



2018 Annual Status Report

Long Term 2 Enhanced Surface Water Treatment Rule Watershed Control Program Plan

Queen Lane Drinking Water Treatment Plant
Schuylkill River, Philadelphia, PA

Prepared by the Philadelphia Water Department

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List of Acronyms

AEU	Animal Equivalent Unit
BCCD	Berks County Conservation District
BCWSA	Berks County Water and Sewer Association
BMP	Best Management Practice
CAC	Citizens Advisory Council
CAFO	Concentrated Animal Feeding Operation
CDC	Community Design Collaborative
CNMP	Comprehensive Nutrient Management Plan
CSO	Combined Sewer Overflow
CREP	Conservation Reserve Enhancement Program
DRBC	Delaware River Basin Commission
DRWI	Delaware River Watershed Initiative
EPA	United States Environmental Protection Agency
EWS	Early Warning System (Delaware Valley)
FWWIC	Fairmount Water Works Interpretive Center
GCCW	<i>Green City, Clean Waters</i>
LTCPU	Long Term Control Plan Update
LT2	Long Term 2 Enhanced Surface Water Treatment Rule
MS4	Municipal Separate Storm Sewer System
NLCD	National Land Cover Database
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
PADEP	Pennsylvania Department of Environmental Protection
PDE	Partnership for the Delaware Estuary
PEC	Pennsylvania Environmental Council
PHS	Pennsylvania Horticultural Society
PWD	Philadelphia Water Department
SAN	Schuylkill Action Network
SAS	Schuylkill Action Students
SRDC	Schuylkill River Development Corporation
SRG NHA	Schuylkill River Greenways National Heritage Area
SRRF	Schuylkill River Restoration Fund
SWA	Source Water Assessment
SWPP	Source Water Protection Plan
WCP	Watershed Control Plan
WSS	Watershed Sanitary Survey
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
USDA	United States Department of Agriculture

1.0 Executive Summary

In 2018, the Philadelphia Water Department (PWD) completed its Watershed Control Program Plan (WCP) for the Queen Lane intake in the Schuylkill River Watershed in compliance with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2). The plan reduces *Cryptosporidium* loadings in the Schuylkill River watershed from priority sources such as wastewater effluent, agriculture, animal vectors, and urban stormwater runoff. Source water protection initiatives as well as structural control measures were identified and implemented as part of the WCP to achieve a target *Cryptosporidium* load reduction. Completion of WCP objectives is summarized below by priority source along with highlights from the first six years of the WCP.

Priority Source: Wastewater Effluent

The UV installation projects upstream of the PWD Queen Lane intake, at Upper Gwynedd Wastewater Treatment Plant (WWTP) and Fleetwood WWTP, are fully operational and effective at inactivating *Cryptosporidium* oocysts and reducing the public health risk. In 2015, PWD completed a comprehensive Schuylkill Watershed Sanitary Survey (WSS) detailing the status of wastewater treatment technologies and sewage system planning efforts throughout the Schuylkill River watershed. PWD continues to track developments in the watershed related to Act 537 sewage facility planning through the Schuylkill Action Network (SAN) Pathogen and Point Source Workgroup and updates the WSS accordingly. Additionally, PWD engages wastewater utilities through its continued participation in the SAN Pathogen and Point Source workgroup and as the owner of the Early Warning System for the lower Delaware River watershed. In 2018, the SAN Pathogen and Point Source Workgroup strengthened communication between and provided educational resources to wastewater and drinking water utilities to improve source water protection efforts. The group also facilitated data and information sharing to document wastewater treatment technologies and improvements, and investigated evolving source water issues - including unregulated contaminants.

Priority Source: Agriculture

During the first five years of the WCP PWD has supported the construction of either manure storage basins or vegetated buffers at 10 separate agricultural operations in the watershed through its participation and annual contribution to the Schuylkill River Restoration Fund (SRRF). In 2018, \$72,067 from PWD's annual contribution to the SRRF funded two watershed protection projects in the Schuylkill River watershed. These priority projects were selected for the implementation of agricultural best management practices on farms to support WCP *Cryptosporidium* control objectives. The A. Burkholder Farm, a 60-acre property in the Saucony Creek Watershed in Berks County, received a \$50,000 SRRF grant, matched by several partner organizations to construct a dry roofed manure storage area and to install rain gutters and other stormwater controls on the property. The Brown Farm, a 511-acre property on the main stem of Manor Creek in the Maiden Creek Watershed in Albany Township, Berks County, project was

awarded \$90,000 in 2018 SRRF funds, of which \$22,067 was specifically awarded by PWD. BMP projects at the Brown Farm include the construction of a dry-roofed feeding and manure storage area, the installation of stream bank and wetland exclusion fencing, a water supply well establishment, the installation of an automatic drinker, rain gutter improvements, and other on-site stormwater controls.

PWD continues to be an active participant in the SAN Agricultural Workgroup to most efficiently coordinate efforts among watershed partners with similar environmental protection objectives. Through the SAN, education and outreach materials were developed and additional stakeholders were engaged to promote the implementation of agricultural best management practices and nutrient management plans throughout the watershed. In 2018, SAN partners continued to help develop and implement Comprehensive Nutrient Management Plans (CNMP) were for agricultural properties across the Schuylkill River watershed.

Priority Source: Animal Vectors

At Fairmount Park properties and PWD facilities Canada geese, known mechanical vectors of *Cryptosporidium*, were removed and nests and eggs treated through a partnership with the US Department of Agriculture (USDA) during each year of the WCP. In FY2018, a total of 35 Canada goose eggs were removed and 14,368 geese were harassed or removed from the Fairmount Park properties. A total of 49 eggs were treated and 5,174 geese were dispersed or removed from PWD facilities. In 2018 PWD also continued monitoring and analysis of *Cryptosporidium* occurrence and animal sources in the watershed through a research contract with Lehigh University. Both ongoing initiative are expected to continue into future years of the WCP.

Priority Source: Urban Stormwater

Stormwater best management practices (BMPs) were not directly included in the scope of the WCP. Stormwater projects are already implemented through a variety of other programs, including stormwater ordinances and MS4 permits. Stormwater management practices are implemented throughout the City of Philadelphia as part of PWD's *Green Cities, Clean Waters* (GCCW) program, which is a 25-year plan to reduce stormwater pollution by 85% through the installation of green infrastructure. Since the inception of GCCW in June 2011, PWD and private developers have implemented over 1,300 green stormwater tools within the City of Philadelphia. Additionally, through the Rain Check program residents of Philadelphia learn about the benefits of green stormwater infrastructure and how to select the best options for their property. In FY2018, a total of 76 workshops were held with 1,815 participants. As a result of the FY2018 program, residential properties in Philadelphia have installed a variety of stormwater management tools including 6 depaving projects and 90 installations of permeable pavers to allow for better infiltration of stormwater, 103 downspout planters, 20 rain garden plantings, and 674 rain barrels.

Through the SAN, a number of riparian buffer plantings and education and outreach events have occurred throughout the watershed. The SAN Stormwater and Education & Outreach Workgroups have engaged students in managing stormwater on school campuses to benefit MS4 communities through the Schuylkill Action Students (SAS) program. In 2018, the Stormwater Workgroup provided technical assistance to schools with projects ranging from rain gardens to master planning and implementation. PWD plans to continue its participation in the SAN Stormwater Workgroup into the future years of the WCP.

Estimated Cryptosporidium Reductions from WCP Projects

The WCP was developed with the objective of reducing the *Cryptosporidium* load to the Queen Lane intake on the Schuylkill River by 2.7% or an estimated range of 2.1E+11 to 3.8E+13 oocysts per year. The annual removal of *Cryptosporidium* from Queen Lane source water due to the installation of 10 agricultural best management practices implemented over 5 years is estimated to be in the range of 2.87E+10 to 4.31E+13 oocysts per year, or 13.6-112% of the targeted reduction. Including the installation of UV disinfection at upstream WWTPs, the estimated reduction of viable *Cryptosporidium* is in the range of 2.89E+10 to 6.45E+13 oocysts per year or 13.7-168% of the targeted reduction. Targeted reduction estimates serve as a preliminary step in developing a quantitative assessment of Schuylkill River watershed *Cryptosporidium* loading reduction, and uncertainties in the method emphasize the need for further research.

The Future of the WCP

The second round of LT2 compliance sampling ended in March 2017. Each PWD intake on the Schuylkill and Delaware Rivers was sampled bimonthly for a period of 2 years. *Cryptosporidium* results from the Queen Lane Water Treatment Plant achieved an average result less than the 'Bin 1' threshold value of 0.075 oocysts per liter; however, the Queen Lane Water Treatment Plant remains classified as 'Bin 2' due to sampling results obtained from the first round of LT2 monitoring. The Queen Lane Water Treatment Plant will continue to achieve individual and combined filter effluent performance requirements as approved by PADEP to maintain compliance with the first round of LT2 sampling. PWD will continue ongoing initiatives outlined in the WCP through its existing Source Water Protection Program framework and will explore opportunities to expand WCP efforts into the Delaware River watershed.

2.0 Introduction

In April 2011, the Philadelphia Water Department (PWD) completed a Watershed Control Plan (WCP), and after receiving approval from the Pennsylvania Department of Environmental Protection (PADEP) the WCP went into effect December 2012. The WCP presents a comprehensive source water protection approach to reducing levels of infectious *Cryptosporidium* in finished drinking water (US EPA, 2006). The elements of the WCP were achieved through previously established and ongoing efforts of the PWD Source Water Protection Program and through WCP actions aimed to specifically reduce levels of *Cryptosporidium* in the Schuylkill River watershed, a PWD drinking water source. The following report documents PWD completion of WCP initiatives during 2018. Despite completion of WCP goals, the existing framework of the plan and its underlying initiatives will continue to be maintained and developed.

3.0 Background

The US Environmental Protection Agency (EPA) published the first source water quality-based drinking water regulation on January 5, 2006. The Long Term 2 Enhanced Surface Water Treatment Rule (LT2), a series of amendments to the Safe Drinking Water Act, serves to protect the public from waterborne illness caused by *Cryptosporidium* and other microbial pathogens in drinking water. In the United States, *Cryptosporidium* has been the cause of several outbreaks of Cryptosporidiosis, a gastrointestinal disease particularly dangerous for immunocompromised individuals. The LT2 requires public drinking water systems with surface water sources, or groundwater sources influenced by surface water, to monitor monthly for *Cryptosporidium* at each supply intake for two years. The observed *Cryptosporidium* concentrations categorize each intake into one of four 'Bins.' Public water systems placed in Bin 1 indicate the lowest concentrations of *Cryptosporidium* and require no additional treatment. Public water systems placed in Bins 2, 3 and 4 require 4-log, 5-log and 5.5 log removals, respectively. Public water systems using conventional treatment processes, coagulation, flocculation, sedimentation, filtration, are assumed to achieve a 3-log removal. Therefore, additional 1-log, 2-log or 2.5 log treatment credit(s) is required of a conventional treatment facility if placed in Bins 2 through 4. The EPA provides a "microbial toolbox" describing options to earn additional treatment credits including source water protection and management programs, pre-filtration processes, treatment performance programs, additional filtration components and inactivation technologies.

PWD *Cryptosporidium* monitoring data categorized each of Philadelphia's three drinking water treatment plants (WTPs) into Bins. During the first round of LT2 compliance sampling, Baxter and Belmont achieved Bin 1 status with average oocyst concentrations less than 0.075 per liter. However, Queen Lane data resulted in an average oocyst concentration of 0.076 per liter falling into Bin 2. Since Queen Lane uses conventional treatment processes, and automatically receives a 3-log removal credit, an additional 1-log removal credit was required. PWD selected to use the combined filter effluent for 0.5-log credits, the individual filter effluent for 0.5-log credits,

and the development and implementation of a WCP for 0.5-log back up credits. PWD submitted a WCP to the PADEP in April 2011 and received approval in December 2012. A timeline of critical LT2 events is shown in Table 3-1.

Table 3-1: LT2 WCP Timeline

Action	Reporting	Due Date
Notification to State of intent to submit WCP		April 2010
WCP submitted to State		April 2011
State approved WCP		December 2012
	Presentation of 2013 Annual Status Report to State	January 2014
	2013 Annual Status Report due to State	January 2014/ Approved May 2014
Sampling Plan for 2nd round of monitoring due		January 2015
2014 Annual Status Report due to State	2014 Annual Status Report due to State	January 2015/ Approved February 2015
Second round of <i>Cryptosporidium</i> sampling scheduled to begin		April 2015
	Watershed Sanitary Survey due to State	December 2015
	2015 Annual Status Report due to State	January 2016
	2016 Annual Status Report due to State	January 2017
Second round of <i>Cryptosporidium</i> sampling scheduled to end		March 2017
Bin classification and supporting data from 2nd round of monitoring due to State		October 2017
	2017 Annual Status Report due to State	January 2018
	2018 Annual Status Report due to State	January 2019

Note: Shading indicates milestones that have been completed at the time of the report's preparation.

4.0 Source Water Protection Program Initiatives

After recognizing the need for a watershed wide effort to improve and promote the health of the Schuylkill River watershed, PWD, EPA, PADEP, Delaware River Basin Commission (DRBC), and Partnership for the Delaware Estuary (PDE) formed the Schuylkill Action Network (SAN) in 2003. The SAN is comprised of workgroups to address several watershed issues: abandoned mine drainage, agricultural runoff, stormwater runoff, pathogens and compliance,

land protection, and education and outreach. PWD participates in many projects led by these workgroups, but because the Schuylkill River watershed is a diverse watershed affected by a range of pollution sources, PWD looks to the expertise of SAN partners to achieve certain watershed protection goals and WCP objectives. The SAN Agriculture and SAN Pathogens and Point Sources Workgroups are particularly important to the WCP because they address potential sources of *Cryptosporidium* in the watershed. To further support this effort, PWD continues to contribute funding to the administration of SAN through a contract with PDE to support the SAN coordinator position and SAN workgroup leadership.

In the WCP, PWD outlines ongoing and proposed initiatives from the Schuylkill River watershed Source Water Protection Plan (SWPP) that are relevant to the control of *Cryptosporidium* upstream of the Queen Lane intake. In the WCP, PWD identifies four categories of source water protection initiatives. The four categories include mitigation of *Cryptosporidium* from wastewater treatment plant (WWTP) effluent, agricultural runoff, animal vectors, education and outreach in the City and watershed. This section discusses the contribution PWD has made towards each of the ongoing and proposed initiatives by category.

4.1 Wastewater Discharge/Compliance

Effluent from WWTPs upstream of the Queen Lane intake is a source of *Cryptosporidium* in the watershed (PWD, 2002; PWD, 2011). Although only 2% of the Schuylkill River watershed is in Philadelphia, PWD plays a leadership and supporting role in multiple initiatives outside of the city. These initiatives aim to reduce the risk of *Cryptosporidium* contamination from treated WWTP effluent and minimize the occurrence of raw sewage discharge. Ongoing and proposed initiatives in Philadelphia and in the Schuylkill River watershed are detailed in Table 4-1 and Table 4-2, both reproduced from the WCP. Contributions made towards these initiatives is summarized in this section.

Table 4-1: Ongoing Wastewater Discharge/Compliance SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>4.1.1 Philadelphia's Act 537 Plan Continue to regularly review and update Philadelphia’s Act 537 Plan. The plan was last updated on February 27th, 2009.</p>
	<p>4.1.2 Combined Sewer Overflow (CSO) and Municipal Separate Storm Sewer System (MS4) National Pollutant Elimination System (NPDES) Permit Annual Report Continue to implement the initiatives outlined in the annual Combined Sewer Management and Stormwater Management Plans in order to fulfill the City’s Stormwater and CSO permits. Ongoing initiatives include monitoring as part of the Defective Lateral Detection and Abatement Program and completion of the Main and Shurs Elimination project.</p>
	<p>4.1.3 Early Warning System Continue to maximize usage for the Early Warning System while maintaining the system’s ongoing operations and maintenance needs.</p>
Schuylkill River Watershed	<p>4.1.3 Provide Project Support for the Lehigh University <i>Cryptosporidium</i> Study Continue to support Lehigh University’s <i>Cryptosporidium</i> source tracking study by providing support in terms of sampling, elution, and project management and oversight.</p>
	<p>4.1.5 SAN Pathogens and Point Source Workgroup Continue to support efforts of the SAN Pathogens and Point Source Workgroup. The strategies for the 2018 SAN Pathogens and Point Source Work Plan are as follows: <ol style="list-style-type: none"> 1) Strengthen communication between and provide educational resources to wastewater and drinking water utilities to improve source water protection efforts. 2) Facilitate data and information sharing to document wastewater treatment technologies, improvements, and other pertinent source water protection information. 3) Investigate evolving source water issues, such as unregulated contaminants, and develop a better understanding of what these issues mean for water suppliers source water protection strategies. 4) Promote pathogen successes and understanding of pathogen water quality issues and solutions to target audiences in the watershed. </p>
	<p>4.1.6 Abate Wildcat Sewers Continue to support SAN in its efforts to identify and abate wildcat sewers throughout the Schuylkill River watershed.</p>

Table 4-2: Proposed Wastewater Discharge/Compliance SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>4.1.7 PWD Schuylkill River Watershed 10-Year Review</p> <p>Develop a Source Water Assessment (SWA) update for the Schuylkill River by revisiting priorities established in the 2002 assessment and updating water quality analyses with recent data.</p>
	<p>4.1.8 Support <i>Cryptosporidium</i> Monitoring at Major WWTPs and Inclusion in NPDES Permits</p> <p>Support/help develop an effluent monitoring plan for <i>Cryptosporidium</i> at major WWTPs in the Schuylkill River watershed. In conjunction with this effort, should <i>Cryptosporidium</i> monitoring be considered for incorporation into NPDES permits, PWD will support such an effort. However, in regard to <i>Cryptosporidium</i> monitoring, it is very important to PWD that the EPA promulgate an analytical method that takes into account critical factors such as recovery rates and sample variability. Track the progress of these initiatives by continuing to attend SAN Pathogens/Compliance workgroup meetings.</p>
Schuylkill River Watershed	<p>4.1.9 Track Wastewater Related Changes in the Watershed</p> <p>Through continued participation in the SAN Pathogens/Compliance workgroup, help ensure that high-priority areas requiring regulatory enforcement action are identified and addressed. Areas of concern may be identified using the following measures to track wastewater related changes in the watershed.</p> <ul style="list-style-type: none"> o Assist the workgroup in identifying high-priority municipalities in need of updated Act 537 Plans in the Schuylkill River watershed. Municipalities with outdated plans located in Zones A and B of the area of influence are especially relevant. o Assist the workgroup at continuing to align sewage facilities planning, or Act 537, enforcement with the wasteload management reports filed under Chapter 94. o In addition to the above two measures, track WWTP upgrades, new facilities and community sewer improvement projects (such as the sewerage of new areas) by reviewing Part II Permits. o Track projects funded under government loan programs, such as PennVest.
	<p>4.1.10 Wet Weather and High Flow Management Education for WWTP Operators</p> <p>Coordinate with SAN to provide wet weather and high flow management education to WWTP operators in a workshop format. Include overview of information that should be included in I & I abatement and high-flow maintenance plans.</p>
	<p>4.1.11 Research on WWTP Effluent and <i>Cryptosporidium</i> in Surface Waters</p> <p>Support future research initiatives surrounding the impact of WWTP effluent on <i>Cryptosporidium</i> surface water concentrations by partnering with research organizations and/or academic institutions</p>

4.1.1 Philadelphia's Act 537 Plan

Act 537 is the Pennsylvania Sewage Facilities Act. The program addresses existing sewage disposal needs and future disposal needs through proper planning, permitting and design of sewage facilities. The Philadelphia Act 537 Plan was last updated in 2009.

4.1.2 Combined Sewer Overflow (CSO) and Municipal Separate Storm Sewer System (MS4) National Pollutant Elimination System (NPDES) Permit Annual Report

Each year, PWD submits a report to PADEP summarizing activities and programs pertaining to the management of stormwater in combined and separate sewers in accordance with the CSO and MS4 NPDES permits. A major component of PWD CSO NPDES permit requirements is the implementation of the Long-Term Control Plan Update (LTCPU), also called the *Green City, Clean Waters* program. *Green City, Clean Waters* is a 25-year program that includes a green stormwater infrastructure-based approach to reduce pollutants discharged by the combined sewer system. The 2018 annual report is available on phillywatersheds.org.

4.1.3 Early Warning System

The Delaware Valley Early Warning System (EWS) is designed to improve the safety of the drinking water supply by providing real time water quality monitoring results and event notification to regional users. The system features include a notification system, a time of travel model, the Spill Model Analysis Tool, real-time water quality data and a central website where users can access event information, analysis tools and data. As of 2018, the EWS user base consists of more than 350 registered users from 50 organizations.

PWD continues to develop and enhance the EWS Tidal Spill Trajectory Tool. The Tidal Spill Trajectory Tool was developed using a \$295,000 grant awarded to PWD by the Maritime Exchange for the Delaware River and Bay. The tool was first launched in 2014 and expanded EWS capabilities to include predicting a contaminant spill path and contaminant plume arrival times at tidal intakes in the lower Delaware River. In 2015, the EWS was honored with the Governor's Award for Environmental Excellence due to the integration of the advanced spill modeling capabilities.

In September 2016, EWS was nationally recognized by EPA Water Security Division as a case study published in *Online Source Water Quality Monitoring for Water Quality Surveillance and Response System*. The EWS was also featured as part of the Philadelphia Water Department case study in the 2017 publication of the American Water Works Association (AWWA) entitled *Operational Guide to AWWA Standard G300: Source Water Protection*, 2nd Edition. Planned system upgrades for 2019 include continuing efforts towards a newly designed user interface to facilitate event reporting and information gathering.

4.1.4 Provide Project Support for the Lehigh University *Cryptosporidium* Study

For over a decade, Lehigh University has been contracted by PWD to support continuing research on *Cryptosporidium* in Philadelphia source water. PWD and Lehigh University

collaborate to develop sampling programs to better understand the occurrence, sources and vectors of *Cryptosporidium* in the Schuylkill River watershed. Sampling programs are designed to answer research questions and improve and expand methods for field sample collection and laboratory analysis of *Cryptosporidium*. PWD contributes field sample collection support, project management and oversight. PWD regularly communicates with project partners at Lehigh to create solutions for issues encountered in the field and lab, incorporate improvements and expand the project. Beginning in October 2015 and continuing through March 2017, PWD collected samples approximately twice per month in Philadelphia and at locations upstream in the Schuylkill River watershed. For more information refer to Sections 4.1.11, 4.2.6, and 4.3.3. Throughout 2018, PWD collaborated with Lehigh researchers to better understand fate and transport of *Cryptosporidium* in soils. Improving laboratory detection methods to maximize the recovery rate of *Cryptosporidium* oocysts in environmental samples began in 2018 and are ongoing. Lab protocols should be tested on PWD priority samples in 2019.

4.1.5 SAN Pathogens and Point Source Workgroup

The SAN Pathogens/Compliance Workgroup was renamed the SAN Pathogens and Point Source Workgroup during the 2016-2020 strategic planning process. The new strategic goal of the SAN Pathogens and Point Source Workgroup is to facilitate and strengthen communication and coordination among regulatory agencies, downstream water users, and basin stakeholders regarding Clean Water Act and Safe Drinking Water Act goals. The workgroup identifies ten strategies to address this goal. The objectives and strategies can be reviewed in the 2016-2020 SAN Strategic Plan available at schuylkillwaters.org and in Appendix A. PWD regularly attends quarterly SAN Pathogens and Point Source Workgroup meetings. The minutes for the meetings in 2018 are included in Appendix B.

4.1.6 Abate Wildcat Sewers and Cross-Connections

Wildcat sewers are sewer systems that discharge sewage directly into creeks and streams without any treatment at a waste water treatment facility. These systems discharge pathogens into the Schuylkill River watershed and can be a source of *Cryptosporidium*. In 1990, EPA identified communities in the Schuylkill River watershed with wildcat sewers. After the formation of the SAN, the formerly named SAN Pathogens/Compliance workgroup led efforts addressing issues in many of the listed communities (PWD, 2011). PWD supports the SAN in efforts to identify and abate wildcat sewers through participation in the SAN Pathogens and Point Source Workgroup. In 2015, PWD completed a Watershed Sanitary Survey (WSS), required under LT2 to maintain the WCP credit. As part of the WSS, PWD compiled available information from the PENNVEST database, news sources, community announcements, and personal communication with a contracted engineering firm on projects addressing wildcat sewers in the Schuylkill River watershed. The wildcat sewer project update serves as a working document and is available in the 2015 Watershed Sanitary Survey (PWD, 2015). The document with 2018 updates is included in Appendix C.

A sewer cross-connection occurs when two sewers or pipelines with distinct purposes (e.g. potable, storm, sanitary) are temporarily or permanently connected. A cross-connection can contaminate potable water in the event of a backflow or can lead to wastewater being discharged along with sanitary stormwater flow into waterways at stormwater outfalls. In 2018, PWD began working with Penn State Abington to develop best methods to detect illicit cross-connections. Once such connections are identified, they can be corrected to limit the discharge of wastewater into the watershed's natural waterways.

4.1.7 PWD Schuylkill River Watershed 15-Year Review

The Source Water Protection Program 15-Year Review focuses on the objectives defined in the SWPP and highlights program achievements towards these objectives. The 15-Year Review describes PWD SWPP capabilities and responses to unplanned source water events. Water quality data from PWD's WTP intakes on the Schuylkill River from the last decade are included and observed for changing trends. Additionally, Schuylkill River watershed water quality data provided by other water utilities and sources is used to observe spatial trends in pH, temperature, TDS and iron and manganese. PWD continues to monitor water quality trends in the Schuylkill River observed at PWD intakes and at watershed sampling locations.

4.1.8 Support *Cryptosporidium* Monitoring at Major WWTPs

PWD regularly attends and co-chairs the quarterly SAN Pathogens and Point Source Workgroup meetings. Through this involvement, PWD supports the development of research and monitoring for *Cryptosporidium* at major WWTPs. Although the feasibility of such efforts is still being determined, PWD remains an active participant of the workgroup and related activities and shares with the workgroup pertinent updates regarding PWD monitoring and research efforts in the watershed.

4.1.9 Track Wastewater Related Changes in the Watershed

Through the SAN Pathogens and Point Source Workgroup, PWD and the PADEP Southeast Regional Office initiated a data compilation effort in 2013. The project compiled information submitted in Chapter 94 reports to three PADEP regional offices by WWTPs in the Schuylkill River watershed upstream of Philadelphia. In 2014, PWD collected information from Chapter 94 annual reports from the PADEP southeast regional office and from the Reading District Office for WWTPs in the south central region. In 2015, PWD staff reviewed Chapter 94 reports from the northeast region. The data includes WWTP location, receiving stream, average and permitted discharge flow rates, overload conditions, treatment technologies and more. The intended purpose of the project is as follows:

- To promote a holistic view of WWTP discharge in the Schuylkill River watershed
- To serve as a quick reference to SAN Pathogen workgroup members when WWTP discharge related events are reported on EWS
- To encourage the sharing of specific WWTP related events and news in the watershed

- To provide an informational tool for water utilities assessing source water protection planning strategies related to upstream point sources.

PWD used this information to inform the Watershed Sanitary Survey submitted to PADEP in December 2015. A map of the WWTPs in the Schuylkill River watershed upstream of Philadelphia is presented in Figure 4-1. The map shows WWTP locations and relative average flows and incorporates data from the Chapter 94 reports and the EPA Permit Compliance System and Integrated Compliance Information System (PCS-ICIS).

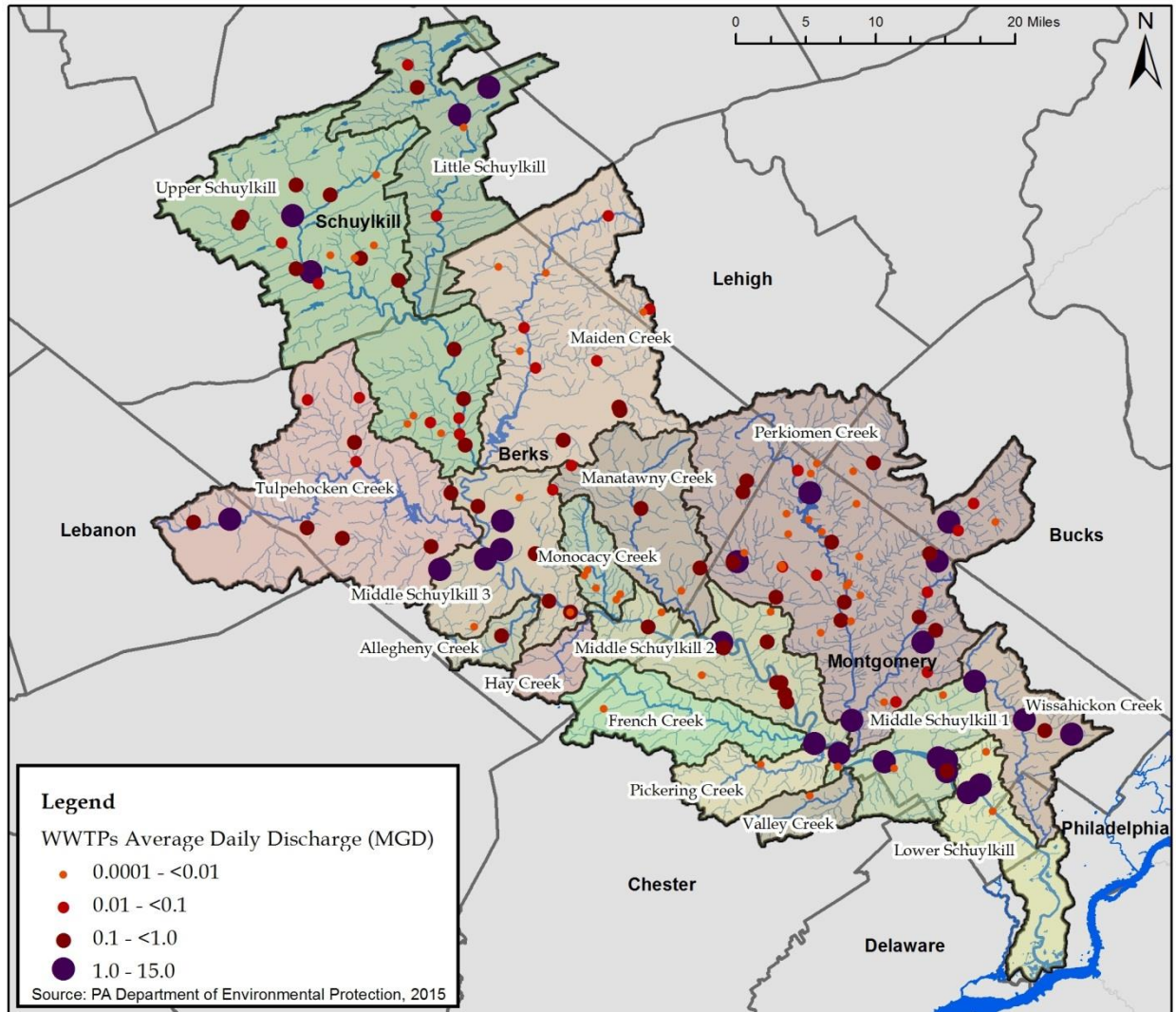


Figure 4-1: Wastewater Treatment Plants in the Schuylkill River Watershed by Average Daily Discharge (MGD) and Subwatershed (PCS-ICIS, 2015; PWD, 2015b)

4.1.10 Wet Weather and High Flow Management Education for WWTP Operators

Providing a wet weather and high flow management workshop to WWTP operators and potentially reducing wastewater overflows in the Schuylkill River watershed during wet

weather has been a long-term goal of the SAN Pathogen and Point Source Workgroup. The Eastern Pennsylvania Water Pollution Control Operators Association hosted this workshop in 2017, which was available to take for PADEP continuing education hours towards the renewal of their operator certification. In 2017, the Pathogens and Point Source workgroup aimed to provide further assistance to wastewater utilities. An educational pamphlet, “What Not to Put Down the Drain” was developed to assist WWTPs with public messaging. The resource is available through the SAN website and wastewater treatment plants can purchase copies to print as mailers or rack cards. In 2018, the SAN Pathogens and Point Source Workgroup continued to promote educational opportunities, training resources, and grant opportunities for WWTPs.

4.1.11 Research on WWTP Effluent and *Cryptosporidium* in Surface Waters

In collaboration with Lehigh University, PWD funds and conducts research investigating sources of *Cryptosporidium* in the source water. In 2015, PWD and Lehigh expanded their research project goals and began collecting samples in October 2015 at five sites in the Schuylkill River watershed. Sampling continued through March 2017 aligning with the timeline for Round 2 LT2 *Cryptosporidium* monitoring. Sample collection sites include the Wissahickon Creek, the Schuylkill River near the USGS Norristown and Berne gage stations, the Tulpehocken Creek and Lake Ontelaunee, see Figure 4-2. PWD partnered with two other water suppliers: Western Berks Water Authority and Reading Area Water Authority. Samples were analyzed at Lehigh University to determine the species of any *Cryptosporidium* detected and assist in source tracking. The project also documented watershed conditions including rainfall, streamflow and, as available from PADEP, WWTP overflow events to correlate with *Cryptosporidium* sample results. PWD expanded existing *Cryptosporidium* research in 2018 to include how fate and transport of *Cryptosporidium* in soils may affect surface waters. Throughout 2018, PWD collaborated with Lehigh researchers to better understand fate and transport of *Cryptosporidium* in soils. Improving detection methods to maximize the recovery rate of *Cryptosporidium* oocysts in environmental samples are ongoing and should be tested on PWD priority samples in 2019.

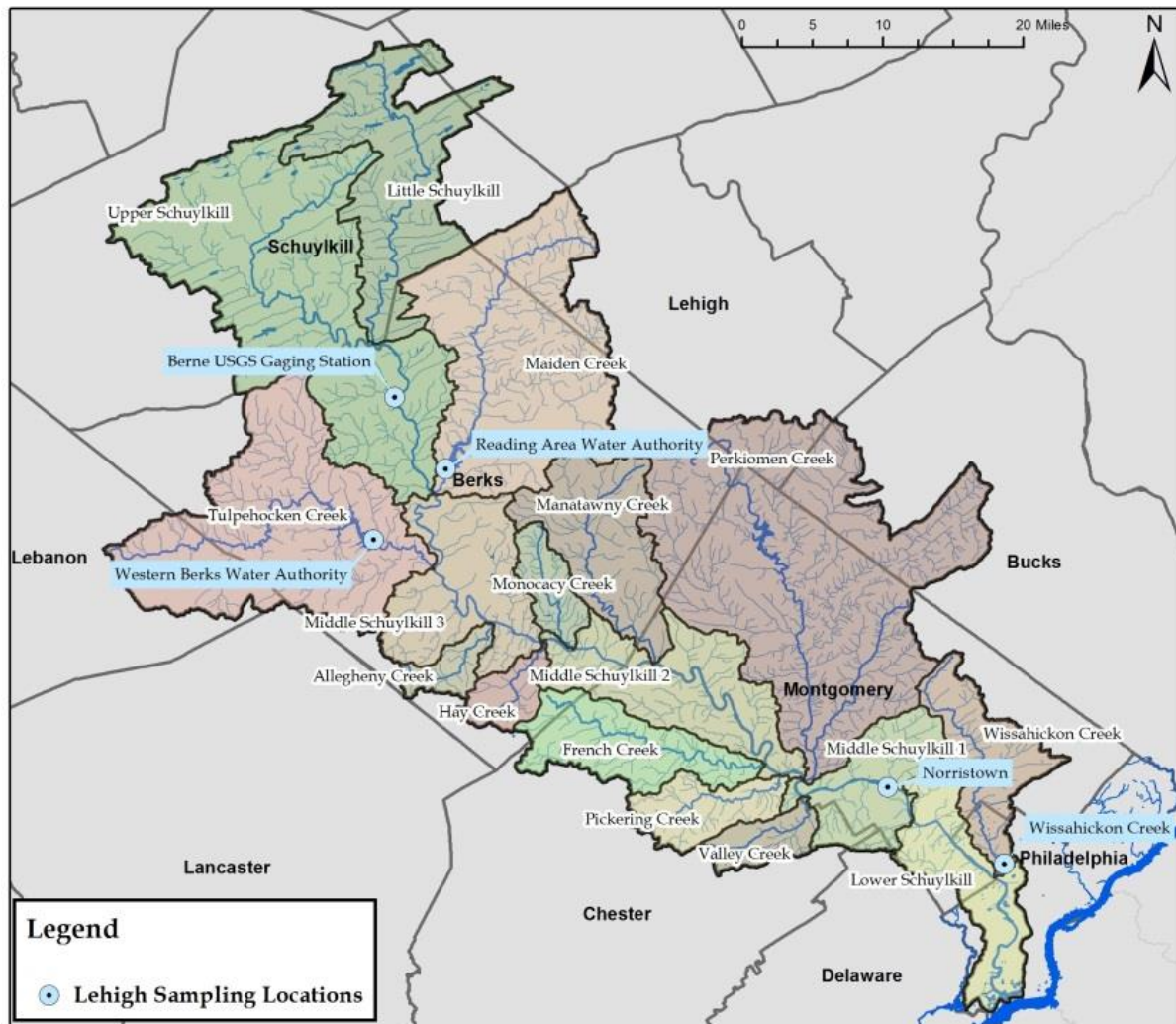


Figure 4-2: Lehigh Study Sampling Locations for October 2015 through March 2017

4.2 Agricultural Land Use and Runoff

Stormwater runoff containing manure from agricultural land is a source of *Cryptosporidium* and pathogens in the Schuylkill River watershed (PWD, 2002; PWD, 2011). PWD efforts to address agricultural runoff occur upstream of Philadelphia because the agricultural land within the city and upstream of the intakes is minimal and best management practices (BMPs) have previously been installed at Northwestern Stables, Belmont Stables, Courtesy Stables, Monastery Stables and W.B Saul High School (PWD, 2011). Table 4-3 and Table 4-4 outline the ongoing and proposed SWPP initiatives that aim to reduce the impact of agricultural activities on water quality in the Schuylkill River watershed. This section explains the ongoing work performed in 2018 relation to each initiative listed.

Table 4-3: Ongoing Agricultural Land Use and Runoff SWPP Initiatives

Project Location	Project Overview
Phila- delphia	<i>BMPs have been implemented at all agricultural sites within the City.</i>
Schuylkill River Watershed	4.2.1 SAN Agriculture Workgroup
	Continue to be an active participant in the SAN Agriculture Workgroup and support future efforts. The strategies for the 2018 SAN Agriculture Workgroup plan are as follows: <ol style="list-style-type: none"> 1) <i>BMP Implementation</i>: Support and implement agricultural best management practice (BMP) with funding, information, expertise, and collaborative problem solving. 2) <i>Communication</i>: Provide a forum for partner and agency communication and coordination around agricultural projects and issues and the formulation of creative new approaches for solving agricultural related problems. 3) <i>Monitoring</i>: Monitor the impacts of agricultural BMP installations on stream water quality.

Table 4-4: Proposed Agricultural Land Use and Runoff SWPP Initiatives

Project Location	Project Overview
Philadelphia	4.2.2 PWD In-City Agricultural BMPs Develop a maintenance plan for PWD’s in-city agricultural BMPs, which include Northwestern Stables, Belmont Stables, Courtesy Stables, Monastery Stables and the WB Saul High School project.
	4.2.3 Natural Lands and Erdenheim Farm Natural Lands (formerly Natural Lands Trust) is currently performing stream restoration on a tract of land on Erdenheim Farm, located in the Wissahickon Creek watershed. The land is currently not being used for grazing, but may be used for this purpose in the future. PWD will consider future coordination with Natural Lands and the Erdenheim Farm Foundation to install additional agricultural BMPs at the farm.

	<p>4.2.4 Land Use in the Schuylkill River Watershed</p> <p>As part of the SWA update process, PWD plans to re-assess land use in the Schuylkill River watershed. To complete this update, the 2011 National Land Use Database will be used, along with more current information from the 2010 Census.</p>
Schuylkill River Watershed	<p>4.2.5 Visual Assessments for the Agriculture BMP Projects</p> <p>Coordinate with SAN to develop a maintenance and monitoring plan for the agricultural BMPs installed as a result of the parcel prioritization process. The maintenance plan may be centered on regular visual assessments to identify any problems or repair needs.</p>
	<p>4.2.6 Agricultural BMP Monitoring for <i>Cryptosporidium</i></p> <p>PWD will explore the possibility of partnering with academic institutions on <i>Cryptosporidium</i>-related research. Relevant research may include monitoring to assess the efficacy of different agricultural BMPs at removing pathogens from runoff. PWD will also identify priority research needs that may be fulfilled in collaboration with Lehigh University.</p>
	<p>4.2.7 Promotion of SAN Agriculture Projects</p> <p>Through involvement in the SAN Agriculture Workgroup, PWD will continue to work with partners, state and federal agency representatives to identify priority projects and available funding sources. For funding programs that already exist within the watershed, such as the United States Department of Agriculture (USDA) – Natural Resource Conservation Service (NRCS) conservation programs outlined in the 2008 Farm Bill, PWD will help promote drinking water protection and <i>Cryptosporidium</i> contamination reduction as a high-priority water quality improvement goal that requires adequate funding.</p>
	<p>4.2.8 CAFO Identification in the Watershed</p> <p>Through the SAN Agriculture Workgroup, PWD will work with partners to identify CAFOs located in the Schuylkill River watershed and identify opportunities to reduce agricultural runoff.</p>
	<p>4.2.9 Schuylkill River Restoration Fund (SRRF) Grants for Agriculture BMP Projects</p> <p>Starting in 2012, PWD has committed SRRF dollars to be directed toward priority agricultural BMPs addressing pathogen-contaminated stormwater runoff from livestock operations. These projects will be selected on an annual basis through the established project selection processes. PWD commitments to the SRRF will address priority stormwater and pathogen concerns while promoting the importance of watershed partnerships.</p>

4.2.1 SAN Agriculture Workgroup

The strategic goal of the SAN Agriculture Workgroup is to maximize reduction and/or prevention of agricultural impacts to water quality. The workgroup identifies 11 strategies to address this goal. The objectives and strategies can be reviewed in the 2016-2020 SAN Strategic Plan available at schuylkillwaters.org. PWD regularly attended quarterly SAN Agriculture Workgroup meetings. The minutes for the meetings in 2018 are included in Appendix B.

4.2.2 PWD In-City Agricultural BMPS

In 2015, the Community Design Collaborative (CDC) completed a master plan for Saul High School. PWD served on the Saul Task Force for the (CDC) with community members and other stakeholders to participate in development of the master plan. Additionally, the Natural Resource Conservation Service (NRCS) performed an Engineering Inventory and Evaluation Report for the agricultural portion of the Saul campus. The report details nutrient and sediment management and stormwater issues on the site by area (dairy facility, equine facility, sheep and swine facility, beef operation, composting facility and community supported agriculture (CSA) area), and one or two optional solutions to address each issue. Master planning efforts allowed Saul to apply for and win grant funding for green infrastructure implementation. Throughout 2016 and 2017, CH2M engineers and Nature Conservancy scientists worked directly with students and faculty to design and construct a rain garden on campus to address stormwater quality concerns. The rain garden was completed in June 2017. PWD is currently coordinating internally to determine resources available to support projects to manage stormwater and protect source water on the Saul Agricultural High School campus. Efforts to begin BMP implementation at Saul should begin in 2019.

4.2.3 Natural Lands and Erdenheim Farm

Erdenheim Farm is located in Lafayette Hill along the Wissahickon Creek. The section of the Wissahickon Creek that enters and exits the Erdenheim property is surrounded by preserved forests, the Fort Washington State Park to the north of the property and parcels of Wissahickon Valley Park to the south of the property. In cooperation with Natural Lands (formerly the Natural Lands Trust) and the Whitemarsh Foundation, the entire property has been protected by conservation easements since 2009. Projects previously implemented at Erdenheim farm include the planting of a 14-acre native meadow, the stabilization of a meandering channel, and construction of a shallow stormwater basin and forebay, a basin constructed to allow sediment from incoming stormwater to settle before reaching the main stormwater basin. These projects intend to reduce erosion of Erdenheim Farm and detain stormwater prior to discharging to the Wissahickon Creek.

4.2.4 Land Use in the Schuylkill River Watershed

USGS released the 2011 National Land Cover Dataset (NLCD) at the end of 2013. As part of the 2015 Watershed Sanitary Survey (WSS), PWD completed an updated analysis on land cover and land cover changes since 2001 in the Schuylkill River watershed. A map of the Schuylkill River watershed overlain by the 2011 NLCD is shown in Figure 4-3.

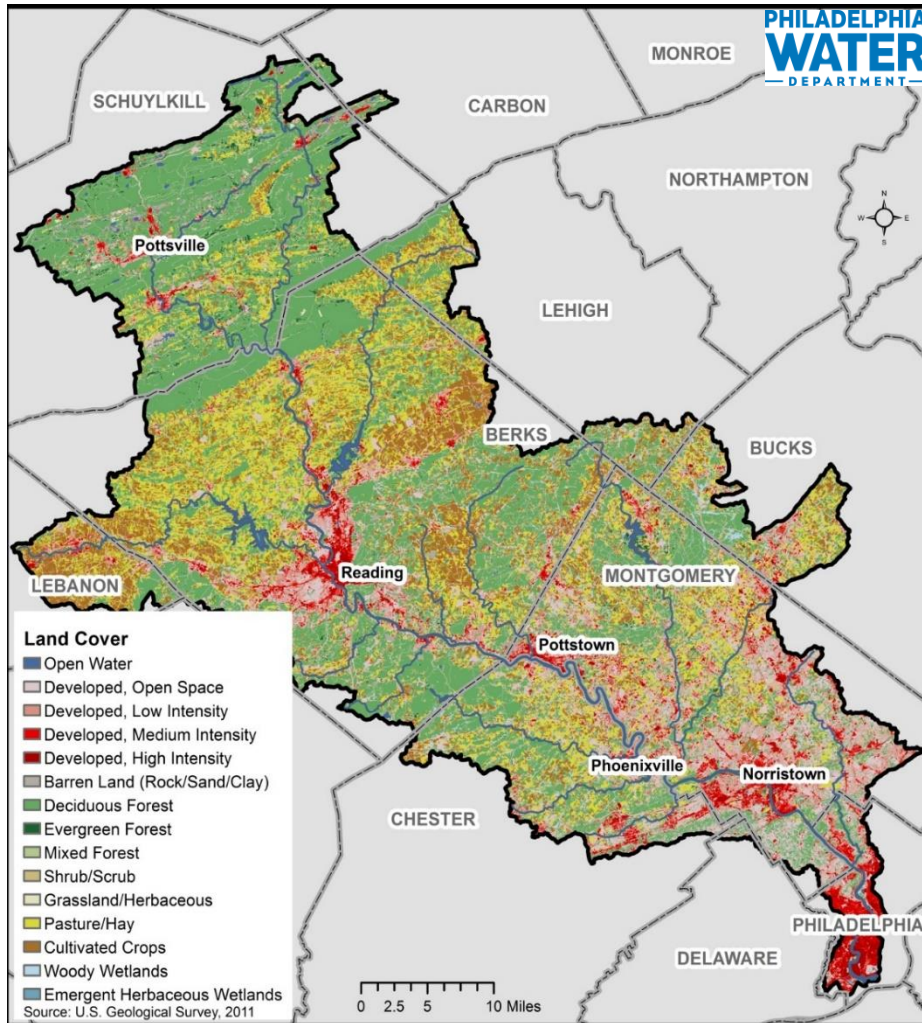


Figure 4-3: Land Cover Type in the Schuylkill River Watershed (USGS, 2011)

4.2.5 Visual Assessments for Agriculture BMP Projects

PWD developed a field visual monitoring form, which was shared with the SAN Agriculture Workgroup in 2013. The field visual monitoring assessment serves as a tool available to SAN Agriculture Workgroup members implementing and tracking projects on the ground. Beginning in 2015, portions of the field visual monitoring form were incorporated into required monitoring strategies for a number of projects receiving grants through the Delaware River Watershed Initiative (DRWI). The DRWI is a multi-year investment by the William Penn Foundation to protect and restore watersheds that provide a critical drinking water source.

Additionally, PWD annually visits agricultural BMP projects funded by the SRRF during or after construction to assess project progress, take photos and document BMPs installed.

4.2.6 Agricultural BMP Monitoring for *Cryptosporidium*

Beginning in October 2015 and continuing through March 2017, PWD and Lehigh University began a new *Cryptosporidium* source tracking research project. There are five sampling locations throughout the Schuylkill River watershed. *Cryptosporidium* samples collected at each site will be genotyped. Although this project does not specifically focus on monitoring for BMPs, two of the sampling locations are in sub-watersheds heavily influenced by agriculture: the Tulpehocken and the Maiden Creek watersheds. These watersheds are approximately 50% agricultural land cover, including cultivated crops and pasture/hay designated by the National Land Cover Database (NLCD) (PWD, 2015). PWD and Lehigh University are currently evaluating opportunities to use biofilm samplers to monitor *Cryptosporidium* at prospective agricultural BMP sites in Philadelphia. These efforts are planned to commence in early 2019.

4.2.7 Promotion of SAN Agriculture Projects

PWD and PDE completed a BMP guide for agricultural properties in the Schuylkill River watershed in 2014. The guide, entitled *A Farmer's Guide for Healthy Communities*, includes the importance of managing runoff on agricultural properties, sample stormwater projects, spotlight farms with projects completed through the SAN and watershed partners, and funding resources for farmers interested in implementing projects on their own properties. The SAN continues to distribute *A Farmer's Guide for Healthy Communities* to farmers, SAN members and other interested stakeholders. The guide is available on the SAN website at www.schuylkillwaters.org/projects.cfm.

In November 2018, PWD organized a site visit of recent Schuylkill River Restoration Fund (SRRF) grant recipient projects in Berks County with watershed partners. The site visit was attended by representatives from the Partnership for the Delaware Estuary, Berks Nature, Berks County Conservation District, and Aqua Pennsylvania. Project sites included previous SRRF recipients: Josh Brown Farm, the A. Burkholder Farm, and the Youse Farm.

4.2.8 CAFO Identification in the Watershed

Concentrated animal feeding operations (CAFOs) are agricultural operations where animals are confined in small land areas. CAFOs have the potential to contribute *Cryptosporidium* contaminated runoff to the Schuylkill River watershed. In 2018, PWD received updated CAFO data from PADEP including number of animal equivalent units and primary animal for each operation. As of December 2018, a total of 32 CAFOs exist in the Schuylkill River watershed representing more than 22,700 animal equivalent units (AEUs, 1 AEU = 1,000 lbs of animal weight). These totals mark only a slight increase from 2017 data, during which 29 CAFOs representing more than 16,500 AEUs existed in the Schuylkill River watershed. A map depicting 2017 data is shown in Figure 4-4.

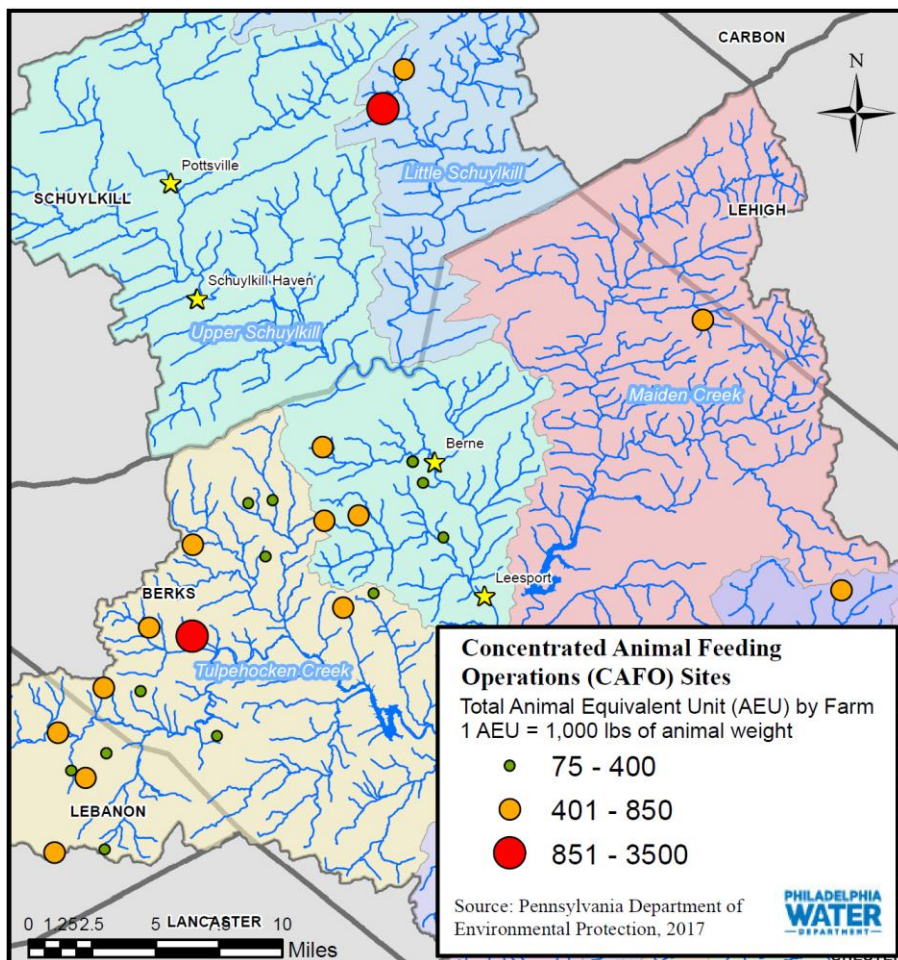


Figure 4-4: Concentrated Animal Feeding Operations in the Schuylkill River Watershed by Total Animal Equivalent Units (AEUs) (PADEP 2017)

4.2.9 Schuylkill River Restoration Fund Grants for Agriculture BMP Projects

PWD contributes financial support and participates in the SRRF grant selection process. PWD identifies and advocates for high priority projects. In 2018, PWD supported the selection of two

agricultural projects to receive SRRF grants for stormwater management projects: The Josh Brown Farm and the A. Burkholder Farm. BMPs to be implemented at each farm include dry-roofed feeding and manure storage areas, the installation of stream bank and wetland exclusion fencing, a water supply well establishment, the installation of an automatic waterer, rain gutter improvements, and other on-site stormwater controls. The SRRF projects are discussed in more detail in Section 4.4.

4.3 Animal Vectors

Animals in the Schuylkill River watershed serve as mechanical vectors of *Cryptosporidium*, transferring viable oocysts from original hosts. Geese are particularly effective vectors, as identified in PWD and Lehigh University source tracking studies (Jellison et al., 2009; Jellison, 2010a). Table 4-5 and Table 4-6 outline the SWPP ongoing and proposed initiatives that aim to reduce the impact of animal vectors near the PWD Queen Lane and Belmont intakes and expand implementation of animal vector control in the Schuylkill River watershed. This section explains the progress made in 2018 towards each initiative listed.

Table 4-5: Ongoing Animal Vectors SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>4.3.1 Belmont Meadow Extension and Intake Project</p> <p>Continue to maintain plantings at the site of the Belmont Meadow Extension/Intake project. Continue to monitor goose activity around the Belmont intake.</p>
	<p>4.3.2 Education and Outreach on Threat of Animal Vectors in the City</p> <p>Continue education/outreach efforts concerning the threat of animal vectors and the role they play in the cycle of pathogen contamination. These efforts may include working with Fairmount Park to expand existing programs, such as the dog waste program, and developing new programs that focus on the relationship between geese and drinking water quality.</p>
Schuylkill River Watershed	<p>4.3.3 Lehigh University <i>Cryptosporidium</i> Source Tracking</p> <p>Continue to support Lehigh University source tracking research to further identify and understand the animals that serve as mechanical vectors of <i>Cryptosporidium</i> in the watershed.</p>

Table 4-6: Proposed Animal Vectors SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>0 Goose Measures at Fairmount Park Properties</p> <p>Continue to implement appropriate goose control measures at Fairmount Park properties, including Peter’s Island, and incorporate educational signage in these areas.</p>
	<p>Error! Reference source not found. Waterfowl Management at PWD Facilities</p> <p>Complete implementation of the USDA waterfowl management program at the Queen Lane WTP, Belmont WTP and Baxter WTP as well as the three PWD WWTPs.</p>
Schuylkill River Watershed	<p>4.3.5 Animal Vector Education and Outreach in the Watershed</p> <p>As part of the Source Water Protection Program education and outreach efforts, raise awareness of the threat animal vectors pose to drinking water supplies. These efforts may focus on supporting Lehigh University efforts to publish scientific journal articles.</p>

4.3.1 Belmont Meadow Extension and Intake Project

The goal of the Belmont meadow project is to deter non-native Canada geese, vectors for *Cryptosporidium*, from dwelling and feeding around the Belmont intake. This was achieved by installing fencing along Peter's Island, installing educational signage shown in Figure 4-5(b), and planting trees, shrubs, and two meadows. The project began in 1999 with the implementation of the Phase I meadow, and was completed in 2004 with the Phase II extension meadow. The plants create an inhospitable environment by obstructing the sight of the geese and increasing their fear of predators (PWD, 2011). In 2018, the Belmont meadow and intake plantings were maintained by Philadelphia Parks and Recreation to continue deterring geese from the area.



Figure 4-5: Belmont Goose Meadow (a) Educational Signage (b) Accompanying Educational Flyer

4.3.2 Education and Outreach on Threat of Animal Vectors in the City

PWD provides education and outreach efforts concerning the management of animal vectors in the Schuylkill River watershed. In partnership with PDE, PWD hosts the Philly's Best Friend Spokes Dog Competition where two dogs are selected to be the Philly's Spokes Dog and serve for one year as ambassadors educating dog owners on the importance of picking up pet waste. The last competition occurred in December 2015, and the next one is in the planning phase.

Additionally, Penn Praxis, Philadelphia Parks and Recreation, Fairmount Park Conservancy and University of Pennsylvania Project for Civil Engagement collaborated on "The New Fairmount Park," a community vision and improvement plan for Fairmount Park in Philadelphia. The plan was completed in 2014, and progress has been made towards some of the priority projects identified. PWD will continue to follow the plan status and look for opportunities to align source water goals with the plan, such as including educational signage on geese as vectors of pathogens in Fairmount Park.

4.3.3 Lehigh University *Cryptosporidium* Source Tracking

PWD continues to support Lehigh University research on the prevalence of *Cryptosporidium* in the Schuylkill River watershed. Lehigh University has the capability to genotype *Cryptosporidium* species in field samples and assists PWD in tracking sources of *Cryptosporidium*. In October 2015, PWD and Lehigh University began sampling for *Cryptosporidium* at five sites in the Schuylkill River watershed: the Schuylkill River at Berne and Norristown USGS gaging stations, the Wissahickon Creek, the Tulpehocken Creek downstream of Blue Marsh Reservoir and Lake Ontelaunee in the Maiden Creek sub-watershed, see Figure 4-2. *Cryptosporidium* samples collected at each site are genotyped. Additionally, Lehigh University and PWD will collect watershed data including streamflow, rainfall and WWTP discharge data as available to correlate with *Cryptosporidium* sample results. Sampling coincided with LT2 Round 2 monitoring and ended in March 2017. PWD expanded existing *Cryptosporidium* research in 2018 to include how *Cryptosporidium* in soils may contaminate surface waters. Throughout 2018, PWD collaborated with Lehigh researchers to better understand fate and transport of *Cryptosporidium* in soils. Improving detection methods to maximize the recovery rate of *Cryptosporidium* oocysts in environmental samples are ongoing and should be tested on PWD priority samples in 2019.



Figure 4-6: Lehigh Sampling Locations on the Schuylkill River near USGS gage stations at (a) Norristown and (b) Berne

4.3.4 Waterfowl Management at Fairmount Park and PWD Properties

To address animal vectors of *Cryptosporidium*, PWD is committed to geese management through the WCP. PWD has active contracts with the United States Department of Agriculture (USDA) for geese management at Fairmount Park properties and PWD facilities. Geese management is conducted at Fairmount Park properties including Peter's Island, Pleasant Hill Park, Concourse and Centennial Park and FDR Park and Golf Course. Geese management is also conducted at PWD facilities including the Belmont WTP, Queen Lane WTP, Baxter WTP, Southeast WWTP, Southwest WWTP, Northeast WWTP, and Oak Lane Reservoir.

On Fairmount Park properties and PWD facilities, the geese are harassed and dispersed or removed from the site. Geese are dispersed using a range of harassment techniques including physical harassment, electronic harassment devices, pyrotechnics, lasers and paintball guns. At all locations, any nests and eggs are treated with 100% food grade corn oil that stops embryo development by preventing air from passing through the shell.

In 2018, under a PWD contract with the USDA, goose control measures were implemented at several Fairmount Park locations, including Pleasant Hill Park, FDR Park and Golf Course, Concourse and Centennial Park, and Peter’s Island. Under this contract, geese are harassed or removed from the site and eggs and nests are treated to reduce the population.

Also in 2018, under a PWD contract with the USDA, goose control measures were implemented at the three drinking WTPs, three WWTPs and Oak Lane Reservoir. Under this contract, geese are harassed or removed from the site and eggs and nests are treated to reduce the population. Additional measures are taken to control other wildlife populations at PWD facilities.

The numbers of Canada geese removed and dispersed and eggs treated July 2017 through June 2018 at Fairmount Park properties are shown in Figure 4-7. A total of 35 eggs were removed, 7 nests removed, 140 geese removed during roundups, and more than 14,000 geese were harassed and dispersed from the Fairmount Park properties.

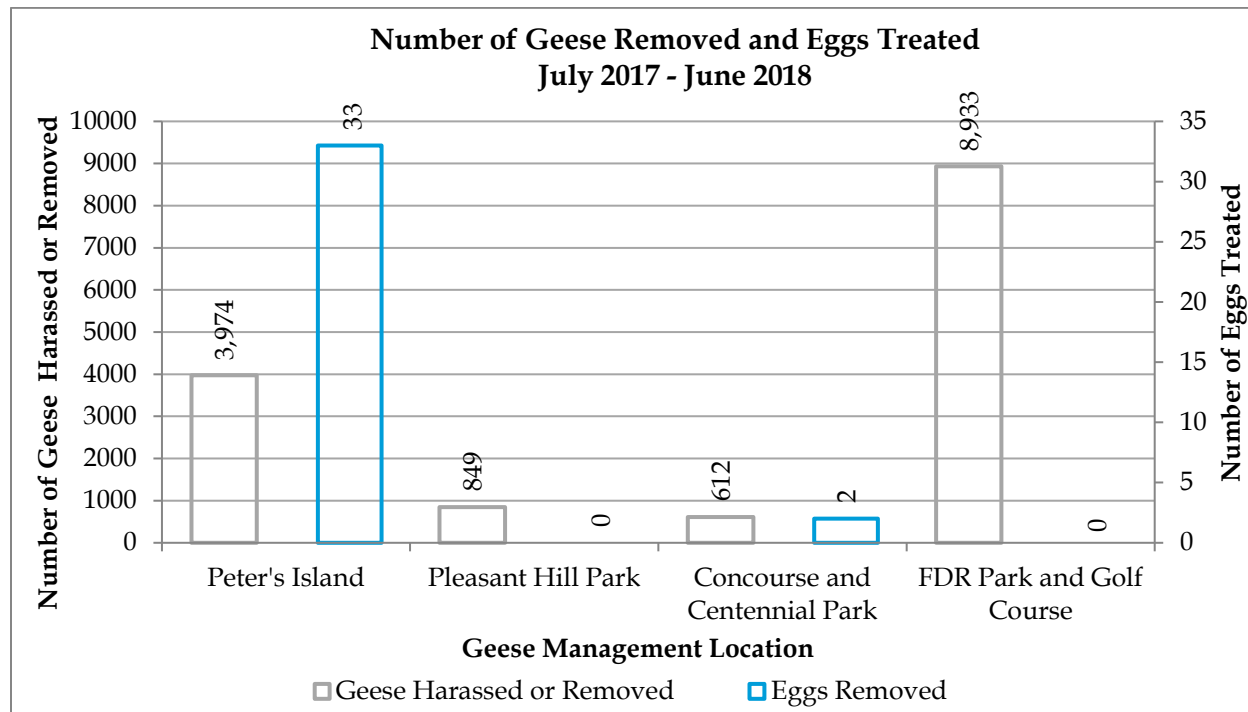


Figure 4-7: A total of 35 Canada goose eggs were removed and 14,368 geese were harassed or removed from the Fairmount Park properties during FY2018.

The numbers of Canada geese removed and dispersed and eggs treated July 2017 through June 2018 at PWD properties are shown in Figure 4-8. A total of 49 eggs were treated, 11 nests removed, 75 geese removed during roundups, and more than 5,000 geese were harassed and dispersed from the PWD properties.

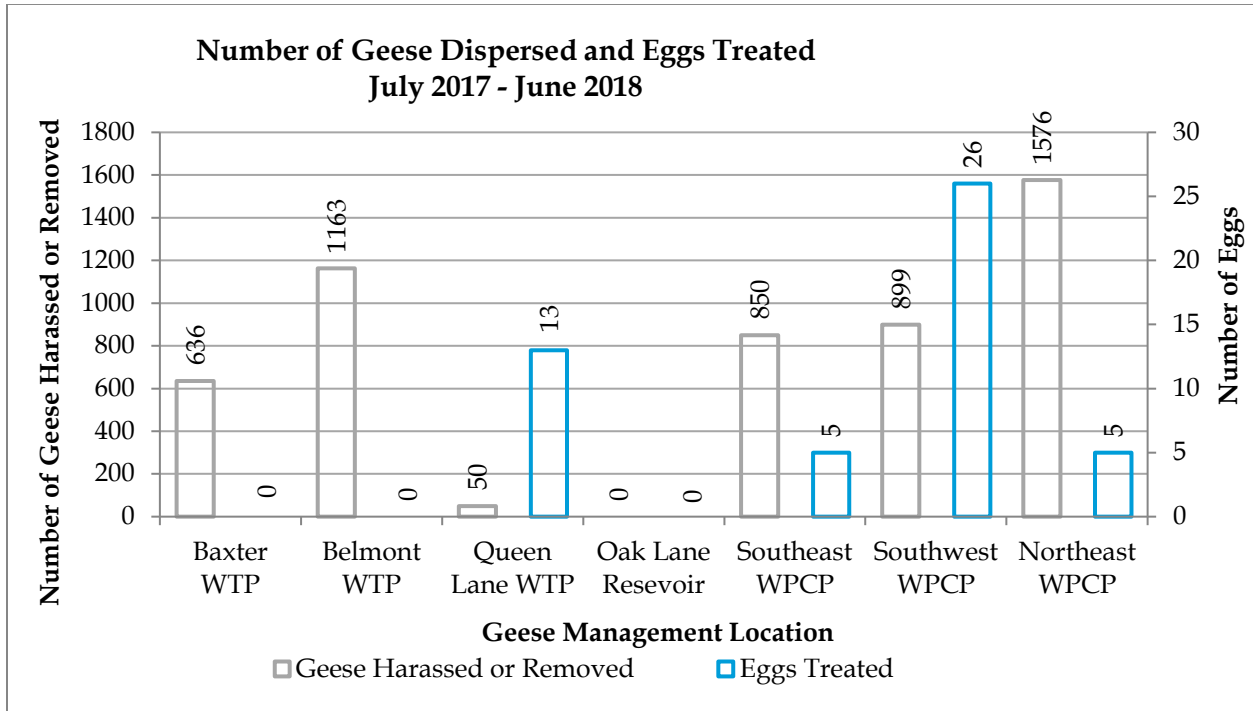


Figure 4-8: A total of 49 Canada goose eggs were treated, 75 geese were removed, and 5,099 were harassed and dispersed from PWD facilities.

The data collected between 2011 and 2018 is encouraging and suggests that the geese management strategies implemented by PWD through contracts with the USDA are impacting geese populations. These impacts are particularly evident at Peter’s Island and the surrounding park area. Peter’s Island is located directly upstream of Belmont WTP intake and offers breeding habitat for geese. In the past five years, PWD has observed a decrease in the number of eggs treated during the nesting season at this site. In 2011, 2012 and 2013, the numbers of eggs treated were 499, 535 and 353, respectively. In 2014, 2015, 2016, 2017, and 2018, 55, 58, 66, 61, and 35 eggs were treated, respectively. The number of geese removed and harassed is more challenging to compare from year to year. This data may be affected by specific site conditions and the number of times USDA staff visited the sites to conduct harassment and round ups.

4.3.5 Animal Vector Education and Outreach in the Watershed

PWD continues to support Lehigh University efforts in *Cryptosporidium* related research and the publishing of scientific articles by incorporating PWD source water protection goals into Lehigh University research goals. PWD shares Lehigh University literature and research findings on

deer and geese as vectors of human-infectious *Cryptosporidium* with upstream water utilities and SAN partners to support the implementation of animal vector control techniques.

4.4 Education and Outreach

Education and outreach initiatives are a critical component of PWD SWPP because point and nonpoint source discharges and land management throughout the Schuylkill River watershed influence water quality at the Queen Lane and Belmont intakes. Many education and outreach initiatives are implemented through PWD watershed partnerships, which are maintained by various programs within PWD. Table 4-7 and Table 4-8 outline the SWPP ongoing and proposed initiatives that maintain watershed partnerships and continue to promote the importance of source water protection. This section explains the progress made in 2018 towards each initiative listed.

Table 4-7: Ongoing Education and Outreach SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>4.4.1 Watershed Partnerships in the City Remain an active participant in watershed partnerships and begin integrating drinking water issues into the scope of work for the Wissahickon Watershed Partnership.</p>
	<p>4.4.2 Annual Water Quality Report Continue to submit a comprehensive annual water quality report that emphasizes critical source water issues and, in particular, educate customers as to the research initiatives and implementation strategies PWD is using to reduce the risk of <i>Cryptosporidium</i> contamination.</p>
	<p>4.4.3 Water Quality Committee Continue to convene PWD’s Water Quality Committee (WQC) to address water quality issues on a holistic basis. Utilize the committee as a forum for providing feedback to strengthen the WCP.</p>
	<p>4.4.4 Improve Environmental Quality of Philadelphia Fairmount Park System Continue to work with Fairmount Park to improve the environmental quality of City parks and streams through land management practices and BMP implementation.</p>
	<p>4.4.5 Maintain Fairmount Water Works Interpretive Center Continue to maintain the FWWIC and promote source water protection through FWWIC exhibits and learning programs.</p>
	<p>4.4.6 Philly RiverCast Continue to operate Philly RiverCast and promote the web-based recreational warning system.</p>
Schuylkill River Watershed	<p>4.4.7 Active Members of SAN Pathogen and Point Sources and Agriculture Workgroups Continue to be an active member of the SAN Pathogens and Point Sources and Agriculture workgroups and support initiatives outlined in the annual work plans.</p>
	<p>4.4.8 Collaboration with Partnership for the Delaware Estuary Continue to collaborate with PDE on various education and outreach initiatives, including the publication of guidance materials and organization of public programs and meetings surrounding water quality concerns.</p>
	<p>4.4.9 Schuylkill River Restoration Fund Continue to support the SRRF to achieve implementation of BMPs at high-priority sites in the watershed.</p>

Table 4-8: Proposed Education and Outreach SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>4.4.11 Implement In-City Source Water Programs in East Falls, Roxborough and Manayunk</p> <p>Implement in-city source water projects in the East Falls, Roxborough, and Manayunk neighborhoods along the Schuylkill River. These projects will involve the implementation of stormwater management practices, storm drain labels and a dog waste control program. Through these initiatives, communities will become more involved in protecting their waterways as they develop a better understanding of the impacts of daily activities on their drinking water source.</p>

4.4.1 Watershed Partnerships in the City

PWD supports a contract with the Pennsylvania Environmental Council (PEC) for the coordination of watershed partnerships for the City of Philadelphia. PEC coordinates the Watershed Alliance of Southeastern Pennsylvania including facilitating meetings for the Watershed Alliance and for the five individual watershed partnerships in the city, conducting a needs assessment for the Watershed Alliance members, promoting multi-municipal collaboration, identifying stormwater financing programs and maintaining the Watershed Alliance newsletter. PEC conducts outreach to upstream landowners on projects proposed in the Integrated Watershed Management and Act 167 Stormwater Management Plans (available at phillywatersheds.org) and coordinates this effort with the William Penn Foundation Upstream Suburban Cluster. PEC also facilitates the *Green Cities, Clean Waters* advisory committee meetings and e-newsletter.

PWD and PEC are collaborating to coordinate a community-based maintenance program, Soak It Up Adoption. The Adoption program provides grants to civic organizations in exchange for help with aesthetic maintenance on green stormwater infrastructure in their community. This hands-on approach reinforces community acceptance of infrastructure completed under the *Green City, Clean Waters* initiative and provides on-going opportunities for public engagement on stormwater. In 2017, PWD expanded PEC's role to include engagement in the MS4 sewershed. Drawing on their experience as a regional facilitator, PEC is engaging community leaders on stormwater management and helping to further refine PWD public education programs on non-point source pollution.

In 2018, PWD continued to help Philadelphia residents manage stormwater and beautify their homes through the Rain Check program, a collaborative effort with the Pennsylvania Horticultural Society (PHS) and the Sustainable Business Network. As part of the program, residents attend a workshop to learn about stormwater tools and how to select the most appropriate management tools for the property, see example project in Figure 4-9. Once the property owner identifies the most suitable stormwater management practices, PWD and PHS will help connect them with a contractor to assist with the installation, and Rain Check provides a portion of the project cost. In FY2018, Rain Check held a total of 76 workshops throughout Philadelphia with a total of 1,815 participants. Stormwater controls installed are itemized in Table 4-9.



Figure 4-9: Photo of Rain Check Depaving Project (a) Before and (b) After Installation

Table 4-9: Rain Check Program Progress in FY2018

Stormwater Management Practice	Total FY2018 Installations	Cumulative Total (Fall 2014 - July 2018)
Depaving	6	38
Permeable pavers	90	220
Downspout planters	103	414
Rain gardens	20	77
Rain barrels	674	2,336

Source: J. Waldowski, personal communication, October 23, 2018.

4.4.2 Annual Water Quality Report

PWD annually distributes source water protection information to customers in the annual Drinking Water Quality Report. The most recent [report](#) published in 2018 shares 2017 water quality data and information on the Schuylkill and Delaware River SWPPs, pharmaceuticals and *Cryptosporidium* source tracking. The report also includes sources for additional information on source water protection issues. PWD takes a proactive approach to customer education and goes beyond reporting requirements by including robust overviews of source water and watershed protection efforts.

4.4.3 Water Quality Council

In 2001, the Stormwater and Drinking Water Quality Citizen Advisory Councils (CACs) merged to form the Water Quality Council. The Water Quality Council was facilitated by PDE and took a holistic approach to water quality issues (PWD, 2011). The Water Quality Council no longer convenes, but citizens take an active role addressing stormwater and water quality issues

through PDE programs (Section 3.4.8) and watershed partnership groups in the City (Section 3.4.1).

4.4.4 Improve Environmental Quality of Philadelphia Fairmount Park System

As described earlier in Section 3.3, Penn Praxis, Philadelphia Parks and Recreation, Fairmount Park Conservancy and University of Pennsylvania Project for Civil Engagement collaborated on “The New Fairmount Park.” The community-driven revitalization plan was completed in 2014. The Fairmount Park Conservancy has begun the design phase of a new recreational space along Parkside Avenue that will better connect residents of West Parkside to the park and increase park use between the Please Touch Museum and the Philadelphia Zoo. The East Park Coalition of more than 30 organizations was created to better serve the larger community. The coalition is leading efforts to improve the Mander Recreation Center and has begun to establish a half mile trail along Randolph Creek connecting the Schuylkill River Trail to the Strawberry Mansion Community. PWD will continue to follow the implementation of the plan and look for opportunities to align source water protection goals with the plan.

4.4.5 Maintain Fairmount Water Works Interpretive Center

The Fairmount Water Works Interpretive Center (FWWIC) is a PWD educational center that presents the history of the Schuylkill River, and the influence of human activities on water quality and quantity through innovative exhibits and interactive educational programs. Fairmount Water Works, PWD, Academy of Natural Sciences and PDE have partnered to develop a Freshwater Mussel Recovery Program. Freshwater mussels filter water and improve water quality. The goal of the program is to rebuild populations of native mussels through hatchery propagation to improve water quality in the Schuylkill and Delaware River watersheds. Additional program information is available online at delawareestuary.org/Science_Programs. The project includes the development and construction of a freshwater mussel hatchery and an aquatic field station at the FWWIC. The goal of the hatchery is to propagate new mussels to increase the population in the Delaware River watershed. Installation of the demonstration hatchery at the FWWIC was completed in 2017 and the hatchery is now open to the public. Over the course of 2018, several mussel species were successfully propagated. Propagation efforts will continue in 2019 alongside research focusing on maximizing generation rates and increasing the efficiency of mussel recovery protocols.

4.4.6 Philly RiverCast

PWD continues to promote and maintain Philly RiverCast. The website has received over 1,000,000 visits since its launch in 2005. In 2018, PWD assisted individuals and recreational groups in interpreting RiverCast ratings. In the past organizers of the Philadelphia TriRock triathlon had reached out to PWD for assistance interpreting the RiverCast ratings and referenced the tool to assess race day conditions alongside their own pre-race water quality testing. In 2016, PWD updated some aesthetic components to the RiverCast interface. The

Source Water Protection Program and Public Affairs at PWD are developing a communication plan for RiverCast including strategies to make the tool more user-friendly.

4.4.7 Active Members of SAN Pathogens and Point Source and Agriculture Workgroups

PWD regularly attends quarterly SAN Pathogens and Point Source and Agriculture Workgroup meetings. The 2018 meeting minutes for both workgroups are included in Appendix B. In 2015, the SAN began planning for a SAN website upgrade and redesign. SAN worked with PWD on creative solutions to include priority website functions and minimize cost. The newly designed website was launched in 2018.

To support education and outreach in 2018, the SAN Agriculture Workgroup continued to promote and distribute *A Farmer's Guide for Healthy Communities*, detailed in Section 3.2.7. The guide and additional complimentary outreach materials including a PowerPoint and photos from the guide are available on the SAN website www.Schuylkillwaters.org. Additionally, the Saucony Creek Brewing Company continues to contribute a portion of each sale of its Stonefly India Pale Ale to the Berks Watershed Restoration Fund to support agricultural BMP projects in Berks County in the Schuylkill River watershed.

Several SAN Pathogens and Point Source Workgroup members are a part of the Berks County Water and Sewer Association (BCWSA). In 2016, the BCWSA and the Berks County Planning Commission developed a county-wide program to combine source water protection and stormwater management practices, which allows for assistance to cross watershed and municipal boundaries. In July 2018, the BCWSA held its 6th annual conference, which brought together regional drinking water suppliers, wastewater operators, and related organizations to discuss common concerns and issues.

4.4.8 Collaboration with Partnership for the Delaware Estuary

In 2018, PWD continued to contribute financial resources towards collaboration efforts with Partnership for the Delaware Estuary (PDE) on several education and outreach initiatives. Initiatives include engaging Philadelphia residents in the prevention of stormwater pollution to the Schuylkill and Delaware Rivers and facilitating coordinated action, communication and projects for the Schuylkill Action Network (SAN). In 2018, PDE organized its annual *Green City, Clean Waters* art contest for Philadelphia students grades K to 12, receiving entries from 30 schools. The four first place winners from each age group have his or her artwork used in advertisements featured on SEPTA buses and subways, as shown in Figure 4-1010, and as temporary street art stickers promoting clean water.



Figure 4-10: Green City, Clean Waters SEPTA Advertisements featuring Student Artwork (PDE 2017)

PDE hosted the 2018 annual Pennsylvania Coast Day at Penn’s Landing in Philadelphia, which received more than 3,000 visitors. Additionally, PDE aided coordination of the annual Schuylkill Scrub cleanup effort partnering again with the Keep Pennsylvania Beautiful. The 2018 Schuylkill Scrub included 819 cleanups covering 431 miles of river with approximately 20,744 volunteers that removed an estimated 959,917 pounds of trash and 338 tires.

The SAN also sponsored a Sojourn Steward, Garrett Hoover, to participate in the 2018 Schuylkill River Sojourn, shown in Figure 4-11. On the 112-mile kayak journey, Garrett focused on photographing and identifying the plants and wildlife he found. As a part of a larger biodiversity study, Garrett also catalogued the species he witnessed in the *Schuylkill River Biodiversity* project on the *iNaturalist* application.



Figure 4-11: 2018 Schuylkill River Sojourn

Additionally, PWD, PDE, Academy of Natural Sciences, and FWWIC partnered to install a freshwater mussel hatchery demonstration project at FWWIC that was opened to the public on February 16, 2017. The hatchery is now being used for mussel propagation and research, as well as serving education and outreach purposes. See Section 4.4.5 for more detail.

4.4.9 Schuylkill River Restoration Fund

PWD continues to support the SRRF. In 2018, PWD contributed \$100,000 to the SRRF, and staff participated in the review of grant applications and the selection of the recipients.

In the WCP, PWD outlines several actions to reduce *Cryptosporidium* in the Schuylkill River watershed from agricultural runoff. These include the installation of agricultural BMPs, including manure storage basins and vegetated buffers, on select farms in the Schuylkill River watershed. PWD contributions to the Schuylkill River Restoration Fund (SRRF) and involvement in the SAN Agriculture Workgroup are the main vehicles for identifying projects and implementing them. Projects funded by the SRRF and the SAN partners are described in the following sections.

4.4.10 Schuylkill River Restoration Fund Farms

In 2006, Exelon, SAN, and the Schuylkill River Greenways National Heritage Area (SRG NHA) established the Exelon Restoration Fund, now the SRRF. The SRRF provides grants to support projects that improve and protect water quality in the Schuylkill River watershed. Initially, Exelon provided all the funding to fulfill a requirement in their DRBC docket for the Wadesville

Mine Demonstration Project. Beginning in 2009, PWD became the second annual contributor to the SRRF. Partnership for the Delaware Estuary (PDE) became a member and contributor in 2010 and Aqua PA followed in 2012. Additionally, MOM's Organic Market contributed to the SRRF 2014 through 2016, and Coca Cola contributed in 2015. Members of the SAN serve as technical experts in the grant selection process to support the review of project applications for their benefit to the Schuylkill River watershed. SRG NHA oversees the SRRF and distributes grant money.

PWD has been part of the grant recipient selection process since the creation of the SRRF. Since 2009, PWD has contributed \$100,000 annually to the SRRF. As a contributor to the SRRF, a select few applications per year are deemed high priority to PWD. These projects are advocated for by PWD in grant award deliberations.

In 2018, two farms received funding from the SRRF. The highest priority project for PWD was the installation of agricultural best management practices (BMPs) at A. Burkholder Farm. PWD also identified the Josh Brown Farm as a second high-priority project, advocating for SRRF funding to be directed towards agricultural BMPs there as well. Farms receiving SRRF grants also receive match funding and project support from other SAN and watershed partners, including Natural Resource Conservation Service (NRCS), Berks Nature (formerly Berks Conservancy), Berks County Conservation District (BCCD), National Fish and Wildlife Foundation (NFWF), William Penn Foundation, and local townships and water suppliers. The two 2018 SRRF farm projects are described below in detail. Updates for farms receiving SRRF grants in 2017 are also provided.

4.4.10.1 Burkholder Farm

The A. Burkholder Farm property was recognized by PWD as one of its highest priority projects during the 2018 round of SRRF grants. The Burkholder Farm operation includes several properties totaling 60 acres in the Saucony Creek Watershed in Berks County. The farm focuses on maintaining steer, including approximately 60 cattle and calves, and the production of organic vegetables. The Burkholder Farm property is situated upon a porous limestone formation which acts as a conduit for groundwater contamination. Berks Nature has been working with the Burkholder family for 4 years to implement best management practices on their farm operation to minimize such effects.

The A. Burkholder Farm project includes the construction of a dry roofed manure storage area, a waste transfer system, a water pipeline to the pasture, roof-leading rain gutters, and other barnyard stormwater controls. PWD awarded the Burkholder farm a \$50,000 SRRF grant, which is matched by contributions from both the Natural Resource Conservation Service (NRCS) under the US Department of Agriculture and the National Fish and Wildlife Fund as part of the William Penn Delaware River Watershed Initiative. These grants cover a total project cost of over \$168,700. Other project partners include Berks Nature, Berks County Conservation District, and the SAN.

As of November 2018, a visit to the A. Burkholder Farm demonstrates that construction of the BMPs is nearly complete. The dry-roofed manure storage area shown in Figure 4-12 is designed to store manure over the nongrowing season so that it can be applied to pasture at an appropriate time in the following growing season. Without this storage area, manure is often applied to pasture prior to the growing season and is then prone to runoff during precipitation events. The rain gutters shown in Figure 4-13 are designed to capture and divert stormwater away from the storage area to prevent manure runoff. A water pipeline will soon be installed to provide water for the cattle in pasture.



Figure 4-12: Cement Dry-Roofed Manure Storage Area at A. Burkholder Farm (November 2018)



Figure 4-13: Manure Storage Area Rain Gutters at A. Burkholder Farm (November 2018)

4.4.10.2 Brown Farm

The Brown Farm was also considered by PWD to be a high-priority project. The Brown Farm focuses on steer and sheep grazing, maintaining approximately 100 cattle and calves and 90 sheep. The farm is situated on the main stem of Manor Creek in the Maiden Creek Watershed in Albany Township, Berks County. The Brown Farm consists of more than 511 acres of owned and leased land, and its approved Conservation and Nutrient Management Plan covers the entire property.

BMP projects at the Brown Farm include the construction of a dry-roofed feeding and manure storage area, the installation of stream bank and wetland exclusion fencing, a water supply well establishment, the installation of an automatic drinker, rain gutter improvements, and other on-site stormwater controls. This project was awarded \$90,000 in 2018 SRRF funds, of which \$22,067 was specifically awarded by PWD. The cash match was \$216,439, with in-kind contributions of \$18,643 for a total project cost of \$325,073. Other project partners include Berks Nature, Berks County Conservation District, and the SAN.

As of November 2018, BMP construction on the Brown Farm has not yet begun but is scheduled to launch in the spring of 2019. Cattle currently have direct access to the streams and wetlands on this property, acting as a vector of contamination and erosion. Exclusion fencing will be installed throughout the riparian and wetland-adjacent portions of the property to prevent cattle from accessing these waterways. Instead, a groundwater well will be established to

provide water for the cattle via automatic drinker stations located throughout pasture. Figure 4-14 shows sloped hillsides on the property where manure-contaminated runoff enters an adjacent stream during precipitation events. A dry-roofed manure storage area will improve manure containment on the property and rain gutter improvements will divert stormwater to prevent manure runoff. The construction of a dry-roofed feeding area will limit cattle access to pasture over the nongrowing season, improving soil health and better limiting erosion.



Figure 4-14: Brown Farm Prior to BMP Construction (November 2018)

4.4.10.3 Youse Farm

Over the course of the 2017 SRRF grant round, the Youse Farm was considered by PWD to be the highest priority project. This dairy operation includes several properties totaling 325 acres in the Manatawny Creek Watershed in Berks County. Portions of the farm are located at the headwaters of an unnamed tributary to the Little Manatawny Creek and include approximately 50 milking cows and 50 calves and heifers. The Youse Farm project included the construction of a liquid manure storage basin, installation of rain gutters, and other barnyard stormwater controls.

The manure storage basin shown in Figure 4-155 is designed to hold six months' worth of manure generated by the farm's dairy cows. The manure is collected in an underground septic tank that pumps the liquid manure into the cement pit. The storage allows the farmer to spray the slurry on crops when nutrients are needed to grow, preventing the application of manure outside of the growing season when it is likely to be washed away by precipitation and runoff into nearby waterways.



Figure 4-15: Liquid Manure Storage at Youse Farm

Repair of the rain gutters allows stormwater to be collected from the roof on both sides of the barn where it is gravity fed to an underground pipe into a wetland on the property, shown in



Figure 4-16: Youse Farm Wetland

Figure 4-166. Grading of the cement surrounding the barnyard allows runoff to enter the drain system via gravity, as shown in Figure 4-17.



Figure 4-17: Youse Farm (a) Pitched Feeding Area (b) Stormwater Drainage collection at the corner of the barn (c) Drain to Collect Stormwater Runoff with Screen to Capture Large Debris

The cemented area alongside the barn shown in Figure is a heavy use area designed for cows to travel without impacting farmland. As shown by the presence of tire marks, farm vehicles also use this space to bring feed to the milk cows. The heavy use area is fenced to prevent cow access to an adjacent stream as shown in Figure. With this area now cemented, soil erosion is prevented and the water quality of stormwater runoff is improved - ultimately improving water quality of the nearby stream. The heavy use area leads to a fenced alley that will lead to pasture, with the alley constructed using geotextiles to reduce erosion. The wetlands, shown in Figure 4-166, have exclusion fencing. Dirt areas adjacent to the septic tank will be matted to avoid the creation of sediment rich runoff.



Figure 4-18: Youse Farm Cemented Heavy Use Area (June 2018)



Figure 4-19: Youse Farm Cemented Heavy Use Area with Exclusion Fencing and Stormwater Runoff Collection Drain (June 2018)

4.4.10.4 Irish Creek Streambank Stabilization

During the 2017 SRRF grant round, PWD also considered streambank stabilization at Irish Creek to be a high priority project. Approximately 70% of the Irish Creek watershed is agricultural land. Thirty-one miles of Irish Creek are listed as impaired by the PADEP for sediment from agriculture runoff and erosion from derelict land. The 21.7 acre J. Madenford property in Berks County, shown in Figure4-20, is adjacent to impaired segments of the Irish Creek. The property was once leased to a beef operation where years of livestock overgrazing and uncontrolled access to the creek has led to eroded stream banks, Figure4-21.



Figure 4-20: Google Imagery of Madenford Property on Irish Creek (April 2017)



Figure 4-21: Irish Creek Streambank Erosion - (a) Upstream View of the Left Bank where Stormwater Drains into the Creek (b) Right Stream Bank

The project included 350 feet of streambank restoration and vegetation and was implemented with the protection of 1.4 acres of forested riparian buffer and 1.3 acres of marginal pastureland wildlife habitat buffer through the USDA Conservation Reserve Enhancement Program (CREP), and 700 feet of livestock exclusion fencing. Approximately 28 beef feeder cows (800-1000 lbs. each) were removed from the property as 3.0 acres of pasture was removed from grazing production. About 1.5 acres of riparian forest buffer and 1.5 acres of wetland protection takes its place. A conjoined property of about 11 acres was also planted as part of CREP, as seen in Figure4-20.

The left bank was graded to a slope of 3:1 and a total of five rock structures measuring 500 square feet each (called “barbs”) were installed, as shown in Figure4-22. The deflectors stabilize the streambank, prevent erosion, and create fish habitat for the warm water fish stream. As runoff flows over the left bank and into the creek, the rock captures sediment and helps to rebuild streambank.



Figure 4-22: Irish Creek Project (October 2018) - Barbs Installed to Stabilize Left Bank

Since the CREP planting in 2017, the riparian buffer has become more established and ecologically mature, as shown in Figure4-23. A stream crossing, shown in Figure4-24, was installed to give the property owner access to the opposite bank while maintaining the integrity of the riparian buffer. On the adjacent property, the right bank will be backfilled with rock toe.



Figure 4-23: Irish Creek CREP Buffer Planting (a) November 2017 (b) October 2018



Figure 4-24: Irish Creek Project (October 2018) Stream Crossing

4.4.11 Implement In-City Source Water Protection Programs in East Falls, Roxborough and Manayunk

First steps to implement source water protection programs in East Falls, Roxborough and Manayunk neighborhoods are in progress. North Light Community Center, in Manayunk, received a grant from the SRRF in 2016 to remove impervious playground surface and install a stormwater management system with a rain garden and native plants. The project has been completed and serves as a demonstration and outdoor learning space for students and the community. AMY Northwest middle school, located in the Roxborough neighborhood, is also developing plans for a greener schoolyard. In 2016, Saul High School created a 501(c)(3) as a mechanism to acquire funding for projects identified in the school master plan as detailed in Section 4.2.2. PWD began collaborating with Saul and other stakeholders in 2018 to facilitate the implementation of BMPs to reduce sediment, pathogen, and nutrient loading in the Schuylkill watershed. These schools and community spaces in Manayunk and Roxborough will serve as demonstrations of source water protection and stormwater management for the students and surrounding community.

Progress has also been made in the Roxborough neighborhood to implement green stormwater infrastructure to control the quantity and improve the quality of stormwater draining into the Wissahickon Creek. Initial concepts for Roxborough's Pocket Park project resulted from the Roxborough 2020 Initiative, a comprehensive stakeholder engagement and strategic planning process led by the Roxborough Development Corporation (RDC). The project transformed an unused asphalt parking lot on Ridge Avenue into a multi-purpose green space with social, economic, and environmental benefits. The remediation of impermeable pavement and the installation of a green stormwater infrastructure system works to improve stormwater runoff quality entering the Wissahickon Creek and ultimately the Schuylkill River. In 2016 the first phase of the project was completed with the installation of 14 evergreen and deciduous trees, 33 shrubs, and mulch for planting beds. In 2017 the second phase of the project began, which included site preparation activities like excavating and grading the site for the installation of permeable pavers, plantings, rain gardens, and flower beds. In 2017, PWD worked with the Roxborough Development Corporation (RDC) and Mural Arts Program to commission artist and Roxborough native, Paul Santoleri, to develop a water and history themed mural at the site. The project was completed in 2018 and a ribbon-cutting ceremony was held to celebrate the space's addition to the Roxborough community.

4.5 Additional 2018 Highlights

4.5.1 Outreach to Watershed Community

On November 30, 2018, PWD and the Schuylkill Action Network (SAN) hosted a tour of Philadelphia-based green stormwater infrastructure projects in the Schuylkill River watershed. The tour included stops at green stormwater management projects at Kemble Park, a

stormwater wetland at Saylor's Grove, and a stream restoration project at Gorgas Run in Fairmount Park.

PWD participated in the SAN Annual Meeting in November 9, 2018. The meeting drew approximately 80 watershed partners to participate in a day of presentations and discussion. The theme was *Celebrating 15 Years of Action* focusing on the history and work accomplished over the course of the SAN's 15-year existence. See Appendix D for presentations from the annual meeting.

4.5.2 Ecological Restoration Group

The Ecological Restoration Group at PWD has implemented several projects that manage stormwater and restore stream banks throughout the Wissahickon Creek Watershed, upstream of the Queen Lane WTP intake on the Schuylkill River. Most recently, a stream channel improvement project was implemented at Gorgas Run, a tributary to the Wissahickon Creek. This project will stabilize the stream banks, reduce erosion and prevent large amounts of sediment from being carried downstream. Additional projects include the development of conceptual plans for stormwater wetland sites, similar to those implemented at Wisers Mill Run and Saylor Grove.

5.0 2018 Watershed Control Plan

5.1 Watershed Control Plan Project Summary

PWD continues to be a part of many projects and partnerships that support the WCP. Below is a summary of the action items PWD committed to as WCP deliverables and the progress made. The UV installation projects upstream of the Queen Lane intake at Upper Gwynedd WWTP and Fleetwood WWTP, which PWD has followed through publicly available information, are both fully operational, as previously noted within Annual Status Reports. PWD contributed to the SRRF, which awarded grants to support the construction of best management practices at two farms in the Schuylkill River Watershed in 2018. Geese were removed and nests and eggs treated at Fairmount Park properties and PWD facilities. The WCP accomplishments in 2018 are summarized in Table 5-1.

Table 5-1: WCP Project Progress Summary

WCP Project Type		Project Description	Status
2013	WWTP Upgrade	UV installation at Upper Gwynedd WWTP	Complete
	WWTP Upgrade	UV installation at Fleetwood WWTP	Complete
	Farm BMP	Manure storage basin at Havens Farm	Complete
	Farm BMP	Manure storage basin at Leid Farm	Complete
	Nutrient Management Plans	4 Comprehensive Nutrient Management Plans	Complete
	Riparian Buffer Planting	Shawmont Waterfront Restoration Project	Complete
	Waterfowl management	Geese removed and eggs treated at Fairmount Park properties and PWD facilities 2013	Complete/ Ongoing
2014	Farm BMP	Manure storage basin at Martin Farm	Complete
	Farm BMP	Manure storage basin at A. Zimmerman Farm	Complete
	Nutrient Management Plans	1 Comprehensive Nutrient Management Plan	Complete
	Riparian Buffer Planting	--	Complete
	Waterfowl management	Geese removed and eggs treated at Fairmount Park properties and PWD facilities 2014	Complete/ Ongoing
2015	Farm BMP	Manure storage basin at Donald Rice Farm	Complete
	Farm BMP	Manure storage basin at Dalton Biehl Farm	Complete
	Nutrient Management Plans	12 Comprehensive Nutrient Management Plans	Complete
	Riparian Buffer Planting	--	Complete
	Waterfowl management	Geese removed and eggs treated at Fairmount Park properties and PWD facilities 2015	Complete/ Ongoing
2016	Farm BMP	Manure storage basin at Zettlemoyer Farm	Complete
	Farm BMP	Manure storage basin at Durkin Farm	Complete
	Nutrient Management Plans	29 Comprehensive Nutrient Management Plans	Complete
	Riparian Buffer Planting	--	Complete
	Waterfowl management	Geese removed and eggs treated at Fairmount Park properties and PWD facilities 2016	Complete / Ongoing
2017	Farm BMP	Manure storage basin at Youse Farm	Complete
	Farm BMP	Riparian buffer plantings at Irish Creek property	Complete
	Nutrient Management Plans	36 Comprehensive Nutrient Management Plans	Complete
	Riparian Buffer Planting	---	Complete
	Waterfowl management	Geese removed and eggs treated at Fairmount Park properties and PWD facilities 2017	Complete/ Ongoing
2018 WCP Completion Requirement Check	WWTP Upgrades	Track UV Installation at 2 plants	Complete
	Farm BMPs	2 Sites encompassing several BMPs	Complete/ Ongoing
	Nutrient Management Plans	Nutrient Management Plans - 8	Complete
	Riparian Buffer Planting	Sites - 1	Complete
	Waterfowl management	Years - 6	Complete/ Ongoing

* There is an alteration to the original PADEP-approved timeline. In the first three years of the WCP implementation, PWD decided to contribute to a second manure storage basin project instead of a vegetated buffer at a farm.

In 2016, PWD received approval from the PADEP to support the implementation of a manure storage basin or a riparian buffer at ten different farms in the watershed. This was an adjustment from the initial WCP which required five manure storage basins and five riparian buffers at a total of ten different farms. The letter requesting the adjustment and the approval letter are included in Appendix F.

The SRRF is the primary vehicle through which PWD can support projects on farms with the needed expertise and matching funds from partners. The partners, NRCS, Berks Nature and the Berks County Conservation District, take a holistic approach when implementing BMPs to control animal waste and stormwater on a farm choosing a combination of BMPs that address all nutrient and stormwater management issues. The BMPs typically include manure storage solutions, stormwater management, a riparian buffer for stream reaches on the property, and other best management practices. Many of the farms entering into contracts for BMP projects do not have streams and riparian corridors directly on the property. However, this does not make manure and stormwater management less important on the site. With earthen lagoons as manure storage basins, the stormwater and groundwater are at risk of contamination. If groundwater on the site becomes contaminated, the karst and limestone geology in the Berks County area, which allows groundwater to move quickly underground, makes nearby surface waters vulnerable to contamination. PWD considers both manure storage basins and riparian buffers on farms in Berks County essentially equal in benefit to the watershed and will support the BMPs recommended by the expertise of SAN partners. To date, manure storage has been most critical at the priority farms identified for funding by SAN partners.

6.0 Expectations for 2019

Although the second round of LT2 compliance sampling resulted in an average *Cryptosporidium* concentration within 'Bin 1' range, the Queen Lane intake will remain a 'Bin 2' facility based on the results from the first round of compliance sampling as mandated by PADEP regulations. The PWD Queen Lane Water Treatment Plant will continue to employ options from the 'Microbial Toolbox' including achieving individual and combined filter effluent performance requirements to maintain in compliance with LT2 regulations. Additionally, PWD will continue ongoing initiatives outlined in the WCP through its existing Source Water Protection Program framework.

In 2019, PWD will continue maintaining its programs and activities that allowed it to accomplish its LT2 goals as outlined in the WCP. These include continuing to address WWTP effluent, agricultural land runoff, and animal vectors as priority sources of *Cryptosporidium*, as well as expanding education and outreach in the watershed through SWPP initiatives. It also includes completing WCP actions that specifically reduce *Cryptosporidium* in the watershed. Specific focus will continue to be on the following:

- Continued partnership with SAN and PDE for project facilitation and collaboration
- Continued support for research surrounding *Cryptosporidium* in Philadelphia source water and collaboration with Lehigh University.
- Continued funding towards SAN administration and the SAN Coordinator position
- A \$100,000 contribution to SRRF for 2019 project grants
- Involvement with the SAN Pathogens and Point Source Workgroup to track wastewater discharge related changes in the watershed
- Involvement with the SAN Agriculture Workgroup to identify and contribute to agricultural BMP and CNMP implementation in the watershed
- Geese management at Fairmount Park properties and PWD facilities

PWD also intends to expand Watershed Control Program Plan efforts into the Delaware River watershed and formalize these efforts in the forthcoming 2020 Watershed Control Program Plan Update.

7.0 References

- American Society of Agricultural Engineering. 2003. *Manure Production and Characteristics*. ASAE D384.1, St. Joseph, MI.
- Carroll Engineering Corporation. 2013. *Municipal Wasteload Management North Wales Water Authority Wastewater Treatment Plant Annual Report Calendar Year 2012*. Print. Obtained through communication with PA DEP Southeast Regional Office.
- Cox, Peter; Griffith, Merran; Angles, Mark; Deere, Daniel; & Ferguson, Christobel. (2005) *Concentrations of Pathogens and Indicators in Animal Feces in the Sydney Watershed*. Applied Environmental Microbiology. 71 (10):5929.
- Crockett, C.S. 2007. "The Role of Wastewater Treatment in Protecting Water Supplies Against Emerging Pathogens." *Water Environment Research* 79.3: 221-32. Print.
- Duzinski, Phil. 2008. *Schuylkill Action Network Pathogens Workgroup Study of Cryptosporidium Occurrence in Wastewater Treatment Plants*. Rep. Print.
- Environmental Engineering & Management Associates, Inc. 2013. *Upper Gwynedd Township, Chapter 94 Municipal Wasteload Management, Annual Report 2012*. Print. Obtained through communication with PA DEP Southeast Regional Office.
- Fayer, Ronald; Santin, Mónica; Trout, James M.; Greiner, Ellis. 2006. Prevalence of species and genotypes of *Cryptosporidium* found in 1-2-year-old dairy cattle in the eastern United States. *Veterinary Parasitology*, 135(2):105-112.
- Jellison, Kristen L., Amy E. Lynch, and Joseph M. Ziemann. 2009. "Source Tracking Identifies Deer and Geese as Vectors of Human-Infectious *Cryptosporidium* Genotypes in an Urban/Suburban Watershed." *Environmental Science and Technology* 43.12: 4267-272. Print.
- Jellison, Kristen. 2010a. *Detection and Genotyping of Cryptosporidium Spp. Oocysts in Water and Geese Feces in the Wissahickon Watershed: September 2008-May 2010*. Rep. Lehigh University, Department of Civil and Environmental Engineering, Bethlehem, PA. Print.
- Johnson, E.; Atwill, E.R.; Filkins, M.E.; & Kalush, J. 1997. *The prevalence of shedding of Cryptosporidium and Giardia spp. Based on a Single Fecal Sample Collection from each of 91*

Horses used for Backcountry Recreation. Journal of Veterinary Diagnostic Investigation. 9.1:56-60. Print.

Fleetwood Borough. 2013. Fleetwood Borough Council Meeting Minutes. Web.
www.fleetwoodboro.com/page3.html.

R.H. McCuen. 2004. *Hydrologic Analysis and Design*. Prentice Hall, Upper Saddle River, New Jersey, 07458, 3rd edition.

Philadelphia Water Department (PWD). 2002. *Belmont & Queen Lane Treatment Plant Source Water Assessment Report (PWSID #1510001)*. Publication.

Philadelphia Water Department (PWD). 2006. *The Schuylkill River Watershed Source Water Protection Plan, Belmont & Queen Lane Surface Water Intakes (PWSID#1510001)*. Publication.

Philadelphia Water Department (PWD). 2011. *Long Term 2 Enhanced Surface Water Treatment Rule Watershed Control Program Plan*. Publication.

Philadelphia Water Department (PWD). 2014. *2013 Watershed Control Plan Annual Status Report*. Publication.
www.phillywatersheds.org/what_were_doing/documents_and_data/watershed_plans_reports

Philadelphia Water Department (PWD). 2015a. *2014 Watershed Control Plan Annual Status Report*. Publication.
www.phillywatersheds.org/what_were_doing/documents_and_data/watershed_plans_reports

Philadelphia Water Department (PWD). 2015b. *Watershed Sanitary Survey*. Publication.

Philadelphia Water Department (PWD). 2015c. *Philadelphia's Wet Weather Management Programs Combined Sewer Management Program Annual Report and Stormwater Management Program Annual Report*. Publication. phillywatersheds.org/doc/FY15CSO_MS4AnnualReport.pdf

Pennsylvania Department of Environmental Protection (PA DEP). 2016. *2016 Draft Pennsylvania Integrated Water Quality Monitoring and Assessment Report: Clean Water Act Section 305(b) Report and 303(d) List*. <http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-13014>

United States Environmental Protection Agency (US EPA). 2006. *Federal Register: 40 CFR Parts 9, 141, and 142 National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule; Final Rule*. 3rd ed. Vol. 71. Print.

United States Department of Agriculture (USDA). 1993. *Cryptosporidium* is Common in Dairy Calves: National Dairy Heifer Evaluation Project. Web.
http://www.aphis.usda.gov/animal_health/nahms/dairy/ U.S. Department of Agriculture (USDA). 2002. *2002 Census of Agriculture*. Publication.

World Climate. "Hamburg, Berks County, Pennsylvania USA Average Rainfall." Web.
<http://www.worldclimate.com/cgi-bin/data.pl?ref=N40W075+2300+363632C>

Appendix A: 2016-2020 SAN Strategic Plan



Schuylkill Action Network
Strategic Plan
2016-2020

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SAN Drinking Water Protection History

Following the passage of the Clean Water Act and the Safe Drinking Water Act in the early 1970s¹, we started to think very differently about our rivers and streams and how they impact our daily lives. The Schuylkill River, which was once seen as a place to dispose waste, is now a vital resource for our quality of life. As the largest single tributary and source of fresh water to the Delaware River, the Schuylkill River is also an important component of the Delaware Estuary. The river provides opportunities for recreation, helps to meet our energy needs, and is a major source of freshwater to the Delaware Estuary, a major economic driver for the region. However, one of its most important benefits is something we all rely on every day, drinking water.

More than 2 million people get their drinking water from the river and streams in the Schuylkill watershed, making protecting it a very important goal for water suppliers. Over a decade ago, the Philadelphia Water Department (PWD) embarked on a very ambitious effort to identify and prioritize all of the potential pollution threats to the Schuylkill River, which provides about half of the city's drinking water. This process led to the creation of a protection plan for the river, laying out a roadmap for addressing these threats. One of the primary goals of this plan was to create a mechanism for regional coordination across geographic, regulatory, and jurisdictional boundaries. The Schuylkill Action Network (SAN) was created shortly thereafter to help accomplish this goal. The SAN takes a watershed-wide approach to protecting drinking water sources by partnering with upstream communities, other regional water suppliers, businesses, governments, and watershed protection groups.

Strategic Plan Background

Since its inception, the SAN has regularly produced a Strategic Plan to help guide the network's future growth and direction. The SAN 2016-2020 Strategic Plan (the "Plan") was developed through an effort of the SAN Planning Committee to serve as a guide for the next five years. The Plan was informed by the SAN's original goals and purposes, past priorities and long-term agenda items, as well as the current and ongoing work of its various workgroups, committees, and partners.

¹ The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1972. <http://www.epa.gov/laws-regulations/summary-clean-water-act>.

The Safe Drinking Water Act (SDWA) was established in 1974 to protect the quality of drinking water in the U.S. This law focuses on all waters actually or potentially designed for drinking use, whether from above ground or underground sources. <http://www.epa.gov/laws-regulations/summary-safe-drinking-water-act>

The SAN facilitated a variety of processes for gathering new input from partners and watershed stakeholders during the strategic planning update process. Early in 2015, the Planning Committee and Executive Steering Committee (ESC) initiated the planning process by identifying key themes for the new plan. During the summer of 2015, the Planning Committee held regional strategic planning listening sessions in Reading and Philadelphia and engaged members online through a webinar meeting. Several online surveys developed for water suppliers, recreational users, and the general public were distributed throughout the watershed to garner additional input. In total, over 300 SAN partners and stakeholders provided responses. All solicited feedback was organized by the SAN Planning Committee and incorporated into new strategies and objectives which are reflected in the Plan below.

The Plan is a tool crafted to guide and coordinate the SAN’s work over the next five years and to communicate the SAN’s intentions to the surrounding community of partners, potential partners, and funders. Planning is a fluid process and this plan was designed to be regularly revisited – and revised – as needed as part of the work planning process. The Plan is supported and further detailed by the yearly workplans for each SAN workgroup/committee.

The SAN is a voluntary partnership dedicated to meeting its mission and vision for the Schuylkill River. The deadlines, actions, and commitments of this Plan are subject to the availability of sufficient resources and funding to carry them out. The SAN leadership will periodically review the progress of the Plan, make adjustments as needed to reflect the latest priorities, needs and available resources, and continue to work toward the vision and mission of the SAN at an efficient and feasible pace.

Overview of SAN Strategic Goals

Strategic Goal	Workgroup / Committee Responsible
<p>To advance drinking water and watershed protection for the Schuylkill River and its tributaries by facilitating communication and decision making on a regional, state, and federal level.</p> <p>Work collaboratively to ensure the availability of resources, expertise, and commitments to support the work.</p>	Executive Steering Committee
<p>Focus efforts on improving watershed management, especially activities that will enhance the quality and flow of Schuylkill waters for the protection of public health and aquatic resources.</p> <p>Create and maintain an effective network that maximizes the resources of its membership to protect and restore the Schuylkill watershed.</p>	Planning Committee
<p>Maximize reduction and/or treatment of abandoned mine drainage discharges.</p>	Abandoned Mine Drainage (AMD) Workgroup
<p>Maximize reduction and/or prevention of agricultural impacts to water quality.</p>	Agricultural Workgroup
<p>Improve public support for watershed protection actions.</p>	Education & Outreach Workgroup

Engage recreational users of the watershed in activities that lead to increased awareness and advancement of watershed protection and restoration strategies.	Recreation Workgroup
Facilitate and strengthen communication and coordination among regulatory agencies, downstream water users, and basin stakeholders regarding point source compliance programs and drinking water protection strategies.	Pathogens/Compliance Workgroup
Maximize reduction and/or prevention of stormwater runoff pollution.	Stormwater Workgroup
Promote a sustainable landscape in the Schuylkill River watershed through strategic conservation and efficient land resource use to protect the integrity of water supplies for future generations.	Watershed Land Protection Collaborative Workgroup

Vision

The Schuylkill watershed is a healthy ecosystem and a foundation for a thriving network of communities in southeastern and central Pennsylvania. It is the largest source of fresh water to the Delaware River and an important natural resource of the Delaware Estuary. Residents recognize themselves as citizens of the watershed and they value its unique cultural and natural resources. Reflecting this common value, residents, businesses, non-profit organizations, and governments actively work to address current and past threats to drinking water sources and watershed health while working to protect these natural resources from new stress. Members of the Schuylkill Action Network share information, expertise, and technology to help each other achieve this shared vision of clean water and a healthy environment for the Schuylkill River and its tributaries. Management practices, restoration efforts, and protective measures are implemented using a sustainable source of funding to improve and protect the water resources and water quality of the Schuylkill River watershed.

Mission

The mission of the Schuylkill Action Network is to improve water resources in the Schuylkill River watershed by working in partnership with local watershed organizations and land conservation organizations, businesses, academics, water suppliers, recreational communities, local governments, and regional, state, and federal agencies to transcend regulatory and jurisdictional boundaries in the strategic implementation of protection measures. The SAN seeks to achieve this mission through enhanced communication and collaboration and, more specifically, by working cooperatively with interested parties to:

- Support existing efforts and implement actions to restore and protect water quality in the Schuylkill River watershed;
- Promote the long-term coordinated stewardship and restoration of the watershed and educate others regarding their roles in protecting the watershed and water supplies;
- Transfer the experience and lessons learned to other communities; and
- Enhance intergovernmental communication and coordination by working together on the identification and resolution of environmental issues with shared regulatory responsibility.

SAN Objectives

To improve the quality of drinking water as indicated by:

- Reduction in annual pollutant loadings to source water due to drinking water protection efforts.
- Participation of Schuylkill River water suppliers in SAN workgroups and events directly supporting utility's Source Water Protection Plans and Source Water Protection Plan goals.

To improve watershed health as indicated by:

- Increased efforts to achieve healthy and resilient aquatic ecosystems.
- Promoting the restoration of impaired stream miles and continuing to further advance the protection of stream miles through the network's many collaborative efforts and watershed strategies.

To improve public value as indicated by:

- Significant improvement in public perception of the Schuylkill River as a vital regional natural resource that should be protected.
- A return to the river by the public for the purposes of recreation, sport, and enjoyment.

Key Strengths of the SAN

Overview

During the strategic planning process, SAN members were asked to describe the services provided by the SAN that they value most. These services should be maintained and/or improved by the SAN in order to achieve a shared vision for a clean and healthy Schuylkill watershed. The following themes represent this feedback and are incorporated throughout the goals, strategies, and objectives of the SAN leadership and workgroups.

Resource

The SAN provides valuable resources and information related to the Schuylkill watershed. This has been a primary objective of the SAN since its inception, and achieved by utilizing the SAN website as a clearinghouse of information on Schuylkill-related topics, documents, reports, guides, photos, and more. Maintaining this benefit of the SAN is important for the watershed community and is embedded as a key element of the strategies for the next 5 years. The SAN should also continue to look for additional opportunities to serve as a resource for its partners that will add value to the shared work throughout the watershed.

The SAN's key strengths as a resource include being:

- A leading source for information on watershed related issues or materials;
- Supportive, and possessing a high level of watershed knowledge and expertise;
- A resource for assisting partners in obtaining funding necessary to complete their priority projects. For example: partners submit many multi-organizational grant applications, focus on sub-award projects coordinated by the Partnership for the Delaware Estuary, and provide letters of support for SAN priority projects.

Networking and Collaboration

One of the primary goals of the SAN is to serve as a platform for individuals, organizations, agencies, utilities, schools, businesses, and others to come together to share resources, information, and strategies that improve the health of the watershed.

The SAN's key strengths in networking/collaboration include:

- Effective collaboration with partners;
- Welcoming and engaging members;
- Strategically planning events and meetings;
- Bringing together a variety of stakeholder groups. For example: environmental nonprofits, water utilities, and governments;
- Having geographical diversity among its partners;
- Continuously developing the SAN and including new members/partners;
- Providing professional connection and networking.

Issue-focused Action

The SAN is largely structured around issue-driven workgroups, tasked with addressing the most pressing problems in the watershed. This approach is valued by SAN partners in that it represents a prioritized approach and leads to high quality projects. In the strategic plan, strategies have been developed to ensure that issue-driven work continues and is expanded when possible.

The SAN's key strengths in maintaining issue-focused action include:

- The SAN's focus on many different aspects of water, while maintaining a central emphasis on watershed health and clean and safe drinking water;
- Linking together drinking water, waste water, recreation, societal issues, and economics;
- Defining clear objectives;
- Taking proven approaches to solving problems;
- Identifying tools to protect and restore the watershed.

Watershed Improvements

The SAN has positively impacted the environmental conditions of the watershed, as well as communities in the watershed, despite limited money, resources, and staff. This is especially highlighted in the Agricultural and Abandoned Mine Drainage workgroups where water quality improvements are very noticeable. Throughout this strategic plan, the SAN will focus on achieving watershed improvement results.

The SAN's key strengths in achieving watershed improvements include:

- Fostering positive environmental change;
- Positively impacting communities in the watershed;
- Clearly communicating what progress looks like to its members;
- Achieving goals despite limited money, resources, and staff;
- Identifying tools to protect and restore the watershed.

Education and Outreach

The SAN works to integrate education in many of its watershed restoration and protection goals. In addition to maintaining an Education and Outreach Workgroup, the SAN strives to implement actions that increase the understanding of and affinity for the Schuylkill Watershed across all of its work. Education and outreach is also a key focus in many of the SAN's partners' missions. When possible, education and outreach should be further embedded throughout SAN initiatives and projects with the goal of increasing public awareness and care for the watershed.

The SAN's key strengths in education and outreach include:

- Making the connection between upstream and downstream waters;
- Including strong, clear messages about clean water in outreach materials;
- Creating and managing the Schuylkill Action Students program.

Data and Monitoring²

In order to advance the restoration and protection efforts of the SAN, it is important to document the extent and impact of activities. This is largely accomplished through water quality monitoring efforts. Data collection and monitoring is a key element of many SAN workgroup strategies. The SAN will work to acquire resources for monitoring and to connect local monitoring activities with larger regional monitoring and data collection and modeling efforts. A primary goal of the SAN will be to provide a mechanism for sharing data among partners to

² In the previous strategic plan, data and monitoring was listed as a separate team. The SAN is now integrating basin-wide monitoring through the Delaware River Watershed Initiative.

assist in identifying priority areas for program implementation, reducing contamination, and protecting public health.

The SAN's key collaborative monitoring and data collection efforts include:

- Abandoned mine drainage monitoring efforts completed by the Schuylkill Headwaters Association, Schuylkill Conservation District, United States Geological Survey, and the Army Corps of Engineers.
- Agriculture monitoring efforts by the Delaware River Watershed Initiative (DRWI).
- Conservation monitoring efforts by the DRWI

Additional monitoring strategies of the SAN include:

- Provide guidance and support to workgroups for determining and measuring workgroup objectives.
- Provide guidance and support to the SAN partners for integrating watershed monitoring information into the SAN website and other outreach tools.
- Support the maintenance of key monitoring stations, such as the USGS gauge station at Norristown and other USGS gauge stations located upstream of drinking water intakes.
- Coordinate watershed monitoring and analysis needs with current or new initiatives through the Delaware River Watershed Initiative and with the Academy of Natural Sciences.
- Support water suppliers in their efforts to better coordinate and share water quality data and information.
- Encourage the involvement of colleges and universities in helping the meet additional monitoring needs in the Schuylkill River watershed.
- Identify opportunities and provide support for connecting data and monitoring activities of the Delaware Valley Early Warning System with SAN watershed outreach and planning efforts.

Water Suppliers

Since the inception of the SAN, the SAN has been actively involved in water suppliers' source water protection planning and implementation efforts.

The SAN should continue to:

- Maintain and update the water suppliers list on the SAN website.
- Share relevant information with the water suppliers listserv.
- Participate in water supplier source water protection meetings.

EXECUTIVE STEERING COMMITTEE

TO ADVANCE DRINKING WATER & WATERSHED PROTECTION FOR THE SCHUYLKILL RIVER & ITS TRIBUTARIES BY FACILITATING COMMUNICATION & DECISION MAKING ON A REGIONAL, STATE, & FEDERAL LEVEL;

&

BY WORKING COLLABORATIVELY TO ENSURE THE SAN HAS THE NECESSARY RESOURCES TO SUPPORT ITS WORK.

Objectives

1. *Leadership* - Provide leadership on issues, policies, and practices influencing drinking water and watershed protection.
2. *Visioning* - Increase the SAN's ability to advance a progressive agenda by communicating opportunities, challenges, and needs.
3. *Collaboration* - Facilitate collaboration among public and private interests in drinking water protection. Work to secure strategic partnerships with public and private entities to support restoration and protection efforts.
4. *Sustainable Operational Funding* - Support the investigation and acquisition of resources needed to meet the operational needs of the SAN.

Strategy

The SAN Executive Steering Committee (ESC) provides support, leadership, and oversight of the overall goals and objectives of the network, working to collaborate on strategies and practices that will advance the SAN's primary mission of drinking water protection while supporting efforts to connect this work to other water resource protection needs. The ESC provides direction to the SAN from a regional, state, federal, and utility perspective. The ESC is represented by members of Pennsylvania Department of Environmental Protection, U.S. Environmental Protection Agency, Delaware River Basin Commission, Philadelphia Water Department, the Partnership for the Delaware Estuary, and the Schuylkill River Heritage Area. The ESC will work together to prioritize and articulate strategies that encourage the above agencies and organizations to strengthen their commitment to the restoration and protection goals of the SAN for the Schuylkill River watershed. Over the next 5 years, the ESC will explore the engagement of 3-5 new strategic partners from among public and private entities to support the restoration and protection of the Schuylkill River. The ESC will assist with the facilitation of strategic planning and goal setting in for the SAN and approve updates to the SAN Strategic Plan on at least a 5-year cycle. The ESC will provide guidance on decision making and prioritization for investments of agency/organizational time to meet the objectives of the SAN and its Strategic Plan. The ESC will provide guidance to the SAN workgroups, when needed, to prioritize work and set goals for achieving its overall mission.

PLANNING COMMITTEE

FOCUS EFFORTS ON IMPROVING WATERSHED MANAGEMENT, ESPECIALLY ACTIVITIES THAT WILL ENHANCE THE QUALITY AND FLOW OF SCHUYLKILL WATERS FOR THE PROTECTION OF PUBLIC HEALTH AND AQUATIC RESOURCES.

&

CREATE AND MAINTAIN AN EFFECTIVE NETWORK THAT MAXIMIZES THE RESOURCES OF ITS MEMBERSHIP TO PROTECT AND RESTORE THE SCHUYLKILL WATERSHED.

Objectives

1. Secure funding of \$500,000 per year or more to support watershed restoration/protection and partnerships, with at least 50% coming from sustainable sources.
2. Increase the number of participants contributing to the Schuylkill River Restoration Fund each year.
3. Maintain operational funding necessary for the day to day operations of the SAN.
4. Redesign the SAN website to better serve the needs of workgroups, partners, and the general public.
5. Increase the participation and diversity of the SAN membership.
6. Oversee the development of a Recreation Workgroup and strategic plan element until it becomes established.
7. Serve as a facilitator for improving the processes that guide restoration and protection efforts in the Schuylkill River watershed.
8. Provide guidance and take action to remove barriers that impede watershed restoration and protection.

Strategy

In order for the SAN to achieve long-term success in restoring and protecting the health of the Schuylkill watershed, it is important that the Planning Committee continues its focus on maintaining the health of the network, providing guidance and resources to SAN partners for workgroup priorities. Since its creation in 2003, the SAN has successfully developed a system of prioritizing and implementing projects that advance drinking water protection in the watershed. In doing so, the SAN has been able to establish itself as a leader in the watershed and provide a forum for communicating and advancing discussions on activities that impact the watershed's natural resources. Over the next five years, the SAN must continue to secure resources for the watershed; create opportunities for networking and collaboration; maintain focus on the most pressing watershed issues; lead watershed outreach; and advance the goal of achieving watershed protection and improvements.

In order to maintain network health and promote a progressive drinking water protection agenda for the Schuylkill watershed, the SAN Planning Committee will work to secure resources, facilitate communication among its partners, and eliminate barriers to better watershed management. The Planning Committee will continue the goal of acquiring both sustainable funding for watershed implementation projects, as well as securing long-term funding to cover the operational expenses of the network. The Planning Committee will look for opportunities that will leverage resources and provide positive outcomes in priority watersheds that align with both the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA).

The Planning Committee will continue to create opportunities that engage watershed stakeholders and encourage the sharing of information and resources throughout the network. This includes working collaboratively with the Education and Outreach Workgroup to redesign the SAN website. Also, through the various SAN outreach channels, including the SAN website and social media sites, workgroup and network-wide meetings, and SAN publications, the Planning Committee will direct needs-driven information and resources to its members.

The Planning Committee will focus specifically on the following strategies:

1. Continue to strengthen the SAN communication infrastructure to maintain active communication among SAN members (website, social media, newsletters, and meetings) and provide more needs-focused support to SAN workgroups.
2. Implement elements of the SAN Fundraising Strategy, securing both public and private funding for SAN priority projects, with a goal of establishing an annual fund of \$500,000.
3. Investigate new fundraising strategies for the SRRF and operational SAN funding.
4. As needed, convene meetings of a Watershed Practices Implementation Committee with the goal of examining the processes and policies that guide watershed management and developing and presenting strategies that improve them (See Appendix C).
5. Support SAN partners as they continue their assessment of the impacts of climate change on the Schuylkill River watershed and Delaware Estuary and identify linkages between workgroup activities and climate change adaptation recommendations.
6. Provide support to SAN workgroups in projects that engage municipalities and water utilities in watershed restoration, protection, and planning.
7. Work cooperatively with SAN partners to encourage and support regional collaborative watershed planning efforts that integrate the Clean Water Act and Safe Drinking Water Act programs.
8. Support drinking water protection activities within the City of Philadelphia, including education and outreach projects, planning initiatives, and other relevant endeavors, and disseminate information to upstream communities.
9. Engage recreational users in the SAN through events, projects, and the establishment of a new Recreation Workgroup; increase awareness of need for protection efforts among the users of the River.
10. Continue to integrate SAN's connection with the Delaware River Watershed Initiative through both the Middle Schuylkill and Schuylkill Highland's clusters, as well as through watershed-wide efforts of this initiative.
11. Continue to support partners and leverage funding by providing letters of support.
12. Explore the feasibility of developing a *State of the Schuylkill* report to effectively communicate water quality improvements and conditions in the watershed.
13. Consider the relationship of flow and water quality as it relates to SAN Goals.
14. Coordinate with the Partnership for the Delaware Estuary (PDE) on its freshwater mussel recovery program.

ABANDONED MINE DRAINAGE (AMD)

MAXIMIZE REDUCTION AND/OR TREATMENT OF ABANDONED MINE DRAINAGE DISCHARGES.

Objectives

1. Reduce surface water infiltration into the Pine Knot mine-pool to lessen discharge.
2. Reduce legacy coal silt from streams.
3. Remediate AMD pollution for Pine Knot/Oak Hill mine pool complex.
4. Remove 92 tons of iron, 6 tons manganese, 7 tons aluminum annually from discharges and streams.
5. Improve the pH of mine discharges/streams to pH 6.0 or above as needed to support fisheries and aquatic life.
6. Convert 15 miles of streams to healthy habitat to support fisheries and aquatic life over the next 5 years.
7. Increase partner participation so at least two or more partners are actively involved in every AMD project.
8. Complete 5 AMD remediation projects over the next 5 years.
9. Maintain existing AMD projects so they continue to function properly in removing metals and improving pH.

Strategy

Abandoned Mine Drainage (AMD) is one of the primary sources of pollution in the headwaters of the Schuylkill River and the biggest source of metals downstream. It is responsible for 24% of water quality impairments in the watershed. AMD is created deep below the ground in abandoned mines where streams, groundwater and stormwater fill tunnels that were once kept dry by active pumping operations. Water and oxygen react with lingering iron sulfide (pyrite) producing metal-laden and sometimes highly acidic discharges that exit the tunnels in telltale orange and silver plumes, easily visible in regional surface waters. AMD interferes with vegetative growth and reproduction of aquatic animals by armoring the streambed with deposits of iron and other metals. Acidity and metals impair both surface and ground drinking water resources and quickly corrode pipes and industrial mechanisms. Legacy mining also causes sediment pollution as silt from coal refuse piles flows into nearby creeks and streams.

Over the next five years, the AMD Workgroup will continue to implement projects that reduce the impact of legacy mining practices on the water quality of the Schuylkill River. The workgroup will target priority discharges by designing and constructing AMD treatment systems with the most current treatment technologies; implementing projects that keep unpolluted water clean by reducing surface water infiltration into mine pools; and assisting with projects that utilize best practices for mine land reclamation, including programs that promote reclamation through reforestation. The workgroup will also work to direct new investments into their work, largely by securing resources from the PA Department of Environmental Protection's Title IV Set-Aside Program. The workgroup will explore options for utilizing this funding to construct a treatment system for the Oak Hill/Pine Knot discharge, the most pressing AMD issue in the Schuylkill watershed.

The workgroup will also improve stream habitat, which will result from AMD abatement work and in-stream habitat improvements. The workgroup will continue to assess the impact of their activities through project tracking, biological and chemical monitoring, and ongoing oversight of existing and future treatments systems. The workgroup will maintain and strengthen relationships with all stakeholders, including government agencies, landowners, mining operators, NGO's, and local governments.

The AMD Workgroup will focus specifically on the following strategies:

1. Implement elements of the West Branch Qualified Hydrologic Unit Plan (QHUP) and utilize Abandoned Mine Land (AML) set-aside funding and implement projects under this program.
2. Construct treatment system(s) to address metals and pH loading from the Oak Hill/Pine Knot Mine pool.
3. Investigate completion of additional QHUPs for additional stream reaches impacted by AMD.
4. Maintain focus on reducing surface water infiltration into the Pine Knot Mine pool, working with partners to identify the best opportunities for implementing projects.
5. Implement in-stream restoration practices that will improve habitat for fisheries and aquatic life.
6. Promote, support, and demonstrate best practices for mine land reclamation, focusing on techniques promoted by the Appalachian Regional Reforestation Initiative (ARRI).
7. Continue to assess and address AMD treatment system maintenance needs.
8. Continue to monitor the impact of AMD treatment systems in the watershed.
9. Provide support to the SAN Planning Committee as it works to address the gaps and barriers in local, regional, state, and national processes that focus on issues related to AMD and legacy mining impacts on source water.

AGRICULTURE

MAXIMIZE REDUCTION AND/OR PREVENTION OF AGRICULTURAL IMPACTS TO WATER QUALITY.

Objectives

1. Rehabilitate and/or buffer 5 miles (26,000 feet) of streams over the next 5 years.
2. Through the Berks County Conservation District and Berks Nature, complete 20 conservation and nutrient management plans annually.
3. Through Natural Resource Conservation Services (NRCS), complete 25 conservation plans (2,500 acres) annually.
4. Monitor water quality (quarterly) and aquatic life (annually) of streams downstream of completed agriculture restoration projects.
5. Through the NRCS, complete 15 Comprehensive Farm Management plans over the next 5 years.
6. Advance restoration goals of the Middle Schuylkill Implementation Plan as part of the Delaware River Watershed Initiative (DRWI).
7. Create and continue to populate database of farm best management practices (BMPs) completed in Berks County.
8. Evaluate impact of agriculture BMPs on stream health and communicate results to the watershed community.
9. Develop and maintain involvement in funding programs and initiatives to support current and future agriculture restoration activities.

Strategy

Agricultural runoff is a primary source of pollution in streams and rivers in the Schuylkill watershed and is responsible for over 30% of the watershed's water quality impairments. Pollutants carried in agricultural runoff include soil, nutrients, pesticides, bacteria, and other substances, all of which may increase water treatment costs and degrade aquatic habitats. Runoff from animal operations can contain manure, depositing high nutrient values and potentially disease-causing bacteria and pathogens into the local waterways. Nutrients cause excessive plant growth and algae blooms in waterways, which deplete the water of dissolved oxygen as the plant materials die. The presence of pathogens in source water may increase the cost and complicate the processes of downstream drinking water treatment.

Over the next five years, the Agriculture Workgroup will complete projects that reduce the impact of agriculture runoff on drinking water sources in the Schuylkill watershed. Through a collaborative approach, the workgroup will engage key partners and watershed stakeholders in the strategic implementation of agriculture BMPs, conservation and nutrient management plans, and progress monitoring. To accomplish the above agenda, the workgroup will identify and secure resources; support and help guide decisions on agriculture related programs; and continue to work with and strengthen its relationship with farmers, water utilities, and local watershed and conservation organizations.

The workgroup will also advance efforts of the DRWI, working to complete key elements of the Middle Schuylkill Cluster implementation plan. The workgroup will monitor the impact of its investments by regularly monitoring water quality of agriculture impacted streams. The workgroup will also catalogue all BMP projects completed that are contributing to improvement in the watershed.

The Agriculture Workgroup will focus specifically on the following strategies:

1. Continue to update and map priority farms for workgroup assistance.
2. Continue to maintain focus on BMP implementation on farms in priority subwatersheds that will have the greatest impact on improving drinking water sources.
3. Identify and secure funding from new sources, including programs such as the Pennvest NPS pollution program, Schuylkill River Restoration Fund, DRWI, and others to allow for greater leveraging of farm bill appropriations in the watershed.
4. Maintain involvement with the DRWI to substantially complete agriculture restoration projects in the Middle Schuylkill Cluster.
5. Strengthen relationships with water suppliers in priority subwatersheds and pursue joint ventures for implementing BMPs on priority farms/sites.
6. Utilize resource of the Conservation Reserve Enhancement Program (CREP) in the Delaware River watershed to restore priority streamside habitat.
7. Document agriculture BMP investments and successes in the watershed, including load reduction modeling results, and promote to watershed stakeholders.
8. Report gaps and barriers in local, state and regional programs for mitigating agricultural impacts to the Planning Committee and provide support for addressing them.
9. Expand restoration activities in Lehigh, Montgomery, and Chester counties.
10. Complete and implement the Lower Maiden Watershed Implementation Plan, securing additional federal funding for agriculture restoration in this area.
11. Continue to support and share data and other pertinent water quality and project information with Philadelphia Water Department and other water suppliers in support of their watershed planning efforts associated with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2)/ Watershed Control Plan.

EDUCATION AND OUTREACH

IMPROVE PUBLIC SUPPORT FOR WATERSHED PROTECTION ACTIONS.

Objectives

1. Redesign and enhance the SAN website to better serve the needs of workgroups, partners, and the general public.
2. Increase engagement of the watershed community through social media (Facebook, Twitter, and Instagram) by 50% in 5 years (500 new combined followers).
3. Improve public perception of and/or connections with the Schuylkill watershed.
4. Post project descriptions, pictures, and/or videos on the SAN website for every completed workgroup project.
5. Increase media coverage of SAN events, projects, and activities (10 media hits per year).
6. Increase applicants for the Schuylkill Scholastic Drinking Water Awards program.
7. Increase number of cleanups, volunteers, and trash removed from the watershed through the *Schuylkill Scrub* initiative (700 cleanups over 5 years).
8. Develop a litter sampling protocol for *Schuylkill Scrub* volunteers to conduct and track types of litter found throughout the watershed.

Strategy

One of the most important aspects of ensuring the long-term protection of the Schuylkill watershed is raising awareness as to the resources it provides to residents. In the Schuylkill watershed, residents are accustomed to turning on a tap and receiving clean, safe drinking water, with little or no thought given to the source of that water or its availability. However, clean water cannot be taken for granted; polluted water is everyone's concern. Through concentrated public education and outreach efforts, people can discover how their decisions and daily actions directly impact the water they drink, the recreation they enjoy, regional wildlife habitat, human health, and sustainability for future generations. Education and outreach are necessary to raise public awareness of the problems and of the local management options to fix them. Ideally, SAN outreach efforts foster an appreciation and awareness of local water resources, inspiring stewardship and meaningful changes in the daily actions of residents.

Over the next five years, the SAN Education and Outreach (E&O) Workgroup will continue to generate the support and awareness necessary for the long-term protection and restoration of the Schuylkill watershed. To accomplish this, the E&O Workgroup will promote SAN projects and successes, watershed news and events, restoration and protection priorities, and individual opportunities for watershed action through the SAN website, social media, media outlets, and within the network. The E&O Workgroup will support the efforts of all the SAN workgroups. The E&O Workgroup will maximize these efforts, aiming to increase its reach by utilizing social media tools and resources. The workgroup will also partner more closely with the Philadelphia Water Department, advancing city-wide watershed outreach initiatives and finding opportunities to replicate them in upstream communities. The workgroup will also continue to support school-based watershed activities through its annual Schuylkill Scholastic Drinking Water awards programs and by assisting with workgroup school-based programs. The workgroup will lead engagement activities through the *Schuylkill Scrub* initiative, serving as a tool for watershed residents to take action in improving the health of the Schuylkill watershed. To accomplish the above agenda, the workgroup will identify and secure resources; support and help guide decisions on outreach-related activities; and continue to identify new opportunities for working on collaborative projects that increase watershed awareness and appreciation (such as Keep Pennsylvania Beautiful's Great American Cleanup of PA and EPA's Trash Free Waters program).

The Education and Outreach Workgroup will focus specifically on the following strategies:

1. Redesign the SchuylkillWaters.org website and continue to facilitate internal communication among SAN members, provide opportunities for online sharing of information among watershed professionals, and support public advocacy for protecting and restoring Schuylkill Waters.
2. Recognize, expand, promote, and support watershed education initiatives and schools/teachers/students as they implement water quality restoration, protection, and awareness projects.
3. Provide assistance to SAN workgroups on educational elements of their restoration and conservation activities.
4. Provide assistance to SAN Recreation Workgroup on all SAN outreach tools and messaging.
5. Maximize use of social media tools for outreach campaigns that aim to influence public perceptions/attitudes/behavior of watershed residents, encouraging them to view the watershed as a valuable resource.
6. Work with the Philadelphia Water Department to model drinking water protection education and outreach projects in the City of Philadelphia and disseminate to upstream communities for replication and collaboration.
7. Provide audience-specific education to different communities, making linkages between their community and water quality.
8. Host workgroup projects tours for specific audiences (ex. MS4 project tour to exhibit models for other municipalities to follow).
9. Develop a marketing strategy, using clear, concise, and uniform messaging.
10. Develop a simple brochure about SAN and separate brochures about each workgroup ready for partners to use and share.
11. Highlight local leaders in the watershed (farmers, teachers, township employees, etc) in outreach materials to promote and encourage replication of model watershed management practices.
12. Develop public education materials to targeted stakeholders not currently involved with the SAN and disseminate this information to watershed related/reliant business and community organizations.
13. Develop school outreach programs, including contests and games, to engage students in learning and caring about the Schuylkill watershed.
14. Assist workgroups in communicating SAN current and past accomplishments to build support from community leaders, elected officials, and corporate partners for future SAN activities.
15. Use key messaging received from feedback in the Strategic Plan General Public survey in all outreach materials.
16. Promote more citizen science involvement in PDE's freshwater mussel recovery program.

PATHOGENS AND POINT SOURCE

FACILITATE AND STRENGTHEN COMMUNICATION AND COORDINATION AMONG REGULATORY AGENCIES, DOWNSTREAM WATER USERS, AND BASIN STAKEHOLDERS REGARDING CLEAN WATER ACT AND SAFE DRINKING WATER ACT GOALS

Objectives

1. Provide educational opportunities to wastewater utilities on inflow and infiltration management, drinking water protection, and other clean water initiatives.
2. Track progress of projects addressing unsewered communities (on-lot malfunctions and wildcat sewer discharges).
3. Develop an outreach strategy to increase wastewater treatment operators' participation in the SAN.
4. Share information and facilitate discussion with wastewater and drinking water utilities on emerging contaminants and watershed issues.
5. Characterize conditions and treatment technologies of wastewater treatment plants (WWTPs) in the Schuylkill watershed (e.g. UV treatment for *Cryptosporidium*).
6. Track Act 537 Planning initiatives throughout the watershed.

Strategy

Over the next five years, the SAN Pathogens and Point Source Workgroup will maintain the current level of coordination and communication provided by wastewater treatment compliance practitioners, identifying opportunities to improve compliance and reduce threats to downstream water suppliers and other river users. The workgroup will maintain a focus on reducing illegal discharges, supporting and promoting the Delaware Valley Early Warning System (EWS), and supporting planning efforts aimed at reducing pathogen introduction in the watershed. Additionally, the workgroup will also provide assistance in coordinating support for increased pathogen monitoring efforts in the watershed.

The SAN Pathogens and Point Source Workgroup will focus specifically on the following strategies:

1. Promote funding opportunities, such as Pennvest, to wastewater and drinking water utilities.
2. Utilize the permit and compliance process to minimize discharges from wastewater treatment and encourage/require upgrades.
3. Implement a strategy to address any remaining and unidentified wildcat sewers.
4. Improve discharger/water supplier communication of events through use of the Delaware Valley EWS to minimize water quality threats to the Schuylkill River.
5. Assist the Philadelphia Water Department in the implementation of their LT2 Watershed Control Program Plan for the Queen Lane intake.
6. Support efforts that provide wet weather and inflow and infiltration management education to WWTP operators.
7. Explore options to improve monitoring at strategic locations in the watershed: downstream of point sources that could influence the water quality profile at drinking water intakes.
8. Characterize conditions of WWTPs in the Schuylkill watershed through Philadelphia Water Department's Sanitary Survey.
9. Continue to update information on wastewater treatment technologies and systems throughout the watershed (e.g. Chapter 94 reports).
10. Investigate evolving source water issues, such as Harmful Algal Blooms (HABs) and emerging contaminants and develop a better understanding of what these issues mean for water supplier's source protection strategies.

RECREATION WORKGROUP

ENGAGE RECREATIONAL USERS OF THE WATERSHED IN ACTIVITIES THAT LEAD TO INCREASED AWARENESS AND ADVANCEMENT OF WATERSHED PROTECTION AND RESTORATION STRATEGIES.

Objectives

1. Work with the SAN Planning Committee to improve and finalize the Recreation Workgroup strategic plan section and yearly workplans.
2. Initially invite at least 25 potential partners and 5 new partners annually, to participate in the newly formed Recreation Workgroup.
3. With the Education and Outreach work group, develop and implement an outreach strategy for the recreational community along the Schuylkill River.
4. Increase recreational engagement in the watershed.
5. Implement watershed restoration projects in close proximity to high traffic recreation sites (e.g. trailheads and boat launches).
6. Improve public perception of the Schuylkill River watershed as a safe, clean, and fun place to recreate.

Strategy

Within the last decade, recreational use and access to the Schuylkill River and its tributaries has increased remarkably. In 2009, 800,000 people used the Schuylkill River Trail. In 2015, that number grew to 2 million users, an increase of 150%. Also that year, the Schuylkill River Trail was voted the "Best Urban Trail" by *USA Today*. To capitalize on this success, the SAN Recreation Workgroup will focus on changing public perspective on the Schuylkill River, underscoring its transformation from a once heavily polluted river to a significantly cleaner and safer recreational resource. The Recreation Workgroup will do this by developing an outreach strategy for the recreational community that will heavily focus on experiential learning, as well as capture cultural and heritage aspects of the waterways.

Over the next 5 years, the SAN Recreation Workgroup will increase support for protection and restoration of the Schuylkill watershed by educating recreational users about the history and progress of the Schuylkill River and the SAN. The workgroup will work with existing recreational groups, such as rowing clubs, kayaking clubs, and hiking groups, to implement an outreach strategy for the entire recreational community along the Schuylkill River. The workgroup will strategically identify opportunities for connecting restoration and conservation projects with important recreational areas in the watershed. With the Education and Outreach Workgroup, The Recreation Workgroup will develop clear, concise messaging and innovative events to connect users to watershed protection and restoration efforts.

The SAN Recreation Workgroup will focus specifically on the following strategies:

1. Collaborate with the SAN Education & Outreach Workgroup, specifically the Schuylkill River Trash Task Force, to develop citizen science litter monitoring/sampling protocols for the *Schuylkill Scrub*.
2. Promote the use of reusable water bottles instead of single-use bottles.
3. Develop simple outreach materials with clear, concise messaging about the SAN and its connection to recreation for partners to use at recreational (and other outreach) events.
4. Attend at least four recreational events a year to promote the SAN and increase membership.
5. Pilot use the Schuylkill Acts & Impacts environmental curriculum as a model for the Schuylkill Sojourn during 2016-2020.
6. Develop a webpage on the SAN website that lists recreational events/opportunities in the Schuylkill watershed.
7. Promote existing recreational events on the SAN's newly formed recreational webpage and social media sites.
8. Develop educational signage in parks, along trails, at bike and boat rentals, and at boat ramps.

9. Increase public access to the Schuylkill River and its tributaries.
10. Expand and improve connection of the Schuylkill River Trail network.

STORMWATER

IMPROVE MANAGEMENT OF STORMWATER TO REDUCE AND/OR PREVENT POLLUTION FROM RUNOFF.

Objectives

1. Complete 15 stormwater BMPs, including riparian buffer restoration projects, on priority headwater streams.
2. Conduct workshops, tours and educational events for watershed stakeholders on best practices for stormwater management.
3. Develop an outreach strategy to increase municipality participation in the SAN and encourage more watershed based collaboration.
4. Perform targeted outreach and provide support to municipalities for better stormwater management.
5. Support implementation and documentation of stormwater BMPs and green infrastructure by workgroup partners.
6. Identify new partners/sites that are working to complete stormwater management projects.
7. Implement 10 stormwater improvement practices on school campuses within the next 5 years through the Schuylkill Action Students program.
8. Apply for funding for at least 3 stormwater improvement practices on school campuses annually through the Schuylkill Action Students program.

Strategy

Pollution carried by stormwater poses a serious threat to the health of the Schuylkill River, contributing to over 30% of the impairments to water quality in the watershed. Polluted stormwater degrades the quality of our river with sediment, excess nutrients, bacteria and pathogens, and debris. Stormwater runoff can lead to increased point and non-point source impacts along the Schuylkill River during storm events. Addressing stormwater runoff requires a multifaceted approach that involves engaging all stakeholders, including municipalities, state and federal governments, homeowners, businesses, schools, planners, developers, and water suppliers.

Over the next five years, the SAN Stormwater Workgroup will focus its efforts on activities that will reduce the volume and velocity, and improve water quality, of stormwater runoff. Focusing on priority watershed areas, the workgroup will implement both outreach and implementation projects including technical assistance to municipalities to improve their stormwater management strategies; dissemination of information on BMPs for innovative stormwater practices; implementation of on-the-ground projects that reduce runoff; and provision of a forum for stormwater practitioners to share information and resources for managing stormwater. The SAN will collaborate with the PWD to promote *Green City, Clean Waters* efforts to upstream communities.

The workgroup will continue to advance its focus on implementing innovative stormwater improvement projects on school campuses. Through the SAN's Schuylkill Action Students program, the workgroup will complete projects that will serve as demonstration projects for the schools' communities and be a catalyst for additional projects in the future. The workgroup will also work to identify and secure resources to accomplish this agenda.

The Stormwater Workgroup will focus specifically on the following strategies:

1. Implement stormwater BMPs and riparian buffer restoration projects on priority first and second order headwater streams through partner programs such as Treevitalize and the Schuylkill Action Students program.
2. Secure funding annually and complete innovative stormwater projects through the Schuylkill Action Students program.
3. Support and promote the implementation of stormwater BMPs and green infrastructure through outreach, education, and technical assistance in priority watershed areas.
4. Assist municipalities to better understand, navigate, and fulfill their stormwater management responsibilities by providing technical assistance and support in priority areas.
5. Work with the SAN Planning Committee to apply for and secure funds to implement stormwater BMPs and explore feasibility of stormwater authorities through new funding mechanisms such as the PENNVEST Nonpoint Source (Green Infrastructure) Program.
6. Integrate more closely with stormwater activities of the Delaware River Watershed Initiative.
7. Collaborate with the Philadelphia Water Department to disseminate information on the *Green City, Clean Waters* initiative to other communities in the watershed.
8. Implement projects designed for managing runoff to maintain stream base flows, reduce flashiness of streams and improve groundwater recharge.
9. Report gaps and barriers in local, state and regional programs for mitigating stormwater impacts on source water to the Planning Committee and provide support for addressing them.

WATERSHED LAND COLLABORATIVE

PROMOTE A SUSTAINABLE LANDSCAPE IN THE SCHUYLKILL RIVER WATERSHED THROUGH STRATEGIC CONSERVATION AND EFFICIENT LAND USE/MANAGEMENT TO PROTECT THE INTEGRITY OF WATER SUPPLIES FOR FUTURE GENERATIONS.

Objectives

1. Maintain or increase the pace of priority lands protected in the watershed (4,853 acres per 5 year period).
2. Permanently protect at least 400 acres annually of priority watershed lands in the Schuylkill Highland Cluster.
3. Protect and restore water quality advanced through completion of proposed projects, including: land protection, stewardship, and adoption of improved municipal policies.
4. Advance conservation goals of the Schuylkill Highlands Implementation Plan as part of the Delaware River Watershed Initiative.
5. Monitor water quality (quarterly) and aquatic life (annually) of streams downstream of completed conservation projects.
6. Maintain or increase the pace of priority lands protected in the Delaware Valley Regional Planning Commission (DVRPC) area to keep pace with priority lands developed (approximately 2,345 acres per 5 year period).
7. Support and work with the Schuylkill River Restoration Fund to administer a land transaction assistance program for the protection of priority lands.
8. Communicate successes of land protection projects to the watershed community.

Strategy

One of the greatest threats to source water in the Schuylkill watershed is the loss of open space. When undeveloped land is converted to hardscapes such as roads, parking lots, buildings, etc, water quality is impacted by both the introduction of new pollutants and a loss of the watershed's filtering capacity. Undeveloped land generally does not contribute pollutants to our water sources, and when covered with natural grasses, wetlands, plants, shrubs and trees, it serves as a filter, removing pollutants before they get deposited into our water bodies. Water quality improvement is one of the most powerful benefits of preserving open space.

Over the next two decades, development is expected to increase by 40% in the Schuylkill watershed. While it is both impossible and unnecessary to stop all development from occurring, it is critical that development is directed away from the most sensitive watershed areas. The Watershed Land Collaborative (WLC) will work with key watershed stakeholders to implement projects and promote actions that will lead to the conservation of the highest priority lands for drinking water protection. The WLC will provide outreach and technical assistance to local governments in priority watershed areas and utilize planning tools such as the watershed land prioritization model to engage local decision makers in activities that will protect critical watershed lands. When appropriate, outreach efforts will also provide townships with information on other drinking water protection strategies, including surface water and wellhead protection opportunities.

The WLC will continue to advance efforts of the Delaware River Watershed Initiative and implement key conservation, engagement, monitoring, and technical assistance activities in the Schuylkill Highlands region. The success of this work will be shared with the conservation community to encourage replication in other areas of the watershed. The workgroup will also monitor the water quality impact of its accomplishments. Additionally, the WLC will provide resources to land conservation practitioners to incentivize the protection of high priority lands. The WLC will also maintain focus on the practices and policies that lead to the protection of the watershed's riparian areas.

The Watershed Land Collaborative Workgroup will focus specifically on the following strategies:

1. Continue to promote the results of the watershed land prioritization model with local practitioners.
2. Provide targeted outreach to priority townships with goal of providing technical assistance to townships for implementing conservation measures.
3. Promote riparian buffer protection.
4. Secure funding to provide transaction assistance to land trusts, local governments, and other land conservation practitioners for projects that result in the permanent protection of priority watershed land.
5. Complete land restoration activities on properties with conservation priorities.
6. Implement demonstration projects on developed lands, such as Homeowner Associations (HOAs), to promote better development and stormwater management on high quality watershed land.
7. Implement land conservation measures with priority landowners in targeted areas throughout the Schuylkill watershed.
8. Continue to promote and utilize resources for land conservation activities through the Delaware River Watershed Initiative.
9. Transfer best practices and successful programs of the Schuylkill Highland Cluster to other areas of the watershed.
10. Engage new landowners by offering educational and recruitment events focusing on conservation and stewardship in targeted areas throughout the watershed.
11. Develop and update prioritization mapping to identify the most valuable land to protect in the watershed.
12. Implement professional-level monitoring programs with volunteers, such as the Schuylkill Water Stewards program, to assess the impact of conservation and stewardship practices.
13. Provide support to the SAN Planning Committee as it works to address the gaps and barriers in local, regional, state, and national processes that focus on issues related to protection of priority watershed lands.

LIST OF APPENDICES:

Appendix A: Background on the SAN's Organizational Development

Background on the SAN's Organizational Development (presented in a separate MSWord file) provides a brief history of the SAN's organizational development resulting in how the Network functions today.

Appendix B: Yearly Workgroup Workplans

Yearly workgroup workplans together provide detailed information on the SAN's strategies and activities. These workplans are presented as a series of eight files, one for each workgroup and corresponding goal area.

Appendix C: Watershed Practices Implementation Committee Guidelines

The WPIC overview guide explains the purpose and general function of the initiative.

Appendix A:

Background on SAN Organizational Development

Creation of SAN

The Schuylkill Action Network (SAN) is a collaborative network of over 100 partners working together to improve water resources in the Schuylkill River watershed. The SAN seeks to achieve this vision by working in partnership with local watershed and land conservation organizations, businesses, academics, water suppliers, recreational communities, local governments, and regional, state, and federal agencies.

In response to source water assessment efforts in 2003, the Philadelphia Water Department (PWD) sought help from the Environmental Protection Agency (EPA) Region III to develop a network of stakeholders that would include various agencies and organizations working to protect Schuylkill watershed resources. The EPA led the creation of the Schuylkill Action Network to address major threats to drinking water in the Schuylkill watershed, including pollutants from agriculture, abandoned mines, stormwater, and sewage.

The SAN was structured as a series of integrated workgroups or committees to address the identified threats to the Schuylkill River. The original workgroups include: Abandoned Mine Drainage, Agriculture, Stormwater, and Pathogens/Compliance Workgroups. Each workgroup was designed to meet regularly, under the leadership of a volunteer chairperson, to discuss watershed issues and plan and implement projects of strategic importance related to these topics. These workgroups were designed to represent the core of the SAN and the vehicle by which most of the SAN's work is accomplished. Workgroup membership and meetings were created to be open and accessible to anyone.

In addition to the workgroups, the SAN included an Executive Steering Committee (ESC), Planning Committee, Education/Outreach Committee, and Data Team to guide and support the activities of the workgroups. The ESC met semi-annually to provide high-level guidance and buy-in from the major public agencies, while the Planning Committee met monthly to provide more hands-on strategic direction to the SAN and help insure good internal communication. The Education/Outreach Committee and Data Team provided support services, benefitting all SAN workgroups and members. Figure 1 depicts the original organization of SAN workgroups and their responsibilities as of 2004.

Evolution of SAN

Over time, the organization of the SAN has evolved in several critical ways. In 2004, a subcommittee of the Stormwater workgroup was convened to address the recommendations of the Schuylkill River Watershed Conservation Plan. This was a critical first step for the SAN, taking a preventative approach to drinking water threats. The Schuylkill River Conservation Plan led to a successful Pennsylvania Department of Environmental Protection *Growing Greener* grant to prioritize land for preservation based on drinking water protection.

Also in 2004, the PWD and the Partnership for the Delaware Estuary (PDE) submitted a successful Targeted Watershed Grant proposal to the EPA to fund a series of projects in the Schuylkill watershed. This funding (\$1.15 million of federal funds, leveraging an additional \$1.49 million in match from various sources) has been critical in allowing the SAN to take action on the ground. It is also an example of the SAN at its best: a diversity of organizations and agencies leveraging their individual strengths/skills to bring new resources to the watershed and tackle widespread and complex problems in a targeted, strategic way. Under this grant, local organizations

acted as project managers and received and managed project funds for implementation of projects. Projects included abandoned mine drainage remediation, stormwater management improvements, agricultural improvements, and educational pilots and case studies. This grant provided funding for the SAN to implement a set of selected projects from 2004 to 2008, during which time the SAN leadership cultivated new financial resources to continue and expand on this model of implementation.

In August 2005, the Planning Committee began the process of strategic planning by taking a critical look at SAN's organizational structure and how it could be improved to enable and encourage more stakeholder leadership within the SAN. As part of this effort, several important decisions were made, including:

- ***The decision to add a non-governmental position at the ESC level*** for more balanced representation. Based on this decision, the PDE joined the SAN ESC in the beginning of August 2006.
- ***The decision to maintain a federal lead for the ESC*** in order to provide credibility to the collaborative approach and influence for stakeholder involvement.
- ***The decision to expand Planning Committee membership to include representatives from each of SAN's workgroups*** to provide a mechanism for additional stakeholder involvement and better communication across groups.
- ***The decision to focus on the Schuylkill River Congress as the primary outreach event for the SAN each spring, and hold the SAN Annual Workshop each fall.***

In spring 2006, the SAN engaged the Institute for Conservation Leadership (ICL) to lead a stakeholder input process to inform the strategic growth and direction of SAN.

The following critical decisions were made by the SAN leadership in August 2006 in response to the ICL's recommendations:

- ***The decision to elevate the Watershed Land Collaborative (WLC) to full workgroup status*** in an effort to make the connection between land and water management more explicit. As a result, the WLC was reinvigorated and met quarterly, which re-engaged land conservation interests in the watershed.
- ***The decision to devote time/effort to and get professional help for improving SAN communications***, including exploring new resources and ideas for improving SAN's internal communication, creating a website, and exploring the feasibility of a major public outreach campaign. As a result, one of the SAN's top priorities for organizational improvement was to hire a communications consultant to provide assistance on these critical communication issues in 2007.
- ***The decision to devote time/effort to sort and identify specific policy issues that the SAN could play a role in addressing on an issue-specific basis.*** As a result, the Planning Committee evaluated the vast number of policy suggestions made by stakeholders to identify discrete actions for the SAN and its leading agencies to undertake for improvement
- ***The decision to target municipalities as a key audience in the work of both the Stormwater Workgroup and the Watershed Land Protection Collaborative.***

Also in 2006, the SAN contracted with the Environmental Finance Center (EFC) to explore the feasibility for building a sustainable financing/funding mechanism for Schuylkill Watershed protection activities. Based on interviews and research, the EFC's report outlined the scale, sources, and institutions for financing/funding and steps to fill the financing/funding gap for each of the SAN's priority areas/workgroups. The EFC also made a series of recommendations to the SAN leadership, including developing a unified restoration/protection plan, expanding community engagement with outreach/education and by working with relevant stakeholder groups, focusing on prevention, and convening an Implementation Task Force to help create a funding institution.

In 2004, the SAN launched a webpage. In 2007, the SAN created its website: www.SchuylkillWaters.org. This website serves as a clearinghouse for information on the Schuylkill Watershed, SAN projects, and provides a

public outreach component of the network. The website also features an internal component, designed to facilitate interaction amongst SAN partners, allowing for projects reports to be created and shared, news items to be shared, email between workgroups and SAN members, and the hosting of workgroup documents. Since 2007, the website was upgraded to add an interactive calendar and was integrated with social networking tools and sites.

In 2009, the SAN, through the PDE, brought on a full time coordinator to oversee the day-to-day operation of the SAN, facilitate collaboration amongst members, and advance workgroup goals by securing funding and resources for priority projects.

In 2011, the SAN updated its strategic plan for another 5 years (2011-2016). This plan renewed commitments of the SAN workgroups, integrated new initiatives and workgroups strategies into the process, and set out an ambitious agenda to strengthen SAN's presence in the watershed.

In 2013, the SAN celebrated its 10 year anniversary, which was commenced with a series of events throughout the year, including a celebration that recognized the many milestones that the SAN was able to achieve, commitments of SAN partners, and a renewal of the stakeholders that contributed to making SAN what it is today. The SAN also released a 10-year progress report that highlighted all of the workgroup accomplishments since the SAN's inception.

In 2014, the SAN secured a fellow to assist the coordinator, which has since been turned into a full time SAN specialist position. Today, SAN now has two full-time staff members to oversee the network and assist workgroup with advancing an aggressive agenda for a clean and healthy Schuylkill Watershed.

SAN Today

Since 2003, the SAN has grown to approximately 150 organizations (over 500 people) including local watershed organizations and land conservation organizations, businesses, academics, water suppliers, recreational communities, local governments, and regional, state, and federal agencies. The SAN uses unique skills and experience of each of its partners to implement on-the-ground projects that improve water quality of the Schuylkill River and its tributaries.

Today, the SAN is composed of an Executive Steering Committee, a Planning Committee, six workgroups (Abandoned Mine Drainage, Agriculture, Education & Outreach, Pathogens/Compliance, Stormwater, and Watershed Land Collaborative) and is developing a seventh, Recreation workgroup. Figure 3 depicts the SAN's organizational structure as it is in 2016.

Over the past several years, the SAN has strived to encourage greater stakeholder participation and leadership. Because of these efforts, there are many opportunities for stakeholders to be involved in the SAN today. All workgroup meetings, times, and locations are posted on the SAN website and are open for anyone to attend. With the completion of its most recent strategic plan, an even more aggressive and inclusive agenda has been established to guide SAN through 2020. Many new partners have become part of the SAN and together, this collaborative network will continue to lead efforts to restore and protect the Schuylkill Watershed.

Schuylkill Action Network Fact Sheet – May 2004

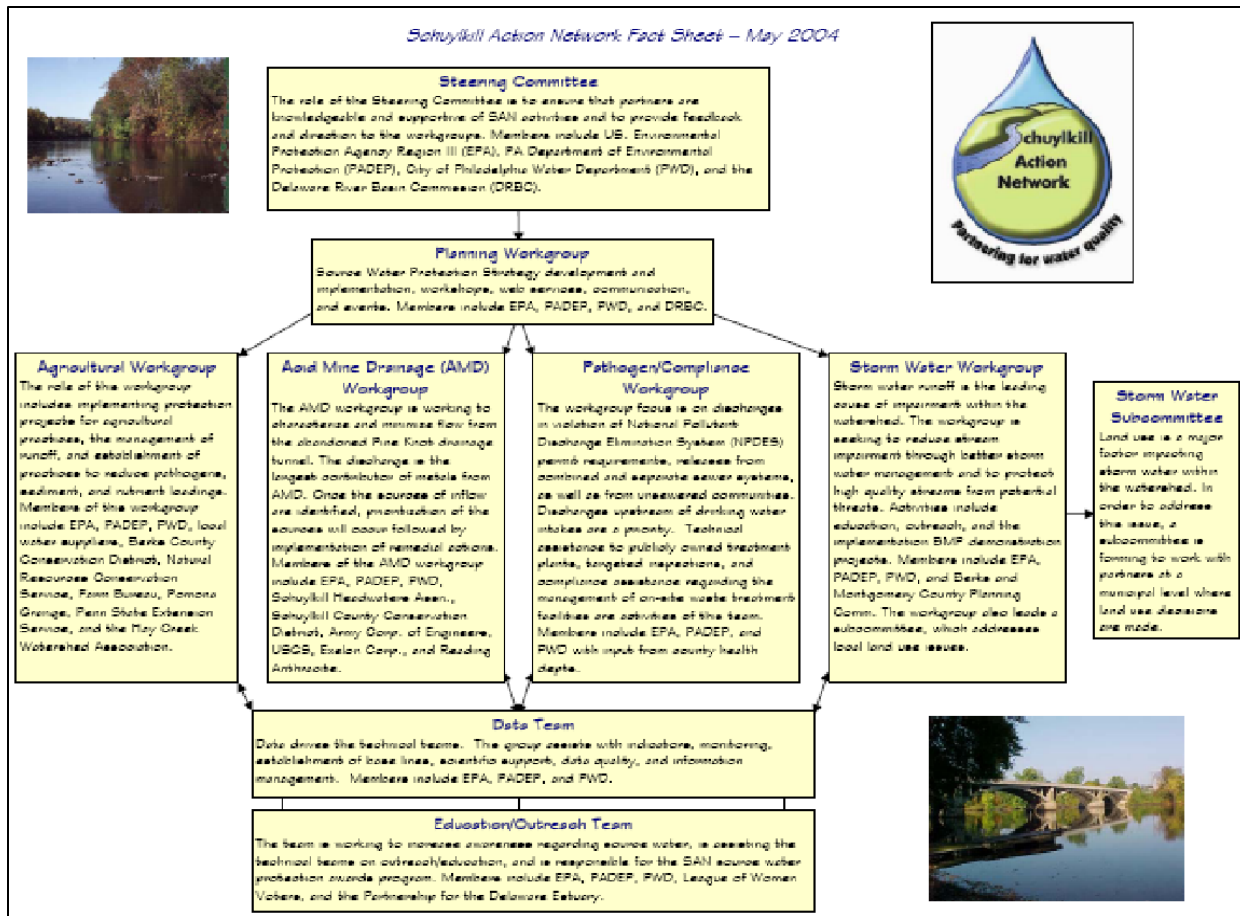


Figure 1: SAN Organizational Chart 2004

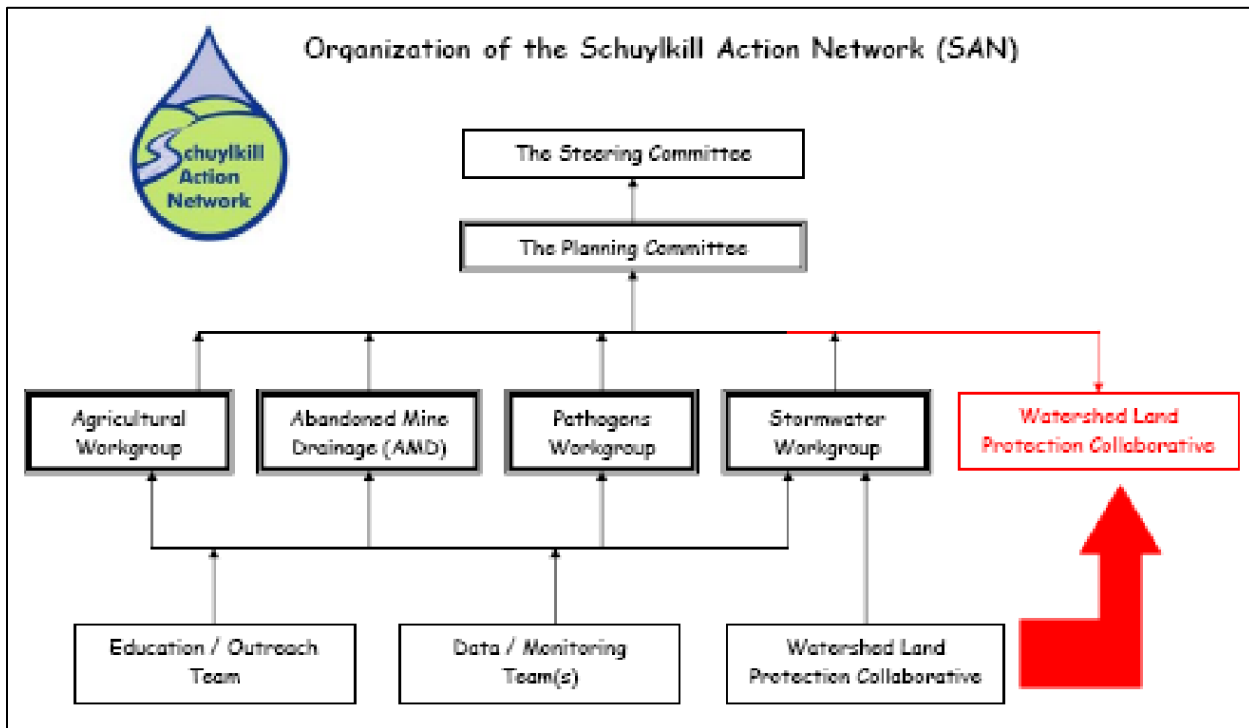


Figure 2: SAN Organizational Chart 2007

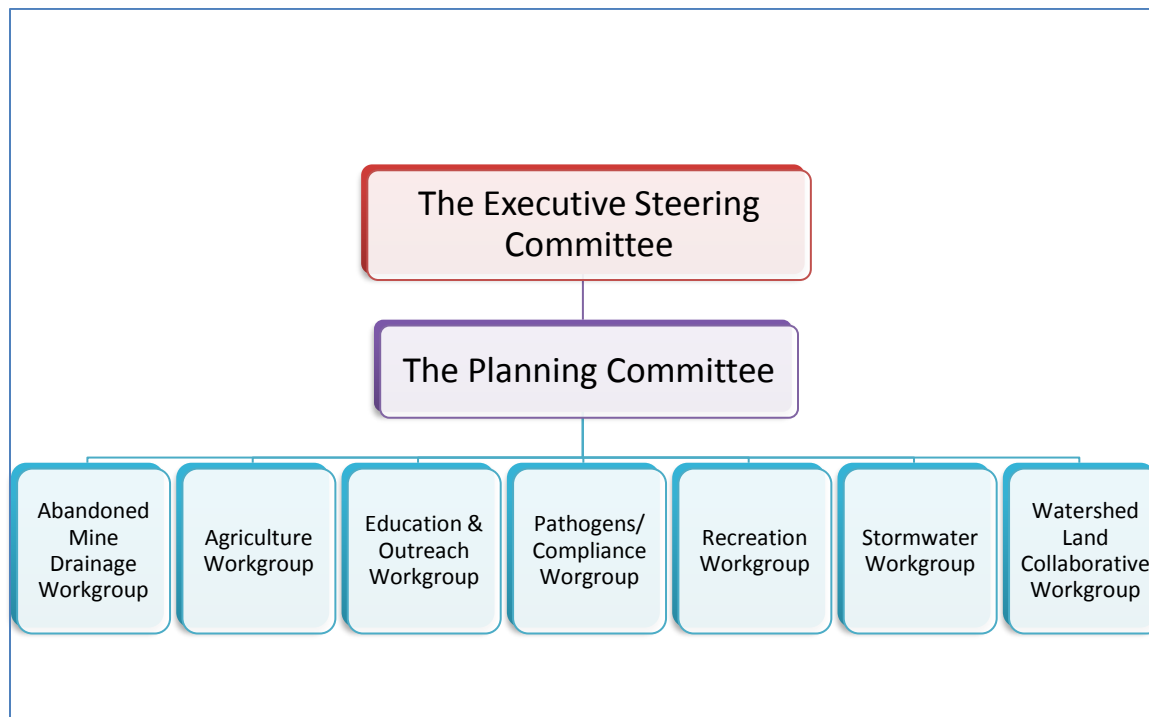


Figure 3: SAN Organizational Chart 2016

Appendix B: Yearly Workplans

View the Workplans

The Schuylkill Action Network's workgroups can be downloaded by clicking the below links. Please note that these are the 2016 workgroups' workplans, and the links will be updated each year.

- **Abandoned Mine Drainage** -
http://www.schuylkillwaters.org/doc_files/SAN%20AMD%202016%20FINAL%20Workplan.pdf
- **Agriculture**
- **Education & Outreach** – http://www.schuylkillwaters.org/doc_files/SAN%20E&O%202016%20Workplan.pdf
- **Pathogens & Point Source** -
http://www.schuylkillwaters.org/doc_files/SAN%20Pathogens%20Workplan%202016%20Final.pdf
- **Planning Committee** -
http://www.schuylkillwaters.org/doc_files/2016%20SAN%20Planning%20Committee%20Workplan.pdf
- **Recreation** – to be developed
- **Stormwater** -
http://www.schuylkillwaters.org/doc_files/SAN%20Stormwater%20Workgroup%20Workplan%202016.pdf
- **Watershed Land Collaborative**

Appendix C: Watershed Practices Implementation Committee

Purpose:

The SAN will take a leadership role in identifying and communicating opportunities for improving the processes that guide restoration and protection efforts in the Schuylkill River Watershed. This initiative will examine the processes, including common restoration and protection practices, watershed policies, decision making structures, procedures, and guidance documents with the intent of identification of gaps and barriers that impede the improvement of watershed management. When warranted, the effort will result in the formation of recommendations and strategies for eliminating these gaps and barriers.

Process:

A subset of SAN Planning Committee members will take the lead role in identifying specific issues that impede or frustrate restoration and protection efforts in the Schuylkill Watershed. The committee will meet as needed to discuss issues and develop recommendations. The recommendations will be reviewed by the Planning Committee and forwarded to the Executive Steering Committee (ESC) for additional action if warranted.

Dissemination:

For the purpose of both gathering and disseminating relevant information, a new section on the SAN website will be created to foster dialog among the SAN membership relating to improving policies and decision-making processes for watershed management, restoration and protection. This section will support the website purpose as a clearinghouse for watershed related information and platform for workgroup communication.

**Appendix B: SAN Pathogens and Point Sources and SAN Agriculture
Workgroups**

2018 Work Plans and Meeting Minutes

SAN Agriculture 2018 Workplan

Workgroup Goal: Maximize reduction and/or prevention of agricultural impacts to water quality.						
Strategy/Action #	Action	Lead	Timing	Status	Progress Tracking	Notes
Strategy 1: BMP Implementation	Support and implement agricultural best management practice (BMP) with funding, information, expertise, and collaborative problem solving.					Strategic Plan Alignment: Objectives 1, 2, 3, 5, 9 and Strategies 2, 3, 5, 6
Action 1.a	Implement agricultural BMPs in selected priority subwatersheds.	All	Ongoing		# of BMPs implemented; projected water quality reductions	
Action 1.b	Investigate and apply for funding for BMP implementation on priority farms.	All	Ongoing		# of grants written; # of grants awarded; amount of funding awarded	
Action 1.c	Develop new conservation and nutrient management plans as needed.	All	Ongoing		# of conservation and nutrient management plans written	
Action 1.d	Work with farm and forest landowners and the Watershed Land Collaborative Workgroup to explore opportunities for using conservation easements for long-term protection.	All	Ongoing		# of conservation easements; # of acres protected	
Action 1.e	Provide support and continue development of potential projects that advance Source Water Protection in the watershed (specifically with the creation of the Berks County Source Water Protection Plan).	All	Ongoing			
Strategy 2: Communication	Provide a forum for partner and agency communication and coordination around agricultural projects and issues and the formulation of creative new approaches for					Strategic Plan Alignment: Objective 6 and Strategies 1, 4, 8, 9, 10
Action 2.a	Convene quarterly meetings of the Agriculture workgroup, incorporating guest speakers and/or site-visit opportunities whenever appropriate and feasible.	Workgroup Chair	Feb, May, Aug, Nov		# of meetings	
Action 2.b	Continue to identify key partners and expand workgroup, using resources like the Saucony Creek Watershed Report and Agricultural BMP Guide.	All	Ongoing		# of new partners	
Action 2.c	Develop an annual/final report of Ag team accomplishment, present at SAN annual workshop in fall, and create an annual work plan.	Workgroup Chair	Ongoing		Presentation given; progress report finalized	

SAN Agriculture 2018 Workplan

Action 2.d	Provide workgroup information for posting on SAN's new website and social media sites (funding opportunities, success stories, events, volunteer opportunities, etc.).	All	Ongoing		# of postings and views of those postings	
Action 2.e	Provide coordination of the Middle Schuylkill Cluster in the William Penn Foundation Delaware River Watershed Initiative, utilizing the SAN Ag workgroup as vehicle for collaboration and action.	PDE, BN, Stroud	Ongoing			
Strategy 3: Monitoring	Monitor the impacts of agricultural BMP installations on stream water quality.	Strategic Plan Alignment: Objective 4, 7, 8 and Strategy 11				
Action 3.a	Coordinate monitoring plans and share data between conservation organizations, agencies, and water utilities.	SSM Group, PDE, Stroud, BN, BCCD, RAWA, WBWA	Ongoing		monitoring plans coordinated and shared	
Action 3.b	Implement quarterly chemical monitoring and annual macroinvertebrate sampling at select sites in the Maiden, Tulpehocken, and Upper Perkiomen Creek Watersheds as described in the Middle Schuylkill Monitoring Plan.	Stroud	Ongoing until 2021		sampling completed quarterly	
Action 3.c	Implement quarterly chemical monitoring and annual macroinvertebrate sampling at select sites in the Maiden Creek Watershed as described in the EPA section 319 Maiden Creek Monitoring Plan.	BCCD	Ongoing until 2020		sampling completed quarterly	
Action 3.d	Provide support to watershed partners coordinating volunteer water quality monitoring programs (e.g. Berks Ambassador program, Master Watershed Stewards).	All	Ongoing		support provided	
Action 3.e	Work with DEP-Central Office on requirements for reassessing and delisting impaired streams-improving waters program.	All	Ongoing		# of streams delisted	

Glossary

BCCD	Berks County Conservation District	EPA	US Environmental Protection	SSM Group	Spots, Stevens, and McCoy
BN	Berks Nature	PDE	Partnership for the Delaware	Stroud	Stroud Water Research Center
BMP	Best Management Practice	RAWA	Reading Area Water Authority	WBWA	Western Berks Water Authority
DEP	PA Department of Environmental Protection	SAN	Schuylkill Action Network		

Schuylkill Action Network Agriculture Workgroup

February 21, 2018 Meeting Agenda

INTRODUCTIONS/NEW MEMBERS

Review of November 2017 Meeting Notes

I. Update on grant requests/funding efforts

Berks Watershed Restoration Fund (Berks Nature) – Proposals for RAWA and Kutztown projects.

National Fish & Wildlife Fund (Berks Nature/Stroud) – RFP is out; applications due in April. Berks Nature is requesting cost-share for RCPP (\$225K). Stroud is requesting support for farm project in Tulpehocken and Maiden Creek watersheds.

USDA programs (NRCS) – 2018 Farm Bill Reauthorization

- Environmental Quality Incentive- \$1.1Million in Berks & Schuylkill counties; possibly more \$\$ later in year.
- Conservation Stewardship – will accept applications until March 2
- Regional Conservation Partnership Program - \$150,000 obligated to Berks projects, approximately half installed
- Conservation Innovation Grant – No report
- Conservation Reserve Enhancement Program (CREP) – reopened for documentation and planning; large backlog

Schuylkill River Restoration Fund Recipients (Berks Nature/Berks CD/Lehigh CD) – Letters of Intent due in February; full proposals will be presented in April. Berks Nature is seeking match for RCPP farmers; BCCD has Ag and Stormwater projects; Stroud requesting support for buffers and stabilization projects

Growing Greener Grant 2016 Program (DEP) – Announcement in December – contracts in progress. BCCD is planning 3 projects. No information for a 2018 announcement yet.

PACD Mini-Grants (BCCD/MCCD/LCCD) – Backyard Basics for the tree sale

5-Star Urban Grants (EPA) – No report

Mitigation Projects (Berks Nature/BCCD) – Bird habitat protection at Hawk Mountain.

Dark Skies/Sentinel Landscape at Ft Indiantown Gap (Berks Nature/NRCS/Army Corps) – RCPP geography; land preservation to mitigate light pollution

II. Projects in Progress

Delaware River Watershed Initiative (PDE/Berks Nature/Stroud) – Phase II for 2018-2021 grant has been awarded for \$40M. Middle Schuylkill Cluster will receive up to \$2M.

Cornerstone Grant (PDE): \$500,000, with \$412,000 for implementation. Some geography overlaps in Manor/Saucony/Manatawny/Furnace/Licking creeks.

Outstanding Growing Greener Projects (Stroud/LCCD/BCCD) –BCCD is working on Giorgi Mushroom plans from 2015; expect to complete at end of 2019; tracking compost is an issue. Stroud is working on projects from 2013.

Wyomissing Creek Watershed Coalition (BCCD) – Exploring the development of a Watershed Implementation Plan; applying for a grant to CFWP to develop.

Topton/Toad Creek project (BCCD) – Little Lehigh stream restoration in Topton; submitted plan to DEP for review.

Lower Maiden Watershed Implementation Plan (PDE) – Submitted WIP in December 2017; invited to 319 meeting in April for DEP/EPA review.

Crypto monitoring (PWD/Lehigh) – working on report

NACD Urban Ag (MCCD) – No report

III. **Education/Outreach**

Blue Marsh Get Outdoors Day – Saturday June 9

Farm Achieving Resource Management – FARM Program (BCCD/Stroud) – Newsletter article

Stroud workshops – Workshops and handout through Cornerstone grant; pesticide credit workshops

Source Water Collaborative (EPA) – EPA Leadership Forum – March 6-7; Learning Exchange webinars; Factsheets on animal waste reporting

IV. **Planning**

Progress Report – planned for later in 2018.

New SAN Website: - Populating content, launched at the end of February. SAN will also have a new e-mail system through MailChimp.

V. **Other Workgroup Updates**

Stormwater/Schuylkill Action Students (AquaPA) – projects written into the DRWI Phase II.

Education/Outreach (PDE) – Schuylkill Street Art, will install in Fleetwood on May 25

Pathogens (DEP) – Next meeting is on April 18, all are welcome.

Recreation (SRHA) – New workgroup, in the strategic planning phase, led by Schuylkill River Greenways.

VI. **Other Notable Items**

- Geigertown Sewer Authority received grant money to fix issues near Hay Creek
- Kutztown Borough Farm – new 10-year lease all grass, eliminating row crops
- DEP guidance for maintaining streams to be available

NEXT MEETING:

Wednesday May 23, 2018, 10:00 Am at the Berks Ag Center

Schuylkill Action Network Agriculture Workgroup

May 23, 2018 Meeting Notes

INTRODUCTIONS/NEW MEMBERS

Review of February 2018 Meeting Notes

I. Update on grant requests/funding efforts

Berks Watershed Restoration Fund (Berks Nature) – Kutztown and RAWA have made donations. Saucony Creek may start partnering again.

National Fish & Wildlife Fund (Berks Nature/Stroud) – Grants will be announced at beginning of July.

USDA programs (NRCS) – 2018 Farm Bill Reauthorization – hasn't passed House yet. Contracting funds for EQIP, and RCPP.

- Environmental Quality Incentive
- Conservation Stewardship
- Regional Conservation Partnership Program
- Conservation Innovation Grant
- Conservation Reserve Enhancement Program (CREP)

Schuylkill River Restoration Fund Recipients (Berks Nature/Berks CD/Lehigh CD) – full presentations were made; grant applications awaiting announcements.

PACD Mini-Grants (BCCD/MCCD/LCCD) – Manure management workshop was held, but had low attendance.

5-Star Urban Grants (EPA) – No report

Mitigation Projects (Berks Nature/BCCD) – Sunrise Grant for 78 acres in Pine Creek for an easement.

II. Projects in Progress

Delaware River Watershed Initiative (PDE/Berks Nature/Stroud) – Phase II launched in April.

Cornerstone Grant (PDE) – grant is for 2 years; 8 farm projects expected to be completed by end of year. Part of NFW from William Penn Foundation for \$500,000.

Outstanding Growing Greener Projects (Stroud/LCCD/BCCD) – BCCD has 3 grants; waiting for execution documents. SE Region has priority watershed points. Stroud received an extension for 2013 BMP vouchers projects. Rodale/Stroud has a soil health project.

Mariner II projects – proposals due in June. American Rivers will apply for Cacoosing Dam.

Wyomissing Creek Watershed Coalition (BCCD) – No report

Topton/Toad Creek project (BCCD) – Waiting for DEP permit to continue project.

Lower Maiden Watershed Implementation Plan (PDE) – PDE is retracting WIP from 319 approval.

Crypto monitoring (PWD/Lehigh) – now focusing on crypto in soil. PWD will approve summary report for distribution to WBWA and RAWA.

NACD Urban Ag (MCCD) – No report

DCNR/CLI (Berks Nature) – Fleetwood watershed management plan for watershed properties.

III. **Education/Outreach**

Blue Marsh Get Outdoors Day – Saturday June 9

Farm Achieving Resource Management – FARM Program (BCCD/Stroud) – No Report

Stroud workshops –No report

Source Water Collaborative (EPA) –Learning Exchange webinars; Factsheets

Gov. Miffling riparian buffer – Berks Nature

Tire Collection (BCCD)

IV. **Planning**

Progress Report – due this summer

New SAN Website – online toolkit; social media posts;

Schuylkill Scrub rescheduled to May 24 at the Upper Merion Boathouse

Annual Bus Tour – September 21

Annual Meeting – November 9 at Albright College

V. **Other Workgroup Updates**

Stormwater/Schuylkill Action Students (AquaPA/PWD) – meeting at Villanova; MS4 topics and tours

Education/Outreach (PDE) – Naturalist on Schuylkill Sojourn, it's the 20th anniversary for Sojourn. Fleetwood is installing Street Art; Schuylkill Shots contest in summer; Gov Mifflin "Rabbit Run"renamed

Pathogens (DEP) – next meeting July

Recreation (SRHA) – next meeting June 19

VI. **Other Notable Items**

- Delaware River Basin Commission has an opening on their TAC committee, see website for details
- Joe Hebelka – redeployed samplers

NEXT MEETING:

August 9, 2018 at **11:00 AM** – followed by on-you-own lunch at the Reading Fair

Schuylkill Action Network Agriculture Workgroup August 8, 2018 Meeting Notes

INTRODUCTIONS/NEW MEMBERS

Review of May 2018 Meeting Notes

I. Update on grant requests/funding efforts

Berks Watershed Restoration Fund (Berks Nature) – Sly Fox

National Fish & Wildlife Fund (Berks Nature/Stroud) – Announcements scheduled for 8/9/18. Berks Nature requested \$200,000 for several projects.

NFWF/Delaware Watershed Conservation Fund opens in September for stream restorations/habitat/water quality

USDA programs (NRCS) – 2018 Farm Bill Reauthorization – no info on reauthorization

- Environmental Quality Incentive – completed for year
- Conservation Stewardship – 5 applicants for 2000 acres; 3 in Schuylkill County, 2 in Berks
- Regional Conservation Partnership Program – wrapped up
- Conservation Innovation Grant – no report
- Conservation Reserve Enhancement Program (CREP) – Stroud reporting high demand on nurseries for plants
- NWQI/NRCS pilot program for drinking water – conference call with agencies, PDE

Schuylkill River Restoration Fund Recipients (Berks Nature/Berks CD/Lehigh CD) – Berks Nature received \$135,000 for two farms; Land Protection provided transaction costs. BCCD- horse farm; LCCD- hog farm.

PACD Mini-Grants (BCCD/MCCD/LCCD) – BCCD-legislative lunch in October; LCCD- 3 fall workshops

5-Star Urban Grants (EPA) – No report

Mitigation Projects (Berks Nature/BCCD) – Hawk Mountain has to end of year to complete; BCCD-Womelsdorf PennDOT project

Mariner II (BN) Cacoosing Dam from American Rivers/Berks Nature

Coldwater Heritage – opens in September. Pennypack and Wissahickon Watersheds; Fox Chase/NRCS/PWD partners for nutrient management plans

II. Projects in Progress

Delaware River Watershed Initiative (PDE/Berks Nature/Stroud) – Ongoing Phase II

Cornerstone Grant (PDE) - \$500,000 for BMPs, outreach, and virtual farm tour

Outstanding Growing Greener Projects– BCCD has Showtop in progress; Samsel in Irish Creek

Wyomissing Creek Watershed Coalition (BCCD) – no report – decided not to pursue a WIP

Topton/Toad Creek project (BCCD) – engineer filed joint permit application

Crypto monitoring (PWD/Lehigh) – wrapped up review of method to capture *crypto* in soil

DCNR-CLI – Fleetwood management plan (Berks Nature) – Willow Creek

III. **Education/Outreach**

Stroud workshops – No-till Alliance had a good turnout. No-till workshop at Shady Maple in December.

Source Water Collaborative (EPA) – website will be administered by another partner

AWWA – partnership with farms/water

Audubon – new registration for Schuylkill Highlands (PDE)

LCCD – videos available on website; workshops coming up in fall

NFWF wants RCPP tour

IV. **Planning**

Progress Report

SAN Annual Conference – November 9 at Albright College

Annual Bus Tour scheduled for September 21

Water Supplier forum scheduled at Albright College for 9/12/18

V. **Other Workgroup Updates**

Stormwater/Schuylkill Action Students (AquaPA) – meeting on 8/29 – tour of school projects

Education/Outreach (PDE) – upcoming Street Art contest; Schuylkill Shots contest on Facebook

Pathogens (DEP) – meeting held 7/11

Recreation (SRHA) – meeting on 10/3 at Greenways office; discussion on installation of refill stations

VI. **Other Notable Items**

- Biosolids comment letter – Berks Nature will discuss with Dept of Ag staff to see if we want to comment

NEXT MEETING:

Wednesday November 14, 2018 , 10:00 AM at the Berks Ag Center

Schuylkill Action Network Agriculture Workgroup November 14, 2018 Meeting Notes

INTRODUCTIONS/NEW MEMBERS

Erica Rossetti- PDE intern for SAN/Outreach

Review of August 2018 Meeting Notes

Update on grant requests/funding efforts/projects

NWQI/NRCS Pilot Program (EPA/PDE)

- New pilot program for agricultural restoration/technical assistance for source water protection.
- Lower Maiden Creek Watershed selected (same area as the Lower Maiden Creek Watershed Restoration Plan).
- \$20,000 for technical assistance for assessment in 2019.
- 2020 implementation funding expected.

Berks Watershed Restoration Fund (Berks Nature) – completed in the spring by RAWA and Kutztown

Cornerstone Grant (PDE) – 2017 grant for \$500k is wrapping up. Middle Schuylkill may apply for 2019 grant.

National Fish & Wildlife Fund (Berks Nature/Stroud)

- Stroud: one project ended, another in spring.
- BN: approved for \$200K for DRWI focus area.

Pennsylvania Association for Sustainable Agriculture (PASA)

- Worked together with William Penn Foundation to bring citizen science to farming families
- Stroud helping with parameters and monitoring equipment.
- Want to involve sustainable agriculture school clubs, 3 pilot farms, and assess DO, turbidity, temperature, and pH before/after restoration practices

USDA programs (NRCS) – 2018 Farm Bill Reauthorization – No report

- Environmental Quality Incentive – Loumpe project completed
- Conservation Stewardship – no update
- Regional Conservation Partnership Program- program ends in 2020; Berks Nature-Martin/Burkholder dairy close to completing Phase I; Love project in Hay Creek awarded
- Conservation Innovation Grant – no update
- Conservation Reserve Enhancement Program (CREP) – no update

Schuylkill River Restoration Fund Recipients (Berks Nature/Berks CD/Lehigh CD)

- Love project received land transaction grant
- OSI received conservation easement for 100 ft buffer on active farms
- 2018 projects:

- Brown in Manor Creek
- Kunkle in Lehigh County (multiple watersheds)
- BCCD will close Betsy Myers
- Chaveaux (sp?) Horse Farm in Upper Maiden Creek

5-Star Urban Grants (EPA) – webinar scheduled for November 15 at 2pm. Deadline for grants January 31.

Mitigation Projects (Berks Nature/BCCD)

- BCCD has permit in place in Womelsdorf for \$275K stream restoration project for 2,200 feet. Project will go out to bid, manage with PennDOT
- PennDOT is looking for new mitigation sites.
 - Contact information:
 - See Kent at BCCD for more information.
 - eneal@pa.gov, jgolomb@pa.gov
 - District 5 number: 717-216-5285
- Berks Nature is closing on Newell purchase on Hawk Mountain for wildlife habitat (77 acres in Pine Creek/Maiden Creek) and also removing farmhouse easement with no septic system

Mariner II (BCCD) – Almost all projects received funding including the Paper Mill Dam removal and Doug Zeitset (sp?) farm project; no other reports.

Coldwater Heritage – BCCD developing plan for Cacoosing Creek, expect a draft document in January.

Growing Greener Projects (Stroud/LCCD/BCCD)

- Stroud finished in Dec/Jan
- BCCD is working on Showtop
- 2 Giorgi mushroom plans approved to date, which leads to NRCS assistance for BMPs; there are a lot in Maiden Creek

Wyomissing Creek Watershed Coalition (BCCD)

- received some Mariner II funds
- Center for Watershed Protection designed rain gardens/wild meadow
- reviewing a basin retrofit at the Lowe's store.

Topton/Toad Creek project (BCCD)

- Land swap being discussed in PA senate; amended and awaiting vote. If not passed an identical bill will have to be introduced for 2019.
- project has a joint permit in place, and the bog turtle survey completed.

Crypto monitoring (PWD/Lehigh) – contract is being renegotiated

DCNR-CLI – Fleetwood management plan (Berks Nature) – visited site and hope to move ahead with plan for wetland areas soon, especially protection.

PACD Mini-Grants – BCCD installed a demonstration riparian buffer on creek along County Welfare Road.

DCED – \$125K grant at Mt Penn/Crystal Lake for stream restoration, but need additional funding to complete entire project.

Education/Outreach

BCCD workshops

- BMP trail and Master Gardener's Green Trail
- Over 20 schools utilizing Trout in the Classroom program

LCCD workshops – Fall workshops; PDE will send out information via e-mail

Stroud workshops

- January 31 is a no-till cover crop workshop at Stroud
- February 26 no-till workshop at Shady Maple
- a video on soil health is available on website.

Source Water Collaborative – Learning Exchange – EPA will not host website (ASDWA currently is); it is going through a transitional period as other partners take over responsibility

PDE Science Conference – January 28-30 in Cape May. Registration is live!

Berks Nature

- State of the Environment 10 year update (water, air, energy, waste, land) now downloadable
- Held a well-attended volunteer mixer on 9/27

Tulpehocken Creek Watershed Association – new organization help for Tulpehocken Chapter of Trout Unlimited; fundraiser coming.

Stroud – needs information for spotted lanternfly on farms to create distributable materials

Berks County Dept of Ag – working on a program for signs on preserved farms.

Planning

Progress Report – 2018 report and 15-year anniversary report available from PDE on website or in print (contact Virginia for printed copies)

SAN Annual Conference

- Held on November 9 at Albright College
- Positive feedback: great variety of speakers; liked not having individual workgroup chairs speak; great venue
- Suggestions: Maybe only have 4 speakers in the afternoon with no break as 5 was a lot and people left after the break

Other Workgroup Updates

Stormwater/Schuylkill Action Students (AquaPA) – tour of 2 sites in Philadelphia on Nov 30 – must register to attend.

Education/Outreach (PDE)

- CleanSweep app from SAN conference will be available in December. Seeking promotional ideas!
- Street Art contest for grades 6-8 will be announced in December, deadline February 28th. Aligns with the contests in Philadelphia and Wilmington.

Pathogens (DEP) – Next meeting on Dec. 12 at DEP-Reading office. Water supplier forum this fall was very well-received.

Recreation (SRG)

- The meeting in October focused on water refilling station placement
- Ideas for meaningful additional signage at stations?
- Next meeting: 1/10/19, 10-12, SRG

Other Notable Items

Biosolids comment letter (Berks Nature/Dept Ag)

- concerns with over-application of Phosphorus from biosolids violating NRCS contracts.
- Kim and Larry - will create draft for next meeting to send to state. Then workgroup to review and sign.

Reading Enviro Advisory Council – plan removal of 5 dams in area.

PASA Farming for the Future Conference in Lancaster, 2/7-2/9

Wild Trout streams – Northkill tributary and others

Next Meeting:

Wednesday, February 20, 2019 - 10:00 AM - at Berks County Ag Center

SAN Pathogens and Point Source 2018 Workplan

Workgroup Goal: Facilitate and strengthen communication and coordination among regulatory agencies, downstream water users, and basin stakeholders regarding the Clean Water Act and Safe Drinking Water Act goals.						
Strategy/Action #	Action	Lead	Timing	Status	Progress Tracking	Notes
Strategy 1	Strengthen communication between and provide educational resources to wastewater and drinking water utilities to improve source water protection efforts.			Strategic Plan Alignment: Objectives 1, 3 and Strategies 1, 4, 6		
Action 1.a	Promote use of the Delaware Valley Early Warning System (EWS) at workgroup meetings, workshops, and outreach events.	PWD, PADEP	Ongoing		# of users (PWD tracks)	Need assistance reaching industrial users. PWD developing new fact sheet, training sheets, and user manuals - DEP to hand out when doing inspections. PWD to have updates website and phone application by the summer?
Action 1.b	Conduct EWS demonstration session for PADEP and other water users/discharges during existing PADEP meeting.	PWD	Summer 2018		# of EWS trainings	
Action 1.c	Promote PA WARN.	All	Ongoing			Add to SAN website
Action 1.d	Promote various funding opportunities, such as Pennvest, for pathogen reduction projects throughout the watershed.	PennVest / All	Ongoing			Add to SAN website; link to Pennvest website.
Action 1.e	Host tours of waste water and drinking water treatment plants.	All	1 / Year		# of tours	BCWSA talking about touring Reading WWTP. Perhaps Sinking Spring? Caernarvon has UV treatment - Erick to follow up with John.
Strategy 2	Facilitate data and information sharing to document wastewater treatment technologies, improvements, and other pertinent source water protection information.			Strategic Plan Alignment: Objectives 2, 5, 6 and Strategies 3, 5, 7, 8, 9		
Action 2.a	Convene quarterly meetings of the Pathogens & Point Source workgroup, incorporate educational opportunities with experts in the field of pathogen research, whenever appropriate and feasible.	Workgroup Chair	Jan, April, July, October 2018		# of meetings	
Action 2.b	Develop a list of potential partners, such as wastewater treatment operators, to expand and enhance the Pathogens & Point Source workgroup.	All	April 2018		# of partners contacted on developed list	

SAN Pathogens and Point Source 2018 Workplan

Action 2.c	Track progress of projects addressing unsewered communities and identify partners currently working with those communities.	All	Ongoing		Spreadsheet shared	Joe to send original list. Erick has 537 compliance issue list... West Norriton/Port Indian, Tamaqua (2017 revised plan submitted to DEP), and Albany Township/Kempton (unknown).
Action 2.d	Share information on publically owned treatment works' (POTW) to identify POTW that need to meter and sample flows that are not fully treated.	EPA, PADEP	Ongoing		Information shared	Reading going to eliminated their bypass. Not many other bypasses.
Action 2.e	Track WWTP upgrades, new facilities, and community sewer improvement projects through DEP Regional Offices, Part II Permits, media releases, and review of government-funded projects.	PADEP, PWD	Ongoing		Information shared	Yes, on DEP PA Bulletin or DRBC dockets.
Action 2.f	Track status of Act 537 Plan statuses and provide assistance if needed.	PADEP	Ongoing		Information shared	
Action 2.g	Build on PWD's sanitary survey by identifying other sources of data to further characterize WWTP conditions.	PWD	April 2018			Last sanitary survey done in 2015; PWD to work on list at next meeting.
Strategy 3	Investigate evolving source water issues, such as unregulated contaminants, and develop a better understanding of what these issues mean for water suppliers source water protection strategies.			Strategic Plan Alignment: Objective 4 and Strategy 10		
Action 3.a	Coordinate unregulated contaminants presentation for workgroup members.	PADEP, DRBC	January 2018	Completed	Presentation given	
Action 3.b	Plan and facilitate a mini-workshop on unregulated contaminants for utilities.	PADEP, DRBC	Summer 2018		Workshop coordinated; # of participants attended	
Strategy 4	Promote pathogen successes and understanding of pathogen water quality issues and solutions to target audiences in the watershed.			Strategic Plan Alignment: Objectives 3, 4		
Action 4.a	Develop an annual/final report of workgroup accomplishments to present at SAN annual workshop in fall and to include in the SAN annual progress report.	PDE, PADEP, PWD	Fall 2018		Presentation given; progress report finalized	

SAN Pathogens and Point Source 2018 Workplan

Action 4.b	Finalize short fact sheet for WWTPs to distribute, looking at existing fact sheets and other groups' gathered information.	All	January 2018		# of downloads	Post fact sheet on SAN website
Action 4.c	Provide workgroup information for posting on SAN's new website and social media sites (funding opportunities, success stories, etc.).	All	Ongoing		# of postings and views of those postings	



SAN Pathogens & Point Source Workgroup Meeting Minutes

January 10, 2018 10am-12pm
PADEP – Reading District Office

1. Attendees

- Joe Hebelka, PADEP
- Virginia Vassalotti, PDE
- Kevin Buss, PADEP
- Steve Flannery, PADEP (on phone)
- Tess Schlupp, Pennvest
- Jared Sabitsky, PADEP
- Beth Garcia, EPA
- Krista Scheirer, Aqua PA
- Ron MacGillivray, DRBC
- Alison Aminto, PWD (on phone)

2. Review Last Meeting Minutes – No updates

3. Emerging Contaminants

- **Presentation From Ron MacGillivray, DRBC (20 mins)** – The presentation can be downloaded [here](#) (you will need to login to the workgroup hub in order to access the document. The presentation was split into 3 different types of emerging contaminants: personal care products (PCP), perfluoroalkyl and polyfluoroalkyl (PFAS), and polybrominated diphenyl ethers (PBDE). Grab samples were taken during low flow conditions. The main take-aways are listed below.
 - PCP Studies:** PCPs were found at such low concentrations that they are not affecting aquatic life. Temple and DRBC study will be published shortly.
 - PFAS Studies:** DRBC's data indicates a decrease in PFAS in surface water from 2007-2015, varying by compound. PFAs are more of a human health concern than PCPs because they are water soluble and bioaccumulate. PFAS was not found at detectable levels in the non-tidal portion of the river where drinking water sources are. There is another study that was conducted in 2017 by NJDEP, EPA, and DRBC; Ron will share the one page summary and the publication when it is finalized.
 - PBDE Studies:** Overall PDBEs are decreasing in fish from 2004-2012. Good news is there is a voluntary phase out and NY has banned PBDEs.
- **Plan Mini Workshop** – The group decided a mini-workshop would be valuable to host in the summer for water suppliers. Krista, Alison, and Virginia formed a subcommittee to further plan the workshop. The following topics/presenters were suggested:
 - Amy Williams, DEP** – Joe to reach out to Amy
 - ASTDR** – Beth to reach out and ask what they've been doing
 - Micoplastics** – Brian Swissdock (sp?) at Penn State; Ron to give contact for UD study
 - Road Salt** – Stroud (conductivity study); USGS (chloride study)
 - Pennvest Funding Opportunities** - Tess

4. **Develop 2018 Workplan** – Virginia reviewed the draft 2018 workplan with the group. The new layout includes a status, progress tracking, and notes column to better track our progress towards reaching our goals. The updated draft workplan can be downloaded [here](#).
5. **Finalize WWPTs Fact Sheet** – No updates, ready to publish. The fact sheet can be downloaded on the workgroup hub and the public [Pathogens](#) workgroup page.
6. **PWD Schuylkill Watershed Control Plan/Sanitary Survey** – PWD last updated in 2015; will discuss more in depth next meeting.
7. **PWD Chapter 94 Data** – Share Beth V's spreadsheet to the workgroup.

8. Algae Info

- Freshwater HABs Newsletters: [December](#) and [November](#) 2017
 - i. Grant Opportunity: [WaterSMART Cooperative Watershed Management Program Phase I](#) (in December newsletter)
- [Estrogens in Vernal Pools Impacted by Wastewater Irrigation](#) – recorded webinar by PSU extension
- EPA held a Harmful Algal Bloom Workshop in December
- [National Water Quality Monitoring Council webinars](#)

9. Quarry – No updates

10. **Delaware Valley EWS** – Theft of potassium cyanide in December; never found where it was supposedly dumped.

11. BCWSA Activities

- GIS training on Jan 11 (8-11)
- Annual conference on July 25 at Albright

12. **PENNVEST** – There are 3 potential projects in the PA southeast region, but have not been approved yet. Pennvest has quarterly board meetings (January, April, July, and October) to review the applications. The potential projects are listed below.

- City of Chester to develop a stormwater authority (implementing a fee; potentially a loan not a grant).
- Doylestown Township has malfunctioning on-lot sewers, which would be upgraded to sewer, then transferred to Bucks treatment.
- Schwenksville replacing old water lines.

13. EPA

- [AWWA Exemplary Source Water Protection Award](#) – nominate water system by January 15th

- EPA is hosting the second Source Water Protection Leadership Forum on March 6-7. This event is invite only due to space limitations.
- ASDWA & AWWA [Sustainable Water Management Conference](#) in Seattle, WA from March 25-28
- [EPA launches cross-agency effort to address PFAS](#)
- [Alternative Disinfection: Dichlor and Trichlor](#) Jan 30 webinar
- [EPA announced deletion of Landsale site in PA from superfund national priorities list](#)

14. DEP

- Signed a modified consent decree with Reading
- DEP consent order decrement with largest road salt company, American Rock Salt Company (Reading and York City locations). Agreed to implement some best practices.
- [Triennial Review of Water Quality Standards](#) – January 30
- PA DCED [Small Water and Sewer grants](#) due February 28
- [DEP invites comments on draft general permit NPDES permit for aquatic animal production facilities](#)

15. Watershed News

- **DRBC Dockets**
 - i. Global Advanced Metals USA, Inc.
 - ii. Royersford Borough
 - iii. WG American Company
 - iv. Delaware County Solid Waste Authority
- [Marion Township, supervisors continue sewer dispute](#)
- [Alsace supervisors hear recommendations on sewer service; State grant could reduce Alsace sewer costs](#)
- [\\$400,000 in grants help Pottstown, Royersford, Limerick parks, trails and soccer fields](#)
- [Sludge press will save money, Fleetwood officials say](#)
- [W. Penn, Walker to meet with DEP over previously submitted](#)
- [Toxic Algae Confirmed in Pine Run Creek: DEP](#)

16. Other Items

- Jan 16 webinar – [green stormwater infrastructure used to control combined sewer overflows](#)
- DRBC grant – green stormwater infrastructure monitoring component

17. **Next Meeting Date** – Wednesday, April 18th 10AM-12PM at DEP Reading



SAN Pathogens & Point Source Workgroup Meeting Minutes

April 18, 2018 10am-12pm
PADEP – Reading District Office

1. Attendees

- Joe Hebelka, PADEP
- Kate Hutelmyer, PDE
- Virginia Vassalotti, PDE
- Kevin Buss, PADEP RDO
- Steve Flannery, PADEP
- Jared Sabitsky, PADEP
- Beth Garcia, EPA
- Alison Aminto, PWD
- Tracey Johnson, PADEP SERO
- Erick Ammon, PADEP SCRO
- Chip Bilger, Western Berks Water Authority

2. **Review Last Meeting Minutes** – No updates. Joe passed around the original list of wildcat sewers that was compiled in 1990. There is only one outstanding in Schuylkill County is West Walker. PWD uses in their watershed control plan (any updates on Act 537 plans).

3. SAN's 15th Anniversary

- New Website/[Online Toolkit](#)
- Annual Meeting – Save the date for Friday, November 9th at Albright with a special happy hour celebration immediately after the conference.
- **RESCHEDULED!** [Schuylkill Scrub Cleanup](#) on May 24th in partnership with United by Blue, PWD, Schuylkill River Greenways, and Upper Merion Township

4. Plan Workshop

- **Date** – Tentatively ½ workshop scheduled for Thursday, August 9th
- **Location** – Mid-watershed (Downingtown area); maybe water provider to host (Aqua, PA American)?; or Albright?
- **Draft Agenda** – Chip suggested getting approved credit hours (2 ½ hours of content per 1 credit hour), and will reach out to Bill McNamara once we have a draft agenda. Potential topics include:
 - i. UCMR4 and any new regulations as a result from UCMR3 and UCMR2; overview presentation; separate presentations on manganese and pesticides – Michelle Hoover, EPA
 - ii. Investing in source water protection partnerships and projects – Kelly Anderson, PWD
 - iii. Emerging contaminants studies – Ron MacGillivray, DRBC
 - iv. Revised Total Coliform Rule – PADEP

- **Next Steps** – Virginia will schedule a follow up conference call with the subcommittee (Alison, Krista, Kate, and Chip) to finalize more details and develop a list of utilities to invite. The conference call is scheduled for Monday, May 21st at 10am.
5. **WWTP Tour** – A couple partners have offered WWTP tours (Tess with Reading; Jason with Northern Lancaster Water Authority) for this workgroup. BCWSA is currently hosting a tour every quarter and Chip offered to co-sponsor a tour with the SAN. The next tour is of RAWA on May 17th. The group agreed it would be great to attend the fourth quarter tour of Reading's WWTP.
 6. **PWD Schuylkill Watershed Control Plan/Sanitary Survey** – Last status update was approved and PWD is planning for next phase of the watershed control plan (to be implemented by 2020), where there will be more of a focus in the Delaware River Watershed (specifically Bucks County). It would be interesting to look at all the data submitted to DEP to compare which water utilities were placed in bin 1 vs bin 2 for LT2 sampling.
 7. **PWD Chapter 94 Data** – The spreadsheet that Beth Ventura compiled was referenced to do crypto loading calculations.
8. **Algae Info**
 - Freshwater HABs Newsletters: [February](#); [March](#); [April](#)
 9. **Quarry** – No updates
 10. **Delaware Valley EWS** – The manufacturer from the potassium cyanide incident has now joined the system.
 11. **BCWSA Activities**
 - Annual conference on July 25 at Albright
 - Conducting water utility and waste water treatment tours
 - Golf tournament on Monday, September 17th – all money going towards Berks County Source Water Protection coordination
 - Governors Excellence Award – Berks County Source Water Protection
 12. **PENNVEST** – No update
 13. **EPA**
 - EPA hosted the second Source Water Protection Leadership Forum on March 6-7. Webinar on CWA & SDWA revolving funds.
 - [Emergency preparedness training for first responders](#)
 - [Nutrient Reduction Progress Tracker](#)
 - [Webinar series – post on SAN's resources webpage](#)

14. DEP

- Exeter – in the process of selling WWTP
- Water Resources Agency of the Delaware River Basin awarded East Penn Manufacturing with the water conservation award
- North Heidelberg – Aqua now supplying water in that township
- Albany Township was on wildcat sewer list and will have an Act 537 plan by 2019

15. Watershed News

- **DRBC Dockets**
 - i. Coldale-Lansford-Summit Hill Sewer Authority
 - ii. Robesonia – Wernersville Municipal Authority
- Schuylkill County [DEP Publishes Revised NPDES General Permit For Concentrated Animal Feeding Operations For Comment](#)
- [DEP Asks For Information ON Adequacy, Impact of New Manganese Water Quality Standard Required by Law](#)
- [ENVironemntal Groups Urge DEP to Implement Strong Water Quality Standards in Triennial Review](#)
- [EQB Invites Comments on Proposed Changes to Storage Tank Regulations](#)
- [DEP Invites Comments on Guidance to Implement Act 26 on Alternative Onlot Septic Systems](#)
- [National Prescription Drug Take-Back Day: Sat April 28](#)
- [Infrastructure Week: May 14-21](#)
- [CFA Accepting Applications for Act 13 Water-Related, Recreation Grants Until May 31](#)
- [West Penn hears update on sewage facility plan](#)
- [PUC takes action against North Heidelberg Sewer Company](#)
- [UMJA Expansion Moving Forward](#)
- [Wipes in the Pipes: Flushable Wet Wipes Are Wreaking Havoc on Pottstown's Sewage System](#)
- [Lower Pottsgrove sewer repair costs could top \\$100K](#)
- [States fine Eurofins lab in Montgomery County \\$600,000 for falsifying test results](#)
- [Penn State: Presence, Persistence of Estrogens in Vernal Pools an Emerging Concern](#)

16. **Next Meeting Date** – Wednesday, July 11th 10AM-12PM at DEP Reading



SAN Pathogens & Point Source Workgroup Meeting Minutes

Wednesday, July 11, 2018 10am-12pm

PADEP – Reading District Office

1. Attendees

- Erick Ammon, PADEP SCRO
- Alison Aminto, PWD
- Kevin Buss, PADEP RDO
- Beth Garcia, EPA
- Steve Flannery, PADEP
- Joe Hebelka, PADEP
- Tracey Johnson, PADEP SERO
- Krista Scheirer, Aqua
- Virginia Vassalotti, PDE

2. Introductions – Welcome Alison as co-chair!

3. Review Last Meeting Minutes – Discussion about sharing Act 537 plans in the Schuylkill River Watershed.

4. Bacteria Data – A discussion took place about water quality data in communities that are now connected to sewer treatment (i.e., Port Carbon, Virginville, Lenharstville) to show improvements. The SAN Pathogens workgroup collected data early on through the Targeted Watershed Initiative Grant (TWIG), which was entered into STORET. The question arose if there is any existing comparable data? A good start would be to start with water utilities to assess what regulatory sampling they are doing.

- **Next Steps:** Krista, Alison, and Virginia will discuss the idea of re-establishing the SAN data support team.

5. Workgroup Name Change – The group discussed a name change to “Utilities” or “Contaminants” workgroup, as it was originally brought up with the SAN Planning Committee. The group agreed upon not changing the name until the next strategic plan is finalized. When considering a name change, the group needs to take into consideration the goal of the workgroup and target audiences to be engaged in the workgroup.

6. SAN’s 15th Anniversary – Save the dates for the following events

- **Bus Tour** – Friday, September 21
- **Annual Meeting** – Friday, November 9 at Albright College

7. Water Utility Forum – Wednesday, September 12 at Albright College

- Presentations from the following speakers on the following topics:
 - i. Kelly Anderson, PWD – Investing in source water protection
 - ii. Michelle Hoover, EPA – UCMR4 results
 - iii. Adam Carpenter, AWWA – Upcoming drinking water regulations

- iv. Chris Crockett & Chuck Hertz, Aqua – PFAS
- v. Fred Lubnow, Princeton Hydro – HABs Testing Methods

- **Registration:** <https://schuylkill-water-utility-forum.eventbrite.com/>

8. Reading WWTP Tour – The tour is actually scheduled for August 16 and is limited on space. The group will consider partnering with the BCWSA for a fall tour of WBWA water treatment plant.

9. PWD Schuylkill Watershed Control Plan/Sanitary Survey – Update due Dec 2018.

10. PWD Chapter 94 Data – The workgroup agreed upon updating the spreadsheet that Beth initially put together every 5 years. Erick (SCRO) has a spreadsheet of Chapter 94 data, but is unsure if other regional offices track the data similarly.

11. Algae Info

- EPA Freshwater HABs Newsletters: [May](#), [June](#), [July](#)

12. Quarry – No updates

13. Delaware Valley EWS – Event reported on 7/10 in the tidal Schuylkill upstream of Bartram’s Garden. PWD is interested in doing another training session, perhaps starting with BCWSA. The group expressed interested in PWD updating the fact sheet to share with partners.

14. BCWSA Activities

- Annual conference on July 25 at Albright
- Conducting water utility and waste water treatment tours quarterly
- WBWA Golf tournament on Monday, September 17th – all money going towards Berks County Source Water Protection coordination
- Governors Excellence Award – Berks County Source Water Protection

15. PENNVEST – No update

16. EPA

- PFAS listening session in Horsham on July 25
- WIFI Water Infrastructure Loan – extended to July 31.
- 2017 = 5 year review of the 2012 recreational water quality criteria
- [NETI Coffee Break 30 minute webinar series](#)
- [Guidance for Building Field Capabilities to Respond to Drinking Water Contaminants](#)

17. DEP

- July 11 – DEP listening session
- Exeter – in the process of selling WWTP to PA American (a number of violations with Exeter)
- SERO staffing changes
 - i. Tom Magge – Clean Water Programs Manager
 - ii. James Roth – Biosolids Coordinator

18. Watershed News

- DRBC Dockets
 - i. [Global Advanced Metals](#)
 - ii. [Whitemarsh Township Authority](#)
- New Engineer and Code Enforcement Inspector for Bally – SSM
- PA Emerging Contaminants Sampling – 70 sites in PA (Amy Williams)
- Lower Salford Township Sewer Authority Force Main Project
- [DEP Suspends Accreditation for Southcentral PA Laboratory – Analytical Laboratory Services, Inc's Middletown Facility](#)
- PA Water & Wastewater Technology Summit to be Held Nov 1-2
- [Engineering team wins grand prize for water-saving, impactful tech](#)
- [Geigertown Joint Sewer Authority Oks payments, change orders](#)
- [PA American Water paying \\$96 million for wastewater system in Berks County](#)
- [Water Challenge aims to prevent contamination in Philadelphia rivers, streams](#)
- [UMJA Holds Ceremonial Groundbreaking](#)
- [DEP sets public hearing on Rolling Hills Landfill expansion](#)

19. **Next Meeting Date** – Schuylkill Water Utility Forum will count as fall meeting; winter meeting TBD via doodle poll.



SAN Pathogens & Point Source Workgroup Meeting Agenda

Wednesday, December 12, 2018 10am-12pm

PADEP – Reading District Office

1. Attendees

- Alison Aminto, PWD
- Erick Ammon, PADEP SCRO
- Chris Anderson, PWD
- Chris Bilger, WBWA
- Kevin Buss, PADEP RDO
- Beth Garcia, EPA
- Joe Hebelka, PADEP CO
- Kent Himelright, BCCD
- Kate Hutelmyer, PDE
- Ron MacGillivray, DRBC
- Erica Rossetti, PDE
- Krista Scheirer, Aqua
- Tess Schlupp, Pennvest
- Virginia Vassalotti, PDE

2. Review Last Meeting Minutes – approved

3. **Feedback from Water Utility Forum** – The forum took place on Wednesday, September 12 2018 with about 30-40 attendees. All of the feedback was positive, and the workshop was seen as overall valuable and something we would like to continue doing annually in the future. There was some concern about it being too technical and not having a clear target audience (Decision-makers/leaders? Engineers? Operators?). Recommendations for the future include: advertising to a wider audience, bringing technical leaders onboard for the planning process, having more time for discussion, and possibly offering continuing credits as an incentive.

4. **2019 Workplan Development** – The updated workplan will be available through the website's workgroup hub.

- **Priorities for 2019**

- i. **Strategy 1: Communication between wastewater & drinking water**

- Updated Action 1.e. - We would like to coordinate with other tours of waste water and drinking water treatment plants, specifically through Berks County Water & Sewer and using them as a model.
 - Added Action 1.f. – Develop and enhance partnership and communication relating to emergency response / preparedness
 - Added Action 1.g. – Standardize downstream notification form and/or database of contact information

- ii. **Strategy 2: Data sharing**

- Action 2.b. - Erick can get a list of municipal contacts to help continue developing our list of potential partners to expand and enhance the workgroup.
- Removed old Action 2.d. (POTW)
- Would like to share more data on emerging contaminants and PFAS

iii. **Strategy 3: Emerging Contaminants** – Would like to emphasize that this strategy should focus on outreach and education, sharing information, lessons learned, best practices, and improving communication.

iv. **Strategy 4: Public Education and Outreach**

- Removed Action 4.b – The WWTP fact sheet was finalized and posted on the SAN website.
- Added Action 4.c. – Research, compile, and promote pharmaceutical take-back programs
- Other things to think about:
 - “What Not to Put Down the Drain” fact sheet
 - Compiling partner resources for public outreach: what resources does each partner bring to the table?

5. **Water Supplier Data – Ongoing Conversation** – moved to next meeting due to time

6. **PWD**

- **Schuylkill Watershed Control Plan/Sanitary Survey** – next update coming January 2019
- **Delaware Valley EWS** – We would like to plan another demonstration session for upstream water users/discharges in fall 2019, possibly during/in place of fall meeting

7. **Emerging Contaminants** – Things to think about: what should be our greatest focus, and what other industries could be of concern?

8. **BCWSA Activities** – Hoping to expand their WWTP tours to other counties

9. **Funding**

- **PennVEST** – Warrington accepted \$5.3 million in loans for PFAS remediation
- **Other** - [USDA Water & Waste Disposal Loan & Grant Program](#)

10. **Regulatory Updates**

- **EPA**
- **DEP**
 - in process of hiring toxicologist in order to create a PFOA standard

- Changed some regulations regarding underground and aboveground storage tanks
- Shift in Manganese laws: standards now need to be met right where drinking water suppliers pull from rivers, no longer across the water body

11. Watershed News

- [NJ becomes the first state to set a PFAS standard](#)
- [Commonwealth Financing Authority funded 359 projects to improve infrastructure, September 2018](#)
- [DEP launched electronic permits for new projects affecting wetlands/waterways in modernization attempts. It is accessible through DEP GreenPort](#)
- [EPA receives record numbers of interest letters for WIFIA Water Infrastructure Loans \(totaling \\$9.1 billion\)](#)
- [The \\$6 billion federal, bipartisan America Water Infrastructure Act funding bill was signed October 2018](#)
- [Flushed contact lenses are causing problems at WWTPs](#)
- Several pharmaceutical take-back programs occurred:
 - i. DEP, April 28, 2018
 - ii. Montgomery County, August 3, 2018
 - iii. Berks County, October 27, 2018
- [Engineers give PA infrastructure a rating of C-](#)
- [Fecal contamination found in Wissahickon](#)

12. Other Items – EPA Awards open until January 15th

13. Next Meeting Date – March 6th, 10-12pm. Location TBA

Appendix C: Wildcat Sewer Update

Current Progress of Efforts in Schuylkill River Watershed to Improve Wastewater Planning and Infrastructure

Discharger	Municipality	County	Stream	Update	Sources
Blythe Township	Blythe Township	Schuylkill	Silver Creek and Schuylkill River	The municipalities of Middleport Borough, New Philadelphia Borough, Blythe Township and Schuylkill Township joined together to form the Schuylkill Valley Sewer Authority (SVSA) and completed an Act 537 plan. A new sewage treatment plant with the capacity to treat 550,000 gallons per day and over 30 miles of sewage pipe was construction using SVSA funds and an over \$18 million combined loan and grant package from PENNVEST. The new wastewater treatment plant began discharging treated effluent in June 2006. As of 2009, 1432 customers were connected to the SVSA WWTP, and 69 were not connected. Of those customers not connected, most were abandoned properties, buildings being foreclosed on or were being pursued legally to force connection.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; PENNVEST. www.pennvest.pa.gov
Village of Cumbola	Blythe Township	Schuylkill	Schuylkill River		
Middleport Borough	Middleport Borough	Schuylkill	Schuylkill River		
New Philadelphia	New Philadelphia Borough	Schuylkill	Silver Creek and Schuylkill River		
Schuylkill Township	Schuylkill Township	Schuylkill	Schuylkill River & tributaries		
Village of Brockton	Schuylkill Township	Schuylkill	Schuylkill River		
Village of Delano	Delano Township	Schuylkill	Pine Creek	Delano has public sewer. In 2007, Delano Township received a nearly \$3 million grant and loan package from PENNVEST to construct three miles of sewer lines and a pump station to convey sewage to Northeast Schuylkill Joint Municipal Authority which was previously being discharged to Delano Creek, a branch of Pine Creek.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; "Governor Rendell Announces \$61 Million Investment to Help Protect Pennsylvania's Waterways, Public Health; Promote Community Revitalization Efforts." April 17, 2007. PRNewswire. www.prnewswire.com
Minersville	Minersville Borough	Schuylkill	West Branch Schuylkill River	Minersville has public sewer. Minersville Sewer Authority received over \$4 million loan from PENNVEST to construct almost two miles of sewer and stormwater lines and replace about one mile of water mains to eliminate a continuous discharge of	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; "Governor Rendell Announces Funding to Protect Pennsylvania's Waterways, Public Health; Promote Community Revitalization Efforts." Jul 18, 2006. PRNewswire. www.prnewswire.com

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				untreated wastewater to the West Branch Schuylkill River.	
Village of Llewellyn	Branch Township	Schuylkill	West Creek and West Branch Schuylkill River	The Village of Llewellyn has public sewer. Branch-Cass Regional Sewer Authority recived an over \$16 million loan and grant package from PENNVEST to construct over 28 miles of sewer collect lines and a 450,000 gallons per day wastewater treatment plan to serve portions of Branch, Cass and New Castle Townships and mitigate wildcat sewers and malfunctioning on-lot systems discharging untreated sewage into local streams. In 2010, Branch-Cass Regional Sewer Authority was acquired by the Schuylkill County Municipal Authority (SCMA).	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; "PA Gov. Schweiker Administration Announces \$94 Million in Loans and Grnts for Clean-Water Projects." Nov 14, 2001. PRNewswire. www.prnewswire.com; Schuylkill county Municipal Authority. www.scmawater.com
Deer Lake Municipal Authority (acquired by Schuylkill County Municipal Authority in 2008)	Deer Lake Borough	Schuylkill	Pine Creek	In 2011, Schuylkill County Municipal Authority (SCMA) received grant and loan funding from PENNVEST to expand its Deer Lake wastewater treatment plant and construct several miles of sewerage collection lines. The project would eliminate several small, inadequate wastewater treatment plants and discharges from wildcat sewers and malfunctioning on on-lot septic systems to locate streams. Expansion and construction began in 2013. The wastewater treatment plant was completed and operational in September 2014. SCMA was awarded the Governor's Award for Environmental Excellence from PADEP in 2015 for completion of the project.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; "Pennsylvania Governor Corbett Announces \$99 Million Investment in Water Infrastructure Projects in 20 Counties." Jul 20, 2011. PRNewswire. www.prnewswire.com; Schuylkill county Municipal Authority. www.scmawater.com

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New Ringgold Municipal Authority	New Ringgold Borough	Schuylkill	Little Schuylkill and Koenig Creek	<p>In 2001, the Borough of New Ringgold received a loan from PENNVEST to design sewage collection lines and a WWTP to eliminate malfunction on-lot septic systems contaminating local drinking water wells, Koenig Creek and the Little Lehigh. The Borough of New Ringgold received over \$1.4 million in loans and grants in 2004 and over \$2.6 million in loans and grants in 2005 from PENNVEST to install approximately 3 miles of sewage collection lines to eliminate the use of malfunctioning on-lot septic systems that are contaminating a local stream and drinking water wells. The WWTP was completed in 2006.</p>	<p>"PA Gov. Schweiker Administration Announces \$94 Million in Loans and Grants for Clean-Water Projects." Nov 14, 2002. PRNewswire, www.prnewswire.com "PENNVEST Initiates Brownfield Program Approves \$97 Million for Water Projects," Mar 24, 2004. PRNewswire. www.prnewswire.com; "PENNVEST Approves \$100 Million for Water Projects." Mar 23, 2005. PRNewswire. www.prnewswire.com; "2014 Chapter 94 Annual Report Borough of New Ringgold Sewage Treatment Plant." 2014. <i>Chapter 94 Municipal Wasteload Management Report.</i></p>
West Hamburg	Tilden Township	Berks	Schuylkill River	<p>In 2008, Tilden Township received a \$5.3 million loan from PENNVEST to construct nearly six miles of sewage collection and transmission lines, three pump stations and other facilities to eliminate the use of wildcat sewers and malfunctioning on-lot septic systems discharging untreated and inadequately treated sewage into areas draining to the Schuylkill River.</p>	<p>"Governor Rendell Announces \$72 Million in Water Infrastructure Investments." Apr 14, 2008. PRNewswire. www.prnewswire.com</p>
Virginville	Richmond Township	Berks	Maiden Creek, Sacony Creek	<p>Richmond Township received a \$1.6 million loan in 2008 and over \$1.7 million in loans and grants in 2001 to construct a new WWTP, pump station, and sewage collection lines to serve 247 homes in the township, where malfunctioning on-lot septic systems are contaminating local wells. The Richmond-Virginville WWTP was completed in 2013.</p>	<p>"Governor Rendell Announces \$66 Million Investment in PA's Water Infrastructure," Oct 27, 2008, PRNewswire, www.prnewswire.com; "Governor Corbett Announces \$84 Million Investment in Water Infrastructure Projects in 14 Counties," Oct 26, 2011, PRNewswire, www.prnewswire.com; Steckbeck Engineering and Surveying, Inc., <i>Facebook</i>. www.facebook.com</p>

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Strausstown	Strausstown Borough	Berks	Tributaries to Blue Marsh Reservoir	<p>In 2002, Strausstown Borough received a loan from PENNVEST to design a sewage collection and treatment facility to serve Strausstown Borough and portions of Upper Tulpehocken Township, where wildcat sewers and malfunctioning on-lot septic systems are contaminating almost half of the local drinking water wells. In 2007, Strausstown Borough received \$3.65 million in loans and grants from PENNVEST to construct the wastewater collection and treatment system to serve both the Borough of Strausstown, as well as Upper Tulpehocken Township. The construction of approximately 3 miles of sewage collection lines and a 65,000-gallon per day wastewater treatment plant was completed in November 2009.</p>	<p>"Pennsylvania Gov. Schweiker Administration Announces \$95.5 Million in Loans and Grants for Clean Water Projects." Mar 20, 2002. PRNewswire. www.prnewswire.com; "Governor Rendell Announces \$69 Million in Clean, Safe Water Infrastructure Investments." Oct 23, 2008. PRNewswire. www.prnewswire.com; "Borough of Strausstown, Berks County, Sewage Treatment Plan, Municipal Wasteload Management." 2012. <i>Annual Report for 2012 DEP Rules and Regulations, Chapter 94</i>.</p>
Lenhartsville	Lenhartsville Borough	Berks	Furnace Creek, Maiden Creek	<p>Lenhartsville Borough received over \$1.3 million in 2002 and over \$1.6 million in 2004 in loans and grants from PENNVEST to construct a new sewage treatment plant and collection system to eliminate the use of on-lot septic systems contaminating drinking water wells and local streams, including Furnace Creek and Maiden Creek. The new sewage treatment plant went online in July 2005.</p>	<p>"Pennsylvania Governor Schweiker Announces \$3 Billion Milestone for Funding of Clean Water Projects in Pennsylvania." Nov 20, 2002. PRNewswire. www.prnewswire.com; "PENNVEST Initiates Brownfields Program, Approves \$97 Million for Water Projects." Mar 24, 2004. PRNewswire. www.prnewswire.com; PENNVEST. www.pennvest.pa.gov; "Borough of Lenhartsville Waste Water Treatment and Conveyance Facilities." 2012. <i>Title 25 Chapter 94 Municipal Wasteload Management Annual Report</i>.</p>
Sassmansville	Douglass Township	Montgomery	Schlegal Run and Middle Creek	<p>In 1999, 20 houses were cited by the Montgomery County Health Department for failing sewage systems. In 2007, Berks-Montgomery Municipal Authority completed a \$2.3 million project constructing a pump station and sewerage lines to serve a</p>	<p>"Douglass (Mont.) Oks Sassamansville Sewer Project." The Mercury News; Berks-Montgomery Municipal Authority Sewer Revenue Bonds. Apr 20, 2015. McElwee & Quinn Financial Printing. www.mcelweequinn.com.</p>

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				community of Sassmansville which is located in Douglass and New Hanover Townships.	
Village of Branchdale	Reilly Township	Schuylkill	Muddy Branch	The Village of Branchdale has wildcat sewers and failing on-lots. Alfred Benesch has worked on an Act 537 Plan for them but it is not affordable.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015
Tamaqua	Tamaqua Borough	Schuylkill	Wabash Creek	Tamaqua Borough hired Alfred Benesch and Company to investigate wildcat sewers in Wabash Creek. A total of 101 connections were investigated - 17 had abandoned lines to Wabash Creek and were connected to the municipal sewer system. Five properties are not connected, four of which are vacant, abandoned properties with water service shut off. The remaining property is illegally discharging into Wabash Creek and has been issued several Notice of Violation Tickets and is being processed through the court system.	(Rob Jones, Tamaqua Public Works, personal communication, May 22, 2015)
South Tamaqua*	West Penn Township	Schuylkill	Little Schuylkill	Act 537 planning in Walker and West Penn Townships is ongoing. The existence of wildcat sewers and malfunctioning on-lot disposal systems has been confirmed. In 2016, West Penn and Walker Townships continued to work with Rettew Associates and PADEP on Act 537 planning and creating a financially feasible plan to address 30 residences in five areas in need of sewage disposal. Possible solutions include five community on-lot sewage disposals or new or repaired individual on-lot sewage disposals. In March 2017, Walker Township's Board adopted a resolution to advance its	"Wildcat Sewers Exist in West Penn Township." Times News, LLC.. Apr 5, 2013. http://www.tnonline.com/2013/apr/05/wildcat-sewers-exist-west-penn-township ; "WestPenn-Walker Twp.. Sewage Plan Advances." Times News, LLC.. Mar 6, 2016. http://www.tnonline.com/2016/mar/05/west-penn-walker-twp-sewage-plan-advances "Walker Twp. submits sewage facility plan to DEP" Times News, LLC. Jun, 3, 2017. https://www.tnonline.com/2017/jun/0

				revised Act 537 plan to the state. In June 2017, the revised sewage facilities plan was submitted to the PADEP. The plan includes a maintenance ordinance that requires residents to have their on-lot septic systems pumped and inspected every three years. The 30 residences would either repair or replace their current system. Township officials met with DEP in December 2017 and adopted resolutions for their revised Act 537 sewage facility plan. The townships continue to await the completion of an administratively complete plan.	3/walker-twp-submits-sewage-facility-plan-dep "W. Penn, Walker to meet with DEP over previously submitted." Times News, LLC. Nov. 9, 2017. https://www.tnonline.com/w-penn-walker-meet-dep-over-previously-submitted "West Penn hears update on sewage facility plan." Times News, LLC. Feb. 21, 2018. https://www.tnonline.com/west-penn-hears-update-sewage-facility-plan
River Road Properties*	Philadelphia	Philadelphia	Schuylkill	Construction to connect residents of Upper Roxborough along Nixon Street and River Road to the public sewer system is scheduled for the Spring 2019. The Philadelphia Water Department met with residents of the Shawmont Valley Civic Association on November 20, 2018, to discuss the construction plans.	Weilbacher, M. "Natural Selections: Joanne Dahme - water is in her blood" Montgomery News. Nov. 28, 2018. http://www.montgomerynews.com/roxrview/opinion/natural-selections-joanne-dahme-water-is-in-her-blood/article_17d5fbbe-f262-11e8-9b89-9f0a3a92d9bb.html?fbclid=IwAR1urpw dEjXprlRONJTrbq_Obg5WjrlxAXl_hNd3E3fqv5pMnIrXk9Nd_JY
Albany	Albany Township	Berks	Maiden Creek	Unknown	
Port Indian	West Norriton	Montgomery	Schuylkill River, main stem	Unknown	

*Updated from news sources

Appendix D: Schuylkill Action Network Annual Meeting

Schuylkill Action Network (SAN) Annual Meeting



FRIDAY, NOV 9, 2018
ALBRIGHT COLLEGE
READING, PA
9:30 AM - 5:00 PM

SPONSORS

Platinum



Gold



Silver



AGENDA

9:30-10:00

Registration & light breakfast

Kicking Off the "SANnual" meeting

10:00-10:40

10:00-10:10 Program Overview

Virginia Vassalotti,
Partnership for the Delaware Estuary

10:10-10:25 Celebrating 15 Years of Action!

Rick Rogers, *U.S. EPA Region 3*
& *SAN Executive Steering Committee Chair*

10:25-10:40 Learning from our Leaders: How
was the Schuylkill Action Network
formed?

Lori Reynolds, *U.S. EPA Region 3* &
Jen Adkins, *Partnership for the Delaware Estuary*

Schuylkill Stories from Watershed Champions

10:40-11:50

10:40-11:05 A Farmer's Perspective from the
Willow Run Farm

Deanne Boyer, *Willow Run Farm*

11:05-11:30 Perks of Teaching in the
Perkiomen

Jim Coffey, *Upper Perkiomen High School*

11:30-11:50 SAN MVP & 15 Year Awards

Steve Tambini, *Delaware River Basin Commission*
& Rick Rogers, *U.S. EPA Region 3*

11:50-12:50

Lunch & SAN Trivia!

Roads to Creative Funding

12:50-1:40

12:50-1:15 Partnering with PennDOT

John Ferro,
Wissahickon Valley Watershed Association

1:15-1:40 Innovative Solutions Using Dirt &
Gravel Roads Funding

Bryan Kulakowsky, *Arro Engineers*

1:40-1:50

BREAK

New Tools

1:50-2:50

1:50-2:10 Using Story Maps for Innovative
Outreach

Phil Pierdomenico & Dan Schupsky,
Philadelphia Water Department

2:10-2:30 Schuylkill Clean Sweep:
Trash Cleanup App

Marshall Oram & Scott Sharadin,
Miller Designworks

2:30-2:50 Mayfly: An Affordable Stream
Monitoring Sensor

Dave Bressler, *Stroud Water Research Center*

3:00-5:00

Happy Hour Celebration!



Photo by: Jessie Kemper, Splash of Fun



Photo by: Bruce Gaydos, Wild and Scenic



SAN Annual Meeting
November 9, 2018

Rick Rogers, Chair, ESC
Water Protection Division

Associate Director Office of Drinking Water and Source Water Protection
EPA Region 3

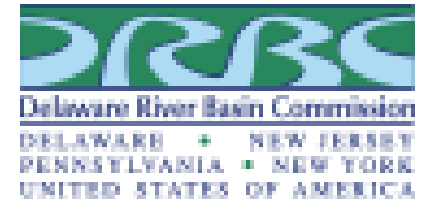


Photo by: Carol Tersine, People's Choice



Photo by: Donna Davis, Urban Waters

SAN ESC AND PLANNING MEMBERS



By the mid 1880s, fouled water, factory waste, coal by-products, and agriculture and urban runoff were being drained into our rivers at an alarming rate.



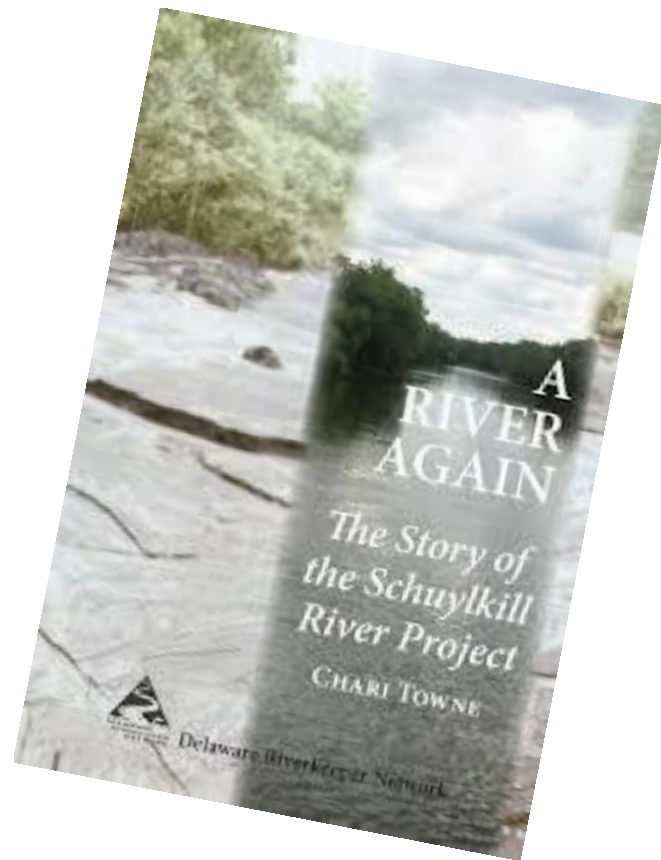
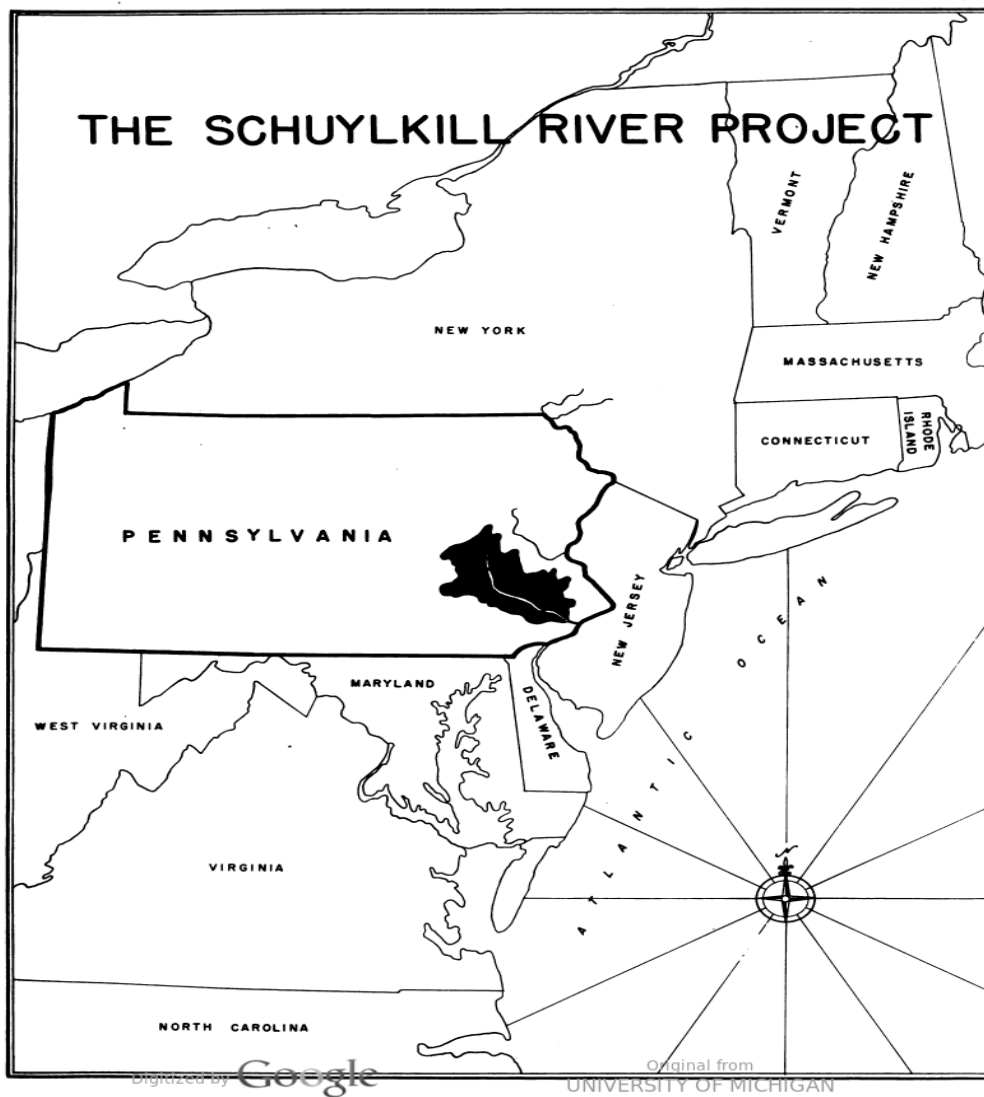
“How offensive is the stench, when the air is heavy and the wind blowing from the Southwest.”

-John Frederick Lewis

NORRISTOWN MAGNESIA AND ASBESTOS CO.

4-2-28

Schuylkill River Project: 1947-1951





Today's Theme: Celebrating 15 Years of Action

Photo Credit: Carol Tersine

SAN Milestones



1999 Source Water Assessment started



Spring 2003 SAN Formed

2006 Schuylkill River Restoration Fund

www.SchuylkillWaters.org

2009 SAN Coordinator Hired
SAN Website

2014 SAN Fellow hired



2018 SAN 15 yrs.



2002 Source Water Assessment Completed

2004 Targeted Watershed Initiative Grant



2007 SAN 3 yr Strategic Plan

2013 SAN 10 yrs. Delaware River Watershed Initiative



2016 6 yr. Strategic Plan

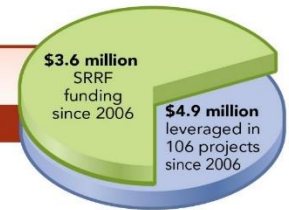
SAN Investments and Actions

- 2004–2007 Targeted Initiative Watershed Grant:
 - \$1.15(EPA); \$1.5(PADEP)=\$3M total; 40 projects
- 2006–2018 SRRF:
 - \$8.5M total; 106 projects
- 2013–2021 Delaware River Watershed Initiative
 - \$5.4 total for Middle Schuylkill and Schuylkill Highlands clusters
- Abandoned Mine Drainage
 - \$14.3M; 8 treatment systems
 - Reduce Iron: 88 tons, Aluminum: 3 tons; Manganese: 6 tons
- Agriculture
 - \$24.4M NRCS; 166 manure storage; 172 barnyard repairs
 - 86 stream crossings; 475 acres riparian buffers
- Education and Outreach
 - 2009–2017 Schuylkill Scrub: 3,584 trash cleanups
 - 94K volunteers; 207 tons of trash removed from the watershed

SCHUYLKILL RIVER RESTORATION FUNDING

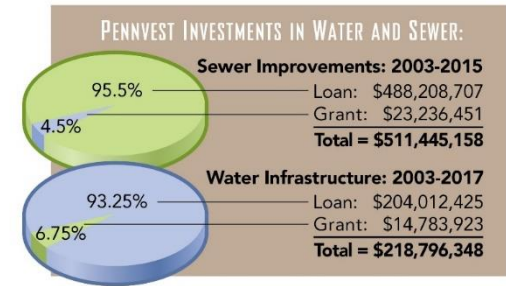
Since 2006, Schuylkill River Restoration Funds (SRRF) awarded \$4.9 million in grants to fund 106 projects in the Schuylkill River Watershed.

2006-2018 SCHUYLKILL RIVER RESTORATION FUNDING AND LEVERAGED FUNDING



SAN Investments and Actions

- Pathogens and Point Source
 - 30 wildcat sewers addressed
 - Delaware Valley Early Warning System
 - 359 users; 50 organizations; 362 events



- Stormwater
 - Schuylkill Action Students
 - \$347K; 25+ school projects
 - \$21M; over 200 projects



- Watershed Land Collaborative
 - Land Transaction Grants
 - 19 grants; 1,901 acres– 18% watershed permanently protected
 - Schuylkill Highlands Cluster
 - \$1.7M; 2,036 acres protected– 39% watershed permanently protected

Total Investment: \$865,334,652 Million

Schuylkill Supports Big Fish



Recreation on Schuylkill

20th Annual Schuylkill SOJOURN

- 1998–2018: 4,000 people
- 112–miles; 200+ each year



3rd Annual Ride for the River

- 2016–2018: 900 cyclists
- Sly Fox Donates \$5.5K+ for Trail
- \$18K total trail investments



DID YOU KNOW?

About 1.2 million people use the Schuylkill River Trail annually!

Schuylkill River Trail

- Best Urban Trail 2015
- \$12M DOT grant
- Goal: 130 miles; 60 miles to go



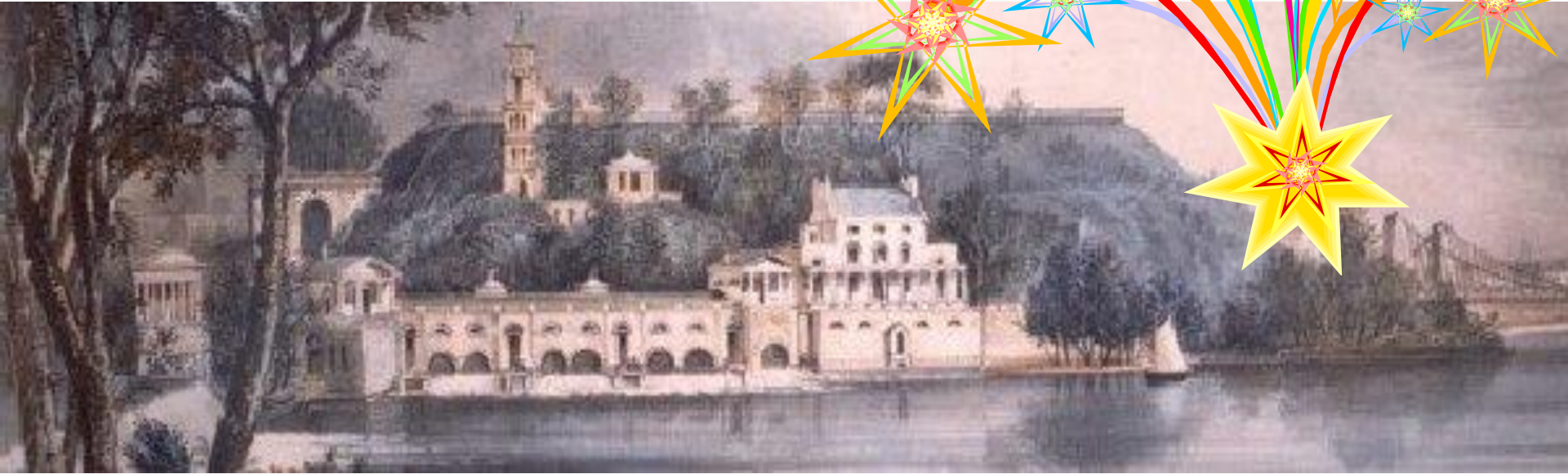
SAN 15 YEARS OF ACTION



Photo by: Jared Kofsky

SAN 15th Anniversary

Lori Reynolds, U.S. EPA Region 3
& **Jen Adkins**, Partnership for the
Delaware Estuary



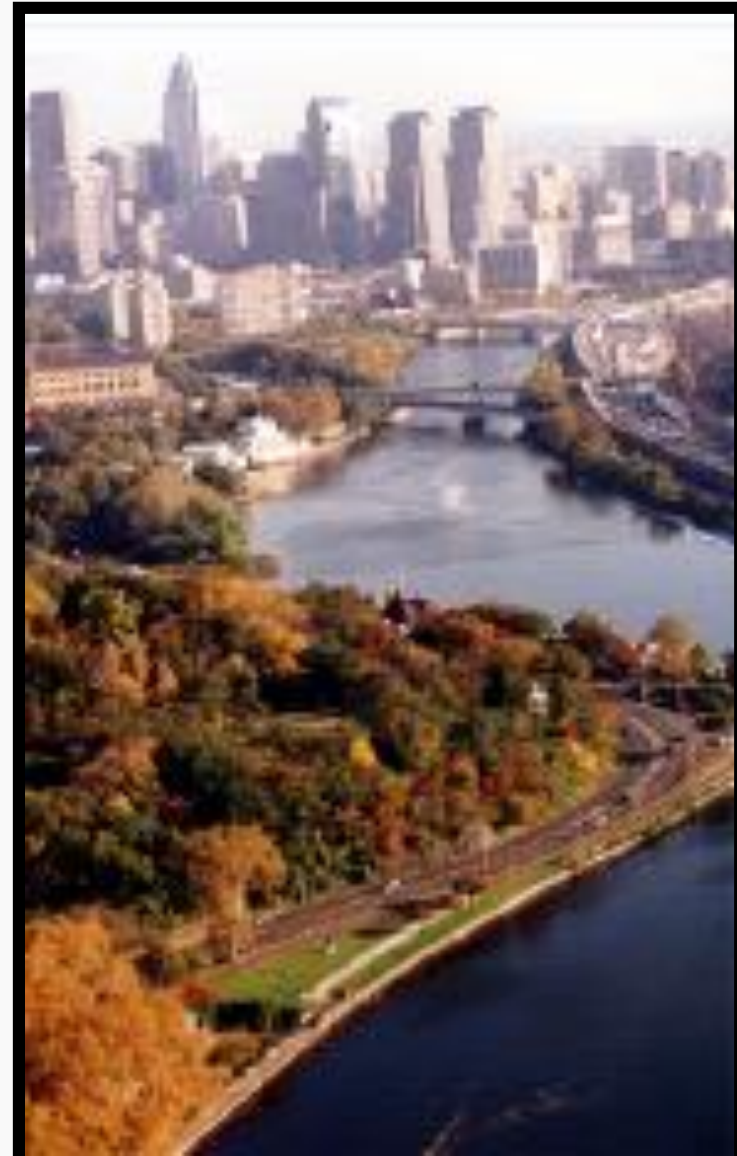
“Too thin to cultivate, too thin to navigate”



Saturday Evening Post, July 9, 1949



1978, the main stem of the Schuylkill River became the first scenic river designated under the PA Scenic Rivers Act





1996 Amendments to the Safe Drinking Water Act

Source Water Assessments



- **delineate & map the sources of drinking water**
- **inventory potential contamination activities & identify contaminants**
- **assess the susceptibility of the drinking water resources to contaminants**
- **provide the assessment information to the public**



11 counties

232 municipalities

130 miles of river

42 surface water intakes

Source of drinking water for 1.75 million people





February 14, 2003 Meeting Phila. Water Department & EPA

A vision of our future...

- Shift our focus beyond point sources...toward protecting our natural resources;
- Take ownership of our streams and rivers;
- Bring the environment back into urban life;
- Promote urban ecology and sustainable RE-development; and
- Lead through partnerships, innovations and demonstrations.



Philadelphia Water Department

Office of Watersheds





April 11, 2003 Meeting EPA, PWD, and PADEP Southeast **Meeting Notes**

The following key actions were identified:

- A champion is needed for the Schuylkill River
- A name needs to be developed for this initiative and a vision needs to be written and disseminated.
- Develop an action plan



The Original Planning Committee



Phila. Water Dept. (PWD)
PA Dept. of Env.
Protection (PADEP)
Del. River Basin
Commission (DRBC)
Env. Protection Agency
(EPA)



Taking it to the River





Schuylkill Action Network Mission

"To improve the water resources of the Schuylkill River Watershed by working in partnership with state agencies, local watershed organizations and land conservation organizations, businesses, academics, water suppliers, local and state governments, regional agencies, and the federal government to transcend regulatory and jurisdictional boundaries in the strategic implementation of protection measures".



Potential Names

- Schuylkill River Restoration & Protection Project
- Save The Schuylkill River
- Schuylkill River Restoration & Revitalization Project
- Schuylkill River Stewardship Project





The Goals

- “Work cooperatively with interested partners to:
- support existing efforts & implement actions to restore & protect the water quality of the Schuylkill River Watershed as a regional drinking water source,
 - promote the long term coordinated stewardship & and restoration of the Schuylkill River Watershed, to educate others regarding their roles in protecting the watershed & water supplies,



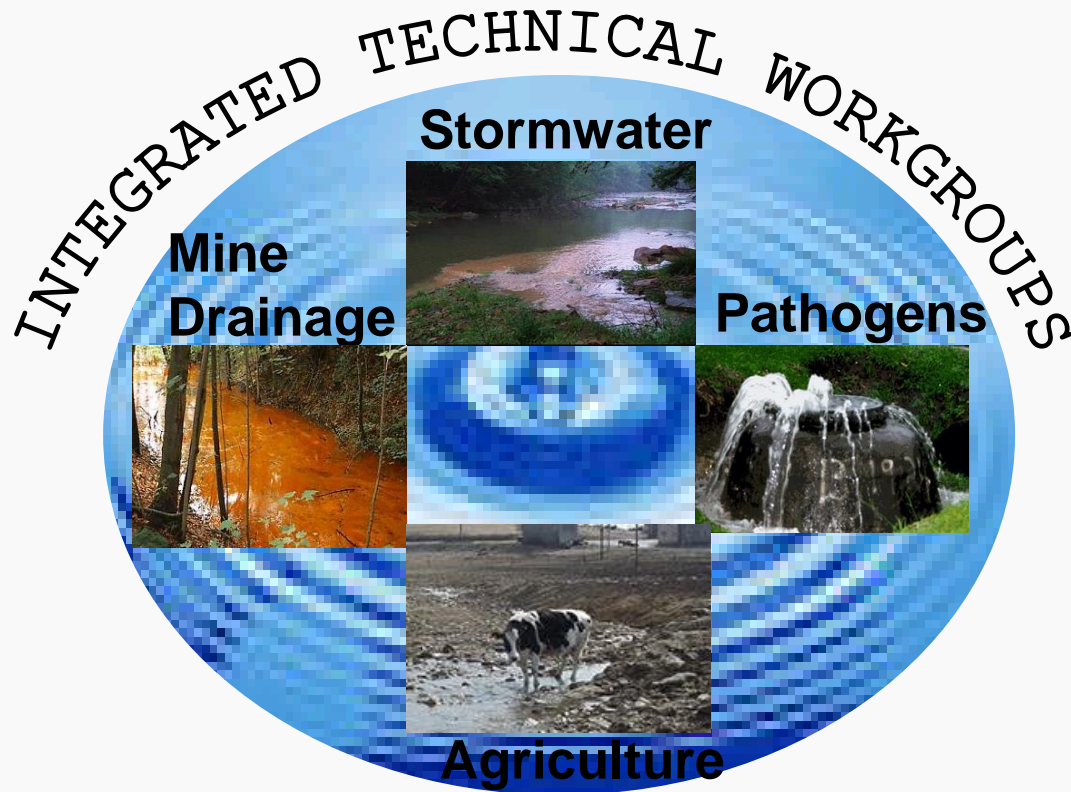
The Goals

“Work cooperatively with interested partners to:

- transfer the experience and lessons learned to other communities, and
- enhance intergovernmental communication & coordination by working together on the identification and resolution of environmental issues with shared regulatory responsibility.”



The Plan and Structure





The Schuylkill Action Network is Created



Kick-Off Meeting held October 2003 at Green Valleys Association at Welkinweir



The Original Executive Steering Committee





2004 EPA Targeted Watershed Initiative Grant

- EPA awarded \$1.15M for water quality improvement & demonstration projects in the Schuylkill watershed

BEFORE



AFTER



Seidel Farms restoration





Collaborative Problem Solving “Pick your Partners Well”





Collaborative Problem Solving "Pick your Partners Well"

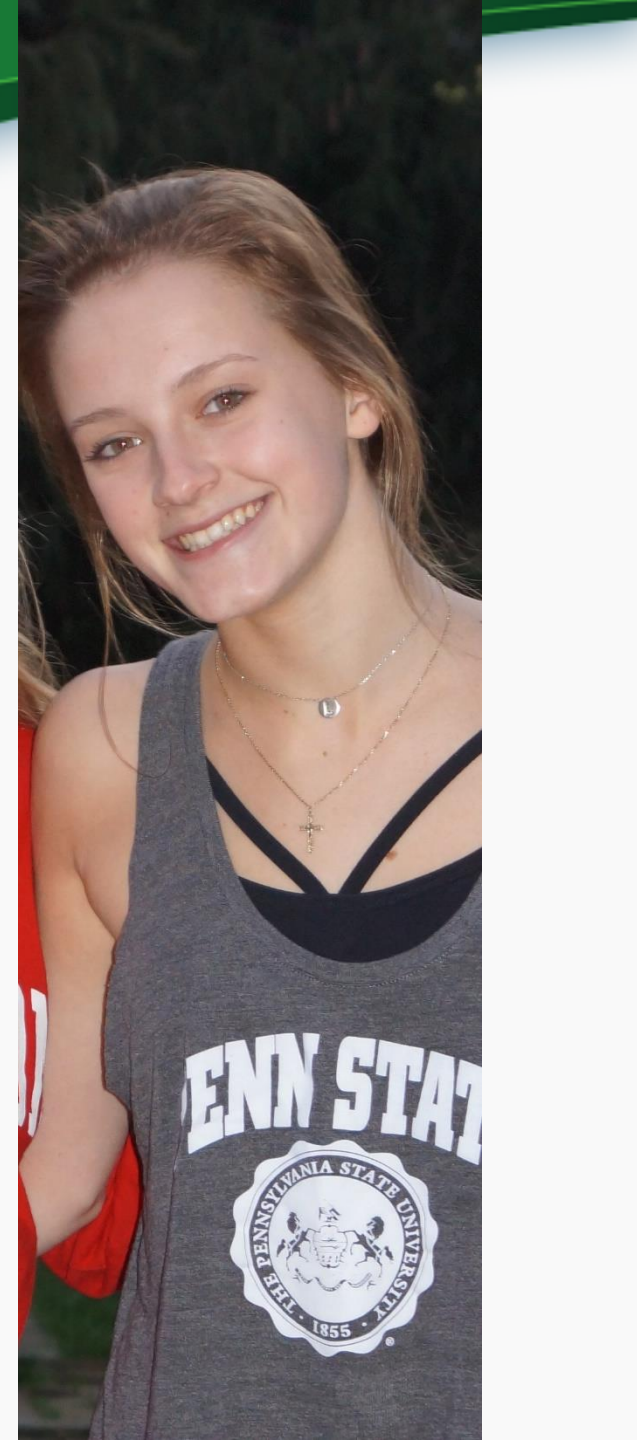








Thank You.....
.....for the 15 Years!



A Future Based on Communication, Collaboration, and Partnership



The SAN... From SWIG to DRWI

A brief history in acryonyms

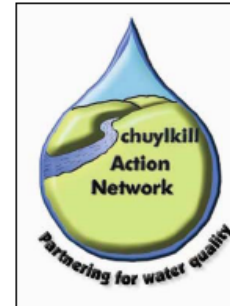


Partnership for the
**DELAWARE
ESTUARY**



First there was SAN... (Schuylkill Action work)

Schuylkill Action Network Fact Sheet – May 2004



- EPA
- PWD
- PADEP
- DRBC
- PDE

Steering Committee
The role of the Steering Committee is to ensure that partners are knowledgeable and supportive of SAN activities and to provide feedback and direction to the workgroups. Members include US Environmental Protection Agency Region III (EPA), PA Department of Environmental Protection (PADEP), City of Philadelphia Water Department (PWD), and the Delaware River Basin Commission (DRBC).

Planning Workgroup
Source Water Protection Strategy development and implementation, workshops, web services, communication, and events. Members include EPA, PADEP, PWD, and DRBC.

Agricultural Workgroup
The role of this workgroup includes implementing protection projects for agricultural practices, the management of runoff, and establishment of practices to reduce pathogens, sediment, and nutrient loadings. Members of this workgroup include EPA, PADEP, PWD, local water suppliers, Berks County Conservation District, Natural Resources Conservation Service, Farm Bureau, Pomona Grange, Penn State Extension Service, and the Hay Creek Watershed Association.

Acid Mine Drainage (AMD) Workgroup
The AMD workgroup is working to characterize and minimize flow from the abandoned Pine Knot drainage tunnel. The discharge is the largest contributor of metals from AMD. Once the sources of inflow are identified, prioritization of the sources will occur followed by implementation of remedial actions. Members of the AMD workgroup include EPA, PADEP, PWD, Schuylkill Headwaters Assn., Schuylkill County Conservation District, Army Corp. of Engineers, USGS, Exelon Corp., and Reading Anthracite.

Pathogen/Compliance Workgroup
The workgroup focus is on discharges in violation of National Pollutant Discharge Elimination System (NPDES) permit requirements, releases from combined and separate sewer systems, as well as from unsewered communities. Discharges upstream of drinking water intakes are a priority. Technical assistance to publicly owned treatment plants, targeted inspections, and compliance assistance regarding the management of on-site waste treatment facilities are activities of this team. Members include EPA, PADEP, and PWD with input from county health depts.

Storm Water Workgroup
Storm water runoff is the leading cause of impairment within the watershed. The workgroup is seeking to reduce stream impairment through better storm water management and to protect high quality streams from potential threats. Activities include education, outreach, and the implementation BMP demonstration projects. Members include EPA, PADEP, PWD, and Berks and Montgomery County Planning Comm. The workgroup also leads a subcommittee, which addresses local land use issues.

Storm Water Subcommittee
Land use is a major factor impacting storm water within the watershed. In order to address this issue, a subcommittee is forming to work with partners at a municipal level where land use decisions are made.

Data Team
Data drives the technical teams. This group assists with indicators, monitoring, establishment of base lines, scientific support, data quality, and information management. Members include EPA, PADEP, and PWD.

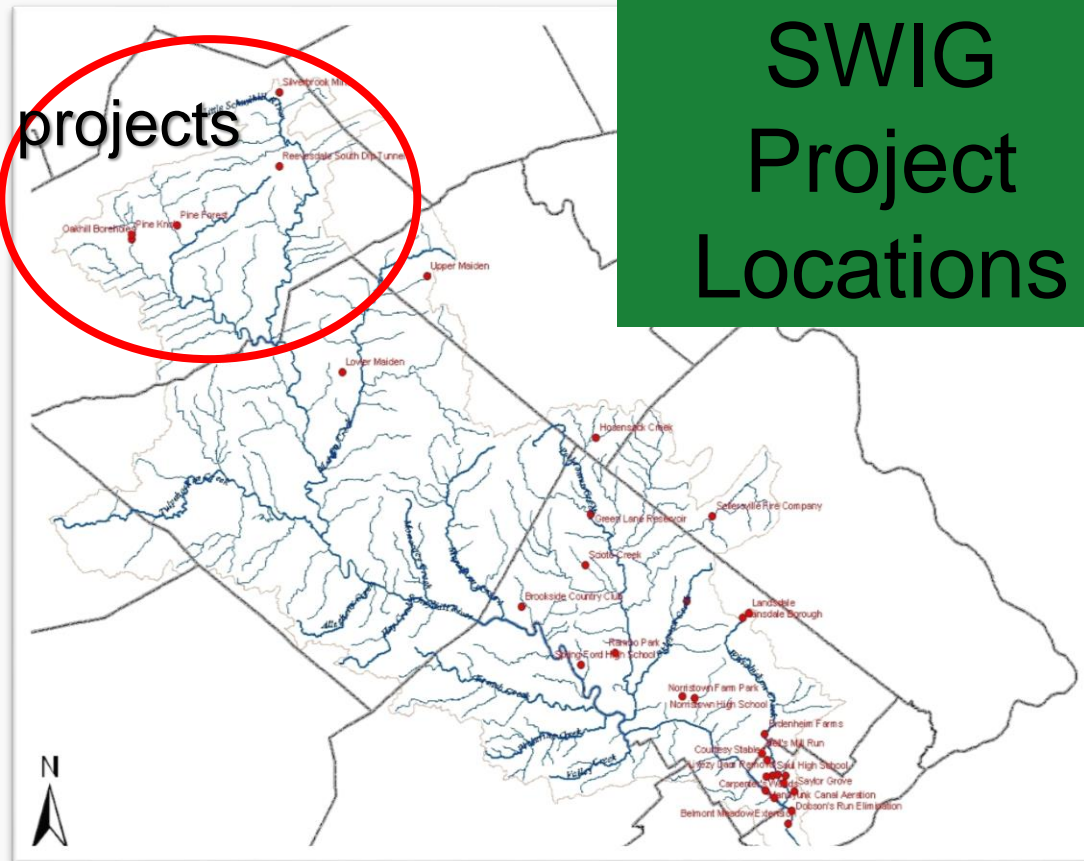
Education/Outreach Team
The team is working to increase awareness regarding source water, is assisting the technical teams on outreach/education, and is responsible for the SAN source water protection awards program. Members include EPA, PADEP, PWD, League of Women Voters, and the Partnership for the Delaware Estuary.



In the SAN and SWIG there was AMD... (Abandoned Mine Drainage)



AMD projects

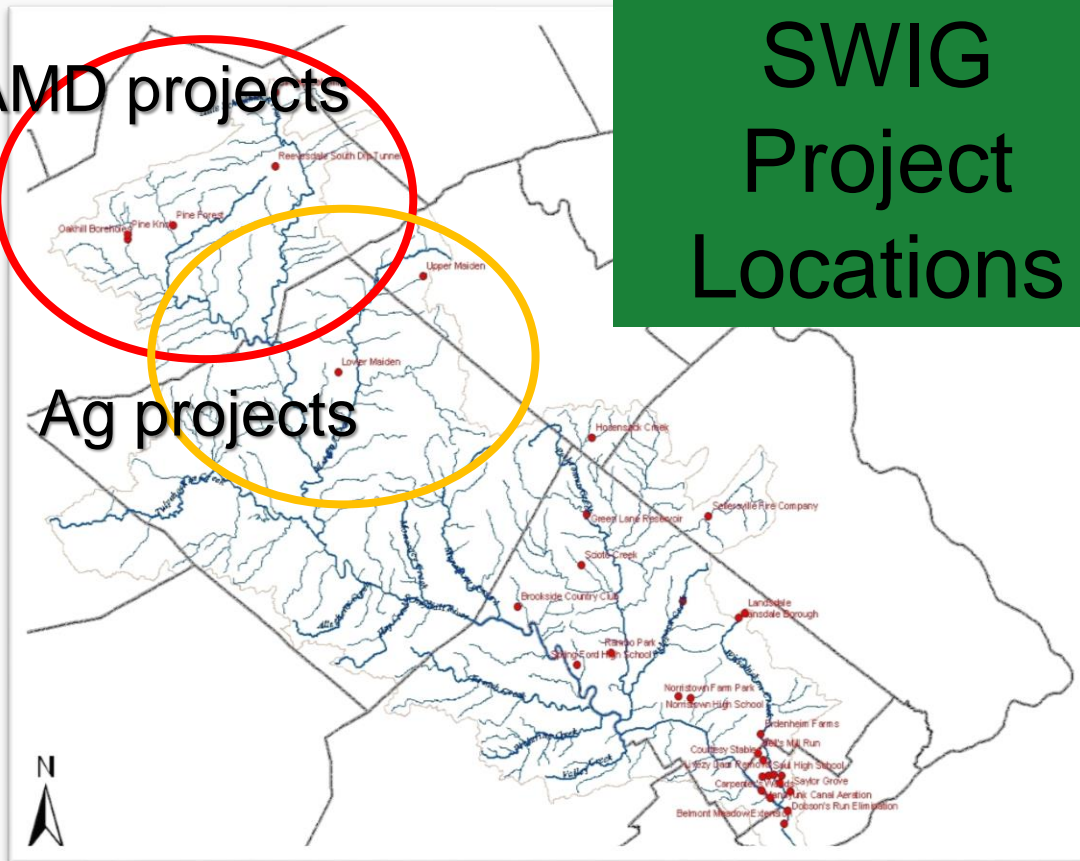


SWIG
Project
Locations

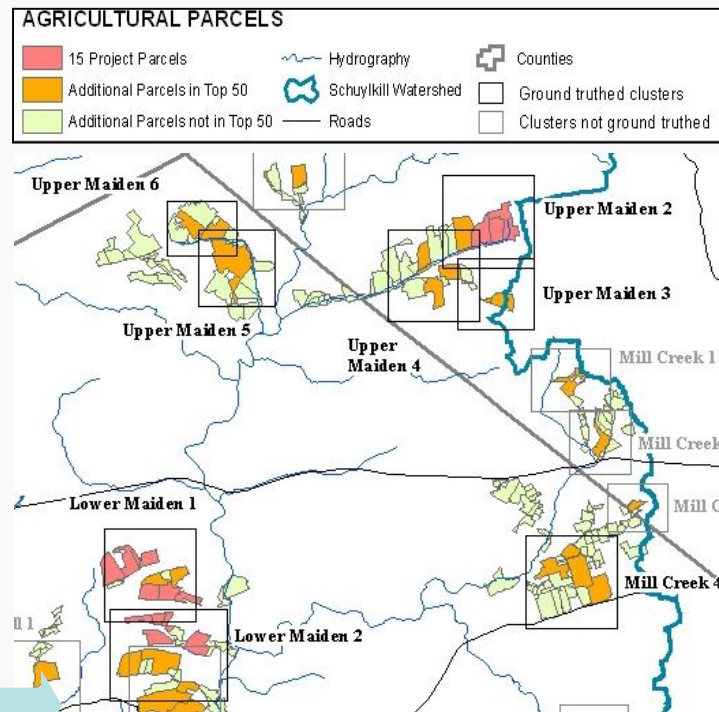
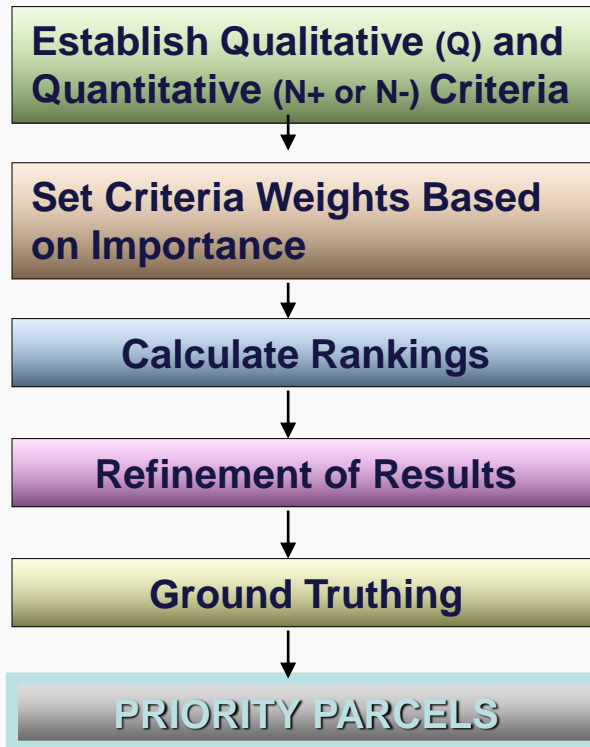
And AG... (AGriculture)



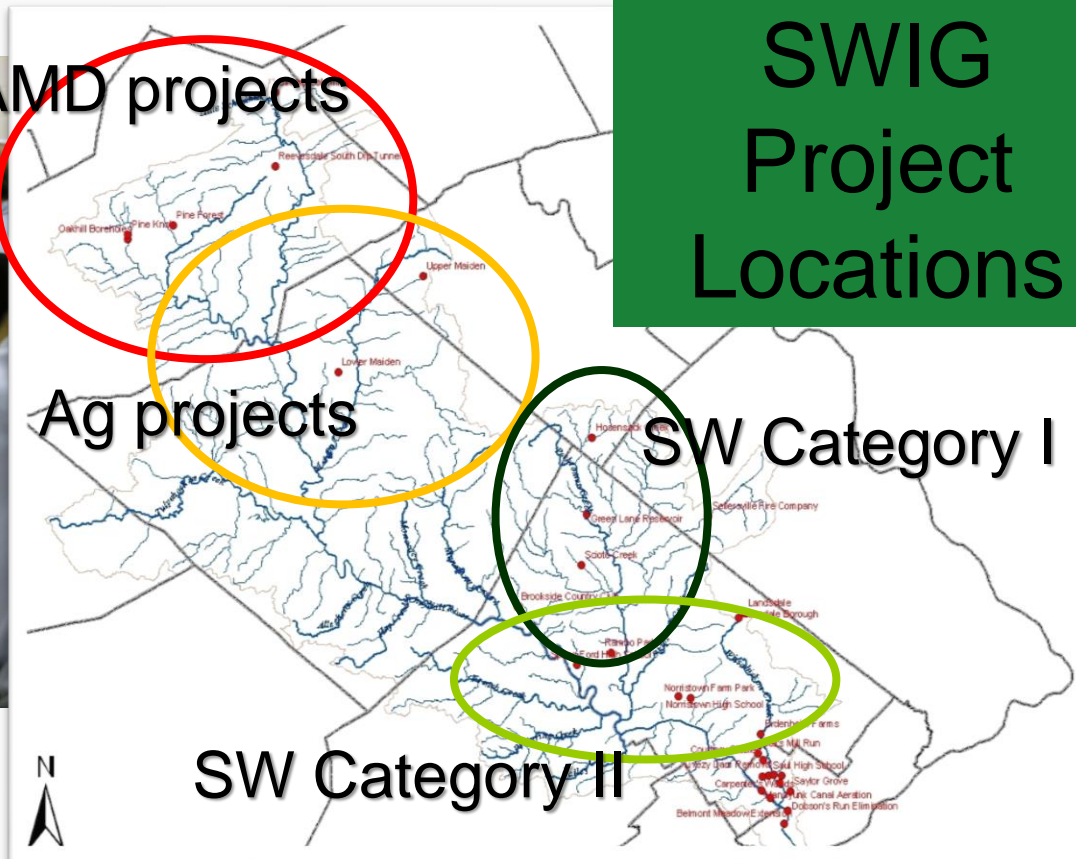
AMD projects



And AG there was EVAMIX... (EVALuation MetrIX)



In the SAN and SWIG there was also SW... (StormWater)

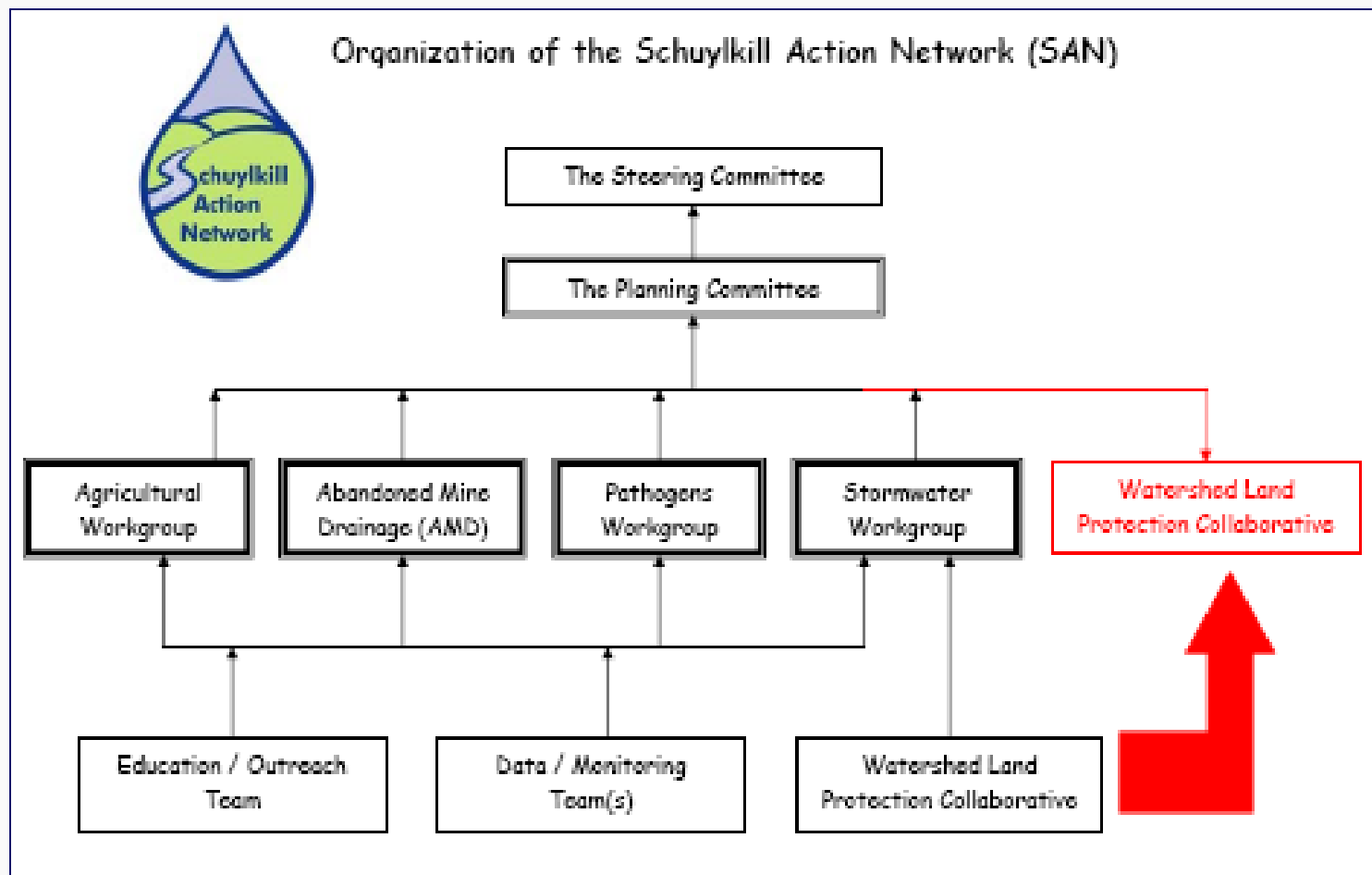


And E & O... (Education and Outreach)

- Environmental Advisory Councils
- Perkiomen Subshed Outreach Pilot
- Pervious Parking Lot Demo at Riverbend EEC
- Case Studies
- Gold Course Certification
- School Certification



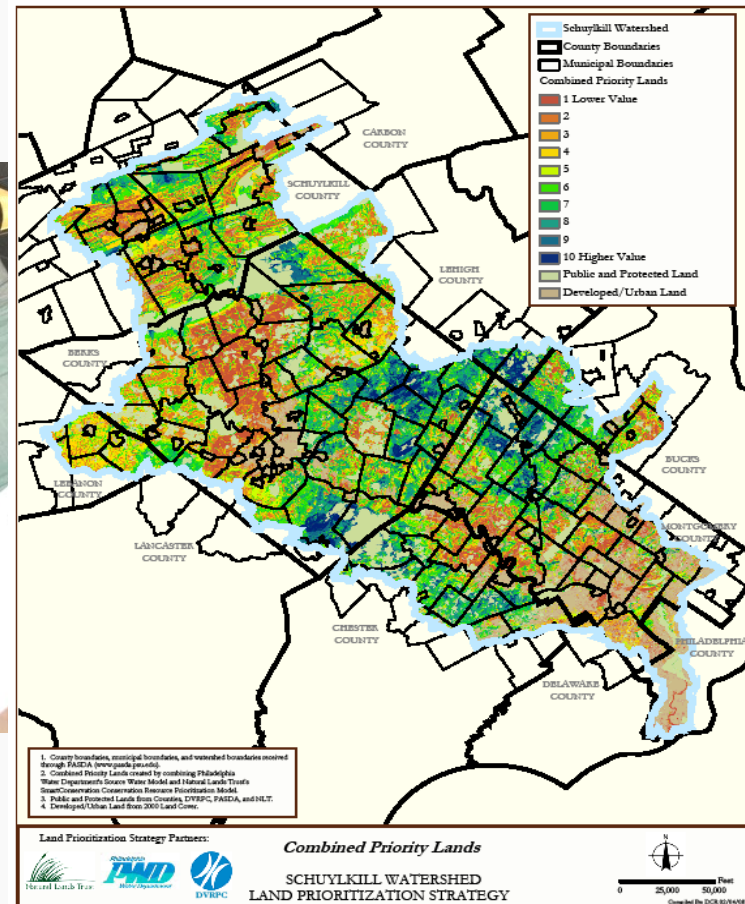
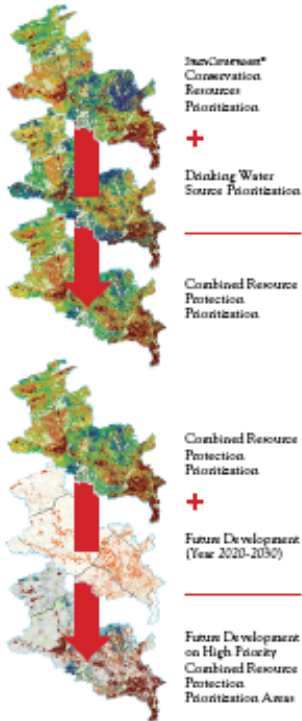
And later the WLPC... (Watershed Land Protection Collaborative)



...with new partners: DVRPC and NLT (Delaware Valley Regional Planning Commission and Natural Lands Trust, now Natural Lands)

Process Overview

(See inside for more information)



After the SWIG, the SAN had the DWSRF & SRRF... (Drinking Water State Revolving Fund & Schuylkill River Restoration Fund)



With SRHA
(Schuylkill River Heritage
Area, now Schuylkill River
Greenways)

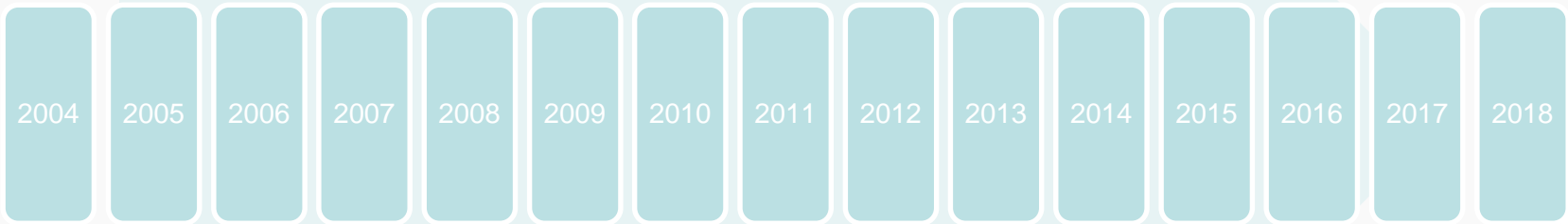
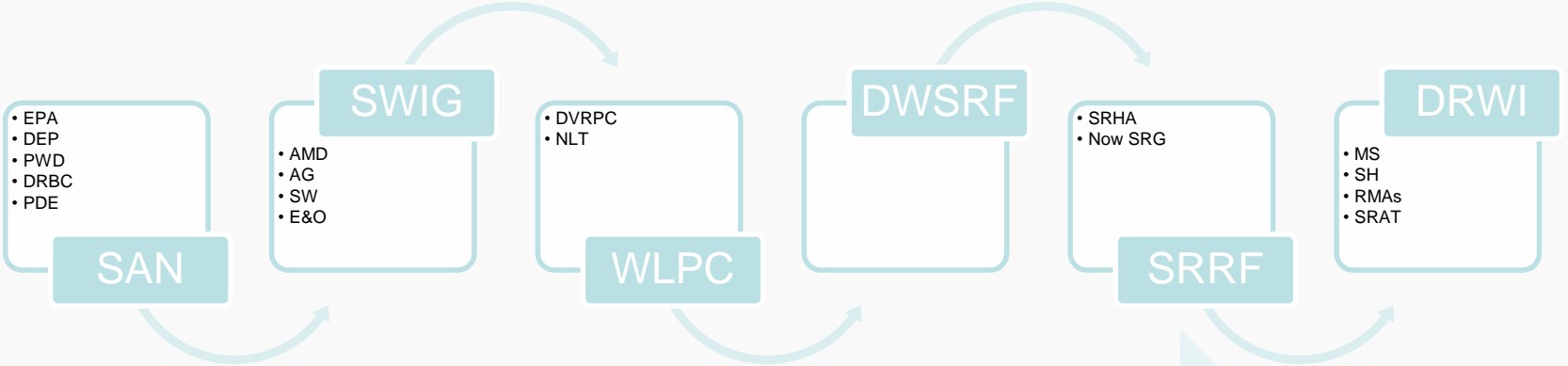


And later, the DRWI (Delaware River Watershed Initiative)

- MS = AG (Middle Schuylkill = Agriculture)
- SH = WLPC (Schuylkill Highlands = Watershed Land Protection Collaborative)
- Phase 1 = RMAs (Results, Milestones, Activities)
- Phase 2 = SRAT (Stream Reach Assessment Tool)



In Summary...



Willow Run Farm









10/30/18























Follow Our Story

Like us on Facebook!

Website:

willowrunfarm.wordpress.com

Contact:

Deanne Boyer

willowrunfarm@gmail.com

Schuylkill Action Network 15th Anniversary

Stewardship, Conservation and Education
Upper Perkiomen High School

Thank You!



Seeds of Hope

Love of the Outdoors



Pride & Hard Work



Being part of something bigger than just yourself



Environmental Science

Stewardship
Sound Science
Sustainability



In the Beginning

- Green Lane Park & Chris Weikel
1991 Re-establish Tree Line Kutztown Road
1992 Riparian Restoration Walt Road Boat Launch



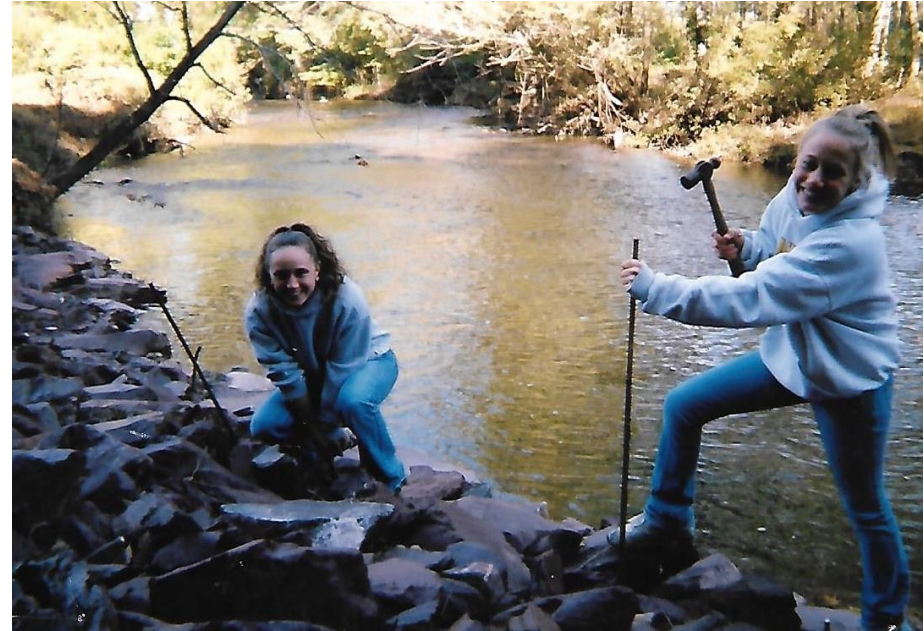
And Along Comes Bob!

- 1993- 2018 The Fun Begins



Partners at Planting Seeds of Hope

- SAN/Partners DE
- Aqua PA
- Green Lane Park
- Perkiomen Watershed Conservancy
- Delaware Riverkeeper
- Pennsburg Borough
- East Greenville Borough
- Montgomery County Conservation District
- Perkiomen Creek Watershed Improvement Corp
- Tree Vitalize
- Perkiomen Chapter Trout Unlimited



UPHS Conservation Work

- Where?
- Main Branch Perkiomen
- West Branch Perkiomen
- Pennsburg Nature Center Macoby Creek
- Deep Creek
- Green Lane Park
- Hereford Elementary
- UPHS



Schuylkill Action Network

- Rain Garden Hereford Elementary



Rain Gardens Upper Perk HS



Seeds Lead To Hope/Change!



2012 Fall Environmental Science Photo Story - Shortcut.Ink

Perkiomen Creek Riparian Restoration

Fly Fishing Area
Green Lane Park



Another SAN Funded Project with Perkiomen TU & The Montgomery County Conservation District Perkiomen Creek 2017



<https://www.youtube.com/watch?v=yIELZIQGIqk&feature=youtu.be>

Brook Trout Spring 2018

Perkiomen Creek Fly Fishing Area



Schuylkill Action Network Planter of Seeds of Hope!



Wissahickon Valley Watershed Association and PennDot Projects

SAN Annual Meeting
November 9th , 2018

John Ferro
Director of Conservation
215-646-8866 / john@wwwa.org



We Believe People Benefit when Nature Thrives

Overview

- Background on WVWA
- 202 Widening Project
- PA Ave Bridge Replacement
- Lessons Learned

WVWA

- **We believe that people benefit when nature thrives**
- Protecting land, water, and environment for over 60 years
- Preserved over 1,300 acres of land in the watershed
- Protect and monitor water quality of the Wissahickon
- Serve and educate our community



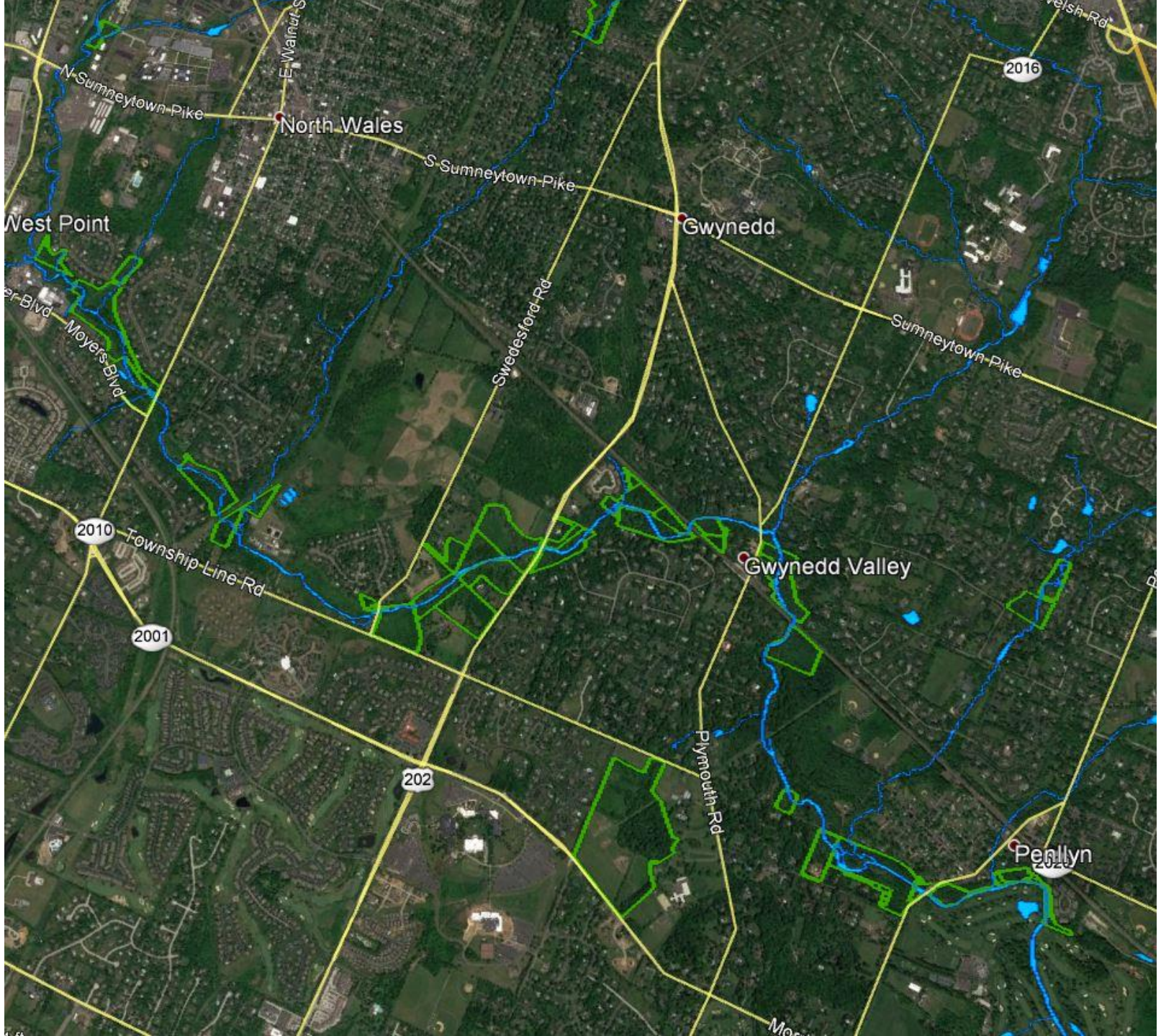
PENNDOT PROJECTS

- WVWA Owned Land
- Acquisition
- Public Safety
- Environmental Impacts
- Temporary Construction Easements

GREEN RIBBON TRAIL

- Upper Gwynedd to Fort Washington State Park
- Comprised of 45 different properties
- Preserves stream corridor & riparian buffer
- Managed by WVWA staff & volunteers

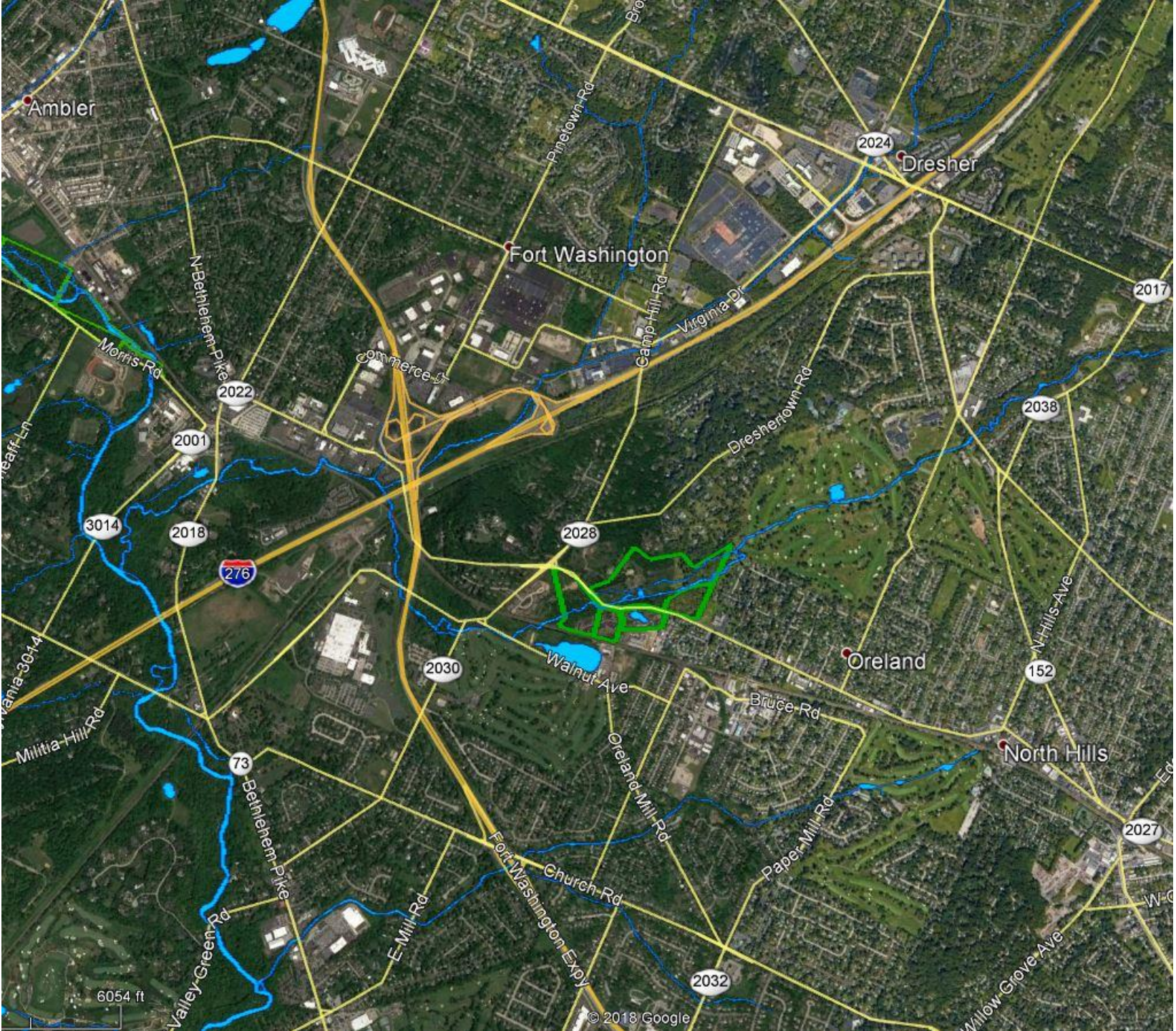




PISZEK PRESERVE

- 36-acres of woodlands and meadows along the Sandy Run
- Piszek family, Copernicus Society, Montgomery Lands Trust (MCLT) , Montgomery County, Upper Dublin, Springfield Townships , PA Department of Conservation and Natural Resources





Ambler

Fort Washington

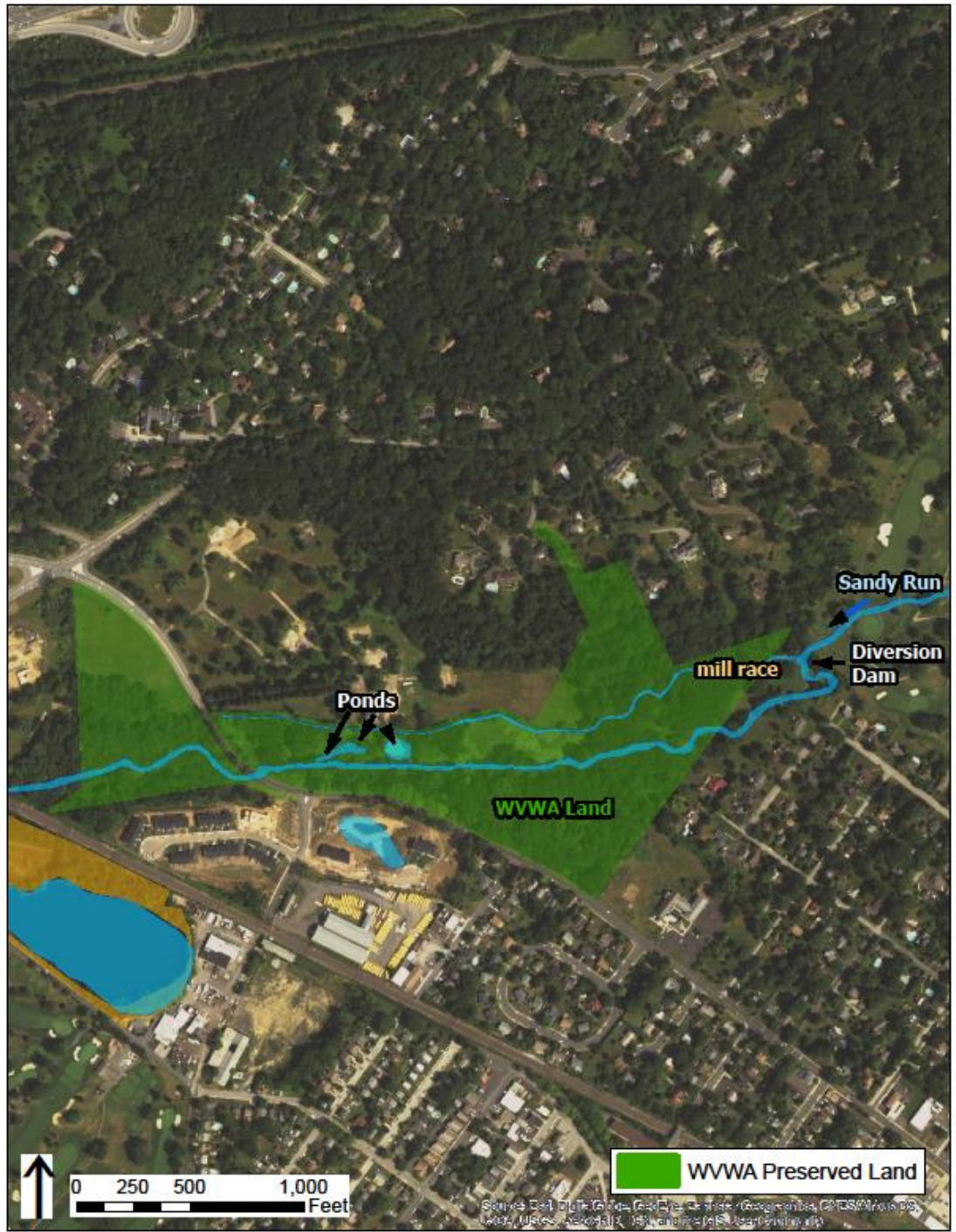
Dresher

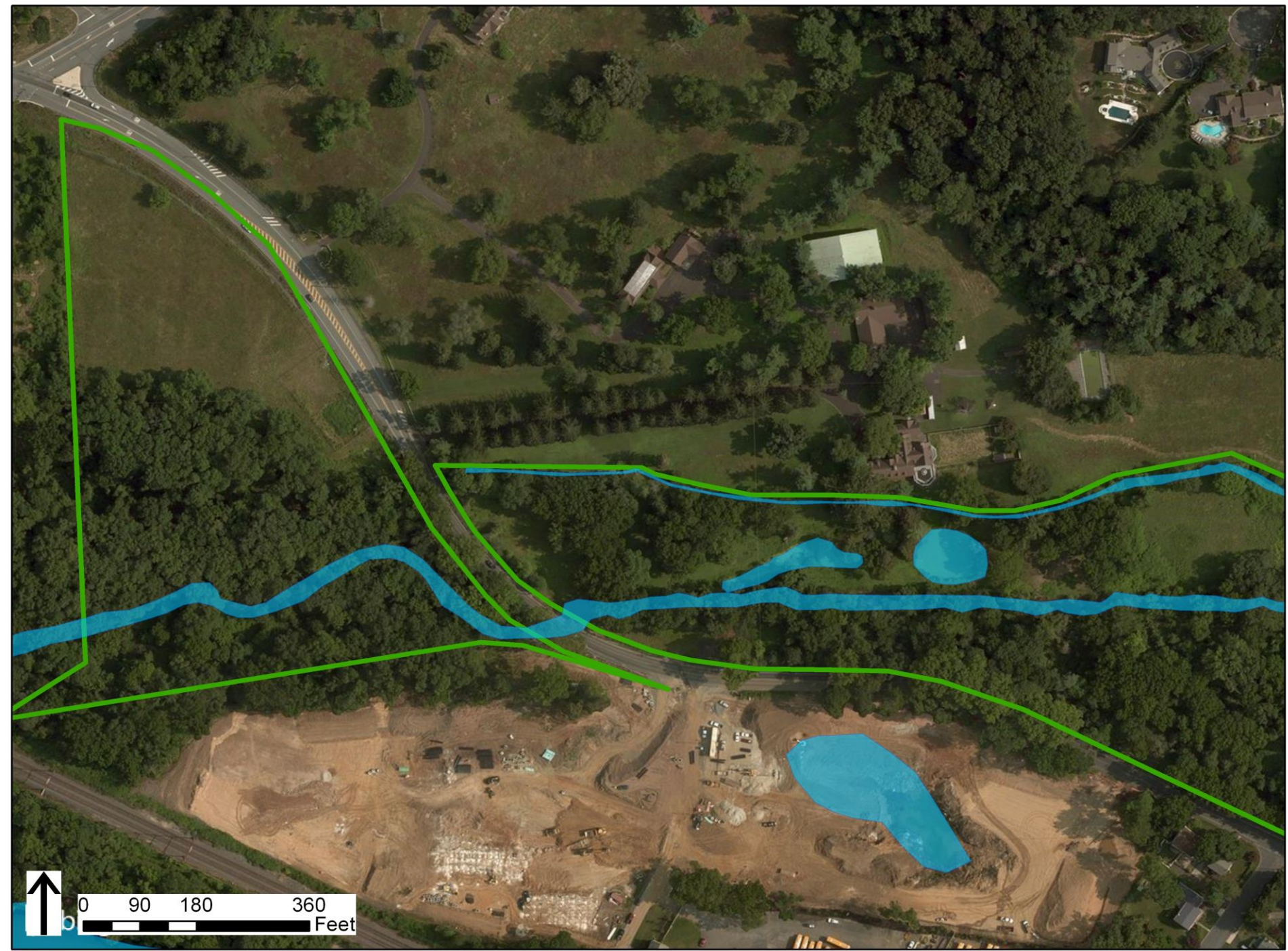
Oreland

North Hills

6054 ft

© 2018 Google





0 90 180 360 Feet

WHAT IS A “RAPID BRIDGE”?

- Public-private partnership between PennDOT/Plenary Walsh Keystone Partners (PWKP) to replace 558 structurally deficient bridges
- In 2017, 218 bridges were replaced in 220 construction days



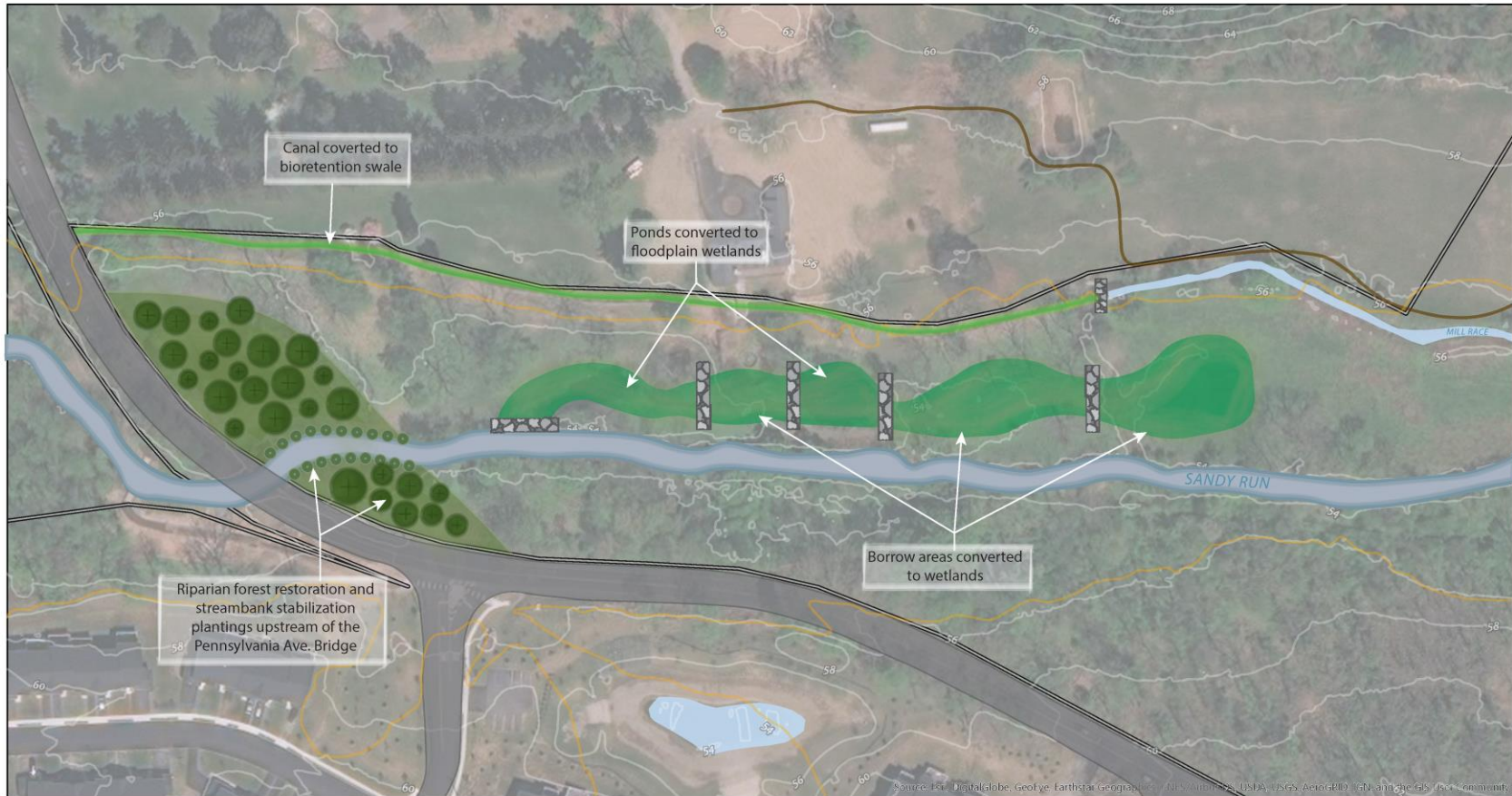
ENVIRONMENTAL IMPACT

- Temporary Construction Easement
- Performed landscaping survey with PWKP inside the Limits of Disturbance
- WVWA to perform own restoration project once bridge work is completed

RESTORATION- SCOPE OF WORK-PHASE I

1. Bridge Construction Area Riparian Restoration Plantings
2. Field/Environmental Assessment - environmental information for the site including, topographic survey wetland delineation, T&E species coordination, and PHMC coordination.
3. Concept Development
4. Permit Ready Plan

RESTORATION



Pizsek Preserve Restoration
 Wissahickon Valley Watershed Association
 Springfield Township
 Montgomery County, PA

-  WWVA Property
-  100 YR Floodplain
-  Streams and Ponds
-  Streambank Stabilization Plantings
-  Rock Stabilization
-  Bioretention Swale
-  Riparian Forest Restoration Area
-  Converted Wetlands

 Footpath



Any thoughts?

LESSONS LEARNED

LESSONS LEARNED

- 1) Having a Story
- 2) Open Communication- early and often, clearly express goals, understand limitations
- 3) Productive Meetings- issues ID, alternative solutions
- 4) Working Together- review/evaluate alternatives, best for both sides

QUESTIONS?

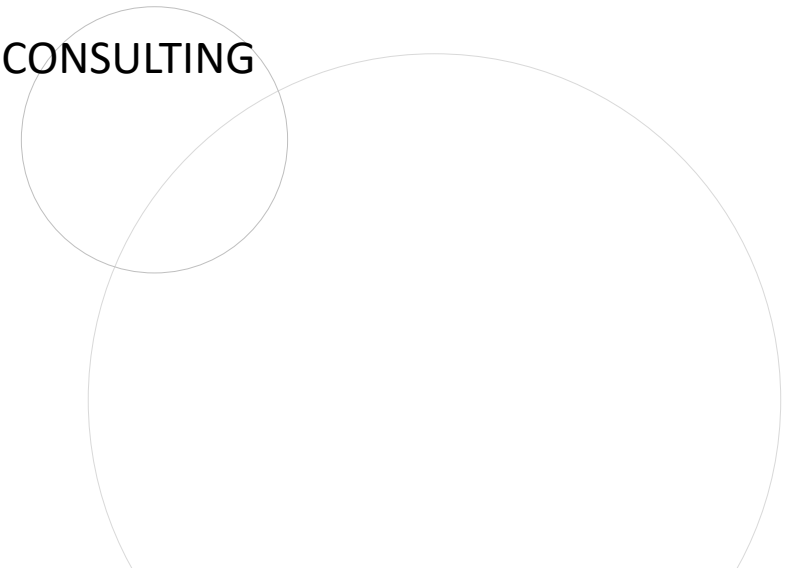


John Ferro
Director of Conservation
215-646-8866 / john@wvwa.org



INNOVATIVE SOLUTIONS USING D&G FUNDING

BRYAN D. KULAKOWSKY, P.E. – ARRO CONSULTING





BRYAN D. KULAKOWSKY, P.E.



Over twenty years of experience in civil engineering.

Municipal Engineer in Chester County, PA for Caln Township, Easttown Township, and West Vincent Township.

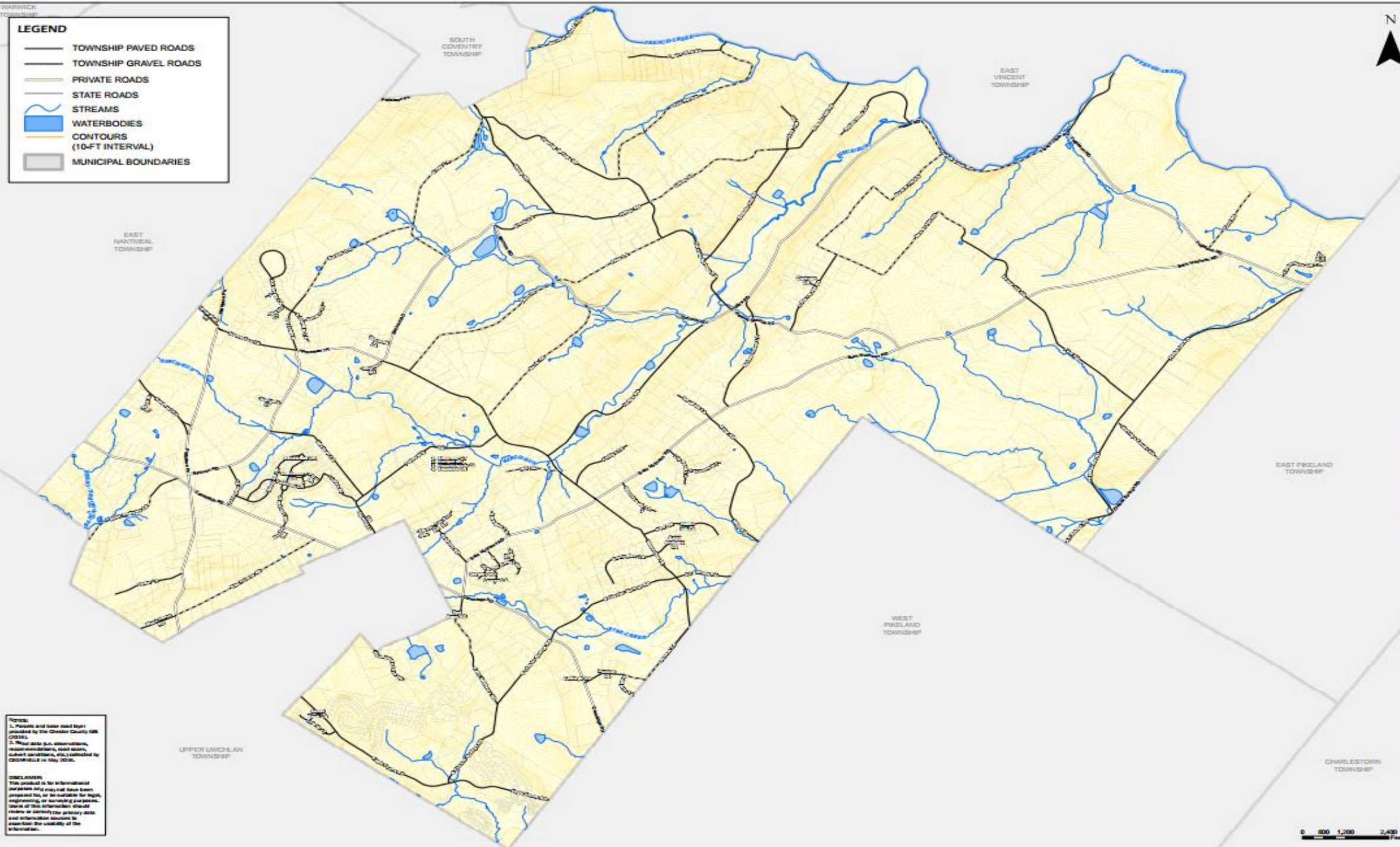
WEST VINCENT TOWNSHIP

- Established: 1832
- Total Area: 17.9 sq. miles
- Total Acres: 11,456
- Year 2010 Population: 4,567
- State Roads: 18.37 miles
- Township Roads:
 - Miles Paved: 31.76
 - Miles Gravel: 17.29



LEGEND

- TOWNSHIP PAVED ROADS
- TOWNSHIP GRAVEL ROADS
- PRIVATE ROADS
- STATE ROADS
- STREAMS
- WATERBODIES
- CONTOURS (10-FT INTERVAL)
- MUNICIPAL BOUNDARIES



NOTES:

1. Parcels and base road layer provided by the Chester County GIS (GIS).
2. Road data (i.e. administration, easement/encroachments, road signs, current conditions, etc.) published by CEDARVILLE in May 2024.

DISCLAIMER:
 This product is for informational purposes only and may not have been prepared for, or be suitable for legal, engineering, or planning purposes. Users of this information should review or verify the primary data and information sources to ascertain the reliability of the information.



DATE	BY
05/20/2024	MM
05/20/2024	MM

CEDARVILLE Engineering Group, LLC
 1033 S Hanover Street, 300
 North Coventry, PA 19365
 610-705-8500 (office) 610-705-8900 (fax)
www.cedarvillellc.com

WEST VINCENT TOWNSHIP
ROAD PROGRAM
 CHESTER COUNTY, PA

West Vincent Township
 CHESTER COUNTY, PA
 729 N. Matthews Road
 Chester Springs, PA 19325
 610-656-1101

DESIGNED BY
 CHECKED BY
 SCALE: 1" = 1,000'

1 OF 1



BARTLETT LANE – 15 INCH PIPE

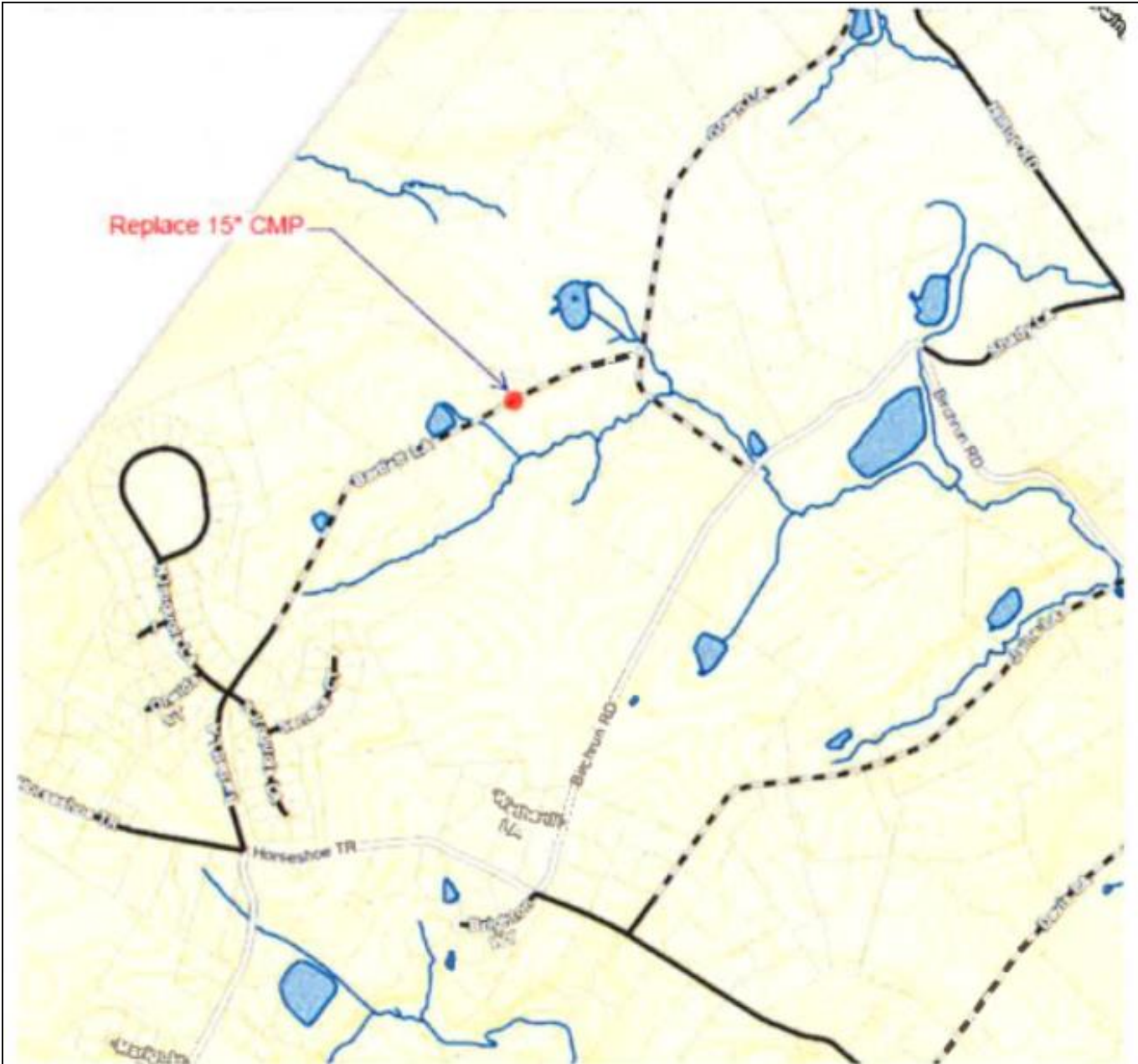
REPLACE EXISTING CMP WITH RCP, INSTALL INLET AND ENDWALL





BARTLETT LANE – 15 INCH PIPE

SITE LOCATION MAP





Attachment B
To Contract

SECTION 9106 OF THE PENNSYLVANIA VEHICLE CODE

DIRT, GRAVEL AND LOW VOLUME ROAD MAINTENANCE PROJECT WORK PLAN

West Vincent Township
Applicant

Bartlett Lane / T425
Road Name / ID Number

10/18/16
Date

Schematic Drawing
Not to Scale



Replace 15-inch CMP with
15" HDPE or RCP, install
inlet and endwall.

Instructions:

- Draw a sketch of the proposed project that includes:
 - All Proposed Work (i.e., Cross Pipes, Stream Crossings, Other ISM Practices)
 - Project Road Length in Feet or Miles
 - Nearest Intersection and/or Reference Landmarks
 - Known Utilities
 - North Arrow
- Attach a copy of a locational map with the project highlighted
- Attach additional project details as necessary



Call 8-1-1 or 1-800-645-6779 not less than 3 business days nor more than 19 business days prior to the start of excavation.

Project Length = _____ feet / miles (circle one)

North Arrow



BARTLETT LANE – 15 INCH PIPE

PROJECT SKETCH





BARTLETT LANE – 15 INCH PIPE

REPLACE EXISTING CMP WITH RCP, INSTALL INLET AND ENDWALL



- Total Project Value \$4,068.60
- In-Kind Contribution \$2,085.60
- Project Reimbursement \$1,983.00



JAINE LANE - PIPE LINING

LINE EXISTING 24" CMP





JAINE LANE - PIPE LINING

SITE MAP





JAINE LANE - PIPE LINING

PROJECT SKETCH

Attachment B
To Contract

SECTION 9106 OF THE PENNSYLVANIA VEHICLE CODE
DIRT, GRAVEL AND LOW VOLUME ROAD MAINTENANCE
PROJECT WORK PLAN

West Vincent Township Jaine Lane / T434 _____
Applicant Road Name / ID Num Date

Schematic Drawing:
Not to Scale

±18 ft
Gravel
Road

Line existing 24" CMP

Instructions:

- Draw a sketch of the proposed project that includes:
 - All Proposed Work (i.e., Cross Pipes, Stream Crossings, Other ESM Practices)
 - Project Road Length in Feet or Miles
 - Nearest Intersection and/or Reference Landmarks
 - Known Utilities
 - North Arrow
- Attach a copy of a locational map with the project highlighted
- Attach additional project details as necessary

811 Dial 8-1-1 or 1-800-242-1778 not less than 3 business days nor more than 10 business days prior to the start of excavation.

Project Length = _____ feet / miles (circle one)

North Arrow
←



JAINE LANE - PIPE LINING

LINE EXISTING 24" CMP



• Total Project Value	\$13,880.00
• In-Kind Contribution	\$ 0
• Project Reimbursement	\$13,880.00



BARTLETT LANE

STORM SEWER, EXTENSION, & GABIONS

INSTALL APPROX 350 LF 15 INCH PIPE WITH INLETS ALONG WEST SIDE OF BARLETT LANE TO CONTROL DRAINAGE & EROSION ALONG EDGE OF GRAVEL LANE.

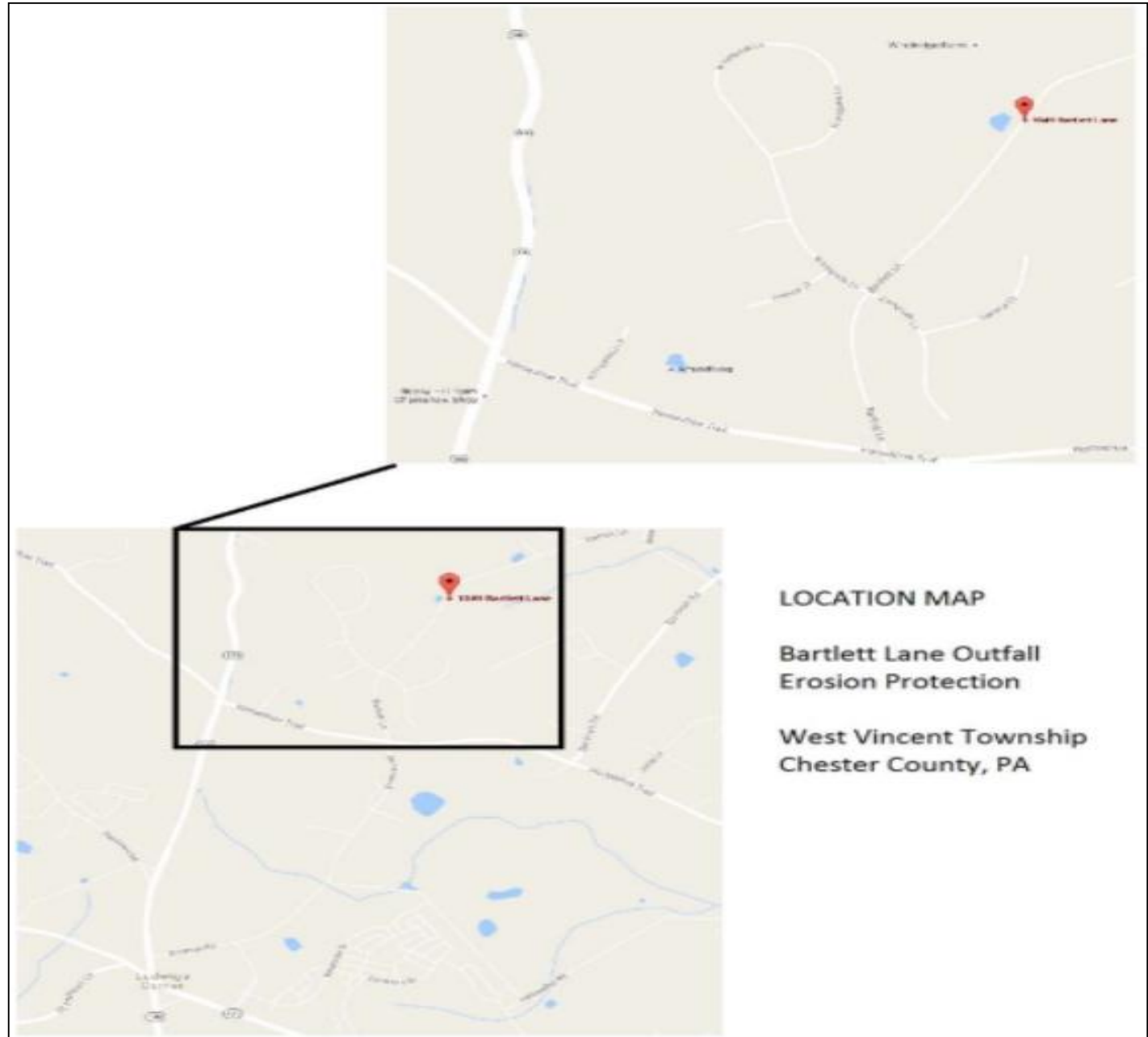




BARTLETT LANE

STORM SEWER, EXTENSION, & GABIONS

SITE MAP





BARTLETT LANE STORM SEWER, EXTENSION, & GABIONS

PROJECT SKETCH

Attachment B SECTION 9106 OF THE PENNSYLVANIA VEHICLE CODE
To Contract DIRT, GRAVEL AND LOW VOLUME ROAD MAINTENANCE
PROJECT WORK PLAN

WEST VINCENT TOWNSHIP Applicant BARTLETT LANE / T425 Road Name / ID Numbr 10/17/2016 Date

INSTALL GABION EROSION PROTECTION AT PIPE OUTFALL

DRIVEWAY

INSTALL APPROXIMATELY 350 LF 15-INCH PIPE WITH INLETS ALONG THE WEST SIDE OF BARTLETT LANE TO CONTROL DRAINAGE AND EROSION ALONG EDGE OF GRAVEL LANE.

GRAVEL

PAVED

Instructions:

- Draw a sketch of the proposed project that includes:
 - All Proposed Work (i.e., Cross Pipes, Stream Crossings, Other ESM Practices)
 - Project Road Length in Feet or Miles
 - Nearest Intersection and/or Reference Landmarks
 - Known Utilities
 - North Arrow
- Attach a copy of a locational map with the project highlighted
- Attach additional project details as necessary

811 Call 8-8-1 or 1-800-243-1178 not less than 3 business days nor more than 15 business days prior to the start of excavation.

Project Length = 350 feet / miles (circle one)

North Arrow



BARTLETT LANE

STORM SEWER, EXTENSION, & GABIONS





BARTLETT LANE

STORM SEWER, EXTENSION, & GABIONS





BARTLETT LANE

STORM SEWER, EXTENSION, & GABIONS





BARTLETT LANE

STORM SEWER, EXTENSION, & GABIONS





BARTLETT LANE

STORM SEWER, EXTENSION, & GABIONS

- Grant Requested \$5,830.00
- In-Kind Contribution \$9,916.00
- Total Project Value \$15,746.00





BARTLETT LANE

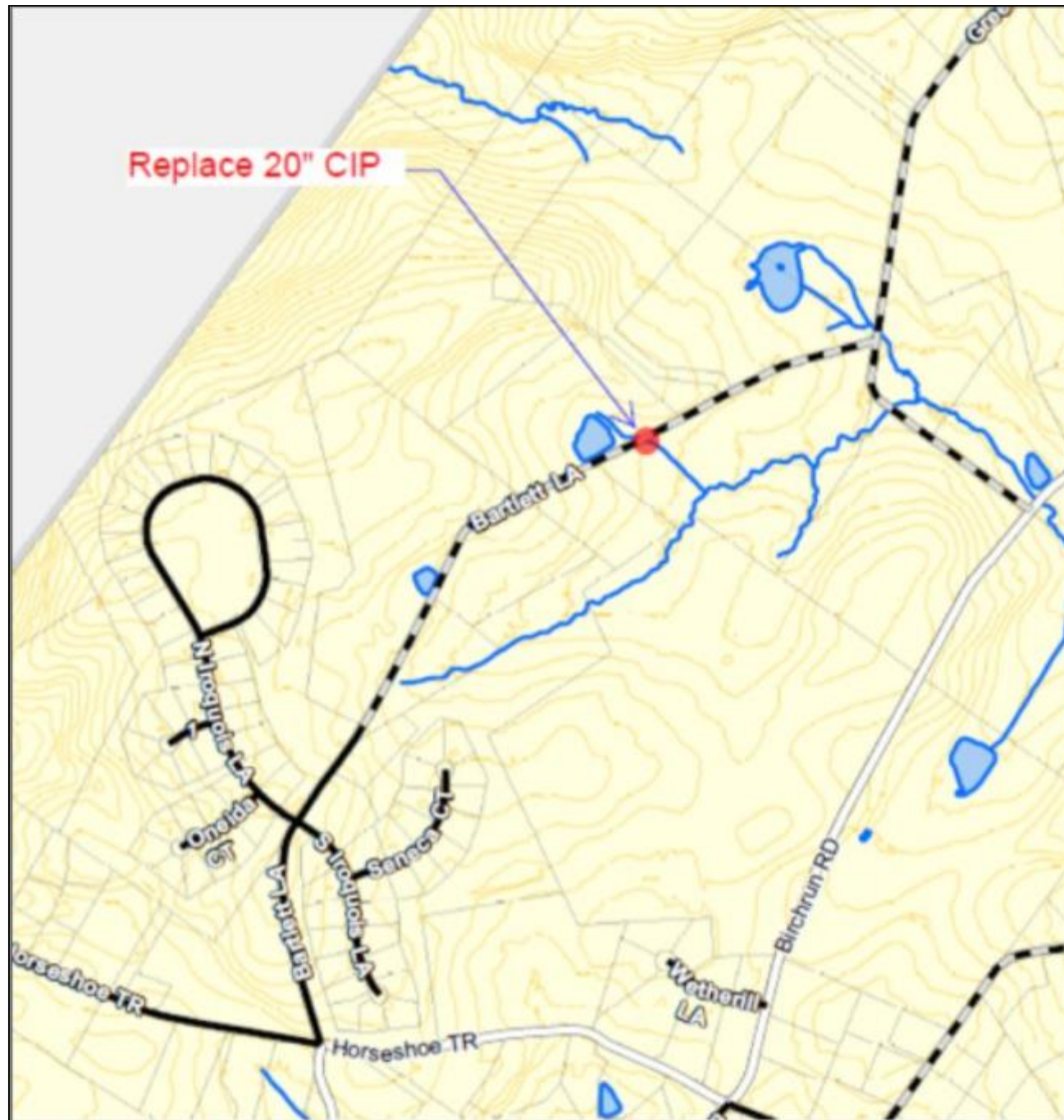
REPLACE 20" CLIP





BARTLETT LANE REPLACE 20" CLIP

SITE MAP





BARTLETT LANE REPLACE 20" CLIP

PROJECT SKETCH

Attachment B SECTION 9106 OF THE PENNSYLVANIA VEHICLE CODE
To Contract DIRT, GRAVEL AND LOW VOLUME ROAD MAINTENANCE
PROJECT WORK PLAN

West Vincent Township Applicant Bartlett Lane / T425 Road Name / ID Number 10/18/2016 Date

Schematic Drawing:
Not to Scale

16 ft Gravel Road

Replace 20-inch CIP with 24x38 RCP, install endwalls

Instructions:

- Draw a sketch of the proposed project that includes:
 - All Proposed Work (i.e., Cross Pipes, Stream Crossings, Other ESM Practices)
 - Project Road Length in Foot or Miles
 - Nearest Intersection and/or Reference Landmarks
 - Known Utilities
 - North Arrow
- Attach a copy of a locational map with the project highlighted
- Attach additional project details as necessary

811 Call 8-1-1 or 1-800-240-1778 not less than 5 business days nor more than 10 business days prior to the start of excavation.

Project Length = _____ feet / miles (circle one)

North Arrow



BARTLETT LANE

REPLACE 20" CLIP

- Grant Requested \$5,303.92
- In-Kind Contribution \$2,476.00
- Total Project Value \$7,779.92





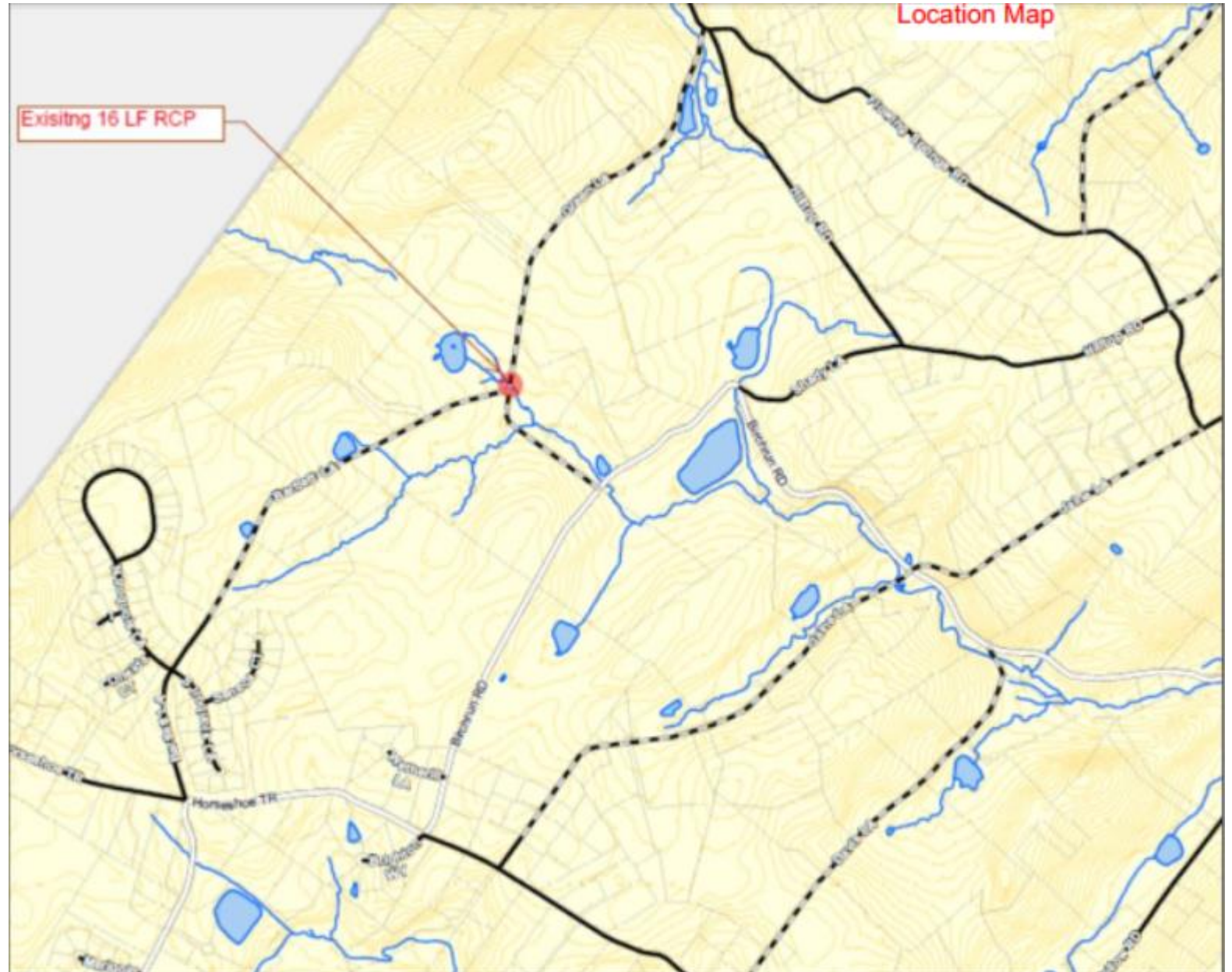
GREEN LANE EXTEND 36" RCP





GREEN LANE EXTEND 36" RCP

SITE MAP





GREEN LANE EXTEND 36" RCP

PROJECT SKETCH

Attachment B
To Contract

SECTION 9106 OF THE PENNSYLVANIA VEHICLE CODE
**DIRT, GRAVEL AND LOW VOLUME ROAD MAINTENANCE
PROJECT WORK PLAN**

West Vincent Township Green Lane / T426 10/17/2016
Applicant Road Name / ID Num Date

**TOTAL PERMANENT
STREAM IMPACT:
16 LF / 48 SQ FT**

THERE ARE NO FEMA
MAPPED FLOODPLAINS
WITHIN THE PROJECT AREA.

**SCHEMATIC
DRAWING:
NOT TO SCALE**

14-FT WIDE
GRAVEL ROAD

16 LINEAR FEET

PLAN VIEW

32 LINEAR FEET

24 LF TOTAL PROPOSED
CULVERT LENGTH

TYPICAL CROSS SECTION

A QUALIFIED WETLAND
SCIENTIST FROM
CEDARVILLE ENGINEERING
GROUP, LLC INVESTIGATED
THE SITE ON 10/11/16 AND
DETERMINED THERE ARE NO
WETLANDS WITHIN THE
PROJECT AREA.

Instructions:

- Draw a sketch of the proposed project that includes:
 - All Proposed Work (i.e., Cross Pipes, Stream Crossings, Other ESM Practices)
 - Project Road Length in Feet or Miles
 - Nearest Intersection and/or Reference Landmarks
 - Known Utilities
 - North Arrow
- Attach a copy of a locational map with the project highlighted
- Attach additional project details as necessary

811 Dial 8-6-1 or 1-800-243-1778 not less than 3 business days nor more than 10 business days prior to the start of excavation.

Project Length = _____ feet / miles (circle one)

North Arrow



GREEN LANE EXTEND 36" RCP



• Grant Requested	\$4,742.00
• In-Kind Contribution	\$3,048.00
• Total Project Value	\$7,790.00



ARRC

Where Sound Thinking Meets Innovation

Using Story Maps for Innovative Outreach

Schuylkill Action Network Conference **November 2018**



PHILADELPHIA
WATER
— DEPARTMENT —



PWD Background & Outreach Overview

Part 1: PWD Background

- PWD Vision
- PWD Core Services
- Philly's Water Legacy

Part 2: Wet Weather Problem

- Combined Sewer Overflows (CSOs)
- How Green Tools Help
- *Green City, Clean Waters*

Part 3: Green Stormwater Infrastructure (GSI) Outreach

- Outreach Districts
- Outreach Phases
- Cobbs Creek Outreach Strategies

Part 4: GSI Tools

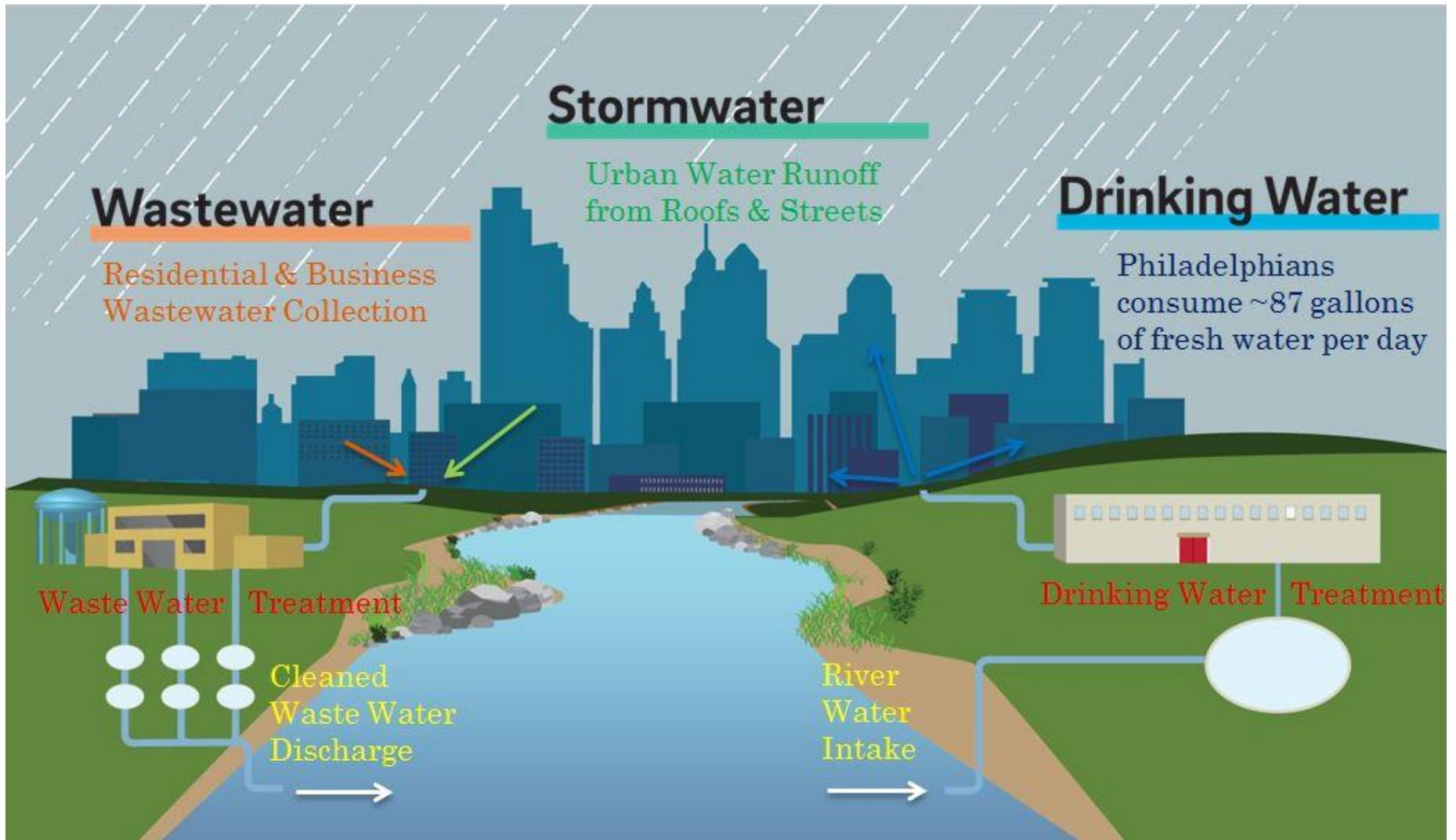
We are a sustainable utility in support of a sustainable city.

Vision: To become America's model 21st century urban water utility



- ▶ We are one of the City's ten operating departments
- ▶ We serve under a dedicated Water Fund established pursuant to City Charter
- ▶ We operate, maintain, repair and improve the Water and Wastewater Systems
- ▶ We are fully funded by our customers; not taxes

What does the Philadelphia Water Department do?



What is Philadelphia's water legacy?

Philly's Watershed Beginnings:

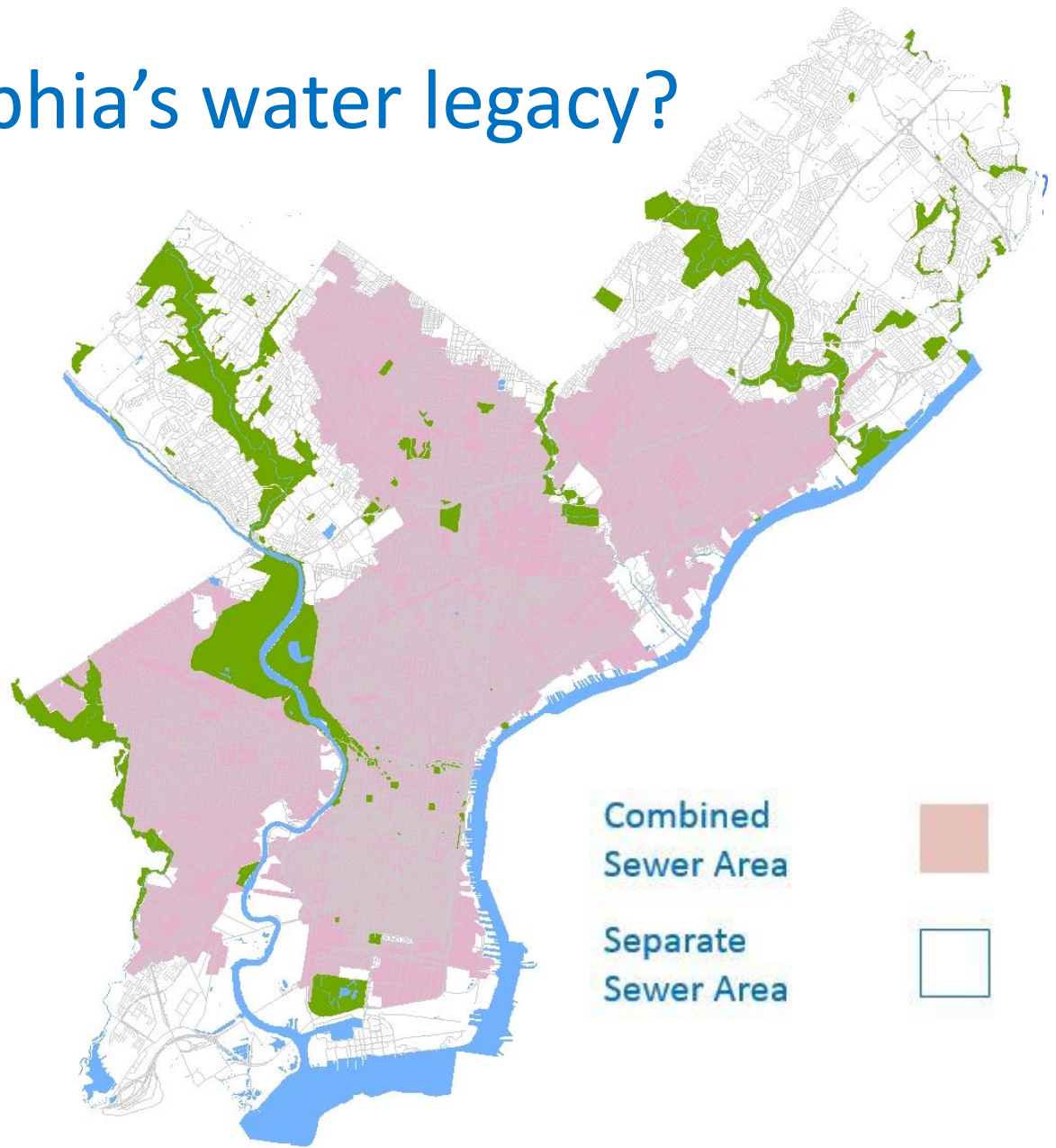
Philadelphia was historically a region filled with streams and creeks.

A Growing Philly:

To protect public health and promote growth, the streams were buried and turned into sewers.

Present Day Philly:

Buried streams serve as sewers, but still act like watersheds for the urban water cycle.



Combined Sewer Overflows (CSOs) - Philly's wet weather challenge



Green Stormwater Infrastructure (GSI): Philly's wet weather solution



Green City, Clean Waters: 25-year plan for success



1.5 BILLION GALLONS

in Combined Sewer Overflow reduction volume



6,000 TONS TRASH & DEBRIS

removed from Philadelphia's waterways through our skimming vessel and on land



1,600+ STORMWATER TOOLS

constructed and in progress



\$51 MILLION

Grant funds from public and private sources invested in Philadelphia parks, streets, schools and public housing as a result of leveraged GSI investments



Approximately

308,759 CITIZENS ENGAGED



2985 RAIN CHECK PROJECTS

installed at homes across Philadelphia



8 AWARDS

won in the fields of Government Systems, Water Quality, Planning, Green Building, and Communications



10.3%

Estimated Property Value Gain from Proximity to GSI Investment †



430 NEW JOBS & 14% GROWTH

In Greater Philadelphia Green Stormwater Infrastructure Industry †

† Source: *The Economic Impact of Green City, Clean Waters: The First Five Years*



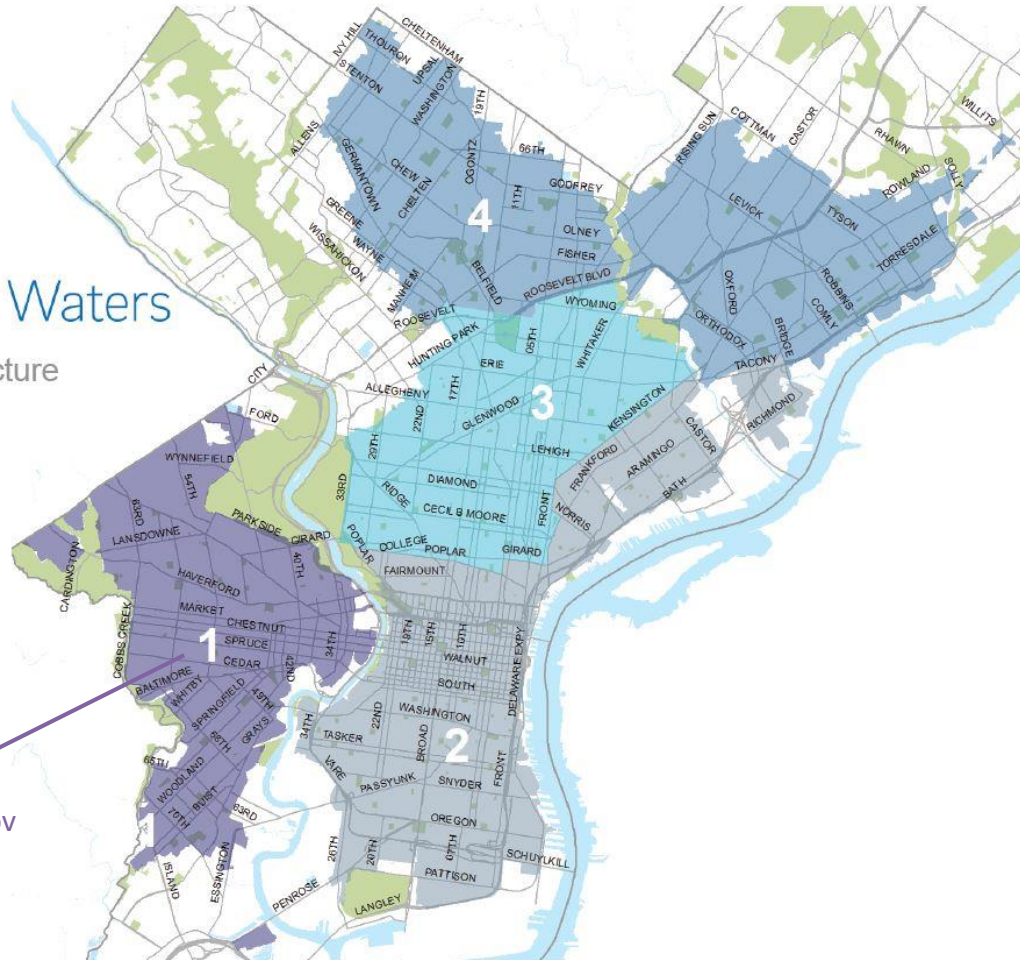
The public engagement team's GSI districts



Public Affairs

Green City, Clean Waters

Green Stormwater Infrastructure
Program Contacts



Dan Schupsky
Daniel.Schupsky@phila.gov

Green Stormwater Infrastructure Public Engagement Team
The following staff work on public outreach for GSI projects in each of the four designated districts.

Public Engagement's GSI project notification process

Planning

Packaging

Design

(Pre) Construction

(Post) Construction

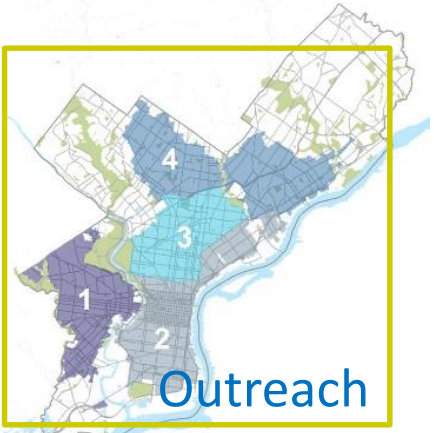
Water Department meets with residents to discuss Wissinoming Park project

Some neighbors worried Wissinoming Park rain garden project will take away open space.



Tiffany Ledesma, of the Philadelphia Water Department, speaks to residents Oct. 25 about a project to install rain gardens at Wissinoming Park.





Outreach

Virtual Walking Tour: Cobbs Creek Green Improvements

This website is a tool to inform the public about the major details of this project – why it is being constructed, where the systems will be installed, and what the sites could potentially look like. We hope this virtual walking tour will give you the idea that green tools can help reduce stormwater runoff, protect the local environment, and beautify neighborhoods.

Instructions
Click the down arrow or use your mouse wheel to scroll down. On a mobile phone, tap and swipe to navigate.

Background
The Philadelphia Water Department (PWD)'s Green City Waters program is protecting local waterways and reducing stormwater pollution by building green tools that soak up water wherever it rains all over the city.

These green tools will be installed on the west side of Cobbs Creek Parkway beginning in early 2018.



Cobbs Creek GSI Virtual Tour

COMMUNITY MEETING
Join the Philadelphia Water Department appearing at the Cobbs Creek Neighbors meeting.

Monday April 2, 2018	7:00pm (doors open 6:30pm)	Blanche A. Nixon - Cobbs Creek Library 5800 Cobbs Creek Parkway
--------------------------------	--------------------------------------	---

Learn about significant green stormwater improvements coming to the Cobbs Creek Neighborhood, and have the opportunity to provide input about these projects.

Flyers
The marker signifies an upcoming construction site.



Open House



Letters & Maps

SHARE THIS POST: [social media icons]

COBBS CREEK Open House
Monday, August 7

- Virtual Stormwater Tour Debut
- Oral History Exhibition Opening
- Refreshments

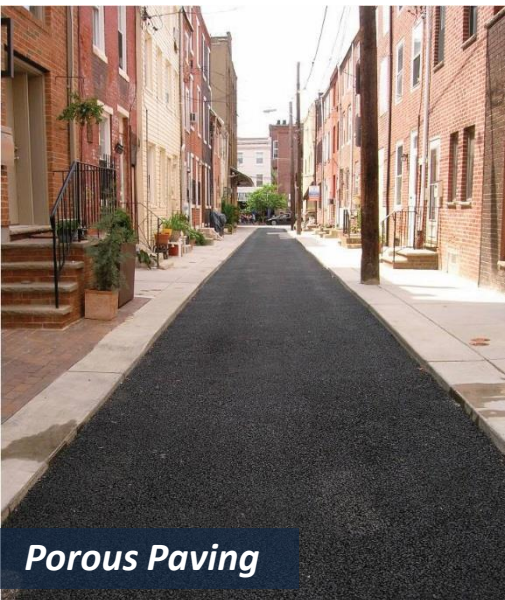
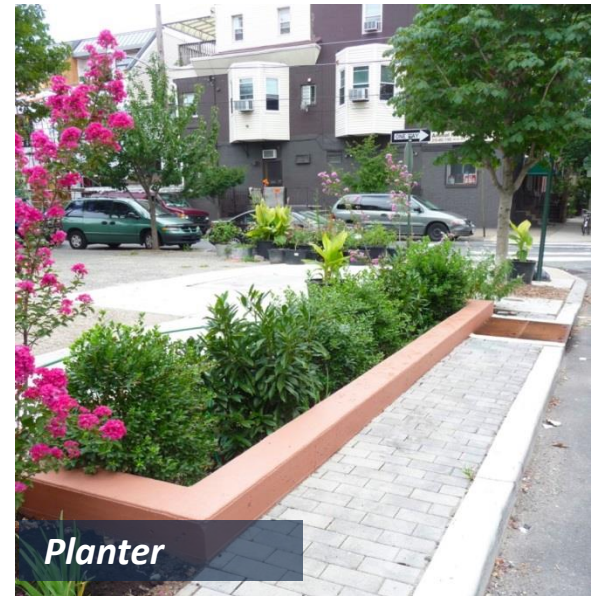
Hosted by **COBBS CREEK Neighbors** and **PHILADELPHIA WATER**

Starting in 2015, the Philadelphia Water Department's Public Engagement team began providing conversations with members of the Cobbs Creek community.

The goal?
To understand how people feel about Cobbs Creek, one of Philadelphia's seven major watersheds. We're looking for ways to improve the neighborhood and the water that flows through it. We're looking for ways to make the neighborhood a better place to live. We're looking for ways to make the neighborhood a better place to live. We're looking for ways to make the neighborhood a better place to live.

An open house event being held at the Cobbs Creek branch of the Free Library on **Monday, August 7 at 6:30 p.m.**

Social Media





Story Map Presentation Overview

Part 5: PWD's GIS Presence

- Office of Watersheds
- Big Green Map
- Open Data Philly
- Publishing Data

Part 6: Cobbs Creek GSI Virtual Tour

- Look & Feel
- Features
- Development & Tips
- Engagement Through Viewership

Part 7: PWD's GIS 'Wish List'

- Maps, Collaboration & Learning

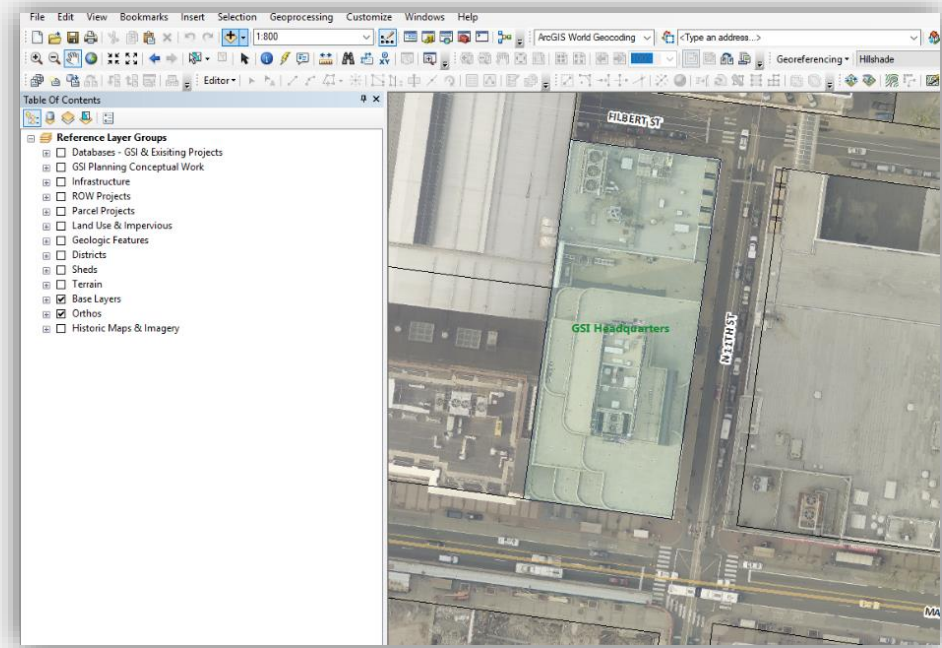
Part 8: Thank You & Questions

Part 9: Resource Slide

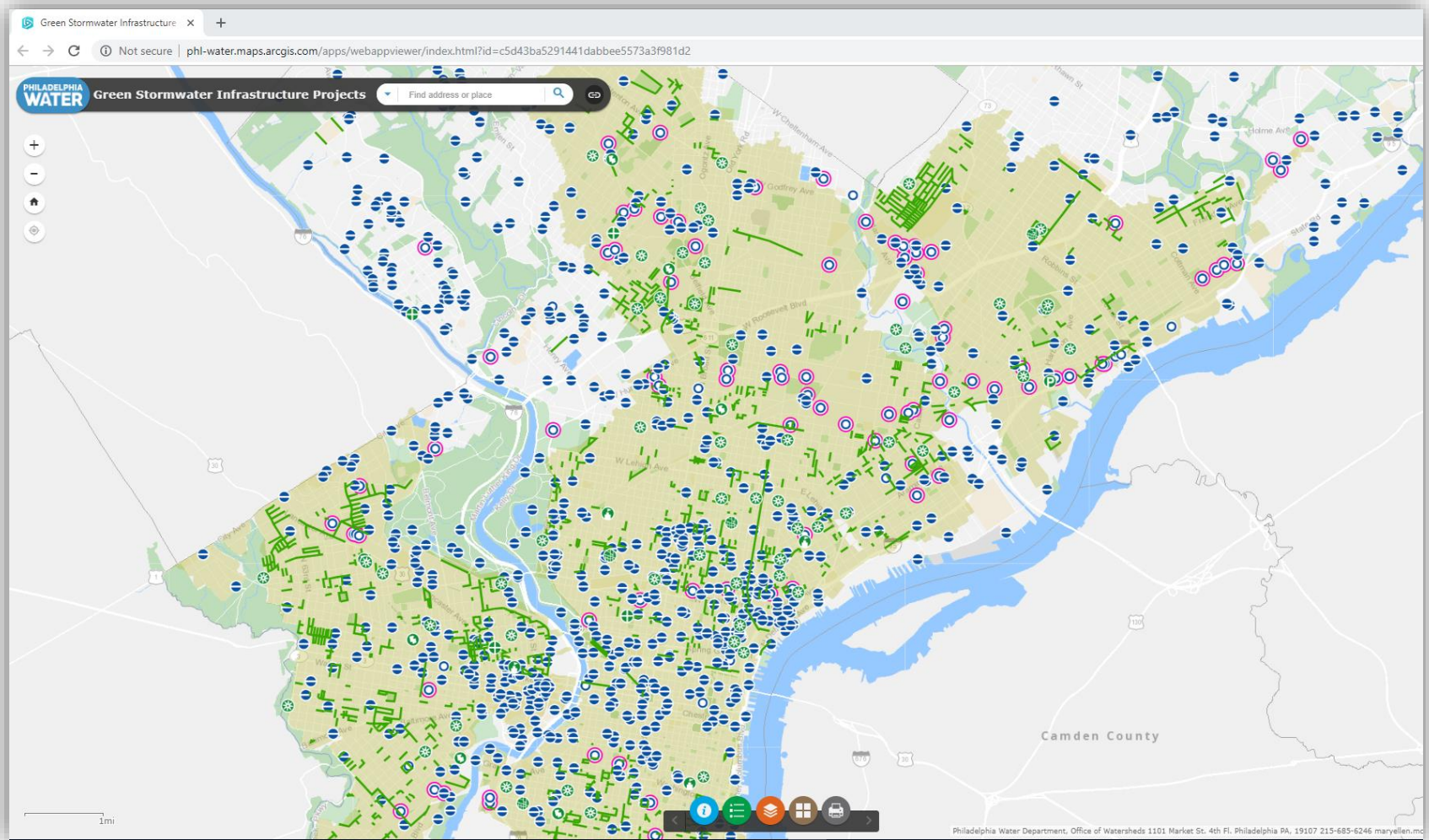
Part 10: Our Contact Info

Office of Watersheds: GIS Data

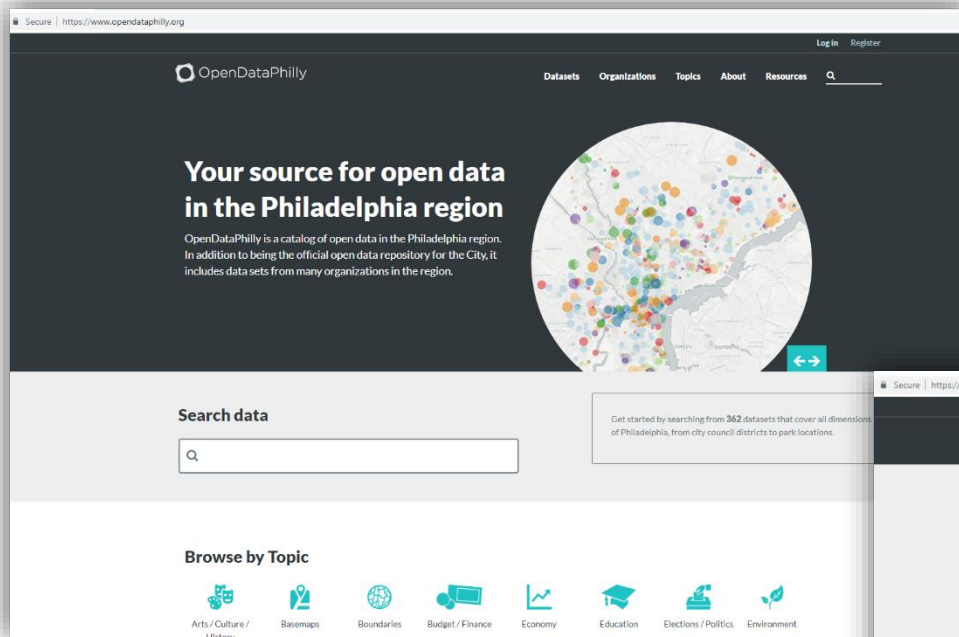
- **Two units**
- **Wet Weather Compliance**
 - Maintain data on stormwater management; private development; billing and credits
- **Green Stormwater Infrastructure planning**
 - Data on projects from planning, design, construction, completion
 - GSI Planners use ArcGIS basemaps for site selection; we maintain layers



PWD's GIS Presence: Big Green Map



PWD's GIS Presence: Open Data Philly



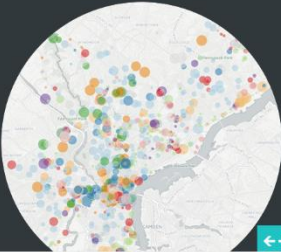
Secure | https://www.opendataphilly.org

OpenDataPhilly

Datasets Organizations Topics About Resources

Your source for open data in the Philadelphia region

OpenDataPhilly is a catalog of open data in the Philadelphia region. In addition to being the official open data repository for the City, it includes data sets from many organizations in the region.

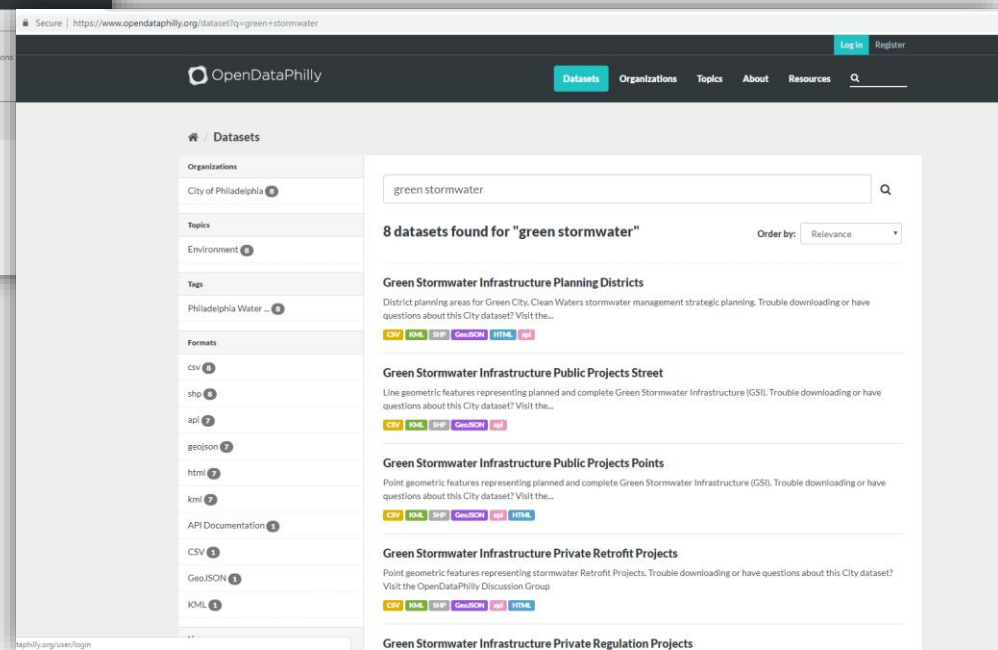


Search data

Get started by searching from 362 datasets that cover all dimensions of Philadelphia, from city council districts to park locations.

Browse by Topic

- Arts / Culture / Media
- Basemaps
- Boundaries
- Budget / Finance
- Economy
- Education
- Elections / Politics
- Environment



Secure | https://www.opendataphilly.org/dataset?q=green+stormwater

OpenDataPhilly

Datasets Organizations Topics About Resources

Datasets

City of Philadelphia

Environment

Philadelphia Water

Formats

- CSV
- SHP
- API
- geojson
- html
- kml
- API Documentation
- CSV
- GeoJSON
- KML

green stormwater

8 datasets found for "green stormwater" Order by: Relevance

Green Stormwater Infrastructure Planning Districts

District planning areas for Green City, Clean Waters stormwater management strategic planning. Trouble downloading or have questions about this City dataset? Visit the...

CSV HTML SHP GeoJSON HTML

Green Stormwater Infrastructure Public Projects Street

Line geometric features representing planned and complete Green Stormwater Infrastructure (GSI). Trouble downloading or have questions about this City dataset? Visit the...

CSV HTML SHP GeoJSON HTML

Green Stormwater Infrastructure Public Projects Points

Point geometric features representing planned and complete Green Stormwater Infrastructure (GSI). Trouble downloading or have questions about this City dataset? Visit the...

CSV HTML SHP GeoJSON HTML

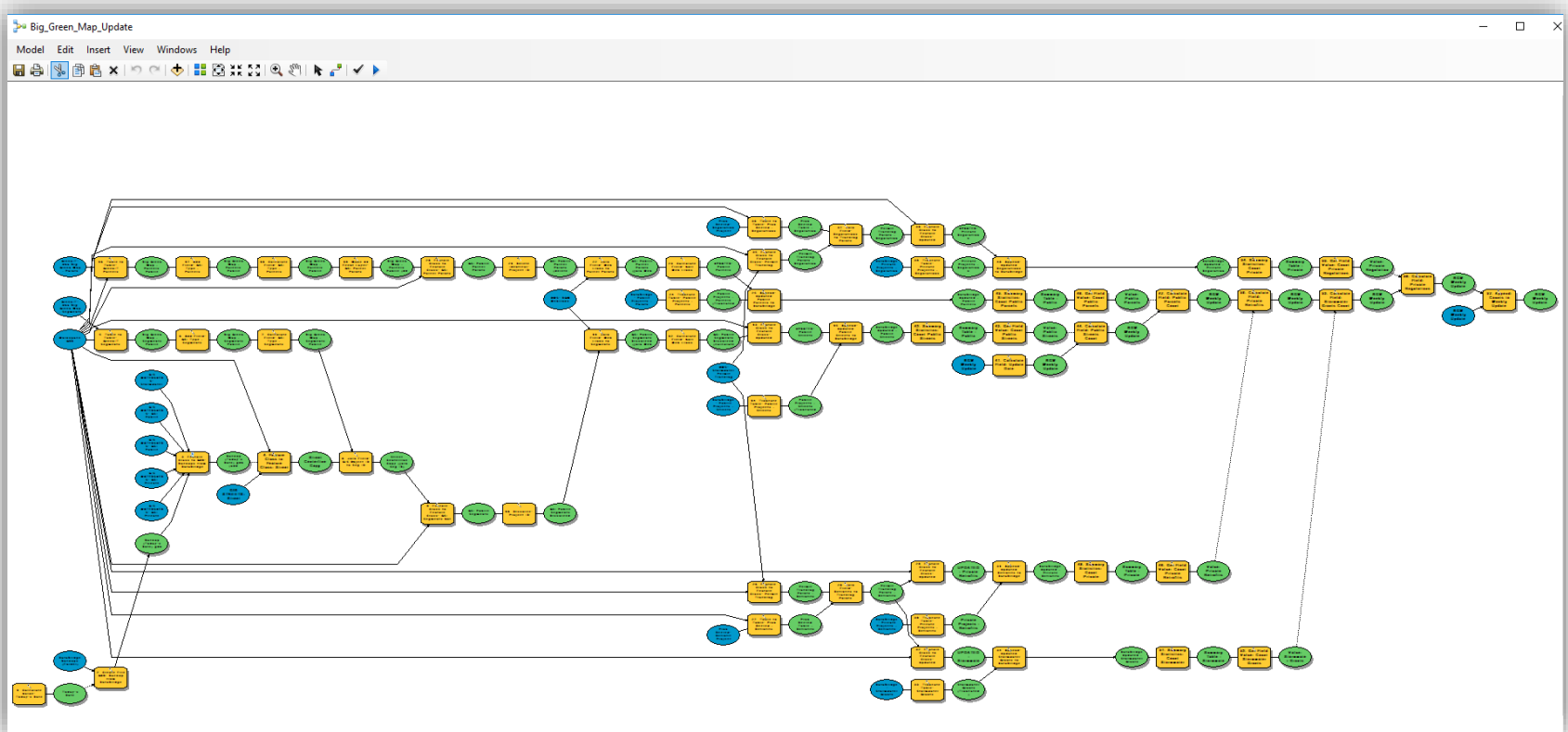
Green Stormwater Infrastructure Private Retrofit Projects

Point geometric features representing stormwater Retrofit Projects. Trouble downloading or have questions about this City dataset? Visit the OpenDataPhilly Discussion Group

CSV HTML SHP GeoJSON HTML

Green Stormwater Infrastructure Private Regulation Projects

PWD's GIS Presence: Publishing Data



- Model takes today's data from databases; truncates and appends City's enterprise geodatabase
- City shares data with Open Data Philly and ArcGIS Online
- Big Green Map pulls data from ArcGIS Online feature layers

Cobbs Creek Walking Tour

A story map



PHILADELPHIA WATER Green City. Clean Waters.

No issues detected x

A Virtual Walking Tour: Cobbs Creek Green Improvements

This website is a tool to inform the public about the major details of this project – why it is being constructed, where the systems will be built, and what the sites could potentially look like. We hope this virtual walking tour will reinforce the idea that green tools can help manage stormwater runoff, protect the local environment, and beautify neighborhoods.

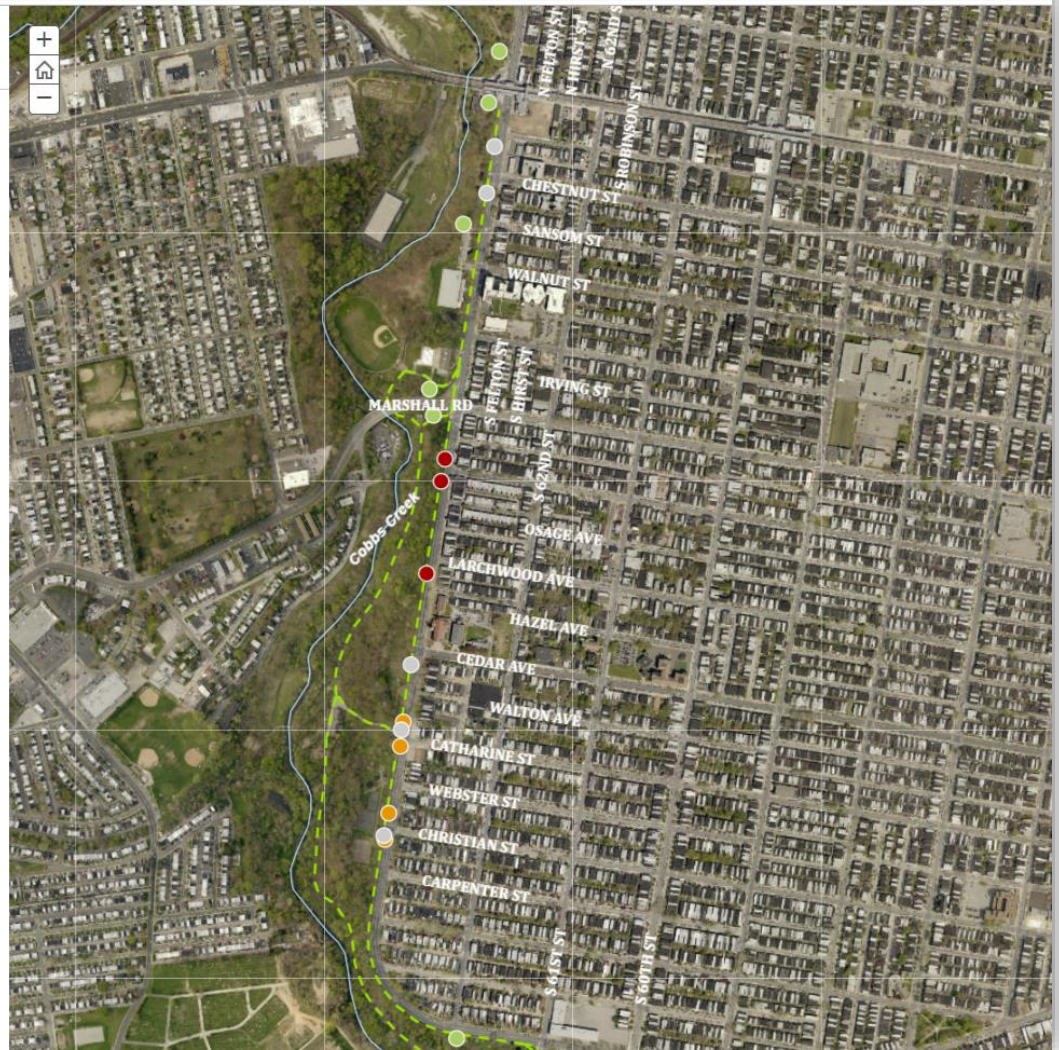
Instructions

Click the down arrow or use your mouse wheel to scroll down.
On a mobile phone, tap and swipe to navigate.

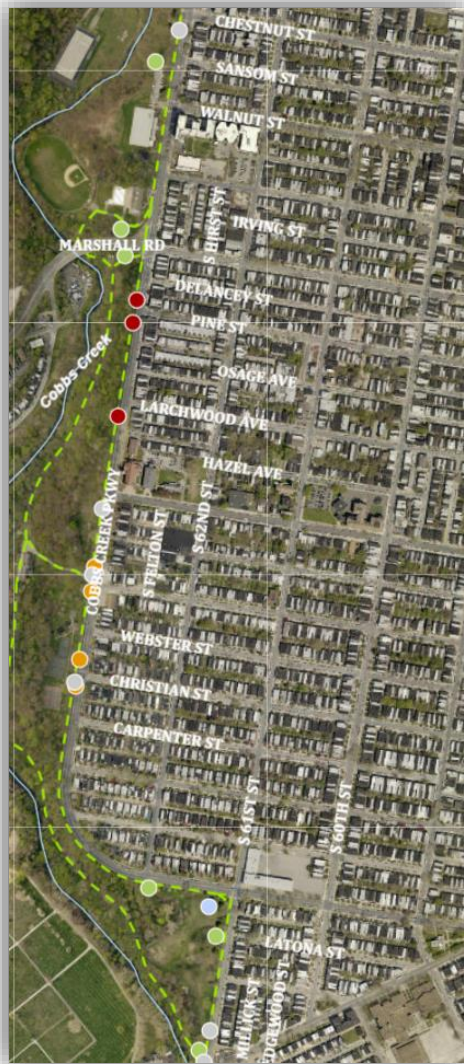
Background

The Philadelphia Water Department (PWD)'s Green City, Clean Waters program is protecting local waterways from pollution by building green tools that soak up water from storms all over the city.

A series of these green tools will be installed on the west side of the Cobbs Creek Parkway beginning in early 2018. The stormwater runoff captured by these systems, called green stormwater infrastructure, will be combined sewer overflow in Cobbs Creek and help protect the Delaware River.



Cobbs Creek Walking Tour: Features



Starts at Market St

Travels south along
Cobbs Creek Pkwy to
Baltimore Ave

Stops at each site along
the way

Provides a description,
schematic drawing,
statistics, links

Site 10
Tree Trench

Two new green stormwater trees will protect Cobbs Creek from stormwater runoff during rainstorms and add green to this section of the Parkway.

Impact
The basin they grow in will collect about 35,500 gallons of runoff during a typical storm.

Details
An American Hornbeam and a Kousa Dogwood will grow in this trench.

Trees filter water, provide shade, and enhance streetscape.
Water filters through soil.
Stormwater flows from street into the tree trench.
Perforated pipe distributes water throughout the trench.

Rendering of a tree trench

Cobbs Creek Walking Tour: Development

Dan:

Determine sites to include; provide engineering plans & graphics

Write & edit copy, determine readability, provide links to media

Stakeholder beta-testing

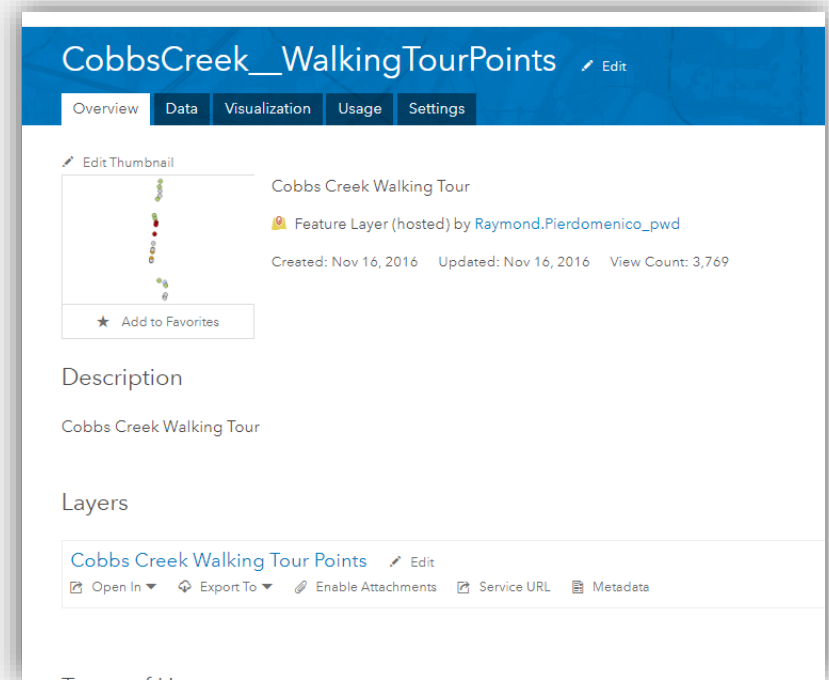
Phil:

Digitize site points in ArcGIS, add basemap and layers

Configure copy, links, symbology, pop-ups, scalability

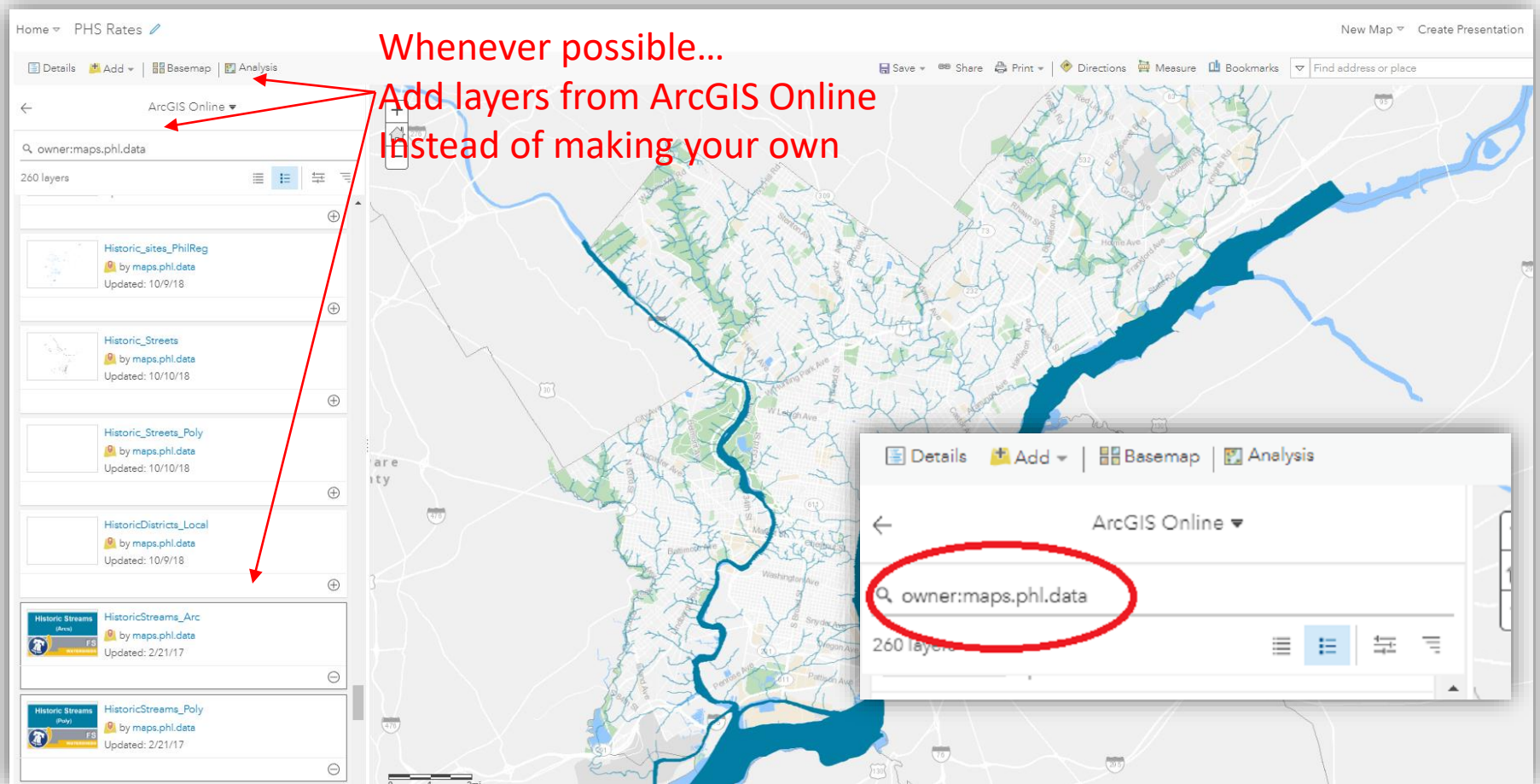
Publish web app

Both: Share, promote (public outreach, social media)



Hosted content: PHL on ArcGIS Online

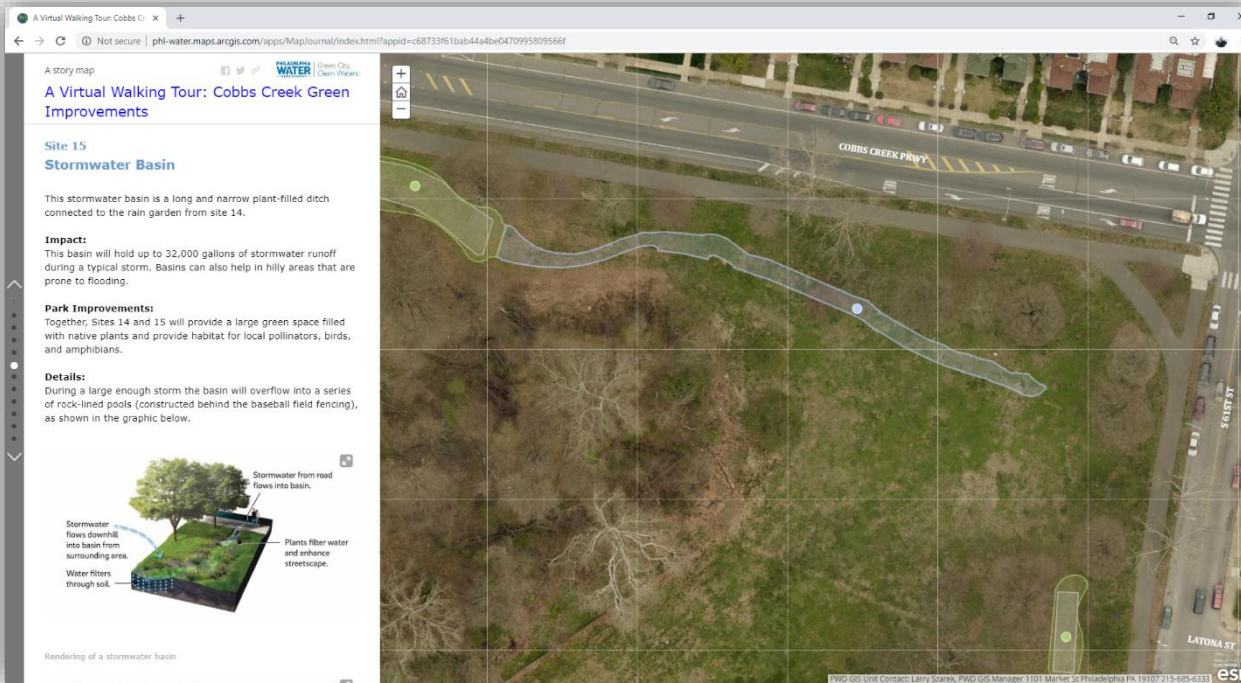
Whenever possible...
Add layers from ArcGIS Online
Instead of making your own



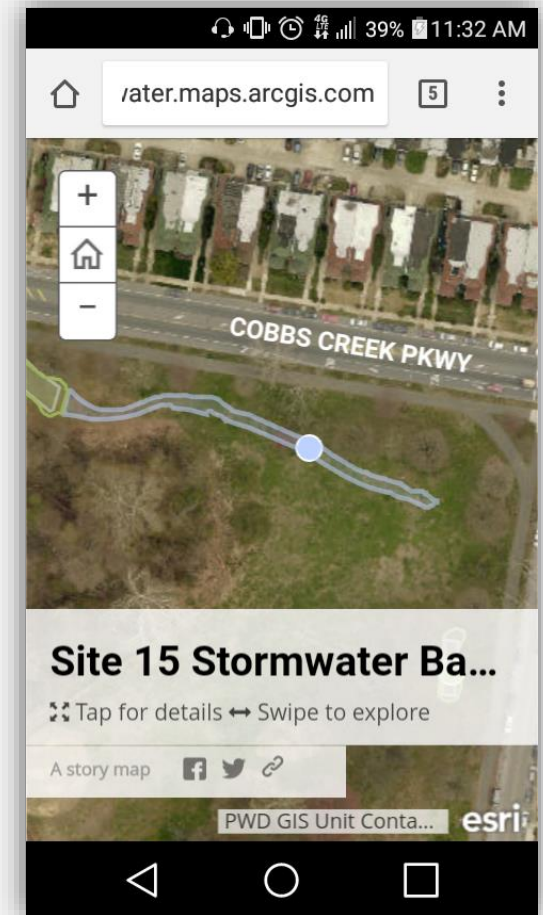
Living Atlas: Hosted layers, curated by ESRI, authoritative content

Cartographic Tips: Scalability Testing

PHONE

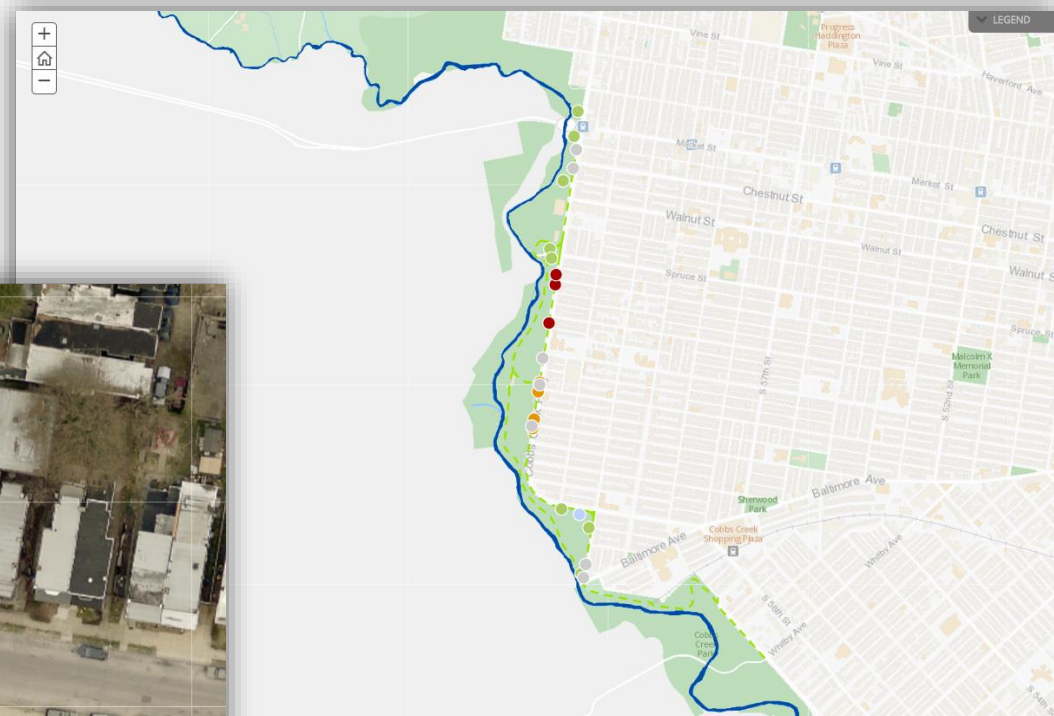


DESKTOP



Cartographic Tips: Visibility Levels

Zoomed out – Street map



Zoomed in – Aerial imagery

Metrics: Engagement Through View Counts

A Virtual Walking Tour: Cobbs Creek Green Improvements

Overview Usage Settings

Usage details for the period:
Aug 3, 2017, 1:28:14 PM GMT - Oct 2, 2017, 1:28:14 PM GMT

Past 60 Days

Views this Period
366

Avg Views Per Day
6.10

Usage Time Series



Story map debut at the Cobbs Creek Open House (100+ views in 1 day)

A Virtual Walking Tour: Cobbs Creek Green Improvements

Overview Usage Settings

Usage details for the period:
April 10, 2018 - June 12, 2018

Custom Date Range

Set a Custom Date Range

Start Date:

4/10/2018

End Date:

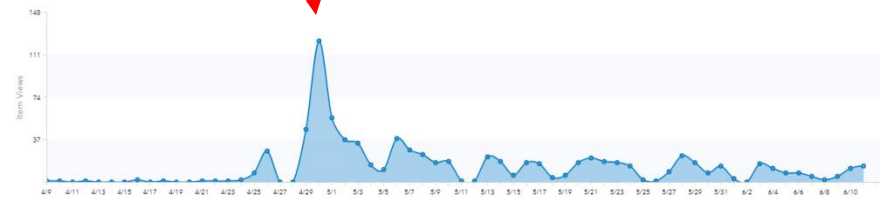
6/12/2018

Update Report

Item Views this Period
830

Avg Item Views Per Day
13.17

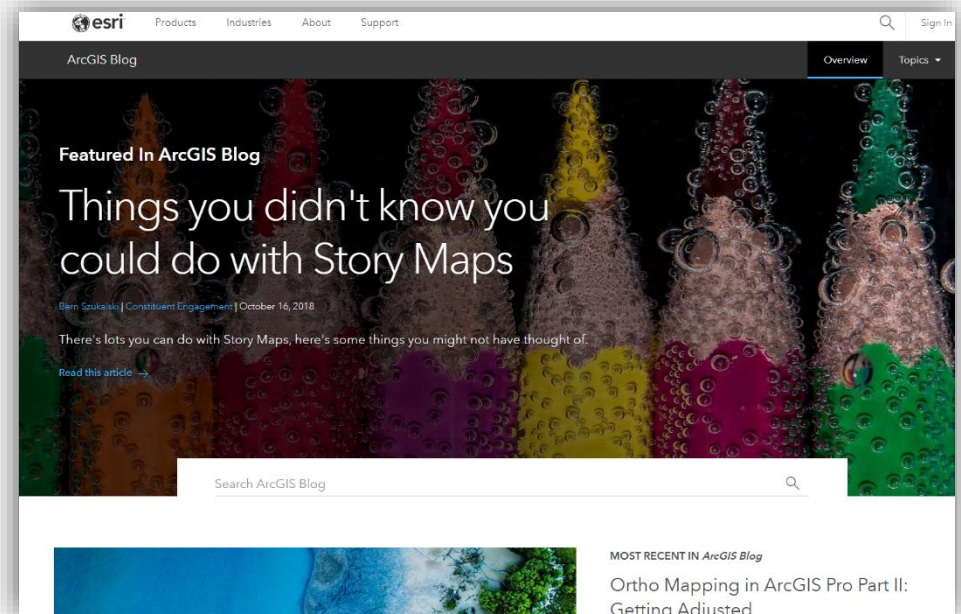
Usage Time Series



Added to ESRI Story Maps Gallery here (another 100+ views in 1 day)

Looking Ahead: PWD's Wish List

- **More story maps**
 - American Street, Mantua Greenway
 - CSO Cast, recreational water quality
 - Write blogs
- **Collaboration with other PHL departments**
 - Parks & Rec
- **Learn new techniques all the time**
 - Reproject layers into Web Mercator; Use ArcGIS Pro Portal
 - Try new things: some work, some don't
 - READ ESRI BLOGS



Thank You! Questions?



PHILADELPHIA
WATER
— DEPARTMENT —

PWD Resource Slide

- Home Page: www.phila.gov/water/pages/default.aspx
- *Green City, Clean Waters*: www.phillywatersheds.org/LTCPU
- Cobbs Creek GSI Virtual Walking Tour: <http://phl-water.maps.arcgis.com/apps/MapJournal/index.html?appid=c68733f61bab44a4be0470995809566f>
- Big Green Map: <http://phl-water.maps.arcgis.com/apps/webappviewer/index.html?id=c5d43ba5291441dabbee5573a3f981d2>
 - PWD Construction Map: <http://phl-water.maps.arcgis.com/apps/PanelsLegend/index.html?appid=0ad34eff4c3e4f53aa83c9955fc748cb>
- PWD Flickr: www.flickr.com/photos/philadelphiawater/albums/with/72157694192372740
- PWD Blog: <http://water.phila.gov/blog/>
- Open Data Philly: www.opendataphilly.org/
- Great Maps from Other Water Utilities:
 - Stormwater Management from MN: <https://maplegrovern.mn.maps.arcgis.com/apps/Cascade/index.html?appid=64c60faaf01248eaa42010c5fbd5cc1c>
 - Water Quality in IL & CO: <https://gispub.mwrdd.org/awqa/>; <http://geospatialdenver.maps.arcgis.com/apps/MapJournal/index.html?appid=d5e7de9fad8c45dfac1e53cb36b5df83>
- ArcGIS Blog: www.esri.com/arcgis-blog/overview/
- Story Maps Gallery: <http://storymaps.arcgis.com/en/gallery/#s=0>
- Contact Information:
 - Dan Schupsky, Outreach Specialist: 215-683-3405 or Daniel.Schupsky@Phila.gov
 - Phil Pierdomenico, GIS Specialist: 215-686-9411 or Raymond.Pierdomenico@Phila.gov



PhillyH2O



Facebook.com/PhillyH2O



@PhillyH2O

Appendix Slides



***Green City, Clean Waters* will eliminate 2+ billion gallons of combined sewer overflow pollution annually!**

Determining Outreach Goals

Federal and state requirements.

- Drinking water information
- General watershed education

Urban planning outreach theory.

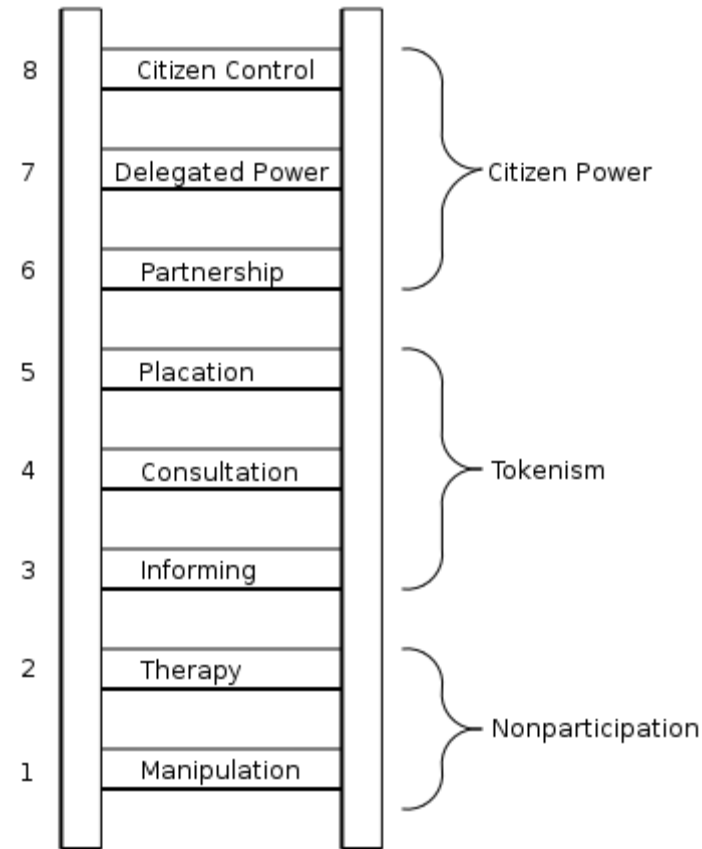
- Ex: Sherry Arnstein's Ladder of participation
- How does this relate to mandatory infrastructure investments?

EPA Guides & International Association for Public Participation

- More recent guides; geared toward international audiences

Look to Philadelphia citizens.

- Increased communication expectations
- Want advanced notice, input and resources to take action.



Ladder of Participation, 1969

Outreach Overview

PWD provides a two-pronged approach towards Green City, Clean Waters outreach.

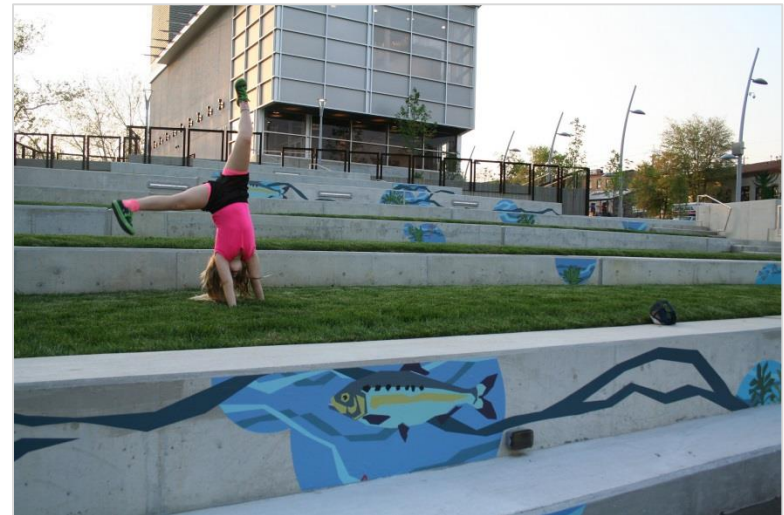
1. GSI Notification Process

- Formal process for notifying communities about each GSI project
- Primary goal is to inform



2. GSI Wraparound Programming

- Programs and tools that reach a broader audience
- Primary goal is to inspire and help people take action



Goals of the Notification Process

1. Inform
2. Address major concerns
3. Cultivate understanding
4. Provide resources for people inspired to take action
5. Develop partnerships



Residents at public meeting in Point Breeze

What feedback can we incorporate?

Planning:

- Location of GSI features
- Leveraging other community visions or plans

Design:

- Types of each feature: planter, bumpout, tree trench
- Landscaping

Construction:

- Season of construction
- Community events to avoid: farmers markets, festivals, etc.
- Materials stockpile



Philly's Combined Sewer System Service Area

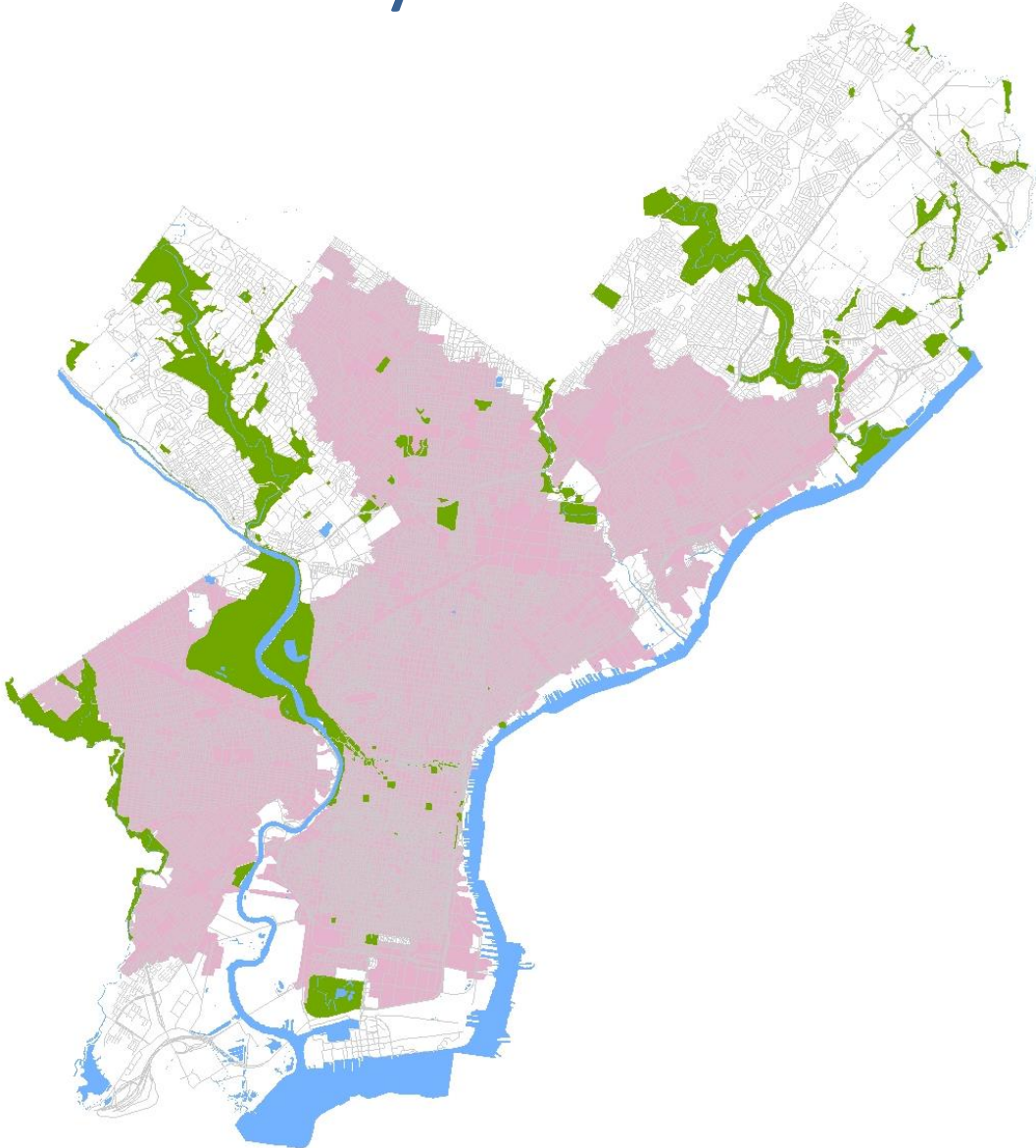
Combined Sewer Area



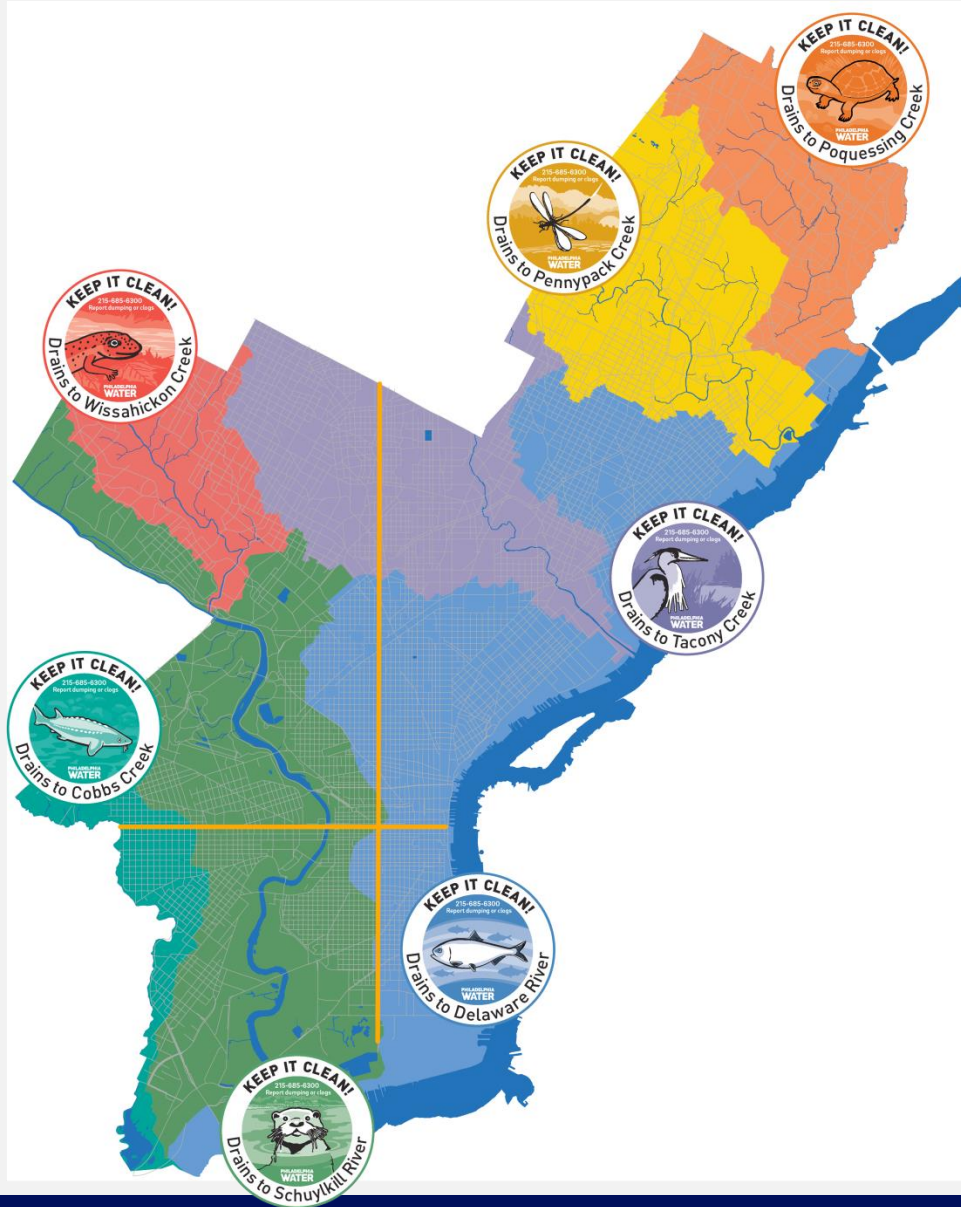
Separate Sewer Area



Kingsessing:
Schuylkill River
Watershed



Philadelphia is built upon 7 watersheds

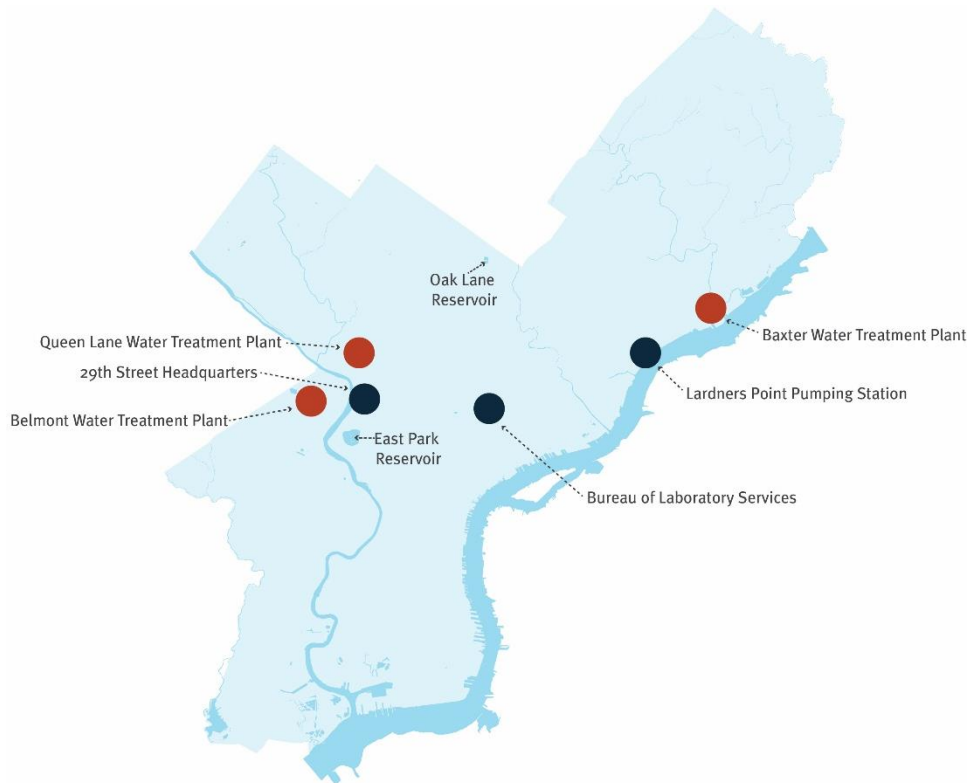


Nearby *Green City, Clean Waters* project

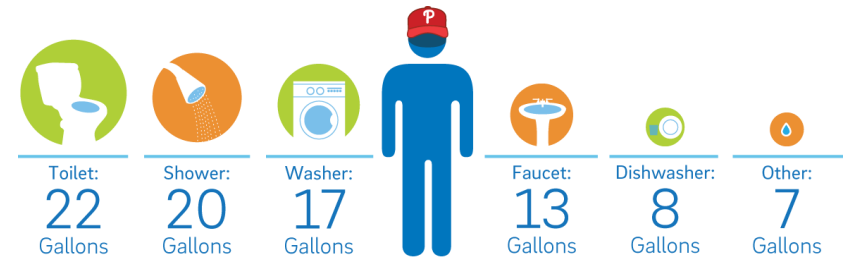


Rain gardens at the Zoo, along Parkside Ave, & at the Hestonville pocket park

Our Drinking Water Service



- ▶ 58% of water comes from the Delaware and 42% from the Schuylkill
- ▶ **3,000** miles of water mains, **25+** pumping stations, **91,000** valves, **25,000** fire hydrants
- ▶ **Three** water treatment facilities: Baxter, Belmont and Queen Lane



**DAILY WATER USAGE FOR AN
AVERAGE PHILADELPHIAN**

87
gallons per day

Customer Service & Assistance



Water/ Sewer Emergencies



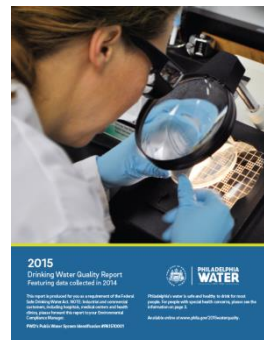
Construction/Quality of Life



Green City, Clean Waters Outreach



Environmental Education

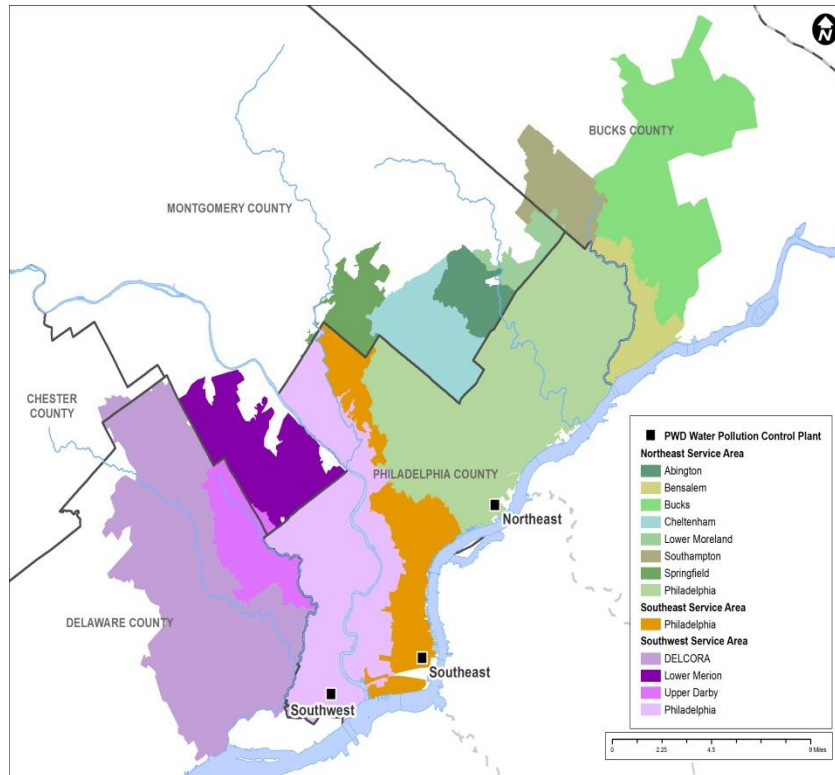


Regulatory Compliance



Call Center and Assistance

Wastewater Service



- ▶ **3** water pollution control plants: **Northeast, Southeast and Southwest**, all which receive awards for excellence
- ▶ **3,716** miles of sewers, **19** pumping stations
- ▶ Centralized biosolids handling facility



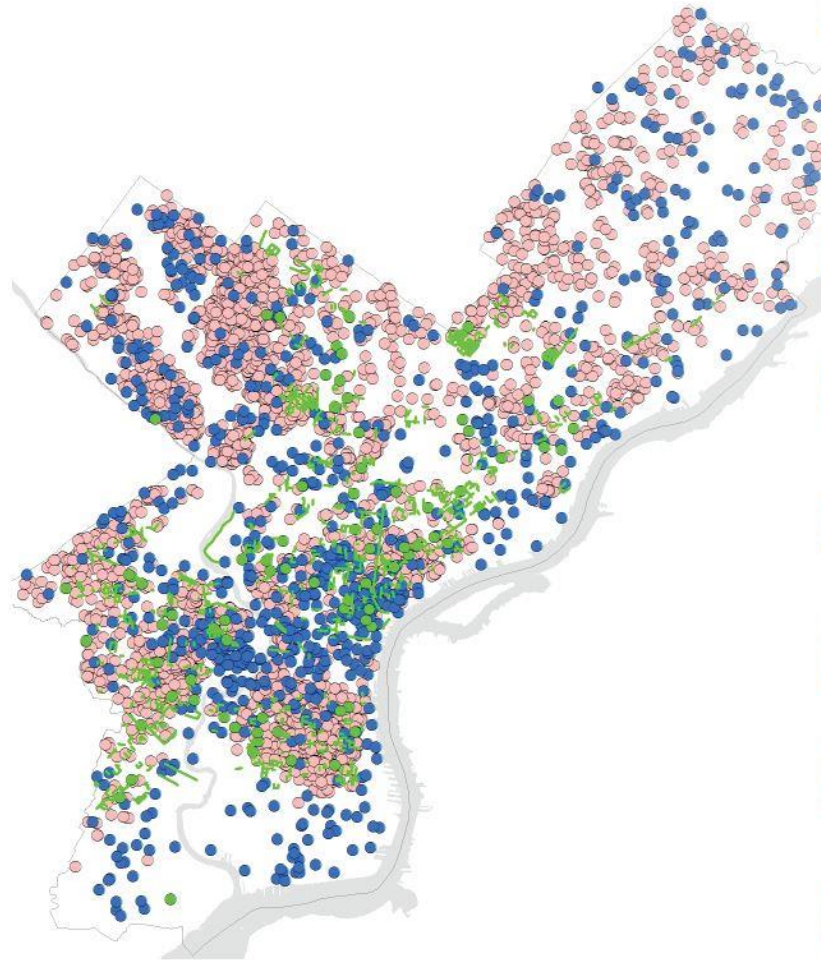
AVERAGE DAILY CAPACITY
522,000,000
gallons daily

What does construction look and sound like?



Green City, Clean Waters Program Overview

Active & Completed GSI Projects in Philadelphia



Key

- PWD Initiated Projects on Streets
- PWD Initiated Projects on Parcels
- Private Development Projects
- Rain Check, Rain Barrel



1.5 BILLION GALLONS

in Combined Sewer Overflow reduction volume



6,000 TONS TRASH & DEBRIS

removed from Philadelphia's waterways through our skimming vessel and on land



1,600+ STORMWATER TOOLS

constructed and in progress



\$51 MILLION

Grant funds from public and private sources invested in Philadelphia parks, streets, schools and public housing as a result of leveraged GSI investments



Approximately

308,759 CITIZENS ENGAGED



2985 RAIN CHECK PROJECTS

installed at homes across Philadelphia



8 AWARDS

won in the fields of Government Systems, Water Quality, Planning, Green Building, and Communications



10.3%

Estimated Property Value Gain from Proximity to GSI Investment †



430 NEW JOBS & 14% GROWTH

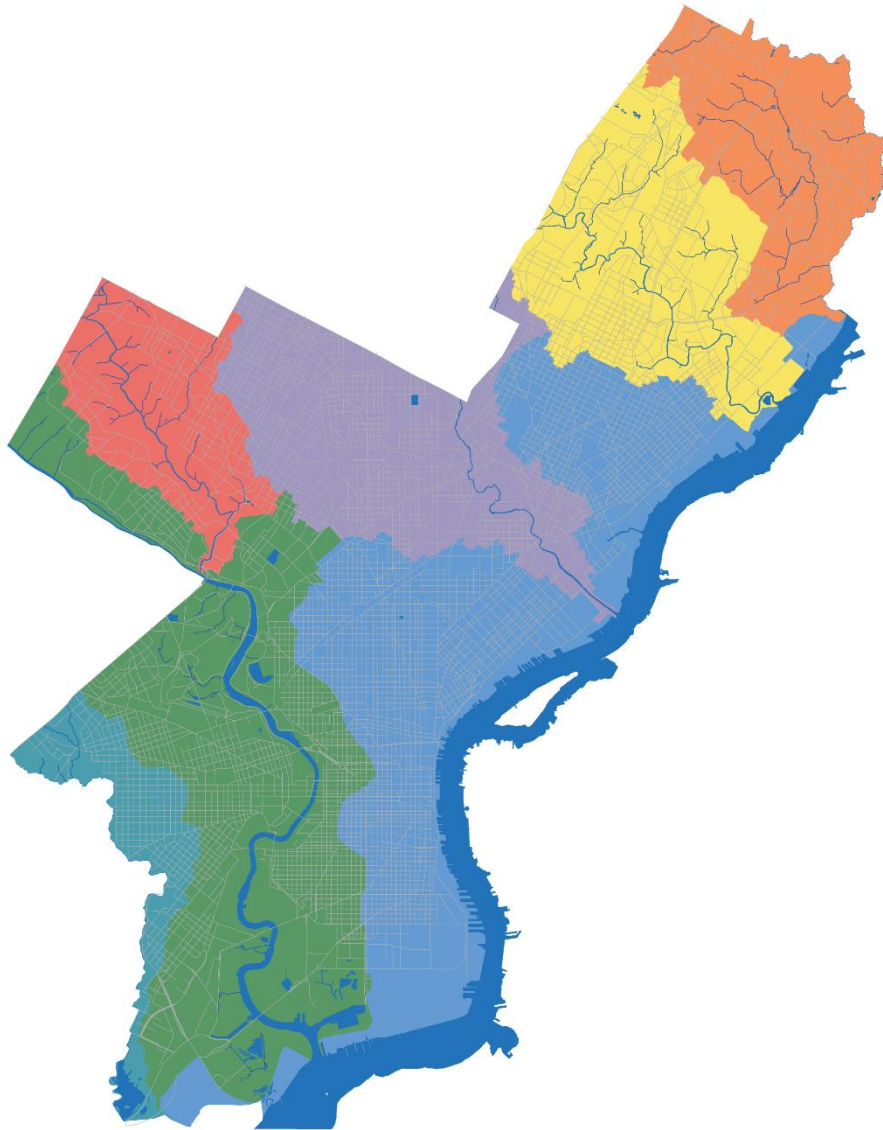
In Greater Philadelphia Green Stormwater Infrastructure Industry †

† Source: *The Economic Impact of Green City, Clean Waters: The First Five Years*

Combined sewers in dry weather



The City of Brotherly Love & Sisterly Affection



7 Watersheds

CSO & MS4 Stormwater Discharges

Population – 1,567,442

\$41,233 Median Income

~10.9% Unemployment Rate

~26% of Philadelphians live in poverty

~50% of Philadelphians have completed higher education

~53% of housing units are owner-occupied

Negative impacts of stormwater runoff



The Clean Water Act & National Combined Sewer Overflow Control Policy

Know Your Bill Better

Your Account	
Balance at last bill	\$30.43
Payments received	-\$30.43
Balance forward	\$0.00
Usage Charge	\$28.85
Stormwater Charge	\$13.01
Service Charge	\$14.15
Stormwater Charge	-\$13.52
Total Account Balance	\$40.49

Stormwater Charge

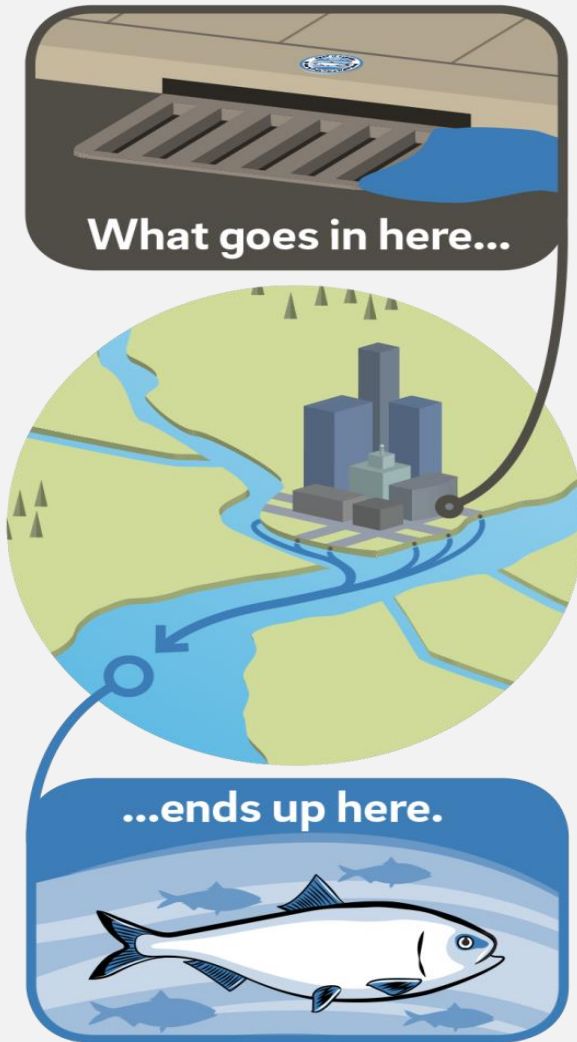
Usage History

The stormwater charge provides essential services to manage rain runoff that flows into sewers and waterways, as required by law. This is achieved through the Green City, Clean Waters initiative. ↓

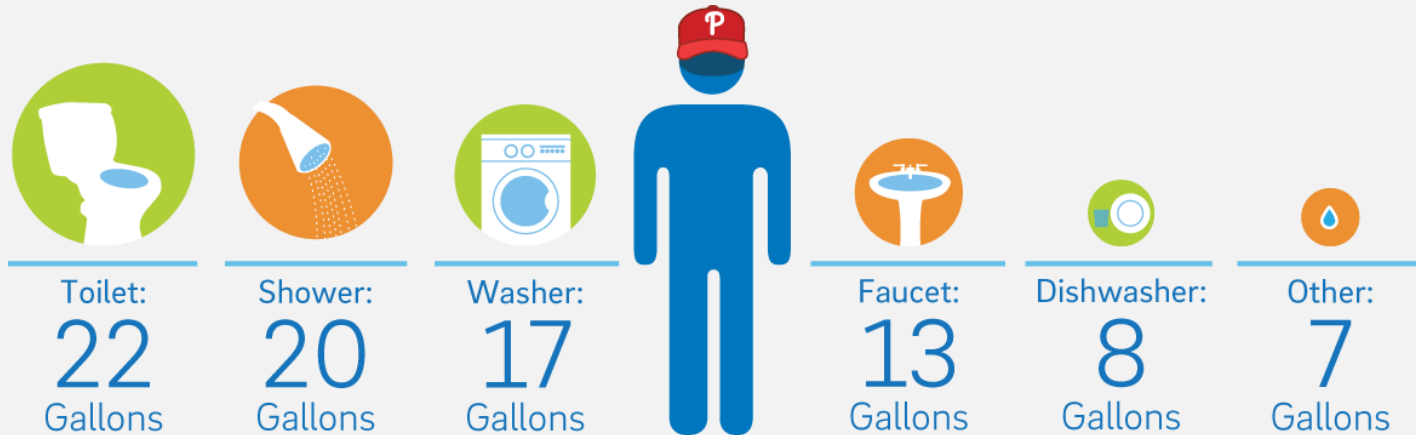


Every city with Combined Sewer Overflows **must** create a “Long Term Control Plan” to clean up the water.

PWD is here today because...



How much water do you use per day?



DAILY WATER USAGE FOR AN AVERAGE PHILADELPHIAN

87
gallons per day

Philadelphia's drinking water treatment plants deliver **520 million gallons of fresh water daily**; 60% of that water comes from the Delaware River and 40% comes from the Schuylkill River.

Secondary benefits of green tools



Approximately
**308,759 CITIZENS
ENGAGED**

We've hosted hundreds of meetings and events, educating citizens about green infrastructure and allowing residents to help shape the GSI investments that are transforming our neighborhoods.



**430 NEW JOBS
14% GROWTH**

In Greater Philadelphia Green Stormwater Infrastructure industry, including members of the PowerCorpsPHL program for at-risk youth + local GSI design and maintenance firms.



**10.3% PROPERTY
VALUE INCREASE**

Estimated property value gain from proximity to GSI investment. Sustainable Business Network estimates an aggregate \$1.3B increase in citywide property value, producing an annual increase of \$18M in property taxes.

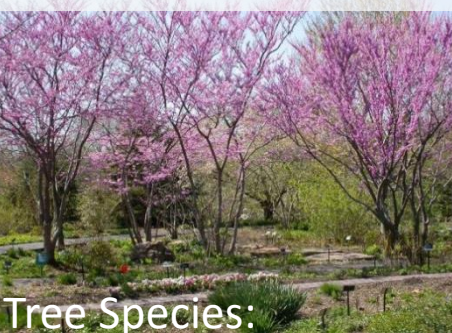


**1,600+ STORMWATER
TOOLS**

Over 1,600 green stormwater tools featuring native plants that filter pollutants, replenish groundwater and provide habitat for animals + pollinators have been constructed or are in progress.



Eastern Redbud



Canadian Serviceberry



Basswood



Red Horse Chestnut



Yoshino Cherry



Tree Species:

Shenandoah Switch Grass



Northern Bush Honeysuckle



Common Rush



After Midnight Coneflower



Grass & Shrub Species:

Bee Balm



Black-eyed Susan



Rough Stemmed Goldenrod



Threadleaf Giant Hyssop



Herbaceous Species:

Keep It Clean! Philadelphia Water's Storm Drain Marking Program

- Help PWD protect our drinking water by volunteering to place markers in your community
- **FREE** supplies are available for any community event
- There are 71,000+ storm drains in Philadelphia – 71,000+ ways to help!



More Info: www.phillywatersheds.org/inletmarkers

Why Flint is Different from Philly

FLINT, MI

Switched drinking water sources to a river that had known problems, and changed the chemistry of the water

Did not perform corrosion control to prevent lead service pipe corrosion

Dismissed science and best practices by not conducting technical, evaluation

Decisions were made by officials at state level as well as outside contracts

Did not comply with EPA lead and copper sampling program requirements

PHILADELPHIA, PA

Maintained sources for established drinking water for decades

Practices proven corrosion control (and has for decades)

Makes treatment decision based on science and testing

Operated by people who live in Philadelphia and drink our water

Complied with EPA Lead and copper sampling requirements since 1992

PWD Resource Slide



PhillyH2O



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@PhillyH2O

CleanSweep

A Litter Cleanup Registration and Data Collection App



millerdesignworks

Scott Sharadin
Creative Director

Marshall Oram
Interactive Director

Challenge



- Project initiated by Schuylkill River Greenways
 - Create an app that would collect and report data about the Schuylkill River Watershed's trash problem

Challenge

- Key objectives

- It would also help document the results of cleanup efforts to support future plans and help secure funding.
- Get input with other like-minded organizations to hear their needs and
- Try to alleviate potential duplication of efforts at both the organizational level as well as specific to an “app” or website.
- i.e. Who could “own” the app and reporting, and what are the key data points needed
- convened several brainstorming sessions with various stakeholders
- Became clear that the Schuylkill Action Network was the natural "owner" for the project and effort, and that tying into the Schuylkill Scrub as a program made the most sense.

Solution

- Identified the potentially involved organizations in the cleanup process
 - Keep America Beautiful/Keep Pennsylvania Beautiful
 - Schuylkill Action Network
 - Schuylkill River Greenway
- Through a series of brainstorming meetings, defined the app functionality and reporting goals as well as registration process for the cleanups
- With a better handle on the goals and scope of work we came back with a proposed smart phone app and web dashboard solution.

CleanSweep



CleanSweep

- The new app and dashboard would help watershed cleanup efforts by
 - help register their cleanups and teams by tying into the existing Keep Pennsylvania Beautiful registration process and database
 - easily record the results of their cleanups
 - aggregate and visually display the results on a web dashboard
 - provide admin reporting capabilities to help facilitate awareness and potential funding resources



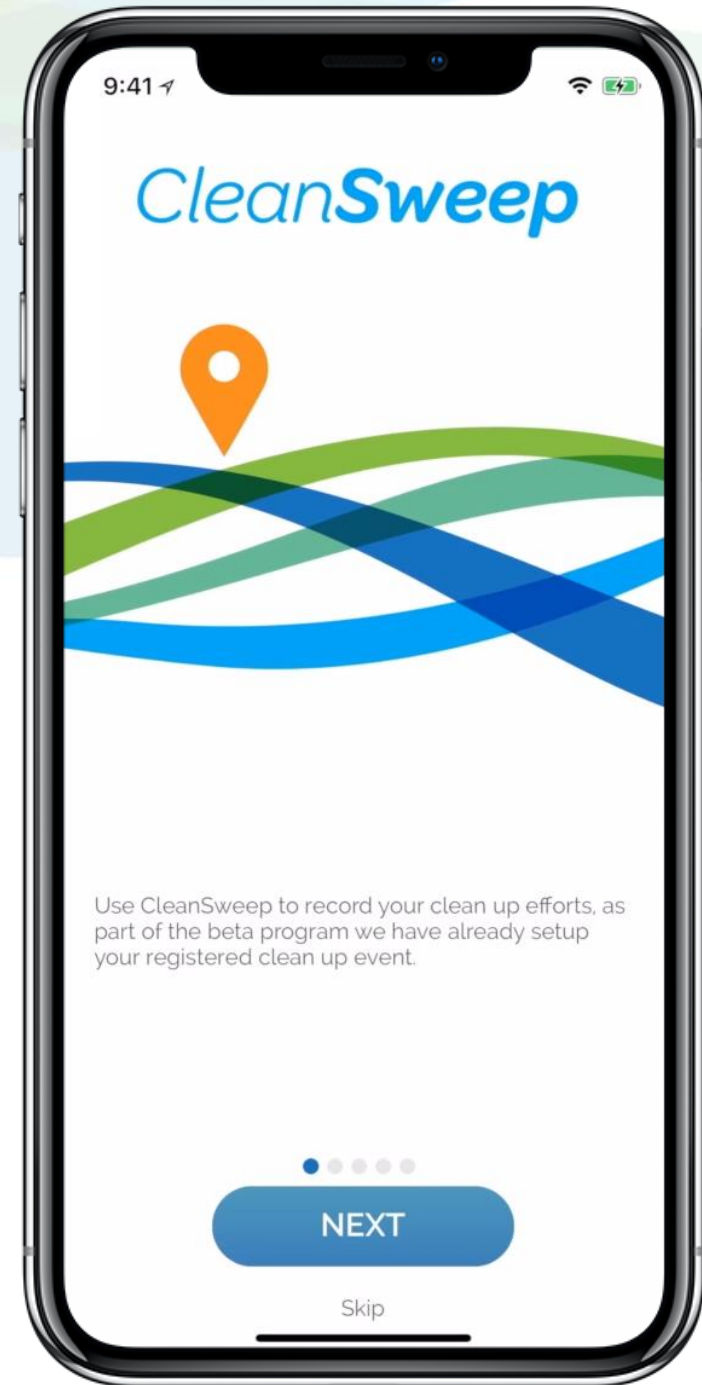
CleanSweep

- We started with a laundry list of things to track, but quickly realized you can only expect so much from someone using a tool like this
- What does it report?
 - Narrowed it down to key info about the organizer, the organization, the cleanup details itself, and # of participants
 - We tried to standardize to # of bags of trash, recyclables, tires, and other kinds of removals can be noted e.g. refrigerators, shopping carts, etc.
- Let's run through it



Welcome / On-Boarding

- New Users are greeted with a series of on-boarding screens
 - Provide an overview of functionality
 - Orient users to the app



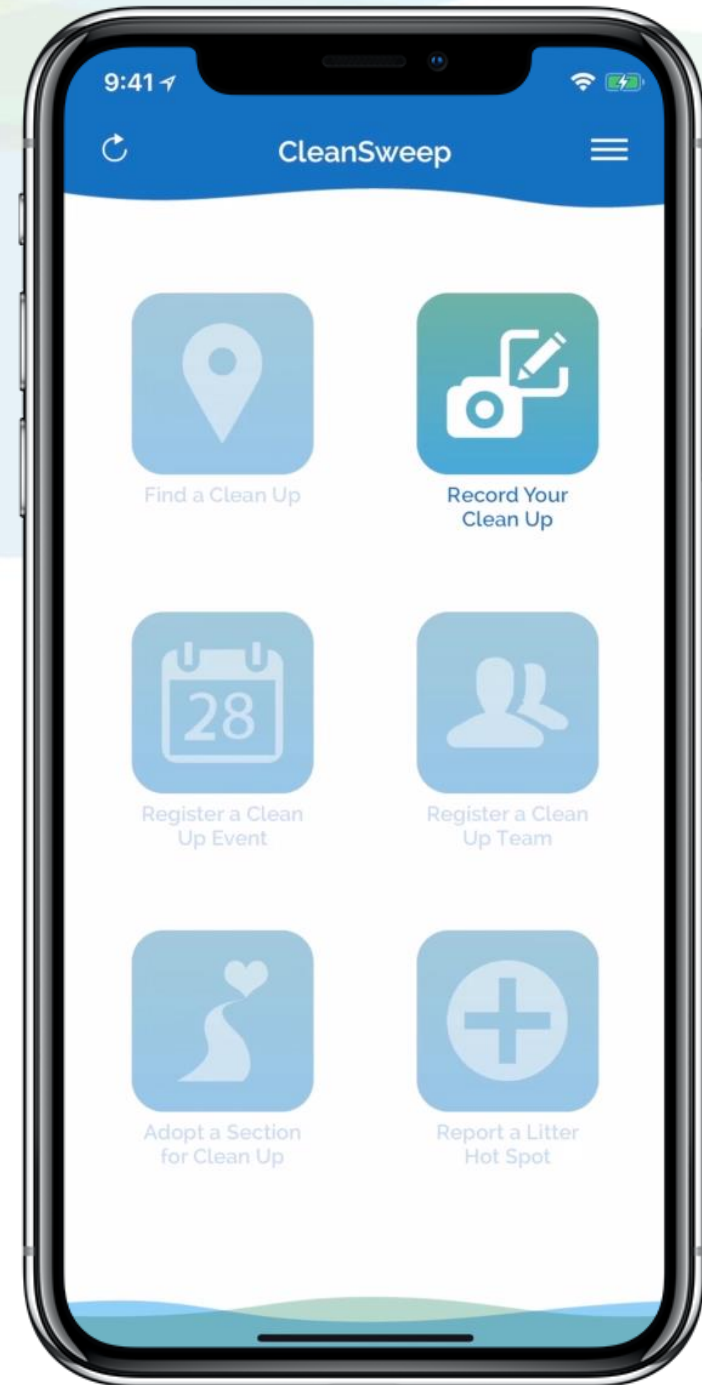
Main Menu Highlights

- **Register a new cleanup:** interfaces directly with the KeepPABeautiful.com website to register a new cleanup event.
 - KPAB handles moderating events through their existing process.
 - Approved events are automatically sync'd to your list of cleanups.
 - Those who choose to register events directly with KeepPABeautiful.com will have events sync'd by email to the app.
- **Report a litter hot spot:** uses GPS to report the location, the app will encourage these users to take action themselves and create their own ad-hoc cleanup event.
- **Record a cleanup:**



Record A Cleanup

- Recording is streamlined so it's quick and easy
 - Choose the cleanup to record
 - Select, set the crop of, and upload photos taken throughout the cleanup event.
 - Fill in the values of the measurable results of their cleanup in either bags or lbs.
 - Add a few notes about the cleanup: things not captured in the measurable results or anything else they want to note.
 - Lastly indicate how many volunteers participated.
 - Review and submit.



Results and the CleanSweep Dashboard

- The website serves a dual purpose of marketing the effort and summarizing report results
- Report results are sync'd with KeepPABeautiful.com's website backend and go through existing moderation process
- Approved results are returned the CleanSweep Dashboard website

The screenshot shows the CleanSweep website dashboard. At the top, there are navigation links: About, Cleanup Results, What's Happening, Gallery, and Find a Cleanup. The main header features a large image of a river with a bridge, overlaid with the 'CleanSweep' logo and a location pin icon. Below the header is an orange call-to-action box with text: 'CleanSweep makes it easy to make a difference locally. Use CleanSweep to find and record your clean up efforts, register clean up events and teams, adopt and report litter hotspots. Check back here to see the progress and data being collected by people like you. Measuring results can help secure ongoing funding and cleanup efforts like these.'

Below the call-to-action box, there are two columns of content. The left column shows two smartphones displaying the CleanSweep app interface. The right column is titled 'Get the CleanSweep App & Manual!' and includes links to 'Download on the App Store', 'ANDROID APP ON Google play', and a 'PDF manual' icon. Below this is a section titled 'Record Your Clean Up Efforts' with a sub-header 'As a Clean Up Coordinator, you will be able to document and record the successes of your team's clean up right in the app. Encourage your volunteers to take photos and take some yourself. After you submit the information, it will be collected with others and appear on the dashboard below.'

At the bottom of the dashboard, there is a large graphic with a blue arrow pointing to the right. The text reads: 'Here are the results of the 2018 cleanups so far:'. Below this, there is a large green number '530' with the text 'trash bags' underneath it. The graphic also includes icons of a grass blade, several green trash bags, and a small green turtle.

What's next?

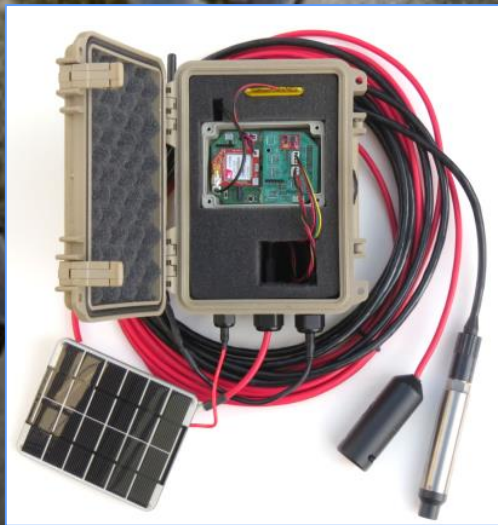
- What Marshall has shown has been the beta release which was distributed to a select group of cleanup organizers this last spring for field testing, and the dashboard is showing those results.
- Potentially can be scaled to include other geographic areas and other clean up efforts and organizations.
- Incorporating feedback from the testers and are in the process of finishing up the app and dashboard for a phase one launch for the spring Schuylkill Scrub season.
- The handbook has been printed and will be distributed this spring as well.
- We hope that this will be a fun easy tool to use and that a central visual repository for the clean up results will encourage greater public effort, first to prevent, and second to remediate, litter entering our watersheds.

EnviroDIY Mayfly sensor stations for real-time stream monitoring

David Bressler, Stroud Water Research Center

Stroud Staff Collaborators: David Arscott, **Shannon Hicks (engineer/designer)**, David Bressler, Rachel Johnson, Sara Damiano, Matt Gisondi, Scott Ensign, Matt Ehrhart

Partners: Anthony K. Aufdenkampe, Limnotech; Jeff Horsburgh, Utah State University



What is EnviroDIY?

- A community of enthusiasts sharing do-it-yourself ideas for environmental science and monitoring
 - web-based forum for users to help each other
 - workshops for training (researchers, citizens scientist, educators, students)
 - open source hardware/software
 - web-based mapping and data display

WikiWatershed®

About Model Monitor Community Help News Events David Bressler

Web Tools Advancing Knowledge and Stewardship of Fresh Water

Like Us Follow Us Subscribe GitHub

STROUD WATER RESEARCH CENTER

WikiWatershed is an initiative of **Stroud™ Water Research Center**. The Stroud Center seeks to advance knowledge and stewardship of freshwater systems through global research, education, and watershed restoration.

Welcome to WikiWatershed, a web toolkit designed to help citizens, conservation practitioners, municipal decision-makers, researchers, educators, and students advance knowledge and stewardship of fresh water. [Learn more](#)

Explore the WikiWatershed Toolkit

Model My Watershed

Analyze geospatial data, model storms, and compare conservation or development scenarios in a watershed. [Learn more](#)

Launch the App

Monitor My Watershed

Analyze, Monitor, and Report. Resource: White Clay Creek - Stage, Streamflow, Discharge (1968-2014). Discover and map monitoring data from multiple sources. Share and compare your monitoring data with the world. [Learn more](#)

Launch the App

Runoff Simulation

Explore how land use and soil determine runoff for the Site Storm Model package of Model My Watershed. [Learn more](#)

Launch the App

EnviroDIY

Join a community of do-it-yourself enthusiasts sharing open-source ideas for environmental science and monitoring.

Visit EnviroDIY

Leaf Pack Network

Discover what aquatic insects can tell you about your stream's health by performing a simple leaf pack experiment.

Visit Leaf Pack Network

Water Quality Mobile App

Enhance stream study and monitoring activities for students and citizen scientists. Available for Apple and Android devices.

Learn More

NEWS

SEE ALL ITEMS >

Model My Watershed Release 1.22

© 2019-02-12

Subscribe to e-news

Teaching Environmental Sustainability with Model My Watershed (TES-MMW)

The TES-MMW curriculum gives students the ability to use data to understand how human actions impact watershed health. TES-MMW is funded by National Science Foundation grant [DRL #1418133](#).

EnviroDIY.org



Welcome to EnviroDIY, a community for do-it-yourself environmental science and monitoring. EnviroDIY is part of [WikiWatershed](#), a web toolkit designed to help citizens, conservation practitioners, municipal decision-makers, researchers, educators, and students advance knowledge and stewardship of fresh water. **New to EnviroDIY? [Start here](#)**



Check out the [EnviroDIY Mayfly Data Logger](#), a powerful user-programmable microprocessor board that is fully compatible with Arduino IDE software.



For sketches, libraries, and documentation, [visit our EnviroDIY GitHub repository](#).

COMMUNITY ACTIVITY

[SEE ALL ACTIVITY >](#)



Dan replied to the topic **Trouble initializing XBee3 LTE-M** in the forum **Mayfly Data Logger** 15 hours, 45 minutes ago

OK, looking at the [GitHub issue](#), it looks like I may need to Solder SJ13 after all...?



Dan started the topic **Trouble initializing XBee3 LTE-M** in the forum **Mayfly Data Logger** 17 hours, 39 minutes ago

I recently successfully set up a MayFly with GPRSbee radio. It works great.

I'm trying to get a second MayFly working with the Digi XBee3 LTE-M radio. This is on hologram, using a brand-new SIM card, which I understand should be possible. I'm not sure if I'm getting to

ENVIRODIY BLOG

[SEE ALL >](#)



The Internet of Things Meets the Internet of Water

© 2018-10-17

BLOG COMMENTS

Ask a Question

Have a question about DIY environmental monitoring? Post it in the forum.

[Start a forum topic](#)

FORUM TOPICS

[ACTIVITY >](#)

Current, best-supported cellular XBee radio for MayFly

© 2018-10-04

FORUM REPLIES

Why EnviroDIY ?

- Desire/need for continuous real-time monitoring
 - Rationale is diverse...e.g., pollution monitoring, temporally rich data to detect short term events, need for monitoring real-time conditions, detecting change due to actions (restoration)...
- Technological complexity is becoming more simplified
- Need for greater data transparency
- **Need for low-cost solutions, so we can monitor more places with limited budgets**



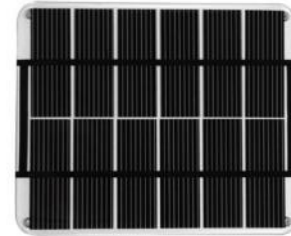
EnviroDIY cost estimates



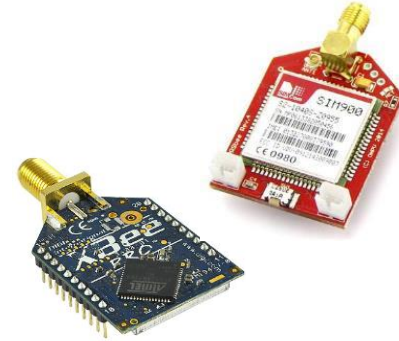
Stroud EnviroDIY Mayfly
Microprocessor & Datalogger
\$60



Accessories
(vary depending on need)
\$30-100



Solar Panel
\$10-35



Cell Phone or Radio
Modules
\$30-80



Campbell OBS3+ Turbidity

\$140-\$240 = logger and parts
\$750 = CTD sensor and parts
\$1500 = turbidity sensor and parts
CTD station = ~\$1000
CTD/Turbidity station = ~\$2500



Meter Hydros 21 CTD



4 results for "envirodiy"

prime | FREE One-Day
Get FREE One-Day Shipping on qualifying orders over \$35

- Show results for
- Computers & Accessories
 - Computer Internal Components
 - Computer Components
 - Single Board Computers
 - Electronics
 - Audio & Video Connectors & Adapters
- See All 3 Departments

- Refine by
- Delivery Day
- Get it by Tomorrow
- Amazon Prime
- prime
 - prime | FREE One-Day

- Avg. Customer Review
- ★★★★★ & Up
 - ★★★★☆ & Up
 - ★★★☆☆ & Up
 - ★★☆☆☆ & Up
- Condition
- New
 - Used



EnviroDIY Mayfly Data Logger Arduino Compatible Board and Starter Kit

by Stroud Water Research Center

\$90⁰⁰ prime
FREE Delivery Tue, Sep 18 - Wed, Sep 19
Only 13 left in stock - order soon.

★★★★★ ▾ 1

Product Features
EnviroDIY Mayfly Data Logger Board (v0.5b) plus accessories to get you started



EnviroDIY Mayfly Data Logger Board, Arduino Compatible

by Stroud Water Research Center

\$60⁰⁰ prime
FREE Delivery by Sat, Sep 15
Only 16 left in stock - order soon.

★★★★☆ ▾ 4

Product Description
... EnviroDIY Mayfly Data Logger Board v0.5 A powerful, user-programmable ...



Stroud Water Research Center EnviroDIY Mayfly ProtoShield

by Stroud Water Research Center

\$12⁰⁰ prime
FREE Delivery by Sat, Sep 15

★★★★☆ ▾ 1

Product Description
... ProtoShield for EnviroDIY Mayfly Data Logger board. Breaks out all of ...

Manual

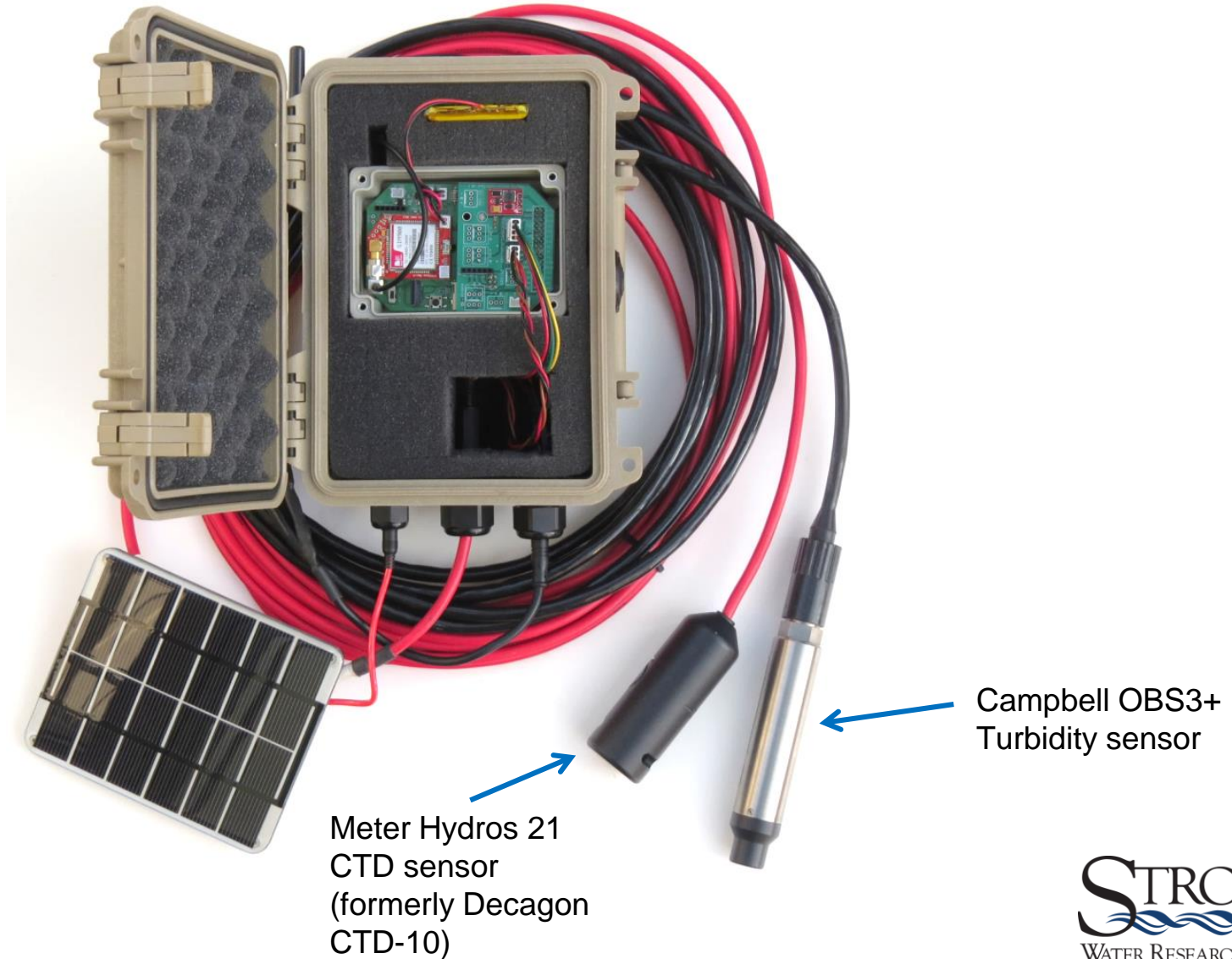
Comprehensive manual being finalized



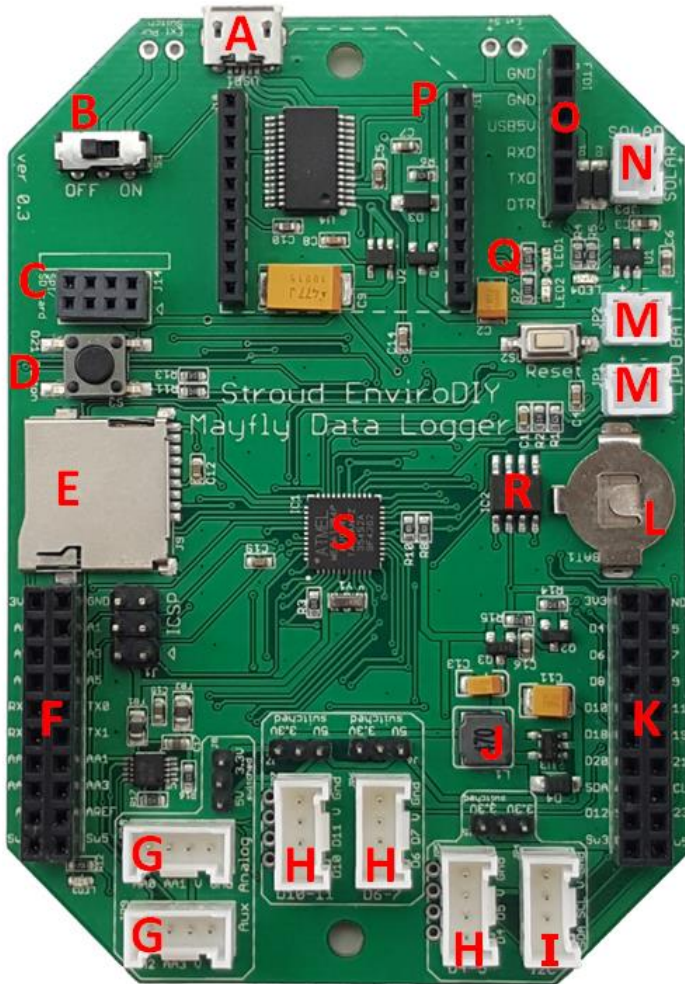
EnviroDIY Sensor Station Manual

Programming, building, installing, and managing an EnviroDIY Sensor Station

Current standard EnviroDIY sensor station



EnviroDIY Mayfly data logger



Features of the EnviroDIY Mayfly Data Logger

A	MicroUSB port – connect a standard MicroUSB cable to a computer for programming the Mayfly using the Arduino software
B	Power switch – turns the Mayfly board on and off
C	microSD/SPI connector – socket for vertical microSD memory card adapter board or other SPI devices
D	Pushbutton – connected to pin D21 for user-defined input
E	microSD card socket – socket for storing data on a standard microSD memory card
F	Analog pin header – access to the Mayfly’s power, ground, & analog pins, and also the four Auxiliary 16-bit Analog-to-Digital converter pins
G	Auxiliary ADC Grove connectors – pairs of Auxiliary Analog pins along with ground and power (3.3v or 5V)
H	Digital pin Grove connectors – pairs of digital pins along with ground and power (3.3v or 5v), for connecting sensors and Grove accessories
I	I²C port Grove connector – connection for any devices that use the I ² C protocol
J	5-volt boost converter – generates 5v for powering external sensors
K	Digital pin header – access to the Mayfly’s power, ground, & digital pins
L	Clock battery – socket for CR1220 lithium battery to keep clock chip (R) running when no other power is connected to Mayfly
M	LiPo battery connectors – JST socket for connecting Lithium Polymer (LiPo) rechargeable battery. Additional socket is for providing power to high-current peripheral devices
N	Solar panel connector – JST socket for connecting 6v solar panel for charging the LiPo battery
O	FTDI programming header – alternative port for programming board using an external FTDI adapter instead of using the Mayfly microUSB port
P	Bee module socket – connection port for various telemetry modules that use the Bee footprint (mesh radio , WiFi , cellular)
Q	Red & Green LEDs – LEDs for providing visual feedback, connected to pins D8 (green) and D9 (red)
R	Real-time clock – DS3231 clock module with on-board temperature sensor, retains the date and time after initial programming, requires battery (L)
S	Processor – ATmega1284p microprocessor

***Open source; Arduino based programming**

Program Mayfly for different sensors

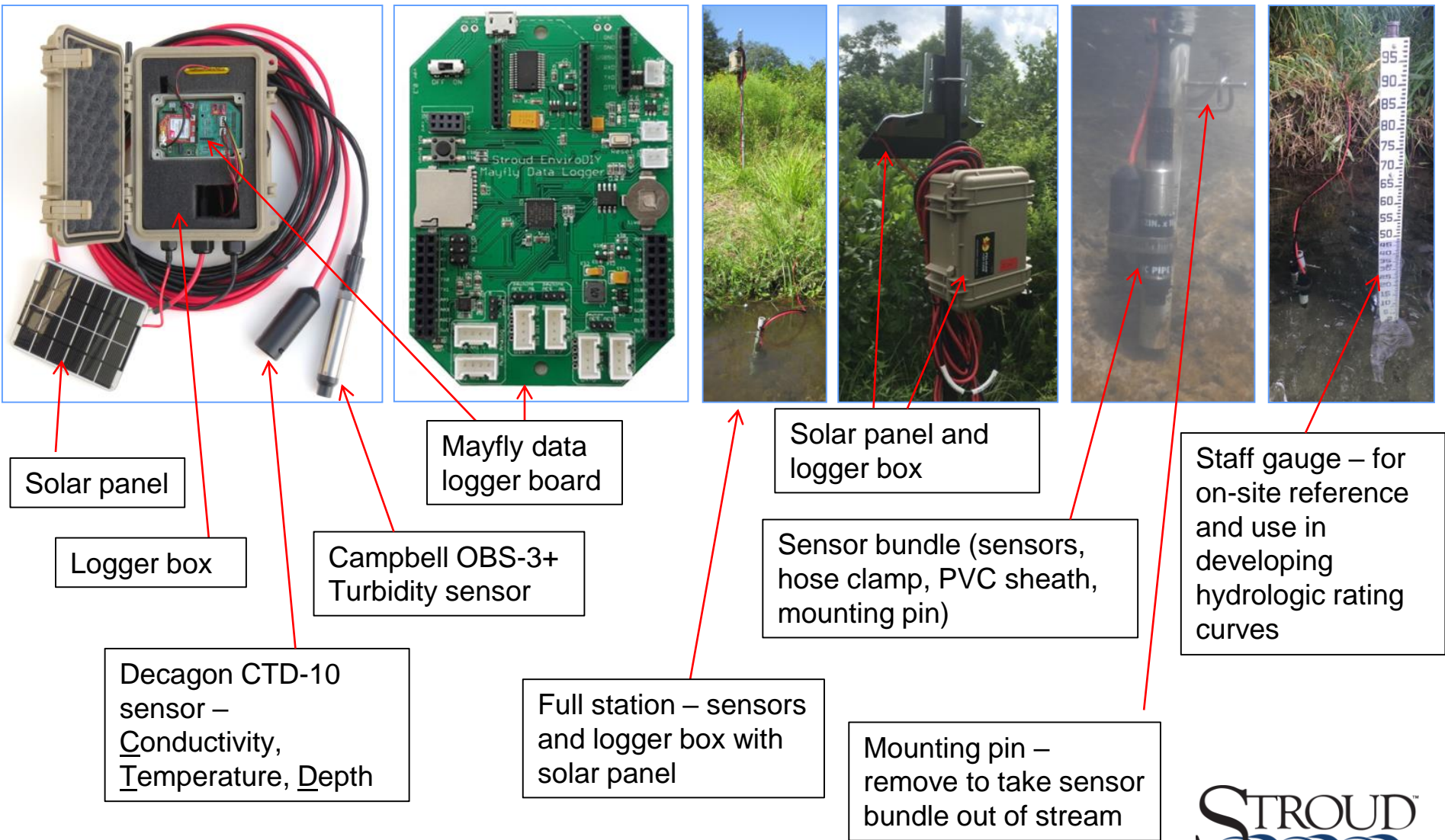
- Bare-wire commercial sensors: Decagon, Sensorex, Vaisala, Keller America, Apogee, Campbell, Hobo, SonTek, ZebraTech, MaxBotix, YosemiteTech...

A few examples:

Soil moisture, conductivity, redox, CO₂, water depth, oxygen, turbidity, CTD



EnviroDIY sensor stations



Solar panel

Logger box

Decagon CTD-10 sensor –
Conductivity,
Temperature, Depth

Campbell OBS-3+
Turbidity sensor

Mayfly data
logger board

Full station – sensors
and logger box with
solar panel

Solar panel and
logger box

Sensor bundle (sensors,
hose clamp, PVC sheath,
mounting pin)

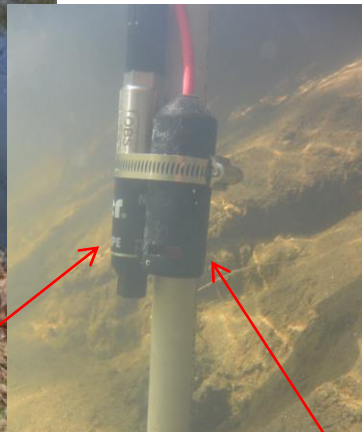
Mounting pin –
remove to take sensor
bundle out of stream

Staff gauge – for
on-site reference
and use in
developing
hydrologic rating
curves

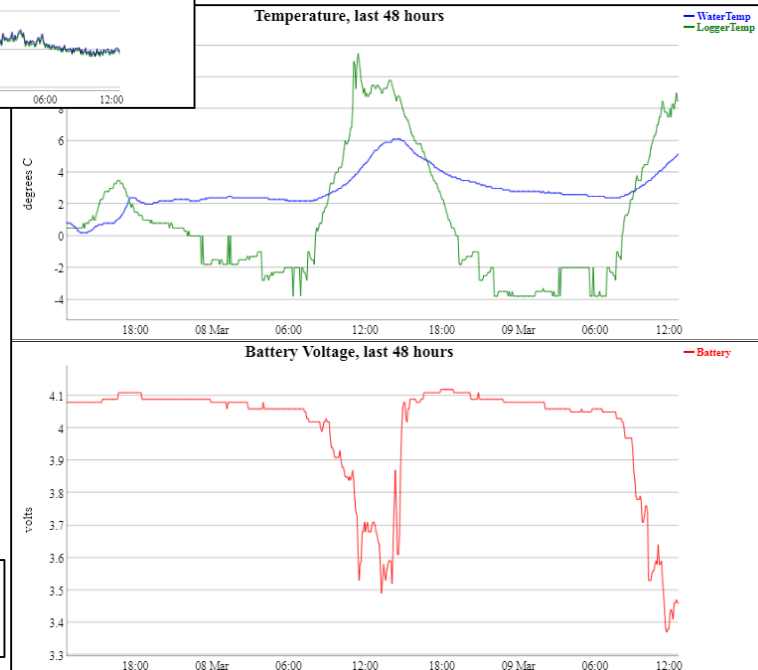
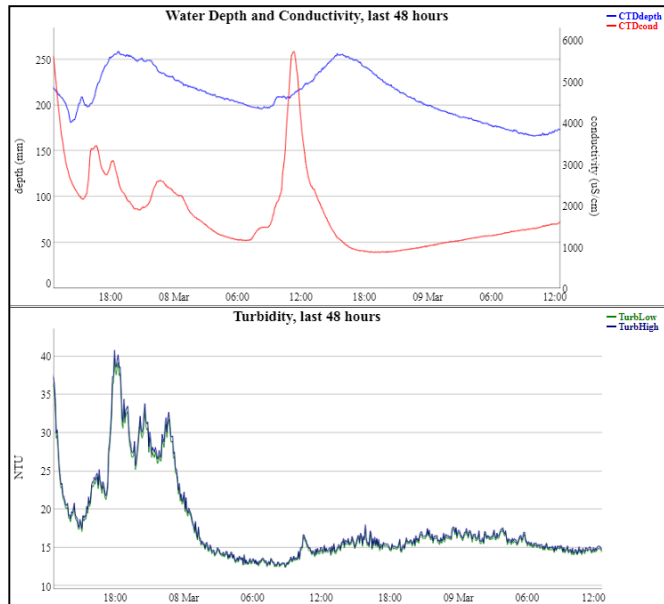
EnviroDIY sensor station



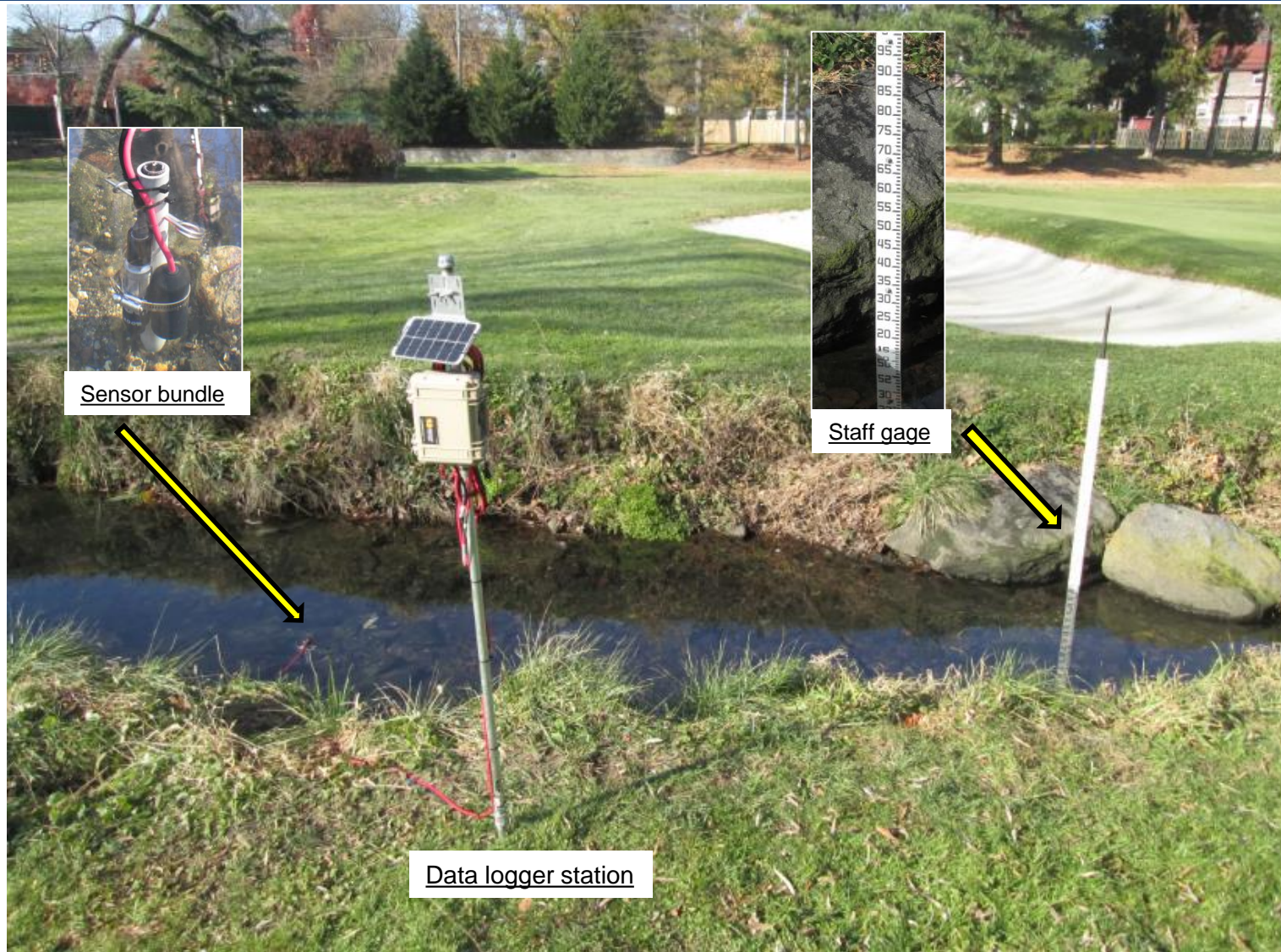
Campbell OBS3+ Turbidity sensor



Meter Hydros 21 CTD sensor (formerly Decagon CTD-10)



Standard current EnviroDIY sensor station setup



EnviroDIY sensor station



EnviroDIY sensor station



EnviroDIY sensor station

Schuylkill River at Bartrams Gardens, Philadelphia



EnviroDIY sensor station

Schuylkill River at Towpath Park, Pottstown



WikiWatershed®

Web Tools Advancing Knowledge and Stewardship of Fresh Water

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STROUD WATER RESEARCH CENTER

WikiWatershed is an initiative of Stroud™ Water Research Center. The Stroud Center seeks to advance knowledge and stewardship of freshwater systems through global research, education, and watershed restoration.

Welcome to WikiWatershed, a web toolkit designed to help citizens, conservation practitioners, municipal decision-makers, researchers, educators, and students advance knowledge and stewardship of fresh water. [Learn more](#)

Explore the WikiWatershed Toolkit

Model My Watershed

Analyze geospatial data, model storms, and compare conservation or development scenarios in a watershed. [Learn more](#)

Launch the App

Monitor My Watershed

Resource: White Clay Creek - Stage, Streamflow, Discharge (1968-2014)
Discover and map monitoring data from multiple sources.
Share and compare your monitoring data with the world. [Learn more](#)

Period: 5/21/1968 - 10/31/2014

Sub: [unclear]

Run: [unclear]

Type: [unclear]

Rating: [unclear]

Launch the App

Runoff Simulation

Explore how land use and soil determine runoff for the Site Storm Model package of Model My Watershed. [Learn more](#)

Launch the App

EnviroDIY

Join a community of do-it-yourself enthusiasts sharing open-source ideas for environmental science and monitoring.

Visit EnviroDIY

Leaf Pack Network

Discover what aquatic insects can tell you about your stream's health by performing a simple leaf pack experiment.

Visit Leaf Pack Network

Water Quality Mobile App

Enhance stream study and monitoring activities for students and citizen scientists. Available for Apple and Android devices.

Learn More

NEWS

SEE ALL ITEMS >

Model My Watershed Release 1.22

© 2016-02-12

Subscribe to e-news

Teaching Environmental Sustainability With Model My Watershed (TES-MMW)

The TES-MMW curriculum gives students the ability to use data to understand how human actions impact watershed health. TES-MMW is funded by National Science Foundation grant DRL #1418133.

MonitorMyWatershed.org

MonitorMyWatershed.org

EnviroDIY **Leaf Pack Network**

Data Sharing Portal

Contribute your water quality data

Ready to start sharing your data?

[SIGN UP](#)

HOW IT WORKS

The WikiWatershed Data Portal supports multiple types of water quality data:

Share and Explore Sensor Datasets

EnviroDIY

EnviroDIY is a community of enthusiasts sharing do-it-yourself ideas for environmental science and monitoring.

- 1**
Register your compatible data logger and your sensors.
- 2**
Deploy your data logger and start collecting data.
- 3**
Stream your data continuously and view your results online.

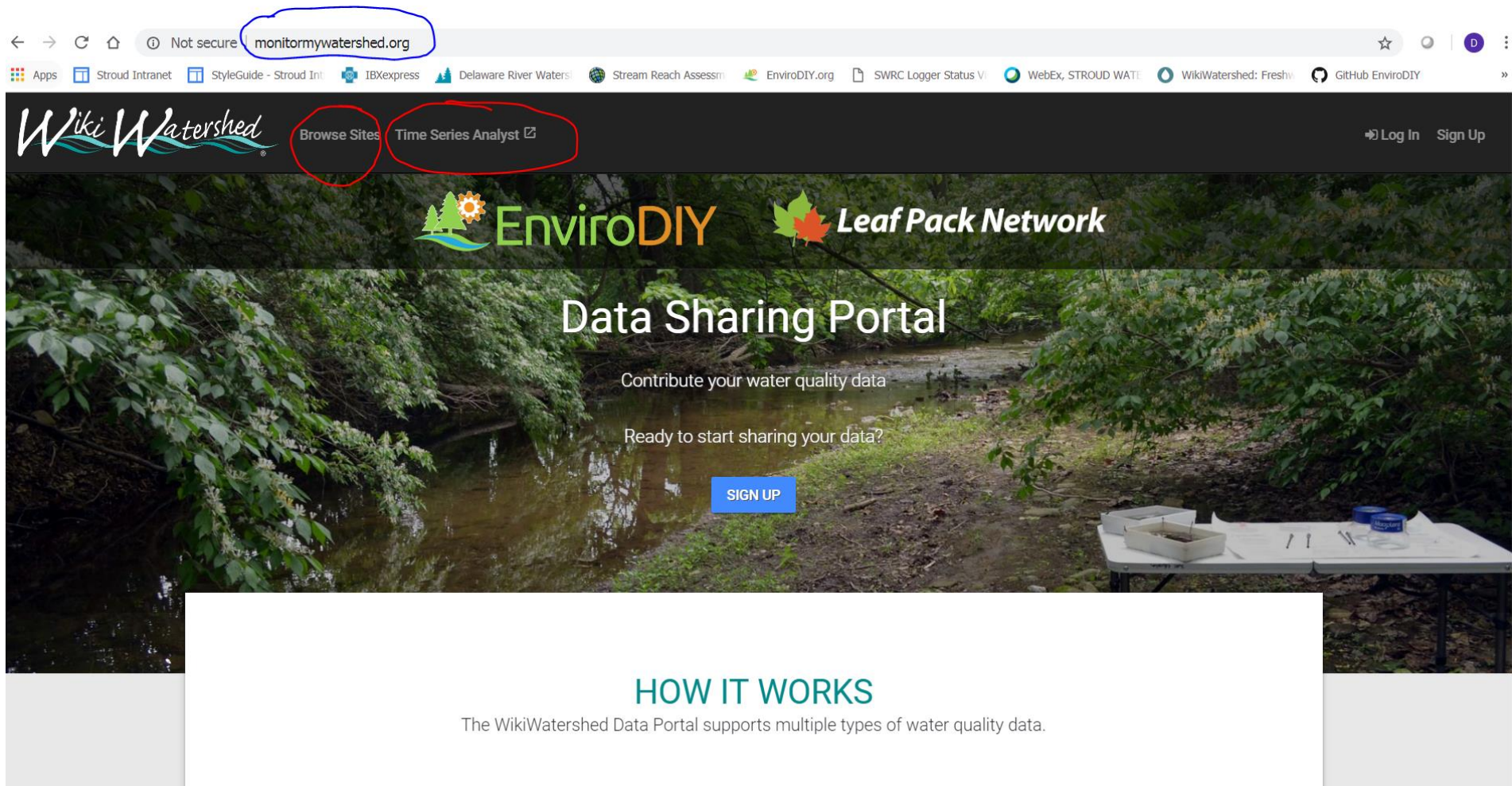
Share and Explore Macroinvertebrate Datasets

Leaf Pack Network

The Leaf Pack Network is an

EnviroDIY sensor stations and MonitorMyWatershed

- <http://monitormywatershed.org/> (data.envirodiy.org and data.wikiwatershed.org will also get you there)



The screenshot shows a web browser window with the URL monitormywatershed.org in the address bar. The website header features the "Wiki Watershed" logo on the left and navigation links for "Browse Sites" and "Time Series Analyst" in the center, both highlighted with red circles. On the right side of the header, there are links for "Log In" and "Sign Up". Below the header, the main content area displays the "EnviroDIY" and "Leaf Pack Network" logos. The central text reads "Data Sharing Portal" with the subtext "Contribute your water quality data" and "Ready to start sharing your data?". A prominent blue "SIGN UP" button is positioned below this text. At the bottom of the page, a section titled "HOW IT WORKS" is visible, with the text "The WikiWatershed Data Portal supports multiple types of water quality data." The background of the website is a photograph of a stream flowing through a wooded area, with a table and equipment in the foreground.

EnviroDIY sensor stations in MonitorMyWatershed

The screenshot displays the MonitorMyWatershed website interface. At the top, the browser address bar shows the URL `monitormywatershed.org/browse/`. The navigation bar includes the "Wiki Watershed" logo, "Browse Sites", and "Time Series Analyst" links. A secondary navigation bar lists various tools and services like "Apps", "Stroud Intranet", "StyleGuide", "IBXpress", "Delaware River Waters", "Stream Reach Assessm", "EnviroDIY.org", "SWRC Logger Status V", "WebEx, STROUD WATI", "WikiWatershed: Fresh", and "GitHub EnviroDIY".

The main content area is titled "BROWSE DATA COLLECTION SITES" and includes a sub-header: "Browse all sites that have been registered in the database by all users. Clicking on a site shows its details and provides a link to view the data collected at that site." The interface features a sidebar on the left with the following sections:

- Auto Zoom:** A toggle switch is currently turned on.
- Data Types:** A dropdown menu showing "EnviroDIY" with a count of 201 and "Leaf Pack" with a count of 5.
- Organizations:** A search bar labeled "Search Organizations..." and a list of organizations with their respective site counts:
 - American Littoral Society: 2
 - Aquashicola Pohopoco Watershed Conservancy: 2
 - Berks County Conservation District: 3
 - Berks Nature: 2
 - Brodhead Watershed Association: 1
 - Chattahoochee Riverkeeper: 2
 - Cleveland Metroparks: 1
 - Darby Creek Valley Association: 1

The main map area shows a satellite view of the Northeastern United States, with numerous blue location pins indicating the positions of 205 EnviroDIY sensor stations. Major cities like New York, Philadelphia, and Baltimore are visible. A status box at the bottom of the map indicates "Showing 205 out of 205 results." The bottom right corner of the map area contains a small person icon and copyright information: "Map data ©2018 Google | 20 km | Terms of Use | Report a map error".

EnviroDIY sensor stations in MonitorMyWatershed

The screenshot shows the MonitorMyWatershed website interface. At the top, the browser address bar displays "monitormywatershed.org/browse/". The page header includes the "Wiki Watershed" logo and navigation links for "Browse Sites" and "Time Series Analyst". A teal banner below the header reads "BROWSE DATA COLLECTION SITES" and provides instructions: "Browse all sites that have been registered in the database by all users. Clicking on a site shows its details and provides a link to view the data collected at that site." The main content area is split into a left sidebar and a central map. The sidebar has an "Auto Zoom" toggle and a "CLEAR" button. It contains two sections: "Data Types" with checkboxes for "EnviroDIY" (201 sites) and "Leaf Pack" (5 sites); and "Organizations" with a search bar and a list of organizations including American Littoral Society (2), Aquashicola Pohopoco Watershed Conservancy (2), Berks County Conservation District (3), Berks Nature (2), Brodhead Watershed Association (1), Chattahoochee Riverkeeper (2), and Cleveland Metroparks (1). The central map shows a satellite view of a region in Pennsylvania with several blue location pins. A popup window for site SHPK6S is open, displaying the following information: Site Code: SHPK6S; Site Name: Pickering Creek at Phoenixville YMCA; Latitude: 40.10818; Longitude: -75.51937; Elevation: 57 m; Latest Measurement: Oct. 26, 2018, 1:15 p.m. (UTC-05:00) (30 minutes ago). A link "View data for this site" is at the bottom of the popup.

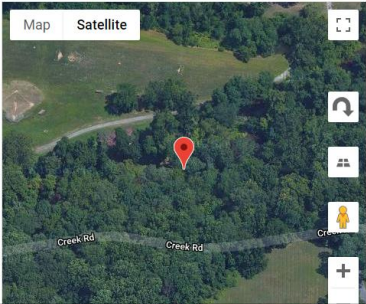
EnviroDIY sensor stations in MonitorMyWatershed

Not secure | monitormywatershed.org/sites/SHPK65/

Wiki Watershed [Browse Sites](#) [Time Series Analyst](#)

PICKERING CREEK AT PHOENIXVILLE YMCA (SHPK6S) FOLLOW

Deployment By	Michael Bullard
Organization	Green Valleys Watershed Association
Registration Date	Jan. 25, 2018, 9:56 a.m.
Deployment Date	Jan. 22, 2018, 5 p.m.
Latitude	40.10818
Longitude	-75.51937
Elevation (m)	57.0
Elevation Datum	-
Site Type	Stream
Stream Name	-
Major Watershed	-
Sub Basin	-
Closest Town	-
Notes	-



Not secure | monitormywatershed.org/sites/SHPK65/

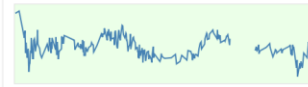
Wiki Watershed [Browse Sites](#) [Time Series Analyst](#) Log In Sign Up

SENSOR OBSERVATIONS AT THIS SITE EnviroDIY

Info Only the most recent 72 hours of available data are shown on the sparkline plots. The plots are broken when there are gaps in the data longer than 6 hours. Plots shaded in green have recent data. Plots shaded in red have not reported data in the last 72 hours.

Time Series Analyst
View data for this site.
[Related Link](#)

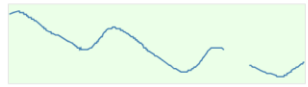
Water depth Provisional



Last observation
Oct. 26, 2018, 1:20 p.m. (UTC-05:00) **269.0**
(mm)

Medium	Liquid aqueous
Sensor	Decagon_CTD-10 Electrical Conductivity Temperature Depth Sensor
Height	-

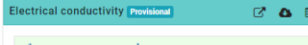
Temperature Provisional




Last observation
Oct. 26, 2018, 1:20 p.m. (UTC-05:00) **9.1**
(degC)

Medium	Liquid aqueous
Sensor	Decagon_CTD-10 Electrical Conductivity Temperature Depth Sensor
Height	-

Electrical conductivity Provisional



Turbidity Provisional

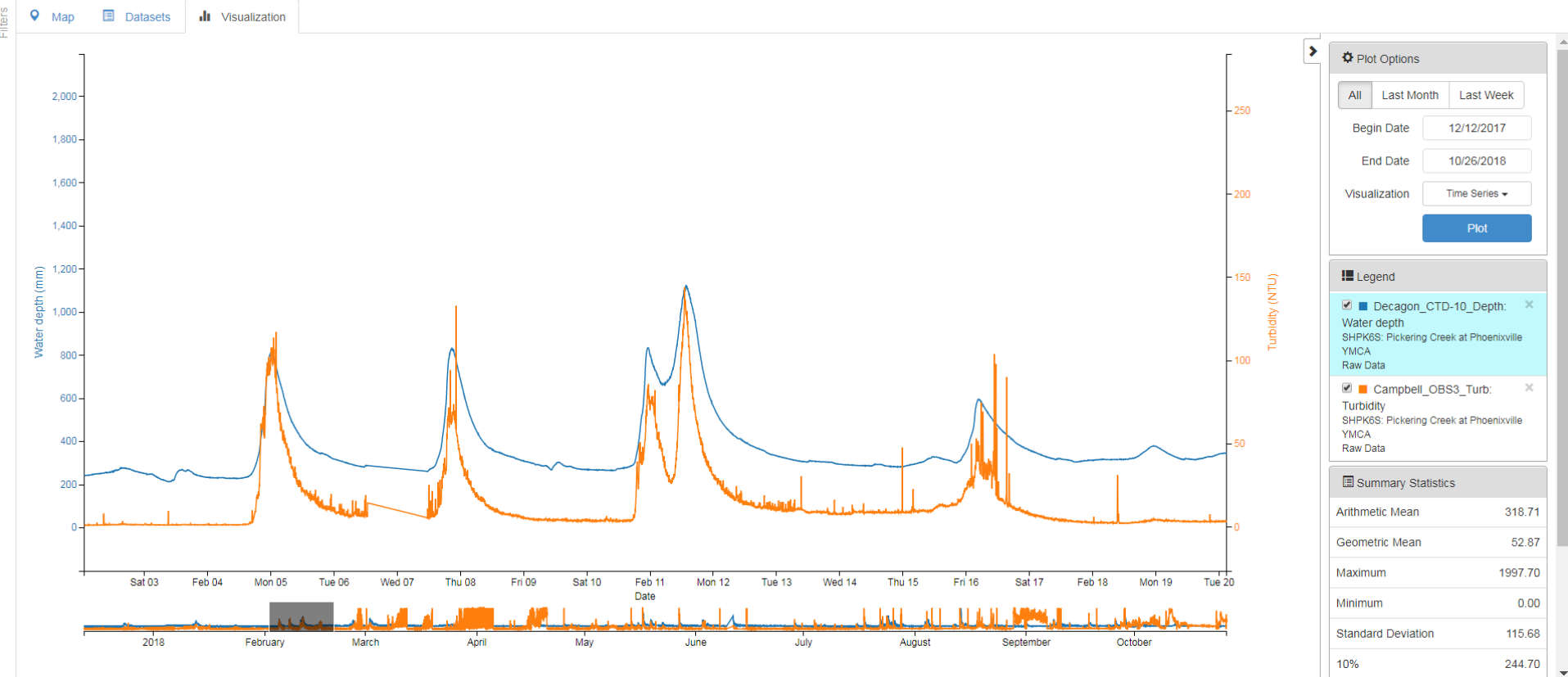


EnviroDIY sensor stations in MonitorMyWatershed

Not secure | data.envirodiy.org/tsa/?sitecode=SHPK6S&variablecode=Decagon_CTD-10_Depth&view=visualization&plot=true

Apps | Stroud Intranet | StyleGuide - Stroud Int. | IBXexpress | Delaware River Waters | Stream Reach Assessm | EnviroDIY.org | SWRC Logger Status V | WebEx, STROUD WAT | WikiWatershed: Fresh | GitHub EnviroDIY

EnviroDIY Time Series Analyst



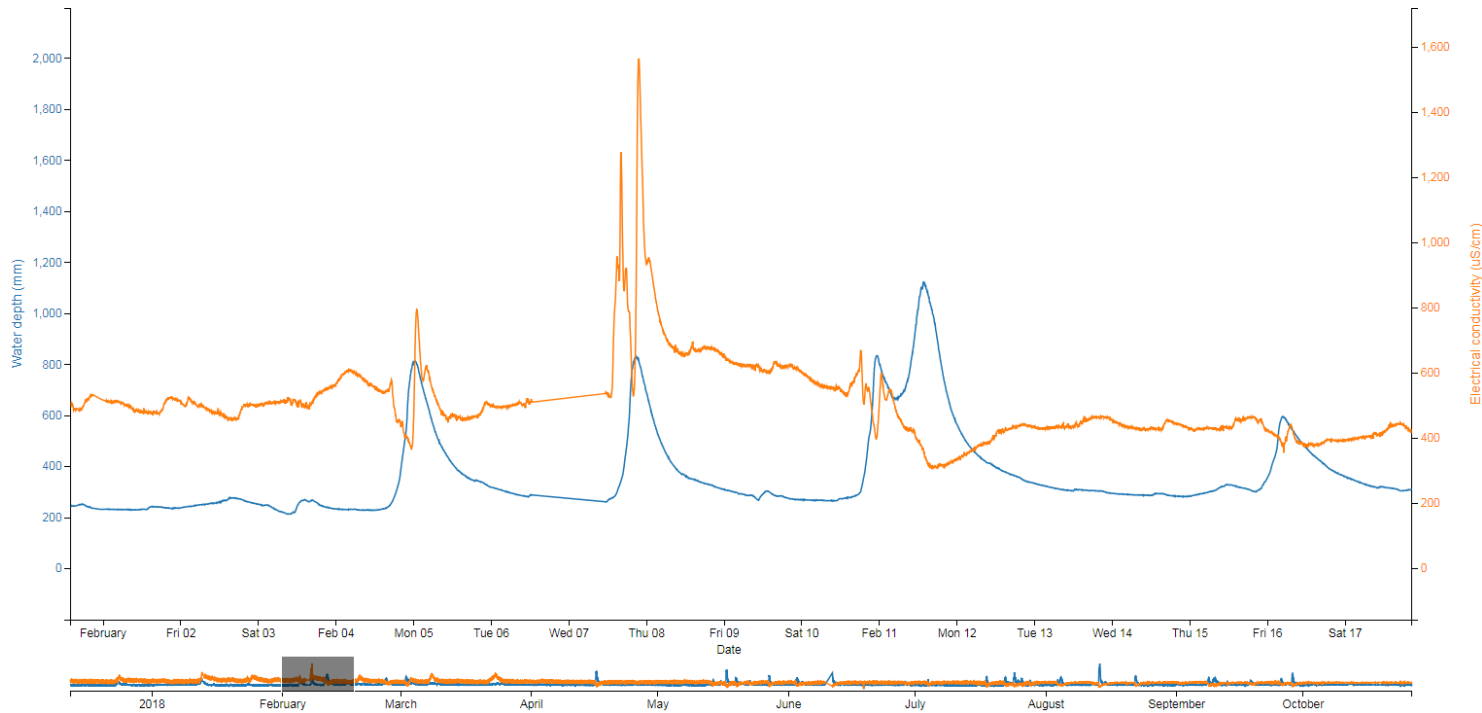
EnviroDIY sensor stations in MonitorMyWatershed

Not secure | data.envirodiy.org/tsa/?sitecode=SHPK6S&variablecode=Decagon_CTD-10_Depth&view=visualization&plot=true

Apps | Stroud Intranet | StyleGuide - Stroud Int | IBXexpress | Delaware River Waters | Stream Reach Assessm | EnviroDIY.org | SWRC Logger Status V | WebEx, STROUD WAT | WikiWatershed: Fresh | GitHub EnviroDIY

EnviroDIY Time Series Analyst

Map | Datasets | Visualization



Plot Options

All | Last Month | Last Week

Begin Date: 12/12/2017

End Date: 10/26/2018

Visualization: Time Series

Plot

Legend

- Decagon_CTD-10_Depth: Water depth SHPK6S: Pickering Creek at Phoenixville YMCA Raw Data
- Decagon_CTD-10_Cond: Electrical conductivity SHPK6S: Pickering Creek at Phoenixville YMCA Raw Data

Summary Statistics

Arithmetic Mean	318.71
Geometric Mean	52.87
Maximum	1997.70
Minimum	0.00
Standard Deviation	115.68
10%	244.70

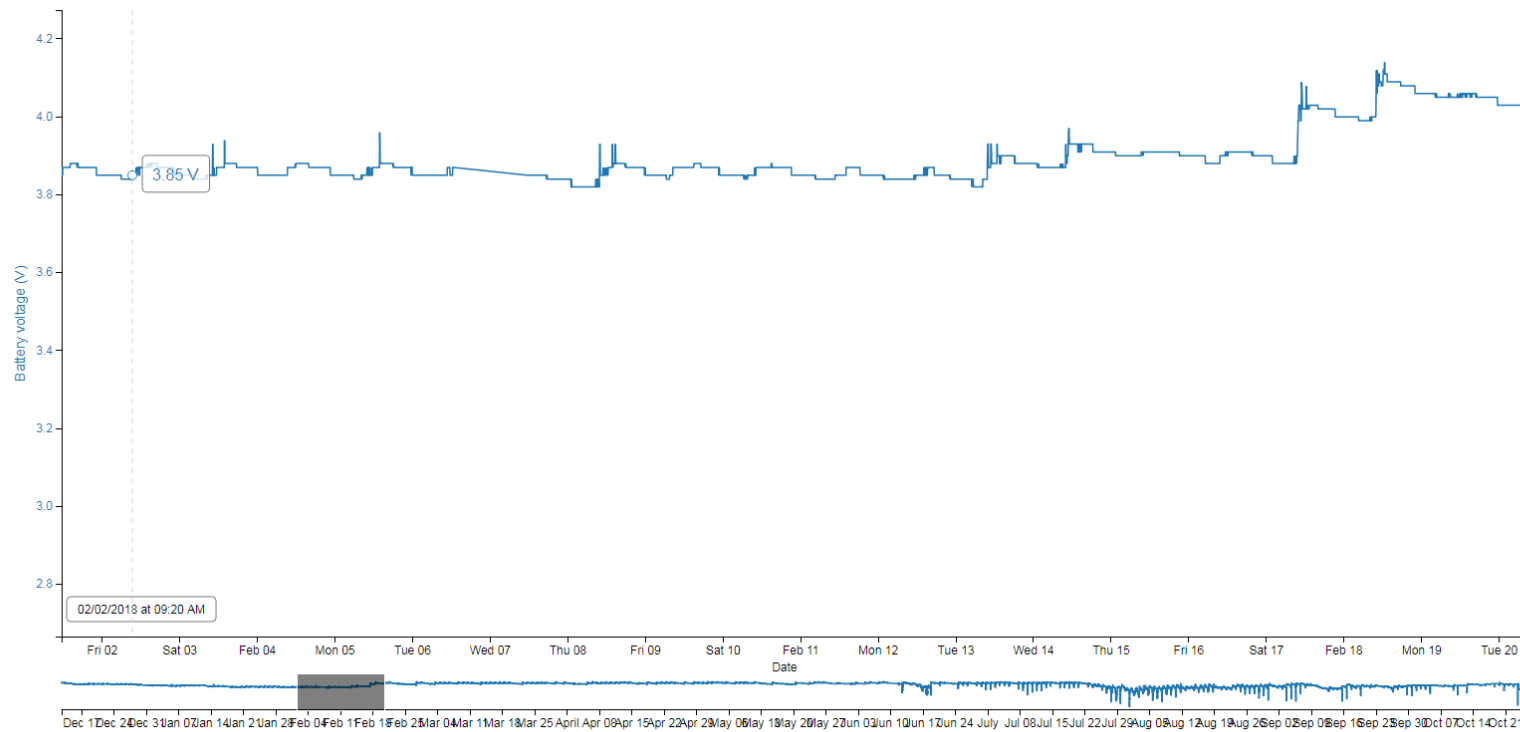
EnviroDIY sensor stations in MonitorMyWatershed

← → ↻ 🏠 Not secure | data.envirodiy.org/tsa/?sitecode=SHPK6S&variablecode=Decagon_CTD-10_Depth&view=visualization&plot=true 🔍 ☆ 🌐 D

📱 Apps 📄 Stroud Intranet 📄 StyleGuide - Stroud Int. 📄 IBXexpress 🌳 Delaware River Waters 🌐 Stream Reach Assessm. 🌱 EnviroDIY.org 📄 SWRC Logger Status V. 🌐 WebEx, STROUD WAT: 🌐 WikiWatershed: Fresh 🌐 GitHub EnviroDIY

 **EnviroDIY** Time Series Analyst

📍 Map 📄 Datasets 📊 Visualization



⚙️ Plot Options

All | Last Month | Last Week

Begin Date: 12/12/2017

End Date: 10/26/2018

Visualization: Time Series ▾

Plot

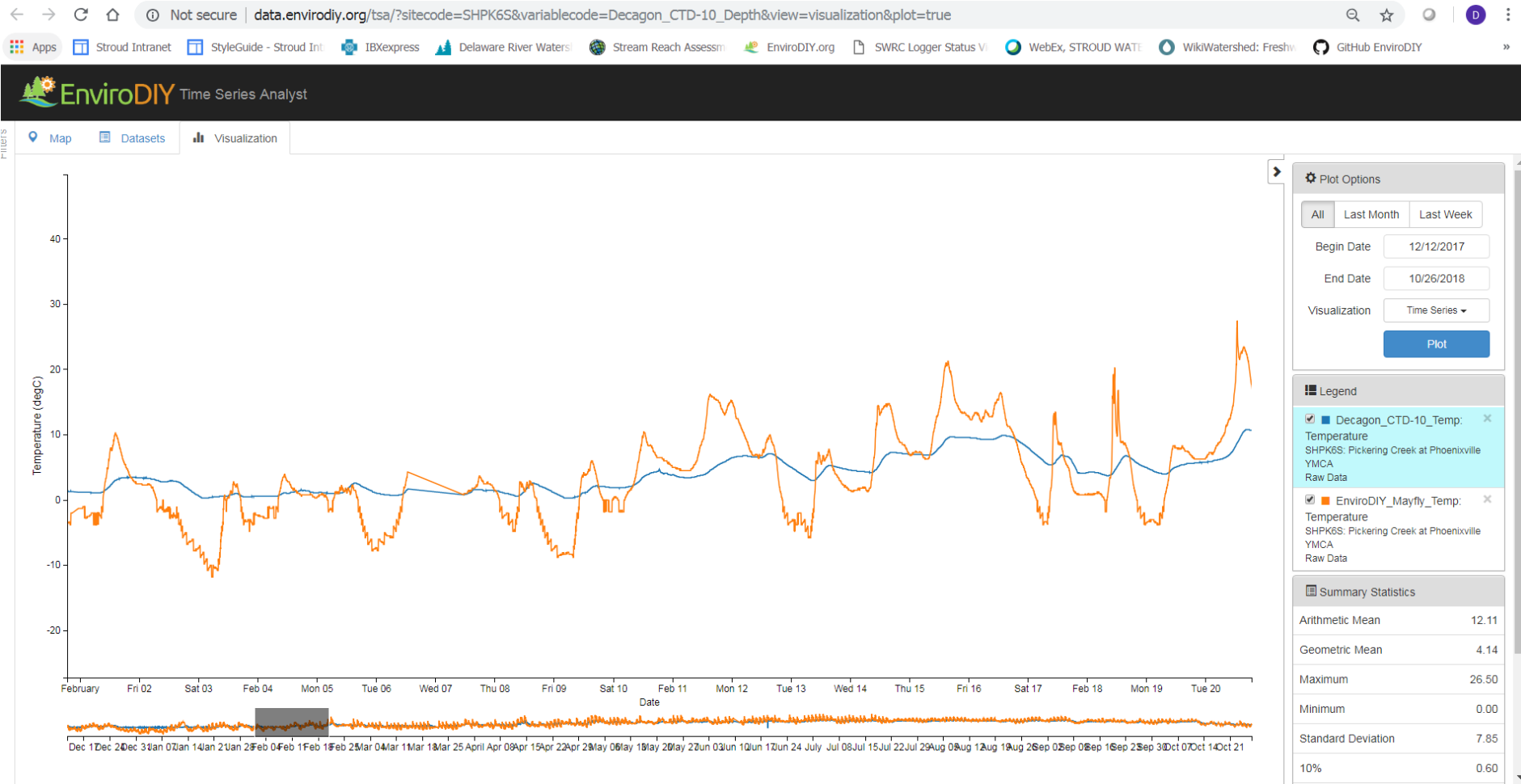
📋 Legend

- EnviroDIY_Mayfly_Batt: ✕
- Battery voltage
- SHPK6S: Pickering Creek at Phoenixville
- YMCA
- Raw Data

📊 Summary Statistics

Arithmetic Mean	4.00
Geometric Mean	2.61
Maximum	4.14
Minimum	2.80
Standard Deviation	0.11
10%	3.85
25%	3.93
Median, 50%	4.03
75%	4.08

EnviroDIY sensor stations in MonitorMyWatershed



Current Stroud Center sensor station support/facilitation – Delaware River Watershed Initiative

- Sensor stations to groups: building/coding, installation, station management and monitoring guidance
- 1:1 support
- Workshops
 - EnviroDIY introductory workshop
 - Support workshops
 - Watershed 101
- Manuals
 - Building/coding – building a station, programming Mayfly data logger board for specific sensors
 - Installation – site selection, installing equipment
 - Operation – management, data usage, supplemental sampling, rating curves, load calculation
- Online forum via Wikiwatershed.org (private DRWI group)
- Data sheets and online data entry
 - Field Visit Data form (<https://wikiwatershed.org/drwi/>)
 - Stream Discharge Data form
- Spreadsheet calculators
 - Stage to Area Predictor spreadsheet – predict wetted area for calculating discharge in unwadeable conditions
 - Discharge rating curve calculator spreadsheet – calculates discharge and incorporates into rating curve
 - Load calculation template spreadsheets – uses rating curve equations along with continuous sensor data to calculate sediment and chloride loads
- Online data and graphing
 - <http://monitormywatershed.org/>; <http://data.envirodiy.org/>;
<http://data.envirodiy.org/browse/>
 - <http://drwisensors.dreamhosters.com/> (temporary and backup)



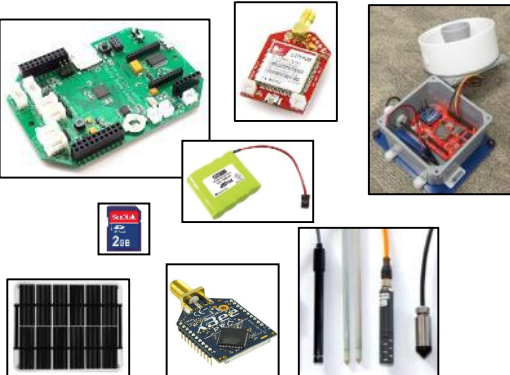
Intro EnviroDIY Workshop

Hardware Components and Sensors

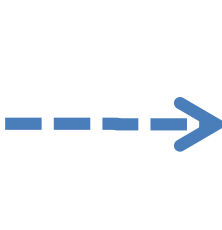
Programming with Open Source Software

Building Monitoring Stations

Strategies for Deployment



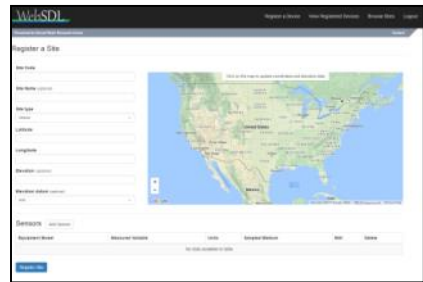
```
BinWiredDelay | Arduino 1.8.1
File Edit Sketch Tools Help
BinWiredDelay
This example code is in the public domain.
http://www.arduino.cc/en/Tutorial/BinWiredDelay
// constants won't change. Used here to set a pin number :
const int ledPin = LED_BUILTIN; // the number of the LED pin
// Variables will change :
int ledState = LOW; // ledState used to set the LED
// Generally, you should use "unsigned long" for variables that hold time
// The value will quickly become too large for an int to store
unsigned long previousMillis = 0; // will store last time LED was updated
// constants won't change : // interval at which to blink (milliseconds)
const long interval = 1000;
```



Quality Assurance and Control

Online System for Data Capture and Visualization

Data Management, Analysis, and Interpretation



User group support workshops and small group trainings

- For individuals who are already using sensor stations
- Time for discussion, networking, and updates; topics:
 - Maintenance/upkeep
 - Field procedures
 - Quality control procedures
 - Data analysis – usage of MonitorMyWatershed
 - Defining/refining goals for data usage



Field Visit Data sheet



EnviroDIY Field Visit Data

Enter all data online: wikiwatershed.org/drwi; password: drwi

Name(s): _____

Site ID: _____

Stream Name: _____

GPS (Lat/Long): _____

Photos? Yes/No _____

Precipitation last 24 Hours? Yes/No Amount: _____

General Notes/ Photo Descriptions: _____

LoggerID: _____

Location: _____

Date: _____ Arrival Time: _____ AM/PM? _____ *EST/EDT?

*EST=Eastern Standard Time; EDT=Eastern Daylight Time (Daylight Savings)

Water Clarity (Clear, Cloudy, Muddy): _____

SENSOR CLEANING (Recommended frequency: weekly or biweekly; monthly if only CTD sensor)

*Cleaned Sensors? Yes/No If Yes, exact time: _____ AM/PM? _____ EST/EDT? _____ *Clean >5 min. before grab sampling

GRAB SAMPLES (Rec frequency: Situational; for rating curves, collect when water is high/turbid or higher than normal conductivity)

Grab Sample Taken? Yes/No _____

Sample Number: _____

Bottle Type: _____

Lab Sent To: _____

Time collected (to minute): _____ AM/PM? _____ EST/EDT?

Volume: _____

Date Shipped: _____

Notes: _____

*SENSOR STATION DATA TO MATCH WITH GRAB SAMPLE LAB RESULTS (Complete in field or office)

Sensor station Conductivity (uS/cm): _____ Time (military): _____ Not applicable _____ Always EST

Sensor station Turbidity (NTU): _____ Time (military): _____ Not applicable _____ Always EST

**For use in Turbidity/TSS and Conductivity/Chloride rating curve development. Record sensor station Cond and Turb data at time nearest to grab sample collection time. Can be completed in field (by accessing online data) or in office (online or download from microSD card). Acquire final grab sample lab results from Stroud Center (or lab that processed sample).*

QUALITY CONTROL - WATER LEVEL DATA (Rec frequency: quarterly and/or more frequently as needed)

*Staff Gauge Height (m): _____ Time: _____ AM/PM? _____ EST/EDT?

*Sensor Station Water Depth (mm): _____ Time (military): _____ Not applicable _____ Always EST

*QC Sensor Station Water Depth (mm): _____ Time: _____ AM/PM? _____ EST/EDT?

Offset (=Staff Gauge Height - Sensor Station Water Depth)(mm): _____

a - Staff Gauge Height and Sensor Station Water Depth readings should be from about the same time (+/- 5 minutes).

b - Use metric ruler to measure from pressure transducer (white disc in CTD sensor) to water surface. Note - this depth measure may be slightly different from the sensor-measured depth but should be consistent over time.

QUALITY CONTROL - CHEMISTRY DATA (Rec frequency: quarterly and/or more frequently as needed)

Parameter	QC Hand-held Meter Result	QC Time	QC AM/PM?	QC EST/EDT?	Sensor Station Result	Sensor Station-Time (Military, EST)
Conductivity (uS/cm):			AM/PM	EST/EDT		
Temperature (degC):			AM/PM	EST/EDT		
Turbidity (NTU):			AM/PM	EST/EDT		
Dissolved Oxygen (mg/L):			AM/PM	EST/EDT		

QUALITY CONTROL CHEMISTRY FIELD METER INFORMATION

Parameter	Field Meter Brand/Model/Serial # or unique ID	Meter calibrated?	Standard	Calibration
Conductivity (uS/cm):		Yes/No		
Temperature (degC):		Yes/No		
Turbidity (NTU):		Yes/No		
Dissolved Oxygen (mg/L):		Yes/No		

SENSOR STATION MAINTENANCE

Sensors Submerged? Yes/No
If no or partially, describe in Notes. _____

Location of Sensors Changed? Yes/No
If yes, explain in notes. *Please consult Stroud Center before changing location of sensors. _____

Retrieved Memory Card? Yes/No
(Rec frequency for QC: quarterly if online; biweekly-monthly if not online) _____

Changed Batteries? Yes/No _____

Cleaned Solar Panel? Yes/No _____

Other sensor station maintenance? Yes/No
(If Yes, describe in Notes) _____

Notes (Describe specific sensor station management actions and any other issues): _____

OTHER IN-SITU PARAMETERS (e.g., Nitrate, Phosphate, Chloride, pH, Dissolved Oxygen)

Parameter	Result	Brand/Model

OTHER INFORMATION

Field Duplicate Taken of Grab Sample? Yes/No _____

Flow Measurement w/ Neutrally Buoyant Object? Yes/No _____

Performed Cross Section Survey? Yes/No _____

Flow Measurement w/ another method? Yes/No _____

Flow Measurement w/ Flow Meter? Yes/No _____

If Yes, explain in Notes _____

Manuals

Operation Manual in use now



EnviroDIY Sensor Station Operation Manual

Sensor station management and use in stream monitoring - station maintenance, time-series data curation, supplemental data collection, rating curve development, and discharge and load calculations

Comprehensive manual being finalized



EnviroDIY Sensor Station Manual

Programming, building, installing, and managing an EnviroDIY Sensor Station



Delaware Basin online group

https://wikiwatershed.org/groups/delaware-basin-sensor-stations/

intranet | StyleGuide - Stroud Int. | IBXexpress | Delaware River Waters | Stream Reach Assessm | EnviroDIY.org | SWRC Logger Status Vi | WebEx, STROUD WATE | WikiWatershed: Freshw | Git



About Model Monitor Community Help News Events David Bressler 1

Web Tools Advancing Knowledge and Stewardship of Fresh Water

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Delaware Basin Sensor Stations



Leave Group

Your email status is All Email [\(change\)](#)

Hidden Group 10 days ago

Facilitating communication and collaboration among individuals managing sensor stations and conducting supplemental sampling and data collection in the Delaware River Basin.

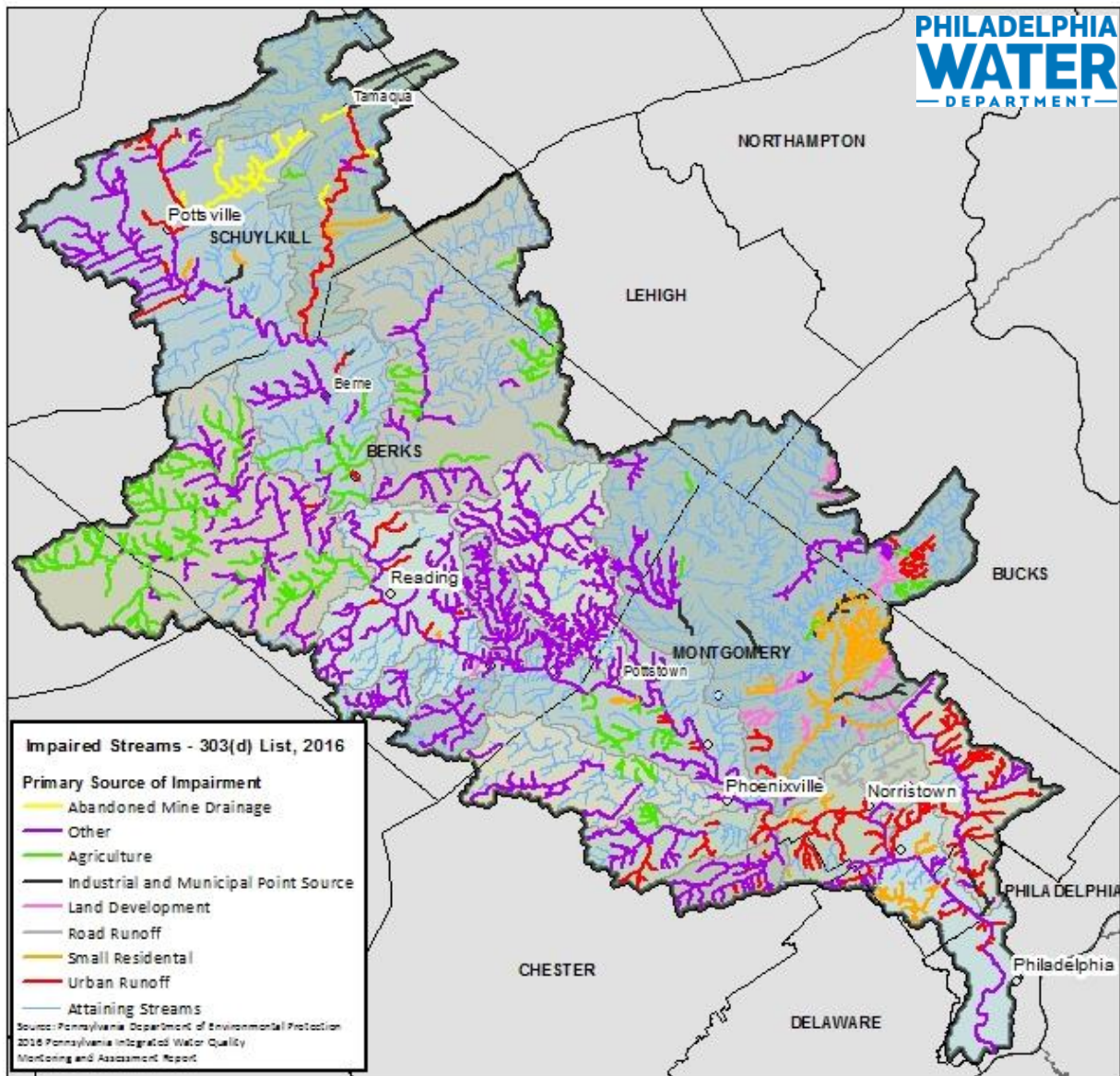
Home Forum Uploaded Files 110 Members 116 Send Invites Send Email Email Options Manage

RSS SHOW: Everything

Questions?

David W. Bressler
Citizen Science Project Facilitator
Stroud Water Research Center
410-456-1071 (mobile)
610-268-2153 x312 (office)
dbressler@stroudcenter.org

Appendix E: 303(d) List Map of Impaired Streams



303(d) Listed Streams for Impairment in the Schuylkill River Watershed by Primary Source of Impairment (PADEP 2016)

This map shows the primary source of impairment for streams on the 2016 303(d) list. Portions of the Perkiomen Creek (5.6 miles) and unnamed tributaries to the Perkiomen Creek (1.5 miles), originally listed in 2016, were delisted for impairments from pathogens in 2016 (PADEP, 2016).

Appendix F: WCP Program Change Approval – March 2016



Debra McCarty, Water Commissioner

Ms. Zahra Nucci
Safe Drinking Water Program Manager
Southeast Regional Office
Pennsylvania Department of Environmental Protection
2 East Main Street
Norristown, PA 19401

February 29, 2016

Dear Ms. Nucci,

In compliance with the Environmental Protection Agency National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), Philadelphia Water (PWD) submitted a Watershed Control Plan (WCP). The WCP was approved in December 2012, and the third of five implementation years was completed in 2015. In accordance with 40 CFR §141.716 which states, "If a system determines during implementation that making a significant change to its approved watershed control program is necessary, the system must notify the State prior to making any such changes," Philadelphia Water is requesting to make a change to the approved WCP.

In the WCP, control measures to reduce *Cryptosporidium* in Philadelphia's source watershed are identified for implementation during the five-year timeline. The table below lists the control measures.

WCP Control Measure	Project Description
Wastewater Treatment Plant (WWTPs) Upgrades	Track ultraviolet disinfection installation at two WWTPs
Farm Best Management Practices (BMPs)	Manure storage basins at five farms
	Riparian buffers at five farms
Comprehensive Nutrient Management Plans	Comprehensive Nutrient Management Plans for five farms
Riparian Buffer Planting	Riparian buffer planting at one site
Waterfowl Management	Waterfowl management at priority sites in Philadelphia for five years

Philadelphia Water requests a minor wording change to the farm BMP control measure obligation, which presently includes "**supporting the installation of manure storage units on at least five separate farms; [and] supporting the installation of vegetated buffers on at least five separate farms**" (WCP, Appendix A, page 9). PWD is requesting a change to the farm BMP control measure obligation to include "**supporting the installation of manure storage basin(s) AND/OR riparian buffer(s) at ten separate farms.**" This change will maintain the same level of source water protection achieved through the WCP by implementing BMP control measures at ten farms. To date, PWD has supported implementation of six manure storage basins in the source watershed. With this change, PWD is requesting the flexibility to implement more manure storage basins if projects become available. PWD believes this change should be made for the following reasons:

- 1. Experts in stormwater and nutrient management on farms recommend a holistic approach to BMP implementation.**

PWD implements agricultural BMPs by leveraging funding through the Schuylkill River Restoration Fund and expertise from Schuylkill Action Network (SAN) partners including the Natural Resource Conservation Service, Berks Nature and Berks County Conservation District. These experts, on whom PWD relies to select projects with the greatest positive

impact on the watershed, take a holistic approach when implementing BMPs on a farm. A holistic approach controls animal waste and stormwater on a farm by choosing a combination of BMPs that address all nutrient and stormwater management issues.

2. Manure storage basins protect groundwater from contamination in addition to surface waters.

Many farms entering into agreements for the implementation of BMP projects on their property are identified by the SAN as priority farms but do not have streams and riparian corridors directly on the property. This does not make animal waste and stormwater management on the site any less important. With manure stored in open piles or earthen lagoons, both surface water and groundwater are at risk for contamination. The karst and limestone geology in the Berks County region allows groundwater to move quickly beneath the ground surface. Groundwater contaminated by improperly stored manure on a farm may be contributing flow to nearby creeks making surface waters not on the property vulnerable to contamination as well. It is critical that contaminants to ground and surface waters are controlled at the source: the location the manure is produced and stored.

3. When compared, manure storage basins and riparian buffers provide equivalent removal of *Cryptosporidium* from stormwater.

*As part of the WCP, PWD provided a quantitative assessment of the relative impact of contamination sources and source water protection initiatives on water quality at the Queen Lane intake (WCP, Appendix A, page 17). The assessment estimates that manure storage basins detain 100% of *Cryptosporidium* on site, and riparian buffers filter 99% of *Cryptosporidium* from stormwater before it enters the stream. For this reason, PWD considers both manure storage basins and riparian buffers on farms in Berks County to provide an equivalent removal of *Cryptosporidium* from stormwater.*

In line with these three justifications, PWD has supported the implementation of manure storage basins on farms for the first three years of WCP implementation, and wishes to continue to support the BMPs recommended by the expertise of SAN partners. A change in the requirements to allow implementation of manure storage basin(s) AND/OR riparian buffer(s) at ten separate farms will best reflect the holistic approach taken by experts and provide flexibility for best addressing nutrient and stormwater management issues at selected priority farms.

If you have questions, please do not hesitate to contact us. We look forward to your review of the requested change to the PWD WCP.

Sincerely,

Kelly Anderson
Source Water Protection Program
Office of Watersheds
1101 Market Street, 4th Floor
Philadelphia, PA 19107
(215) 685-6245

CC:

Chris Crockett
Marc Cammarata
Kevin Smith
Elizabeth Ventura



March 9, 2016

Ms. Debra McCarty, Water Commissioner
Philadelphia Water Department
1101 Market Street
Philadelphia, PA

Re: Philadelphia Water Department – Queen Lane Intake
Watershed Control Program Plan 2016 program change letter
PWSID 1510001

Dear Ms. McCarty:

Thank you for submitting to the Pennsylvania Department of Environmental Protection a copy of your letter indicating a program change, dated February 29, 2016, regarding the Watershed Control Program Plan for the Queen Lane Intake. Please be advised that your submission satisfies Philadelphia Water Department's obligation related to Chapter 109, Safe Drinking Water regulations, Section 109.1204(b)(4)(i), and this information has been made part of the file.

If you have any questions regarding this matter, please contact Mr. Kevin Smith of our office at 484.250.5131.

Sincerely,

A handwritten signature in blue ink that reads "D. J. Bolig". The signature is written in a cursive style with a large initial "D" and "B".

David J. Bolig, P.E., P.L.S.
Environmental Engineer Manager
Safe Drinking Water

Cc:

Ms. Kelly Anderson - PWD
Mr. Smith-SDW
Mr. Bolig - SDW
File (kr16sdw) 067-2

Southeast Regional Office