suburban townships that wholesale discharge sewerage into PWD's collection system for which PWD manages their pretreatment permit.
3. All such listed sites will be visited during this five year plan
4. PWD will attempt to enlist either the suburban community's wastewater utility or its fire code enforcement organization to visit the remaining suburban township sites and provide PWD with the requested information.

5. On the occasion of a visit to a site, PWD will disseminate information to the site contact individual regarding their obligations for proper disposal of the PCB equipment. We will request that the site contact individual notify PWD of any change in status of the PCB equipment.

6. If the site containing the PCB equipment has an industrial waste pretreatment permit with PWD, we will, on the occasion of their next permit renewal, insert language into the pretreatment permit which obligated the permittee to notify PWD if the status changes of the PCB equipment and to follow proper procedures when disposing of the equipment.

7. PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards requiring the electric service provider, to any facility which operates a PCB transformer, to notify PWD whenever one the referenced facilities requests that their high tension electrical power be shut down for an indeterminate period. If such an arrangement can be accomplished, upon notification, PWD will visit the facility and inquire as to the facility's plans for the transformer and provide information regarding the proper disposal of PCB equipment.

8. Upon identifying a facility, containing PCB equipment, which is closed or not secured, PWD will request a meeting with the DRBC, PaDEP and USEPA to discuss regulatory assistance towards minimizing the potential of PCBs from that equipment becoming released into the environment.

PMP
Southwest Plant
Source Prioritization
Item 10

Identified potential sources of PCBs have been prioritized in accordance with their decreasing weights of contained PCBs. Data used to compare PCB weights was limited, as only the USEPA and Philadelphia Water Department records contained information regarding the weight of PCBs contained within the devices. The files provided in Item 5 Potential Sources display the prioritized sites.

PWD will follow this prioritization in the scheduling of site inspections unless geographical convenience or scheduled inspections for the purpose of pretreatment inspections allows us to efficiently inspect sites in addition to those at the top of the list.

Two known PCB sites have been identified in Section 4 of this report. PWD will prioritize PCBs contained in ferric chloride used in the water treatment process.

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 21	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 Activitiess (# 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.			10				10				11									
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	2
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																				

PMP
Southwest Plant
Measuring, Demonstrating and Reporting Progress
Item 12

12.1 Sampling and Analytical Approaches

PWD intends to utilize several different approaches to demonstrate progress towards achieving PCB minimization resulting from the implementation of our PMP.

As required by the PMP, we will sample the effluent of the plant once every two years and will analyze the sample for PCBs using Method 1668A. Reductions in the total PCB concentration over time may be an indicator program success. However, as the DRBC has correctly pointed out in their document entitled "*Recommended Outline for Pollutant Minimization Plans for Polychlorinated Biphenyls in the Delaware Estuary, Municipal Waste Water Treatment Plants and Publicly Owned Treatment Works",* analytical uncertainties may mask effluent reductions. Furthermore, wet weather samples will be collected and their PCB concentrations used in the analysis. However, the data indicates that there is far greater variability in the PCB concentrations of wet weather samples versus dry weather samples. Although there can be a number of causes of this variability, it is likely that the characteristics of each storm event (rainfall intensity, duration, etc) are significant factors. Since future wet weather sampling will cover a range of types of storm events (as long as each meets the requirements of a qualifying storm event), it is likely that the resulting PCB concentrations will contain significant variability due solely to the nature of each rain event.

Therefore, alternative approaches will be included in our annual reports to demonstrate progress.

As provided in the list of PCB potential sources, Item 5, there may be as many 157 sites in the Southwest Plant sewer shed housing PCB contained devices. Additionally, a number of these sites are reported to hold more than one PCB device. At this stage in the program, PWD is uncertain of the current existence of all of the reported devices, but we know that they were reported by the authorities to have existed in the not distant past and there is no reported knowledge on the part of those agencies that they have been removed. PWD will visit each site during the term of this plan and will report the number of devices that have been removed. If the institutional knowledge can provide us with the weight of the removed PCBs, we will report that value also.

Furthermore, PWD has stated concerns over the potential release of PCBs from vulnerable devices – i.e. those located at sites which are closed or abandoned or devices which have been deenergized or moved into storage. We have recommended that, upon identification of such devices, the regulators and ourselves discuss and implement procedures to minimize the risk of these PCBs from being released into the environment. At such, we will separately report the removal of any vulnerable devices.

PWD has reported two known sources. Both sources are discharged into the sewer shed from the Belmont Lane Water Treatment Plant. We will report any reduction in PCB concentrations in the waste streams from the water plant by both measuring the PCBs in the ferric chloride product as well as, using available DRBC ambient data, PCB reductions in the plant's source (Schuylkill River) water.

PWD has identified a number of sites from the Philadelphia Dept. of Public Health which, we believe, have undergone some form of prior remediation. PWD will inspect each site to either remove it as a potential liability for future PCB release or to recommend activities to reduce the potential risk. We will report the number of sites removed from the list or sites where further remedial action has been recommended or completed.

PWD's objective in conducting its trackdown program is to identify significant sources of PCBs discharged into our sewer shed and then, in cooperation with our regulators, determine and implement procedures to minimize or eliminate those discharges. PWD will report each reduction of PCB load into the shed.

12.2 Estimated Load

An estimate of the annual baseline load from the Southwest Plant has been determined by calculating the average wet and dry weather PCB concentrations in the plant effluent and then determining the flow for a typical year.

PWD recommends using the typical year flows for future year comparisons and calculations. By doing so, we remove, from the analysis, the variability in annual PCB loads caused by the variation in annual rainfall. Secondly, it is clear that the Southwest Plant will discharge a greater PCB annual loading if it increases its capture of stormwater and thereby increases its flows during wet weather. However, by accomplishing this goal, the environment will receive an overall benefit since the volume of untreated CSO discharge will be reduced. Of course, PWD has been directed, via its NPDES permit, to implement plans to minimize CSO discharge and is well on its way towards accomplishing this long term requirement. By using a typical year plant flow for the annual PMP analysis, we can properly focus our attention on progress towards reducing PCB concentrations in the plant effluent.

The following chart entitled *"Southwest Plant, Baseline PCB Plant Effluent Concentration (pg/l)"* provides our methodology for determining the baseline PCB concentration. PWD uses the PCB data collected in 2001 as the basis for its baseline concentration since that was the time frame in which PWD began to focus attention on reducing PCBs affecting its sewer shed. However, the analytical procedures employed to analyze that data set focused on only 85 congeners while more recent data (2005) required data from 209 congeners. In order to make the 2001 data reflect all 209 congeners, a procedure was employed to estimate the concentrations of the unanalyzed congeners in the 2001 data set by developing a ratio between the total concentration in the 85 congeners to the total concentration of the 209 congeners in the 2005 data set. That ratio was then applied to the 2001 data and an estimate of the concentration from 209 congeners was derived. It is estimated that the average baseline PCB concentration during wet weather is 22,076 pg/l while the average dry weather concentration is 9,929 pg/l.

In order to estimate plant flow for a typical year, PWD examined the annual rainfall patterns for the past 103 years and determined that the year 2000 exhibited close to the average annual rainfall while also providing relevant plant flow data, which were also near long term averages. The plant flow data was examined to identify flows consistent with rainfall events. The attached graph entitled *"SW WPCP Average Daily Flows – 2000"* identifies wet weather days. The average flow for wet weather days and dry weather days were then calculated together with the number of days in each category. Thus, in a typical year, the Southwest Plant experiences 138 wet weather days and 227 dry weather days, while the average plant flow in wet weather is 219 MGD and is 174 MGD in dry weather.

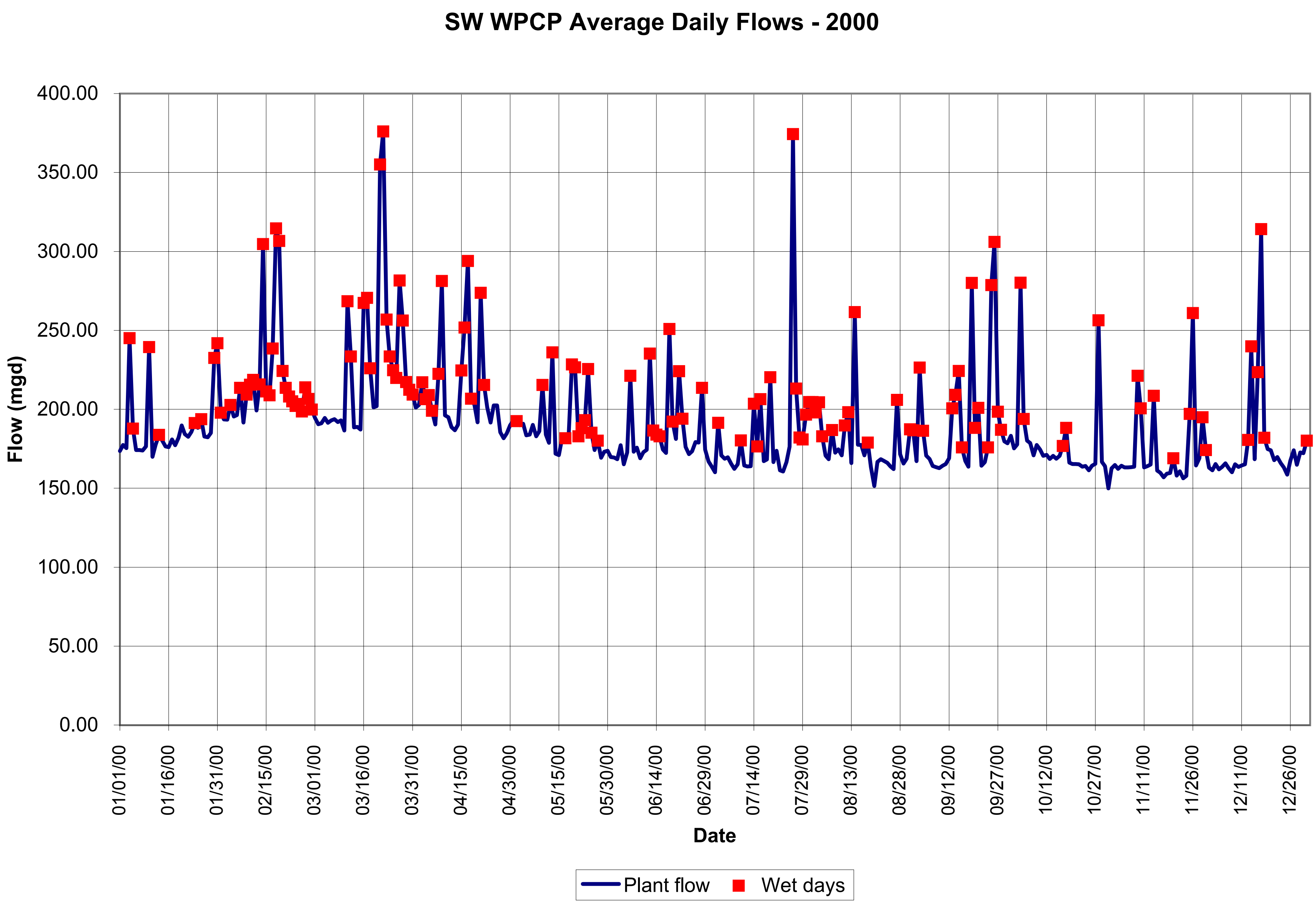
The attached chart entitled *"Southwest Plant, Baseline PCB Plant Effluent Loading (gm/yr)"* displays this data and calculates the baseline annual loading to be 4,004 gm/year.

12.3 Anticipated Reductions to Baseline Load

Currently, PWD has committed to a reduction in the PCB concentration in the ferric chloride product utilized in its Belmont Water Treatment Plant and which is then discharged into the sewer. We expect to experience a 90 percent reduction in concentration by the end of the third year of the program. Beyond that known source, PWD is uncertain as to the expected success of its ability to identify and, subsequently, minimize other sources and therefore cannot, with any degree of confidence, anticipate further reductions to baseline load. PWD is committed, however, to making every reasonable effort to achieve success of this program and is hopeful that its labors will result in significant load reductions.

12.4 Continuing Assessment

PWD will report progress towards PCB minimization in an annual report starting one year after the commencement of this PMP. Commencement of the PMP will start within 60 days of the receipt of a determination of completeness from the DRBC.


SW WPCP Average Daily Flows - 2000
Flow (mgd)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
01/01/00
01/16/00
01/31/00
02/15/00
03/01/00
03/16/00
03/31/00
04/15/00
04/30/00
05/15/00
05/30/00
06/14/00
06/29/00
07/14/00
07/29/00
08/13/00
08/28/00
09/12/00
09/27/00
10/12/00
10/27/00
11/11/00
11/26/00
12/11/00
12/26/00
Date
Plant flow
Wet days

Measuring, Demonstrating and Reporting Progress
Item # 12
Southwest Plant

Baseline PCB Plant Effluent Concentration (pg/l)

			Wet Weather				Dry Weather			
Line	**Year Samples Taken**	**Data**	**Sample # 1**	**Sample # 2**	**Sample # 3**	**Average**	**Sample # 1**	**Sample # 2**	**Sample # 3**	**Average**
1	**2005**	**Total of all 209 congener concentrations with positive values plus 1/2 detection level for all congeners with non-detections**	**3,975**	**11,049**	**6,881**	**7,302**	**3,155**	**3,436**	**5,340**	**3,977**
2	**2005**	**Using only the 85 (2001) congeners, total concentrations with positive values plus 1/2 detection level for all congeners with non-detections**	1913	6208	3566	**3,895**	1456	1569	2714	**1,913**
3		**ratio of Line 1 to Line 2**	2.08	1.78		**1.87**	2.17	2.19	1.97	**2.08**
4	**2001**	**Total of 85 congener concentrations with positive values plus 1/2 detection level for all congeners with non-detections**	7419	13805	14109	**11,778**	5673	4693	3960	**4,775**
5	**2001**	**Estimate of total concentration assuming analysis of 209 congeners (Line 3 multiplied by Line 4)**	15,417	24,571	-	**22,076**	12,290	10,281	7,793	**9,929**

All reported PCB concentrations **include** 'J' values, and 1/2 the detection limit for those cogeners reported as non-detect ('U')
In 2001, only 85 congeners were analyzed, while 209 were analyzed for in 2005

Measuring, Demonstrating and Reporting Progress
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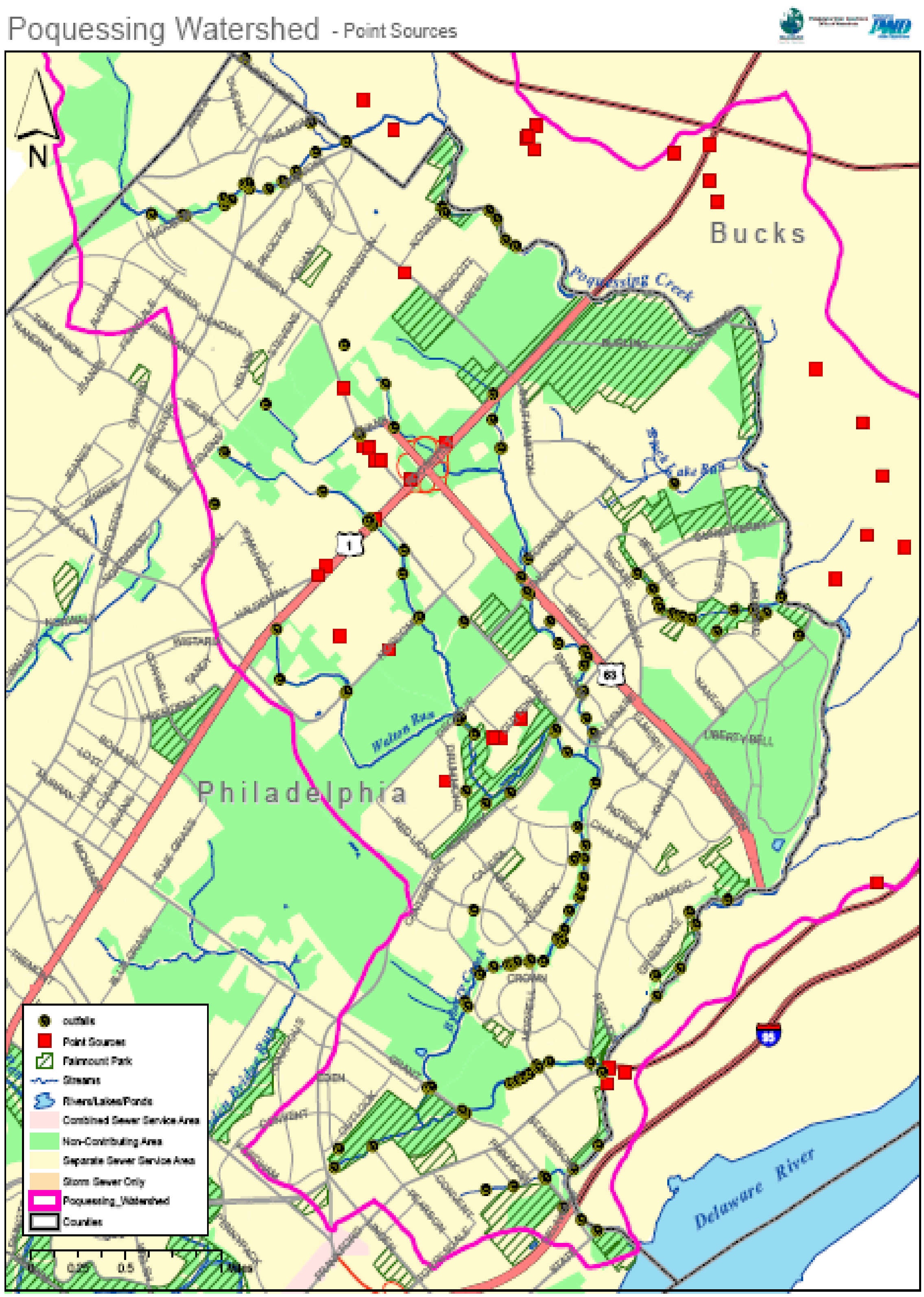
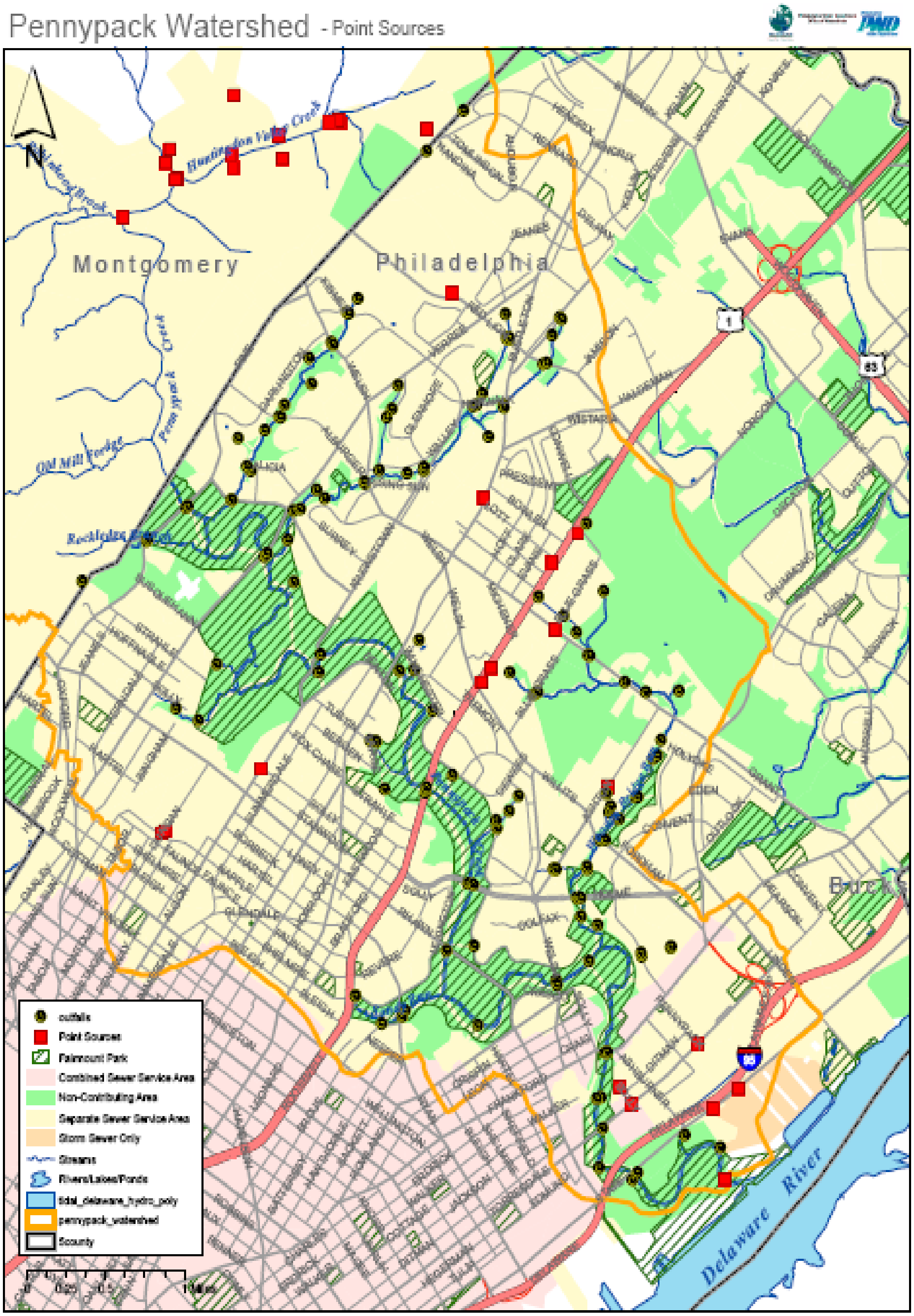
Southwest Plant

		Wet Weather		Dry Weather		Total
Baseline Flows (MGD)		219		174		
Baseline Flow Days per Year		138		227		
Baseline PCB Concentration (pg/l)		22,076		9,929		
Baseline PCB Loading (gm/year)		2,522		1,482		**4,004**

APPENDIX F – LAND USE AND RESOURCE MAPPING

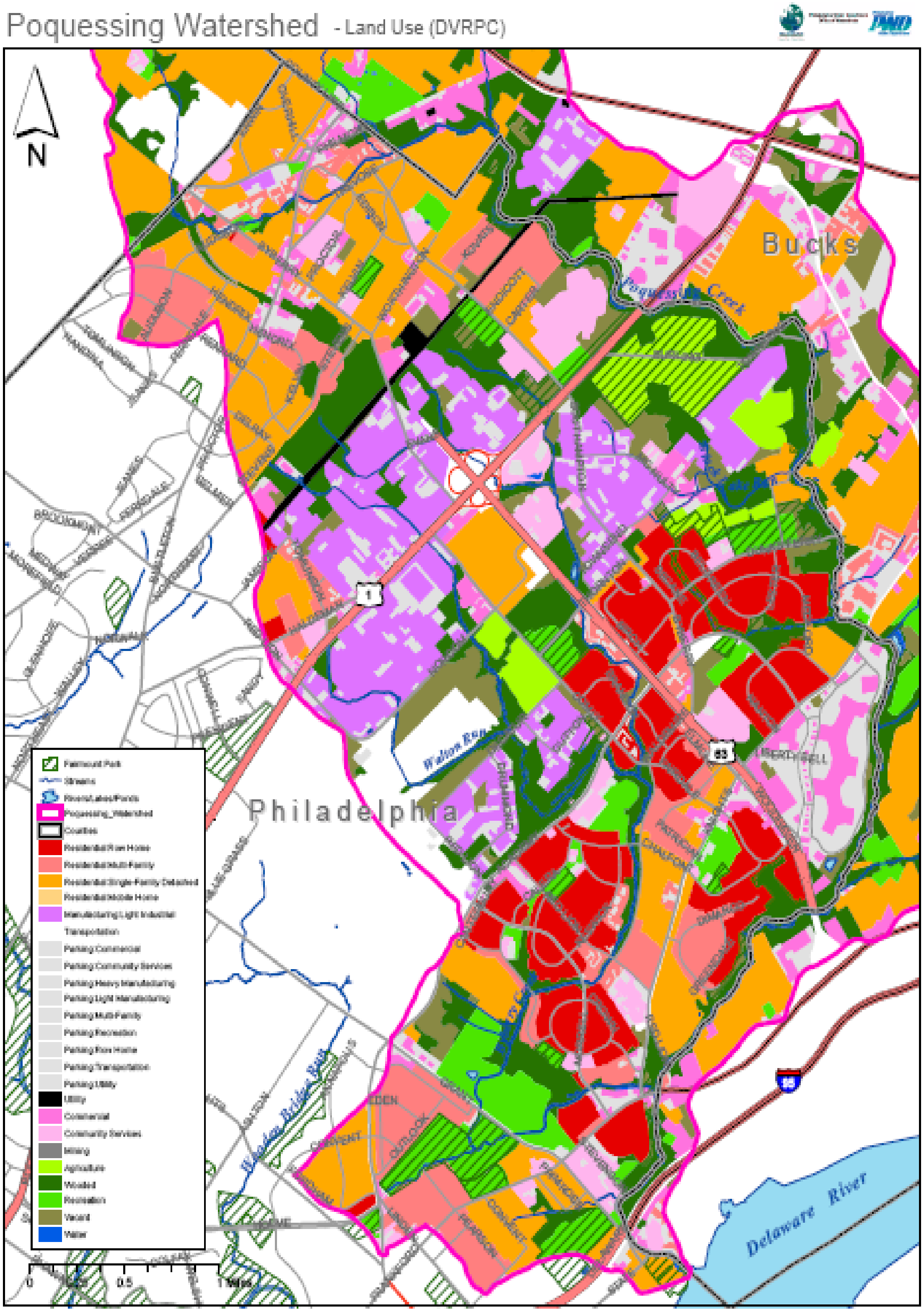


Appendix C, Figure 1 - Poquessing Watershed Point Sources & Outfall Locations

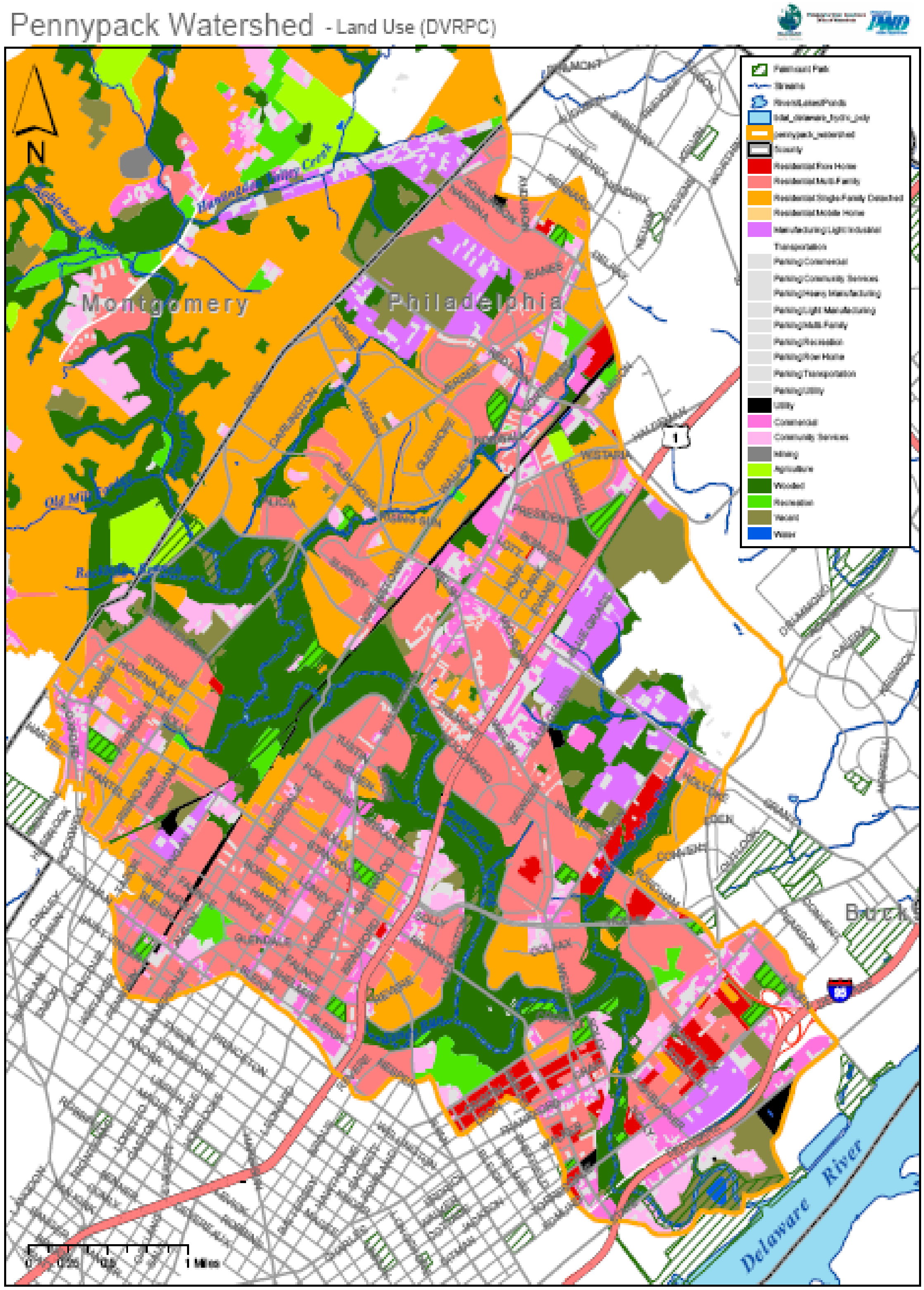


Appendix C, Figure 2 - Pennypack Watershed Point Sources & Outfall Locations

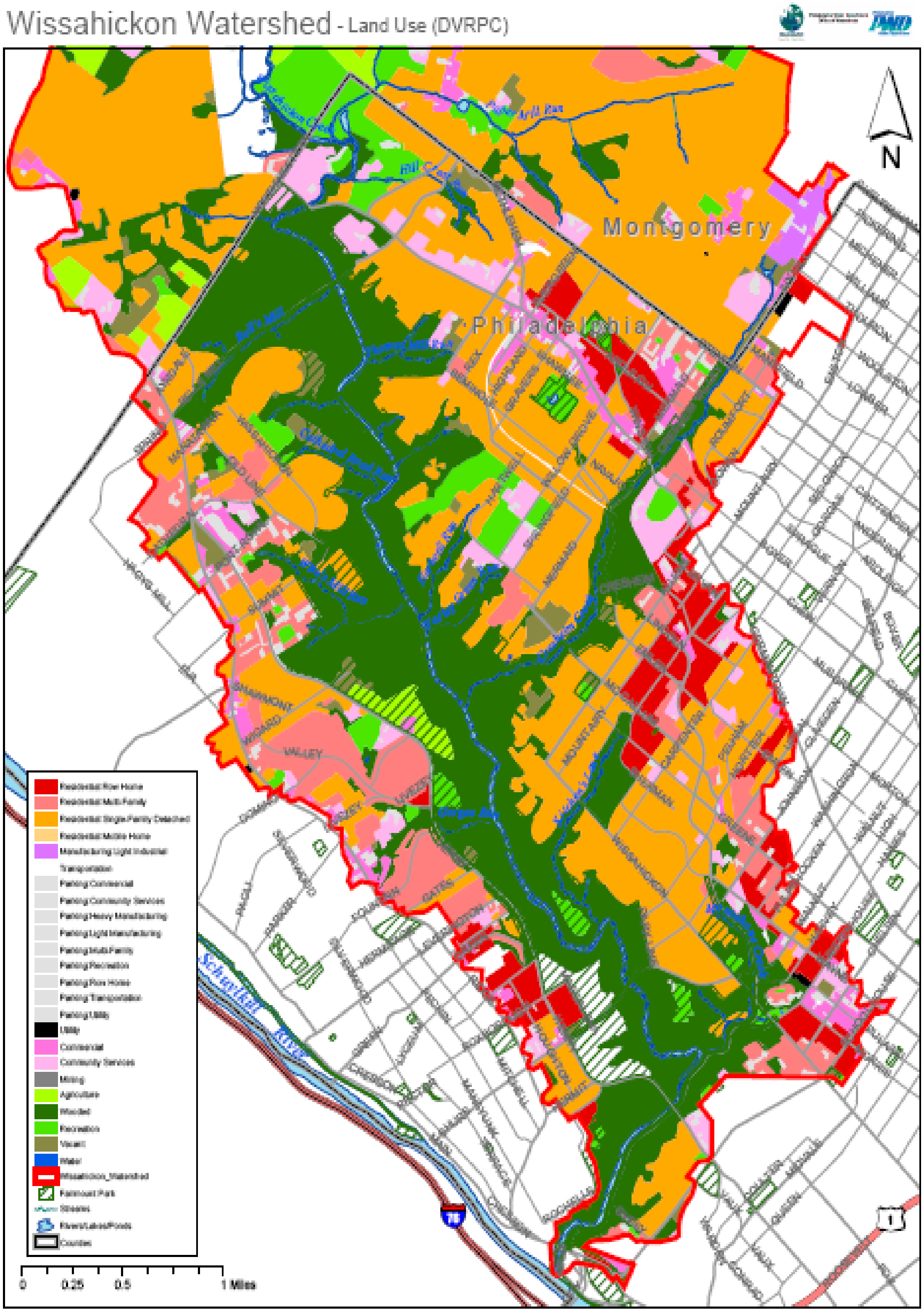
Appendix C, Figure 3 - Wissahickon Watershed Point Source & Outfall Locations



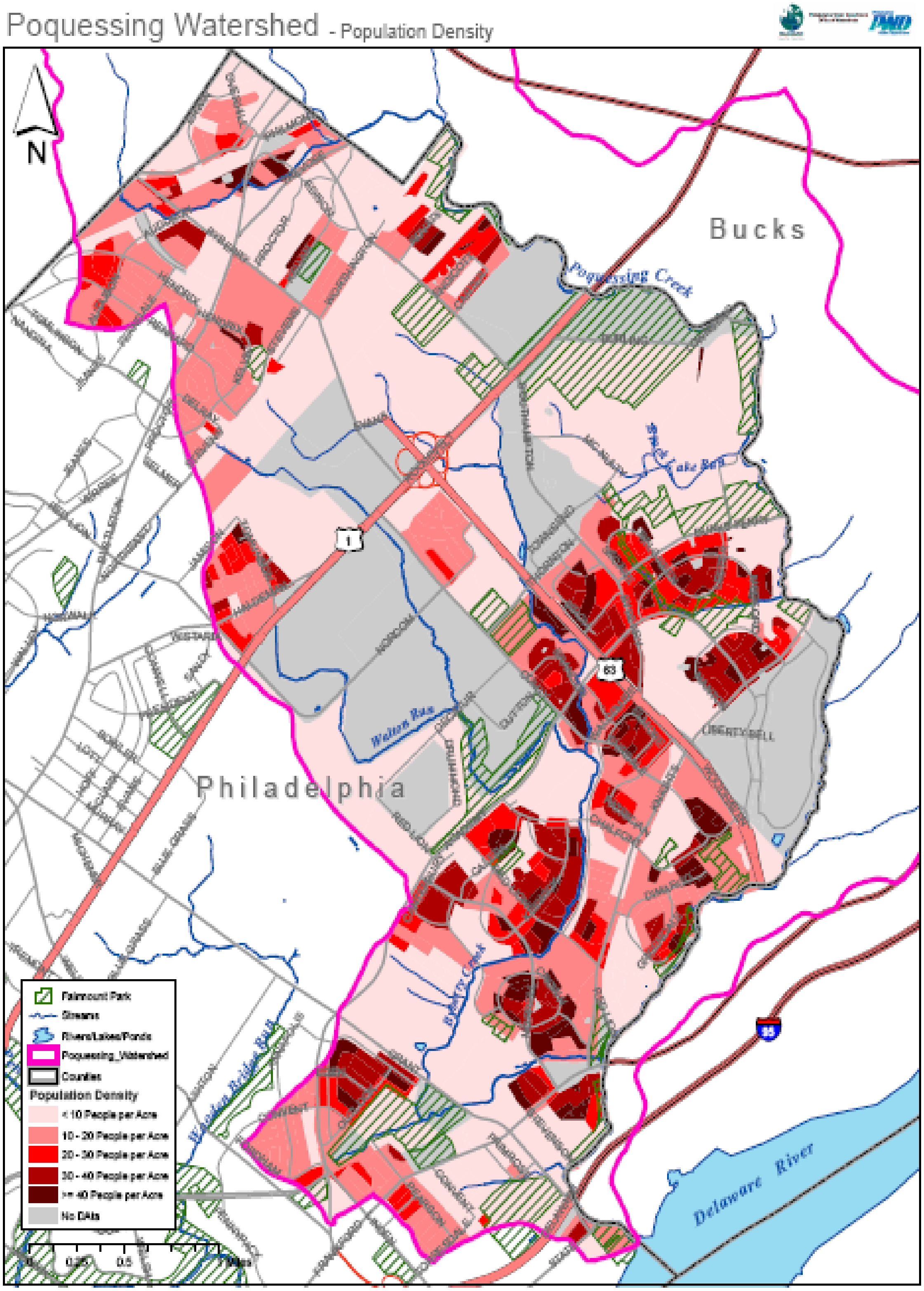
Appendix C, Figure 4 - Poquessing Watershed DVRPC Land Use Mapping



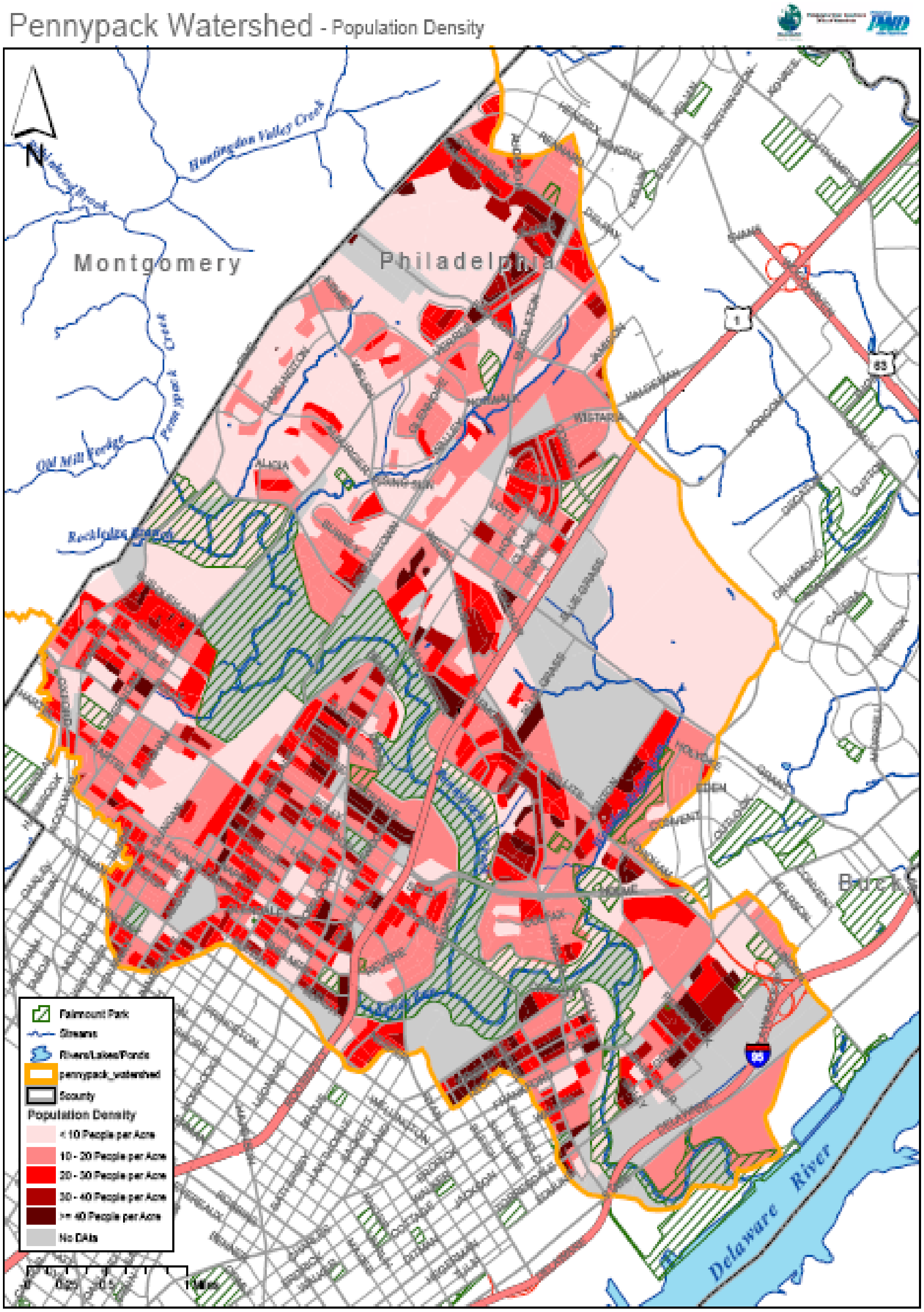
Appendix C, Figure 5 - Pennypack Watershed DVRPC Land Use Mapping



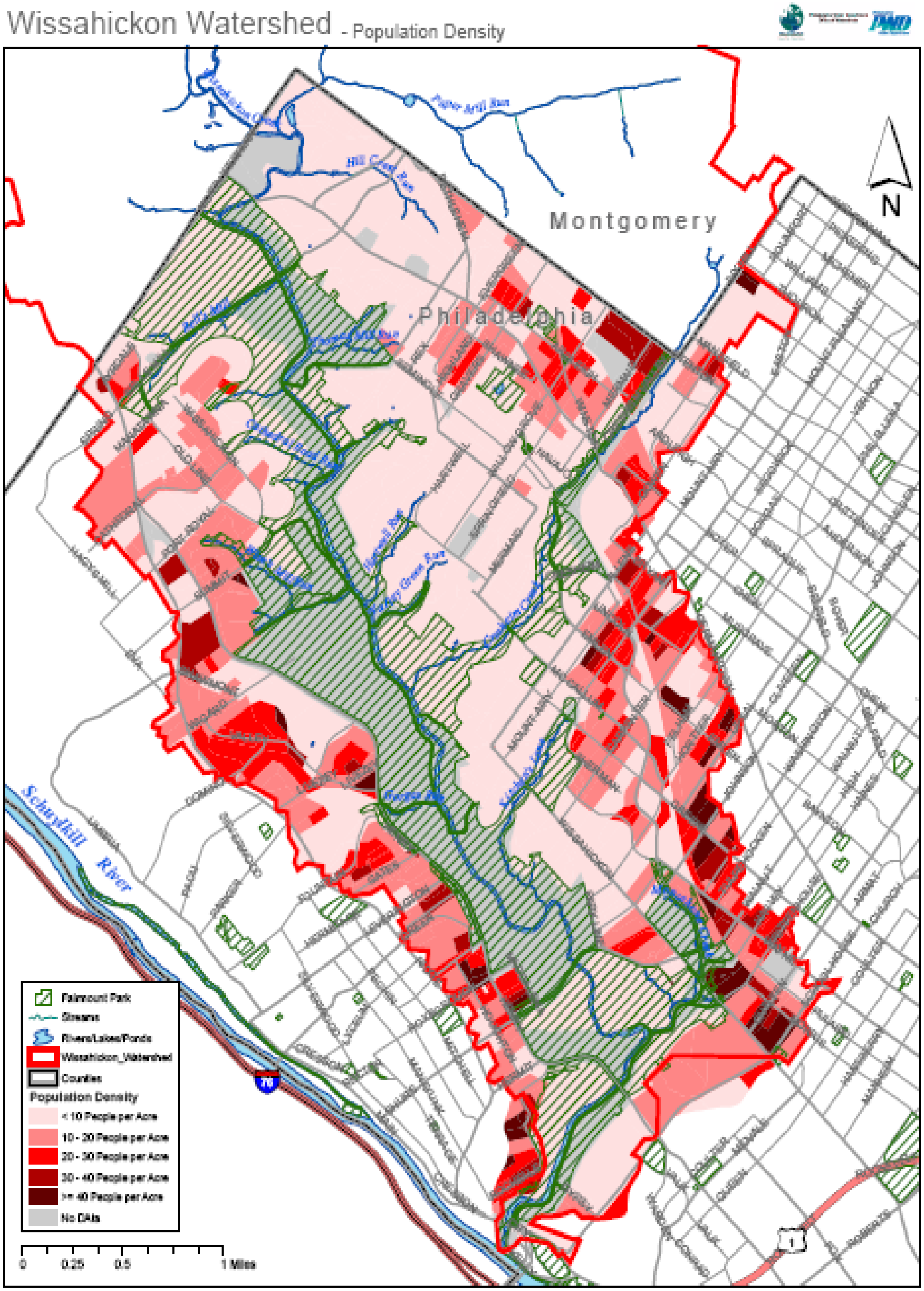
Appendix C, Figure 6 - Wissahickon Watershed DVRPC Land Use Mapping



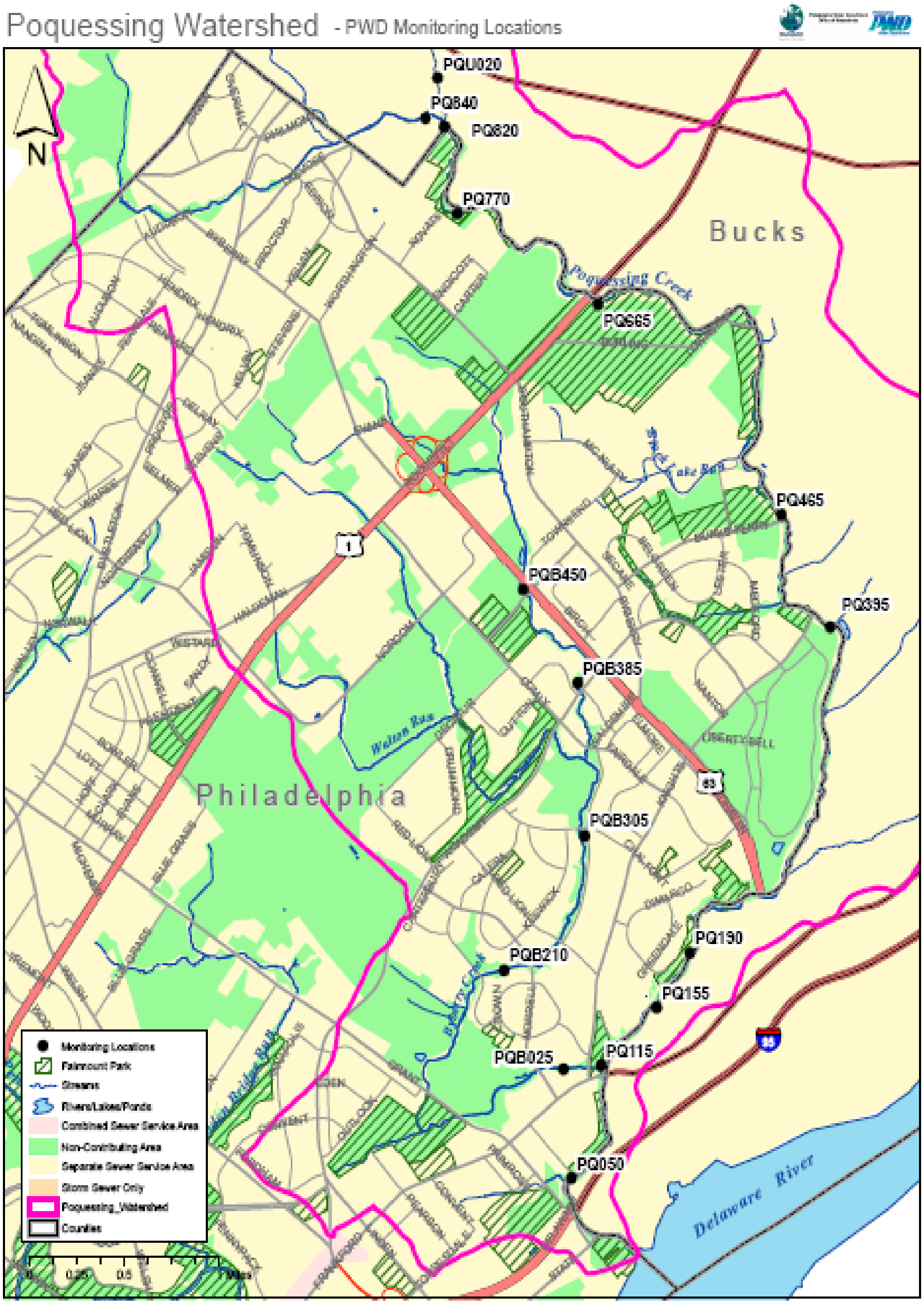
Appendix C, Figure 7 - Poquessing Watershed Population Density



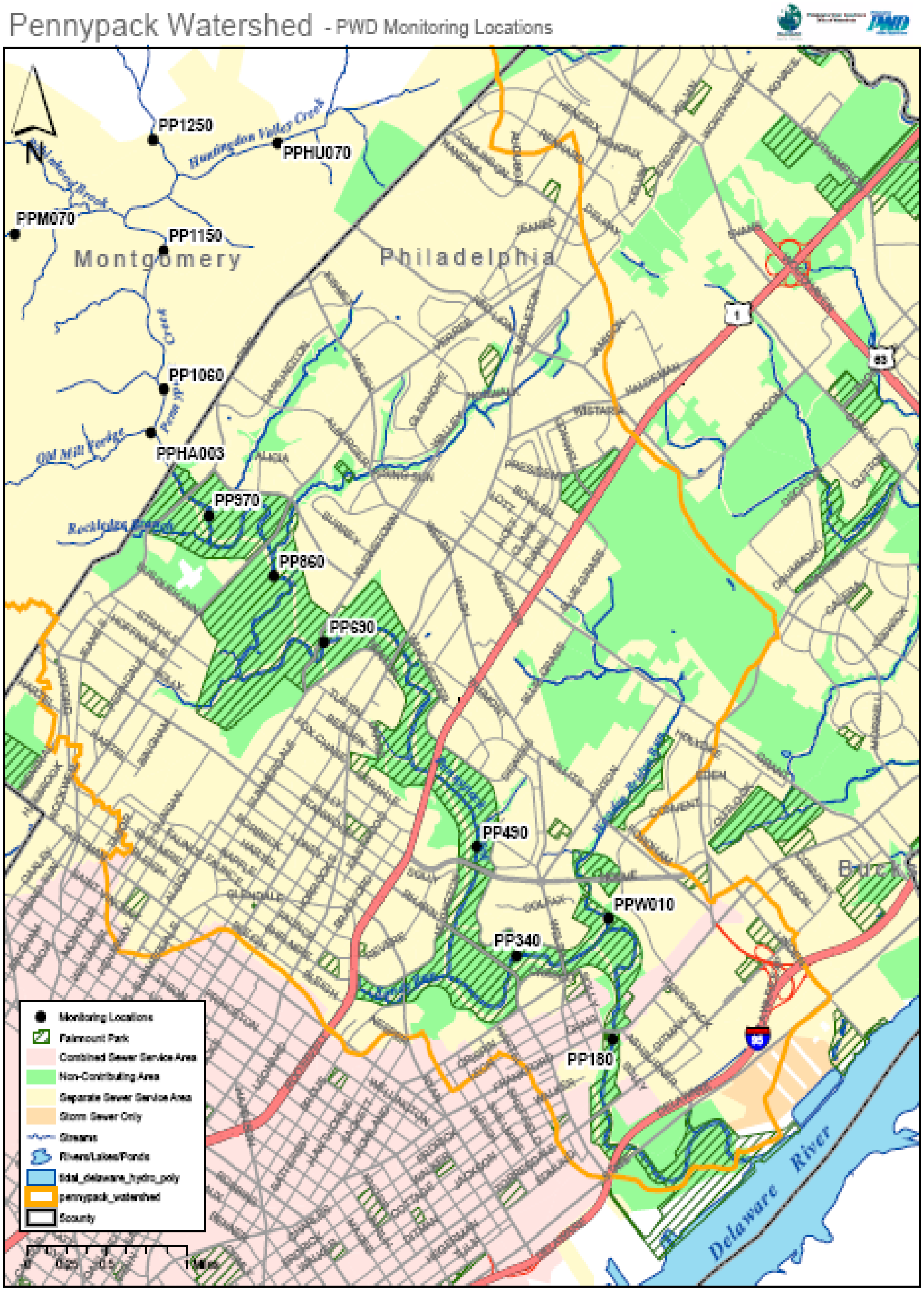
Appendix C, Figure 8 - Pennypack Watershed Population Density



Appendix C, Figure 9 - Wissahickon Watershed Population Density



Appendix C, Figure 10 - Poquessing Watershed PWD Monitoring Locations



Appendix C, Figure 11 - Pennypack Watershed PWD Monitoring Locations

Appendix C, Figure 12 - Wissahickon Watershed PWD Monitoring Locations

APPENDIX G – PWD QUARTERLY DRY WEATHER WATER QUALITY MONITORING PROGRAM

Quarterly Dry Weather Water Quality Monitoring

Background

General

In 2009, the Philadelphia Water Department (PWD) initiated a dry weather water quality sampling program designed to work in tandem with the continuous data collection efforts of the PWD/USGS Cooperative Program. Grab samples are collected from ten sites covering all six of Philadelphia County's watersheds on a quarterly basis by the staff of PWD's Bureau of Laboratory Services (BLS). Data collected through this program are most pertinent to Target A (Dry Weather Water Quality & Aesthetics) of the PWD's Integrated Watershed Management Plan (IWMP) Strategy, as outlined in the following section.

PWD's IWMP "Target" Strategy

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 PWD's experience in working with stakeholder groups in goal prioritization and option evaluation, they have learned that stakeholder priorities can at times differ from those identified by the data driven problem identification process. This could present a challenge in development and approval of a management alternative for watershed implementation. PWD has developed an approach that is able to address what often emerges as a set of high priority stakeholder concerns while simultaneously addressing the scientifically defined priorities.

By defining three distinct "targets" to meet the overall plan objectives, priorities identified by stakeholders could be addressed simultaneously with those identified through scientific data. Two of the targets were defined so that they could be fully met through implementation of a limited set of options, while the third target would be best addressed through an adaptive management approach. In addition to the three Targets – a fourth category has been developed to capture the more programmatic implementation options related to planning, outreach, reporting, and continuation of the Watershed Partnership.

Targets are defined here as groups of objectives that each focus on a different problem related to the urban stream system. They can be thought of as different parts of the overall goal of fishable and swimmable waters through improved water quality, more natural flow patterns, and restored aquatic and riparian habitat. Targets are specifically designed to help focus plan implementation. By defining these targets, and designing alternatives and an implementation plan to address the targets simultaneously, the plan will have a greater likelihood of success. It also will result in realizing some of the objectives within a relatively short time frame, providing positive incentives to the communities and agencies involved in the restoration, and more immediate benefits to the people living in the watershed. PWD's IWMP planning targets are defined below:

Program Support

A number of implementation options deemed appropriate for a given watershed are "programmatic" in nature. While these options may support achievement of Targets A, B, and/or C, implementation of these options alone would not result in achievement of a particular Target. These "Program Support" associated options include items such as monitoring, reporting, feasibility studies, outreach/education, and continuation of the Watershed Partnership.

Target A: Dry Weather Water Quality and Aesthetics

Streams should be aesthetically appealing (look and smell good), be accessible to the public, and be an amenity to the community. Target A was defined with a focus on eliminating sources of sewage discharge and other pollution during dry weather, along with trash removal and litter prevention. Access and interaction with the stream during dry weather has the highest priority, because dry weather flows occur about 60-65% of the time during the course of a year. These are also the times when the public is most likely to be near or in contact with the stream. In dry weather, stream water quality should be similar to background concentrations in groundwater, particularly with respect to bacteria.

Target B: Healthy Living Resources

Improvements to the number, health, and diversity of benthic macroinvertebrate and fish species need to focus on habitat improvement and the creation of refuges for organisms to avoid high velocities during storms. Fluvial geomorphological studies, wetland and streambank restoration/creation projects, and stream modeling should be combined with continued biological monitoring to ensure that correct procedures are implemented to increase habitat heterogeneity within the aquatic ecosystem.

Improving the ability of an urban stream to support viable habitat and fish populations focuses primarily on the elimination or remediation of the more obvious impacts of urbanization on the stream. These include loss of riparian habitat, eroding and undercut banks, scoured streambed or excessive sediment deposits, channelized and armored stream sections, trash buildup, and invasive species. Thus, the primary tool to accomplish Target B is stream restoration.

Target C: Wet Weather Water Quality and Quantity

The third target is to restore water quality to meet fishable and swimmable criteria during wet weather. Improving water quality and flow conditions during and after storms is the most difficult target to meet in the urban environment. During wet weather, extreme increases in streamflow are common, accompanied by short-term changes in water quality. Where water quality and quantity problems exist, options may be identified that address both. Any BMP that increases infiltration or detains flow will help decrease the frequency of damaging floods; however, the size of such structures may need to be increased in areas where flooding is a major concern. (Reductions in the frequency of erosive flows and velocities also will help protect the investment in stream restoration made as part of the Target B.)

Target C must be approached somewhat differently from Targets A and B. Full achievement of this target means meeting all water quality standards during wet weather, as well as elimination of flood related issues. Meeting these goals will be difficult. It will be expensive and will require a long-term effort. A rational approach to achieve this target includes stepped implementation with interim goals for reducing wet weather pollutant loads and stormwater flows, along with monitoring for the efficacy of control measures.

Monitoring Locations

Water quality samples are taken at ten USGS gage sites in the USGS/PWD Cooperative Monitoring Program (Figure 1). Site identification codes used by PWD's Bureau of Laboratory Services (BLS) are presented alongside USGS gage station numbers in Table 1. USGS stream gaging stations are ideal monitoring points as they allow discrete sample data to be coupled with continuous data being collected year-round at these sites for loading estimate purposes. Furthermore, grab sample results and field meter readings taken at the time of grab sampling may be invaluable when evaluating continuous water quality data from these USGS gages.

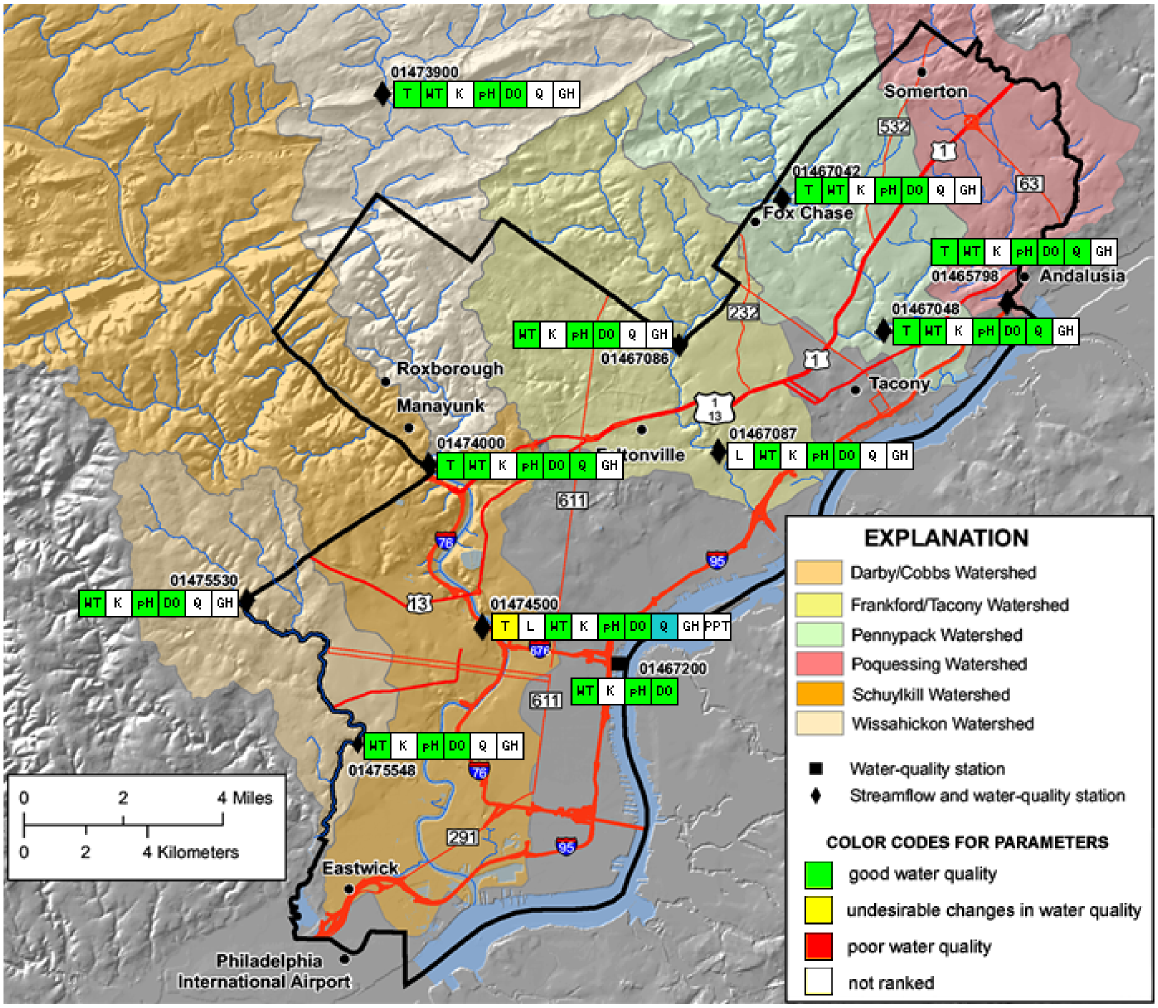


Figure 1. Philadelphia Water Quality Gauge Stations as Viewed on Cooperative USGS-PWD Website (http://pa.water.usgs.gov/pwd/).

Table 1. Monitoring Locations in the PWD/USGS Cooperative Monitoring Program with location IDs used by PWD Bureau of Laboratory Services

Description	USGS Gage #	BLS Location ID
Cobbs Creek at US Rt. 1 (City Line Ave.)	01475530	COBB700

Cobbs Creek at Mt. Moriah cemetery	01475548	COBB355
Schuylkill River at Fairmount Dam	01474500	SCHU154
Wissahickon Creek at Ft Washington (Rt. 73)	01473900	WISS500
Wissahickon Creek at Ridge Ave.	01474000	WISS130
Tacony Creek at Castor Ave.	01467087	TACO250
Tacony Creek at Adams Ave.	01467086	TACO435
Pennypack Creek at Pine Rd.	01467042	PENN407
Pennypack Creek at Rhawn St.	01467048	PENN175
Poquessing Creek at Grant Ave.	01465798	POQU150

PWD is implementing a City-wide approach to dry weather water quality monitoring, rather than focusing on a single individual watershed. Currently a number of BMP projects are in their early stages of implementation across the city, water quality benefits of which will only be observable over a period of several years. This fact remains, regardless of whether water quality is monitored on a broad or focused scale. Gauging the success of such projects on a more immediate scale is best accomplished solely by hydrological analysis. Therefore, the strategic value of the widespread sampling approach is that as more BMP projects are completed over the coming years, the water quality data should gradually begin to reflect their positive environmental impacts.

Quarterly Monitoring - June 2009

Stream Conditions

This initial report summarizes results from a single set of grab samples that were collected June 30, 2009. In subsequent years, four sets of samples per year will be presented in the annual summary, along with comparison to historical data from Comprehensive Characterization Reports (CCR). June 2009 was a relatively cool and rainy month overall (Figure 2), making it difficult to find an opportunity to collect samples during dry weather. PWD is not aware of any spills, discharges or unusual conditions that would cause misleading results in the water quality data from these grab samples.

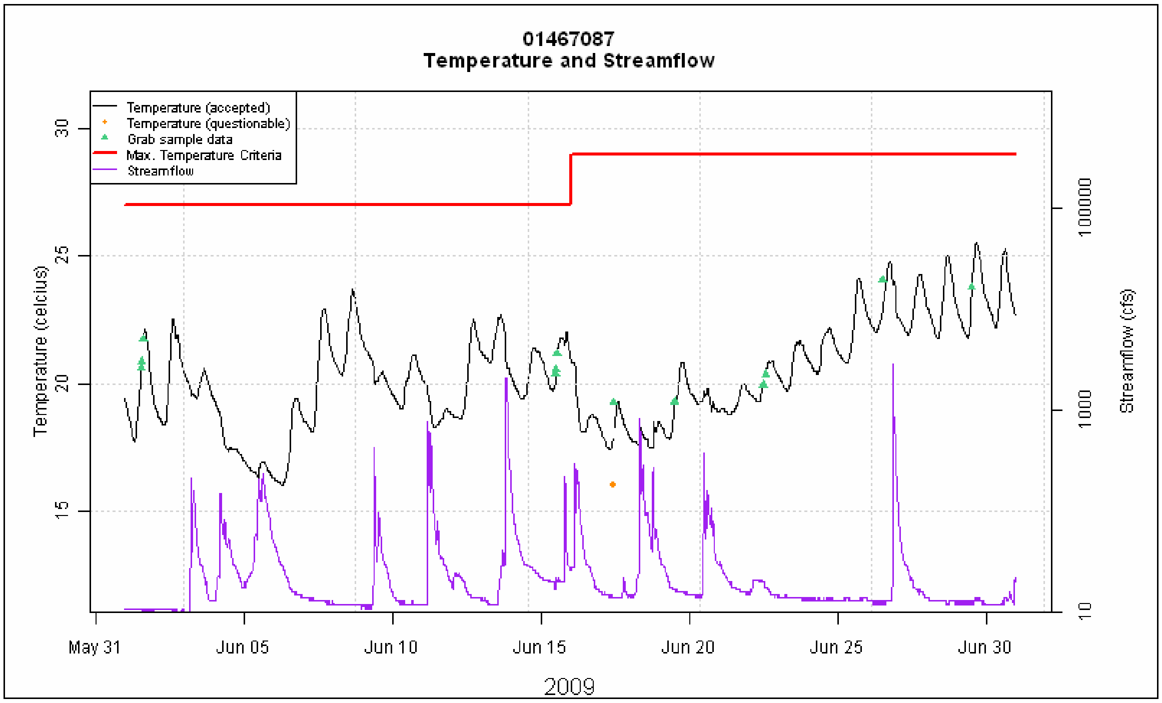


Figure 2. Temperature and Streamflow conditions at USGS gage 01467087.

Nutrient Analysis

The macronutrients phosphorus and nitrogen are essential to the growth and overall survival of all plants. However, when occurring in surplus they can be extremely detrimental to aquatic ecosystems, and in turn to the human population that utilizes these water bodies for recreational activities such as fishing, boating, and swimming. Elevated nutrient concentrations in rivers and streams can most often be attributed to anthropogenic pollution sources. In these situations, the most common sources of both nutrients are runoff from fertilized lawns/farmland and wastewater discharge.

The most immediate result of excessive nutrient concentrations in any natural water body is excessive plant growth, seen in a variety of growth forms from suspended algae to aquatic macrophytes. As the first step in the process of eutrophication, this unnatural acceleration of aquatic plant growth can start a chain reaction leading to highly adverse effects to that ecosystem. For example, in small shallow streams, unnaturally high densities of algal periphyton can cause pronounced fluctuations in dissolved oxygen and pH and also adversely affect aquatic habitat by forming thick mats of filamentous algae or algal scums on stream substrates. Moreover, alteration of the algal community structure can lead to the proliferation of nuisance taxa, taste and odor problems in the drinking water supply, increased water treatment costs, and in rare cases, production of toxins (*e.g.*, from cyanobacteria blooms). As a result of these direct and indirect responses, streams and rivers can suffer severe impacts in regards to both aquatic biodiversity and human recreational use.

It should be noted that several phosphorus-containing compounds, known as polyphosphates, can be found in the region's waterways, but they are naturally occurring and are present due to the geologic composition of the area. Furthermore, these polyphosphates pose little ecological threat as they are not present in a biologically available form. Only over long periods of time can these compounds be broken down into orthophosphates, which plants and algae can absorb and utilize for growth. Therefore, aside from the relatively minor contributions of the regions geology, the most significant source of orthophosphates in rivers and streams is human-generated pollution. It is for this reason that orthophosphates, along with nitrates, are included as components of this water quality monitoring program. These forms of N and P are readily available to stream producers.

Nutrient Results

Nutrient data collected in June of 2009 were generally consistent with the data collected for Comprehensive Characterization Reports (CCRs) prepared for each of the respective watersheds. Five of 10 sites are not affected by treated wastewater and had orthophosphate concentration less than the reporting limit of 0.1 mg/L (Figure 3). Conversely, Pennypack and Wissahickon Creeks had elevated P concentration which is likely attributable to point source discharge of treated wastewater. Dilution effects were observed between upstream and downstream gages. PWD recognizes that the 0.1mg/L reporting limit value is close to, or perhaps even within the recommended range of instream phosphorus concentration expected to result in nuisance densities of algal periphyton and is working to improve the low-scale performance of phosphorus laboratory analyses.

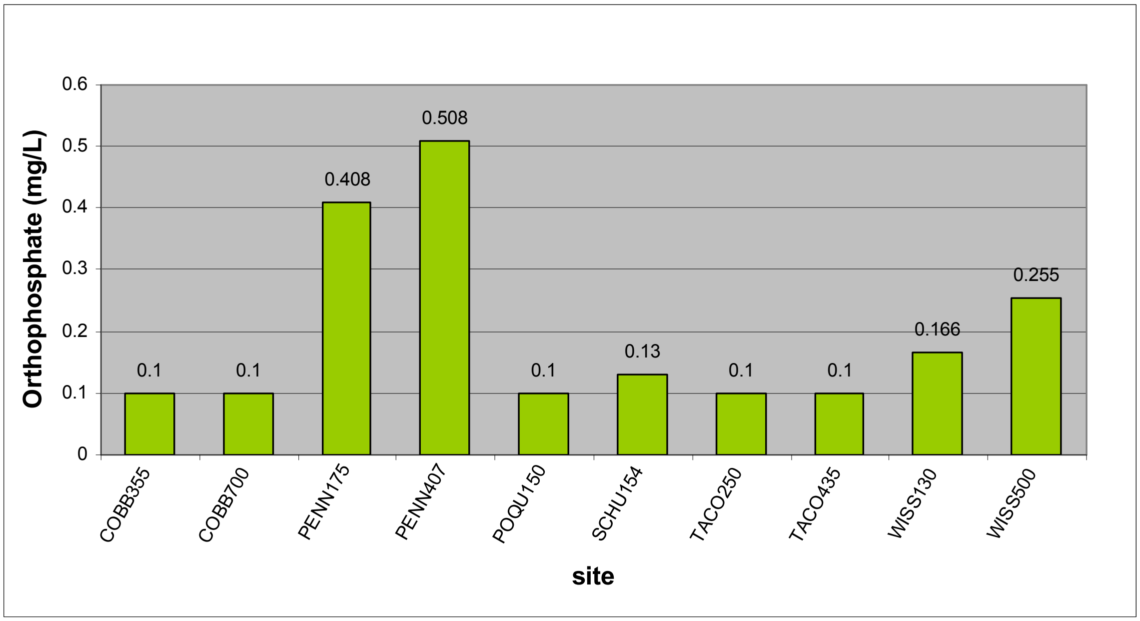


Figure 3. Orthophosphate concentration at 10 USGS gage stations sampled 6/30/2009

Figure 4. Nitrate concentration at 10 USGS gage stations sampled 6/30/2009

Microbial Analysis

Fecal indicator bacteria, found naturally in the gut of warm–blooded animals, can be used in detection of human or animal waste contamination in a body of water. While these bacteria themselves are generally harmless to humans, they are considered to be very reliable indicators of the presence of other more serious fecal-borne pathogens, such as viruses, protozoa, and other bacteria. The extent to which a water body is contaminated with fecal indicator bacteria can indicate the likelihood that the water has been contaminated by human or animal wastes. In urban environments, the most likely dry weather pollution sources are domestic animals, wildlife, and untreated sewage from improperly connected or leaking sanitary sewers.

PWD performs three fecal indicator bacteria tests, including fecal coliform, *Escherichia coli*, and enterococci. The fecal coliform test covers a relatively wide subgroup of fecal-specific bacteria, however it does include some species that are not necessarily fecal in origin. *E. coli*, on the other hand, is a single coliform species that is noteworthy due to the fact that it occurs only in the fecal matter of humans and other warm-blooded animals. This qualifies *E. coli* as an excellent indicator of human waste. The final coliform group tested, the enterococci, are significant in that they tend to mimic many enteric pathogens with their ability to thrive in saline conditions over a wide range of temperatures. This makes the enterococci test very useful in waterways that may have a marine influence, or any other river or stream that may have above normal salinity due to the geology of the area.

Microbial Analysis Results

PADEP bacteria water quality criteria require that the geometric mean of a group of at least five samples collected on non-consecutive days over a thirty day period not exceed 200 fecal coliform CFU/100mL. Generally, results of the microbial analyses from June 30 2009 indicate fecal indicator bacteria levels greater than 200CFU/100mL, but within "background" urban dry weather range at all locations with the exception of site COBB355, where both fecal coliform (Figure 3) and *E. coli* (Figure 4) were noticeably elevated, perhaps indicating some dry weather source of pollution. However, these data represent a single test from a single sample taken on a single day rather than a geometric mean of five samples. Fecal coliform counts can show a range of variation amongst samples collected on a given day, as well as variability within each given sample. While the sample size is very small, fecal coliform and *E. coli* counts were very closely correlated but there was no correlation between either fecal coliform or *E. coli* and enterococci. This lack of correlation has been observed in other data sets from the Philadelphia area as well. Lack of correlation may be related to differential survivability of the various fecal indicator bacteria.

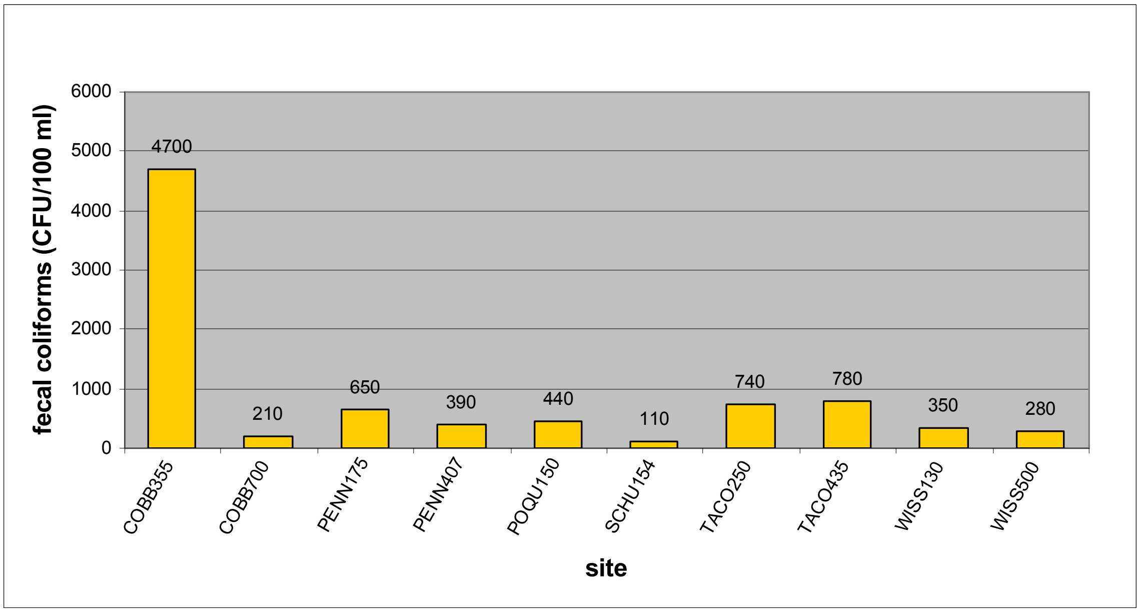


Figure 5. Fecal coliform results at 10 USGS gage stations sampled 6/30/2009

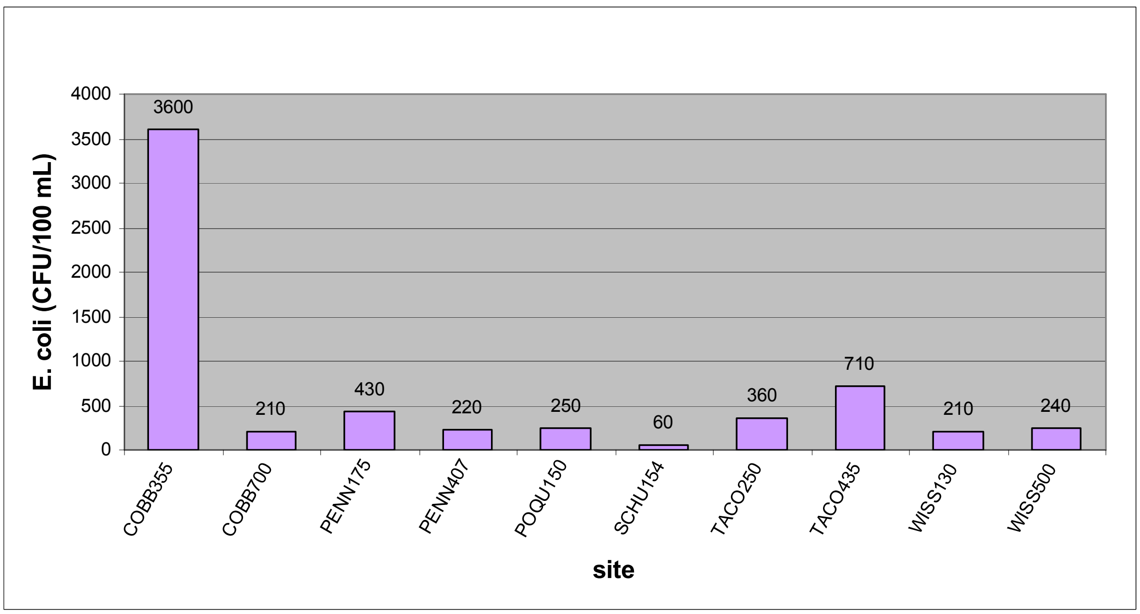


Figure 6. *E. coli* results at 10 USGS gage stations sampled 6/30/2009

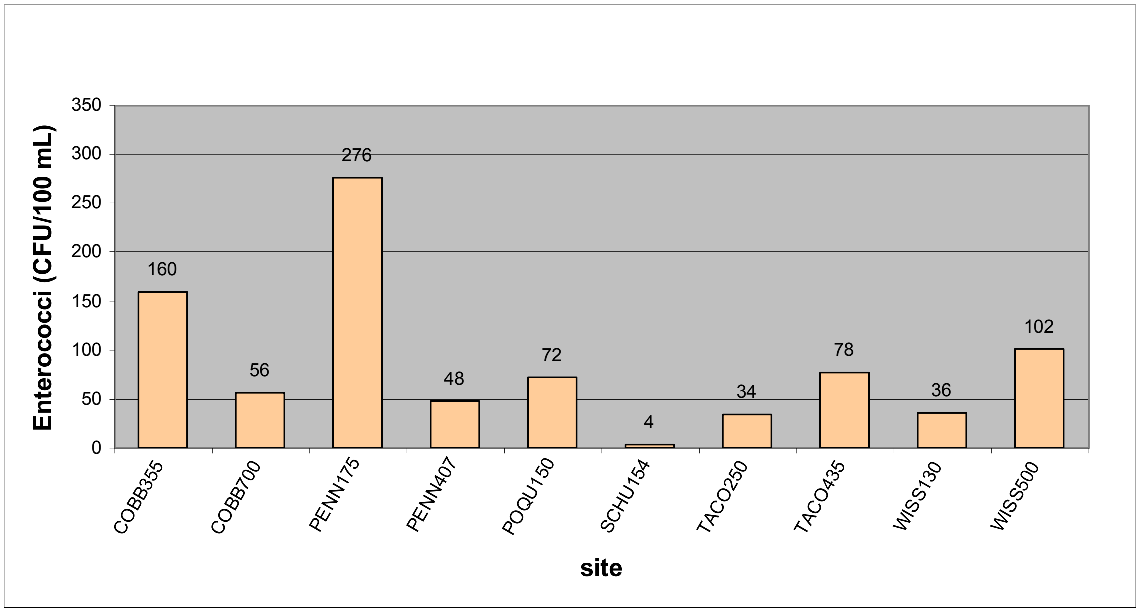


Figure 7. Enterococci results at 10 USGS gage stations sampled 6/30/2009

Physicochemical Analysis

In addition to nutrient and microbial analyses, a basic set of physicochemical parameters were also monitored as part of the discrete quarterly sampling program. These parameters (dissolved oxygen, pH, temperature, and specific conductance) were specifically chosen to coincide with those being measured by the USGS continuous water quality monitoring gages. These data can then be utilized as valuable field checks when analyzing continuous water quality data from USGS gages.

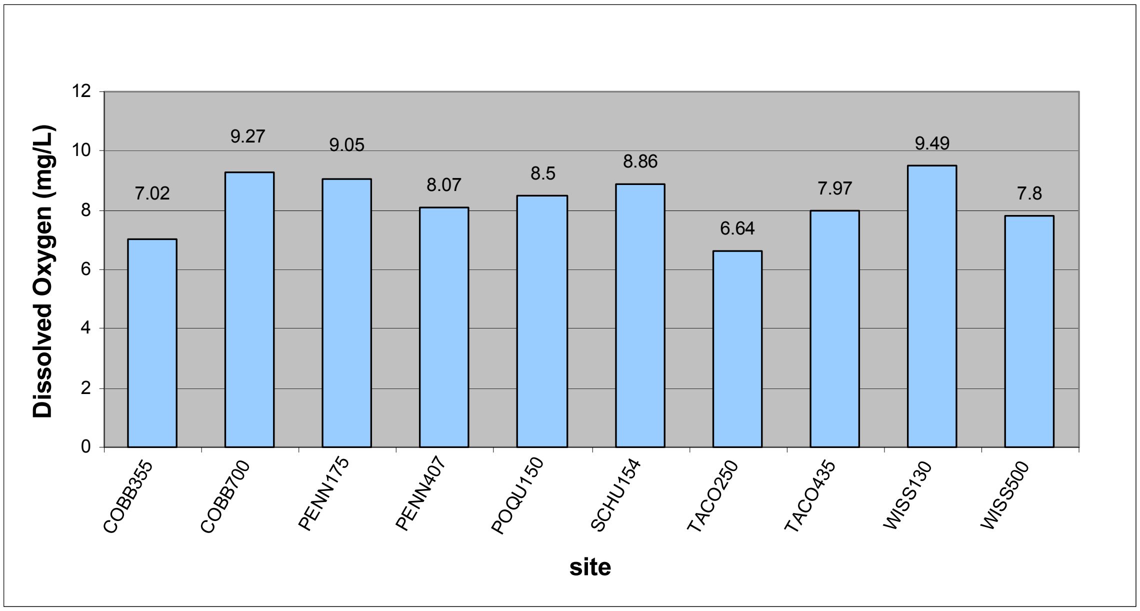


Figure 8. Dissolved oxygen results at 10 USGS gage stations sampled 6/30/2009

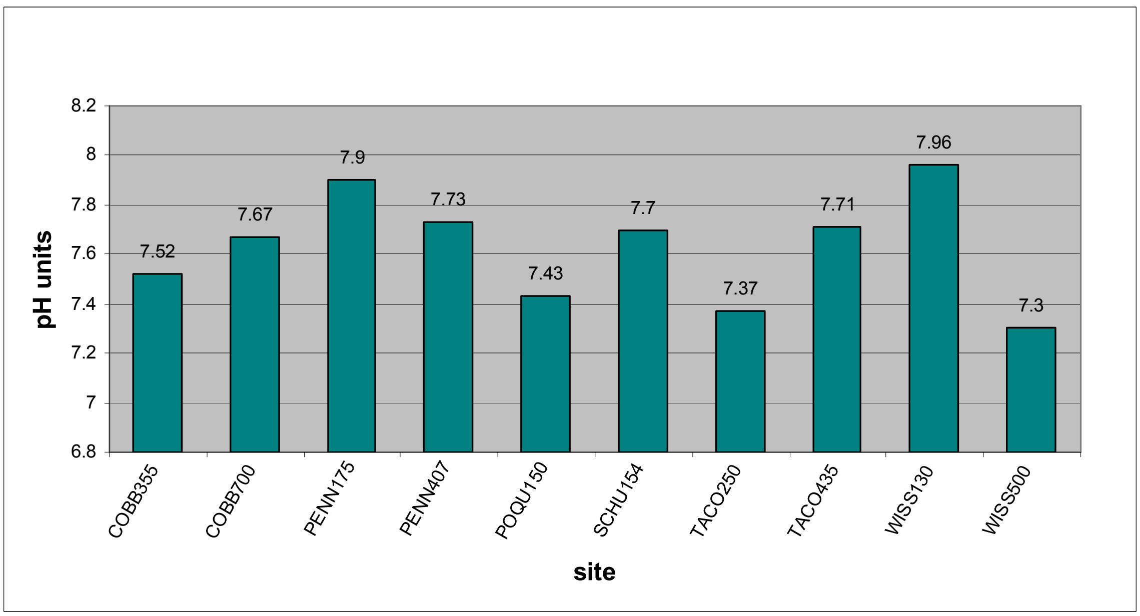


Figure 9. pH results at 10 USGS gage stations sampled 6/30/2009

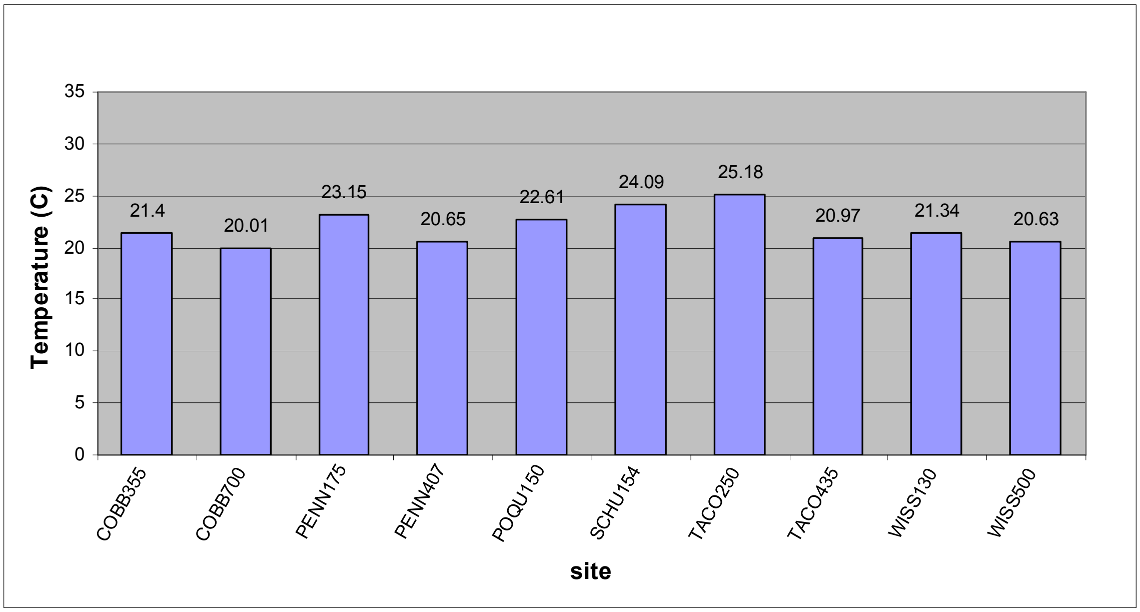


Figure 10. Temperature results at 10 USGS gage stations sampled 6/30/2009

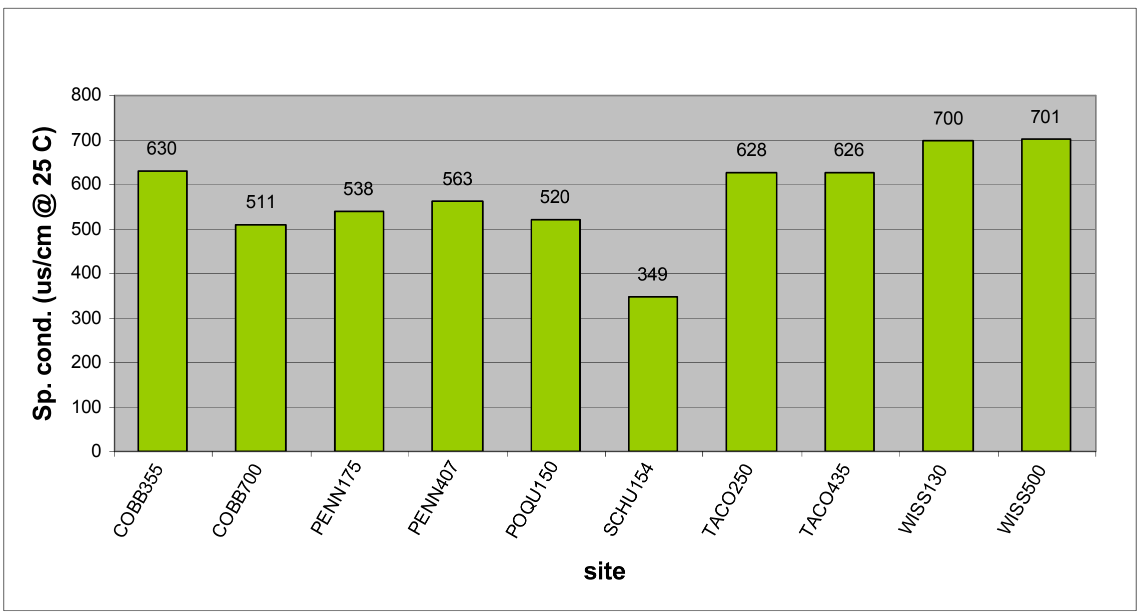


Figure 11. Specific conductance results at 10 USGS gage stations sampled 6/30/2009

APPENDIX H –PWD/USGS COOPERATIVE WATER QUALITY MONITORING PROGRAM ANNUAL SUMMARY

PWD/USGS Cooperative Water Quality Monitoring Program Annual Summary

Background

PWD and the United States Geologic Survey (USGS) have constructed and/or refurbished gaging stations in ten locations throughout Philadelphia's watersheds. USGS staff are responsible for construction and maintenance of the gage structure, stream stage monitoring instruments, data communications, maintaining and verifying stage-discharge rating curves and pumping apparatus. PWD staff are responsible for installation and maintenance of continuous water quality instrumentation. Data collected through the PWD/USGS cooperative water quality monitoring program are disseminated through the USGS National Water Information System (NWIS) Web Interface (http://waterdata.usgs.gov/pa/nwis/nwis), as well as a website specifically dedicated to Philadelphia's watersheds (Figure 1).

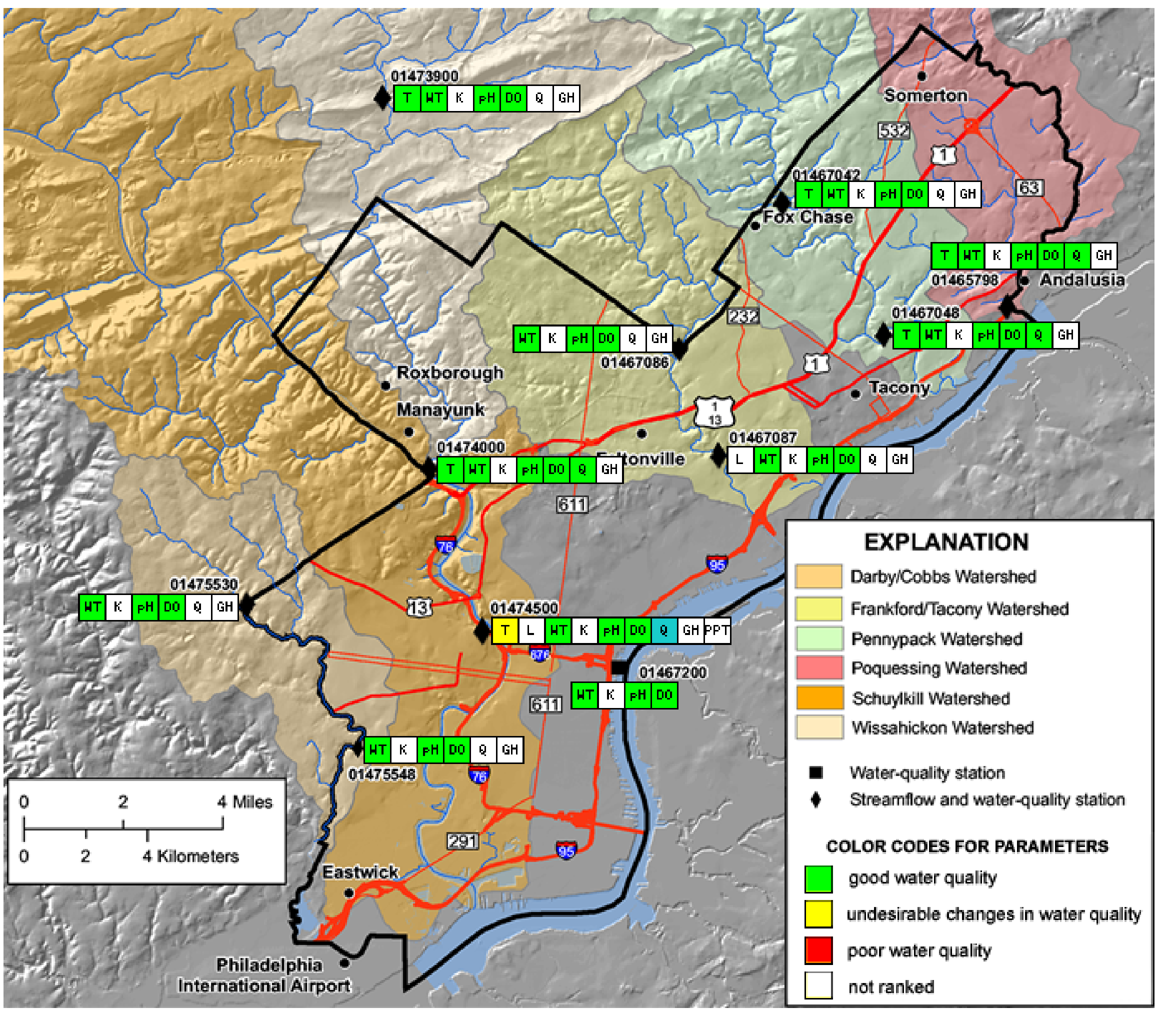


Figure 1. Philadelphia Water Quality Gauge Stations as Viewed on Cooperative USGS-PWD Website (http://pa.water.usgs.gov/pwd/).

Monitoring Locations

The PWD/USGS Cooperative Monitoring Program builds upon the widespread network of USGS gages that were formerly operated throughout Philadelphia. These gages are logically situated and/or have a continuous period of record making them ideal for water quality monitoring purposes. Within a given watershed, downstream-most historic stations were chosen to represent water quality as these streams flow through Philadelphia into the receiving waters (*i.e.*, the Schuylkill and Delaware Rivers).

Regarding upstream stations, three gages (Pennypack Creek at Pine Rd, Tacony Creek at Adams Ave, and Cobbs Creek at US Rt.1) are strategically located to monitor water quality of the streams as they enter Philadelphia (Figure 1). The upstream Wissahickon Creek monitoring station is located at Rte 73 in Fort Washington, which is approximately 3.7 river miles upstream of the City. This location was chosen due to its extensive period of record (Table 1). Upstream water quality is not measured in Poquessing-Byberry Creek Watershed. The Schuylkill River gage is in an ideal location to provide data related to the Schuylkill River Fairmount Dam Fish Ladder Renovation Project and was equipped with water quality monitoring instrumentation upon project completion in early 2009.

This annual report summarizes water quality data from July 1, 2008 – June 30, 2009, excluding the period of December 2008 through February 2009, during which time monitoring probes were not deployed in order to protect the equipment from cold temperatures. Per agreement with USGS, water quality data at the Delaware River gage 01467200 was not available for an additional month, from December 2008 through March 2009. Finally, Schuylkill River gage data collection did not begin until March 2009.

Table 1. PWD/USGS Cooperative Water Quality Monitoring Program Gages

Gage Number	Gage name	Flow Data Record
01465798	Poquessing Creek at Grant Avenue, Philadelphia, PA	July 1965 to Present

01467042	Pennypack Creek at Pine Road, Philadelphia, PA	August 1964 to September 1974; September 2007 to Present
01467048	Pennypack Creek at Lower Rhawn St Br., Philadelphia, PA	June 1965 to Present
01467086	Tacony Creek at County Line, Philadelphia, PA	October 1965 to September 1986; September 2005 to Present
01467087	Frankford Creek at Castor Ave, Philadelphia, PA	July 1982 to Present
*01467200	Delaware River at Ben Franklin Bridge, Philadelphia, PA	August 1949 to Present
01474000	Wissahickon Creek at Mouth, Philadelphia, PA	June 1897 to September 1903; January 1905 to July 1906; October 1965 to Present
01474500	Schuylkill River at Philadelphia, PA	October 1931 to Present
01475530	Cobbs Creek at U.S. Highway No. 1, Philadelphia, PA	October 1964 to September 1981; September 2004 to Present
01475548	Cobbs Creek at Mt. Moriah Cemetery, Philadelphia, PA	October 2005 to Present

*Funding for the operation of this gage is provided by USGS and the Delaware River Basin Commission (DRBC)

USGS Gage Data Processing & Analysis Procedures

With 10 USGS gages collecting data for multiple water quality parameters at half hour intervals, a large amount of data are produced. PWD Office of Watersheds (OOW) staff have developed procedures for the processing and analysis of these data using Microsoft Excel and Access software, as well as R, a free software environment for statistical computing and graphics. Most aspects of the data processing and analysis have been automated with custom Visual Basic and R code.

OOW independently maintains databases of water quality and streamflow via automated regular retrievals of these data from USGS NWIS. On a monthly basis, the databases are queried and results for each gage are imported into MS Excel workbooks. If available, any field data collected during that period (*e.g.*, hand meter readings from field maintenance checks, water quality grab samples, etc.) are also imported. Once all required data have been entered, separate plots are produced for each parameter (dissolved oxygen, turbidity, pH, specific conductance, and temperature) to enable a subjective review of data quality.

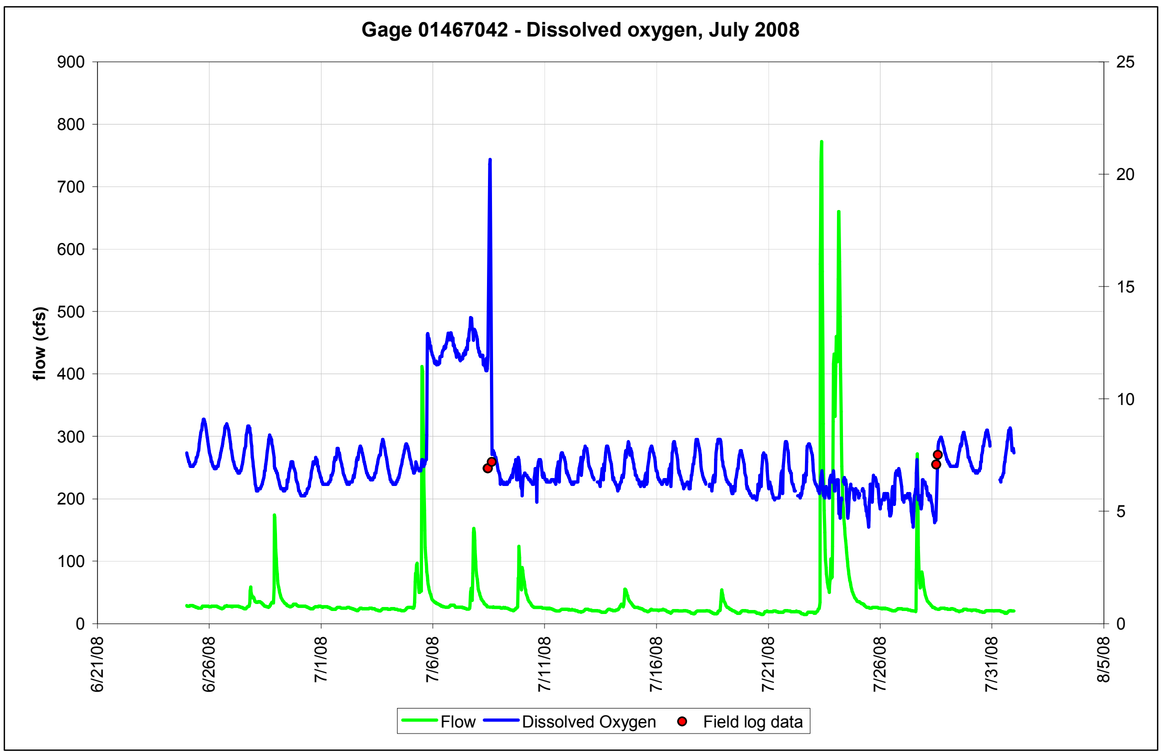


Figure 2. Example of an Excel-generated data processing/analysis plot; Gage 01467042, Dissolved Oxygen, July 2008.

These plots are examined and are the primary basis for the selection of good vs. questionable data for a given month. Intervals of questionable data are located, and added to a table of "flagged" data for that particular parameter, which is then used to update the water quality database.

The final step of the procedure utilizes R, a statistical programming language and software environment. The R software code developed by OOW staff analyzes all of the water quality data in a database, as well as the good and questionable flags, and generates statistical and graphic results in a variety of forms. These include monthly plots for all data parameters for each site, showing accepted and questionable data, water quality criteria, grab sample data, and stream flow (Figure 3); assorted statistics including accepted and questionable data comparisons, monthly exceedance percentages, and comparisons of wet and dry weather periods; additional plots, including average dissolved oxygen (DO), percent DO saturation, and pH/percent DO saturation.

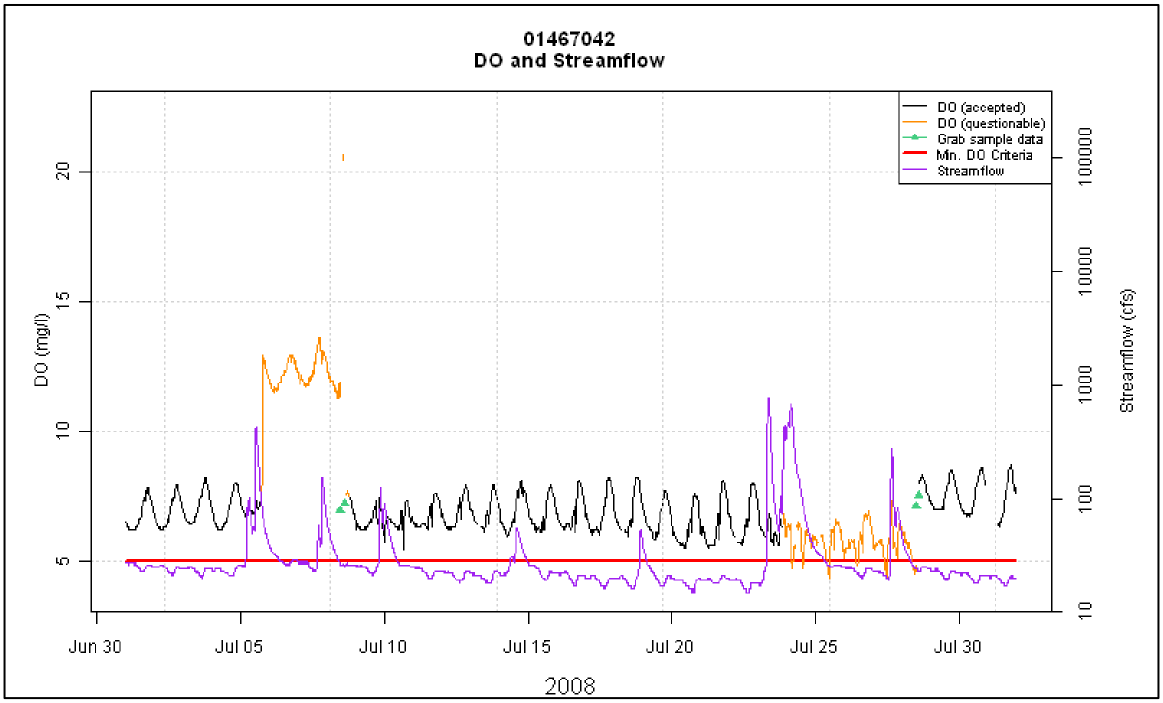


Figure 3. Example of an R-generated plot showing accepted and questionable data, and minimum water quality criteria; Gage 01467042, Dissolved Oxygen, July 2008.

Continuous Water Quality Monitoring Results

Annual Summary, July 2008 - June 2009

Dissolved Oxygen

Background

Dissolved oxygen concentrations are a concern in several of Philadelphia's watersheds. Dissolved oxygen concentration is suppressed by high temperatures, respiratory activity of stream organisms, and nitrification and other oxidation reactions. Streams generally develop problems with dissolved oxygen due to water column BOD, sediment oxygen demand (SOD) and eutrophication due to increased nutrient concentration. These processes are inter-related, and physical conditions can also affect dissolved oxygen concentrations.

Designated Uses

Streams in the Philadelphia region are affected by ambient temperatures, which can be quite warm in the spring and summer months. For this reason, these streams cannot support natural self-sustaining populations of cold water fish. Different water quality criteria for dissolved oxygen and temperature are applied to different stream segments. Of the sites that were instrumented for water quality, the Wissahickon and Pennypack Creek gages (*i.e*., 01473900, 01474000, 01467042, and 01467048) are each designated as a Trout Stocking Fishery (TSF) with conditions appropriate for maintenance of stocked trout over the period February 15 to July 31. Water quality criteria for dissolved oxygen are more stringent for these sites, with a daily instantaneous minimum criterion of 5 mg/L and daily mean criterion of 6 mg/L. Dissolved oxygen criteria for Warm Water Fisheries (WWF) are 4 mg/L and 5 mg/L, respectively. The Delaware River gage 01467200 dissolved oxygen criteria are defined by the Delaware River Basin Commission (DRBC) criteria for Zone 3 (DRBC, 2007) with a daily mean of 3.5 mg/L and a seasonal mean (April 1 to June 15, and September 16 to December 31) of 6.5 mg/L (Table 2).

Table 2. PADEP Dissolved Oxygen Water Quality Criteria

Gage number	Designated Use	DO Minimum Criterion	DO Daily Mean Criterion
01465798	WWF	4.0 mg/L	5.0 mg/L
01467042	TSF*	5.0 mg/L	6.0 mg/L
01467048	TSF*	5.0 mg/L	6.0 mg/L
01467086	WWF	4.0 mg/L	5.0 mg/L
01467087	WWF	4.0 mg/L	5.0 mg/L
01467200	DRBC**	None	3.5 mg/L
01473900	TSF*	5.0 mg/L	6.0 mg/L
01474000	TSF*	5.0 mg/L	6.0 mg/L
01474500	WWF	4.0 mg/L	5.0 mg/L
01475530	WWF	4.0 mg/L	5.0 mg/L

01475548	WWF	4.0 mg/L	5.0 mg/L

*TSF criteria for DO only apply from February 15 - July 31. WWF criteria are applicable from August 1 – January 31.
**A seasonal mean criterion of 6.5 mg/L also applies from April 1 - June 15, and September 16 - December 31.

Results

Results were processed as follows for Table 3. The "total hours accepted data" are the total hours of data that were not flagged; that quantity divided by 24 yields the "total days accepted data". The remainder of the table lists the percent of total hours of data that was flagged, and the percentages of accepted data that violated the standard and complied with the standard.

Results were processed as follows for Table 4. If a single day contained at least one flagged measurement, the entire day was considered flagged for calculating the daily mean. Thus the "percent days flagged data" corresponds to the percentage of total days of data that contained at least one flag in a single day. Conversely, if none of the measurements in a single day were flagged, that day was considered one day of accepted data, and the total amount of accepted days was calculated. Finally, the percentages of accepted data that violated the standard and complied with the standard were calculated.

DO minimum and daily mean criteria were most frequently violated at the downstream Tacony Creek site (gage 01467087). The percentage of flagged data was also highest at this site for both criteria. At all other sites, less than 1% violation of the DO minimum criterion, and less than 2.5% violation of the daily mean criterion were observed. A more in-depth discussion of potential causes of DO problems at gage 01467087 is contained in the Monthly Results section.

Table 3. USGS Gage July 2008 - June 2009 Dissolved Oxygen Minimum Criterion Summary Results

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance
01465798	WWF	6105.0	254.4	4.2	0.0	100.0
01467042	TSF	6054.5	252.3	5.0	0.0	100.0
01467048	TSF	6190.0	257.9	2.9	0.0	100.0
01467086	WWF	6029.5	251.2	3.3	0.3	99.7
01467087	WWF	5100.5	212.5	12.7	15.2	84.8
01467200	DRBC	N/A*				
01473900	TSF	5776.5	240.7	8.7	0.9	99.1
01474000	TSF	6125.5	255.2	4.5	0.3	99.7
01474500	WWF	2600.0	108.3	1.0	0.0	100.0
01475530	WWF	6333.5	263.9	2.5	0.0	100.0
01475548	WWF	5989.5	249.6	7.5	0.9	99.1

*No minimum DO criterion applies at gage 01467200

Table 4. USGS Gage July 2008 - June 2009 Dissolved Oxygen Daily Mean Criterion Summary Results

Gage number	Designated Use	Total days accepted data	% days flagged data	% days violation	% days compliance
01465798	WWF	231	13.0	0.0	100.0
01467042	TSF	228	14.2	0.0	100.0
01467048	TSF	238	10.4	0.0	100.0
01467086	WWF	225	15.2	0.0	100.0
01467087	WWF	157	40.9	17.2	82.8
01467200	DRBC	199	18.4	0.5	99.5
01473900	TSF	213	19.2	0.9	99.1
01474000	TSF	229	15.9	0.9	99.1
01474500	WWF	84	23.2	0.0	100.0
01475530	WWF	244	9.8	0.0	100.0
01475548	WWF	225	16.8	2.2	97.8

Table 5. USGS Gage 01467200 Dissolved Oxygen Seasonal Mean Criterion Summary Result

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Seasonal mean	Attained Standard?
01467200	DRBC	1465	61.0	19.7	7.1	Yes

pH

Background

pH has been identified as a parameter of potential concern for some of Philadelphia's watersheds, primarily because of algal effects on the dissolved inorganic carbon (DIC) composition of stream water. Algae take up CO2 during photosynthesis and shift the composition of DIC toward the alkaline carbonates, resulting in occasional violations of daily maximum pH violations at some sites (Table 6). There were no observed violations of the daily minimum pH criterion in the report timeframe. pH fluctuations are typically observed concomitant with pronounced dissolved oxygen fluctuations, as detailed in the Monthly Results section.

At gage 01467200, pH criteria (regulated by DRBC) are bounded by 6.5 and 8.5. At all other gages, pH criteria are bounded by daily minima and maxima of 6.0 and 9.0, respectively, as defined by PADEP water quality standards.

Results

Results were processed as follows for Table 6. The "total hours accepted data" are the total hours of data that were not flagged; that quantity divided by 24 yields the "total days accepted data". The remainder of the table lists the percentage of total hours of data that was flagged, the percentages of accepted hours that violated or complied with criteria, and the percentages of daily minima and maxima that violated or complied with criteria.

There were no observed violations of the daily minimum pH criterion in the report timeframe. The daily maximum criterion was violated in 15.5% of observed days at the Schuylkill River gage, and 13.3% of observed days at the upstream Tacony Creek gage. The daily maximum criterion was violated between 6% to 9% of observed days at the downstream Pennypack, upstream Wissahickon, and downstream Cobbs Creek gages.

Table 6. USGS Gage July 2008 - June 2009 pH Criteria Summary Results

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance
01465798	6182.5	257.6	3.0	0.0	0.0	0.0	0.0	100.0	100.0
01467042	6279.0	261.6	1.5	0.0	0.0	0.0	0.0	100.0	100.0
01467048	6210.0	258.8	2.6	2.3	8.4	0.0	0.0	97.7	91.6
01467086	6152.0	256.3	3.4	2.7	13.3	0.0	0.0	97.3	86.7
01467087	6210.0	258.8	2.6	0.0	0.0	0.0	0.0	100.0	100.0
01467200	4642.5	193.4	20.7	0.0	0.0	0.0	0.0	100.0	100.0
01473900	5801.5	241.7	8.3	1.5	8.8	0.0	0.0	98.5	91.2
01474000	6225.5	259.4	4.8	2.6	4.9	0.0	0.0	97.4	95.1
01474500	2598.5	108.3	1.0	10.2	15.5	0.0	0.0	89.8	84.5
01475530	6332.0	263.8	2.5	0.1	0.8	0.0	0.0	99.9	99.2
01475548	6299.0	262.5	3.0	2.9	6.3	0.0	0.0	97.1	93.7

Turbidity

Background

Turbidity in Philadelphia's streams increases with increased flow as inorganic sediment and additional constituents of stormwater runoff are introduced to the stream or scoured/eroded from the stream channel. There are no numeric PADEP water quality criteria for Turbidity, so PWD Watershed management plans used a reference value for turbidity that was derived from EPA Guidance document EPA 822-B-00-023 (*i.e.*, 8.05 NTU). This value is seldom surpassed in dry weather, but consistently surpassed during wet weather (Table 77). Turbidity data has also been used to help investigate sediment loading and transport in the Wissahickon Creek Watershed for the Wissahickon Creek Sediment TMDL.

Results

Results were processed as follows for Table 7. The "total hours accepted data" are the total hours of data that were not flagged; that quantity divided by 24 yields the "total days accepted data". The remainder of the table lists the percentage of total hours of data that was flagged, and the percentages of accepted hours that either surpassed or fell below the maximum guideline.

The maximum guideline was most frequently surpassed at the Schuylkill River gage, and least frequently surpassed at the downstream Wissahickon Creek gage. This cannot necessarily be attributed to the differences in drainage areas or sewer system types (*i.e.*, combined or separate) that discharge to these locations, since the Delaware River gage results are very similar to the other gages located in much smaller, separate sewer system drainage areas.

Table 7. USGS Gage July 2008 - June 2009 Turbidity Summary Results

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline
01465798	5923.5	246.8	7.1	19.4	80.6
01467042	6169.0	257.0	3.3	18.7	81.3
01467048	6196.5	258.2	2.8	19.6	80.4
01467086	N/A*				
01467087	N/A*				
01467200	2163.5	90.1	0.9	20.8	79.2
01473900	5758.0	239.9	9.0	19.3	80.7
01474000	6222.5	259.3	4.8	13.1	86.9
01474500	2581.5	107.6	1.7	31.9	68.1
01475530	N/A*				
01475548	N/A*				

*Turbidity is not continuously monitored at these locations

Specific Conductance

Background

Specific Conductance is a measure of the ability of water to conduct electricity over a given distance, expressed as microsiemens/cm (corrected to 25ºC). Dissolved ion content is useful in determining the start of wet weather events at ungaged water quality monitoring stations, but not applicable to the USGS gage network. Conductivity in Philadelphia streams is extremely sensitive to changes in flow, as stormwater (diluent) usually contains smaller concentrations of dissolved ions than stream baseflow. Data collected in the report timeframe were generally consistent with earlier observations. Stations receiving inputs of treated wastewater generally had greater conductivity.

Results

There is no water quality standard for specific conductance. Table 8 merely illustrates the total hours of data that was not flagged and considered "accepted", the equivalent quantity in day-units, and the percentage of total hours of data that was flagged. More detailed results at each site are described in the Monthly Results section.

Table 8. USGS Gage July 2008 - June 2009 Specific Conductance Summary Results

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data
01465798	6132.0	255.5	3.8
01467042	6277.5	261.6	1.6
01467048	6211.0	258.8	2.6
01467086	6082.5	253.4	4.5
01467087	6265.0	261.0	1.8
01467200	5737.0	239.0	2.0
01473900	5716.0	238.2	9.6
01474000	6159.5	256.6	5.8
01474500	2584.5	107.7	1.6
01475530	6132.0	255.5	5.6
01475548	6332.5	263.9	2.5

Temperature

Background

Streams in the Philadelphia region are designated Warm Water Fisheries (WWF) or Trout Stocking Fisheries (TSF), with separate corresponding temperature criteria (Table 9). These criteria are "stepped" (remaining constant for 15 or 30-day intervals), while streams tend to warm up and cool down more gradually due primarily to changes in ambient temperature. (Gage 01467200 is the exception and is subject to a DRBC criterion of 30°C maximum). Stream temperatures were observed to exceed these criteria, somewhat frequently in springtime. These exceedances are generally natural, as there are no major sources of heated wastes. It is possible that baseflow diminution is partially responsible for a lack of buffering against temperature increases.

Table 9. PADEP Temperature Water Quality Criteria

Date range start	Date range end	WWF maximum (°C)	WWF maximum (°F)	TSF maximum (°C)	TSF maximum (°F)
1/1	1/31	4	40	4	40
2/1	2/29	4	40	4	40
3/1	3/31	8	46	8	46
4/1	4/15	11	52	11	52
4/16	4/30	14	58	14	58
5/1	5/15	18	64	18	64
5/16	5/31	22	72	20	68
6/1	6/15	27	80	21	70
6/16	6/30	29	84	22	72
7/1	7/31	31	87	23	74
8/1	8/15	31	87	27	80
8/16	8/30	31	87	31	87
9/1	9/15	29	84	29	84
9/16	9/30	26	78	26	78
10/1	10/15	22	72	22	72
10/16	10/31	19	66	19	66
11/1	11/15	14	58	14	58
11/16	11/30	10	50	10	50
12/1	12/31	6	42	6	42

Results

Results were processed in the same manner as the parameters described above. The highest exceedance rate occurred at the Schuylkill River gage, however data was only collected at that gage in 2009. Had data from the later, cooler months in 2008 also been collected, the overall exceedance rate observed at that gage would have likely declined. Aside from the Delaware River gage, the lowest exceedance rates were observed at the Poquessing, both Cobbs, and both Tacony Creek gages (Table 10). Those five gages are all designated as WWF and have less stringent criteria.

Table 10. USGS Gage July 2008 - June 2009 Temperature Maximum Criteria Summary Results

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. exceedance	% hrs. compliance
01465798	WWF	6177.5	257.4	3.1	12.4	87.6
01467042	TSF	6279.0	261.6	1.5	21.5	78.5
01467048	TSF	6210.0	258.8	2.6	25.6	74.4
01467086	WWF	6191.5	258.0	2.8	12.6	87.4
01467087	WWF	6338.5	264.1	0.6	15.5	84.5

01467200	DRBC	5638.5	234.9	3.7	0.0	100.0
01473900	TSF	5796.0	241.5	8.3	20.2	79.8
01474000	TSF	6353.0	264.7	2.8	22.2	77.8
01474500	WWF	2594.5	108.1	1.2	34.3	65.7
01475530	WWF	6332.5	263.9	2.5	12.2	87.8
01475548	WWF	6333.0	263.9	2.4	14.3	85.7

Monthly Results, July 2008 - June 2009

This section summarizes results at the monthly time scale. Results were processed in the same manner as in the previous section. Gages are grouped according to the type of sewer system that impacts water quality at the site.

Gages in Combined Sewer System Watersheds

Tookany/Tacony-Frankford Creek (Gages 01467086 and 01467087)

Dissolved oxygen and pH
Dissolved oxygen concentrations were markedly worse between the upstream and downstream Tacony Creek gages. The monthly minima, percentage of hours the minimum criteria was violated, and percentage of days the daily mean criteria was violated were all much worse at the downstream gage (Tables 11-14). For example, DO was particularly poor at the downstream Tacony Creek gage in July 2008; the minimum DO criterion was violated throughout much of the month (Figure 4). Poor DO was also observed in the same month at the upstream gage, however the minimum criterion was never violated there (Figure 5). This difference likely reflects the additional stormwater runoff and sewage overflows that entered the creek between the two gages.

The lowest DO concentrations are typically seen in the period after storm events, reflecting both the immediate and lingering, oxygen-depleting effects of stormwater runoff and biochemical oxygen demand (BOD) entering the stream (Figure 6).

Diel DO fluctuations are suppressed for a few days following a storm event because the event either scours away algae or temporarily inhibits their growth. As dry weather continues, the algae recover and diel DO and pH fluctuations typically increase, sometimes resulting in pH maximum criterion violations, as observed at the upstream gage in April 2009 (Figure 7). Percent DO saturation extremes of 50% at night and over

150% in daylight were observed at gage 01467086 in April 2009, indicating high levels of algal activity (Figure 8).

Interestingly, no pH maximum criterion violations were recorded at the downstream gage. A lower monthly mean pH was consistently observed at gage 01467087, along with less pronounced diel pH fluctuations, probably due to an increased buffering capacity at the downstream gage (Tables 15-16)

Table 11. Gage 01467086 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance	Min	Max	Mean
Jul-08	WWF	742.0	30.9	0.3	0.0	100.0	4.0	10.4	6.60
Aug-08	WWF	740.5	30.9	0.5	0.0	100.0	4.7	12.3	8.08
Sep-08	WWF	716.5	29.9	0.5	0.0	100.0	4.3	13.0	7.94
Oct-08	WWF	622.0	25.9	16.4	0.0	100.0	4.4	13.8	9.37
Nov-08	WWF	719.0	30.0	0.1	0.0	100.0	7.0	14.1	10.50
Mar-09	WWF	445.0	18.5	13.3	0.0	100.0	7.0	19.1	11.70
Apr-09	WWF	718.5	29.9	0.2	0.0	100.0	4.2	18.6	9.95
May-09	WWF	651.5	27.1	12.4	0.5	99.5	3.3	14.5	7.47
Jun-09	WWF	674.5	28.1	6.3	1.9	98.1	2.2	10.1	6.60

Table 12. Gage 01467087 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance	Min	Max	Mean
Jul-08	WWF	568.5	23.7	23.6	33.7	66.3	2.1	13.3	4.94
Aug-08	WWF	606.5	25.3	18.5	22.7	77.3	2.1	13.5	5.86
Sep-08	WWF	530.0	22.1	26.4	15.7	84.3	2.1	10.8	5.87
Oct-08	WWF	694.0	28.9	6.7	1.9	98.1	2.4	11.7	7.69
Nov-08	WWF	648.5	27.0	9.9	21.6	78.4	2.1	11.6	6.60
Mar-09	WWF	520.0	21.7	0.2	1.1	98.9	2.2	14.7	10.83
Apr-09	WWF	691.0	28.8	4.0	9.3	90.7	2.1	12.2	6.87
May-09	WWF	579.5	24.1	22.1	14.8	85.2	0.2	9.2	5.74
Jun-09	WWF	264.5	11.0	63.3	21.7	78.3	0.2	7.4	4.73

Table 13 . Gage 01467086 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days violation	% days compliance	Min.	Max.	Mean
Jul-08	WWF	29	6.5	0.0	100.0	6.0	7.4	6.63
Aug-08	WWF	28	9.7	0.0	100.0	6.7	8.8	8.09
Sep-08	WWF	28	6.7	0.0	100.0	6.2	10.0	7.92
Oct-08	WWF	18	41.9	0.0	100.0	8.2	11.2	9.41
Nov-08	WWF	29	3.3	0.0	100.0	7.7	12.8	10.47
Mar-09	WWF	13	39.2	0.0	100.0	9.6	13.6	11.57
Apr-09	WWF	29	3.3	0.0	100.0	6.5	12.2	9.89
May-09	WWF	26	16.1	0.0	100.0	5.4	10.4	7.40
Jun-09	WWF	25	16.7	0.0	100.0	5.2	7.5	6.63

Table 14. Gage 01467087 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days violation	% days compliance	Min.	Max.	Mean
Jul-08	WWF	15.0	51.6	53.3	46.7	3.3	8.1	5.22
Aug-08	WWF	16.0	48.4	0.0	100.0	5.3	8.9	6.84
Sep-08	WWF	16.0	46.7	18.8	81.3	4.0	8.3	6.43
Oct-08	WWF	25.0	19.4	4.0	96.0	4.6	9.5	7.81
Nov-08	WWF	17.0	43.3	17.6	82.4	4.0	11.4	7.77
Mar-09	WWF	19.0	12.5	0.0	100.0	7.2	12.8	10.97
Apr-09	WWF	24.0	20.0	12.5	87.5	4.5	10.5	6.94
May-09	WWF	19.0	38.7	26.3	73.7	3.0	8.3	5.77
Jun-09	WWF	6.0	80.0	66.7	33.3	3.2	5.8	4.45

Table 15. Gage 01467086 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance	Min.	Max.	Mean
Jul-08	742.0	30.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	6.9	8.3	7.54
Aug-08	740.5	30.9	0.5	0.0	0.0	0.0	0.0	100.0	100.0	7.1	8.8	8.02
Sep-08	716.5	29.9	0.5	0.5	6.7	0.0	0.0	99.5	93.3	7.1	9.1	7.87
Oct-08	610.0	25.4	18.0	1.1	6.9	0.0	0.0	98.9	93.1	6.7	9.2	7.87
Nov-08	719.0	30.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	6.9	8.1	7.52
Mar-09	445.0	18.5	13.3	11.6	59.1	0.0	0.0	88.4	40.9	7.1	9.4	8.17
Apr-09	718.5	29.9	0.2	14.3	60.0	0.0	0.0	85.7	40.0	7.0	9.5	7.97
May-09	743.0	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.9	7.48
Jun-09	717.5	29.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	6.7	8.1	7.40

Table 16. Gage 01467087 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance	Min.	Max.	Mean
Jul-08	738.5	30.8	0.7	0.0	0.0	0.0	0.0	100.0	100.0	6.6	8.8	7.15
Aug-08	725.0	30.2	2.6	0.0	0.0	0.0	0.0	100.0	100.0	6.8	8.6	7.32
Sep-08	715.5	29.8	0.6	0.0	0.0	0.0	0.0	100.0	100.0	6.4	8.2	7.28
Oct-08	732.0	30.5	1.6	0.0	0.0	0.0	0.0	100.0	100.0	6.5	7.9	7.21
Nov-08	718.0	29.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	6.5	7.3	6.95
Mar-09	520.0	21.7	0.2	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.6	7.74
Apr-09	717.5	29.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	6.6	8.3	7.25
May-09	649.5	27.1	12.7	0.0	0.0	0.0	0.0	100.0	100.0	6.5	7.5	7.05
Jun-09	695.0	29.0	3.5	0.0	0.0	0.0	0.0	100.0	100.0	6.6	7.6	7.17

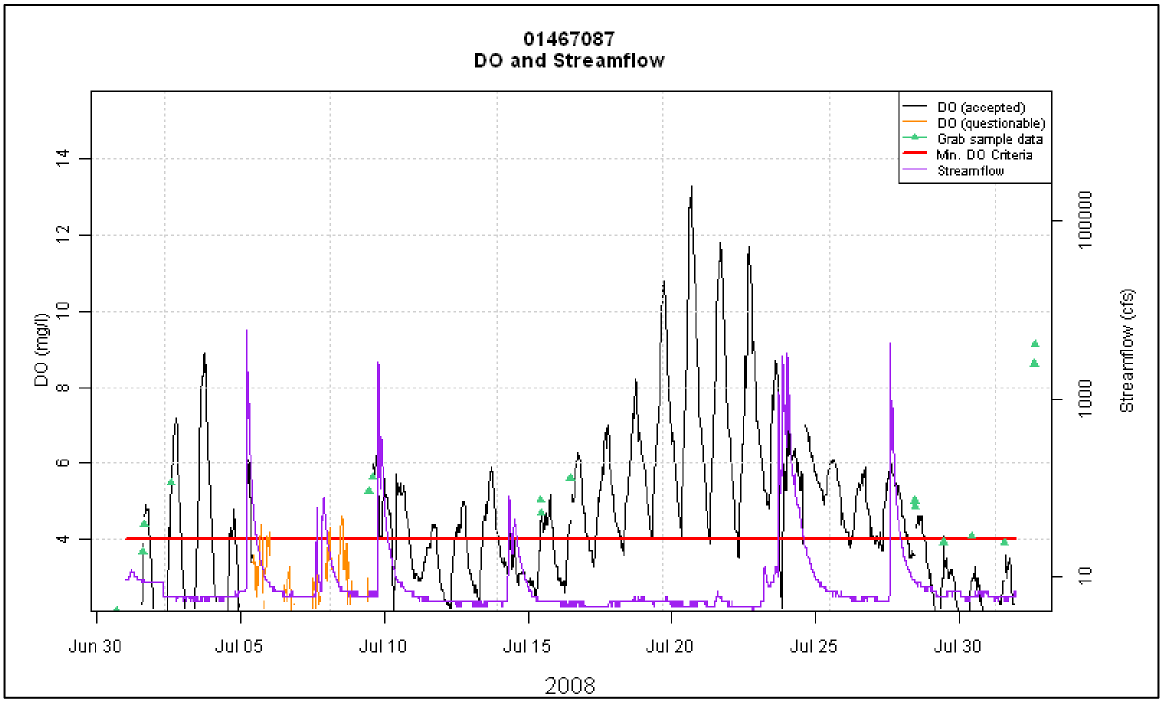


Figure 4. Gage 01467087, Dissolved Oxygen and Streamflow, July 2008.

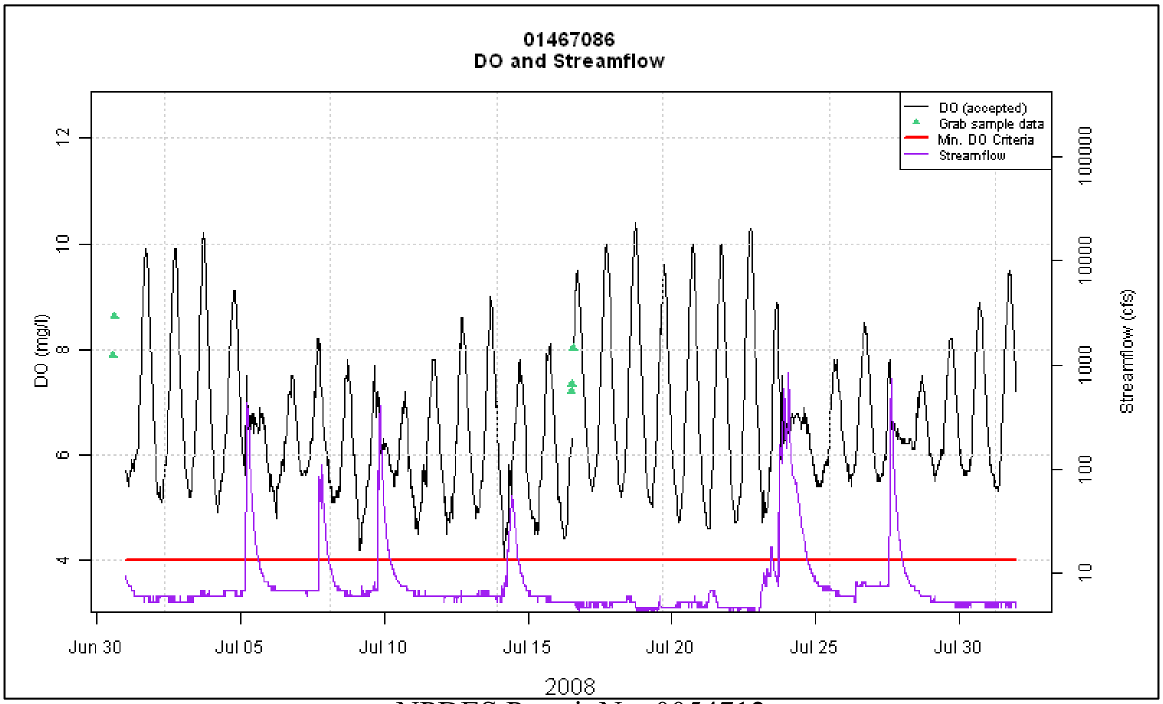


Figure 5. Gage 01467086, Dissolved Oxygen and Streamflow, July 2008.

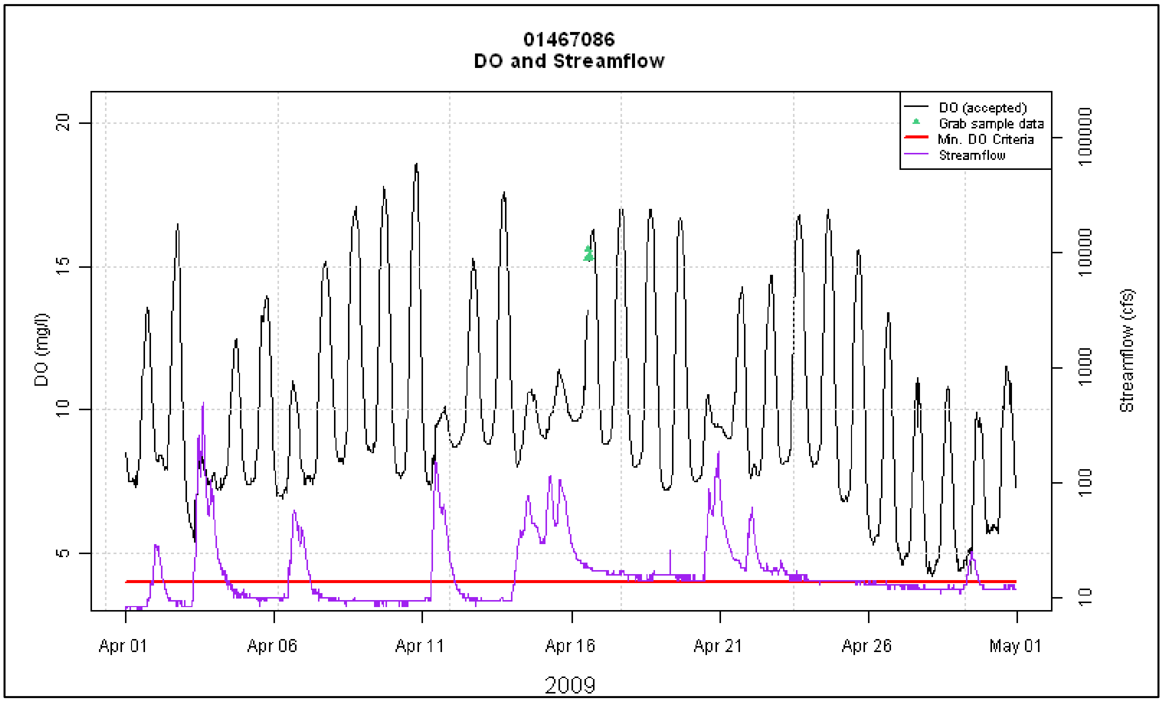


Figure 6. Gage 01467086, Dissolved Oxygen and Streamflow, April 2009.

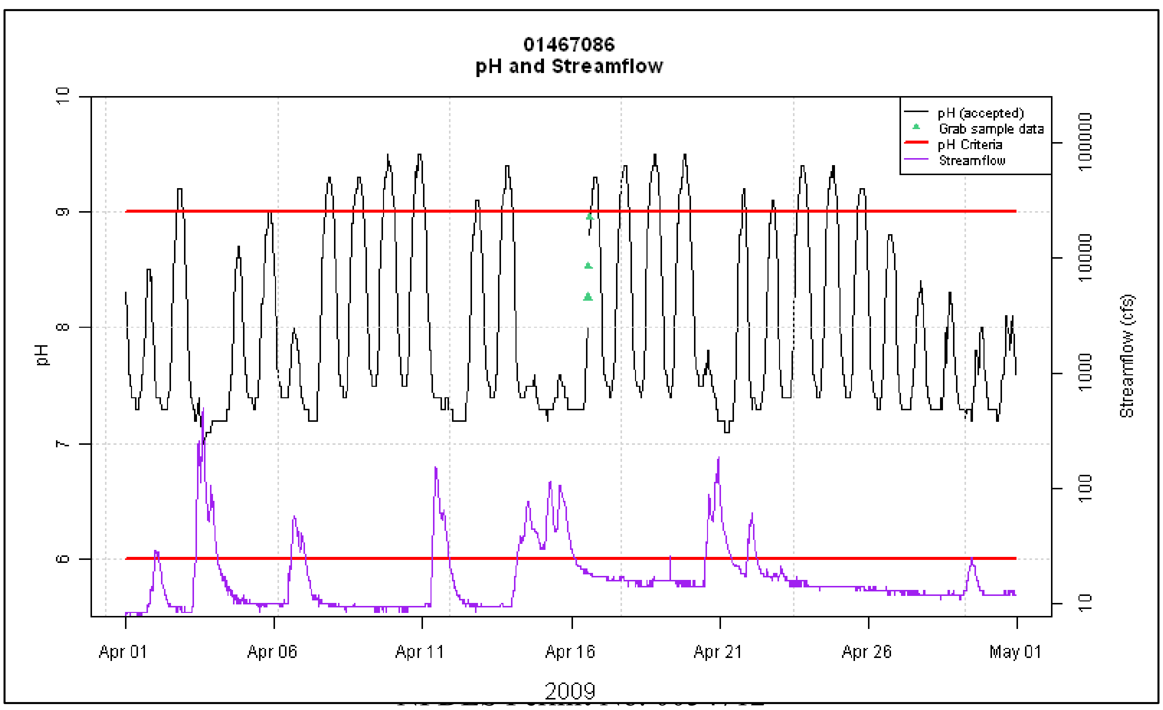


Figure 7. Gage 01467086, pH and Streamflow, April 2009.

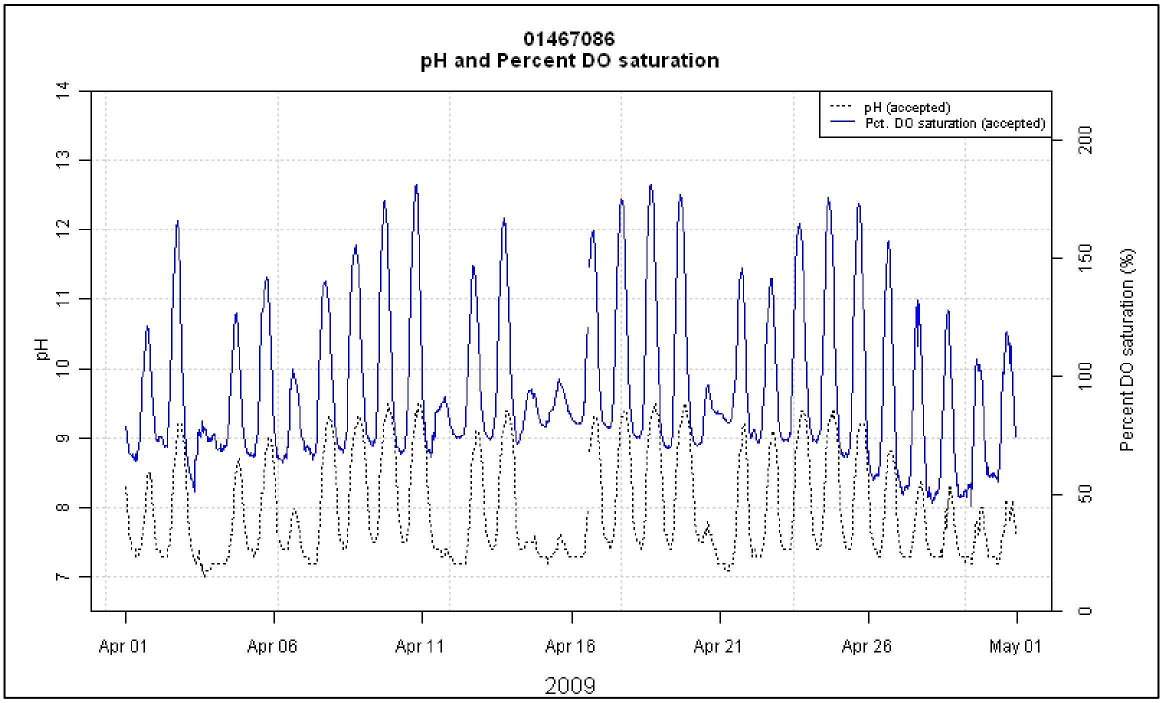


Figure 8. Gage 01467086, pH and Percent Dissolved Oxygen Saturation, April 2009.

Specific Conductance

Table 17. Gage 01467086 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-08	742.0	30.9	0.3	125	649	473.90
Aug-08	740.5	30.9	0.5	198	679	603.20
Sep-08	656.5	27.4	8.8	66	729	491.82
Oct-08	601.5	25.1	19.2	44	688	545.55
Nov-08	719.0	30.0	0.1	146	688	535.56
Mar-09	444.0	18.5	13.5	300	1060	718.08
Apr-09	718.5	29.9	0.2	163	702	559.04
May-09	743.0	31.0	0.1	108	649	530.94
Jun-09	717.5	29.9	0.3	90	726	477.75

Table 18. Gage 01467087 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-08	738.0	30.8	0.8	104	657	423.18
Aug-08	741.5	30.9	0.3	240	670	585.03
Sep-08	715.0	29.8	0.7	40	653	452.72
Oct-08	732.0	30.5	1.6	97	673	508.56
Nov-08	718.0	29.9	0.3	164	607	443.81
Mar-09	520.0	21.7	0.2	371	1010	751.74
Apr-09	717.0	29.9	0.4	220	697	530.50
May-09	742.0	30.9	0.3	156	736	545.63
Jun-09	717.0	29.9	0.4	226	923	481.83

Temperature

Monthly mean temperatures observed at the downstream gage were consistently higher than at the upstream gage. Consequently a higher rate of temperature criteria violations was observed at the downstream gage in November, March, April and May. No violations were observed in the other months (Tables 19-20).

Table 19. Gage 01467086 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. compliance	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
WWF	1-Jul	31-Jul	0.0	100.0	0.3	742.0	30.9	20.9	28.0	23.91
WWF	1-Aug	15-Aug	0.0	100.0	0.6	358.0	14.9	18.2	26.6	21.92
WWF	16-Aug	31-Aug	0.0	100.0	0.4	382.5	15.9			
WWF	1-Sep	15-Sep	0.0	100.0	0.6	358.0	14.9	15.1	24.7	19.91
WWF	16-Sep	30-Sep	0.0	100.0	0.4	358.5	14.9			
WWF	1-Oct	15-Oct	0.0	100.0	4.9	342.5	14.3	5.5	18.8	13.17
WWF	16-Oct	31-Oct	0.0	100.0	19.4	309.5	12.9			
WWF	1-Nov	15-Nov	19.6	80.4	0.0	360.0	15.0	0.9	16.9	8.07
WWF	16-Nov	30-Nov	5.8	94.2	0.3	359.0	15.0			
WWF	1-Mar	31-Mar	64.1	35.9	16.2	442.5	18.4	3.3	14.6	8.89
WWF	1-Apr	15-Apr	44.2	55.8	0.0	360.0	15.0	6.6	24.3	13.09
WWF	16-Apr	30-Apr	56.9	43.1	0.4	358.5	14.9			
WWF	1-May	15-May	10.0	90.0	0.3	359.0	15.0	11.3	22.6	16.67
WWF	16-May	31-May	1.7	98.3	0.0	384.0	16.0			
WWF	1-Jun	15-Jun	0.0	100.0	0.7	357.5	14.9	15.3	23.6	19.34
WWF	16-Jun	30-Jun	0.0	100.0	0.0	360.0	15.0			

Table 20. Gage 01467087 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. compliance	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
WWF	1-Jul	31-Jul	0.0	100.0	1.1	735.5	30.6	22.0	30.8	25.50
WWF	1-Aug	15-Aug	0.0	100.0	0.4	358.5	14.9	19.6	28.5	23.89
WWF	16-Aug	31-Aug	0.0	100.0	0.3	383.0	16.0			
WWF	1-Sep	15-Sep	0.0	100.0	1.0	356.5	14.9	16.6	26.5	21.09
WWF	16-Sep	30-Sep	0.0	100.0	0.6	358.0	14.9			
WWF	1-Oct	15-Oct	0.0	100.0	0.6	358.0	14.9	6.2	19.8	13.74
WWF	16-Oct	31-Oct	0.0	100.0	2.7	373.5	15.6			
WWF	1-Nov	15-Nov	24.2	75.8	0.1	359.5	15.0	1.5	17.3	8.41
WWF	16-Nov	30-Nov	8.2	91.8	0.3	359.0	15.0			
WWF	1-Mar	31-Mar	71.5	28.5	1.6	519.5	21.6	5.5	14.4	9.09
WWF	1-Apr	15-Apr	51.7	48.3	0.4	358.5	14.9	7.7	24.8	13.69
WWF	16-Apr	30-Apr	61.4	38.6	0.3	359.0	15.0			
WWF	1-May	15-May	13.9	86.1	0.1	359.5	15.0	13.1	24.3	17.66
WWF	16-May	31-May	9.4	90.6	0.1	383.5	16.0			
WWF	1-Jun	15-Jun	0.0	100.0	0.4	358.5	14.9	16.0	25.5	20.31
WWF	16-Jun	30-Jun	0.0	100.0	0.4	358.5	14.9			

Cobbs Creek (Gages 01475530 and 01475548)

Dissolved oxygen and pH

Higher pH was generally observed at the downstream gage (Tables 25-26), the reverse of the trend seen in Tacony Creek. In Cobbs Creek, this is likely due to a greater difference in algal activity between the two gages, with more algal growth occurring downstream. This is supported by comparing the monthly DO minima and maxima at the two gages (Tables 21-22). In all key algal growing season months, minima are lower and maxima are higher at gage 01475548, indicating more pronounced diel DO fluctuations downstream (Figures 9-10).

Table 21. Gage 01475530 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance	Min	Max	Mean
Jul-08	WWF	746.5	31.0	0.2	0.0	100.0	6.0	9.2	7.40
Aug-08	WWF	741.5	30.9	0.3	0.0	100.0	6.0	10.0	7.78
Sep-08	WWF	585.5	24.4	18.7	0.0	100.0	5.9	10.8	7.77
Oct-08	WWF	733.0	30.5	1.5	0.0	100.0	7.4	12.1	9.34
Nov-08	WWF	718.0	29.9	0.3	0.0	100.0	7.5	13.2	10.07
Mar-09	WWF	630.0	26.3	0.8	0.0	100.0	8.1	15.9	11.03
Apr-09	WWF	718.0	29.9	0.3	0.0	100.0	6.0	14.2	9.71
May-09	WWF	743.0	31.0	0.1	0.0	100.0	6.6	10.7	8.42
Jun-09	WWF	718.0	29.9	0.3	0.0	100.0	6.0	9.1	7.62

Table 22. Gage 01475548 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance	Min	Max	Mean
Jul-08	WWF	529.0	22.0	28.9	8.9	91.1	2.1	11.4	6.14
Aug-08	WWF	666.5	27.8	10.4	0.7	99.3	2.8	12.4	7.65
Sep-08	WWF	596.0	24.8	17.2	0.0	100.0	4.8	12.9	7.57
Oct-08	WWF	699.0	29.1	6.0	0.0	100.0	7.0	14.7	9.54
Nov-08	WWF	718.5	29.9	0.2	0.0	100.0	5.3	12.7	9.46
Mar-09	WWF	617.0	25.7	3.0	0.0	100.0	7.4	19.4	12.34
Apr-09	WWF	718.5	29.9	0.2	0.0	100.0	4.4	16.9	9.06
May-09	WWF	743.5	31.0	0.1	0.2	99.8	3.3	11.4	7.57
Jun-09	WWF	702.5	29.3	2.4	0.5	99.5	3.8	9.2	6.40

Table 23. Gage 01475530 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days violation	% days compliance	Min.	Max.	Mean
Jul-08	WWF	30.0	3.2	0.0	100.0	7.0	8.0	7.40
Aug-08	WWF	29.0	6.5	0.0	100.0	7.0	8.2	7.79
Sep-08	WWF	22.0	26.7	0.0	100.0	6.9	9.1	7.74
Oct-08	WWF	28.0	9.7	0.0	100.0	8.2	10.4	9.32
Nov-08	WWF	27.0	10.0	0.0	100.0	7.9	12.4	10.12
Mar-09	WWF	22.0	16.9	0.0	100.0	9.7	12.8	11.02
Apr-09	WWF	28.0	6.7	0.0	100.0	7.7	11.3	9.68
May-09	WWF	30.0	3.2	0.0	100.0	7.5	9.2	8.40
Jun-09	WWF	28.0	6.7	0.0	100.0	7.0	8.3	7.62

Table 24. Gage 01475548 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days violation	% days compliance	Min.	Max.	Mean
Jul-08	WWF	16.0	48.4	12.5	87.5	4.6	8.2	6.48
Aug-08	WWF	26.0	16.1	0.0	100.0	5.4	8.9	7.66
Sep-08	WWF	22.0	26.7	0.0	100.0	5.9	9.8	7.49
Oct-08	WWF	27.0	12.9	0.0	100.0	8.0	11.8	9.58
Nov-08	WWF	28.0	6.7	0.0	100.0	6.5	12.1	9.41
Mar-09	WWF	22.0	17.0	0.0	100.0	9.2	14.7	12.23
Apr-09	WWF	28.0	6.7	0.0	100.0	6.5	11.9	8.98
May-09	WWF	30.0	3.2	6.7	93.3	4.6	9.0	7.53
Jun-09	WWF	26.0	13.3	3.8	96.2	4.7	8.2	6.42

Table 25. Gage 01475530 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance	Min.	Max.	Mean
Jul-08	746.0	31.0	0.3	0.0	0.0	0.0	0.0	100.0	100.0	6.8	7.7	7.31
Aug-08	741.5	30.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.0	7.37
Sep-08	585.5	24.4	18.7	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.3	7.39
Oct-08	733.0	30.5	1.5	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.0	7.40
Nov-08	718.0	29.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.6	7.34
Mar-09	629.0	26.2	0.9	0.0	0.0	0.0	0.0	100.0	100.0	7.1	8.8	7.45
Apr-09	718.0	29.9	0.3	1.2	6.7	0.0	0.0	98.8	93.3	7.0	9.2	7.56
May-09	743.0	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	6.9	7.7	7.37
Jun-09	718.0	29.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.6	7.34

Table 26. Gage 01475548 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance	Min.	Max.	Mean
Jul-08	632.0	26.3	15.1	0.0	0.0	0.0	0.0	100.0	100.0	6.6	8.6	7.43
Aug-08	715.0	29.8	3.9	0.0	0.0	0.0	0.0	100.0	100.0	6.9	9.0	7.85
Sep-08	706.5	29.4	1.9	0.0	0.0	0.0	0.0	100.0	100.0	6.8	8.9	7.73
Oct-08	731.5	30.5	1.7	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.8	7.78
Nov-08	718.5	29.9	0.2	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.9	7.53
Mar-09	617.0	25.7	3.0	27.6	55.6	0.0	0.0	72.4	44.4	7.0	9.8	8.47
Apr-09	718.5	29.9	0.2	1.5	6.7	0.0	0.0	98.5	93.3	6.8	9.2	7.71
May-09	743.0	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.1	7.47
Jun-09	717.0	29.9	0.4	0.0	0.0	0.0	0.0	100.0	100.0	6.2	8.0	7.23

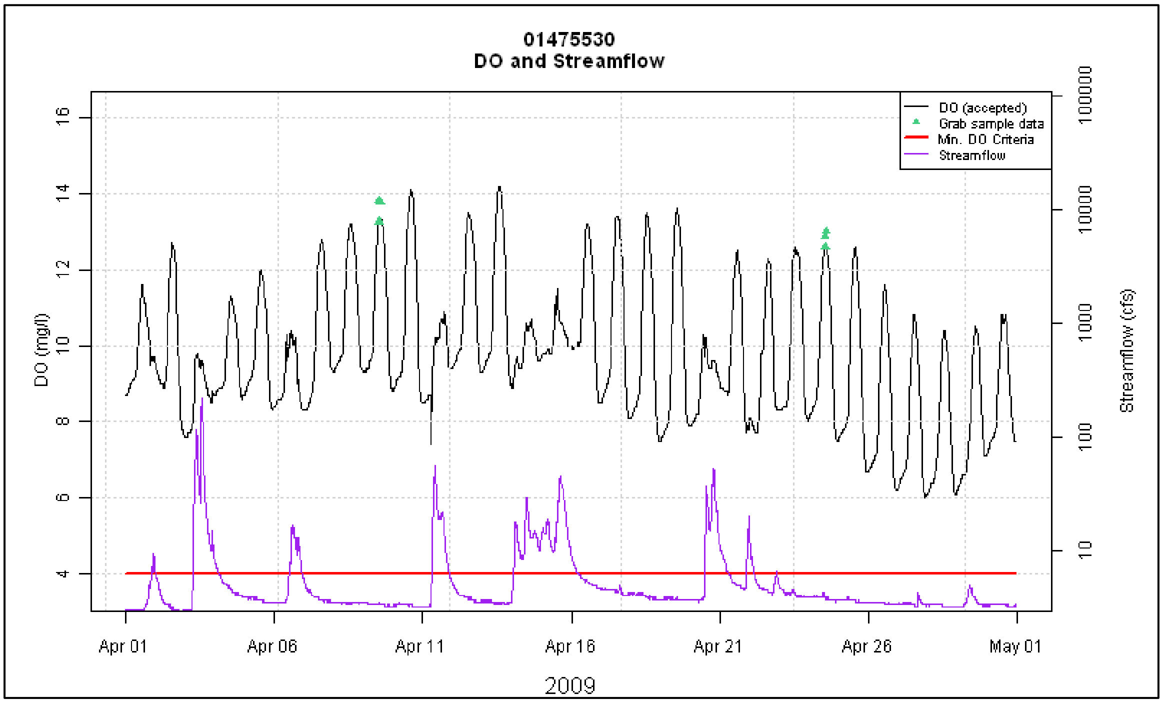


Figure 9. Gage 01475530, Dissolved Oxygen and Streamflow, April 2009.

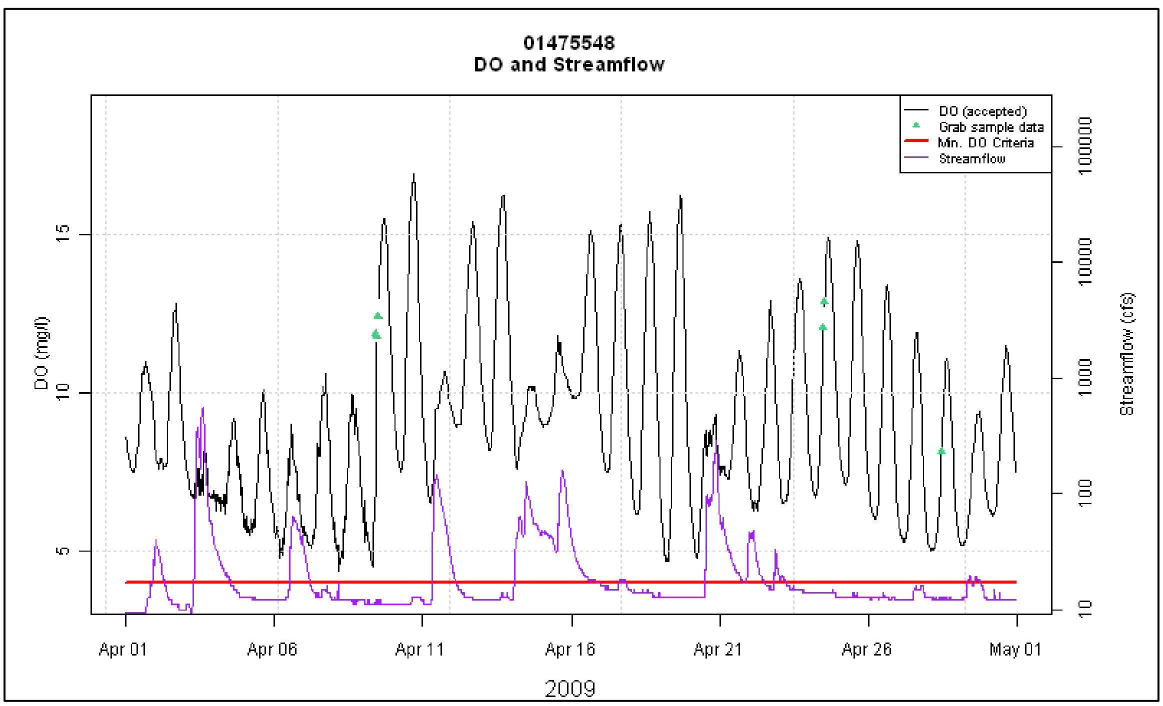


Figure 10. Gage 01475548, Dissolved Oxygen and Streamflow, April 2009.

Specific Conductance

Specific conductance observations were consistently higher at the downstream gage 01475548 (Tables 27-28). Since stormwater runoff typically lowers the specific conductance in the stream, this might indicate stormwater runoff having a less dilutive effect at the downstream gage. A comparison of April 2009 specific conductance plots at each gage indicates less variability and higher concentrations were observed at the downstream gage throughout the month. (Figures 11-12). The higher concentrations also indicate a higher buffering capacity downstream.

Table 27. Gage 01475530 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-08	746.5	31.0	0.2	65	541	411.24
Aug-08	741.5	30.9	0.3	105	492	446.13
Sep-08	585.5	24.4	18.7	59	535	403.29
Oct-08	732.5	30.5	1.5	63	501	421.84
Nov-08	718.0	29.9	0.3	106	566	414.47
Mar-09	630.0	26.3	0.8	168	1540	643.29
Apr-09	689.5	28.7	4.2	117	652	468.62
May-09	617.0	25.7	17.1	48	507	417.54
Jun-09	682.0	28.4	5.3	94	511	408.81

Table 28. Gage 01475548 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-08	632.0	26.3	15.1	80	597	452.84
Aug-08	739.5	30.8	0.6	107	739	560.29
Sep-08	717.0	29.9	0.4	74	795	467.54
Oct-08	731.5	30.5	1.7	132	724	520.10
Nov-08	718.0	29.9	0.3	164	719	506.42
Mar-09	617.0	25.7	3.0	250	2630	876.35
Apr-09	718.0	29.9	0.3	182	735	535.89
May-09	743.0	31.0	0.1	151	749	516.85
Jun-09	717.0	29.9	0.4	120	631	468.67

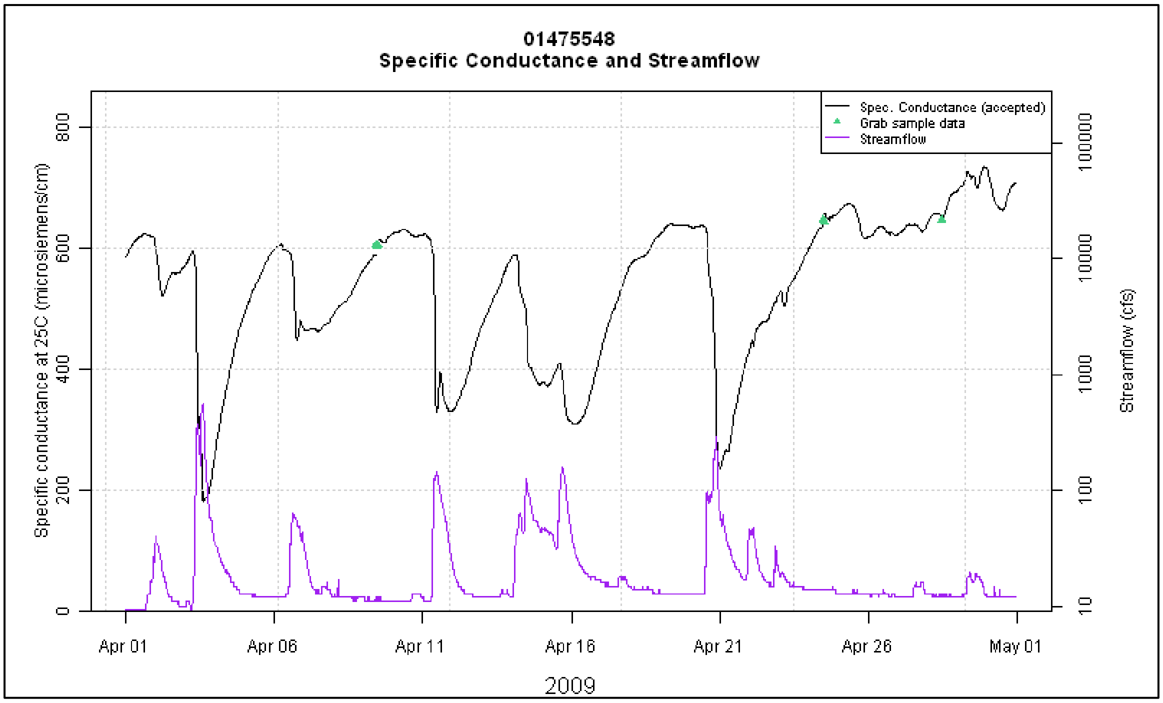


Figure 11. Gage 01475548, Specific Conductance and Streamflow, April 2009.

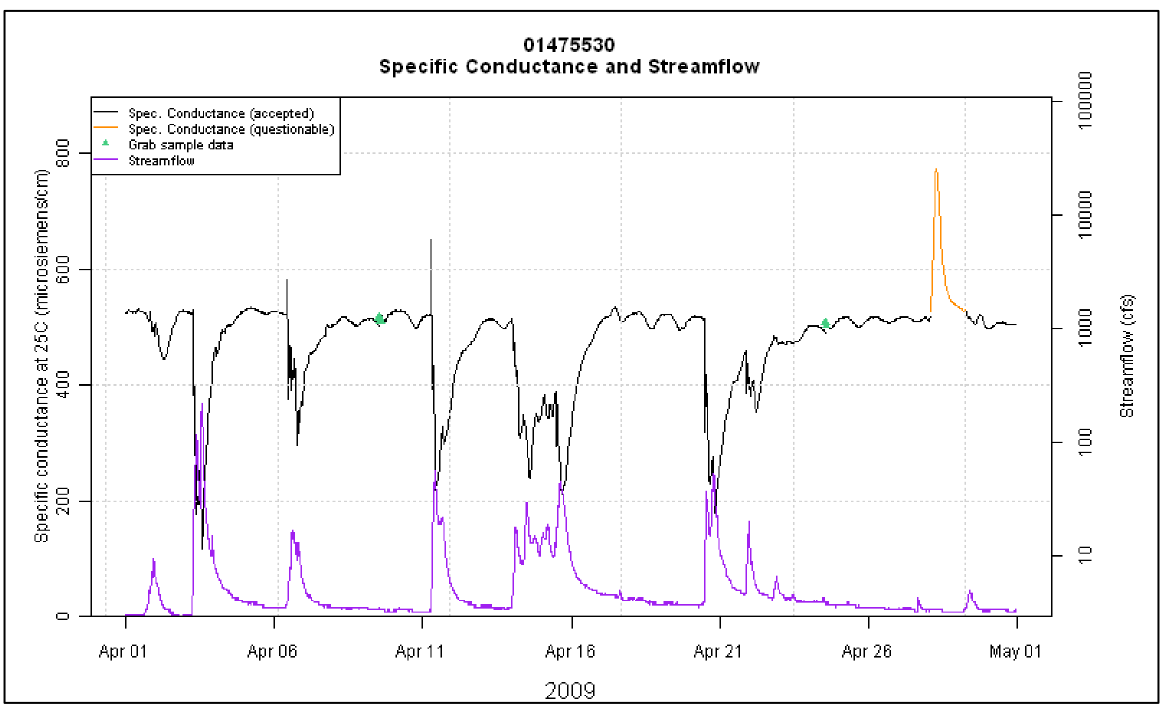


Figure 12. Gage 01475530, Specific Conductance and Streamflow, April 2009.

Temperature

As was also observed in Tacony Creek, slightly higher temperatures were recorded at the downstream gage in Cobbs Creek, resulting in more frequent violations downstream in November, March, April and May (Tables 29-30).

Table 29. Gage 01475530 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. compliance	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
WWF	1-Jul	31-Jul	0.0	100.0	0.0	746.5	31.0	19.6	26.4	22.52
WWF	1-Aug	15-Aug	0.0	100.0	0.4	358.5	14.9	17.5	25.0	20.66
WWF	16-Aug	31-Aug	0.0	100.0	0.3	383.0	16.0			
WWF	1-Sep	15-Sep	0.0	100.0	0.3	359.0	15.0	15.3	24.4	19.59
WWF	16-Sep	30-Sep	0.0	100.0	37.1	226.5	9.4			
WWF	1-Oct	15-Oct	0.0	100.0	0.4	358.5	14.9	6.5	18.7	12.85
WWF	16-Oct	31-Oct	0.0	100.0	2.6	374.0	15.6			
WWF	1-Nov	15-Nov	15.0	85.0	0.3	359.0	15.0	2.1	17.1	8.52
WWF	16-Nov	30-Nov	5.4	94.6	0.3	359.0	15.0			
WWF	1-Mar	31-Mar	59.7	40.3	2.9	629.5	26.2	3.3	13.5	8.50
WWF	1-Apr	15-Apr	36.1	63.9	0.3	359.0	15.0	6.4	22.9	12.50
WWF	16-Apr	30-Apr	49.4	50.6	0.3	359.0	15.0			
WWF	1-May	15-May	5.0	95.0	0.3	359.0	15.0	11.0	21.1	15.96
WWF	16-May	31-May	0.0	100.0	0.0	384.0	16.0			
WWF	1-Jun	15-Jun	0.0	100.0	0.3	359.0	15.0	14.7	22.3	18.58
WWF	16-Jun	30-Jun	0.0	100.0	0.3	359.0	15.0			

Table 30. Gage 01475548 Temperature Summary Results by Maximum Criteria Period

<table>
<tr><th>Designated Use</th><th>Date range start</th><th>Date range end</th><th>% hrs. exceedance</th><th>% hrs. compliance</th><th>% hrs. flagged data</th><th>Total hrs. accepted data</th><th>Total days accepted data</th><th>Min.</th><th>Max.</th><th>Mean</th></tr>
<tr><td>WWF</td><td>1-Jul</td><td>31-Jul</td><td>0.0</td><td>100.0</td><td>15.5</td><td>629.0</td><td>26.2</td><td>20.9</td><td>28.9</td><td>23.98</td></tr>
<tr><td>WWF</td><td>1-Aug</td><td>15-Aug</td><td>0.0</td><td>100.0</td><td>0.7</td><td>357.5</td><td>14.9</td><td rowspan="2">18.7</td><td rowspan="2">26.7</td><td rowspan="2">22.30</td></tr>
<tr><td>WWF</td><td>16-Aug</td><td>31-Aug</td><td>0.0</td><td>100.0</td><td>0.4</td><td>382.5</td><td>15.9</td></tr>
<tr><td>WWF</td><td>1-Sep</td><td>15-Sep</td><td>0.0</td><td>100.0</td><td>0.3</td><td>359.0</td><td>15.0</td><td rowspan="2">15.6</td><td rowspan="2">25.4</td><td rowspan="2">20.20</td></tr>
<tr><td>WWF</td><td>16-Sep</td><td>30-Sep</td><td>0.0</td><td>100.0</td><td>0.3</td><td>359.0</td><td>15.0</td></tr>
<tr><td>WWF</td><td>1-Oct</td><td>15-Oct</td><td>0.0</td><td>100.0</td><td>0.7</td><td>357.5</td><td>14.9</td><td rowspan="2">6.5</td><td rowspan="2">19.3</td><td rowspan="2">13.25</td></tr>
<tr><td>WWF</td><td>16-Oct</td><td>31-Oct</td><td>0.0</td><td>100.0</td><td>2.6</td><td>374.0</td><td>15.6</td></tr>
<tr><td>WWF</td><td>1-Nov</td><td>15-Nov</td><td>20.3</td><td>79.7</td><td>0.1</td><td>359.5</td><td>15.0</td><td rowspan="2">1.7</td><td rowspan="2">17.2</td><td rowspan="2">8.41</td></tr>
<tr><td>WWF</td><td>16-Nov</td><td>30-Nov</td><td>6.3</td><td>93.7</td><td>0.3</td><td>359.0</td><td>15.0</td></tr>
<tr><td>WWF</td><td>1-Mar</td><td>31-Mar</td><td>61.3</td><td>38.7</td><td>4.8</td><td>617.0</td><td>25.7</td><td>1.3</td><td>13.0</td><td>8.46</td></tr>
<tr><td>WWF</td><td>1-Apr</td><td>15-Apr</td><td>46.2</td><td>53.8</td><td>0.4</td><td>358.5</td><td>14.9</td><td rowspan="2">7.3</td><td rowspan="2">23.8</td><td rowspan="2">13.17</td></tr>
<tr><td>WWF</td><td>16-Apr</td><td>30-Apr</td><td>55.5</td><td>44.5</td><td>0.1</td><td>359.5</td><td>15.0</td></tr>
<tr><td>WWF</td><td>1-May</td><td>15-May</td><td>13.1</td><td>86.9</td><td>0.1</td><td>359.5</td><td>15.0</td><td rowspan="2">12.6</td><td rowspan="2">23.1</td><td rowspan="2">17.16</td></tr>
<tr><td>WWF</td><td>16-May</td><td>31-May</td><td>4.7</td><td>95.3</td><td>0.0</td><td>384.0</td><td>16.0</td></tr>
<tr><td>WWF</td><td>1-Jun</td><td>15-Jun</td><td>0.0</td><td>100.0</td><td>0.3</td><td>359.0</td><td>15.0</td><td rowspan="2">16.0</td><td rowspan="2">24.5</td><td rowspan="2">19.90</td></tr>
<tr><td>WWF</td><td>16-Jun</td><td>30-Jun</td><td>0.0</td><td>100.0</td><td>0.4</td><td>358.5</td><td>14.9</td></tr>
</table>

Gages in Combined Sewer System Watersheds

Pennypack Creek (Gages 01467042 and 01467048)

Dissolved oxygen and pH

Both the upstream (gage 01467042) and downstream (gage 01467048) gages of Pennypack Creek showed pronounced diel fluctuations in dissolved oxygen and pH as a result of algal activity. These patterns are most evident during dry weather periods, when algal growth is able to excel because of abundant sunshine and a lack of storm events which might otherwise scour the algal population.

March 2009 was a particularly dry month, with baseflow remaining nearly constant up until March 27 at gage 01467042. During this time, algal populations seemed to flourish, with daily DO fluctuations as high as 7 mg/L (Figure 13), and daily pH fluctuations of approximately 1.5 units (Figure 14). While major pH fluctuations did occur at this gage, there were no pH maximum violations. However, during the same period, a number of violations were seen at gage 01467048 (Figure 15) where more drastic diel fluctuations in DO and pH were observed. Furthermore, it would be reasonable to conclude that if not for periodic interruptions of algal activity due to rainfall, those extreme fluctuations and subsequent criteria violations would likely occur on a constant basis through the entire season.

Algal populations in the area of gage 01467048 recover quickly after storm events. In September 2008, a series of storm-related flow events took place during the first half of the month (Figures 16-17). Prior to this, both DO and pH showed the typical high fluctuations indicative of strong algal activity. This stopped abruptly with the three storms that occurred during the period of September 6-14, during which much of the algae was likely scoured away and overcast conditions likely inhibited further growth. However, within 3-4 days of the conclusion of the rainfall, the signature fluctuations of DO and pH made a very dramatic return (even exceeding the maximum pH criterion), and within a week the algal activity returned to extremely high levels. This not only demonstrates the resilience of the algal population in this ecosystem, but also a likely abundance of nutrients that allows such a resurgence to occur.

Table 31. Gage 01467042 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance	Min	Max	Mean
Jul-08	TSF	538.5	22.4	27.6	0.0	100.0	5.4	8.7	6.85
Aug-08	TSF	739.0	30.8	0.7	0.0	100.0	6.0	9.3	7.54
Sep-08	TSF	715.5	29.8	0.6	0.0	100.0	5.9	10.4	7.85
Oct-08	TSF	732.0	30.5	1.6	0.0	100.0	5.6	11.4	8.72
Nov-08	TSF	693.5	28.9	3.7	0.0	100.0	7.0	12.4	9.71
Mar-09	TSF	519.0	21.6	0.3	0.0	100.0	7.6	16.5	11.14
Apr-09	TSF	717.5	29.9	0.3	0.0	100.0	5.8	13.6	9.46
May-09	TSF	681.0	28.4	8.5	0.0	100.0	5.2	10.9	8.34
Jun-09	TSF	718.5	29.9	0.2	0.0	100.0	6.1	9.1	7.73

Table 32. Gage 01467048 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance	Min	Max	Mean
Jul-08	TSF	740.5	30.9	0.5	0.0	100.0	5.3	12.0	7.75
Aug-08	TSF	741.0	30.9	0.4	0.0	100.0	5.9	14.4	8.65
Sep-08	TSF	719.0	30.0	0.1	0.0	100.0	5.1	16.5	8.57
Oct-08	TSF	709.5	29.6	4.6	0.0	100.0	7.2	15.7	10.30
Nov-08	TSF	717.5	29.9	0.3	0.0	100.0	8.0	13.7	11.05
Mar-09	TSF	517.0	21.5	0.2	0.0	100.0	9.1	19.2	12.71
Apr-09	TSF	719.0	30.0	0.1	0.0	100.0	6.3	17.0	10.54
May-09	TSF	608.0	25.3	18.3	0.0	100.0	6.6	12.8	9.10
Jun-09	TSF	718.5	29.9	0.2	0.0	100.0	7.0	11.0	8.51

Table 33. Gage 01467042 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days violation	% days compliance	Min.	Max.	Mean
Jul-08	TSF	16.0	48.4	0.0	100.0	6.3	7.5	6.79
Aug-08	TSF	28.0	9.7	0.0	100.0	6.9	8.1	7.52
Sep-08	TSF	27.0	10.0	0.0	100.0	6.7	9.1	7.83
Oct-08	TSF	28.0	9.7	0.0	100.0	7.0	10.2	8.67
Nov-08	TSF	25.0	16.7	0.0	100.0	7.9	11.7	9.71
Mar-09	TSF	20.0	7.8	0.0	100.0	9.5	12.3	11.07

Apr-09	TSF	28.0	6.7	0.0	100.0	7.7	11.1	9.49
May-09	TSF	27.0	12.9	0.0	100.0	6.4	9.4	8.34
Jun-09	TSF	29.0	3.3	0.0	100.0	6.7	8.3	7.71

Table 34. Gage 01467048 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days violation	% days compliance	Min.	Max.	Mean
Jul-08	TSF	29.0	6.5	0.0	100.0	6.7	8.5	7.77
Aug-08	TSF	29.0	6.5	0.0	100.0	7.4	9.3	8.66
Sep-08	TSF	29.0	3.3	0.0	100.0	6.6	11.1	8.59
Oct-08	TSF	26.0	16.1	0.0	100.0	8.3	11.7	10.35
Nov-08	TSF	27.0	10.0	0.0	100.0	8.4	13.4	11.04
Mar-09	TSF	20.0	7.3	0.0	100.0	10.2	14.6	12.64
Apr-09	TSF	29.0	3.3	0.0	100.0	8.1	12.6	10.49
May-09	TSF	21.0	32.3	0.0	100.0	7.5	10.5	9.09
Jun-09	TSF	28.0	6.7	0.0	100.0	7.8	9.2	8.49

Table 35. Gage 01467042 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hours max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance	Min.	Max.	Mean
Jul-08	739.5	30.8	0.6	0.0	0.0	0.0	0.0	100.0	100.0	7.2	7.9	7.55
Aug-08	741.5	30.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	7.3	8.1	7.71
Sep-08	715.5	29.8	0.6	0.0	0.0	0.0	0.0	100.0	100.0	6.8	8.4	7.59
Oct-08	732.0	30.5	1.6	0.0	0.0	0.0	0.0	100.0	100.0	6.7	8.2	7.57
Nov-08	714.5	29.8	0.8	0.0	0.0	0.0	0.0	100.0	100.0	6.9	8.0	7.41
Mar-09	519.0	21.6	0.3	0.0	0.0	0.0	0.0	100.0	100.0	7.3	8.9	7.96
Apr-09	717.5	29.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.7	7.66
May-09	681.0	28.4	8.5	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.8	7.46
Jun-09	718.5	29.9	0.2	0.0	0.0	0.0	0.0	100.0	100.0	6.9	7.8	7.48

Table 36. Gage 01467048 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance	Min.	Max.	Mean
Jul-08	740.5	30.9	0.5	0.0	0.0	0.0	0.0	100.0	100.0	6.8	8.8	7.69
Aug-08	740.5	30.9	0.5	0.7	6.5	0.0	0.0	99.3	93.5	7.2	9.1	7.98
Sep-08	718.5	29.9	0.2	3.1	16.7	0.0	0.0	96.9	83.3	6.8	9.3	7.68
Oct-08	731.5	30.5	1.7	0.2	3.2	0.0	0.0	99.8	96.8	7.0	9.1	7.80
Nov-08	717.0	29.9	0.4	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.8	7.56
Mar-09	517.0	21.5	0.2	21.3	59.1	0.0	0.0	78.7	40.9	7.3	9.6	8.49
Apr-09	719.0	30.0	0.1	0.5	3.3	0.0	0.0	99.5	96.7	7.2	9.1	7.91
May-09	607.5	25.3	18.3	0.0	0.0	0.0	0.0	100.0	100.0	7.1	8.5	7.55
Jun-09	718.5	29.9	0.2	0.0	0.0	0.0	0.0	100.0	100.0	6.8	8.3	7.54

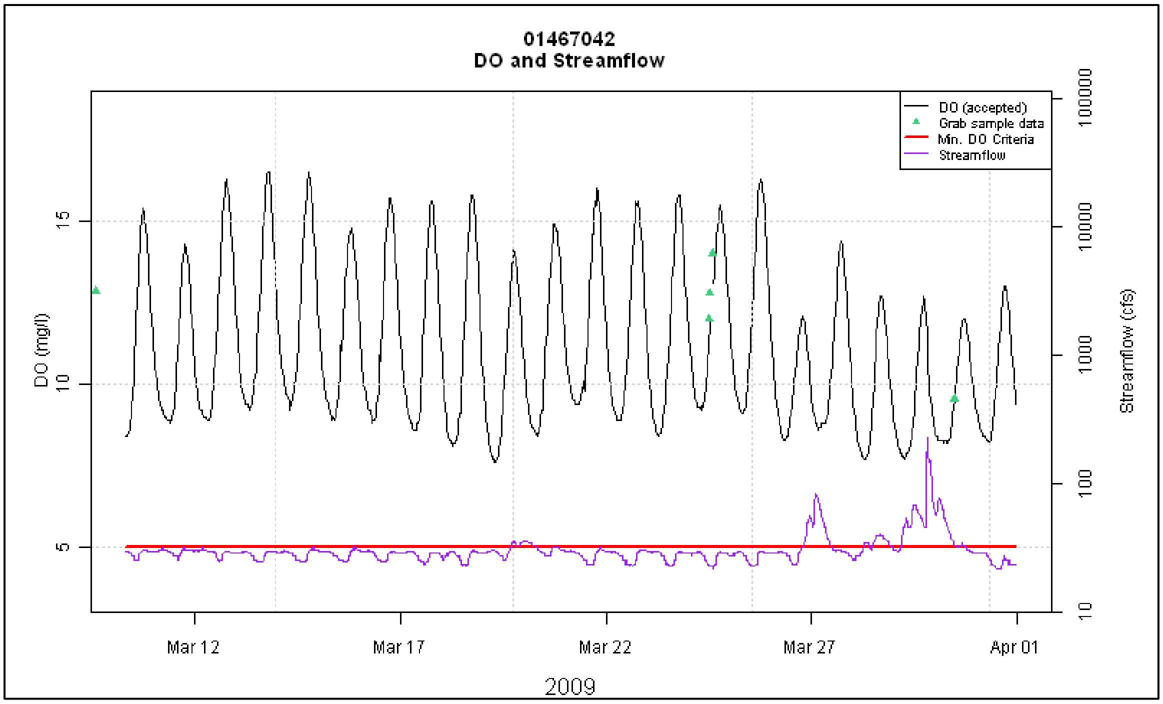


Figure 13. Gage 01467042, Dissolved Oxygen and Streamflow, March 2009.

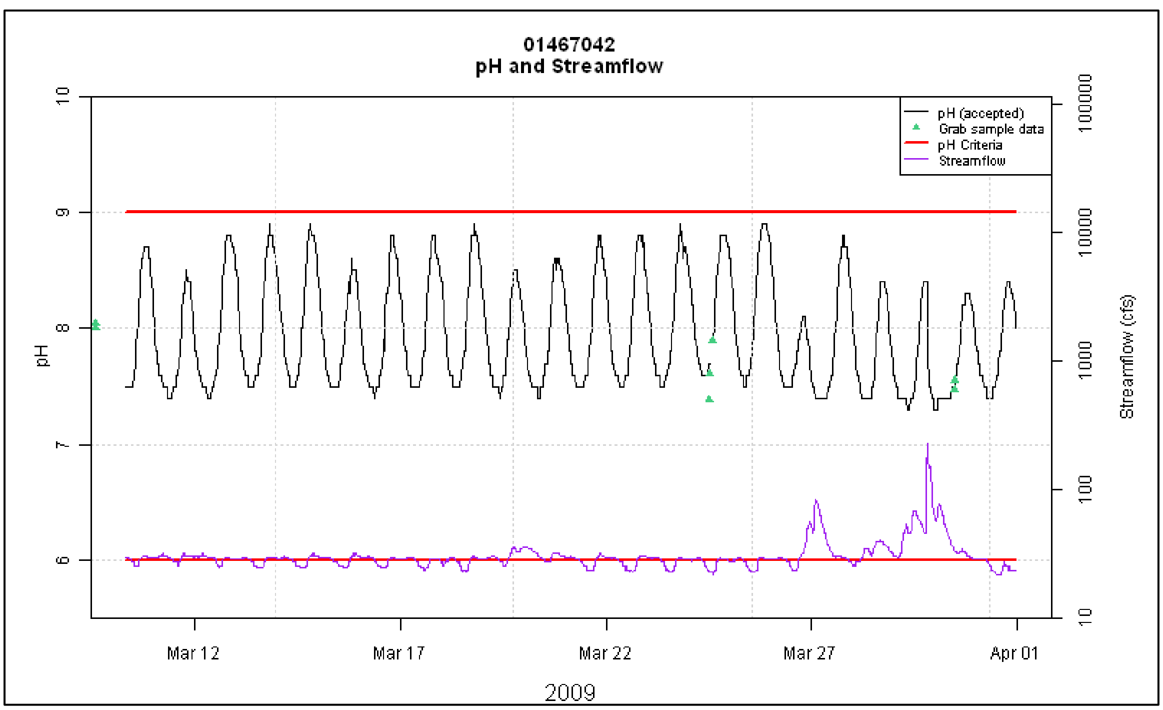


Figure 14. Gage 01467042, pH and Streamflow, March 2009.

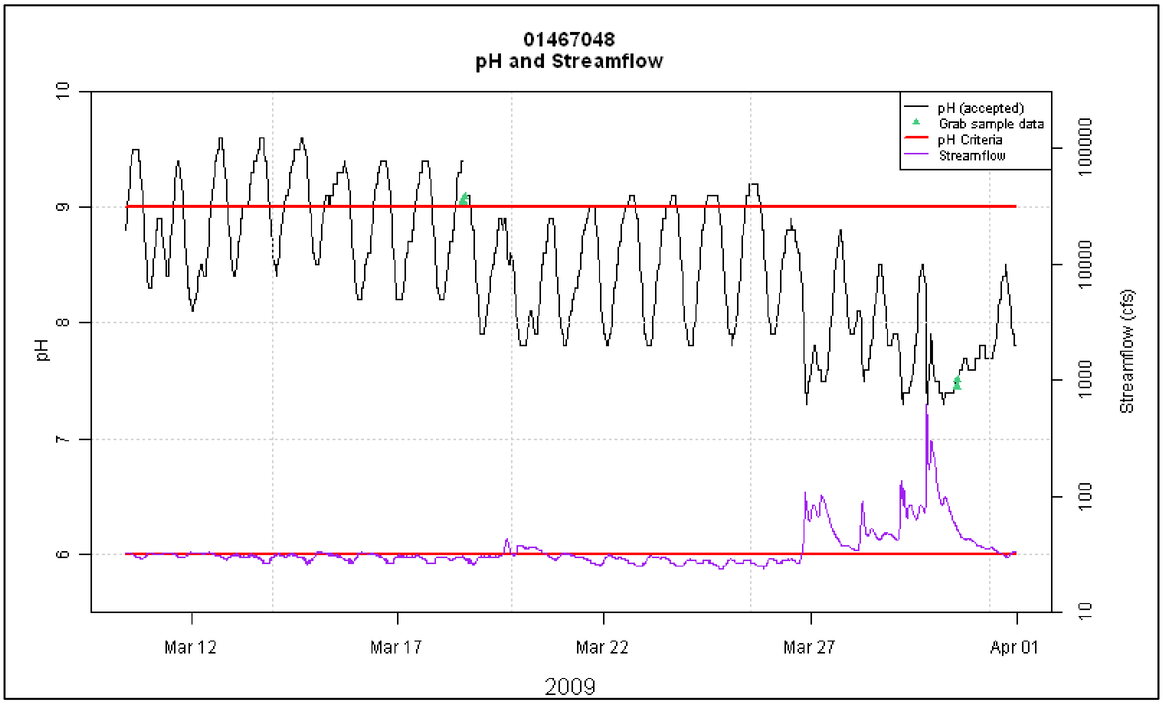


Figure 15. Gage 01467048, pH and Streamflow, March 2009.

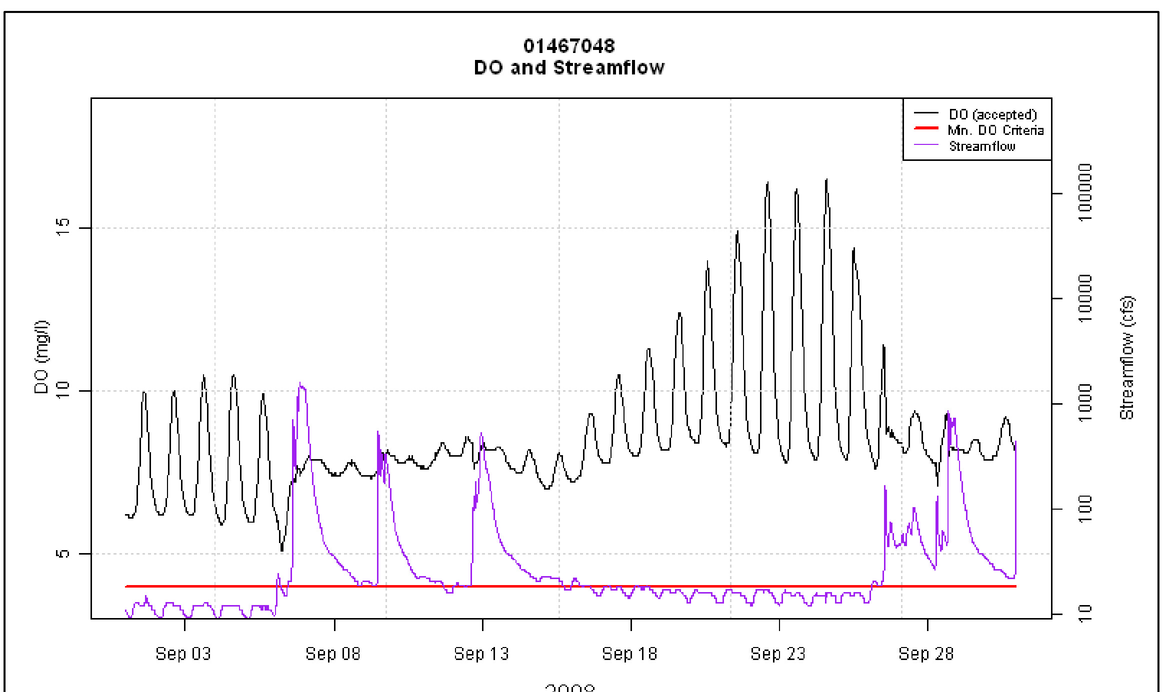


Figure 16. Gage 01467048, Dissolved Oxygen and Streamflow, September 2008.

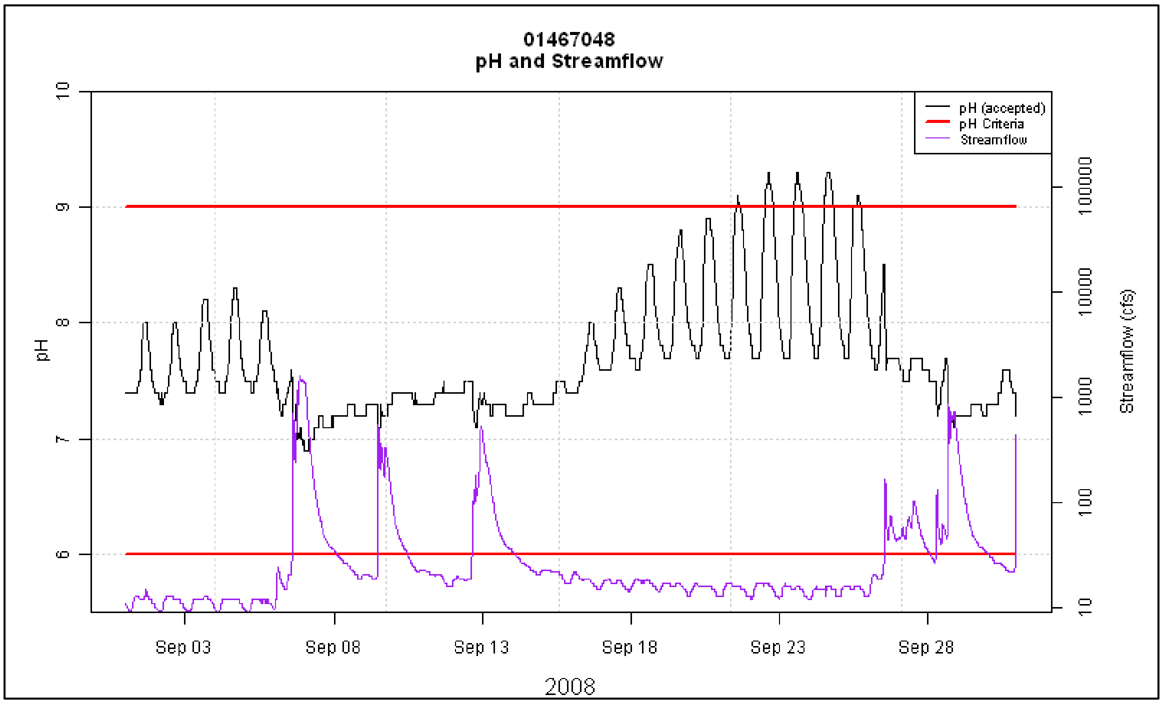


Figure 17. Gage 01467048, pH and Streamflow, September 2008.

Turbidity

The most notable aspect of the turbidity data from the upstream site (gage 01467042) was an unusual pattern of regularly spaced and repeating spikes in turbidity. The pattern became most noticeable September through November 2008 (Figures 18-20). There seemed to be a clear correlation between the frequent increases in turbidity and a similar daily fluctuation in flow. Upon careful examination of the data, it appeared that the daily timing for each rise and fall in flow (as well as each turbidity spike) took place almost always between 9:00 am-6:00 pm. Furthermore, the majority of these turbidity spikes do not correspond to rainfall events. Therefore it would seem that an anthropogenic phenomenon was taking place on a daily basis upstream of these gages. Possible causes might include a streamside construction site or the regular discharge from a wastewater treatment facility.

Table 37. Gage 01467042, Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-08	733.5	30.6	1.4	16.9	83.1	0.5	210	7.90
Aug-08	724.0	30.2	2.7	1.1	98.9	0.4	29	1.79
Sep-08	711.5	29.6	1.2	23.4	76.6	0.1	270	10.45
Oct-08	696.5	29.0	6.4	19.0	81.0	0.1	340	8.53
Nov-08	678.0	28.3	5.8	11.4	88.6	0.1	67	3.45
Mar-09	516.0	21.5	0.9	5.3	94.7	0.7	950	6.23
Apr-09	713.0	29.7	1.0	21.8	78.2	0.3	420	9.39
May-09	680.5	28.4	8.5	28.0	72.0	0.2	330	15.46
Jun-09	718.5	29.9	0.2	38.4	61.6	0.8	680	15.69

Table 37. Gage 01467048, Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-08	739.5	30.8	0.6	19.3	80.7	0.5	460	9.98

Aug-08	740.0	30.8	0.5	0.9	99.1	0.3	49	1.34
Sep-08	714.0	29.8	0.8	15.8	84.2	0.3	430	9.49
Oct-08	731.5	30.5	1.7	15.2	84.8	0.3	500	7.09
Nov-08	717.0	29.9	0.4	11.0	89.0	0.6	83	4.02
Mar-09	516.5	21.5	0.3	11.4	88.6	0.1	880	7.76
Apr-09	718.5	29.9	0.2	27.8	72.2	0.8	680	12.07
May-09	603.0	25.1	19.0	39.0	61.0	1.5	440	23.08
Jun-09	718.5	29.9	0.2	37.4	62.6	1.3	740	17.88

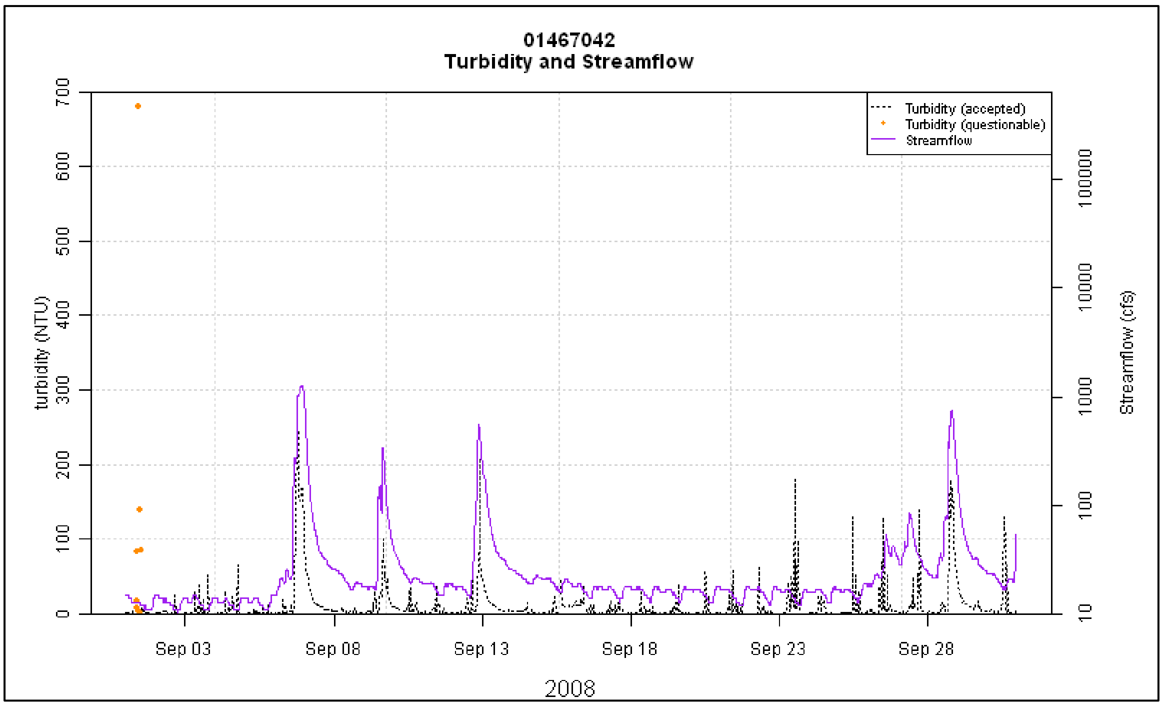


Figure 18. Gage 01467042, Turbidity and Streamflow, September 2008.

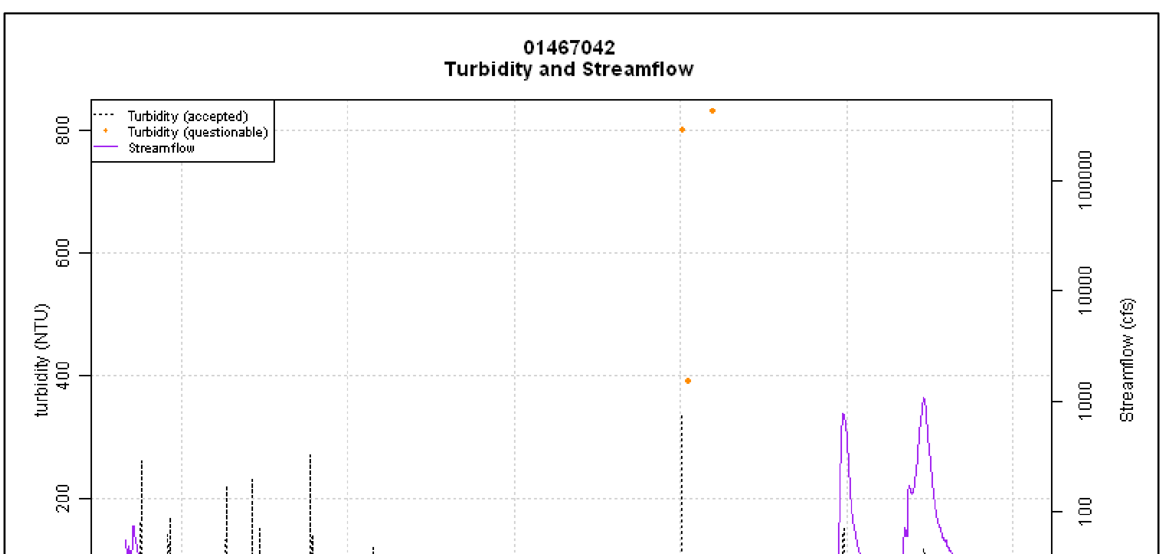


Figure 19. Gage 01467042, Turbidity and Streamflow, October 2008.

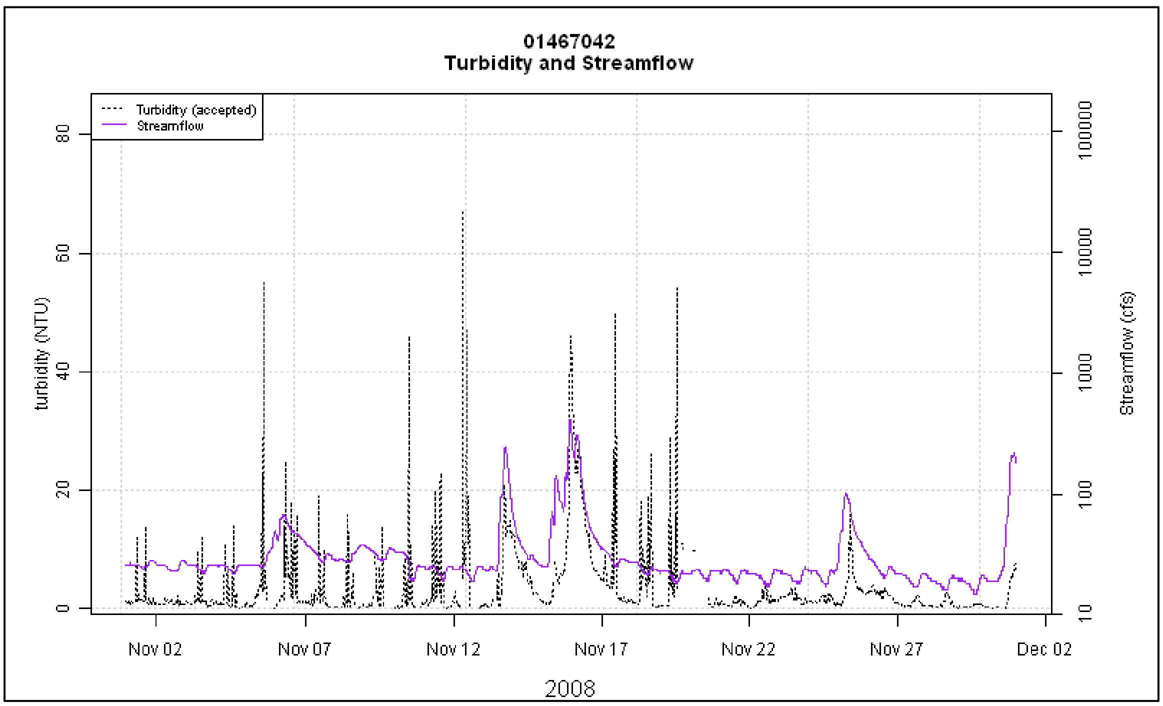


Figure 20. Gage 01467042, Turbidity and Streamflow, November 2008.

Specific Conductance

As discussed in the previous section, a potentially anthropogenic turbidity/flow phenomenon was noted at gage 01467042. A notable pattern can also be seen in the specific conductance data gathered at this site in November 2008 (Figure 21). During what would normally be the more stable periods of conductance, regular fluctuations were observed that may be directly related to the unusual flow pattern of suspected anthropogenic origin noted above.

Table 38. Gage 01467042 Specific Conductance Summary Results by Month

Month	Total hours accepted data	Total days accepted data	Percent hours flagged data	Min.	Max.	Mean
Jul-08	739.5	30.8	0.6	149	662	504.05
Aug-08	740.5	30.9	0.5	488	724	646.17
Sep-08	716.0	29.8	0.6	97	725	515.34
Oct-08	731.0	30.5	1.7	169	700	564.99
Nov-08	714.5	29.8	0.8	225	655	545.08
Mar-09	519.0	21.6	0.3	506	990	804.09
Apr-09	717.5	29.9	0.3	401	839	650.37
May-09	681.0	28.4	8.5	154	666	521.39
Jun-09	718.5	29.9	0.2	101	605	478.32

Table 39. Gage 01467048 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-08	740.5	30.9	0.5	108	630	451.18
Aug-08	740.5	30.9	0.5	321	746	637.65
Sep-08	719.0	30.0	0.1	105	758	473.27
Oct-08	731.5	30.5	1.7	108	749	554.63
Nov-08	717.5	29.9	0.3	182	649	516.53
Mar-09	517.0	21.5	0.2	349	1020	795.24
Apr-09	719.0	30.0	0.1	333	820	619.22
May-09	607.5	25.3	18.3	124	666	519.97
Jun-09	718.5	29.9	0.2	105	609	442.77

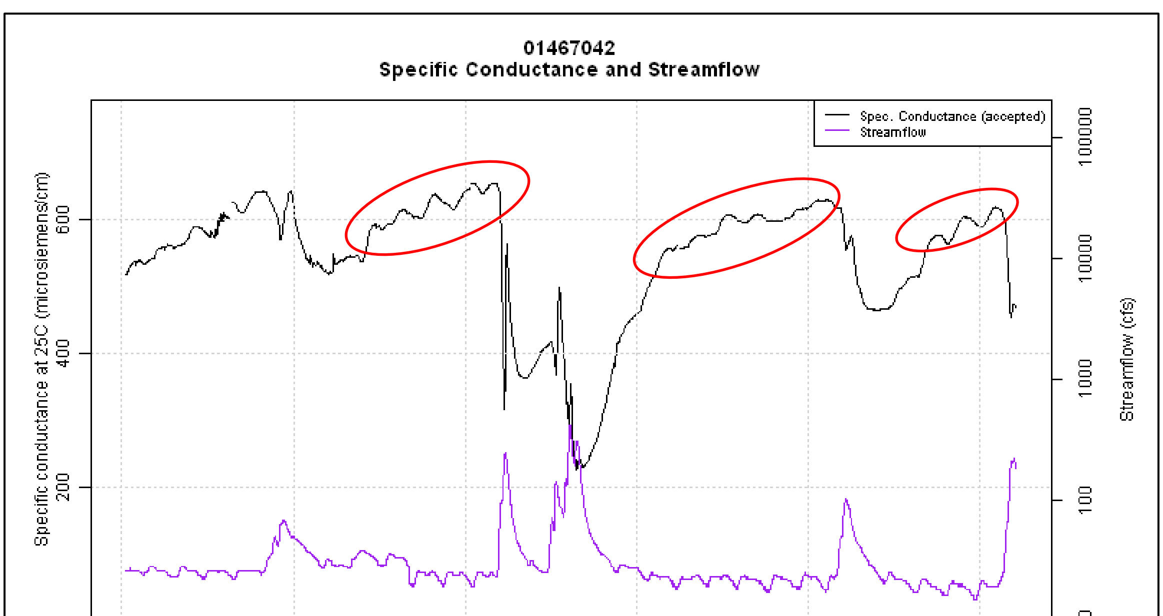


Figure 21. Gage 01467042, Specific Conductance and Streamflow, November 2008. Unusual fluctuations in conductance are circled in red.

Temperature

Temperature data collected were mostly in compliance with maximum temperature criteria (Tables 40-41). The only periods that did exceed maximum criteria were July 2008 and March-April 2009. Late fall and early spring months are always subject to major air temperature fluctuations, and reliably predicting average stream temperatures during these periods of time is difficult at best. In July, exceedances occurred during a mid-summer month which is prone to periods of above normal temperatures (*i.e.*, heat waves). However, the maximum criteria for this stream are constant over the course of July (23°C), and therefore do not take into account natural mid-summer temperature peaks, as occurred during the period of July 15-23 (Figures 22-23). It was this week-long air temperature increase that likely caused the high stream temperature exceedance rates in July. The data from the other months was more consistent and minimally exceeded criteria.

Table 40. Gage 01467042 Temperature Summary Results by Maximum Criteria Period.

Des. Use	Date range start	Date range end	Percent hours exceedance	Percent hours compliance	Percent hours flagged data	Total hours accepted data	Total days accepted data	Min.	Max.	Mean
TSF	1-Jul	31-Jul	59.4	40.6	0.6	739.5	30.8	21.1	27.0	23.58
TSF	1-Aug	15-Aug	0.0	100.0	0.6	358.0	14.9	18.6	25.6	21.68
TSF	16-Aug	31-Aug	0.0	100.0	0.4	382.5	15.9			
TSF	1-Sep	15-Sep	0.0	100.0	0.4	358.5	14.9	15.4	24.1	19.76
TSF	16-Sep	30-Sep	0.0	100.0	0.6	358.0	14.9			
TSF	1-Oct	15-Oct	0.0	100.0	0.3	359.0	15.0	5.5	19.2	13.17
TSF	16-Oct	31-Oct	0.0	100.0	2.9	373.0	15.5			
TSF	1-Nov	15-Nov	20.3	79.7	1.0	356.5	14.9	2.5	15.4	8.76
TSF	16-Nov	30-Nov	7.1	92.9	0.7	357.5	14.9			
TSF	1-Mar	31-Mar	72.4	27.6	1.7	519.0	21.6	4.6	13.5	8.94
TSF	1-Apr	15-Apr	41.4	58.6	0.3	359.0	15.0	7.1	23.2	12.82
TSF	16-Apr	30-Apr	51.6	48.4	0.4	358.5	14.9			
TSF	1-May	15-May	6.3	93.7	0.3	359.0	15.0	11.6	22.2	16.33
TSF	16-May	31-May	10.4	89.6	16.1	322.0	13.4			
TSF	1-Jun	15-Jun	3.8	96.3	0.0	360.0	15.0	15.5	22.9	18.95

TSF	16-Jun	30-Jun	9.6	90.4	0.3	359.0	15.0			

Table 41. Gage 01467048, Temperature Summary Results by Maximum Criteria Period.

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. compliance	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
TSF	1-Jul	31-Jul	83.9	16.1	0.5	740.5	30.9	21.6	30.0	24.70
TSF	1-Aug	15-Aug	1.5	98.5	0.4	358.5	14.9	19.2	28.1	22.75
TSF	16-Aug	31-Aug	0.0	100.0	0.4	382.5	15.9			
TSF	1-Sep	15-Sep	0.0	100.0	0.3	359.0	15.0	15.7	25.8	20.39
TSF	16-Sep	30-Sep	0.0	100.0	0.0	360.0	15.0			
TSF	1-Oct	15-Oct	0.0	100.0	0.7	357.5	14.9	5.7	19.1	13.26
TSF	16-Oct	31-Oct	0.0	100.0	3.0	372.5	15.5			
TSF	1-Nov	15-Nov	17.2	82.8	0.4	358.5	14.9	1.3	15.8	8.21
TSF	16-Nov	30-Nov	7.4	92.6	0.1	359.5	15.0			
TSF	1-Mar	31-Mar	63.8	36.2	2.2	516.5	21.5	5.5	13.6	8.81
TSF	1-Apr	15-Apr	42.9	57.1	0.3	359.0	15.0	7.5	24.1	13.19
TSF	16-Apr	30-Apr	53.3	46.7	0.0	360.0	15.0			
TSF	1-May	15-May	6.9	93.1	4.0	345.5	14.4	12.7	22.5	16.86
TSF	16-May	31-May	25.0	75.0	31.8	262.0	10.9			
TSF	1-Jun	15-Jun	8.8	91.2	0.1	359.5	15.0	15.8	24.1	19.62
TSF	16-Jun	30-Jun	21.2	78.8	0.3	359.0	15.0			

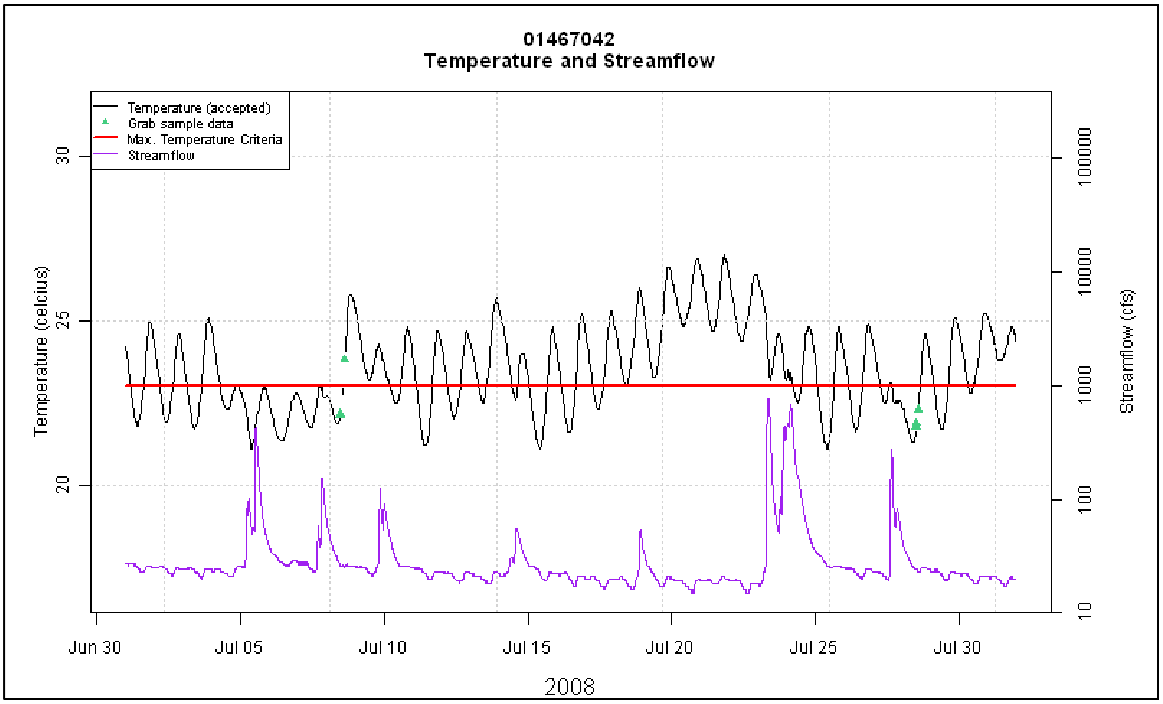


Figure 22. Gage 01467042, Temperature and Streamflow, July 2008.

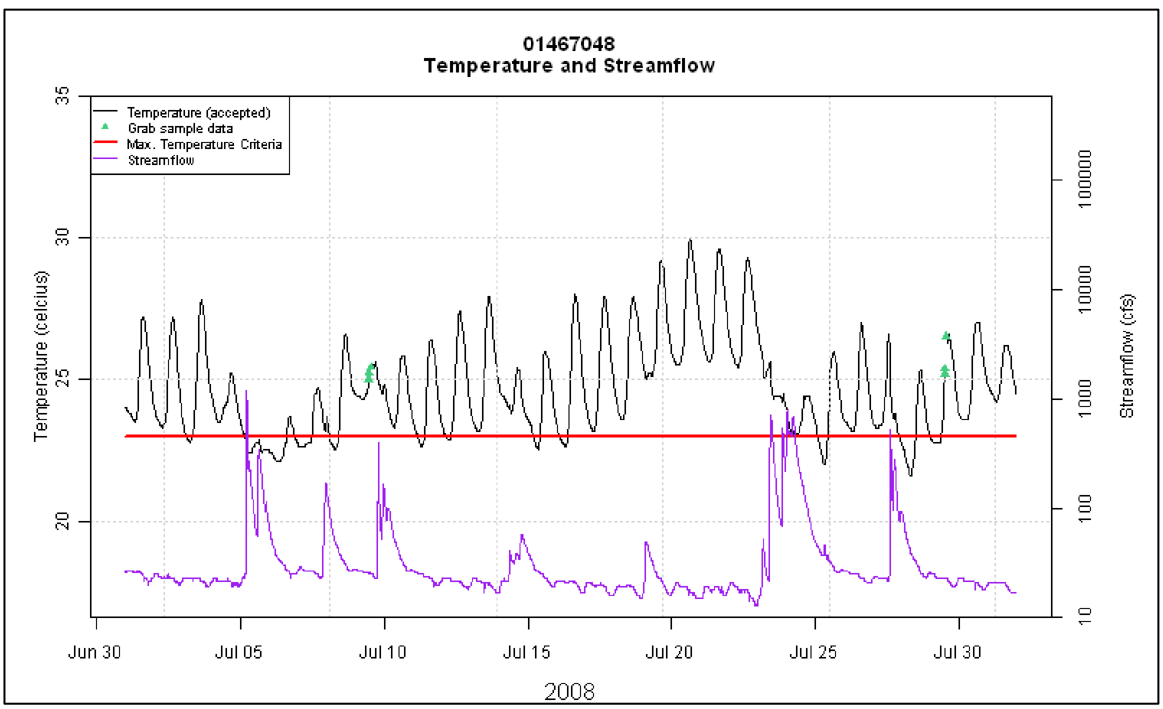


Figure 23. Gage 01467048, Temperature and Streamflow, July 2008.

Wissahickon Creek (Gages 01473900 and 01474000)

Dissolved oxygen and pH

Dissolved oxygen and pH data collected from the Wissahickon Creek gages also show signs of strong algal activity in the form of diel fluctuations. The upper gage (01473900) exhibits some of the most dramatic diel fluctuations of any of the Philadelphia USGS gage sites. In March 2009, dissolved oxygen is seen fluctuating from 7 to 21 mg/L in a single day/night period (Figure 24), with pH ranging from approximately 7.5 to 9.2 at the same time (Figure 25). Frequent pH maxima exceedances also occurred during that month on an almost daily basis, a direct result of algal activity. A contributing factor for the number of exceedances is the fact that March 2009 was a particularly dry month, and therefore provided a very long period for algal growth, uninterrupted by cloudy weather and scouring storm events.

Table 42. Gage 01473900 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance	Min	Max	Mean
Jul-08	TSF	740.0	30.8	0.5	3.4	96.6	4.3	10.8	6.81
Aug-08	TSF	740.0	30.8	0.5	0.0	100.0	5.3	10.7	7.47
Sep-08	TSF	713.0	29.7	1.0	0.0	100.0	4.9	11.4	7.80
Oct-08	TSF	707.5	29.5	4.9	0.0	100.0	5.7	11.3	8.29
Nov-08	TSF	703.5	29.3	2.3	0.0	100.0	7.0	13.6	9.89
Mar-09	TSF	740.0	30.8	0.5	3.4	96.6	4.3	10.8	6.81
Apr-09	TSF	559.5	23.3	22.3	5.3	94.7	4.2	20.4	10.68
May-09	TSF	728.0	30.3	2.2	0.0	100.0	5.5	12.9	8.03
Jun-09	TSF	418.5	17.4	41.9	0.0	100.0	6.4	10.6	8.14

Table 43. Gage 01474000 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance	Min	Max	Mean
Jul-08	TSF	740.5	30.9	0.5	2.4	97.6	3.2	13.2	7.31
Aug-08	TSF	716.0	29.8	3.8	0.0	100.0	5.9	10.4	7.74
Sep-08	TSF	600.5	25.0	16.6	0.0	100.0	6.0	10.6	8.06
Oct-08	TSF	732.0	30.5	1.6	0.0	100.0	7.7	12.3	9.72

Nov-08	TSF	717.0	29.9	0.4	0.0	100.0	7.3	13.2	10.33
Mar-09	TSF	541.5	22.6	0.4	0.0	100.0	8.4	18.3	12.31
Apr-09	TSF	660.0	27.5	8.3	0.0	100.0	5.2	13.9	9.59
May-09	TSF	626.0	26.1	15.9	0.0	100.0	6.5	11.5	8.44
Jun-09	TSF	717.5	29.9	0.3	0.0	100.0	5.2	9.7	7.74

Table 44. Gage 01473900 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days violation	% days compliance	Min.	Max.	Mean
Jul-08	TSF	29.0	6.5	6.9	93.1	5.9	7.4	6.80
Aug-08	TSF	29.0	6.5	0.0	100.0	6.8	8.1	7.47
Sep-08	TSF	24.0	20.0	0.0	100.0	5.8	8.9	7.71
Oct-08	TSF	26.0	16.1	0.0	100.0	7.0	10.6	8.24
Nov-08	TSF	25.0	16.7	0.0	100.0	7.5	11.7	9.84
Mar-09	TSF	29.0	6.5	6.9	93.1	5.9	7.4	6.80
Apr-09	TSF	21.0	30.0	0.0	100.0	7.0	13.4	10.68
May-09	TSF	28.0	9.7	0.0	100.0	6.5	9.4	8.00
Jun-09	TSF	13.0	56.7	0.0	100.0	7.2	9.1	8.05

Table 45. Gage 01474000 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days violation	% days compliance	Min.	Max.	Mean
Jul-08	TSF	29.0	6.5	6.9	93.1	5.2	8.8	7.32
Aug-08	TSF	25.0	19.4	0.0	100.0	6.9	8.2	7.74
Sep-08	TSF	19.0	36.7	0.0	100.0	7.1	9.1	8.18
Oct-08	TSF	28.0	9.7	0.0	100.0	8.2	10.9	9.74
Nov-08	TSF	28.0	6.7	0.0	100.0	7.9	12.2	10.25
Mar-09	TSF	20.0	11.7	0.0	100.0	9.8	14.3	12.29
Apr-09	TSF	27.0	10.0	0.0	100.0	7.6	11.1	9.55
May-09	TSF	23.0	25.8	0.0	100.0	7.6	10.0	8.41
Jun-09	TSF	28.0	6.7	0.0	100.0	6.7	8.7	7.72

Table 46. Gage 01473900 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance	Min.	Max.	Mean
Jul-08	740.0	30.8	0.5	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.2	7.55
Aug-08	740.0	30.8	0.5	0.0	0.0	0.0	0.0	100.0	100.0	7.3	8.2	7.63
Sep-08	713.5	29.7	0.9	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.1	7.51
Oct-08	730.0	30.4	1.9	0.0	0.0	0.0	0.0	100.0	100.0	6.9	7.8	7.47
Nov-08	705.5	29.4	2.0	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.0	7.52
Mar-09	740.0	30.8	0.5	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.2	7.55
Apr-09	559.5	23.3	22.3	5.9	36.0	0.0	0.0	94.1	64.0	7.1	9.2	8.00
May-09	728.0	30.3	2.2	0.0	0.0	0.0	0.0	100.0	100.0	7.1	8.3	7.51
Jun-09	418.5	17.4	41.9	0.0	0.0	0.0	0.0	100.0	100.0	7.3	7.7	7.53

Table 47. Gage 01474000 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance	Min.	Max.	Mean
Jul-08	740.5	30.9	0.5	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.6	7.86
Aug-08	718.0	29.9	3.5	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.4	8.08
Sep-08	694.5	28.9	3.5	0.0	0.0	0.0	0.0	100.0	100.0	7.3	8.4	7.95
Oct-08	731.0	30.5	1.7	0.0	0.0	0.0	0.0	100.0	100.0	7.3	8.5	8.02
Nov-08	716.5	29.9	0.5	0.0	0.0	0.0	0.0	100.0	100.0	7.4	8.1	7.80
Mar-09	541.5	22.6	0.4	19.2	39.1	0.0	0.0	80.8	60.9	7.7	9.6	8.66
Apr-09	657.5	27.4	8.7	0.0	0.0	0.0	0.0	100.0	100.0	7.3	8.9	8.04
May-09	634.0	26.4	14.8	0.0	0.0	0.0	0.0	100.0	100.0	7.4	8.3	7.78
Jun-09	717.5	29.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.2	7.78

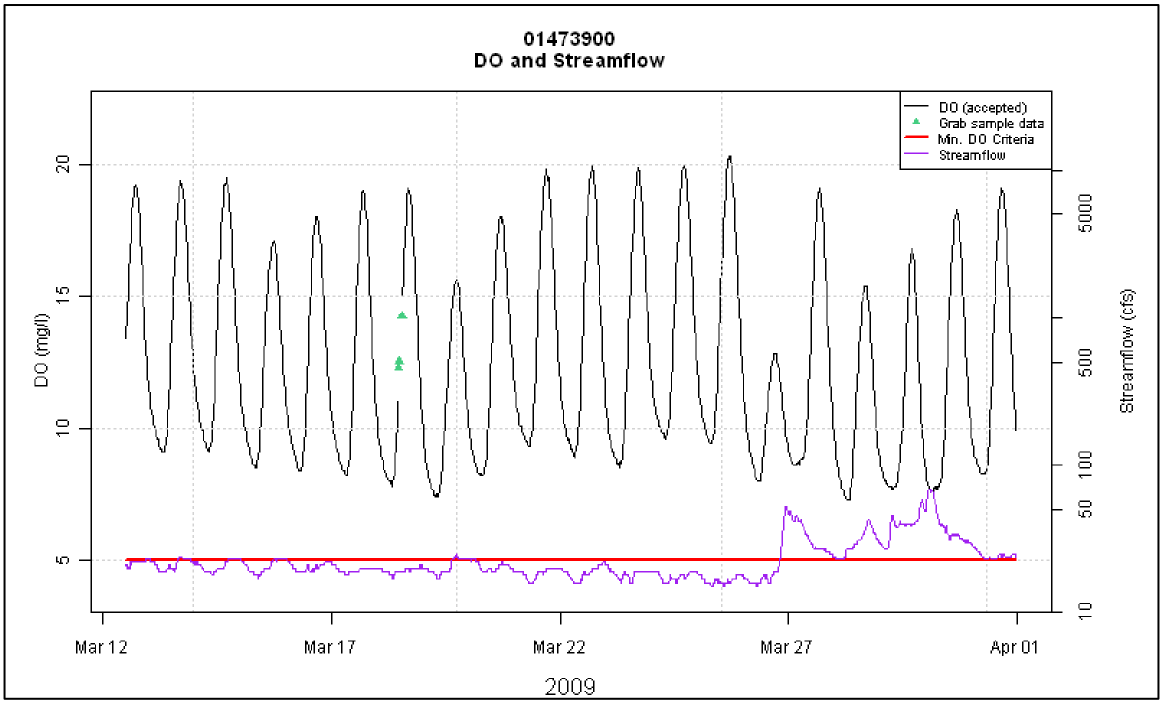


Figure 24. Gage 01473900, Dissolved Oxygen and Streamflow, March 2009.

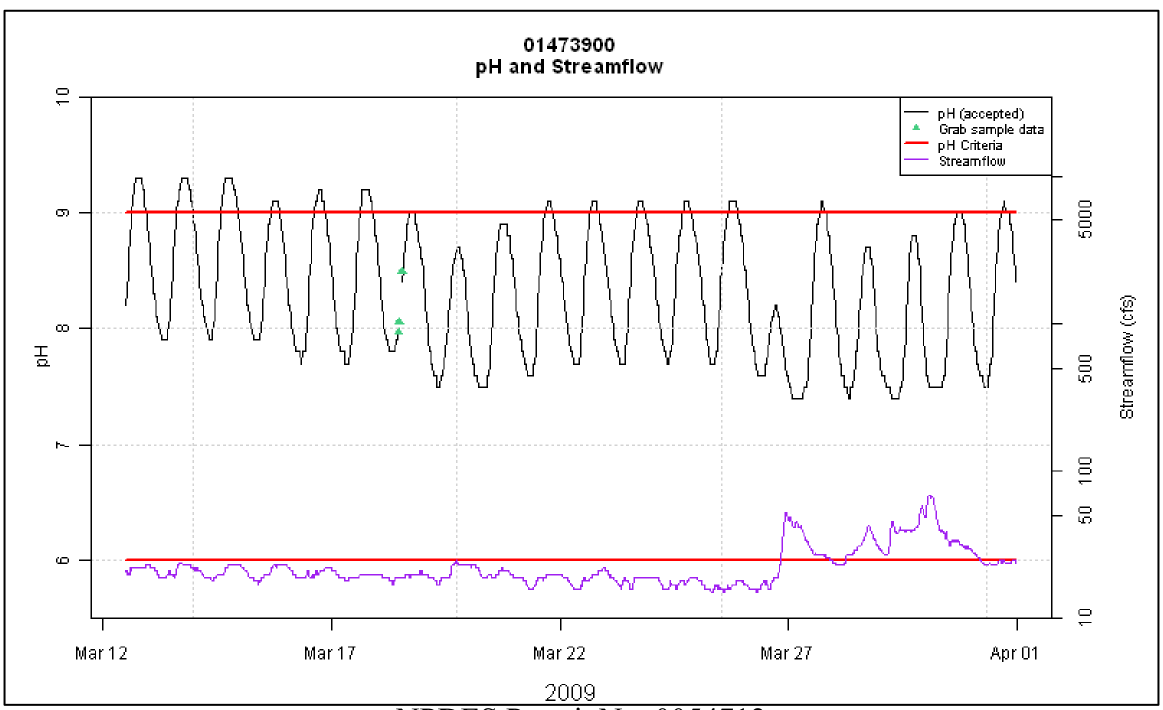


Figure 25. Gage 01473900, pH and Streamflow, March 2009.

Turbidity

Turbidity at this site, as with most of Philadelphia's streams, increases drastically with increased flow from rainfall. During the wet months of March-June 2009, turbidity averaged well above the guideline (Tables 48-49). However, during dry periods between storm events, turbidity quickly decreased. A number of sizeable storm events during July 5-10 (Figure 26) resulted in sharp increases in stream turbidity, however those levels decreased rapidly afterwards as stream flow returned to normal. Such is the case with nearly all storm-related high turbidity events in Philadelphia's streams.

Table 48. Gage 01473900 Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-08	738.5	30.8	0.7	27.2	72.8	1.8	170	11.34
Aug-08	740.0	30.8	0.5	1.6	98.4	0.7	22	3.07
Sep-08	712.5	29.7	1.0	18.0	82.0	0.3	140	7.23
Oct-08	727.0	30.3	2.3	11.1	88.9	0.0	97	4.55
Nov-08	705.5	29.4	2.0	7.3	92.7	0.8	43	4.00
Mar-09	738.5	30.8	0.7	27.2	72.8	1.8	170	11.34
Apr-09	558.5	23.3	22.4	29.6	70.4	0.9	560	14.60
May-09	699.0	29.1	6.0	33.5	66.5	1.7	470	15.73
Jun-09	414.0	17.3	42.5	54.0	46.0	2.8	1160	22.06

Table 49. Gage 01474000 Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-08	735.0	30.6	1.2	17.5	82.5	0.4	1020	19.07
Aug-08	719.0	30.0	3.4	0.9	99.1	0.0	65	2.11
Sep-08	677.5	28.2	5.9	15.1	84.9	0.0	480	12.32
Oct-08	709.0	29.5	4.7	9.0	91.0	0.0	140	4.20
Nov-08	716.5	29.9	0.5	8.1	91.9	0.2	39	3.14
Mar-09	540.5	22.5	0.6	4.1	95.9	0.6	71	2.45
Apr-09	672.5	28.0	6.6	12.1	87.9	0.5	95	6.41
May-09	664.0	27.7	10.8	25.8	74.2	0.4	290	12.33
Jun-09	715.0	29.8	0.7	25.7	74.3	0.2	550	11.56

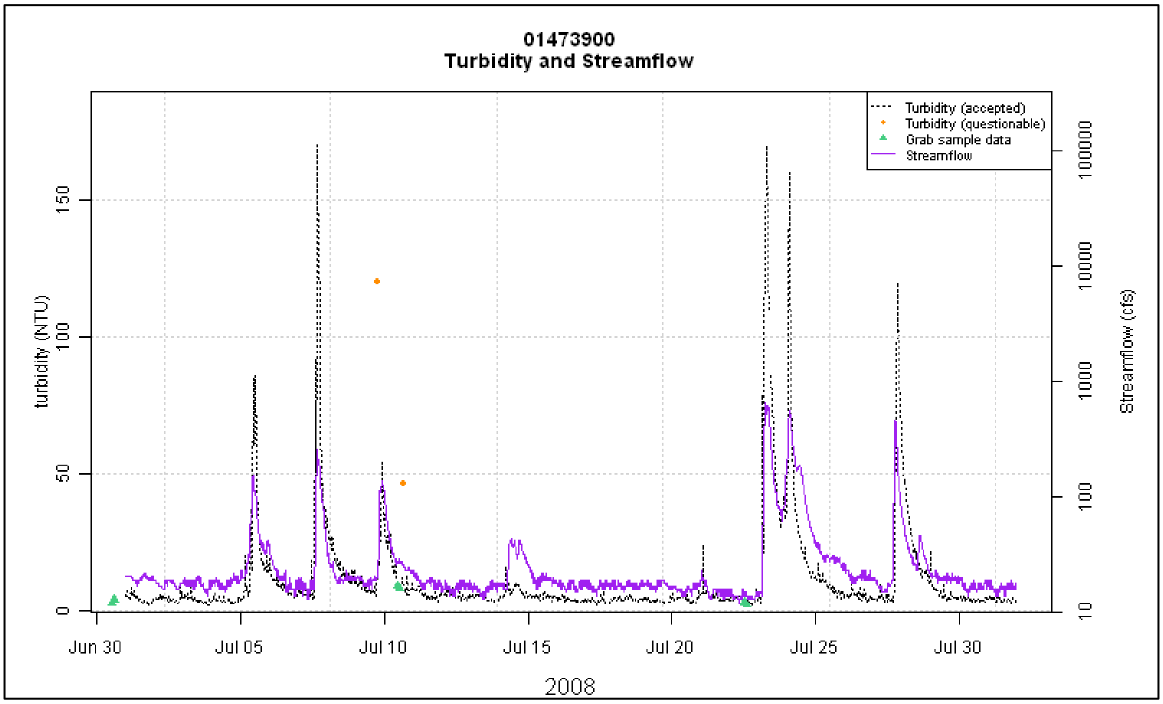


Figure 26. Gage 01473900, Turbidity and Streamflow, July 2008.

Specific Conductance

Table 50. Gage 01473900 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-08	740.0	30.8	0.5	208	1010	728.76
Aug-08	740.0	30.8	0.5	664	1150	919.79
Sep-08	629.0	26.2	12.6	184	1180	740.89
Oct-08	728.0	30.3	2.2	170	1090	837.47
Nov-08	706.5	29.4	1.9	255	870	741.21
Mar-09	740.0	30.8	0.5	208	1010	728.76

Apr-09	559.5	23.3	22.3	488	1170	862.73
May-09	728.0	30.3	2.2	228	952	708.90
Jun-09	418.5	17.4	41.9	358	833	657.80

Table 51. Gage 01474000 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-08	740.5	30.9	0.5	255	840	638.22
Aug-08	540.5	22.5	27.4	645	888	807.48
Sep-08	692.5	28.9	3.8	238	999	648.58
Oct-08	732.0	30.5	1.6	230	904	727.56
Nov-08	717.0	29.9	0.4	288	813	676.74
Mar-09	541.5	22.6	0.4	740	1180	981.63
Apr-09	719.0	30.0	0.1	515	1100	794.21
May-09	685.5	28.6	7.9	225	813	656.61
Jun-09	717.5	29.9	0.3	159	761	597.40

Temperature

Temperature trends and exceedance rates in Wissahickon Creek Watershed were similar to those observed in Pennypack Creek (Tables 52-53, Figures 27-28).

Table 52. Gage 01473900 Temperature Summary Results by Month by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. compliance	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
TSF	1-Jul	31-Jul	56.5	43.5	0.7	738.5	30.8	20.7	27.7	23.40
TSF	1-Aug	15-Aug	0.0	100.0	0.8	357.0	14.9	18.3	26.1	21.64
TSF	16-Aug	31-Aug	0.0	100.0	0.7	381.5	15.9			
TSF	1-Sep	15-Sep	0.0	100.0	0.4	358.5	14.9	15.5	24.5	20.02
TSF	16-Sep	30-Sep	0.0	100.0	1.8	353.5	14.7			
TSF	1-Oct	15-Oct	0.0	100.0	1.0	356.5	14.9	6.7	18.9	13.62
TSF	16-Oct	31-Oct	0.0	100.0	2.9	373.0	15.5			
TSF	1-Nov	15-Nov	22.8	77.2	1.1	356.0	14.8	3.5	16.0	9.36
TSF	16-Nov	30-Nov	7.1	92.9	2.6	350.5	14.6			
TSF	1-Jul	31-Jul	56.5	43.5	0.7	738.5	30.8	20.7	27.7	23.40
TSF	1-Apr	15-Apr	35.8	64.2	27.5	261.0	10.9	7.2	23.0	13.07
TSF	16-Apr	30-Apr	52.6	47.4	17.1	298.5	12.4			
TSF	1-May	15-May	4.5	95.5	4.4	344.0	14.3	11.8	21.8	16.30
TSF	16-May	31-May	9.4	90.6	0.1	383.5	16.0			
TSF	1-Jun	15-Jun	0.0	100.0	62.8	134.0	5.6	15.6	22.0	18.70
TSF	16-Jun	30-Jun	0.0	100.0	21.0	284.5	11.9			

Table 53. Gage 01474000 Temperature Summary Results by Month by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. compliance	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
TSF	1-Jul	31-Jul	72.0	28.0	0.5	740.5	30.9	21.3	27.5	23.92
TSF	1-Aug	15-Aug	0.0	100.0	0.8	357.0	14.9	18.8	26.2	22.06
TSF	16-Aug	31-Aug	0.0	100.0	5.5	363.0	15.1			
TSF	1-Sep	15-Sep	0.0	100.0	3.3	348.0	14.5	16.1	24.9	19.96
TSF	16-Sep	30-Sep	0.0	100.0	0.7	357.5	14.9			
TSF	1-Oct	15-Oct	0.0	100.0	0.3	359.0	15.0	6.5	18.9	13.17
TSF	16-Oct	31-Oct	0.0	100.0	2.9	373.0	15.5			
TSF	1-Nov	15-Nov	9.3	90.7	0.4	358.5	14.9	2.5	14.4	8.45
TSF	16-Nov	30-Nov	8.9	91.1	0.4	358.5	14.9			
TSF	1-Mar	31-Mar	68.9	31.1	1.9	541.5	22.6	5.9	12.4	8.91
TSF	1-Apr	15-Apr	45.6	54.4	0.0	360.0	15.0	8.0	22.5	12.89
TSF	16-Apr	30-Apr	46.5	53.5	0.3	359.0	15.0			
TSF	1-May	15-May	2.1	97.9	0.3	359.0	15.0	13.0	22.4	16.76
TSF	16-May	31-May	14.2	85.8	15.0	326.5	13.6			
TSF	1-Jun	15-Jun	1.8	98.2	0.3	359.0	15.0	15.8	23.3	19.25
TSF	16-Jun	30-Jun	13.8	86.2	0.4	358.5	14.9			

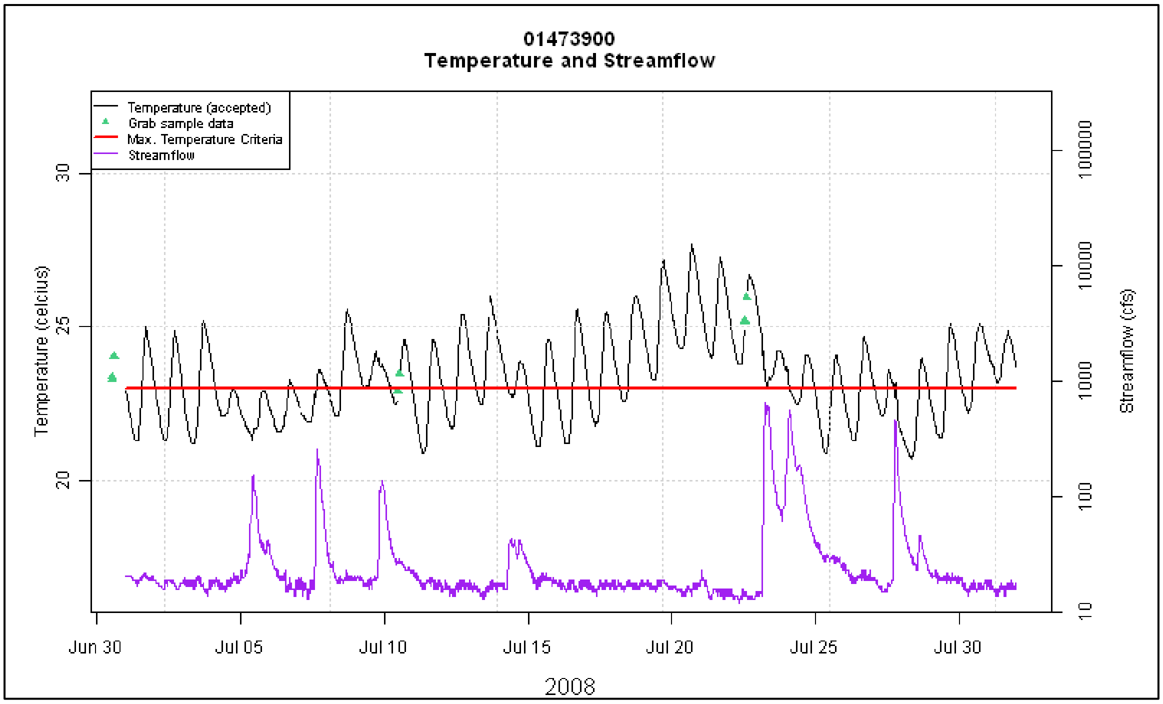


Figure 27. Gage 01473900, Temperature and Streamflow, July 2008.

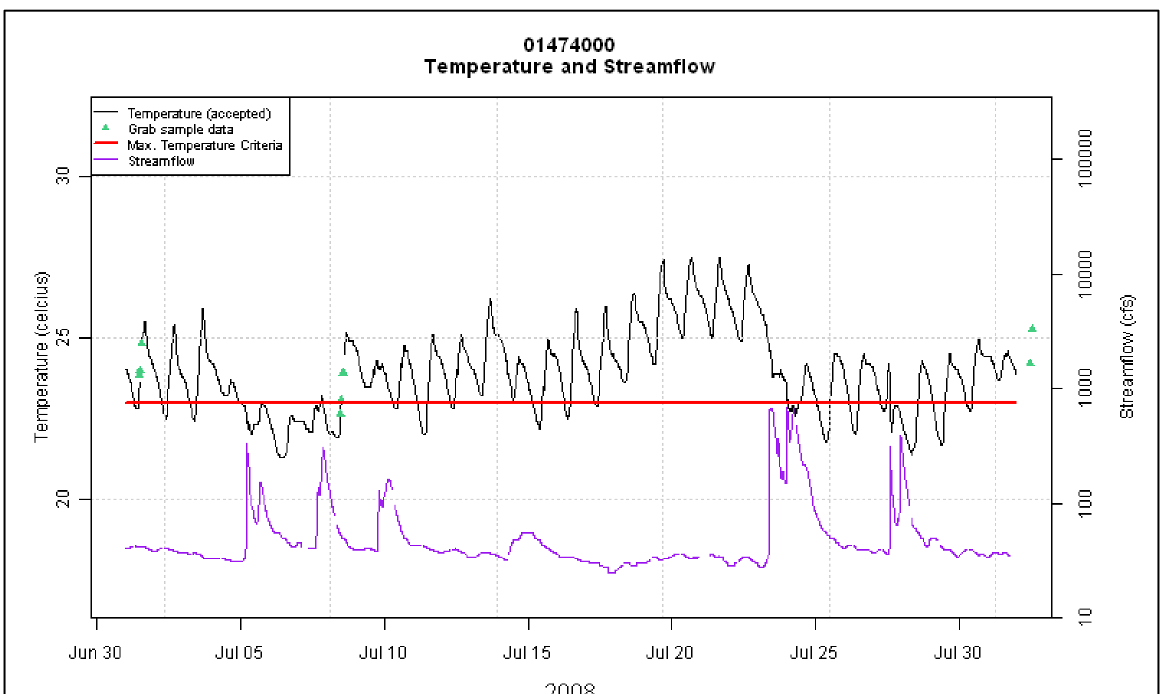


Figure 28. Gage 01474000, Temperature and Streamflow, July 2008.

Poquesssing Creek (Gage 01465798)

Dissolved oxygen and pH

Dissolved oxygen and pH at this gage site were well within acceptable ranges and almost never fell below the minimum criterion (Tables 54-59). Data collected from Poquessing Creek did exhibit classic signs of algal activity, as indicated by diel fluctuations in both DO and pH (Figures 29-30).

As seen with previous sites, the algal activity and related diel fluctuations in DO and pH are only suppressed by storm events. These suppressions, however, are only very temporary. Given an adequate period of uninterrupted algal growth, such as July 10-23 (Figures 29-30), one can expect steadily increasing DO & pH fluctuations. While there were no maximum pH violations at these particular sites, it is clear that lengthy periods of dry weather and algal growth raise diel pH peaks close to 9.0, as seen on July 23 (Figure 30).

Table 54. Gage 01465798 Dissolved Oxygen Min. Criteria Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance	Min	Max	Mean
Jul-08	WWF	738.0	30.8	0.8	0.0	100.0	4.4	11.2	6.94
Aug-08	WWF	740.5	30.9	0.5	0.0	100.0	4.7	11.5	7.34
Sep-08	WWF	648.5	27.0	9.9	0.2	99.8	3.7	13.5	7.75
Oct-08	WWF	732.5	30.5	1.5	0.0	100.0	6.4	12.8	9.19
Nov-08	WWF	707.0	29.5	1.8	0.0	100.0	6.4	12.8	9.67
Mar-09	WWF	518.5	21.6	0.3	0.0	100.0	7.9	17.0	11.63
Apr-09	WWF	671.0	28.0	6.8	0.1	99.9	3.8	16.7	9.49
May-09	WWF	742.5	30.9	0.2	0.0	100.0	4.2	11.2	7.81
Jun-09	WWF	606.5	25.3	15.8	0.0	100.0	5.1	10.5	7.56

Table 55. Gage 01465798 Dissolved Oxygen Mean Criteria Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days violation	% days compliance	Min.	Max.	Mean
Jul-08	WWF	28.0	9.7	0.0	100.0	6.2	7.8	6.95
Aug-08	WWF	28.0	9.7	0.0	100.0	6.2	8.1	7.32
Sep-08	WWF	24.0	20.0	0.0	100.0	5.3	9.8	7.71
Oct-08	WWF	28.0	9.7	0.0	100.0	7.7	10.7	9.17
Nov-08	WWF	26.0	13.3	0.0	100.0	7.1	12.3	9.66
Mar-09	WWF	19.0	12.3	0.0	100.0	9.3	13.4	11.67
Apr-09	WWF	27.0	10.0	0.0	100.0	6.8	11.6	9.51

May-09	WWF	29.0	6.5	0.0	100.0	6.0	8.9	7.74
Jun-09	WWF	22.0	26.7	0.0	100.0	6.6	8.1	7.52

Table 56. Gage 01465798 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance	Min.	Max.	Mean
Jul-08	738.5	30.8	0.7	0.0	0.0	0.0	0.0	100.0	100.0	6.7	8.9	7.27
Aug-08	740.5	30.9	0.5	0.0	0.0	0.0	0.0	100.0	100.0	6.4	8.2	7.16
Sep-08	717.5	29.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	6.1	8.6	7.10
Oct-08	732.5	30.5	1.5	0.0	0.0	0.0	0.0	100.0	100.0	6.7	7.6	7.01
Nov-08	716.0	29.8	0.6	0.0	0.0	0.0	0.0	100.0	100.0	6.6	7.2	6.93
Mar-09	517.5	21.6	0.5	0.0	0.0	0.0	0.0	100.0	100.0	6.9	8.6	7.38
Apr-09	671.0	28.0	6.8	0.0	0.0	0.0	0.0	100.0	100.0	6.6	9.0	7.35
May-09	742.5	30.9	0.2	0.0	0.0	0.0	0.0	100.0	100.0	6.6	7.5	7.17
Jun-09	606.5	25.3	15.8	0.0	0.0	0.0	0.0	100.0	100.0	6.6	7.8	7.21

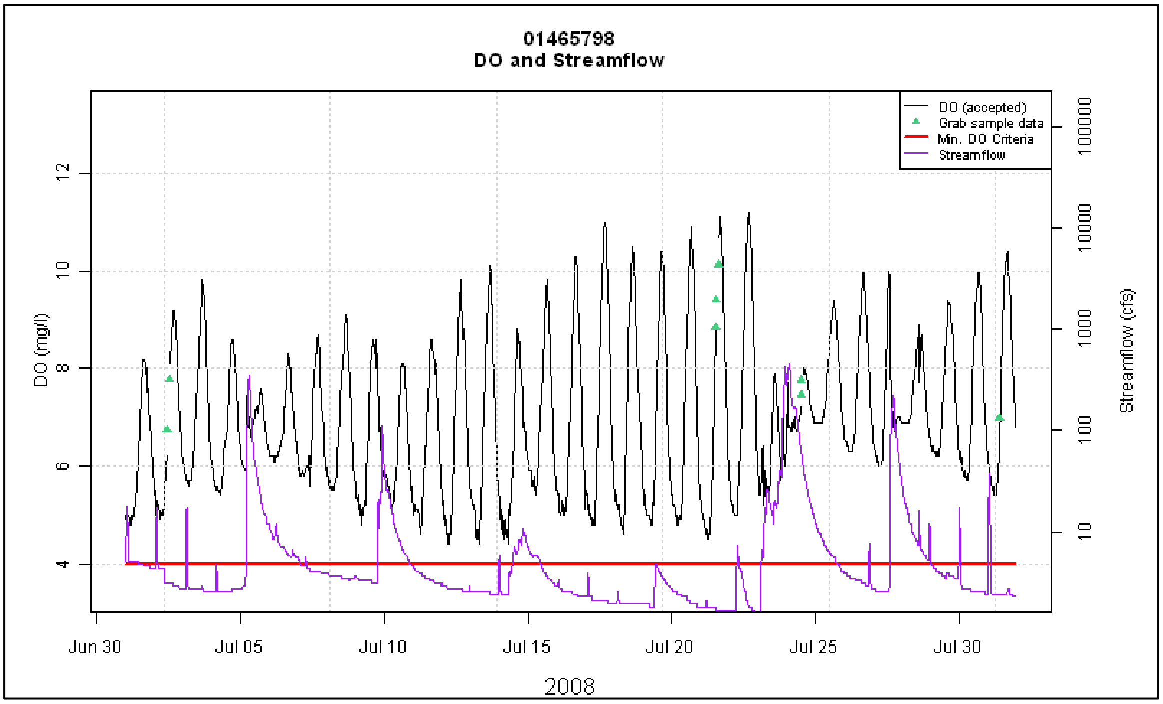


Figure 29. Gage 01465798, Dissolved Oxygen and Streamflow, July 2008.

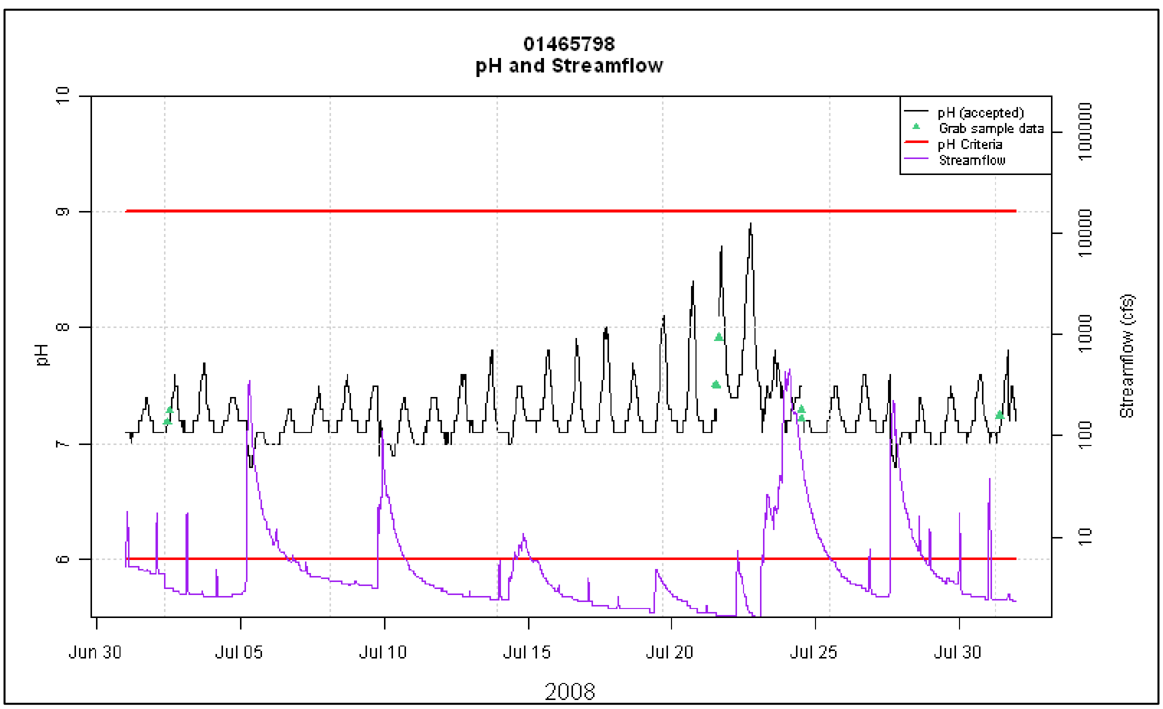


Figure 30. Gage 01465798, pH and Streamflow, July 2008.

Turbidity

Table 57. Gage 01465798 Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-08	735.5	30.6	1.1	12.7	87.3	0.0	660.0	7.16
Aug-08	740.0	30.8	0.5	4.7	95.3	0.6	240.0	3.17
Sep-08	714.5	29.8	0.8	18.2	81.8	0.5	190.0	7.33
Oct-08	732.0	30.5	1.6	15.4	84.6	0.1	270.0	7.42
Nov-08	627.0	26.1	12.9	4.6	95.4	0.3	76.0	2.64
Mar-09	502.0	20.9	3.5	18.2	81.8	0.0	370.0	5.24
Apr-09	643.5	26.8	10.6	40.0	60.0	1.7	210.0	11.99
May-09	648.5	27.0	12.8	38.5	61.5	0.6	510.0	28.18
Jun-09	604.0	25.2	16.1	28.8	71.2	0.7	500.0	13.70

Specific Conductance

Table 58. Gage 01465798 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-08	738.0	30.8	0.8	113	644	418.71
Aug-08	740.0	30.8	0.5	209	611	491.01
Sep-08	718.0	29.9	0.3	6.6	632	360.54
Oct-08	682.5	28.4	8.3	72	699	468.13
Nov-08	716.0	29.8	0.6	117	588	399.99
Mar-09	517.5	21.6	0.5	352	1490	977.13
Apr-09	671.0	28.0	6.8	154	861	599.59
May-09	742.5	30.9	0.2	72	659	447.81
Jun-09	607.0	25.3	15.7	79	592	384.10

Temperature

Temperature exceedance rates observed in Poquessing Creek were similar to those in other WWF designated use creeks (*e.g.*, Tacony and Cobbs Creeks).

Table 59. Gage 01465798 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. compliance	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
WWF	1-Jul	31-Jul	0.0	100.0	0.7	738.5	30.8	21.1	29.4	24.12
WWF	1-Aug	15-Aug	0.0	100.0	0.6	358.0	14.9	18.5	27.9	22.10
WWF	16-Aug	31-Aug	0.0	100.0	0.4	382.5	15.9			
WWF	1-Sep	15-Sep	0.0	100.0	1.4	355.0	14.8	15.2	25.9	20.01
WWF	16-Sep	30-Sep	0.0	100.0	0.7	357.5	14.9			
WWF	1-Oct	15-Oct	0.0	100.0	0.4	358.5	14.9	5.5	19.2	13.18
WWF	16-Oct	31-Oct	0.0	100.0	2.7	373.5	15.6			
WWF	1-Nov	15-Nov	19.9	80.1	0.3	359.0	15.0	1.0	16.8	8.33
WWF	16-Nov	30-Nov	6.2	93.8	0.8	357.0	14.9			
WWF	1-Mar	31-Mar	56.5	43.5	1.8	518.5	21.6	3.7	13.9	8.54
WWF	1-Apr	15-Apr	45.3	54.7	13.6	311.0	13.0	6.8	24.4	13.12
WWF	16-Apr	30-Apr	53.6	46.4	0.0	360.0	15.0			
WWF	1-May	15-May	9.1	90.9	0.4	358.5	14.9	11.9	23.1	16.75
WWF	16-May	31-May	3.3	96.7	0.1	383.5	16.0			
WWF	1-Jun	15-Jun	0.0	100.0	31.1	248.0	10.3	15.8	24.1	19.69
WWF	16-Jun	30-Jun	0.0	100.0	0.4	358.5	14.9			

Gages in Large Watersheds

Schuylkill River (Gage 01474500)

Dissolved oxygen and pH

DO criteria were never violated at this location (Tables 60-61). pH criteria were exceeded in March due to an apparent algal bloom (Table 62). Supersaturated DO conditions were observed concomitant with pH above 9.0 for most of March (Figure 31), indicating high algal activity.

Table 60. Gage 01474500 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance	Min	Max	Mean
Mar-09	WWF	434.5	18.1	1.7	0.0	100.0	10.5	16.3	13.06
Apr-09	WWF	714.0	29.8	0.8	0.0	100.0	9.5	14.9	11.32
May-09	WWF	739.5	30.8	0.6	0.0	100.0	7.7	11.6	8.98
Jun-09	WWF	712.0	29.7	1.1	0.0	100.0	7.4	10.1	8.45

Table 61. Gage 01474500 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days violation	% days compliance	Min.	Max.	Mean
Mar-09	WWF	13.0	29.4	0.0	100.0	11.1	14.1	12.99
Apr-09	WWF	24.0	20.0	0.0	100.0	9.8	13.1	11.32
May-09	WWF	25.0	19.4	0.0	100.0	8.1	10.3	9.02
Jun-09	WWF	22.0	26.7	0.0	100.0	7.7	9.3	8.45

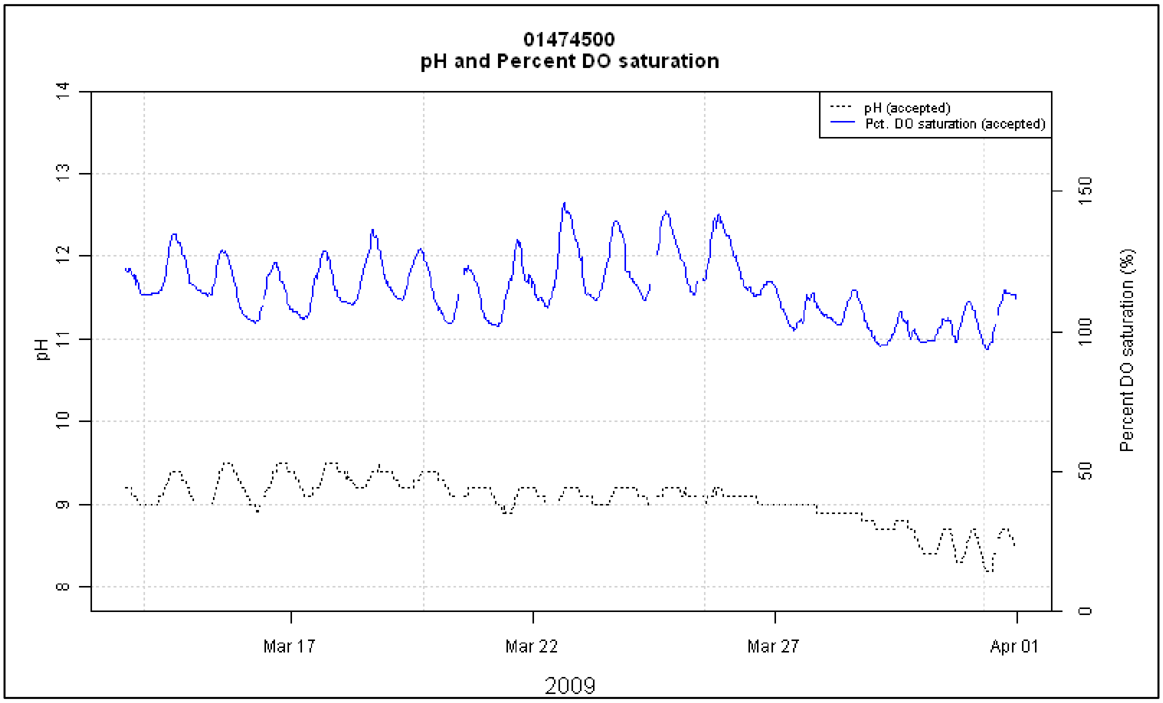


Figure 31. Gage 01474500, pH and Percent Dissolved Oxygen Saturation, March 2009.

Table 62. Gage 01474500 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance	Min.	Max.	Mean
Mar-09	434.0	18.1	1.8	58.1	73.7	0.0	0.0	41.9	26.3	8.2	9.5	9.06
Apr-09	715.0	29.8	0.7	1.7	10.0	0.0	0.0	98.3	90.0	7.4	9.2	8.13
May-09	737.5	30.7	0.9	0.0	0.0	0.0	0.0	100.0	100.0	7.3	8.8	7.65
Jun-09	712.0	29.7	1.1	0.0	0.0	0.0	0.0	100.0	100.0	7.4	8.1	7.62

Temperature

Table 63. Gage 01474500 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. compliance	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
WWF	1-Mar	31-Mar	100.0	0.0	4.8	434.0	18.1	8.3	11.9	9.79
WWF	1-Apr	15-Apr	42.3	57.7	1.3	355.5	14.8	9.1	21.8	13.08
WWF	16-Apr	30-Apr	47.3	52.7	0.4	358.5	14.9			
WWF	1-May	15-May	22.8	77.2	0.7	357.5	14.9	13.5	24.1	18.58
WWF	16-May	31-May	14.5	85.5	1.3	379.0	15.8			
WWF	1-Jun	15-Jun	0.0	100.0	1.4	355.0	14.8	17.8	25.2	21.07
WWF	16-Jun	30-Jun	0.0	100.0	1.4	355.0	14.8			

Turbidity

Table 64. Gage 01474500 Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Mar-09	434.0	18.1	1.8	0.9	99.1	2.3	11	3.53
Apr-09	713.5	29.7	0.9	12.8	87.2	3.1	72	7.43
May-09	728.5	30.4	2.1	44.3	55.7	4.3	180	13.41
Jun-09	705.5	29.4	2.0	57.5	42.5	3.5	83	11.54

Specific Conductance

Table 65. Gage 01474500 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Mar-09	434.0	18.1	1.8	499	543	517.11
Apr-09	713.5	29.7	0.9	316	531	405.50
May-09	725.0	30.2	2.6	188	453	358.69
Jun-09	712.0	29.7	1.1	237	416	341.38

Delaware River (Gage 01467200)

Dissolved oxygen and pH

The DRBC DO daily mean criterion of 3.5mg/L was met July 2008-June 2009 with the exception of one day (Table 66). The single violation occurred in July 2008 (Figure 32). However, although there is no DRBC criterion for minimum DO at this gage, it is worth noting that DO less than 3 mg/L was observed in three separate days in July 2008, with a minimum observation of 2.5 mg/L (Figure 33).

The pH criteria were never exceeded (Table 67).

Table 66. Gage 01467200 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days violation	% days compliance	Daily Avg. Min.	Daily Avg. Max.	Daily Avg. Mean	Min.	Max
Jul-08	DRBC	24	22.6	4.2	95.8	3.39	4.49	3.99	2.5	5.2
Aug-08	DRBC	23	25.8	0.0	100.0	4.18	4.98	4.60	3.5	5.4
Sep-08	DRBC	27	10.0	0.0	100.0	3.95	5.54	4.71	3.5	5.9
Oct-08	DRBC	28	9.7	0.0	100.0	5.37	9.11	6.47	4.9	9.6
Nov-08	DRBC	29	3.3	0.0	100.0	8.42	10.68	9.39	8.1	11.2

Apr-09	DRBC	14	53.3	0.0	100.0	7.62	9.44	8.74	6.3	9.8
May-09	DRBC	29	6.5	0.0	100.0	5.66	7.50	6.59	4.7	8.3
Jun-09	DRBC	29	3.3	0.0	100.0	5.53	7.42	6.43	4.5	8.3

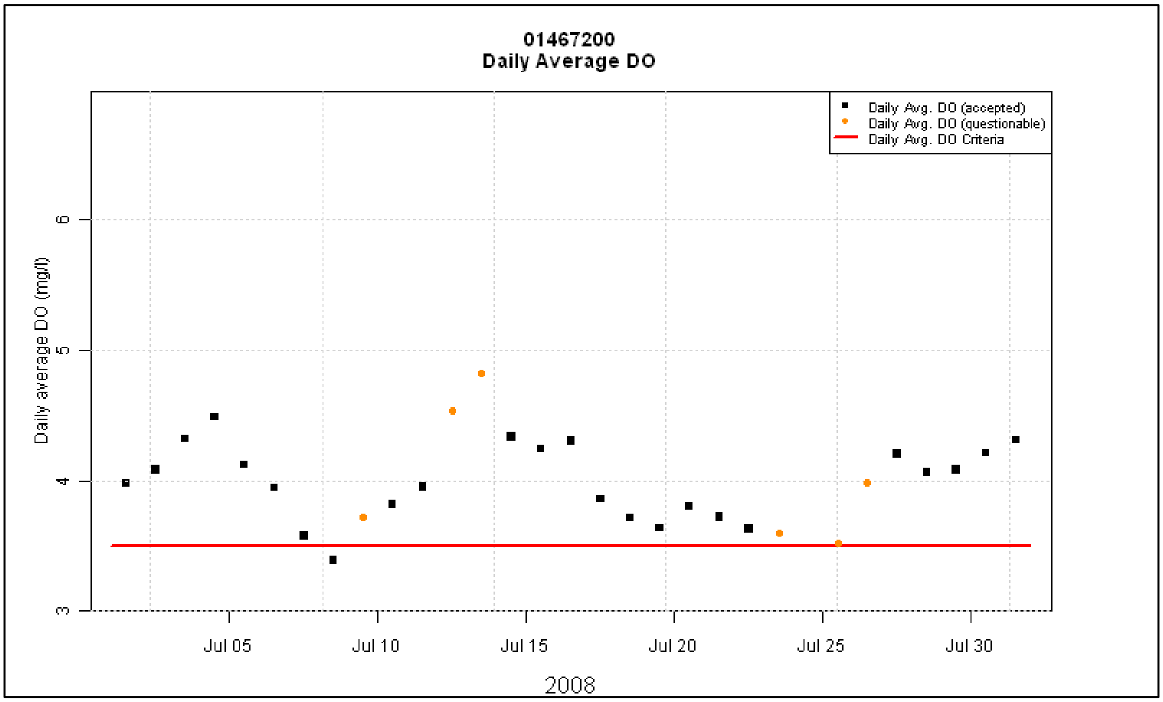


Figure 32. Gage 01467200, Daily Average Dissolved Oxygen, July 2008.

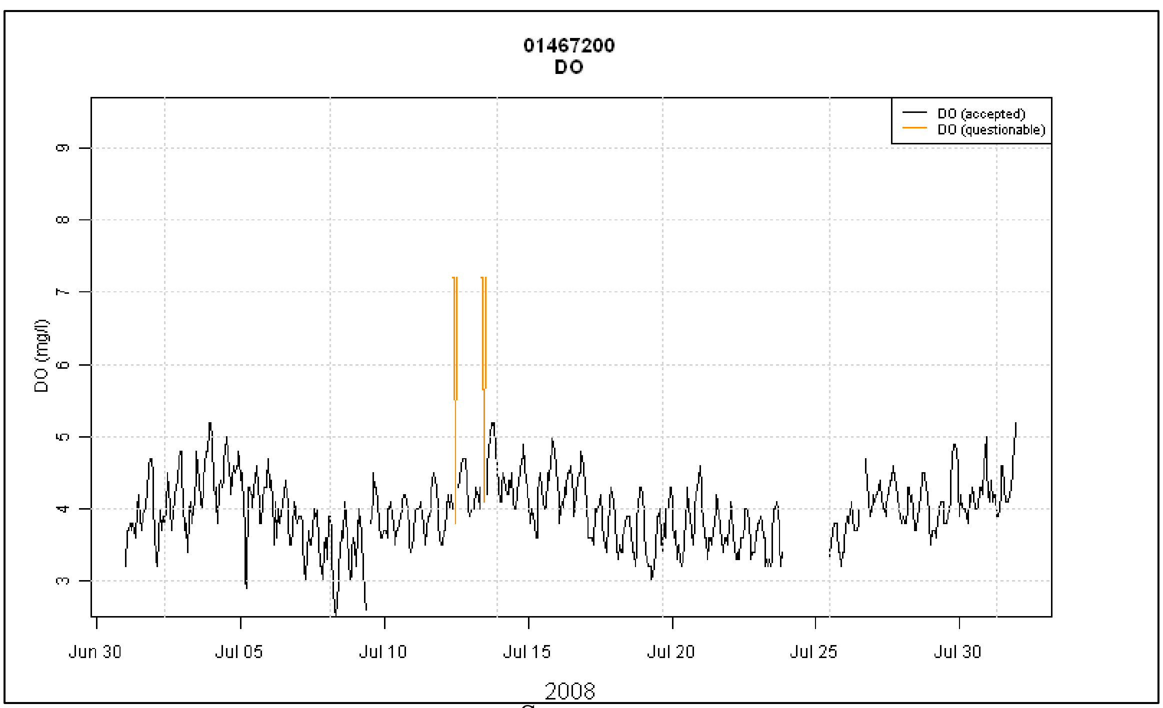


Figure 33. Gage 01467200, Dissolved Oxygen, July 2008.

Table 67. Gage 01467200 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance	Min.	Max.	Mean
Jul-08	693.0	28.9	6.9	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.3	7.16
Aug-08	697.0	29.0	6.3	0.0	0.0	0.0	0.0	100.0	100.0	6.9	7.2	7.09
Sep-08	184.0	7.7	74.4	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.2	7.13
Oct-08	384.0	8.0	74.2	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.6	7.34
Nov-08	1439.0	30.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.4	7.22
Apr-09	1392.0	29.0	3.3	0.0	0.0	0.0	0.0	100.0	100.0	7.2	7.6	7.38
May-09	1485.0	30.9	0.2	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.5	7.29
Jun-09	1439.0	30.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.2	7.6	7.30

Temperature

Table 68. Gage 01467200 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. compliance	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
DRBC	1-Jul	31-Jul	0.0	100.0	13.6	643.0	26.8	26.1	28.5	27.25
DRBC	1-Aug	31-Aug	0.0	100.0	2.2	728.0	30.3	24.9	27.6	25.85
DRBC	1-Sep	30-Sep	0.0	100.0	3.0	698.5	29.1	21.1	25.8	23.72
DRBC	1-Oct	31-Oct	0.0	100.0	1.8	1461.0	30.4	10.1	21.3	17.78
DRBC	1-Nov	30-Nov	0.0	100.0	0.1	1439.0	30.0	5.2	11.2	9.08
DRBC	1-Apr	30-Apr	0.0	100.0	8.8	1314.0	27.4	9.5	16.1	11.44
DRBC	1-May	31-May	0.0	100.0	0.2	1485.0	30.9	15.7	20.8	18.01
DRBC	1-Jun	30-Jun	0.0	100.0	0.1	1439.0	30.0	18.6	22.9	20.55

Specific Conductance

Monthly mean concentrations observed at this gage were lower than those observed in all other gages described in the report.

Table 69. Gage 01467200 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-08	706.0	29.4	5.1	243	311	287.03
Aug-08	726.0	30.3	2.4	204	281	238.23
Sep-08	697.0	29.0	3.2	254	322	281.19
Oct-08	1461.0	30.4	1.8	222	341	291.77
Nov-08	1439.0	30.0	0.1	171	233	198.65
Apr-09	1393.0	29.0	3.3	201	248	224.84
May-09	1484.0	30.9	0.3	176	266	228.72
Jun-09	1439.0	30.0	0.1	148	235	188.33

Turbidity

Table 70. Gage 01467200 Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Oct-08	116	4.8	92.2	81.0	19.0	3.3	22.0	11.83
Nov-08	715	29.8	50.3	87.0	13.0	3.1	23.0	11.67
Apr-09	705	29.4	2.1	16.5	83.5	1.9	80.0	6.31
May-09	736	30.9	0.4	24.8	75.2	1.7	96.0	7.40
Jun-09	717.5	29.9	0.3	20.8	79.2	1.5	20.0	6.37

Wet Weather and Dry Weather Results

Annual Summary, July 2008 - June 2009

Water quality data was also categorized as wet or dry for the purpose of evaluating weather effects on water quality, and specifically the incidence of violations of water quality criteria. A wet weather condition was defined as rainfall greater than 0.05 inches in the preceding 72 hours, as measured at the nearest PWD rain gage.

In general, more frequent violations of DO criteria were observed in wet weather due to the tendency of storm events to decrease DO via the introduction of stormwater runoff and BOD (Tables 71-74). The pH maximum criterion was more frequently violated in dry weather due to the effect of algal growth (Tables 75-76). The turbidity maximum guideline was more frequently surpassed in wet weather (Tables 77-78). Temperature criteria violation frequencies were generally similar in dry and wet weather conditions (Tables 81-82).

Table 71. USGS Gage July 2008 - June 2009 Dissolved Oxygen Minimum Criterion Summary Results During Wet Weather

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance
01465798	WWF	3537.5	147.4	2.3	0.0	100.0
01467042	TSF	3538.0	147.4	5.3	0.0	100.0
01467048	TSF	3609.5	150.4	1.0	0.0	100.0
01467086	WWF	3651.0	152.1	4.1	0.4	99.6
01467087	WWF	2781.0	115.9	28.1	20.9	79.1
01467200	DRBC	N/A*				
01473900	TSF	3313.0	138.0	1.3	0.2	99.8
01474000	TSF	3609.0	150.4	7.1	0.5	99.5
01474500	WWF	1802.0	75.1	0.9	0.0	100.0
01475530	WWF	3919.5	163.3	0.2	0.0	100.0
01475548	WWF	3255.5	135.6	10.1	1.6	98.4

*No minimum DO criterion applies at this location.

Table 72. USGS Gage July 2008 - June 2009 Dissolved Oxygen Minimum Criterion Summary Results During Dry Weather

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. violation	% hrs. compliance
01465798	WWF	2567.5	107.0	0.7	0.0	100.0
01467042	TSF	2516.5	104.9	2.1	0.0	100.0
01467048	TSF	2580.5	107.5	0.2	0.0	100.0
01467086	WWF	2378.5	99.1	3.3	0.0	100.0
01467087	WWF	2319.5	96.6	7.2	8.5	91.5
01467200	DRBC	N/A*				
01473900	TSF	2463.5	102.6	0.7	1.9	98.1
01474000	TSF	2516.5	104.9	2.8	0.0	100.0
01474500	WWF	798.0	33.3	1.1	0.0	100.0
01475530	WWF	2410.0	100.4	5.6	0.0	100.0
01475548	WWF	2734.0	113.9	2.4	0.1	99.9

*No minimum DO criterion applies at this location.

Table 73. USGS Gage July 2008 - June 2009 Dissolved Oxygen Daily Mean Criterion Summary Results During Wet Weather

Gage number	Designated Use	Total days accepted data	% days flagged data	% days violation	% days compliance
01465798	WWF	135.0	2.9	0.0	100.0
01467042	TSF	135.0	5.6	0.0	100.0
01467048	TSF	137.0	1.4	0.0	100.0
01467086	WWF	141.0	6.0	0.7	99.3
01467087	WWF	89.0	40.3	33.7	66.3
01467200	DRBC	117.0	11.4	0.9	99.1
01473900	TSF	125.0	1.6	1.6	98.4
01474000	TSF	136.0	8.7	1.5	98.5
01474500	WWF	72.0	0.0	0.0	100.0
01475530	WWF	154.0	0.0	0.0	100.0
01475548	WWF	125.0	11.3	7.2	92.8

Table 74. USGS Gage July 2008 - June 2009 Dissolved Oxygen Daily Mean Criterion Summary Results During Dry Weather

Gage number	Designated Use	Total days accepted data	% days flagged data	% days violation	% days compliance
01465798	WWF	94.0	1.1	0.0	100.0
01467042	TSF	92.0	3.2	0.0	100.0
01467048	TSF	95.0	0.0	0.0	100.0
01467086	WWF	87.0	4.4	0.0	100.0
01467087	WWF	82.0	9.9	13.4	86.6
01467200	DRBC	87.0	3.3	0.0	100.0
01473900	TSF	92.0	0.0	0.0	100.0
01474000	TSF	92.0	5.2	0.0	100.0
01474500	WWF	27.0	0.0	0.0	100.0
01475530	WWF	90.0	6.3	0.0	100.0
01475548	WWF	104.0	2.8	0.0	100.0

Table 75. USGS Gage July 2008 - June 2009 pH Criteria Summary Results During Wet Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance
01465798	3606.0	150.3	0.4	0.0	0.0	0.0	0.0	100.0	100.0
01467042	3722.0	155.1	0.4	0.0	0.0	0.0	0.0	100.0	100.0
01467048	3630.0	151.3	0.5	0.2	1.1	0.0	0.0	99.8	98.9
01467086	3754.5	156.4	1.4	2.0	9.5	0.0	0.0	98.0	90.5
01467087	3779.5	157.5	2.3	0.0	0.0	0.0	0.0	100.0	100.0
01467200	1841.0	76.7	20.7	0.0	0.0	0.0	0.0	100.0	100.0
01473900	3338.0	139.1	0.6	0.8	6.6	0.0	0.0	99.2	93.4
01474000	3706.0	154.4	4.6	1.6	2.2	0.0	0.0	98.4	97.8
01474500	1801.0	75.0	1.0	4.0	7.2	0.0	0.0	96.0	92.8
01475530	3918.0	163.3	0.3	0.1	0.5	0.0	0.0	99.9	99.5
01475548	3559.5	148.3	1.7	1.0	2.9	0.0	0.0	99.0	97.1

Table 76. USGS Gage July 2008 - June 2009 pH Criteria Summary Results During Dry Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. violation	% days max. violation	% hrs. min. violation	% days min. violation	% hrs. compliance	% days compliance
01465798	2576.5	107.4	0.4	0.0	0.0	0.0	0.0	100.0	100.0
01467042	2557.0	106.5	0.5	0.0	0.0	0.0	0.0	100.0	100.0
01467048	95.0	0.0	0.0	100.0	14.9	0.0	0.0	94.7	85.1
01467086	2397.5	99.9	2.6	3.7	16.4	0.0	0.0	96.3	83.6
01467087	2430.5	101.3	2.8	0.0	0.0	0.0	0.0	100.0	100.0
01467200	1266.5	52.8	35.7	0.0	0.0	0.0	0.0	100.0	100.0
01473900	2463.5	102.6	0.7	2.4	10.4	0.0	0.0	97.6	89.6
01474000	2519.5	105.0	2.7	4.1	6.8	0.0	0.0	95.9	93.2
01474500	797.5	33.2	1.2	24.1	31.1	0.0	0.0	75.9	68.9
01475530	2410.0	100.4	5.6	0.2	1.6	0.0	0.0	99.8	98.4
01475548	2739.5	114.1	2.2	5.3	9.9	0.0	0.0	94.7	90.1

Table 77. USGS Gage July 2008 - June 2009 Turbidity Summary Results During Wet Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline
01465798	3422.0	142.6	5.4	30.5	69.5
01467042	3677.0	153.2	1.6	27.8	72.2
01467048	3617.5	150.7	0.8	31.9	68.1
01467086	N/A*				
01467087	N/A*				
01467200	1128.5	47.0	0.8	19.4	80.6
01473900	3298.5	137.4	1.8	31.3	68.7
01474000	3691.5	153.8	4.9	21.2	78.8
01474500	1784.0	74.3	1.9	43.5	56.5
01475530	N/A*				
01475548	N/A*				

*Turbidity not continuously monitored at this location

Table 78. USGS Gage July 2008 - June 2009 Turbidity Summary Results During Dry Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline
01465798	2501.5	104.2	3.3	4.2	95.8
01467042	2492.0	103.8	3.0	5.4	94.6
01467048	2579.0	107.5	0.3	2.4	97.6
01467086	N/A*				
01467087	N/A*				
01467200	364.0	15.2	0.8	24.4	75.6
01473900	2459.5	102.5	0.8	3.2	96.8
01474000	2531.0	105.5	2.3	1.4	98.6
01474500	797.5	33.2	1.2	6.1	93.9
01475530	N/A*				
01475548	N/A*				

*Turbidity not continuously monitored at this location

Table 79. USGS Gage July 2008 - June 2009 Specific Conductance Summary Results During Wet Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data
01465798	3607.0	150.3	0.3
01467042	3721.5	155.1	0.4
01467048	3630.5	151.3	0.4
01467086	3741.0	155.9	1.8
01467087	3804.5	158.5	1.6
01467200	2307.0	96.1	0.4
01473900	3338.5	139.1	0.6
01474000	3719.5	155.0	4.2
01474500	1787.0	74.5	1.8
01475530	3827.5	159.5	2.6
01475548	3558.5	148.3	1.7

Table 80. USGS Gage July 2008 - June 2009 Specific Conductance Summary Results During Dry Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data
01465798	2525.0	105.2	2.4
01467042	2556.0	106.5	0.5
01467048	2580.5	107.5	0.2
01467086	2341.5	97.6	4.8
01467087	2460.5	102.5	1.6
01467200	1778.0	74.1	0.6
01473900	2377.5	99.1	4.2
01474000	2440.0	101.7	5.8
01474500	797.5	33.2	1.2
01475530	2300.5	95.9	9.9
01475548	2774.0	115.6	1.0

Table 81. USGS Gage July 2008 - June 2009 Temperature Maximum Criteria Summary Results During Wet Weather

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. exceedance	% hrs. compliance
01465798	WWF	3601.0	150.0	0.5	13.8	86.2
01467042	TSF	3722.5	155.1	0.3	20.7	79.3
01467048	TSF	3629.5	151.2	0.5	24.4	75.6
01467086	WWF	3756.5	156.5	1.4	13.6	86.4
01467087	WWF	3848.5	160.4	0.5	16.1	83.9
01467200	DRBC	2239.5	93.3	4.3	0.0	100.0

01473900	TSF	3336.0	139.0	0.7	20.2	79.8
01474000	TSF	3820.0	159.2	1.6	21.4	78.6
01474500	WWF	1796.0	74.8	1.3	28.6	71.4
01475530	WWF	3919.0	163.3	0.3	12.3	87.7
01475548	WWF	3557.5	148.2	1.7	14.9	85.1

Table 82. USGS Gage July 2008 - June 2009 Temperature Maximum Criteria Summary Results During Dry Weather

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. exceedance	% hrs. compliance
01465798	WWF	2576.5	107.4	0.4	10.5	89.5
01467042	TSF	2556.5	106.5	0.5	20.8	79.2
01467048	TSF	2580.5	107.5	0.2	23.0	77.0
01467086	WWF	2435.0	101.5	1.0	11.1	88.9
01467087	WWF	2490.0	103.8	0.4	14.5	85.5
01467200	DRBC	1766.5	73.6	1.2	0.0	100.0
01473900	TSF	2460.0	102.5	0.8	20.3	79.7
01474000	TSF	2533.0	105.5	2.2	21.3	78.7
01474500	WWF	798.5	33.3	1.1	47.1	52.9
01475530	WWF	2409.5	100.4	5.6	12.1	87.9
01475548	WWF	2775.5	115.6	0.9	13.4	86.6

References

Delaware River Basin Commission, 2007. Delaware River Basin Water Code: 18 CFR Part 410 (With Amendments Through September 27, 2006). West Trenton, NJ.

APPENDIX I – NPDES Permitted Dischargers

Table 1

	NPDES ID	FACILITY NAME	ADDRESS	COUNTY	PERMIT ISSUED DATE	PERMIT EXPIRED DATE	SIC CODE	SIC DESC	CSO/SW area	Receiving Waterbody *
1	PA0010855	DU PONT MARSHALL LAB	3401 GRAYS FERRY AVENUE, PHILADELPHIA, PA 19146	PHILADELPHIA	OCT-28-2004	OCT-31-2009	2851	PAINTS, VARNISHES, LACQUERS, ENAMELS, AND ALLIED PRODUCTS	CSO	Schuylkill
2	PA0011088	PLAINS PRODUCTS TERMINALS LLC	6850 ESSINGTON AVE., PHILADELPHIA, PA 19153	PHILADELPHIA	OCT-21-2005	OCT-31-2010	5171	PETROLEUM BULK STATIONS AND TERMINALS	SW Only	Schuylkill
3	PA0011428	AMERADA HESS - PHILADELPHIA TERMINAL	1630 SOUTH 51ST STREET, PHILADELPHIA, PA 19143	PHILADELPHIA	JUN-03-2004	JUN-30-2009	5171	PETROLEUM BULK STATIONS AND TERMINALS	CSO	Schuylkill
4	PA0011533	SUNOCO POINT BREEZE PROCESSING AREA	3144 PASSYUNK AVENUE, PHILADELPHIA, PA 19145	PHILADELPHIA	FEB-07-2006	FEB-28-2011	2911	PETROLEUM REFINING	CSO	Schuylkill
5	PA0011622	EXELON GENERATION CO DELAWARE STA	1325 NORTH BEACH STREET, PHILADELPHIA, PA 19125	PHILADELPHIA	JAN-16-2003	JAN-31-2008	4911	ELECTRIC SERVICES	Non-contributing	Delaware
6	PA0011649	EXELON RICHMOND GENERATING STA	3901 NORTH DELAWARE AVENUE, PHILADELPHIA, PA 19137	PHILADELPHIA	SEP-12-2002	SEP-30-2007	4911	ELECTRIC SERVICES	Non-contributing	Delaware
7	PA0011657	PECO ENERGY SCHUYLKILL GEN STA	2800 CHRISTIAN STREET, PHILADELPHIA, PA 19146	PHILADELPHIA	OCT-07-1999	OCT-07-2004	4911	ELECTRIC SERVICES	CSO	Schuylkill
8	PA0012572	PAPERWORKS INDUSTRIES INC	5000 FLAT ROCK ROAD, PHILADELPHIA, PA 19127	PHILADELPHIA	JUN-18-2004	JUN-30-2009	2631	PAPERBOARD MILLS	Non-contributing	Schuylkill
9	PA0012777	ROHM & HAAS CHEMICAL RICHMOND ST PLT	5000 RICHMOND STREET, PHILADELPHIA, PA 19137	PHILADELPHIA	FEB-28-2003	FEB-28-2008	2869	INDUSTRIAL ORGANIC CHEMICALS, NOT ELSEWHERE CLASSIFIED	Non-contributing	Delaware
10	PA0012882	PHILA GAS WORKS RICHMOND PLT	3100 EAST VENANGO STREET, PHILADELPHIA, PA 191346192	PHILADELPHIA	MAR-29-2005	MAR-31-2010	4925	MIXED, MANUFACTURED, OR LIQUEFIED PETROLEUM GAS PRODUCTION AND/OR DISTRIBUTION	CSO	Delaware
11	PA0024252	SUNOCO TRANSP	1801 MARKET STREET, 26TH FLOOR, PHILADELPHIA, PA 19126	PHILADELPHIA	JUL-25-1995	JUL-25-2000	5171	PETROLEUM BULK STATIONS AND TERMINALS	CSO	Schuylkill
12	PA0026662	PHILA SOUTHEAST POTW	25 PATTISON AVENUE, PHILADELPHIA, PA 19148	PHILADELPHIA	JUL-07-2000	JUL-07-2005	4952	SEWERAGE SYSTEMS	CSO	Delaware
13	PA0026671	SOUTHWEST WATER POLLUTION CONTROL PLANT	8200 ENTERPRISE AVENUE, PHILADELPHIA, PA 19153	PHILADELPHIA	JUL-07-2000	JUL-07-2005	4952	SEWERAGE SYSTEMS	Non-contributing	Schuylkill

14	PA0026689	NORTHEAST WPCP	3900 RICHMOND STREET, PHILADELPHIA, PA 19137	PHILADELPHIA	JUL-07-2000	JUL-07-2005	4952	SEWERAGE SYSTEMS	MS4	Tacony
15	PA0036447	PHILADELPHIA NAVAL BUSINESS CENTER	4500 SOUTH BROAD STREET, PHILADELPHIA, PA 19112-1403	PHILADELPHIA	MAR-03-2006	MAR-31-2011	8731	COMMERCIAL PHYSICAL AND BIOLOGICAL RESEARCH	Non-contributing	Delaware
16	PA0040991	PHILA TERM	4210 G STREET, PHILADELPHIA, PA 19124-4821	PHILADELPHIA	SEP-23-2004	SEP-30-2009	5171	PETROLEUM BULK STATIONS AND TERMINALS	CSO	Tacony
17	PA0046876	PHILA GAS WORKS PASSYUNK AVE PLT	3100 PASSYUNK AVE, PHILADELPHIA, PA 19145	PHILADELPHIA	OCT-26-1999	OCT-26-2004	4925	MIXED, MANUFACTURED, OR LIQUEFIED PETROLEUM GAS PRODUCTION AND/OR DISTRIBUTION	CSO	Schuylkill
18	PA0050202	NATIONAL RAILROAD PASSENGER CO	AMTRAK RACE ST/PENN COACH YARD, PHILADELPHIA, PA 191042898	PHILADELPHIA	FEB-11-2003	FEB-28-2008	4011	RAILROADS, LINE-HAUL OPERATING	CSO	Schuylkill
19	PA0054241	AMOCO OIL COMPANY	63RD & PASSYUNK AVENUE, PHILADELPHIA, PA 19142	PHILADELPHIA	JUL-03-2006	JUL-31-2011	5171	PETROLEUM BULK STATIONS AND TERMINALS	MS4	Schuylkill
20	PA0054712	PHILADELPHIA MS4	1101 MARKET STREET, PHILADELPHIA, PA 19107	PHILADELPHIA	SEP-30-2005	SEP-30-2010	4952	SEWERAGE SYSTEMS	CSO	Delaware
21	PA0056090	AIRCRAFT SVC INTL GROUP TINICUM TWP FAC	3 HOG ISLAND RD, PHILADELPHIA, PA 19153	PHILADELPHIA	APR-12-2000	APR-12-2005	5171	PETROLEUM BULK STATIONS AND TERMINALS	Non-contributing	Schuylkill
22	PA0057479	METRO MACHINE CORP	5120 SOUTH 17TH STREET, PHILADELPHIA, PA 19112	PHILADELPHIA	JUN-26-2006	JUN-20-2011	3731	SHIP BUILDING AND REPAIRING	Non-contributing	Delaware
23	PA0057690	AKER PHILA SHIPYARD	PORTER AVENUE AND BRIDGE STREET, PHILADELPHIA, PA 19112	PHILADELPHIA	JUL-06-2000	JUL-06-2005	3731	SHIP BUILDING AND REPAIRING	CSO	Delaware
24	PA0058947	JDM MATERIALS	2750 GRANT AVE, PHILADELPHIA, PA 19114	PHILADELPHIA	JUN-20-2006	JUN-30-2011	3273	READY-MIXED CONCRETE	Non-contributing	Pennypack
25	PA0058955	JDM MATERIALS CO	BARTRAM BATCH PLANT, PHILADELPHIA, PA 19153	PHILADELPHIA	JUN-20-2006	JUN-30-2011	3273	READY-MIXED CONCRETE	Non-contributing	Schuylkill
26	PAG100012	SUN PIPELINE CO	FORT MIFFLIN TERMINAL, PHILADELPHIA, PA 19153	PHILADELPHIA	MAR-04-2002	MAR-03-2007	2911	PETROLEUM REFINING	Non-contributing	Schuylkill
27	PAG100021	PHILA INTL AIRPORT PIPELINE RELOCATIOIN PROJ	8000 ESSINGTON AVE, PHILADELPHIA, PA 19153	PHILADELPHIA					MS4	Schuylkill

28	PAR110007	MARTIN MARIETTA ASTRO SPACE	BUILDING 100, PHILADELPHIA, PA 19101	PHILADELPHIA	FEB-08-1996	FEB-08-2001	3769	GUIDED MISSILE AND SPACE VEHICLE PARTS AND AUXILIARY EQUIPMENT, NOT ELSEWHERE CLASSIFIED	CSO	Schuylkill
29	PAR110015	MELCO AUTO PARTS	5112 UMBRIA ST, PHILADELPHIA, PA 19128	PHILADELPHIA	APR-24-1996	APR-24-2001	3533	OIL AND GAS FIELD MACHINERY AND EQUIPMENT	MS4	Schuylkill
30	PAR110036	CROWN CORK & SEAL	9300 ASHTON ROAD, PHILADELPHIA, PA 191143464	PHILADELPHIA	AUG-15-1996	AUG-15-2001	3559	SPECIAL INDUSTRY MACHINERY, NOT ELSEWHERE CLASSIFIED	MS4	Pennypack
31	PAR110040	LAVELLE AIRCRAFT COMP	275 GEIGER RD, PHILADELPHIA, PA 19115	PHILADELPHIA	SEP-20-1996	SEP-20-2001	3724	AIRCRAFT ENGINES AND ENGINE PARTS	MS4	Pennypack
32	PAR110042	L3 COMMUNICATIONS ROOSEVELT BLVD FAC	13500 ROOSEVELT BOULEVARD, PHILADELPHIA, PA 191164299	PHILADELPHIA	MAY-22-2001	MAY-22-2006	3613	SWITCHGEAR AND SWITCHBOARD APPARATUS	MS4	Poquessing
33	PAR110047	HOWARD MCCRAY REFRIG CO INC	GRANT AVE & BLUE GRASS RD, PHILADELPHIA, PA 19114	PHILADELPHIA	MAY-02-1997	MAY-02-2002	3585	AIR-CONDITIONING AND WARM AIR HEATING EQUIPMENT AND COMMERCIAL AND INDUSTRIAL REFRIGERATION EQUIPMENT	MS4	Pennypack
34	PAR110048	KURZ HASTINGS INCORPORATED	10901 DUTTON ROAD, PHILADELPHIA, PA 19154	PHILADELPHIA	DEC-09-1998	DEC-09-2003	3999	MANUFACTURING INDUSTRIES, NOT ELSEWHERE CLASSIFIED	MS4	Poquessing
35	PAR120002	DIETZ & WATSON INCORPORATED	5701 TACONY ST., PHILADELPHIA, PA 19135	PHILADELPHIA	MAY-17-1996	MAY-17-2001	2013	SAUSAGES AND OTHER PREPARED MEAT PRODUCTS	Non-contributing	Delaware
36	PAR120003	PEPSI COLA	11701 ROOSEVELT BLVD., PHILADELPHIA, PA 19154	PHILADELPHIA	AUG-22-1996	AUG-22-2001	2086	BOTTLED AND CANNED SOFT DRINKS AND CARBONATED WATERS	MS4	Poquessing
37	PAR120008	DEGUSSA FLAVORS & FRUIT SYS	1741 TOMLINSON RD, PHILADELPHIA, PA 19116	PHILADELPHIA	SEP-06-2001	SEP-06-2006	2033	CANNED FRUITS, VEGETABLES, PRESERVES, JAMS, AND JELLIES	MS4	Poquessing
38	PAR120011	HYGRADE FOOD PROD	8400 EXECUTIVE AVE, PHILADELPHIA, PA 19153	PHILADELPHIA	MAY-02-2001	MAY-02-2006	2013	SAUSAGES AND OTHER PREPARED MEAT PRODUCTS	MS4	Schuylkill
39	PAR120018	PHILADELPHIA BAKING CO	GRANT AVE & ROOSEVELT AVE, PHILADELPHIA, PA 19115	PHILADELPHIA	APR-23-1996	APR-23-2001	2051	BREAD AND OTHER BAKERY PRODUCTS, EXCEPT COOKIES AND CRACKERS	MS4	Pennypack

40	PAR120025	NABISCO	12000 EAST ROOSEVELT BOULEVARD, PHILADELPHIA, PA 19116	PHILADELPHIA	JUL-11-2002	JUL-10-2007	2052	COOKIES AND CRACKERS	MS4	Poquessing
41	PAR130004	IMPERIAL METAL & CHEM	2050 BYBERRY ROAD, PHILADELPHIA, PA 19116	PHILADELPHIA	JUL-16-1996	JUL-16-2001	2796	PLATEMAKING AND RELATED SERVICES	MS4	Poquessing
42	PAR140005	INTL PAPER	2100 EAST BYBERRY ROAD, PHILADELPHIA, PA 19116	PHILADELPHIA	AUG-21-1996	AUG-21-2001	2656	SANITARY FOOD CONTAINERS, EXCEPT FOLDING	MS4	Poquessing
43	PAR140020	FIBREFLEX PACKING & MANUF CO	INC, PHILADELPHIA, PA 19127	PHILADELPHIA	JUL-06-2000	JUL-06-2005	2675	DIE-CUT PAPER AND PAPERBOARD AND CARDBOARD	MS4	Schuylkill
44	PAR140021	PERFECSEAL BUSTLETON AVE FAC	9800 BUSTLETON AVENUE, PHILADELPHIA, PA 19115	PHILADELPHIA	JAN-01-2006	DEC-31-2010	2671	PACKAGING PAPER AND PLASTICS FILM, COATED AND LAMINATED	MS4	Pennypack
45	PAR140023	SMURFIT STONE CONTAINER ENTER	BLUE GRASS RD PLT, PHILADELPHIA, PA 19114	PHILADELPHIA	JUN-01-2005	MAY-31-2010	2653	CORRUGATED AND SOLID FIBER BOXES	MS4	Pennypack
46	PAR150006	LAWRENCE MCFADDEN	7430 STATE RD., PHILADELPHIA, PA 191364299	PHILADELPHIA	AUG-15-1996	AUG-15-2001	2851	PAINTS, VARNISHES, LACQUERS, ENAMELS, AND ALLIED PRODUCTS	CSO	Delaware
47	PAR200002	ALLIED TUBE & CONDUIT NORCOM RD PLT	11350 NORCOM ROAD, PHILADELPHIA, PA 19154	PHILADELPHIA	AUG-29-2005	AUG-31-2010	3317	STEEL PIPE AND TUBES	MS4	Poquessing
48	PAR200007	HENSHELL CORP	2955 NORTH 20TH STREET, PHILADELPHIA, PA 19132	PHILADELPHIA	FEB-26-1997	FEB-26-2002	3479	COATING, ENGRAVING, AND ALLIED SERVICES, NOT ELSEWHERE CLASSIFIED	CSO	Delaware
49	PAR200010	NESBITT DIV OF MESTEK INC	TULIP & RHAWN STS, PHILADELPHIA, PA 19136	PHILADELPHIA	AUG-13-1996	AUG-13-2001	3499	FABRICATED METAL PRODUCTS, NOT ELSEWHERE CLASSIFIED	CSO	Pennypack
50	PAR200011	GROSS METALS	221 WEST GLENWOOD AVENUE, PHILADELPHIA, PA 19135	PHILADELPHIA	MAY-07-1997	MAY-07-2002	3479	COATING, ENGRAVING, AND ALLIED SERVICES, NOT ELSEWHERE CLASSIFIED	CSO	Delaware
51	PAR200016	JOWITT & RODGERS STATE RD FAC	9400 STATE RD, PHILADELPHIA, PA 19114	PHILADELPHIA	OCT-02-2001	OCT-02-2006	3291	ABRASIVE PRODUCTS	MS4	Delaware
52	PAR200036	BUDD COMP	PHILADELPHIA PLANT, PHILADELPHIA, PA 19129	PHILADELPHIA	MAY-09-2000	MAY-09-2005	3465	AUTOMOTIVE STAMPINGS	MS4	Schuylkill
53	PAR200038	TJ COPE NORCOM RD FAC	11500 NORCOM RD, PHILADELPHIA, PA 19154	PHILADELPHIA	OCT-01-2003	OCT-31-2008	3443	FABRICATED PLATE WORK (BOILER SHOPS)	MS4	Poquessing
54	PAR200041	ABINGTON METALS REFIN & MFG IN	4924 WELLINGTON ST, PHILADELPHIA, PA 19135	PHILADELPHIA	AUG-17-2004	AUG-31-2009	3339	PRIMARY SMELTING AND REFINING OF NONFERROUS METALS, EXCEPT COPPER AND ALUMINUM	CSO	Delaware

55	PAR230043	DICKLER CHEMICAL LABORATORIES INCORPORATED	4201 TORRESDALE AVENUE, PHILADELPHIA, PA 191241001	PHILADELPHIA	MAR-05-1996	MAR-05-2001	2842	SPECIALTY CLEANING, POLISHING, AND SANITATION PREPARATIONS	CSO	Tacony
56	PAR230044	ASHLAND CHEM	2801 CHRISTOPHER COLUMBUS BOULEVARD, PHILADELPHIA, PA 19148	PHILADELPHIA	MAR-29-1996	MAR-29-2001	2821	PLASTICS MATERIALS, SYNTHETIC RESINS, AND NONVULCANIZABLE ELASTOMERS	CSO	Delaware
57	PAR230045	SUNOCO CHEMICAL & FRANKFORD PLANT	MARGARET & BERMUDA STREETS, PHILADELPHIA, PA 191371193	PHILADELPHIA	APR-28-2003	APR-30-2008	2869	INDUSTRIAL ORGANIC CHEMICALS, NOT ELSEWHERE CLASSIFIED	CSO	Delaware
58	PAR230060	RICHARDSAPEX INC	4202-10 MAIN STREET, PHILADELPHIA, PA 19127	PHILADELPHIA	SEP-17-2001	SEP-17-2006	2899	CHEMICALS AND CHEMICAL PREPARATIONS, NOT ELSEWHERE CLASSIFIED	Non-contributing	Schuylkill
59	PAR230088	SUN CHEM HUNTING PARK AVE PLT	3301 HUNTING PARK AVE., PHILADELPHIA, PA 19129	PHILADELPHIA	APR-01-2005	MAR-31-2010	2893	PRINTING INK	CSO	Schuylkill
60	PAR230089	UNITED COLOR MANUF INC	EAST TIOGA ST PLANT, PHILADELPHIA, PA 19134	PHILADELPHIA	NOV-01-2005	OCT-31-2010	2869	INDUSTRIAL ORGANIC CHEMICALS, NOT ELSEWHERE CLASSIFIED	CSO	Delaware
61	PAR600015	WASTE MGMT OF PA	PHILLY TRANS STATION, PHILADELPHIA, PA 19146	PHILADELPHIA	DEC-13-2001	DEC-13-2006	5093	SCRAP AND WASTE MATERIALS	CSO	Schuylkill
62	PAR600024	S D RICHMAN SONS WHEATSHEAF LN FAC	2435 E WHEATSHEAF LANE, PHILADELPHIA, PA 19137	PHILADELPHIA	OCT-31-2001	OCT-31-2006	5093	SCRAP AND WASTE MATERIALS	MS4	Tacony
63	PAR600025	SPC PENROSE AVE FAC	26TH STREET AND PENROSE AVENUE, PHILADELPHIA, PA 19145	PHILADELPHIA	JAN-28-2002	JAN-28-2007	5023	HOMEFURNISHINGS	CSO	Schuylkill
64	PAR600026	ALLEGHENY IRON & METAL TACONY ST FAC	TACONY STREET AND ADAMS AVENUE, PHILADELPHIA, PA 19124	PHILADELPHIA	OCT-23-2001	OCT-26-2006	5093	SCRAP AND WASTE MATERIALS	CSO	Tacony
65	PAR600028	CIMCO TERMINAL INC	C/O CAMDEN IRON & METAL INC, PHILADELPHIA, PA 19125	PHILADELPHIA	NOV-01-1998	NOV-01-2001	5093	SCRAP AND WASTE MATERIALS	CSO	Schuylkill
66	PAR600030	ORTHODOX AUTO UNRUH AVE FAC	5247 UNRUH AVE, PHILADELPHIA, PA 19135	PHILADELPHIA	JUN-01-2006	MAY-31-2011	5015	MOTOR VEHICLE PARTS, USED	Non-contributing	Delaware
67	PAR600034	ACER ENGINEERS INC	JIMMIES AUTO PARTS, PHILADELPHIA, PA 19137	PHILADELPHIA	FEB-26-1998	FEB-26-2001	5015	MOTOR VEHICLE PARTS, USED	CSO	Delaware
68	PAR600039	MORRIS IRON & STEEL CO INC	7345 MILNOR ST, PHILADELPHIA, PA 19136	PHILADELPHIA	AUG-28-1996	AUG-28-2001	5093	SCRAP AND WASTE MATERIALS	Non-contributing	Delaware
69	PAR600042	PHILADELPHIA CITY POLICE DEPT	POLICE & AUTO IMPOUNDMENT LOT, PHILADELPHIA, PA 19153	PHILADELPHIA	SEP-20-1996	SEP-20-2001	5015	MOTOR VEHICLE PARTS, USED	Non-contributing	Delaware

70	PAR600054	AMERICAN AUTO PARTS & SALV CO	3501 S 61ST ST, PHILADELPHIA, PA 191533522	PHILADELPHIA	JUN-12-2000	JUN-12-2005	5015	MOTOR VEHICLE PARTS, USED	Non-contributing	Schuylkill
71	PAR600055	FIORES AUTO PARTS	3300 S 61ST ST, PHILADELPHIA, PA 19153	PHILADELPHIA	JUN-12-2000	JUN-12-2005	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
72	PAR600056	B & L AUTO PARTS 61ST STREET FAC	3404 S 61ST ST, PHILADELPHIA, PA 19153	PHILADELPHIA	JUL-25-2000	JUL-25-2005	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
73	PAR600057	MICHAEL MACHINO DBA	OSCARS AUTO PARTS/PASSYUNK AVE, PHILADELPHIA, PA 19153	PHILADELPHIA	APR-01-2005	MAR-31-2010	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
74	PAR600065	JT S USED AUTO PARTS S 61ST ST FAC	3505 SOUTH 61ST STREET, PHILADELPHIA, PA 19153	PHILADELPHIA	NOV-01-2005	OCT-31-2010	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
75	PAR600066	DRIVE TRAIN EXCHANGE	DBA VENICE AUTO PARTS, PHILADELPHIA, PA 19153	PHILADELPHIA	OCT-01-2005	SEP-30-2010	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
76	PAR600070	PASCO INC	PASCO PASCHALL AVE FACILITY, PHILADELPHIA, PA 19142	PHILADELPHIA	MAY-04-2004	MAY-31-2009	5093	SCRAP AND WASTE MATERIALS	CSO	Darby-Cobbs
77	PAR600071	ESSINGTON AVE AUTO PARTS	6746 ESSINGTON AVE, PHILADELPHIA, PA 19153	PHILADELPHIA	SEP-01-2004	AUG-31-2009	5015	MOTOR VEHICLE PARTS, USED	CSO	Schuylkill
78	PAR600072	HAROLDS USED AUTO PARTS	WHITBY AVE FAC, PHILADEPHIA, PA 19143	PHILADELPHIA	OCT-01-2004	SEP-30-2009	5015	MOTOR VEHICLE PARTS, USED	CSO	Darby-Cobbs
79	PAR600073	BRUCE PAUL AUTO PARTS	LEHIGH AVE FAC, PHILADELPHIA, PA 19125	PHILADELPHIA	OCT-01-2004	SEP-30-2009	5015	MOTOR VEHICLE PARTS, USED	CSO	Delaware
80	PAR600074	FREDDIES AUTO PARTS	CARTEL AUTO PARTS W PASSYUNK, PHILADELPHIA, PA 19153	PHILADELPHIA	NOV-01-2004	OCT-31-2009	5015	MOTOR VEHICLE PARTS, USED	Non-contributing	Schuylkill
81	PAR600075	POOR BOYS USED AUTO PARTS W ANNSBURY ST FAC	532 W ANNSBURY ST, PHILADELPHIA, PA 19140	PHILADELPHIA	DEC-01-2004	NOV-30-2009	5015	MOTOR VEHICLE PARTS, USED	CSO	Tacony
82	PAR600076	JACKS AUTO PARTS SALES	61ST ST FAC, PHILADELPHIA, PA 19153	PHILADELPHIA	DEC-01-2004	NOV-30-2009	5015	MOTOR VEHICLE PARTS, USED	CSO	Darby-Cobbs
83	PAR600078	KNOCK OUT AUTO PARTS E TIOGA ST FAC	3201 E TIOGA ST, PHILADELPHIA, PA 19134	PHILADELPHIA	APR-01-2005	MAR-31-2010	5015	MOTOR VEHICLE PARTS, USED	CSO	Delaware
84	PAR600079	K & A AUTO SALVAGE	EAST SOMERSET ST FAC, PHILADELPHIA, PA 19134	PHILADELPHIA	APR-01-2005	MAR-31-2010	5015	MOTOR VEHICLE PARTS, USED	CSO	Delaware
85	PAR600080	ATLANTIC USED AUTO PARTS W PASSYUNK AVE FAC	6030 W PASSYUNK AVE, PHILA, PA 19153	PHILADELPHIA	APR-01-2005	MAR-31-2010	5015	MOTOR VEHICLE PARTS, USED	Non-contributing	Schuylkill
86	PAR600081	BUTCHS AUTO PARTS	SOUTH 61ST ST FAC, PHILADELPHIA, PA 19142	PHILADELPHIA	APR-01-2005	MAR-31-2010	5015	MOTOR VEHICLE PARTS, USED	Non-contributing	Schuylkill

87	PAR600082	SAMMY'S AUTO PARTS	3405 SOUTH 61ST ST, PHILADELPHIA, PA 19153	PHILADELPHIA	APR-01-2006	MAR-31-2011	5015	MOTOR VEHICLE PARTS, USED	Non-contributing	Schuylkill
88	PAR600083	ROBERT VOLIO	DBA NICE GUYS AUTO PARTS, PHILADELPHIA, PA 19153	PHILADELPHIA	MAY-01-2005	APR-30-2010	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
89	PAR600084	JIMS AUTO RECYCLING INC	W PASSYUNK FAC, PHILADELPHIA, PA 19153	PHILADELPHIA	JUN-01-2005	MAY-31-2010	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
90	PAR600085	STEVEN NGO	DBA STEVES AUTO PARTS II, PHILADELPHIA, PA 19153	PHILADELPHIA	JUL-01-2005	JUN-30-2010	5015	MOTOR VEHICLE PARTS, USED	Non-contributing	Schuylkill
91	PAR600086	T&E AUTO PARTS W PASSYUNK AVE FAC	6219 W PASSYUNK AVE, PHILADELPHIA, PA 19153	PHILADELPHIA	SEP-01-2005	AUG-31-2010	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
92	PAR600088	WILLIAM DORTONE DBA BILLS AUTO	PASSYUNK AVE FAC, PHILADELPHIA, PA 19153	PHILADELPHIA	NOV-01-2005	OCT-31-2010	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
93	PAR600089	DRIVE LINE AUTO PARTS	WEST PASSYUNK AVE FAC, PHILADELPHIA, PA 19153	PHILADELPHIA	JAN-01-2006	DEC-31-2010	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
94	PAR600090	JKL'S AUTO SALES & PARTS	ESSINGTON AVE FAC, PHILADELPHIA, PA 19153	PHILADELPHIA	JAN-01-2006	DEC-31-2010	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
95	PAR600091	A&H AUTO PARTS PASSYUNK AVE FAC	6255 W. PASSYUNK AVE, PHILADELPHIA, PA 19153	PHILADELPHIA	JUN-01-2006	MAY-31-2011	5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
96	PAR600092	DAVE S DELAWARE VALLEY TOWING PASSYUNK AVE FAC	6159 PASSYUNK AVE, PHILADELPHIA, PA 19153	PHILADELPHIA					MS4	Schuylkill
97	PAR800019	CROWLEY AMERICAN TRANS	TIOGA MARINE TERMINAL, PHILADELPHIA, PA 19134	PHILADELPHIA	SEP-11-1996	SEP-11-2001	4212	LOCAL TRUCKING WITHOUT STORAGE	CSO	Delaware
98	PAR800027	CSX TRANSPORTATION	PHILADELPHIA RIP TRACK, PHILADELPHIA, PA 19145	PHILADELPHIA	JUN-01-2006	MAY-31-2011	4011	RAILROADS, LINE-HAUL OPERATING	CSO	Schuylkill
99	PAR800029	ABF FREIGHT SYSTEM INC	4000 RICHMOND ST, PHILADELPHIA, PA 19137	PHILADELPHIA	MAR-05-1996	MAR-05-2001	4213	TRUCKING, EXCEPT LOCAL	MS4	Tacony
100	PAR800033	SEPTA	ALLEGHENY GARAGE, PHILADELPHIA, PA 19129	PHILADELPHIA	AUG-22-1996	AUG-22-2001	4111	LOCAL AND SUBURBAN TRANSIT	MS4	Schuylkill
101	PAR800035	SEPTA	ROBERTS AVE FAC, PHILADELPHIA, PA 19129	PHILADELPHIA	FEB-01-2005	JAN-31-2010	4111	LOCAL AND SUBURBAN TRANSIT	MS4	Schuylkill
102	PAR800041	BFI TRANSF SYS OF PA CHRISTOPHER COLUMBUS BLVD FAC	2904 S CHRISTOPHER COLUMBUS BLVD, PHILADELPHIA, PA 19148	PHILADELPHIA	OCT-16-2001	OCT-16-2006	4212	LOCAL TRUCKING WITHOUT STORAGE	CSO	Delaware
103	PAR800052	TDSI PHILADELPHIA BIDS TERM	36TH & MOORE STS, PHILADELPHIA, PA 19145	PHILADELPHIA	JUN-04-1996	JUN-04-2001	4011	RAILROADS, LINE-HAUL OPERATING	CSO	Schuylkill

104	PAR800055	CF MOTOR FREIGHT PHL	2625 E CASTOR AVE, PHILADELPHIA, PA 19134	PHILADELPHIA	AUG-08-1996	AUG-08-2001	4213	TRUCKING, EXCEPT LOCAL	CSO	Delaware
105	PAR800060	DEGUSSA CORP	DEGUSSA CSX/BIDS FACILITY, PHILADELPHIA, PA 19145	PHILADELPHIA	OCT-09-2002	OCT-31-2007	4226	SPECIAL WAREHOUSING AND STORAGE, NOT ELSEWHERE CLASSIFIED	CSO	Delaware
106	PAR800062	US POSTAL SERV	BYBERRY RD FAC, PHILADELPHIA, PA 19116	PHILADELPHIA	NOV-01-2005	OCT-31-2010	4311	UNITED STATES POSTAL SERVICE THIS INDUSTRY INCLUDES ALL ESTABLISHMENTS OF THE UNITED STATES POSTAL SERVICE.	MS4	Poquessing
107	PAR800064	BFI WASTE SVC OF PA	3000 E HEDLEY STREET, PHILADELPHIA, PA 19137	PHILADELPHIA	SEP-28-2001	SEP-28-2006	4212	LOCAL TRUCKING WITHOUT STORAGE	Non-contributing	Delaware
108	PAR800067	WASTE MGMT OF PA INC	FORGE RECYCLING & RES REC CENT, PHILADELPHIA, PA 19036	PHILADELPHIA	SEP-12-2002	SEP-30-2007	5621	WOMEN'S CLOTHING STORES	MS4	Delaware
109	PAR800085	ROADWAY EXPRESS	CHURCH & PEARCE STREETS, PHILADELPHIA, PA 19124	PHILADELPHIA	AUG-29-2002	AUG-31-2007	4231	TERMINAL AND JOINT TERMINAL MAINTENANCE FACILITIES FOR MOTOR FREIGHT TRANSPORTATION	MS4	Tacony
110	PAR800088	CSX INTERMODAL	GREENWICH YARD, PHILADELEPHIA, PA 19148	PHILADELPHIA	JUL-14-1998	JUL-14-2003	4011	RAILROADS, LINE-HAUL OPERATING	CSO	Delaware
111	PAR800112	NORTHEAST PHILADELPHIA AIRPORT (PNE)	NORTHEAST PHILADELPHIA AIRPORT, PHILADELPHIA, PA 19114	PHILADELPHIA	FEB-12-2002	FEB-12-2007	4581	AIRPORTS, FLYING FIELDS, AND AIRPORT TERMINAL SERVICES	MS4	Pennypack
112	PAR800113	FEDERAL EXPRESS CORP	3600 GRAYS FERRY AVENUE, PHILADELPHIA, PA 19146	PHILADELPHIA	JUN-10-2002	JUN-09-2007	4513	AIR COURIER SERVICES	CSO	Schuylkill
113	PAR800118	ACAD RECYCLING TORRESDALE FAC	8901 TORRESDALE AVENUE, PHILADELPHIA, PA 19154	PHILADELPHIA	DEC-04-2002	DEC-31-2007	4953	REFUSE SYSTEMS	MS4	Pennypack
114	PAR800131	FEDEX GROUND	TOWNSEND RD FAC, PHILADELPHIA, PA 19154	PHILADELPHIA	MAR-01-2005	FEB-28-2010	4215	COURIER SERVICES, EXCEPT BY AIR	MS4	Poquessing
115	PAR800138	DHL EXPRESS USA INC	HOLSTEIN AVE FAC, PHILADELPHIA, PA 19153	PHILADELPHIA	APR-01-2006	MAR-31-2011	4215	COURIER SERVICES, EXCEPT BY AIR	MS4	Schuylkill
116	PAR802212	SUN COMPANY INC	EXETER TERMINAL, PHILADELPHIA, PA 19103	PHILADELPHIA	NOV-07-1992	NOV-06-1997	5171	PETROLEUM BULK STATIONS AND TERMINALS	CSO	Schuylkill
117	PAR900005	DELAWARE VALLEY RECYCLING	3107 SOUTH 61ST STREET, PHILADELPHIA, PA 19153	PHILADELPHIA	JAN-26-1996	JAN-26-2001	4953	REFUSE SYSTEMS	Non-contributing	Schuylkill

118	PAR900013	PHILADELPHIA CITY WATER DEPT	NE/WPCP, PHILADELPHIA, PA 19137	PHILADELPHIA	OCT-07-2002	OCT-31-2007	4952	SEWERAGE SYSTEMS	CSO	Delaware
119	PAR900017	CLEAN EARTH OF PHILA FAC	3201 SOUTH 61ST STREET, PHILADELPHIA, PA 19153	PHILADELPHIA	JUN-01-2006	MAY-31-2011	4953	REFUSE SYSTEMS	Non-contributing	Schuylkill
120	PAR900020	PHILADEPHIA WATER DEPT	SE WPCP, PHILADELPHIA, PA 19148	PHILADELPHIA	OCT-07-2002	OCT-31-2007	4952	SEWERAGE SYSTEMS	CSO	Delaware
121	PAR900024	PGW PASSYUNK PLANT	3100 W PASSYUNK AVE, PHILADELPHIA, PA 191455208	PHILADELPHIA	JUN-01-2006	MAY-31-2011	4925	MIXED, MANUFACTURED, OR LIQUEFIED PETROLEUM GAS PRODUCTION AND/OR DISTRIBUTION	CSO	Schuylkill
122	PAU123244	BILL'S AUTOGLASS	3402 S. 61ST ST, PHILADELPHIA, PA 19153	PHILADELPHIA			5015	MOTOR VEHICLE PARTS, USED	MS4	Schuylkill
123	PAU123245	JT'S AUTOMOBILE PARTS	PHILADELPHIA COUNTY, PA, EAST SOMERSET ST FAC	PHILADELPHIA			5015	MOTOR VEHICLE PARTS, USED	CSO	Delaware
124	PAU123248	JOHN'S USED AUTO PARTS	PHILADELPHIA COUNTY, PA, 9400 STATE RD	PHILADELPHIA			5015	MOTOR VEHICLE PARTS, USED	MS4	Delaware
125	PAU123459	CJ ASHLAND	4001 ASHLAND AVE, PHILADELPHIA, PA 19124	PHILADELPHIA			5015	MOTOR VEHICLE PARTS, USED	MS4	Tacony
126	PAU123460	LEGEND AUTO SALES	3990 FRANKFORD AVE, PHILADELPHIA, PA 19124	PHILADELPHIA			5015	MOTOR VEHICLE PARTS, USED	CSO	Tacony
127	PAU123461	UKNOWN AUTO SCRAP YARD	3970 FRANKFORD AVE, PHILADELPHIA, PA 19124	PHILADELPHIA			5015	MOTOR VEHICLE PARTS, USED	CSO	Tacony

APPENDIX J – MONITORING LOCATIONS

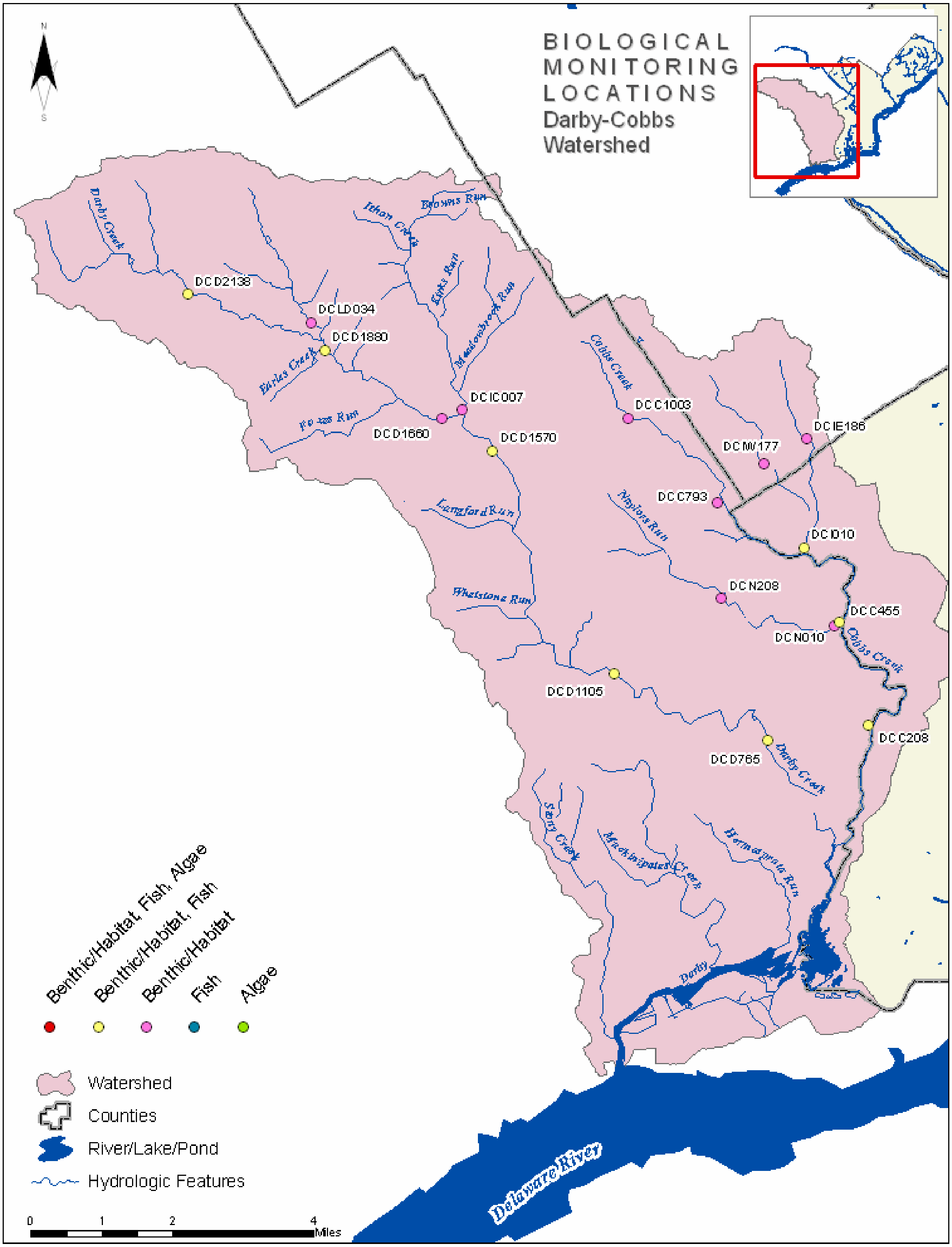


Figure J-1 Biological and Physical assessment locations in Darby-Cobbs Watershed

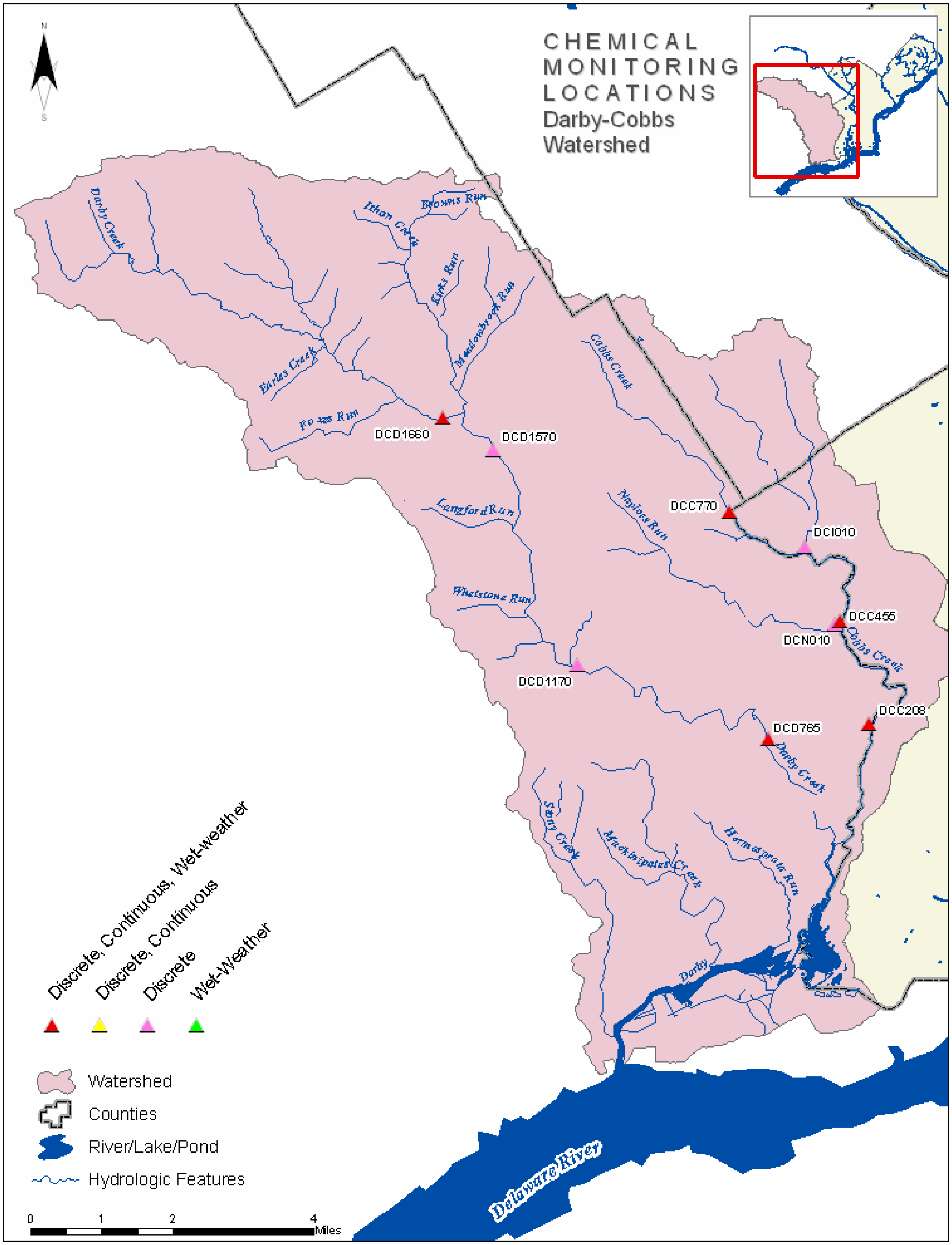


Figure J-2 Chemical monitoring locations in Darby-Cobbs Watershed

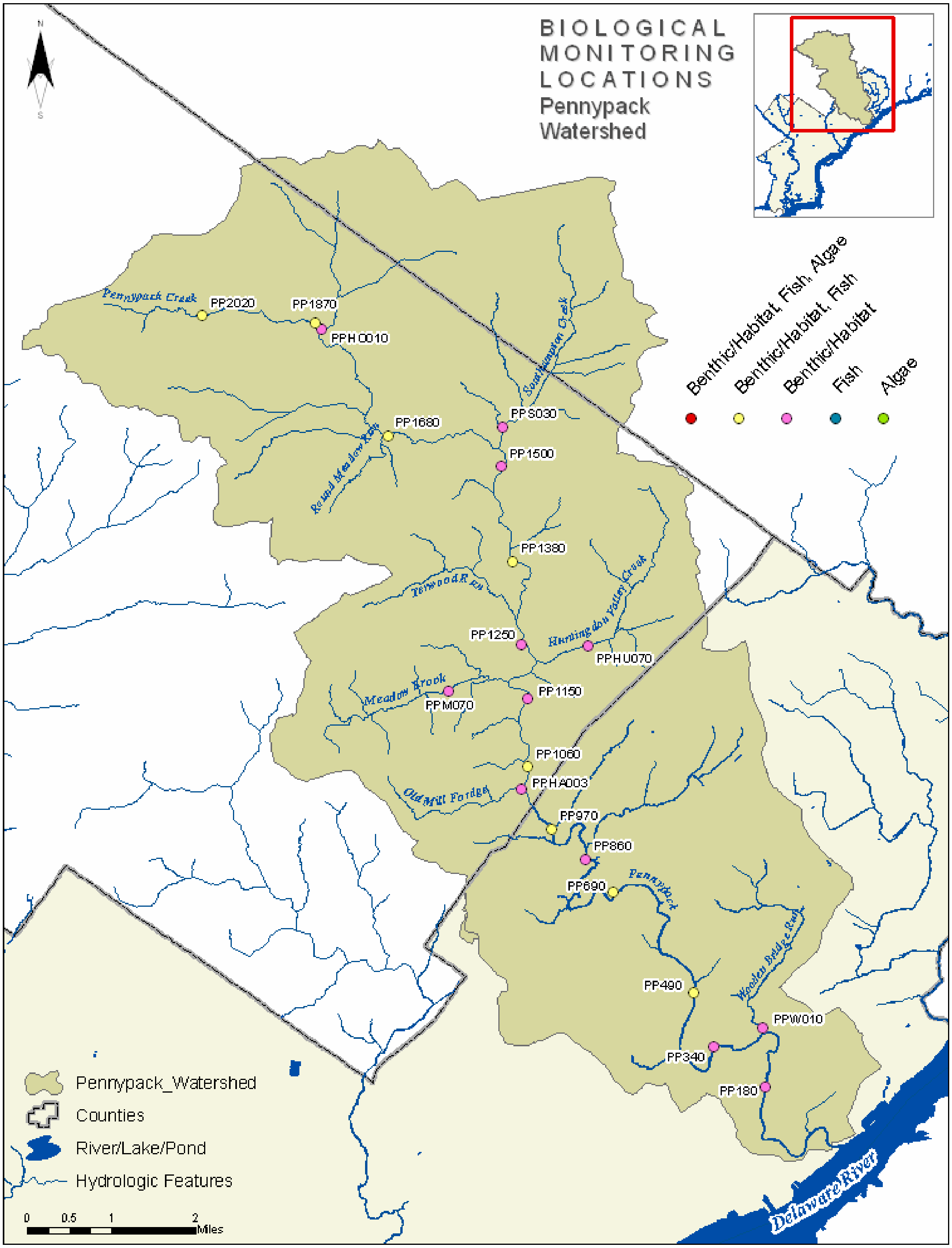


Figure J-3 Biological and Physical assessment locations in Pennypack Watershed

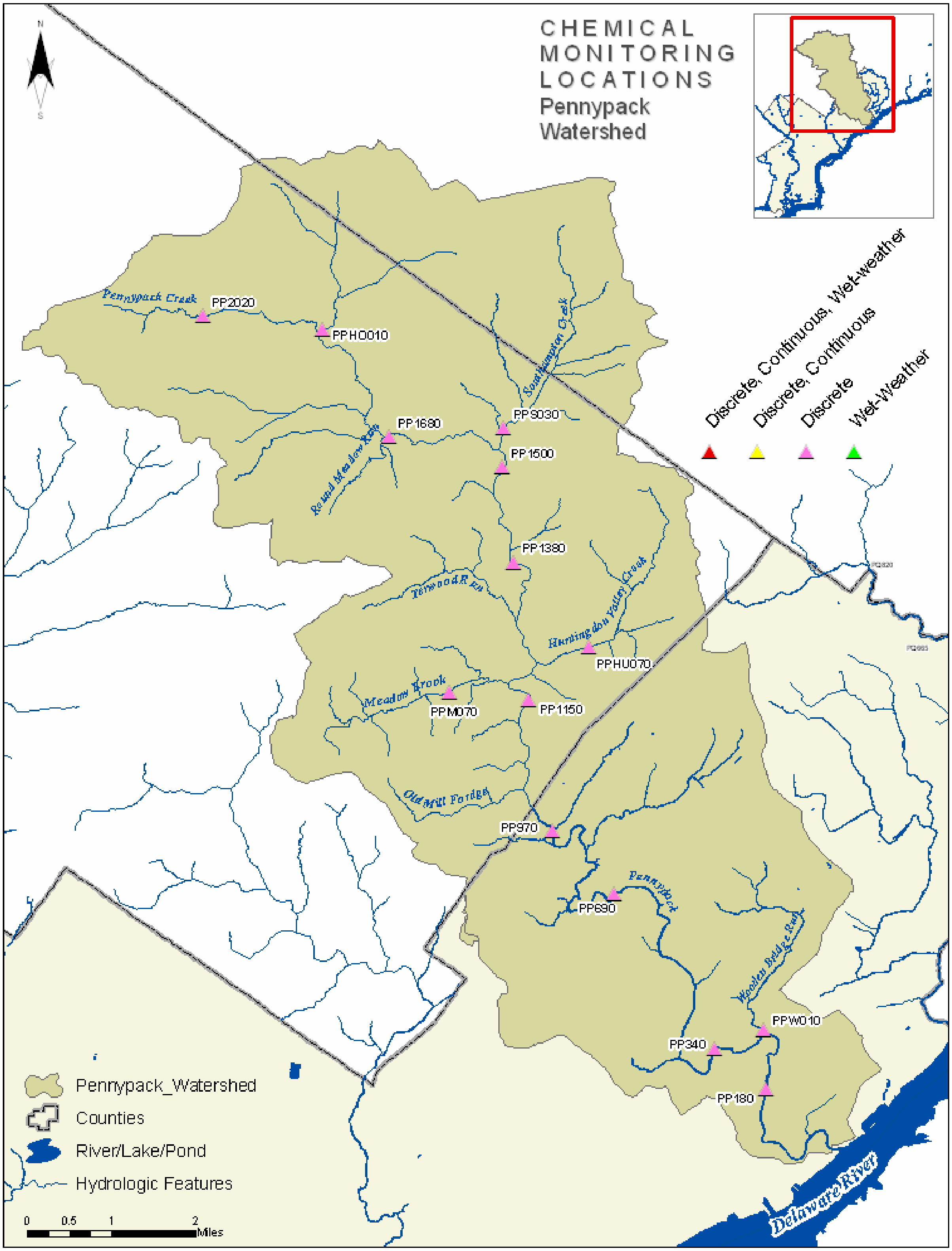


Figure J-4 Chemical monitoring locations in Pennypack Watershed

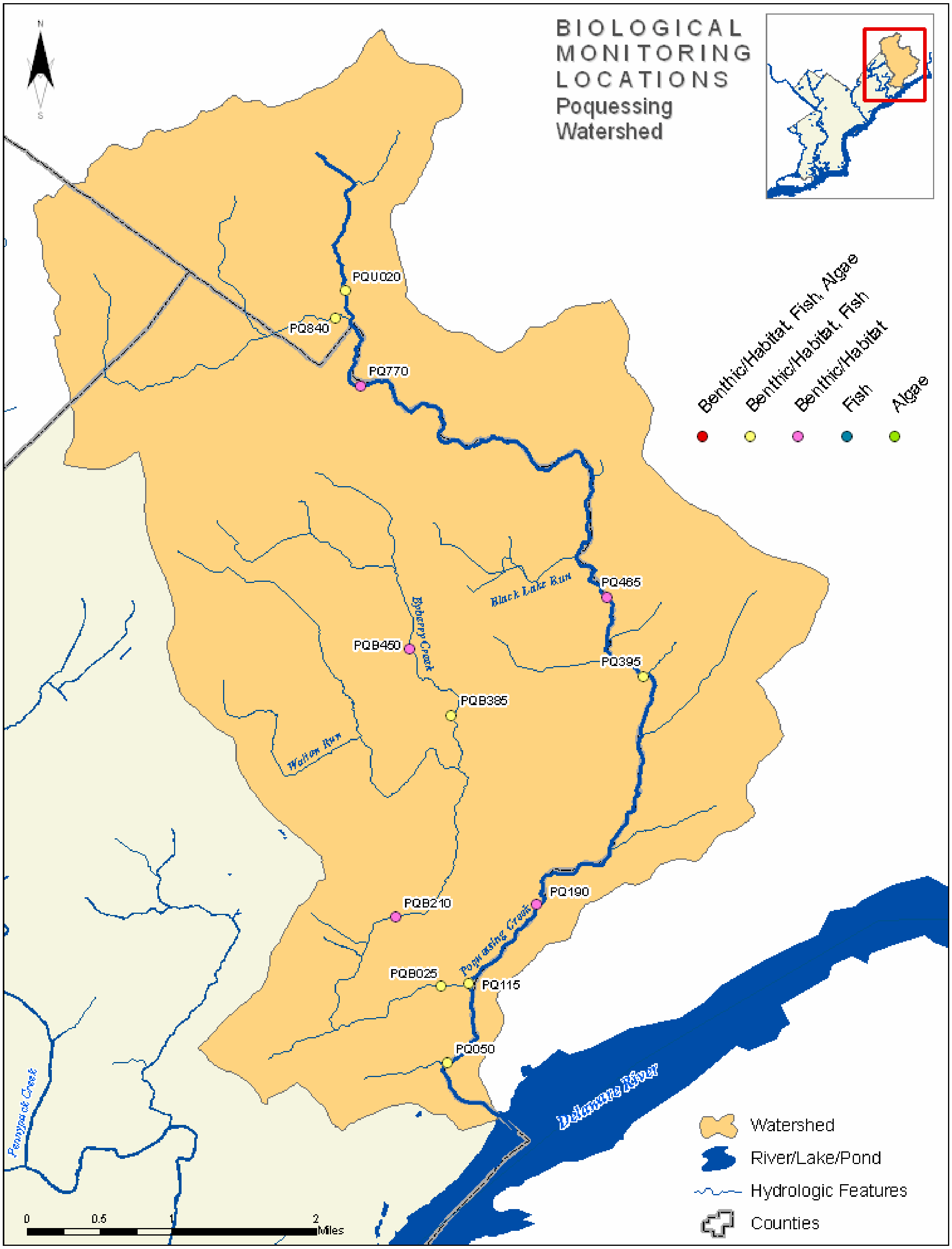


Figure J-5 Biological and Physical assessment locations in Poquessing-Byberry Watershed

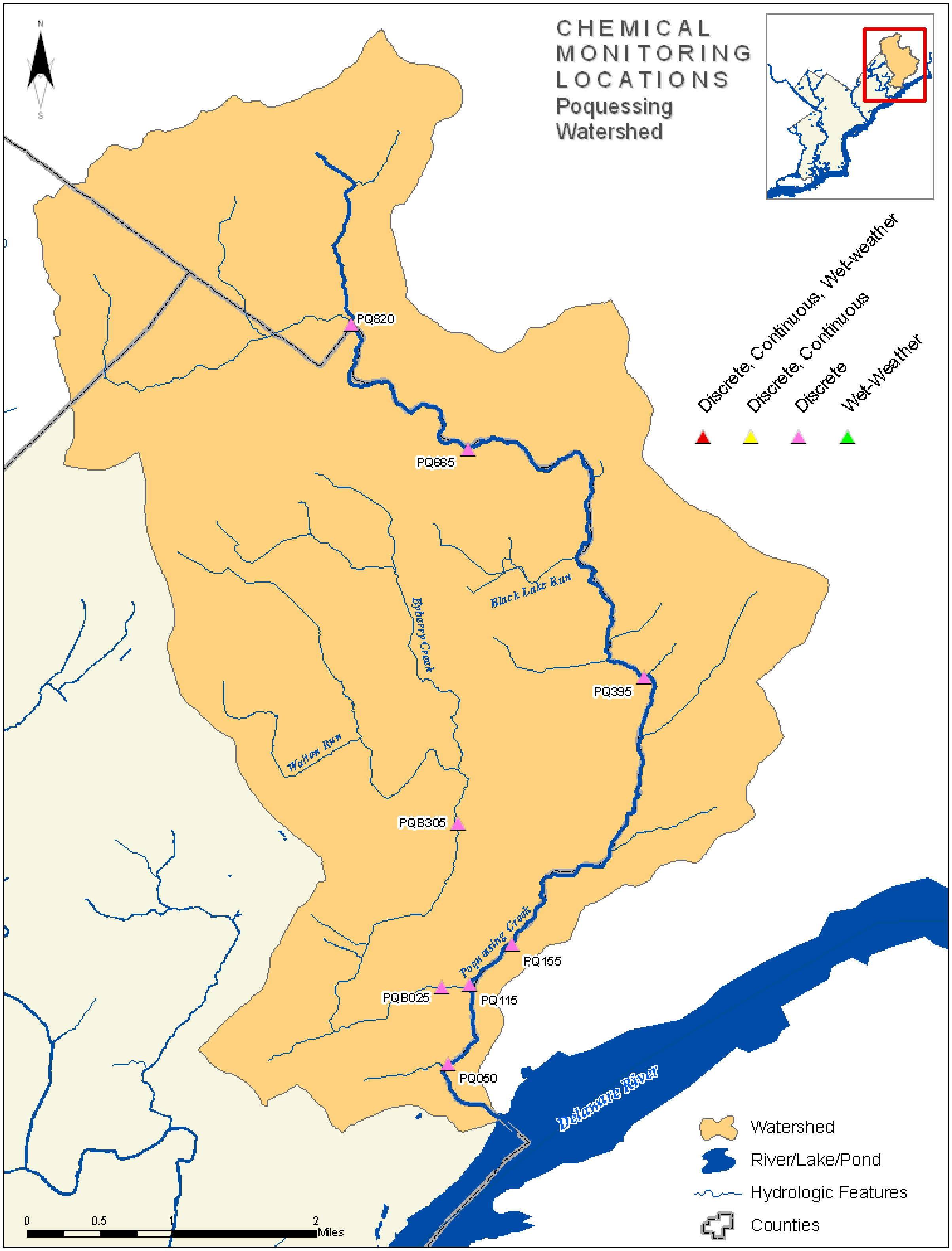


Figure J-6 Chemical monitoring locations in Poquessing-Byberry Watershed

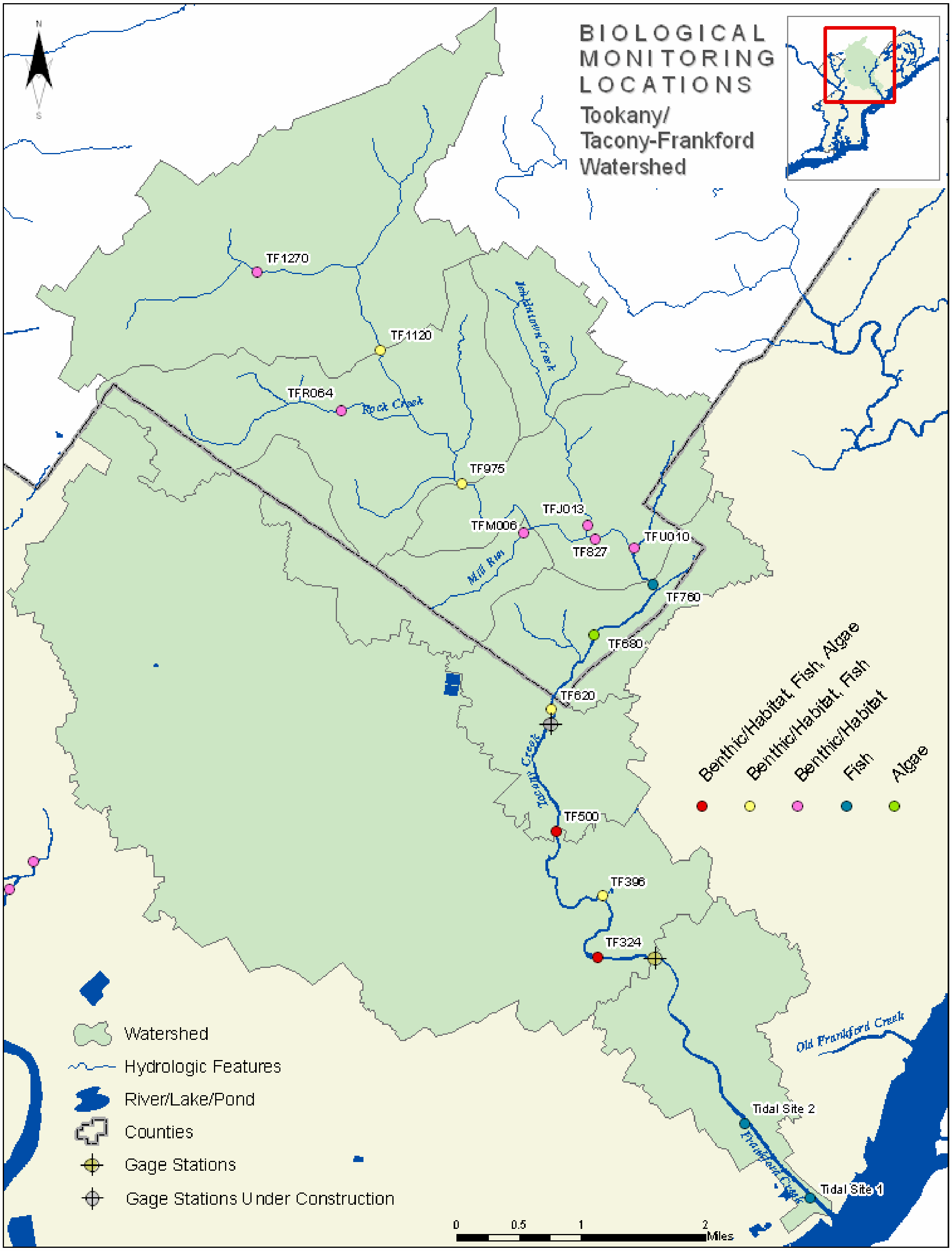


Figure J-7 Biological and Physical assessment locations in Tacony-Frankford Watershed

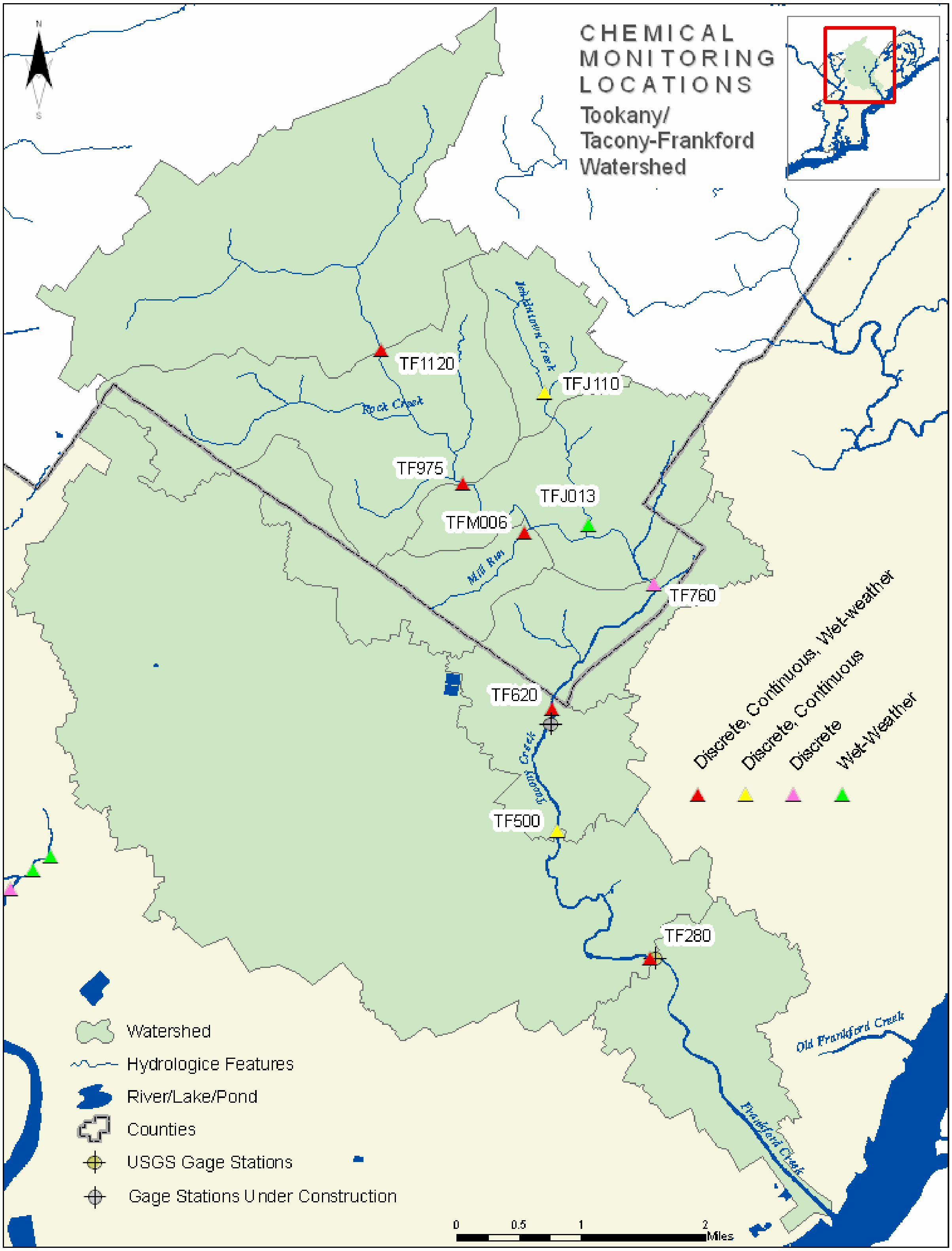


Figure J-8 Chemical monitoring locations in Tacony-Frankford Watershed

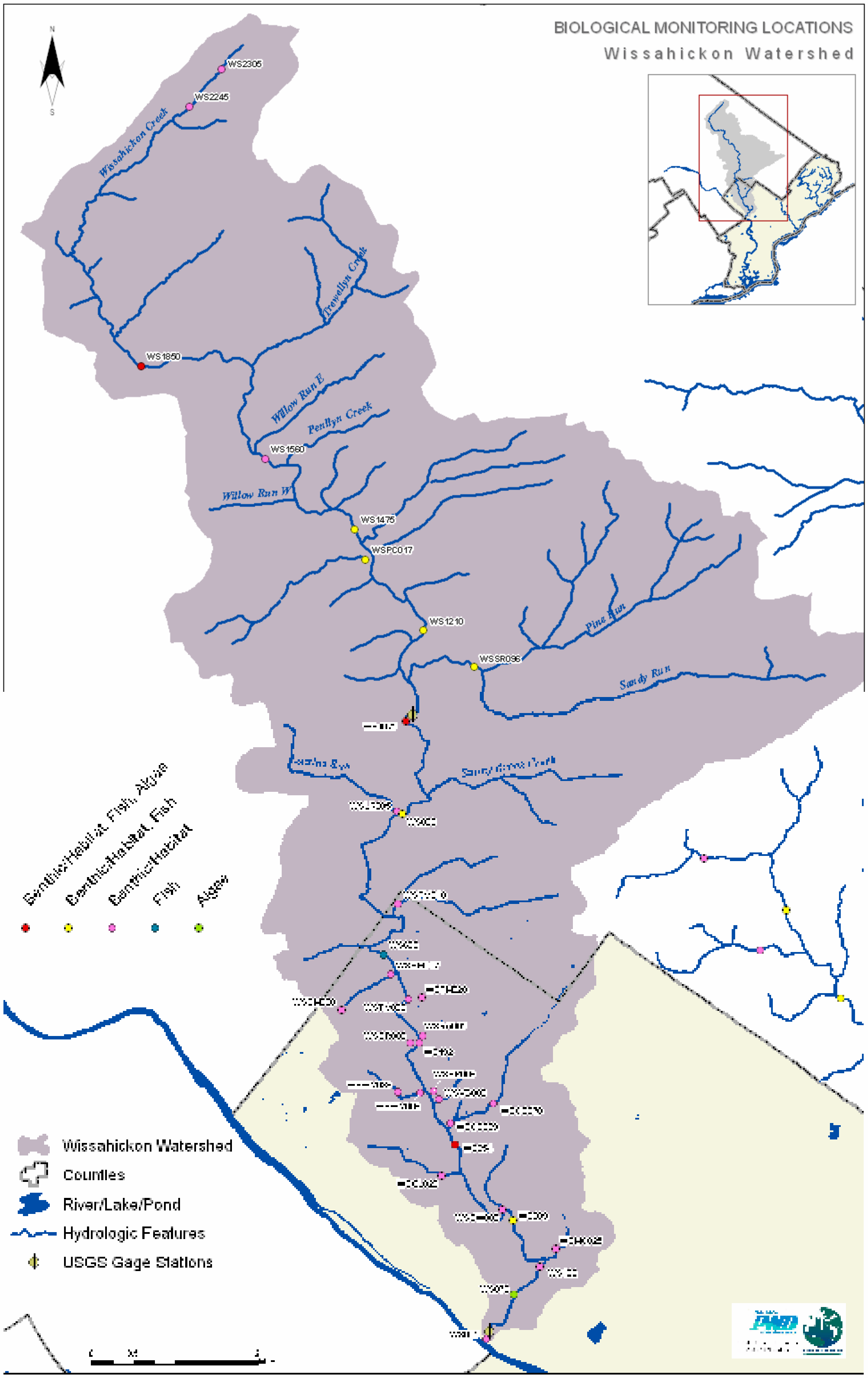


Figure J-9 Biological and Physical assessment locations in Wissahickon Watershed

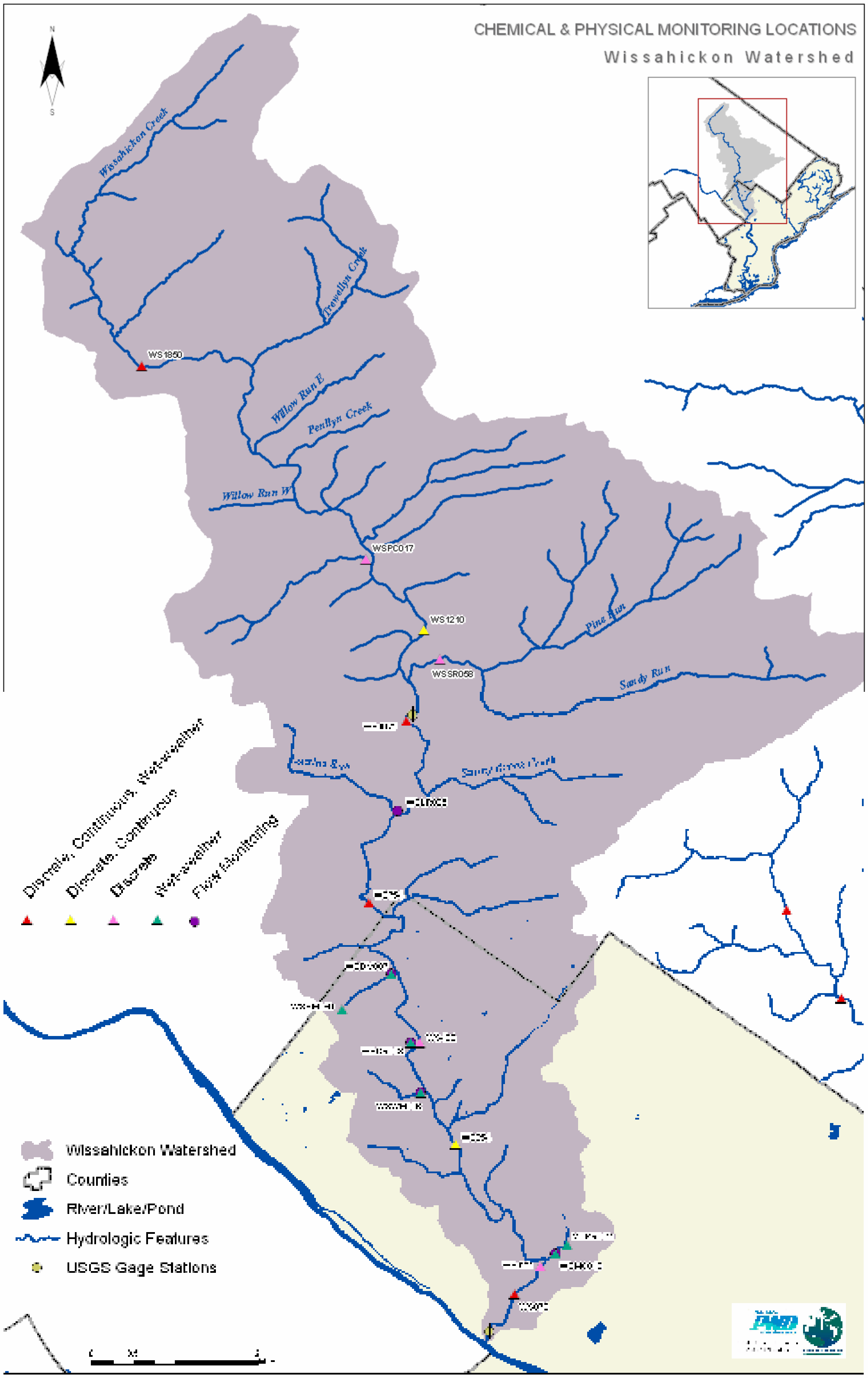


Figure J-10 Chemical monitoring locations in Wissahickon Watershed

APPENDIX K – WISSAHICKON/PENNYPACK/POQUESSING PRELIMINARY STORMWATER LOAD ESTIMATES

OCTOBER 23, 2008

Memorandum

To: PWD Office of Watersheds

From: Matt Vanaskie, Aaron Signarovitz

Date: October 23, 2008

Subject: Wissahickon/Pennypack/Poquessing Stormwater Load Estimates

SUMMARY

- This memo is an update to the Wissahickon/Pennypack/Poquessing Stormwater Load estimates included in the 2006 Stormwater permit.
- Estimates are being prepared based on an existing NetSTORM model.

Summary of Annual Pollutant Load

Watershed	BOD5	TSS	COD	TP	Cu	Zn	Fe	Tn	Fecal	Pb	Cd
	(lb/yr)	(lb/yr)	(lb/yr)	(lb/yr)	(lb/yr)	(lb/yr)	(lb/yr)	(lb/yr)	(#/yr)	(lb/yr)	(lb/yr)
Wissahickon	92237	437122	358520	2077	89.0	1035	18447	16065	2.08E+14	407	2.97
Pennypack	214790	1017919	834881	4837	207	2409	42958	37411	4.84E+14	947	6.91
Poquessing	153877	729242	598112	3466	149	1726	30775	26801	3.47E+14	678	4.95

Permit Language

Part I. PERMIT CONDITIONS

F. STORM WATER MANAGEMENT PROGRAM

2. DISCHARGE MANAGEMENT, CHARACTERIZATION, AND WATERSHED-BASED ASSESSMENT & MANAGEMENT PROGRAM

Step 2 – Watershed Plan Development: Permit issuance through end of year 4.

d. Estimate of Loadings from the City’s MS4 System

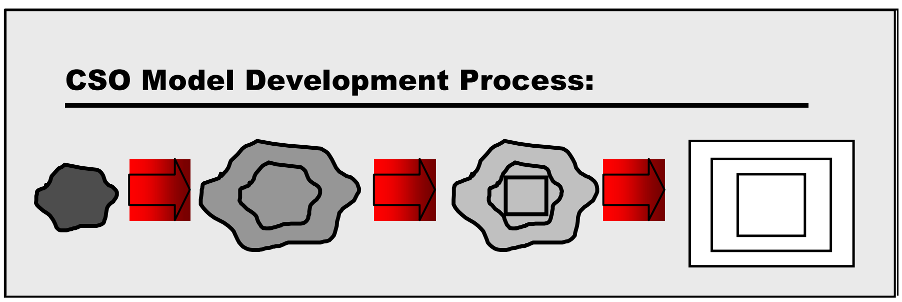
The City shall estimate annual and seasonal pollutant loads for all storm water outfalls in the watersheds. Estimates of pollutant concentrations shall be based on the nationally derived storm water event mean concentrations (EMCs) developed pursuant to the National Urban Runoff Program (NURP) database or any other database the City and DEP deem to be as reliable. Parameters shall include, but are not limited to: Total Suspended Solids (TSS), Biochemical

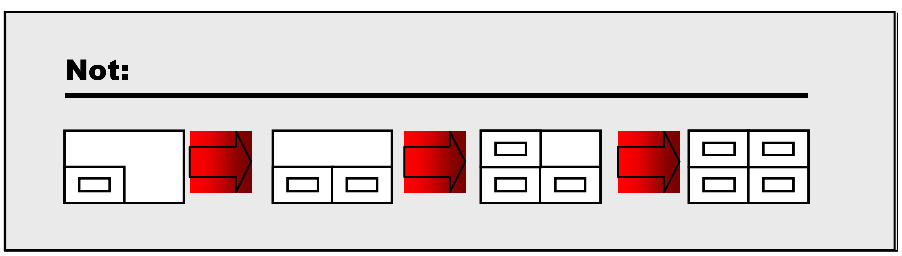
Oxygen Demand (BOD5), Chemical Oxygen Demand (COD), total nitrogen, total phosphorus, fecal coliform, copper, lead, zinc, cadmium, and dissolved iron.

Stormwater runoff rates shall be estimated by the City's application of the USEPA's Stormwater Management Model (SWMM) or any other model the City deems to be as reliable as the SWMM model. These loading estimates shall be included in the City's annual report.

Introductory Text

Estimates of stormwater volumes and loads for the Wissahickon, Pennypack, and Poquessing watersheds will be prepared in two stages, or tiers. Tier 1 results, based on a simplified representation of system hydrology, will provide initial estimates prior to development of a comprehensive watershed management plan for each system. The refined Tier 2 results, based on more detailed representations of hydrologic elements, will support development, implementation, and monitoring of the comprehensive watershed management plans. The models will be successively made more detailed as the need for detail increases throughout the watershed planning process, as illustrated in the figure below.





Tier 1 estimates were prepared using two independent evaluation methods. In the first method, streamflow records collected by USGS were analyzed to estimate mean annual and seasonal runoff volumes. Stormwater event mean concentrations reported by Smullen, Shallcross, and Cave (1999) were applied to these runoff volumes to yield pollutant load estimates. Estimates of total runoff volume and load were apportioned to individual MS4 outfalls based on drainage area. Estimates of runoff volume and load from areas not covered by the original Phase I NPDES stormwater permit were assigned to an "Other" category. Some of these areas drain to small outfalls not covered by the original permit, and some areas drain directly to receiving waters via overland flow.

In the second Tier 1 method, the MS4 drainage area was modeled in the United States Army Corps of Engineers (USACOE) Storage, Treatment, Overflow, Runoff Model (STORM), providing a simple algorithm for the computation of rainfall excess. Impervious cover estimates in this model were derived from GIS information collected in the early 1990s. Because these values represent total impervious cover, a correction factor was applied to represent the portion of the area that is directly connected to the drainage system. Based on detailed studies conducted in the Wissahickon Watershed, a 40% reduction was applied. STORM thereby provides a relatively coarse-level wet weather characterization that is useful for initial assessment of impacts and for planning-level alternatives screening used to establish the direction for more detailed planning and design. The hourly rainfall record at Philadelphia International Airport between 1902 and 2005 was run in a continuous simulation mode to estimate runoff volumes.

NetSTORM-Based Estimates

Pennypack Outfall Annual Flow

Outfall	Annual Flow (MG)	Outfall	Annual Flow (MG)	Outfall	Annual Flow (MG)	Outfall	Annual Flow (MG)
P04-A-S	7.77	P-100-06	1.77	P-105-01	80.9	P-108-21	17.9
P-082-01	4.56	P-100-07	3.35	P-105-02	29.0	P-108-22	0.220
P-083-01	1.99	P-100-08	39.1	P-105-03	27.7	P-108-23	3.29
P-083-02	7.06	P-100-09	0.890	P-105-04	1.90	P-108-24	22.2
P-083-03	183	P-100-10	1.57	P-105-05	2.81	P-109-01	30.3
P-083-04	48.6	P-100-11	17.3	P-105-06	67.0	P-109-02	4.09
P-090-01	4.40	P-100-12	0.050	P-105-07	7.55	P-109-03	1.96
P-090-02	477	P-100-13	4.33	P-105-08	3.48	P-109-04	22.4
P-091-01	16.5	P-100-14	15.9	P-105-09	0.090	P-109-05	9.02
P-091-02	7.85	P-100-15	2.93	P-105-10	0.310	P-109-13	58.2
P-091-03	3.82	P-100-16	17.2	P-105-11	6.99	P-109-X	1.42
P-091-04	12.4	P-100-17	7.19	P-105-12	18.6	P-112-01	4.67
P-091-05	4.70	P-100-18	0.020	P-105-13	6.15	P-112-02	6.74
P-091-06	57.2	P-100-19	2.25	P-106-01	12.0	P-112-03	34.5
P-091-07	22.1	P-100-20	5.31	P-106-02	4.91	P-112-04	9.21
P-091-08	13.4	P-100-21	4.73	P-108-01	3.23	P-112-05	2.73
P-091-09	14.2	P-100-22	1.96	P-108-02	0.850	P-113-01	16.5
P-091-10	14.8	P-100-23	4.67	P-108-03	8.15	P-113-02	0.690
P-091-11	5.62	P-100-24	6.12	P-108-04	2.21	P-113-03	3.94
P-091-12	4.93	P-100-25	2.28	P-108-05	2.76	P-113-04	85.1
P-091-13	1.57	P-101-01	2.99	P-108-06	2.93	P-113-05	0.230
P-092-01	1.48	P-101-02	13.7	P-108-07	11.2	P-113-06	7.42
P-092-02	2.34	P-103-01	7.04	P-108-08	6.36	P-113-07	34.3
P-092-03	1.47	P-103-02	0.700	P-108-09	7.75	P-113-08	43.1
P-092-04	1.56	P-103-03	7.39	P-108-10	3.94	P-113-12	0.090
P-099-01	18.9	P-104-01	0.620	P-108-11	15.4	P-113-13	0.160
P-099-02	47.5	P-104-02	1.90	P-108-12	8.64	P-116-01	9.93
P-099-03	42.8	P-104-03	20.0	P-108-13	10.8	P-116-02	22.2
P-099-04	6.80	P-104-04	1.79	P-108-14	14.6		
P-099-05	8.88	P-104-05	6.87	P-108-15	6.28		
P-100-01	6.77	P-104-06	15.3	P-108-16	18.9		
P-100-02	5.26	P-104-07	31.8	P-108-17	5.22		
P-100-03	14.4	P-104-08	14.4	P-108-18	1.96		
P-100-04	14.0	P-104-09	12.0	P-108-19	2.45		
P-100-05	7.55	P-104-10	7.77	P-108-20	10.0		

Pennypack Outfall Annual Pollutant Load

Outfall	BOD5 (lb/yr)	TSS (lb/yr)	COD (lb/yr)	TP (lb/yr)	Cu (lb/yr)	Zn (lb/yr)	Fe (lb/yr)	Tn (lb/yr)	Fecal (#/yr)	Pb (lb/yr)	Cd (lb/yr)
P04-A-S	745	3,529	2,894	16.8	0.719	8.35	149	130	1.68E+12	3.28	0.0240
P-082-01	437	2,071	1,699	9.84	0.422	4.90	87.4	76.1	9.85E+11	1.93	0.0141
P-083-01	191	904	741	4.30	0.184	2.14	38.1	33.2	4.30E+11	0.841	0.00614
P-083-02	677	3,206	2,630	15.2	0.653	7.59	135	118	1.52E+12	2.98	0.0218
P-083-03	17,552	83,181	68,223	395	16.9	197	3,510	3,057	3.95E+13	77.4	0.565
P-083-04	4,659	22,082	18,111	105	4.50	52.3	932	812	1.05E+13	20.5	0.150
P-090-01	422	1,998	1,639	9.50	0.407	4.73	84.3	73.4	9.50E+11	1.86	0.0136
P-090-02	45,685	216,506	177,574	1,029	44.1	512	9,137	7,957	1.03E+14	201	1.47
P-091-01	1,585	7,512	6,161	35.7	1.53	17.8	317	276	3.57E+12	6.99	0.0510
P-091-02	752	3,565	2,924	16.9	0.726	8.44	150	131	1.69E+12	3.32	0.0242
P-091-03	366	1,735	1,423	8.24	0.353	4.11	73.2	63.8	8.25E+11	1.61	0.0118
P-091-04	1,184	5,609	4,600	26.7	1.14	13.3	237	206	2.67E+12	5.22	0.0381
P-091-05	450	2,135	1,751	10.1	0.435	5.05	90.1	78.5	1.01E+12	1.99	0.0145
P-091-06	5,481	25,974	21,303	123	5.29	61.5	1,096	955	1.23E+13	24.2	0.176
P-091-07	2,113	10,014	8,214	47.6	2.04	23.7	423	368	4.76E+12	9.32	0.0680
P-091-08	1,286	6,095	4,999	29.0	1.24	14.4	257	224	2.90E+12	5.67	0.0414
P-091-09	1,365	6,467	5,304	30.7	1.32	15.3	273	238	3.07E+12	6.02	0.0439
P-091-10	1,421	6,735	5,524	32.0	1.37	15.9	284	248	3.20E+12	6.27	0.0457
P-091-11	539	2,552	2,093	12.1	0.520	6.04	108	93.8	1.21E+12	2.37	0.0173
P-091-12	472	2,239	1,836	10.6	0.456	5.30	94.5	82.3	1.06E+12	2.08	0.0152
P-091-13	150	713	585	3.39	0.145	1.69	30.1	26.2	3.39E+11	0.663	0.00484
P-092-01	142	672	551	3.19	0.137	1.59	28.4	24.7	3.20E+11	0.625	0.00456
P-092-02	224	1,063	872	5.05	0.216	2.52	44.9	39.1	5.05E+11	0.989	0.00722
P-092-03	141	668	548	3.17	0.136	1.58	28.2	24.5	3.17E+11	0.621	0.00453
P-092-04	150	709	581	3.37	0.144	1.68	29.9	26.0	3.37E+11	0.659	0.00481
P-099-01	1,811	8,584	7,040	40.8	1.75	20.3	362	315	4.08E+12	7.99	0.0583
P-099-02	4,554	21,582	17,701	103	4.40	51.1	911	793	1.03E+13	20.1	0.147
P-099-03	4,106	19,457	15,958	92.5	3.96	46.1	821	715	9.25E+12	18.1	0.132
P-099-04	652	3,088	2,533	14.7	0.629	7.31	130	114	1.47E+12	2.87	0.0210
P-099-05	851	4,033	3,308	19.2	0.821	9.55	170	148	1.92E+12	3.75	0.0274
P-100-01	649	3,075	2,522	14.6	0.626	7.28	130	113	1.46E+12	2.86	0.0209
P-100-02	504	2,389	1,959	11.4	0.487	5.65	101	87.8	1.14E+12	2.22	0.0162
P-100-03	1,384	6,558	5,379	31.2	1.34	15.5	277	241	3.12E+12	6.10	0.0445
P-100-04	1,337	6,336	5,196	30.1	1.29	15.0	267	233	3.01E+12	5.89	0.0430
P-100-05	724	3,429	2,812	16.3	0.698	8.12	145	126	1.63E+12	3.19	0.0233
P-100-06	170	804	659	3.82	0.164	1.90	33.9	29.5	3.82E+11	0.748	0.00546
P-100-07	321	1,521	1,248	7.23	0.310	3.60	64.2	55.9	7.23E+11	1.42	0.0103
P-100-08	3,745	17,749	14,557	84.3	3.61	42.0	749	652	8.44E+12	16.5	0.120
P-100-09	85.3	404	332	1.92	0.0823	0.957	17.1	14.9	1.92E+11	0.376	0.00274
P-100-10	150	713	585	3.39	0.145	1.69	30.1	26.2	3.39E+11	0.663	0.00484
P-100-11	1,654	7,839	6,429	37.3	1.60	18.6	331	288	3.73E+12	7.29	0.0532

Pennypack Outfall Annual Pollutant Load

Outfall	BOD5 (lb/yr)	TSS (lb/yr)	COD (lb/yr)	TP (lb/yr)	Cu (lb/yr)	Zn (lb/yr)	Fe (lb/yr)	Tn (lb/yr)	Fecal (#/yr)	Pb (lb/yr)	Cd (lb/yr)
P-100-12	4.79	22.7	18.6	0.108	0.00463	0.0538	0.958	0.835	1.08E+10	0.0211	0.000154
P-100-13	415	1,967	1,613	9.35	0.401	4.65	83.0	72.3	9.35E+11	1.83	0.0134
P-100-14	1,527	7,235	5,934	34.4	1.47	17.1	305	266	3.44E+12	6.73	0.0491
P-100-15	281	1,331	1,091	6.32	0.271	3.15	56.2	48.9	6.33E+11	1.24	0.00903
P-100-16	1,647	7,807	6,403	37.1	1.59	18.5	329	287	3.71E+12	7.26	0.0530
P-100-17	689	3,265	2,678	15.5	0.665	7.73	138	120	1.55E+12	3.04	0.0222
P-100-18	1.92	9.08	7.45	0.0432	0.00185	0.0215	0.383	0.334	4.32E+09	0.00845	0.0000617
P-100-19	216	1,022	838	4.86	0.208	2.42	43.1	37.6	4.86E+11	0.951	0.00694
P-100-20	509	2,412	1,978	11.5	0.491	5.71	102	88.6	1.15E+12	2.24	0.0164
P-100-21	453	2,148	1,762	10.2	0.438	5.08	90.7	79.0	1.02E+12	2.00	0.0146
P-100-22	188	890	730	4.23	0.181	2.11	37.6	32.7	4.23E+11	0.828	0.00604
P-100-23	448	2,121	1,740	10.1	0.432	5.02	89.5	78.0	1.01E+12	1.97	0.0144
P-100-24	587	2,780	2,280	13.2	0.566	6.58	117	102	1.32E+12	2.59	0.0189
P-100-25	219	1,036	849	4.92	0.211	2.45	43.7	38.1	4.92E+11	0.963	0.00703
P-101-01	287	1,358	1,114	6.45	0.277	3.21	57.3	49.9	6.46E+11	1.26	0.00922
P-101-02	1,311	6,213	5,096	29.5	1.27	14.7	262	228	2.95E+12	5.78	0.0422
P-103-01	675	3,197	2,622	15.2	0.651	7.57	135	118	1.52E+12	2.97	0.0217
P-103-02	67.1	318	261	1.51	0.0648	0.753	13.4	11.7	1.51E+11	0.296	0.00216
P-103-03	708	3,356	2,753	16.0	0.684	7.94	142	123	1.60E+12	3.12	0.0228
P-104-01	59.4	282	231	1.34	0.0574	0.667	11.9	10.3	1.34E+11	0.262	0.00191
P-104-02	182	863	708	4.10	0.176	2.04	36.4	31.7	4.10E+11	0.803	0.00586
P-104-03	1,917	9,083	7,450	43.2	1.85	21.5	383	334	4.32E+12	8.45	0.0617
P-104-04	172	813	667	3.86	0.166	1.92	34.3	29.9	3.86E+11	0.756	0.00552
P-104-05	658	3,120	2,559	14.8	0.635	7.39	132	115	1.48E+12	2.90	0.0212
P-104-06	1,468	6,958	5,707	33.1	1.42	16.5	294	256	3.31E+12	6.47	0.0472
P-104-07	3,045	14,429	11,834	68.6	2.94	34.2	609	530	6.86E+12	13.4	0.0980
P-104-08	1,375	6,517	5,345	31.0	1.33	15.4	275	240	3.10E+12	6.06	0.0442
P-104-09	1,149	5,445	4,466	25.9	1.11	12.9	230	200	2.59E+12	5.07	0.0370
P-104-10	745	3,529	2,894	16.8	0.719	8.35	149	130	1.68E+12	3.28	0.0240
P-105-01	7,755	36,751	30,143	175	7.49	87.0	1,551	1,351	1.75E+13	34.2	0.250
P-105-02	2,782	13,184	10,814	62.7	2.69	31.2	556	485	6.27E+12	12.3	0.0895
P-105-03	2,654	12,576	10,315	59.8	2.56	29.8	531	462	5.98E+12	11.7	0.0854
P-105-04	182	863	708	4.10	0.176	2.04	36.4	31.7	4.10E+11	0.803	0.00586
P-105-05	269	1,276	1,047	6.06	0.260	3.02	53.9	46.9	6.07E+11	1.19	0.00866
P-105-06	6,418	30,416	24,946	145	6.19	72.0	1,284	1,118	1.45E+13	28.3	0.206
P-105-07	724	3,429	2,812	16.3	0.698	8.12	145	126	1.63E+12	3.19	0.0233
P-105-08	334	1,581	1,296	7.51	0.322	3.74	66.7	58.1	7.51E+11	1.47	0.0107
P-105-09	8.63	40.9	33.5	0.194	0.00833	0.0968	1.73	1.50	1.94E+10	0.0380	0.000278
P-105-10	29.7	141	115	0.669	0.0287	0.333	5.94	5.17	6.69E+10	0.131	0.000956
P-105-11	670	3,175	2,604	15.1	0.647	7.51	134	117	1.51E+12	2.95	0.0216
P-105-12	1,781	8,438	6,921	40.1	1.72	20.0	356	310	4.01E+12	7.85	0.0573
P-105-13	589	2,793	2,291	13.3	0.569	6.61	118	103	1.33E+12	2.60	0.0190
P-106-01	1,145	5,427	4,451	25.8	1.11	12.8	229	199	2.58E+12	5.05	0.0368

Pennypack Outfall Annual Pollutant Load

Outfall	BOD5 (lb/yr)	TSS (lb/yr)	COD (lb/yr)	TP (lb/yr)	Cu (lb/yr)	Zn (lb/yr)	Fe (lb/yr)	Tn (lb/yr)	Fecal (#/yr)	Pb (lb/yr)	Cd (lb/yr)
P-106-02	471	2,230	1,829	10.6	0.454	5.28	94.1	82.0	1.06E+12	2.07	0.0151
P-108-01	310	1,467	1,203	6.97	0.299	3.47	61.9	53.9	6.97E+11	1.36	0.0100
P-108-02	81.5	386	317	1.83	0.0786	0.914	16.3	14.2	1.84E+11	0.359	0.00262
P-108-03	781	3,701	3,036	17.6	0.754	8.76	156	136	1.76E+12	3.44	0.0251
P-108-04	212	1,004	823	4.77	0.204	2.38	42.4	36.9	4.77E+11	0.934	0.00681
P-108-05	265	1,254	1,028	5.96	0.255	2.97	52.9	46.1	5.96E+11	1.17	0.00851
P-108-06	281	1,331	1,091	6.32	0.271	3.15	56.2	48.9	6.33E+11	1.24	0.00903
P-108-07	1,071	5,078	4,165	24.1	1.03	12.0	214	187	2.41E+12	4.72	0.0345
P-108-08	610	2,889	2,369	13.7	0.588	6.84	122	106	1.37E+12	2.69	0.0196
P-108-09	743	3,520	2,887	16.7	0.717	8.33	149	129	1.67E+12	3.27	0.0239
P-108-10	378	1,789	1,468	8.50	0.364	4.24	75.5	65.8	8.51E+11	1.66	0.0121
P-108-11	1,472	6,976	5,722	33.2	1.42	16.5	294	256	3.32E+12	6.49	0.0474
P-108-12	828	3,924	3,218	18.6	0.799	9.29	166	144	1.87E+12	3.65	0.0266
P-108-13	1,033	4,896	4,016	23.3	1.00	11.6	207	180	2.33E+12	4.55	0.0332
P-108-14	1,403	6,649	5,453	31.6	1.35	15.7	281	244	3.16E+12	6.19	0.0451
P-108-15	602	2,852	2,339	13.6	0.581	6.75	120	105	1.36E+12	2.65	0.0194
P-108-16	1,808	8,570	7,029	40.7	1.75	20.3	362	315	4.07E+12	7.97	0.0582
P-108-17	500	2,371	1,944	11.3	0.483	5.61	100	87.1	1.13E+12	2.21	0.0161
P-108-18	188	890	730	4.23	0.181	2.11	37.6	32.7	4.23E+11	0.828	0.00604
P-108-19	235	1,113	913	5.29	0.227	2.63	47.0	40.9	5.29E+11	1.04	0.00755
P-108-20	958	4,542	3,725	21.6	0.925	10.8	192	167	2.16E+12	4.23	0.0308
P-108-21	1,714	8,121	6,660	38.6	1.65	19.2	343	298	3.86E+12	7.55	0.0551
P-108-22	21.1	99.9	82.0	0.475	0.0204	0.237	4.22	3.67	4.75E+10	0.0930	0.000678
P-108-23	315	1,494	1,226	7.10	0.304	3.54	63.1	54.9	7.10E+11	1.39	0.0101
P-108-24	2,125	10,069	8,258	47.9	2.05	23.8	425	370	4.79E+12	9.37	0.0684
P-109-01	2,901	13,748	11,276	65.3	2.80	32.5	580	505	6.54E+12	12.8	0.0933
P-109-02	392	1,858	1,524	8.83	0.378	4.40	78.4	68.3	8.83E+11	1.73	0.0126
P-109-03	188	890	730	4.23	0.181	2.11	37.6	32.7	4.23E+11	0.828	0.00604
P-109-04	2,144	10,160	8,333	48.3	2.07	24.0	429	373	4.83E+12	9.45	0.0690
P-109-05	864	4,097	3,360	19.5	0.834	9.70	173	151	1.95E+12	3.81	0.0278
P-109-13	5,578	26,433	21,680	126	5.38	62.6	1,116	971	1.26E+13	24.6	0.179
P-109-X	136	645	529	3.06	0.131	1.53	27.2	23.7	3.07E+11	0.600	0.00438
P-112-01	448	2,121	1,740	10.1	0.432	5.02	89.5	78.0	1.01E+12	1.97	0.01440
P-112-02	646	3,061	2,511	14.5	0.623	7.25	129	113	1.46E+12	2.85	0.0208
P-112-03	3,301	15,646	12,833	74.4	3.19	37.0	660	575	7.44E+12	14.6	0.106
P-112-04	883	4,183	3,431	19.9	0.852	9.90	177	154	1.99E+12	3.89	0.0284
P-112-05	262	1,240	1,017	5.89	0.253	2.93	52.3	45.6	5.89E+11	1.15	0.00842
P-113-01	1,577	7,476	6,131	35.5	1.52	17.7	315	275	3.55E+12	6.95	0.0508
P-113-02	66.1	313	257	1.49	0.0638	0.742	13.2	11.5	1.49E+11	0.292	0.00213
P-113-03	378	1,789	1,468	8.50	0.364	4.24	75.5	65.8	8.51E+11	1.66	0.0121
P-113-04	8,156	38,654	31,703	184	7.87	91.5	1,631	1,421	1.84E+13	36.0	0.262
P-113-05	22.0	104	85.7	0.496	0.0213	0.247	4.41	3.84	4.97E+10	0.0972	0.000709
P-113-06	711	3,370	2,764	16.0	0.686	7.98	142	124	1.60E+12	3.13	0.0229

Pennypack Outfall Annual Pollutant Load

Outfall	BOD5 (lb/yr)	TSS (lb/yr)	COD (lb/yr)	TP (lb/yr)	Cu (lb/yr)	Zn (lb/yr)	Fe (lb/yr)	Tn (lb/yr)	Fecal (#/yr)	Pb (lb/yr)	Cd (lb/yr)
P-113-07	3,285	15,569	12,769	74.0	3.17	36.9	657	572	7.40E+12	14.5	0.106
P-113-08	4,127	19,556	16,040	92.9	3.98	46.3	825	719	9.30E+12	18.2	0.133
P-113-12	8.63	40.9	33.5	0.194	0.00833	0.097	1.73	1.50	1.94E+10	0.0380	0.000278
P-113-13	15.3	72.7	59.6	0.345	0.0148	0.172	3.07	2.67	3.45E+10	0.0676	0.000493
P-116-01	952	4,510	3,699	21.4	0.919	10.7	190	166	2.14E+12	4.20	0.0306
P-116-02	2,123	10,060	8,251	47.8	2.05	23.8	425	370	4.78E+12	9.36	0.0683

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Poquessing Outfall Annual Flow

Outfall	Annual Flow (MG)
Q-101-03	49.4
Q-101-04	11.3
Q-101-05	26.9
Q-101-06	0.310
Q-101-07	6.77
Q-101-08	1.10
Q-101-09	49.6
Q-101-10	3.96
Q-101-11	7.77
Q-101-12	0.090
Q-101-13	2.14
Q-101-14	2.20
Q-101-15	1.54
Q-101-16	1.80
Q-101-17	10.2
Q-101-18	1.94
Q-101-19	4.64
Q-101-20	17.5
Q-102-01	5.31
Q-102-02	14.0
Q-102-03	12.0
Q-102-04	2.95
Q-102-05	1.11
Q-102-X	1.14
Q-106-03	15.5
Q-106-04	10.3
Q-106-05	7.62
Q-106-06	2.85
Q-106-07	1.01

Outfall	Annual Flow (MG)
Q-106-19	1.07
Q-106-20	0.880
Q-106-21	26.4
Q-106-22	6.47
Q-107-01	4.53
Q-107-02	64.5
Q-107-03	2.29
Q-107-04	3.04
Q-107-05	7.84
Q-107-06	8.31
Q-107-07	13.4
Q-109-06	26.2
Q-109-07	64.6
Q-110-01	12.3
Q-110-02	7.68
Q-110-03	17.0
Q-110-04	6.77
Q-110-05	35.9
Q-110-06	15.0
Q-110-07	3.04
Q-110-08	3.52
Q-110-09	9.33
Q-110-10	2.90
Q-110-11	21.0
Q-110-12	2.61
Q-110-13	7.61
Q-110-14	13.8
Q-110-15	25.9
Q-110-16	8.79

Outfall	Annual Flow (MG)
Q-114-04	16.1
Q-114-05	6.36
Q-114-06	14.6
Q-114-07	16.1
Q-114-08	5.28
Q-114-09	3.39
Q-114-10	9.60
Q-114-11	8.01
Q-114-12	16.4
Q-114-13	2.75
Q-114-14	1.32
Q-114-15	12.6
Q-114-16	9.49
Q-114-17	2.21
Q-114-18	17.9
Q-115-01	24.1
Q-115-02	5.75
Q-115-03	1.91
Q-115-04	5.35
Q-115-05	3.21
Q-115-06	3.45
Q-115-07	2.44
Q-115-08	1.56
Q-115-09	18.2
Q-115-10	6.68
Q-115-11	5.17
Q-115-12	39.5
Q-115-13	2.49
Q-115-14	5.16

Outfall	Annual Flow (MG)
Q-118-03	12.6
Q-118-04	2.08
Q-118-05	5.25
Q-118-06	10.2
Q-118-07	6.45
Q-119-01	68.3
Q-120-01	0.940
Q-120-02	21.7
Q-120-03	15.4
Q-120-04	1.99
Q-120-05	4.27
Q-120-06	0.940
Q-120-07	1.60
Q-120-08	27.9
Q-120-09	2.29
Q-120-10	11.7
Q-120-11	23.8
Q-120-X	3.26
Q-120-Y	0.940
Q-120-Z	2.34
Q-121-01	10.5
Q-121-02	27.4
Q-121-03	1.01
Q-121-04	1.19
Q-121-05	14.0
Q-121-06	11.9

Q-106-08	4.64	Q-110-17	16.8	Q-115-15	0.090
Q-106-09	3.38	Q-110-18	3.64	Q-115-16	1.01
Q-106-10	0.900	Q-110-19	2.04	Q-115-17	4.25
Q-106-11	1.60	Q-110-20	15.0	Q-115-18	3.68
Q-106-12	8.02	Q-110-21	28.1	Q-117-01	0.740
Q-106-13	7.35	Q-113-09	34.2	Q-117-02	57.0
Q-106-14	2.59	Q-113-10	1.90	Q-117-03	5.69
Q-106-15	9.09	Q-113-11	5.35	Q-117-04	32.8
Q-106-16	3.62	Q-114-01	4.38	Q-117-05	24.9
Q-106-17	3.14	Q-114-02	25.4	Q-118-01	13.0
Q-106-18	6.10	Q-114-03	10.6	Q-118-02	12.5

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Poquessing Outfall Annual Pollutant Loads

Outfall	BOD5 (lbs/yr)	TSS (lbs/yr)	COD (lbs/yr)	TP (lbs/yr)	Cu (lbs/yr)	Zn (lbs/yr)	Fe (lbs/yr)	TN (lbs/yr)	Fecal (#/yr)	Pb (lbs/yr)	Cd (lbs/yr)
Q-101-03	4738	22454	18416	107	4.57	53.1	948	825	1.07E+13	20.9	0.152
Q-101-04	1085	5141	4217	24.4	1.05	12.2	217	189	2.44E+12	4.78	0.0349
Q-101-05	2582	12235	10035	58.1	2.49	29.0	516	450	5.82E+12	11.4	0.0831
Q-101-06	29.7	141	115	0.669	0.0287	0.333	5.94	5.17	6.69E+10	0.131	0.000956
Q-101-07	649	3075	2522	14.6	0.626	7.28	130	113	1.46E+12	2.86	0.0209
Q-101-08	105	500	410	2.37	0.102	1.18	21.1	18.4	2.38E+11	0.465	0.00339
Q-101-09	4756	22540	18487	107	4.59	53.4	951	828	1.07E+13	21.0	0.153
Q-101-10	380	1799	1475	8.55	0.366	4.26	75.9	66.1	8.55E+11	1.67	0.0122
Q-101-11	745	3529	2894	16.8	0.719	8.35	149	130	1.68E+12	3.28	0.0240
Q-101-12	8.63	40.9	33.5	0.194	0.00833	0.0968	1.73	1.50	1.94E+10	0.0380	0.000278
Q-101-13	205	972	797	4.62	0.198	2.30	41.0	35.7	4.62E+11	0.904	0.00660
Q-101-14	211	999	820	4.75	0.204	2.37	42.2	36.7	4.75E+11	0.930	0.00678
Q-101-15	148	699	574	3.32	0.142	1.66	29.5	25.7	3.33E+11	0.651	0.00475
Q-101-16	173	818	671	3.89	0.167	1.94	34.5	30.0	3.89E+11	0.761	0.00555
Q-101-17	976	4623	3792	22.0	0.942	10.9	195	170	2.20E+12	4.30	0.0314
Q-101-18	186	881	723	4.19	0.179	2.09	37.2	32.4	4.19E+11	0.820	0.00598
Q-101-19	445	2107	1728	10.0	0.429	4.99	88.9	77.4	1.00E+12	1.96	0.0143
Q-101-20	1678	7952	6522	37.8	1.62	18.8	336	292	3.78E+12	7.40	0.0540
Q-102-01	509	2412	1978	11.5	0.491	5.71	102	88.6	1.15E+12	2.24	0.0164
Q-102-02	1337	6336	5196	30.1	1.29	15.0	267	233	3.01E+12	5.89	0.0430
Q-102-03	1153	5464	4481	26.0	1.11	12.9	231	201	2.60E+12	5.08	0.0371
Q-102-04	283	1340	1099	6.37	0.273	3.17	56.5	49.2	6.37E+11	1.25	0.00910
Q-102-05	106	504	413	2.40	0.103	1.19	21.3	18.5	2.40E+11	0.469	0.00342
Q-102-X	109	518	425	2.46	0.105	1.23	21.9	19.0	2.46E+11	0.482	0.00352
Q-106-03	1484	7031	5766	33.4	1.43	16.6	297	258	3.34E+12	6.54	0.0477
Q-106-04	984	4664	3826	22.2	0.950	11.0	197	171	2.22E+12	4.34	0.0317
Q-106-05	730	3461	2838	16.4	0.705	8.19	146	127	1.65E+12	3.22	0.0235
Q-106-06	273	1294	1062	6.15	0.264	3.06	54.6	47.6	6.15E+11	1.20	0.00879
Q-106-07	96.8	459	376	2.18	0.0934	1.09	19.4	16.9	2.18E+11	0.427	0.00311

Poquessing Outfall Annual Pollutant Loads

Outfall	BOD5 (lbs/yr)	TSS (lbs/yr)	COD (lbs/yr)	TP (lbs/yr)	Cu (lbs/yr)	Zn (lbs/yr)	Fe (lbs/yr)	TN (lbs/yr)	Fecal (#/yr)	Pb (lbs/yr)	Cd (lbs/yr)
Q-106-08	445	2107	1728	10.0	0.429	4.99	88.9	77.4	1.00E+12	1.96	0.0143
Q-106-09	324	1535	1259	7.30	0.313	3.63	64.8	56.4	7.30E+11	1.43	0.0104
Q-106-10	86.3	409	335	1.94	0.0833	0.968	17.3	15.0	1.94E+11	0.380	0.00278
Q-106-11	153	727	596	3.45	0.148	1.72	30.7	26.7	3.45E+11	0.676	0.00493
Q-106-12	769	3642	2987	17.3	0.742	8.62	154	134	1.73E+12	3.39	0.0247
Q-106-13	704	3338	2738	15.9	0.680	7.90	141	123	1.59E+12	3.11	0.0227
Q-106-14	248	1176	965	5.59	0.240	2.78	49.6	43.2	5.59E+11	1.09	0.00799
Q-106-15	871	4128	3386	19.6	0.841	9.77	174	152	1.96E+12	3.84	0.0280
Q-106-16	347	1644	1348	7.81	0.335	3.89	69.4	60.4	7.82E+11	1.53	0.0112
Q-106-17	301	1426	1170	6.78	0.290	3.38	60.2	52.4	6.78E+11	1.33	0.00968
Q-106-18	585	2770	2272	13.2	0.564	6.56	117	102	1.32E+12	2.58	0.0188
Q-106-19	103	486	399	2.31	0.0990	1.15	20.5	17.9	2.31E+11	0.452	0.00330
Q-106-20	84.3	400	328	1.90	0.0814	0.946	16.9	14.7	1.90E+11	0.372	0.00271
Q-106-21	2534	12008	9849	57.1	2.45	28.4	507	441	5.71E+12	11.2	0.0815
Q-106-22	620	2938	2410	14.0	0.598	6.96	124	108	1.40E+12	2.73	0.0199
Q-107-01	434	2057	1687	9.78	0.419	4.87	86.8	75.6	9.78E+11	1.91	0.0140
Q-107-02	6179	29285	24019	139	5.96	69.3	1236	1076	1.39E+13	27.2	0.199
Q-107-03	219	1040	853	4.94	0.212	2.46	43.9	38.2	4.94E+11	0.968	0.00706
Q-107-04	291	1381	1132	6.56	0.281	3.27	58.3	50.7	6.56E+11	1.28	0.00937
Q-107-05	751	3561	2920	16.9	0.725	8.43	150	131	1.69E+12	3.31	0.0242
Q-107-06	796	3774	3095	17.9	0.769	8.93	159	139	1.79E+12	3.51	0.0256
Q-107-07	1280	6068	4977	28.8	1.24	14.4	256	223	2.88E+12	5.64	0.0412
Q-109-06	2508	11886	9748	56.5	2.42	28.1	502	437	5.65E+12	11.1	0.0807
Q-109-07	6188	29326	24052	139	5.97	69.4	1238	1078	1.39E+13	27.3	0.199
Q-110-01	1181	5595	4589	26.6	1.14	13.2	236	206	2.66E+12	5.21	0.0380
Q-110-02	736	3488	2861	16.6	0.710	8.26	147	128	1.66E+12	3.24	0.0237
Q-110-03	1633	7739	6347	36.8	1.58	18.3	327	284	3.68E+12	7.20	0.0525
Q-110-04	649	3075	2522	14.6	0.626	7.28	130	113	1.46E+12	2.86	0.0209
Q-110-05	3442	16314	13380	77.5	3.32	38.6	688	600	7.76E+12	15.2	0.111
Q-110-06	1434	6794	5573	32.3	1.38	16.1	287	250	3.23E+12	6.32	0.0461
Q-110-07	291	1381	1132	6.56	0.281	3.27	58.3	50.7	6.56E+11	1.28	0.00937
Q-110-08	337	1599	1311	7.60	0.326	3.78	67.5	58.8	7.60E+11	1.49	0.0109
Q-110-09	894	4237	3475	20.1	0.863	10.0	179	156	2.01E+12	3.94	0.0288
Q-110-10	278	1317	1080	6.26	0.268	3.12	55.6	48.4	6.26E+11	1.23	0.00894
Q-110-11	2012	9533	7819	45.3	1.94	22.6	402	350	4.53E+12	8.87	0.0647
Q-110-12	250	1185	972	5.63	0.241	2.81	50.0	43.6	5.64E+11	1.10	0.00805
Q-110-13	729	3456	2835	16.4	0.704	8.18	146	127	1.64E+12	3.22	0.0235
Q-110-14	1323	6268	5141	29.8	1.28	14.8	265	230	2.98E+12	5.83	0.0426
Q-110-15	2478	11745	9633	55.8	2.39	27.8	496	432	5.58E+12	10.9	0.0797
Q-110-16	842	3992	3274	19.0	0.813	9.45	168	147	1.90E+12	3.71	0.0271
Q-110-17	1614	7648	6273	36.3	1.56	18.1	323	281	3.64E+12	7.11	0.0519
Q-110-18	349	1653	1356	7.86	0.337	3.91	69.8	60.8	7.86E+11	1.54	0.0112
Q-110-19	196	927	760	4.40	0.189	2.19	39.1	34.1	4.40E+11	0.862	0.00629

Poquessing Outfall Annual Pollutant Loads

Outfall	BOD5 (lbs/yr)	TSS (lbs/yr)	COD (lbs/yr)	TP (lbs/yr)	Cu (lbs/yr)	Zn (lbs/yr)	Fe (lbs/yr)	TN (lbs/yr)	Fecal (#/yr)	Pb (lbs/yr)	Cd (lbs/yr)
Q-110-20	1434	6794	5573	32.3	1.38	16.1	287	250	3.23E+12	6.32	0.0461
Q-110-21	2691	12753	10460	60.6	2.60	30.2	538	469	6.06E+12	11.9	0.0866
Q-113-09	3275	15519	12728	73.8	3.16	36.7	655	570	7.38E+12	14.4	0.105
Q-113-10	182	863	708	4.10	0.176	2.04	36.4	31.7	4.10E+11	0.803	0.00586
Q-113-11	513	2430	1993	11.5	0.495	5.75	103	89.3	1.16E+12	2.26	0.0165
Q-114-01	420	1989	1632	9.45	0.405	4.71	84.0	73.1	9.46E+11	1.85	0.0135
Q-114-02	2435	11540	9465	54.8	2.35	27.3	487	424	5.49E+12	10.7	0.0783
Q-114-03	1017	4819	3952	22.9	0.981	11.4	203	177	2.29E+12	4.48	0.0327
Q-114-04	1540	7298	5986	34.7	1.49	17.3	308	268	3.47E+12	6.79	0.0495
Q-114-05	610	2889	2369	13.7	0.588	6.84	122	106	1.37E+12	2.69	0.0196
Q-114-06	1397	6622	5431	31.5	1.35	15.7	279	243	3.15E+12	6.16	0.0450
Q-114-07	1542	7308	5994	34.7	1.49	17.3	308	269	3.47E+12	6.80	0.0496
Q-114-08	506	2398	1967	11.4	0.488	5.68	101	88.1	1.14E+12	2.23	0.0163
Q-114-09	325	1540	1263	7.32	0.314	3.64	65.0	56.6	7.32E+11	1.43	0.0105
Q-114-10	920	4360	3576	20.7	0.888	10.3	184	160	2.07E+12	4.06	0.0296
Q-114-11	768	3638	2984	17.3	0.741	8.61	154	134	1.73E+12	3.38	0.0247
Q-114-12	1572	7448	6109	35.4	1.52	17.6	314	274	3.54E+12	6.93	0.0506
Q-114-13	264	1249	1024	5.94	0.254	2.96	52.7	45.9	5.94E+11	1.16	0.00848
Q-114-14	127	600	492	2.85	0.122	1.42	25.3	22.0	2.85E+11	0.558	0.00407
Q-114-15	1208	5723	4694	27.2	1.17	13.5	242	210	2.72E+12	5.32	0.0389
Q-114-16	909	4310	3535	20.5	0.878	10.2	182	158	2.05E+12	4.01	0.0293
Q-114-17	212	1004	823	4.77	0.204	2.38	42.4	36.9	4.77E+11	0.934	0.00681
Q-114-18	1714	8125	6664	38.6	1.65	19.2	343	299	3.86E+12	7.56	0.0552
Q-115-01	2306	10927	8962	51.9	2.23	25.9	461	402	5.19E+12	10.2	0.0742
Q-115-02	551	2611	2142	12.4	0.532	6.18	110	96.0	1.24E+12	2.43	0.0177
Q-115-03	183	867	711	4.12	0.177	2.05	36.6	31.9	4.12E+11	0.807	0.00589
Q-115-04	513	2430	1993	11.5	0.495	5.75	103	89.3	1.16E+12	2.26	0.0165
Q-115-05	308	1458	1196	6.93	0.297	3.45	61.5	53.6	6.93E+11	1.36	0.00990
Q-115-06	331	1567	1285	7.45	0.319	3.71	66.1	57.6	7.45E+11	1.46	0.0106
Q-115-07	234	1108	909	5.27	0.226	2.62	46.8	40.7	5.27E+11	1.03	0.00752
Q-115-08	150	709	581	3.37	0.144	1.68	29.9	26.0	3.37E+11	0.659	0.00481
Q-115-09	1743	8261	6776	39.3	1.68	19.6	349	304	3.93E+12	7.69	0.0561
Q-115-10	640	3034	2488	14.4	0.618	7.18	128	112	1.44E+12	2.82	0.0206
Q-115-11	495	2348	1926	11.2	0.478	5.56	99.1	86.3	1.12E+12	2.18	0.0159
Q-115-12	3788	17953	14725	85.3	3.66	42.5	758	660	8.53E+12	16.7	0.122
Q-115-13	239	1131	928	5.37	0.230	2.68	47.7	41.6	5.38E+11	1.05	0.00768
Q-115-14	495	2344	1922	11.1	0.477	5.55	98.9	86.1	1.11E+12	2.18	0.0159
Q-115-15	8.63	40.9	33.5	0.194	0.00833	0.0968	1.73	1.50	1.94E+10	0.0380	0.000278
Q-115-16	96.8	459	376	2.18	0.0934	1.09	19.4	16.9	2.18E+11	0.427	0.00311
Q-115-17	407	1930	1583	9.17	0.393	4.57	81.5	70.9	9.18E+11	1.80	0.0131
Q-115-18	353	1671	1371	7.94	0.340	3.96	70.5	61.4	7.95E+11	1.55	0.0113
Q-117-01	70.9	336	276	1.60	0.0685	0.796	14.2	12.4	1.60E+11	0.313	0.00228
Q-117-02	5463	25892	21236	123	5.27	61.3	1093	952	1.23E+13	24.1	0.176

Poquessing Outfall Annual Pollutant Loads

Outfall	BOD5 (lbs/yr)	TSS (lbs/yr)	COD (lbs/yr)	TP (lbs/yr)	Cu (lbs/yr)	Zn (lbs/yr)	Fe (lbs/yr)	TN (lbs/yr)	Fecal (#/yr)	Pb (lbs/yr)	Cd (lbs/yr)
Q-117-03	545	2584	2120	12.3	0.526	6.12	109	95.0	1.23E+12	2.40	0.0175
Q-117-04	3142	14892	12214	70.8	3.03	35.2	628	547	7.08E+12	13.9	0.101
Q-117-05	2387	11313	9279	53.8	2.30	26.8	477	416	5.38E+12	10.5	0.0768
Q-118-01	1246	5904	4843	28.1	1.20	14.0	249	217	2.81E+12	5.49	0.0401
Q-118-02	1194	5659	4641	26.9	1.15	13.4	239	208	2.69E+12	5.26	0.0384
Q-118-03	1204	5704	4679	27.1	1.16	13.5	241	210	2.71E+12	5.31	0.0387
Q-118-04	199	945	775	4.49	0.192	2.24	39.9	34.7	4.49E+11	0.879	0.00641
Q-118-05	503	2384	1956	11.3	0.486	5.64	101	87.6	1.13E+12	2.22	0.0162
Q-118-06	974	4614	3785	21.9	0.940	10.9	195	170	2.19E+12	4.29	0.0313
Q-118-07	618	2929	2403	13.9	0.597	6.93	124	108	1.39E+12	2.73	0.0199
Q-119-01	6541	30997	25423	147	6.31	73.4	1308	1139	1.47E+13	28.8	0.210
Q-120-01	90.1	427	350	2.03	0.0870	1.01	18.0	15.7	2.03E+11	0.397	0.00290
Q-120-02	2076	9837	8068	46.7	2.00	23.3	415	362	4.68E+12	9.15	0.0668
Q-120-03	1472	6976	5722	33.2	1.42	16.5	294	256	3.32E+12	6.49	0.0474
Q-120-04	191	904	741	4.30	0.184	2.14	38.1	33.2	4.30E+11	0.841	0.00614
Q-120-05	409	1939	1591	9.22	0.395	4.59	81.8	71.3	9.22E+11	1.80	0.0132
Q-120-06	90.1	427	350	2.03	0.0870	1.01	18.0	15.7	2.03E+11	0.397	0.00290
Q-120-07	153	727	596	3.45	0.148	1.72	30.7	26.7	3.45E+11	0.676	0.00493
Q-120-08	2669	12649	10374	60.1	2.58	29.9	534	465	6.01E+12	11.8	0.0859
Q-120-09	219	1040	853	4.94	0.212	2.46	43.9	38.2	4.94E+11	0.968	0.00706
Q-120-10	1117	5296	4343	25.2	1.08	12.5	223	195	2.52E+12	4.93	0.0360
Q-120-11	2282	10814	8869	51.4	2.20	25.6	456	397	5.14E+12	10.1	0.0734
Q-120-X	312	1481	1214	7.04	0.302	3.50	62.5	54.4	7.04E+11	1.38	0.0101
Q-120-Y	90.1	427	350	2.03	0.0870	1.01	18.0	15.7	2.03E+11	0.397	0.00290
Q-120-Z	224	1063	872	5.05	0.216	2.52	44.9	39.1	5.05E+11	0.989	0.00722
Q-121-01	1008	4778	3919	22.7	0.973	11.3	202	176	2.27E+12	4.44	0.0324
Q-121-02	2623	12431	10195	59.1	2.53	29.4	525	457	5.91E+12	11.6	0.0844
Q-121-03	96.8	459	376	2.18	0.0934	1.09	19.4	16.9	2.18E+11	0.427	0.00311
Q-121-04	114	540	443	2.57	0.110	1.28	22.8	19.9	2.57E+11	0.503	0.00367
Q-121-05	1340	6349	5208	30.2	1.29	15.0	268	233	3.02E+12	5.91	0.0431
Q-121-06	1142	5414	4440	25.7	1.10	12.8	228	199	2.57E+12	5.04	0.0368

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Wissahickon Outfall Annual Flow

Outfall	Annual Flow (MG)
W-052-01	2.59
W-052-02	5.17
W-060-01	29
W-060-02	5.79

Outfall	Annual Flow (MG)
W-076-04	2.25
W-076-05	0.96
W-076-06	2.34
W-076-07	5.31

W-060-03	17.5	W-076-08	1.11
W-060-04	2.25	W-076-09	11.04
W-060-05	16.64	W-076-10	7.7
W-060-06	0.58	W-076-11	2.03
W-060-07	3.39	W-076-12	6.75
W-060-08	4.77	W-076-13	27.91
W-060-09	3.35	W-076-14	13.36
W-060-10	47.54	W-076-X	2.28
W-060-11	10.23	W-077-01	6.38
W-067-01	106.81	W-077-02	39.95
W-067-02	12.01	W-084-01	13.44
W-067-03	7.24	W-084-02	24.47
W-067-04	5.61	W-084-03	0.64
W-067-05	2.21	W-084-04	1.94
W-067-06	6.75	W-085-01	15.01
W-068-01	2.21	W-085-02	11.82
W-068-02	1.94	W-086-01	71.22
W-068-03	0.72	W-086-02	17.63
W-068-04	166.85	W-086-03	7.24
W-068-05	26.2	W-086-04	11.72
W-068-06	2.32	W-086-05	9.72
W-068-07	4.27	W-086-06	18.26
W-068-08E	3.64	W-086-07	9.09
W-068-08W	4.93	W-095-01	19.77
W-075-01	41.39	W-095-02	0.88
W-075-02	2.45	W-095-03	8.88
W-076-01	24.68	W-095-04	1.35
W-076-02	10.45	W-095-05	6.22
W-076-03	2.32		

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Wissahickon Outfall Annual Pollutant Load

Outfall	BOD5 (lb/yr)	TSS (lb/yr)	COD (lb/yr)	TP (lb/yr)	Cu (lb/yr)	Zn (lb/yr)	Fe (lb/yr)	Tn (lb/yr)	Fecal (#/yr)	Pb (lb/yr)	Cd (lb/yr)
W-052-01	248	1,176	965	5.59	0.240	2.78	49.6	43.2	5.59E+11	1.09	0.00799
W-052-02	495	2,348	1,926	11.2	0.478	5.56	99.1	86.3	1.12E+12	2.18	0.0159
W-060-01	2,779	13,171	10,803	62.6	2.68	31.2	556	484	6.26E+12	12.3	0.0894
W-060-02	555	2,630	2,157	12.5	0.536	6.22	111	96.6	1.25E+12	2.45	0.0179
W-060-03	1,677	7,948	6,519	37.8	1.62	18.8	335	292	3.78E+12	7.39	0.0540
W-060-04	216	1,022	838	4.86	0.208	2.42	43.1	37.6	4.86E+11	0.951	0.00694
W-060-05	1,595	7,557	6,198	35.9	1.54	17.9	319	278	3.59E+12	7.03	0.0513
W-060-06	55.6	263	216	1.25	0.0537	0.624	11.1	9.68	1.25E+11	0.245	0.00179
W-060-07	325	1,540	1,263	7.32	0.314	3.64	65.0	56.6	7.32E+11	1.43	0.0105

Wissahickon Outfall Annual Pollutant Load

Outfall	BOD5 (lb/yr)	TSS (lb/yr)	COD (lb/yr)	TP (lb/yr)	Cu (lb/yr)	Zn (lb/yr)	Fe (lb/yr)	Tn (lb/yr)	Fecal (#/yr)	Pb (lb/yr)	Cd (lb/yr)
W-060-08	457	2,166	1,777	10.3	0.441	5.13	91.4	79.6	1.03E+12	2.02	0.0147
W-060-09	321	1,521	1,248	7.23	0.310	3.60	64.2	55.9	7.23E+11	1.42	0.0103
W-060-10	4,556	21,591	17,709	103	4.40	51.1	911	794	1.03E+13	20.1	0.147
W-060-11	980	4,646	3,811	22.1	0.946	11.0	196	171	2.21E+12	4.32	0.0315
W-067-01	10,236	48,510	39,787	231	9.88	115	2,047	1,783	2.31E+13	45.1	0.329
W-067-02	1,151	5,455	4,474	25.9	1.11	12.9	230	200	2.59E+12	5.07	0.0370
W-067-03	694	3,288	2,697	15.6	0.670	7.78	139	121	1.56E+12	3.06	0.0223
W-067-04	538	2,548	2,090	12.1	0.519	6.03	108	93.6	1.21E+12	2.37	0.0173
W-067-05	212	1,004	823	4.77	0.204	2.38	42.4	36.9	4.77E+11	0.934	0.00681
W-067-06	647	3,066	2,514	14.6	0.624	7.26	129	113	1.46E+12	2.85	0.0208
W-068-01	212	1,004	823	4.77	0.204	2.38	42.4	36.9	4.77E+11	0.934	0.00681
W-068-02	186	881	723	4.19	0.179	2.09	37.2	32.4	4.19E+11	0.820	0.00598
W-068-03	69.0	327	268	1.55	0.0666	0.774	13.8	12.0	1.55E+11	0.304	0.00222
W-068-04	15,990	75,778	62,152	360	15.4	179	3,198	2,785	3.60E+13	70.5	0.514
W-068-05	2,511	11,899	9,760	56.5	2.42	28.2	502	437	5.66E+12	11.1	0.0808
W-068-06	222	1,054	864	5.01	0.215	2.49	44.5	38.7	5.01E+11	0.980	0.00715
W-068-07	409	1,939	1,591	9.22	0.395	4.59	81.8	71.3	9.22E+11	1.80	0.0132
W-068-08E	349	1,653	1,356	7.86	0.337	3.91	69.8	60.8	7.86E+11	1.54	0.0112
W-068-08W	472	2,239	1,836	10.6	0.456	5.30	94.5	82.3	1.06E+12	2.08	0.0152
W-075-01	3,967	18,798	15,418	89.3	3.83	44.5	793	691	8.94E+12	17.5	0.128
W-075-02	235	1,113	913	5.29	0.227	2.63	47.0	40.9	5.29E+11	1.04	0.00755
W-076-01	2,365	11,209	9,193	53.3	2.28	26.5	473	412	5.33E+12	10.4	0.0761
W-076-02	1,001	4,746	3,893	22.6	0.967	11.2	200	174	2.26E+12	4.42	0.0322
W-076-03	222	1,054	864	5.01	0.215	2.49	44.5	38.7	5.01E+11	0.980	0.00715
W-076-04	216	1,022	838	4.86	0.208	2.42	43.1	37.6	4.86E+11	0.951	0.00694
W-076-05	92.0	436	358	2.07	0.0888	1.03	18.4	16.0	2.07E+11	0.406	0.00296
W-076-06	224	1,063	872	5.05	0.216	2.52	44.9	39.1	5.05E+11	0.989	0.00722
W-076-07	509	2,412	1,978	11.5	0.491	5.71	102	88.6	1.15E+12	2.24	0.0164
W-076-08	106	504	413	2.40	0.103	1.19	21.3	18.5	2.40E+11	0.469	0.00342
W-076-09	1,058.0	5,014	4,112	23.8	1.02	11.9	212	184	2.38E+12	4.66	0.0340
W-076-10	738	3,497	2,868	16.6	0.712	8.28	148	129	1.66E+12	3.25	0.0237
W-076-11	195	922	756	4.38	0.188	2.18	38.9	33.9	4.38E+11	0.858	0.00626
W-076-12	647	3,066	2,514	14.6	0.624	7.26	129	113	1.46E+12	2.85	0.0208
W-076-13	2,675	12,676	10,396	60.2	2.58	30.0	535	466	6.03E+12	11.8	0.0861
W-076-14	1,280	6,068	4,977	28.8	1.24	14.4	256	223	2.88E+12	5.64	0.0412
W-076-X	219	1,036	849	4.92	0.211	2.45	43.7	38.1	4.92E+11	0.963	0.00703
W-077-01	611	2,898	2,377	13.8	0.590	6.86	122	106	1.38E+12	2.70	0.0197
W-077-02	3,829	18,144	14,881	86.2	3.70	42.9	766	667	8.63E+12	16.9	0.123
W-084-01	1,288	6,104	5,006	29.0	1.24	14.4	258	224	2.90E+12	5.68	0.0414
W-084-02	2,345	11,113	9,115	52.8	2.26	26.3	469	408	5.28E+12	10.3	0.0754
W-084-03	61.3	291	238	1.38	0.0592	0.688	12.3	10.7	1.38E+11	0.270	0.00197
W-084-04	186	881	723	4.19	0.179	2.09	37.2	32.4	4.19E+11	0.820	0.00598
W-085-01	1,438	6,817	5,591	32.4	1.39	16.1	288	251	3.24E+12	6.34	0.0463

Wissahickon Outfall Annual Pollutant Load

Outfall	BOD5 (lb/yr)	TSS (lb/yr)	COD (lb/yr)	TP (lb/yr)	Cu (lb/yr)	Zn (lb/yr)	Fe (lb/yr)	Tn (lb/yr)	Fecal (#/yr)	Pb (lb/yr)	Cd (lb/yr)
W-085-02	1,133	5,368	4,403	25.5	1.09	12.7	227	197	2.55E+12	4.99	0.0364
W-086-01	6,825	32,346	26,529	154	6.59	76.6	1,365	1,189	1.54E+13	30.1	0.220
W-086-02	1,690	8,007	6,567	38.1	1.63	19.0	338	294	3.81E+12	7.45	0.0544
W-086-03	694	3,288	2,697	15.6	0.670	7.78	139	121	1.56E+12	3.06	0.0223
W-086-04	1,123	5,323	4,366	25.3	1.08	12.6	225	196	2.53E+12	4.95	0.0361
W-086-05	932	4,415	3,621	21.0	0.899	10.4	186	162	2.10E+12	4.11	0.0300
W-086-06	1,750	8,293	6,802	39.4	1.69	19.6	350	305	3.94E+12	7.71	0.0563
W-086-07	871	4,128	3,386	19.6	0.841	9.77	174	152	1.96E+12	3.84	0.0280
W-095-01	1,895	8,979	7,364	42.7	1.83	21.3	379	330	4.27E+12	8.35	0.0610
W-095-02	84.3	400	328	1.90	0.0814	0.946	16.9	14.7	1.90E+11	0.372	0.00271
W-095-03	851	4,033	3,308	19.2	0.821	9.55	170	148	1.92E+12	3.75	0.0274
W-095-04	129	613	503	2.91	0.125	1.45	25.9	22.5	2.91E+11	0.570	0.00416
W-095-05	596	2,825	2,317	13.4	0.575	6.69	119	104	1.34E+12	2.63	0.0192

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APPENDIX L –BMP FACTSHEETS

PAGE NO.

Traffic Triangle Retrofit at 47th and Grays Ferry

Stormwater BMP Project | **Schuylkill Watershed**

Contact: Amy Leib
215.685.6035
amy.leib@phila.gov

Status: Completed

Partners:

PA Department of Environmental Protection (PADEP)
Philadelphia Department of Recreation
University City Green (UCG)
Pennsylvania Horticultural Society (PHS)
Philadelphia Streets Department
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 vegetated, but unused traffic triangle at the intersection of 47th and Grays Ferry in West Philadelphia was retrofitted with a rain 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 trees, shrubs, and herbaceous plants that will tolerate the fluctuating conditions and provide year round interest as a gateway landscape.

Benefits:

•Reduces the flow of stormwater into the combined sewer system through on-site infiltration, thus reducing overflows to the river.
•Reduces non-point source pollution from stormwater 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.

Allens Lane Art Center Porous Basketball Court

Stormwater BMP Project | **Wissahickon Creek Watershed**

Contact: Joanne Dahme
215.685.4944
joanne.dahme@phila.gov

Status: Completed

Partners:

Councilwoman Donna Reed Miller
U.S. Environmental Protection Agency
Fairmount Park Commission (FPC)

Allens Lane Art Center Porous Basketball Court...

The Fairmount Park Commission has embarked on the complete reconstruction of the basketball court at the Allens Lane Art Center and teamed up with the Office of Watersheds to demonstrate pervious asphalt.

To improve the quality of the courts and reduce the volume of stormwater that flows into the Wissahickon Creek, the basketball courts will be retrofitted with porous asphalt over an infiltration bed. Rain that falls on the basketball courts will pass through the porous surface and be stored in a subsurface stone bed until it can soak into the ground, eventually helping to provide baseflow for the creek.

Benefits:

- The system is designed to capture most of the stormwater that falls on the two basketball courts, thereby reducing the volume and rate of stormwater that flows into Wissahickon Creek

- Rainfall is infiltrated, recharging groundwater and providing needed baseflow for Wissahickon Creek

- No puddles on the court, so players can play immediately after it rains

Clean Water........
Green City
www.phillyriverinfo.org

PWD's Bureau of Laboratory Services

Stormwater BMP Project

Tacony-Frankford Watershed

Contact: Glen Abrams
215.685.6039
Glen.Abrams@phila.gov

Status: Concept Design

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

Clark Park Infiltration Bed

Stormwater BMP Project

Mill Creek Watershed

Contact: Glen Abrams
215.685.6039
Glen.Abrams@phila.gov

Status: Completed

Partners:

Friends of Clark Park (FOCP)

Pennsylvania Department of Conservation & Natural Resources

Philadelphia Department of Recreation

PA Department of Environmental Protection (PADEP)

Philadelphia Capital Program Office

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 areas.
- Opportunity to monitor long-term performance of a stormwater management strategy most often selected by private developers.
- Example of integrating management of runoff from the street into a planned capital improvement project on a City facility.

Clean Water........
Green City
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Office of Watersheds

Philadelphia Water Department

Cliveden Park

Stormwater BMP Project

Tacony-Frankford Watershed

Contact: Amy Leib
215.685.6035
amy.leib@phila.gov

Status: Completed

Partners:

Bank of America
Pennsylvania Department of Environmental Protection (PADEP)
Philadelphia Department of Recreation
Friends of Cliveden Park
Pennsylvania Horticultural Society (PHS)

Cliveden Park…

The stormwater demonstration project at Cliveden Park captures runoff from adjacent streets and uses the park's natural topography to detain stormwater before it flows into the combined sewer system. Small upland depressions provide water quality treatment and infiltration of stormwater, and a modified outlet structure allows 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 system meets stormwater management objectives, enhances the existing wetland in the park, and is also provides an amenity for the park community.

Benefits:

•Combined sewer overflows are reduced through infiltration, evapotranspiration, and flow attenuation

•Stormwater filtration and water quality treatment

•Wetland and park enhancement

Riparian Restoration at Courtesy Stables

Restoration Project

Wissahickon Creek Watershed

Contact: Kelly Anderson
215-685-6245
Kelly.Anderson@phila.gov

Status: Ongoing Initiative

Partners:

DE Estuary Grant- The National Fish & Wildlife Foundation

Friends of the Wissahickon (FOW)

Philadelphia Water Department - OOW

Fairmount Park Commission (FPC)

Natural Resources Conservation Service

Riparian Restoration at Courtesy Stables...

This project's aim is to correct problems contributing to nutrient-laden stormwater that flows from a 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. Invasive plant species onsite were removed and replaced with Philadelphia-native trees and shrubs. Educational signage was erected, linking nutrient runoff reduction to improvement of the Delaware Estuary.

Benefits:

● Elimination of 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

Clean Water........ Green City
www.phillyriverinfo.org

Parking Lot in East Falls

Stormwater BMP Project

Schuylkill Watershed

Contact: Amy Leib
215.685.6035
amy.leib@phila.gov

Status: Completed

Partners:

East Falls Development Corporation

Philadelphia Capital Program Office

PA Department of Environmental Protection (PADEP)

Parking Lot in East Falls...

The City of Philadelphia constructed a 50-space parking lot to serve the East Falls commercial district and Kelly Drive recreational trail users. The lot was designed with a rain garden that manages the majority of surface runoff from the parking lot. The system serves as a demonstration of an encouraged stormwater management practice and provides an opportunity for stormwater education and awareness in a riverside community. The bioinfiltration garden is located in a high traffic location and also serves as a gateway to the East Falls Neighborhood.

Benefits:

- Provides highly visible demonstration of bioretention for parking lot runoff management.
- Helps manage nonpoint source pollution in priority sourcewater area.
- Provides an attractive gateway to the East Falls neighborhood.

Riparian Restoration at Fox Chase Farms

Restoration Project

Pennypack Watershed

Contact: Kelly Anderson
215-685-6245
Kelly.Anderson@phila.gov

Status: Completed

Partners:

Fairmount Park Commission (FPC)
Philadelphia Water Department - OOW
Philadelphia School District (PSD)

Riparian Restoration at Fox Chase Farms...

Prior to project implementation, cows on Fox Chase Farm had free access to a small tributary which runs through the farm. The surrounding pasture was mowed right to the tributary's edge. This combination resulted in extremely high concentrations of fecal coliform and E. Coli in the tributary and the Pennypack Creek downstream of the farm. This project aims to reduce the impact of farm runoff through the construction of a cattle crossing over the tributary and the installation of a 1.85 acre riparian buffer. In 2002, approximately 400 trees and 700 shrubs were planted on the farm, creating a 15 yard buffer on either side of the tributary. 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

- Addition of native plant species to the site

- Enhanced biological habitat in the tributary and the Pennypack

- Lower water temperatures in the Pennypack through improved shading along the tributary

Herron Playground

Stormwater BMP Project

Delaware Watershed

Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Completed

Partners:

Philadelphia Capital Program Office

Philadelphia Department of Recreation

Herron Playground...

Herron Playground, a city-owned facility managed by the Philadelphia Department of Recreation (PDR), is located in a neighborhood served by a combined sewer system. The Philadelphia Water Department collaborated with PDR and the City's Capital Program Office to design and construct an infiltration system as part of an overall reconstruction of the Playground to manage both on-site and off-site runoff from the adjacent streets. The existing basketball court was reconstructed and resurfaced with porous asphalt. A subsurface infiltration system was installed beneath the basketball court area and to manage stormwater runoff from portions of Earp St. and American St. The total area managed is approximately 13,000 SF.

Benefits:

Reduces runoff into the combined sewer
Improved park ammenities for neighborhood
Pilot project for collaboration between City Departments

Clean Water........
Green City
www.phillyriverinfo.org

Jefferson Square Park

Stormwater BMP Project

Delaware Watershed

Contact: Glen Abrams
215.685.6039
Glen.Abrams@phila.gov

Status: Completed

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 rain garden at the northwest edge of the park to intercept sidewalk runoff.

Benefits:

Reduction of stormwater runoff to the combined sewer
Demonstration of a pervious pavement material in a public area
Rain garden mitigates frequent sidewalk ponding

Clean Water........ Green City
www.phillyriverinfo.org

Liberty Lands

Stormwater BMP Project

Delaware Watershed

Contact: Glen Abrams
215.685.6039
Glen.Abrams@phila.gov

Status: Completed

Partners:

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

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 phase of implementation was a performance stage backed by a vegetated stormwater management area that manages runoff from park and an adjacent street.

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

Stream Restoration of Cobbs Creek at Marshall Road

Restoration Project

Darby-Cobbs Watershed

Downstream view of Cobbs Creek post construction

Contact: Marc Cammarata
215.685.4948
marc.cammarata@phila.gov

Status: Completed

Partners:

Academy of Natural Sciences
City of Philadelphia

Delaware River Basin Commission (DRBC)
PA Department of Environmental Protection (PADEP)
US Fish and Wildlife Service (USFWS)

ArmyCorps of Engineers
Cobbs Cr Community Environmental Education Center (CCCEEC)
Fairmount Park Commission (FPC)
Pennsylvania Environmental Council (PEC)

Stream Restoration of Cobbs Creek at Marshall Road...

●Implemented restoration techniques targeted at removing stream impairments and restoring ecological resources.
●Served as a pilot project for habitat restoration, stream bank stabilization, natural channel design, water quality improvement, and infrastructure protection.
●Mitigated the impacts of urban runoff and non-point source pollution.
●Restored native vegetation to the riparian corridor to enhance bank stability.
●Reduced the likelihood of further stream erosion and exposure of sanitary sewage infrastructure.
●Completed a fluvial geomorphologic assessment of the Cobbs Creek to serve as a tool for integrated bank stabilization/habitat restoration for this and future projects.

Tree and shrub planting at restoration site

Benefits:

●A stable channel in dynamic equilibrium with its 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

US view of Cobbs Creek post construction

Clean Water........ Green City
www.phillyriverinfo.org

Porous Basketball Courts at Mill Creek Playground

Stormwater BMP Project **Multiple Watersheds**

Contact: Amy Leib
215.685.6035
amy.leib@phila.gov

Status: Completed

Partners:

Councilwoman Blackwell

Philadelphia Department of Recreation

Pennsylvania Department of Environmental Protection (PADEP)

Porous Basketball Courts at Mill Creek Playground...

The porous basketball court at Mill Creek
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
•Neighbors have reported that the courts are quieter and the children like playing on them better.
•Rain that falls on the basketball courts passes through the porous surface and is stored in a subsurface stone bed until it can soak into the ground.

Mill Creek Urban Farm

Stormwater BMP Project

Schuylkill Watershed

Contact: Glen Abrams
215.685.6039
Glen.Abrams@phila.gov

Status: Completed

Partners:

A Little Taste of Everything
Neighborhood Gardens Association

Pennsylvania Horticultural Society (PHS)
Project NEAT

Councilwoman Blackwell
Pennsylvania Department of Environmental Protection (PADEP)
Philadelphia Water Department

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

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

Clean Water........
Green City
www.phillyriverinfo.org

Monastery Stables

Stormwater BMP Project

Wissahickon Watershed

Contact: Kelly Anderson
215-685-6245
Kelly.Anderson@phila.gov

Status: Completed

Partners:

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

Monastery Stables...

The Philadelphia Water Department is partnering with the Fairmont Park Commission (FPC) to address stormwater and agricultural runoff at Monastery Stables, an 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. 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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Rain Barrels & Tree Program on N. 50th Street in Mill Creek Watershed

Education Project

Multiple Watersheds

Contact: Joanne Dahme
215.685.4944
joanne.dahme@phila.gov

Status: Design

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.

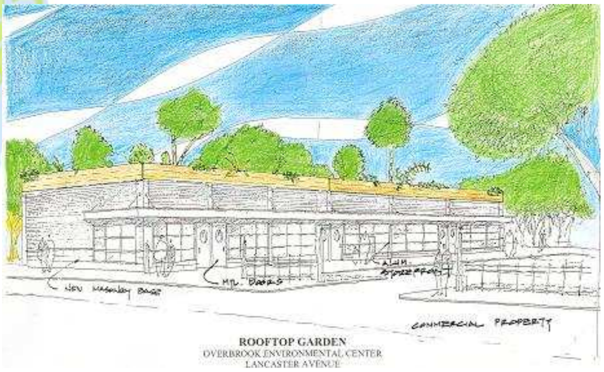
The project also included the re-grading of vacant parcels in the middle of the block to minimize stormwater runoff and create a community green space and gardens.

Benefits:

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

Overbrook Environmental Education Center

Stormwater BMP Project — **Multiple Watersheds**



Contact: Laureen Boles
215.685.6268
laureen.boles@phila.gov

Status: Concept Design

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.

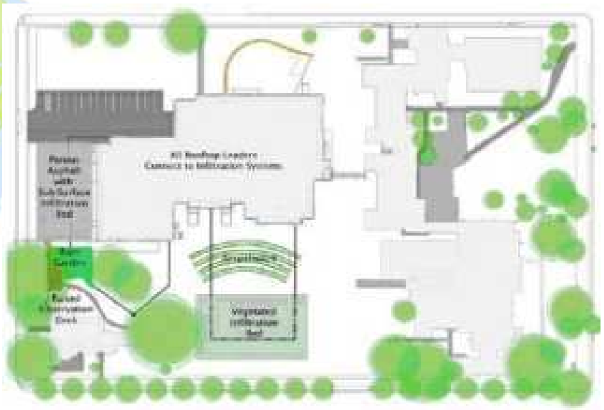
Benefits:

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

Penn Alexander School

Stormwater BMP Project

Mill Creek Watershed



Contact: Amy Leib
215.685.6035
amy.leib@phila.gov

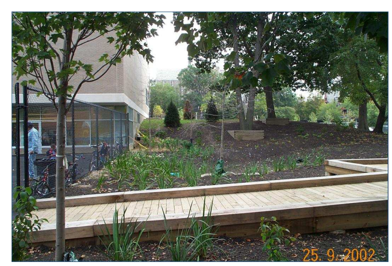
Status: Completed

Partners:

Pennsylvania Department of Environmental Protection (PADEP)
University of Pennsylvania (UPENN)
Philadelphia School District (PSD)

Penn Alexander School...

In partnership with the Philadelphia Water Department, the University of Pennsylvania and the School District of Philadelphia implemented numerous stormwater management practices during construction of the Penn Alexander School. The project includes a pervious asphalt play yard, as well as a rain garden and subsurface infiltration bed that manage roof runoff.



Benefits:

- Reduces the flow of stormwater into the combined sewer system through infiltration, thereby reducing combined sewer overflows
- Provides opportunities for on-site environmental education to elementary school children

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ES&ED Verree Road Wetland and Parking Lot

Restoration Project

Pennypack Watershed

Contact: Glen Abrams
215.685.6039
Glen.Abrams@phila.gov

Status: Monitoring

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

Stormwater Treatment Wetland at Saylor Grove

Restoration Project

Wissahickon Creek Watershed

Contact: Marc Cammarata
215.685.4948
marc.cammarata@phila.gov

Status: Monitoring

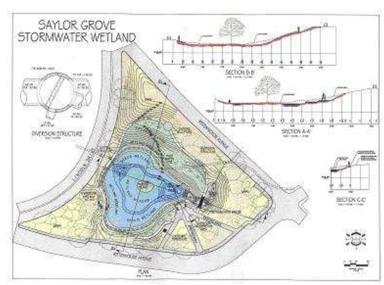
Partners:

Chestnut Hill College
Friends of the Monoshone (FOM)
PA Department of Environmental Protection (PADEP)
Senior Environment Corp
Fairmount Park Commission (FPC)
Friends of the Wissahickon (FOW)
Philadelphia Water Department
Wissahickon Restoration Volunteers (WRV)

Stormwater Treatment Wetland at Saylor Grove...

A one-acre stormwater wetland was constructed in the fall of 2005 on a parcel of Fairmount Park known as Saylor Grove. The wetland is 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 sewershed
- Remove total suspended solids from the Monoshone Creek
- 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
- Help improve stormwater flows into an impaired water body

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School of the Future Green Roof

Stormwater BMP Project

Schuylkill Watershed

Contact: Glen Abrams
215.685.6039
Glen.Abrams@phila.gov

Status: Completed

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

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

Springside School (SWIG)

Education Project

Wissahickon Creek Watershed

Contact: Kelly Anderson
215-685-6245
Kelly.Anderson@phila.gov

Status: Closed

Partners:

Environmental Protection Agency (EPA)
Philadelphia Water Department - OOW
Springside School
Pennsylvania Horticultural Society (PHS)
Schuylkill Action Network (SAN)

Springside School (SWIG)...

The Springside School project includes the installation of rain gardens and flow-through planter boxes to manage stormwater runoff from impervious areas on school grounds. The project design was funded by the Schuylkill Watershed Initiative Grant and its implementation completed by the school. A rain garden was established in the parking lot by removing the existing asphalt in an area that previously had a painted circle that directed traffic flow. The addition of soil and native vegetation completed the rain garden. A portion of stormwater runoff drains from the parking lot into the rain garden, where infiltration occurs. As parking lot resurfacing projects are undertaken in the future, more runoff will be directed toward the rain garden.

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

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Waterview Recreation Center

Stormwater BMP Project

Tacony-Frankford Watershed

Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Completed

Partners:

Pennsylvania Horticultural Society (PHS)

Philadelphia Department of Recreation

Waterview Recreation Center...

The Office of Watersheds is working with the Philadelphia Department of Recreation (PDR) and the Pennsylvania Horticultural Society (PHS) to incorporate stormwater management into Waterview Recreation Center's master plan in ways that can demonstrate effective stormwater management strategies while enhancing recreation programs and improving site aesthetics. The following components are incorporated into the plan:
1. A subsurface infiltration tree trench and new porous concrete sidewalk to provide management of street and sidewalk runoff and provide more tree canopy.
2. Flow through planter boxes adjacent to the main building entrance to manage roof runoff and beautify the entrance.

Benefits:

- Reduce stormwater runoff to Philadelphia's combined sewer system
- Provide neighborhood greening and beautification
- Implement Tookany/Tacony Frankford Integrated Watershed Management Plan

Clean Water........ Green City
www.phillyriverinfo.org

Riparian Restoration at W.B. Saul High School

Project **Wissahickon Watershed**

Contact: Kelly Anderson
215-685-6245
Kelly.Anderson@phila.gov

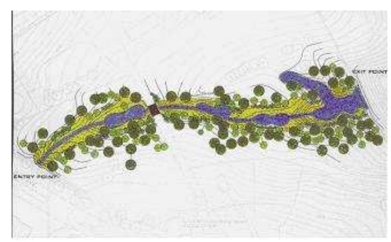
Status: Completed

Partners:

City of Philadelphia
Fairmount Park Commission (FPC)
Philadelphia Water Department - OOW
Environmental Protection Agency (EPA)
Philadelphia School District (PSD)

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

This project combines urban stormwater and agricultural Best Management Practices to reduce the harmful impact of the school's runoff on the Wissahickon Creek. After implementation, agricultural runoff from the livestock and farming practices, as well as stormwater runoff from the school's roofs and parking lots, are captured and treated through a series of long pools connected by wetland swales prior to discharging into the sewer.



Benefits:

- Prevents excess nutrients and harmful pathogens from entering the Wissahickon Creek
- Improves water quality of urban stormwater runoff
- Additon of native vegetation to the site
- Provides educational demonstration of the proper management of stormwater and agricultural runoff
- Creates aesthetically pleasing enhancement of the school's landscape

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West Mill Creek Infiltration Tree Trench

Stormwater BMP Project

Schuylkill Watershed

Contact: Amy Leib
215.685.6035
amy.leib@phila.gov

Status: Completed

Partners:

Pennsylvania Department of Environmental Protection (PADEP)

Philadelphia Department of Recreation

Pennsylvania Horticultural Society (PHS)

West Mill Creek Infiltration Tree Trench...

Runoff from the street and sidewalk is diverted into a stormwater tree trench at the intersection of Ogden and Ramsey Streets in West Philadelphia through modified inlet structures. Trees are planted in pockets of soil within a continuous stone trench that stores stormwater until it can infiltrate. Porous pavers replaced the brick sidewalk over the trench and allow runoff from the sidewalk to infiltrate into trench. The continuous trench provides also provides the tree roots with better access to air and water.

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

Contact: Amy Leib
215.685.6035
amy.leib@phila.gov

Status: Completed

Partners:

CITY PLAY Landscape Design

Philadelphia Water Dept. -Office of Watersheds

Pennsylvania Department of Environmental Protection (PADEP)

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. Runoff from the school parking lot is intercepted in a series of two rain gardens that overflow to an infiltration bed beneath turfstone pavers. The surface and subsurface basins recharge stormwater runoff from the school parking lot and give the students at Wissahickon Charter School an opportunity to learn and play in a natural environment at their school.

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

Clean Water........ Green City
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Greenfield Elementary School

Stormwater BMP Project

Lower Schuylkill Watershed

Contact: Glen Abrams
215.685.6039
Glen.Abrams@phila.gov

Status: Construction

Partners:

School District of Philaldelphia (SDP)

Greenfield Elementary School...

The Greening Greenfield project primarily consists of stormwater management and landscape improvements, including the replacement of asphalt with rain gardens, pervious pavers, and porous rubber safety play surface. Furthermore, new play structures and other site furnishings will be incorporated into the design. The project will tranform this urban schoolyard into an outdoor laboratory that teaches children about micro-climates, indigenous plants, and the hydrologic cycle.

Benefits:

Reducing impervious services and encouraging infiltration or detention of stormwater runoff will improve water quality and can help minimize combined sewer overflows
Integrating stormwater management into schoolyards offers good opportunities for experiential environmental education

Baxter Treatment Plant Visitor Parking Lot

Stormwater BMP Project

Delaware Watershed

Contact: Amy Leib
215.685.6035
amy.leib@phila.gov

Status: Design

Partners:

PWD Capital Budget

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.

Benefits:

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

Blue Bell Tavern Triangle

Project

Darby-Cobbs Watershed

Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Design

Partners:

Fairmount Park Commission (FPC)

Pennsylvania Horticultural Society (PHS)

PA Department of Environmental Protection (PADEP)

U.S. Environmental Protection Agency

Blue Bell Tavern Triangle...

The historic Blue Bell Tavern dates to 1776 and was the scene of a Revolutionary War skirmish. General George Washington and many colonial travelers rested and ate at this well-known establishment. The Tavern is now located within Cobbs Creek Park and is maintained by the Fairmount Park Commission.

Across from the Tavern is a large triangle of land that will be designed to manage runoff from the surrounding roadways through a series of curb cuts, swales, and modified storm inlets. Options for creating curb bump-out rain gardens will also be explored as another measure to mitigate runoff and provide traffic calming on Cobbs Creek Parkway.

Benefits:

- Reduce stormwater runoff to Philadelphia's combined sewer system
- Enhance an underutilized green space and create community amenity
- Implement the Cobbs Creek Integrated Watershed Management Plan

Clean Water........ Green City
www.phillyriverinfo.org

Cathedral Run Stream Restoration

Restoration Project

Wissahickon Creek Watershed

Contact: Erik Haniman
215-685-4877
Erik.Haniman@phila.gov

Status: Concept Design

Partners:

Fairmount Park Commission (FPC)

Philadelphia Water Department - OOW

Cathedral Run Stream Restoration...

Streambank restoration and stabilization of Cathedral Run is part of a larger comprehensive watershed management program. Restoration of the tributary would involve a detailed survey of the streambed and installation of appropriate structures such as rock vanes and channel-spanning, keystone-anchored, step structures to dissipate energy and protect eroding streambank. The macroinvertebrate community in Cathedral Run is severely impaired. Reduced sediment load will increase habitat heterogeneity vital for various macroinvertebrates. Once restoration is complete, a stable, sustainable environment will allow a reintroduced macroinvertebrate community to thrive.

Benefits:

- Increased habitat heterogeneity
- Enhanced aquatic and riparian habitat
- Increased ecological stability
- Improved biological integrity
- Minimize erosion and stabilize stream banks
- Sediment Reduction

Clean Water........ Green City
www.phillyriverinfo.org

Columbus Square Streetscape

Stormwater BMP Project

Delaware Watershed

Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Concept Design

Partners:

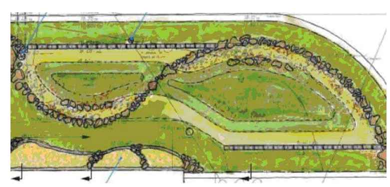
Capital Program Office (CPO)

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. A raingarden will be constructed in front of the newly constructed Recreation Center on Wharton Street that will manage runoff from the new building in addition to the streets and sidewalk.

Benefits:

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



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Delaware Avenue Extension Project

Restoration Project

Delaware Watershed

Contact: Glen Abrams
215.685.6039
Glen.Abrams@phila.gov

Status: Proposed-Short Term

Partners:

Philadelphia Streets Department

Delaware Avenue Extension Project...

The Delaware Avenue Extension Project will extend the Avenue north from Lewis Street to Buckius Street (across a new bridge over the Frankford Creek) in Phase I and is intended to offer greater access to the currently underutilized waterfront and encourage residential and commercial redevelopment. The project will consist of a two-lane roadway, with acquisition of right-of-way for pedestrian use.   If considered from the onset of design, non-structural measures, such as vegetated swales and bioretention gardens, can be the primary method of stormwater management and provide a greater measure of water quality treatment than is offered by conventional infrastructure.

Benefits:

Encouraging infiltration or detention of stormwater runoff will improve water quality and protect aquatic habitats
Integrating stormwater management into streetscape and public rights-of-way offer good opportunities for widespread watershed education
Non-structural measures can add aesthetic interest

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Lancaster Avenue ReStore Corridor – Green Street Demonstration Project

Stormwater BMP Project

Schuylkill Watershed

Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Concept Design

Partners:

Philadelphia Department of Commerce
U.S. Environmental Protection Agency
Philadelphia Industrial Development Corporation

Lancaster Avenue ReStore Corridor – Green Street Demonstration Project...

Streets and sidewalks comprise about 40% of impervious surfaces within Philadelphia. Managing the stormwater runoff from these areas is critical in meeting PWD's combined sewer overflow mitigation goals. The City's "Green Streets" program will aid in determining the effectiveness of reducing stormwater flows to the combined sewer systems. PWD recognizes that such practices should realize many other environmental and community benefits.

One phase of the program will work with the City's ReStore corridors program.. Green street practices, such as sidewalk rain gardens and stormwater tree trenches, will be incorporated into the corridor designs.

Benefits:

• Mitigates runoff from impervious surfaces within the public right-of-way
• Provides demonstration projects to inform larger-scale, long-term program
• Additional landscaping and tree canopy cover provide visual interest, aesthetic appeal, and mitigate the urban heat island effect
• Improves the appearance of important neighborhood commercial corridors

Passyunk Avenue Street Realignment and Stormwater Improvements

Education Project

Delaware Watershed

Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

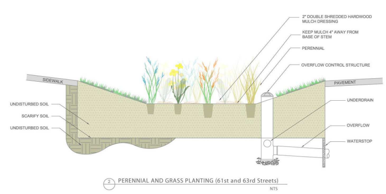
Status: Concept Design

Partners:

Philadelphia Streets Department

Passyunk Avenue Street Realignment and Stormwater Improvements...

Streets and sidewalks comprise about 40% of impervious surfaces within Philadelphia. Managing the stormwater runoff from these areas is critical in meeting PWD's combined sewer overflow mitigation goals. PWD is working with the Department of Streets to construct green infrastructure as part of a larger streetscaping project. Several intersections of Passyunk Ave. are being realigned; creating large areas of open space. PWD is collaborating with Streets to transform these spaces into raingardens that will treat runoff from other portions of the street.



Benefits:

Mitigates runoff from impervious surfaces within the public right-of-way
Provides demonstration projects to inform larger-scale, long-term program
Additional landscaping provide visual interest, aesthetic appeal, and mitigates the urban heat island effect

39th and Olive Recreation Center Improvements

Stormwater BMP Project

Schuylkill Watershed

Rec Center Site

Contact: Lisa Beyer

Lisa.Beyer@phila.gov

Status: Concept Design

Partners:

Philadelphia Water Department - OOW

University City Green (UCG)

39th and Olive Recreation Center Improvements...

OOW is providing design support to UC Green for their redesign of the Recreation Center Site. The project includes additional tree plantings and stormwater management designs to capture overland flow on site.

Benefits:

The project will provide additional tree coverage, capture stormwater in a combined sewer area, and infiltrate on site.

Bureau of Laboratory Services Stormwater Streetscape

Education Project **Darby-Cobbs Watershed**

Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

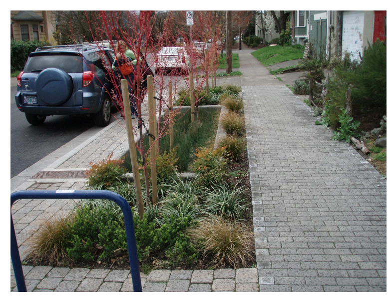
Status: Design

Partners:

U.S. Environmental Protection Agency

Bureau of Laboratory Services Stormwater Streetscape...

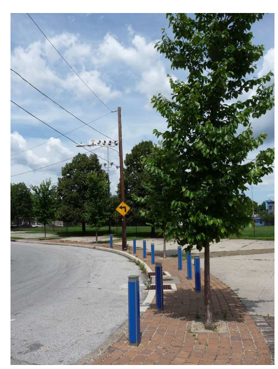
Streets and sidewalks comprise about 40% of impervious surfaces within Philadelphia. Managing the stormwater runoff from these areas is critical in meeting PWD's combined sewer overflow mitigation goals. The City's "Green Streets" program will aid in determining the effectiveness of reducing stormwater flows to the combined sewer systems. PWD recognizes that such practices should realize many other environmental and community benefits.



A first phase of the program will target several green street practices along street frontages at PWD facilities. At the Bureau of Laboratory Services, sidewalk rain gardens and stormwater tree trenches are proposed.

Benefits:

Mitigates runoff from impervious surfaces within the public right-of-way
Provides demonstration projects to inform larger-scale, long-term program
Additional landscaping and tree canopy cover provide visual interest, aesthetic appeal, and mitigate the urban heat island effect



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Philadelphia PWD Water Department

Barry Playground Stormwater Management Improvements

Stormwater BMP Project

Schuylkill Watershed

Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Design

Partners:

PA Department of Environmental Protection (PADEP)

U.S. Environmental Protection Agency

Philadelphia Department of Recreation

Barry Playground Stormwater Management Improvements...

Barry Playground's basketball courts are in a state of disrepair and currently drain directly to the overburdened combined sewer system. In addition, three street frontages around the playground are not planted with street trees. Planned improvements include replacing the existing basketball courts with pervious asphalt and install stormwater tree trenches/rain gardens along the three street frontages without trees to mitigate runoff from the surrounding streets. This effort is an important demonstration in Philadelphia’s commitment to streetscape improvements that help manage stormwater runoff and is also an important component in PWD’s combined sewer overflow long-term control plan.

Benefits:

● Directly connect impervious area will be decreased by approximately 11,000 square feet by installing pervious asphalt

● Tree trenches will manage runoff from approximately 20,000 square feet of street and sidewalk area

● Additional landscaping and tree canopy cover provide visual interest, aesthetic appeal and mitigate the urban heat island effect

Clean Water....... Green City
www.phillyriverinfo.org

Bells Mill Stream Restoration

Restoration Project

Wissahickon Creek Watershed

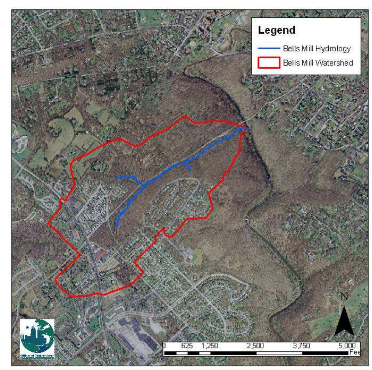
Contact: Erik Haniman
215-685-4877
Erik.Haniman@phila.gov

Status: Design

Partners:

Fairmount Park Commission (FPC)
Philadelphia Water Department
GTS Technologies, Inc.

Bells Mill Stream Restoration...



Due to the volume and velocity of water being discharged to Bells Mill during wet weather events, the tributary is deeply entrenched and overwidened. The restoration of Bells Mill would include eliminating the scour pool below outfall W-084-02 by utilizing stone for energy dissipation. Additionally, the streambanks and bed downstream of the outfall would need to be stabilized using principles of natural stream channel design. High grades and the presence of Bells Mill road adjacent to the creek inhibit the creation of meanders. Instead, appropriate energy dissipating structures such as rock vanes and channel-spanning, keystone-anchored, step structures are proposed for installation.

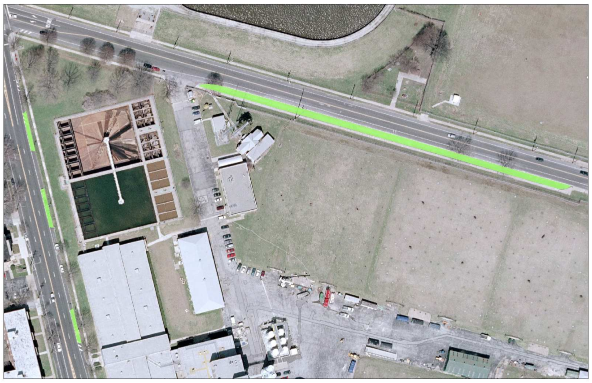
Benefits:

- Increased habitat heterogeneity
- Enhanced aquatic and riparian habitat
- Increased ecological stability
- Improved biological integrity
- Minimize erosion and stabilize stream banks
- Sediment Reduction

Belmont Water Treatment Green Streets Project

Infrastructure Project

Schuylkill Watershed



Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Concept Design

Partners:

PA Department of Environmental Protection (PADEP)

U.S. Environmental Protection Agency

Belmont Water Treatment Green Streets Project...

Streets and sidewalks comprise about 40% of impervious surfaces within Philadelphia. Managing the stormwater runoff from these areas is critical in meeting PWD's combined sewer overflow mitigation goals. The City's "Green Streets" program will aid in determining the effectiveness of reducing stormwater flows to the combined sewer systems. PWD recognizes that such practices should realize many other environmental and community benefits.

A first phase of the program will target several green street practices along street frontages at PWD facilities. At the Queen Lane Water Treatment Plant, vegetated curb extensions and tree trenches are proposed.

Benefits:

● Mitigates runoff from impervious surfaces within the public right-of-way
● Provides demonstration projects to inform larger-scale, long-term program
● Additional landscaping and tree canopy cover provide visual interest, aesthetic appeal, and mitigate the urban heat island effect

Ben Franklin Blvd Streetscaping

Stormwater BMP Project

Schuylkill Watershed

Contact: Marc Orgovan
215-685-6378
Marc.Orgovan@phila.gov

Status: Design

Partners:

Fairmount Park Commission (FPC)

Ben Franklin Blvd Streetscaping...

The Philadelphia Water Department is collaborating with the Fairmount Park Commission on a streetscaping project along the Benjamin Franklin Parkway. The streetscaping portion of the project includes updating walkways and planting new trees. In conjunction with this work, PWD will install stormwater trenches that collect and manage runoff from the southern portion of road between 21st Street and 23rd Street. The water enters through a grate inlet and is distributed throughout the trench where it infiltrates and waters the new trees, which provide stormwater volume reduction through evapotranspiration. The trench size meets PWD goals to reduce flooding and combined sewer overflows.

Benefits:

Infiltrates water from the street which leads to less combined sewer overflows.

Removing stormwater from the city system through infiltration allows for existing infrastructure to be used without the need for expansion or upsizing.

Provides water to the street trees.

Cherry Street Connector

Stormwater BMP Project

Schuylkill Watershed

View of Cherry Street looking west

Contact: Lisa Beyer

Lisa.Beyer@phila.gov

Status: Design

Cherry Street Connector...

The 2300 block of Cherry Street is an historic street paved with granite block, but does not have stormsewer connections. Podning occurs at the end of the block where the ground rises for the CSX tracks. The design for Cherry Street includes a tree trench, rain garden and linear swale to manage the runoff from the street and sidewalks along the 2300 block of Cherry Street, continuing along the rail line to the river trail connection at Race Street. The vegetated system with capture surface flow, filter the stormwater through vegetation, hold the water in subsurface stone beds and overflow into the stormsewer system at Race Street.

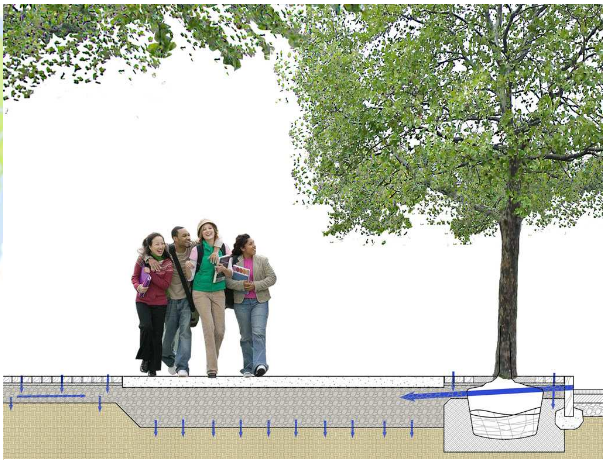
Benefits:

Reduces flow to combined sewer at peak flow periods and filters stormwater and provides opportunity for infiltration before slow releasing to stormsewer.

Clark Park Permeable Sidewalk and Tree Trench

Stormwater BMP Project

Mill Creek Watershed



Contact: Glen Abrams
215.685.6039
Glen.Abrams@phila.gov

Status: Concept Design

Partners:

Friends of Clark Park (FOCP)
University City District (UCD)
Philadelphia Water Department - OOW
University City Green (UCG)

Clark Park Permeable Sidewalk and Tree Trench...

The proposed project is located on the Farmer's Market side of Clark Park, along 43rd St. between Baltimore Ave. and Chester Ave., and is part of a master revitalization plan for PARC A of Clark Park. Stormwater runoff from adjacent streets and Clark Park will be captured by using a pervious pavement sidewalk with an infiltration bed which will water trees planted along the sidwalk. This design will capture rainfall from a one-inch storm and capture and estimate of 85% to 91% of the stormwater runoff in the project drainage area.

Benefits:

Improvements to the health of the Schuylkill Watershed caused by the prevention CSO release the from Mill Creek sewer into the Schuylkill River
Improvement to recreational use of Clark Park, which is impeded when flooding occurs, especially in the Farmers Market area.

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Clemente Park Infiltration Tree Trenches

Stormwater BMP Project

Schuylkill Watershed

Contact: Lisa Beyer

Lisa.Beyer@phila.gov

Status: Design

Partners:

Department of Public Property

Clemente Park Infiltration Tree Trenches...

The Department of Public Property is redesigning parts of the interior of Clemente Park and PWD is developing designs to manage stormwater runoff from the street in new tree trenches proposed on the interior fenceline of the Park.

Benefits:

Reduce and slow the quantity of stormwater entering the combined stormsewer, particularly in large storm events.

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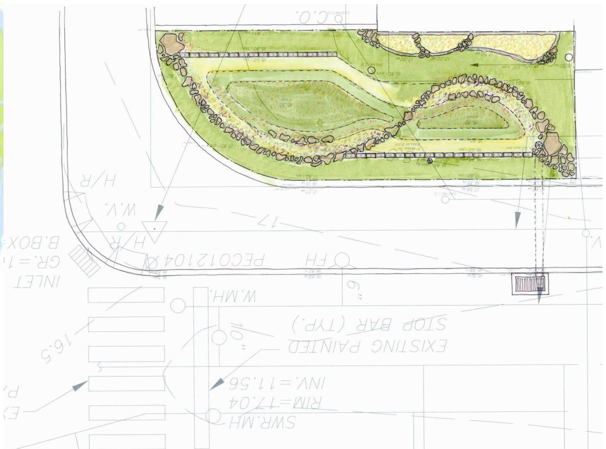
Columbus Square Raingarden

Stormwater BMP Project

Delaware Watershed



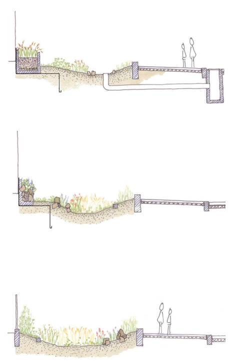
Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Design

Partners:

Philadelphia Department of Recreation

Columbus Square Raingarden...



The intersection of 12th and Reed Streets at Columbus Square Recreation Center is currently covered by a large concrete pad. This stormwater demonstration project proposes to replace this concrete with a raingarden that would capture runoff and beautify the Center's entrance. Inlets will be placed in the streets to capture and divert runoff into the raingarden. A control structure will be used to detain the stormwater within the raingarden and slowly release it back into the combined sewer. The system will be designed to reduce the flow rate during the small frequent storms that cause the majority of combined sewer overflows. The vegetated portion of the system will also provide some volume reduction through uptake and evapotranspiration.

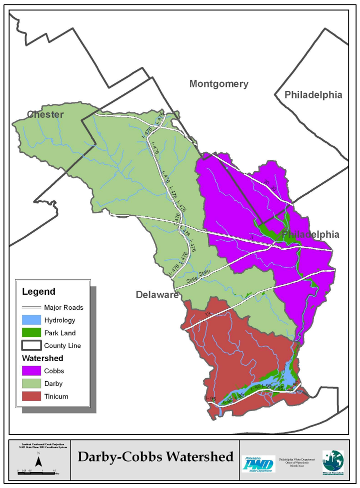
Benefits:

Combined sewer overflows are reduced through evapotranspiration and flow attenuation
Recreation Center entrance enhancements
Reduction in unneccessary impervious area

Darby Cobbs Stream Restoration

Restoration Project

Darby-Cobbs Watershed



Contact: Erik Haniman
215-685-4877
Erik.Haniman@phila.gov

Status: Concept Design

Partners:

Biohabitats, Inc
O'Brien & Gere Engineers

Fairmount Park Commission (FPC)
Philadelphia Water Dept. -Office of Watersheds

Darby Cobbs Stream Restoration...

Proposed restoration activities include streambank and streambed stabilization and/or realignment, planting of native vegetation, habitat restoration, trash removal, renovatations and protection for infrastructure, potential for constructed wetlands along the reach length, and the enhancements to park ammenities.

Benefits:

- Reduced erosion and sediment load
- Enhanced aquatic and riparian habitat
- Improved biological integrity
- Improved ecological stability
- Infrastructure improvement and protection
- Enhancement of the surrounding park

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Dickinson Square Streetscaping

Project

Delaware Watershed

Contact: Glen Abrams
215.685.6039
Glen.Abrams@phila.gov

Status: Concept Design

Partners:

Department of Recreation

Friends of Dickinson Square

Dickinson Square Streetscaping...

The Philadelphia Water Department is working with the Department of Public Property and the Department of Recreation on a streetscaping project around Dickinson Square Park. The streetscaping will utilize green infrastructure to manage stormwater while also improving and beautifying the area around the park. The streetscaping is likely to include tree trenches and stormwater planters. The green infrastructure will be designed to treat stormwater based on the management goals defined by PWD.

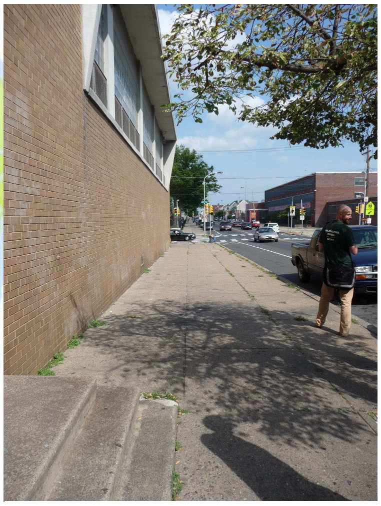
Benefits:

Improvements to the sidewalk around the park
Increased greening and shading though installation of green infrastructure
Reduce stormwater runoff to combined sewer

Gathers Recreation Center

Stormwater BMP Project

Delaware Watershed


Sidewalk in front of Recreation Center

Contact: Lisa Beyer

Lisa.Beyer@phila.gov

Status: Concept Design

Gathers Recreation Center...

Partnering with the Department of Parks and Recreation, and the Mural Arts Program, OOW is conceptualizing alternatives for managing stormwater runoff from the site and adjacent streets. The sytems will incorporate educational art and opportunities for interacting with the design.

Benefits:

Reduced stormwater runoff to the combined sewer
Community education

Germantown Avenue Streetscaping

Project

Delaware Watershed

Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Concept Design

Germantown Avenue Streetscaping...

The Philadelphia Water Department is planning to construct a large storm flood relief sewer along Germantown Avenue and Laurel Street between Delaware Avenue and Wildey Street. The construction of this sewer will require that a large portion of the existing street and sidewalk be replace. During their replacement PWD will install systems that provide stormwater management for runoff from the streets and sidewalks. These systems may include tree trenches and stormwater planters. This project serves as an example of how green infrastructure may be included within the scope of future water and sewer construction projects.

Benefits:

Reduces stormwater runoff entering the combined sewer system
Reduces localized flooding
Green streetscaping reduces urban heat island effect, improves air quality, and increases evapotranspiration.
Illustrates a more cost effect method for construction of green infrastructure

Madison Memorial Park

Stormwater BMP Project

Delaware Watershed

Contact: Lisa Beyer

Lisa.Beyer@phila.gov

Status: Concept Design

Partners:

Department of Recreation

Northern Liberties Neighborhood Association

Madison Memorial Park...

As part of master planning for Spring Garden Greenway between 3rd Street and the Delaware River, Madison Memorial Park at 2nd Street will be re-designed to include manage stormwater from adjacent streets.

Benefits:

● Capturing street runoff in vegetated systems helps reduce combined sewer overflows

● Integrating stormwater management into community open space offers opportunities for watershed education

Mander Recreation Center

Project

Schuylkill Watershed

Contact: Lisa Beyer

Lisa.Beyer@phila.gov

Status: Concept Design

Partners:

Department of Recreation

Mural Arts Program

Mander Recreation Center...

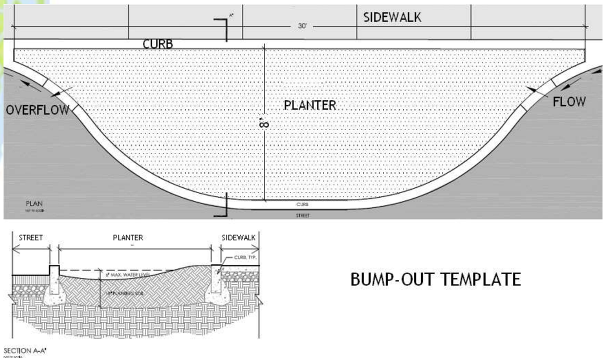
Partnering with the Department of Parks and Recreation, and the Mural Arts Program, OOW is conceptualizing alternatives for managing stormwater runoff from the site and adjacent streets. The sytems will incorporate educational art and opportunities for interacting with the design.

Benefits:

Stormwater Management
Environmental Education

Queen Lane Water Treatment Plant Green Streets Project

Stormwater BMP Project **Schuylkill Watershed**



BUMP-OUT TEMPLATE

Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Concept Design

Partners:

East Falls Development Corporation

Philadelphia Water Department

PA Department of Environmental Protection (PADEP)

U.S. Environmental Protection Agency

Queen Lane Water Treatment Plant Green Streets Project...

Streets and sidewalks comprise roughly 40% of impervious surfaces within Philadelphia. Managing stormwater runoff from these areas is crucial in meeting PWD's combined sewer overflow mitigation goals. The City's 'Green Streets' program will aid in reducing stormwater flows to the combined sewer systems. PWD recognizes that such practices should realize many more environmental and community benefits in addition to the improved water quality benefit.

The first phase of the 'Green Streets' program will implement several stormwater management practices along street frontages at PWD facilities. At the Queen Lane Water Treatment Plant, vegetated bump-outs are proposed.

Benefits:

● Mitigates runoff from impervious surfaces within the public right-of-way

● Provides demonstration projects to inform larger-scale, long-term program

● Additional landscaping and tree canopy cover provide visual interest, aesthetic appeal, and mitigate the urban heat island effect

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Stream Restoration of Redd Rambler Run

Restoration Project

Pennypack Watershed

Contact: Erik Haniman
215-685-4877
Erik.Haniman@phila.gov

Status: Design

Partners:

Philadelphia Water Department

Stream Restoration of Redd Rambler Run...

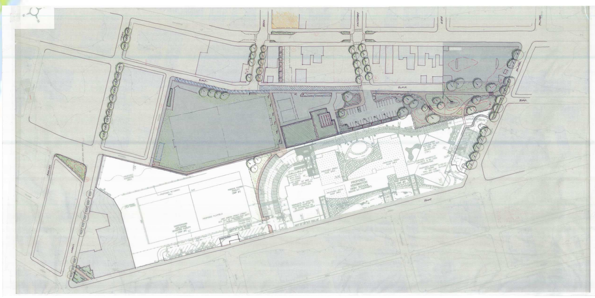
Redd Rambler Run sits within a narrow PWD easement that cuts through approximately 70 backyards in a Philadelphia subdivision. Its problems are typical for an urban stream including channel incision, bank erosion, and blockages to the movement of fish and other aquatic life. The project purpose is to recreate a stable, aesthetically pleasing stream with the potential to nurture habitat. The Redd Rambler Run project entails stream improvements on approximately 2,500 linear feet of stream channel. Urban stream restoration methods are intended to mimic nature and help the stream maintain itself, while improving water quality and reducing damage caused by fast, heavy flows of stormwater runoff.

Benefits:

●Creates a natural channel condition
●Creates a dynamically stable channel utilizing different stabilization techniques and materials
●Aims to improve water quality and aquatic habitat
●Creates a pleasing backyard stream which can be viewed by neighboring houses
●Creates the opportunity for public involvement which can empower the community to develop a stronger sense of stewardship for the creek

Schissler Recreation Center - Big Green Block

Stormwater BMP Project — **Delaware Watershed**



Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Concept Design

Partners:

New Kensington Community Development Corporation

Philadelphia Department of Recreation

Pennsylvania Horticultural Society (PHS)

Schissler Recreation Center - Big Green Block...

The Philadelphia Water Department is partnering with the Pennsylvania Horticultural Society and the New Kensington Community Development Cooperation in support of their master planning efforts for the “block” around Schissler Recreation Center. The goals of this master plan include community greening, improving access to public transportaion, and stormwater management. The master plan for the Recreation Center includes an improved parking lot, tree plantings, and pedestrian access to the Berks subway stop. The site is part of a larger effort to rejuvenate the New Kensington neighborhood. The Office of Watersheds will construct tree trenches to manage street runoff as part of the Model Neighborhood and Green Streets programs.

Benefits:

Reduce stormwater runoff through infiltration and evapotranspiration
Neighborhood greening and beautification
Increases access to public transportaion
Provides shaded areas for spectators at Recreation Center events

Spring Garden Greenway

Project

Delaware Watershed

Contact: Lisa Beyer

Lisa.Beyer@phila.gov

Status: Concept Design

Partners:

Northern Liberties Neighborhood Association

Spring Garden Greenway...

The Northern Liberties Neighborhood Association plans to green Spring Garden between 3rd Street and Delaware Avenue, creating a pedestrian friendly path with trees and stormwater management techniques.

Benefits:

Stormwater management
Increased tree canopy

Stream Restoration on Tacony Creek at Whitaker Avenue

Restoration Project **Tacony-Frankford Watershed**

Contact: Marc Cammarata
215.685.4948
marc.cammarata@phila.gov

Status: Design

Partners:

Cheltenham Township (CT)
Delaware Estuary Program (DELEP)
Friends of Tacony Creek Park (FTC)

Pennsylvania Environmental Council (PEC)

Cora L. Brooks Foundation
Fairmount Park Commission (FPC)
PA Department of Environmental Protection (PADEP)

Stream Restoration on Tacony Creek at Whitaker Avenue...

Currently in the design phase, 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 its 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 and morphology

Thompson and Columbia Bumpouts

Stormwater BMP Project

Delaware Watershed

Contact: Jessica Brooks
215.685.6038
Jessica.K.Brooks@phila.gov

Status: Concept Design

Partners:

New Kensington Community Development Corporation

Philadelphia Water Department - OOW

Pennsylvania Horticultural Society (PHS)

Thompson and Columbia Bumpouts...

The New Kensington Community Development Corporation was awarded a Growing Greener grant for installation of vegetated bumpouts at the intersection of Thompson St and Columbia Ave. The bumpouts will be designed to manage the stormwater runoff from the surrounding streets and sidewalks. Stormwater enters the bumpout through curb cuts, filters through the soil, and it stored in a subsurface stone trench. The stored water is used by the vegetation in the bumpout and infiltrates into the surrounding soil. The size of the stone storage is designed to meet PWD stormwater management requirements. PWD is assisting the project by providing design services as well as additional construction funding and oversight.

Benefits:

Improvements to the neighborhood through traffic calming and greening
Shorter, safer pedestrian crossing at intersections
Stormwater management reduces flooding and combined sewer overflows

Model Neighborhoods - Phase 1 Streets

Stormwater BMP Project

Watershed

Contact: Amy Leib
215.685.6035
amy.leib@phila.gov

Status: Ongoing Initiative

Model Neighborhoods - Phase 1 Streets...

PWD's Model Neighborhoods program is an initiative to transform the neighborhoods of Philadelphia into model green communities that manage stormwater in innovative ways. The streets in these neighborhoods will showcase green infrastructure practices such as stormwater tree trenches, stormwater planters, and stormwater bumpouts.

Benefits:

- Reduce combined sewer overflows through infiltration, evapotranspiration, and extended detention of runoff from the right of way
- Reduce urban heat island effect, improve air quality, and provide shade on streets
- Beautify neighborhood
- Provides opportunities for to educate entire communities about water resources protection

Wises Mill Wetland Creation and Stream Restoration

Restoration Project | **Wissahickon Creek Watershed**

Contact: Erik Haniman
215-685-4877
Erik.Haniman@phila.gov

Status: Design

Partners:

AKRF, Inc.

Fairmount Park Commission (FPC)

Wises Mill Wetland Creation and Stream Restoration...

Wises Mill Run consists of a 92 acre southern portion and a 169 acre northern portion that merge just north of Wises Mill Road before meeting the Wissahickon Creek. Both branches are hindered by urbanization and large storm events. As a result, severe entrenchment occurred in both branches and excessive amounts of sediment has been added to the Wissahickon Creek. This project proposes to reduce flows prior to entering the southern branch by the creation of a stormwater treatment wetland. Secondly, the restoration and stablization of the two branches will be possible by the improvement of the channel and banks to enhance water quality. Overall, sediment and erosion will be reduced, and aquatic and macroinvertebrate life will be improved.

Benefits:

- Increased habitat heterogeneity
- Enhanced aquatic and riparian habitat
- Increased ecological stability
- Improved biological integrity
- Minimize erosion and stablize stream banks
- Sediment reduction
- Creation and enhancement of approximately 1.9 acres of wetland area
- Riparian restoration and stablization
- Storm flow reduction and treatment prior to entering Wises Mill Run

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Philadelphia Water Department

APPENDIX M –WATERSHED OUTREACH EVENTS

Table M-1 Tookany/Tacony-Frankford (TTF) Watershed Partnership Outreach Events

Table M-2 Delaware Direct Watershed Partnership Outreach Events

Table M-3 Darby Cobbs Watershed Partnership Outreach Events

Table M- 4 Stormwater BMP Recognition Program Awards

Table M-1 Tookany/Tacony-Frankford (TTF) Watershed Partnership Outreach Events

Tookany/Tacony-Frankford (TTF) Watershed Partnership Outreach Events				
Event Title:	**Location**	**Date:**	**Description**	**Number Served**
Watershed Lessons	Taylor Elementary School	1/22/2008	One 45 minute watersheds lesson co-taught with Awbury Arboretum's Director of Outreach and Public Programs. Watersheds lesson included the "Curly the Catfish" activity (importance of clean water and good stewardship).	54 third graders during school time
	Emlen Elementary School (Upshal & Chew)	3/12/2008		15 - 7th graders, 15 - 3rd graders, 15 - 2nd graders after school
"Stormwater Management for Business" Lecture	Elkins Park Rotary Club	3/12/2008	30 minute presentation on ways businesses can help manage stormwater and reduce non-point source pollution. Main presentation given by PWD's Watersheds Program coordinator.	11 Rotary Club Members (adults)
	Cheltenham/ Rockledge Rotary Club	3/20/2008		26 Rotary Club Members (adults)
Wingohocking Creek Watershed Historic Stream Mystery Tour	TTF Watershed	4/5/2008	The Wingohocking Creek, the largest creek in the City to be encapsulated in a sewer, ran from the top of East Mt Airy, through Germantown, to Juniata Park. In the four hours of the tour, we'll cover some natural history and a lot of human history, concentrating on the important role of man-made drainage structures in the development of the City.	33 participants
		10/11/2008		26 participants
		12/18/2008		12 participants
Rain Barrel Workshop	Glenside-Weldon Elementary School	4/16/2008	Rain Barrel Workshop	61 families
Stream Cleanup	Wall Park	4/19/2008	Volunteer stream clean up day, 28 bags of trash collected, 12 evaluation forms completed	12 adults, 3 children
Rain Barrel Workshop	Cedarbrook Middle School	4/26/2008	Rain Barrel Workshop	79 families
TOXTOUR w/ Christopher Swain	Cedarbrook Middle School	4/27/2008	Hosted by Christopher Swain, He arranged volunteers to assist with e-waste collection (950 lbs), TTF Watershed display table	15 adults
TOXTOUR school visit	Cedarbrook Middle School	4/28/2008	Christopher spoke to 7 classes about clean water issues and e-waste	4 adults, 150 children (7th graders)

Mt. Airy Day	Cliveden Historic Site (6401 Germantown Ave)	5/3/2008	Shared a display table with Awbury Arboretum, Talked to adults about the TTF Watershed information, Did the Nature's Filter activity with children	30 children, 15 adults
Jenkintown Fair		5/10/2008	Hosted TTF display table, Talked to adults about the TTF Watershed information	23 adults, 1 child
Park Clean Up and Invasive Removal	Tacony Creek Park (Snake Road by I and Ramona)	5/14/2008	Frankford high School City Year students collected trash and removed invasive in Tacony Creek Park, led by Jackie Olson, FPC	4 Frankford High School Students, 3 City Year Leaders (college age)
TTF Watershed Bus Tour	Multiple sites in the TTF Watershed	6/27/2008	5-hour bus Tour of 7 demonstration sites across the TTF Watershed	25 adults, 11 speakers
Model Neighborhood Presentation	Chew & Belfield Organization - 1124 Chew Avenue	8/18/2008	2 hour meeting with neighborhood block captains, Renovo Developers, Mt Airy USA and Awbury Arboretum. The sole agenda item was the Model Neighborhood Project. Sarah described the program and then a long discussion followed in which feedback and suggestions about neighborhood improvement were given.	11 adults
Belfield Block Party	6424 Belfield	8/23/2008	Hosted a TTF display table with Model Neighborhood information highlighted. 2.5 hours	15 adults, 2 teens
Volunteer Work Day in Tacony Creek Park	Tacony Creek Park in Rising Sun and Olney	8/26/2008	In collaboration with Fairmount Parks Commission, removed invasive species and trash from Tacony Creek Park for 3 hours with Red Cross volunteers	4 adults, 4 teens
Watershed Lessons, Academy for Middle Years	Awbury Arboretum	8/27/2008	Taught a Watershed lesson while touring the Arboretum property. Focused on the onsite stormwater management demonstration projects.	6 adults, 50 7th-graders
Rain Barrel Workshop	Waterview Recreation Center	9/11/2008	Hosted Rain Barrel Workshop taught by PWD staff, Porous pavement demonstration by PHS staff, Model neighborhood presentation by TTF	48 families

Model Neighborhood Presentation	Chew & Belfield Organization - Corner of Chew and Belfield	9/16/2008	Presented the Model Neighborhood Project to residents of Chew and Belfield neighborhood as part of their monthly block meeting. Surveys about neighborhood improvement were distributed.	24 adults, 1 teen
Coast Day	Penn's Landing	9/20/2008	Hosted a TTF display table with Awbury Arboretum. Did the "What's Your Watershed Address?" with hundreds of children and adults using large-scale street/watershed maps. 4 hours	approx. 200 adults and children
Model Neighborhood Presentation	Chew & Belfield Organization - E. Herman St. near Chewfield Avenue	9/22/2008	Presented the Model Neighborhood Project to residents of E. Herman Street as part of their monthly block meeting. Project ideas were shared verbally and surveys about neighborhood improvement were completed	18 adults
Senior Environment Fair	Center in the Park, Senior Environment Corps	9/26/2008	Hosted a TTF display table with Model Neighborhood information highlighted. Surveys about neighborhood improvement were distributed. 5 hours.	50 adults
Stream Clean Up	Wall Park	9/28/2008	Volunteer neighborhood clean up day. 16 evaluation forms completed and 20 bags of trash collected.20 bags of trash collected & 16 evaluation forms completed	9 adults, 12 children
Neighborhood Clean Up	1124 Chew Avenue (Chew and Walnut Lane)	10/11/2008	Volunteer neighborhood clean up day. 11 tons of trash collected & 15 evaluation forms completed	19 adults, 5 children
Neighborhood Clean Up	Whitaker and F St	11/8/2008	Volunteer clean up day run by PA clean ways in collaboration with PWD, Streets Department, Penn DOT, FPC, and TTF. 231, 860 lbs (115.93 tons)	38 volunteers
TOXTOUR school visit	High School of the Future	December 3-7, 2008	Christopher Swain, swimmer conservationist presented his work at numerous schools throughout Cheltenham and Philadelphia. He spoke about clean water issues, his past work swimming rivers to raise awareness, his upcoming swim (1000+ miles down the Atlantic Coast from Boston to Washington DC), and the	60 HS students
	Arcadia University			15 college students, 1 adult
	Cheltenham high School			58 HS Students
	Elkins Park Elementary			25 6th graders
	Cedarbrook Middle School			210 7th and 8th graders

	Glenside Elementary		problems associated with common e-waste disposal techniques.	350 K-4th graders
TOXTOUR, Ethical Electronics Recycling Event	Cedarbrook Middle School	12/6/2008	Hosted a drive to collect used electronics for ethical recycling at a fee of $1/lb.	150 families

Table M-2 Delaware Direct Watershed Partnership Outreach Events

Delaware Direct Watershed Partnership Outreach Events				
Event Title:	**Location**	**Date:**	**Description**	**Result**
Pulaski Pier River Conservation Plan Workshop #1	Pennsylvania Horticultural Office (PHS) Office, Philadelphia	April 30, 2008	Research and problem-solving session on Pulaski Pier as a park, wetland and riparian restoration park expansion	35 attendees representing 26 organizations
21st Century Parking Solutions River Conservation Plan Workshop #2	Philadelphia Seaport Museum, Philadelphia	July 4, 2008	Research and problem-solving session on 21st century parking solutions	32 attendees representing 17 organizations and businesses
Green and Complete Streets River Conservation Plan Workshop #3	Penn Treaty Park, Philadelphia	July 31, 2008	research and problem solving session on green and complete streets	39 attendees representing 27 organizations and businesses
Healthy Neighborhoods River Conservation Plan Public Meeting #1	Center for Architecture, Philadelphia	12/4/2008	Rather than a traditional lecture format, the meeting plan provided for a series of activities and one-to-one discussions. The open house format allowed for drop in visitations over a several hour time frame.	Estimated 60 attendees from surrounding watershed and neighborhoods

Table L-3 Darby Cobbs Watershed Partnership Outreach Events

Darby Cobbs Watershed Partnership Outreach Events				
Event Title:	**Location**	**Date:**	**Description**	**Number Served**
Second Ward porous Basketball Court hoops Challenge	Second Ward playground in Upper Darby Township, PA	9-Sep-07	In celebration of the porous pavement basketball court, an Enviroscape demonstration was set up, along with an awards ceremony to honor the Darby Cobbs Watershed Partnership.	25 participants
25th Annual Darby Creek Valley Association Stream Clean Up	77 square miles of the Darby Watershed	25-Apr-08	Help continue the "Ribbon of GREEN" from Tinicum to Tredyffrin	
Indian Creek East Branch Walking and Bus tour	Friend's Central School (1101 City Ave., Wynnewood	17-May-08	This event involved a bus/walk tour of stormwater Best Management Practices (BMP) projects and stream restoration projects, along with presentations by project leaders on the visited sites. Lunch was included.	20 participants
Free Rain Barrel Workshop	Christ Lutheran Church (7240 Walnut St, Upper Darby)	29-May-08	This Rain Barrel Workshop provided a brief overview of the rainwater cycle, the importance of stormwater management at the property level, and how to install and use a rain barrel. The first 50 households that pre-registered for the workshop received a free rain barrel. This event was offered to residents of the Darby-Cobbs Watershed.	45 participants
Delaware County Riverfront Ramble	Along the Delaware Riverfront	20-Sep-07	This day included community service events, education, other activities, dining and fireworks in honor of the river, 30+ contacts made from this event	
Clean Up in Morris Park	Papa Playground (Lansdowne Ave and 68th St.)	20-Sep-07	A community clean up took place in the park	40+ volunteers

Thinking Like a Watershed	Ridley Creek State Park	4-Nov-08	The purpose of this workshop was to educate participants about watersheds and how to enhance the beneficial features of an urban system. This free one day workshop was intended for teachers of grades four through eight. Participants enjoyed the hands-on activities offered through this workshop, which included trudging through the stream and receiving in-class instructions while participating in activities.	9 School teachers

Table L- 4 Stormwater BMP Recognition Program Awards

Stormwater BMP Recognition Program Awards	
Awardee	**Project**
AD Marble & Company	Evaluation of Potential Improvements within the Cobbs Creek Corridor: Marshall Road to Cobbs Creek Golf Club
Andropogon Associates & Friends of Wissahickon	Valley Green ~ Environmental Restoration Program
Andropogon Associates, Ltd.	Thomas Jefferson University Plaza
Awbury Arboretum Association	Awbury Arboretum Watershed Restoration Project
Cahill Associates	Porous Asphalt Parking Lot for the Morris Arboretum, University of Pennsylvania
	John Heinz National Wildlife Refuge at Tinicum
	Innovative Stormwater Management and Education at the K-8 Penn-Alexander School
	Demonstration of Innovative Stormwater Management Using Porous Pavement and Rain
	Gardens in an Urbanized Setting (Wayne Art Center)
Cheltenham Township	Leaf Leachate Stormwater Management Waverly Road Leaf Composting Facility
Community Design Collaborative	Haven in the Goodlands
	Overbrook Environmental Education Center
CSA Group, Inc.	School of the Future
Fairmount Park Commission	Monastery Stables Runoff Control Project
Friends Center Corporation	Friends Center Urban Water Management
F.X. Browne, Inc.	Stony Creek Farms Age-Qualified Residential Development
	F.X. Browne Constructed Stormwater Wetland

Stormwater BMP Recognition Program Awards	
Awardee	**Project**
Gladnick Wright Salameda	Swarthmore College Science Center
Gilmore & Associates	Chatham Financial Corporate Headquarters
Green Valleys Association	Porous Parking & Bioretention
Hunt Engineering Company	Smith Memorial Playground
Interface Studio LLC	Sheridan Street Housing
	Third Street Condominiums
Johnson & Johnson	Pharmaceutical Research and Development Spring House Road Property
Kling	Ortho McNeil Springhouse
	Centocor Horsham
Lower Merion Environmental Advisory Council	Riverbend Environmental Education Center
Lower Merion Township	Aqua America Headquarters
Lower Providence Township	Image
Onion Flats	Rag Flats
Pennoni Associates, Inc.	3925 Walnut Street Mixed Use Facility
Pennsylvania Horticultural Society	Tree Vitalize
	Models for Stormwater Management on Vacant Land
Roofscapes, Inc. (Lifetime Achievement Award)	Philadelphia Fencing Academy
The Enterprise Center Community Development Corporation	The Plaza at Enterprise Heights

Stormwater BMP Recognition Program Awards	
Awardee	**Project**
The Schuylkill Center for Environmental Education	Green Roof Installation
Upper Darby Township and Cahill Associates	Second Ward Park
Upper Perkiomen High School (UPHS)	UPHS Stormwater BMPs
Upper Providence Township	Black Rock
UC Green	Lower Mill Creek Stormwater Management Demonstration Garden
Ursinus College Environmental Studies Program	Design of an Extended-detention Wet-pond Retrofit for Ursinus College
Villanova University Stormwater Partnership	Villanova University Bioinfiltration BMPs
Wallace, Roberts & Todd, LLC	Mill Creek Hope VI Project
Warrington Environmental Advisory Committee	Igoe, Porter, Wellings Memorial Field
Wissahickon Charter School	Harmony Garden
Wissahickon Valley Watershed Association	Sandy Run

APPENDIX N – MONOSHONE CREEK PROJECT IMPLEMENTATION AND WATER QUALITY ASSESSMENT 1999-2006

EXECUTIVE SUMMARY

The purpose of this report is to both evaluate the impact of completed defective lateral abatements and sewer relining activities in reducing fecal coliform contributions to the Monoshone Creek, and to estimate the additional fecal coliform reductions anticipated from the Saylor Grove Stormwater Wetland BMP, in order to more fully understand the relative value of each approach and to inform future efforts aimed at addressing the problem of fecal coliform concentrations in the Monoshone.

In this report, dry weather fecal coliform data collected at the 7 Monoshone outfalls are analyzed to determine the reductions achieved through defective lateral abatement and sewer relining activities. Since 82 of the 90 abatements performed in the Monoshone were conducted in the sewershed of outfall W-068-04/05, water quality data collected at this outfall is utilized for determining the overall benefit of defective lateral abatements and sewer relining in reducing fecal coliform contributions. After the reductions achieved by these activities are determined for outfall W-068-04/05, the impact of these reductions on fecal coliform concentrations in Monoshone Creek is analyzed. The anticipated dry weather fecal coliform reduction from the Saylor Grove stormwater wetland is then determined and compared with the reductions achieved though the abatements and sewer relining. Wet weather fecal coliform reductions are also estimated for the stormwater wetland and the analysis is then broadened to estimate also the impact of the wetland on total suspended solids concentrations and loadings entering the Monoshone. From this analysis, the following observations were made:

- The 82 defective lateral abatements conducted between 1999 and 2003 in the sewershed of outfall W-068-04/05 have resulted in an 87% or 7/8 log reduction in average fecal coliform *concentrations* and an 88% or 1 log reduction in average fecal coliform *loadings*, a reduction equivalent to 68 billion fewer fecal coliform units each day or 235,532 #/day per $1 of project costs
- The sewer relining completed 2004 in the sewershed of outfall W-068-04/05 resulted in a 50% or 1/3 log further reduction in fecal coliform *concentrations*, and a 44% or ¼ log further reduction in fecal coliform *loadings,* a reduction equivalent to 4.1 billion fecal coliform units/day or 5,663 #/day per $1 of project costs
- A 93% or 1 1/6 reduction in both fecal coliform *concentrations* and *loadings*, equivalent to the removal of an average of 128,000 #/100mL, 72 billion #/day, and 241,200 #/day per $1 of project costs has been achieved as a result of defective lateral abatements and sewer relining
- While fecal coliform concentrations in the headwaters of the Monoshone exceed DEP standards as a result of outfall W-068-04/05, dilution and die-off result in downstream concentrations *consistently* lower than the 2,000 #/100mL non-swimming season standard and concentrations *occasionally* lower than the 200 #/100mL swimming season standard (May-Sept)
- The Saylor Grove stormwater wetland is anticipated to result in a dry weather fecal coliform reduction of 4,081 #/100mL, 1.33 billion #/day, and 2,300 #/day

per $1 spent, values which are much lower than the dry weather reductions achieved through defective lateral abatements or the sewer relining

- Wet weather fecal coliform loading reductions anticipated from the Saylor Grove Wetland BMP, however, exceed the combined dry weather reductions achieved by defective lateral abatements and sewer relining
- Wet weather fecal coliform reductions anticipated from the Saylor Grove wetland are equivalent to 366,213 #/day per $1 spent, about 1.5 times the dry weather reduction value of the defective lateral abatements and sewer relining
- The Saylor Grove wetland is also expected to reduce total suspended solids loadings by about 4.3 tons/yr and reduce the impact of peak flows from outfall W-060-10 to the Monoshone, thereby reducing stream bank erosion and associated suspended solids loadings downstream

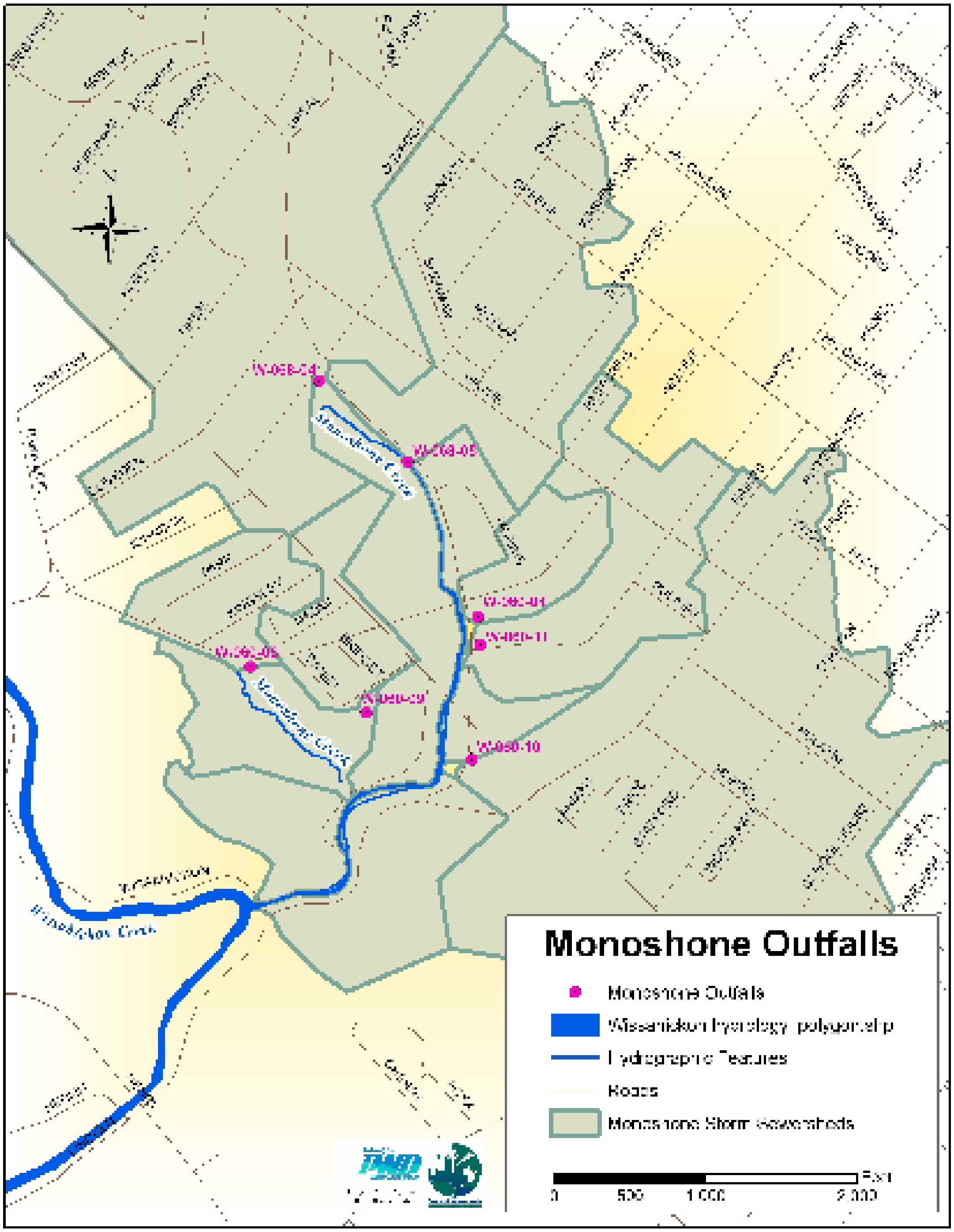
The Defective Lateral Abatement Program (DLAP) has been very successful in reducing dry weather fecal coliform contributions to the Monoshone through defective lateral abatement and sewer relining activities. The implementation of the Saylor Grove wetland is expected to further address the fecal coliform contributions to the Monoshone by treating both dry weather and wet weather contributions from the sewershed of the downstream outfall W-060-10. The analysis conducted in this report shows how both approaches are valuable for addressing the problem of fecal coliform. Furthermore, it is evident that strategic monitoring is required to more accurately determine water quality trends in the Monoshone and to better evaluate the performance of the Saylor Grove wetland. Outfall W-068-04/05 continues to be a significant source of fecal coliform to the Monoshone and innovative treatment solutions may be required to further reduce this impact.

INTRODUCTION

The Saylor Grove Stormwater Treatment Wetland is a 1 acre constructed wetland designed to treat a portion of the stormwater from an underground storm sewer that discharges to the Monoshone Creek. A 48" brick storm sewer collects runoff from a 156-acre drainage area and passes under Saylor Grove Park before discharging through an outfall to the Monoshone Creek. Prior to project implementation, Saylor Grove Park was heavily eroded as a result of stormwater passing through the site from the underground storm sewer, overland flow, and the continuous base flow emerging onto the site from an underground stream. The Saylor Grove wetland project is designed to divert the first flush of each storm through a constructed wetland where the polluted runoff will be treated and then released to the storm sewer that discharges to the Monoshone Creek. Base flow entering the park from Radium Spring supplies the wetland with the continuous flow necessary for sustaining the wetland vegetation.

Seven stormwater outfalls discharge to the Monoshone Creek, identified as W-060-04, W-060-08, W-060-09, W-060-10, W-060-11, W-068-04, and W-068-05 (Appendix F, Figure 1). Runoff passing through the 48" storm sewer underneath Saylor Grove Park discharges to the Monshone through outfall W-060-10. The Industrial Waste Unit (IWU) of PWD has conducted routine monitoring of each of the seven outfalls since 1997 to assess the fecal coliform and fluoride concentrations present in each outfall and to determine the flow rate of the outfall discharge at the time of sampling.

Since 1999, PWD's Defective Lateral Abatement Program (DLAP) has worked to identify the presence of defective laterals in the sewersheds of the Monoshone outfalls and to correct improper connections. A defective lateral, or cross connection, is a commercial or residential sanitary sewer line that is improperly connected to the city's storm sewer infrastructure, resulting in dry weather flow from stormwater outfalls and associated fecal contamination in the receiving streams. Defective laterals are identified through dye testing and then abated by properly connecting the commercial or residential sanitary line to the sanitary sewer, thereby reducing bacterial contamination in the receiving stream.



Appendix F, Figure 1 - Monoshone Creek & Outfalls

One of the primary objectives of the Saylor Grove wetland is to reduce fecal coliform loadings entering the Monoshone from outfall W-060-10. The fecal coliform samples routinely collected from the 7 Monoshone outfalls by IWU provide an indication of the fecal coliform reductions so far achieved through the Defective Lateral Abatement Program. This data will also help determine the relative fecal coliform contributions from outfall W-060-10 in the context of the other Monoshone outfalls and can be utilized to anticipate fecal coliform reductions that will be achieved by the Saylor Grove wetland.

All outfall samples collected by IWU were collected during dry weather conditions. In this report, a sample is considered to be collected during dry weather if the sample was collected more than 12 hours after a rain event of 0.05 inches or greater. Since the evaluation of the benefits of defective lateral abatements and sewer relining in reducing fecal coliform entering the Monoshone will be based exclusively on dry weather data, the initial evaluation of the Saylor Grove wetland will also look at dry weather reduction anticipated from this project even though the actual function of the wetland is to treat stormwater flows. After the project is evaluated based on anticipated dry weather fecal coliform reductions, further analysis will estimate fecal coliform reductions anticipated from the wetland during rain events. Finally, total suspended solids reductions from the Saylor Grove wetland will be estimated since this parameter is also of great importance in stormwater wetland implementation and the evaluation of the anticipated performance of the wetland without consideration of this parameter would provide an incomplete picture of the overall benefit of project implementation.

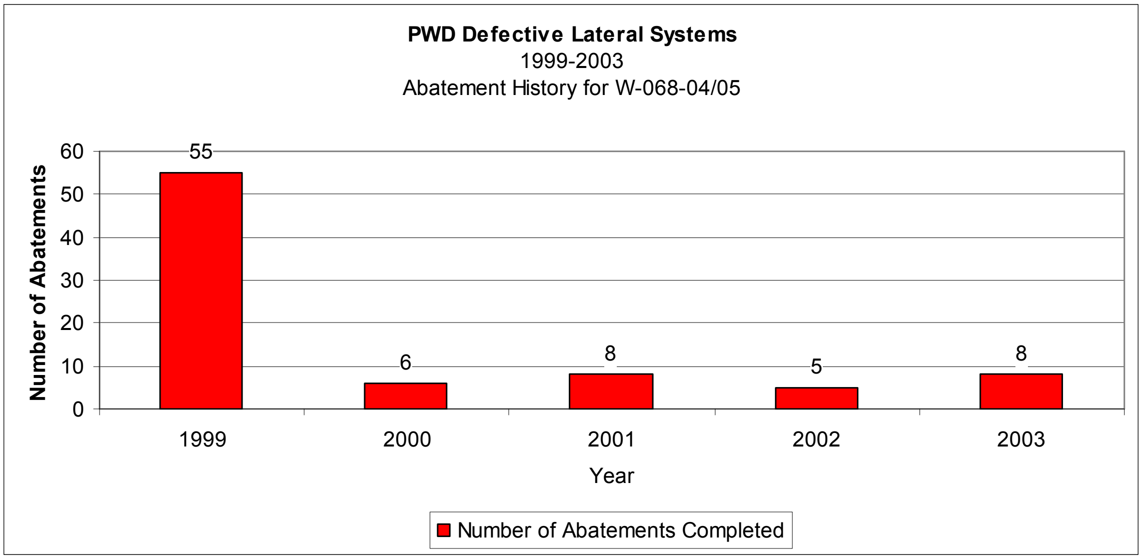
Defective Lateral Abatements in the Monoshone

As of August 2005, 90 defective lateral abatements have been completed within the Monoshone Creek sewersheds. All abatement work completed to date has been conducted within the sewersheds of 4 outfalls, W-060-08, W-060-09, W-060-10, W-068-04, and W-068-05. Since W-68-04 and W-068-05 drain a single sewershed, the DLAP identifies the combined area under the single outfall identification of W-068-05 while IWU continues to sample both outfalls and identifies them separately as W-068-04 and W-068-05. For the purpose of clarity, the combined sewershed is identified consistently in this report as W-068-04/05 and the IWU sampling data for the two separate outfalls are combined accordingly. Appendix F, Table 1 indicates the number of abatements that have been performed in each outfall drainage area to date.

Appendix F, Table 1 - Defective lateral abatements completed in the Monoshone

Outfall	Defective Lateral Abatements
W-060-04	0
W-060-08	1
W-060-09	2
W-060-10	5
W-060-11	0
W-068-04 / W-068-05	82
TOTAL	**90**

Of the 90 defective lateral abatements performed in the Monoshone sewersheds, 82 have been performed in the W-068-04/05 drainage area. Of these 82 abatements, 55 were completed in 1999, with no more than 8 abatements per year being completed in subsequent years (Appendix F, Figure 2). No abatements have been performed in the Monoshone since 2003.

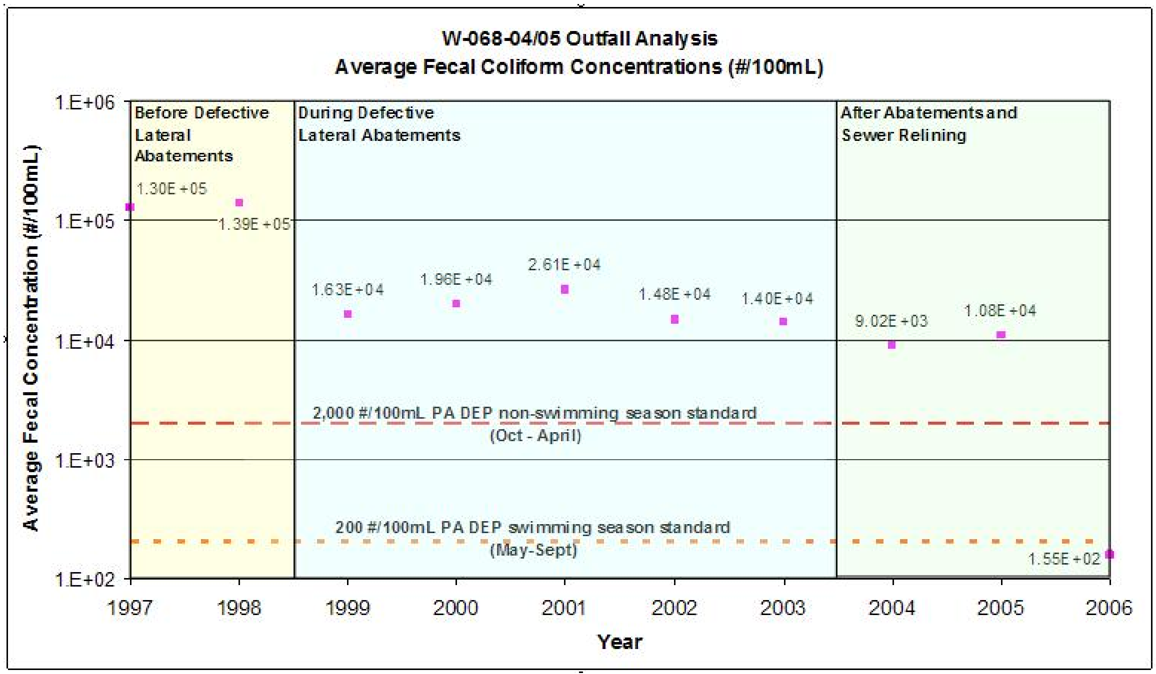


Appendix F, Figure 2 - Abatement History for Outfall W-068-04/05

Since the majority of the defective lateral abatements have been performed in the sewershed of outfall W-068-04/05, the comparison of pre-abatement to post-abatement fecal coliform data from this combined area provides the best indication of the direct benefits achieved in the Monoshone from defective lateral abatements. Prior to 1999, fecal coliform concentrations in W-068-04/05 averaged 137,025 #/100mL. Between 1999 and 2003, during and following the completion of 82 abatements in the same sewershed, concentrations were reduced to an average of 18,481#/100 mL, an 87% or 7/8 log reduction. The most dramatic reduction occurred in 1999, when 55 abatements were performed. The average fecal coliform concentrations observed in the outfall between 1997 and 2003 are depicted in Appendix F, Figure 3 below. Appendix F, Table 2 shows the total number of samples collected at W-068-04/05 per year.

Flow data was collected alongside fecal coliform data between 1997 and 2003, enabling the calculation of fecal coliform loadings from W-068-04/05 during this time period. As a result of defective lateral abatements in this sewershed, average fecal coliform loadings were reduced from 7.74×10^{10} #/day between 1997 and 1998 to 9.34×10^{9} #/day from 1999 to 2003, an 88% or 1 log load reduction equivalent to 68 billion fewer fecal coliform colonies each day. Fecal coliform loadings between 1997 and 2003 are presented in Appendix F, Figure 4.

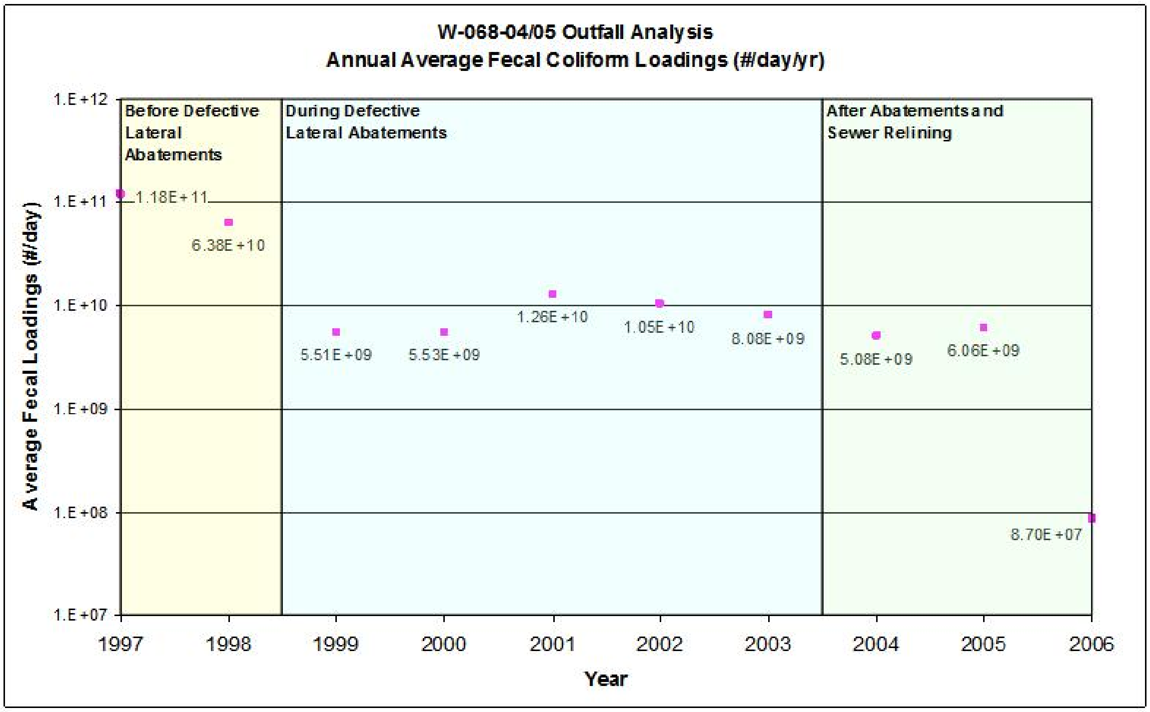
The total cost of the 82 abatements performed in the W-068-05 sewershed was $288,800 with an average cost of $3,565 per abatement. The reduction of approximately 68 billion counts of fecal coliform per day from the 82 abatements performed in the sewershed of outfall W-068-05 is equivalent to the removal of 235,532 counts/day of fecal coliform per $1 spent.



Appendix F, Figure 3 - Average fecal coliform concentrations at W-068-04/05 from 1997-2006

Appendix F, Table 2 - W-068-04/05 samples collected/yr

YEAR	# samples
1997	1
1998	3
1999	7
2000	9
2001	9
2002	10
2003	6
2004	34
2005	29
2006	4



Appendix F, Figure 4 - Fecal coliform loadings at W-068-04/05 from 1997-2006

<u>SEWER RELINING IN SEWERSHED OF OUTFALL W-068-05</u>

In the spring of 2004, a project was implemented to address a leak observed in the sanitary sewer under Lincoln Drive in the vicinity of Johnson Street. Inspection of the sewer indicated that a few bricks were missing which resulted in sanitary flow entering the sewershed discharging to the Monoshone through outfall W-068-04/05. The leak was addressed by lining 3,160 feet of the 2'6" brick interceptor sewer under Lincoln Drive from Washington Lane to Arbutus Street. The cost of this project was approximately $729,600 which does not include the $50,000 stream channel restoration conducted at the outfall which was completed under the project scope but not directly related to the relining.

The 2004 and 2005 fecal coliform data collected by IWU reflects a further reduction in fecal coliform at outfall W-068-04/05 as a result of the sewer relining as can be seen from Appendix F, Figure 3 and Appendix F, Figure 4 above. From 1999 to 2003, during which the defective lateral abatements were completed in the sewershed, the average fecal coliform concentration at the outfall was 18,481 #/100mL. From 2004 to 2005, following the sewer relining, average concentrations were reduced to about 9,256 #/100mL, a 50% reduction.

While flow data was not collected during 2004 and 2005 following sewer relining, fecal coliform loadings have been calculated using average flows from 1999-2003. Based on this flow data, this sewer relining resulted in a 44% reduction in daily fecal loadings, the equivalent of removing 4.1 billion fecal coliform colonies per day or 5,663 colonies/day per $1 spent. Since flows were actually reduced following the relining, actual post-project loadings, and therefore overall reductions, are greater than what is reflected in this analysis.

As a result of both defective lateral abatements and sewer relining in the sewershed of W-068-04/05, both fecal concentrations and loadings have been reduced by about 93%. Average fecal coliform concentrations have been reduced by almost 128,000 #/100mL and fecal loadings by over 72 billion #/day, for a total removal of about 241,200 #/day of fecal coliform per $1 spent. Average concentrations and loadings for W-068-04/05 from 1997-2005 are provided in Appendix F, Figure 3 and Appendix F, Figure 4 above and reductions achieved are summarized in Appendix F, Table 3 and Appendix F, Table 4 below.

Appendix F, Table 3 - Fecal coliform concentrations and loadings in W-068-04/05 before and after defective lateral abatements and sewer relining

	Avg Fecal Concentrations (#/100mL)	**Avg Fecal Loadings (#/day)**
Before 1999 (prior to abatements)	137,025	7.74E+10
1999-2003 (following abatements)	18,481	9.34E+09
2004-2006 (following sewer relining)	9,256	5.21E+09

Appendix F, Table 4 - Fecal coliform concentration and loading reductions achieved through defective lateral abatement and sewer relining in outfall W-068-04/05

	Concentration Reductions (#/100mL)		**Loading Reductions (#/day)**	
	%	log	%	log
Defective Lateral Abatements (1999-2003)	87%	7/8	88%	1
Sewer Relining (2004)	50%	1/3	44%	1/4
Total	93%	1 1/6	93%	1 1/6

Impacts of DLAP and Sewer Relining on Monoshone Creek Water Quality

In addition to the outfall sampling conducted by IWU, BLS conducts routine sampling at two in-stream locations on the Monoshone Creek, MONO250 and MONO840. MONO250 is located at Rittenhouse Town just downstream of the W-060-10 outfall and MONO840 is located at Lincoln Drive and Morris Street just downstream of the W-068-04/05 outfall on the Monoshone Creek. Sampling began at MONO250 in April 1999 and samples were collected monthly though 2001 after which quarterly samples have been collected up to the present time. Sampling began at MONO840 in July 2001 and has continued quarterly to the present time with the exception of 6 additional samples collected consecutively on a single day in August 2002. Of the 41 samples collected at MONO250, 23 were collected during dry weather conditions and 18 during wet weather conditions. Of the 19 samples collected at MONO840, 16 were collected during dry weather conditions and only 3 during wet weather. For samples collected in the Monoshone, wet weather samples are considered to be those collected within 36 hrs of a rain event of 0.05 inches or greater. All samples were analyzed for fecal coliform as well as several additional parameters. Appendix F, Table 5 summarizes the number of samples collected during wet and dry conditions from MONO250 and MONO840 between 1999 and 2005.

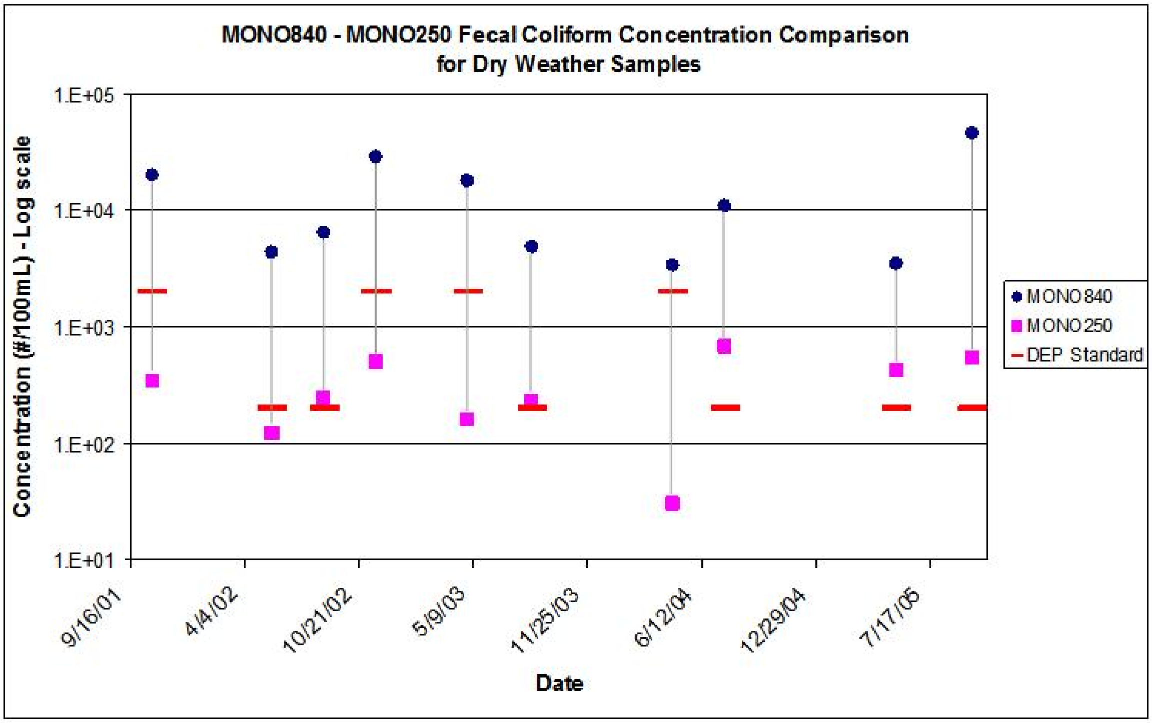
Appendix F, Table 5 - MONO250 and MONO840 samples collected 1999-2005

	MONO250		**MONO840**	
Year	# Dry	# Wet	# Dry	# Wet
1999	5	4	0	0
2000	5	8	0	0
2001	4	4	1	1
2002	3	0	9	0
2003	2	1	2	1
2004	2	1	2	1
2005	2	0	2	0
Total	23	18	16	3

For a variety of reasons the in-stream data collected from the Monoshone does not help in determining the impact of defective lateral abatements or sewer relining on fecal coliform in the Monoshone. The reasons are as follows: 1) neither MONO250 nor MONO840 were sampled prior to 1999 when the majority of the defective lateral abatements were completed; 2) Monoshone sampling is conducted too infrequently to make strong determinations regarding the presence of a downward trend in fecal coliform concentrations; 3) outfall sampling is not conducted in conjunction with Monoshone sampling and therefore the in-stream data cannot be evaluated in the context of the outfall data; and 4) while the fecal coliform concentration data by itself does not show a significant downward trend over the period of time of sampling, without corresponding flow data for the Monoshone it is impossible to determine whether actual fecal coliform counts are decreasing in the Monoshone as a result of these efforts.

While the data collected from MONO840 and MONO250 is not helpful for determining the impact of defective lateral abatements and sewer relining on fecal coliform in the Monoshone, the comparison of data collected from the two Monoshone locations during dry weather do provide some understanding of how the impacts of W-068-04/05 persist downstream. Appendix F, Figure 5 and Appendix F, Table 6 compare dry weather samples from MONO250 and MONO840 and Appendix F, Figure 5 provides the applicable DEP standard for fecal coliform concentrations for each sampling date in the context of recreational human contact. During the swimming season (May 1 – Sept 30), the fecal coliform standard is 200 #/100mL and at other times of the year the standard is 2,000 #/100mL. While these standards are based on the geometric mean of 5 consecutive samples collected on different days during a 30 day period, showing the standard in relationship to single values can be helpful in providing a context for evaluating data which otherwise isn't collected according to the protocols required for a strict application of the standard.

From 2001 to 2005, the time period during which samples were collected for both MONO840 and MONO250, a consistent reduction in fecal coliform concentrations are observed between the two locations on the Monoshone. While concentrations do not follow an identifiable trend at each location between years, from upstream to downstream a consistent reduction between 88 and 99% can be observed, the equivalent of a 1 to 2 log removal with downstream migration. Also, while all 10 MONO840 samples exceed the DEP limit for fecal coliform concentrations in the Monoshone, 4 of the 10 samples collected at MONO250 were below the 200 #/100mL DEP standard for the swimming season and all 10 samples at MONO250 fell below the non-swimming season standard of 2,000 #/100mL. This indicates that while outfall W-068-04/05 continues to significantly impact the headwaters of the Monoshone Creek, fecal coliform concentrations are often reduced to within an acceptable range prior to entering the Wissahickon Creek. This reduction is most likely associated with die-off from sunlight exposure or dilution from downstream outfalls.



Appendix F, Figure 5 - MONO840 - MONO250 Fecal Coliform Concentration Comparison

Appendix F, Table 6 - Dry weather MONO840 and MONO250 fecal coliform concentrations compared (#/100 mL)

Sample Date	MONO840	MONO250	%Reduction	Log reduction	DEP Standard (#/100mL)
10/25/2001	20,000	340	98%	1.77	2,000
5/23/2002	4,400	120	97%	1.56	200
8/22/2002	6,500	240	96%	1.43	200
11/21/2002	29,000	500	98%	1.76	2,000
4/30/2003	18,000	160	99%	2.05	2,000
8/20/2003	4,900	230	95%	1.33	200
4/22/2004	3,400	30	99%	2.05	2,000
7/21/2004	11,000	670	94%	1.22	200
5/18/2005	3,500	420	88%	0.92	200
9/29/2005	46,000	540	99%	1.93	200

FECAL COLIFORM CONTRIBUTIONS FROM MONOSHONE OUTFALLS

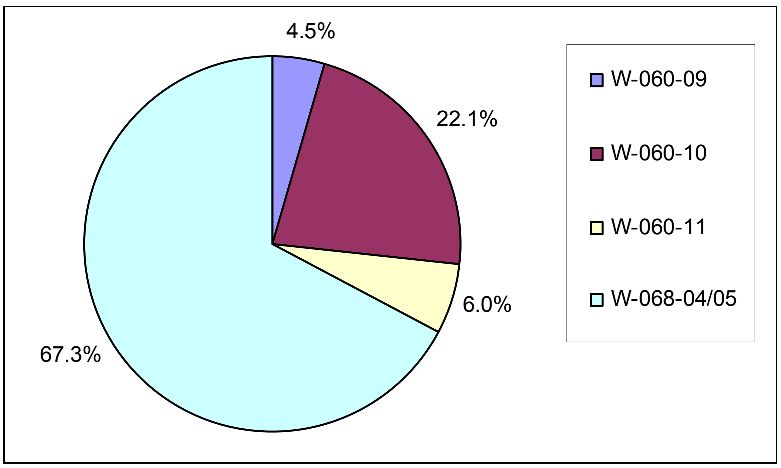
The Saylor Grove Stormwater Wetland is designed to capture and treat the base flow that passes through the site from natural springs, dry weather flow that enters the site from the storm sewer that eventually discharges to outfall W-060-10, and a percentage of the stormwater from the same storm sewer during rain events. A comparison of dry weather fecal coliform contributions from the 7 Monoshone outfalls provides an indication of the significance of implementing a stormwater wetland to treat the W-060-10 discharge as well as the relative significance of this discharge in relation to W-068-04/05 where the majority of the defective lateral abatement and sewer relining activities have been performed to date. Comparing the outfall contributions using data since 2003 provides the best indication of relative contributions of each outfall following the completion of the defective lateral abatements.

Of the 7 Monoshone outfalls illustrated in Appendix F, Figure 1, W-068-04 and W-068-05 drain a single sewershed and are therefore considered as a single outfall (W-068-04/05) and 2 other outfalls have not been sampled since 1999. Consequently, only 4 outfalls are compared in the present analysis.

Appendix F, Table 7 summarizes the loading contributions from each of these outfalls. Appendix F, Figure 6 shows that 67% of the total fecal coliform outfall loading comes from W-068-04/05 and 22% comes from outfall W-060-10. This illustration provides justification for the high priority accorded to W-068-04/05 as well as the present attention being given to W-060-10 through the implementation of the Saylor Grove Stormwater Wetland BMP.

Appendix F, Table 7 - Dry weather fecal coliform loading contributions from Monoshone outfalls since 2003

Outfall	Avg Flow (gal/yr)	Avg fecal conc (#/100mL)	Avg Fecal Loading (#/yr)	# samples
W-060-04	NA	NA	NA	0
W-060-08	NA	NA	NA	0
W-060-09	534,426	7,657	1.55E+11	7
W-060-10	2,940,060	6,794	7.56E+11	12
W-060-11	2,052,168	2,665	2.07E+11	11
W-068-04/05	5,543,669	10,989	2.31E+12	73



Appendix F, Figure 6 - Dry Weather Average Annual Fecal Contributions (#/yr) from Monoshone Outfalls, 2003-2006

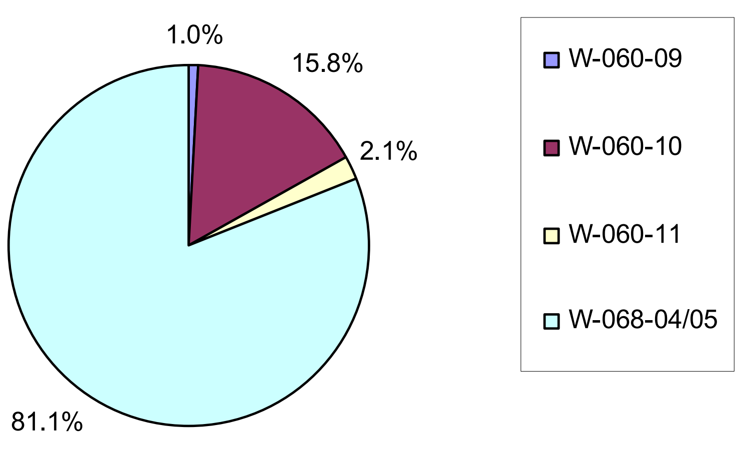
While all outfall samples were collected during dry weather conditions, an estimate of the wet weather contributions of these same 4 outfalls can be made utilizing model predictions for outfall flow, based on drainage area and annual rainfall data (Appendix F, Table 8), and an estimated fecal coliform concentration based on the actual maximum concentrations observed at each outfall during dry conditions (Appendix F, Table 9). Since the Saylor Grove wetland is designed for the treatment of stormwater flows, this assessment allows for the determination of whether estimated wet weather loadings from W-060-10 are significant in relation to the other Monoshone outfalls. Appendix F, Figure 7 illustrates that during rain events W-068-04/05 contributes an even greater percentage of the total outfall loading contribution than during dry weather conditions due to the high fecal concentrations originating from this outfall as well as the tremendous size of its drainage area which is over 3 times greater than the sum of the additional 5 Monoshone outfalls. After W-06/8-04/05, outfall W-060-10 continues to be the next most significant source of fecal coliform loadings to the Monoshone during wet weather, contributing 16% of the total outfall loading.

Appendix F, Table 8 - Estimated outfall discharges modeled using drainage area, precipitation, infiltration, and evapotranspiration

Basin #	Area (ac)	Annual (MG/Y)	Annual (in/Y)
W-068-04/05	717.97	305.2	15.7
W-060-11	38.31	16.2	15.6
W-060-10	138.68	75.2	20.0
W-060-09	17.63	5.3	11.1
W-060-04	9.4	3.5	13.8
W-060-08	17.42	7.5	15.9

Appendix F, Table 9 - Wet weather fecal coliform loading contributions from Monoshone outfalls since 2003

Outfall	Avg WET Flows (gal/yr)	Max fecal conc (#/100mL)	Fecal Loading (#/yr)	# samples
W-060-04	0	NA	NA	0
W-060-08	0	NA	NA	0
W-060-09	5,300,000	40,000	8.03E+12	7
W-060-10	75,200,000	46,000	1.31E+14	12
W-060-11	16,200,000	28,000	1.72E+13	11
W-068-04/05	305,200,000	58,000	6.70E+14	73

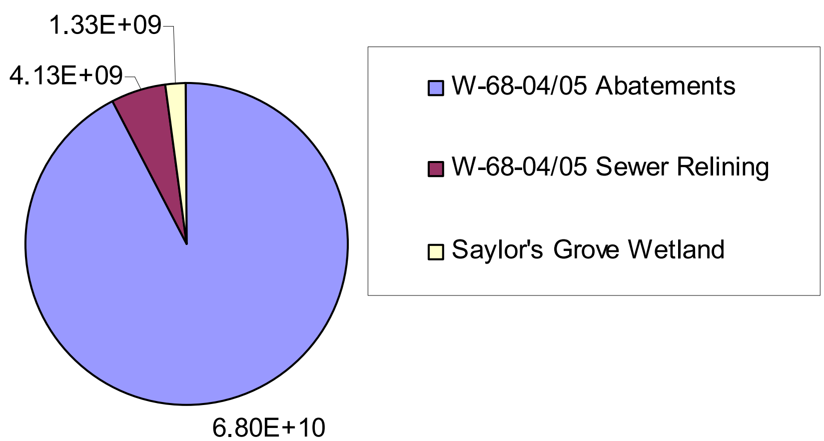


Appendix F, Figure 7 - Wet Weather Average Annual Fecal Contributions (#/yr) from Monoshone Outfalls, 2003-2006

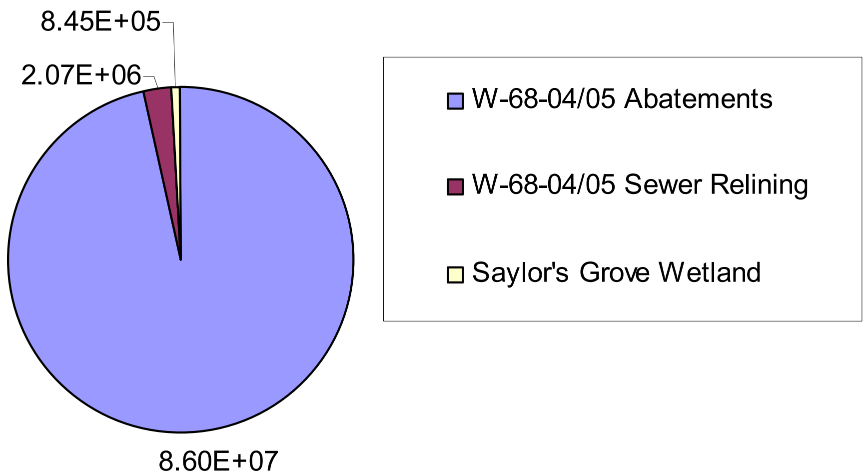
DRY WEATHER FECAL COLIFORM REDUCTIONS FROM SAYLOR GROVE WETLAND

The Saylor Grove Stormwater Wetland is designed to collect and treat 100% of the dry weather flow conveyed through the site and approximately 60% of annual stormwater runoff. The wetland is designed to treat 75% of runoff from a 1" rainfall and 60% of the runoff from a 2" rainfall event. In the W-060-10 sewershed, only 2 events per year would exceed a 2" rainfall event.[1]

The average fecal coliform contribution from W-060-10, based on data collected from 1998 to 2006, is about 4,535 #/100mL or 1.48 billion #/day during dry weather events. Research conducted by Rita Nokes et. Al on water quality improvements associated with wetland treatment has shown that a constructed wetland can reduce fecal coliform concentrations by 99.5% +/- 3% (Nokes et. Al., 2003). From a conservative estimate of 90% fecal coliform removal for the Saylor Grove wetland, dry weather removal is anticipated at 4,081 #/100mL or 1.33 billion #/day. With total project cost of about $575,000, dry weather fecal coliform will be reduced by about 2,300 #/day per $1 spent. Appendix F, Figure 8 and Appendix F, Figure 9 illustrate dry weather fecal coliform loading reductions in outfall W-060-10 anticipated from the Saylor Grove wetland in comparison to the reductions achieved through defective lateral abatements and sewer relining in outfall W-068-04/05. The same data is also presented in Appendix F, Table 10 below.



Appendix F, Figure 8 - Daily dry weather fecal coliform removals from defective lateral abatements, sewer relining, and Saylor Grove Wetland (#/day)



Appendix F, Figure 9 - Annual dry weather fecal coliform removals per project dollar from defective lateral abatements, sewer relining, and Saylor Grove Wetland (#/yr Removed per $1 spent)

Appendix F, Table 10 - Summary of project costs and associated loading reductions

	Costs	Load removal (#/day)	Removal/day/$	Removal/yr/$
W-68-04/05 Abatements	$288,800*	68,021,714,536	235,532	85,969,272
W-68-04/05 Sewer Relining	$729,600	4,131,423,512	5,663	2,066,844
Saylor's Grove Wetland	$575,000	1,330,930,733	2,315	844,852

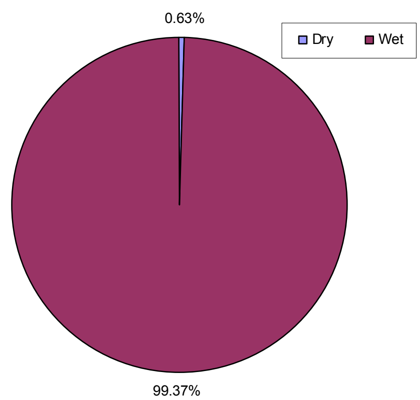
*Abatement costs do not include the cost of dye testing or other activities involved in identifying defective laterals

WET WEATHER FECAL COLIFORM REDUCTIONS FROM SAYLOR GROVE WETLAND

Annual stormwater runoff through W-060-10 is approximately 75.2 MGY (Appendix F, Table 8), and with 60% of the annual runoff passing through the wetland, approximately 45.1 MGY will be treated annually by the wetland.

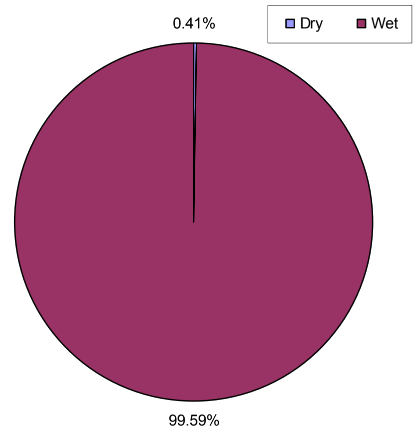
During a 1" rainfall event on 5/20/2005 and a 2" rainfall event on 7/8/2005, ISCO samples were collected from outfall W-060-10 to observe the relationship of fecal coliform concentrations in the outfall to the rise and fall of the hydrograph. The 1" rainfall event showed a peak concentration of 110,000 #/100mL and an event mean concentration of about 20,000 #/100mL. The 2" rainfall had a peak greater than the 200,000 #/100mL and an event mean concentration of about 90,000 #/100mL. The average of all the fecal coliform samples collected during both events was about 50,000 #/100mL. Based on this average wet weather concentration and the 45.1 MGY of stormwater treated annually by the wetland, 2.34×10^{11} #/day of fecal coliform enters the wetland during storm events. Using the treatment efficiency of 90%, approximately 45,000 #/100mL or 211 billion #/day will be removed during wet weather events. The wet weather fecal coliform reduction is equivalent to about 366,213 #/day per $1 spent, approximately 1.5 times the removal value of the combined dry weather removal achieved by defective lateral abatement and sewer relining activities in sewershed W-068-04/05.

Appendix F, Figure 10 illustrates the relative wet and dry weather annual fecal coliform loadings that enter the Saylor Grove wetland from the sewershed that eventually discharges through outfall W-060-10. While the dry weather fecal coliform removal anticipated from the wetland is not nearly as significant as what has been achieved through the 82 defective lateral abatements conducted in sewershed W-068-04/05, the real significance of the Saylor Grove wetland is to be found in its performance in the wet weather conditions for which it has been designed.



Appendix F, Figure 10 - Wet vs. dry annual fecal loading contributions to Saylor Grove Wetland

Appendix F, Figure 11 compares the total annual fecal loading from all Monoshone outfalls during dry weather conditions to the annual loading during wet weather conditions. Both Appendix F, Figure 10 and Appendix F, Figure 11 illustrate that while dry weather fecal coliform contributions from outfalls are significant, they are very small in relationship to wet weather fecal coliform contributions. While defective lateral abatement activities address the very real problem of dry weather fecal coliform contributions, Appendix F, Figure 10 and Appendix F, Figure 11 reveal the importance of also addressing wet weather contributions specifically, through implementation of projects such as the Saylor Grove Stormwater Wetland BMP.



Appendix F, Figure 11 - Wet vs. dry total fecal coliform loadings from outfalls on Monoshone, 2003-2006

TOTAL SUSPENDED SOLIDS

While the majority of this report has focused on fecal coliform with the purpose of comparing anticipated reductions from the Saylor Grove wetland to the reductions achieved through defective lateral abatements and sewer relining in outfall W-068-04/05, the full value of the wetland cannot be appreciated without realizing its benefit for other water quality parameters. In the Monoshone and Wissahickon creeks, suspended solid loads, the erosion which increases suspended solids in the watershed, and the peak flows that cause erosion, poses a significant problem. The Saylor Grove wetland is designed to reduce peak flows from the storm sewer connected to outfall W-060-10 and will significantly reduce concentrations of suspended solids (TSS) entering the wetland as well.

While TSS samples are not routinely collected from W-060-10 by IWU during dry weather conditions, TSS was collected during the two rain events previously discussed, on 5/20/2005 and 7/8/2005. During these events, average TSS concentrations were 25.8 mg/L. Taking an estimated treatment efficiency of 80% based on the Nokes et. Al observation of over 83.9% reduction of TSS in constructed wetlands, the Saylor Grove wetland can be expected to remove about 23 mg/L of TSS during storm events, approximately 4.3 tons/yr.

CONCLUSION

The first portion of this report summarized the fecal coliform reductions achieved by the defective lateral abatements and sewer relining in the sewershed of outfall W-068-04/05 in the Monoshone Creek. Since the samples that formed the basis of this analysis were all collected during dry weather conditions, the Saylor Grove wetland fecal coliform reductions were estimated for dry weather conditions for the sake of comparing the anticipated benefits of this project with the previous work completed in the Monoshone. The results of this comparison showed a much more significant reduction in dry weather fecal coliform loadings from defective lateral abatements than from either sewer relining or the anticipated reductions from the stormwater wetland. When the costs of each project were considered, defective lateral abatements achieved 12 times the annual loading removal than the relining and the wetland combined at about half the cost of both the stormwater wetland and the relining. Since the relining was done in the same sewershed as the majority of the defective lateral abatements it was possible to observe the extent to which the relining further reduced fecal coliform loadings, which was certainly noticeable.

While the Saylor Grove estimates for fecal coliform reductions during dry weather are minimal when compared to those achieved by the defective lateral abatements and sewer relining, it is recognized that the purpose of the wetland is to treat stormwater and not dry weather flows and the benefit of such a project is not solely limited to fecal coliform reduction but also addresses water quality parameters such as total suspended solids and reduces downstream erosion resulting from peak flows in the storm sewer. As the Monoshone outfall with the second-highest drainage area, W-060-10 which is treated by the Saylor Grove stormwater wetland is expected to have the second highest wet weather fecal coliform loading after W-068-04/05. Wet weather fecal coliform loading reductions were calculated and exceeded the dry weather reductions achieved by both defective lateral abatements and sewer relining in outfall W-068-04/05. Dry weather fecal coliform loadings entering the wetland were calculated to be almost negligible in comparison to the wet weather loadings. Wet weather TSS reductions for the wetland were also calculated and shown to be significant.

While outfall W-068-04/05 continues to be a major source of fecal coliform for the Monoshone Creek, concentrations are significantly reduced as a result of die-off from sunlight exposure and dilution from downstream outfalls. Consequently, while fecal coliform from this outfall continues to significantly impact the headwaters of the Monoshone, the affect is not likely to be seen in the Wissahickon Creek downstream.

RECOMMENDATIONS AND FUTURE STEPS

While significant progress has been made in reducing fecal coliform contributions to the Monoshone Creek from outfall W-068-04/05 through defective lateral abatements and sewer relining, this outfall continued to discharge concentrations well above the DEP standards of 200 and 2,000 #/100mL. The tremendous size of the sewershed which discharges to this outfall makes further defective lateral identification and abatement very challenging. It is recommended, however, that the results of the above analysis be utilized by DLAP in future prioritization of areas where additional dye testing and abatements are needed.

In addition to future defective lateral abatement activities in the sewershed of outfall W-068-04/05, DLAP is working with the Office of Watersheds (OOW) to pilot the applicability of anti-microbial filtration technology in reducing fecal coliform in stormwater outfalls. OOW has purchased filtration fabric that is surface bonded with an antimicrobial agent which reduces fecal coliform through surface contact. OOW and DLAP are working together to deploy this technology and OOW will be collecting water quality data to evaluate product performance. If this product performs successfully, additional quantities should be purchased and a schedule should be implemented to ensure continues deployment and optimal performance. If the product does not prove effective, other end of pipe technologies should be researched and piloted.

For future characterization of Monoshone Creek water quality it is recommended that more frequent sampling of the Monoshone be conducted, that samples also be conducted just upstream and downstream of the confluence of the Monoshone with the Wissahickon to determine its impact of the Monoshone on the Wissahickon, and to coordinate the in-stream sampling conducted by BLS with the outfall sampling conducted by IWU. More frequent sampling would allow a better determination of water quality trends and the coordination of in-stream with outfall sampling would enable a more thorough evaluation of the direct impacts of the various outfalls on the water quality of the Monoshone Creek.

To determine the actual performance of the Saylor Grove Stormwater Wetland BMP, it is recommended that wet weather monitoring be conducted both at the influent and effluent to the wetland using ISCO automatic samplers. This should being sometime around spring 2007 after the vegetation has had time to grow in the infrastructure issues identified after construction have been resolved. Results from this monitoring will enable the determination of the value of constructing stormwater wetlands for similar applications in other parts of the city.

REFERENCES

1. TRC Omni Environmental Corporation. "Draft Hydrological Study; Saylor Grove Stormwater Wetland". January 2003, p.6
2. Nokes, R.L.; Gerba, C.P.; Karpiscak, M.M. Microbial Water Quality Improvement by Small Scale On-Site Subsurface Wetland Treatment. Journal of Environmental Science and Health. 2003. Vol. A38, No. 9. pp. 1849-1855.
3. Phone conversation with Bill Lucas, TRC Omni Environmental Corporation. May 19, 2006.

APPENDIX O– INDUSTRIAL WASTE INSPECTION FORM

PHILADELPHIA WATER DEPARTMENT INDUSTRIAL WASTE UNIT
INDUSTRIAL USER YEARLY INSPECTION REPORT

Inspection Date ______________________

Industry Name:		*Industry Type*			
Permit Number:		*SIC code (s):*		*Year Established:*	
Facility Address					
Contact Person #1		*Title:*		*Phone:*	
Signature					
Contact Person #2		*Title:*		*Phone:*	
Signature				*Fax:*	

Number of Employees:		*Process times*		*Total hours*	
Work Days of the Week:		*Through*			

I.W.U. Inspectors:		*Employee Number*	
		Employee Number	
Signature			
Signature			

Receiving Wastewater Treatment Plant		*Drainage Plat#*	
Receiving Collecting sewer			

Permit Effective Date:

Permit Expiration Date:

☐ Entered into PACS

PRE-INSPECTION REVIEW OF FILE

Current Status: ______________________________

____

Specific problem areas:

____

____

____

____

____

RECORDS REVIEW

1. Is Representative aware of reporting requirements?	YES	NO
2. Does the Representative understand the Permit?	YES	NO
3. Who collects the samples?		
4. Are COCs employed?	YES	NO
5. Available?	YES	NO
6. Correctly done?	YES	NO
7. Are samples labeled in a manner that eliminates sample confusion and mix-ups?		
8. Are the lab sheets data consistent with the data reported by the IU?		

COMMENTS:

____

____

____

____

WATER USAGE

Account Number	Cycle	Meter Number	Meter Size	Usage

WATER IN	GPD	WATER USAGE	GPD
City		Sanitary	
River		Process Flows:	
Well		Wash Downs	
Rain		In-product	
TOTAL		Boiler Blowdown	
		Boiler Evaporation	
		Cooling Tower Bleed-off	
		Cooling Tower Evaporation	
		Non-contact Cooling	
		Other	

Has there been a 20% increase or decrease in water usage over the past 12 months? YES NO

RAW MATERIALS / CHEMICALS STORED ON SITE (* HAZMATS)

Technical Name /Group	Amount Used Per Day	Maximum Amount Stored

HAZARDOUS WASTE GENERATION AND DISPOSAL

Does the facility generate **HAZARDOUS WASTE**? | **YES** | **NO** |

Signature ______________________________

If so what types and in what amounts?

EPA Generator ID # ______________________________

Does the facility generate non-hazardous waste? | YES | NO |

If so what types and in what amounts?

Are manifests available? | YES | NO |

SPILL / SLUG CONTROL MEASURES

Describe spill control measures:

1. Date of last approved spill prevention plan: ______________
2. Any slug / spill discharges since last inspection? __________
3. What is the potential for spills? If potential exists, how significant is it?
   ____
   ____
   a. Are raw materials or products stored near drains?____________
   b. Are wastes stored near drains?____________
   c. Any other drains of concern?
      ____
      ____
4. What is the potential for “non-routine” discharges? If potential exists, how significant is it?
   ____
   ____
   ____
5. Do existing practices address potential threats?_____________
6. Are phone numbers posted on an employee bulletin board?____________
7. Any changes to the existing spill prevention plan (include new areas of concern)
   ____
   ____
   ____

SOLVENT/TOXIC ORGANIC MANAGEMENT PLAN

Date of last approved S.T.O.M.P. ________________________

Describe main points of the S.T.O.M.P.

____

____

____

Any changes to the S.T.O.M.P.

____

____

____

PROCESS SYSTEMS

Describe Process:

1. *Process changes since last inspection*

Process Area	Wastewater discharged	Pollutants

2. *General Condition of equipment?* ______
3. *General Condition of housekeeping?* ______
4. *Schematic Attached?* ______

PRETREATMENT SYSTEMS

Describe the pretreatment system:

1. *Any changes to the pretreatment system?*

2. *General Condition of equipment?* ____________________
3. *General Condition of housekeeping?* ____________________
4. *Schematic Attached?*

BOILERS AND COOLING TOWERS

Is there a cooling tower | YES | NO |
If yes, how many ________________
What capacities ________________
____
____
____
____

Is there a boiler? | **YES** | **NO** |

What type of fuel? ______________
____

If yes, how many? _______________________

If oil what grade? ______________
____

What capacities? ________________
____
____
____

Natural Gas Contingency | YES | NO |
Oil Contingency | YES | NO |
Oil is stored | ABOVE | BELOW | BOTH |

Capacity __________________
____
____
____
____

How many Tanks? __________________________

Steam is used for | PROCESS | AREA HEATING | BOTH |
Is steam from external source? | YES | NO |
External source steam provider? __________________________________

TRANSFORMERS AND CAPACITORS

Are there transformers?	YES	NO	*How Many?*	________
Are they oil filled?	YES	NO		

What volume?

Are there drains in the transformer vaults?	YES	NO
Are the vaults diked?	YES	NO
Are there drains within 10 feet of transformers?	YES	NO

The transformers are	PCB	PCB-CONTAMINATED	NON-PCB	NO PCB	OTHER

Are there capacitors?	YES	NO	*How Many?*	________
Are they oil filled?	YES	NO		

What volume?

Are there drains within 10 feet of capacitors?	YES	NO
Are the drains diked or plugged?	YES	NO

The capacitors are	PCB	PCB-CONTAMINATED	NON-PCB	NO PCB	OTHER

☐ **Delivered PCB Information Sheet**

NON-PCB = Retrofilled PCB Transformer to Less than 50 PPM

CSO INITIATIVE

Facility is in a (combined / separate) sewer system area.

CSO Impacted by discharge from this facility: CSO# _________

Platt # ___________

SWO Impacted by discharge from this facility: SWO# _________

Platt # ___________

This facility is **(ZERO) (PERIODIC) (CONTINUOUS) (BATCH) DISCHARGE** facility

The frequency of the discharge of process wastewater is (DAILY)(WEEKLY)(MONTHLY)

Non-process related wastewater discharges:

Check all that apply

Type of non-process discharge	**Treated**	**Untreated**
Boiler Blow Down		
Cooling Tower Blow Down		
Rain Water		
Sanitary		
Other		

Does the facility discharge process wastewater during rain events? YES NO

Can the facility delay discharging process wastewater during a rain event? YES NO

Part X: Storm water

Does the facility's Storm water discharge to the City's MS4 sewer?

Yes - Outfall ID:_________ No – CSO:_______

Does the facility have an NPDES Storm water Discharge Permit?_______

If so, are Discharge Monitoring Reports in compliance with the NPDES Storm water Permit Requirements?____

What are the potential sources of pollutants stored outside that could possibly impact storm water? Include chemicals, hazardous waste, any roll-offs that could leak liquid material such as oil?

Are there any SARA 3 Title chemicals?____

Where are they stored?____

Are the tanks in a contained area?_______________________________________

Is the tank area clean?____

How is the dike water handled?____

Does the facility file a Tier II form under SARA Title III?_______________________________

Are there storm drains in the vicinity?__________________

Is the area clean?_______

If not good record observations and possible corrective action.________________________

Are all activities performed so to minimize or prevent pollutant contact with storm water?__________

List approved spill/pollution prevention plans (PPC):______________________________________

APPENDIX P –
CITY OF PHILADELPHIA
STORM WATER MANAGEMENT REGULATIONS

600.0 STORMWATER MANAGEMENT

The Water Department, as authorized by Section 14-1603.1 of the Philadelphia Code, requires the following specifications for stormwater detention and retention systems as of January 1, 2006.

600.1 Definitions

For the purposes of these Regulations, the following words and phrases shall mean and be interpreted pursuant to the below definitions. Whenever any of these words appear in these Regulations in the singular or plural form, the opposite shall also hold as applicable.

(a) Buffer: The area of land immediately adjacent to any surface water body measured perpendicular to and horizontally from the top-of-bank on both sides of a stream that must remain or be restored to native plants, trees, and shrubs.

(b) Design Professional: A licensed professional engineer registered in the Commonwealth of Pennsylvania.

(c) Design Storm: The magnitude and temporal distribution of precipitation from a storm event defined by probability of occurrence (e.g., five-year storm) and duration (e.g., 24-hours), used in the design and evaluation of stormwater management systems.

(d) Developer: Any landowner, agent of such landowner, or tenant with the permission of such landowner, who makes or causes to be made a subdivision of land or land development project prior to issuance of the Certificate of Occupancy.

(e) Development: Any human-induced change to improved or unimproved real estate, whether public or private, including but not limited to land development, construction, installation, or expansion of a building or other structure, land division, street construction, and site alteration such as embankments, dredging, grubbing, grading, paving, parking or storage facilities, excavation, filling, stockpiling, or clearing. As used in these Regulations, development encompasses both new development and redevelopment. It includes the entire development site, even when the project is performed in stages.

(f) Development Site: The specific tract of land where any Earth Disturbance activities are planned, conducted, or maintained.

(g) Diffused Drainage Discharge: Drainage discharge not confined to a single point location or channel, such as sheet flow or shallow concentrated flow.

(h) Directly Connected Impervious Area (DCIA): An impervious or impermeable surface, which is directly connected to the drainage system as defined in the Manual.

(i) Earth Disturbance: Any human activity which moves or changes the surface of land, including, but not limited to, clearing and grubbing, grading, excavation, embankments, land development, agricultural plowing or tilling, timber harvesting activities, road maintenance activities, mineral extraction, and the moving, depositing, stockpiling, or storing of soil, rock or earth materials.

(j) Erosion and Sediment Control Plan: A plan for a project site that identifies stormwater detention and retention structures that will minimize accelerated erosion and sedimentation during the construction phase.

(k) Groundwater Recharge: The replenishment of existing natural underground water supplies without degrading groundwater quality.

(l) Management District: Sub-area delineations that determine peak rate attenuation requirements, as defined in the Manual. Sites located in more than one management district shall conform to the requirements of the district into which the site discharges.

(m) Manual: The most recent version of the Philadelphia Stormwater Management Guidance Manual.

(n) New Development: Any development project that does not meet the definition of redevelopment as defined in these Regulations or any development project at a site where structures or impervious surfaces were removed before January 1, 1970.

(o) Post Construction Stormwater Management Plan (PCSMP): A complete stormwater management plan as described in these regulations and in the Manual.

(p) Predevelopment Condition: For new development, the predevelopment condition shall be the existing condition of the site, and for redevelopment, predevelopment shall be defined according to the procedures found in the Manual.

(q) Redevelopment: Any development on a site that requires demolition or removal of existing structures or impervious surfaces and replacement with new impervious surfaces. This includes replacement of impervious surfaces that have been removed on or after January 1, 1970, with new impervious surfaces. Maintenance activities such as top-layer grinding and re-paving are not considered redevelopment. Interior remodeling projects are also not considered redevelopment.

(r) Stormwater Management Practice (SMP): Any man-made structure that is designed or constructed to convey, store, or otherwise control stormwater runoff quality, rate, or quantity. Typical SMPs include, but are not limited to, detention and retention basins, swales, storm sewers, pipes, and infiltration structures.

(s) Stormwater Pretreatment: Techniques employed to remove pollutants before they enter the SMP, limited to techniques defined and listed as pretreatment in the Manual.

600.2 Regulated Activities

(a) Regulated activities under these Regulations include any development, including new development and redevelopment, that results in an area of earth disturbance greater than or equal to 15,000 square feet. The area of Earth Disturbance during the construction phase determines requirements for both the erosion and sediment controls and the post-construction stormwater management.

(b) The applicability of these Regulations is summarized in the Table of Applicable Stormwater Regulations in Philadelphia.

(c) These Regulations shall apply to the entire development site even if development on that site is to take place in phases.

(d) Existing SMPs may be used on sites where development occurs as long as they meet all of the requirements of these Regulations.

600.3 Exemptions

(a) General Exemptions

The following cases are exempt from the specified requirements of these Regulations.

(1) Development, including new development and redevelopment, that results in an area of Earth Disturbance less than fifteen thousand (15,000) square feet is exempt from all requirements of these Regulations;

(2) Redevelopment that results in an area of Earth Disturbance greater than or equal to fifteen thousand (15,000) square feet, but less than one (1) acre, is exempt from the requirements of Section 600.5(b), Channel Protection Requirement.

(3) Redevelopment that results in an area of Earth Disturbance greater than or equal to one (1) acre and reduces the predevelopment DCIA on the site by at least twenty percent (20%) is exempt from the Channel Protection and Flood Control Requirements of this Regulation.

(b) Exemption Responsibilities

An exemption shall not relieve the Developer from implementing such measures as are necessary to protect public health and safety.

(c) Emergency Exemption

Emergency maintenance work performed for the protection of public health and safety is exempt from the requirements of these Regulations. A written description of the scope and extent of any emergency work performed shall be submitted to the Water Department within two (2) calendar days of the commencement of the activity. If the Water Department finds that the work is not an emergency then the work shall cease immediately and the requirements of these Regulations shall be addressed as applicable.

(d) Special Circumstances

If conditions exist that prevent the reasonable implementation of water quality and /or quantity control practices on site, upon written request by the owner, the Philadelphia Water Department may at its sole discretion accept off-site stormwater management practices, retrofitting, stream restorations, or other practices that provide water quality and /or quantity control equal or greater than onsite practices for the volume which the owner has demonstrated to be infeasible to manage and treat on site.

Table of Applicable Stormwater Regulations in Philadelphia

		Earth Disturbance Associated with Development		
		0-15,000 sq. ft.	15,000 sq. ft.-1 acre	> 1 acre
Section 600.5(a) Water Quality Requirement	New Development	N/A**	Yes	Yes
	Redevelopment	N/A**	Yes	Yes
Section 600.5(b) Channel Protection Requirement	New Development	N/A**	Yes	Yes
	Redevelopment	N/A**	Exempt	Yes (Alternate Criteria)
Section 600.5(c) Flood Control Requirement	New Development	N/A**	Yes	Yes
	Redevelopment	N/A**	Yes (Alternate Criteria)	Yes (Alternate Criteria)
Section 600.6 Nonstructural Project Design Requirement	New Development	N/A**	Yes	Yes
	Redevelopment	N/A**	Yes	Yes
Section 600.8 Post-Construction Stormwater Management Plan Requirement	New Development	N/A**	Yes	Yes
	Redevelopment	N/A**	Yes	Yes

Yes (Alternate Criteria) – requirements of section may be waived depending on post-development site conditions (See Sections 600.3(a)(3), 600.5(b) and 600.5(c) for further details).

N/A - Not Applicable, development project is not subject to requirements of indicated Regulations section. Voluntary controls are encouraged.

Exempt – Development project is not subject to requirements of indicated Regulations section.

**– If the proposed development results in stormwater discharge that exceeds stormwater system capacity, causes a combined sewer overflow, or degrades receiving waters, the design specifications presented in these Regulations may be applied to proposed development activities as warranted to protect public health, safety, or property.

600.4 Erosion and Sediment Control during Earth Disturbance

(a) All Earth Disturbance must comply with the Erosion and Sediment Control requirements of the Pennsylvania Department of Environmental Protection (PADEP) as specified in 25 Pa. Code § 102.4(b).

(b) No Earth Disturbance greater than or equal to fifteen thousand (15,000) square feet and less than 1 acre shall commence until the Water Department approves an Erosion and Sediment Control Plan conforming to the regulations of the PADEP.

600.5 Post-Construction Stormwater Management Criteria

(a) Water Quality Requirement: The Water Quality Requirement is designed to recharge the groundwater table and to provide water quality treatment for stormwater runoff.

(1) The following formula shall be used to determine the water quality volume, (WQv), in cubic feet of storage for the development site.

$$WQ_v = \left(\frac{P}{12}\right) * (I) \qquad \text{Eqn: 600.1}$$

Where:
WQv = Water Quality Volume (cubic feet)
P = 1.0 inch
I = DCIA within the limits of earth disturbance (square feet)

(2) Groundwater Recharge Requirement: In order to preserve or restore a more natural water balance on new development and redevelopment sites, the water quality volume shall be infiltrated on site. A list of acceptable practices for infiltration is provided in the Manual.

(A) The infiltration volume shall be equal to one (1.0) inch of rainfall over all DCIA within the limits of Earth Disturbance.

(B) The Design Professional is required to follow the Hotspot Investigation, Subsurface Stability, and Suitability of Infiltration procedures in the Manual to determine whether the proposed infiltration on the Development Site is appropriate.

(C) If soil investigation reports demonstrate that the soil is unsuitable for infiltration, the Design Professional shall be responsible for providing written documentation to the Water Department showing that the required volume cannot physically be infiltrated within the required time period.

(3) Water Quality Treatment Requirement.

(A) Where it has been demonstrated, in accordance with section 600.5(a)(2) of these Regulations, that a portion or all of the water quality volume cannot be infiltrated on site, the water quality volume which cannot be infiltrated on site must be treated for water quality.

(B) Water quality treatment is attained differently in separate sewer areas than in combined sewer areas. Separate sewer areas achieve water quality treatment through approved stormwater management practices. Combined sewer areas achieve water quality treatment by detaining and releasing stormwater at a specified maximum rate as stated in the Manual.

(b) Channel Protection Requirement: The Channel Protection Requirement is designed to minimize accelerated channel erosion resulting from stormwater runoff from Development Sites.

(1) To meet the Channel Protection Requirement, SMPs shall retain or detain the runoff from all DCIA within the limits of Earth Disturbance from a one-year, 24-hour Natural Resources Conservation Service (NRCS) Type II design storm in the proposed site condition such that the runoff takes a minimum of 24 hours and a maximum of 72 hours to drain from the facility.

(2) Redevelopment sites with less than one (1) acre of Earth Disturbance or redevelopment sites that demonstrate a twenty percent (20%) reduction in DCIA from predevelopment conditions as described in the Manual are exempt from this requirement.

(3) The infiltration and water quality volumes may be incorporated into the channel protection portion of the design provided the design meets all requirements concurrently.

(4) Design criteria and a list of SMPs for channel protection are included in the Manual.

(c) Flood Control Requirement

(1) To prevent flooding caused by extreme events, the City of Philadelphia is divided into Management Districts that require different levels of stormwater attenuation depending on their location. Design Professionals shall determine the appropriate Management District for the development site using the maps provided in the Manual.

(A) The Table of Peak Runoff Rates for Management Districts lists the attenuation requirements for each Management District.

(B) Sites located in more than one Management District shall conform to the requirements of the district where the discharge point is located.

(2) Redevelopment sites that can demonstrate a twenty percent (20%) reduction in DCIA from predevelopment conditions as described in the Manual are exempt from this requirement.

(3) Predevelopment Conditions for Redevelopment are specified in the Manual.

Table of Peak Runoff Rates for Management Districts

District	**Column A** NRCS Type II 24-hour Design Storm applied to Proposed Condition	**Column B** NRCS Type II 24 –hour Design Sto applied to Predevelopment Conditio
A	2 – year	1 - year
A	5 – year	5 - year
A	10 – year	10 - year
A	25 – year	25 - year
A	100-year	100-year
B-1	2 – year	1- year
B-1	10 – year	5 - year
B-1	25 – year	10 - year
B-1	50- year	25- year
B-1	100-year	100-year
B-2	2 – year	1- year
B-2	5 – year	2 - year
B-2	25 – year	5 - year
B-2	50- year	10- year
B-2	100 – year	100 - year
C*	Conditional Direct Discharge District	

SMPs shall be designed such that peak rates from Column B are less than or equal to Peak Ra from Column A.

* In District C, development sites that can discharge directly to the Delaware River main channel or Tidal Schuylkill River major tributary without use of City infrastructure may do s without control of proposed conditions peak rate of runoff. When adequate capacity in the downstream system does not exist and will not be provided through improvements, the propo conditions peak rate of runoff must be controlled to the Predevelopment Conditions peak rate required in District A provisions for the specified Design Storms.

The Predevelopment Condition for new development is the existing condition. For redevelopment purposes, the Predevelopment Condition is determined according to the procedures found in the Manual.

600.6 Nonstructural Project Design and Sequencing to Minimize Stormwater Impacts

(a) A Developer is required to find practicable alternatives to the surface discharge of stormwater, the creation of impervious surfaces, and the degradation of Waters of the Commonwealth.

(b) All development shall include the following steps in sequence to comply with water quality requirements of §14.1603.1 of the Philadelphia Code. The goal of the sequence is to minimize the increases in stormwater runoff and impacts to water quality resulting from the proposed regulated activity.

(1) Prepare an Existing Resource and Site Analysis (ERSA) map and worksheet, showing environmentally sensitive areas including, but not limited to: steep slopes, ponds, lakes, streams, suspected wetlands, hydric soils, vernal pools, land development, any existing recharge areas, and any other requirements of the worksheet available in the Manual;

(2) establish a Buffer by preserving or restoring native plants, trees, and shrubs to the area of land immediately adjacent to any surface water body.

(A) The Buffer shall be a minimum of ten (10) feet on both sides of the stream, measured perpendicular to and horizontally from the top-of-bank.

(B) In the Wissahickon Watershed, there shall be no new impervious ground cover constructed or erected within 200 feet of the bank of a surface water body or within 50 feet of the centerline of a swale.

(3) prepare a draft project layout avoiding the sensitive areas identified in ERSA;

(4) evaluate nonstructural stormwater management alternatives as described in the Manual;

(5) minimize Earth Disturbance during the construction phase;

(6) use site design techniques described in the Manual to minimize the impervious surfaces within the limits of Earth Disturbance;

(7) use techniques in the Manual to minimize DCIA within the limits of Earth Disturbance;

(8) design appropriate detention and retention structures according to the Manual;

(A) meet Water Quality Requirement and provide for Stormwater Pretreatment prior to infiltration or water quality treatment in accordance with the Manual

(B) meet Channel Protection Requirement in accordance with Section 600.5(b) of these Regulations;

(C) meet Flood Control Requirement for the appropriate Management District in accordance with Section 600.5(c) of these Regulations; and

(9) adjust the site design as needed to meet all requirements of the Regulations concurrently.

600.7 Requirements for the Design of SMPs

(a) General Requirements

(1) In order to provide for the protection of public health and safety and to more effectively manage stormwater in Philadelphia, all SMPs shall meet the requirements of these Regulations.

(2) The existing points of concentrated drainage that discharge onto adjacent land shall not be altered in any manner that could cause property damage without written permission of the owner of the adjacent land.

(3) The design of all SMPs shall incorporate sound engineering principles and practices as detailed in the Manual. The Water Department reserves the right to disapprove any design that would result in the creation or continuation of a stormwater problem area.

(4) All stormwater runoff in excess of any volume infiltrated on site must be routed through a dedicated stormwater pipe and conveyed up to the approved connection or point of discharge.

(5) When the Development Site is located within a combined sewer area and adjacent to a receiving water body, stormwater shall be discharged directly to receiving waters after requirements of these Regulations and any applicable state or federal requirements are met.

(6) Areas of existing diffused drainage discharge shall be subject to any applicable discharge criteria in the general direction of existing discharge, whether proposed to be concentrated or maintained as diffused drainage areas, except as otherwise provided by these Regulations. If diffused drainage discharge is proposed to be concentrated and discharged onto adjacent land, the Developer must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge, or otherwise prove that no erosion, sedimentation, flooding or other impacts will result from the concentrated discharge.

(7) All SMPs shall incorporate maximum ponding and/or draw down requirements consistent with the Manual.

(8) Calculation Methodology: Acceptable calculation methods for the design of SMPs are provided in the Manual.

600.8. PCSMP Requirements

(a) General Requirements

For any activities regulated by these Regulations and the Philadelphia Code Section §14.1603.1:

(1) No zoning permit may be applied for until the Water Department has approved a conceptual site plan.

(2) No Earth Disturbance may commence or Zoning Permit be issued until the Water Department has approved a PCSMP.

(b) Preliminary Approval

In order to obtain preliminary approval from the Water Department, the owner must complete the ERSA worksheet and map and Site Plan Review Meeting with the City as described in the Manual.

(c) PCSMP Approval

(1) The PCSMP shall include a general description of the project, project sequence, calculations, maps and plans as described in Section 600.6(b) of these Regulations. A list of required contents of the PCSMP is located in the Manual.

(2) For any activities that require one or more state or federal permits, proof of application for said permit(s) or approvals shall be part of the plan.

(3) All PCSMP materials shall be submitted to the Water Department in a format that is clear, concise, legible, neat, and well organized; otherwise, the PCSMP shall not be accepted for review and shall be returned to the Developer for revision.

600.9 Permit Requirements by Other Government Entities

(a) Other government entities may require permits for certain regulated Earth Disturbance activities.

(b) Requirements for these permits must be met prior to commencement of Earth Disturbance.

600.10 Inspections

(a) The Water Department or its designee may inspect any phase of the installation of the SMPs.

(b) During any stage of the work, if the Water Department or its designee determines that the SMPs are not being installed in accordance with the approved PCSMP, the Water Department shall issue a "Stop Work Order" until a revised PCSMP is submitted and approved and the deficiencies are corrected.

(c) As-built drawings for all SMPs must be submitted to the Water Department prior to final inspection.

(d) A final inspection of all SMPs shall be conducted by the Water Department or its designee to confirm compliance with the approved PCSMP prior to the issuance of any Certificate of Occupancy.

600.11 Responsibilities for Operations and Maintenance of SMPs

(a) No regulated Earth Disturbance activities shall commence until the Water Department has approved a PCSMP and SMP Operations and Maintenance Plan (O & M Plan), prepared in accordance with the requirements set forth in the Manual, which describes how the post-construction SMPs will be properly operated and maintained.

(b) The O & M Plan must include a signed agreement between the owner and the City to maintain the SMPs in accordance with the O & M Plan.

(c) There shall be no alteration or removal of any SMP required by an approved PCSMP and O & M Plan, and the owner must not allow the property to remain in a condition which does not conform to an approved PCSMP and O & M Plan.

(d) The Water Department reserves the right to accept or reject the operations and maintenance responsibility for any or all of the stormwater controls and SMPs.

600.12 Stormwater Management Easements

(a) Stormwater management easements or right-of-ways are required for all areas used for off-site SMPs or stormwater conveyance, unless a waiver is granted by the Water Department.

(b) Stormwater management easements shall be provided by the owner if necessary for access for inspections and maintenance, or for the preservation of stormwater runoff conveyance, infiltration, detention areas and/or other stormwater controls and SMPs, by persons other than the property owner.

(c) The stormwater management easement and its purpose shall be specified when recorded in accordance with section 600.13 of these Regulations.

600.13 Recording of O& M Plans

(a) The owner of any land upon which SMPs will be placed, constructed or implemented as described in the PCSMP and Operation and Maintenance Plan (O & M Plan), shall record the following documents with the Philadelphia Department of Records, within fifteen (15) calendar days of approval of the PCSMP by the Water Department:

(1) The O & M Plan, or a summary thereof, and

(2) Operations and Maintenance Agreements as included as part of the PCSMP submitted under Section 600.8 and Easements under Section 600.12 of these Regulations.

(b) The Water Department may suspend or revoke any approvals granted for the project site upon discovery of the failure of the owner to comply with these Regulations.

600.14. Prohibited Discharges

(a) No person shall allow, or cause to allow, stormwater discharges into the City's separate storm sewer system which are not composed entirely of stormwater.

(b) In the event that the Water Department determines that any discharge to a storm sewer is not composed entirely of stormwater, the Water Department will notify the responsible person to immediately cease the discharge.

(c) Nothing in this Section shall affect a discharger's responsibilities under state law.

600.15 Prohibited Connections

(a) The following connections are prohibited, except as provided in Section 600.14(a)(1) of these Regulations.

(1) Any drain or conveyance, whether on the surface or subsurface, which allows any non-stormwater discharge including sewage, groundwater, process wastewater, and wash water, to enter the separate storm sewer system.

(2) Any connections to the storm drain system from indoor drains and sinks.

(3) Any drain or conveyance connected from a commercial or industrial land use to the separate storm sewer system that has not been documented in plans, maps, or equivalent records, and approved by the City.

____

Bernard Brunwasser
Water Commissioner

Approved as to Form,
Romulo L. Diaz, Jr., City Solicitor

Per:______________________________

Keith J. Jones
Deputy City Solicitor

APPENDIX Q – MINGO CREEK SURGE BASIN 2009 DEWATERING PICTURES

Figure P-1

Figure P-2

Figure P-3

Figure P-4

Figure P-5

Figure P-6

Figure P-7

Figure P-8

APPENDIX R – SNOW AND ICE OPERATIONS PLAN

1. - Snow & Ice Removal Operations Plan

1.1 - Plan Summary

Philadelphia, like many other northeastern cities in the United States, often faces winter storms that bring potentially dangerous accumulations of ice, sleet, freezing rain, and snow.

In order to provide roadway conditions that are safe for traffic on primary, secondary, and tertiary (residential) streets throughout the entire City of Philadelphia, the Streets Department has prepared a Snow and Ice Removal Operations Plan outlining the City's response to adverse winter weather conditions.

The goal of the Plan is to help ensure a continuity of City services by reducing, if not eliminating, the occasions when the City government will have to be closed or City services halted due to severe winter weather, particularly with regards to curbside trash collection. The chief objective for the City in all severe winter weather is to allow all Philadelphians to return to their normal daily activities as quickly as is feasible.

The purpose of this document is to delineate procedures and responsibilities for dealing with winter weather in Philadelphia. This is a plan for alerting, assembling, and deploying personnel and material resources for storms ranging from minor accumulations to blizzards.

The Plan prioritizes route systems, indicates the appropriate distribution of resources, and identifies the duties and responsibilities of all personnel engaged in the response. Also, the Plan delineates necessary linkages with other City departments and agencies including but not limited to, the Office of Fleet Management and the Office of Emergency Management.

In addition, the Plan outlines areas requiring planning before, during, and after a winter weather storm, understanding that the severity of the storm and the conditions that might result from it require some degree of flexibility in adhering to the Plan's timetable.

The following pages provide a summary of the resources required for an expanded neighborhood response to the eight winter storm types that have on average affected the City of Philadelphia, based on historical data compiled by the Streets Department's Highway Division. A matrix (see: Chart A, page 2) indicating the storm type with a brief description and resources required to respond to the emergency is provided. An in depth description about resources required to respond to each storm type is provided in subsequent sections of the plan.

Chart A - RESOURCE DEPLOYMENT WINTER 2008 / 2009

POST STORM FORECAST: ABOVE FREEZING TEMPERATURES

	STORM TYPE	HIGHWAY DIVISION	SANITATION DIVISION	NEIGHBORHOOD OPERATIONS	BRINE APPLICATION *	CONTRACTORS	MELTERS	LIFT SETS
1	SLEET / FREEZING RAIN	X			X			
2	1 - 3 INCHES OF SNOW	X		Partial clearing focusing on higher terrain (15 routes)	X			
3	4 - 6 INCHES OF SNOW	X		Partial clearing focusing on higher terrain	X	X	X	
4	ABOVE 6 INCHES OF SNOW	X	X	Partial clearing focusing on higher terrain	X	X	X	X
5	ABOVE 12 INCHES OF SNOW	X	X	Full Deployment (121 routes)	X	X	X	X

POST STORM FORECAST: BORDERLINE & BELOW FREEZING TEMPERATURES

	STORM TYPE	HIGHWAY DIVISION	SANITATION DIVISION	NEIGHBORHOOD OPERATIONS	BRINE APPLICATION *	CONTRACTORS	MELTERS	LIFT SETS
6	SLEET / FREEZING RAIN	X		Partial clearing focusing on higher terrain (15 routes)	X	X		
7	1 - 3 INCHES OF SNOW	X		Partial clearing focusing on higher terrain	X	X		
8	4 - 6 INCHES OF SNOW	X	X	Partial clearing focusing on higher terrain	X	X	X	
9	ABOVE 6 INCHES OF SNOW	X	X	Partial clearing focusing on higher terrain	X	X	X	X

10	ABOVE 12 INCHES OF SNOW	X	X	Full Deployment (121 routes)	X	X	X	X

* For pre-storm forecasts of rain to snow, brine will not be pre-applied. It will wash away.

1.1.2 - Essential Staff Policy

A. Purpose

The Streets Department is the primary response agency for the City in weather events such as snow and ice storms. As such, it is essential the Department maintain an adequate workforce in such emergencies. The purpose of this policy is to define essential personnel as related to weather events.

B. Definitions

Weather Event – Includes all weather emergencies as declared by the Managing Director's Office, in consultation with the Mayor's Office, and any weather event that requires the mobilization of staff to maintain clear roadways.

Essential Staff – All Department employees and any employees assigned to Streets Department Operations during a weather event are deemed essential, and must report to work unless otherwise instructed by the appropriate supervisor.
(see: Streets Order No. 100 – Change #6, below)

C. Policy

When a weather emergency occurs, all personnel, as determined essential by the appropriate supervisor, will be required to report to their assigned functions. Since there are significant differences in the size and severity of weather events, those employees required to report may vary from event to event. When possible, employees will be notified by the appropriate supervisor/manager as to their status prior to an event. However, since such notification is not feasible in all situations, employees should report for duty unless otherwise instructed.

During weather events all employees should monitor local news broadcasts for information, and should contact their work location to obtain direction on their work status.

Employees who are not instructed to report for duty during a weather event shall be authorized to utilize accrued vacation, comp, or AL leave during weather events.

Employees not engaged in storm operations may be required to report to work, at the discretion of their supervisor, if the nature of their regular work assignments has become critical.

Employees may be assigned shift work as required by the event response plan.

D. Responsibilities

Streets Commissioner – Will serve as incident commander for snow and ice operations. Supervise the logistical response of the Streets Department to winter storm events. Consult with the Managing Director and Deputy Mayor for Transportation regarding the declaration of a Snow Alert, or the declaration of a Snow Emergency and the activation of the Emergency Operations Center (EOC).

The decision to open EOC will be made by the Deputy Mayor for Transportation, the Deputy Mayor for Public Safety, and the Managing Director.

The Streets Commissioner will contact the Philadelphia School District and the Philadelphia Archdiocese regarding winter storm events.

Chief Highway Engineer – Will develop and maintain a comprehensive snow plan that defines required staffing levels during weather events, and identifies specific job positions and functions. Direct all field operations during winter weather events.

Supervisor – Will maintain a list of employees, and notify those employees assigned to snow operations as required by this policy. Supervisors grant leave time only as prescribed in this policy statement, or in the event of extraordinary circumstances.

Human Resource Division – Will distribute the Essential Staff Policy to all employees prior to the winter season.

Residential Snow Coordinator – Will serve under direction of the Chief Highway Engineer. Coordinate, identify and develop the training of operators and inspectors for the residential snow effort. Assign vehicles to individual districts, and assign operators to vehicles.

1.1.3 - Expectation of Staff

All personnel, including all supporting departments, will be under the direction of the Streets Department personnel. In the interest of public safety, all personnel will report directly to Streets Department supervisors, and will not be released until directed by the Chief Highway Engineer. All are expected to be in place, on time, and ready to perform the duties for which they have been trained. Exceptions will be at the Streets Commissioner's and Managing Director's discretion.

Streets Order No. 100 – Change #6:

Department of Streets
Office of the Commissioner
City of Philadelphia

October 2, 2006

Streets Order No. 100 – Change #6

Subject: Essential Staff Policy

General

The City of Philadelphia Streets Department's mission is to maintain clean and safe streets. The Department delivers a number of City services that are critical to maintaining public health and safety in our communities. These essential services include, but are not limited to, maintaining all traffic control devices and street lighting, the safe operation and maintenance of our roads and bridges, timely and consistent removal of trash and debris, and during winter weather events the plowing and salting of City streets. In the performance of such functions, it is essential that employees of the Department report to work on time when scheduled to provide services to the public. Since each division has varying needs, each division head is responsible for implementing staffing policies to effectively manage the number of employees required for duty on a mandatory basis, to insure that these essential services are delivered and that public health and safety are maintained in communities at all times.

To maintain the essential services identified above, employee leave may be cancelled as determined necessary by the division head. In addition, employees assigned to essential services are required to continue their assignments until properly relieved.

Winter Weather Events

During a winter weather event, all Streets Department employees are expected to report to work at their regularly scheduled time unless notified to report to a different location and/or at a different time. All employees with a valid Pennsylvania Commercial Driver's License (CDL) shall be considered essential during a winter weather event. Any employee holding a valid Pennsylvania Driver's License will be considered essential if notified of such by the Department. During an event, the times and location of reporting may vary significantly depending upon the nature of the event. The Department will notify, in a timely manner, essential employees whose starting time and location are modified. However, all employees should monitor weather conditions and are expected to report for duty during winter weather events or snow emergencies.

Since there are significant variations in the time, nature and intensity of events, the assignments of employees will vary. Some employees may be excused from reporting during an event. Those employees excluded from reporting shall be granted exemptions on a case by case basis provided their assigned function will not be required as dictated by the event, and if the Department Head, or designee, grants such exception.

Compliance

The Streets Department can not successfully deliver core services without the participation of its entire team. Due to the critical nature and importance of the work to be performed, an employee who does not work his or her assigned hours may be subject to disciplinary action up to and including discharge.

1.2 – Goals

The Streets Department is the lead City agency for development and implementation of Philadelphia's snow and ice removal program. The goal of the program is to maintain safe egress for citizens throughout the duration of a storm, and to return the City to normal operations as soon as possible after the event has ceased. The Department works closely with other City agencies to clear and make safe more than 2,500 miles of streets and roadways. This allows businesses and City agencies to maintain their normal operations during most events. Significant resources in the form of vehicles, materials, and staff are dedicated to the operation. As in similar emergency response plans, priority is given to major thoroughfares, our primary route system; however, the plan also addresses the needs of all streets within the City limits.

An important part of our plan is the ability to maintain trash collections during most events. Municipal trash collection is one of the most critical and costly services that the City provides. To minimize the need to mobilize the Sanitation fleet, and the subsequent cessation of this service, the current plan augments the Streets Department's traditional fleet with a reserve snow fighting fleet of vehicles from various departments. The Streets Department and supporting agencies are committed to provide the most efficient and effective snow and ice removal operations as possible, and are continually evaluating new methods and processes.

1. 3 Scope

1.3.1 - The Roadway System

There is a network of approximately 2,575 miles of City and State roads within the boundaries of the City of Philadelphia. The responsibility for maintaining these roadways during winter storms is split among the Pennsylvania Department of Transportation (PennDOT), the Streets Department, and the Fairmount Park Commission. Of the 360 miles of state roads, PennDOT maintains 50 miles of limited access state highways, including I-95 and I-76. The remaining 310 miles are state roads that the State contracts with the City for snow and ice removal. This amounts to a total of 2,525 miles of City and State roads that the City maintains.

The Fairmount Park Commission removes snow and ice from 35 miles of Park roads, including Lincoln Drive, Kelly Drive and Martin Luther King Drive (formerly West River Drive). Snow and ice removal on the remaining 2,490 miles of City streets is the responsibility of the Streets Department. The Highway Division maintains general responsibility for the organization and deployment of City forces during winter storm operations. In storms of large accumulation, the Sanitation Division will be called in to supplement the snow removal effort with Sanitation vehicles that are outfitted with plows. Finally, private contractors supplement City forces in storms of significant magnitude.

In order to provide effective service during winter storms, the City's streets are divided into primary, secondary, and tertiary route systems. The primary route system encompasses 665 miles, including 110 miles of Snow Emergency Routes. The secondary route system includes another 700 miles of streets (both systems exclude the roadway maintained by the Fairmount Park Commission). The balance of City streets falls into the tertiary street system, covering approximately 1,125 miles of streets, 25 miles of which are private streets where the residents contract for private snow removal.

1.3.2 - Routes

When a Snow Emergency is declared, Philadelphia's Snow Emergency Routes become the first priority for snow removal efforts. In other cases, the initial snow removal focus is on the primary route system. Primary routes include major access roads through the central business district, and in and out of neighborhoods. The majority of primary routes encompass major and minor arterials, which serve the highest traffic volumes and distribute traffic throughout the City.

The secondary route system, which includes other streets that primarily convey traffic within neighborhoods, is the second focus of snow removal efforts. Most SEPTA routes fall within the boundaries of the primary and secondary route system. The tertiary system includes most local residential streets. These streets are cleared based upon storm type as defined later in this document. Reserve and active snow fighting equipment will be deployed when conditions warrant.

The primary and secondary route systems are salted as soon as significant moisture has accumulated on roadways, thereby minimizing travel conditions that are potentially dangerous. Plowing begins when there is such a sufficient buildup of snow that salting is no longer effective. Plowing and salting will occur on local and residential streets as defined later in this document.

Residential streets that are inaccessible for snow and ice removal efforts due to illegally parked vehicles will not be treated until those vehicles are removed by the owner, or ticketed and subsequently towed.

1.3.3 - Snow Emergency Declaration

A snow emergency declaration allows curb to curb plowing on designated snow emergency routes (see: Section 2 for Snow Emergency Route Listings). No parking is allowed on snow emergency routes during a snow emergency. The Philadelphia Parking Authority and Police Department are responsible for ticketing and towing vehicles parked on snow emergency routes.

1.4 - Winter Weather Action Outline

Snow and ice removal operations are divided into three elements:

1.4.1 - Planning

The Streets Commissioner will work with the Chief Highway Engineer and the Deputy Commissioner for Sanitation to develop coordinated, effective response mechanisms for winter weather emergencies. Planning will continue throughout the year. Planning will encompass continuing communications with the Office of Fleet Management to ensure that vehicles are properly maintained and outfitted for salting and snow removal. Further, the Commissioner, Chief Highway Engineer, and Deputy Commissioner for Sanitation will undertake periodic reviews of the Snow and Ice Operations Plan and the route structures.

During this phase, responsibilities are outlined, key positions are identified, and crews are trained. In addition, materials are requisitioned, received, and stockpiled; equipment is repaired and readied, and snow routes and route maps are reviewed and revised as needed. Planning occurs both during the months preceding the winter storm season, and before each winter weather event requiring a coordinated response effort.

1.4.2 - Operations

The operations phase begins when the forecast is for temperatures consistent with snow, ice, sleet or freezing rain, with at least a 50 percent chance of precipitation. Highway Districts and the Residential Snow Coordinator are notified of the possibility of precipitation.

The Highway Division spearheads all snow removal efforts undertaken by the Streets Department. The Division operates under the supervision of the Chief Highway Engineer, and is divided into six regional Highway Districts, supervised by District Highway Engineers. District Highway Engineers and the Residential Snow Coordinator, in consultation with the Snow Headquarters, located at the Bridge Maintenance Office at Whitaker Avenue and Luzerne Street, direct winter weather operations.

The 6 Highway District yards are at the following locations:

Highway District 1 --	48th Street and Parkside Avenue
Highway District 2 --	63rd Street and Essington Avenue
Highway District 3 --	22nd Street and York Street
Highway District 4 --	Stenton Avenue and Sylvania Street
Highway District 5 --	Whitaker Avenue and Luzerne Street
Highway District 6 --	State Road and Ashburner Street

The 6 Residential District Headquarters are at the following locations:

District 1 --	3033 63rd St. (63rd St. & Eastwick Ave.) - trailer
District 2 --	3033 63rd St. (63rd St. & Eastwick Ave.) - trailer
District 3 --	4501 G St. (G & Ramona Ave.)
District 4 --	Domino Lane & Umbria Street - trailer
District 5 --	4040 Whitaker Ave. (Whitaker & Luzerne)
District 6 --	8401 State Road (State & Ashburner)

Once the storm arrives and precipitation is falling creating icy or snow-covered streets, salting operations begin. Salt trucks are deployed to cover the route structure. Salting will continue until it is no longer necessary or has become ineffective.

As snow continues to fall and build up on the streets, plows are deployed to the routes. Plowing will continue until the streets are passable and safe for use by vehicular traffic. At this time, individual complaints are addressed.

1.4.3 - Cleanup and Assessment

Following each storm, the snow removal equipment is cleaned; spreaders and plows are removed and stored; personnel are released from snow duty; and final reports are submitted. At this time, after action reviews are undertaken.

1.4.4 - Primary / Secondary Network

Primary and secondary routes, as defined in this manual, will receive first priority during most events. It is critical to the continuation of traffic flow and the city's commerce that these routes are maintained. Selected residential areas may be treated during every event, based on topography; however, the majority will be cleaned once the primary/secondary network is capable of sustaining normal traffic volumes.

1.5 - Tasks for Participating Organizations

1.5.1 - Assignments and Reporting Structure

All personnel involved in fighting winter weather events will be under the direction of Streets Department personnel. They will be relieved from their respective daily assignments and will not be released, except for emergency, to their respective operating departments without approval of Streets Department supervision.

1.5.2 - Streets Department

The Streets Commissioner is the incident commander for all winter weather operations The Highway Division coordinates the citywide program for snow removal from the City street system. Highways is directly responsible for salting and plowing the primary, secondary, and tertiary route structures. In addition, the Chief Highway Engineer is responsible for the supervision and organization of all snow removal efforts. With the approval of the Streets Commissioner, the Chief Highway Engineer is responsible for mobilizing necessary plowing and lifting operations. These operations may require the cessation of normal Sanitation Division operations under certain conditions, and the conversion of Sanitation vehicles for plow operations. However, the Department's goal is to minimize the impact on Sanitation operations and avoid the delay or interruption of curbside collection services. In addition, private contractors may be called in to supplement the efforts as conditions dictate. Sanitation personnel, Highway personnel and contractors are responsible for plowing under the direction of the Highway Division.

1.5.3 - Fairmount Park Commission

The Fairmount Park Commission maintains a portion of the roadways in and around the Park system, the Benjamin Franklin Parkway and some residential grids.

1.5.4 - Office of Fleet Management

The Office of Fleet Management is responsible for the maintenance and repair of all vehicles in the City's fleet. They are on duty during snow and ice control operations. The Office of Fleet Management is responsible for opening fuel sites (see: Fuel Site Locations Table) during winter weather events, providing and installing chains, and where necessary, assisting with the installation of plows, with the exception of the Sanitation Division, which installs chains and plows on compactors.

Fuel Site Locations

LOCATION	SITE #	DEPARTMENT	FUEL TYPE	NORMAL DAYS AND HOURS OF OPERATION**
24TH & WOLF	2	POLICE 1 dist.	NO LEAD	7DAYS-24 HOURS
11TH & WHARTON	3	POLICE 3&4dist.	NO LEAD	7DAYS-24 HOURS
R 8200 ENTERPRISE	5	WATER	DIESEL AND NO LEAD	RESTRICTED (GATE) MON-FRI 7:30AM - 3PM
INTERNATIONAL AIRPORT	6	COMMERCE	DIESEL AND NO LEAD	MON-FRI 8:00 AM -3:30P M
51ST & GRAYS	7	STREETS	DIESEL	MON-FRI 7:00 AM - 3:30 PM
55TH & PINE	8	POLICE 18 dist.	NO LEAD	7DAYS-24 HOURS
61ST & THOMPSON	9	POLICE 19 dist.	NO LEAD	7DAYS-24 HOURS
25TH & TASKER	11	SCHOOL	DIESEL AND NO LEAD	MON-FRI 7:00 AM - 3:30 PM
GIRARD & MONTGOMERY	13	POLICE 26 dist.	NO LEAD	7DAYS-24 HOURS
21ST & PENNSYLVANIA	14	POLICE 9 dist.	NO LEAD	7DAYS-24 HOURS
26TH & GLENWOOD	15	STREETS	DIESEL AND NO LEAD	MON-FRI 7:00 AM - 10:00 PM
7800 PENROSE	17	WATER	DIESEL AND NO LEAD	MON-FRI 6:00 AM - 6:00 PM

R

3900 RICHMOND	18	WATER	DIESEL AND NO LEAD	RESTRICTED (GATE) MON-FRI 7:00AM - 3PM
DELAWARE & WHEATSHEAF	19	STREETS	DIESEL AND NO LEAD	MON-FRI 6:00 AM - 5:00 PM
100 E. HUNTING PARK	21	FLEET	DIESEL AND NO LEAD	7DAYS-24 HOURS
29TH & CAMBRIA	23	WATER	DIESEL AND NO LEAD	MON-FRI 8:00 AM - 4:30 PM
22ND & HUNTING PARK	24	POLICE 39 dist.	NO LEAD	7DAYS-24 HOURS
HARBINSON & LEVICK	25	POLICE 15 dist.	NO LEAD	7DAYS-24 HOURS
BROAD & CHAMPLOST	26	POLICE 35 dist.	NO LEAD	7DAYS-24 HOURS
GERMANTOWN & HAINES	28	POLICE 14 dist.	NO LEAD	7DAYS-24 HOURS
RIDGE & CINNAMINSON	29	POLICE 5 dist.	NO LEAD	7DAYS-24 HOURS
DOMINO & UMBRIA	31	STREETS	DIESEL AND NO LEAD	MON-FRI 7:00 AM - 11:00 PM
STATE & ASHBURNER	32	FLEET	DIESEL AND NO LEAD	M0N-FRI 7:00 AM - 11:00 PM
ACADEMY & REDLION	33	POLICE 8 dist.	NO LEAD	7DAYS-24 HOURS
BUSTLETON & BOWLER	34	POLICE 7 dist.	NO LEAD	7DAYS-24 HOURS
17TH & MONTGOMERY	35	POLICE 22&23dist.	NO LEAD	7DAYS-24 HOURS
GERMANTOWN & CARPENTER	38	FIRE	DIESEL AND NO LEAD	7DAYS-24 HOURS
3RD & SPRING GARDEN	39	FIRE	NO LEAD	7 DAYS-24 HOURS
FOX & ABBOTTSFORD	40	WATER	DIESEL AND NO LEAD	MON-FRI. 7:00-AM - 5:00 PM
4040 WHITAKER	41	STREETS	DIESEL AND NO LEAD	MON-FRI 6:00AM - 11:30 PM
28TH & THOMPSON	43	FIRE eng. 34	DIESEL	7 DAYS-24 HOURS
COTTMAN & LORETTA	44	FIRE eng. 71	DIESEL	7 DAYS-24 HOURS
8205 ROOSEVELT BLVD	45	FIRE eng. 18	DIESEL	7 DAYS-24 HOURS
711 S BROAD	46	FIRE eng. 01	DIESEL	7 DAYS-24 HOURS
4TH & SNYDER	47	FIRE eng. 53	DIESEL	7 DAYS-24 HOURS
CHAMONIUX & FORD ROAD	48	FAIRMOUNT PARK	DIESEL AND NO LEAD	MON-FRI 7:00 AM - 3:30 PM
63RD & LANCASTER	49	FIRE eng. 54	DIESEL	7 DAYS-24 HOURS
48TH & PARKSIDE	50	STREETS	DIESEL	MON-FRI 7:00 AM - 6:00 PM
10TH & CHERRY	51	FIRE eng. 20	DIESEL	7 DAYS-24 HOURS
4TH & GIRARD	52	FIRE eng. 29	DIESEL	7 DAYS-24 HOURS
82ND & TINICUM	53	FIRE eng. 69	DIESEL	7 DAYS-24 HOURS
52ND & WILLOWS	54	FIRE eng. 68	DIESEL	7 DAYS-24 HOURS
FOULKROD & DARRAH	56	FIRE eng. 14	DIESEL	7 DAYS-24 HOURS
BUSTLETON & BOWLER	57	FIRE eng. 62	DIESEL	7 DAYS-24 HOURS
812 HENDRIX	58	FIRE eng. 58	DIESEL	7 DAYS-24 HOURS

	CHELTEN & BAYTON	59	FIRE eng. 19	DIESEL	7 DAYS-24 HOURS
	3031 GRAYS FERRY	60	FIRE eng. 47	DIESEL	7 DAYS-24 HOURS
	BELGRADE & ONTARIO	61	FIRE eng. 28	DIESEL	7 DAYS-24 HOURS
	13TH & SHUNK	62	FIRE eng. 49	DIESEL	7 DAYS-24 HOURS
	24TH & RITNER	65	FIRE eng. 60	DIESEL	7 DAYS-24 HOURS
R	NORTHEAST AIRPORT	67	COMMERCE	DIESEL	RESTRICTED MON-FRI. 7:30 AM - 3:30 PM
	ACADEMY & COMLY	68	FIRE eng. 22	DIESEL	7 DAYS-24 HOURS
	RIDGE & CINNAMINSON	69	FIRE eng. 39	DIESEL	7 DAYS-24 HOURS
R	7790 DUNGAN RD	70	POLICE	NO LEAD	RESTRICTED
	PARK & CAMBRIA	71	FIRE eng. 50	DIESEL	7 DAYS-24 HOURS
	5931 OLD YORK ROAD	72	FIRE eng. 51	DIESEL	7 DAYS-24 HOURS
	43RD & MARKET	73	FIRE eng. 05	DIESEL	7 DAYS-24 HOURS
	BELGRADE & HUNTINGDON	74	FIRE eng. 06	DIESEL	7 DAYS-24 HOURS
	5332 RISING SUN AVE	75	FIRE eng. 61	DIESEL	7 DAYS-24 HOURS
R	BYBERRY & WOODHAVEN	95	SCHOOL	DIESEL	RESTRICTED
R	BROAD & LEHIGH	96	SCHOOL	DIESEL	RESTRICTED
R	OGONTZ & OLNEY	97	SCHOOL	DIESEL	RESTRICTED
R	63RD & PASSYUNK	98	SCHOOL	DIESEL	RESTRICTED

TOTAL NUMBER OF SITES IS SIXTY THREE (63)

"R" = RESTRICTED TO VEHICLES ASSIGNED TO THE DEPARTMENT ONLY !!!!

** NORMAL HOURS OF OPERATION ARE SUBJECT TO CHANGE IN AN EMERGENCY

site list #11 revised 10/28/08

1.5.5 - Managing Director’s Office

The Managing Director, in consultation with the Mayor, has the authority to declare a snow emergency and close the City. This plan should limit, if not eliminate, the need to enforce any closures during snow events.

When a snow emergency is declared the Managing Director's Office is responsible for coordinating the citywide response to the emergency. Streets Department personnel, along with personnel from other departments, participate in the staffing of the Emergency Operations Center, located at 3rd and Spring Garden Streets in the Fire Administration Building, and in other coordinated efforts as necessary.

1.5.6 - Police Department

Police Department support is required to support existing parking regulations. Police will ticket vehicles identified as impeding snow removal efforts including, but not limited to, vehicles parked on corner radii and double-parked vehicles. Police officers will stop all private entities placing snow in previously cleared streets. During declared snow emergencies, Police support will ensure snow emergency routes are clear.

1.5.7 - Other City Departments

The tertiary route structure is maintained by the following City Departments under the direction of the Residential Snow Coordinator.

Streets Department
Water Department
Public Property
Recreation
Fairmount Park
Managing Director's Office
Licenses & Inspections

1.6 – Snow Fighting Equipment Inventory

Streets Department 2008/2009 Fleet Summary

Listed below is the Streets Department's fleet inventory for snow operations. Due to the age of the fleet and the challenges facing the Office of Fleet Management, we have concerns about the reliability of the equipment. Winter operations place a great strain on aging vehicles, and equipment availability will have a significant impact on the Department's ability to effectively respond to weather events. With projected downtime, the City will be challenged to field a full complement of equipment to cover all routes.

The result of insufficient equipment will be slow response time, particularly on residential streets. To address this issue, in part, the Streets Department has lease agreements to provide supplemental equipment for both large and residential streets. The Department also continues to work closely with the Managing Director's Office to identify interdepartmental equipment that can supplement the inventory.

All departments are required to provide a full complement of necessary vehicles for snow operations for clearing the roadway system.

Highway Division Salt Trucks:		84
includes tandem, triaxle & crewcab dumps		
Sanitation Compactors:		248
with snow plow hitches		
Dedicated Residential:		55
Small	33	
Medium	7	
Large	15	
Departmental (includes Active Residential):		198
Small	151	
Medium	32	
Large	15	
Highway Division Loaders:		45
Snow Melters (Rentals)		2
Large, 100 tons / hour		
Total Snow Equipment Inventory:		**632**

1.7 - Route Designations and Treatment

The primary and secondary route systems are divided into 148 specific routes. Salting and/or plowing of these routes will continue until the routes are deemed passable and safe for vehicular traffic.

The tertiary street system is covered in a grid pattern determined by each District Highway Engineer and the Residential Snow Coordinator. These streets are salted/plowed as storm type dictates (see Chart A, page 2). Grids are assigned and the plows attempt to clear all streets in that grid. Streets that are blocked by parked cars or other obstructions will not be treated until the obstruction is removed. Double-parked vehicles or vehicles parked on corner radii will be ticketed and towed by Police to permit snow removal efforts.

All tertiary grids will not be treated during every storm. The City's topography will primarily dictate the specific areas that will be treated during every storm type. Storm severity will dictate the expansion of treatment in the tertiary network. Regional commerce, public health, mass transit issues, and time of year will guide these decisions.

Snow and ice on the tertiary street system will be cleared to provide one passable lane for each direction that the specific streets can accommodate. Residential efforts are designed to allow access to the primary and secondary route system and mass transit.

In the event of major storm accumulations, specific business corridors within the Highway Districts are targeted for snow removal and/or snow melting upon completion of primary, secondary and tertiary routes.

1.7.1 - Use of Salt and Other De-icing Materials

Salt (sodium chloride) or a brine solution of the same chemical, or in extreme situations, sand or other abrasives, will be spread on Philadelphia's roadway network to ensure safety for the traveling public.

1.7.2 - Level of Service

It is the goal of the City of Philadelphia that for the majority of the winter weather events that typically affect this city, that we will have, depending on storm type and response protocol, all routes identified in these response protocols clear within 24 hours of the fall of the last flake. Storms outside of the protocol upper limits may lead to significant adjustments in this time line.

1.8 - Storm Types and Response

There are eight (8) basic storm types that require different responses as outlined below.

POST STORM FORECAST: Above Freezing Temperatures

Storm Type — Deployment of Fleet

1. Sleet/Freezing Rain City salt truck deployment and primary and secondary routes only.

2. 1 to 3 inches of snow City salt truck deployment on primary and secondary routes. Partial residential deployment in limited areas of higher elevation.

3. 4 to 6 inches of snow City and contractor salt truck deployment on primary and secondary routes. Partial residential deployment in limited areas of higher elevation. A snow lifting and melting operation will be deployed in the central business district.

4. Above 6 inches of snow As above, plus the declaration of a "snow emergency." Sanitation compactors will plow the primary and secondary route system. Additional contractor equipment will be deployed to clear intersections and the lifting/melting operation will be expanded to outlying commercial corridors.

5. Above 12 inches of snow As above, plus a full residential neighborhood operation will be deployed across the City.

POST STORM FORECAST: Borderline and Below Freezing Temperatures

Storm Type — Deployment of Fleet

6. Sleet/Freezing Rain City salt trucks deployed on primary and secondary routes only. Partial residential deployment in limited areas of higher elevation.

7. 1 to 3 inches of snow City salt truck deployment on primary and secondary routes. Salting operation for tertiary streets may occur once the primary and secondary network is complete. This operation will be performed by primary and secondary route vehicles that can navigate smaller streets. Partial residential deployment in limited areas of higher elevation.

8. 4 to 6 inches of snow As above, plus a snow lifting and melting operation will be deployed in the central business district.

9. **Above 6 inches of Snow** As above, plus the declaration of a snow emergency. Sanitation compactors will plow the primary and secondary route system. Additional contractor vehicles will help clear snow and additional lifting/melting operations may be deployed in neighborhoods with smaller tertiary streets upon completion of outlying commercial corridors.

10. **Above 12 inches of Snow** As above, plus a full residential neighborhood operation will be deployed across the City. Additional contractor vehicles will be utilized.

1.8.1 - Weather Forecasting Services

The City of Philadelphia will, in addition to monitoring local national weather forecasts for our metropolitan region and maintaining contact with local media forecasts, contract with independent private weather service contractors to ensure that forecasts are made specific to our needs. The city recognizes that there are unique geographic differences within our boundaries, and expects detail in our contracted services to assist in deployment decisions.

1.8.2 - RWIS (Road Weather Information Systems)

The city will use its existing RWIS System to assist in decisions, and explore expanding the capability as technology improves.

1.9 - Storm Response Guidelines

1.9.1 - Storm Conditions

Philadelphia's geographic position contributes substantially to the forecasting uncertainties that it faces. Due to our location, with the mountains to our west and the

Atlantic Ocean to our east, forecasters usually must watch storm systems for as long as possible before determining if they are going to hit Philadelphia or be deflected to the east or west. In addition, there are literally thousands of types of winter storms - each storm combines a number of factors that lends to its uniqueness.

The Streets Department must be prepared to deal with these planning uncertainties, as well as uncertainties that occur during the storm. For example, the Blizzard of March 1993 was originally forecasted as a 3" storm. It mushroomed into a major storm of upwards of 12 inches, including sleet and freezing rain. The unexpected change in forecast made it more difficult for the Streets Department to mobilize the most effective response to react to a storm of such magnitude.

There are several other variables that affect the Department's timely response to storm events. These variables are briefly outlined below. Each of the variables listed may have a significant impact on the Department's response. Proper planning and the development of appropriate procedures, combined with some level of operational flexibility is a priority to develop the most appropriate, effective response possible, given the existing conditions.

Storms may fail to materialize at the forecasted hour. Conversely, storms may stall, thereby increasing the duration of the event and the amount of accumulation. These factors increase the expense associated with responding to a storm and the chance of work force fatigue.

During a storm, the type of precipitation may change. Different types of precipitation require different responses. For example, plowing may be hampered as ice accumulates on the top of the snow, creating a hard crust.

The time of the year also impacts the Department’s response to storms. In the late fall and early spring months when the temperature is warmer, it may be possible to fight a storm of four to five inch accumulation with salt alone. In colder months, plowing would be necessary.

If two or more severe storms occur in rapid succession, the Department's response may be affected. Response to the initial event may be expanded in anticipation of the subsequent storm.

Low temperatures increase the amount of salt necessary to melt off precipitation.

Winds can create havoc during storms. Although light breezes help to dry roadways following storms, stronger winds may hamper snow fighting efforts by drifting snow across cleared roadways.

Significant elevation differences exist between the southern portion of the City and the areas in the northeast and northwest. In the northeast and northwest, snow frequently accumulates to greater depths.

The Department's Snow and Ice Operations Plan presents a flexible framework providing effective response to all types of storms.

1.9.2 - Storm Types 1 & 2

A. Deployment

1. Streets Department

Chief Highway Engineer
- Notifies District Highway Engineers of mobilization time
- Notifies Residential Snow Coordinator of mobilization time
- Notifies Highway Division Snow Headquarters, located at the Bridge Maintenance Yard – 4010 Whitaker Avenue, personnel to report at specified deployment time
- Notifies Office of Fleet Management of mobilization decision

Highway District Engineers
- Notify Maintenance Supervisors to assemble salting staff
- Notify spotters to report at specified deployment time

Highway District Maintenance Supervisors
- Notify personnel to report at specified deployment time

Residential Snow Coordinator
- Notifies personnel identified in Sections 4.6 & 4.8 of partial residential deployment

2. Office of Fleet Management
- Will open garages for Fleet maintenance support and fueling sites for duration of event

3. Fairmount Park Commission
- Responsible to activate operation for salting Park road system and Benjamin Franklin Parkway

B. Operations

1. Highway Districts

Spotters monitor street conditions. Salt trucks are loaded and positioned at the start of an assigned route. As street surfaces accumulate sufficient moisture for effective salting, spotters notify Maintenance Supervisors to begin salting activity. Spotters will provide route condition reports to their district headquarters on two (2) hour intervals. District headquarters will compile this data and forward to Highway Division Snow Headquarters.

2. Residential Districts

Spotters monitor street conditions. Trucks are positioned at the start of an assigned route. Treatment of the street surface begins upon notification from the Residential Snow Coordinator. Spotters will provide route condition reports to their district headquarters on two (2) hour intervals. District headquarters will compile this data and forward it to the Residential Snow Coordinator, who in turn summarizes the information and forwards it to Highway Division headquarters.

3. Highway Division Snow Headquarters

Snow Headquarters will:
- Inform Highway Districts of weather forecasts
- Monitor, through Highway Districts, the status of all salting operations
- Maintain a log of all service calls for snow and ice related activities
- Monitor weather conditions and forecasts. Analyze the data and forward it to the appropriate parties
- Analyze reports from the field and make changes to future operations where required
- Forward emergency calls from Police and Fire Departments to Highway Districts
- Maintain Snow Route Status Report
- Order commodities as required to maintain an adequate supply at all Districts

4. Office of Fleet Management

- Repair vehicles as necessary
- Report vehicle down time to Snow Headquarters

5. Fairmount Park Commission

- Treat Park road system and Benjamin Franklin Parkway as required by conditions

C. End of Operations

1. Highway Districts

- District Engineers release spotters to regularly assigned duties. District Engineers collect route inspection information.

2. Residential Districts

- Release spotters and drivers to their respective departments. Forward all reports to Residential Snow Coordinator who, in turn, forwards them to Highway Division Snow Headquarters. Supervise the cleaning and redeployment of residential snow equipment.

3. Highway Division Snow Headquarters

- Compile final report on personnel, equipment utilized and material usage and forward to Streets Commissioner.
- Estimate cost of event

4. Office of Fleet Management

- Compile final report on equipment costs and return to normal Fleet repair activities

5. Fairmount Park Commission

- Compile final report on personnel and equipment utilized
- Return to normal Park maintenance activities

1.9.3 - Storm Types 5 & 6

Same as response 1 & 2, except the following additions:

A. Deployment

1. Streets Department

Chief Highway Engineer

- Notifies District Highway Engineers and Residential Snow Coordinator of decision to salt/plow tertiary system (Note: Storm type 6 only, partial to full residential deployment depending on event specifics).
- Will advise everyone for potential of multiple shifts

Residential Snow Coordinator

- Notifies personnel identified in Appendix A - Sections 4.6 & 4.8 of partial to full residential deployment

1.9.4 - Storm Types 3, 4, 7 & 8

A. Deployment

1. Streets Department

Chief Highway Engineer
- Notifies District Highway Engineers of initial mobilization time for salting operations and subsequent mobilization time for plowing operation. Advises district that Sanitation, contractor equipment and residential roadway treatment will occur
- Notifies Highway Division Snow Headquarters, personnel to report at specified deployment time.
- Notifies Assistant Chief Highway Engineer (Construction) to order contractor support equipment at specified time
- Notifies Residential Snow Coordinator of mobilization time
- Notifies Deputy Commissioner for Sanitation for full deployment of Sanitation resources, both for plowing primary and secondary routes
- Notifies Office of Fleet Management of mobilization decisions
- If applicable, orders snow melters and support equipment (See Snow Melting Section)
- Advises all involved of anticipated number of shifts

Assistant Chief Highway Engineer (Construction)
- Contact private sector vendors and orders equipment for each highway district. Assistant Chief Highway Engineer advises of deployment time and likelihood of deployment duration
- Advises contractors of lifting set (if any) requirements

Highway District Engineers
- Notify Maintenance Supervisors to deploy their staff at specified time
- Notify spotters to report at specified time
- Notify inspection staff for contracted equipment to report at specified time
- Are advised that residential street system snow removal has been activated

Residential Snow Coordinator
- Notifies personnel identified in Sections 4.6 & 4.8 of residential deployment

Highway District Maintenance Supervisors
- Notify personnel to report at specified deployment time

2. Sanitation Division

Deputy Commissioner-Sanitation
- Mobilizes plows for primary/secondary route system at six Sanitation yards at specified time.

Sanitation Areas are at the following locations:

Sanitation Area 1	51st Street & Gray Avenue
Sanitation Area 2	63rd Street & Essington Avenue
Sanitation Area 3	63rd Street & Essington Avenue
Sanitation Area 4	Domino Lane & Umbria Street
Sanitation Area 5	Delaware Avenue & Wheatsheaf Lane
Sanitation Area 6	State Road & Ashburner Road

- Notify Chief of Operations to designate a Sanitation representative for Highway Division Snow Headquarters
- Notify division management of deployment times and subsequent suspension of curbside collections

3. Office of Fleet Management
- Will deploy sufficient resources to support fleet maintenance activities for duration of winter weather event
- Will open fuel sites for duration of event
- Will support Sanitation Division of Streets Department during plow and chain mounting for Sanitation compactors and support equipment

4. Fairmount Park Commission
- Responsible to activate operations for salting/plowing road system and Benjamin Franklin Parkway

5. Office of the Managing Director
- Will issue declaration of snow emergency
- Will activate the city's Emergency Management Center located at the Fire Administration Building 2nd and Spring Garden Streets.
- Emergency Operation Plan is included in Appendix B

B. Operations

1. Streets Department

1. Highway Division

- Spotters monitor street conditions
- District Highway Engineers assign inspection staff to contract salting vehicles
- Salt trucks are loaded & positioned at the start of an assigned route. As street conditions accumulate sufficient moisture for salt to be effective, spotters notify districts to begin salting operation. Salt will be applied prior to plowing operations or until no longer effective.
- Plowing operations will begin at 2" accumulation and continue until routes are clear
- Chief Highway Engineer directs Residential Snow Coordinator to begin tertiary street plowing/salting when needed.
- Highway District Engineers direct Sanitation plowing commencement
- All spotters & inspectors will provide route condition reports on two (2) hour intervals. Each district headquarters will compile this information & forward to Highway Division Snow Headquarters
- Highway District Engineers will insure that all routes are salted upon completion of plowing efforts
- Highway District Engineers will direct snow lifting/melting operations within their respective district.

2. Residential Snow Districts

- Spotters monitor street conditions. Trucks are positioned at the start of an assigned route. Treatment of the street surface begins upon notification from the Residential Snow Coordinator. Spotters will provide route condition reports to their district headquarters on two (2) hour intervals. District headquarters will compile this data and forward it to the Residential Snow Coordinator, who in turn summarizes the information and forwards it to Highway Division Snow Headquarters.

2. Sanitation Division

- Sanitation Assistant Chiefs of Operation and District Managers direct Sanitation Operations and report progress to Highway District Engineers.
- At the Highway District Engineers direction, they will adjust on-street operations for specified route assignments
- Progress reports are to be provided at two (2) hour intervals to Highway District Sanitation Coordinator
- Managers will insure that all vehicles are manned at shift change. Personnel will not be released without replacement

3. Highway Division Snow Headquarters

Snow Headquarters will:
- Inform Highway Districts of weather forecasts
- Monitor, through Highway Districts, the status of all salting operations
- Maintain a log of all service calls for snow and ice related activities
- Monitor weather conditions & forecasts. Analyze the data & forward it to the appropriate parties
- Analyze reports from the field & make changes to future operations where required
- Forward emergency calls from Police and Fire Departments to Highway Districts
- Maintain Snow Route Status Report
- Order commodities as required to maintain an adequate supply at all Districts
- Snow Headquarters will provide Emergency Operations Center (EOC) reports every two hours detailing manpower and equipment deployed, route conditions, weather updates and identified trouble spots

4. Office of Fleet Management (OFM)

- OFM will provide necessary manpower & garage space as need to support storm type
- OFM will supply vehicle status reports to Highway Division Snow Headquarters, the Managing Director's Office and Emergency Operations Center on an hourly basis

5. Fairmount Park Commission
- Treat Park road system and Benjamin Franklin Parkway as required by conditions

6. Office of the Managing Director
- See Appendix B

C. End of Operations

1. Streets Department

1. Highway Division

- Highway District Engineers will release all equipment to their respective departments for regularly assigned duties. Highway District Engineers will release all personnel to their regularly assigned duties.
- District Maintenance Supervisors will insure salt truck operators return unused material to stockpiles and wash truck beds, augers and spinners.
- Highway District Engineers will compile final contractor billing information

- All storm related information on personnel, equipment deployed, contract support & material used will be compiled by each district and forwarded to Snow Headquarters.

2. Residential Districts

- Release spotters and drivers to their respective departments. Forward all reports to Residential Snow Coordinator who in turn forwards them to Highway Division Snow Headquarters. Supervise the cleaning and redeployment of residential snow equipment.

2. Sanitation Division

- Sanitation Division will dismount plows, remove chains and ready fleet for return to normal collection/cleaning activities

3. Highway Division Snow Headquarters

- Compile final report on all elements deployed for specific storm type
- Forward report to Streets Commissioner and EOC
- Compile cost estimate for event
- Direct highway districts post storm clean up deployment

4. Office of Fleet Management (OFM)

- OFM to compile final report on equipment repair costs and vehicle status and return to normal fleet repair activities

5. Fairmount Park Commission

- Compile final report on personnel and equipment utilized
- Return to normal Park maintenance activities

6. Office of the Managing Director

- End snow emergency declaration and close EOC

1.10 - Snow Melting & Brine Application

1.10.1 - Snow Melting Program

This winter season will include a snow melting program. Snow melters will be rented and deployed in the central business district and select residential areas. Snow melting is intended to replace snow lifting and hauling. Traditionally with lifting and hauling snow is trucked to either the City's rivers for disposal or piled at predetermined sites and left to melt. The Department anticipates that by melting where the snow has fallen, we will provide faster service delivery and a tool for fighting major winter weather events at a reduced cost.

1.10.2 - Snow Melters

Snow melters may mobilize during certain storm types depending on accumulation.

1.10.3 - Central Business District

One (1) 100-ton/hour snow melter will be deployed in Center City. It is a portable unit. The unit will be supported by two loaders, which will feed it continually. Melted discharge will be directed to the existing storm water drainage system.

Snow melting will take place on the wider streets of Center City, such as Market Street and Benjamin Franklin Parkway.

Where required, additional equipment will be utilized to move snow to these locations.

1.10.4 - Selected Commercial Areas

One (1) 100-ton/hour snow melter will be deployed in several neighborhood commercial corridors as well as congested residential street systems, such as those found in South Philadelphia and parts of Northeast Philadelphia. The melter will be supported by two loaders. Snow will be pushed to the intersection of the wider streets in those areas and the unit will melt snow moving from intersection to intersection.

1.10.5 - Brine

This winter season will include the continuation of the salt brine program. Salt brine is a liquid containing a 23 per cent sodium chloride solution. Applied at rates of 30 gallons per lane mile, this treatment should effectively melt the first 2 inches of snow before re-application is necessary. The treatment can also be applied before storms begin. The Department will utilize this program in the Northwest and Northeast sections of the city, areas that typically have greater accumulations. It should provide greater service delivery at a reduced cost, especially in the higher elevation areas of the City.

1.10.6 - Seasonal Variable

Seasonal variables, such as time of year of event and proximity to holiday and/or special functions, may dictate that prescribed deployment scenarios, as outlined in this plan, be amended as needed.

1.11 - Snow Removal Support Personnel Assignments

The following functions will be performed by Streets Department personnel not directly involved with operating snow fighting equipment or providing a support function:

1.11.1 - Bridge Maintenance Unit

The Bridge Maintenance Unit will remove snow on the sidewalks of the City's bridges as well as removing snow from the 17 stairways in Manayunk. Highway maintenance district yard personnel and Sanitation area personnel will be called to assist with this effort as dictated by storm type.

1.11.2 - Highway maintenance district personnel and Sanitation area personnel

Highway maintenance district personnel and Sanitation area personnel, as dictated by storm type, will be provided hand snow removal equipment and will clear snow from curb ramps and open city inlets to allow melting snow access to the drainage system. Snow will also be cleared from areas surrounding fire hydrants.

1.11.3 - All City Departments

All City departments will be responsible for removing snow on the sidewalks abutting their facilities.

1.11.4 - Highway Division Support Personnel

Highway Division support personnel will continue snow removal support functions as part of their daily work activities after Sanitation workers return to regular trash collection. Snow removal equipment will supplement these efforts as it becomes available.

1.11.5 - PWD Support (Philadelphia Water Department)

During major events, PWD crews will be dispatched to clear snow at inlets to prevent intersection flooding.

1.11.6 - Police Department Support

The Philadelphia Police Department will enforce existing ordinance/regulations prohibiting the discharge of snow back onto city streets. Private plow contractors caught in the act of plowing snow from private property onto city streets risk fine and/or forfeiture of equipment.

1.11.7 - SWEEP Support (Streets & Walkways Education and Enforcement Program)

SWEEP Officers will, beginning in commercial corridors, enforce sidewalk clearance - Ordinance 10-719. Upon completion, enforcement will expand to schools, hospitals, etc., culminating in residential inspection.

1.12 - Public Relations and Education

1.12.1 - PPA and Major Media Notification

PPA will use the local major media and community newspapers to ensure that notification of the Department's plan is timely as well as effective.

Key communications tools include:

- Issuing of press releases/advisories

- Posting information on Streets Department's website including list of FAQs, snow tips and status of departmental services as appropriate. Suggested snow tips will include:
  - "Park car as far away from the corner as possible. Cars parked too close to the corner limit the turning radius of snow equipment."
  - "Obstructions, such as, illegally parked cars affect our ability to plow effectively."
  - For effective snow and ice management partnership, City and citizens need to work together.
- Posting information on community websites/list serves
- Posting information on the City's Government Access Cable Channel 64
- Utilizing MOIS to distribute announcements via Lotus Notes email

1.12.2 - SwiftReach System

The Department will again utilize a voice mail messaging system (SwiftReach Networks) to reach essential personnel during snow alerts. The system is designed to contact employees on each designated shift and to confirm receipt of the voice mail message. The system will not only reduce the time spent making individual telephone calls, it will also enable supervisors to alert essential personnel, in a timely manner, to report for work.

When appropriate, SwiftReach messages will also be distributed to inform residents on the status of services.

1.12.3 - Customer Affairs

As always, residents will continue to be encouraged to call the Streets Department's Customer Affairs Unit at 215-686-5560 for information. When appropriate, "updated" advisories regarding the status of services will be pre-recorded on the Customer Affairs' voice mail system.

1.12.4 - Responding to Citizens' Complaints

- Delegation – Service requests are, as always, delegated from the centralized system to operational units for appropriate action.
- Tabulation – Information can be gathered from the Customer Affairs Unit's computerized system to provide a post-storm picture of complaints.
- Planning – This information can be further utilized to plan appropriately and change plans for future snow events.

1.13 - Post Season Survey/Spring Maintenance

Beginning February 15 of each year and continuing through April 15th, bi-weekly, weather permitting, sweeps will be made of Philadelphia road network, identifying defects for the upcoming Spring repair season. Streets Department personnel, as well as those involved with residential inspection, will perform this task.

APPENDIX A

SNOW FIGHTING IN PHILADELPHIA

Appendix A - Snow Fighting in Philadelphia

A.1 - Material Resources

Salt inventory is dictated by several factors: storage capacity (including salt domes and secure, satellite locations throughout the city), availability of product, and environmental concerns. A salt dome is located at each of the six Highway District Yards

The Department orders salt as the inventory is depleted to maintain maximum capacity throughout the winter, as the budget allows. Initial salt orders are placed against purchase orders cut from a blanket purchase order under the Commonwealth of Pennsylvania's contract.

Subsequent product is obtained from the City of Philadelphia's citywide rock salt contract. This contract provides for a primary and secondary vendor, and has language that includes the product specification, testing procedures, delivery locations, quantities and requirements, weight certifications, and liquidated damages. This contract is normally utilized only after the Streets Department has fulfilled its obligation under State contract requirements.

A.1.1 - Requisitioning

The District Supervisor keeps an up-to-date inventory of the materials used for snow and ice removal during the winter months. S/he notifies the Administrative Officer (AO) as orders need to be placed. An overall salt inventory for all six Districts is maintained by the AO.

At the end of the winter season, the Chief Highway Engineer, the Director of Planning & Analysis, and the Budget Officer review the remaining salt inventory to determine the necessary amount of salt needed to meet the following year's requirements. Accordingly, the State is notified of our estimated quantities, as is the

Procurement Department for use in developing contracts for the following year. For the 2003, 2004, 2005 and 2006 seasons, the Streets Department had an average salt usage of 46,722 tons.

A.1.2 - Usage and Application

Other abrasives may be used in combination with salt to improve traction. Usage may require subsequent clean-up efforts including inlet cleaning.

A.1.3 - Application Guidelines

The application of salt alone depends on the type of precipitation, temperature, and snowfall intensity. When there is enough frozen precipitation on the pavement (non plowable depth), and the temperature is above 25 degrees Fahrenheit, straight salt is optimized. Below 25 degrees Fahrenheit, a mixture of salt and abrasives will be used. The initial treatment of the roadway before plowing operations begin is to reduce ice or snow bonding to the pavement.

A.1.4 - Salting Policy

The Highway Division follows this policy in order to get the most out of every application of de icing salt and maintaining the safest roads possible in the most economical way while protecting the environment. The policy includes:

Personnel Training: The Streets Department is committed to providing continuing personnel training to ensure that staff are well equipped to perform their jobs effectively.

Good Equipment: The Streets Department and Office of Fleet Management should update and replace equipment in an economically responsible manner.

Calibration of Spreaders: Regardless of whether automatic or manual controls are used, they should be calibrated before the snow season starts. Poorly maintained and uncalibrated controls are responsible for excessive salt use.

Use of Automatic Controls: The use of automatic controls is recommended for spreaders to make sure the correct amount of salt is being spread at all times.

Adequate Covered Storage: Storage facilities are vital to any winter operation. They must have sufficient capacity and good cover preferably under roof. Stock piles should be covered to prevent loss of materials and to protect the environment.

Proper Maintenance: Proper maintenance procedures should be followed around storage areas. Outside stockpiles should be properly shaped and should be on impermeable pads. There must also be proper drainage to keep the salt dry and protect the surrounding area. A method for disposal or retention of the leached salt should be in place.

Safeguarding the Environment: An awareness of safeguarding the environment should be developed by all who use salt. If misused, de-icing can pollute. If improperly used or stored it can get into wells or ground water. Excessive salt use can be damaging to certain plants and trees when runoff leaves sodium chloride in the soil.

Timing of Rock Salt Application is Essential: Getting salt down early will prevent snow and ice from bonding to the surface of the roadway. Salt application rates range from 200 to 800 pounds per two-lane mile, depending on the storm conditions. Salt can be applied in a windrow or full width, which is sometimes necessary. Brine, formed by salt and water, will run to other parts of the road and be spread by traffic. Plowing operations should be timed to allow maximum melting. Salt reaction time is usually 20 to 30 minutes. (Reaction time increases as temperature decreases.)

A.2 - Equipment Resources

A.2.1 - General

Some specialized equipment is required to support the snow and ice removal plan; namely, snow plows, salt spreaders, and snow loaders. Much of this equipment is available within the Department. Additional equipment is obtained through contract and is provided by other operating departments and the City's reserve fleet.

A.2.1.1 - Spreaders: Spreaders include tailgate and V-box spreaders. They are used to apply salt or sand, which are the primary de-icing chemicals used for fighting winter storms. Application rates are set for various conditions following Salt Institute guidelines.

A.2.1.2 - Plows: Plows are mounted on Highway Division dump trucks and Sanitation Division compactors of the Streets Department, as well as equipment in supporting departments for residential plowing once accumulation predictions are for 4" or more snow.

A.2.1.3 - Contract Equipment: City equipment is supplemented by the use of private sector contracted equipment for significant weather events. This equipment is used to assist clearing snow and ice from the primary/secondary network, as well as hauling snow from the CBD.

A.2.1.4 - Residential Equipment: The Office of Fleet Management has provided a dedicated fleet of reserve equipment for fighting snowstorms in the residential network. This is supplemented by active reserve pieces from various city departments.

A.2.1.5 - Snow Melters: Rented snow melters are used in the CBD during significant events. Snow is loaded into these pieces on site, melted and discharged into the sewer system.

A.2.1.6 - Footbridge/Sidewalk Clearance Protocol: Bridge Maintenance employees of the Streets Department are dispatched after each event ends to clear snow from pre-determined footbridges and from the sidewalks of bridges in the CBD.

A.2.1.7 - Communication: All vehicles will be equipped with either radios or cell phones for communication during the events.

A.2.1.8 - Winter Maintenance Facilities: The six Highway Division maintenance facilities serve, along with Snow Headquarters, located in the Bridge Maintenance Yard, as the bases of all snow removal operations. During significant events, they are supplemented by Sanitation area facilities. Salt is stored at the six Highway Division yards.

A.2.2 - Operation and Safety

Equipment will be operated in a safe, effective manner by trained, properly licensed, operators. Winter is the season when equipment fails to start, personnel take shortcuts, traction is poor, visibility is poor, and other motorists may not see the operators of other vehicles. All drivers and crews should make required checks prior to and during the use of equipment to ensure safe operations are maintained. Pre and post trip inspections are mandatory.

A.3 - Personnel Resources

A.3.1 - General

All Streets Department personnel are subject to duty during snow and ice storms. Failure to notify the supervisor of the inability to work during a storm is grounds for disciplinary action. Volunteers will be recruited to fill positions during storms. Tasks assigned during the storm will be within the capabilities of the individual, and where possible, will parallel normal duties. Please see the Essential Staff Policy in Section 1.1.2.

The Highway Division is responsible for overall coordination of snow and ice control preparations. Supervisors are responsible for providing the direction required for effective snow and ice control.

A.3.2 - Clothing

It must be remembered that the winter months are the times that many personnel accidents occur. The lack of proper clothing is a direct cause of most frostbite occurrences, falls, and in many cases is a factor in equipment accidents. All crews are urged to dress for the possibility that they may be stranded without heat for several hours. It is contemplated that within two hours assistance will be provided to any crew experiencing difficulty.

A.3.3 - Communications

On street communications are maintained by inspectors and spotters, who are in constant communication with the Highway and Sanitation Districts and Snow Headquarters.

Personnel Notification Lists (and equipment and other assignments) are included in this manual. Phone trees are to be initiated as necessary at the beginning of a snow alert.

A.3.4 - Reporting Procedures

A.3.4.a - Status Reports: District Highway Engineers will be responsible for maintaining contact with all supervisors and operators in their districts and reporting on the progress of the field personnel to the Snow Headquarters. District Highway Engineers or their designee will make their first report one hour after notification of the snow alert and will continue to make reports every two hours throughout the duration of the snow removal operations.

A.3.4.b - Accident Reports: The following are the responsibilities of the driver if an accident should occur during snow removal operations:

Check for injury to persons, never admit liability , call 911 immediately for medical emergencies and state that there is a medical emergency;

Obtain identification of the other vehicle and driver;

Notify Police immediately either through radio dispatcher or by telephone. Do not leave the scene of an accident except in cases where physical harm is threatened. If physical harm is threatened, relocate then notify the police;

Notify supervisor by radio or telephone immediately;

Forms 77-501 (Employee Accident/Incident Information) and 77-502 (Citizen Accident Information) should be carried in every vehicle and thoroughly completed at the scene of any accident then forwarded to either a supervisor or directly onto Form 82-S-87 (Traffic Accident Report);

Employee should not sign statements, suggest any settlement or volunteer information about the accident except as noted above. All other requests for statements or signatures should be forwarded to the City of Philadelphia's Risk Management Department;

Non-Municipal Employees contracted for snow removal operations should follow all of the directives listed above except completion of Form 82-S-7 which should be completed by the City on duty supervisor;

A.4 - Training

A.4.1 - Requirements and Timelines: Training will be held for all personnel involved in snow removal. Snow plow training for Highway Division and Sanitation Division personnel is part of on-going CDL training. Residential training is an intensive effort that will take place in November of each year.

A.5 - Field Inspection Procedure

Spotters/inspectors will report on actual roadway conditions on two-hour intervals. Reports will include surface condition, material application, plow progress, and problem locations. Conditions which have prevented the removal of snow and ice, such as illegally parked cars, abandoned cars, vehicles stuck in snow, etc. will be noted for follow-up removal efforts. Spotters/inspectors will file their field reports with their respective coordinators after each event.

A.5.1 - Primary/Secondary

Spotters/inspectors are to report on the condition of the network, with a focus on identifying areas that are particularly troublesome for immediate follow-up.

A.5.2 - Residential

Spotters/inspectors, as well as the residential navigators, are to report on residential conditions, noting streets that will require follow-up work due to problems encountered during the initial effort.

A.5.3 - Frequency of Report & Detail

Reports are to be made every two hours to the district managers and forwarded to Snow Headquarters. Detail to include whether road is passable, snow covered, salted, plowed or bare pavement. Conditions are coded and noted on inspector's reports.

A.5.4 - Expectations

It is the city's expectation that the road network be at least passable, no longer than 12 hours after the last flake has fallen.

A.6 - Policy on Snow Plowed into Street

As noted in the Philadelphia Code, Chapter 9, Section 601 (4) (f), Chapter 9, Section 404 and Chapter 10, Section 720, snow is not permitted to be plowed or shoveled onto City streets. Enforcement and penalties are described in the respective chapters.

A.6.1 - Police Department Responsibility

Police Department personnel are to stop private contractors from plowing snow off of parking lots and driveways into city streets.

A.6.2 - Streets Department Responsibility

SWEEP Officers will be dispatched to warn residents about throwing snow in the streets, as well as enforcing the 6-hour timeline to have your sidewalk shoveled to a minimum of a 30-inch path.

A.7 - Communication

A.7.1 - Internal

Communication of on-street activity during winter weather events will occur at two-hour intervals. Spotters and inspectors will report to their respective coordinators route conditions and any identified trouble spots on their assigned routes. Operators will report any mechanical problems to both their headquarters and the Office of Fleet Management. All district coordinators will forward the two-hour updates to Highway Division Snow Headquarters, where the information will be compiled.

A.7.2 - External

Highway Division Snow Headquarters will disseminate all information concerning winter weather events to external sources. Route progress reports, street conditions, equipment and personnel deployed, and materials used will be included in these reports. For major events, this information will be forwarded at two-hour intervals to the Emergency Operations Center.

APPENDIX S – SPILL RESPONSE PLANS

PAGE NO.

ANNEX F

HAZARDOUS MATERIALS

CITY OF PHILADELPHIA - EMERGENCY OPERATIONS PLAN

I. PURPOSE

A. DEVELOPMENT OF OFF-SITE RESPONSE PLANS

To establish responsibilities and policies for the development of off-site response plans for hazardous materials releases at each facility for which such plans are required under Federal and state laws.

B. RESPONSE TO A HAZARDOUS MATERIALS RELEASE

To establish procedures for handling a hazardous material incident in the City of Philadelphia to insure prompt, coordinated action, to facilitate the mobilization of all necessary personnel and equipment, and to define the role of each department, office or agency.

C. COMPLIANCE WITH RIGHT-TO-KNOW

To establish responsibilities and policies for compliance with Community Right-To-Know provisions of Federal legislation.

II. SITUATION AND ASSUMPTIONS

A. SITUATION

1. The use and storage of hazardous materials by industry, laboratories, and institutions, continues to grow and present an ever increasing threat, not only to the industrial community but the residential neighborhoods in close proximity to the manufacturing center of the city. In addition, the transport of hazardous materials adds to the threat of a major accident involving such materials.
2. The nature of hazardous materials poses a severe threat to emergency service personnel responding to the scene of an incident.
3. The volume of use and transportation of these materials is constantly increasing.
4. Advancing technology is adding more substances to the list of hazardous materials each year, with over 30,000 presently identified.
5. Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 established requirements for Federal, state, county and municipal governments regarding emergency planning and community right-to-know reporting on hazardous and toxic chemicals. This included:
   a. Extremely hazardous substances identified in Environmental Protection Agency (EPA) regulations.
   b. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, also known as "Superfund").

B. ASSUMPTIONS

1. Incidents are most likely to occur in facilities where hazardous materials are being used, processed or stored, or during transportation of such materials.
2. The hazard will increase with the expanding production, use, storage and transportation of such materials.
3. Accidents or incidents involving hazardous materials while in transit might occur at any time and at virtually any location.
4. The identification of the hazardous material(s) and the quantities involved in an incident may not be immediately known.

5. It may become necessary to require the evacuation or sheltering-in-place of areas in proximity to industrial centers and/or transportation routes should a large scale hazardous material incident occur.

6. Fires may occur in buildings storing and/or using hazardous materials with an attendant hazard to firefighters and other personnel in the vicinity.

7. Ships carrying hazardous cargoes present a substantial risk while in the Port of Philadelphia.

8. Abandoned or apparently abandoned stores of hazardous materials may be found in buildings throughout the City, along the highways or on vacant lots. Explosion, leakage or other dispersal of such hazardous materials is a potential threat to life and property, and to the environment.

9. Accidents or spills involving hazardous materials may allow such materials to reach underground water, sewers, or surface waters thereby creating a threat to water supplies. In addition, such materials may present a threat to health by direct exposure to persons.

10. The City must be prepared to respond to radiological emergencies occurring at university research centers, hospitals, and along transportation routes.

III. CONCEPT OF OPERATIONS

A. GENERAL

The Pennsylvania Emergency Response Commission (PERC), with the Pennsylvania Emergency Management Agency (PEMA) as the operational agency, and the Philadelphia Local Emergency Planning Committee (PLEPC), with the Philadelphia Office of Emergency Management (OEM) as the operational agency, established by the Governor's Executive Order 1987-8 under the provisions of SARA, provide the organizational response to hazardous materials releases including:

1. Notification and Response

   The facility owner/operator initiates the response by following the prescribed notified procedures.

2. Containment and Neutralization

   The owner/operator and the public responders share the work of containment and neutralization.

3. Protection of Public

   City officials, departments and agencies, working with OEM, provide for protection of the public from the consequences and impact of potential releases.

4. Cleanup

   The facility owner/operator provides the planning and response capability for cleanup, to the extent possible. Federal and state authorities, may pursue cleanup efforts in cases where no responsible party can be found.

5. Non-SARA Emergencies

   For those hazardous material emergencies which are not covered within the scope of SARA or CERCLA legislation, the City response mechanism will function in the same manner, but the notification and reporting responsibilities will be different.

6. Broken Arrow

   A term used to identify and report an accident involving a nuclear weapon, warhead, or nuclear component. Response to any such accident is the responsibility of the Federal government. These officials may request local assistance for traffic control, security, public information, etc. for the area outside the established perimeter. Jurisdictions involved in an incident of this nature should provide assistance as requested and report the occurrence directly to the PEMA EOC (1-800-HBG-PEMA).

B. CATEGORIES OF EMERGENCIES

Four categories have been established reflecting hazardous materials release of varying severity. Procedures for categories controlled at the scene require different actions than those with public impact. Planners will develop procedures to coincide with these four levels.

1. Category I

   Routine release. Totally within the facility. Contained within site. Report voluntary.

2. Category II

   Reportable quantity. Release outside of facility. Requires assistance of City responders. OEM provides coordination, if required.

3. Category III

   Response requires public notification and may require protective action. PEMA may provide On-Scene Liaison Officer.

4. Category IV

   Public notification and protective action are required. PEMA may provide On-Scene Coordinator.

C. PHASES OF EMERGENCY MANAGEMENT

This represents a chronological listing of events, not an assignment of specific responsibilities.

1. Preparedness

   a. Establish emergency organization.

   b. Conduct hazmat vulnerability analysis.

   c. Develop hazmat Off-Site Response Plans.

   d. Select and train response personnel.

   e. Provide first response equipment.

   f. Identify and locate additional resources.

   g. Develop and maintain mutual aid agreements.

   h. Establish emergency notification procedures.

   i. Develop public warning systems.

   j. Establish protective action/evacuation procedures.

   k. Designate On-Scene Coordinators.

   l. Develop public awareness and education program.

   m. Identify and designate mass care centers.

   n. Conduct training and exercises.

   o. Continue planning.

2. Response

   a. Notify appropriate officials and agencies.

   b. Dispatch response teams.

c. Establish communications with release site.

d. Determine hazmat involved.

e. Determine category of emergency.

f. Fulfill reporting requirements.

g. Issue appropriate public warning.

h. Provide public protective actions guides.
i. Control containment.

j. Operate decontamination facilities as necessary.

k. Keep Emergency Operations Center (EOC) and PEMA informed of situation.

l. Report unmet needs.

3. Recovery

a. Continue security of emergency area.

b. Conduct cleanup operations.

c. Continue to provide public information.

d. Conduct re-entry operations.

e. Conduct damage assessment.

f. Prepare after-action reports.

g. Continue support of disaster requirements.

h. Stand down equipment and personnel.

i. Conduct incident critique.

j. Evaluate plan based on critique.

D. EMERGENCY NOTIFICATION

1. Reporting responsibilities under SARA and CERCLA are required under the following conditions:

a. Whenever an emergency or accidental non-permitted release of any "Extremely Hazardous Substance (EHS)" takes place above the reportable quantity established by EPA for that substance.

b. Whenever an emergency or accidental release of any non-permitted "Hazardous Substance" covered by CERCLA occurs above the reportable quantity for that substance.

c. For any substance on the CERCLA list or SARA EHS list which has not had a reportable quantity established, the reportable quantity shall be one pound.

d. For any substance covered under the Occupational Health and Safety Administration regulations, for which a Material Safety Data Sheet (MSDS) is required, and for which an unpermitted accidental release has occurred, which constitutes a hazardous materials incident.

e. All facility owners or operators and transportation carriers involved in hazardous materials releases should contact 911 immediately to report any hazardous materials incident.

f. For releases of substances on the SARA/CERCLA list, exceeding a reportable quantity which has been assigned (or one pound reportable quantity for all substances on the SARA/CERCLA list for which no reportable quantity has been assigned) the facility owner or operator or transportation carrier should also call the National Response Center at 1-800-424-8802 and PEMA at 1-800-424-7362.

2. SARA/CERCLA Release Information

Contents of Emergency Notification for SARA/CERCLA Release.

a. Initial report - (See Attachment 4)

Initial, immediate report will reference each of the following to the extent known at the time, so long as no delay in responding to the emergency results.

(1) Chemical name or identity of any substance involved in the release.

(2) Estimate of the quantity of any substance which was released into the environment.

(3) Specific location of release.

(4) Date and time of release.

(5) Duration of release.

(6) Medium or media into which the release occurred.

(7) Any known or anticipated acute or chronic health risks associated with the emergency.

(8) Advice regarding medical attention necessary for exposed individuals, if appropriate.

(9) Proper precautions to take as a result of the release, including evacuation (unless such information is readily available to the facility emergency coordinator based on the Off-Site Response Plan).

(10) The name and telephone number of the person or persons to be contacted for further information.

(11) Actions taken to respond to and contain the release.

(12) Weather conditions - A brief description of the weather at the scene, to include precipitation, temperature, and wind conditions.

(13) Personnel at scene - The facility and public responders which have already arrived at the scene by the time this report is rendered.

DO NOT DELAY REPORT TO OBTAIN FULL INFORMATION.

b. Written follow-up (Sec. 304(c), SARA) Release Information

A follow-up written emergency notice or notices will be submitted by the facility owner/operator. It will update information provided in the initial notice set forth in Section III. D.2, above, and provide additional information on:

(1) Actions taken to respond to and contain the release.

(2) Any known and anticipated chronic or acute health risks associated with the release.

(3) Advice regarding medical attention necessary for exposed individuals.

E. The Fire and/or Police Departments will usually be first in responding to the scene of a suspected hazardous material incident. When both departments or the Fire Department alone is on location, the Senior Fire Officer will command all operations, except in the case of a clandestine drug lab where the Police Department will command all operations (Incident Commander).

F. The hazard area will be isolated and entry denied to all but essential emergency response personnel. The Incident Commander will define specific "work zones" based upon known and/or expected levels of contamination or danger. The Incident Commander will insure that movement between zones is controlled at checkpoints. (See Attachment 7).

   a. Hot Zone (exclusion or contaminated area) - the innermost area is considered contaminated or "hot". The hot zone boundary should be established initially based on the type of hazardous material(s) involved, initial instrument readings, and a safe distance from any potential exposure. Subsequently, the boundary may be readjusted based on additional observations and/or measurements. The hot zone <u>can</u> be further subdivided into three (3) separate zones based on their known or potential levels of contamination.

   b. Warm Zone (contamination reduction area) - this area located between the "hot" and "cold" zones provides an area to prevent or reduce the transfer of contaminants which may have been picked up by personnel of equipment returning from the "hot" zone. <u>All</u> decontamination activities occur in this area.

   c. Cold Zone (support area) - the outermost area of the site and is considered a non-contaminated or clean area. It is designated as a controlled traffic area for authorized support personnel and the location for support equipment (command post, staging area, etc.).

   d. Properly protected Fire Department personnel will control entrance and egress between the "Hot, Warm, and Cold" zones. The Police Department will control the outer perimeter of the "Cold" zone.

G. Required emergency equipment and sheltering facilities shall be requested by the Incident Commander. A current description of emergency equipment and facilities in the community and the persons responsible for such equipment and facilities is maintained at the EOC in the Emergency Information System (EIS). Copies of this information are available to emergency response organizations upon request to OEM, and to the public upon request to the PLEPC.

H. If the Incident Commander requires technical assistance on whether a health hazard exists, he will request consultation from the Health Department, and/or other agencies including the Water Department, EPA or Pennsylvania Department of Environmental Protection (DEP).

   In the event that the Fire Department obtains the services of a technical on-site emergency response contractor, this consultant will also make appropriate recommendations.

   Personnel from these departments and agencies responding to the incident site will report to the Hazardous Material Liaison Officer who will be assisted by the Duty Fire Marshal at the Command Post immediately upon arrival.

I. The Police Department will provide transportation for required personnel, if necessary (call Police Radio Supervisor).

J. Evacuation of the public from area outside the "work zones" is sometimes, but not always, necessary. In-place sheltering is a viable option in many cases. The relative merits of evacuation vs. in-place sheltering or a combination of the two will depend upon the following factors:

   a. Characteristics of the chemical.

   b. Quantity of the release or potential release.

   c. Distance from release.

   d. Wind direction and weather.

   e. Sheltering quality of the building in question.

   f. Degree of difficulty in evacuating the building in question, without increasing the risk to evacuees.

   g. Availability of specialized transportation requirements (ambulance, etc.).

   h. Potential for outbreak of fire.

   i. Terrain, including buildings, underpasses, storm sewers, etc.

If required and where necessary, the Senior Fire Officer will direct evacuation of the area at times where, in his judgment, such action is necessary, based upon departmental guidelines.

K. Should only the Police Department respond, the Senior Police Supervisor is responsible for initiating appropriate actions and notification of other responsible authorities, within the concept of operations above.

L. When the existence of a hazardous material has been confirmed and when it has been determined that there is a danger to substantial numbers of the general public and/or relatively large area (i.e., a city block or larger), the Managing Director or his designee should be notified. The Incident Commander is responsible for determining when the scope of the hazard warrants notifying the Managing Director.

M. The Police Department will, in all instances, provide security and crowd control as required.

N. If shelter for evacuees is required, the Office of Emergency Shelter and Services (OESS) will assume responsibility for mass care functions and coordinate with the American Red Cross in such operations. The School District will make school buildings available for shelter as required, and, if necessary, will support mass feeding operations to the extent of its capabilities (See Annex K, Mass Care).

O. Final disposition or cleanup of the hazardous material will be accomplished by the party responsible, and will be under the supervision of DEP, EPA, the U.S. Coast Guard (USCG), the Nuclear Regulatory Commission (NRC), or other state or Federal agencies as the situation requires. The City will act only to eliminate the immediate danger, prevent the spread of contamination and protect the lives and property of its residents, and will cooperate with the agencies noted above in final disposition or cleanup to the extent of its capabilities. In the event that a principal responsible party is unavailable, or lacks the expertise to remove and dispose of hazardous materials that pose a threat to the health and safety of citizens and to the environment, the Fire Department with the support of OEM will ask that EPA or DEP engage in the clean-up effort.

P. If state or Federal authorities are unavailable for this work, the Department of Licenses and Inspections (L & I) will hire a licensed and certified contractor to perform clean-up, and provide technical assistantance to identify, evaluate, mitigate and remove the hazard.

IV. <u>RESPONSIBILITIES (RESPONSE)</u>

A. MANAGING DIRECTOR'S OFFICE (MDO)/OEM

1. The Director of OEM shall be the Community Emergency Coordinator for SARA Title III purposes.

2. Establish communication with PEMA and provide situation updates and request assistance, if necessary.

3. Obtain information on specific chemicals (Chemtrec "HIT", Response Data Sheets, etc.) and provide such information to on-scene personnel, when possible.

4. Determine special emergency need facilities and provide information to on-scene personnel.

5. Locate and determine evacuation centers available in area.

6. Obtain and coordinate available resources requested by On-Scene Coordinator or Incident Commander.

B. FIRE DEPARTMENT

1. Extrication and rescue including necessary first aid and evacuation of casualties.

2. Fire fighting.

3. Determine existence of hazard and its extent, and establish appropriate site work zones.

4. Establish communications.

5. Senior Fire Officer (Incident Commander) assumes initial command of incident site (exception: Clandestine Drug Lab & bomb threats), notifies the Fire Communications Center (FCC) of conditions, and requests the proper departments and agencies be notified.

6. Determine need for evacuation or in-place sheltering.
7. Coordinate with Police and other departments as required.
8. Decontamination.
9. FCC dispatches appropriate fire apparatus, Hazardous Material Task Force (HMTF) and Medic Units in accordance with alarm and/or official requests received.
10. The Hazardous Materials Liaison Officer will, assisted by the Duty Fire Marshal coordinate the activities of responding technical support personnel (Health, Water, L & I, EPA, DEP, etc.) and keep the Incident Commander informed of their presence and activities.

C. POLICE DEPARTMENT

1. When operating independently:
   a. Extrication and rescue.
   b. Determine existence of hazard.
   c. Establish incident site communications.
   d. Incident site command.
   e. Security, crowd and traffic control.
   f. Direct evacuation of threatened areas if necessary.
2. When operating in conjunction with the Fire Department and other departments:
   a. Coordinate with Senior Fire Officer (Incident Commander).
   b. Security, crowd and traffic control.
   c. Provide vehicles for transportation of uninjured evacuees.
   d. Provide vehicles to supplement Fire Medic Units in evacuation of casualties, if required.
   e. Direct evacuation or in-place sheltering of threatened areas where necessary.
   f. Provide transportation for Health Department personnel where required.

D. HEALTH DEPARTMENT

1. Advise, recommend and coordinate, where possible, with EPA, DEP, and any technical assistance support contractor, on what appropriate medical and health actions need to be taken.
2. Advise, recommend and coordinate, where possible, with EPA, DEP, and any technical assistance support contractor on the identity, existence and extent of the hazard involved.
3. Take appropriate measures to inform the general public about any effects of the hazardous materials release, based on consultations with the Incident Commander and other Federal, state of contractual service authorities present.
4. Provide for follow-up through medical evaluation and testing of any city personnel, city contractual services or member of the public who may have been exposed to substances involved in the release.
5. Provide for periodic medical evaluations and screening of emergency responders involved in hazardous material incidents, pursuant to the requirements of 29 CFR 1910.120.

E. OFFICE OF EMERGENCY SHELTER AND SERVICES (OESS)

1. Assume responsibility for mass care functions.
2. In coordination with the American Red Cross, provide for the establishment and overall management of shelters.
3. Provide trained personnel to work with the Red Cross in shelter operations.
4. Coordinate human service activities of all supporting social agencies such as the Red Cross, Salvation Army, etc.

F. DEPARTMENT OF LICENSES AND INSPECTIONS (L & I)

1. Contract to clean-up hazardous materials abandoned in buildings or on the ground.
2. Issue official notice to the party determined by the Law Department to be responsible for a hazardous waste situation. Emergency conditions may require that L & I cite the violation without the Law Department's input.

G. WATER DEPARTMENT

1. Insure that levels of water system contamination do not exceed acceptable limits; control contamination in the sewer system to extent possible.
2. Coordinate efforts with Health Department and other agencies and departments as required.
3. Maintain liaison with EPA, DEP and/or USCG on the site.
4. Clean-up incident area if emergency relates to the immediate protection of public water supply, or waste water treatment operations.

H. STREETS DEPARTMENT

1. Provide vehicles and equipment for transport of materials required for decontamination, restricting extent of spills and transportation of contaminated material to approved storage or disposal site, provided safety conditions exist that will ensure the safety of both personnel and vehicles.
2. Coordinate with other departments as required.

I. DEPARTMENT OF PUBLIC PROPERTY

1. Maintain communications with FCC and Police Radio.
2. Upon request, notify Managing Director, Emergency Coordinator, and other specified City officials and departments.

J. LAW DEPARTMENT

1. Make determination of responsibility for hazardous waste situation.
2. Assess and collect costs to the City for clean-up from the responsible party(ies).
3. Refer information on responsible party to District Attorney's Office when criminal prosecution is indicated.
4. Notify L & I of determination of responsible party so that official notice may be issued.

K. SCHOOL DISTRICT OF PHILADELPHIA

1. Provide mass care facilities upon request.
2. Provide food service for evacuees, if required.

L. AMERICAN RED CROSS

1. Establish shelters in coordination with OESS and other responding social service agencies.

2. Social services.

3. Registration and inquiry services.

V. INTERFACE WITH ADJACENT JURISDICTIONS

A. If an incident occurs within the City, but close enough to its borders so that another jurisdiction could be threatened, the FCC will alert the communications center of the affected county and provide them with all available information.

B. If an incident occurs in adjacent jurisdiction, but close enough to Philadelphia so that areas within the City could be threatened, a Command Post will be established in the City near the site to coordinate potential City actions.

VI. COMMUNICATIONS

A. Utilize Fire, Police and Municipal radio in accordance with established procedures. All other communications systems will be employed as required.

B. FIRE COMMUNICATIONS CENTER (FCC)

1. Dispatch appropriate fire apparatus and Fire Medic Units in accordance with alarms and/or official requests received.

2. Upon receipt of information from the Incident Commander that a serious hazardous material incident exists, notify the following at the request of the Incident Commander:

a. Police Radio

b. On-duty Deputy Commissioner

c. Fire Commissioner

d. Managing Director (through Municipal Radio)

e. Health Commissioner

f. Emergency Coordinator (through Municipal Radio)

g. Municipal Radio

h. Water Department

i. U. S. Coast Guard (river spills)

j. Duty Chief Fire Marshal

k. U. S. Environmental Protection Agency (EPA)

l. Pa. Department of Environmental Protection(DEP)

C. POLICE RADIO

1. Upon receiving information from the Fire Communications Center that a serious hazardous materials incident exists initiates the following notifications:

a. Police Commissioner

b. Deputy Police Commissioners

c. Chief Inspectors

d. All Command Inspectors - Bureau Commanders

e. Commanding Officers and Divisional Commander of District of occurrence

f. Traffic Division Headquarters

g. Philadelphia Gas Works

h. Philadelphia Electric Company

i. Bell Telephone Company

D. DEPARTMENT OF PUBLIC PROPERTY - COMMUNICATIONS DIVISION

Municipal Radio - Upon request, notifies specified City officials and departments. This notification list will be made available to all involved departments, upon request.

VII. AUTHORITIES AND REFERENCES

A. AUTHORITIES

1. Superfund Amendments and Reauthorization Act of 1986 (SARA), Public Law 99-499, October 17, 1986.

2. Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA or "Superfund"), P. L. 96-510.

3. Executive Order 1987-8, Governor's Office, Commonwealth of Pennsylvania, April 20, 1987.

B. REFERENCES

1. City of Philadelphia Emergency Operations Plan

2. Annex J, Health and Mass Casualty Plan, City of Philadelphia Emergency Operations Plan

3. Commonwealth of Pennsylvania Emergency Operations Plan

4. Pennsylvania Pollution Incident Response Manual

5. Code of Federal Regulations, Title 49, Transportation, Parts 100-117

6. City/County of Philadelphia Hazards/Vulnerability Analysis

7. Emergency Handling of Hazardous Materials in Surface Transportation, Washington: Bureau of Explosives of the Association of American Railroads, 1996.

8. Federal Register, Volume 40, Number 28, Part II, Council on Environmental Quality, National Oil and Hazardous Substance Pollution Contingency Plan

9. Commonwealth of Pennsylvania Act 1982-220

10. National Contingency Plan, 1982 (40 CFR 1510)

11. Pamphlet, DOT P 5800.3, U.S. Department of Transportation "Emergency Response Guide Book for Hazardous Materials"

12. Clean Water Act (Section 311 of 33 USC 1251

13. April 22, 1987, Part II, 40 CFT Part 355 and Appendix A, List of 406 Extremely Hazardous Substances, as amended

14. March 16, 1987, 40 CFR Part 302, CERCLA List of 717 Hazardous Substances

15. June 4, 1987, Part II, 40 CFR Part 372, Toxic Chemical List, Chemical Release Reporting, Community Right-To-Know

16. October 15, 1987, Part IV, 40 CFR part 370, Emergency and Hazardous Chemical Inventory Forms and Community Right-To-Know Reporting Requirements (Tier II Forms)

17. August 24, 1987, Part III, 29 CFR Parts 1910, 1915, 1917, 1918, 1926 and 1928, Hazard Communication.

18. October 21, 1957, 40 CFR Part 310, Reimbursement to Local Governments for Emergency Response to Hazardous Substance Releases

19. National Response Team Hazardous Materials Emergency Planning Guide, March, 1987

20. Technical Guidance for Hazards Analysis: Emergency Planning for Extremely Hazardous Substances U. S. Environmental Protection Agency, Federal Emergency Management Agency, U. S. Department of Transportation, December, 1987.

VIII. ADMINISTRATION AND LOGISTICS

A. RECORDS

Each department involved in hazardous materials incident emergency response shall keep records of employees exposed to hazardous and toxic substances, and shall also provide such information to the Health Department and Personnel Department.

B. TRANSPORTATION

1. Departments and other agencies furnish own transportation except that the Police Department will furnish transportation for Health Department representatives responding to the incident, if required.

2. The Police Department will, when necessary, transport uninjured evacuees from the incident area and assist in evacuating casualties.

3. The Fire Department will control and coordinate the transportation of casualties by Fire Medic Units, police vehicles, volunteer, commercial and/or improvised ambulances.

4. The Streets Department will furnish vehicles and equipment for transport of material required for decontamination, restriction of spills, and disposition of contaminated material, provided that conditions exist that will ensure the safety of both personnel and vehicles.

C. MEDICAL

As required, the Health and Mass Casualty Plan, Annex G, City of Philadelphia Emergency Operations Plan, will be implemented.

IX. DIRECTION, CONTROL AND ACTIVATION

A. The Senior Fire Officer, shall be in command at the incident site (Incident Commander) when more than one department is involved, unless a Clandestine Drug Lab or bomb threats are involved, in which case the Senior Police Official shall assume command.

B. If only one department, i.e., Police, Health, etc., is involved, the senior individual assumes command.

C. Fire Department provides for coordination and control of casualty transportation.

D. Coordination of the activities of responding technical support personnel (Health, Water, L & I, EPA, DEP, etc.) shall be accomplished by the Hazardous Material Liaison Officer at the incident command center immediately upon arrival at the site.

E. Police Department provides for coordination and control of transportation of uninjured evacuees.

F. When required, Managing Director or his designee, either at the incident site or EOC (if activated), exercises control over total effort and insures that all departments support the operation.

G. EOC is located in Fire Administration Building, 3rd and Spring Garden Streets. Activated as directed by the Managing Director or authorized representatives upon occurrence of large scale hazardous material incident.

X. TRAINING AND EXERCISES

A. TRAINING STANDARDS

1. PEMA will develop training standards that meet or exceed federally imposed training standards. Revisions to existing programs will be implemented as required to reflect changes and upgrading of these standards.

2. Any individual who has not received the specified training is prohibited from engaging in hazardous material operations covered by the established standard.

B. TRAINING

1. PEMA will arrange appropriate courses for LEPC and facility personnel at the following institutions:

   a. State Fire Academy

   b. Emergency Management Institute, Emmitsburg, Md.

   c. National Fire Academy, Emmitsburg, Md.

2. Facility Emergency Coordinators develop training programs and schedules for:

   a. General site workers

   b. On-site managers

   c. Supervisors

   d. On-site emergency response workers

3. Philadelphia Office of Emergency Management (OEM)

   OEM will coordinate the provision of all training offered by FEMA, PEMA, EPA, etc., in accordance with established standards with the exception of training offered by the National Fire Academy.

4. Fire Department

   a. Provide training for all city personnel with Hazmat incident responsibilities to assure that they will be able to function as a coordinated "team". The training will include the responsibilities of personnel of involved City departments with regard to this plan, site control, and safety considerations.

   b. Insure that its Hazardous Material Task Force continues to receive sufficient formal training to meet or exceed federal and state standards for HazMat teams.

C. EXERCISES

1. Facility Coordinator

   Conduct at least one in-plant emergency exercise per year.

2. Office of Emergency Management (OEM)

   a. Conduct an annual tabletop exercise for all Hazmat response personnel.

   b. Involve facility emergency coordinators from SARA facilities in periodic exercise program involving the Fire, Police, Health and Water Departments.

XI. PLAN DEVELOPMENT AND MAINTENANCE

A. CITY HAZARDOUS MATERIALS ANNEX TO EOP

OEM will coordinate development and maintenance of this annex. The annex will be updated as necessary and reviewed at least annually. Whenever portions of this annex are implemented in an emergency event or exercise, a review will be conducted to determine necessary changes.

B. INDIVIDUAL FACILITY OFF-SITE RESPONSE PLANS

1. The PLEPC will develop an Off-site Response Plan for each facility subject to such plans by SARA, and for any other facilities it deems necessary. These off-site plans will be Appendix 2 to this annex.

2. Current listing of facilities subject to the Title III requirements that are within the emergency planning district is maintained in a computer data base. Copies of this information are available to emergency response organizations upon request to OEM, and to the public upon request to the PLEPC.

3. Upon request of the PLEPC, the facility owner/operator will provide all information necessary for development of the off-site plan. The facility will promptly inform the PLEPC of any relevant changes to the information as such changes occur or are expected.

4. The PLEPC will forward the plan to the PERC for review and comment. To the maximum extent practicable, such review will not delay implementation of the plan.

5. The plan will be reviewed annually by the PLEPC one month prior to its anniversary date. Revisions, as appropriate, will be forwarded to the PERC for review prior to the anniversary date.

C. HAZARD VULNERABILITY ANALYSIS

Hazard Vulnerability Analysis for all SARA Title III Planning Facilities will be done by OEM. Hazard Vulnerability Analysis will be composed of three Sections. 1. Vulnerability Zones, 2. Evacuation Zones, 3. At Risk Facilities, Sites, and Populations.

1. Vulnerability Zones are circles around each SARA Planning Facility. These circles depict the impacted area involving complete release of an "Extremely Hazardous Substance" with 10 minutes from its largest container. To depict vulnerability zones, OEM must obtain the information from each SARA Planning Facility. The collection and analysis of this information is termed as "initial screening", and consists of identification and analysis of the following:

    a. The presence of extremely hazardous substances at the facility

    b. The form of each substance (solid, liquid or gas)

    c. The percentage of the extremely hazardous substance if it is in a mixture

    d. For molten solids or liquids, the square footage of any dike present

    e. The amount of each extremely hazardous substance at the facility for the single largest container or series of interconnected containers present containing that substance.

    f. The prevailing wind speed, based on data assembled by the U. S. Weather Service for Philadelphia. The prevailing wind speed for Philadelphia is approximately 9 miles per hour.

    g. Vulnerability Zones for each EHS at SARA Planning Facilities are computed on EIS (Emergency Information System). The single EHS having the largest vulnerability zone using the criteria noted in 1. a-f above will be the vulnerability zone for that facility. The selection of this final zone is termed "secondary screening."

2. Realizing that evacuation of facilities, sites and population in urban environments where large vulnerability zones exist is an impossibility, the PLEPC has adopted a scheme of "primary potential" and "secondary potential" evacuation zones. The Incident Commander is free to employ the use of these primary and secondary evacuation zones or to exercise his own judgement. For areas within the vulnerability zone beyond the primary and secondary evacuation zones, in place sheltering is considered the preferred precautionary measure.

3. "At Risk" Facilities and populations are those within the primary and secondary evacuation zones. They will be determined by use of the OEM Emergency Information System (EIS), with support and assistance from other City departments, and the involved facility.

XII. PLAN DISTRIBUTION

A. This annex will be distributed to all holders of the Philadelphia EOP. Additionally, copies will be made available to the public when requested from the PLEPC (in writing) under procedures and reproduction fees established by that committee.

B. Off-site plans developed as Appendix 2 to this annex will be distributed under separate cover to all Philadelphia Emergency Operations Plan holders upon request, and each facility will receive a copy of the annex and the off-site plan for that facility.

The public may request copies of an individual off-site plan (in writing) under procedures and fees established by the PLEPC.

XIII. ATTACHMENTS

ATTACHMENT 1. Operational Procedures (Fire Department)

ATTACHMENT 2. CHEMTREC information

ATTACHMENT 3. PLEPC Organization and Responsibilities

ATTACHMENT 4. Emergency Release Notification Form

ATTACHMENT 5. Abbreviations and Definitions

ATTACHMENT 6. Sources of Technical Information

ATTACHMENT 7. Site Work Zones

ATTACHMENT 8. Protective Action Decision Making

XIV. APPENDICES

APPENDIX 1. Transportation Routes
APPENDIX 2. Facility Off-site Response Plans (To Be Published Separately)

ANNEX F

APPENDIX 1

HAZARDOUS MATERIALS

TRANSPORTATION ROUTES

I. PURPOSE

A. To describe, in general terms, the methods and routes used to transport hazardous materials within Philadelphia.

B. Specific routes and methods will if feasible, be described in each off-site plan (Appendix 2, to be published separately).

II. SITUATION

1. The City of Philadelphia is a destination point, transhipment point, and origination point for the transportation of hazardous materials.

2. Hazardous materials arrive and depart the City by ship, rail, and motor vehicle.

   a. Motor vehicles, including tank truck, motor freight, and mixed content delivery vehicles.

      (1) Tank truck and bulk motor freight vehicles general use the interstate highway system. (I-95, I-76) and other major roads such as Route 1, however must inevitably leave the highway system at some point to either deliver or pick up their cargo.

      (2) Mixed shipment motor freight and delivery vehicles carrying hazardous materials can be found on most primary and secondary streets within the city.

   b. Rail Car

      (1) The city is dissected by a number of rail lines which regularly transport hazardous materials most notably, phenol, liquid chlorine, ethylene oxide, and hydrogen chloride.

      (2) Additionally several major rail yards serve as temporary storage points for shipments in route.

      (3) Ameliorating the situation is the fact that rail traffic speeds within the city are relatively slow, thereby limiting the chances of catastrophic failure of containment due to collision or derailment.

   c. Ship

      (1) In addition to crude oil associated with refineries located in Philadelphia, ship and barge traffic along the Delaware and lower parts of the Schuylkill River carry significant quantities of hazardous materials, significant among these are phenol and sulfuric acid.

   d. Pipelines

      (1) Underground pipelines servicing the oil refining industry and LNG facilities are concentrated mostly in the southern portion of the city.

ANNEX F ATTACHMENT 1

HAZARDOUS MATERIALS INCIDENT PLAN

OPERATIONAL PROCEDURES

(PHILADELPHIA FIRE DEPARTMENT OPERATIONAL PROCEDURES, PUBLISHED SEPARATELY)

ANNEX F ATTACHMENT 2

HAZARDOUS MATERIAL INCIDENT PLAN

CHEMTREC INFORMATION

CHEMTREC (CHEMICAL TRANSPORTATION EMERGENCY CENTER) is a private operation established by the Chemical Manufacturers Association (CMA) to provide information on chemicals involved in transportation emergencies.

Emergency calls to CHEMTREC are answered by professional communicators (NOT CHEMISTS), who retrieve the best available information on the chemicals involved from a file of over 45000 product and trade name listings. After providing available information to the caller, CHEMTREC immediately relays relevant information to the company shipping the product for more detailed assistance and appropriate follow-up. Responsibility for further guidance rests with the shipper.

CHEMTREC can usually provide hazard information warnings and guidance when given the IDENTIFICATION NUMBER or the NAME OF THE PRODUCT and the NATURE OF THE PROBLEM. For more detailed information and/or assistance, of if PRODUCT IS UNKNOWN, attempt to provide as much of the following information as possible.

1. Name of caller and call-back number.
2. Nature and location of the problem.
3. Guide number you are using (from DOT North American Emergency Response Guidebook).
4. Shipper and/or manufacturer.
5. Container type.
6. Rail car or trucker number.
7. Carrier name.
8. Consignee.
9. Local conditions (weather, wind speed and direction, temperature, etc.).

ANNEX F ATTACHMENT 3

HAZARDOUS MATERIALS INCIDENT PLAN

PHILADELPHIA LOCAL EMERGENCY PLANNING COMMITTEE (P.L.E.P.C.)

I. AUTHORITY

In accordance with the Superfund Amendments and Reauthorization Act of 1986 and Governor's Executive Order of April 20, 1987 the Philadelphia Local Emergency Planning Committee (PLEPC) shall be responsible for Title III implementation for the City and County of Philadelphia.

The PLEPC is a county/city organization comprised of representation from government, emergency responders, the public at large, those who are involved with the manufacture, storage or transportation of hazardous materials, and others in order to determine, define and promulgate the manner necessary to mitigate the effects of hazardous material emergencies in Philadelphia County.

II. REFERENCES

- Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III - Emergency Planning and Community Right-To-Know.
- 29 CFR Part 1910 - OSHA Final Rule on Hazardous Waste Operations and Emergency Response.
- Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).
- Act 1984-159 Pennsylvania Right-To-Know (RTK).
- Act 1978-323 Pennsylvania Emergency Management Services Act.
- EPA Chemical Emergency Preparedness Program (CEPP).
- NRT Hazardous Materials Emergency Planning Guide.
- Governor's Executive Order No. 1987-8, Establishment of Pennsylvania Emergency Response Commission, Local Emergency Planning Districts and Committees.

III. OBJECTIVES

- To inventory hazardous material storage, supply and transportation points.
- To assess available resources and capabilities to deal with hazardous material emergencies.
- To develop individual off-site plans for each facility requiring such plans under SARA.
- To assist in the establishment of a policy and development of a plan that provides for the integrated and coordinated use of those resources in responding to and recovering from hazardous material emergencies.
- To exercise the plan, refining it where necessary, and provide training where the exercise indicates shortfalls in knowledge and experience.
- To develop a long range approach to enhance resources and improve capability as time and money permit.
- To provide for the review and update of the emergency plan to account for changes in the hazards, in resources and capabilities, or in policy.
- To promote appropriate legislation.
- To promote community awareness activities.

IV. ORGANIZATION

The PLEPC will function in accordance with SARA guidelines and will be comprised of an Executive Committee and various operating committees.

The entire PLEPC will be a permanent organization within the City and County of Philadelphia.

A. Executive Committee

The Executive Committee shall consist of all the officers of the PLEPC, and Chairpersons of the various committees. Officers of the PLEPC may also serve as Chairpersons of the various committees.

The initial Chairperson of the PLEPC shall be a representative from the City of Philadelphia. Thereafter, the Chairperson shall be selected by the membership by secret ballot.

B. Officers of the PLEPC

The Officers shall be as follows:

a) Chairperson

b) Vice Chairperson

C. Executive Committee Staff

a) Administrative Coordinators

b) Planning Coordinators

c) Right-To-Know Coordinator

d) Public Information Coordinator

Each of the Officers noted above, shall serve in their positions for a six (6) month period from date of appointment.

Thereafter, the Officers shall be elected at semi-annual reorganization meetings of the PLEPC.

The PLEPC Offices shall be open to all members of the PLEPC following initial appointment of a City of Philadelphia representative.

D. Roles of PLEPC Executive Committee Officers

1. Chairperson

The Chairperson shall be responsible for the mission and objectives of the PLEPC during his or her tenure.

He or she shall see to it that all matters are executed expeditiously, and consistent with guidelines and regulations promulgated by EPA, the Pennsylvania Emergency Response Commission and other governing bodies involved in SARA Title III compliance.

The Chairperson shall appoint all persons to committee assignments. The Chairperson shall also develop agendas for each Executive Committee and PLEPC meetings, and shall chair such meetings.

The Chairperson shall review and disseminate reports and materials associated with SARA Title III compliance consistent with his/her role.

2. Vice Chairperson

The Vice Chairperson shall assume all duties of the Chairperson in his or her absence. Further, the Vice Chairperson shall assume duties created or delegated to him/her by the Chairperson.

E. Other Officers

1. Other officers shall from time to time be selected by the PLEPC, based on recommendations of the Executive Committee.

F. Roles of the Executive Committee Staff

1. Administrative Coordinators

The PLEPC Administrative Coordinators shall be responsible to the Chairperson and PLEPC for day to day management of the PLEPC.
The Administrative Coordinators shall also act as Secretary to the PLEPC and shall prepare and disseminate minutes of minutes.

Upon request of the Chairperson, the Administrative Coordinators shall act as Corresponding Secretary as needed.

Should funding and contributions be made available to the PLEPC, the Administrative Coordinators shall establish accounts, and disseminate funds as mandated by the PLEPC, through the Executive Committee.

2. Planning Coordinators

The Planning Coordinators shall see to it that all required Facility Emergency Plans are prepared, based on guidelines established by the PLEPC.

The Planning Coordinators shall also work with facilities and the PLEPC to ensure that all required plans are updated and exercised, according to Federal regulations, and other regulations and guidelines established by the State Emergency Response Commission, other Federal and State governing bodies, and guidelines established by the PLEPC.

G. Specific Organizational Roles

1. Powers of Executive Committee

The Executive Committee shall:

a) recommend actions to the full PLEPC for action,

b) established further rules and procedures for PLEPC approval for execution of the SARA Title III mission of Philadelphia City and County,

c) make recommendations on disbursements of funds received for execution of the SARA Title III mission, and report such to the full PLEPC,

d) ensure that all work executed is done expeditiously and within established regulations and guidelines, and report such to the full PLEPC, and

e) prepare agendas for all PLEPC meetings.

2. Powers of the full PLEPC

a) Make all decisions on Philadelphia's compliance with SARA Title III, within all pertinent laws and policies of the United States, Commonwealth of Pennsylvania and City of Philadelphia.

b) Appoint officers to the Executive Committee.

c) Review all work executed by the Executive Committee and other working committees.

d) Recommend people to fill vacancies, where required.

V. COMMITTEES

There shall be six permanent committees in the PLEPC. They are:

a. Planning Committee

b. Facilities Management Committee

c. Transportation Committee

d. Public Affairs Committee

e. Emergency Response Committee

f. Education Committee

A. Planning Committee

The Planning Committee will develop off-site plans for facilities requiring such plans, and conduct periodic reviews of the plans.

B. Facilities Management Committee

The Facility Management Committee will assist in ascertaining the accuracy of information presented to the PLEPC from facilities, and will also undertake various outreach activities to ensure that facilities are aware of SARA Title III requirements.

C. Transportation Committee

The Transportation Committee will analyze how extremely hazardous substances enter and exit covered facilities. The Transportation Committee will also seek to indicate transportation needs for targeted populations at selected facilities in the event of a chemical emergency.

D. Public Affairs Committee

The Public Affairs Committee will assist in determining information dissemination requirements to the general public as part of the PLEPC powers, and will also provide oversight into the Right-To-Know requirements as needed.

The Public Affairs Committee will also review various reports made available to the PLEPC from State, Federal or private sources.

The Public Affairs Committee will review legislative initiatives in SARA Title III and will recommend specific legislative actions.

E. Emergency Response Committee

The Emergency Response Committee is responsible for determining the functions that would be required of an emergency response in a major hazardous materials emergency.

The Emergency Response Committee will also identify and list public and private sector resources that can be used in an emergency.

The Emergency Response Committee will develop and test procedures to exercise facility plans.

Finally, the Emergency Response Committee will recommend specific training needs and protocols that can be employed in the emergency response mission in SARA Title III.

F. Education Committee

The Education Committee will assist in developing education seminars and programs for facilities and others.

VI. COMMITTEE ASSIGNMENTS

A. All committee assignments will be made by the Chairman of the PLEPC, based upon needs of the PLEPC, and preferences of the PLEPC members.

B. Committee Chairpersons will also be designated by the PLEPC Chairperson. Members of the Executive Committee may be asked to serve as Committee Chairpersons.

C. Meetings of the various committees will be scheduled by the Committee Chairperson.

D. Committees may utilize expertise from outside resources in carrying out committee business. Outside resource personnel will not be permitted to vote on committee business matters, nor will they be permitted to vote at Executive Committee or PLEPC meetings, although such personnel may be called upon to testify, and to participate at various functions.

VII. MEETING SCHEDULES

A. All meetings of the PLEPC and Executive Committee will be announced by the PLEPC Chairperson. Further, a meeting schedule will be developed.

B. All meetings of the PLEPC and Executive Committee are open to the public, unless otherwise indicated by the PLEPC Chairperson.

C. All committee meetings will be scheduled by the Committee Chairperson. All such committee meetings will be open to the public unless otherwise indicated by the Committee Chairperson.

VIII. PUBLIC INFORMATION

The Executive Committee shall provide for release of pertinent information using various strategies which shall include, but are not restricted to:

- Meetings with interested parties and persons such as off-site responders, businesses, industrial and other facilities affected by the Act and elected municipal government officials and staff.
- Newsletters to all appropriate and interested representatives associated with emergency response including affected facilities, elected County and municipal officials, interested citizens and community organizations on request as well as representatives of the print and broadcast news media.
- Brochures for countywide residential and commercial distribution.
- News Releases as necessary and relevant.
- Citizen Information Center protocols for handling telephone inquiries.
- Provisions for citizen accessibility to final plans for perusal and review.

ANNEX F ATTACHMENT 4

COMPLETED DATE ______________ TIME ______________

HAZARDOUS MATERIAL INCIDENT REPORT
(RELEASE NOTIFICATION FORM)

DO NOT DELAY REPORT FOR FULL INFORMATION

1. CHEMICAL NAME OF SUBSTANCE RELEASE ______________________________
2. QUANTITY RELEASED ____
3. LOCATION OF RELEASE ____
4. DATE AND TIME OF RELEASE ____
5. DURATION OF RELEASE ____
6. RELEASE WAS INTO: AIR ________ SURFACE WATER ________ SEWER _______ GROUND _______
7. ANTICIPATED ACUTE OR CHRONIC HEALTH RISKS: _______________________

   ____
8. ADVICE ON MEDICAL ATTENTION FOR EXPOSED INDIVIDUALS (IF APPROPRIATE)

   ____

   ____
9. PROPER PRECAUTIONS TO TAKE (INCLUDING EVACUATION IF APPROPRIATE)____

   ____
10. NAME AND PHONE NO. OF PERSON TO CONTACT FOR FURTHER INFORMATION:

    ____

    PHONE ____
11. RESPONSE ACTIONS ____

    ____
12. WEATHER CONDITIONS: ____
13. RESPONSE PERSONNEL AT SCENE: ____

    ____

NOTE: IF DECISION WAS MADE NOT TO NOTIFY LERC AND PERC, RECORD REASON:

____

ADDITIONAL INFORMATION IF TRANSPORTATION ACCIDENT

1. TYPE OF INCIDENT (VEHICLE, PLANT, RAIL, ETC.) ________________________
2. PLACARD/LABEL INFORMATION ____
3. CONTAINER TYPE ____
4. CARRIER ____

5. IDENTITY OF OWNER/SHIPPER ____

HAZARDOUS MATERIALS INCIDENT PLAN

ABBREVIATIONS AND DEFINITIONS

1. CERCLA

   Comprehensive Environmental Response, Compensation, and Liability Act regarding hazardous substance release into the environment and the cleanup of inactive hazardous waste disposal sites, commonly referred to as "Superfund".

2. CHEMTREC

   The Chemical Emergency Transportation Center (CHEMTREC) has a centralized toll free telephone service (1-800-424-9300) which has been set up to provide immediate advice on the nature of the product and steps to be taken in handling the early stages of transportation emergencies when hazardous chemicals are involved. CHEMTREC promptly contacts the shipper of the material involved for more detailed information and appropriate follow-up action, including on-scene assistance when feasible.

3. CHLOREP

   The Chlorine Emergency Plan (CHLOREP) was established by the Chlorine Institute to enable the nearest producer of chlorine products to respond to an accident involving chlorine. CHEMTREC serves as the communications link for this program.

4. COMBUSTIBLE LIQUIDS

   Any liquid having a flash point at or above 100 degrees F and below 200 degrees F.

5. COMPRESSED GASES

   Any material or mixture having in the container a pressure exceeding 40 psi absolute at 70 degrees F, or a pressure exceeding 104 psi absolute at 130 degrees F, or any liquid flammable material having a vapor pressure exceeding 40 psi absolute at 100 degrees F.

6. CORROSIVE MATERIAL

   Any liquid or solid that causes visible destruction of human skin tissue of a liquid that has a severe corrosion rate on steel.

7. DEP

   Department of Environmental Protection, Commonwealth of Pennsylvania.

8. EIS

   Emergency Information System, an emergency management computer program.

9. EPA

   The U. S. Environmental Protection Agency.

10. EOC

    Emergency Operations Center, City of Philadelphia.

11. ETIOLOGIC AGENTS

    Any viable micro-organism, or its toxin, which causes or may cause human disease.

12. EXPLOSIVE

Any chemical compound, mixture or device, the primary or common purpose of which is to function by explosion, with substantially instantaneous release of gas and heat.

Class 1.1, 1.2, 1.3

Detonating or otherwise of maximum hazard.

Class 1.4, 1.5, 1.6

Function by rapid combustion rather than detonation and include some explosive devices such as special fireworks, flash powers, etc.

Class C Explosive

Certain types of manufactured articles containing Class A or Class B explosives, or both, as components but in restricted quantities, and certain types of fireworks.

Blasting Agents

A material designed for blasting which has been tested and found to be so insensitive that there is very little probability of accidental initiation to explosion or of transition from deflagration to detonation.

13. EXTREMELY HAZARDOUS SUBSTANCE

A hazardous substance identified by EPA as extremely hazardous and meeting reporting requirement under SARA. Extremely hazardous substances are listed in Part II, 40 CFR Part 355, Appendix A.

14. FACILITY

All buildings, equipment, structure, and other stationary items which are located on a single site or on contiguous or adjacent sites and which are owned or operated by the same person. For purposes of Sec. 304 SARA includes motor vehicles, rolling stock, and aircraft.

15. FCC

Fire Communications Center, City of Philadelphia.

16. FLAMMABLE LIQUIDS

Any liquid having a flash point below 100 degrees F.

17. FLAMMABLE SOLIDS

Any solid material, other than an explosive, which is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily, and when ignited burns so vigorously and persistently as to create a serious hazard.

18. HIT-HAZARDOUS INFORMATION TRANSMISSION PROGRAM

Hazardous Information Transmission Program provides a digital transmission of the CHEMTREC emergency chemical report to first responders at the scene of a hazardous materials incident. The report advises the responder on the hazards of the materials, the level of protective clothing required, mitigating action to take in the event of a spill, leak or fire, and first aid for victims. HIT is a free public service provided by the Chemical Manufacturers Association. Reports are sent in emergency situations only to organizations that have pre-registered with HIT and have a computer available with Modem. Call CHEMTREC at 1-800-424-9300.

19. HAZARDOUS MATERIAL (HAZMAT)

Refers generally to hazardous substances, petroleum, natural gas, synthetic gas, acutely toxic chemicals and other toxic chemicals. The Secretary of Transportation, U. S. Department of Transportation has determined that a hazardous material is a substance or material which is capable of posing an unreasonable risk to health, safety and property when transported in commerce. Hazardous materials include, but are not limited to:

a. Explosives

b. Radiological materials

c. Etiologic (disease carrying) agents

d. Flammable liquids or solids
e. Combustible liquids or solids

f. Poisons or poison gases

g. Oxidizing or corrosive materials

h. Irritants

20. HAZARDOUS SUBSTANCE

A substance identified as hazardous and meeting reporting requirements under CERCLA. CERCLA hazardous substances are listed in 40 CFR, Part 302.

21. HAZARDOUS WASTE

Any garbage, refuse, or sludge from an industrial or other waste treatment plant, sludge from a water supply treatment plant or air pollution control facility, and other discarded material including solid, liquid, semisolid or contained gaseous material resulting from municipal, commercial, industrial, institutional, mining, or agriculture operations, and from community activities, or any combination of these factors which, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may:

a. Cause or significantly contribute to an increase in mortality or morbidity in either an individual or the total population.

b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed.

22. HMTF

Hazardous Materials Task Force, Philadelphia Fire Department.

23. IRRITANTS

A liquid or solid substance which, upon contact with fire or when exposed to air, gives off dangerous or intensely irritating fumes, but not including any poisonous material.

24. PLEPC

Philadelphia Local Planning Committee, responsible for preparing hazardous material plans and reports in accordance with SARA Title III for Philadelphia City/County.

25. MDO

Managing Director's Office, City of Philadelphia.

26. MSDS

Material Safety Data Sheet -- a document that provides information on chemical substances that must be provided from the manufacturer.

27. NRC-NATIONAL RESPONSE CENTER

A communications center for activities related to response actions, located at Coast Guard headquarters in Washington, D.C. The toll free number (800-424-8802) can be reached 24 hours a day for reporting actual or potential pollution incidents.

28. NRT-NATIONAL RESPONSE TEAM

Consisting of representatives of 14 government agencies, is the principal organization for implementing the National Contingency Plan (NCP). When the NRT is not activated for a response action, it serves as a standing committee to develop and maintain preparedness, to evaluate methods of responding to discharges or releases, to recommend needed changes in the response organization, and to recommend revisions to the NCP. The NRT may consider and make recommendations to appropriate agencies on the training, equipping, and protection of response teams; and necessary research, development, demonstration, and evaluation to improve response capabilities.

29. OEM

Office of Emergency Management, the emergency management agency for Philadelphia City/County.

30. ORGANIC PEROXIDE

An organic compound the bivalent-o-o structure and which may be considered a derivative of hydrogen peroxide where one or more of the hydrogen atoms have been replaced by organic radicals.

31. ORM-OTHER REGULATED MATERIALS

Any material that may pose an unreasonable risk to health and safety or property when transported in commerce and does not meet any of the definitions of the other hazard classes.

32. OXIDIZERS

Any substance such as chlorate, permanganate, inorganic peroxide, or a nitrate that yields oxygen readily to stimulate the combustion of organic matter.

33. PEMA

Pennsylvania Emergency Management Agency, to include the headquarters in Harrisburg and the three offices (Eastern, Hamburg, Central, Selinsgrove, Western, Indiana).

34. PERC

Pennsylvania Emergency Response Commission, responsible for overall policy and direction of statewide emergency planning and notification activities and organization consistent with the provisions of SARA.

35. PESTICIDE SAFETY TEAM NETWORK (PSTN)

Consists of approximately 40 emergency teams located throughout the country, operated by the National Agricultural Chemical Association. Teams will respond to hazardous emergencies involving agricultural chemical pesticides. CHEMTREC serves as the communications link for this program.

36. POISON (DOT Hazard class 2.3)

Poisonous gases of such nature that a very small amount of the substance mixed with air is dangerous to life.

37. POISON (DOT Hazard class 6 materials)

Substances, liquids or solids (including pastes and semisolids), other than DOT Hazard class 2.3 or irritating materials, which are known to be toxic to man so as to afford a hazard to health or which, in the absence of adequate data on human toxicity, are presumed to be toxic to man.

38. PYROPHORIC LIQUIDS

Any liquids that ignites spontaneously in dry or moist air or at temperatures below 130 degrees F.

39. RADIOACTIVE MATERIALS

Any material or combination of materials that spontaneously emits ionizing radiation and having a specific activity greater than 0.002 microcuries per gram.

40. RELEASE

Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles) of any hazardous chemical, extremely hazardous substance or toxic chemical.

41. RRT-REGIONAL RESPONSE TEAM

Composed of representatives of federal agencies and a representative from each state in a federal region. During a response to a major hazardous materials incident involving transportation of a fixed facility, the OSC may request that the RRT be convened to provide advice or recommendations on specific issues requiring resolution. Under the NCP, RRTs may be convened by the chairman when a hazardous materials discharge or release exceeds the response capability available to the OSC in the place where it occurs; crosses regional boundaries; or may pose a substantial threat to the public health, welfare, or environment, or to regionally significant amounts of property. Regional contingency plans specify detailed criteria for activation of RRTs. RRTs may review plans developed in compliance with Title III, if the Local Emergency Planning Committee so requests.

42. SARA

The "Superfund Amendments and Reauthorization Act of 1986", Title III of SARA includes detailed provisions for community planning to respond to hazardous material releases.

43. SPILL

Accident allowing material to flow or escape from containment.

44. SPONTANEOUSLY COMBUSTIBLE MATERIALS (SOLID)

Any solid substance (including sludges and pastes) which may undergo spontaneous heating or self-ignition under conditions normally incident to transportation or which may, upon contact with the atmosphere, undergo an increase in temperature and ignites.

45. SUPERFUND

The trust fund established under CERCLA to provide money the OSC can use during a cleanup.

46. TITLE III (SARA)

The "Emergency Planning and Community Right-To-Know Act of 1986". Specifies requirements for organizing the planning process at the state and local levels for specified extremely hazardous substances; minimum plan content; requirements for fixed facility owners and operators to inform officials about extremely hazardous substances present at the facilities; and mechanisms for making information about extremely hazardous substances available to citizens.

47. TOXIC CHEMICALS

Toxic chemicals identified as chemicals of concern by states of New Jersey and Maryland. This list of chemicals is subject to Toxic Chemical Release Reporting under SARA, Title III, Section 313.

48. USCG

United States Coast Guard.

49. WATER REACTIVE MATERIALS (SOLID)

Any solid substances (including sludges and pastes) which, by interaction with water is likely to become spontaneously flammable or to give off flammable organic gases in dangerous quantities.

ANNEX F ATTACHMENT 6

HAZARDOUS MATERIAL INCIDENT PLAN

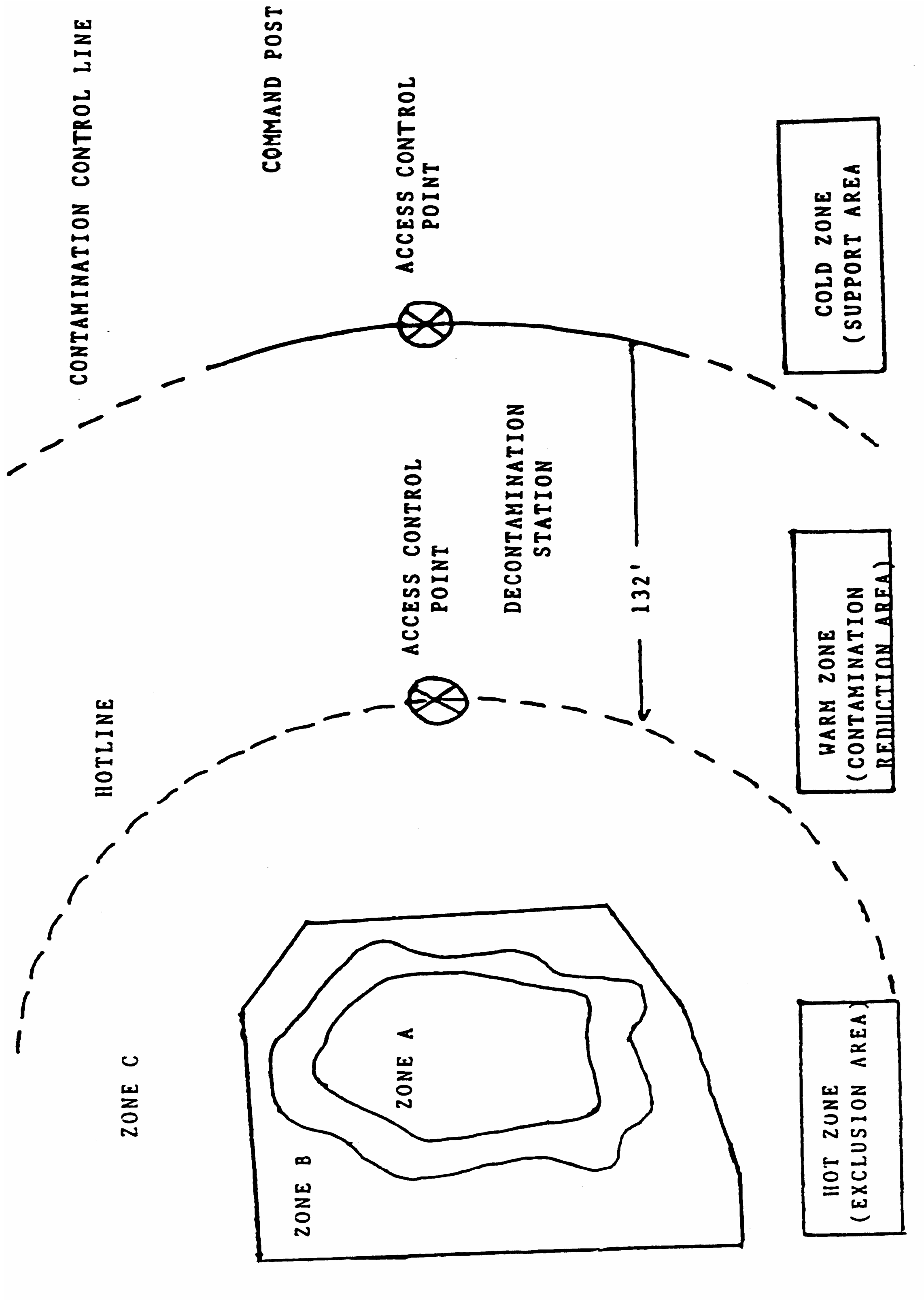
SOURCES OF TECHNICAL INFORMATION AND/OR ASSISTANCE

Philadelphia Fire Department	215-922-6000
Philadelphia Police Department Explosive Ordinance Disposal Unit	215-685-8013, 8067
Philadelphia Department of Public Health Air Management Services	686-5000 (Normal Working) 215-686-1776 (Other) 215-686-4514
Philadelphia Water Department Industrial Waste Unit	215-592-6233 (Normal Working) 215-686-4514 (Other)
Pennsylvania Department of Agriculture	(717) 783-5320
Pennsylvania Emergency Management Agency (PEMA)	(717) 783-8150 1-800-HBG-PEMA
Pennsylvania Department of Environmental Protection	270-1920 (Normal Working) 270-1900 (Other)
(DEP) (Hazardous Wastes Identification and Disposal)	(717)787-7381(Normal Working) 787-4343 (Other)
U. S. Center of Disease Control	(404) 633-5313
U. S. Coast Guard Environmental Protection Agency National Response Center Hazardous Assessment Computer System (HACS)	(800) 424-8802 (24-Hour)
U. S. Department of Energy (DOE) Information Hotline (Nuclear)	(301) 353-5555
U. S. Environmental Protection Agency (EPA)	814-9016
U. S. Nuclear Regulatory Commission (NRC) Emergency Hotline	337-5000 (202) 951-0550 (24-Hour)
Chemical Manufacturers Association	(202) 328-4200
CHEMTREC (Chemical Transportation Emergency Center)	(800) 424-9300 (24-Hour)
Chlorine Institute	(212) 682-4324
Hazardous Material Advisory Council	(202) 223-1271
National Pesticide Telecommunications Network	(800) 856-7378 (24-Hour)
Radiation Management Corporation	215-243-2950

ANNEX F ATTACHMENT 7

HAZARDOUS MATERIAL INCIDENT PLAN

SITE WORK ZONES


CONTAMINATION CONTROL LINE
COMMAND POST
ACCESS CONTROL POINT
COLD ZONE (SUPPORT AREA)
DECONTAMINATION STATION
ACCESS CONTROL POINT
132'
WARM ZONE (CONTAMINATION REDUCTION AREA)
HOTLINE
ZONE A
ZONE B
ZONE C
HOT ZONE (EXCLUSION AREA)

ANNEX F ATTACHMENT 8

PROTECTIVE ACTION DECISION-MAKING

General. Numerous factors affect the spread of hazardous materials. The decision-maker must carefully consider each of these factors in order to determine the areas that have been or will be affected, the health effects on people, and the appropriate protection action. The factors that affect public protective decisions include, but are not limited to:

- The hazardous material(s) involved, its (their) characteristics, amount, condition, configuration, and location;
- The population at risk, and its capability and resources to implement a recommended protective action;
- The time factors involved in the emergency and their effect on the selected protective action;
- The effect of the present and predicted meteorological conditions on the control and movement of the hazardous materials and the feasibility of the protective actions;
- The capability to communicate with both the population at risk and emergency response personnel before, during, and after the emergency; and
- The capabilities and resources of the response organizations to implement, control, monitor and terminate the protective action.

In deciding on the most appropriate protective action, two questions need to be answered: (1) Will in-place protection provide adequate protection? and (2) Is there sufficient time to evacuate? The next sections provide information to answer these questions. As much information as possible should be collected and evaluated in advance. The National Institute for Chemical Studies', Protecting the Public in a Hazardous Material Emergency, provide a checklist based on the above six factors. The Environmental Protection Agency's Technical Guidance for Hazards Analysis, Appendix H, provides additional factors to consider in choosing in-place protection and evacuation.

The public protection decision tree and checklist on pages F-A8, 9 and 10 was developed using these and other sources and can be used to help make this decision. It is highly recommended that a systematic procedure be developed and used to guide the decision-making. A decision-making process, endorsed ahead of time, and used during an incident in a sound manner within a scope of authority can be defended against liability claims. The completed checklist should be kept on file to record the decision-making process.

Evacuation. Evacuation of people from certain areas to prevent injury or death is sometimes an appropriate protective action. These areas may include those directly affected and those areas that may be potentially affected during the course of the incident (e.g., through wind shift, a change in site conditions). Evacuation is a complex undertaking. The first evacuation consideration, determining whether an evacuation is necessary and possible, involves a comprehensive effort to identify and consider both the released hazardous material, its effect on people, and the community circumstances (e.g., winter storm in a highly urbanized area). For an area that is only threatened by a hazardous release, it should be determined whether potential evacuees can be evacuated before hazards reach the area. To safely evacuate the area, a significant amount of lead time may be required. If it is decided to evacuate an area, the evacuation must be conducted in a well-coordinated, thorough, and safe manner. Evacuation decisions are of necessary very incident-specific and good judgement is necessary. Evacuation involves a number of steps as shown on the evacuation checklist. The back of the evacuation checklist page analyzes the benefits and negative aspects of evacuation.

A significant body of knowledge exists on evacuation implementation. Research shows:

- unless the family is together or missing members are safely accounted for, people may be less likely to evacuate;
- those persons of limited financial means are less likely to evacuate because they are less likely to have reliable transportation, resources for sheltering, or be absent from their jobs;
- residents with either prior knowledge of plans or who received specific instructions during the incident (routes, destination, etc.) were more likely to evacuate;
- a high percentage of persons see evacuation as a matter of personal choice and consider alternatives; therefore, enough information must be given so these persons can judge for themselves their personal risk and be convinced of the best action to take; and

- different ethnic groups vary in what they perceive as risk, their attitude toward authority, and the credibility they place on organizations which might be involved in the warning.

In-place Protection. During some hazardous material releases, there will not be enough time to evacuate because airborne toxicants have been released and are moving downwind rapidly. There also may be many uncertainties as to what is being released, how much, what are exposure levels now and what will they be, how dangerous are such levels, what areas will be affected, and who and what are in those areas. It may be that in-place protection is the only practical choice. For short-term releases, often the most prudent course of action for the protection of the nearby residents is to remain inside with the windows and doors closed and the heating and air conditioning systems shut off. An airborne cloud will frequently move past quickly. Vulnerable populations, such as the elderly and sick, may sustain more injury during evacuation than they would by staying inside and putting simple countermeasures in effect. In-place protection, therefore, may be a sensible course of action when the risks associated with an evacuation are outweighed by the benefits of in-place protection. Even when a protective action decision has not yet been made, in-place protection could be the initial response while the emergency situation is being assessed. The public protection decision tree and checklist on pages F-A8, 9 and 10 can be used to help make this decision. In-place protection involves a number of steps as shown on page F-A8-5. Page F-A8-4 analyzes the benefits and negative aspects of in-place protection.

EVACUATION CHECKLIST

____ 1. Determine areas that must be evacuated by readily identifiable boundaries.

____ 2. Secure authority for evacuation.

____ 3. Choose evacuation routes.

____ 4. Identify traffic control procedures.

____ 5. Identify shelters.

____ 6. Identify access control procedures.

____ 7. Assign tasks (i.e., traffic control, warning, shelter, transportation, etc.)

____ 8. Activate alert warning devices (i.e., sirens, patrol cars, etc.)

____ 9. Issue specific instructions to population (i.e., activate EBS, door-to-door, etc.)

____ 10. Conduct the evacuation. Consider:

- Permanent residents (day-time vs. night-time)
- Transient population (tourists at marinas, park, resorts, motels, etc.)
- Special populations (hospitals, nursing homes)
- Group quarters (prisons, jails, senior centers, care centers)
- Handicappers (mental and physical)
- Schools (public, private, parochial, pre-school)
- Large facilities (factories, sports stadiums, etc.)

____ 11. Provide transportation for those needing it (on school buses, public transit).

____ 12. Establish reception centers and public shelters.

____ 13. Provide emergency medical care, as necessary.

____ 14. Provide traffic control.

____ 15. Provide door-to-door checks after evacuation, if possible, and provide for security for evacuation area.

____ 16. Provide for the care of pets and farm animals.

____ 17. Choose and implement policy for those refusing to evacuate.

____ 18. Monitor and inspect areas for safe re-entry.

____ 19. Issue all-clear.

____ 20. Manage the return of evacuees.

EVACUATION

PRO

1. <u>Feel Safer</u>. Evacuees "feel" safer by traveling away from danger.

2. <u>Vehicles Are Available</u>. Most evacuees (65-76%) use an available family vehicle and many others (11-19%) use a relative's or friends vehicles.

3. <u>Destinations</u>. Most evacuees (67% est.) go to homes of relatives and friends, or to cottages and second homes.

4. <u>Family Units</u>. Nighttime evacuations are as family units (whereas daytime evacuations are usually without family unity, as many are at work, school, recreation, or shopping).

5. <u>Effective Precautionary Evacuations</u>. Precautionary evacuations are very effective when sufficient time is available or when the incident is under control (e.g., an overturned tank car accident where righting of the tank car or transfer of the chemical contents can be held off until the evacuation is completed, or where the population potentially affected is some distance away and the leak rate is slow.)

6. <u>Long Term</u>. An evacuation is necessary when an accidental release could be long term or when there is real potential for explosion.

CON

1. <u>Time Required</u>. Requires considerable time to accomplish successfully (may take 2 to 4 hours or longer).

2. <u>Lengthy Warning Message</u>. The public warning message may be very lengthy since it has to identify the danger, describe the area to be evacuated, list evacuation routes, identify public shelters, list what can and cannot be taken to shelters, etc.

3. <u>Extensive Support Services</u>. Requires setting up public shelters, traffic controls, and area security and providing special transportation for those without vehicles, handicapped, and on intensive care.

4. <u>Transient Populations</u>. Transient populations at parks, shopping centers, etc., may not be familiar with area to accomplish an evacuation.

5. <u>Potential Exposure</u>. If toxic fumes are present during the evacuation and wind changes speed/direction, evacuees could travel unaware into or through dangerous gases.

6. <u>"Panic Flight"</u>. The evacuation must be well controlled and organized with frequent credible information provided, to prevent "panic" and erratic flight.

7. <u>Multi-jurisdictional Problems</u>. Problems of coordination of effort exist when evacuees of one jurisdiction are sent to another, or where the area evacuated consists of parts of several municipalities.

8. <u>Liability</u>. The protective action decision-maker must have a sound decision-making process and act with good faith effort to prevent being held liable for injuries and damages and loss of business and production.

IN-PLACE PROTECTION CHECKLIST

____ 1. Determine area to be sheltered in-place by readily identifiable boundaries.

____ 2. Activate alert warning devices (vehicle).

____ 3. Issue specific instructions to population (through EBS, telephones, patrol vehicles, P.A. Systems).

____ 4. Implement in-place protection, including:

- Stay inside house or building, or go inside immediately,
- Close windows and doors,
- Turn off air conditioners and heating system blowers,
- Close fireplace dampers,
- Gather radio, flashlight, food, water, medicines, duct tape,
- Go to inside leeward area or basement of building and seal cracks and openings to provide extra protection (particularly if inside stay is to be longer than 2 hours),
- Do not use basements if toxic gases are heavier than air, and
- Provide protective breathing, if necessary (may be wet towel).

____ 5. Provide special sheltering for transient populations (people in campgrounds, marinas, parks, etc.).

____ 6. Provide special instructions to special populations (hospitals, nursing homes, etc.).

____ 7. Provide special instructions to group quarters (prisons, jails, senior centers, care centers).

____ 8. Provide special instructions/aid to handicappers (mental and physical).

____ 9. Once conditions have stabilized, monitor and inspect affected areas for safe exit.

____ 10. Issue all-clear.

____ 11. Instruct residents to go outdoors, air out house or building.

IN-PLACE PROTECTION

PRO

1. Immediate Protection. Protection can be provided immediately with little or no time required after warning.
2. Short Warning Message. The public warning message is short since it is only necessary to identify the danger, describe the area affected, describe expedients to reduce air infiltration to the home or building, etc.
3. Little Preparation Time. Little or no preparation time is necessary for shelter (only possible to "sealing" of room by expedient improvements).
4. Ideal Life Support System. The home is an ideal life support system with food, water, sanitation, medicines, bedding, clear air, communications (TV, radio, telephone), and familiar surroundings.
5. Short-term Exposures. May be very appropriate for short-term exposures (particularly "puff" releases) of 2-4 hours duration.
6. Little Staff Support. Requires considerably less emergency staff support than evacuation, as public shelter, traffic control, special transportation, and security personnel are not needed.
7. Reduced Liability. An in-place public protection action issued for a chemical leak may not be as liable as an evacuation order if the protective action decision was made using a sound decision-making process with good faith effort.

CON

1. Public Training Needed. The general public needs to be trained on shelter in-place actions and acceptance, as this action may be contrary to normal human nature to run from danger.
2. Indoor Air Uncertainties. Uncertainties may exist about whether indoor air concentrations will remain sufficiently low for a sufficiently long time period.
3. Explosive/Flammable Materials. Inappropriate where releases of explosive or flammable gases could enter structures and be ignited by furnace and water heater ignitions.
4. Long-term Exposures. May be very inappropriate for long-term exposures ("plume" potential) of 12 hours or more.
5. Need To Air Out. Infiltration of contaminated air into the structure over a period of time could result in high cumulative inhalation exposures unless the structure is vacated and "aired out" after the plume outdoors has passed on or dispersed.
6. Transients. Those in parks, marinas, campgrounds, and outdoor sporting events may not have suitable shelter available and would have to travel to such.

In-place Stay Time. Consideration of in-place protection as an effective public protection action requires an analysis, even if rudimentary, of the stay time possible in an enclosed indoor structure, such as a house or building. Several studies have been conducted on the degree of air infiltration into buildings. Dr. George O. Rogers concluded that air exchange rates in most United States dwellings range from .5 to 1.5 air changes per hour. Dr. David J. Wilson of the University of Alberta, Canada, also examined the rate of infiltration of outside air into buildings. He found that typical Canadian home air exchange rates vary between .2 and 1 air changes per hour. He noted that rates vary, depending on the season of the year and the tightness of construction. He noted that the most important factor that influences leakage is whether a house has an air-vapor barrier in the walls and ceiling. As a rough estimate, houses built in cold climates after 1960 usually have a vapor barrier, while older homes do not.

Although a discussion of air exchange rates is useful, Lindell and Perry state that for protective action decision-making, it is more useful to think in terms of "turnover time". As Dr. Wilson emphasizes, an infiltration rate of 1 air change per hour does not imply that all the clean air will be gone in one hour. In order for this to happen, all the clean air would somehow have t be "pushed out". In reality, the outside contaminated air infiltrates into the structure and mixes with clean air. Thus, the proportion of contaminated air actually rises more slowly than one might initially suppose. Using a typical air exchange rate of one hour, after one hour only 63% of the original air will have been replaced by contaminated air. After three hours, 95% of the indoor air will have been replaced. Using these typical air exchange rates, sheltering in-place is at least three times as effective as it first appears to be.

In-place protection also provides extended protection against peak concentrations of contaminated outdoor air. For buildings with .5 changes per hour, Dr. Wilson found that in 7.2 minutes, the maximum indoor concentration is only 2% of what is outdoors; at 1.2 hours, it is only 13%; and at 12 hours, it is still only 50%. Therefore, even though 95% of the indoor air will be contaminated in 3 hours, the concentrations are well below 50% of what they would be outdoors. For releases of relatively low concentrations, in-place protection provides a viable alternative to evacuation.

Once the plume has passed, the contaminated air is trapped inside the structure until clean outdoor air infiltrates. This process can be speeding up by giving an "all clear" signal that instructs persons to open doors and windows and ventilate the structure. This is an important action in the cycle of in-place protection implementation.

While the above analysis are based on normal house air infiltration rates, it is also possible to significantly increase the stay time by improvising a "sealed room" in the house. Sealing a room by covering window and door cracks and other openings with duct or masking tape and plastic sheets will minimize outdoor air infiltration and trap a good supply of clean air in the room. Weather-strip type seals can reduce infiltration rates by at least a factor of 3. Many studies and analyses have been conducted to measure the stay time of individuals in "sealed rooms," with no one study agreeing on time limit for sheltering in-place. Research conducted for civil defense survival shelters provides one indication of stay time with "sealed room" improvements. One study, taken from the ASHRAE Data Book, gauges the effects of chemicals on closed sheltered occupants. This book states that closed shelters in which there is no replacement of the air from outside sources would have the permissible stay time determined by the time required to raise the carbon dioxide concentration to 3% by volume. The stay time is determined by the following equation:

$$T \text{ (Hours to reach 3\% CO2)} = 0.04 \, \frac{V \text{ (Net cubic feet of space)}}{N \text{ (Number of occupants)}}$$

The ASHRAE Data Book further declares that 1 person could safely stay for 20 hours in a closed shelter having a net volume of 500 cubic feet (such as a large bathroom). Similarly, 3 persons (typical household size) could stay for 19.2 hours in a typical small living room or bedroom (12' x 15' x 8' at 1,440 cubic feet) that was "sealed". The book further advances that "the recommended minimum ventilation rate of 3 cubic feet per minute of air will maintain a carbon dioxide concentration of 0.50 percent and an oxygen content of 20.3 percent, by volume, in a shelter occupied by sedentary people," or 8 hours for 3 people in a 12' x 15' x 8' room. This is the level where air begins to have a stale odor, but is not exhausted. The MERCK Manual shows that the range of air requirement per person is 5 liters per minutes while at rest to 100 liters per minutes if active. Using 20 liters (0.7062 cubic feet) per person as an example, 3 persons with some movement in the same room as above would require 60 liters (2.1186 cubic feet) per minute, resulting in a maximum stay time of 11.3 hours.

It has been shown that in-place sheltering provides substantial protection from chemical releases, particularly for those which are short of low chemical concentrations.

HAZMAT PUBLIC PROTECTION DECISION CHECKLIST

BASIC FACTORS:

1. DATE ______________ 2. TIME ______________ 3. LOCATION ______________
4. CHEMICAL NAME ______________
5. FACILITY CLASSIFICATION ______________
6. Facility Protective Action Recommendation: ☐ IN- PLACE PROTECTION ☐ EVACUATION ☐ NONE NECESSARY ☐ NONE GIVEN

CHEMICAL FACTORS

7.	Physical Status:	☐ Gas	☐ Liquid	☐ Solid	☐ Dust	
8.	Odor:	☐ Yes	☐ No			
9.	Color:	☐ Yes	☐ No			
10.	Visible:	☐ Yes	☐ No			
11.	Vapors:	☐ Rise	☐ Ground Level			
12.	Water Soluble:	☐ Yes	☐ No			
13.	Flotation:	☐ Floats	☐ Sinks			
14.	Flammable:	☐ Yes	☐ No			
15.	Explosive:	☐ Yes	☐ No			
16.	Reactivity:	☐ With Air	☐ With Water	☐ Other Materials		
17.	Combustion Toxic:	☐ Yes	☐ No			
18.	Hazard:	☐ Highly Toxic	☐ Toxic	☐ Acute/Chronic	☐ Irritant	
		☐ Lungs	☐ Eyes/Skin	☐ Ingestion		
19.	Release Type:	☐ Continuous	☐ Puff	☐ Liquid Pool	☐ Vapor	
		☐ Dust	☐ Elevated	☐ Ground Hugging		
20.	Cause:	☐ Valve Failure	☐ Tank Puncture	☐ Seal Rupture	☐ Pipeline Break	☐ Other/Unknown
21.	Condition:	☐ Contained	☐ Contained, Potential Release		☐ Uncontained & Uncontrolled	☐ Uncontrolled

WEATHER FACTORS

22.	Wind Speed:	☐ 0 - 3	☐ 4 - 12	☐ 13 - 25	☐ 26-60	☐ 50 +
23.	Direction From:	☐ N	☐ NE	☐ E	☐ SE	☐ S
		☐ SW	☐ W	☐ NW	☐ Variable	
24.	Temperature:	☐ 32 or below	☐ 33 - 60	☐ 61 - 80	☐ 81 - 95	☐ 95 +
25.	Humidity:	☐ High	☐ Medium	☐ Low		
26.	Moisture:	☐ Rain	☐ Snow	☐ Fog	☐ None	
27.	Visibility:	☐ Daytime Sunlit	☐ Daytime Cloudy/Hazy		☐ Nighttime Moonlit	☐ Nighttime Cloudy/Hazy

AREA FACTORS (1-2 MI. RADIUS)

28.	Development:	☐ Urban	☐ Suburban	☐ Rural	
29.	Land Use:	☐ Residential	☐ Commercial	☐ Industrial	☐ Agriculture
30.	Specific Types:	☐ Houses	☐ Schools	☐ Hospitals	
		☐ Health Care Facilities	☐ Child Care Facilities	☐ Correctional Facilities	☐ Offices
		☐ Retail Stores	☐ Shopping Malls	☐ Industrial Plants	☐ Churches
		☐ Governmental Buildings	☐ Parks/Campgrounds	☐ Arenas/Stadiums	☐ Marinas
31.	Special Populations:	☐ Mentally Handicapped	☐ Mobility Impaired	☐ Hearing Impaired	☐ Elderly
		☐ Visually Impaired	☐ Tourists	☐ Non-English Speaking	☐ Resorts
		☐ Retirement Communities	☐ No Automobile in Household		
32.	Terrain:	☐ Uphill	☐ Downhill	☐ Level	☐ Trees/Foliage

☐ No Trees/No Foliage ☐ Open Unobstructed

PROTECTION FACTORS

33. In-place Protection Considerations

Yes	No	
☐	☐	Can public accept
☐	☐	Need for short term protection
☐	☐	Need for long term protection
☐	☐	Can accomplish quickly
☐	☐	Can provide for those without indoor structures available (marinas, parks, sport events, etc.)
☐	☐	Can turn off heating/air conditioning
☐	☐	Are fumes non-flammable or non-explosive indoors
☐	☐	Can provide public warning/clear instructions

34. Evacuation Considerations

Yes	No	
☐	☐	Can use evacuation routes
☐	☐	Can set up traffic controls
☐	☐	Can secure evacuated area
☐	☐	Can establish public shelters
☐	☐	Can transport those without
☐	☐	Can close businesses, schools
☐	☐	Can evacuate without harmful exposure
☐	☐	Can provide for transients (parks, marinas)
☐	☐	Can provide clear public warning/clear instructions
☐	☐	Can handle multi-jurisdictions (if necessary)

35. Time Estimates

Unprotected Exposure __________ hours

In-place Protection __________ hours

Evacuation __________ hours

DECISION **COMMENTS:**

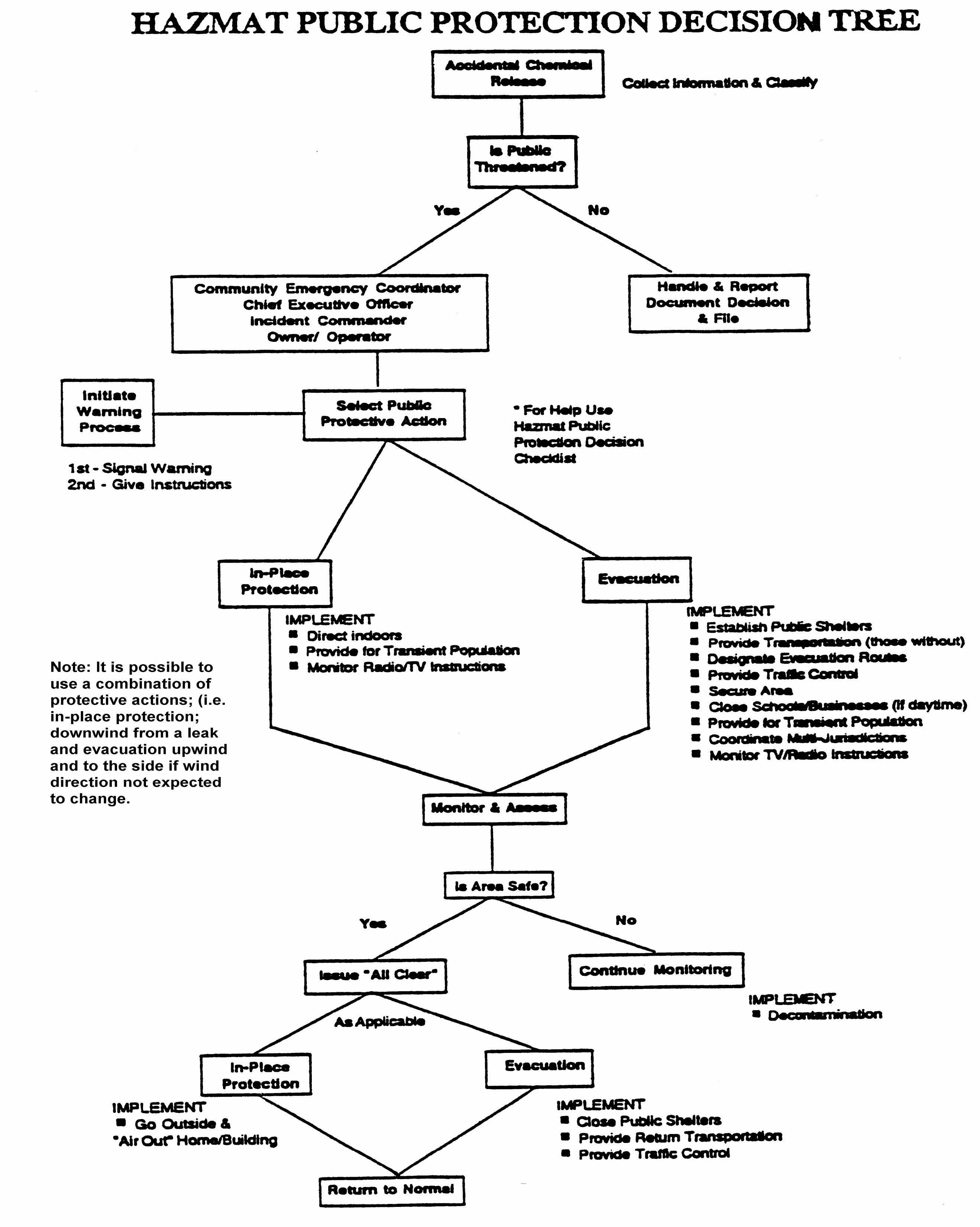
36. ☐ In-place Protection

37. ☐ Evacuation

38. ☐ Combination

39. ☐ No Action

PUBLIC PROTECTION DECISION CHECKLIST



EXPLANATORY COMMENTS

Items 1-2-3 Self explanatory.

Item 4 PRINT accurately and completely the chemical name.

Item 5 Name the classification assigned to the incident. (This should be included in the facility's emergency notification).

Item 6 Check off the public protection action suggested by the facility, if any. (This should be included in the emergency notification).

Item 7 The primary concern is airborne dispersion in concentrations that could cause health effects or death. Gases typically become airborne more readily than liquids. Liquids and molten solids become airborne by evaporation. The surface area (pool size) of the spill, surface temperature, vapor pressure, and wind speed are major factors that affect the rate of evaporation. A higher vapor pressure, a larger surface area (pool size), a greater wind speed, or a higher temperature than ambient will provide a faster evaporation. Molten solids may volatilize and those in a solid state may not. Solids as powders or dust may only become airborne if propelled into the air by force, such as explosion or wind.

Item 8 The existence of odor makes it easier to detect a presence of the chemical to emergency responders as well as the public. This will increase the perceived presence of danger. However, some chemicals (such as hydrogen sulfide) have a detectable odor (like rotten eggs) at a low p.p.m., but numb the sense of smell at higher lethal levels.

Item 9 The existence of color makes it easier to detect the presence of the chemical to emergency workers, as well as the public, as they will be able to see its location and extent.

Item 10 Visibility is affected by time of day, weather conditions, the existence of color. A chemical may not be visible if it is colorless, or one with color may not be visible at night. A chemical may also be masked by fog or snow if it is a similar whitish color. Perception of danger is reduced when invisible.

Item 11 Vapors that rise may be dispersed faster by winds, or if little or no wind may rise straight up and be a minimal problem to surrounding areas. Also, vapors rising straight up due to no surface wind could encounter above ground downwinds and drop the vapors to areas beyond those immediately adjacent. Vapors that stay at ground level may settle into low lying areas, into lakes and rivers, and into basements and stay for longer periods.

Item 12 Chemicals that are water soluble may be absorbed by any water or moisture present on trees and foliage, lakes and streams in the plume, or by firefighting spray. However, they may also be absorbed by moisture present in human respiratory systems, eyes, nasal passages, and skin.

Item 13 A chemical that floats may be dammed up and absorbed. However, floating pools of chemicals on water may evaporate quicker. They may also float downwind if blown by winds.

Item 14 Flammable chemicals present a threat of fire if ignited and when burning may produce toxic fumes and pollutant particles and may travel downwind.

Item 15 Explosive chemicals may provide instantaneous dispersion of toxic fumes and pollutant particles when detonated.

Item 16 Some substances generate heat when mixed with water. Some strong acids may evolve into large amounts of fumes when in contact with water or moisture. This may consist of fine droplets of acid in air and acid-vapors. Such fumes are usually highly irritating, corrosive, and heavier than air. Strong oxidizing or reducing agents are able to decompose organic materials and react with a variety of inorganic materials to generate heat, flammable gases, and possible toxic gases. Heat generated could be sufficient to ignite combustible materials or flammable gases resulting in fire or explosion. The combination of various chemicals may produce new chemicals quite different and more severe than the original materials.

Item 17 Many substances become highly toxic when burned and some may form even more toxic materials when in combination with heat and water (if present from fire spray or otherwise).

Item 18 Self explanatory.

Item 19 Gases escaping under pressure from a tank or cylinder form a cloud or plume. A rapid release through pressure relief valves, punctures or broken pipes may take several seconds to several minutes. On the other hand, a flow from a spill or leak at fittings, or tears or large punctures may take minutes to days. Liquids may flow along the ground as a stream while simultaneously vaporizing and being absorbed into the ground or other materials. A puff may occur with a release over a short period of time. A release that is elevated will mix with air and tend to disperse more quickly.

Item 20 The cause may provide an indication of the potential for control and reduction of release duration and amounts. A valve failure may be easier to handle than a puncture, split, or crack in a tank.

Item 21 A release that is contained is less of a problem. On the other hand, a contained incident may not be an immediate problem, but has potential for release if corrective actions are not able to be accomplished in time or fail. Some incidents may be controlled, but uncontained. In such cases, the situation may be continuous, but may not get any worse. Others may be completely out-of-hand and out-of-control and maximum release of all contents will occur over a period of time.

Item 22 Higher wind speeds will disperse gases quicker than low speeds. However, they could also result in higher concentrations further downwind in a narrower band than lower speeds. Higher speed winds will also increase contaminated air infiltration into homes and buildings. Lower speed winds result in reduced dispersion and tend to spread contaminated air in multi-directions. Gusty winds are more unpredictable for dispersion than steady winds as wind eddies from hills, trees, and buildings may spread contamination in several different directions.

Item 23 Self explanatory.

Item 24 Higher temperatures increase evaporation of liquids and expansion of gases. Most liquids become less active in temperatures below freezing.

Item 25 High humidity increases air absorption of water soluble chemicals. Also high humidity conditions may be associated with stagnant air conditions and air inversions.

Item 26 Rain or snow occurring will tend to purge the atmosphere of contamination. Heavy rain will drop contaminants in heavier concentrations and closer to the origin which would result in greater exposure close-in. Precipitation may also cause chemical reactions, depending on the type of chemical.

Item 27 The amount of visibility has an influence on the ease or difficulty of accomplishing emergency response activities and public protection actions. These can be much more difficult and hard to accomplish particularly at night and under low light conditions.

Item 28 Urban and suburban areas will be more populated than rural areas. Even though rural areas may have less population to take protective actions, it may be much more difficult to warn them and monitor protective actions due to the widely spaced locations of homes and buildings.

Item 29 Predominantly residential areas will be more populated at night, than between 7:00 a.m. to 6:00 p.m. During these normal working hours, 2 out of every 3 residents (67%) will be at work, school, shopping, and at recreational activities (many of which will be out of the immediate area). During these same hours, commercial, industrial, and school areas represent locations of high concentrated populations.

Item 30 Some affected areas, if large enough, may include many, if not all, of these types of facilities. Each may present different and unique methods of warning and evacuation/in-place protection needs. Tourists and recreational populations may be on boats, at marinas, in parks and campgrounds, and otherwise out-of-touch with radio, TV, and telephone communications.

Item 31 Special populations, particularly the mobility impaired, may required transportation if an evacuation is to be conducted. Also, many special populations do not drive and do not have a private vehicle available and are usually solely dependent on public transportation.

Item 32 The type of terrain will affect dispersal of airborne chemicals. Heavier than air contaminants will stay closer to the ground and flow downhill and settle to low lying areas. The reverse is true for lighter than air chemicals. Trees and foliage will serve as obstructions to dispersal and may even absorb some substances on leaves and branches. Buildings and structures in built up areas will also tend to obstruct dispersion and will result in some absorption through infiltration into the insides of buildings.

Items 33-34 Consider each of these factors in making the decision.

Item 35 Develop general time estimates based on a review of all of the above factors. Use best judgements and do not spend too much time. The time estimate for unprotected exposure should consider the amount and rate of release, the chemical and weather factors, and the travel distance to the potentially affected populations. The time estimates for both in-place protection and evacuation should be an addition of the warning time, preparation time, and the travel/movement time.

Items 36-39 Based on a comparison of the time estimates and an overall review of the factors, SELECT an appropriate decision for public protection. IMPLEMENT this decision and file this worksheet for reference.

ANNEX MAINTENANCE AND CONCURRENCE

Responsibility for the Hazardous Materials Annex has been assigned to the Office of Emergency Management (OEM) by the Managing Director. The Annex will be reviewed and updated as necessary, but at least biennially. Whenever the Annex is implemented during an emergency response or for an exercise, a review will be conducted to determine what changes, if any, are necessary. Reviews and updates by OEM will be coordinated with all parties assigned responsibilities in this Annex.

Development, maintenance and implementation of this Annex will be in accordance with and under the auspices of the City of Philadelphia Emergency Operations Plan, developed in consonance with the Commonwealth of Pennsylvania Emergency Operations Plan which is in conformance with Pennsylvania's Emergency Management Services Code and Radiation Protection Act, the Federal Civil Defense Act of 1950, the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the Federal Superfund Amendments and Reauthorization Act of 1986 (SARA) and applicable regulations of the Federal Emergency Management Agency and the Nuclear Regulatory Commission.

We the undersigned adopt, accept, concur with and support the provisions of this Annex as part of the City of Philadelphia Emergency Operations Plan.

*

HAROLD B. HAIRSTON Fire Commissioner City of Philadelphia	DATE

*

MICHAEL A. NUCCI, JR. Emergency Management Director City of Philadelphia	DATE

*

JOSEPH S. MARTZ Managing Director City of Philadelphia	DATE

* Signatures and dates on file at Office of Emergency Management, 240 Spring Garden Street, City

Waterways Contamination Response Protocol

The Industrial Waste Unit (IWU) is PWD's first responder in the event of suspected or known waterways contamination events. PWD Water Treatment has in place procedures to respond to threats that have the potential to affect finished water quality (see "PWD Contaminant Response Plan"). Those procedures will be followed once Water Treatment becomes aware of an event, either via notification by IWU or otherwise. This document is intended to clarify IWU's place in the lines of communication relevant to a known or suspected waterways contamination event. It is not intended to lay out detailed investigatory procedures that IWU will follow during such an event.

Notification to IWU of a Waterways Contamination Event

IWU can be made aware of an event in any of the following ways:

- Member of public or PWD employee calls PWD Customer Information Unit (CIU); CIU relays information to Municipal Dispatcher; Municipal Dispatcher relays information to IWU Standby person.
- PWD employee calls Municipal Dispatcher; Municipal Dispatcher relays information to IWU Standby person.
- PWD Water Treatment personnel call IWU Standby person (directly or via Municipal Dispatcher).
- Early Warning System (EWS) sends email to IWU Standby person.

Note: IWU receives notification via other routes (e.g. direct call to IWU form Philadelphia Fire Department). Use of the Standby / Priority Call list may result in a call being made to the wrong IWU person, as schedule changes can be made at any time. A call to the Municipal Dispatcher is the recommended procedure to notify IWU.

Actions by IWU related to a Waterways Contamination Event

IWU Notified by PWD Water Treatment:

- Water Treatment follows "PWD Contaminant Response Plan."
- IWU makes attempt to identify source of contamination (if not already known) and stop or contain it (if not already done).
- IWU standby person notifies EWS by phone or online report form.

IWU Notified by other than PWD Water Treatment (e.g. Municipal Dispatcher):

- IWU makes preliminary assessment of type, extent, source, etc. of contamination.
- If warranted, IWU notifies PWD Water Treatment, who follows "PWD Contaminant Response Plan".
- IWU continues to attempt to identify source of contamination (if not already known) and stop or contain it (if not already done).
- IWU standby person notifies EWS by phone or online report form.

In any case, IWU will follow its usual procedures for entering industrial or commercial facilities, notifying PWD Sewer Maintenance or Flow Control, taking samples and delivering them to the appropriate lab for analysis, etc. IWU will request assistance from the Pennsylvania Department of Environmental Protection, the Philadelphia Fire Department's HazMat unit and/or other entities as appropriate.