Hanover Municipal Water Works

PWSID# 7670076

York County, PA

Source Water Protection Plan

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Glossary of Water Terms

Note: Not all terms will be applicable to this report.

Aquifer Recharge - Recharge is the rate at which precipitation infiltrates in the ground to supply water to groundwater wells or springs.

Community Water System – a public water system that serves at least 15 service connections used by year-round residents, or regularly serves at least 25 year-round residents.

Contaminant – A physical, chemical, biological or radiological substance or matter in water.

Delineate – to mark the outline of a groundwater or surface water study area.

Emergency Response Plan – a preparedness plan developed by a water system to form consistent procedures to provide safe and adequate drinking water in an emergency situation. The reference outlining the requirements is found in 25 Pa. Code § 109.707.

Geology – The study of the Earth, and the Earth's materials and processes.

Groundwater – water that is located within the saturated zone below the water table and is available to supply wells and springs.

Point Source Pollution – pollutants that come from a single exit point, like a pipe.

Management Strategies – approaches or options selected by the water supplier and the Steering Committee to protect the sources of drinking water currently and in the future.

New Source – a source of water supply that is not covered by a valid permit or as a regular source of supply for the public water system.

Non-Point Source (NPS) Pollution – pollutants that are contained in water runoff from construction, roads, agriculture, or residential areas.

Municipal Separate Storm Sewer System (MS4) – a regulated stormwater management program required by municipalities with urbanized areas.

Source Water – the place from which water originates or is derived, including from wells, springs, reservoirs, streams, ponds, or lakes.

Source Water Assessments – an evaluation documented in writing of the potential contamination of a drinking water source, which includes identifying the contributing area to the source, an inventory of potential contaminants, and a determination of the susceptibility of the water source to contamination, as described in 25 Pa. Code § 109.705.

Source Water Protection Area – a surface water intake protection area, a wellhead protection area, or both.

Source Water Protection Program – a surface water intake protection program, a wellhead protection program, or both, as described in 25 Pa. Code § 109.713.

Study Area – the land regions that may impact the drinking water source.

Surface Water – water open to the atmosphere to subject to surface or stormwater runoff. This does not include finished water intended for distribution.

Surface Water Intake Protection Area – the surface and subsurface area surrounding a surface water intake supplying a public water system, through which contaminants are reasonably likely to move toward and reach the water source. The protection areas consist of up to three (3) zones:

- **Zone A** – a ¼ mile wide are inland from the edge of a water or surface water body and from an area ¼ mile downstream of the intake to a 5-hour time-of-travel upstream.
- **Zone B** – a 2-mile wide area inland from the edge of a waterway or surface water body and extending upstream to the 25-hour time-of-travel.

- **Zone C** – for drainage basins greater than 100 square miles, the remainder of the upstream basin. Zone B and Zone C (if present) comprise the contributing area for the source.

Surface Water Intake Protection Program – a comprehensive program designed to protect each surface water source used by a public water system.

Time-of-Travel – the amount of time water will take to move from the upstream end of a stream segment to a downstream specific location by calculating average stream flow data.

Topography – graphic display of the Earth's surface including the elevation, and position of natural and man-made features.

Watershed – the land area from which water eventually drains to a body of water or other specific location.

Wellhead Protection Area – the surface and subsurface area surrounding a groundwater well, wellfield, spring, or infiltration gallery that supplies a public water system, through which contaminants are reasonably likely to move toward and reach the water source. The wellhead protection area must consist of up to three (3) zones:

- **Zone I** – the protective area immediately surrounding the well, spring, or infiltration gallery with a radius between 100 and 400 feet, depending on site-specific source and aquifer characteristics.
- **Zone II** – the zone encompassing the portion of an aquifer where water is diverted to a well, or flows to a spring, or infiltration gallery.
- **Zone III** – as hydrogeologic conditions warrant, the zone beyond Zone II that provides groundwater recharge to Zone I and Zone II. Zones II and III, if present, comprise the contributing area for the water source.

Wellhead Protection Program - a comprehensive program designed to protect each well, spring, or infiltration gallery source used by a public water system.

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Acronym List

Note: Not all terms will be applicable to this report.

AST	Aboveground Storage Tank
BMP	Best Management Practice
CD	Compact Disc
CERCLIS	Comprehensive Environmental Response, Conservation, & Liability Information System
DCNR	Pennsylvania Department of Conservation & Natural Resources
DEM	Digital Elevation Model
DEP	Pennsylvania Department of Environmental Protection
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ERRI	Environmental Resources Research Institute
ESRI	Environmental Systems Research Institute
GMS	Groundwater Modeling System
MGD	Million Gallons per Day
MODFLOW	Modular Three-Dimensional Finite-Difference Ground-Water Flow Model
MODPATH	Particle Tracking Post-Processing System
NPDES	National Pollutant Discharge Elimination System
NWIS	National Water Information System
PAGWIS	Pennsylvania Ground Water Information System
PENNDOT	Pennsylvania Department of Transportation
PEST	Model-Independent Parameter Estimation
P.G.	Professional Geologist

PSOC	Potential Source of Contamination
PSU	Pennsylvania State University
PWSID	Public Water System Identification Number
RCRA	Resource Conservation & Recovery Act
SCAS OSU	Spatial Climate Analysis Service, Oregon State University
SDWA	Safe Drinking Water Act
SSM	Spotts, Stevens and McCoy
SWAP	Source Water Assessment and Protection program
SWPP	Source Water Protection Plan
SWPTAP	Source Water Protection Technical Assistance Program
TOT	Time-of-Travel
TRI	Toxic Release Inventory
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UST	Underground Storage Tank

Hanover Municipal Water Works

York County, PA

Source Water Protection Plan

Executive Summary

Clean, safe drinking water is often taken for granted. Many people have no idea where their water comes from, how it is purified, or how it arrives at their sink. Protecting the raw water supply has been increasingly recognized as a critical element in the overall mission of delivering a safe and reliable supply of drinking water to consumers. Comprehensive source water protection not only benefits the water supply, but ultimately the economic, social, and environmental well-being of a community.

Project Background

Hanover Municipal Water Works (HMWW) delivers drinking water to a population of approximately 40,900 people in portions of York and Adams Counties, southcentral Pennsylvania. In 2018, HMWW staff applied for assistance from the Pennsylvania Department of Environmental Protection's Source Water Protection Technical Assistance Program (SWPTAP) to develop a thorough and complete source water protection program.

HMWW wishes to improve and protect the safety of its drinking water supply for its customers today and into the future. Although the water system has not experienced pollution problems, there is a possibility of contamination from various sources including quarry operations and naturally-occurring sinkholes.

The objective of this project is to develop a source water protection plan that delineates the protection areas for the HMWW water sources, determines the transport times and pathways of potential contaminants, identifies potential sources of contamination, and offer strategies to protect the water sources from contamination. This project complies with Pennsylvania Department of Environmental Protection's (DEP) Chapter 109 regulations on minimum elements for local source water protection programs, which were updated in August 2018.

Description of Study Area and Previous Studies

The study area developed for this system encompasses multiple municipalities in York and Adams counties. Approximately 27.7 square miles of watershed contribute to the water sources, as the South Branch Conewago Creek merges with Conewago Creek's main stem before draining into the Susquehanna River. The study area predominantly consists of agricultural land and sections of large developed areas. The South Branch Conewago Creek has been designated as a Warm Water Fishes (WWF) and Migratory Fishes (MF) water use by the DEP.

This drainage basin is located within the Piedmont Upland, Piedmont Lowland, and Gettysburg-Newark Lowland sections of the Piedmont physiographic province. Because the watershed spans several physiographic provinces, it flows through a variety of topographic features.

The Codorus State Park and Lake Marburg are recreational facilities located east of Hanover Borough in York County. State Route 194 (Hanover Pike) and State Route 94 are the main transportation corridors passing through the study area.

This project builds upon previous work completed for the Hanover water system. In 2003, the Susquehanna River Basin Commission developed a report through their Watershed Assessment and Protection Program. Several non-point potential sources of contamination (PSOCs) to the surface water intakes were highlighted in the report. Concerns included transportation corridors, agricultural cropland and livestock, on-lot septic systems, and urban stormwater runoff. Point-source that may impact the water sources include auto repair stations, industrial discharges, wastewater treatment plants, and storage tanks. Suggested management strategies included partnering with local organizations and watershed groups active in the watershed.

Description of Water System

The Hanover Municipal Water Works serves drinking water to several municipalities in York County and Adams County. The Hanover treatment plant is located in Adams County, and is served by three surface water sources.

Raw water from the Sheppard Myers Dam and Lawrence Baker Sheppard (LBS) Dam impoundments is gravity-fed to the Kitzmiller Dam, then flows to Clear Lake. Slagel Run is a secondary source, and water is pumped directly to Clear Lake when in use. Clear Lake is a man-made impoundment that receives water from all the surface sources, and used to store raw water to lower turbidity before flowing

by gravity into the filtration plant. An average demand of 4.7 million gallons of water is delivered through 16,850 residential and commercial connections on a daily basis. A groundwater well has been abandoned for use.

Surface Water Intake Protection Area Delineations

A significant purpose of the source water protection program is to delineate protection areas around each of the system's water sources. In general, surface water intake protection areas are divided into Zones A, B, and C for the intakes.

The surface intake protection areas are determined using a geographic information system (GIS) and hydrologic data from the United States Geologic Survey (USGS). By adding up the travel times along a series of stream segments, the model determines the 5-hour and 25-hour time-of-travel boundaries. The water quality in a creek, river, lake, or reservoir is affected by the quality of all the water flowing into it and all the land upstream of it. The HMWW protection areas cover several communities in York and Adams counties.

Zone A is the most protective area, and is the area within 0.25 miles on either side of the stream, and represents, on average, a 5-hour time-of-travel to the intake. Zone A typically also extends downstream 0.25 miles from the intake, except in the case of impoundments or other controlled water bodies. Zone A includes 13.6 square miles for the HMWW intakes. Since a time-of-travel analysis was not performed for the Clear Lake intake, a 0.25-mile buffer of the impoundment was used as the Zone A area for this intake.

Zone B of a surface water source encompasses the drainage area extending upstream from Zone A to a 25-hour TOT along the contributing streams. Due to the small size of the watershed (less than 100 square miles), the remainder of the watershed not designated as Zone A has been designated as Zone B. This combined Zone B covers 21.1 square miles, and flows through several municipalities in York and Adams Counties and passes across the Pennsylvania state border into Maryland.

Zone C for an intake is typically the remainder of the watershed, or the drainage area contributing to streams greater than a 25-hour TOT. There are no areas greater than a 25-hour TOT; therefore all the HMWW protection areas are designated as either Zone A or Zone B.

Though the HMWW Filtration Plant is located in York County, much of the protection areas are located in York, Adams and Carroll counties. Several other community water systems within Adams County have also developed a source water protection plan. HMWW may consider partnering with these systems and other organizations in the future.

Potential Sources of Contamination (PSOCs)

After the protection areas were delineated, numerous sources were used to identify potential sources of contamination (PSOCs) in the areas. Both point sources and non-point sources were identified. Example of non-point sources, where contamination occurs over a widespread area, include stormwater runoff from agricultural fields, residential development, transportation corridors, and commercial and industrial properties. Point sources, where contamination originates from a single discharge point, can include industrial or commercial facilities, permitted pipe discharges, and cleanup sites. All of the PSOCs were rated from A to F, with *A* posing the greatest potential threat and *F* the least potential threat.

Non-point PSOCs were identified through land cover data. The total size of land cover for the protection areas located in Pennsylvania is over 14,953 acres, over 23 square miles. Undeveloped areas, including tree canopy and vegetation, comprise 89% of the protection areas – approximately 13,274 acres. Developed areas, which includes structures and other impervious surfaces, comprise the remaining portions of the Pennsylvania protection areas, about 1,706 acres.

Publicly-available environmental databases, field surveys, and input from the steering committee and DEP were all used to identify point source PSOCs. The initial database search resulted in a total of 146 preliminary PSOCs identified for the protection areas in Pennsylvania, including water pollution control points, illegal dumps, cleanup sites, and other areas of concern. This database has since been revised. The highest-rated point sources were illegal dump sites, storage tank and recycling cleanup sites, and Toxic Release Inventory facilities, all rated A for susceptibility in Zone A.

Contingency Planning

25 Pa. Code § 109.707 requires that community water suppliers develop a plan for the provision of safe and adequate drinking water under emergency circumstances. In the event of an accident or spill that has the potential to impact the water supplies, the water system will initiate their emergency response plans to minimize any potential impacts. The system maintains an emergency response plan (ERP) that

is regularly updated. The plan includes emergency contacts and provisions for alternate sources of water. HMWW plans to work closely with local and county first responders in the event of a spill or accident that may threaten the water supply.

If a contamination event eliminated any of the sources, HMWW can utilize a variety of the remaining sources. The system also has an emergency supply available, with a capacity of more than 13 million gallons, and two elevated storage tanks with a combined capacity of 750,000 gallons. There is an 18 day emergency allowance through an interconnect with York Water Company located at the intersection of Route 94 at Cardinal Lane. In the event that the emergency supply is exhausted, HMWW has historically used water from a nearby quarry during a water shortage.

New Sources

As part of an approved source water protection plan, the HMWW must review steps that would be taken to replace their sources in the event that an existing source becomes unusable. Slagel Run was developed since the reservoirs were produced to ensure adequate supply to maintain service to the customers. Additional sources that may be identified in the future will be protected with the same management strategies outlined in this plan.

Selected Management Strategies

HMWW will use a variety of management options to develop a comprehensive approach to source water protection and protect its water supplies from the PSOCs. Public education of customers, residents, and businesses will be a strategy implemented by the program, as well as distribution of information. HMWW plans to work cooperatively with New Oxford Municipal Authority, the York and Adams County Planning staff, the York County and Adams County Conservation Districts, municipal officials, and other partner organizations to implement this source water protection plan. Some of the strategies selected for implementation include providing the protection area mapping to planning agencies, supporting ordinances that protect water sources, encouraging watershed improvement projects, and working with emergency management personnel on timely response to spills and releases.

Implementing and Sustaining the Source Water Protection Program

The HMWW staff recognizes that the sustainability of this source water protection program is one tool to ensure successful improvements to the watersheds over time. The selected management strategies outlined in this program will reviewed and evaluated by HMWW. New strategies may be added to the implementation list, and other options may be discontinued or suspended as human and financial resources are allocated.

1.0 Introduction

1.1 Project History and Objectives

Clean, safe drinking water is often taken for granted. Many people have no idea where their water comes from, how it is purified, or how it arrives at their sink. Protecting the raw water supply has been increasingly recognized as a critical element in the overall mission of delivering a safe and reliable supply of drinking water to consumers. Comprehensive source water protection not only benefits the water supply, but ultimately the economic, social, and environmental well-being of a community.

Hanover Municipal Water Works (HMWW, PWSID #7670076) delivers drinking water to a population of approximately 40,900 people in portions of York and Adams Counties, southcentral Pennsylvania. The filtration plant, located in Adams County, was originally constructed in 1930 with a new section added in 1964. Plant upgrades were completed in 2018.

HMWW wishes to preserve and improve the safety of its drinking water supply for its customers today and into the future. Although the water system has not experienced pollution problems, there is a possibility of contamination from various sources including quarry operations and naturally-occurring sinkholes. In 2018, HMWW applied for assistance from the Pennsylvania Department of Environmental Protection (DEP) Source Water Protection Technical Assistance Program (SWPTAP) to develop a thorough and comprehensive source water protection plan.

The objective of this project is to develop a source water protection plan that delineates the recharge areas for the HMWW water sources, determines the transport times and pathways of potential contaminants, identifies potential sources of contamination, educates the public on the importance of source water protection, plan for potential pollution events, and complies with DEP's Chapter 109 regulations on minimum elements for local source water protection programs (see Section 1.3).

1.2 The Importance of Source Water Protection

Developing a source water protection plan has numerous benefits. Some benefits are financial – for example, the reduced cost of water treatment and avoidance of additional monitoring costs, remedial efforts, and unanticipated source replacement. Other benefits are less tangible, including:

- Reduced risk to human health
- Protection of a valuable resource for current and future generations

- Increased consumer confidence in water suppliers
- Support of healthy ecosystems, recreation and other beneficial uses
- Increased knowledge of the importance of protecting your public water supply sources
- Identifying potential sources of contamination
- Identifying source water protection areas
- Developing methods and management strategies to mitigate any potential sources of contamination
- Identifying and developing priorities to protect drinking water sources

The economic benefit of protecting a water supply from contamination can be significant. **Table 1-1** lists source water protection case studies throughout the United States. Each of the thirteen communities experienced a contamination problem that could have been avoided by better protection of the water supply. **Table 1-1** lists the contamination problem and the cost needed to either remediate the problem or develop a new water supply.

Scattered throughout this report are additional case studies that provide greater detail regarding how source water supplies can be contaminated and the impact the contamination can have on a community. These case studies are included to reinforce the need to remain vigilant in protecting drinking water for all Pennsylvanians.

Source Water Protection
Case Study

Charleston, West Virginia
Chemical Spill into River, 2014

In January 2014, industrial chemicals were released into the Elk River in Charleston, WV from a leaking aboveground storage tank with inadequate secondary containment. The chemicals reached the drinking water intake of the West Virginia American Water Kanawha Valley Treatment Plant, which ultimately resulted in a Do-Not-Use order that affected approximately 300,000 people in portions of nine counties.

Shortly thereafter, the West Virginia Legislature passed SB 373 requiring all water systems in the state with a surface water intake, or groundwater under the influence of surface water, to update or develop a new source water protection plan by July 1, 2016. Additional regulations were passed to establish standards and enforcement for proper management of aboveground storage tanks. [53]

1.3 Overview of Source Water Protection Regulations

In 1974, Congress developed the Safe Drinking Water Act (SDWA) to protect human health by ensuring clean drinking water was provided by public water systems. As the SDWA matured, States were required in 1986 to develop Wellhead Protection (WHP) Programs to protect public water systems

using ground water sources from contamination that would adversely affect human health. The Pennsylvania Safe Drinking Water regulations (25 Pa. Code § 109) were updated in 1994 to include some basic aspects of WHP which established three-tiered WHP areas, required ownership/control of the innermost WHP Area (Zone I) and set minimum elements for systems seeking DEP approval of their local WHP program.

The US Environmental Protection Agency (EPA) recognized the success of WHP efforts in identifying potential contaminant threats and minimizing risk to wells and springs through proper management of the contributing area, and the WHP concept was subsequently expanded to all sources used by public water systems in 1996 when the SDWA was reauthorized. States were now required to develop a Source Water Assessment and Protection (SWAP) Program to assess all drinking water sources - surface water and ground water - serving public water systems for their susceptibility to pollution. The source water assessment serves as the skeletal framework for building a voluntary, community-based drinking water source protection program to prevent costly contamination of public drinking water sources. Most of these assessments for sources in existence at the time were completed by DEP or a contractor around 2003 and provided a general evaluation of the protection area for an existing water source. Efforts since then have focused on using the assessments as a basis for developing local source water protection (SWP) programs for community water systems. Source water assessments for unassessed sources are conducted as needed.

In August 2018, the PA Safe Drinking Water regulations were updated to incorporate source water assessments and expand protection efforts to all sources used by community water systems. As part of this update, DEP defined source water assessment, updated definitions of SWP Areas for surface-water and ground-water sources, revised permit application requirements to include a source water assessment of each new raw water source, and updated requirements for systems with an approved local SWP program. The update also includes a requirement to conduct an annual inspection of the SWP Area to identify and evaluate actual and probable sources of contamination, along with updating the source water assessment if needed. [1]

Community water systems may opt to voluntarily develop a comprehensive, community-oriented SWP program for DEP approval. At the very least, approval by DEP allows better tracking to facilitate environmental program coordination, legitimizes a community-based effort and provides an opportunity for formal recognition and positive publicity. In order for DEP to approve a local SWP program, the plan must include the following elements: [2]

- Formation of a steering committee representing, but not limited to, the water supplier, local government entities, water supply customers, farming and business community representatives (as applicable).
- Encouragement of public participation through informational and educational activities.
- A map of the delineation of areas to be protected, using approved DEP methods.
- Assessment and inventory of potential and existing sources of contamination to each permitted water source.
- Development of a management plan to protect the water supply from potential contamination as part of a strategic long-term program, including potential adoption of municipal ordinances or transfer of development rights inside the protection areas, purchase of the source water protection area by the water system, public education, and other methods approved by DEP.
- Preparation of a contingency plan for emergency response and alternate sources.
- Provisions to protect sites identified for development of new water sources.
- Provisions to review and update the program annually.

Source Water Protection
Case Study

Pennsylvania
Heating Oil Contamination, 2014

A county 9-1-1 call center contacted the DEP Emergency Response hotline reporting a heating oil smell in the drinking water at an apartment building. Two tanks, located within 25 feet of the drinking water well appear to have leaked, and tap water samples had benzene levels above drinking water standards. The property owner provided bottled water for the residents and installed VOC treatment. Since both soil and ground water were contaminated by this release, the property owner is required to clean up the contaminated soil. Because this release was not covered under his policy, the owner was responsible for the soil cleanup and drinking water treatment at his own expense [46].

In 2007, DEP initiated the Source Water Protection Technical Assistance Program (SWPTAP) to help community water systems develop a protection plan that meet DEP's Minimum Elements for Local Source Water Protection Programs. Using the federal Drinking Water State Revolving Fund set-asides, DEP contracted the engineering firm Spotts, Stevens and McCoy (SSM) of Reading, PA to assist water suppliers throughout Pennsylvania develop source water protection plans. All CWS are eligible to participate in this program through their regional DEP office.

1.4 Description of Study Area

The study area developed for this system encompasses multiple municipalities in York and Adams counties ~~as well as Carroll County~~ shown in **Figure 1-1**. Within this area, approximately 27.7 square miles of watershed contribute to the HMWW water sources, as the South Branch Conewago Creek merges with Conewago Creek's main stem before draining into the Susquehanna River. The Susquehanna River system is part of the Mid-Atlantic Region, which consists of the drainage area between the states of New York and Virginia that ultimately drain into the Atlantic Ocean. The study area predominantly consists of agricultural land and sections of large developed areas. The South Branch Conewago Creek has been designated as a Warm Water Fishes (WWF) and Migratory Fishes (MF) water use by the DEP. [3]

This drainage basin is located within the Piedmont Upland, Piedmont Lowland, and Gettysburg-Newark Lowland sections of the Piedmont physiographic province. Because the watershed spans several physiographic provinces, it flows through a variety of topographic features.

State Route 194 (Hanover Pike) and State Route 94 are the main transportation corridors passing through the study area.

Source Water Protection
Case Study

Adams County, Pennsylvania
Water Restrictions from Plant Fire, 2015

In June 2015, 3.8 million gallons of water used to extinguish a fire at a chemical plant flowed into a neighboring creek, a tributary of the South Branch Conewago Creek. This contamination posed a significant threat to the New Oxford Municipal Authority, who used the creek as their source of drinking water. After learning of the incident, NOMA closed the intake to prevent any contamination of their treatment and distribution systems. NOMA utilized an interconnection with another water system, bulk water tankers, and shipments of finished water from nearby systems in order to provide service to their customers. A mandatory conservation notice was issued for the service area to ensure sufficient water was available. After extensive water quality testing and communication with PA DEP staff, NOMA is back online. [55]

1.5 Previous Studies

This project builds upon previous work completed for the Hanover water system. In 2003, the Susquehanna River Basin Commission developed a report through their Watershed Assessment and Protection Program. This assessment provided an overview of the watershed and potential contamination sources that have some risk of polluting the water supply. Several non-point potential sources of contamination (PSOCs) to the surface water intakes were highlighted in the report. Concerns included transportation corridors, agricultural cropland and livestock, on-lot septic systems, and urban stormwater runoff. Point-source that may impact the water sources include auto repair stations,

industrial discharges, wastewater treatment plants, and storage tanks. Suggested management strategies included partnering with local organizations and watershed groups active in the watershed. [4]

In 2019, HMWW staff attended a source water protection class conducted by the PA Rural Water Association. The class provided an overview of the DEP's Source Water Protection Program, and assisted staff with delineation information and tools for managing potential sources of contamination, contingency planning, and watershed management options. [5]

1.6 Overview of Water System

The Hanover Municipal Water Works serves drinking water to several municipalities in York County and Adams County. The Hanover treatment plant is located in Adams County, and is served by five surface water sources.

- Sheppard Myers Dam
- Lawrence B. Sheppard (LBS) Dam
- Kitzmiller Dam
- Slagle Run
- Clear Lake

Raw water from the Sheppard Myers and LBS Dam impoundments is gravity-fed to the Kitzmiller Dam, which serves as the intake for Clear Lake. Clear Lake is a man-made impoundment that receives water from all the surface sources, and used to store raw water to lower turbidity before flowing by gravity into both filtration plants. Slagle Run is a secondary source, and water is pumped directly to Clear Lake when in use. HMWW has the capability of obtaining water from Kitzmiller Dam directly into both plants if Clear Lake is out-of-service for any reason.

Chlorine is added for disinfection, and alum as a coagulant. After flowing through a mixing chamber, the water enters a sedimentation basin for clarification, filtered to remove any remaining particles, then treated for pH. Finished water is stored in two covered reservoirs called Parr's Hill, and two elevated storage tanks. An average demand of 4.7 million gallons of water is delivered through 16,850 residential and commercial connections on a daily basis. A groundwater well has been abandoned for use.

HMWW has completed several major improvements to its infrastructure in the past several years, including a reservoir cover and pump station at Parr's Hill Reservoir, treatment plan upgrades, and rehabilitation of the spillway and embankment at LBS Dam.

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2.0 Steering Committee and Public Participation

2.1 Purpose of the Steering Committee

A steering committee was formed for this project. The committee can be comprised of project stakeholders, including local officials, citizens, and other interested parties. The steering committee has: (a) provided comments and ideas to the project team with respect to knowledge of issues in the watershed; (b) served as a sounding board for ideas and recommendations being developed as part of the source water protection plan; and (c) helped to carry the "message" of the source water protection plan back to its representative communities. Specific duties have not been assigned to individual members of the steering committee. The steering committee is an advisory body only; its recommendations are not binding.

2.2 Steering Committee Members

The steering committee members that participated in the development of this plan included:

Zach Steckler, Hanover Borough
Michael Bowersox, Hanover Borough
Terry Sterner, Hanover Borough
Tim Mayers, Hanover Borough
Michael Harman, Hanover Borough
Dale Ault, Hanover Borough
Kevan Anschuetz, Hanover Borough
Robin Smith, Hanover Borough
Sam Miller, Hanover Borough
Falyn Morningstar, Hanover Borough
Lori Musselman, Hanover Borough
Jeff Waltman, Hanover EMA
Jeanine Pranses, Hanover Borough Council
Tony Clousher, Hanover Area Fire/Rescue
John Seitz, York County Planning Commission
Adam Winters, New Oxford Municipal Authority
Gary Peacock, York County Conservation District
Emily Neideigh, York County Conservation District

Source Water Protection
Case Study

Berks County, Pennsylvania
Industrial Contamination 2003-2010

In 2003, 1,4-dioxane was found in the Borough of Bally's municipal water, which is supplied by one groundwater well. It was determined that the solvent was used by a local manufacturer of refrigeration systems, which is located a short distance from the Bally municipal well. Seven years later, a new groundwater well was completed and placed online for the 500 homes and businesses currently using bottled water supplied by the industry responsible for the contamination [42] [43].

Bicky Redman, Adams County Department of Planning and Development
G. Patrick Bowling, P.G., DEP-Central Office

Rhonda Hakundy-Jones, P.G. was the DEP-Southcentral Region Office representative who guided development of this project. Technical advisors responsible for the source water protection plan also included Al Guiseppe, P.G., Lyn O'Hare, and Ashton Prifer of Spotts, Stevens and McCoy.

2.3 Steering Committee Meetings

Steering committee meetings were held to gather local input, receive feedback about the project results and recommendations, and interact with government agencies.

The following meetings were scheduled for this project:

- April 3, 2019
- July 30, 2019
- October 2, 2019
- October 8, 2019
- December 11, 2019

Appendix A includes information from these meetings. Source water protection is an ongoing and evolving process. The committee will continue to address the implementation of this plan. Although individual members may change, the committee will remain intact and will continue to meet at least once annually.

2.4 Public Education in the Community

HMWW offers information on a webpage through Hanover Borough. A link to the annual Drinking Water Quality Reports are available, along with information on ways to prevent water waste. Additional data on regulations and rates is also linked to this page. The information can be accessed at: http://www.hanoverboroughpa.gov/Water-Department.html. A semi-annual newsletter is also distributed by the Borough.

2.5 Availability of Plan

Copies of the approved plan will be available for review at the Borough of Hanover office. Appointments should be made in advance to view the plan, as review may be subject to the Borough's Right-to-Know policy.

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3.0 Delineation of Surface Water Intake Protection Areas

This section describes the methodology for identifying the protection areas for the Hanover surface water intakes. These protection areas were determined using available data and hydrologic methods consistent with DEP guidance. The summary of the approach and resulting protection areas are described below. A detailed technical description of the analysis is included in **Appendix C**, with the data package electronic files available in **Appendix H.**

3.1 Description of Surface Water Sources

The HMWW obtains its water supply from water intakes throughout the South Branch Conewago Creek watershed, which is displayed in **Figure 3-1**. These sources include the Sheppard Myers (DEP Source ID 001), the Lawrence B. Sheppard (LBS) Dam (DEP Source ID 002), the Kitzmiller intake (DEP Source ID 003), the Clear Lake (DEP Source ID 004), and the Slagle Run intake (DEP Source ID 005). The intakes are permitted for a combined allocation of 10,100,000 gallons of daily water withdrawal.

3.2 Methodology for Determining Surface Water Intake Protection Areas

The water quality in a creek, river, lake, or reservoir is affected by the quality of all the water flowing into it and all the land upstream of it. The protection areas were determined using a geographic information system (GIS) and hydrologic data from the United States Geologic Survey (USGS). The USGS data includes the network of streams, drainage area, and mean annual stream velocity. The GIS computes how long it takes water to move from the upstream end of a stream segment to the downstream end. By adding up the travel times along a series of stream segments, the GIS determines the 5-hour and 25-hour time-of-travel boundaries. Therefore, the entire drainage area upstream of a surface water source is considered part of a source water protection area, and are divided into Zones A, B, and C.

Because average velocities are used, the time-of-travel calculations represent average conditions; during floods, water flows much faster and the protection areas would be larger. During drought conditions, water flows more slowly and the protection areas would be smaller.

3.3 Description of Surface Water Intake Protection Areas

The HMWW protection areas cover several communities in York and Adams counties, and are mapped in **Figure 3-2**.

3.3.1 Zone A

Zone A is the most protective area, and is the area within 0.25 miles on either side of the stream. In the case of rivers, reservoirs, or lakes in which intakes are located, Zone A is the area within 0.25 miles on either side of the bank, as opposed to the stream centerline. Along the contributing streams, Zone A extends upstream to a point that represents, on average, a 5-hour time-of-travel to the intake. Zone A typically also extends downstream 0.25 miles from the intake, except in the case of impoundments or other controlled water bodies. Zone A includes 13.6 square miles for the HMWW intakes. Since a time-of-travel analysis was not performed for the Clear Lake, a 0.25-mile buffer of the impoundment was used as the Zone A area for this intake.

3.3.2 Zone B

Zone B of a surface water source encompasses the drainage area extending upstream from Zone A to a 25-hour TOT along the contributing streams. Due to the small size of the watershed (less than 100 square miles), the remainder of the watershed not designated as Zone A has been designated as Zone B. Zone B covers 21.1 square miles, and flows through eight municipalities in York and Adams Counties and passes across the Pennsylvania state border into portions of Carroll County, Maryland.

3.3.3 Zone C

Zone C for an intake is typically the remainder of the watershed, or the drainage area contributing to streams greater than a 25-hour TOT. There are no areas greater than a 25-hour TOT; therefore all the HMWW protection areas are designated as either Zone A or Zone B.

3.4 Regional Source Water Protection Planning

Though the HMWW filtration plant is located in York County, much of the protection areas are located in Adams County. Several other community water systems within Adams County have also developed a source water protection plan. HMWW may consider partnering with these systems and other organizations in the future.

4.0 Contaminant Source Inventory

After the source water protection areas were delineated, a comprehensive inventory of potential sources of contamination (PSOCs) was compiled for the areas. PSOCs are locations or activities that can adversely affect the quality of the water supply. Note that land uses, activities, or individual industries identified in the PSOC inventory are not necessarily a source of pollution; however, they have the *potential* for contaminating surface water. Though the Zone C delineation extends beyond Pennsylvania borders, potential sources of contamination were not evaluated for the portions of protection areas within Maryland.

PSOCs include activities that use, store, transport, or dispose of the following types of contaminants:

- Regulated contaminants with federal primary and secondary maximum contaminant levels for safe drinking water
- Materials on the EPA contaminant candidate list and contaminants with EPA lifetime health advisories or cancer risk numbers; most of these are on the Clean Water Priority Pollutant List
- *Giardia* and *Cryptosporidium*
- Turbidity
- Disinfection by-products
- Contaminants that cause taste and odor problems
- Other contaminants, as necessary, based upon known potential contaminant sources.

PSOCs can be non-point sources (where contamination occurs over a widespread area) or point sources (where contamination originates from a single discharge point). Examples of non-point sources include stormwater runoff from agricultural fields, residential lawns, roads and parking lots, and commercial and industrial properties. Mobile threats like spills or releases along transportation corridors such as highways, railroads, and navigable waterways can also provide a source of non-point pollution.

Point sources can include stationary threats at a fixed location such as an industrial or commercial facility. Point source discharges can be hazardous substances that enter the groundwater or a stream through spills or releases that occur during transport, handling, use or storage. Accidents can occur even when proper precautions are taken and have the potential to release hazardous materials to the subsurface through percolation or to a surface water body through overland flow.

4.1 Priority Concerns of the Water System

The HMWW staff expressed concerns with mining discharges from a nearby quarry, contamination impacts from sinkholes in the Karst terrain, and agricultural impacts in the southern reservoir area. The 2003 Source Water Assessment study also mentioned on-lot septic systems, NPDES dischargers, and several other types of commercial facilities.

4.2 PSOC Identification and Evaluation: Non-Point Sources as Land Cover

All the non-point PSOCs discussed with the steering committee were identified using aerial photographs, land use maps, input from the water system operators, steering committee members, the DEP, and electronic databases. All data sources are referenced in Section 9, and identified by a bracketed number [ ]:

For the purpose of this study, non-point sources are represented by land cover data, which displays which areas are developed, and to what degree they are developed. Development of the land increases stormwater runoff, especially if the development creates impervious surfaces. Impervious surfaces are areas where water cannot infiltrate into the ground, and instead runs off into roads or streams, accumulating sediment, contaminants, and debris along the way. Land cover data is sourced from one of two datasets: western Pennsylvania land cover data is sourced from the 2011 National Land Cover Dataset (NLCD) [6]. The remainder of the state is covered by a 2016 higher resolution dataset from the Chesapeake Conservancy [7]. Where applicable, certain activities and infrastructure may be added to the land cover analysis from the following electronic databases:

- Abandoned mine lands [8]
- Pipelines [9]
- Roads [10]
- Mined out areas [11]
- Railroads [12]
- National Pipeline Mapping System [13]

Non-point examples can include agriculture, residential developments, logging, drilling and mining operations, pipelines, roads, and railways. Even though non-point PSOCs are not easily quantified or standardized, they are still potential threats to the water supply and should be monitored and managed.

The land cover for protection areas within Pennsylvania were inventoried in **Table 4-1. Figure 4-1A** shows generalized land cover for the Slagle Run protection areas; **Figure 4-1B** displays land cover for the remaining southern surface water sources. The total size of land cover for the protection areas located in Pennsylvania is over 14,953 acres, over 23 square miles. Undeveloped areas, including tree canopy and vegetation, comprise 89% of the protection areas – approximately 13,274 acres. Developed areas, which includes structures and other impervious surfaces, comprise the remaining portions of the Pennsylvania protection areas, about 1,706 acres.

Because of the potential impact to the water supply, transportation corridors have been assigned a rating to assist the Steering Committee with management strategies. The rating is based on proximity to the water source, potential contaminants associated with the land use activity, and input from the steering committee and DEP staff. This information is then processed through a matrix system developed by the DEP to assign a susceptibility rating. Numerous roadways pass through the protection areas, and are rated A for susceptibility in Zone A. **Figure 4-2** displays these roadways, as well as pipelines and railroads within the protection areas within Pennsylvania.

Source Water Protection
Case Study

Centre County, Pennsylvania
PCE in Groundwater Spring, 2010

Tetrachloroethylene (PCE) contamination has been found in a Centre County spring since the 1980s, but recent sampling results show that PCE levels have begun to fall. One theory is that a groundwater-treatment system installed at a nearby industry has treated more than 546 million gallons of tainted water, with 4,800 pounds of volatile organic compounds removed. Contaminated soil has also been removed from the site. PCE ingestion has been tied to liver problems and an increased likelihood of cancer [44].

The descriptions below for the selected non-point sources are general in nature; however, each description includes an adequate amount of information that a reader with no knowledge of the non-point source PSOCs will be able to understand how it could impact and affect drinking water quality.

Agriculture – row crops: Polluted runoff is picked up and carried by surface water runoff and snowmelt that is deposited in bodies of water and underground sources of drinking water. Agricultural activities related to row crops that cause these detrimental impacts include plowing too often or at the wrong time, and improper, excessive, or poorly-timed application of pesticides, irrigation water, and fertilizer. The types of pollutants generated include sediment, nutrients (phosphorus, nitrogen, and potassium), pesticides, metals, and salts. The improper handling, storage, application, or disposal of

fertilizers and pesticides used by agricultural operations all have the potential to contaminate groundwater and surface waters.

Commercial land: Improper operations and maintenance at commercial business properties may lead to uncontained spills or contact of contaminants with surface water runoff and seepage into the ground that may pose a threat to the groundwater. Activities that should be properly maintained for uncontrolled contact with runoff or spillage include building maintenance (power washing); outdoor fluid storage; dumping and spilling of liquids, especially hazardous materials; landscaping and grounds care (irrigation); parking lot maintenance (power washing); vehicle fueling; vehicle maintenance repair; vehicle washing; and wash down of greasy equipment and grease traps.

Roads/Highways/Parking Lots: As rainwater or melting snow drains off of impervious surfaces, it picks up deposited pollutants, such as vehicle fluids, sediment, and litter. In addition, uncontained spills and leaks associated with accidents within transportation corridors, as well as, any liquid/solid that is carried in bulk on a truck can be spilled onto the ground or directly into a waterway at a bridge crossing can pose a threat to both groundwater and surface water contamination. Road deicing agents pose a threat to groundwater as it percolates through pervious soil or as runoff entering surface waters.

Urbanized Areas/MS4/Stormwater Management: Increased impervious areas result in a greater volume and velocity of runoff that causes an increased potential for erosion and off-site transport of sediment. Pollutants that are found in urban stormwater consist of suspended sediment; nitrogen and phosphorus from fertilizer; oxygen demanding organic material (pet waste, leaves, grass clippings, litter); pesticides (industrial applications and lawn and gardens); bacteria/pathogens (sanitary sewer overflows, and pet and urban wildlife waste); and miscellaneous debris. The Municipal Separate Storm Sewer System (MS4) regulations require a stormwater program be enacted in urbanized areas – including identifying where flow and discharges are within the municipal stormwater system.

4.3 PSOC Identification and Evaluation: Point Sources

The first step in identifying point source PSOCs in the protection areas was searching publicly-available environmental databases for regulated locations, as identified by a permit or an enforcement action. The PSOCs found through these database searches are point sources; non-point sources typically are not regulated. A preliminary list of point source PSOCs was prepared from the following data sources, which are referenced in Section 9, and identified by a bracketed number [ ]:

- Air emission plants [14]
- Beneficial land uses [15]
- Captive hazardous waste operations [16]
- Cemeteries [17]
- Coal mining operations [18]
- Commercial hazardous waste operations [19]
- Conservation wells [20]
- Golf courses [21]
- Historic oil and gas wells [22]
- Industrial mineral mining operations [23]
- Land recycling cleanup locations [24]
- Municipal waste operations [25]
- Oil and gas water pollution control facilities [26]
- Oil and gas wells [27]
- PA CleanWays Illegal Dump Surveys [28]
- Public PSOCs obtained from 2002 Source Water Assessment Program [29]
- Radiation facilities [30]
- Regulated tank list [31]
- Residual waste operations [32]
- Storage tank cleanup locations [33]
- Storage tank locations [34]
- Water pollution control facilities [35]
- Water resources [36]
- USEPA Envirofacts geospatial data [37]

Source Water Protection
Case Study

Manure Storage Releases, 2018

Two releases from manure storage tanks were reported within a one-week period in Chester County. The first incident released 100,000 gallons of manure into two nearby creeks, creating a fish-kill scenario. The second incident released another 2,000 gallons into streams. These waterways feed the Octoraro Reservoir, a source of drinking water for the Chester Water Authority, serving 200,000 people. The PA Department of Environmental Protection monitored both incidents, but no adverse effects to the reservoir were reported by the Authority. [54]

4.4 PSOC Rating and Susceptibility Analysis

The relative risk of point source PSOCs on surface water is determined through a uniform method developed by DEP known as a susceptibility analysis. [38] The susceptibility analysis is a qualitative measure of the relative priority for concern of PSOCs based on the drinking water source sensitivity, the potential impacts posed by sources of contamination to the water source, and the possibility of release of the contaminant of concern. The intent of the analysis is to identify the most significant PSOCs to assist in making local voluntary source water protection programs more effective.

The susceptibility analysis uses a series of tables to determine high, medium, and low values for five parameters: time of travel, persistence, quantity of pollutant, sensitivity of the source, and potential for release. Some of these parameters are pre-established as a baseline for consistency between watersheds throughout the state. Each PSOC is given a rating from A to F, with *A* posing the greatest potential threat and *F* the least potential threat. The DEP guidance document explaining the susceptibility analysis is available in **Appendix D**.

4.5 Susceptibility Analysis Results and Verification

The initial database search resulted in a total of 146 preliminary PSOCs identified for the protection areas only in Pennsylvania, including water pollution control points, illegal dumps, cleanup sites, and other areas of concern. Verification of the preliminary inventory was completed by the steering committee in 2019. As a result of the verification, some PSOCs have been corrected, and other PSOCs added or deleted from the inventory. The highest-rated point sources were illegal dump sites, storage tank and recycling cleanup sites, and Toxic Release Inventory facilities, all rated A for susceptibility in Zone A. The database results for these PSOCs are displayed in **Figure 4-2A** for Slagle Run, and **Figure 4-2B** for the southern intake sources. All PSOCs have been summarized in **Table 4-2**.

PSOCs, particularly those in Zones A or B for surface sources, pose the greatest threat to the water supply and, in general, merit the most attention for preventing a contamination problem. Descriptions of the PSOCs are described below:

EPA Regulated: These are sites from the EPA Envirofacts data system, which is made up of information from multiple environmental databases. This is a wide range of sites that are subject to environmental regulation by the EPA. Reasons for regulation can vary greatly within the themes of air, land, water, waste, toxics, and radiation. *NOTE: Within this database are other categories that are of particular concern. They include:*

TRI (Toxic Release Inventory) sites: The TRI program was started in 1988 and contains information on releases of nearly 650 chemical and chemical categories by certain industries and federal facilities. Releases and improper transfer of toxic chemicals from a TRI site may therefore pose a potential, if not already confirmed, threat to source water.

Superfund – CERCLIS Sites: A Superfund site is any land in the US that has been contaminated by hazardous waste and identified by the EPA as a candidate for cleanup because it poses a risk to human health and/or the environment. Sites can include abandoned warehouses, manufacturing facilities, processing plants, and landfills. Superfund is a federal program, administered by the EPA, established in 1980. Its goal is to locate, investigate and clean up severe, uncontrolled hazardous waste sites throughout the country. Before this program, hazardous wastes were often left out in the open or abandoned to seep into the ground or waterways.

Source Water Protection
Case Study

Lehigh Valley, Pennsylvania
Mobile Home Park Contamination, 2012

The owners of dozens of mobile home parks, some in the Lehigh Valley area, have agreed to pay a $1.3 million fine and clean up their act after being accused of thousands of violations of water pollution laws.

State and federal environmental authorities said mobile home parks exceeded federal drinking water standards for pollutants; failed to notify residents about drinking water problems; illegally discharged untreated or partially treated sewage into streams; and failed to properly operate and maintain sewage treatment facilities [47].

Hazardous Waste - RCRA (Resource Conservation and Recovery Act) Facilities: RCRA facilities generate, store, transport, handle, treat, or dispose of hazardous waste, which must be handled carefully to prevent release into the environment. RCRA is a federal program which includes a management and inventory system about hazardous waste handlers. In general, all RCRA facilities are required to provide information about their activities to state environmental agencies. This information, in turn, is passed to regional and national EPA offices.

National Pollution Discharge Elimination System (NPDES) Locations: Entities with a National Pollution Discharge Elimination System (NPDES) permit are legally authorized to discharge into a water of the United States from a specified outfall. An NPDES permit is typically given for a wastewater treatment plant, an industrial discharge, and stormwater outfalls in urban areas. All permits specify effluent limits that cannot be exceeded. Typical regulated parameters include bacteria, temperature, pH, nitrates, metals, etc. However, it is still

possible for a violation to occur, which could release higher levels of contaminants into the receiving water.

Industrial Mineral or Non-Coal Mining: Mining is typically undertaken to extract ores from deposits of structurally stable rock formations. Both the excavation and operation of quarries or underground mines can disrupt the existing aquifers and groundwater flow patterns. Water can then percolate through the overburden and mix with mine wastes and other materials releasing acidity and metals. The amount and type of reactions and the chemical quality of the mine or quarry drainage are functions of the amount of reactive material present, characteristics of the overburden, and the amounts of air and water available for chemical reactions.

Land Recycling and Cleanup Locations: Land recycling and cleanup locations are divided into one or more sub-facilities categorized as media and may include: Air, Contained Release or Abandoned Container, Groundwater, Sediment, Soil, Surface Water, and Waste. The media is the environmental resource that is associated with the cleanup effort. This dataset is used to identify and respond to sites from which releases of hazardous substances into the environment have occurred or could potentially occur. It ensures that they are cleaned up by responsible parties or through government funding, and evaluates damages to natural resources.

Storage Tank Cleanup sites: Although some new USTs and ASTs have stringent installation requirements, old tanks may rust and leak their contents into the soil and groundwater. In many cases, old storage tanks were abandoned in place. Leaking tanks therefore pose a potential for groundwater and surface water contamination by the material stored. These release incidents represent leaks, spills and overfills which have occurred from storage tank systems regulated by Title 25 Chapter 245 Administration of the Storage Tank and Spill Prevention Program. Releases from home heating oil tanks, which are not regulated by Chapter 245, are not part of this list.

The complete data results of the preliminary PSOC inventory and susceptibility analysis for each drinking water source are provided in **Appendix D** as a comparison to the final list presented as **Table 4-2**. It lists as much of the following information as is readily available through the database searches for each PSOC. Note that information for some PSOCs was missing from the electronic databases. Although efforts were made to identify missing information, some of this data may not be available. Notification to PSOC owners to educate them about their presence in a source water protection area is often an important early part of a water system's source water protection program. To aid this effort,

Appendix E contains sample letters that can be sent to property owners to notify them of their designation as a PSOC. The letters can be altered to best fit the PSOC and can serve as a first step in opening a dialogue with the owner. The letter should help PSOC owners understand their importance to source water protection and the steps they can take to help protect the community's water supply. Electronic copies of these letters that can be edited by the water system are included on the **Report** media at the end of this report.

4.6 Continued Maintenance of the PSOC Database

PSOCs can change over time, so it is important to maintain updated information to understand potential threats to the water supply. A "live" database of PSOCs should be maintained so that the water system can remain aware of potential threats to the water supply. New PSOCs can be evaluated to assess its potential threat to a water source in a similar way to how the existing PSOCs were evaluated. 25 Pa. Code § 109.713(a)(4) requires an assessment for each source. **Appendix D** includes a document entitled "Source Water Assessment and Protection Program" which contains the DEP guidance information for determining the susceptibility rating of a PSOC.

Appendix D also contains a factsheet about free DEP database subscriptions that may help the water systems with permitted activities within their local area. The eNOTICE database allows citizens to track environmental permit application by selection of a municipality or county, resulting in an e-mail notification. The DEP's eFACTS database provides information on permitted facilities such as inspection results and notices of violation.

To this end, municipal staff, individuals, and organizations should be enlisted to help safeguard the water supply area. Interested people/organizations will be the "eyes and ears" as they live, work, and travel through the watershed. Blank PSOC reporting forms (see **Appendix E**) should be provided to environmental groups and any individuals, if requested, who are interested in watershed monitoring.

Appendix E also includes a blank one-page summary sheet that could be used to summarize information about priority PSOCs that would aid in spill response, such as the type, location, and quantity of chemicals stored at the facility. This summary sheet could be attached to the water system's emergency response plan.

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5.0 Contingency Planning

In the event of an emergency that could impact the water supply, immediate action is often critical in preventing or minimizing contamination. As outlined in 25 Pa. Code § 109.707, the water supplier must maintain preparedness procedures for safe and adequate drinking water under emergency circumstances. [39] Possible emergency situations include a distribution system line break, power outages, drought conditions, disinfection system failure, contamination of water supply, source pump failure, and prolonged water outage. DEP provides additional Emergency Preparedness information for community water systems and wastewater facilities, which can be found at this website:

http://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/EmergencyPreparedness/Pages/default.aspx#.Vx5fzPkrKM8.

5.1 Types of Contamination Events

The DEP recognizes three general categories of contamination, and the general response required [40]:

1. Bacteriological contamination – The water supply should be chlorinated at all times to control bacterial contamination. Standby chlorination facilities – including a chlorinator, supporting equipment, and supply of chemicals – should be available at all times for adequate disinfection of the water supply.
2. Chemical contamination – In general, chemical contaminants will either be toxic, interfere with the normal treatment process, or create taste and odor problems in the finished water. In the event of contamination from a toxic chemical (*e.g.*, heavy metal, cyanide, etc.), the water source should be shut down immediately and alternate sources of supply placed into service. Water rationing may be required, and public notification should be given. If the water is deemed safe but the quality of the finished water is affected,

Source Water Protection
Success Story

Northampton County, Pennsylvania
Forest Protection Agreement, 2012

Clean drinking water, wildlife, recreation, and Pennsylvania's forest products industry will benefit from a new agreement between The Nature Conservancy and the Bethlehem Authority. The agreement will protect 22,000 acres of forest in the watershed that provides drinking water to Bethlehem and surrounding communities. The city serves over 100,000 customers entirely from surface sources stored in reservoirs in the Pocono Mountains. Acting on a unanimous approval vote by the Bethlehem Authority Board, City Council agreed to join the Conservancy's "Working Woodlands Program", which provides forest landowners with a rigorous analysis of their property and access to forest certification and carbon markets, in exchange for a commitment to practice sustainable forestry [50].

plans for additional or alternate treatment should be available. Emergency stores of certain chemicals – such as activated carbon – may be required.

3. Other biological contamination – Non-bacteriological contamination from a biological source, such as excessive algal growth, is more likely in surface water supplies than in groundwater. Alternate or additional treatment processes may be required.

5.2 Emergency Response Plan

25 Pa. Code § 109.713 requires that water suppliers seeking to obtain Department approval for a source water protection program must have contingency planning for the provision of alternate water supplies in the event of a source contamination, and emergency responses to incidents that may impact water supply source quality.

HMWW recognizes that threats to potable water supplies can occur through both accidental and intentional spills and releases. The water system is committed to minimizing the threat of a contamination event; it is also committed to having an effective response plan if contamination of the water supply occurs.

Staff maintains an Emergency Response Plan (ERP) and Drought Contingency Plan that is updated and posted on the Borough website. The plan includes contact information for all local officials, media, and emergency responders. As recommended in Section 5, the staff may wish to attach a one-page fact sheet for each major PSOC in the protection areas to the ERP. The fact sheet could include information that would aid in spill response, such as the type, location, and quantity of chemicals stored at the facility.

5.3 Contingency Procedures

Part of the contingency plan is that corrective actions for probable emergency situations are discussed, along with specific procedures, aid agreements, and equipment to be used. If a contamination event eliminated any of the sources, HMWW can utilize a variety of the remaining sources. The system also has an emergency supply available for distribution. This supply is contained in two covered reservoirs with a capacity of more than 13 million gallons, and two elevated storage tanks with a combined capacity of 750,000 gallons. In the event that the emergency supply is exhausted, HMWW has an interconnection with York Water Company, though the connection cannot meet the entire HMWW daily demand in the high-pressure service areas. [5]

If the ERP needs to be activated, the water system should first notify their DEP Sanitarian, who may determine the need for an emergency permit. In the event of an emergency, staff will contact DEP, local and county emergency management, and water customers. HMWW can also contact SSM, who developed the hydrogeologic model and determined the source water protection areas. SSM personnel can use the model to assess the potential impact from the spill and recommend an approach to prevent or minimize contamination of the intakes.

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6.0 Feasibility of New Source Sites

As outlined in 25 Pa. Code § 109.707, the water supplier must maintain emergency preparedness as discussed in the previous Contingency Planning section. Being fully prepared includes a serious evaluation of alternative sources for both short-term and long-term supply, in the event that an existing source becomes unusable or needs supplemental quantity.

While many suppliers may have redundancy built into their system, some situations will still require the use of emergency sources. The establishment and maintenance of reserve sources is a necessary action for complete source water protection. This may mean examination of obtaining additional groundwater wells or springs, placing an intake in a nearby stream, or constructing an interconnection with another water system. Each of these alternatives requires a substantial monitoring and permitting process, so water systems are encouraged to discuss this issue with their staff and consultants as part of ongoing contingency planning. The plan must address the source protection measures that can be implemented today for the water supply needed for tomorrow.

No new sources have been sited or developed since the variety of reservoir sources produce adequate supply to maintain service to the customers.

HMWW is reviewing opportunities in their service area for potential ways of being proactive in ensuring they have available supply for their customers into the future. Additional sources that may be identified in the future will be protected with the same management strategies outlined in this plan.

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7.0 Source Water Protection Management Program

This section describes the management options that HMWW can implement as part of this source water protection plan. The management plan is intended to protect the source of water for the community from present and/or future potential contaminants, including those identified in Section 5.0, with reasonable and sustainable measures. The plan applies to the delineated protection areas and the potential sources of contamination in these areas.

Source Water Protection
Success Story

Potter County, Pennsylvania
Source Water Protection Coalition, 2017

Potter County has the distinction of being the first county in Pennsylvania to have all the public drinking water systems have a Source Water Protection Plan. The Triple Divide Coalition was formed to assist the water suppliers in communication, seeking grant funding, and improve overall efficiency. The Coalition is working with the PA Department of Environmental Protection to integrate all the protection areas into the DEP's permitting process. The protection areas have also been supplied to the County's emergency management agency, so that water suppliers are notified if a spill or release occurs within a protection area.

Potter County has also updated their Subdivision and Land Development Ordinance to include water suppliers in the commenting process for proposed projects, if the project falls within a protection area. This process seeks to open communication between the applicant, the public water supply, and the planning office. [51]

7.1 Current Source Water Protection Efforts

HMWW has established security measures to protect their water sources from accidental or intentional damage. The Sheppard Myers Dam is currently in the permitting phase for rehabilitation and security upgrades. Fencing protects the reservoir intakes, elevated storage tanks, and Clear Lake. Cameras have been installed at the treatment plant, and HMWW plans to implement other cameras at priority areas. "No Trespassing" and "Warning" signs have been placed to alert pedestrians to avoid critical areas.

7.2 General Options

Community water suppliers may choose from a wide variety of management options, from voluntary activities to highly protective measures that require regulatory implementation. **Table 7-1** lists potential strategies that may be considered for source water protection. Not every option is relevant to every community. Some options can be easily implemented, while others require greater effort, expense, and administrative oversight.

The **Source Water Protection Resources** in **Appendix F** provides additional information that HMWW staff and the steering committee may use in implementing selected management strategies. "*Finding the Green*" provides information on possible funding and support programs for source water protection projects. Additional information may be found on the DEP's "Funding Opportunities" webpage. With the approval of this source water protection plan, HMWW is eligible to install "Water Supply Area" signage within its protection areas. These signs are an education tool to alert drivers to notify emergency management if they witness an accident or spill, and information on developing and installing these signs are available in **Appendix F**.

7.3 Management Strategies Selected by the Committee

This section describes the management options that HMWW can pursue for source water protection. The list below is neither all-inclusive nor required. The list is tailored to include specific measures to address PSOCs in the protection areas as well as general management options to ensure comprehensive source water protection. **Table 7-2** summarizes these options within specific categories, and provides potential partners and a general schedule for accomplishment:

- *Annual* – this identifies management options that should be completed once every year. Examples include updating the emergency response plan, holding a steering committee meeting, and updating the PSOC inventory.
- *Ongoing* – these management options should be implemented as an opportunity arises. For example, a farmer in a critical location for the sources might request assistance with a streambank protection project. The water system could provide financial or other in-kind support for this project that will protect the sources.
- *Priority* – these are management options that the water system should consider implementing soon after their source water protection plan is approved. Immediate management options include those that get the word out to the community about the source water protection plan and future source water protection efforts.
- *Short-term* – this identifies a management option that staff should consider completing sooner rather than later, potentially within the first few years after approval of this plan. These options have a higher priority because they are more likely to have a significant effect protecting the water supply.
- *Long-term* – these management options are less critical and can be completed after most of the short-term tasks are implemented.

Steering Committee and Public Participation

1. Meet with the steering committee annually to address source water protection and other water resources issues in the protection area. Review and update the inventory of existing and potential PSOCs on a regular basis in accordance with Chapter §109.713(a)(4). An annual update form should be submitted to the DEP-Southcentral Region office by March 31 of each subsequent year following approval of the plan. A template form is available in **Appendix G**.

Source Water Protection
Success Story

Berks County, Pennsylvania
Source Water Protection Program, 2018

The Berks County Water & Sewer Association is a non-profit group to advance the operations of drinking water and sewer services, provide training, and promote cooperation among water and sewer service utilities and other members. The BCW&SA along with the Berks County Planning Commission supported the development of the Berks County Source Water Protection Program, which provided county-wide activities and education for all the drinking water suppliers participating on the committee.

The PA Department of Environmental Protection recently recognized this project for the 2018 Governor's Award for Environmental Excellence. [52]

Public Education

2. Conduct public education for area residents and customers regarding where their water originates, and the importance of source water protection. Consider participating in local events such as Earth Day or cleanup activities. Education tools include:
    - Distribute printed media in the community. Distribution methods can consist of information included in water bills, newsletters, articles in the local paper, and distribution of educational materials at fairs and other community events. Seven educational brochures were prepared and given to the water system for distribution to its residents and other interested parties. One brochure provides general information about source water protection, and lists simple things that residents can do to help protect the water supply. Another brochure focuses specifically on proper disposal of pharmaceutical waste and keeping medications out of the water supply. Additional brochures on agriculture, household hazardous waste disposal, residential fuel tanks, wastewater, and septic tanks are also shared with the water system. Copies of all brochures and the handbook are included in **Appendix B**. Electronic versions of the brochures that can be updated are included on the **Report** media at the end of this plan, and can be edited as necessary.

- Show the PowerPoint slide presentation in **Appendix B** highlighting the elements of the source water protection plan, which can be shown to visitors, schools, local organizations, and as a Public Service Announcement during community events or on local television stations. The slideshow can be used with a presenter, or "looped" for continuous play. A summary version is included in **Appendix B**, with an adaptable PowerPoint file located on the **Report** media at the end of this plan.

3. Partner with the York County Conservation District and other steering committee members to provide outreach in the local school district. Consider hosting plant tours for school students or other community groups. The ***Talking About Pennsylvania*** (TAP) Water Kit was developed by the American Water Works Association (AWWA). It contains lessons, activities, and a guide for teachers based on state guidelines on teaching about water, and can be provided to local schools and environmental clubs. The curriculum is included on a CD in **Appendix B**.

Source Water Protection
Success Story

Fayette County, Pennsylvania
Children's Water Festival, 2014

For more than ten years, the Fayette County Children's Water Festival has reached more than 9,000 sixth grade students by providing their schools with an educational field trip. The Festival is a one day educational event designed to teach students about different water concepts, and help make educated choices regarding water quality, quantity, and conservation. Resources and other educational information are then provided to participating teachers in order to meet the Watersheds and Wetlands Academic Standards for Environment and Ecology in their classrooms [48].

4. Provide information via the HMWW website and semi-annual newsletter. Add copies of the plan's Executive Summary and the brochures. Include general statements on the importance of source water protection and how the public can participate. Offer the information to municipalities where intakes are located for placement on their website or other media.
5. Add language to the annual Consumer Confidence Report to explain current source water protection participation. The system can edit the following paragraph as needed: *In 2020, the Hanover Municipal Water Works completed a comprehensive Source Water Protection Plan to protect their water sources. This project delineated protection areas for the water sources, identified potential sources of contamination, planned for potential pollution events, and selected management strategies that can be implemented in the future. This assessment found that our sources are potentially most susceptible to runoff from impervious surfaces in the Hanover area, with additional concerns about agricultural impacts near the reservoirs. Public education and watershed improvements are a focus of the program, which will benefit all*

*residents and companies working and living in our service area. More information is available by contacting HMWW a*t 717-637-3877.

Source Water Protection Area Notification

6. Consider installing public awareness signs along Zone A protection areas. Work with local and County emergency responders for notification if a driver contacts 9-1-1.
7. Provide the Geographic Information Systems (GIS) mapping files for the protection areas to the York County Planning Commission and the Adams County Department of Planning & Development for use in county comprehensive planning. The York County and Adams County Conservation Districts would also benefit from the GIS files that will be provided to assist with watershed improvement planning and projects.
8. Consider working with municipal officials in developing ordinances in support of source water protection.
9. Consider contacting officials in Carroll County, MD to notify them of the protection areas. Explain how activities in their county can impact the drinking water supply.

Source Water Protection
Success Story

Pike County, Pennsylvania
Watershed Awareness Signs, 2011

The Hemlock Farms Community Association (HFCA), located in Pike County, was one of the first water systems to participate in the DEP's Source Water Protection Technical Assistance Program (SWPTAP). In 2011, HFCA decided to install Water Supply Area signs entering their protection areas along Interstate 84 and State Route 739. Each sign notifies the traveling public that they will be within a water supply area, the number of miles they will be traveling through the area, and the spill response number to call if there is a hazardous spill or accident.

HFCA also decided to increase their protection by developing informational placards that will be distributed to carriers of hazardous waste [49].

Watershed Management

10. Work with New Oxford Municipal Authority and environmental organizations in the watershed in support of source water protection activities. Attend collaborative meetings when possible/notified.

Emergency Planning

11. Consider updating the emergency response plan annually to make sure all contact information and provisions for an alternate water supply are current.

12. Provide the GIS shapefiles to the York County, Adams County, and local Emergency Management Agencies to be incorporated into the 9-1-1 call system for water system notification in the event of spill or release within source water protection areas, if requested.
13. Work with local emergency response personnel to ensure they are aware of the protection areas and who to contact in the event of a spill on roads or railroad.
14. Consider joining the *PA Water/Wastewater Agency Response Network* (PaWARN) mutual-aid organization. PaWARN has "utilities helping utilities" for emergency and disaster response.

7.4 Stormwater Management and MS4

The Borough of Hanover maintains a Stormwater Authority for implementation of their Municipal Separate Storm Sewer System (MS4) Stormwater Management Program, required by the PA Department of Environmental Protection in order to comply with State and Federal regulations. The Borough operates a dedicated webpage to provide educational outreach for the program. [41]

8.0 Implementing and Sustaining the Source Water Protection Program

HMWW recognizes that the sustainability of this source water protection program is an important tool to ensure successful improvements to the watersheds over time. During the development of this program, the Committee discussed the need for ongoing leadership and financial support after the implementation/management plan has been completed. System Evaluations and Assessments are required to be performed annually by the water system in 25 Pa. Code § 109.705(a)(1) and (2) of the Safe Drinking Water Regulations.

8.1 Maintenance of Source Water Protection Committee and Leadership

The steering committee has a robust mix of governmental agencies and non-governmental organizations to implement the management strategies selected for implementation. Additional local organizations can be invited to the steering committee, and invitations can also be extended to other community water systems with developing and approved plans. It is expected that these other organizations will connect with the Committee as projects are considered and implemented.

8.2 Short- and Long-Term Implementation Goals

Table 8-1 outlines a yearly implementation plan for protecting the Hanover water supply. General strategies discussed in Section 7 have been assigned a person/organization responsible for completing the activity within a given timeframe with financial and human resources needed to achieve the objective.

8.3 Annual Reporting

Under Chapter §109.713(b), community water systems must submit an annual report to DEP once their source water protection plan has been approved. The report may include a summary of steering committee meetings, educational efforts, or other steps taken to implement their source water protection plan. The annual reporting form is included in **Appendix G**. DEP requests that these forms be submitted to the DEP-Southcentral Region office by March 31 of each subsequent year following implementation of the program.

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