2022 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

December 2022

This report was produced for the Pennsylvania Department of Environmental Protection in accordance with the Environmental Protection Agency National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule.

DISCLAIMER:

This annual status report is provided as of December 2022. It is being provided to the Pennsylvania Department of Environmental Protection (PADEP) to document PWD's completion of certain Watershed Control Plan (WCP) initiatives during 2022 in connection with the requirements of the Long Term 2 Enhanced Surface Water Treatment Rule. The WCP presents a comprehensive source water protection approach to reducing levels of infectious Cryptosporidium in finished drinking water. By presenting this information, PWD has not undertaken any obligation to update the report beyond its date. As such, the information is subject to change without notice. There is no assurance that the programs or initiatives set forth herein or referenced in this report will be realized or come to fruition, and subsequent or actual plans or proposals may differ, perhaps materially, from the descriptions contained herein. The data and information provided are not warranted as to completeness or accuracy and are subject to change without notice. This report is provided for PADEP's information and convenience only.

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

1.0 Executive Summary

This document serves as a yearly report for the Philadelphia Water Department's (PWD) Queen Lane and Baxter drinking water treatment plants to maintain compliance with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2). In 2022, PWD continued to implement its Watershed Control Plan (WCP) for the Queen Lane intake in the Schuylkill River Watershed in compliance with LT2. The plan aims to reduce *Cryptosporidium* loadings in the Schuylkill River watershed from priority sources such as wastewater effluent, agriculture, animal vectors, and urban stormwater runoff. Source water protection initiatives as well as structural control measures were identified and implemented as part of the WCP to achieve a target *Cryptosporidium* load reduction. Additionally, PWD received approval in Summer 2021 of its Watershed Control Plan Update to expand *Cryptosporidium* control strategies into the Delaware River Watershed and improve collaborative foundations among stakeholders and create education and outreach programs.

PWD utilizes two key mechanisms to support WCP implementation: the Schuylkill Action Network (SAN), a watershed-wide collaborative consisting of stakeholders from public, private, and non-profit sectors; and the Schuylkill River Restoration Fund (SRRF), a public-private partnership created to fund the implementation of on-the-ground environmental restoration projects in the Schuylkill River watershed. PWD supports facilitation of the Schuylkill Action Network in the amount of $155,000 annually. PWD also contributes approximately $100,000 annually to the SRRF to fund projects that best align with PWD planning priorities.

Progress towards the WCP objectives is summarized below by priority sources along with highlights from the inception of the WCP.

Priority Source: Wastewater Effluent

In 2018, PWD completed its first triennial update to the Schuylkill Watershed Sanitary Survey (WSS), a comprehensive report detailing the status of wastewater treatment technologies and sewage system planning efforts throughout the Schuylkill River watershed. PWD continues to track developments in the watershed related to Act 537 sewage facility planning through the Schuylkill Action Network (SAN) Pathogen and Point Source Workgroup and updates the WSS accordingly. The 2021 update to the WSS was submitted to the PA DEP in January 2022. Additionally, PWD engages wastewater utilities through its continued participation in the SAN Pathogen and Point Source workgroup and as the owner of the Delaware Valley Early Warning System for the lower Delaware River watershed.

In 2022, the SAN Pathogen and Point Source Workgroup strengthened communication between and provided educational resources to wastewater and drinking water utilities to improve source water protection efforts. The group facilitated data and information sharing to document wastewater treatment technologies and improvements and investigated evolving source water issues – including unregulated contaminants. PWD also helped plan and coordinate the 2022 Water Utility Forum, a day-long event where water utilities throughout the Schuylkill River watershed met to discuss source water issues. The next Water Utility Forum, likely to be held in early 2024, will be expanded to include Delaware River water utilities as both attendees and planning committee members.

Priority Source: Agriculture

PWD supports agricultural best management practice installation through annual contributions to the Schuylkill River Restoration Fund (SRRF) and participation on the grant advisory committee. In 2022, $60,000 from PWD's annual contribution funded three large watershed protection projects on agricultural properties in the Schuylkill River watershed. These priority projects were selected for the implementation of agricultural best management practices to support WCP *Cryptosporidium* control objectives.

- Lynnacres Dairy, a farm located in the headwaters of Maiden Creek in New Tripoli, Lehigh County, received a $100,000 SRRF grant to construct a 6-month storage capacity liquid manure storage facility and other agricultural best management practices (BMPs). PWD contributed $40,000 to Lehigh County Conservation District for Lynnacres Dairy, with Constellation Energy contributing $60,000.
- The Hollinger Farm property, a beef operation in the Maiden Creek Watershed in Berks County, received a $45,000 SRRF grant to construct a 6-month capacity roofed manure storage area and other agricultural BMPs. PWD directed $10,000 to Berks Nature for the Hollinger Farm project. Aqua PA contributed $25,00 to the project, with Constellation Energy and PA American Water each contributing a further $5,000 towards the SRRF award.
- PWD also directed $10,000 towards the SRRF grant awarded to Berks Nature for the Pond View Farm project in the Maiden Creek Watershed. The Pond View Farm's project suite includes the installation of a 6-month capacity roofed manure storage area and other agricultural BMPs. The total SRRF award for the Pond View Farm project was $45,000, with Constellation Energy contributing the remaining funding.
- Additionally, PWD awarded $40,000 of a $53,000 SRRF award to the Schuylkill Center for Environmental Education to implement stormwater BMPs adjacent to Smith Run, a high-quality first-order tributary to the Schuylkill River, the headwaters of which are in Philadelphia. Constellation Energy contributed $13,000 to the total award.

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

Priority Source: Animal Vectors

At PWD facilities and Fairmount Park properties, Canada geese—known mechanical vectors of *Cryptosporidium*—were removed and nests and eggs treated through a partnership with the US Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS). Wildlife

management activities were also conducted on several PWD properties, including Philadelphia's three drinking water treatment plants.

In the second half of 2021, more than 4,674 geese were dispersed or removed from Philadelphia public parks while more than 3,938 geese were dispersed or removed in the first half of 2022 totaling more than 8,612 geese during FY22. In FY22, 4,447 geese were dispersed or removed from Peter's Island and Pleasant Hill Park, both locations near Philadelphia drinking water intakes.

Priority Source: Urban Stormwater

Stormwater best management practices (BMPs) were not directly included in the scope of the WCP. Stormwater projects are already implemented through a variety of other programs, including stormwater ordinances and MS4 permits. Stormwater management practices are implemented throughout the City of Philadelphia as part of PWD's *Green City, Clean Waters* (GCCW) program, a 25-year plan to reduce stormwater pollution through the installation of green infrastructure. Additionally, the Rain Check program informs Philadelphia residents about the benefits of green stormwater infrastructure and how to select the best options for their property. In FY22, a total of 20 workshops were held with 1,346 participants. As a result of the FY22 program, a variety of stormwater management tools were installed on residential properties, including 33 installations of permeable pavers to allow for better infiltration of stormwater, 114 downspout planters, 5 rain garden plantings, and 454 rain barrels.

Through the SAN, a number of riparian buffer plantings and education and outreach events have occurred throughout the watershed. The SAN Stormwater and Education & Outreach Workgroups have engaged students in managing stormwater on school campuses to benefit MS4 communities through the Schuylkill Action Students (SAS) program. From 2020 through 2022, the COVID-19 pandemic restricted the number of in-person education and outreach events that could be held. PWD plans to continue its participation in the SAN Stormwater Workgroup into the future years of the WCP.

The Future of the WCP

The second round of LT2 compliance sampling ended in March 2017. Each PWD intake on the Schuylkill and Delaware Rivers was sampled bimonthly for a period of 2 years. *Cryptosporidium* results from the Queen Lane Water Treatment Plant achieved an average result less than the 'Bin 1' threshold value of 0.075 oocysts per liter; however, the Queen Lane Water Treatment Plant remains classified as 'Bin 2' due to sampling results obtained from the first round of LT2 monitoring. The Queen Lane Water Treatment Plant will continue to achieve individual and combined filter effluent performance requirements as approved by PA DEP to maintain compliance with the first round of LT2 sampling. The resulting round of monitoring placed the Baxter Water Treatment plant on the Delaware River in Bin 2. The same microbial toolbox options selected for Queen Lane were selected for Baxter to ensure that PWD maintains compliance with the LT2 regulation. PWD will continue ongoing initiatives outlined in the WCP through its existing Source Water Protection Program framework. PWD submitted a WCP Update to PA DEP in October 2020 that expands WCP efforts into targeted areas of the Delaware River

watershed. The updated plan was approved in June 2021. WCP Annual Status Reports will now include progress updates relevant to the expanded scope of work.

2.0 Introduction

In April 2011, the Philadelphia Water Department (PWD) completed a Watershed Control Plan (WCP), and after receiving approval from the Pennsylvania Department of Environmental Protection (PA DEP) the WCP went into effect December 2012. The WCP presents a comprehensive source water protection approach to reducing levels of infectious *Cryptosporidium* in finished drinking water (US EPA, 2006). The elements of the WCP were achieved through previously established and ongoing efforts of the PWD Source Water Protection Program and through WCP actions aimed to specifically reduce levels of *Cryptosporidium* in the Schuylkill River watershed, a PWD drinking water source. A proposed Watershed Control Plan Update, expanding the geographic scope into priority areas of the Delaware River Watershed, was submitted in October 2020 and approved in June 2021.

The following report documents PWD completion of WCP initiatives during 2022, despite the continuance of a global pandemic limiting in-person meetings and public engagement. The existing framework of the plan and its underlying initiatives will continue to be maintained and developed to further reduce sources of pathogens, nutrients, and sediment into area waters.

3.0 Background

The US Environmental Protection Agency (EPA) published the first source water quality-based drinking water regulation on January 5, 2006. The Long Term 2 Enhanced Surface Water Treatment Rule (LT2), a series of amendments to the Safe Drinking Water Act, serves to protect the public from waterborne illness caused by *Cryptosporidium* and other microbial pathogens in drinking water. In the United States, *Cryptosporidium* has been the cause of several outbreaks of Cryptosporidiosis, a gastrointestinal disease particularly dangerous for immunocompromised individuals. The LT2 requires public drinking water systems with surface water sources, or groundwater sources influenced by surface water, to monitor monthly for *Cryptosporidium* at each supply intake for two years. The observed *Cryptosporidium* concentrations categorize each intake into one of four 'Bins.' Public water systems placed in Bin 1 indicate the lowest concentrations of *Cryptosporidium* and require no additional treatment. Public water systems placed in Bins 2, 3 and 4 require 4-log, 5-log and 5.5-log removals, respectively. A log removal represents a reduction in pathogen concentration during treatment by calculating the logarithm of the ratio of the influent and effluent concentrations; for example, 1-log removal represents 90% reduction, 2-log represents 99%, 3-log represents 99.9%, and so on. Public water systems using conventional treatment processes, coagulation, flocculation, sedimentation, filtration, are assumed to achieve a 3-log removal. Therefore, additional 1-log, 2-log or 2.5-log treatment credit(s) is required of a conventional treatment facility if placed in Bins 2 through 4. The EPA provides a "microbial toolbox" describing options to earn additional treatment credits including source water protection and management programs, pre-filtration processes, treatment performance programs, additional filtration components and inactivation technologies.

PWD *Cryptosporidium* monitoring data categorized each of Philadelphia's three drinking water treatment plants (WTPs) into Bins. During the first round of LT2 compliance sampling, Baxter and Belmont achieved Bin 1 status with average oocyst concentrations less than 0.075 per liter. However, Queen Lane data resulted in an average oocyst concentration of 0.076 per liter, falling into Bin 2. Since

Queen Lane uses conventional treatment processes and automatically receives a 3-log removal credit, an additional 1-log removal credit was required. PWD selected to use the combined filter effluent for 0.5-log credits, the individual filter effluent for 0.5-log credits, and the development and implementation of a WCP for 0.5-log back up credits. PWD submitted a WCP to the PA DEP in April 2011 and received approval in December 2012.

From April 2015 through March 2017, LT2 Round 2 monitoring occurred. Results from this sampling period classified the Queen Lane WTP as Bin 1. However, the ongoing initiatives outlined in the plan as well as annual status reporting and triennial Watershed Sanitary Survey updates are being continued to maintain the 0.5-log backup treatment credit. PWD results from Round 2 sampling reclassified the Baxter Water Treatment Plant on the Delaware River as a Bin 2 facility. PWD treatment is selecting the same IFE and CFE filter performance options as selected for the Queen Lane WTP for an additional 1-log treatment credit. Additionally, this document expands ongoing WCP for the Queen Lane intake to include priority areas influencing the Baxter intake to achieve a 0.5-log backup credit to ensure Baxter's compliance with LT2 regulation. In October 2020, PWD submitted a Watershed Control Plan Update to protect both the Baxter and Queen Lane intakes. The updated plan was subsequently approved in June 2021. A timeline of critical LT2 events starting with the second round of *Cryptosporidium* monitoring in April 2015 is shown in Table 3-1 along with links to annual status reports detailing progress towards WCP goals.

Table 3-1: LT2 WCP Timeline

Action	Reporting	Due Date
Second round of *Cryptosporidium* monitoring		April 2015 to March 2017
First triennial Watershed Sanitary Survey Submitted	Watershed Sanitary Survey	December 2015
Annual Status Report Submitted to State	2015 Annual Status Report	January 2016
Annual Status Report Submitted to State	2016 Annual Status Report	January 2017
Round 2 Bin Classification		October 2017
Annual Status Report Submitted to State	2017 Annual Status Report	January 2018
First Update to the Watershed Sanitary Survey Submitted	2018 Watershed Sanitary Survey	January 2018
Letter of intent to submit WCP (Baxter)		October 2018
Annual Status Report Submitted to State	2018 Annual Status Report	January 2019
Annual Status Report Submitted to State	2019 Annual Status Report	January 2020
WCP Update Submitted to State	LT2 Watershed Control Plan Update for Baxter and Queen Lane Intakes	October 2020/Approved June 2020
Annual Status Report Submitted to State	2020 Annual Status Report	January 2021
Approval of WCP Update by State		June 2021
Second Update to the Watershed Sanitary Survey	2021 Watershed Sanitary Survey	January 2022
Annual Status Report Submitted to State	2021 Annual Status Report	January 2022
Annual Status Report Submitted to State	2022 Annual Status Report	January 2023

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

4.0 Watershed Control Program Updates

As outlined in the Watershed Control Plan Update, the *Cryptosporidium* control strategies within PWD's Watershed Control Plan include the following broader categories:

- ***Capital Improvements at PWD Drinking Water Treatment Plants*** – Includes the planning, design, and construction of treatment upgrades to enhance drinking water treatment abilities
- ***Watershed Protection Initiatives*** – Consists of various research, coordination, and on-the-ground projects to address priority sources of *Cryptosporidium*
- ***Education and Outreach*** – Includes tasks to support the goal of raising awareness of source water protection issues
- ***Stakeholder Engagement and Partnership Building*** – Outlines tasks associated with the feasibility evaluation of a Delaware River Watershed Collaborative and/or funding mechanism

The sections that follow provide further detail on the progress made in each control strategy.

4.1 Capital Improvements at Philadelphia's Water Treatment Plants

Since the development of the Watershed Control Plan, the Philadelphia Water Department has completed a comprehensive Drinking Water Revitalization Plan that reviews existing drinking water treatment, pumping, distribution, and supply infrastructure in the context of anticipated regulatory and environmental drivers. The objective of the plan is to develop a strategic, long-term capital improvement strategy that anticipates the capacity, treatment, and resiliency needs of the future.

The 2020 Watershed Control Plan Update includes an overview of these updates and commits to annual reporting on the status of UV disinfection upgrades at Philadelphia's three drinking water treatment plants as an effective inactivation mechanism of *Cryptosporidium*.

Table 4-1 displays the planning, design, and construction timelines. Planning for installation of UV treatment systems and other upgrades at Baxter and Belmont water treatment plants started in 2019. The design phases are anticipated to begin in 2024 and 2026 for the Baxter and Belmont plants, respectively. Planning for the installation of UV treatment and other treatment upgrades at the Queen Lane intake commenced in 2021.

Table 4-1: Planned Implementation Schedule – UV Inactivation Installation at PWD DWTPs

Control Strategy: UV Inactivation at PWD Water Treatment Plants						
Planned Capital Project	**Planning**		**Design**		**Construction**	
	Start	End	Start	End	Start	End
Installation of UV treatment system at Baxter WTP on Delaware River*	2019	2023	2024	2027	2028	2033
Installation of UV treatment system at Belmont WTP on Schuylkill River*	2019	2023	2026	2031	2032	2036
Installation of UV treatment system at Queen Lane WTP on Schuylkill River*	2021	2027	2030	2036	2037	2045

**and other treatment process upgrades*

4.2 Watershed Protection Program Initiatives

The Philadelphia Water Department has a robust Watershed Protection Program that includes source water protection, climate change adaptation planning, and water quality modeling focus areas. The Watershed Protection Program uses a multi-barrier approach that includes emergency preparedness systems, public and private communication networks, computer modeling systems, laboratories, regional and national partnerships, and the development and implementation of formal plans to achieve watershed protection goals.

In the Watershed Control Plan Update, 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 as well as programs and initiatives in the Delaware River watershed to protect the Baxter intake. This section discusses the contribution PWD has made toward each of the ongoing and proposed initiatives by each priority source category during 2022.

4.2.1 Wastewater Discharge/Compliance

Effluent from WWTPs upstream of the Queen Lane intake is a source of *Cryptosporidium* in the watershed (PWD, 2002; PWD, 2011). Table 4-2 outlines planned watershed protection projects and tasks aimed to support the goal of pathogen reduction for the priority source of wastewater discharges. Table 4-2 also includes initiatives for the Delaware River Watershed proposed in the Watershed Control Plan Update submitted in October 2020. Progress towards each initiative is detailed in the sections that follow.

Table 4-2: Planned Implementation Schedule – Watershed Protection Control Strategies to Address Wastewater Discharges

Control Strategy: Watershed Protection			
Priority Source - Wastewater Discharger Compliance			
Initiatives	**Target Watershed**	**Target Completion Date**	**Report Section**
Collaborate on *Cryptosporidium* source tracking studies	Various	On hold	4.3.1.1
Continue to regularly review and update Philadelphia's Act 537 Plan	Lower Delaware River	Ongoing	4.3.1.2
Implement initiatives outlined in the annual Combined Sewer Management and Stormwater Management report	Lower Delaware and tidal Schuylkill River Watersheds	Ongoing	4.3.1.3
Maximize usage for the Delaware Valley Early Warning System while maintaining the system's ongoing O&M needs	Lower Delaware and Schuylkill River Watersheds	Ongoing	4.3.1.4
Continue to support efforts identified in the SAN Pathogens/Compliance Workgroup's Annual Workplans	Schuylkill River	Ongoing	4.3.1.5
Re-delineate source water protection zones in the Delaware River Watershed using advanced hydrodynamic tidal modeling and update priority dischargers accordingly	Delaware River	2023	4.3.1.6
Update discharger information from Source Water Assessments to reassess vulnerability from upstream dischargers	Schuylkill and Delaware Rivers	Ongoing	4.3.1.7
Track installation of wastewater treatment upgrades and improvements upstream of Philadelphia's intakes	Schuylkill and Delaware Rivers	Ongoing	4.3.1.8; 4.3.1.9
Work with professional organizations and industry groups e.g., NACWA, WaterRF, et al., to support related research and advocacy efforts	Various	Ongoing	4.3.1.10
Continue to strengthen relationships with upstream wastewater dischargers	Delaware River	Ongoing	4.3.1.11

4.2.1.1 Cryptosporidium Monitoring and Source Tracking Studies

PWD worked with Lehigh University for more than a decade to support ongoing research on *Cryptosporidium* in Philadelphia source water. The collaboration between PWD and Lehigh University consisted of developing sampling programs to better understand the occurrence, sources and vectors of

Cryptosporidium in the Schuylkill River watershed. Sampling programs were designed to answer research questions and improve and expand methods for field sample collection and laboratory analysis of *Cryptosporidium*. PWD contributed field sample collection support, project management and oversight. PWD regularly communicated with project partners at Lehigh to create solutions for issues encountered in the field and lab, incorporate improvements, and expand the project. An article detailing some of the outcomes of research collaboration, "Biofilm Sampling for Detection of *Cryptosporidium* Oocysts in a Southeastern Pennsylvania Watershed" was published in November 2020 in *Applied and Environmental Microbiology*[1]. Due to budgetary limitations resulting from the City of Philadelphia's COVID-19 pandemic response and mitigation efforts, the research collaboration with Lehigh University remains paused for the foreseeable future.

4.2.1.2 Philadelphia's Act 537 Plan

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

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

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

4.2.1.4 Early Warning System

The Delaware Valley Early Warning System (EWS) serves to improve the safety of the drinking water supply by providing rapid communication of surface water pollution events or surface water quality changes. An event reported to the EWS website or via the telephone hotline triggers email notifications and spill model results to the entire user group in a matter of minutes. In addition to email notification, telephone notifications occur for high-risk events. The EWS utilizes a fully automated email and telephone notification system (which does not require staffing) to notify all downstream users when water quality events are reported. The EWS also utilizes predictive spill modeling that can estimate downstream arrival times of pollution discharges at water system intakes using real time water data and tidal conditions.

[1] Jellison K, Cannistraci D, Fortunato J, McLeod C. 2020. Biofilm sampling for detection of *Cryptosporidium* oocysts in a southeastern Pennsylvania watershed. Appl Environ Microbiol 86: https://doi.org/10.1128/AEM.01399-20.

Notifications through the EWS provide critical information to water system and industrial operators who may need to either make changes to treatment processes or to close intakes in response to a surface water contamination event. Participating government agencies are also notified to assist in coordinating spill response activities. The EWS user base consists of more than 480 registered users from 61 water supply and government organizations.

The EWS allows users to review the details of reported pollution events, including the event's location, spill path, and risk level, and provides a description of the event and the status of the event report. Notable recent updates to EWS include adding full mobile device (smartphone) functionality for the EWS website and improved mapping and notification features. These updates were presented to EWS users through a series of regional virtual workshops in 2020 that were adapted to synchronize with COVID-19 pandemic public health and safety recommendations. Additional training is readily available by request to PWD. Water quality events of concern to EWS members include accidental and illicit discharges, as well as natural changes in water quality that can significantly affect drinking water sources. Such events include truck and vehicle accidents on roadways that drain to nearby streams and rivers, railway accidents, on-water accidents (involving boats and tankers), spills on properties near waterways, runoff from fires/firefighting, wastewater system discharges, sewer overflows, releases of impounded sediments, and failures of waste product basins.

The EWS continues to serve as an invaluable communication tool to advance public health and safety and was especially useful in sharing flooding and water quality information during Hurricane Ida in August 2021. In 2022, the Flood Forecast Viewer (FFV) was added to the EWS. The FFV, which was developed to increase users' awareness of possible water quality impacts from flooding, displays information about flood conditions predicted by NOAA 24 hours in the future on major waterways in the EWS service area.

4.2.1.5 SAN Pathogens and Point Source Workgroup

The purpose of the SAN Pathogens and Point Source Workgroup is to facilitate and strengthen communication and coordination among regulatory agencies, downstream water users, and basin stakeholders regarding Clean Water Act and Safe Drinking Water Act goals. A new round of strategic planning for the SAN's next 5 years commenced in 2019 and was finalized in late 2020. PWD regularly attends quarterly SAN Pathogens and Point Source Workgroup meetings and serves as a workgroup co-chair. A quarterly e-newsletter was established in 2019 to improve information sharing among stakeholders. In 2020, in-person meetings were switched to a virtual platform to mitigate COVID-19 pandemic risks while continuing workgroup coordination. Virtual meetings continued throughout 2022. The group continues to be a key mechanism for information exchange among stakeholders on emerging contaminant research, upcoming regulation, and wastewater treatment advancements. Beginning in 2023, this workgroup may be expanded to include water utilities along the lower Delaware River as the geographic scope of the WCP is expanded to include Baxter's area of influence.

4.2.1.6 Source Water Protection Zones

In the Watershed Control Plan Update, PWD plans to re-delineate the source water protection zones previously established for the Schuylkill and Delaware Rivers in the Source Water Assessments. Since

originally delineated, PWD's hydrodynamic modeling capabilities have advanced and can provide better time of travel estimates to inform zone delineation. This proposed project to better define priority protection areas for the Queen Lane and Baxter intake is planned for 2023.

4.2.1.7 Priority Discharger List

In preparation of the 2020 Watershed Control Plan Update, the 2002 priority *Cryptosporidium* point source list was updated to account for changes in treatment technologies. The updated Schuylkill River and Delaware River Watershed areas of influence priority *Cryptosporidium* discharger lists are shown in Table 4-3 and Table 4-4.

Table 4-3: Priority Dischargers of *Cryptosporidium* in the Schuylkill River Watershed *(Updated from 2020 Watershed Control Plan Update)*

Priority Discharger	Watershed
Abington Twp WWTP	Schuylkill River
Swamp Creek STP (Berks Montgomery Municipal Authority)	Schuylkill River
Birdsboro Borough MA Schuylkill	Schuylkill River
Conshohocken STP	Schuylkill River
E. Norriton/Plymouth/Whitpain JSA	Schuylkill River
Exeter Twp STP	Schuylkill River
Hamburg Boro Wastewater Treatment Plant	Schuylkill River
Limerick Twp Municipal Authority	Schuylkill River
Montgomery County Sewer Authority	Schuylkill River
Norristown Municipal STP	Schuylkill River
Pennridge Wastewater Treatment Authority	Schuylkill River
Phoenixville Borough STP	Schuylkill River
Pottstown Borough	Schuylkill River
Sinking Spring Borough Municipal Authority	Schuylkill River
Upper Gwynedd-Towamencin Municipal Authority	Schuylkill River
Upper Merion Municipal Utility Authority	Schuylkill River
Upper Merion Twp Authority- Matsunk WPCC	Schuylkill River
Valley Forge Sewer Authority	Schuylkill River
Whitemarsh Twp SA	Schuylkill River
Antietam Valley Municipal Authority	Schuylkill River
Borough of Souderton	Schuylkill River
Bridgeport Borough	Schuylkill River
Lower Frederick Township Treatment Plant	Schuylkill River
Lower Salford Twp Authority (West Branch Skippack Creek)	Schuylkill River
Maidencreek Township Authority	Schuylkill River
North Coventry Municipal Authority STP	Schuylkill River
Oley Township Municipal Authority	Schuylkill River
Schwenksville Borough Authority	Schuylkill River

Spring City Borough Sewage Plant	Schuylkill River
Telford Borough Authority	Schuylkill River
Spring TWP MA	Schuylkill River
Wyomissing Valley JMA	Schuylkill River

Table 4-4: Priority Dischargers of *Cryptosporidium* in the Delaware River Watershed Area of Influence *(Updated from 2020 Watershed Control Plan Update)*

Priority Discharger	Watershed
Bethlehem City	Delaware River
Beverly Sewerage Authority	Delaware River
Bordentown Sewerage Authority	Delaware River
Bristol Township Sewerage Treatment Plant	Delaware River
Burlington City STP	Delaware River
Catasaqua Borough Authority	Delaware River
Cinnaminson Township Sewerage Authority	Delaware River
Delran Sewerage Authority	Delaware River
Easton City	Delaware River
Ewing-Lawrence SA	Delaware River
Florence Township STP	Delaware River
Hamilton Township WPCF	Delaware River
Mount Holly Municipal Utilities Authority	Delaware River
Mt. Laurel Municipal Utilities Authority	Delaware River
Riverside Township Sewerage Authority	Delaware River
Warminster Twp Municipal Authority	Delaware River

4.2.1.8 Watershed Wastewater Treatment Upgrades and Improvements

Several originally prioritized NPDES dischargers have either undergone, or are approved to undergo, upgrades and improvements to their treatment facilities. A detailed list containing update and improvement information is presented below in Table 4-4, for the Schuylkill River Watershed.

Table 4-5: Planned upgrades and Improvements to the Schuylkill River Source Water Assessment's Priority Dischargers of *Cryptosporidium*

Facility	Owner	Subwatershed	Priority	System Improvements
Conshohocken Borough STP	Borough of Conshohocken	Schuylkill River	Highest - A	• Improvements to plant, pump stations and collection system outlined in 5-year capital improvement plan • In 2018 awarded CFA grant of $341,559 to help rehabilitate the Regional Sanitary Sewer Interceptor • Replacement of rotating biological contractor units 1-9 planned for FY2023; belt filter press replacement planned for FY2026
Lower Perkiomen Valley Regional Sewer Authority	Montgomery County Sewer Authority	Perkiomen Creek	Highest - A	• The Perkiomen Middle Interceptor project is the final phase of the Regional Act 537 Plan approved by PA DEP in 2004 • Includes the installation of ~17,300 ft of sanitary sewer main
Fritz Island Wastewater Treatment Plant	City of Reading	Schuylkill River	Highest - A	• The Reading Wastewater Treatment plant is working with an engineering firm on a $100 million upgrade project needed to accommodate capacities determined in an Act 537 special study and the City's Consent Decree with the Department of Justice
Sinking Spring Borough STP	Municipal Authority of the Borough of Sinking Spring	Cacoosing Creek	Moderately High - B	• $1.7M PA Infrastructure Investment Authority loan to replace 2,950 ft of sanitary sewer line and eliminate raw sewage discharges into Cacoosing Creek
Upper Gwynedd Township Wastewater Treatment Facility	Upper Gwynedd Twp	Wissahickon Creek	Highest - A	• Currently implementing Wastewater Improvement Program • WIP will expand the sewer infrastructure to allow UGT the ability to divert the wastewater currently being sent to the Towamencin Municipal Authority back to Upper Gwynedd Township's Wastewater Treatment Plant – reducing SSOs and allowing rate payer money to be invested in the township.
TMA Wastewater Treatment Facility	Towamencin Municipal Authority	Towamencin Creek	Highest - A	• Awarded $200,000 in CFA funding in March 2019 for a Biosolids Process Transformation and Optimization Planning Study, leading to the adoption of a sustainable biosolids treatment, handling and disposal process within 5 yrs
Whitemarsh WPCC	Whitemarsh Township Authority	Schuylkill River	Highest – A	• In 2018 awarded CFA grant of $323,000 to assist with the rehabilitation of the wastewater treatment plant

Note: This is not an exhaustive list of all planned facility upgrades in the area of interest

4.2.1.9 Wildcat Sewer Abatement

Wildcat sewers discharge sewage directly into creeks and streams without any treatment. These sources discharge pathogens into the Schuylkill River watershed and can be a source of *Cryptosporidium.* PWD supports the SAN in efforts to identify and abate wildcat sewers through participation in the SAN Pathogens and Point Source Workgroup. In 2015, PWD completed a Watershed Sanitary Survey (WSS), required under LT2 to maintain the WCP credit. As part of the WSS, PWD compiled available information from the PENNVEST database, news sources, community announcements, and personal communication with a contracted engineering firm on projects addressing wildcat sewers in the Schuylkill River watershed. The wildcat sewer project update serves as a working document and is included in the latest update to the Schuylkill River Watershed Sanitary Survey as well as on the SAN Workgroup Hub as a standalone worksheet. The updated document is included below in Table 45.

4.2.1.9.1 River Road Properties

River Road in northwest Philadelphia runs along the Schuylkill River upstream of two PWD treatment plant intakes. Sitting at a low elevation, the stretch of residential road is prone to flooding during rain events. Both the city and PA DEP had been concerned about the on-lot septic systems of many River Road residential properties sitting in the Schuylkill River's floodplain, but the existing septic systems could not be replaced as they did not meet current regulations. PWD began the design for sewer installation and hosted public meetings in 2007, permits and approval for the project were obtained from PA DEP in 2008 and 2009, and the road's residents agreed to move forward following more public meetings in 2017.

The approximately mile-long new sanitary sewer can provide service for 42 properties along River Road from Port Royal Avenue to County Line Road. A sewage pumping station was constructed on the river side and sewage collected from the sewer is pumped to the nearby Nixon Street sewer. Construction began in early 2019 and was completed during 2021.

Table 4-6: Progress towards Wildcat Sewer Abatemen and Public Sewer Connections in the Schuylkill River Watershed

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 constructed using SVSA funds and an over $18 million combined loan and grant package from PENNVEST. The new wastewater treatment plant began discharging treated effluent in June 2006. As of 2009, 1432 customers were connected to the SVSA WWTP, and 69 were not connected. Of those customers not connected, most were abandoned properties, buildings being foreclosed on or were being pursued legally to force connection.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; PENNVEST. www.pennvest.pa.gov
Village of Cumbola	Blythe Township	Schuylkill	Schuylkill River		
Middleport Borough	Middleport Borough	Schuylkill	Schuylkill River		
New Philadelphia	New Philadelphia Borough	Schuylkill	Silver Creek and Schuylkill River		
Schuylkill Township	Schuylkill Township	Schuylkill	Schuylkill River & tributaries		
Village of Brockton	Schuylkill Township	Schuylkill	Schuylkill River		
Village of Delano	Delano Township	Schuylkill	Pine Creek	Delano has public sewer. In 2007, Delano Township received a nearly $3 million grant and loan package from PENNVEST to construct three miles of sewer lines and a pump station to convey sewage to Northeast Schuylkill Joint Municipal Authority, which was previously being discharged to Delano Creek, a branch of Pine Creek.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; "Governor Rendell Announces $61 Million Investment to Help Protect Pennsylvania's Waterways, Public Health; Promote Community Revitalization Efforts." April 17, 2007. PRNewswire. www.prnewswire.com
Minersville	Minersville Borough	Schuylkill	West Branch Schuylkill River	Minersville has public sewer. Minersville Sewer Authority received over $4 million loan from PENNVEST to construct almost two miles of sewer and stormwater lines and replace about one mile of water mains to eliminate a continuous discharge of 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 sewage collection lines and a 450,000 gallons per day wastewater treatment plan to serve portions of Branch, Cass and New Castle Townships and mitigate wildcat sewers and malfunctioning on-lot systems discharging untreated sewage into local streams. In 2010, Branch-Cass Regional Sewer Authority was acquired by the Schuylkill County Municipal Authority (SCMA).	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; "PA Gov. Schweiker Administration Announces $94 Million in Loans and Grants for Clean-Water Projects." Nov 14, 2001. PRNewswire. www.prnewswire.com; Schuylkill County Municipal Authority. www.scmawater.com
Deer Lake Municipal Authority (acquired by Schuylkill County Municipal Authority in 2008)	Deer Lake Borough	Schuylkill	Pine Creek	In 2011, Schuylkill County Municipal Authority (SCMA) received grant and loan funding from PENNVEST to expand its Deer Lake wastewater treatment plant and construct several miles of sewerage collection lines. The project would eliminate several small, inadequate wastewater treatment plants and discharges from wildcat sewers and malfunctioning on on-lot septic systems to local streams. Expansion and construction began in 2013. The wastewater treatment plant was completed and operational in September 2014. SCMA was awarded the Governor's Award for Environmental Excellence from PA DEP in 2015 for completion of the project.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015; "Pennsylvania Governor Corbett Announces $99 Million Investment in Water Infrastructure Projects in 20 Counties." Jul 20, 2011. PRNewswire. www.prnewswire.com; Schuylkill County Municipal Authority. www.scmawater.com
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 malfunctioning 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 Announce $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. *Chapter 94 Municipal Wasteload Management Report.*

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
Virginville	Richmond Township	Berks	Maiden Creek, Saucony 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. *Annual Report for 2012 DEP Rules and Regulations, Chapter 94.*

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 contaminating 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 Wastewater Treatment and Conveyance Facilities." 2012. *Title 25 Chapter 94 Municipal Wasteload Management Annual Report.*
Sassamansville	Douglass Township	Montgomery	Schlegel 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 Sassamansville, which is located in Douglass and New Hanover Townships.	"Douglass (Mont.) Oks Sassamansville Sewer Project." The Mercury News; Berks-Montgomery Municipal Authority Sewer Revenue Bonds. Apr 20, 2015. McElwee & Quinn Financial Printing. www.mcelweequinn.com.
Village of Branchdale	Reilly Township	Schuylkill	Muddy Branch	The Village of Branchdale has wildcat sewers and failing on-lots. Alfred Benesch has worked on an Act 537 Plan for them, but it is not affordable.	Chris McCoach, Alfred Benesch & Company, personal communication, April 7, 2015
Tamaqua	Tamaqua Borough	Schuylkill	Wabash Creek	Tamaqua Borough hired Alfred Benesch and Company to investigate wildcat sewers in Wabash Creek. A total of 101 connections were investigated - 17 had abandoned lines to Wabash Creek and were connected to the municipal sewer system. Five properties are not connected, four of which are vacant, abandoned properties with water service shut off. The remaining property is illegally discharging into Wabash Creek and has been issued several Notice of Violation Tickets and is being processed through the court system.	(Rob Jones, Tamaqua Public Works, personal communication, May 22, 2015)

South Tamaqua	West Penn Township	Schuylkill	Little Schuylkill	Act 537 planning in Walker and West Penn Townships is ongoing. The existence of wildcat sewers and malfunctioning on-lot disposal systems has been confirmed. In 2016, West Penn and Walker Townships continued to work with Rettew Associates and PA DEP on Act 537 planning and creating a financially feasible plan to address 30 residences in five areas in need of sewage disposal. Possible solutions include five community on-lot sewage disposals or new or repaired individual on-lot sewage disposals. In March 2017, Walker Township's Board adopted a resolution to advance its revised Act 537 plan to the state. In June 2017, the revised sewage facilities plan was submitted to the PA DEP. The plan includes a maintenance ordinance that requires residents to have their on-lot septic systems pumped and inspected every three years. The 30 residences would either repair or replace their current system. Township officials met with DEP in December 2017 and adopted resolutions for their revised Act 537 sewage facility plan. The townships continue to await the completion of an administratively complete plan.	"Wildcat Sewers Exist in West Penn Township." Times News, LLC. Apr 5, 2013. http://www.tnonline.com/2013/apr/05/wildcat-sewers-exist-west-penn-township; "WestPenn-Walker Twp. Sewage Plan Advances." Times News, LLC. Mar 6, 2016. http://www.tnonline.com/2016/mar/05/west-penn-walker-twp-sewage-plan-advances "Walker Twp. submits sewage facility plan to DEP" Times News, LLC. Jun 3, 2017. https://www.tnonline.com/2017/jun/03/walker-twp-submits-sewage-facility-plan-dep "W. Penn, Walker to meet with DEP over previously submitted." Times News, LLC. Nov. 9, 2017. https://www.tnonline.com/w-penn-walker-meet-dep-over-previously-submitted "West Penn hears update on sewage facility plan." Times News, LLC. Feb. 21, 2018. https://www.tnonline.com/west-penn-hears-update-sewage-facility-plan
River Road Properties	Philadelphia	Philadelphia	Schuylkill	Construction to offer residents of Upper Roxborough along Nixon Street and River Road connection to the public sewer system commenced in October 2019 and was completed in 2021.	Weilbacher, M. "Natural Selections: Joanne Dahme – water is in her blood" Montgomery News. Nov. 28, 2018. http://www.montgomerynews.com/roxreview/opinion/natural-selections-joanne-dahme-water-is-in-her-blood/article_17d5fbbe-f262-11e8-9b89-9f0a3a92d9bb.html?fbclid=IwAR1urpwdEjXprlRONJTrbq_Obg5WjrlxAXl_hNd3E3fqv5pMnIrXk9Nd_JY
Albany	Albany Township	Berks	Maiden Creek	Unknown	
Port Indian	West Norriton	Montgomery	Schuylkill River, main stem	Unknown	

Geigertown	Geigertown	Berks	Hay Creek	Installation of a new sewer system and pumping station which connects 115 residents from failed, antiquated, and non-existent septic systems to an existing system 6 miles away in Birdsboro, PA. Residents will have until June 2020 to connect to the $6 million project.	https://www.dailylocal.com/news/union-township-couple-pushes-to-get-geigertown-sewer-project-back/article_0043a620-ff2e-11e9-9685-df45bfbca347.html

4.2.1.10 Collaboration with Industry Organizations

PWD has a long-standing partnership with professional/industry organizations. In the 2020 Watershed Control Plan Update, PWD proposes leveraging these partnerships to conduct research and advocacy efforts to further LT2 compliance goals. One of these potential partnership mechanisms includes participation in American Water Works Association's Source Water Technical Advisory Workgroup, which PWD's Source Water Program officially joined in Fall 2021. Additionally, PWD's Source Water staff have met with Water Research Foundation representatives throughout 2021 and 2022 to better understand and define research priorities for the near-term.

4.2.1.11 Watershed Wastewater Treatment Partnerships

4.2.1.11.1 Wissahickon Clean Water Partnership

In summer 2016, The City of Philadelphia joined 13 Wissahickon Creek watershed municipalities and four wastewater treatment plant operators to form a Wissahickon Clean Water Partnership (WCWP). The WCWP seeks to collaboratively develop a TMDL alternative for nutrients that would better address aquatic life impairments in the Wissahickon Watershed. The municipal participants represent over 98% of the watershed area, which provides a powerful stakeholder group that is uniquely positioned to develop a coordinated plan to improve water quality in the watershed. The project was funded in part by The William Penn Foundation through the Pennsylvania Environmental Council. Technical work was performed by Temple University. PWD is also a key participant in the effort providing technical support and important historical water quality information about the Wissahickon Creek.

With encouragement from PA DEP and EPA, the WCWP is preparing a comprehensive Water Quality Improvement Plan for this highly visible, urbanized watershed that will include a long-term program to achieve significant water quality improvements through an adaptive management process. Specified projects and/or treatment upgrades may reduce pathogens in addition to nutrients as well as establishing a partnership framework for future collaborative efforts.

4.2.1.11.2 DO Partnership

The Philadelphia Water Department has developed a Dissolved Oxygen (DO) Partnership with other large regional municipal utilities to share strategic utility planning and technology evaluations in response to potential changes in water quality criteria that could impact acceptable levels of DO in local waterways. Dissolved oxygen, or DO, is influenced by several factors, including ammonia-containing sewage discharges and the presence of excess nutrients in rivers and streams. To continue progress in reducing nutrient discharges and improving DO levels, many of the dischargers have participated in the development of an early action matrix that outlines steps to prepare for or better understand the needs for the potential implementation of advanced technologies and operational adjustments. Understanding infrastructure capabilities, limitations, and affordability will be critical to further reducing pollutants in the Delaware Estuary in the future. The DO Partnership continued to meet quarterly throughout 2022. The Partnership has established a foundation for communication and data sharing among the municipal dischargers, with future possibilities to leverage the Partnership as a vehicle to collectively address additional wastewater permitting-related concerns.

4.2.2 Agricultural Land Use and Runoff

Stormwater runoff containing manure from agricultural land is a source of *Cryptosporidium* and pathogens in the Schuylkill River watershed (PWD, 2002; PWD, 2011). PWD efforts to address agricultural runoff occur upstream of Philadelphia because the agricultural land within the city and upstream of the intakes is minimal and best management practices (BMPs) have previously been installed at Northwestern Stables, Belmont Stables, Courtesy Stables, Monastery Stables and W.B. Saul High School (PWD, 2011). In the *Watershed Control Plan Update* (2020), opportunities to address agricultural sources of runoff in the lower Delaware River watershed are also identified.

Table 4-7: Planned Implementation Schedule – Watershed Protection Control Strategies to Address Agricultural Runoff

Control Strategy: Watershed Protection			
Priority Source – Agricultural Runoff			
Initiatives	**Target Watershed(s)**	**Target Completion Date**	**Report Section**
Coordinate with watershed partners to develop Comprehensive Nutrient Management Plans for WB Saul High School, Fox Chase Farm, and Manatawna Farm.	Wissahickon and Pennypack Creeks, Schuylkill River	Ongoing	4.2.2.1
Work with USDA/NRCS, PA Dept of Agriculture and the Philadelphia School District to implement best management practices at WB Saul High School.	Wissahickon Creek	2025	4.2.2.1
Work with USDA/NRCS, PA Dept of Agriculture and the Philadelphia School District to implement best management practices at Fox Chase Farm	Pennypack Creek	2025	4.2.2.1
Work with Northwestern, Courtesy Stables, and Monastery Stables to implement conservation planning practices	Wissahickon and Pennypack Creeks	Some work completed; effort ongoing	4.2.2.1
Develop maintenance plans or MOUs for PWD's in-city agricultural BMPs	Wissahickon and Pennypack Creeks	2024	4.2.2.1
Reassess land use in the Schuylkill River Watershed with each update of the National Land Cover Database	Schuylkill River	Ongoing	4.2.2.2.1
Reassess land use in the priority Delaware River Watershed sub-basins with the 2019 National Land Cover Database (NLCD)	Delaware River	Completed	4.2.2.2.2

Actively participate in the SAN Agricultural Workgroup and support initiatives outlined in the Annual Workplans	Schuylkill River	Ongoing	4.2.2.3
Identify priority projects and available funding sources; work with SAN partners to best utilize Farm Bill funds; Promote drinking water protection in existing funding programs	Schuylkill and Delaware Rivers	Ongoing	4.2.2.6
Assess status of CAFO NPDES permits in the delineated Area of Influence	Schuylkill River	Ongoing	4.2.2.3
Participate in nutrient management trainings and conferences to further develop expertise and enhance liaison role to Philadelphia's agricultural properties	Wissahickon and Pennypack Watersheds	Ongoing	4.2.2.5

4.2.2.1 Philadelphia In-City Agricultural Best Management Practices

4.2.2.1.1 W.B. Saul High School

In 2016, Saul High School created a 501(c)(3) as a mechanism to acquire funding for projects identified in their school master plan. PWD began collaborating with Saul and other stakeholders in 2018 to facilitate the implementation of BMPs to reduce sediment, pathogen, and nutrient loading in the Schuylkill watershed. Construction of BMPs at Saul began in 2019, when the construction of a swale and culvert diverting runoff from the adjacent Henry Avenue was completed. The diversion system connects to a highway inlet at the top of the Saul High School access drive and conveys diverted flow below pastureland adjacent to the Wissahickon Valley Park.

PWD continues to coordinate internally to determine resources available to support projects to manage stormwater and protect source water on the Saul Agricultural High School campus given shifting priorities dictated by the COVID-19 response. Planned BMPs still to be implemented include the construction of a new concrete heavy use area, manure transfer system, and roofed barn area.

4.2.2.1.2 Fox Chase Farm

In the Watershed Control Plan Update submitted in October 2020, Fox Chase Farm is identified as a potential project opportunity in the Pennypack Creek watershed of the Upper Delaware Estuary sub-basin. Project implementation is targeted for 2025.

4.2.2.1.3 Philadelphia Stables

There are several horse stables located throughout the City of Philadelphia. These locations provide opportunities for best management and conservation practices. Water quality benefits include sediment and erosion control, nutrient management and pathogen controls. Figure 4-1 shows the locations of

horse stables on public land along the Schuylkill River (2), Wissahickon Creek (3), and Pennypack Creek (1).

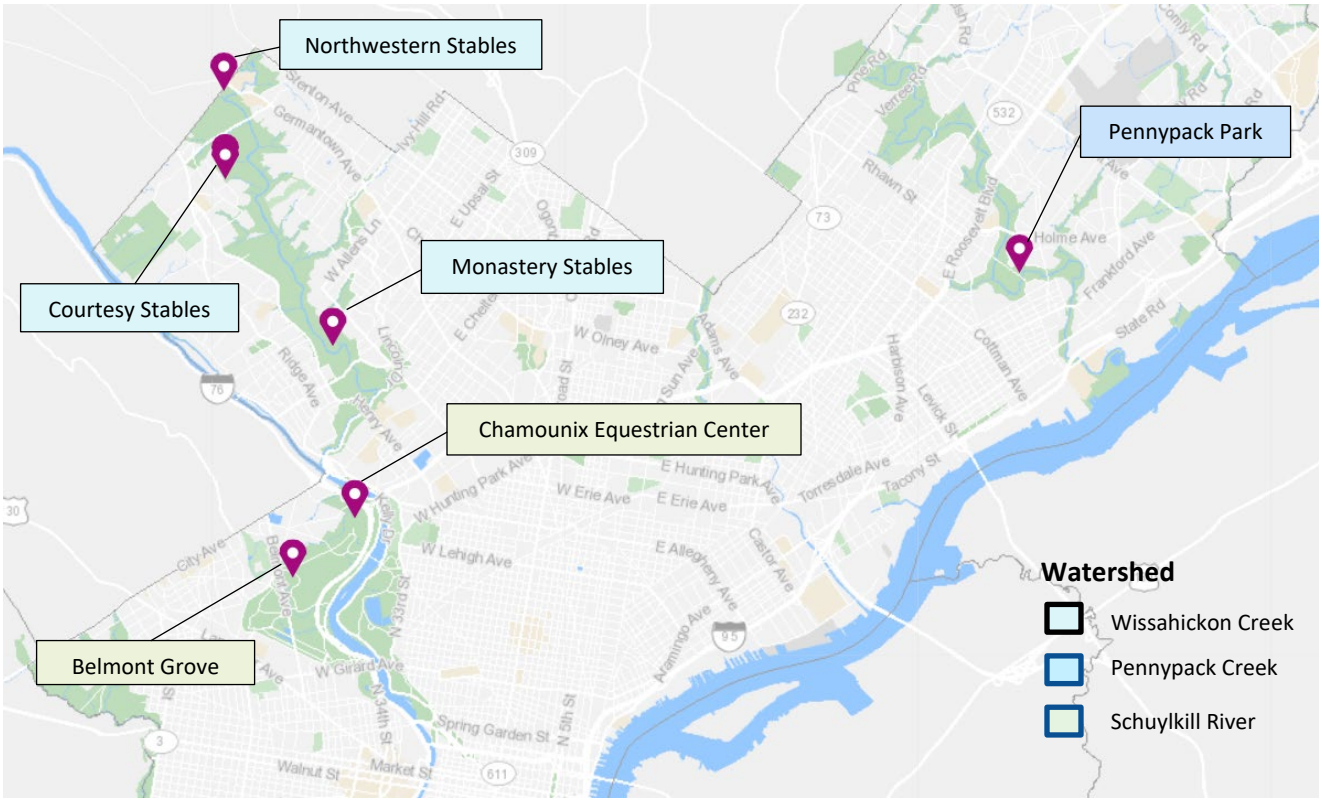

Figure 4-1: Horse Stables in Philadelphia *(Adapted from Philadelphia Parks and Recreation 2020)*

Northwestern Stables

In 2019, PWD contributed $50,000 through the SRRF toward stormwater management projects at Northwestern Stables. The property on which the non-profit stables sit drains into a small tributary of the nearby Wissahickon Creek, which then discharges into the Schuylkill River upstream of the Queen Lane intake. Following recommendations from the NRCS, Northwestern Stables implemented various BMPs including diverting street runoff through a newly constructed trench drain and 200 ft of outlet pipe; roof gutter installation, downspout connection repairs, and underground pipe installation to manage 22,000 ft^2 of impervious roof area; planting 12,000 ft^2 of vegetated buffers; and grading and stabilization of ~41,000 ft^2 of paddock area. In 2020, construction of the stormwater management and paddock stabilization project at Northwestern Stables was completed. Before and after photos of the three main heavy use areas are shown in Figure 4-2. In 2021, Northwestern Stables was the host of the Schuylkill River Restoration Fund grant announcements and project showcase event. Attendees were able to speak to the landowners as well as NRCS staff to get a better understanding of the planning and design considerations.

Pre-Construction Heavy Use Area 1

Post Construction Heavy Use Area 1

Pre-Construction Heavy Use Area 2

Post Construction Heavy Use Area 2

Pre-Construction Heavy Use Area 3

Post Construction Heavy Use Area 3

Figure 4-2: Pre and Post Construction Photos from Northwestern Stables Stormwater Management and Paddock Stabilization Project

4.2.2.2 Land Use Assessments

4.2.2.2.1 Schuylkill River Watershed

In November 2019, the United States Geological Survey released the latest iteration of the National Land Cover Database (NLCD). The land use categories are broken out in Table 4-7. Definitions of the land cover classifications are available from the Multi-Resolution Land Characteristics Consortium. The 2019 dataset is mapped for the Schuylkill River Watershed in Figure 4-3. A total of 27.1% of the Schuylkill River Watershed land cover is attributed to agricultural uses (e.g., pasture/hay and cultivated crops). More information on the National Land Cover Database project can be found on the Multi-Resolution Land Characteristics Consortium website at https://www.mrlc.gov/data.

Table 4-8: Land Cover Classification Areas in the Schuylkill River Watershed (NLCD 2019)

Schuylkill River Watershed Land Cover (NLCD 2019)				
Land Cover Class	**Land Use Classification**	**Code**	**2019 Area (sq. miles)**	**% of Total Area**
Water	Open Water	11	17.6	0.9%
Water	Perennial Ice/Snow	12	-	0.0%
Developed	Developed-Open Space	21	255.6	13.4%
Developed	Developed-Low Intensity	22	158.4	8.1%
Developed	Developed-Medium Intensity	23	91.7	4.8%
Developed	Developed-High Intensity	24	48.6	2.5%
Barren	Barren Land	31	8.7	0.5%
Forest	Deciduous Forest	41	636.6	33.3%
Forest	Evergreen Forest	42	6.5	0.3%
Forest	Mixed Forest	43	117.0	6.1%
Shrubland	Shrub/Scrub	52	18.6	1.0%
Herbaceous	Grassland/Herbaceous	71	11.5	0.6%
Planted/Cultivated	Pasture/Hay	81	247.1	12.9%
Planted/Cultivated	Cultivated Crops	82	271.5	14.2%
Wetlands	Woody Wetlands	90	23.8	1.2%
Wetlands	Herbaceous Wetlands	95	1.9	0.1%
		Total	1,915.1	100.0%

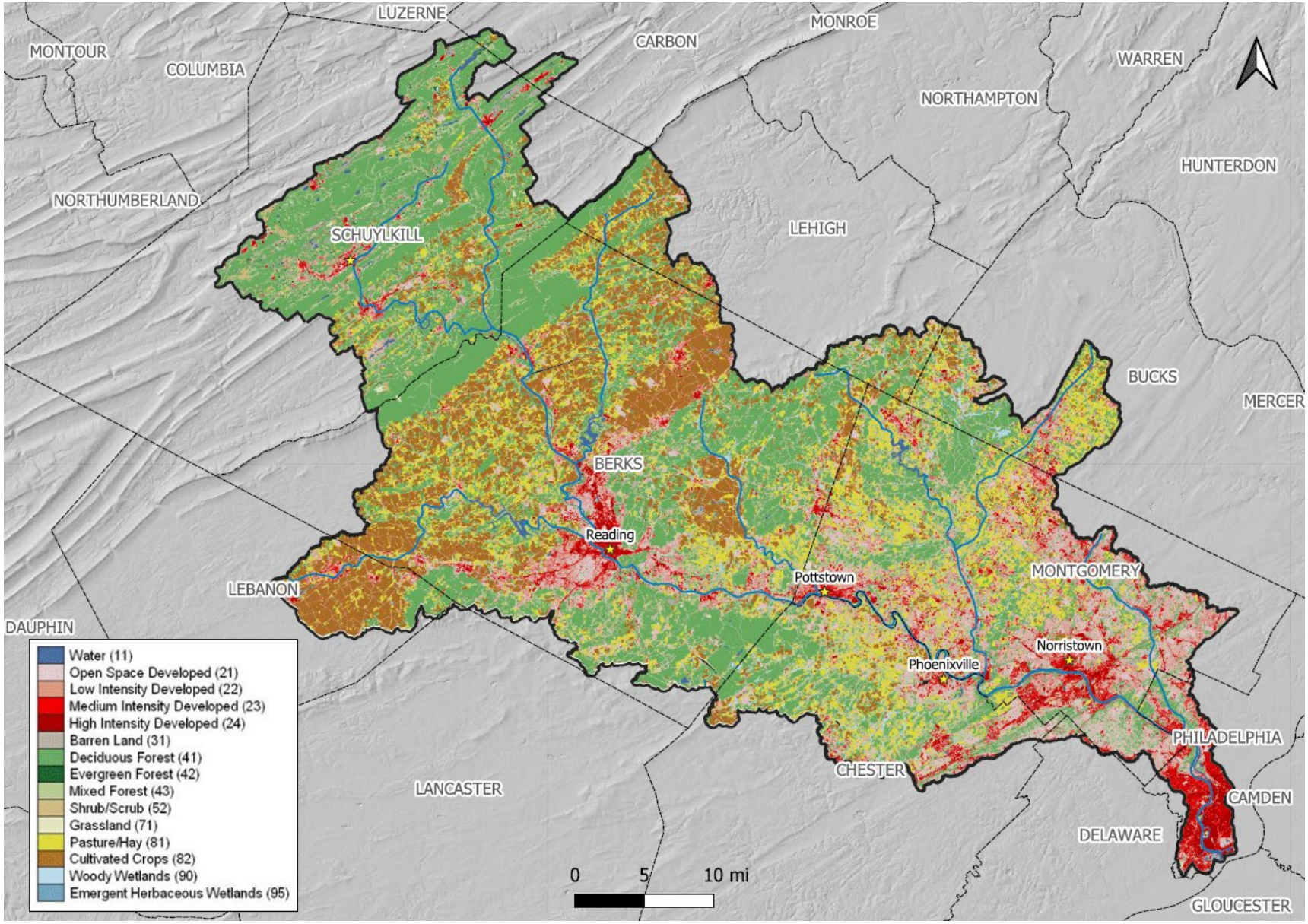

Figure 4-3: Land Use in Schuylkill River Watershed (NLCD 2019)

4.2.2.2.2 Delaware River Watershed

A land use analysis of the Baxter intake's area of influence in the Delaware River Watershed using the 2019 NLCD was completed in 2022.

The sub-basins of the Delaware River Watershed within the Baxter Water Treatment Plant's Area of Influence (AOI) are delineated in the *PWD Watershed Control Plan Update*. The Baxter intake AOI covers a total of 2,873 square miles and includes the Lehigh Valley sub-basin and the Pennsylvania side of the Upper Central, Lower Central, and Upper Estuary sub-basins comprising 47%, 28%, 9%, and 15% of the land area in the AOI, respectively. The largest land cover type in the Baxter AOI is deciduous forest, which comprises 41% of the land cover in the Baxter AOI. In contrast to the Schuylkill River watershed, only 15% of the Baxter AOI land cover is attributed to agricultural uses (e.g., pasture/hay and cultivated crops). Table 4-8 and Figure 4-4 show the NLCD 2019 land use data for the Baxter Water Treatment Plant area of influence. More information on the National Land Cover Database project can be found on the Multi-Resolution Land Characteristics Consortium website at https://www.mrlc.gov/data.

Table 4-9: Land Cover Classification Areas in the Baxter Area of Influence (NLCD 2019)

Baxter Water Treatment Plant Area of Influence Land Cover (NLCD 2019)				
Land Cover Class	**Land Use Classification**	**Code**	**2019 Area (square miles)**	**% of Total Area**
Water	Open Water	11	50.2	1.7%
Water	Perennial Ice/Snow	12	-	-
Developed	Developed-Open Space	21	364.5	12.7%
Developed	Developed-Low Intensity	22	218.1	7.6%
Developed	Developed-Medium Intensity	23	130.6	4.5%
Developed	Developed-High Intensity	24	74.7	2.6%
Barren	Barren Land	31	10.7	0.4%
Forest	Deciduous Forest	41	1,168.8	40.7%
Forest	Evergreen Forest	42	47.2	1.6%
Forest	Mixed Forest	43	207.5	7.2%
Shrubland	Shrub/Scrub	52	15.5	0.5%
Herbaceous	Grassland/Herbaceous	71	15.2	0.5%
Planted/Cultivated	Pasture/Hay	81	223.2	7.8%
Planted/Cultivated	Cultivated Crops	82	214.5	7.5%
Wetlands	Woody Wetlands	90	126	4.4%
Wetlands	Herbaceous Wetlands	95	6.3	0.2%
		Total	1,847,367	100.00%

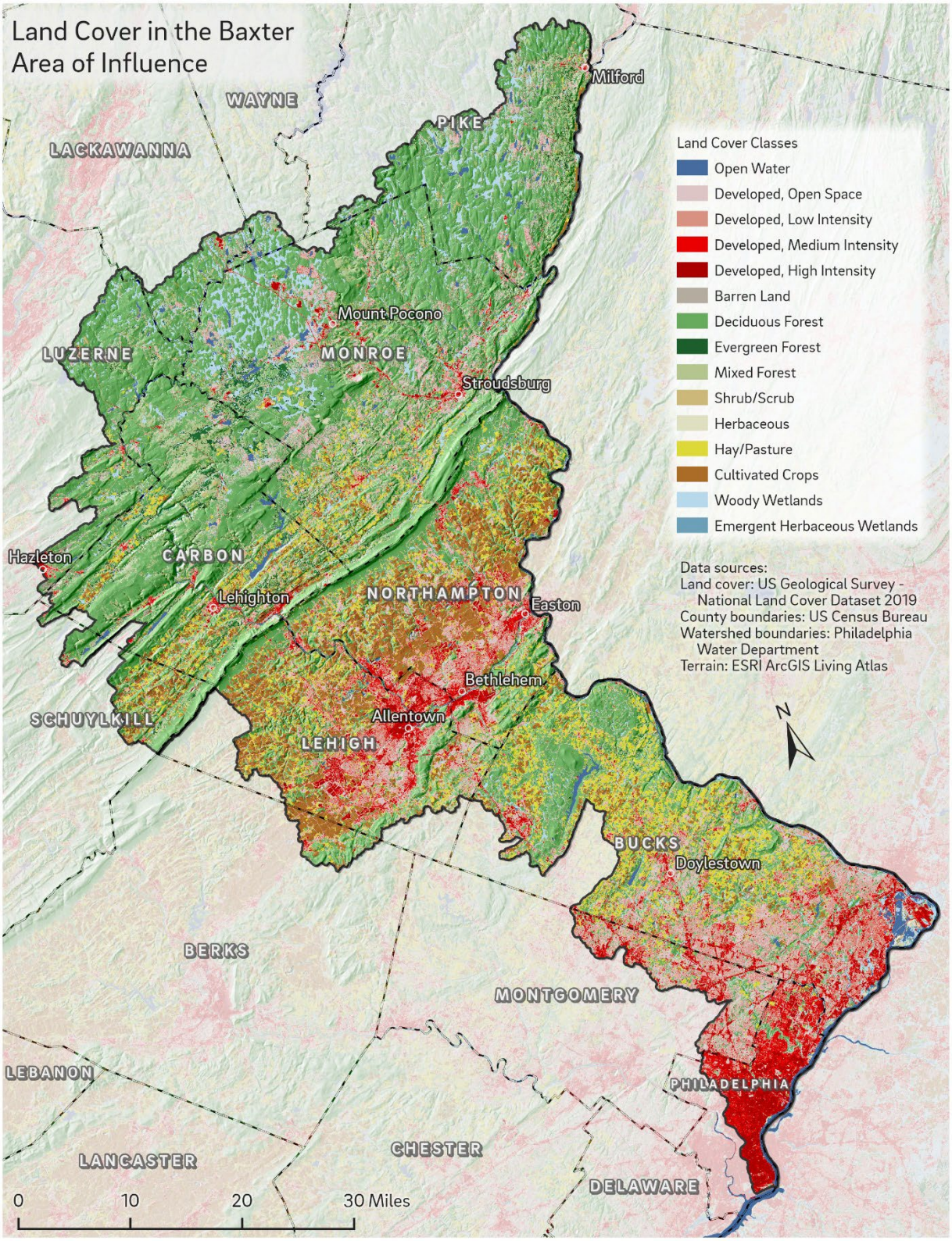

Figure 4-4: Map of Land Use in the Baxter Intake's Area of Influence in the *PWD Watershed Control Plan Update* (2020), (NLCD 2019)

4.2.2.3 SAN Agriculture Workgroup

PWD contributions to the Schuylkill River Restoration Fund (SRRF) and involvement in the SAN Agriculture Workgroup are the main vehicles for identifying and implementing agricultural best management practices in Philadelphia's source watersheds. Through the SAN Agriculture Workgroup, PWD is kept informed about the progress of recent SRRF grant recipients and potential future high priority agricultural BMP projects. The workgroup also develops education and outreach materials including *A Farmer's Guide for Healthy Communities* (available on the SAN website at www.Schuylkillwaters.org) and engages fellow stakeholders to promote the implementation of agricultural best management practices and the development of Comprehensive Nutrient Management Plans throughout the watershed. A new round of strategic planning for the SAN's next 5 years commenced in 2019 and was finalized in late 2020.

In 2022, PWD regularly attended workgroup meetings which were switched to a virtual platform to align with COVID-19 pandemic restrictions.

4.2.2.4 CAFO Identification in the Area of Influence

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 2022, PWD retrieved updated CAFO data from PA DEP including number of animal equivalent units and primary animal for each operation. As of November 2022, a total of 86 CAFOs exist in the Schuylkill River watershed representing more than 69,000 animal equivalent units (AEUs, 1 AEU = 1,000 lbs. of animal weight). These totals mark a significant increase from 2019 data, during which 36 CAFOs representing more than 25,000 AEUs existed in the Schuylkill River watershed.

Following the first full implementation year of the approved Watershed Control Plan update, in 2022 PWD for the first time also retrieved CAFO data from PA DEP for the Baxter intake's area of influence. Within this area, a total of 8 CAFOs exist representing over 3,400 AEUs.

A map depicting 2022 data for both the Schuylkill River watershed and the Baxter intake's area of influence is shown below in Figure 4-9. Due to a lack of significant changes from year to year, this dataset will be updated every 5 years.

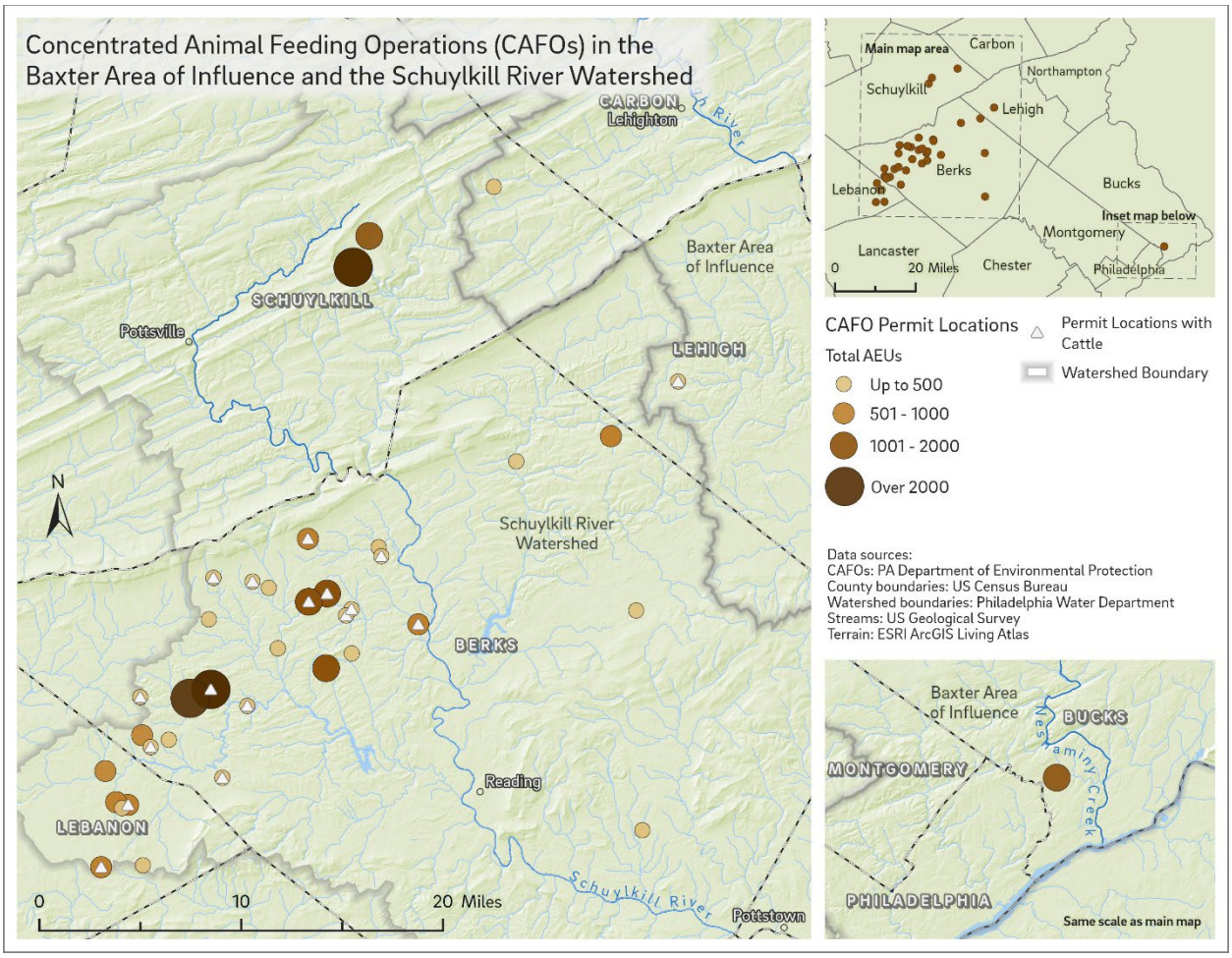

Figure 4-9: Concentrated Animal Feeding Operations in the Schuylkill River Watershed and Baxter Area of Influence by Total Animal Equivalent Units (AEUs) (PA DEP 2022)

4.2.2.5 Nutrient Management Trainings

In 2022, PWD continued to utilize virtual platforms for continuing education and professional development. Opportunities for in-person trainings and conferences continue to be limited due to public health and safety restrictions resulting from the COVID-19 pandemic. PWD staff continues to explore opportunities to attend trainings and webinars to better understand the interconnections between pathogen control, nutrient management, and water supply impacts.

4.2.2.6 Schuylkill River Restoration Fund Grants for Agricultural BMP Projects

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

In 2006, Exelon, SAN, and the Schuylkill River Greenways National Heritage Area (SRG NHA) established the Exelon Restoration Fund, now named the SRRF. The SRRF provides grants to support projects that improve and protect water quality throughout the Schuylkill River watershed. Initially, Exelon provided

all the funding to fulfill a requirement in their DRBC docket for the Wadesville Mine Demonstration Project. Beginning in 2009, PWD became the second annual contributor to the SRRF. Partnership for the Delaware Estuary (PDE) became a member and contributor in 2010 and Aqua PA followed in 2012. Additionally, MOM's Organic Market contributed to the SRRF in 2014 through 2016, and Coca-Cola contributed in 2015. In 2021, Pennsylvania American Water Company signed on to contribute annual funds to the SRRF and officially made their first contribution in 2022. Members of the SAN serve as technical experts in the grant selection process to support the review of project applications for their benefit to the Schuylkill River watershed. SRG NHA oversees the SRRF and distributes grant money.

PWD now contributes approximately $100,000 to the SRRF each year. Priority projects are selected for the implementation of agricultural best management practices to support WCP *Cryptosporidium* control objectives. To meet the WCP objectives specified for the first five years of plan implementation, PWD supported the construction of either manure storage basins or vegetated buffers at 10 separate agricultural operations in the watershed through its participation in the SRRF.

Recognizing the water quality benefits of reducing pathogens, nutrients, and sediment, PWD continues to support the implementation of conservation practices on agricultural properties. SRRF projects that have received PWD grant funding in the past five years are listed in Table 4-8.

Table 4-10: Additional Schuylkill River Restoration Fund Agriculture Projects

Farm	Subwatershed	Award Year	BMP Work Completed or In Progress
Lynnacres Dairy	Maiden Creek	2022	Liquid manure storage facility, a roofed heavy use area, 8,315 linear feet of streambank fencing, two steam crossings, and riparian buffer plantings
Hollinger Farm	Manor Creek	2022	Roofed manure storage area, a heavy use area, rain gutters, and other stormwater controls
Pond View Farm	Maiden Creek	2022	Roofed manure storage area, 1,600 linear feet of streambank fencing, rain gutters, roof leaders, and a lined stormwater outlet
Bolton Farm	Saucony Creek	2021	Liquid manure storage basin, two manure transfer systems, a reception pit, a concrete heavy use area, and 650 linear feet of stream bank fencing
Miller Farm	Manatawny Creek	2021	Liquid manure storage basin, a dry manure storage, a reception pit, two manure transfer systems, a concrete heavy use area, stormwater controls, 400 linear feet of paddock fencing, 310 linear feet of stream bank fencing, and a designated stream crossing
Kunkel Farm	Manor Creek	2020	Dry manure storage, roofed heavy use area, and barnyard stormwater controls
Grube Farm	Irish Creek	2020	Liquid manure storage basin, manure transfer system, dry manure storage, concrete heavy use area, livestock exclusion fencing, barnyard controls, and rain gutters
Love Farm	Hay Creek	2019	Dry manure storage basin, rain gutters and lined outlets, water pipeline to pasture, and animal stream crossing
Northwestern Stables	Wissahickon Creek	2019	Stabilization of 41,000 square foot heavy use paddocks, 12,000 square feet of vegetated buffers and rain gardens, underground pipe system to collect and divert flow from paddocks, and improvements to existing roof drainage
A. Burkholder Farm	Saucony Creek	2018	Dry roofed manure storage area, water pipeline to pasture, animal stream crossing, and rain gutters and other barnyard controls
Brown Farm	Maiden Creek	2018	Manure storage basin, stream bank and wetland exclusion fencing, water supply well establishment, automatic drinker installation, and rain gutter improvements
Youse Farm	Manatawny Creek	2017	Manure storage basin, rain gutters and lined outlets, and other barnyard controls
Maidenford Farm	Irish Creek	2017	350 feet of streambank restoration and planting of vegetation, protection of 1.4 acres of forested riparian buffer and 1.3 acres of marginal pastureland wildlife habitat buffer, and 700 feet of livestock exclusion fencing

Projects Funded to Reduce Non-Point Source Pollution from Agricultural Lands

In 2022, PWD partially funded three new agricultural projects in the Schuylkill River Watershed:

Hollinger Farm, 2022 SRRF Grant Recipient

The Hollinger Farm is a more than 200-acre beef operation located in Albany Township, Berks County, with 25 calf-cow pairs on site. In 2021, the Hollinger family was awarded a USDA-NRCS Environmental Quality Incentive Program (EQIP) contract to implement agricultural conservation practices on their farm. However, USDA-NRCS EQIP requires cash match funding to implement an NRCS contract. At the time of their funding application, there was no manure storage or stormwater management systems on the farm, allowing nutrients, sediment, and pathogens to runoff into an unnamed tributary to Manor Creek, which eventually drains into the Schuylkill River.

The full best management practice suite includes the installation of a 6-month capacity roofed manure storage area, a roofed heavy use area, and barnyard stormwater controls. PWD contributed $10,000 for roughly one fourth of the requested SRRF award for this project, with Constellation Energy, Aqua PA, and PA American contributing the remaining funding. A total of $45,000 is being awarded towards this project from the SRRF.

At the time of this report, construction at the Hollinger Farm is underway.

Pond view Farm, 2022 SRRF Grant Recipient

The Pond View Farm is an over 500-acre beef and chicken operation located in Greenwich and Albany Townships, Berks County. An unnamed tributary to Maiden Creek, itself a tributary to the Schuylkill River, is located on the farm property. The Bauschers were awarded an NRCS EQIP contract and have a shovel-ready project design but need a cash match to satisfy NRCS requirements. At the time of their SRRF application, there was no manure storage or stormwater management systems on the farm, allowing nutrients, sediment, and pathogens to runoff into the unnamed tributary to Maiden Creek, which drains into the Schuylkill River.

The Pond View Farm's project suite includes the installation of a 6-month capacity roofed manure storage basin, stormwater controls, and 1,600 linear feet of streambank fencing.

PWD awarded Berks Nature with $10,000 towards the Pond View Farm project. Constellation Energy contributed the balance of the SRRF award, for a total SRRF grant of $45,000. At the time of this report, improvements to Pond View Farm are expected to be under construction in 2023. Prior to BMP implementation, manure is stored on a small, unroofed concrete pad uphill of an unnamed tributary to Maiden Creek. Following construction, the concrete pad will be expanded and roofed, with stormwater controls including roof leaders and outfall structures added.

Figure 4-6: Pond View Farm paved manure storage area prior to BMP implementation (left) and area downhill of uncontrolled manure storage area, including unnamed tributary to Maiden Creek (right). ***Photo Credit: PWD 2022***

LYNNACRES DAIRY FARM, 2022 SRRF GRANT RECIPIENT

Lynnacres Dairy is Farm is family-operated farm located in New Tripoli, Lehigh County. Kistler Creek, an impaired tributary to Maiden Creek, originates from the farm property, as does an unnamed tributary to Stony Run. The Dietrichs were awarded an NRCS EQIP contract and have a shovel-ready project design but need a cash match to satisfy NRCS requirements. At the time of their SRRF application, there was no manure storage or stormwater management systems on the farm, allowing nutrients, sediment, and pathogens to runoff into the unnamed tributary to Maiden Creek, which drains into the Schuylkill River.

The full best management practice suite includes the installation of a 6-month capacity liquid manure storage area, a roofed heavy use area, 8,315 linear feet of streambank fencing with herbaceous buffer, two stream crossings, a watering location, and a 4,400 square foot animal walkway. PWD contributed $40,000 for roughly one half of the requested SRRF award for this project, with Constellation Energy contributing the remaining funding. A total of $100,000 is being awarded towards this project from the SRRF.

IN-CITY PROJECTS FUNDED TO REDUCE NON-POINT SOURCE POLLUTION

From 2020 through 2022, PWD partially funded two in-city stormwater management projects:

RIPARIAN BUFFER RESTORATION IN EAST FALLS (2021 SRRF AWARD)

The East Falls Development Corporation constructed a new public river landing in East Fairmount Park along the banks of the Schuylkill River in the East Falls neighborhood of Philadelphia. The river landing project includes approximately one half-acre of native riparian vegetation planting at the site.

The River Landing site and riparian corridor immediately upstream and downstream consist of a compromised vegetative community dominated by a native but aging riparian tree canopy and an understory of invasive shrubs and vines. Extending downstream approximately 650 linear feet to the East Falls Bridge and upstream approximately 850 linear feet to PWD's Queen Lane intake, this corridor is one of the few stretches of unarmored riverbank with a naturally vegetated riparian habitat along the eastern edge of the Schuylkill River within Fairmount Park.

The riparian improvement project includes the removal of invasive plant species and planting of native riparian species with soil amendments on 2.5 acres of land. Public education and stewardship will be promoted through signage and programming with partner organizations like the Discovery Center and National Audubon Society. PWD contributed $13,000 towards the riparian restoration component of the project. Additionally, PWD staff provided narration on components of the interactive educational signage.

Initial construction and installation of erosion prevention controls along this new public facility were completed in spring of 2022 after being delayed due to impacts from Hurricane Ida. The associated riparian planting was completed during the fall of 2022.

Smith Run Stabilization Project (2020 and 2022 SRRF Awards)

In 2020, PWD awarded $35,000 through the SRRF to the Schuylkill Center for Environmental Education (SCEE) for the Smith Run stabilization project. Smith Run, located in northwest Philadelphia, is one of Philadelphia's few remaining open first-order streams and flows directly into the Schuylkill River. The stream sits on land managed by the SCEE, founded in 1965 as the nation's first urban environmental education center. Steep topography in the area creates stormwater sheet flows that have proven difficult for SCEE to manage. Heavy stormwater runoff from nearby Port Royal Avenue has caused significant erosion and gullying adjacent to Smith Run, carrying eroded soil and debris directly into the stream's headwaters.

The proposed project aims to alleviate stormwater runoff by constructing a stepped infiltration swale and reinforcing the stream's adjacent riparian forest buffer along the 300 feet of currently scoured land. The project will improve the water quality of Smith Run, as well as that of an educational pond on SCEE property and ultimately the Schuylkill River. SCEE plans to engage community volunteers during construction of the project and to continue to do so through educational programming following the project's completion.

PWD contributed the entirety of the 2020 SRRF award for the Smith Run Stabilization project, at an amount of $35,000. The project was delayed as the COVID-19 pandemic response and supply chain issues impacted both the project timeline and the total project cost. PWD Source Water Protection Staff continued to meet with other department and city stakeholders to assess strategies to move the project forward and has also remained in touch with SCEE staff.

In 2022, SCEE was awarded a second SRRF grant totaling $53,000. PWD contributed $40,000 in funding, with Constellation Energy contributing the remaining $13,000. SCEE has indicated that this second

award will allow implementation of the stormwater BMPs to begin. PWD and SCEE have organized monthly meetings to track progress of implementation and to identify and resolve any remaining needs.

4.2.3 Animal Vectors

Animals in the Schuylkill River watershed serve as mechanical vectors of *Cryptosporidium*, transferring viable oocysts from original hosts. Geese are particularly effective vectors, as identified in PWD and Lehigh University source tracking studies (Jellison et al., 2009; Jellison, 2010a). The SWPP details ongoing and proposed initiatives that aim to reduce the impact of animal vectors near the PWD Queen Lane and Belmont intakes and expand implementation of animal vector control in the Schuylkill River watershed.

Table 4-11: Planned Implementation Schedule – Watershed Protection Control Strategies to Address Animal Vectors

Control Strategy: Watershed Protection			
Priority Source - Animal Vectors			
Initiatives	**Target Watershed**	**Target Completion Date**	**Report Section**
Implement goose control measures on Fairmount Park Properties, including Peter's Island	Wissahickon Creek and Lower Delaware	Ongoing	4.2.3.2
Implement waterfowl management programs at Philadelphia Water Department Facilities	Lower Schuylkill and Delaware River Watersheds	Ongoing	4.2.3.2
Continue to support source tracking research	Various	Ongoing	4.2.1.1
Support efforts to publish scientific journal article to raise awareness and contribute to the state of the science	Various	Ongoing	4.2.1.1
Redesign and install "Do –Not Feed Geese" educational signage in priority locations	Pennypack and Wissahickon Creeks	2023	N/A

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

PWD provides education and outreach efforts concerning the management of animal vectors in the Schuylkill River watershed. In partnership with PDE, PWD hosts the Philly Water's Best Friend Spokesdog Competition where two dogs are selected to be Philly Water's Spokesdog and serve for one year as ambassadors educating dog owners on the importance of picking up pet waste. The Dog Waste Reduction Program educates dog owners about the negative impacts of dog waste on local waterways and the overall environment. During 2022, the program consisted of a traveling dog house exhibit, the Spokesdog Competition and social media campaign, and the Best Friends Partner Program. The 2022 Spokesdog Competition featured four shelters, including Morris Animal Refuge, Philadelphia Animal Welfare Society, Pennsylvania SPCA, and Street Tail Animal Rescue. Each shelter nominated one dog to feature in the competition. PDE shared information directly with dog owners about why picking up dog waste is essential to watershed protection. Sharing content on social media helped to increase the reach of the program by informing Philadelphia residents about the connection between dog waste and clean water and what they can do to help. Overall, the dog waste reduction program utilized key partnerships

and targeted social media to share PWD's message of keeping dog waste out of Philadelphia's local waterways.

4.2.3.2 Wildlife Management at Fairmount Park and PWD Properties

To address animal vectors of *Cryptosporidium*, PWD is committed to geese management through the WCP. PWD has active contracts with the United States Department of Agriculture (USDA) for geese management at Fairmount Park properties and PWD facilities. Geese management is conducted at Fairmount Park properties including Peter's Island, Pleasant Hill Park, Concourse and Centennial Park, and FDR Park. 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. A total annual budget of $140,000 is reserved for wildlife management initiatives throughout Fairmount Park and PWD facilities. These locations are displayed in Figure 4-7.

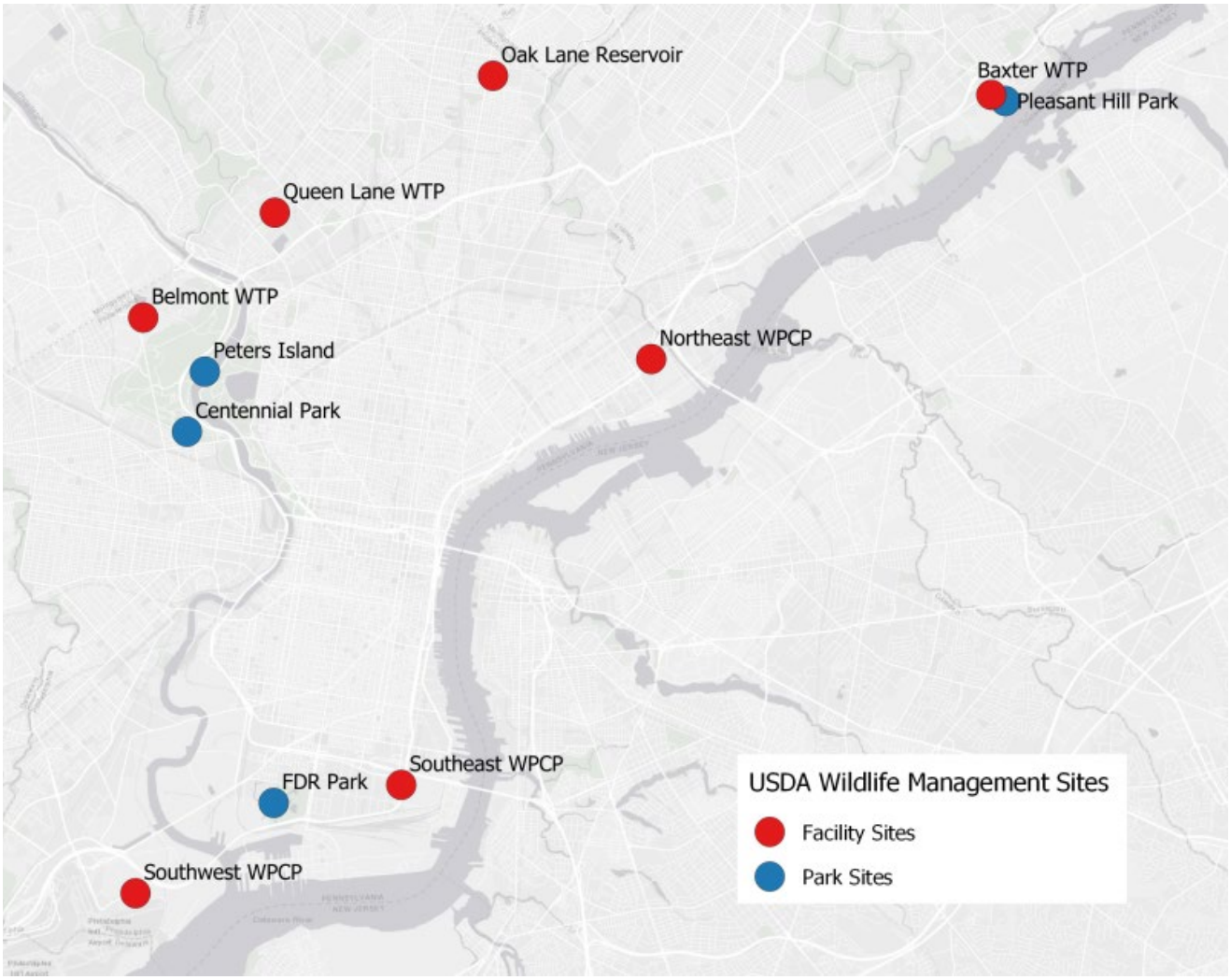

Figure 4-7: Map of USDA-APHIS Wildlife Management Sites

On Fairmount Park properties and PWD facilities, the geese are harassed and dispersed or removed from the site. Geese are dispersed using a range of harassment techniques including physical

harassment, electronic harassment devices, pyrotechnics, lasers, and paintball guns. At all locations, any nests and eggs are treated with 100% food grade corn oil that stops embryo development by preventing air from passing through the shell.

In the last year, goose control measures were maintained at several Fairmount Park locations, including Pleasant Hill Park, FDR Park, Concourse and Centennial Park, and Peter's Island under a PWD contract with the USDA-APHIS (Table 4-10). Under this contract, geese are harassed or removed from the site and eggs and nests are treated to reduce the population.

Table 4-12: Wildlife Management Data for Philadelphia Parks for FY22

	Peter's Island	Centennial Park	Pleasant Hill Park	FDR Park and Golf Course
Quarter	No. of Geese Dispersed/Removed	No. of Geese Dispersed/Removed	No. of Geese Dispersed/Removed	No. of Geese Dispersed/Removed
2021-Q3	1,240	0	57	0
2021-Q4	1,260	20	20	930
2022-Q1	1,540	472	160	2,741
2022-Q2	140	2	30	0
Subtotal	*4,180*	*494*	*267*	*3,671*

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

4.3 Education and Outreach

Education and outreach initiatives are a critical component of PWD SWPP because point and nonpoint source discharges and land management throughout the Schuylkill River watershed influence water quality at the Queen Lane and Belmont intakes. Many education and outreach initiatives are implemented through PWD watershed partnerships, which are maintained by various programs within PWD. The education and outreach control strategy aims to raise awareness of source water protection issues in Philadelphia and throughout Philadelphia's source watersheds. Table 4-11 details initiatives and planned implementation timelines for the in-city education and outreach.

Table 4-13: Planned Implementation Schedule – In-City Education and Outreach Control Strategies

Control Strategy: Education and Outreach **Goal - Continue to raise awareness of source water protection issues in Philadelphia**			
Objectives and Tasks	Target Watershed	Target Completion Date	Report Section
Continue to submit a comprehensive annual water quality report that emphasizes critical source water issues	NA/Citywide	Ongoing (Annually)	4.3.1.1
Continue to maintain the FWWIC and promote source water protection through the center's exhibits and programs	NA/Citywide	Ongoing	4.3.1.2
Continue to operate and maintain Philly RiverCast and promote the web-based recreational warning system	NA/Citywide	Ongoing (Seasonal)	4.3.1.3
Implement in-City stormwater education programs	NA/Citywide	Ongoing	4.3.1.4
Continue to implement pet waste education program in the City of Philadelphia	NA/Citywide	Ongoing	*see 4.2.3.1*

4.3.1.1 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 2022 shares 2021 water quality data and information on the Schuylkill and Delaware River SWPPs, pharmaceuticals and *Cryptosporidium* source tracking. The report also includes sources for additional information on source water protection issues. PWD takes a proactive approach to customer education and goes beyond reporting requirements by including robust overviews of source water and watershed protection efforts.

4.3.1.2 Fairmount Water Works Interpretive Center

The Fairmount Water Works Interpretive Center (FWWIC) is a PWD educational center that presents the history of the Schuylkill River and the influence of human activities on water quality and quantity through innovative exhibits and interactive educational programs. Fairmount Water Works, PWD,

Academy of Natural Sciences and PDE have partnered to develop a Freshwater Mussel Recovery Program. Freshwater mussels filter water and improve water quality. The goal of the program is to rebuild populations of native mussels through hatchery propagation to improve water quality in the Schuylkill and Delaware River watersheds. Additional program information is available online at delawareestuary.org. The project includes the development and construction of a freshwater mussel hatchery and an aquatic field station at the FWWIC. The goal of the hatchery is to propagate new mussels to increase the population in the Delaware and Schuylkill River watersheds. Installation of the demonstration hatchery at the FWWIC was completed in 2017 and over the course of 2018 and 2019, several thousand individual mussels, consisting of five distinct species, were successfully propagated.

Following the COVID-19 pandemic, the FWWIC closed in the interest of public health protection. Additionally, Hurricane Ida caused a flooding event in early September 2021 that required extensive cleanup and repairs of the facility. Efforts to restore the FWWIC while being mindful of public health recommendations to minimize pandemic risks to employees and other FWWIC staff began in 2021 and continued into 2022. FWWIC reopened to public visitors in the summer of 2022.

4.3.1.3 Philly RiverCast

PWD continues to promote and maintain Philly RiverCast. The website, www.phillyrivercast.org, has received more than 1.6 million visits since its launch in 2005. In 2022, PWD launched a revamped version of the website to modernize its appearance and enhance public comprehension. PWD continues to assist individuals and recreational groups in interpreting RiverCast ratings. In 2019, PWD analyzed the data communicated by RiverCast as it compared to laboratory-tested data from PWD routine sampling . This analysis showed that RiverCast continues to protect public health by providing accurate characterizations of ambient bacteria conditions in the river.

4.3.1.4 In-City Stormwater Education and Outreach

PWD continues to help Philadelphia residents manage stormwater and beautify their homes through the Rain Check program, a collaborative effort with the Pennsylvania Horticultural Society (PHS) and the Sustainable Business Network. As part of the program, residents attend a workshop to learn about stormwater tools and how to select the most appropriate management tools for their property. Once the property owner identifies the most suitable stormwater management practices, PWD and PHS will help connect them with a contractor to assist with the installation, and Rain Check provides a portion of the project cost. In FY2022, Rain Check held 20 workshops throughout Philadelphia with a total of 1,346 participants. Stormwater controls installed are itemized in Table 4-12.

Table 4-14: Rain Check Program Progress

Stormwater Management Practice	Total FY2020 Installations	Total FY2021 Installations	Total FY2022 Installations	Cumulative Total (Fall 2014 - July 2022)
Permeable pavers	57	34	33	399
Downspout planters	66	101	114	851
Rain gardens	11	14	5	90
Rain barrels	376	285	454	4,548

Source: J. Waldowski, personal communication, September 19, 2022.

Table 4-13 details initiatives and planned implementation timeline for watershed-wide education and outreach programs to support the LT2 WCP goals.

Table 4-15: Planned Implementation Schedule – Watershed Education and Outreach Control Strategies

Control Strategy: Education and Outreach			
Education and Outreach Goal - Raise awareness of source water protection issues throughout Philadelphia's source watersheds			
Objectives and Tasks	Target Watershed	Target Completion Date	Report Section
Continue to participate in the SAN workgroups and support initiatives outlined in each group's workplan	Schuylkill River	Ongoing	4.5.1.5
Continue to collaborate with the PDE on various education and outreach initiatives	Schuylkill and Lower Delaware River	Ongoing	4.5.1.6
Continue to promote the use of the Delaware Valley Early Warning System among industries, wastewater dischargers, and water suppliers	Schuylkill and Lower Delaware River	Ongoing	4.5.1.4
Work with Philadelphia and regional schools to identify opportunities to enhance conservation practice education in the curriculum	Wissahickon and Pennypack Creeks	2022	4.5.1.7

4.3.1.5 Schuylkill Action Network Collaboration

PWD maintains a $155,000 professional services contract with the Partnership for the Delaware Estuary which incorporates facilitation of the SAN, including workgroup meetings, communication, and project coordination. PWD also sits on the SAN's Planning and Executive Steering Committees, assisting in the planning of annual events and drafting strategic planning documents. PWD regularly attends quarterly SAN Pathogens and Point Source and Agriculture Workgroup meetings, and PWD personnel serve as co-chairs on each of the Pathogens and Point Source and Stormwater Workgroups.

The SAN workgroups provide a mechanism for PWD to engage and collaborate with stakeholders to address priority sources of *Cryptosporidium*, such as agricultural runoff and wastewater effluent. Through the SAN Agriculture Workgroup, PWD is kept informed about the progress of recent SRRF grant recipients and potential future high priority agricultural BMP projects. Through the SAN Pathogens and Point Source Workgroup, PWD can track changes related to wastewater discharge throughout the watershed. PWD and other workgroup partners also share information about water quality, treatment technology improvements, regulatory updates, effective water management best practices, and contaminants of emerging concern (CECs).

4.3.1.6 Collaboration with Partnership for the Delaware Estuary

PWD continues to contribute financial resources toward collaboration efforts with Partnership for the Delaware Estuary (PDE) on several education and outreach initiatives. Initiatives include engaging Philadelphia residents in the prevention of stormwater pollution to the Schuylkill and Delaware Rivers and facilitating coordinated action, communication, and projects for the Schuylkill Action Network (SAN).

PDE hosted what was formally known as the annual Pennsylvania Coast Day at Penn's Landing in Philadelphia, which was renamed the Delaware River Festival beginning in 2019. This celebration of the Delaware River included partners and activities across the river in Camden, NJ. The 2022 Delaware River Festival took place on Saturday, September 24. During the festival, contact information for 371 individuals was collected and 1,208 wristbands were distributed for the ferry and Independence Seaport Museum. More than 1,000 reusable water bottles were distributed as well as 331 scavenger hunt prizes. Feedback from staff, exhibiting organizations, and attendees is being compiled to identify strengths of this year's event and areas for future improvement. Additionally, PDE helps to coordinate the annual Schuylkill Scrub initiative, which takes place from March through May in coordination with Keep Pennsylvania Beautiful. The 2022 Schuylkill Scrub included 56 cleanup events that engaged 13,985 volunteers. In this three-month period, volunteers removed an estimated 26,940 trash bags of litter and bulk waste from the watershed, as well as 2,638 tires.

The SAN also sponsored a Sojourn Steward to participate in the Schuylkill River Sojourn. From June 18 through June 24, 2022, Schuylkill River Greenways hosted the annual Schuylkill Sojourn, a 112-mile kayak journey from Schuylkill Haven to Philadelphia. The SAN-sponsored 2022 Sojourn Steward, Kara Foran, highlighted partner locations throughout the watershed over the week-long journey and the theme of the Schuylkill as a "River of Refuge." Kara engaged sojourn participants while taking photos and video and posting on social media about her experience. Kara's photos and videos have been posted to an album on the SAN Flickr site. The SAN also sponsored a Diversity Scholarship for a 3-day trek for a family of 3 first-time Sojourners. Additionally, PWD, PDE, Academy of Natural Sciences, and FWWIC partnered to install a freshwater mussel hatchery demonstration project at FWWIC that was opened to the public on February 16, 2017. The FWWIC and freshwater mussel hatchery exhibits underwent repair following a flooding event in September 2021 and reopened in the spring of 2022. See Section 4.6.1.2 for more detail on the FWWIC.

4.3.1.7 Educational Partnerships

The 2020 Watershed Control Plan Update commits to working with Philadelphia and regional schools to identify opportunities to enhance conservation practice education.

In FY2022, PWD engineering staff participated as leading members of the Occupational Advisory Council (OAC) for Lincoln High School, a Philadelphia public school adjacent to a tributary to Pennypack Creek. PWD staff played an active role in supporting and enhancing the school's Environmental Engineering career pathway; approximately 100 students from 3 classes attended a presentation on Engineering Careers on October 1, 2021. On May 12, 2022, PWD organized and led an ecology lesson and student clean-up at the nearby Sandy Run and Pennypack Creek, removing trash and litter from the waterways. In FY23, PWD will continue to chair the OAC with the mission of creating student opportunities for internships and post-graduation employment, and to support a yearly work plan that includes procuring guest speakers and facilitating project-based learning.

4.4 Stakeholder Engagement and Partnerships

As described in the 2020 Watershed Control Plan Update, stakeholder engagement and partnership initiatives are intended to support the following goals:

1) Maintain and strengthen existing watershed partnerships, and
2) Develop a framework for a Delaware River Watershed Collaborative.

The first goal focuses primarily on existing Schuylkill River Watershed partnerships and reinvigorating Philadelphia's in-city watershed partnerships. The second goal is to identify and assess the gaps in collaborative efforts to protect and preserve the Lower Delaware River Watershed. Associated objectives and tasks are outlined in Table 4-14.

Table 4-16: Planned Implementation Schedule – Stakeholder Engagement and Partnership Building

Control Strategy: Stakeholder Engagement and Partnership Building			
Goal - Continue to strengthen existing partnerships			
Objectives and Tasks	Target Watershed	Target Completion Date	Report Section
Continue to support the Schuylkill River Restoration Fund to achieve implementation of priority projects	Schuylkill River	Ongoing	4.4.1.1
Champion the Schuylkill River Restoration Fund and work with SAN partners to draw in more funders	Schuylkill River	Ongoing	4.4.1.2
Promote the Schuylkill River Restoration Fund to potential applicants where appropriate	Schuylkill River	Ongoing	4.4.1.2
Remain an active participant in watershed partnerships and reinvigorate Philadelphia Watershed partnerships e.g., Friends of the Pennypack and Friends of Fox Chase Farm	Pennypack and Poquessing Creeks	Ongoing	4.4.1.3
Engage Philadelphia stables in the implementation erosion and sediment control measures	Wissahickon, Pennypack and Poquessing Creeks	Ongoing	4.2.2.1.3
Engage water suppliers and agricultural stakeholders in the lower Delaware River watershed to expand or form new working groups modeled after the Schuylkill Action Network	Delaware River (Baxter AOI)	Ongoing	4.4.1.5

4.4.1.1 Schuylkill River Restoration Fund Grant Advisory Committee

The Schuylkill River Restoration Fund (SRRF) provides grants to government agencies, non-profits, businesses and other organizations to support environmental projects that improve and protect water quality in the watershed. Contributors include Exelon, PWD, PDE, Aqua, DTE Energy, and MOM's Organic Market. The Schuylkill River Greenways National Heritage Area (SRG NHA) oversees the SRRF and distributes grant money. Grant recipients from the SRRF are selected by an advisory committee comprised of representatives from Exelon, Aqua PA, DRBC, PWD, EPA, PA DEP, SRHA, Partnership for the Delaware Estuary, and the Schuylkill Action Network (SAN).

With less than two percent of the Philadelphia source watershed located within the jurisdiction of the city, taking a partnership approach is critical for PWD. Through the SRRF, PWD can leverage funding and support projects that protect the drinking water for Philadelphia, educate the public on the importance of source water protection, and implement on-the-ground projects that support Watershed Control Plan goals.

On May 6, 2022, the SRRF advisory committee met to hear presentations from SRRF applicants and to select grant recipients. More than $369,000 was available for 2022 grants. PWD contributed $100,000 to the SRRF in 2022 and had a carryover of $17,000 from the previous year. In the 2022 SRRF grant round, PWD awarded a total of $100,000 to the following grant recipients:

- $40,000 to Lehigh County Conservation District to implement agricultural best management practices at Lynnacres Dairy Farm in the Maiden Creek Watershed,
- $10,000 to Berks Nature to implement agricultural best management practices at the Pond View Farm in the Maiden Creek Watershed,
- $10,000 to Berks Nature to implement agricultural best management practices at the Hollinger Farm in the Maiden Creek Watershed, and
- $40,000 to the Schuylkill Center for Environmental Education to implement stormwater best management practices adjacent to the high-quality, first-order tributary Smith Run in northwest Philadelphia.

After the completion of the 2022 SRRF grant recipient selection and payment of administrative fees to SRGA, PWD has a balance of $7,000 that will be available to the 2023 SRRF grant round or to other source water protection or restoration projects or education and outreach in the Schuylkill River watershed as approved by PWD. More information on the above projects is in Section 4.4.2.6.

4.4.1.2 Schuylkill River Restoration Fund Outreach and Promotion

The annual Schuylkill Action Network (SAN) Bus Tour and Schuylkill River Restoration Fund (SRRF) Press Event had been adapted to a virtual platform during the COVID-19 pandemic but resumed meeting in-person in 2021. On September 16, 2022, Schuylkill Action Network partners hosted *Celebrate the Schuylkill: SRRF Grant Announcement and SAN Project Showcase* at Schuylkill River Greenways in Pottstown. During this event, 28 attendees toured the suite of BMPs implemented at the Charlestown Playhouse Rain Garden, Jacob Reiff Riparian Buffer with Perkiomen Watershed Conservancy, and the Borough of Pottstown's stormwater filtration system. The 2022 SRRF grant recipients for projects that enhance the Schuylkill Watershed were also announced by Schuylkill River Greenways.

PWD actively works to champion the Schuylkill River Restoration Fund and work with SAN partners to draw in more funders. In recent years, private water utilities were engaged on the work of the Restoration Fund. In 2021, a new private water supplier committed to providing funds for the 2022 grant round.

4.4.1.3 Other Watershed Outreach

PWD helped plan and implement the Schuylkill Action Network Annual Meeting, held on November 10, 2022. The event returned to an in-person format for the first time since 2019 and was held in Berks Nature's new event space, The Rookery. The 2022 meeting drew 62 attendees, who represented both returning and novel faces to the SAN. Discussion topics were centered on the meeting's theme of *Watershed Wins*.

Kelly Anderson, PWD's Watershed Protection Program Manager and SAN Executive Steering Committee Chair, kicked off the meeting with opening remarks and highlights of the SAN's "Watershed Wins." The agenda continued with a lightning round of SAN workgroup updates provided by workgroup co-chairs. Presentation topics included: the Angelica Creek Park Restoration Project given by Kim Murphy, President of Berks Nature; Weir Dam Removals in the Perkiomen given by Krista Seng, Corporate Giving and Community Affairs of Aqua; and Watershed Wins in the Maiden Creek NWQI given by Nick Ramsey, USDA NRCS District Conservationist for Berks and Schuylkill counties. After lunch, attendees went outdoors and toured the Angelica Creek Park trails and wetlands with Larry Lloyd, Berks Nature's Senior Ecologist. During the outdoor portion participants also viewed Berks County Conservation District's (BCCD's) new Riparian Buffer Maintenance Trailer with Kent Himelright, BCCD's Watershed Coordinator.

In the fall of 2022, PWD worked with PDE to connect with the Alliance for Watershed Education (AWE) and invited AWE fellows to attend the 2022 SAN Annual Meeting. PWD volunteered to sponsor eight students by covering the cost of their attendance. AWE students were also invited to present on their capstone projects. Pursuing this college-level student engagement gives PWD and its watershed partners the chance to connect with the next generation of watershed protection professionals. Ivana Quinones, AWE Fellowship Coordinator, introduced AWE's fellowship program. Two presentations were shared by three 2022 Fellows on their capstone fellowship projects at their respective host organizations on public engagement around watersheds and water quality: Abdullah Idris (Cobbs Creek Community Environmental Education Center); Melissa Acosta (Berks Nature); and Nick Furlong (Schuylkill River Greenways).

To round out the event on the theme of public engagement, Tim Fenchel, Deputy Director of Schuylkill River Greenways, and Mike Hartshorne, Aquatic Director at Princeton Hydro, shared a summary of the Schuylkill River Water Quality Project, including a litter analysis and public perception survey focused on the Schuylkill River. In addition to presentations and networking, a highlight of the event was the recognition of Nick Ramsey as the 2022 SAN MVP award for his dedication to improving the Schuylkill watershed and his service to the SAN.

PWD commits to remaining an active participant in watershed partnerships and plans to reinvigorate Philadelphia Watershed partnerships. In 2020, a contract was conformed with the Partnership for the Delaware Estuary to work collaboratively with PWD and other key city partners to deepen and expand current outreach programming and develop diverse educational campaigns centered on the prevention of non-point source pollution and source water protection in the Philadelphia portion of the Delaware River Watershed. PDE will also lay the groundwork for the development of stronger partnerships with

watershed groups and other stakeholders in the city to increase future engagement in clean water initiatives. In 2021, PWD began working with PDE to engage potential partners through preliminary focus groups, gauging interest in the upcoming collaborative and determining shared goals in the region. At the end of calendar year 2020, PDE was also awarded a $57,044 Growing Greener grant by PA DEP towards the establishment of a water quality collaborative for the lower Delaware River watershed. Progress towards the development of a Delaware River Watershed Collaborative is further detailed below in Section 4.7.1.5.

4.6.1.4 Philadelphia Stables Partnerships

In 2020, a comprehensive stormwater improvement and paddock restoration project at Northwestern Stables was completed with the help of $50,000 in PWD funding towards the SRRF grant award. The SRRF award helped the non-profit Northwestern Stables, Inc. leverage $143,000 in additional funding and in-kind support towards the project's completion. This project was showcased during the annual Schuylkill River Restoration Fund press event on September 17, 2021. More information on the Northwestern Stables project is in Section 4.4.2.1.3.

4.6.1.5 Delaware River Watershed Collaborative Development

Throughout 2022, PWD has met with Partnership for the Delaware Estuary (PDE) staff on a monthly basis to develop an initial framework for a water quality collaborative focused on the lower Delaware River watershed, as outlined in the 2020 Watershed Control Plan Update. PDE staff is already tasked with coordinating and facilitating the Schuylkill Action Network (SAN), which will serve as a model for the future Delaware River collaborative.

PWD worked with PDE to create a list of potential partners within the lower Delaware River watershed, and PDE began conducting outreach to those entities in 2022. PDE received immediate interest from conservation districts and other stakeholders in replicating the SAN's Agriculture workgroup for the purposes of soliciting technical assistance and discussing potential project funding mechanisms. Agricultural BMPs tie directly into PWD's Watershed Control Plan *Cryptosporidium* reduction goals and the SAN Agriculture workgroup currently acts as the primary conduit for the Schuylkill River Restoration Fund's (SRRF) agricultural projects. With the hope of building relationships with stakeholders in the lower Delaware River watershed and creating a queue of potential projects that could be supported by an SRRF-style funding mechanism in the future, an initial agriculture-focused meeting consisting of lower Delaware River watershed stakeholders is being planned for early 2023.

Collaboration among regional water utilities in the lower Delaware River watershed was also identified as a high priority. Strengthening these connections should promote opportunities for open dialogue focused on shared regional concerns and create forums to discuss regulatory updates and impacts. PWD and PDE plan to explore expansion of existing the SAN Water Utility Forum by rebranding it as a "Southeastern PA" or "regional" forum to better promote engagement with Delaware River partners. Delaware River utilities will not only be invited to the forum but will also be invited to be event planning committee partners for the next iteration in 2024. Similarly, the SAN Pathogens & Point Source workgroup may be rebranded as "regional" or as a "Utility Forum" workgroup to encourage participation from utilities outside of the Schuylkill River watershed. In the longer-term, these forums

can be used to explore opportunities to implement a Delaware River grant funding program with peer water utilities, modeled after the continuously successful SRRF.

4.5 Expectations for 2023

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

In 2023, PWD will maintain programs and activities that allowed it to accomplish its LT2 goals as outlined in the Watershed Control Plan Update, approved June 2021. These include continuing to address WWTP effluent, agricultural land runoff, and animal vectors as priority sources of *Cryptosporidium*, as well as expanding education and outreach in the watershed through source water protection program initiatives. It also includes completing WCP actions that specifically reduce *Cryptosporidium* in the watershed. Specific focus will continue to be on the following:

- Continued partnership with SAN and PDE for project facilitation and collaboration
- Continued funding toward SAN administration and the SAN Coordinator position
- A contribution of ~$100,000 to the SRRF for 2023 project grants
- Involvement with the SAN Pathogens and Point Source Workgroup to track wastewater discharge related changes in the watershed
- Involvement with the SAN Agriculture Workgroup to identify and contribute to agricultural BMP and CNMP implementation in the watershed
- Wildlife management at Fairmount Park properties and PWD facilities

The Watershed Control Plan efforts will be expanded into the Delaware River watershed as outlined in the 2020 WCP update. Work to coordinate and collaborate among area stakeholders will be a primary aim for the next year.

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