

2015 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

BCCD	Berks County Conservation District
BMP	Best Management Practice
CAC	Citizens Advisory Council
CDC	Community Design Collaborative
CSO	Combined Sewer Overflow
DRBC	Delaware River Basin Commission
EPA	United States Environmental Protection Agency
EWS	Early Warning System
FWWIC	Fairmount Water Works Interpretive Center
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 Dataset
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
PWD	Philadelphia Water Department
SAN	Schuylkill Action Network
SAS	Schuylkill Action Students
SRHA	Schuylkill River Heritage Area
SRRF	Schuylkill River Restoration Fund
SWA	Source Water Assessment
SWPP	Source Water Protection Plan
WCP	Watershed Control Plan
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
USDA	United States Department of Agriculture

Section 1 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 are being achieved through previously established and ongoing efforts of the PWD's Source Water Protection Program and through WCP actions aimed to specifically reduce levels of *Cryptosporidium* in the Schuylkill River watershed, Philadelphia's drinking water source. The following report documents PWD's progress towards WCP initiatives during 2015, the third year of the 5-year plan.

Section 2 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. 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 is required. PWD has 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 2-1.

Table 2-1: 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
Bin classification and supporting data from 2nd round of monitoring due to State		October 2017
	2017 Annual Status Report due to State	January 2018

Section 3 2015 Progress towards 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 workgroups to address a number of watershed issues: acid 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/Compliance 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, and animal vectors, and education and outreach in the City and watershed wide. This section discusses the progress PWD has made towards each of the ongoing and proposed initiatives by category.

3.1 Wastewater Discharge/Compliance

Effluent from WWTPs upstream of the PWD Queen Lane intake is a source of *Cryptosporidium* in the watershed (PWD, 2002; PWD, 2011). Although approximately 2% of the Schuylkill River watershed is in Philadelphia, PWD plays a leadership and supporting role in multiple initiatives outside of the City of Philadelphia. 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 the City of Philadelphia and in the Schuylkill River watershed are detailed in Table 3-1 and Table 3-2, both reproduced from the WCP. Progress made in 2015 towards these initiatives is summarized in this section.

Table 3-1: Ongoing Wastewater Discharge/Compliance SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>3.1.1 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>3.1.2 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>3.1.3 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>3.1.4 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>3.1.5 SAN Pathogens/Compliance Workgroup Continue to support efforts of the SAN Pathogens/Compliance Workgroup. The strategies for the 2015 SAN Pathogens/Compliance Work Plan are as follows: 1) Improve discharger/water supplier communication of events and use of the Delaware Valley Early Warning System and PAWARN, 2) identify priority wastewater discharges/issues in the watershed and formulate action plans to address them, 3) provide support (financial, information, expertise, collaborative problem-solving) for partners/communities to implement projects that reduce priority discharges, and 4) provide a forum for partner and agency communication and coordination around discharge issues and the formulation of creative new ideas and approaches for solving related problems.</p>
	<p>3.1.6 Abate Wildcat Sewers Continue to support SAN in its efforts to identify and abate wildcat sewers throughout the Schuylkill River watershed.</p>

Table 3-2: Proposed Wastewater Discharge/Compliance SWPP Initiatives

Project Location	Project Overview
Phila- delphia	<p>3.1.7 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>
Schuylkill River Watershed	<p>3.1.8 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> <p>3.1.9 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>3.1.10 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>3.1.11 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>

3.1.1 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. Philadelphia's Act 537 Plan was last updated in 2009.

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

Each year, PWD summarizes its activities and programs pertaining to the management of stormwater in combined and separate sewers in accordance with Philadelphia's CSO and MS4 NPDES permits. A major component of Philadelphia's CSO NPDES permit requirements is the implementation of the Long Term Control Plan Update (LTCPU), *Green City, Clean Waters*. *Green City, Clean Waters* is a 25-year plan with a green stormwater infrastructure-based approach to reduce pollutants discharged by the combined sewer system. The 2015 fiscal year report is available to the public on phillywatersheds.org.

3.1.3 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 flow water quality data and a central website where users can access event information, analysis tools and data.

In 2015, PWD was awarded the 2015 Governor's Award for Environmental Excellence for the Tidal Spill Trajectory Tool developed using a \$295,000 grant awarded to PWD by the Maritime Exchange for the Delaware River and Bay. The Tidal Spill Trajectory Tool was launched in 2014 and expands EWS capabilities to include predicting a contaminant spill path and contaminant plume arrival times at tidal intakes in the lower Delaware River. In 2015, PWD also initiated a strategic planning process beginning with an Executive Steering committee meeting in May and the distribution of a user survey. Additionally, the first chemical rail company, Eddystone Rail Company, joined the EWS partnership in 2015.

3.1.4 Provide Project Support for the Lehigh University Cryptosporidium Study

Through the Lehigh University *Cryptosporidium* project, PWD and Lehigh University collaborate to develop sampling programs to better understand the occurrence, sources and vectors of *Cryptosporidium* in the Schuylkill River watershed. For almost a decade, Lehigh University has been contracted by PWD to support PWD's continuing research surrounding *Cryptosporidium* in Philadelphia's source water and watersheds. Sampling programs are designed to answer research questions and improve and expand methods for field sample collection and laboratory analysis of *Cryptosporidium*. In past studies, PWD has provided sampling, project management and oversight. PWD regularly communicates with project partners at Lehigh to create solutions to address issues encountered in the field and lab, incorporate improvements and expand the

project. From July 2013 through March 2015, PWD collected samples twice per month in Philadelphia. Beginning in October 2015, PWD began collecting samples twice per month in both Philadelphia and the surrounding suburban area. More information on the research beginning in 2015 is in Sections 3.1.11, 3.2.6, and 3.3.3.

3.1.5 SAN Pathogens/Compliance Workgroup

The strategic goal of the SAN Pathogens/Compliance Workgroup is to improve NPDES compliance, reduce discharges from unsewered communities and prevent drinking water illness outbreaks. The SAN Pathogens/Compliance Workgroup has four strategies to address this goal: improve discharger and water supplier communication of events and use of EWS, identify priority wastewater discharges and issues in the watershed and formulate action plans to address them, provide support for partners and communities to implement projects that reduce priority discharges, and provide a forum for partner and agency communication and coordination around discharge issues and the formulation of creative new ideas and approaches for solving related problems. PWD regularly attends quarterly SAN Pathogens/Compliance Workgroup meetings. The minutes for the meetings in 2015 are included in Appendix A.

3.1.6 Abate Wildcat Sewers

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 SAN Pathogens/Compliance workgroup led efforts address 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/Compliance Workgroup. In 2015, PWD embarked on 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 and personal communication with a contracted engineering firm on projects addressing wildcat sewers in the Schuylkill River watershed. This wildcat sewer project update is included in Appendix B and will serve as a working document as additional information is available.

3.1.7 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 Source Water Protection Program capabilities and responses to unplanned source water events. Water quality data from PWD's drinking water treatment 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. The draft is currently pending internal review.

3.1.8 Support *Cryptosporidium* Monitoring at Major WWTPs and Inclusion in NPDES Permits

PWD regularly attends the quarterly SAN Pathogens/Compliance Workgroup meetings. Through this involvement, PWD supports the development of 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.

3.1.9 Track Wastewater Related Changes in the Watershed

Through the SAN Pathogens/Compliance 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 under LT2. An updated map of the WWTPs in the Schuylkill River watershed upstream of Philadelphia is included in Appendix C. 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).

3.1.10 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/Compliance Workgroup. However, the workgroup has met challenges with legal implications while planning the content for the workshop, and the planning of the workshop is currently on hold.

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

In collaboration with Lehigh University in past years, PWD has funded and conducted research investigating the impact of WWTP effluent on the presence *Cryptosporidium* in the Wissahickon Creek watershed, a tributary to the Schuylkill River directly upstream of the PWD Queen Lane intake. From July 2013 through August 2014, Lehigh University and PWD collected *Cryptosporidium* samples twice per month at the Schuylkill River, near the Queen Lane intake, and in a tributary to the Wissahickon Creek. Monitoring in the Wissahickon tributary was extended through March 2015. *Cryptosporidium* was detected at both sites. In conjunction with this monitoring, Lehigh University is also developing a more cost effective alternative to the EPA sampling method. The EPA method requires filtering a 10 liter volume of water for one *Cryptosporidium* sample.

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. The sampling plan aligns with the timeline for Round 2 LT2 *Cryptosporidium* monitoring. Sampling sites include the Wissahickon Creek, the Schuylkill River near the USGS Norristown and Berne gage stations, the Tulpehocken Creek and Lake Ontelaunee. PWD is partnering with two other water suppliers: Western Berks Water Authority and Reading Area Water Authority. Samples will be analyzed at Lehigh University to determine the species of any *Cryptosporidium* detected and assist in source tracking. The project will also document watershed conditions including rainfall, streamflow, and WWTP flow and overflow events as available to correlate with *Cryptosporidium* sample results. The water quality profile at all five sampling locations may be influenced by upstream WWTPs.

3.2 Agricultural Land Use and Runoff

Animal manure-laden runoff from agricultural land is a source of *Cryptosporidium* and pathogens in the Schuylkill River watershed (PWD, 2002; PWD, 2011). Much of PWD efforts to address agricultural runoff occur upstream of the PWD intakes because the agricultural land within the City of Philadelphia 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 3-3 and Table 3-4 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 progress made in 2015 towards each initiative listed.

Table 3-3: 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	3.2.1 SAN Agriculture Workgroup
	Continue to be an active participant in the SAN Agricultural Workgroup and support future efforts. The strategies for the 2014 SAN Agricultural Work plan are as follows: 1) support implementation of projects that demonstrate BMPs and/or creative solutions for agriculture in priority areas (with funding, information, expertise, collaborative problems, solving, etc.), 2) provide a forum for partner and agency communication and coordination around agricultural impacts and issues and the formulation of creative new ideas and approaches for solving related problems, 3) promote agricultural BMP successes and understanding of agricultural water quality issues and solutions to target audiences in the watershed through an educational/outreach program, and 4) monitor the impacts of agricultural BMP installations on stream water quality.

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

Project Location	Project Overview
Philadelphia	3.2.2 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.
	3.2.3 Natural Lands Trust and Erdenheim Farm
The National Lands Trust (NLT) is currently performing stream restoration on a tract of land on Erdenheim Farm, located in the Wissahickon 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 the NLT to install additional agricultural BMPs at the farm.	
3.2.4 Land Use in the Schuylkill River Watershed	
As part of the SWA update process, PWD plans to re-assess land use in the Schuylkill River watershed. To complete this update, the 2001 National Land Use Database will be used, along with more current information from the 2010 Census.	

Schuylkill River Watershed	<p>3.2.5 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>3.2.6 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>3.2.7 Promotion of SAN Agriculture Projects</p> <p>Through involvement in the SAN Agriculture Workgroup, PWD will continue to work with partners and state and federal officials 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>3.2.8 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 assess the status of their NPDES permits.</p>
	<p>3.2.9 Schuylkill River Restoration Fund 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’s commitment through the SRRF will address priority stormwater and pathogen concerns while promoting the importance of watershed partnerships.</p>

3.2.1 SAN Agriculture Workgroup

The strategic goal of the SAN Agricultural Workgroup is to maximize reduction and/or prevention of agricultural impacts to water quality. The SAN Agricultural Workgroup has four strategies to address this goal: support implementation of projects that demonstrate BMPs and creative solutions for agriculture in priority areas, provide a forum for partner and agency communication and coordination around agricultural impacts and issues and the formulation for creative ideas and approaches to solving related problems, promote agricultural BMP success and understanding of agricultural water quality issues and solutions to target audiences in the Schuylkill River watershed through education and outreach, and monitor the impacts of agricultural BMP installations on stream water quality. PWD regularly attended quarterly SAN Agriculture Workgroup meetings. The minutes for the meetings in 2015 are included in Appendix A.

3.2.2 PWD In-City Agricultural BMPS

PWD served on the Saul Task Force for the Community Design Collaborative (CDC) with community members and other stakeholders for the pre-development planning of a master plan for the school's campus. In 2015, the CDC completed a master plan for Saul High School. Additionally, the Natural Resource Conservation Service (NRCS) performed an Engineering Inventory and Evaluation Report. 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 solution options to address each issue. PWD is coordinating internally to determine resources available to support projects to manage stormwater and protect drinking source water on Saul High School's campus.

3.2.3 Natural Lands Trust and Erdenheim Farm

Erdenheim Farm is located in Lafayette Hill on the Wissahickon Creek. 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 Wissahickon Creek. Additionally, a 96-acre parcel of Erdenheim Farm was purchased by Natural Lands Trust for preservation from development in 2009. In 2013, PWD reached out to Natural Lands Trust to express interest in collaboration on future projects at Erdenheim Farm. PWD is not aware of any new projects in the planning phase for Erdenheim Farm.

3.2.4 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 included in Appendix D.

3.2.5 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. 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.

3.2.6 Agricultural BMP Monitoring for *Cryptosporidium*

In October 2015, 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 influence 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).

3.2.7 Promotion of SAN Agriculture Projects

In 2014, PWD and PDE completed a BMP guide for agricultural properties in the Schuylkill River watershed. 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.

Additionally, in November 2015, PWD and PDE visited the three farms receiving grants from the SRRF in 2015, detailed in Section 4.2.1. PWD public affairs published a blog post on the visit, entitled *Out to Pasture: Philly Tours Farms Protecting Our Source Water*. The post promotes agricultural BMP projects and tells the story of farmers and watershed partners working together to create better farms and cleaner waterways in the Schuylkill River watershed. The post can be viewed at www.phillywatersheds.org/blog.

3.2.8 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 2015, PWD received updated CAFO data from PADEP including number of animal equivalent units and primary animal for each operation. An updated map is included in Appendix E of this report.

3.2.9 Schuylkill River Restoration Fund Grants for Agriculture BMP Projects

PWD contributes financial support to and participates in the SRRF grant selection process. PWD identifies and advocates for high priority projects. In 2015, PWD supported the selection of three farms to receive SRRF grants for agricultural BMP projects: the Dalton Beihl farm, the David Rice farm, and the Floyd Kurtz farm. The SRRF projects are discussed in more detail in Section 4.2.1.

3.3 Animal Vectors

Animals in the Schuylkill River watershed serve as mechanical vectors of *Cryptosporidium*, transferring viable oocysts from original hosts. Geese in particular are vectors, as identified in PWD and Lehigh University source tracking studies (Jellison et al., 2009; Jellison, 2010a). Table 3-5 and Table 3-6 outline the SWPP ongoing and proposed initiatives that aim to reduce the impact of animal vectors near PWD's Queen Lane and Belmont intakes and expand implementation of animal vector control in the Schuylkill River watershed. This section explains the progress made in 2015 towards each initiative listed.

Table 3-5: Ongoing Animal Vectors SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>3.3.1 Belmont Meadow Extension and Intake Project</p> <p>Maintain plantings at the site of the Belmont Meadow Extension/Intake project. Continue to monitor goose activity around the Belmont intake.</p>
	<p>3.3.2 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>3.3.3 Lehigh University <i>Cryptosporidium</i> Source Tracking</p> <p>Continue to support Lehigh’s source tracking research to further identify and understand the animals that serve as mechanical vectors of <i>Cryptosporidium</i> in the watershed.</p>

Table 3-6: Proposed Animal Vectors SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>3.3.4 Goose Measures at Fairmount Park Properties</p> <p>Identify and implement appropriate goose control measures at Fairmount Park properties, including Peter’s Island, and incorporate educational signage in these areas.</p>
	<p>3.3.5 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 along with PWD’s three WWTPs.</p>
Schuylkill River Watershed	<p>3.3.6 Animal Vector Education and Outreach in the Watershed</p> <p>As part of the Source Water Protection Program’s education and outreach efforts, raise awareness of the threat animal vectors pose to our drinking water supplies. These efforts may focus on supporting Lehigh’s efforts to publish scientific journal articles.</p>

3.3.1 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, 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 2015, the Belmont meadow and intake plantings were maintained by Philadelphia Parks and Recreation to continue deterring geese from the area.

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

In 2015, PWD continued education and outreach efforts concerning the management of animal vectors in the Schuylkill River watershed. In partnership with PDE, PWD annually hosts the Spokes Dog contest. Two dogs are selected to be the Philly's Best Friend Spokes Dog and serve for one year as ambassadors educating dog owners on the importance of picking up pet waste. 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, but no implementation timeline has been determined. PWD will continue to follow the plan status and look for opportunities to align source water goals with the plan, such as including education signage on geese as vectors of pathogens in Fairmount Park.

3.3.3 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 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. *Cryptosporidium* samples collected at each site will be genotyped. Additionally, Lehigh University and PWD will collect watershed data including streamflow, rainfall and WWTP discharge data to correlate with *Cryptosporidium* sample results.

3.3.4 Goose Measures at Fairmount Park Properties

In 2015, under a PWD contract with the USDA, goose control measures were implemented at a number of 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. This effort is discussed in greater detail in Section 4.5 of this report.

3.3.5 Waterfowl Management at PWD Facilities

In 2015, under a PWD contract with the USDA, goose control measures were implemented at PWD's 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. This effort is discussed in greater detail in Section 4.5 of this report.

3.3.6 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.

3.4 Education and Outreach

Education and outreach initiatives are a critical component of PWD SWPP because point 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 3-7 and Table 3-8 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 2015 towards each initiative listed.

Table 3-7: Ongoing Education and Outreach SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>3.4.1 Watershed Partnerships in the City Remain an active participant in the watershed partnerships and begin integrating drinking water issues into the scope of work for the Wissahickon Watershed Partnership.</p>
	<p>3.4.2 Annual Water Quality Report Continue to submit a comprehensive annual water quality report that emphasizes critical source water issues and, in particular, educates customers as to the research initiatives and implementation strategies PWD is using to reduce the risk of <i>Cryptosporidium</i> contamination.</p>
	<p>3.4.3 Water Quality Council Continue to convene the Water Quality Council (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>3.4.4 Improve Environmental Quality of Philadelphia Fairmount Park System Continue to work with Fairmount Park to improve the environmental quality of the City’s parks and streams through land management practices and BMP implementation.</p>
	<p>3.4.5 Maintain Fairmount Water Works Interpretive Center Continue to maintain the FWWIC and promote source water protection through the center’s various exhibits and learning programs.</p>
	<p>3.4.6 Philly RiverCast Continue to operate Philly RiverCast and promote the web-based recreational warning system.</p>
Schuylkill River Watershed	<p>3.4.7 Active Members of SAN Pathogens/Compliance and Agricultural Workgroups Continue to be an active member of the SAN Pathogens/Compliance and Agricultural workgroups and support initiatives outlined in the annual work plans.</p>
	<p>3.4.8 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>3.4.9 Schuylkill River Restoration Fund Continue to support the SRRF to achieve implementation of BMPs at high-priority sites in the watershed.</p>

Table 3-8: Proposed Education and Outreach SWPP Initiatives

Project Location	Project Overview
Philadelphia	<p>3.4.10 Implement In-City Source Water Programs in East Falls, Roxborough and Manayunk</p> <p>Implement in-city source water programs in the East Falls, Roxborough, and Manayunk neighborhoods along the Schuylkill River. These programs will involve the implementation of stormwater management practices, storm drain labels and a dog waste control program. Through the programs, 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>

3.4.1 Watershed Partnerships in the City

PWD supports a contract with the Pennsylvania Environmental Council (PEC) for regional watershed coordination 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 pilot a new grant program, Soak It Up! Adoption. This program provides grants to civic organizations to help maintain green stormwater infrastructure. This infrastructure is designed under the *Green City, Clean Waters* initiative to reduce stormwater runoff captured in CSOs. Organizations receiving grants were asked to participate in an introductory training, monitor green stormwater infrastructure, collect trash and provide feedback on the site to PWD. Seven new organizations were accepted into the program in fiscal year 2015 increasing the total number of organizations to fourteen. Throughout the year, these organizations held guided tours, interactive presentations at local public schools and seasonal replanting activities to highlight their adopted infrastructure. More information is available in Philadelphia's Wet Weather Management Programs Annual Report for fiscal year 2015 available on phillywatersheds.org.

3.4.2 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 2015 shares 2014 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. Although the EPA does not require this breadth of information on source water protection to be included in the annual water quality report, PWD takes a proactive approach to customer education.

3.4.3 Water Quality Council

In 2001, the Water Quality Citizens Advisory Council (CAC) was formed by a merger of the Stormwater and the Drinking Water Quality CACs. The merger of the two CACs, into what is now referred to as the Water Quality Council, complements the WCP as a holistic approach to water quality issues (PWD, 2011). PDE currently facilitates the Water Quality Council committee meetings.

3.4.4 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 planning process was completed in 2014 with no implementation timeline determined. PWD will continue to follow the plan status and look for opportunities to align source water goals with the plan.

3.4.5 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. In February 2015, the Source Water Protection Program participated in the FWWIC Teacher Fellowship Program sharing PWD source water protection efforts with teachers. The program is designed to help middle school teachers develop an urban watershed curriculum for their students.

3.4.6 Philly RiverCast

PWD continues to promote and maintain Philly RiverCast. The website has received over 800,000 visits since its launch in 2005. In 2015, the Source Water Protection Program and Public Affairs at PWD began developing a communication plan for RiverCast including strategies to make the tool more user friendly.

3.4.7 Active Members of SAN Pathogens/Compliance and Agricultural Workgroups

PWD regularly attends quarterly SAN Pathogens/Compliance and Agricultural Workgroup meetings. The 2015 meeting minutes for both workgroups are included in Appendix A. In 2015, the SAN began planning for a SAN website upgrade and redesign, which is slated for 2016 pending funding availability.

To support education and outreach in 2015, 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 towards agricultural BMP projects in Berks County in the Schuylkill River watershed through the Berks Watershed Restoration Fund.

A number of SAN Pathogens workgroup members are a part of the Berks County Water and Sewer Association which held its annual conference in July 2015. The theme of the conference was “Partnership: the Path to Clean Water”, and more than 150 water and sewer providers, municipal, state and county officials, environmental consultants and engineers attended. A Water Supplier Forum was also planned for 2015 but was postponed due to state budget restrictions. The agenda includes presentations and discussion on emerging contaminants led

by RAWA and a case study of the June 2015 Miller Chemical Fire led by PADEP. Contamination to the Conewago Creek from the event killed more than 10,000 fish and the drinking water supply for New Oxford, Pennsylvania was offline for three months. The Water Supplier Forum will be rescheduled for early 2016.

3.4.8 Collaboration with Partnership for the Delaware Estuary

PWD continued to contribute financial resources towards collaboration efforts with PDE on a number of 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 SAN. In 2015, PDE coordinated the 2015 Philly's Best Friend Spokes Dog Competition, organized an annual clean water art contest for Philadelphia students receiving over 1,300 entries, and hosted the annual Coast Day at Penn's Landing in Philadelphia. Additionally, PDE aided coordination of the annual Schuylkill Scrub cleanup effort partnering this year with the Keep Pennsylvania Beautiful. PDE collected photo entries for a monthly Schuylkill Shots photo contest and one larger Delaware Estuary "Every Stream Matters" photo contest with a Schuylkill Shots category. The winners were displayed at the PDE Experience the Estuary Celebration and at the Delaware Museum of Natural History from November 2 through December 14. In 2015, PDE continued its freshwater mussel survey program. Workshop information, training, guidebooks, data sheets, and a reporting system are available for volunteers online at www.delawareestuary.org/mussel-survey-program. The program shows volunteers how to survey streams for mussels and help researchers catalog freshwater mussels in the watershed.

3.4.9 Schuylkill River Restoration Fund

PWD continues to support the SRRF. In 2015, PWD contributed \$100,000 to the SRRF, and staff participated in the review of grant applications and the selection of the recipients. . The SRRF is discussed in more detail in section 4.2.1 of this report.

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

First steps to implement source water programs in East Falls, Roxborough and Manayunk neighborhoods are in progress. Dobson Elementary School received a grant from the SRRF in 2015 to install a woodland walk and native meadow. Additionally, as detailed in Section 3.2.2, PWD served on the Saul High School Task Force for the Community Design Collaborative (CDC). The CDC assisted the school in creating a master plan completed in 2015. The schools are located in Manayunk and Roxborough, respectively, and the projects will serve as demonstrations of source water protection and stormwater management for the students and surrounding community.

3.5 Additional 2015 Highlights

3.5.1 Outreach to Watershed Community

PWD supported the SAN annual meeting in November 2015. The meeting drew approximately 75 watershed partners to participate in a day of presentations and discussion on how successful implementation of restoration and protection projects in the Schuylkill River waterways are being measured in the absence of conclusive water quality data. PWD gave a presentation at the meeting on the Fairmount Dam fish ladder, trash monitoring and clean-up efforts, and the Manayunk Canal improvement project.

3.5.2 Ecological Restoration Unit

The Ecological Restoration Unit at PWD is working on a number of projects that will manage stormwater and restore stream banks upstream of the Queen Lane WTP intake. In 2015, a stream channel improvement project at Gorgas Run, a tributary to the Wissahickon Creek, will stabilize the stream banks, improve flow, and prevent erosion problems and large amounts of sediment from being carried downstream. Additionally, a study at Cresheim Creek is underway exploring the feasibility of a dam removal and additional stream bank improvements in the vicinity.

Section 4 2015 Progress towards Watershed Control Program Plan Initiatives

In addition to the implementation of Source Water Protection Program (SWPP) initiatives, the Watershed Control Plan (WCP) includes implementation of structural and non-structural measures to physically reduce the loading of *Cryptosporidium* in the Schuylkill River watershed. These control measures address priority sources of *Cryptosporidium* identified to be wastewater effluent, agricultural land runoff, and animal vectors. The WCP control measures consist of the following: quantifying the water quality implications of UV installation at the Upper Gwynedd and Fleetwood WWTPs; supporting the installation of manure storage basins on at least five separate farms; supporting the installation of vegetated buffers on at least five farms; supporting the completion of at least five Comprehensive Nutrient Management Plans (CNMPs) at farms throughout the Schuylkill River watershed; implementing a riparian buffer to deter animal vectors at a selected site; and, implementing a PWD waterfowl management program. The WCP control measures and their implementation timeframe are summarized in Table 4-1 below.

Table 4-1: Watershed Control Program Plan Initiatives and Implementation Schedule

Project Type - Priority Source Addressed	Project	Implementation Timeframe			Project Lead and Partners
		Project Initiation	Construction Started	Project/Construction Complete	
Structural - WWTP Effluent	UV Installation - Upper Gwynedd WWTP				N/A
Structural - WWTP Effluent	UV Installation - Fleetwood WWTP				N/A
Structural - Ag Land Use/Runoff	Farm - Manure Storage Basin #1	2012	2012	2013	NRCS, BCCD, Berks Nature, SAN Ag Workgroup Partners, PWD
	Farm - Manure Storage Basin #2	2013	2013	2014	
	Farm - Manure Storage Basin #3	2014	2014	2015	
	Farm - Manure Storage Basin #4	2015	2015	2016	
	Farm - Manure Storage Basin #5	2016	2016	2017	
	Farm - Vegetated Buffers #1	2012	2012	2013	
	Farm - Vegetated Buffers #2	2013	2013	2014	
	Farm - Vegetated Buffers #3	2014	2014	2015	
	Farm - Vegetated Buffers #4	2015	2015	2016	
	Farm - Vegetated Buffers #5	2016	2016	2017	
Non-Structural - Ag Land Use/Runoff	Nutrient Management Plans - 5 Farms	2012-2017	N/A	2017	NRCS, BCCD, SAN Ag Workgroup Partners, PWD
Structural - Animal Vectors	Riparian Buffer Plantings - 1 Site	2014	2014	2014	PWD, SAN Partners
Non-Structural - Animal Vectors	Waterfowl Management Program	2011	N/A	2017	PWD, USDA

4.1 UV Installation at Wastewater Treatment Plants

4.1.1 Upgraded Wastewater Treatment Plants

Since the development of the WCP, PWD has noted the progress of the Upper Gwynedd and Fleetwood WWTP upgrade projects. The Fleetwood UV disinfection system became operational in January 2013 (Fleetwood Borough, 2013). The Upper Gwynedd UV disinfection system became operational in 2011 (Environmental Engineering & Management Associates, Inc., 2013). The North Wales WWTP closed and diverted flow to Upper Gwynedd in June 2013 (Carroll Engineering Corporation, 2013).

In the past, PWD has learned of UV disinfection system installations at WWTPs in the watershed through township news sources and other publically available sources. In 2013, PWD and the Schuylkill Action Network (SAN) Pathogens/Compliance Workgroup initiated an effort to track wastewater in the Schuylkill River watershed, and data collection continued through 2015 as described in Section 3.1.9 of this report. Through this effort, PWD has a more complete understanding of the level of wastewater treatment upstream of the Queen Lane and Belmont intakes, and can better track upgrades to WWTPs such as UV disinfection. In the Watershed Sanitary Survey, a WCP credit requirement submitted to PADEP in December 2015, PWD used the data from Chapter 94 reports to estimate the portion of WWTP discharge disinfected with UV systems. Upstream of Queen Lane, there are 152 wastewater treatment plants (WWTPs) discharging a total average of 109 million gallons per day (MGD) to the Schuylkill River watershed. Of the WWTPs in the Schuylkill River watershed, 33 WWTPs discharging a combined average of 27.8 MGD have UV disinfection systems.

4.1.2 *Cryptosporidium* Loading from Wastewater Treatment Plants

To estimate a range of *Cryptosporidium* loading from WWTP effluent in the Schuylkill River watershed, minimum and maximum loadings were calculated in the WCP using Equation 4-1 and Equation 4-2, respectively and are further detailed in Section 7.5.1.2 of Appendix A of the WCP (PWD, 2011). Average effluent discharge rates from WWTPs in the Schuylkill River watershed are taken from the 2008 *Schuylkill Action Network Pathogens Workgroup Study of Cryptosporidium Occurrence in Wastewater Treatment Plants*. Minimum and maximum estimates of oocysts per liter in WWTP effluent receiving secondary treatment are based on pooled values from literature, and in effluent receiving tertiary treatment, an additional log removal is assumed (Crockett, 2007). The results are summarized in Table 4-2.

Equation 4-1: Maximum Oocysts Loading from all Schuylkill River Watershed WWTPs:

$$\sum_{\text{all WWTPs in Schuylkill River watershed}} [\text{average effluent discharge rate} * 365 \text{ days} * \text{maximum oocysts per liter treated wastewater}] = \text{maximum oocysts per year discharged into Schuylkill River watershed}$$

Equation 4-2: Minimum Oocysts Loading from all Schuylkill River Watershed WWTPs:

$$\sum_{\text{all WWTPs in Schuylkill River watershed}} [\text{average effluent discharge rate} * 365 \text{ days} * \text{minimum oocysts per liter treated wastewater}] = \text{minimum oocysts per year discharged into Schuylkill River watershed}$$

Table 4-2: Schuylkill River Watershed Loading from WWTP Effluent

Schuylkill River Watershed Loading	Min Estimate (oocysts/year)	Max Estimate (oocysts/year)
WWTP Effluent	5.09E+09	6.51E+14

4.1.3 *Cryptosporidium* Loading Reduction from UV Installation at WWTPs

In the WCP, the range of potential *Cryptosporidium* inactivation and loading reduction from the addition of UV disinfection at two WWTPs, Upper Gwynedd and Fleetwood, is calculated

using in Equation 1 and Equation 2 with average effluent discharge rates for only Upper Gwynedd and Fleetwood WWTPs and an assumed additional 3 log (99.9%) removal. The calculation is further detailed in Section 7.5.3.1 of Appendix A of the WCP (PWD, 2011). The results of these calculations are presented in Table 4-3 and compared to the WCP target loading reduction in Section 5.

Table 4-3: Loading Reduction Estimates from UV Installation at WWTPs

Structural Control Measure	Min Potential Inactivation (oocysts/year)	Max Potential Inactivation (oocysts/year)
UV Installation - Upper Gwynedd	1.41E+08	1.80E+13
UV Installation - Fleetwood	2.61E+07	3.34E+12

4.2 Agricultural Best Management Practices

In the WCP, PWD outlines a number of actions to reduce *Cryptosporidium* in the Schuylkill River watershed from agricultural runoff. These include five manure storage basins and five vegetated buffers on separate farms. 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.

4.2.1 Schuylkill River Restoration Fund Farms

In 2006, Exelon, SAN, and the Schuylkill River Heritage Area (SRHA) 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 yearly 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 in 2014 and 2015, 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. SRHA, managed by the nonprofit Schuylkill River Greenway Association, 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 2015, three farms received funding from the SRRF. The PWD highest priority project was agricultural best management practice (BMP) installation at the Donald Rice farm. PWD also identified two additional farms as high priority advocating for the SRRF to fund agricultural BMPs at the Dalton Biehl and the Floyd Kurtz farms. (Additionally, PWD recognized a schoolyard greening project in Philadelphia as high priority addressing focus areas outside of LT2 regulatory goals.) 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, local townships and water suppliers. The three SRRF farm projects are described here in detail.

4.2.1.1 Donald Rice Farm

The Donald Rice Farm is the PWD highest priority project and is located in the Maiden Creek watershed. Donald Rice completed conservation and nutrient management planning in 2014, and received a 2015 SRRF grant for the first two years of a four-year BMP implementation project.



Figure 4-1: The Donald Rice Farm

Figure 4-1 (a) shows a satellite image from Google Earth of the farm prior to BMP implementation. The manure is stored next to the road. The manure pile is shown in Figure 4-1 (b). Manure laden runoff flows from the storage area down the driveway, past the housing for calves, particularly large sources of *Cryptosporidium*, and into a pipe, Figure 4-1 (c). The pipe discharges on the other side of the road near another tributary to the Maiden Creek. The Donald Rice farm is located adjacent to the David Rice farm, recipient of a 2014 SRRF grant. The same unnamed tributary to the Maiden Creek flows through both Rice farm properties. A wetland buffer has been maintained for this unnamed tributary for approximately ten years, originally planted as part of a CREP project shown in Figure 4-1 (d). Although there is a riparian buffer on this farm, the manure storage system continues to contaminate nearby waterways. This demonstrates the importance of a whole farm approach taken by SAN partners.

This project includes the construction of a 6-month heifer dry manure storage structure. It also includes a waste transfer system, barnyard controls, rain gutters and lined outlets to control contaminated stormwater runoff and direct clean rainwater off site. Construction is planned for spring 2016.

4.2.1.2 *Biehl Farm*

The Dalton Biehl Farm was also considered a high priority project by PWD. The farm is located in the Saucony Creek watershed. The Biehl farm completed conservation and nutrient management planning in 2014, and received a 2015 SRRF grant for the first two years of a four-year BMP implementation project.



Figure 4-2: The Dalton Biehl Farm

Figure 4-2 (a) shows a satellite image from Google Earth of the farm prior implementation of this project. Biehl has completed a previous BMP implementation project which included a 6-month liquid manure storage basin for dairy cows visible in the top left corner of Figure 4-2 (a). To address additional manure storage issues, the current BMP implementation project includes two 6-month liquid manure storages for heifer manure and animal heavy use area runoff, shown in Figure 4-2 (b) and Figure 4-2 (c). Construction of a walkway and animal crossing over a runoff pathway is underway and seen in Figure 4-2 (b). The Biehl farm, or Corner View Family Farm, is a unique operation. The Biehl family uses a robotic milking facility and a

freestall barn for their dairy cows. These technological capabilities draw frequent visitors to the farm. State of the art BMPs to manage manure and stormwater on the property will demonstrate to visitors the value the Biehl family places on managing nutrients and protecting waterways. Construction is expected to be completed by December 2015.

4.2.1.3 Kurtz Farm

The Floyd Kurtz farm is located Saucony Creek watershed. The Kurtz farm completed conservation and nutrient management planning in 2014, and received a 2015 SRRF grant for the first two years of a four-year BMP implementation project.



Figure 4-3: The Floyd Kurtz Farm

Figure 4-3 (a) shows a satellite image from Google Earth of the farm prior implementation of this project. The BMP implementation project includes a 6-month liquid manure storage for dairy cows and heifers, a waste transfer system, rain gutters and lined outlets to control contaminated stormwater runoff and direct clean rainwater off site. Figure 4-3 (b) shows manure newly being pumped from the barn on its way to the new manure storage. Manure from the barnyard is scraped directly into the manure storage, Figure 4-3 (c), which will provide 6 months of storage capacity, Figure 4-3 (d). Prior to this project, the farm would haul manure to the fields daily. Storage makes it possible for the farmer to only apply manure as fertilizer to

the fields twice per year at optimal nutrient absorption times. Construction is expected to be fully completed by December 2015.

4.2.2 *Cryptosporidium* Loading from Agricultural Land

To estimate a range of *Cryptosporidium* loading from agricultural land runoff in the Schuylkill River watershed, minimum and maximum loadings were calculated in the WCP using the runoff method and the animal population method detailed in Section 7.5.1.1 in Appendix A of the WCP (PWD, 2011). To estimate the *Cryptosporidium* loading using the agricultural runoff method, the estimated number of oocysts from two agricultural land use types (pasture/hay and row crops) are summed. The method uses agricultural land acreage in Queen Lane’s Zone B (PWD, 2002), event mean concentrations of *Cryptosporidium* (PWD, 2006), rainfall in Hamburg, Pennsylvania (World Climate), and the average of high and low runoff coefficients for the two land use types (McCuen, 2004). The runoff method is described by Equation 4-3. To estimate the *Cryptosporidium* loading using the animal population method, the estimated number of oocysts from beef cattle, dairy cattle, and calves, swine, sheep and horses are summed using numbers of animals in the watershed (USDA, 2002) multiplied by infection prevalence and oocyst shedding rates from available literature sources as noted in Appendix G. The animal population method is described by Equation 4-4. The results are summarized in Table 4-4.

Equation 4-3: Agricultural Runoff Method (Minimum Estimate):

$$\sum_{\text{pasture/hay and row crop land use types}} [\text{Acres agricultural land} * \text{event mean concentration for } \textit{Cryptosporidium} * \text{rainfall per year} * \text{average runoff coefficient}] = \text{oocysts per year introduced to Schuylkill River watershed}$$

Equation 4-4: Animal Population Method for Farm BMP Projects (Maximum Estimate):

$$\begin{aligned} & \sum_{\text{dairy cattle, beef cattle, calves}} [\text{number of animal type} * \text{estimated prevalence of infection in animal type} * \\ & \text{oocysts shed per day per animal} * 365 \text{ days}] \\ & + \sum_{\text{swine, sheep, horses}} [\text{number of animal type} * \text{estimated prevalence of infection in animal type} * \\ & \text{animal mass} * \text{weight of manure per day per weight animal} * 365 \text{ days} * \text{oocysts per weight manure}] \\ & = \text{oocysts per year introduced to Schuylkill River watershed} \end{aligned}$$

Table 4-4: Schuylkill River Watershed Loading from Agricultural Land Runoff

Schuylkill River Watershed Loading	Min Estimate (oocysts/year)	Max Estimate (oocysts/year)
Agricultural Land Use	6.65E+12	7.75E+14

4.2.3 *Cryptosporidium* Loading Reduction from Agricultural BMP Projects

To estimate the Schuylkill River watershed *Cryptosporidium* loading reduction from the agricultural BMPs installed, the WCP follows a set of assumptions. First, a “standard” farm with several set parameters is assumed. All assumptions were confirmed as appropriate for the Schuylkill River watershed with local agricultural management experts, Larry Lloyd from Berks Nature and Nick Ramsey from NRCS. The characteristics of the standard farm are as follows:

- 120 acre dairy farm
- 80 cows (includes heifers) and 10 calves

Second, *Cryptosporidium* removal rates of 2 log (99%) and 100% are assumed for vegetated buffers and manure storage basins, respectively. Additional information may be found in Section 7.5.3.2 in Appendix A of the WCP (PWD, 2011).

Using the assumed “standard” farm characteristics, *Cryptosporidium* removal rates by BMPs and the same methods described for the estimation of the Schuylkill River watershed *Cryptosporidium* loading from agricultural runoff, minimum and maximum estimates for the impact of five manure storage basins and five vegetated buffers are calculated in the WCP, Table 4-5.

Table 4-5: *Cryptosporidium* Loading Reduction Estimates from Agricultural BMPs

Structural Control Measure	Estimated Min Reduction (oocysts/year)	Estimated Max Reduction (oocysts/year)
Manure storage basins - 5 farms	1.10E+10	1.20E+13
Vegetated buffers - 5 farms	1.09E+10	1.19E+13

In 2015, four manure storages were supported by the SRRF. PWD will count two storages towards WCP goals. The characteristics of the farms are:

Donald Rice Farm

- 101 acre heifer operation
- 56 cows (heifers only) and 19 calves (ages 0-6 months)

Dalton Biehl Farm

- 220 acres dairy farm

- 245 cows (including milking cows and heifers) and 35 calves (0-6 months) total; 52 (heifers) and 18 calves (0-6 months) will be used in calculations to account for one of the two manure storages constructed for the heifers as part of this project

The *Cryptosporidium* loading reduction per year is estimated for the Donald Rice farm and one manure storage on the Dalton Biehl farm using the agricultural runoff and the animal population methods described in Equation 4-3 and Equation 4-4, respectively. For the agricultural runoff method, the number of acres of agricultural land in the watershed is replaced with the acreage of each farm. For the animal population method, the number of farm animals in the watershed is replaced with the number of dairy cattle and calves at each farm because both the Donald Rice and Dalton Biehl farms are primarily dairy and heifer operations. Heifers are young female cows that have not born a calf. In the *Cryptosporidium* loading reduction calculations, heifers are assumed to be between six months and two years of age. The results of these calculations are presented in Table 4-6 and compared to the WCP target loading reduction in Section 5.

Table 4-6: Loading Reduction Estimates from Manure Storage Basins Implemented

Structural Control Measure	Estimated Min Reduction (oocysts/year)	Estimated Max Reduction (oocysts/year)
Donald Rice manure storage basin	1.85+09	4.58 E+12
D. Biehl manure storage (one of two constructed for project)	4.03E+09	4.34E+12

4.2.4 SAN Ag BMPs

Outside the SRRF, many other SAN partners contributed to the implementation of agricultural BMPs in the watershed in 2015 including NRCS, Berks Nature, BCCD. Table 4-7 estimates the number of agricultural BMPs implemented in 2015.

Table 4-7: Ag BMPs Implemented in 2015 through SAN partners

Ag BMPs Implemented in 2015 through SAN Partners*			
Comprehensive Nutrient Management	Manure Storages	Barnyard Repairs/ Heavy Use Areas	Stream Crossings
12	12	10	2

*These counts represent the number of projects completed with NRCS involvement. NRCS is responsible for much of the engineering required to complete the design and construction of many of the BMPs. However, additional projects were completed by other SAN partners making these counts a conservative estimate.

4.3 Comprehensive Nutrient Management Plans

Supporting the implementation of five Comprehensive Nutrient Management Plans (CNMPs) is another PWD action item outlined in the WCP. Manure management issues at farms are often addressed through the nutrient management plan process led by NRCS. The SAN and NRCS consider the completion of a CNMP, which includes a nutrient management plan and a conservation plan, at a farm a criteria for funding eligibility in the Schuylkill River watershed. As outlined in the WCP, PWD plays a role in the completion of CNMPs by supporting the implementation of agricultural BMPs on farms with CNMPs, and working to ensure adequate resources are available to complete additional CNMPs. The farms that received SRRF grants had a CNMP in place prior to receiving the grants 2015. Additionally, NRCS implemented twelve CNMPs in 2015.

4.4 Riparian Buffer Plantings

PWD is committed to helping implement one riparian buffer in the Schuylkill River watershed as part of the WCP. The site has not been determined as of 2015, but will be an animal vector impacted site with potential to affect water quality at the Queen Lane intake. However, through the SAN, other riparian buffers have been planted in the Schuylkill River watershed.

4.4.1 SAN Riparian Buffer Plantings

Riparian buffers were planted in the Schuylkill River watershed by SAN partners. In 2015, 5.79 acres of stream buffer was planted in the Tulpehocken Creek sub watershed through the Conservation Reserve Enhancement Program (CREP) with support from Stroud Water Research Center and BCCD. CREP is a partnership between federal and state governments and private groups and is administered by the USDA. It installs stream bank buffers, including trees, fences and livestock crossings, at little or no cost to the landowner and typically pays an annual rent for each acre of buffer. More information on the program is available online at www.creppa.org. Stroud Water Research Center's Stroud Farm Stewardship Program offers "BMP vouchers" of \$4,000 for each acre of stream buffer installed that is at least 35 feet wide. A farmer can earn a maximum of \$20,000 in vouchers. The vouchers are used to plan and install other conservation BMPs on the farm and are typically combined with other funding sources. With continued funding in the watershed from the William Penn foundation as well as additional resources from NRCS through the Resource Conservation Partnership Program, more riparian buffer plantings are anticipated in future years with the help of SAN partners NRCS, Stroud Water Research Center and BCCD.

4.5 Waterfowl Management

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, 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.

The numbers of Canada geese removed and dispersed and eggs treated October 2014 through December 2015 at Fairmount Park properties are shown in Figure 4-7. A total of 63 eggs were treated, 15 geese were removed and 15,585 geese were harassed and dispersed from Fairmount Park properties. The numbers of geese dispersed and eggs treated from October 2014 through December 2015 at PWD facilities are shown in Figure 4-8. A total of 161 Canada goose eggs were treated, 7 geese were removed and 7,119 were harassed and dispersed from PWD facilities.

The data collected between 2011 and 2015 is encouraging and suggests that the geese management strategies implemented by PWD through contracts with the USDA are impacting goose 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 prime 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 and 2015, 55 and 58 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.

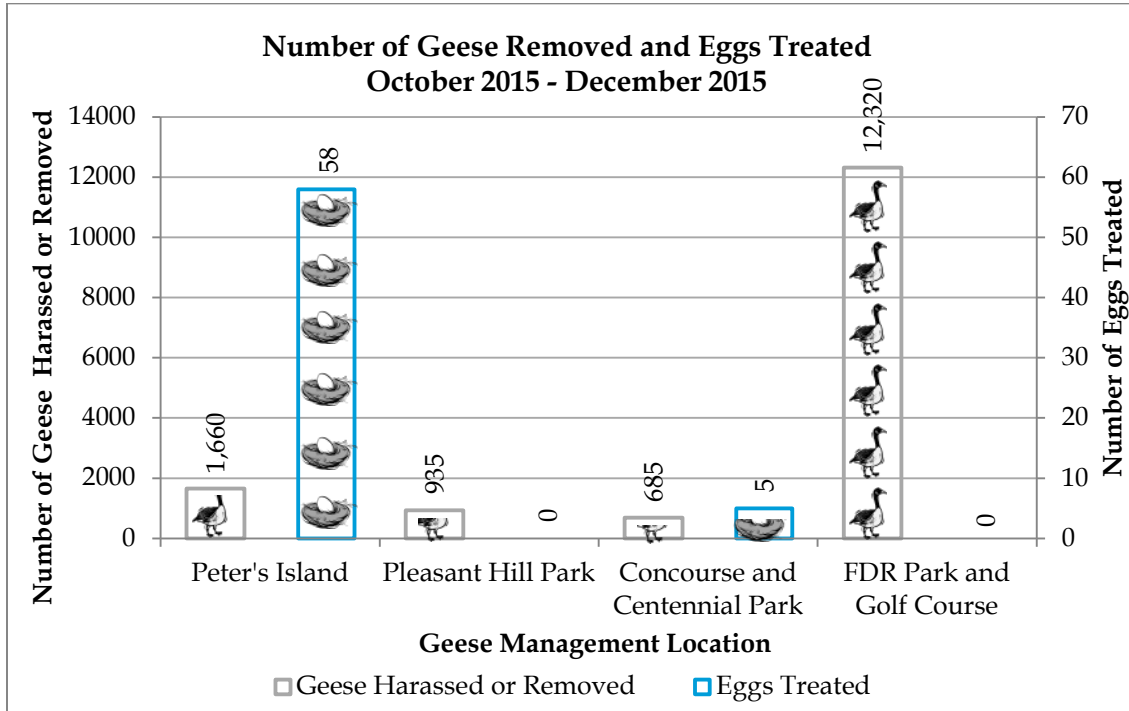


Figure 4-4: Geese Management at Fairmount Park Properties October 2014 through December 2015

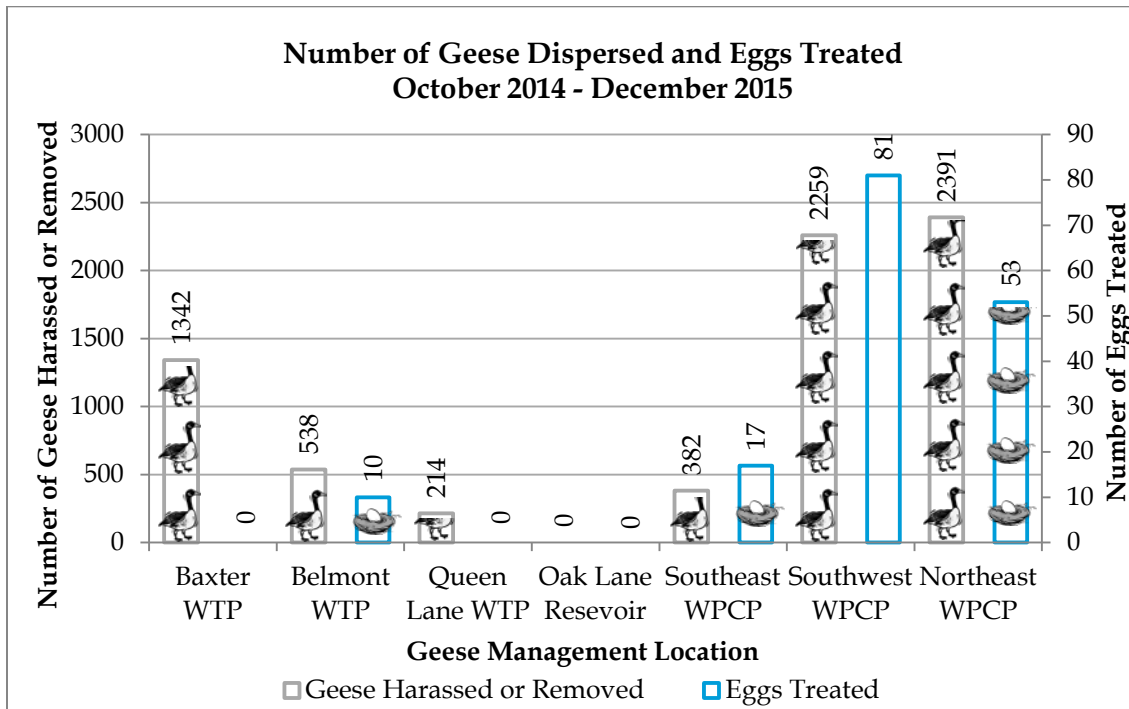


Figure 4-5: Geese Management at PWD Facilities October 2014 through September 2015

Section 5 2015 Watershed Control Plan Progress

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 thus far. The UV installation projects upstream of the Queen Lane intake at Upper Gwynedd WWTP and Fleetwood WWTP, which PWD has followed through publically available information, are both fully operational, as reported in the 2013 and 2014 Annual Status Reports. PWD contributed to the SRRF, which awarded grants to support the construction of two manure storage basins at two separate farms in the Schuylkill River watershed in 2015. Twelve new farms implemented a CNMP through NRCS in 2015. Geese were removed and nests and eggs treated at Fairmount Park properties and PWD facilities. The WCP progress in 2015 is summarized in Table 5-1.

After the completion of the third year of the WCP program, PWD has supported the implementation of six manure storage basins. The SRRF is the primary vehicle through which PWD can support projects on farms with the needed expertise and matching funds from partners. PWD has not directly supported any riparian buffers on farms in the last three years through the SRRF. The 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 a riparian buffer for stream reaches on the property. 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 waste and stormwater management less important on the site. With earthen lagoons as manure storage basins, the storm water and groundwater are at risk for contamination. If groundwater on the site becomes contaminated, the karst and limestone geology in the Berks County area, which allows ground water to move quickly in the ground, will make nearby surface waters vulnerable to contamination as well. Additionally, PWD calculations presented in Section 4.2.3 assume manure storage basins contain 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 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.

Table 5-1: WCP Project Progress Summary

	WCP Project Type	Project Description	Project status
2013	WWTP Upgrade	UV installation at Upper Gwynedd WWTP	Fully Operational
	WWTP Upgrade	UV installation at Fleetwood WWTP	Fully Operational
	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	--	--
	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	Under Construction
	Nutrient Management Plans	1 Comprehensive Nutrient Management Plan	Complete
	Riparian Buffer Planting	--	--
	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	Under Construction
	Farm BMP	Manure storage basin at Dalton Biehl Farm	Under Construction
	Nutrient Management Plans	12 Comprehensive Nutrient Management Plans	Complete
	Riparian Buffer Planting	--	--
	Waterfowl management	Geese removed and eggs treated at Fairmount Park properties and PWD facilities 2015	Complete/Ongoing
2016	Farm BMP		
	Farm BMP		
	Nutrient Management Plans		
	Riparian Buffer Planting		
	Waterfowl management		
2017	Farm BMP		
	Farm BMP		
	Nutrient Management Plans		
	Riparian Buffer Planting		
	Waterfowl management		

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Philadelphia Water Department

WCP Completion Requirement Check	WWTP Upgrades	Track UV Installation at 2 plants	
	Farm BMPs	Manure storage basins -5	
		Vegetated buffers - 5	
	Nutrient Management Plans	Nutrient Management Plans -5	
	Riparian Buffer Planting	Sites - 1	
	Waterfowl management	Years - 5	

* There is an alteration to the original timeline described in Table 10. In the first three years of the WCP implementation, PWD has decided to contribute to a second manure storage basin project instead of a vegetated buffer at a farm.

5.2 *Cryptosporidium* Watershed Loading and Target Reduction

The WCP initiatives described in Section 4 have the potential to reduce the total loading of *Cryptosporidium* to the Schuylkill River. In order to quantitatively assess the impact of PWD projects and their potential to reduce the total loading of *Cryptosporidium* to the Schuylkill River watershed, a series of calculations are performed (Sections 4.1 and 4.2). The calculations described serve as a preliminary step in developing a quantitative method to assess *Cryptosporidium* loading from priority sources in the Schuylkill River watershed. The methods used are based on assumptions and values found in published scientific literature. Due to a lack of scientific agreement regarding the methodology and accuracy of quantitative assessments of *Cryptosporidium* sources, the results should not be used to make absolute conclusions. The uncertainties associated with quantifying total *Cryptosporidium* loading across the Schuylkill River watershed, and reductions in that loading caused by the implementation of priority projects, highlight the need for continued and expanded *Cryptosporidium* research.

The WCP estimates a range of total *Cryptosporidium* loading in the Schuylkill River watershed comprised of contributions from priority sources: WWTP effluent, agricultural land runoff and stormwater runoff. The maximum and minimum *Cryptosporidium* loading from WWTP effluent was estimated using Equation 4-1 and Equation 4-2 and the method summarized in Section 4.1.2. The maximum and minimum *Cryptosporidium* loading from agricultural land use runoff was estimated using Equation 4-3 and Equation 4-4 and the method described in Section 4.2.2.

To estimate the *Cryptosporidium* loading from stormwater runoff, the estimated number of oocysts from three land use types (commercial/industrial/transportation, high density residential and low density residential) are summed. The method used urban land acreage in Queen Lane’s Zone B (PWD, 2002), event mean concentrations of *Cryptosporidium* (PWD, 2006), rainfall in Hamburg, Pennsylvania (World Climate), and the average of high and low runoff coefficients for the land use types (McCuen, 2004). The results are summarized in Table 5-2.

Equation 5-1: Estimate of Oocyst Loading from Stormwater Runoff:

$$\sum_{\text{urban land use types}} [\text{number of acres of land use} * \text{event mean concentration for } \textit{Cryptosporidium} * \text{rainfall per year} * \text{average rainfall coefficient}] = \text{oocysts per year introduced to Schuylkill River watershed}$$

Table 5-2: Schuylkill River Watershed Loading from Stormwater Runoff

Schuylkill River Watershed Loading	Estimate (oocysts/year)
Stormwater Runoff	1.14E+12

The methods used to perform the estimates of the total *Cryptosporidium* loading to the Schuylkill River watershed from priority sources are summarized in Table 5-3.

Table 5-3: Calculation Methods for Annual *Cryptosporidium* Loading Estimates

Schuylkill River Watershed Loading	Minimum Loading Estimate Method	Maximum Loading Estimate Method
WWTP Effluent	Minimum values for oocysts/liter in secondary effluent based on pooled values from various sources of literature documented in Crockett 2007. Oocyst concentrations are multiplied by average daily flow rates at each of the 72 WWTPs in the Schuylkill River watershed. Tertiary systems are assumed to have an additional 1 log removal.	Maximum values for oocysts/liter in secondary effluent based on pooled values from various sources of literature documented in Crockett 2007. Oocyst concentrations are multiplied by average daily flow rates at each of the 72 WWTPs in the Schuylkill River watershed. Tertiary systems are assumed to have an additional 1 log removal.
Agricultural Land Use	Method multiplies agricultural land area, runoff volumes, and <i>Cryptosporidium</i> event mean concentration, similar to the 2002 Source Water Assessment (SWA) approach.	Method estimates infected livestock populations for the Schuylkill River watershed and oocyst shedding rates for each category of livestock.
Stormwater Runoff	Method multiplies various land cover areas, runoff volume and <i>Cryptosporidium</i> event mean concentrations for urban/developed land, similar to the 2002 SWA approach.	
TOTAL LOADING	Summation of minimum estimates of Schuylkill River watershed <i>Cryptosporidium</i> sources.	Summation of maximum estimates of Schuylkill River watershed <i>Cryptosporidium</i> sources.

Upon determining an estimated range for the total Schuylkill River watershed *Cryptosporidium* loading, an attempt is made to establish a loading reduction target by comparing the observed average concentration of 0.076 oocysts/L at the Queen Lane intake during the Long Term 2 Enhanced Surface Water Treatment Rule (LT2) monitoring period (2001- 2003) to a desired Bin 1 concentration of 0.074 oocysts/L. The ratio of the maximum Bin 1 concentration to the observed concentration at the intake, 0.074/0.076 is used to calculate a target *Cryptosporidium* loading reduction of 2.7% in five years. Multiplying the estimated minimum and maximum total Schuylkill River watershed *Cryptosporidium* loadings by 2.7% yields minimum and maximum target reductions. The minimum target reduction is 2.11E+11 oocysts per year, and the maximum target reduction is 3.85E+13 oocysts per year.

As the WCP is implemented, project impact is assessed using the same approaches used to estimate the total Schuylkill River watershed *Cryptosporidium* loading. Schuylkill River watershed *Cryptosporidium* loading reductions from control measures implemented 2013 through 2015 are estimated for UV installation at two WWTPs, and the construction of six manure storage basins at separate farms, Sections 4.1.3 and 4.2.3, respectively. The potential for reducing the total Schuylkill River watershed *Cryptosporidium* loading is then compared to the

range of target reductions established. Schuylkill River watershed loadings, target loading reduction and loading reductions from control measures are summarized in Table 5-4.

By summing the estimated impacts of UV installation at two WWTPs and BMP implementation at six farms, total estimates of *Cryptosporidium* loading reduction in years one through three of the PWD WCP are calculated. The impact of control measures implemented both in 2015 and over the life of the WCP is estimated to potentially account for 2.8% to 23% and 5.8% to 154%, respectively, of the target reduction goal. As previously mentioned, the 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.

Table 5-4: Schuylkill River Watershed *Cryptosporidium* Loading Reduction (2.11E+11 to 3.85E+13 Oocysts per Year) Summary

Schuylkill River Watershed Loading		Minimum Estimate (oocysts/year)	Maximum Estimate (oocysts/year)		
Total Loading from Watershed	WWTP Effluent	5.09E+09	6.51E+14		
	Agricultural Land Use	6.65E+12	7.75E+14		
	Stormwater Runoff	1.14E+12	1.14E+12		
	TOTAL LOADING	7.80E+12	1.43E+15		
WCP Structural Control Measure		Minimum Potential Reduction (oocysts/year)	Maximum Potential Reduction (oocysts/year)	Minimum Reduction as % of Minimum Target Reduction	Maximum Reduction as % of Maximum Target Reduction
2013	Upper Gwynedd WWTP UV Installation	1.41E+08	1.80E+13	0.07%	46.80%
	Fleetwood WWTP UV Installation	2.61E+07	3.34E+12	0.01%	8.70%
	Manure Storage Basin at Havens Farm	1.83E+09	4.82E+12	0.87%	12.51%
	Manure Storage Basin at Leid Farm	1.37E+09	2.17E+12	0.65%	5.63%
2014	Manure Storage Basin at Martin Farm	1.76E+09	2.65E+12	0.83%	6.88%
	Manure Storage Basin at A. Zimmerman Farm	1.25E+09	1.95E+13	0.59%	50.68%
2015	Manure storage basin at Donald Rice Farm	1.85E+09	4.58E+12	0.88%	11.89%
	Manure storage basin at Dalton Biehl Farm	4.03E+09	4.34E+12	1.91%	11.26%
2016	Farm BMP				
	Farm BMP				
2017	Farm BMP				
	Farm BMP				
5-Year Target Reduction	2.7% of Total Schuylkill River Watershed Loading	2.11E+11	3.85E+13	100%	100%
Cumulative Loading Reduction	WWTP UV Installation	1.67E+08	2.14E+13	0.08%	55.50%
	Farm BMPs	1.21E+10	3.81E+13	5.73%	98.85%
	TOTAL LOADING REDUCTION	1.23E+10	5.95E+13	5.81%	154.35%

Section 6 Expectations for 2015

In 2016, PWD will continue efforts toward goals outlined in the WCP. These include continuing addressing 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* the watershed. Specific focus will be on the following:

- Continued partnership with SAN for project facilitation and collaboration
- Continued support for research surrounding *Cryptosporidium* in Philadelphia's source water and watersheds in collaboration with Lehigh University.
- Continued funding towards SAN administration and the SAN Coordinator position
- A \$100,000 contribution to SRRF for 2016 project grants
- Involvement with the SAN Pathogens/Compliance 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

Section 7 References

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Appendix A: SAN Pathogens/Compliance and SAN Agriculture Workgroups 2014 Meeting Minutes

SAN PATHOGENS/COMPLIANCE WORKGROUP FIRST QUARTER MEETING

Schuylkill Action Network Pathogen/Compliance Meeting Minutes March 11, 2015

In Attendance:

Joe Hebelka, DEP CO
Jared Sabitsky (via phone), DEP NERO
Steve Flannery, DEP SERO
Virginia Vassalotti, PDE
Jesse Goldberg, RAWA / Miller Environmental
Kelly Anderson, PWD
Beth Couillard, PWD
Jason Coyle, NLCA
Tom Davidock, PDE
Beth Garcia, EPA

Introductions: Jason Coyle from Northern Lancaster County Authority was introduced to the workgroup. He is an operator at the NLCA waste water treatment plant, and will be participating in the workgroup on behalf of the Berks County Water and Sewer Association.

Minutes from 12/10/2014 Workgroup Meeting: Minutes were uploaded on the SAN website for review. No edits were recommended.

Review 2014 Work Plan/Update 2015 Work Plan: The workgroup reviewed the draft 2015 work plan and identified updates. Tom and Virginia will make the updates to the plan and send it out for review. Below is a summary of the suggested changes.

- Consider adding an Early Warning System training for DEP in the Southeast Regional Office.
- No updates to strategy 2
- Strategy 3: Offer a workshop for water utilities in the Schuylkill watershed, utilizing the Berks County Water and Sewer association as a model. Workshop would focus on the "one water" concept suggested by Kelly. The focus would be on source water protection and improving relationships between the DW and WW utilities.
- Replace the wet weather workshop with the above
- Strategy 4: Add tour of WW and DW facilities (suggestion Reading WWTP).

- Objectives: The group discussed the 50% Phosphorus limit objective. It is currently being measured in Maiden Creek. The DEP SERO also requested data from the PWD. This info may help in documenting progress towards meeting this objective.

PWD - Chapter 94 Report Reviews and Watershed Control Plan: Beth C. provided an overview of the PWD efforts in collecting data from the plans. Currently, all data has been collected from the DEP SCRO and SERO. They are still working on obtaining data for the NERO. Jared mentioned that he will assist them in getting that information. Jesse offered to pick up the reports for PWD when he is up in the NERO office later in the month. The PWD plans to utilize this information for its sanitary survey, which is a requirement in their watershed control plan. Beth asked the group if there were any concerns over how the data would be shared. Since it is all publically available data, no issues were identified. PWD is determining how to best display the data. One possible option is to simply identify UV/Non-UV treatment systems. UV treatment is used for cryptosporidium disinfection.

Wildcat Sewer Data: Kelly asked the group about the wildcat sewer remediation projects in the watershed. The PWD is looking to include this information in their Watershed Control Plan report. They are looking for any reports or documents describing the projects. Tom will ask folks at the AMD meeting next week. Beth G. is checking with Lori Reynolds, EPA. Steve F. will check to see if DEP has anything available.

High Flow Maintenance Plans Workshop: The group agreed to put this workshop on hold due to the challenges with getting it through the legal department at DEP. This coming year, the workgroup will focus on the joint drinking water/waste water workshop.

Lehigh University Project: Beth C. reported that the PWD is continuing to work with Lehigh University on the Crypto sampling project. This coming year, they are planning to move the project to other locations in the watershed. They are looking to collaborate with other water suppliers and sample near intake locations in the watershed. This will be part of their LT2 Control Plan.

BCWSA Activities: The annual conference will be held on July 29th, 2015. Vicky Blazer, USGS, will be presenting at the meeting on emerging contaminants. Vicki presented to a small group at the RAWA office a few weeks ago. It was a very good presentation on emerging contaminant threats and prompted discussions on monitoring locally for them. Jesse set up a meeting with DEP to discuss monitoring options. Tom, Lyn O'Hare and Jesse will be attending this meeting in Harrisburg.

William Penn Foundation Clusters: Tom mentioned that the OSI and NFWF grants are now open. SAN partners are planning to submit requests to both of these programs for restoration and land protection work.

Watershed News: Joe presented recent watershed news articles to the group.

Next Meeting Date: Wednesday, June 17th 10:00 AM - 12:00 PM at PA DEP Reading Office

SAN PATHOGENS/COMPLIANCE WORKGROUP

SECOND QUARTER MEETING

Schuylkill Action Network Pathogen/Compliance Meeting Minutes

June 17, 2015

In Attendance:

Joe Hebelka, PADEP CO

Erick Ammon, PADEP

Steve Flannery, PADEP SERO

Jason Coyle, NLCA

Tom Davidock, PDE

Virginia Vassalotti, PDE Beth Garcia, EPA Megan Keegan, EPA

Tess Schlupp, PennVEST

Jesse Goldberg, RAWA/Miller Environmental

Kelly Anderson, PWD

Beth Couillard, PWD

Introductions

Minutes from 3/11/2015 Workgroup Meeting: Joe brought up the Early Warning System training that was mentioned in the previous minutes under item #3: Review 2014 Workplan/Update 2015 Workplan. Kelly said it would be good to add this training onto another meeting since the training is only 30 minutes to an hour long. Jason suggested combining it with a training that the BCSWA would like to hold in the fall. This training can include water suppliers that are not from Berks.

Regarding adding a tour of wastewater or drinking water facilities in the 2015 workplan, Jesse offered to give a tour of RAWA with a maximum of 15 people. Jason also offered to give a tour of NLCA, which just got a large upgrade.

PWD Schuylkill Watershed Control Plan/Sanitary Survey: Beth C. created and passed out a spreadsheet with updates on wildcat sewer and illegal discharge of untreated sewage in the Schuylkill River Watershed. This spreadsheet is an update to the original one completed over 10 years ago that identified the wildcat sewer location. It offers updates on remediation activities and identifies the new treatment systems in place to address them. Most of the wildcat sewers have been addressed in the watershed. Tom offered to map out the locations. Beth C. asked if Bill Reichert and Dan Koury could look over the chart on Friday at the AMD meeting.

PWD Chapter 94 Data: Beth C. got the data from the NERO office and made copies of everything PWD needs for its sanitary survey. She will compile all of the data into a spreadsheet and share it with the group. The reports were handed over to Tom to give back to Todd Wood [or someone else at the AMD meeting] to bring it back to the NERO office.

Delaware Valley EWS: PWD is starting to plan for the next EWS 5 year strategic plan. PWD sent a survey out to all of the attendees at the last EWS ESC meeting to determine goals and priorities for the

next plan. Kelly said the next ESC meeting will likely be a year from now. PWD was also a recipient for the 2015 Governor's Award for Environmental Excellence for the EWS.

BCWSA Activities: BCWSA received a WREN grant to develop a calendar and brochure. Jesse mentioned the annual forum is on July 29 and registration should be available soon. Unfortunately, Vicki Blazer is no longer able to attend and a replacement has not yet been found.

Jesse (with RAWA) would like to host an event similar to Lehigh County Authority's [Hydromania](#), where about 1,100 elementary students come learn about watershed issues.

Watershed News: Joe presented recent watershed news articles to the group. Some important news items include:

- DRBC [One Process One Permit](#) Program: promote more collaboration between states on water allocation and waste water discharges
- [Clean Water Rule](#)
- EPA's [Technical Guidance on Harmful Algal Blooms](#)
- PWD Article in AWWA Journal: importance of source water protection (*email Kelly to get a copy*)
- Drug Take Back Programs: PA American in Coatesville area, Off Your Med in Montgomery County, US supreme court case in Alameda County, CA, DEA drug take back days will be discontinued
- Reading Sewage Plant: \$84.6 million upgrade
- Cancer confirmed on smallmouth bass in Susquehanna

Other Items:

- Beth C. gave an update on the project with Lehigh University to monitor cryptosporidium. They will be taking samples from RAWA and WBWA intake areas and will correlate results with other areas in the watershed.
- Jesse is working with Tom to set up a meeting in the fall to plan a watershed wide project on emerging contaminants. The group discussed combining this with another issue that is relevant to water suppliers to increase attendance.
- Tess mentioned that a common misconception about PennVEST is that it cannot fund wealthier communities. This is not true; PennVEST can fund wealthier communities with low-interest loans, but not grants.

SAN ESC Meeting & 5 Year Strategic Plan: The ESC meeting was held on Thursday, May 28 in Norristown. All of the agencies who are a part of the ESC were present, including PDE, PADEP, EPA, PWD, DRBC, and SRHA. Tom and Virginia took notes during the meeting and will compile common themes and goals for the next strategic plan. There will be two listening sessions and an online session to get more feedback from SAN members. The first listening session is on Wednesday, June 24 from 10AM to 1PM at Albright College. The second listening session is on Tuesday, July 14 from 10AM to 1PM at Bartram's Garden and the online session is on Wednesday, July 29 from 1-2:30PM. There will also be

targeted surveys to certain audiences throughout the end of the summer and early fall. All of this information will be compiled and used to draft the next plan, which will be ready by winter.

Schuylkill Scrub: There were 65 registered cleanup events through Keep PA Beautiful's online registration, only including the Perkiomen Watershed Conservancy's cleanup as one event. Including the PWC cleanups, there would be close to 100 cleanups in the three month period. The data from the cleanups will be made available through Keep PA Beautiful, including number of trash bags collected and number of volunteers.

Schuylkill Shots: PDE has a new photo contest that encompasses the entire Delaware Estuary. There are four categories: Urban Waters, Splash of Fun, Wild & Scenic, and Schuylkill Shots. There will be a 1st, 2nd, and 3rd place winner for each category (total 12). Prizes are \$250, \$100, and \$50 in cash prizes, respectively. The contest runs until the end of July and photos can be submitted on PDE's Facebook page: www.Facebook.com/DelawareEstuary. The contest ends on July 31.

William Penn Foundation Cluster Update: Tom gave an update on the WPF work.

In the *Middle Schuylkill*, applications for 4-5 farms were submitted to NFWF. Tom and Virginia are creating a WIP for the Lower Maiden Creek, which includes the entire Moselem watershed and 4 unnamed tributaries of Maiden Creek. They will be meeting with Stroud to discuss modeling load reductions through the MapSheds program. Once the plan is finalized, projects in the WIP area will be eligible for 319 funding.

In the *Schuylkill Highlands*, OSI land conservation grants were due in early spring. However, no grant applications were submitted because of the problem with the large amount of forest cover (90%) needed. A number of grants were submitted to DCNR. Tom and Virginia met with three HOAs that were interested in improving their basins. This year, PDE will most likely apply for a TreeVitalize grant to plant additional plants and trees in one of the HOA's basins. In 2016, PDE will look into doing a larger project and possibly apply for Growing Greener funding.

Next Meeting Date: Wednesday, September 30th 10AM-12PM at PADEP Reading Office

SAN PATHOGENS/COMPLIANCE WORKGROUP THIRD QUARTER MEETING

Schuylkill Action Network Pathogen/Compliance Meeting Minutes

September 30, 2015

Attendees:

Joe Hebelka, PADEP CO

Erick Ammon, PADEP

Steve Flannery, PADEP SERO

Tom Davidock, PDE

Virginia Vassalotti, PDE

Beth Garcia, EPA

Jesse Goldberg, RAWA/Miller

Environmental
Beth Ventura (Couillard), PWD

Introductions: Erick has been promoted to a planning specialist in the south central regional office, but will still try to make the SAN Pathogen meetings.

Minutes from 6/17/2015 Workgroup Meeting: no changes

PWD Schuylkill Watershed Control Plan/Sanitary Survey: Beth V. announced that she is still working on sanitary survey and will be submitted in December. She asked if anyone had any edits to the *Wildcat Sewer and Illegal Discharge of Untreated Sewage in the Schuylkill River Watershed* spreadsheet that was mentioned at the last Pathogens meeting. Tom will add this item to the AMD agenda for the Oct 22 meeting.

PWD Chapter 94 Data: Beth V. will send out this spreadsheet, along with the Wildcat Sewer spreadsheet, to the workgroup for review.

Delaware Valley EWS: Beth V. announced there were no major updates. Allison, from PWD, is working on using the feedback from the EWS survey to develop a new strategic plan. Erick announced that there have been no recent alerts.

BCWSA Activities: Joe passed around the agenda and resources from the July 29 BCWSA annual forum. Jesse mentioned the new DEP regulation that states if a second pump at a WWTP comes on, that means that the system is hydraulic overloaded. He said that many WWTP are unhappy with this new regulation. PA DEP is aware of this concern and is working with WWTPs to manage changes.

Joe announced that there is a BCWSA [Revised Total Coliform Rule Sample Siting Plan Workshop](#) for Community Water Systems at Albright College on Oct 1. On October 24, BCWSA is holding a household hazardous waste collection day.

PENNVEST: This item was skipped because Tess was not there.

Harmful Algal Blooms: Joe announced that this will be a recurring item on the Pathogens agenda. He passed around a new publication called [A Water Utility Manager's Guide to Cyanotoxins](#).

Jesse is interested in finding out if there's been any research done on the effects of lakes with cyanotoxins discharging into other lakes. He was referencing Chrisman and Liser Lake which both discharge into Lake Ontelaunee. Chrisman Lake is privately owned and Liser is owned by the Fish & Boat Commission. Tom mentioned that this should be referenced in the Lower Maiden WIP.

Emerging Contaminants: Joe will also be adding this topic to the agenda as a recurring item. EPA is proposing a new rule that would ban hospitals and pharmacies from putting unused prescription drugs down the sink or toilet. Additionally, the Water Utility Meeting, hosted by SAN, is on October 30. The two speakers are Jesse presenting on emerging contaminants and Brian Moore presenting on the Miller

Fire in Adam's County. Jesse sees this more as a round table discussion on if the Schuylkill should develop a monitoring plan for emerging contaminants.

Watershed News/News Articles:

- **WWTP Dockets for DRBC September meeting:**
 - Birdsboro Municipal Authority – renewal of docket
 - Amity Township – renewal of docket
 - Lower Frederick township – application to improve WWTP with UVtreatment, expanded discharge
- [PottstownBoroughstormwatermasterplan](#)
- Reading WWTP upgrades
- [SDWAamendmentforthemangementofHABs](#)

SAN 5-Year Strategic Plan Update: Tom reported that the strategic planning process is moving on as planned. The four targeted surveys (water suppliers, recreational users, municipalities, and general public) have been finalized and the recreational user survey was sent out to partners this week. He plans on sending them out at separate times so there isn't a rush of surveys that confuses people. In December at the next Pathogens

SAN Annual Meeting: The meeting date is finalized as Friday, Nov 13 at Reading Area Community College. Joe asked for ideas for the Pathogens workgroup presentation update. Jesse suggested including the water utility meeting, and discussing HABs and emerging contaminants.

Delaware Estuary/Schuylkill Shots Photo Contest: Virginia announced that the contest is over, but the photos will be displayed at the Delaware Museum of Natural History from Nov 6 to Dec As of now, we are unsure if the contest will run again next year.

William Penn Foundation Cluster update: Tom updated the group that the WPF is working on planning the next phase of initiative. There will be a short gap between the two phases. Also, the WPF is planning cluster site visits in October.

Other Items:

- SRRF grants awarded
- SAN recognized by Perkiomen Watershed Conservancy as Environmental Advocate
- A farm in the Maiden Creek watershed was awarded the USDA Clean Farm Award (Joe Locke)
- Jesse brought up an issue with quarries in Montgomery County. Joe will add this as a recurring item to the agenda.

Next Meeting Date (*consideration 2016 Work Plan Update*): Wednesday, December 9th 10am-12pm

**SAN PATHOGENS/COMPLIANCE WORKGROUP
FORTH QUARTER MEETING**

Schuylkill Action Network Pathogen/Compliance Meeting Minutes

December 9, 2015

Introductions -

Minutes from 9/30/2015 Workgroup Meeting -

- 2 small spelling issues (Christman Lake, Leeser Lake).
- Eric became a compliance specialist.
- Should not be DEP regulation, should be DEP policy.

PWD Schuylkill Watershed Control Plan/Sanitary Survey -

- The PWD is working on finishing the survey, which is due at the end of December. DEP SERO will review it.

PWD - Chapter 94 Data -

- No updates. The info was shared with PA American and DEP offices.
- Will be updated every 5 years.

Algae Info - <http://www2.epa.gov/sites/production/files/2015-11/documents/algal-risk-assessment-strategic-plan-2015.pdf>

- Joe mentioned that there was a Nov document released by EPA (Algal Toxic Risk Assessment and Management Strategic Plan for Drinking Water).
- The Source Water section is page 16-21 (discussed current activities of EPA).
- EPA is planning an Algae summit (at some time in the future) with State partners.
- NASA satellite studies are underway to identify HABs (Harmful Algal Blooms).
- Can be significant issue for water suppliers.
- RAWA is currently studying it and looking at different opportunities to control/treat it.

Emerging Contaminants (UCMR 4) -

- The new rule was signed on Nov.30 by EPA.
- Public stakeholder webinar Jan 13th from 1:00-4:30.
- Beth mentioned that the website is really good and has a lot of info.
- Once signed, it usually take a couple of weeks to get to the Federal Register (should be on soon).
- Some targets are only required by surface systems. All rules are explained on the website.
- EPA issues new list of no more than 30 contaminants for monitoring every 5 years.
- PA House Bill 1737 would allow waste to energy plants to offer programs of free and safe disposal of Pharmaceuticals.
- Wallgreens has new disposal bag on sale that can be thrown away (MedsAway).
- There was a case study by AWWA and partners: Bromide Discharges from Power Plants: a safe Drinking Water Act/Clean Water Act integration Story.

Quarry Updates -

- No update

Delaware Valley EWS -

- Working on the new strategic plan (using the survey to help shape it).
- Last stakeholder meeting was in May.
- Kevin Buss hired as new inspector for Reading office.

BCWSA Activities -

- No update

PENNVEST -

- Pennvest has \$510M/year. Reading is expected to come in for another phase of their project.
- Temple is working on application for green roof on their library.

EPA -

- No other updates
- Kyle Smeck introduced himself and mentioned that he's working on WWTP outreach and trainings as part of his position.

Watershed News -

WWTP Dockets for DRBC December meeting:

- *Nothing new for Dec 9th meeting*

News Articles -

Joe presented new items for the watershed.

- East Norriton Twp. Pays \$54K civil fine for sewage overflows.
- West Pottsgrove municipal budget calls for property tax increase.
- Bally voted to raise rates to complete improvements to their infrastructure.
- 73% of Pottsville Moratorium lifted.

Other Items -

Water Utility Meeting (Emerging Contaminants/Miller Fire) -

2016 Work Plan Update -

http://schuylkillwaters.org/doc_files/SAN%20Pathogens%20Workplan%202015%20FINAL.pdf

SAN 5-Year Strategic Plan Update -

2014 Annual Report for Queen Lane LT2 Watershed Control Plan
Philadelphia Water Department

SAN Annual Meeting follow up -

http://schuylkillwaters.org/doc_files/2015%20Pathogens%20Update.pdf

Plant Tour? - In Spring

Next Meeting Date - March 16th

SAN AGRICULTURE WORKGROUP FIRST QUARTER MEETING

Schuylkill Action Network Agriculture Meeting Minutes February 11, 2015

Review of November 2014 Meeting Notes - no corrections

Update on grant requests/funding efforts:

- Berks Watershed Restoration Fund – Kutztown and RAWA have provided funding; Saucony Creek
- Brewing will donate around \$3,500.
- National Fish & Wildlife Fund – PDE/Conservancy/Stroud – Conservancy’s new application for \$300K due in mid-March; matching NRCS farms.
- USDA programs – NRCS – Ranking 2015 EQIP applications – about \$1.2M in Berks and Schuylkill counties; RCPP will provide around \$15M in the Delaware Basin over 3-4 years; deadline for agreements is end of April.
- Schuylkill River Restoration Fund applications– Conservancy – Letters of Intent due March 26; plan to meet with BCCD and NRCS on possible projects; max amount around \$40K-\$50K.
- Growing Greener – DEP – BCCD received funding for two projects in Tulpehocken, 1 in Maiden Creek; Trust for Tomorrow stream restoration project in Albany Twp; Schuylkill Action Students projects rec’d \$35K for 3 schools.
- Water Resource Education Network grant cycle now open.

Projects in Progress

- William Penn Foundation – Stroud - \$120,000 from WPF for voucher program: for every acre of forested buffer, farmer receives voucher for more BMPs; goal is 16 farms; Stroud/BCCD having farmer workshop on March 10. PDE – outreach has been very successful;
- Growing Greener Ag BMP grant – Stroud - \$170,000 in vouchers to incentivize farmers to install forested buffers.
- Fish & Boat dam projects – Conservancy – meeting with American Rivers/PFBC on Cacoosing; meeting with City of Reading on Bushong; city will do a resolution to remove dam w/funding; working with RAWA and other partners on finding funds to remove Willow Creek dam.
- WBWA Buffer project – Conservancy – started project to add education signs on source water protection and riparian buffers along intake area.
 - Wyomissing Creek Watershed Coalition – BCCD – Center for Watershed Protection; received some funding to assist coalition and Berks Co MS4 program – unknown amount from private foundation.
 - BCCD Topton Creek – BCCD tentatively moving forward with project.

- Watershed Implementation Plan for Moselem Creek – PDE – Researching background for plan; Stroud to complete modeling for creek and tribs; submit to DEP in summer.
- SAN/Kutztown project database – PDE – Requested WPF fund to input all Middle Schuylkill project info in database and be verified – better approach for tracking projects and WQ data; also tracking Kutztown’s nitrates results; levels are decreasing.

Education/Outreach

- SAN website update – PDE – Ag projects have been updated on website; PDE looking into redesign of website in summer.
- Hay Creek outreach event – Conservancy promoted event, and had 20 attendees learn about land protection and easements.
- Innovative Ag Workshop – Conservation District – Feb 26 – “Growing Your Operation”.
- Conservancy asked Berks County for funding for easements.
- PDE is printing Water Conservation Guide with WPF funds.

Planning

- Reviewed 2015 Ag Workplan; new SAN Strategic Plan for next 5 years in progress.
- Annual Conference review – 11/14/14 – Everyone at annual meeting was interested; has anything come out of developing a monitoring/data workgroup?

Other Workgroup Updates

- Schuylkill Action Students projects – one more project at Conrad Weiser middle school to completed.

Other

- Western Berks Water Authority annual steering committee meeting scheduled for February.
- Berks County Water & Sewer Association annual conference scheduled for July 29.
- Schuylkill Watershed Congress – March 14
- Don’t forget to register any cleanups with Schuylkill Scrub – partnering with Keep Pennsylvania Beautiful..
- The Potomac Partnership is using SAN’s Ag Workgroup as a model.
- Coca-Cola may become a corporate partner with the Schuylkill River Restoration Fund.

Next Meeting: WEDNESDAY MAY 13, 10 AM at the Berks Agricultural Building

SAN AGRICULTURE WORKGROUP SECOND QUARTER MEETING

**Schuylkill Action Network Agriculture Meeting Minutes
May 13, 2015**

Review of February 2015 Meeting Notes

Update on grant requests/funding efforts

- Berks Watershed Restoration Fund – Conservancy – RAWA, Kutztown, WBWA all donated to fund; waiting for Saucony Creek donation amount.
- National Fish & Wildlife Fund –Conservancy/Stroud - \$300K maximum for Middle Schuylkill cluster to match EQIP projects with NRCS; Stroud submitted for work in other counties.
- USDA programs – NRCS – EQIP wrapping up 2015 funding; needed to replace a large dollar project - \$500K in Upper Maiden farms. EQIP funds were reduced because of RCPP.
- Schuylkill River Restoration Fund applications– May 28 application deadline; June 30 grant review. Conservancy has 3 farm projects, need support letter from Ag Workgroup
- Growing Greener – DEP – Jineen said that GG open from 5/9-7/10 for proposals. No priority watershed in Berks County this round. Review all potential proposal ideas with Jineen before submitting.
- Berks Conservancy has 2 land assistance projects in Manatawney and Kittatinny Ridge.
- RCPP – Stroud - \$1.5M in Chester & Berks counties; working on ranking criteria. Tom asked about work in Upper Perkiomen; WRP funding is available for some preservation money.

Projects in Progress

- William Penn Foundation/NFWF – PDE/Conservancy/Stroud
- William Penn watershed monitoring program – PDE/Conservancy/Miller/Stroud – Maps are available for macro and WQ sampling. Working with water suppliers to develop a monitoring plan; BCCD mentioned recent stream upgrade proposal from PFBC process.
- Crypto monitoring – PWD/Lehigh – meeting with Western Berks and RAWA to discuss monitoring projects.
- Growing Greener Ag BMP grant – Stroud – held workshop in Bernville last March – 6-8 farms interested in program; Irish Creek farmers interested also.
- Growing Greener – BCCD – still waiting on contracts; 3 manure mgmt. and storages in Maiden Creek and Tulpehocken watershed.
- Fish & Boat (Cacoosing, Willow Creek, Bushong dams) – Conservancy – Money set aside for Cacoosing; Reading passed resolution to remove Bushong dam; RAWA studying feasibility for Willow Creek dam removal.
- WBWA Buffer/Sign project – Conservancy – draft signs with WBWA staff
- Hamburg Watershed Sign project – RAWA/Conservancy – signs ordered – RAWA/Hamburg will install this summer.
- Wyomissing Creek Watershed Coalition – BCCD – Working on BMP ranking; PAWC did not award grant application.
- BCCD Topton Creek project – project moving forward; Working on partner signatures for contracts; municipalities will contract a final design for stream restoration.
- Moselem Creek Watershed Implementation Plan – PDE – basic text together, meeting was held in May to discuss implementation projects to be included; RAWA attempting to work with Kehl Farm for installation of buffer along Moselem Creek.
- SAN/Kutztown project database – PDE – Still waiting for WPF grant announcement.

- Unassessed Waters – RAWA/PFBC – working with national Trout Unlimited group for municipalities in Lehigh County.

Education/Outreach

- SAN website update – PDE – planned for summer/fall updates
- BCWSA Annual Conference – “Partnership: The Path to Clean Water”

Planning

- SAN 2016 Strategic Plan – 5-year plan; several Listening Sessions and online webinars planned for summer; need feedback from members.
- Data/Monitoring Workgroup – possible interest in developing new workgroup – see Tom if interested.
- Recreation Workgroup – exploring this new workgroup as part of strategic plan.

Other Workgroup Updates

- Schuylkill Action Students projects – 3 schools planned for GG grant application; if members have nominations for school participants in current program, see Tom.

Other

- Emerging Contaminants – RAWA/SAN – met with DEP, updated sampling from USGS; plan to meet with surface suppliers to discuss at next meeting (October?)
- Blue Guide for Conservation – PDE – available now
- Photo Contest on website open
- Stroud – BCCD can develop a factsheet that describes all the programs and acronyms; PDE can help with funding and design.
- BCALP – ranked 123 farms in 2015 for \$2.95M – added 892 acres to program.
- BCCD participated in Swamp Creek meeting with MCCD Watershed specialist.
- RACC Drinking Water award

SAN AGRICULTURE WORKGROUP THIRD QUARTER MEETING

Schuylkill Action Network Agriculture Meeting Minutes August 5, 2015

INTRODUCTIONS/NEW MEMBERS

Review of May 2015 Meeting Notes

Update on grant requests/funding efforts

- Berks Watershed Restoration Fund – Conservancy – RAWA, Western Berks, and Kutztown all donated, no word from Saucony Creek Brewing yet.
- National Fish & Wildlife Fund – Conservancy/Stroud – June 2015-\$300,000 for NRCS; Stroud received \$300,000 for Farm Stewardship Program.
- USDA programs – NRCS – 20 EQIP contracts for \$800,000 in Schuylkill Watershed; \$600,000 in Maiden Creek Initiative. Next year will be Upper Maiden; losing Saucony Creek in initiative. CREP is ongoing in Berks – new enrollment from Stroud, and processing re-enrollments. Berks office has 2 new staff.
- Regional Conservation Partnership Program – NRCS/Stroud – NRCS has 32 applications, now ranking; NFWF has \$550,000 invested in 6-8 contracts, with 5-year

implementation. Stroud received \$100,000 for outreach in Berks and Chester counties; considering a new workgroup.

- Conservancy is thinking about a wintertime outreach event in Maxatawny.
- Schuylkill River Restoration Fund applications – grant awards will be announced in September.
- Growing Greener – DEP – 2015 applications will be reviewed after September. BCCD had some invoicing changes for their 2014 grant.
- Land assistance – Conservancy – Provided financial assistance to landowners in Oysterville Creek and Upper Maiden Creek, and a forest easement of 78 acres.

Projects in Progress

- William Penn Foundation/NFWF – PDE/Conservancy/Stroud – considering leftover NRCS farms from 2014. 3 manure storages planned.
- William Penn watershed monitoring program – PDE/Conservancy/Miller/Stroud – 2nd round of sampling conducted in May. Overview of program will be shown at SAN conference.
- Conservation District conducted final cycle of 319 monitoring – have applied again for funding, with 10 new sites.
- Growing Greener Ag BMP grant – Stroud – BCCD outreach in Northkill & Irish Creek area.
- Fish & Boat (Cacoosing, Willow Creek, Bushong dams) – Conservancy – City of Reading has put out an RFP for design and removal services.
- WBWA Buffer/Sign project – Conservancy – Sign design this fall/winter; planting in spring 2016.
- Hamburg Watershed Sign project – RAWA/Conservancy – to be completed in August.
- Wyomissing Creek Watershed Coalition – BCCD – working on final stages of BMP narrative; 70 ranked projects, will present at next meeting.
- BCCD Topton/Toad Creek project – executed funding agreement for erosion & stormwater issues
- Lower Maiden Watershed Implementation Plan – PDE – part of a 319 plan; partners have met to discuss needs.
- SAN/Kutztown project database – PDE – provided William Penn Foundation with proof-of-concept information on just the Kutztown focus.
- Moselem Creek-Kehl Farm buffer – RAWA – no report
- Crypto monitoring – PWD/Lehigh – Phila Water Dept will work with WBWA and RAWA on 2nd round of LT2 sampling.
- Unassessed Waters – RAWA – very successful partnership with Trout Unlimited on Birch Creek, a tributary to Maiden Creek.
- Upper Perkiomen farmer project – MCCD

Education/Outreach

- SAN website update – PDE – quotes/estimates higher than expected; revisit project in 2016.
- BCWSA Annual Conference – July 29 at Albright College – very successful, over 100 attendees.
- Blue Guide for Conservation – PDE – copies available upon request.
- Photo Contest – PDE – ended in July, will announce winners at Coast Day event in September.

- Stroud is planning a stream ecology training for TU Chapters in August.
- Lehigh Conservation District is hosting a Farm visit with the Conservancy.

Planning

- SAN 5-year Strategic Plan Listening Sessions – Ag Workgroup feedback requested; new
- Data/Monitoring and Recreation Workgroups considered
- Surface Supplier Meeting – planned for late fall.

Other Workgroup Updates

- Schuylkill Action Students projects – no report

Other

- PACD awarded a farm in Lehigh County – September event
- NJ Audubon called LCCD regarding an RCPP grant.
- Laura Hopek not returning as LCCD Watershed Specialist
- Rick Rogers replaced Vicky Binetti at EPA Region III; recruiting candidates for Drinking Water Chief.

Next Meeting: Wednesday November 18, 10:00 AM

SAN AGRICULTURE WORKGROUP FORTH QUARTER MEETING

Schuylkill Action Network Agriculture Meeting Minutes November 18, 2015

INTRODUCTIONS/NEW MEMBERS – See attached sign-in sheet Review of August 2015

Meeting Notes

Update on grant requests/funding efforts

- Berks Watershed Restoration Fund (Berks Nature) – RAWA, Kutztown, and Western Berks all contributed, waiting for Saucony Creek Brewing. Larry asked for ideas for a display area at SCB, Tom will look at display boards. There is also a new initiative from William Penn Foundation that may be appropriate.
- National Fish & Wildlife Fund (Berks Nature/Stroud) Stroud: existing grant and new funding for Farm Stewardship Program + Growing Greener has 20-30 projects. 8 farms are under agreement; others in progress. Berks Nature: new round in 2016; 2014-2015 funds expended.
- USDA programs (NRCS) Applications were due in October; Ranking in December/January; expect \$900,000 in EQIP for Berks and Schuylkill counties. CREP opportunities available; wetland easement/bog turtle program available.
- Regional Conservation Partnership Program (NRCS/Stroud/LCCD) NRCS: accepting applications until Dec. 18; \$850,000 in RCPP and NFWF. Lehigh Conservation District: interested in any RCPP partnership projects.
- Schuylkill River Restoration Fund Recipients (Berks Nature) Phila Water Dept. hosted a Farm Tour of grant recipients in November. SRRF Grant Review Committee meeting in November – changing criteria and disbursement procedures, included timeframe.

- Growing Greener Grant Program Updates (DEP) DEP: 2015 announcements probably in 2016 after budget passed.
- Land Assistance Program (Berks Nature) Kittatinny Ridge outreach from Nature Conservancy grant; also will lead BMP discussions.
- PACD Mini-Grants (BCCD) \$2,500 for CREP outreach assistance; working with other initiatives for outreach.
- Conservation Initiative Grant (Stroud) Pilot program to assist farmers with transitioning to year-round cover crops and water quality monitoring.
- Five Star/Urban Waters (EPA) Webinar scheduled for 11/18, available on website too. Grant applications 2/3/16.

Projects in Progress

- William Penn Foundation/NFWF (PDE/Berks Nature/Stroud) PDE: WPF coordinators visited project sites in October; Phase II of the initiative will start in 2018. 2017-2018 timeframe will be used for planning for Phase II. Berks Nature: Larry thanked tour attendees.
- William Penn watershed monitoring program (PDE/Berks Nature/Miller/Stroud) PDE: working with BCCD on their 10 sites from the 319 project – quarterly chemical analysis at 7 sites; Stroud has 5 sites. Results are sent to Academy of Natural Sciences for WPF collection and storage. Berks Nature: Maiden Creek Watershed Association is working on strategic plan, which include water quality monitoring plan.
- Growing Greener Projects (Stroud/LCCD/BCCD) LCCD: Benicoff project BCCD: mushroom applicators Stroud: technical outreach Mt Penn: Carsonia Lake water quality
- Fish & Boat (Cacoosing, Willow Creek, Bushong dams (Berks Nature) Waiting on City of Reading's RFP decision – proposals received; expect award by Dec. 31. Removal of dams is planned for next September if funding available.
- Hamburg Watershed Sign project (RAWA/Berks Nature) 7 watershed signs were installed in September in HMA's Furnace Creek. Project completed.
- WBWA Buffer/Sign project (WBWA/Berks Nature) Sign design in progress; planting and sign installation planned for Spring 2016.
- Wyomissing Creek Watershed Coalition (BCCD) Installed downspouting and infiltration trench at playground area. Coalition is planning an Ag component for horse owners.
- Topton/Toad Creek project (BCCD) US Army Corps of Engineers called BCCD to partner in project. Project still going through a legal process.
- Lower Maiden Watershed Implementation Plan (PDE) Finalizing modeling needs for plan; need to identify projects in Moselem Creek and tributaries.
- SAN/Kutztown project data collection (PDE) PDE submitted a formal grant request to WPF – staff is reviewing application. Grant is for funding to clean up current data and look at Kutztown well data for comparison to restoration criteria. Also requested to

convene organizations to understand restoration needs and meet with NRCS on data-sharing requirements.

- Moselem Creek-Kehl Farm buffer (RAWA) Nitrate levels are increasing near property. Jesse Goldberg met with Kehl, no interest in participation. Next attempt to contact Heffner farm for participation in buffer project.
- Crypto monitoring (PWD/Lehigh) PWD has expanded project areas. Currently sampling 5 sites twice a month, including RAWA and Western Berks. Project includes genotyping crypto to determine origin.
- Unassessed Waters (RAWA) Very successful initiative. National Trout Unlimited and Tulpehocken Chapter looked at 29 stream assessments in Berks County. Developing a formal petition from PA Fish & Boat to DEP for 5 stream segments upgraded to Special Protection. TU wants to help work with Tulpehocken watershed next.
- Reading HS Stormwater (BCCD) Interest in project again - working to get BMPs in place.

Education/Outreach

- SAN Annual Conference - PDE About 70 attendees, evaluations are coming in. Positive feedback on programming.
- Berks Nature SOTE breakfast Attendees impressed with UofD professor speaker.
- SAN website update Current website has some updating in progress; plans to rework entire website in summer if funding is in place.
- PACD Farm Award - Lehigh Conservation District Joel Lock event on Sept. 1 in headwaters of Maiden Creek. Installed a stackpad BMP.
- Farm Achieving Resource Management - FARM Program (BCCD) Implementing procedures for better communication with farmer/BMP projects.
- SOURCE Newsletter (SSM) Autumn issue posted on SAN website; features article from Jesse Goldberg on "Unassessed Waters" success.

Planning

- SAN 5-year Strategic Plan Listening Sessions (PDE)
 - Need to determine metrics for next strategic plan:
 - Look at 2015 numbers to shape goals
 - Emerging issues like chicken industry and horse farms
 - New partnership opportunities - PA Sustainable Ag
 - Implementation of Lower Maiden WIP
 - Ag issues in Upper Perk watershed
 - Stormwater in agriculture
 - New Data/Monitoring and Recreation Workgroups
 - Part of 5-year Strategic Plan
- Surface Supplier Meeting - reschedule date in 2016

Other Workgroup Updates

No reports

Other Notable Items

- DEP: Improving Streams Program guidance document out for comment; comments due 11/30.
- BCCD: “Paint the Rain” school competition to paint rain barrels. Information on BCCD website. Application forms due 12/18/15.

Next Meeting: Wednesday February 17, 2016 - 10:00 AM Berks County Ag Center Auditorium

Appendix B: Wildcat Sewer Update from Watershed Sanitary Survey (PWD, 2015)

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

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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 untreated wastewater to the West Branch Schuylkill River.	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
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 received 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 plant 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-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	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

				Environmental Excellence from PADEP in 2015 for completion of the project.	
New Ringgold Municipal Authority	New Ringgold Borough	Schuylkill	Little Schuylkill and Koenig Creek	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.	"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>
West Hamburg	Tilden Township	Berks	Schuylkill River	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.	"Governor Rendell Announces \$72 Million in Water Infrastructure Investments." Apr 14, 2008. PRNewswire. www.prnewswire.com

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Virginville	Richmond Township	Berks	Maiden Creek, Sacony Creek	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.	"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., Facebook. www.facebook.com
Strausstown	Strausstown Borough	Berks	Tributaries to Blue Marsh Reservoir	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.	"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>

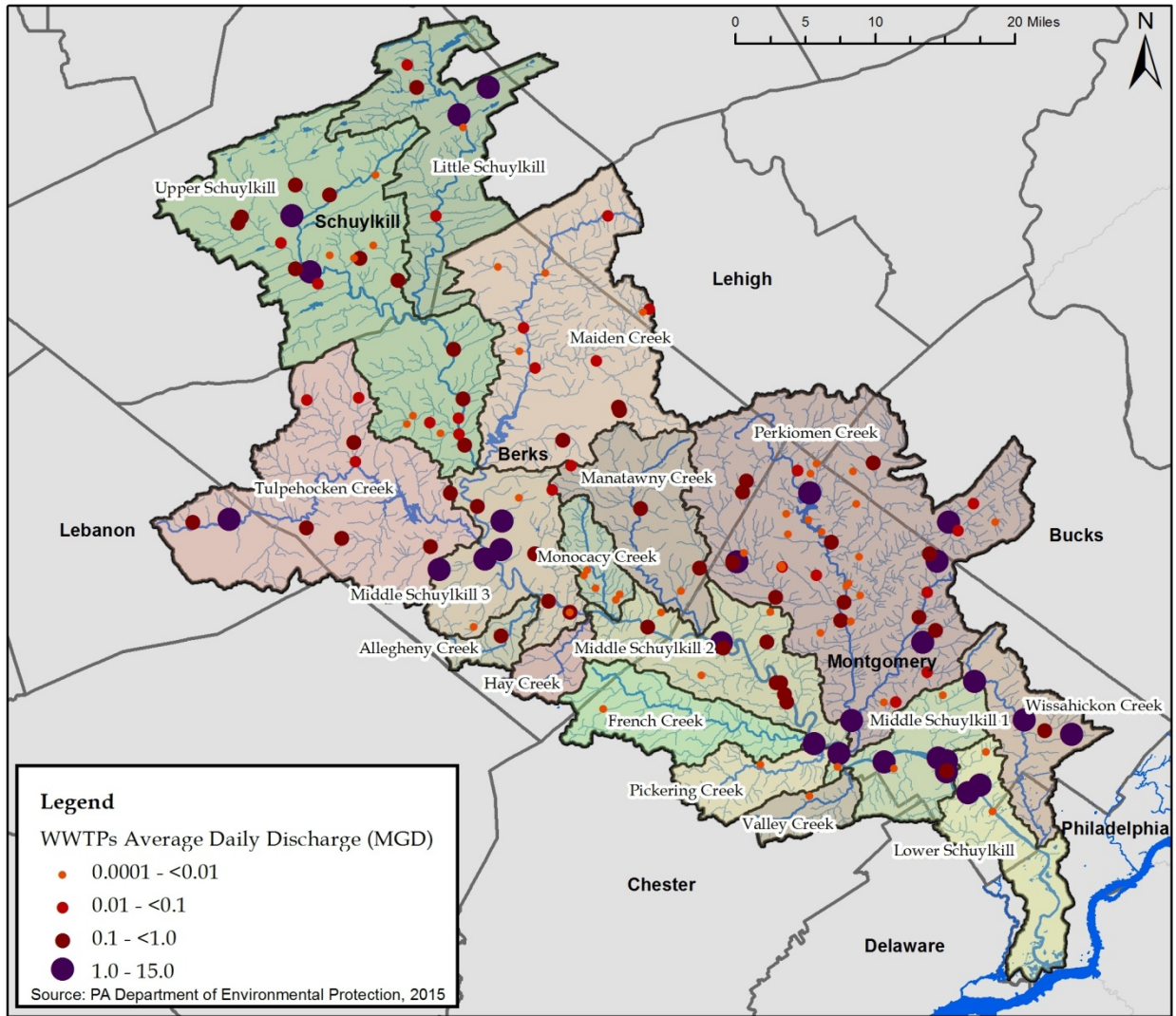
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Lenhartsville	Lenhartsville Borough	Berks	Furnace Creek, Maiden Creek	Lenhartsville Borough received over \$1.3 million in 2002 and over \$1.6 million in 2004 in loans and grants from PENNVEST to construct a new sewage treatment plant and collection system to eliminate the use of on-lot septic systems contamination drinking water wells and local streams, including Furnace Creek and Maiden Creek. The new sewage treatment plant went online in July 2005.	"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>
Sassmansville	Douglass Township	Montgomery	Schlegal Run and Middle Creek	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 community of Sassmansville which is located in Douglass and New Hanover Townships.	"Douglass (Mont.) Oks Sassmansville Sewer Project." The Mercury News; Berks-Montgomery Municipal Authority Sewer Revenue Bonds. Apr 20, 2015. McElwee & Quinn Financial Printing. www.mcelweequinn.com.
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	(Rob Jones, Tamaqua Public Works, personal communication, May 22, 2015)

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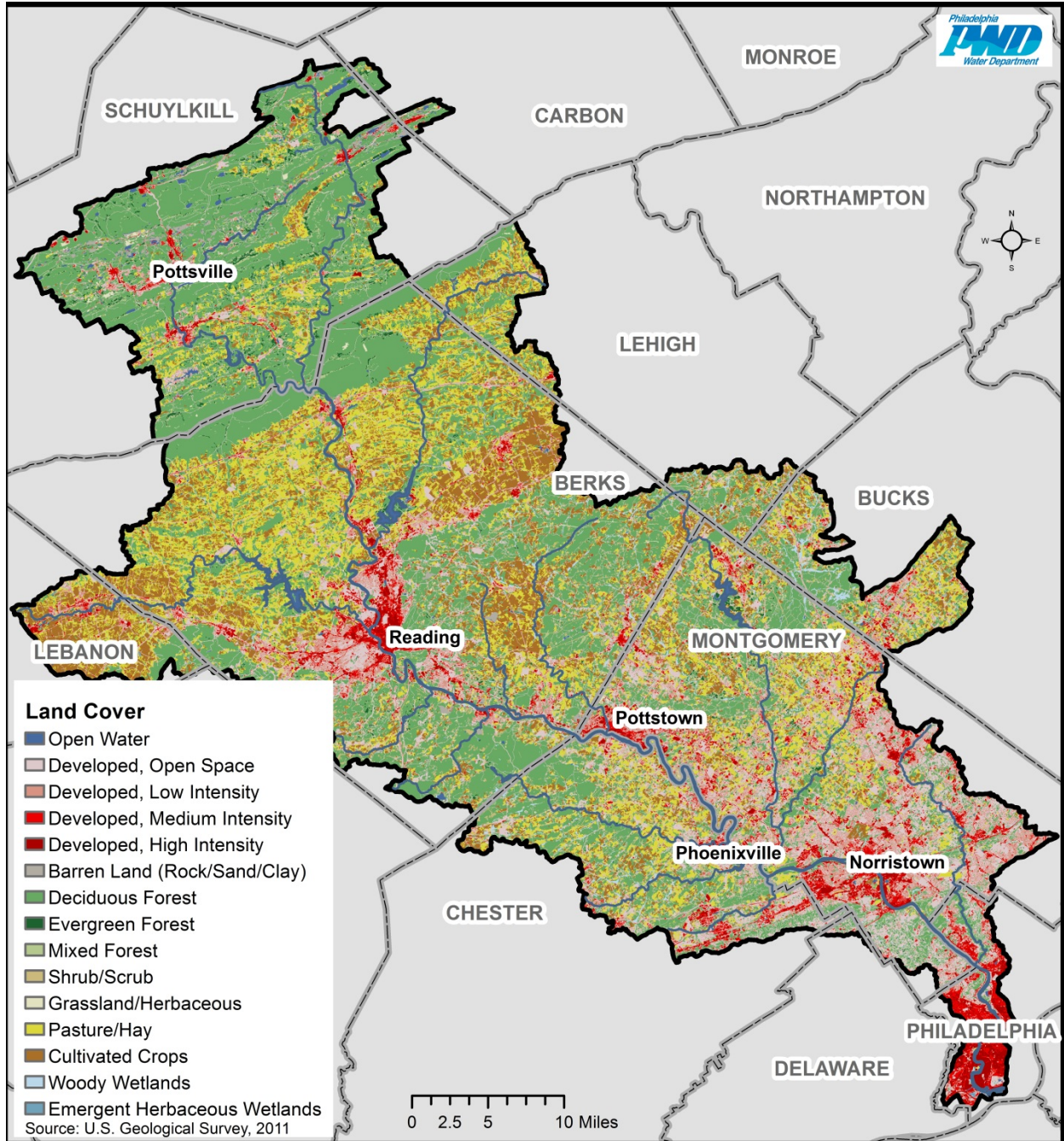
				system.	
South Tamaqua	West Penn Township	Schuylkill	Little Schuylkill	Act 537 planning in Walker and West Penn Townships is ongoing. The existence of wildcat sewers and malfunctioning on-lot disposal systems has been confirmed.	"Wildcat Sewers Exist in West Penn Township." Times News, LLC. Apr 5, 2013. http://www.tnonline.com/2013/apr/05/wildcat-sewers-exist-west-penn-township ; Act 537 Plan. Walker Township. http://www.walkertwp.com/Pages/ACT537Plan.aspx
Albany	Albany Township	Berks	Maiden Creek	Unknown	
Port Indian	West Norriton	Montgomery	Schuylkill River, main stem	Unknown	

Appendix C: WWTPs in the Schuylkill River Watershed Map

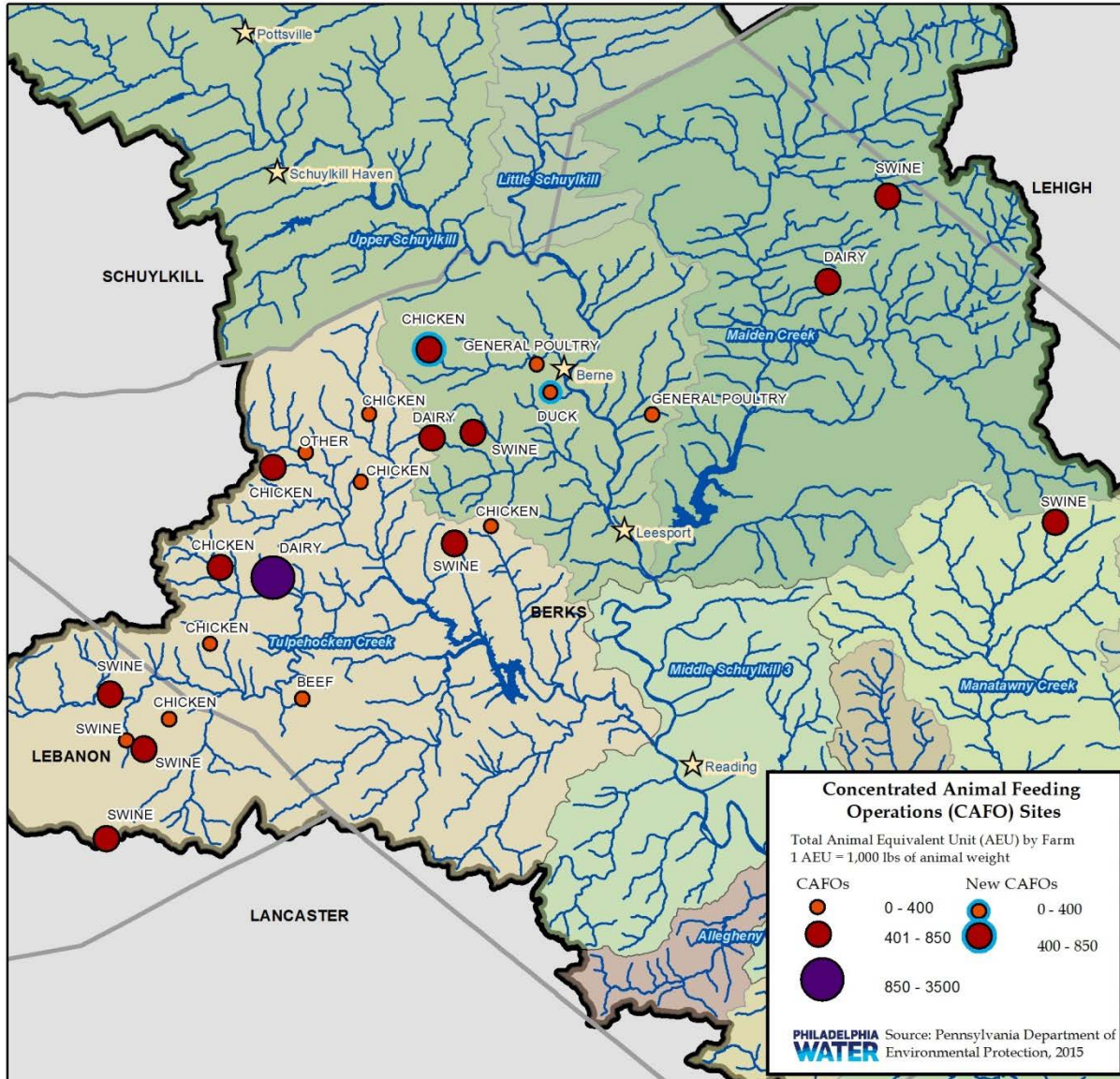


Sources: Developed using EPA Permit Compliance System and Integrated Compliance Information System (PCS-ICIS) and Chapter 94 Reports submitted by WWTPs to PADEP (PWD, 2015b)

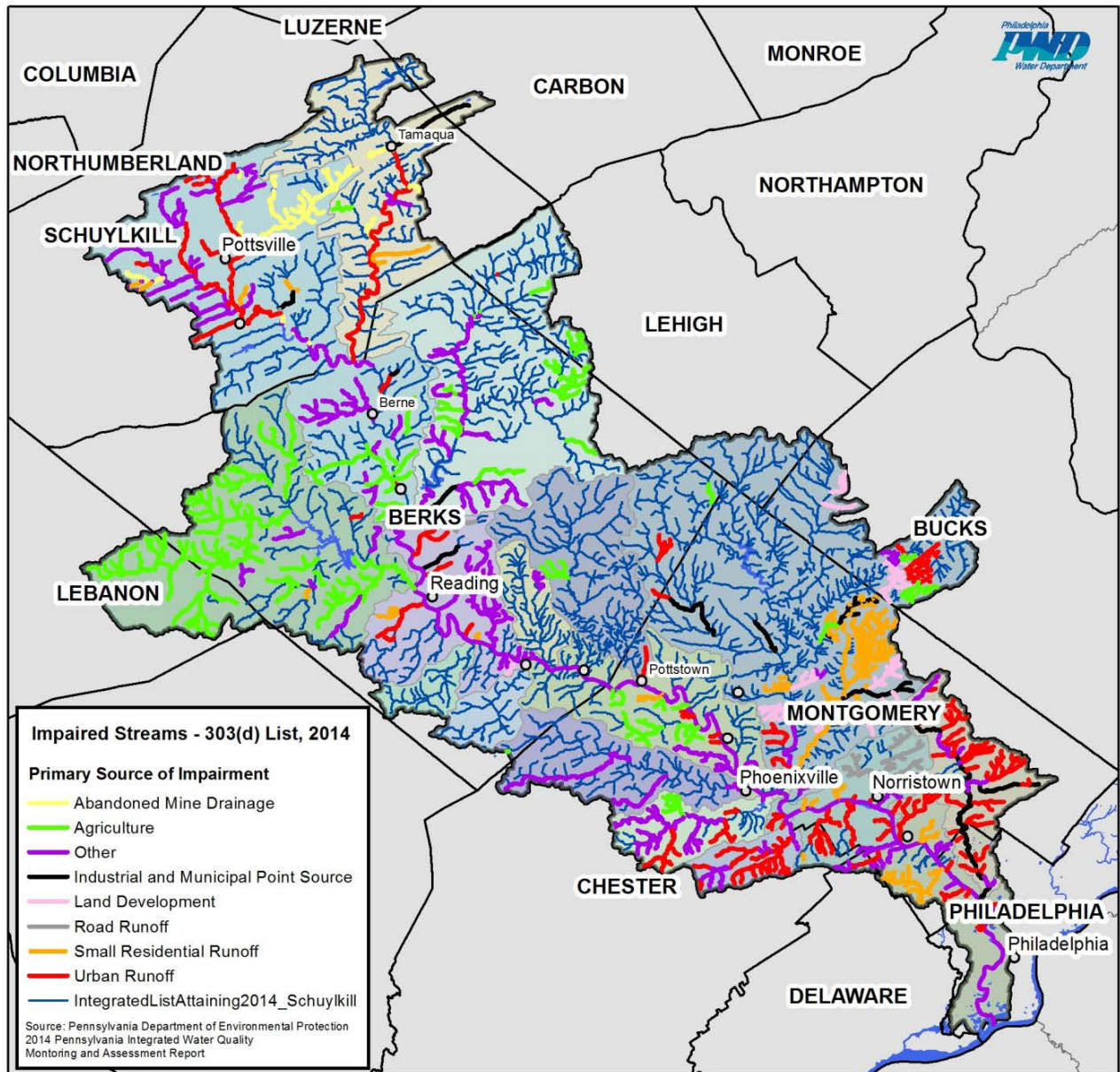
Appendix D: Schuylkill River Watershed Land Cover Map



Appendix E: CAFOs in the Schuylkill River Watershed Map



Appendix F: 303(d) List Map of Impaired Streams



This map shows the primary source of impairment for streams on the 2014 303(d) list. No streams listed as impaired in 2012 were delisted in 2014 in the Schuylkill River watershed.

Appendix G: Additional Literature Sources for *Cryptosporidium* Loading Estimates

	beef cattle, dairy cattle, calves	swine, sheep, horse
Estimated Prevalence of Infection in Animals	(Cox et al., 2005); (Fayer et al., 2006); (USDA, 1993)	(Cox et al., 2005); (Johnson et al., 1997)
<i>Cryptosporidium</i> oocysts per day per animal	(Atwill et al., 2003)	--
<i>Cryptosporidium</i> oocysts per weight feces	--	(Cox et al., 2005)
Weight manure per day per animal	--	(ASAE, 2003)