Newtown Artesian Water Company

PWSID# 1090043

Bucks County, PA

Source Water Protection Plan

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Glossary of Water Terms

Aquifer – a natural underground layer of sand, gravel, or rock that contains water.

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

Community Water System – a water system that supplies drinking water to 25+ people year-round in their residences.

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

Emergency Response Plan – a preparedness plan developed by a municipality to form consistent procedures in an emergency situation.

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

Groundwater – underground water that supplies wells and springs.

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

Management Strategies – approaches taken by the water supplier and the Steering Committee to protect the sources of drinking water.

Municipal Separate Storm Sewer System (MS4) – stormwater management program that is intended to improve waterways by reducing contaminants in runoff.

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

PSOCs – **P**otential **S**ources **O**f **C**ontamination – areas or activities that may potentially have a negative impact on the drinking water source.

Public Water System – a water system that supplies water to 25+ people at least 60 days per year.

Source Water – the wells, springs, reservoirs, creeks, rivers, or lakes in their natural state, prior to treatment for drinking use.

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

Surface Water – water sources that are open to the air, such as rivers, lakes, streams, and reservoirs.

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 lake, river, or reservoir.

Wellhead Protection Area – the land area around a well or wellfield which is proactively managed to prevent contamination.

Zone I - Zone I is a circle around the well or spring with a radius between 100 and 400 feet, with the greatest potential for contamination.

Zone II - Zone II is the surface representation of the "capture zone" of the well, spring, or wellfield, the amount of water contributing to a well or spring in 10 years or less. The zone is usually measured in acres.

Zone III - Zone III, or the zone of contribution, is the portion of the watershed that can contribute water to the capture zone, usually measured in acres or miles.

Acronyms

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
PG	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
SWP	Source Water Protection Plan
SWPTAP	Source Water Protection Technical Assistance Program
TRI	Toxic Release Inventory
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UST	Underground Storage Tank

Newtown Artesian Water Company

Bucks 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

The Newtown Artesian Water Company (NAWCO) delivers drinking water to a population of approximately 33,000 people in Bucks County, southeastern Pennsylvania. NAWCO started out with two wells in 1888, and was merged back into Newtown Artesian Water Company in 1992.

NAWCO wishes to preserve and improve the safety of its drinking water supply for its customers today and into the future, and is concerned about the possibility of contamination from various sources near its two most vulnerable wells. In 2015, NAWCO 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 NAWCO water sources, 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.

Description of Study Area

The 26.6-square mile modeled area includes three watershed subbasins within Newtown Borough and the Townships of Newtown and Middletown in Bucks County. The Neshaminy Creek, to the southwest of the wells, is a local discharge point of the groundwater system. The DEP has designated the main stem of the Neshaminy Creek for Warm Water Fishes and Migratory Fishes.

The study area lies within the Gettysburg-Newark Lowland Section of the Piedmont physiographic province and is characterized by rolling lowlands, shallow valleys, and isolated hills; and underlain by seven geologic formations. The monoclonal geologic structure of the study area consists of low, northwest-dipping beds.

Overview of Water System

Five groundwater wells supply water service to customers in Newtown Borough, Newtown Township, and the northern portion of Middletown Township. NAWCO also maintains two interconnections for the purchase of water: one with the Bucks County Water and Sewer Authority, which accounts for approximately 45% of the total supply to NAWCO. The second interconnection is with the Pennsylvania American Water Company (PAWC) Yardley District, which can supply approximately 10% of NAWCO's total supply. Water obtained from the groundwater wells and interconnections is treated, and serves an average demand of 2.174 million gallons per day through 10,209 residential, commercial, and industrial connections.

Source Water Protection Zone Delineations

A significant purpose of the source water protection program is to delineate protection zones around each groundwater well. Source water protection zones for the wells were delineated using a steady-state hydrogeologic computer model and other calculations based on well information, groundwater flow patterns and watershed configuration. The most protective zone, Zone I, is a circle around each well source with a radius ranging from 100 to 400 feet. The NAWCO wells Zone I ranges from 100-134 feet.

The second most protective zone, Zone II, represents the 10-year time of travel – the area from which groundwater has a high probability of reaching the well in fewer than ten years. The combined Zone II area covers 5.18 square miles in Newtown Borough and Newtown and Middletown Townships. Zone III is the upgradient extent of the subbasin that can contribute water to the capture zone, and occupies an area of 14.5 square miles in several municipalities.

Potential Sources of Contamination (PSOCs)

After the protection zones were delineated, numerous sources were used to identify potential sources of contamination (PSOCs) in the zones. 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, 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 ranked from A to F, with *A* posing the greatest potential threat and *F* the least potential threat.

Non-point PSOCs were identified through land use data, aerial photographs, and input from the DEP and water system. There are no A-ranked non-point areas within the NAWCO protection zones, and the only B- ranked non-point PSOCs are state roads.

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 116 preliminary PSOCs identified for the NAWCO protection areas, and results near the two most vulnerable wells were prioritized for the water system. The steering committee added two PSOCs ranked A: one RCRA site near Well 14, and another RCRA site near Well 18. After review by the steering committee members, the final inventory contained 24 sites of potential concern.

Management Options

NAWCO will use a variety of management options to develop a comprehensive approach to source water protection and protect its water supplies from the PSOCs. Partnerships with other organizations and public education and outreach will be the primary strategies to promote source water protection for the groundwater sources.

Contingency Planning

In the event of an accident or spill that has the potential to impact the water supplies, the water system will initiate emergency response plans to minimize any potential impacts. NAWCO maintains an emergency response plan (ERP) and updates it regularly. The plan includes emergency contacts and provisions for alternate sources of water. Staff will work closely with local and county first responders in the event of a spill or accident that may threaten the water supply.

New Sources

As part of an approved source water protection plan, the community water supplier must review steps that would be taken to replace their sources in the event that an existing source becomes unusable. If a contamination event occurred that results in NAWCO not being able to use any of their sources, use of interconnections and bulk water would provide service to customers. In addition, NAWCO would work with DEP and other partners to identify, develop, and permit additional sources.

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.

Newtown Artesian Water Company (NAWCO, PWSID #1090043) delivers drinking water to a population of approximately 33,000 people in Bucks County, southeastern Pennsylvania. The Newtown Artesian Water Company was first incorporated in 1888 by a group of local citizens. NAWCO started out with two groundwater wells in 1888, and by late 1973, received many inquiries concerning the availability of water service for proposed residential housing developments. The Indian Rock Water Company, a subsidiary of NAWCO, was merged back into Newtown Artesian Water Company in 1992 (NAWCO, 2016).

NAWCO 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 had no previous problems, it is concerned about the possibility of contamination from various sources near the two wells most vulnerable to outside influences. In 2015, NAWCO 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. DEP approved the work plan and initiated the SWPTAP project.

The objective of this project is to develop a source water protection plan that delineates the recharge areas for the NAWCO 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 (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. 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 zones
- 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.

Source Water Protection
Case Study

Bally, 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 (Youker, 2008; Wilcox, 2010).

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.

1.3 Overview of Source Water Protection Regulations

The Safe Drinking Water Act (SDWA) Amendments of 1996 require that each state develop a source water assessment and protection program (SWAP) for all drinking water sources – groundwater and surface water – that serve community water systems. The requirements for the SWAP program were adapted by DEP from 25 Pa. Code §109.713.

The SWAP program for a community water system (CWS) consists of two parts: assessment and protection. The assessment part is mandatory and is typically completed by the DEP or one of its contractors. Many of the assessments were completed in the early 2000s and provided a very general evaluation of the immediate protection area for existing water sources.

The second part of SWAP – protection – is voluntary. That is, a CWS may voluntarily choose to develop a more detailed, comprehensive, and community-oriented source water protection (SWP) plan following DEP's regulations in Chapter 109. For DEP to approve the plan, the following elements must be included:

- Formation of a steering committee representing, but not limited to, local government entities, water supply customers, farming and business community representatives (as applicable).
- Encouragement of public participation through informational and educational activities.
- Delineation of areas to be protected. For groundwater sources, the protection area is determined using field data and/or a hydrogeologic computer analysis. For surface water sources, the area to be protected is typically the watershed upstream of the intake.
- Inventory of potential sources of contaminants to the source water.
- Development of a management plan to protect the water supply from potential contamination as part of a strategic long-term program.
- Preparation of a contingency plan for emergency response and alternate sources.
- Identification of potential areas for new sources of water for long-term needs.

In 2007, DEP initiated the Source Water Protection Technical Assistance Program (SWPTAP) to help community water suppliers develop a protection plan for their water sources. 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 26.6-square mile modeled area includes three watershed subbasins (ERRI, 1997) within Newtown Borough and the Townships of Newtown and Middletown in Bucks County. The Neshaminy Creek, to the southwest of the wells, is a local discharge point of the groundwater system. The DEP has designated the main stem of the Neshaminy Creek for Warm Water Fishes and Migratory Fishes.

The study area, displayed in **Figure 1-1**, lies within the Gettysburg-Newark Lowland Section of the Piedmont physiographic province and is characterized by rolling lowlands, shallow valleys, and isolated hills (Sevon, 2000). The monoclonal geologic structure of the study area consists of low, northwest-dipping beds (Willard, *et al*, 1959). The area is underlain by seven geologic formations (Berg *et al*, 1980).

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 (Smeltz, 2010).

1.5 Overview of Water System

Today, a total of five groundwater wells supply the NAWCO system, which provides water service to customers in Newtown Borough, Newtown Township, and the northern portion of Middletown Township. NAWCO also maintains two interconnections for the purchase of water: one with the Bucks County Water and Sewer Authority (BCWSA), which is capable of supplying 4.5 million gallons per day and accounts for approximately 45% of the total supply to NAWCO. The second interconnection is with the Pennsylvania American Water Company (PAWC) Yardley District, which can supply 750,000 gallons per day - approximately 10% of NAWCO's total supply (NAWCO, 2016). Currently, the water system serves an average demand of 2.174 million gallons per day through 10,209 residential, commercial, and industrial connections (NAWCO, 2015).

Water obtained from the five wells is disinfected with sodium hypochlorite, followed by corrosion control treatment with zinc orthophosphate. Purchased water from BCWSA and PAWC receives

filtration and the addition of sodium hypochlorite to maintain a free chlorine residual in the distribution system (NAWCO, 2015).

1.6 Existing Source Water Protection Efforts

NAWCO is proactively employing some source water protection efforts throughout the system. Security is maintained at the well sources with a burglar alarm or a padlock.

Newtown Borough's Environmental Advisory Council (EAC) is an official Borough committee created in 1999 to assist and advise Borough Council regarding conservation, preservation and acquisition of open space and other areas in need of protection within the Borough. Members of the EAC are active in local restoration projects, and provide educational programs for residents on stormwater management. The EAC has provided input on the development of this plan, and will be involved in the implementation of source water protection education.

The mission of the local Newtown Creek Coalition (NCC) is "To improve, protect and preserve Newtown Creek and to encourage appropriate use of this natural and historic resource by the community". NCC members coordinate an annual clean-up event, and also conduct water quality monitoring in the creek, and believe that the protection of the watershed is vital to the health and welfare of the community (NCC, 2016).

Newtown Township has also implemented an awareness program where medallions are placed on stormdrain inlets to inform the public about pollution in stormwater runoff.

1.7 Previous Studies

This study builds upon previous work completed for the water system. In 2005, DEP developed a report through their source water assessment program (SWAP) for NAWCO. This assessment provided a cursory 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 source water were highlighted in the report (DEP, 2005a).

In 2009, the Newtown Area Joint Comprehensive Plan, covering Newtown, Wrightstown, and Upper Makefield townships, was updated from its original 1983 publication. One guiding principle discussed in the plan was the protection of natural resources, including water quality. Conservation Management Areas were reserved to promote groundwater recharge. The plan recommends that a variety of strategies be used to protect aquifers, including stormwater management, wastewater planning, water conservation, and land use planning (NT, 2016).

2.0 Source Water Protection Steering Committee and Public Participation

2.1 Purpose of the Steering Committee

A steering committee was formed for this project. The committee is comprised of project stakeholders, including local officials, environmental and civic organizations, teachers, citizens, and other interested groups. 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.

Source Water Protection
Case Study

Bucks County, Pennsylvania
TCE/PCE Contamination, 2013

Testing from a former electroplating factory property found high levels of tetrachloroethylene, trichloroethylene, and other hazardous materials in the groundwater. The municipality closed contaminated wells, and connected affected people to a public water system. Remediation estimates projected a cost of $5 million for cleanup of the contaminated water and soil areas (Kristofic, 2013).

2.2 Steering Committee Members

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

- Dan Angove, NAWCO
- Pat Foster, NAWCO
- Tracey Gallo, NAWCO
- George Forsyth, NAWCO
- John Haney, KukTech
- Bill Fox, PA American Water Company
- Ted Schmidt, Newtown Borough Environmental Advisory Council Chair; Newtown Creek Coalition member
- Mike Bergey, former representative from Newtown Borough EAC

Kevin Smith, P.G. of the Southeast Regional Office, was the DEP representative who guided development of this project. Technical advisors responsible for the source water protection plan included Al Guiseppe, PG, Lyn O'Hare, and Ashton Hogarth 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:

- June 1, 2016
- November 29, 2016

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 annually.

2.4 Public Education Efforts

Several public education efforts were made during this project. They include the following programs:

Public meeting – the findings and recommendations for the source water protection plan may be presented at a public meeting following the approval of this plan.

Source Water Protection
Case Study

Hilltown Township, Bucks County Well Contamination Prevention Using a Well Cap Lock, 2002

Source water protection is not often thought of as being as simple as installing a well cap lock on a groundwater well; but for a Bucks County elementary school, a well cap lock could have prevented the contamination of their well due to vandalism. Over the holiday break of 2002, the school had been undergoing construction for some time, when one morning the school's groundwater well cap was found to have been opened and empty bottles of chemical cleaners were scattered near the well. Test results confirmed suspicions that the well had been contaminated, and the water contained ammonia and D-Limonine, but no chlorine, which is pumped into the water regularly. Bottled water had to be used, and expensive flushing and testing of the well was required until results returned to normal. (Naedele, 2003) (Gleaves-Hirsch, 2003)

Six 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, and septic tanks are also shared with the water system. Copies of all brochures are included in **Appendix B**. Electronic versions of the brochures that can be updated are included on the **Report CD** of this plan.

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. A CD containing the entire curriculum is included in **Appendix B**.

A slide presentation highlighting the elements of the source water protection plan has been developed for the water system, and 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 CD**. An Education Handbook was provided to NAWCO during the course of this project. This Handbook can be distributed to anyone interested in working with the water system in implementing their management strategies. The handbook contains a glossary and other useful information that can help with instructing new partners on source water protection. A copy is included in **Appendix B**, with an adaptable PowerPoint file located on the **Report CD**.

The water system operates a dedicated website at http://www.newtownwater.com/, and provides some environmental conservation information. Newtown Borough, Newtown Township, and Middletown Township also offer environmental information on their respective websites.

2.5 Availability of Plan

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

3.0 Delineation of Protection Areas: Groundwater Sources

To adequately protect its water supply, Newtown Artesian Water Company must first understand how water flows to each of its wells. Since groundwater movement is complex, this section describes the source water protection areas for each of the NAWCO wells. A detailed technical discussion of how these areas were determined is presented in **Appendix C,** along with the figures and tables described in each segment. The technical data package electronic files are available in **Appendix I.**

3.1 Description of Groundwater Well Sources

The NAWCO water system, shown on **Figure 3-1**, consists of five groundwater wells. Two wells are located in Newtown Borough, one in Newtown Township, and two in Middletown Township. The well depth of each source ranges from 339 to 498 feet below grade, with a combined safe yield of up to 1.16 million gallons per day.

3.2 Methodology for Delineating Protection Areas

Determining the area from where a well withdraws water is a challenging task. Water flows through the ground in complex ways, depending on surface topography, the underlying geology, and other factors. To identify the source of NAWCO's drinking water, SSM developed a computer model of the study area. The chosen model is called Groundwater Modeling System (GMS), which was developed by the United States Department of Defense. GMS is widely used and well-accepted among geologists and hydrologists, and is commonly used to help manage groundwater resources.

The model requires a significant amount of information about the study area – topography, geology, slopes, soils, infiltration rates, and water table elevations. SSM collected the necessary data from previous studies, aquifer testing, and field measurements.

The model estimates how groundwater flows through the study area, and, in particular, how water flows to the NAWCO wells. It is able to estimate the recharge areas of the well, and how long it takes water to travel through the subsurface to the well. After the model was developed, it was used to delineate protection areas, as described below.

The source water protection area calculations and delineations are based on well information, groundwater flow patterns and watershed configuration.

3.3 Description of Protection Areas

Figure 3-2 shows the protection areas for each of the wells in the wellfield. The protection areas are divided into three zones of varying size, as described below.

3.3.1 Source Water Protection Zone I

Zone I is the smallest of the three zones and is also the most stringent from a protection standpoint. Zone I is a circle around the well with a radius between 100 and 400 feet. The management goal for Zone I is maintaining it in a natural state, under control of the water supplier, with no potential sources of contamination.

For all wells permitted after October 9, 1995, the water supplier is required to own or substantially control the Zone I wellhead protection area to prohibit activities with the zone that may have a potential adverse impact on source quality or quantity. Zone I may be determined using the graphs or calculations in the Compliance Assistance Document entitled "Recommended Zone I Wellhead Protection Area Delineation Methodology"(DEP, 2005b). For wells drilled on or before October 9, 1995, the Water Supply Permit may or may not specify a protective isolation distance. The Zone I radius varies from 100-134 feet among the five wells.

3.3.2 Source Water Protection Zone II

The land that contributes groundwater to a pumping well is referred to as the capture zone, or the zone of diversion. Zone II is the surface representation of the capture zone. This area is delineated by a volume of water, in an aquifer, contributing to a well. The Zone II delineations shown in **Figure 3-2** represent the volume of water entering the sources in a 10-year time of travel. In other words, groundwater that resides below the area identified as Zone II has a high probability of reaching the corresponding source in ten or fewer years. The combined Zone II area extends in a northeast-southwest direction from the wells, and covers 5.18 square miles in Newtown Borough and Newtown and Middletown Townships.

3.3.3 Source Water Protection Zone III

Zone III, or the zone of contribution, is the portion of the watershed that can contribute water to the capture zone. The groundwater that enters the wells is partly derived, by water from the Newtown Creek. For this reason the entire up-gradient portion of the Newtown Creek is included in Zone III, which extends to the west of the wells along geologic strike. Zone III occupies an area of 14.5 square miles, extending into additional sections of the three municipalities, and small portions of Lower Makefield, Wrightstown, and Northampton Townships.

4.0 Contaminant Source Inventory

After the source water protection zones were delineated, a comprehensive inventory of potential sources of contamination (PSOCs) was compiled for the source water protection zones. 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 groundwater.

The Newtown Artesian Water Company staff expressed concerns with pollutants that could potentially affect Well 14 and Well 18 from former manufacturing and industrial properties. The 2005 Source Water Assessment study also mentioned transportation corridors, residential development, and some types of commercial facilities that could impact groundwater.

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-product precursors
- Taste and odor precursors
- Other contaminants, as necessary, based upon known potential contaminant sources

Source Water Protection
Case Study

Lititz, Pennsylvania
Industrial contamination, 2008

In January 2008, residents of Lititz, Pennsylvania, complained of a minty taste and smell in their drinking water. After the borough detected "mouthwash flavoring agents" in several wells, the nearby Johnson and Johnson McNeil Plant – which produces Listerine – found a break in a four-inch cast iron line and a leaking manhole gasket. Approximately 7 to 36 gallons of production wastewater were leaking into the ground every minute. Officials said no raw sewage was released into the environment. Although this industrial discharge was relatively benign, it illustrates the threat to drinking water supplies from industrial sources (WGAL, 2008).

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, and commercial and industrial properties.

Point-sources include wastewater treatment plants, gas stations, dry cleaners, and industrial facilities. Point-source discharges can be hazardous substances that enter groundwater through accidents, spills, misuse, improper handling, leaks from storage tanks, discharge from septic tanks, floor drains connected to a dry well, or illegal dumping. Even when a high-risk activity employs proper precautions, some of the hazardous materials can be accidentally spilled and enter groundwater.

4.1 PSOC Identification and Evaluation: Non-Point Sources

All the non-point PSOCs discussed with Newtown Artesian Water Company were identified using aerial photographs, land use maps, input from the water system operators, steering committee members, the DEP, and the following electronic databases:

- Abandoned mine lands (DEP, 2013a)
- Pipelines (USDOT, 1999)
- Roads (PennDOT, 2013)
- Mined out areas (DEP, 2013b)
- Railroads (ESRI, 2006)
- National Pipeline Mapping System (NPMS, 2012)

Because of the potential impact to the water supply, non-point PSOCs have been assigned a rank to assist the Steering Committee with management strategies. Even though non-point PSOCs are not easily quantified or standardized, they are still threats to the water supply and should be monitored and managed. The ranking is based on proximity to the water source, acreage of the land use within a particular zone, and input from the steering committee and DEP staff. This information is then processed through a matrix system developed by the DEP to assign susceptibility. Each PSOC is given a ranking from A to F, with *A* posing the greatest potential threat and *F* the least potential threat.

Non-point examples can include agriculture, residential activities, logging operations, pipelines, roads, and railways. The non-point PSOC inventory for NAWCO is displayed in **Table 4-1** and mapped in **Figure 4-1**. There are no A-ranked non-point PSOCs within the NAWCO protection zones, and the only B- ranked non-point PSOCs are state roads.

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. When more nutrients are applied than what is needed for crop production, excess amounts are carried into aquatic ecosystems by wind and surface water runoff. 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/Industrial land: A wide variety of business may be found on commercial land. Improper operations and maintenance at these 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; outdoor fluid storage; dumping and spilling of liquids, especially hazardous materials; landscaping and grounds care; parking lot maintenance; vehicle fueling; vehicle maintenance repair; vehicle washing; and wash down of greasy equipment and grease traps.

Outdoor recreational activities: A number of outdoor recreation activities can impact surface sources located nearby. Public parks, camping areas, swimming areas, fishing holes, hunting areas, and bicycle and hiking trails have the potential for contamination through litter, sanitary facilities, and vehicle use. Recreational use of off-road and all-terrain vehicles (ATVs) on unpaved trails and natural areas causes soil compaction and erosion, and also forms mud holes and gullies. Stormwater runoff increases the trail degradation and carries loosened sediment to streams and other bodies of water. Spills and leaks from vehicle engines (typically gasoline or diesel fuel) onto pervious surfaces also pose a potential threat to source water.

Residential land – highly urban (as in a borough or city): 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. In addition, depending on the site geology, the groundwater baseflow may be adversely affected by increased impervious cover. Pollutants that are found in urban stormwater consist of suspended sediment (flakes of metal from rusting vehicles, particles from vehicle exhaust, bits of tires and brake linings, chunks of pavement, soot, and construction runoff); nitrogen and phosphorus (fertilizer, spills, decaying leaves and grass); oxygen demanding organic material (pet waste, leaves, grass clippings, litter); metals (lead and zinc both from vehicular traffic); pesticides (industrial applications and lawn and gardens); polychlorinated biphenyls (PCBs found in transformers and used as coolants and lubricants); polycyclic aromatic hydrocarbons (PAHs found in gasoline, asphalt and wood preservatives); bacteria/pathogens (sanitary sewer overflows, and pet and urban wildlife waste); MTBE; chloride; and miscellaneous debris.

Source Water Protection
Case Study

Limerick, Pennsylvania
Toxic Plumes in Groundwater, 2010

Two industrial manufacturing sites in Limerick, Pennsylvania contributed toxic chemicals to the groundwater, creating potential health hazards to some local residents with private wells. Though bottled water has been supplied for over three years, a new water main from PA American Water will be provided to 47 residents who have contaminated wells. One of the industrial companies estimates a $1.3 million cost for their share of the project that would extend the public water supply to affected residents (Bieber, 2010).

Transportation Corridors/Roads/Highways/Parking Lots: Non-point source runoff from roads, highways, rail lines and parking lots contribute a significant source of pollutants into surface and groundwater. As rainwater or melting snow drains off of impervious surfaces, it picks up deposited pollutants that may impact waterways. 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 can pose a threat to groundwater as it percolates through pervious soil or as runoff entering surface waters.

4.2 PSOC Identification and Evaluation: Point Sources

The first step in identifying point source PSOCs in the protection zones 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.

- Air emission plants (DEP, 2016a)
- Beneficial land uses (DEP, 2016b)
- Captive hazardous waste operations (DEP, 2016c)
- Cemeteries (ESRI, 2010a)
- Coal mining operations (DEP, 2016d)
- Commercial hazardous waste operations (DEP, 2016e)
- Conservation wells (DEP, 2016f)
- Golf courses (ESRI, 2010b)
- Historic oil and gas wells (DEP, 2016g)
- Industrial mineral mining operations (DEP, 2016h)
- Land recycling cleanup locations (DEP, 2016i)
- Municipal waste operations (DEP, 2016j)
- Oil and gas water pollution control facilities (DEP, 2016k)
- Oil and gas wells (DEP, 2016l)
- PA CleanWays Illegal dump surveys (PA CleanWays, 2011)
- Public PSOCs obtained from 2002 Source Water Assessment Program (SSM, 2008)
- Radiation facilities (DEP, 2016m)
- Regulated tank list (DEP, 2016n)
- Residual waste operations (DEP, 2016o)
- Storage tank cleanup locations (DEP, 2016p)
- Storage tank locations (DEP, 2016q)
- Water pollution control facilities (DEP, 2016r)
- Water resources (DEP, 2016s)
- USEPA Envirofacts geospatial data (USEPA, 2016)

4.3 PSOC Verification

Verification of the PSOC inventory was completed by NAWCO staff in 2016 to confirm the location of the preliminary point source PSOCs and identify others that were not included in a database. As a result of the verification, the location of some PSOCs may have been corrected and other PSOCs were added to the inventory. The steering committee also determined the PSOCs that were the greatest priority to the water system.

4.4 PSOC Ranking and Susceptibility Analysis

The relative risk of point source PSOCs on groundwater is determined through a uniform method developed by DEP known as a susceptibility analysis (DEP, 2000). 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 ranking from A to F, with *A* posing the greatest potential threat and *F* the least potential threat. The DEP's guidance document explaining the susceptibility analysis is available in **Appendix D**.

4.5 Susceptibility Analysis Results

The initial database search resulted in a total of 116 preliminary PSOCs identified for the NAWCO protection areas, and results near Well 14 and Well 18 were prioritized for the water system. The steering committee added two PSOCs ranked A: one RCRA site near Well 14, and another RCRA site near Well 18. After review by the steering committee members, the final inventory contained 24 sites of potential concern. These priority PSOCs are displayed in **Figure 4-2**, and summarized in **Table 4-2**.

PSOCs, particularly those in Zones I and II for groundwater sources, pose the greatest threat to the water supply, and in general, merit the most attention for preventing a contamination problem. Descriptions of these 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.

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.

Source Water Protection
Case Study

Armstrong County, Pennsylvania
Fecal coliform contamination, 2008

The Department of Environmental Protection has ordered the owner, a low-income housing development with 200 residents, to permanently fix its water supply, which has been contaminated for at least three months.

The well water that supplies the development's 45 households has been contaminated by its own malfunctioning septic system, and the owner has been trucking in water to meet daily residential needs. If the owner is unable to comply with DEP's order, the firm may have to shut down the development and relocate its tenants (Hopey, 2009).

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.

Municipal Waste Operations: Facilities may be permitted to have composting, land application, sewage sludge, abandoned landfill, landfill, processing, resource recovery, or transfer station activities.

Storage tanks: Aboveground or underground storage tanks are used in industrial, commercial, and agricultural operations, as well as at individual residences, to store petroleum products and chemicals. Discharges of chemicals, petroleum, or non-petroleum oils from storage tanks can contaminate groundwater or surface water. Chemicals that are released due to spills, uncontained overfills, tank corrosion, and piping system and equipment failures may be discharged directly to surface water or accumulate in soils and present a threat to groundwater.

Water Pollution Control facilities: The facilities can include agricultural activities, biosolids treatment, composting/processing of sewage sludge, discharge point to stream, land application of wastewater, manure management, stream outfalls, pipelines or conduits, pump stations, septage land application, sewage or industrial wastewater treatment plant, storage of wastewater, or any facility that covers a variety of industries.

The 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:

- Facility name
- Physical address and municipality
- PSOC type
- Contaminants of concern
- Protection zone and well impacted
- Susceptibility risk ranking from A (highest risk) to F (lowest risk)

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 CD** at the end of this report.

4.6 Continued Maintenance of the PSOC Database

The PSOC inventory will be continually evolving – some PSOCs may change, and new ones will arise. A "live" database of PSOCs should be maintained so that NAWCO staff can remain aware of potential threats to the water supply.

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 who are interested in watershed monitoring. If a possible PSOC is noticed – for example, a group of 55-gallon drums – then the observer can fill out and mail a reporting form for further investigation.

If a new PSOC is identified, it should be field-verified to assess its potential threat to a well. **Appendix D** includes a document entitled "Source Water Assessment and Protection Program" which contains the DEP guidance information necessary for determining the susceptibility ranking of a PSOC. If the PSOC is deemed a serious threat, the owner should be identified and educated about the possible threat to the water supply.

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.

5.0 Source Water Protection Management Plan

This section describes the management options that the Newtown Artesian Water Company 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 4, with reasonable and sustainable measures. The plan applies to the delineated protection zones and the potential sources of contamination in these areas.

Source Water Protection Success Story

Bethlehem Water Authority 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 (WREN, 2012).

Community water suppliers may choose from a wide variety of management options, ranging from a simple installation of signs to highly protective measures that require regulatory implementation. **Table 5-1** lists potential management 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. **Appendix F** provides additional information about funding for source water protection projects. With the approval of this source water protection plan, NAWCO is eligible to install "Water Supply Area" signage within its protection zones. These signs are an education tool to alert drivers to notify emergency responders if they witness an accident or spill. Information on developing and installing these signs are available in **Appendix G**.

Land use controls can be used to restrict existing and potential contamination sources from being located within the critical protection zone. NAWCO may consider supporting regulatory protection strategies, such as ordinances, to offer further source water protection in perpetuity. Examples of ordinances are wellhead protection, riparian buffers, septic systems, and conservation easements.

Zone I and Zone II are confined to portions of Newtown Borough, Newtown Township, and Middletown Township. NAWCO may wish to work with these municipalities when implementing this source water protection plan.

5.1 Land Use Assessment

To assess possible management strategies for the source water protection areas, it is important to understand their existing land uses. Since land use can have impacts to groundwater sources, the steering committee should regularly review use and the possibility of reducing threats within the protection zones. **Table 5-2** summarizes land use in each protection zone based on the acreage and percentage of each land use, and the highest rank in each of the four main land use categories; agriculture, industrial/commercial, residential and transportation.

The three protection areas encompass approximately 9,400 acres. Residential development accounts for 39 percent of the land within Zone III, with commercial/industrial property comprising 19 percent, followed by undeveloped areas covering 17 percent, and agricultural land about 14% of the total protection area. The remaining portions of the zones include roads and water areas.

5.2 Management Options

This section describes the management strategies that NAWCO 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 zones as well as general management options to ensure comprehensive source water protection.

<u>Steering Committee and Public Participation</u>

1. Keep the steering committee together to address source water protection and other water resources issues in the protection area. Meetings can be held once or twice per year. An annual update form should be submitted to the DEP-Southeast Region office by March 31 of each subsequent year following approval of the plan.

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:
    - Provide information via the municipality website. Post copies of this plan's Executive Summary and education brochures for online review and downloading.
    - Distribute printed media, such as the brochures in **Appendix B**, in the community. Electronic copies of all the brochures are located on the **Report CD**, and can be edited as necessary. 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.
    - Show the PowerPoint slide presentation in **Appendix B** highlighting the elements of the source water protection plan to visitors, schools, and local organizations as opportunities arise. The presentation is "looped" for continuous play.
    - Additional education materials can be obtained from the Environmental Protection Agency and PA Department of Environmental Protection websites, county conservation districts, and many other organizations.
3. Contact local school districts about the Source Water Protection Plan, and provide educators, the Newtown Borough Environmental Advisory Council, and the Conservation District with the opportunity to use the *Talking About Pennsylvania* (TAP) Water Kit CD (included in **Appendix B)** and any groundwater models with science classes and environmental clubs.

Source Water Protection Success Story

Elk County, Pennsylvania
Regional Workshop, 2012

In an effort to continue regional source water protection momentum in Elk County, a workshop titled "Tools of the Trade: Ensuring Clean Water for Future Generations" was held in November 2012.

The workshop had a diverse array of professionals speaking on behalf of land use management, partnerships, and specific experiences. Workshop presentations centered on personal experiences in the water supply industry, the importance of partnering, collaboration, and forming coalitions to protect public water supply sources, stormwater management near public water supply sources, wise land use planning, and methods to manage timber harvesting operations to protect water quality and quantity (Moore, 2012).

4. Provide information via the municipality website. Post brochures or articles on Source Water Protection on the NAWCO, Newtown Borough, Newtown Township, and Middletown Township's websites. Place a copy of this plan's Executive Summary on the NAWCO website.
5. Add information about the Source Water Protection Plan to the system's annual Consumer Confidence Report document.

Source Water Protection Zone Notification

6. Discuss with Newtown Borough, Newtown Township, and Middletown Township to consider installing public awareness signs along roads entering the Zone II wellhead protection area that direct drivers to contact 9-1-1 if a spill occurs. Invite municipality officials to the annual Steering Committee meeting.

PSOCs: General

7. Work with the municipalities, local volunteer groups, and the general public to update the inventory of PSOCs annually, and educate facilities that store hazardous chemicals to provide prompt notification of accidental releases, followed by prompt response and cleanup. Invite representatives to the annual Steering Committee meeting.
8. Work with neighboring water systems like Pennsylvania American Water and the Bucks County Water & Sewer Authority in contacting local industry about potential PSOCs and source water protection collaboration.
9. Work with local and county emergency management personnel to ensure they are aware of the protection zones and who to contact in the event of a spill on roads or railroad.

PSOCs: Stormwater Management

10. Contact owners of commercial and industrial facilities in Zone II regarding implementation of BMPs to improve quality of stormwater runoff. Ensure that water supplier contact information is current and included in any facility spill response plans. A letter can explain the importance of the protection zones, request cooperation with the steering committee, and inform the officials of the new plan. Follow the letter with a phone call to solicit participation. Template letters are found in **Appendix E**.
11. Encourage and support the use of stormwater control practices for new and ongoing construction projects within the watershed.

PSOCs: Agriculture

12. Support the Conservation District staff in encouraging the farming community in using best management practices for reduction of nutrients and sediment in agricultural areas. BMPs can include conservation planning, nutrient management, and structural installations. Provide the Agriculture brochure in **Appendix B**.

Watershed Management

13. Register for the DEP eNOTICE and eFACTS databases to be informed of permitting and inspection activities within your protection zones.
14. Provide support to the Newtown Borough Environmental Advisory Council, the Newtown Creek Coalition, and the Bucks County Conservation District for watershed improvement activities. Participate on the NBEAC when possible.
15. Provide the Geographic Information System (GIS) shapefiles to the Newtown Area Joint Planning Commission and the Bucks County Planning Commission for inclusion in comprehensive planning.
16. Support Newtown Township's stormdrain medallion and stenciling program to reduce pollutants in runoff.

Emergency Planning

17. Update the emergency response plan annually to make sure all contact information and provisions for an alternate water supply are current.
18. Provide the GIS shapefiles to the Bucks County Emergency Management Agency 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.
19. Coordinate with emergency (fire and hazmat) responders, in advance to plan responses that will protect drinking water sources.

5.3 Implementation Plan

Table 5-3 outlines the implementation plan for protecting the water supply. The table includes potential partners, a general schedule, and possible funding sources for each management option selected.

The schedule provided in **Table 5-3** is very general, with five options:

- *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.
- *Immediate* – 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 NAWCO 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 should be completed after most of the short-term tasks are implemented.
- *Ongoing* – these management options should be on the back burner, and should be implemented as an opportunity arises. For example, a farmer in a critical location for the wells might request assistance with a streambank protection project. NAWCO could provide financial or other in-kind support for this project that will protect the wells.

5.4 Annual Reporting

After the source water protection plan is approved, NAWCO staff is required to submit an annual report to DEP. Staff must note any steering committee meetings, educational efforts, or other steps taken to implement the source water protection plan. The annual reporting form is included in **Appendix H**.

6.0 Contingency Planning

In the event of an emergency that could impact the water supply, immediate action is often critical in preventing or minimizing contamination. Therefore, it is essential that the water system has a comprehensive emergency plan as required by DEP. The emergency response plan (ERP) will help provide safe and adequate drinking water under emergency conditions. Possible emergency situations include a distribution system line break, power outages, drought conditions, disinfection system failure, contamination of supply, source pump failure, and prolonged water outage. DEP provides Emergency Preparedness information for water facilities, which can be found at http://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/EmergencyPreparedness/Pages/default.aspx#.Vx5fzPkrKM8

6.1 Types of Contamination Events

The DEP recognizes three general categories of contamination, and the general response required (DEP, 1997):

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, plans for additional or alternate treatment

Source Water Protection Success Story

Western Berks Water Authority
Golf Event for Ag BMPs, 2014

The Western Berks Water Authority continued support of its Source Water Protection Plan by hosting a golf event for operators and vendors. Proceeds from the players and sponsors were given to the Berks Nature, a non-profit organization that helps install farm improvements that protect drinking water sources. Over 100 players raised over $3,000, which was contributed for water protection projects around the Tulpehocken Creek, the water source for 25,000 people in three municipalities (WBWA, 2014).

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.

6.2 Emergency Response Plan

PA Code §109.707 requires that community water suppliers develop a plan for the provision of safe and adequate drinking water under emergency circumstances. NAWCO 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) that is updated annually and kept at the water system office. 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 zones 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.

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 zones 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 (HFCA, 2011).

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 were to occur, the system has a 2-day emergency supply capacity. This supply is contained in four storage facilities located throughout the system, and total capacity is more than 4.2 million gallons. In the event of a contamination event that exhausted the emergency supply, NAWCO

would rely on their interconnections with the BCWSA and PAWC plants as well as use of bulk water tankers to provide water to their customers.

In the event of an emergency, staff will contact DEP, local and county emergency management, and water customers. NAWCO staff can also contact SSM, who developed the hydrogeologic model and determined the source water protection zones. 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 groundwater wells.

7.0 Protection of Identified New Source Sites

As outlined in PA Code §109.707, the water supplier must maintain emergency preparedness, which was discussed in Section 6.0 Contingency Planning. 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.

Source Water Protection Success Story

Centre County
Regional Well Construction Ordinance, 2010

According to the State College Borough Engineer, thirteen of the fourteen municipalities located in Centre County's Spring Creek Watershed are in the process of adopting a common ordinance that regulates well and borehole construction. The ordinance can be stand-alone, or adopted as part of a Property Maintenance Code (State College Borough, 2010).

Because of the variety of active sources that contribute to the NAWCO system, no new sources have been sited or developed. The two interconnections are in reserve in the event that the groundwater sources would become unavailable.

The Newtown Artesian Water Company is continually reviewing opportunities in their service area for potential ways of being proactive in ensuring they have available supply for their customers into the future. If additional sources are considered, the water system will work with the DEP for a feasibility study and permitting of any new sources. Any other groundwater sources that are identified in the future will be protected with the same management strategies outlined in this plan.

8.0 References

Berg, T.M., W.E. Edmunds, A.R. Geyer, and others. 1980. Geologic map of Pennsylvania: PA Department of Conservation and Natural Resources Map 1, 3 pls.

Bieber, Dana. 2010. "Toxic Plumes Spreading Into Limerick Groundwater." Retrieved March 30, 2010 from http://www.pottsmerc.com/articles/2010/03/28/news/srv0000007644859.txt

Environmental Resources Research Institute (ERRI). 1997. PA Explorer: Small Watersheds of Pennsylvania [online]: Developed for the Pennsylvania Department of Environmental Protection, URL http://www.pasda.psu.edu.

Environmental Systems Research Institute (ESRI). 2006. U.S. National Transportation Atlas Railroads, ESRI Data and Maps, CD2 [CD-ROM].

Environmental Systems Research Institute (ESRI). 2010a. U.S. Geographic Names Information System Cemetery, [online] ESRI Data and Maps ArcGIS 10.

Environmental Systems Research Institute (ESRI). 2010b. U.S. Geographic Names Information System Golf Locale, [online] ESRI Data and Maps ArcGIS 10.

Gleaves-Hirsch, Melanie. 2003. "Tests Turn Up Ammonia in Water System. Seylar Elementary School Continues to Flush Well to Clear Out Chemicals." Retrieved 11.19.14 from http://articles.mcall.com/2003-01-08/news/3460937_1_water-system-drink-bottled-water-unused-water.

Hemlock Farms Community Association (HFCA). 2011.E-mail correspondence dated 12/12/11.

Hopey, D. 2009. "Armstrong landlord told to provide clean water to complex." Pittsburgh Post-Gazette, January 7, 2009.

Kristofic, Christina. 2013. "EPA will remove contaminated soil from Doylestown". Retrieved 1/29/15 from phillyburbs.com

Moore, Jacob. 2012. "Tools of the Trade: Ensuring Clean Water for Future Generations", 1 p.

Naedele, Walter F. 2003. "Officials Fear Well Tainted by Vandals Empty Bottles of Cleaning Solutions Were Found Outside a Hilltown Township School. Bottled Water is Being Used." Retrieved 11.19.14 from http://articles.philly.com/2003-01-03/news/25468247_1_bottled-water-facility-vandals

National Pipeline Mapping System (NPMS). 2012. NPMS Public Map Viewer [online]. URL: https://www.npms.phmsa.dot.gov/PublicViewer/

Newtown Artesian Water Company (NAWCO). 2015. "2015 Annual Drinking Water Quality Report", 1p.

Newtown Artesian Water Company (NAWCO). 2016. Website accessed on May 23, 2016 at http://www.newtownwater.com/

Newtown Township (NT). 2016. Newtown Area Joint Comprehensive Plan, 266p. URL http://www.newtownpa.gov/wp-content/uploads/2016/03/NewtownArea_JointComprehensivePlan_2009.pdf

Newtown Creek Coalition (NCC). 2016. Website accessed on November 29 2016 at http://newtowncreekcoalition.org/http://www.newtownpa.gov/newtown-township-environmental-advisory-council/

PA CleanWays. 2011. PA CleanWays Illegal Dump Surveys [online]. URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 1997. Public Water Supply Manual, Part IV: Emergency Response: Bureau of Water Supply Management Document 383-5900-111, 30p.

Pennsylvania Department of Environmental Protection (DEP). 2000. Source Water Assessment and Protection Program: Bureau of Water Supply Management Document 383-5000-001, 66p.

Pennsylvania Department of Environmental Protection (DEP). 2005a. Source Water Assessment Public Summary for Newtown Artesian Water Company, 2p.

Pennsylvania Department of Environmental Protection (DEP). 2005b. Recommended Zone I Wellhead Protection Area Delineation Methodology: Bureau of Watershed Management Compliance Assistance Document 3920-BK-DEP4033, 10p.

Pennsylvania Department of Environmental Protection (DEP). 2013a. Abandoned Mine Land Problem Areas (AML) [online]: Office of Surface Mining, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2013b. Mined Out Areas [online]: Bureau of District Mining Operations, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016a. Air Emission Plants [online]: Air Quality Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016b. Beneficial Land Uses [online]: Water Pollution Control Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016c. Captive Hazardous Waste Operations [online]: Bureau of Waste Management, Hazardous Waste Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016d. Coal Mining Operations [online]: Bureau of Mining and Reclamation, Mining Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016e. Commercial Hazardous Waste Operations [online]: Bureau of Waste Management, Hazardous Waste Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016f. Conservation Wells [online]: Bureau of Oil and Gas Management, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016g. Historic Oil and Gas Wells [online]: Bureau of Oil and Gas Management, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016h. Industrial Mineral Mining Operations [online]: Bureau of Mining and Reclamation, Industrial Mineral Mining Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016i. Land Recycling Cleanup Locations [online]: Bureau of Waste Management, Environmental Cleanup Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016j. Municipal Waste Operations [online]: Bureau of Waste Management, Municipal Waste Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016k. Oil and Gas Water Pollution Control Facilities [online]: Bureau of Oil and Gas Management, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016l. Oil and Gas Wells [online]: Bureau of Oil and Gas Management, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016m. Radiation Facilities [online]: Bureau of Radiation Protection, Radiation Protection Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016n. Regulated Tank List [online]: Bureau of Waste Management, Storage Tanks Division, URL http://www.dep.pa.gov/Business/Land/Tanks/Registration/Pages/Regulated-Tank-List.aspx.

Pennsylvania Department of Environmental Protection (DEP). 2016o. Residual Waste Operations [online]: Bureau of Waste Management, Residual Waste Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016p. Storage Tank Cleanup Locations (LUST) [online]: Bureau of Waste Management, Environmental Cleanup Program, URL http://www.dep.pa.gov/Business/Land/SiteRemediation/Storage-Tank-Cleanup-Program/Pages/Storage-Tank-Cleanup-Locations.aspx.

Pennsylvania Department of Environmental Protection (DEP). 2016q. Storage Tank Locations. [online]: Bureau of Waste Management, Storage Tanks Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016r. Water Pollution Control Facilities [online]: Bureau of Wastewater Management, Biosolids Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Environmental Protection (DEP). 2016s. Water Resources [online]: Water Planning Office, Water Use Planning Program, URL http://www.pasda.psu.edu.

Pennsylvania Department of Transportation (PennDOT). 2013. PennDOT - State maintained roadway centerlines of Pennsylvania, 2013 [online]: Bureau of Planning and Research, Geographic Information Division, URL http://www.pasda.psu.edu.

Sevon, W.D. 2000. Physiographic Provinces of Pennsylvania, Commonwealth of Pennsylvania, Department of Conservation and Natural Resources, Bureau of Topographic and Geologic Survey, Map 13, 2pls.

Smeltz, Adam. 2010. Retrieved from Retrieved 08.12.10 from http://www.statecollege.com/news/local-news/pollution-eases-at-penn-stateowned-spring-482510/

Spotts, Stevens and McCoy. (SSM). 2008. Public PSOCs: Developed from comments received from steering committee members and field verification of PSOCs.

State College Borough 2010, e-mail communication.

U.S. Department of Transportation (USDOT). 1999. Pipelines [CD-ROM]: National Pipeline Mapping System.

U.S. Environmental Protection Agency (USEPA). 2015. EPA Envirofacts Geospatial Data, URL http://www.epa.gov/enviro/geo_data.html. Includes: National Priorities List (CERCLIS / Superfund) [online], URL http://www.epa.gov/superfund/sites/npl/index.htm. Permit Compliance System [online]: URL http://www.epa.gov/enviro/html/pcs/index.html. RCRA Facilities [online]: URL http://www.epa.gov/enviro/html/rcris/index.html. Toxic Release Inventory [online]: Toxic Release Inventory Program, URL http://www.epa.gov/tri.

Water Resources Education Network (WREN). 2012. "Bethlehem Authority's Historic Conservation Deal". Retrieved 7/30/12 at http://archive.constantcontact.com/fs070/1102422125407/archive/1110478512876.html

Western Berks Water Authority (WBWA). 2014. Personal communication.

WGAL. 2008. "Borough's Minty-Tasting Water Mystery Solved." February 12, 2008. Accessed online at http://www.wgal.com/news/15277963/detail.html?taf=lan.

Wilcox, K. 2010. "Bally Tap Water Now Safe to Drink, EPA says." Reading Eagle, September 23, 2010.

Willard, B., J. Freedman, D.B. McLaughlin, and others. 1959. Geology and mineral resources of Bucks County, Pennsylvania: PA Department of Conservation and Natural Resources County Report 9, 243 p., 24 pls.

Youker, D. 2008. "Bally Water System Repairs Expected by Summer." Reading Eagle, October 12, 2008.

Table 1-1
Source Water Protection Case Studies
Newtown Artesian Water Company
PWSID #1090043
Bucks County, PA
Source Water Protection Technical Assistance Program

Community	Type of Problem	Response to Problem	Costs
Perrytown, TX	Carbon tetrachloride in groundwater	Remediation	$250,000 (estimated)
Camden-Rockland, ME	Excess phosphorus in Lake Chickawaukie	Advanced treatment	$6 million (projected)
Moses Lake, WA	TCE in groundwater	Blend water, public education	$1.8 million (to date)
Mililani, HI	Pesticides, solvents in groundwater	Build and run treatment plant	$2.5 million plus $154,000 per year to operate
Tallahassee, FL	TCE in groundwater	Enhanced treatment	$2.5 million plus $110,000 per year to operate
Pittsfield, ME	Landfill leachate in groundwater	Replace supply, remediation	$1.5 million
Rouseville, PA	Petroleum, chlorides in groundwater	Replace supply	$300,000+ (to date)
Atlanta, MI	VOCs in groundwater	Replace supply	$500,000 - $600,000
Montgomery County, MD	Solvent, Freon in groundwater	Install county water lines, provide free water	$3 million plus $45,000/year for 50 years
Milwaukee, WI	Cryptosporidium in drinking water	Upgrade water system; immediate water utility, city health dept. costs	$89 million to upgrade system; millions in immediate costs
Hereford, TX	Fuel oil in groundwater	Replace supply	$180,000
Coeur d'Alene, ID	TCE in groundwater	Replace supply	$500,000
Orange County Water District, CA	Nitrates, salts, selenium, VOCs in groundwater	Remediation, enhanced treatment, replace supply	$54 million capital costs

Source: www.lgean.org/html/pdf/154.pdf. Local Government Environmental Assistance Network.

Table 4-1
Non-Point Potential Sources of Contamination
Newtown Artesian Water Company
PWSID# 1090043
Bucks County, PA
Source Water Protection Technical Assistance Program

Land Use Detail	Land Use Category	Zone	Susceptibility	Acres
commercial	industrial/commercial	1	D	0.89
suburban	residential	1	C	2.33
local road	transportation	1	C	0.55
crops	agriculture	2	C	174.77
farm	agriculture	2	D	11.95
pasture	agriculture	2	E	82.96
cemetery	industrial/commercial	2	F	20.73
commercial	industrial/commercial	2	F	312.83
industrial	industrial/commercial	2	C	16.80
institution	industrial/commercial	2	F	97.64
power lines	industrial/commercial	2	F	31.19
recreation	industrial/commercial	2	D	249.91
scrap yard	industrial/commercial	2	C	1.65
stormwater	industrial/commercial	2	D	98.11
utilities	industrial/commercial	2	F	9.32
rural	residential	2	E	34.99
suburban	residential	2	E	1,356.76
urban	residential	2	D	103.62
local road	transportation	2	D	264.84
pipeline	transportation	2	D	71.45
state road	transportation	2	B	95.66
barren	undeveloped	2	*	11.15
forest	undeveloped	2	*	319.45
grass	undeveloped	2	*	10.69
pond	undeveloped	2	*	3.98
stream	undeveloped	2	*	3.62
crops	agriculture	3	C	1,049.02
farm	agriculture	3	D	17.23
pasture	agriculture	3	E	217.80
cemetery	industrial/commercial	3	F	23.08
commercial	industrial/commercial	3	F	451.46
golf course	industrial/commercial	3	E	116.83
industrial	industrial/commercial	3	C	18.71
institution	industrial/commercial	3	F	265.16
power lines	industrial/commercial	3	F	38.74
recreation	industrial/commercial	3	E	654.04
scrap yard	industrial/commercial	3	C	1.65
stormwater	industrial/commercial	3	E	230.06
utilities	industrial/commercial	3	F	10.77
rural	residential	3	E	226.62
suburban	residential	3	E	3,315.47

Land Use Detail	Land Use Category	Zone	Susceptibility	Acres
urban	residential	3	E	107.07
local road	transportation	3	D	646.40
pipeline	transportation	3	D	168.66
state road	transportation	3	C	184.83
barren	undeveloped	3	*	17.26
forest	undeveloped	3	*	1,570.32
grass	undeveloped	3	*	53.52
pond	undeveloped	3	*	12.25
stream	undeveloped	3	*	70.62

*Undeveloped land is not typically ranked for susceptibility

Priority PSOC Summary Results - Well 14 and Well 18
Newtown Artesian Water Company
PWSID# 1090043
Bucks County, PA
Source Water Protection Technical Assistance Program

Map ID	Site Name	Address	PSOC Type	Zone	Susc	Comment	Closest Source
1	RITE AID NO 11109	1 SUMMIT SQUARE LANGHORNE PA 19047	Hazardous Waste - RCRA	2	C	PA-EFACTS, RCRAINFO	WELL 18
3	PROFESSIONAL COMPUTER CORP	23 SUMMIT SQUARE LANGHORNE PA 19047-1078	Hazardous Waste - RCRA	2	C	PA-EFACTS, RCRAINFO	WELL 14
5	GEORGE SCH	1690 NEWTOWN LANGHORNE RD NEWTOWN PA 189400903	Hazardous Waste - RCRA	2	C	ICIS, NCDB, PA-EFACTS, RCRAINFO	WELL 14
6	SUMMIT CLNR SVC	SUMMIT TRACE RD	Land Recycling Cleanup	2	B	SOIL/GROUNDWATER MEDIA	WELL 18
11	JOSEF STONE FARM	272 WOOD STREAM CT, LANGHORNE	Municipal Waste	2	C	LAND APPLICATION	WELL 14
13	NEWTOWN ARTESIAN WATER CO FREEDOM DRIVE PUMP	402 FREEDOM DR	Aboveground Storage Tank	2	D	1550 gal HZSUB	WELL 18
15	WILLIAM W FABIAN & SON	507 S STATE ST	Land Recycling Cleanup	2	B	SOIL MEDIA; UST-ACTIVE PETROL DISTRIB	WELL 18
30	TOMLINSONS AUTO SVC	496 S STATE ST NEWTOWN PA 18940	Hazardous Waste - RCRA	2	C	PA-EFACTS, RCRAINFO; UST-GAS, USDOL, DIESL	WELL 18
38	PENN AUTO BODY	LINCOLN AVE & STERLING ST NEWTOWN PA 18940	Hazardous Waste - RCRA	2	C	PA-EFACTS, RCRAINFO	WELL 18
46	NEWTOWN TWP BUCKS CNTY MS4 UA		Water Pollution Control	3	D	ACTIVE, STORMWATER-MUNICIPAL, DISCHARGE POINT	WELL 18

Map ID	Site Name	Address	PSOC Type	Zone	Susc	Comment	Closest Source
47	NEWTOWN BORO BUCKS CNTY MS4 UA		Water Pollution Control	3	D	ACTIVE, STORMWATER-MUNICIPAL, DISCHARGE POINT	WELL 18
52	GENESIS HEALTH CARE-CREST VIEW CENTER	262 TOLLGATE ROAD LANGHORNE PA 19047	EPA Regulated	3	E	ICIS	WELL 14
53	NEWTOWN BORO BUCKS CNTY MS4 UA		Water Pollution Control	3	D	ACTIVE, STORMWATER-MUNICIPAL, DISCHARGE POINT	WELL 18
63	PENNSWOOD VILLAGE	1382 NEWTOWN LANGHORNE RD	Aboveground Storage Tank	3	D	4550 gal DIESL	WELL 14
65	NEWTOWN TWP BUCKS CNTY MS4 UA		Water Pollution Control	3	D	ACTIVE, STORMWATER-MUNICIPAL, DISCHARGE POINT	WELL 18
66	STORK MMA TESTING LABS	2 PHEASANT AVE NEWTOWN PA 18940-1819	Hazardous Waste - RCRA	2	C	PA-EFACTS, RCRAINFO	WELL 18
70	WOODBRIDGE HOLDING	105 TERRY DRIVE NEWTOWN PA 18940-1872	Hazardous Waste - RCRA	2	C	PA-EFACTS, RCRAINFO	WELL 18
71	MHB MANUFACTURING INC	6 PHEASANT RUN NEWTOWN PA 18940	Hazardous Waste - RCRA	2	C	PA-EFACTS, RCRAINFO	WELL 18
77	KVK TECH INC	110 TERRY DR NEWTOWN PA 18940	Hazardous Waste - RCRA	2	C	PA-EFACTS, RCRAINFO	WELL 18
83	ST MARY MEDICAL CENTER	1201 LANGHORNE NEWTOWN RD LANGHORNE PA 19047-1295	Hazardous Waste - RCRA	3	C	PA-EFACTS, RCRAINFO, AIRS/AFS, EIS; MUNI WST-RESOURCE RECOVERY; AIR-PROCESS	WELL 14
93	KITTS RES		Land Recycling Cleanup	3	B	SOIL/GROUNDWATER MEDIA	WELL 18
95	MARKLOFF RES		Land Recycling Cleanup	3	B	SOIL MEDIA	WELL 18

Map ID	Site Name	Address	PSOC Type	Zone	Susc	Comment	Closest Source
117	SUMMIT SWIM CLUB		Hazardous Waste - RCRA	2	A	STEERING COMMITTEE ADDITION - CHEMICAL STORAGE; CALCULATED RANK C	WELL 14
118	TERMINIX PEST CONTROL	105 TERRY DR, SUITE 117, NEWTOWN	Hazardous Waste - RCRA	2	A	STEERING COMMITTEE ADDITION - CHEMICAL STORAGE; CALCULATED RANK C	WELL 18

Table 5-1
Potential Management Options for Source Water Protection
Newtown Artesian Water Company
PWSID #1090043
Bucks County, PA
Source Water Protection Technical Assistance Program

Regulatory Options	Non-regulatory Options
1. Develop overlay protection district zoning 2. Require special permitting for certain activities within protection zones 3. Implement subdivision controls 4. Encourage smart growth/cluster design/ low impact development subdivisions 5. Require nutrient management programs on agricultural land 6. Regulate underground storage tanks in protection zones 7. Implement stormwater drainage requirements 8. Implement a septic system management program with required inspections and pump-outs 9. Prohibit certain septic system cleaners	1. Install water supply area signs 2. Promote household hazardous waste collections 3. Acquire sensitive land parcels 4. Purchase conservation easements on sensitive land parcels 5. Develop public education programs 6. Support septic system management and encourage regular pump-outs 7. Encourage preservation of open space 8. Develop a detailed emergency response plan and update it regularly 9. Develop a groundwater monitoring program

Table 5-2
Land Use Summary
Newtown Artesian Water Company
PWSID# 1090043
Bucks County, PA
Source Water Protection Technical Assistance Program

Non-Point PSOC	Zone I			Zone II			Zone III		
	Rank	Acres	Percent	Rank	Acres	Percent	Rank	Acres	Percent
Agricultural Land	*	0.0	0%	C	269.7	8%	C	1,284.1	14%
Industrial/ Commerical Land	D	0.9	24%	C	838.2	25%	C	1,810.5	19%
Residential Land	C	2.3	62%	D	1,495.4	44%	E	3,649.2	39%
Transportation Corridors	C	0.6	15%	B	432.0	13%	C	999.9	11%
Undeveloped and Forested Land	*	0.0	0%	**	341.3	10%	**	1,641.1	17%
Water	*	0.0	0%	**	7.6	0%	**	82.9	1%
	Total	**3.8**	**100%**	**Total**	**3,384.1**	**100%**	**Total**	**9,467.6**	**100%**

* This non-point source is not present in the protection zone.
** Undeveloped areas are not typically ranked for susceptibility

Table 5-3
Source Water Protection Implementation Plan
Newtown Artesian Water Company
PWSID# 1090043
Bucks County, PA
Source Water Protection Technical Assistance Program

	Activity	Newtown Artesian Water Company	Potential Partners						Schedule	Cost
			Steering Committee	Adjacent Municipalities	Other Water Systems	Bucks County Emergency Mgmt	Bucks County Conservation District	Newtown Borough EAC		
Steering Committee and Public Participation										
1	Maintain the steering committee to address water resources issues in the protection area. Meetings can be held annually; develop a list of outreach opportunities.	X	X	X	X	X	X	X	1-2 meetings per year	Staff time.
Public Education										
2	Conduct public education for customers and residents regarding the importance of source water protection, including participation in community events. Distribute educational materials, and work with partners in distribution of information. Display source water protection maps and brochures when possible.	X	X	X	X	X	X	X	Ongoing	Cost of printing, mailing; staff time.
3	Work with local educators, the Newtown Borough Environmental Advisory Council, and the Conservation District to provide outreach in schools and demonstrations of any groundwater model.	X	X	X			X	X	Ongoing	Staff time.
4	Place reminders and articles on Source Water Protection on the NAWCO , Newtown Borough, Newtown Township, and Middletown Township's websites.	X		X					Ongoing	Staff time.

	Activity	Newtown Artesian Water Company	Potential Partners						Schedule	Cost
			Steering Committee	Adjacent Municipalities	Other Water Systems	Bucks County Emergency Mgmt	Bucks County Conservation District	Newtown Borough EAC		
5	Add information about NAWC's Source Water Protection Plan to the system's annual Consumer Confidence Report.	X							Ongoing	Staff time.
Source Protection Zone Notification										
6	Work with Newtown Borough, Newtown Township, and Middletown Township to consider installing public awareness signs along roads entering the Zone II wellhead protection area that direct drivers to contact 9-1-1 if a spill occurs.	X	X	X		X	X	X	Long-term	Staff time; cost of signs and installation
PSOCs: General										
7	Work with the municipalities, local volunteer groups, and the general public to update the inventory of PSOCs annually, and educate facilities that store hazardous chemicals to provide prompt notification of accidental releases, followed by prompt response and cleanup.	X	X	X			X	X	Annually and ongoing	Staff time.
8	Work with neighboring water systems like PA American Water and BCWSA in contacting local industry about potential PSOCs and source water protection practices.	X	X		X				Ongoing	Staff time.
PSOCs: Transportation Corridors										
9	Work with local and county emergency management personnel to ensure they are aware of the protection zones and who to contact in the event of a spill on roads or railroad.	X	X	X		X			Immediate	Staff time.

	Activity	Newtown Artesian Water Company	Potential Partners						Schedule	Cost
			Steering Committee	Adjacent Municipalities	Other Water Systems	Bucks County Emergency Mgmt	Bucks County Conservation District	Newtown Borough EAC		
PSOCs: Stormwater Management										
10	Contact owners of commercial and industrial facilities in Zone II regarding implementation of BMPs to improve quality of stormwater runoff. Ensure that water supplier contact information is current and included in any facility spill response plans.	X	X	X			X	X	Short-term	Staff time.
11	Encourage and support the use of stormwater control practices for new and ongoing construction projects within the watershed.	X	X	X			X	X	Ongoing	Staff time.
PSOCs: Agriculture										
12	Support the Conservation District staff and encourage the use of best management practices for reduction of nutrients and sediment in agricultural areas. BMPs can include conservation planning, nutrient management, and structural installations.	X	X	X			X	X	Ongoing	Staff time.
Watershed Management										
13	Register for the DEP eNOTICE and eFACTS databases to be informed of permitting and inspection activities within your protection zones.	X		X					Immediate	Staff time.
14	Provide support to local Environmenal Advisory Councils and the Conservation District for watershed improvement activities.	X	X	X			X	X	Immediate	Staff time.

	Activity	Newtown Artesian Water Company	Potential Partners						Schedule	Cost
			Steering Committee	Adjacent Municipalities	Other Water Systems	Bucks County Emergency Mgmt	Bucks County Conservation District	Newtown Borough EAC		
15	Provide the GIS shapefiles to the Newtown Area Joint Planning Commission and the Bucks County Planning Commission for inclusion in comprehensive planning.	X							Immediate	Staff time.
16	Support Newtown Township's stormdrain medallion and stenciling prgram to reduce pollutants in runoff.	X						X	Short-term	Staff time
Emergency Planning										
17	Update the emergency response plan annually to make sure all contact information and provisions for an alternate water supply are current.	X	X	X		X			Ongoing	Staff time.
18	Provide the GIS shapefiles to the Bucks County Emergency Management Agency 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.	X				X			Short-term	Staff time.
19	Coordinate with emergency (fire and hazmat) responders, in advance to plan responses that will protect drinking water sources.	X	X			X			Short-term	Staff time.

Figure 1-1
Overview of Study Area
Newtown Artesian Water Company
PWSID# 1090043
Bucks County, PA
Source Water Protection Technical Assistance Program

WELL 6
WELL 5
WELL 4A
WELL 18
WELL 14

NAWCO Well

N

0 2,000 4,000 Feet

1:24,000

Data Source:
Sources, SSM, 2016
Boundaries, PENNDOT, 2014

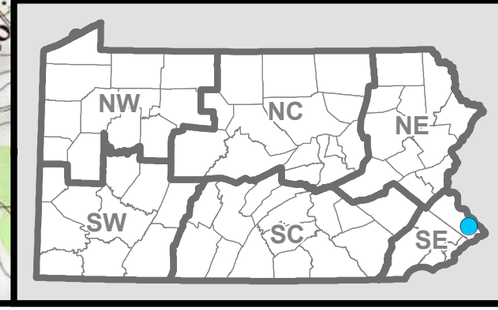

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Figure 3-1
Groundwater Sources
Newtown Artesian Water Company
PWSID# 1090043
Bucks County, PA
Source Water Protection Technical Assistance Program

NAWCO Well

Municipal Boundary

N

0 1,000 2,000 Feet

1:12,000

Data Source:
Sources, SSM, 2016
Boundaries, PENNDOT, 2014

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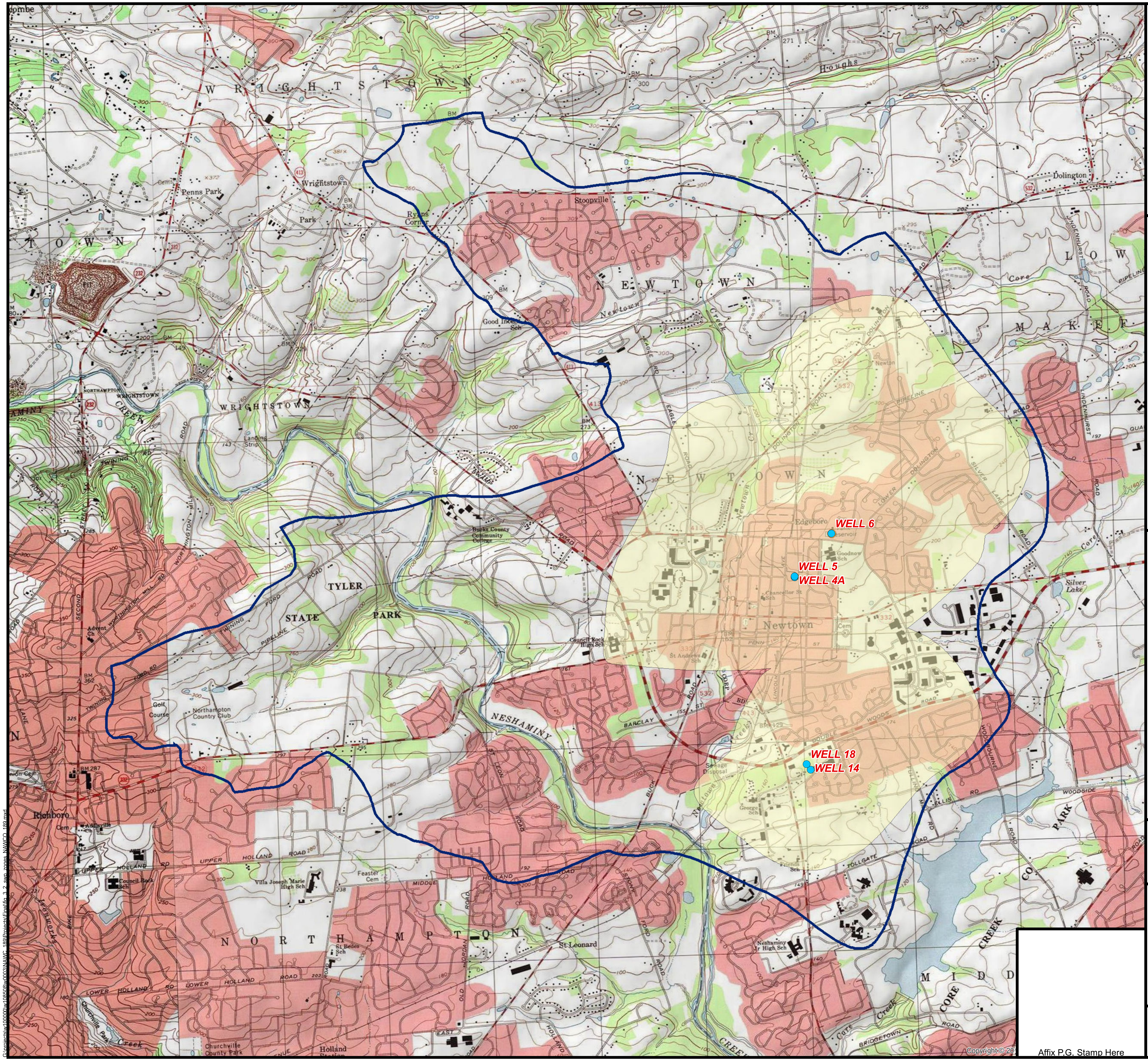
Figure 3-2
Source Water Protection Zones
Newtown Artesian Water Company
PWSID# 1090043
Bucks County, PA
Source Water Protection Technical Assistance Program



- NAWCO Well
- Protection Zone I
- Protection Zone II
- Protection Zone III

N

0 3,000 6,000 Feet

1:24,000

Data Source:
Sources, SSM, 2016
SWP Zones, SSM, 2016

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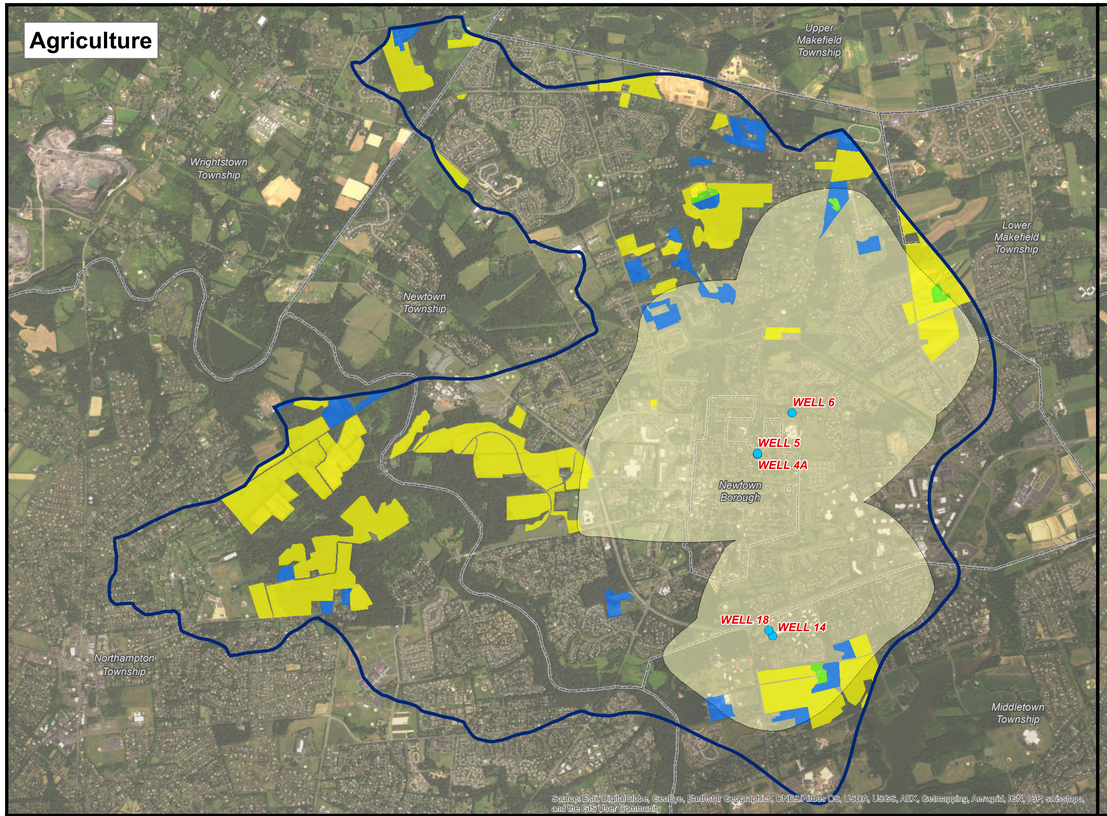

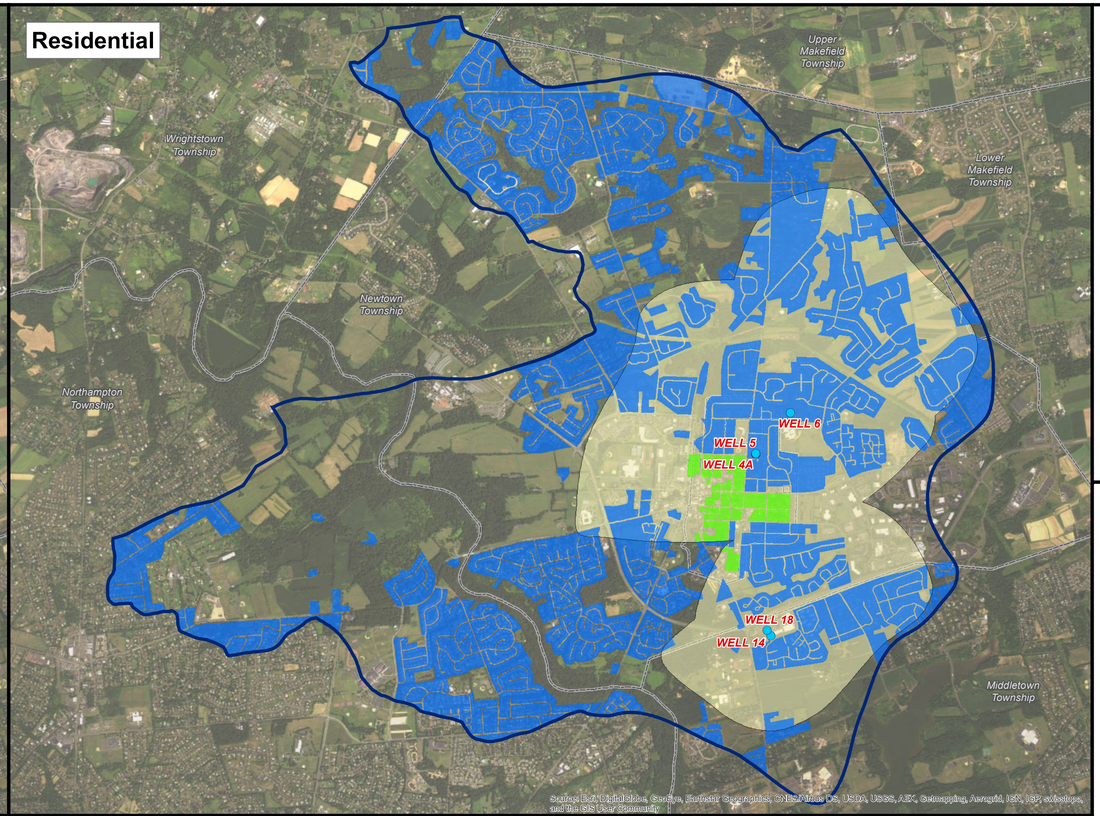

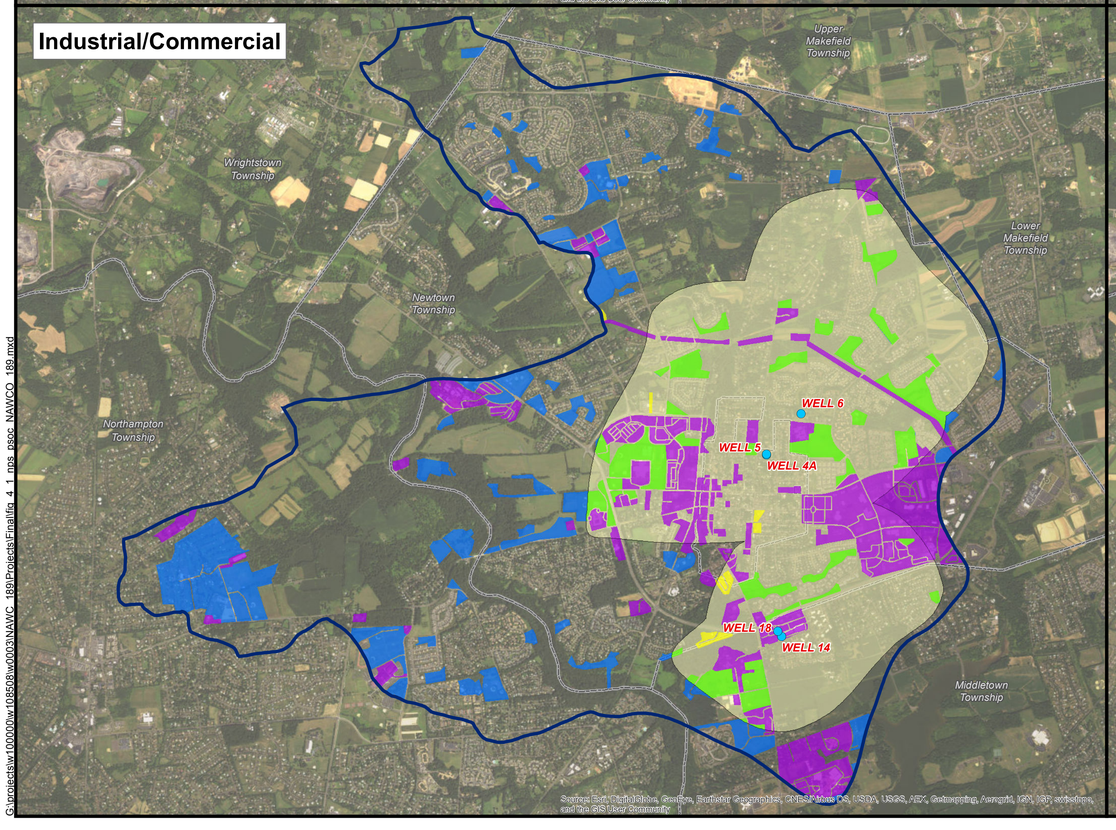

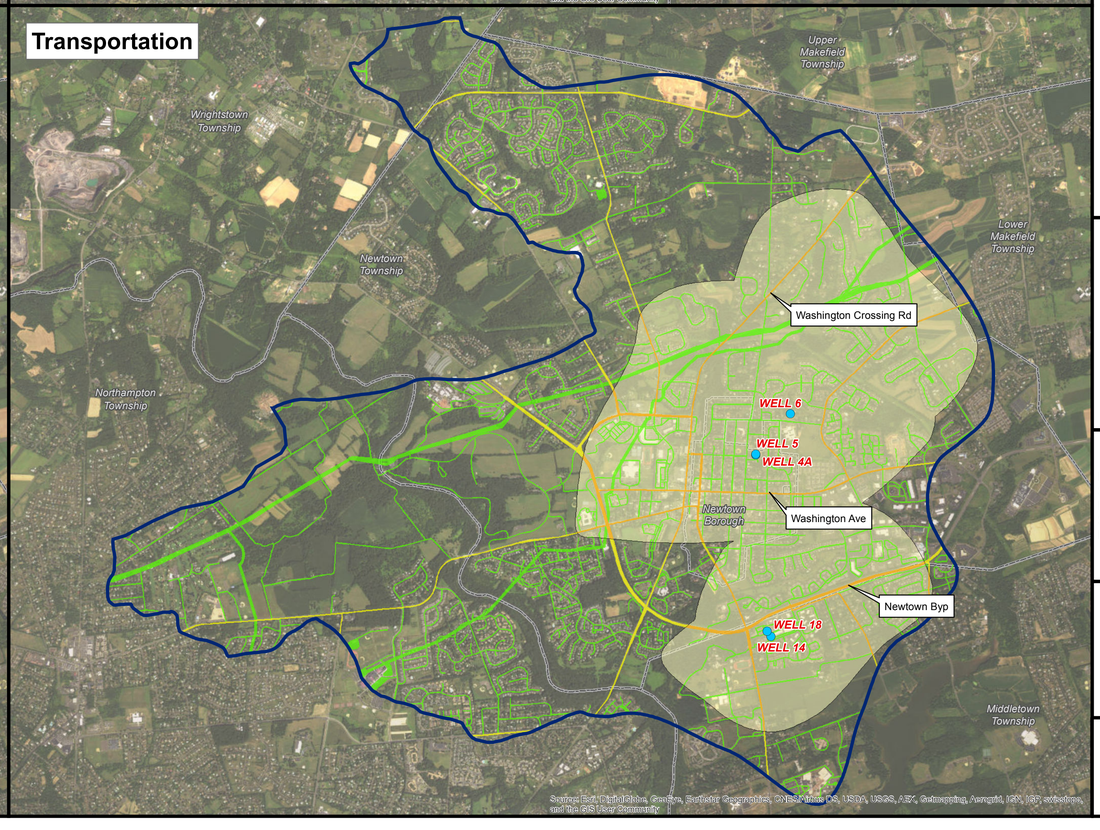

Figure 4-1
Non-Point Source Potential Sources of Contamination
Newtown Artesian Water Company
PWSID# 1090043
Bucks County, PA
Source Water Protection Technical Assistance Program

NAWCO Well

Susceptibility Ranking

- A
- B
- C
- D
- E
- F
- Protection Zone II
- Protection Zone III
- Municipal Boundary

N

0 4,000 8,000 Feet

1:30,000

Data Sources:
Sources, SSM, 2016
NPS PSOC, SSM, 2016
SWP Zones, SSM, 2016
Boundaries, PENNDOT, 2014

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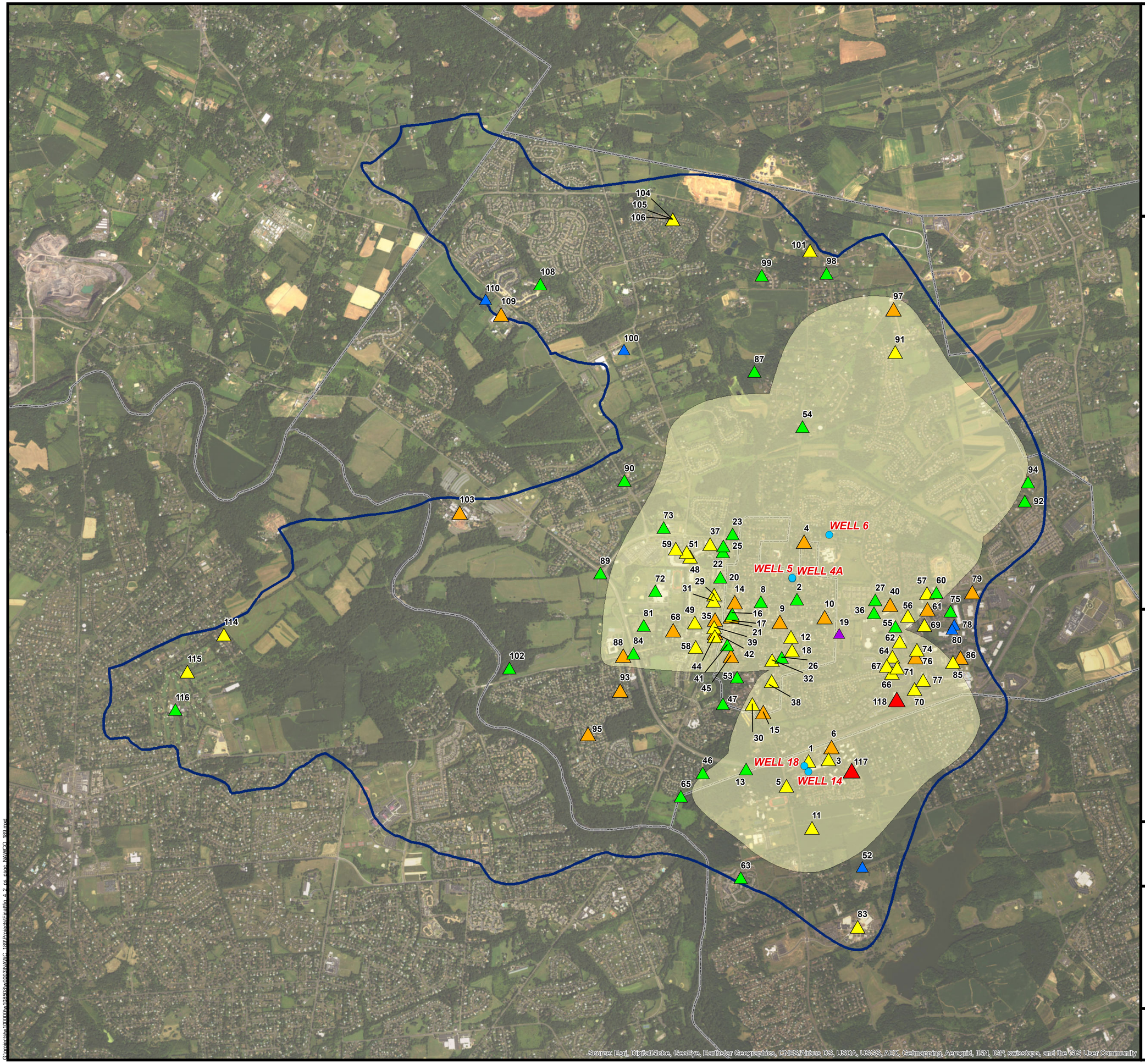
Figure 4-2
Point Source Potential Sources of Contamination
Newtown Artesian Water Company
PWSID# 1090043
Bucks County, PA
Source Water Protection Technical Assistance Program



Data Source:
Sources, SSM, 2016
SWP Zones, SSM, 2016
PS PSOC, SSM, 2016
Boundary, PENNDOT, 2014

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