Source Water Assessment and Protection Program

COMMONWEALTH OF PENNSYLVANIA
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DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER SUPPLY MANAGEMENT

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POLICY: This guidance defines the Pennsylvania Source Water Assessment and Protection Program (SWAPP) in accordance with the federal Safe Drinking Water Act and US EPA guidelines.

PURPOSE: The Source Water Assessment and Protection Program (SWAPP) is required to be submitted to US EPA for approval and describes how Pennsylvania assesses all drinking water sources serving public water systems for the potential for contamination. The assessments are to help "narrow down" and prioritize the potential sources for contamination to a public drinking water source to support voluntary local, source water protection programs. In addition, the SWAPP details the approach the state will take to support the development of voluntary local, source water protection program.

APPLICABILITY: This guidance applies to all local, state and federal agencies and programs with drinking water resource quality monitoring responsibilities.

DISCLAIMER: The policies and procedures outlined in this guidance document are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of the DEP to give the rules in these policies that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY I

INTRODUCTION 3

PUBLIC PARTICIPATION 6

SOURCE WATER ASSESSMENT PLAN 8

Source Water Protection Area Delineation 9

Delineation of Groundwater Sources 9

Delineation of Surface Water Protection Areas 11

Potential Contaminant Source Inventory 14

Ranked Significant Potential Sources of Contamination 14

Groundwater Sources 15

Surface Water Sources 15

Susceptibiity Analysis of Drinking Water Sources to Contamination 16

Susceptibility Analysis of Groundwater Sources to Contamination 17

Susceptibility Analysis of Surface Water Sources to Contamination 17

DISTRIBUTION AND AVAILABILITY OF SOURCE WATER ASSESSMENTS 22

SOURCE WATER PROTECTION PROGRAM 25

Groundwater Sources 25

Surface Water Sources 26

IMPLEMENTATION OF SOURCE WATER ASSESSMENT AND PROTECTION PROGRAM 27

REFERENCES 29

APPENDICIES

Appendix A. Advisory Committee Members 30

Appendix B. Available and Developing GIS Data for Assessments 36

Appendix C. Water Programs with Activities and Jurisdiction Related to SWAP 38

Appendix D. Pennsylvania Maximum Contaminant Levels 41

Appendix E. Potential Contaminant Source Impact Table 50

Appendix F. Example of Source Water Assessment Summary for Surface Water 54

Appendix G. List of Acronyms for Source Water Assessment and Protection Program 62

Executive Summary

The Safe Drinking Water Act (SDWA) Reauthorization of 1996 includes new requirements of states and public water systems, and provides many new opportunities to assure public health and safety through proactive approaches. The Act requires states to develop a Source Water Assessment and Protection (SWAP) Program to assess the drinking water sources that serve public water systems for their susceptibility to pollution and to use this information as a basis for eventually building voluntary, community-based barriers to drinking water contamination. This Program was required to be submitted to EPA 18 months after completion of a EPA guidance document for development of state SWAP Programs. That guidance document was published August 6, 1997. This program has been developed in accordance with the guidance document (U.S. EPA, 1997). The SWAP assessments are of raw water quality, not of finished water quality and are not intended as a measure of water supplier compliance with the Safe Drinking Water Act.

The states are required to assess **all** sources (including ground and surface water sources) serving public water systems (PWSs) within two years of program approval, with the possibility of an 18 month extension. In Pennsylvania, this represents about 14,000 permanent drinking water sources that will need to be assessed by September 2003. A State assessment program is to delineate the boundaries of the areas providing source waters for all PWSs, and identify (to the extent practicable), the origins of regulated and certain unregulated contaminants in the delineated area to determine the susceptibility of public water systems to such contaminants. EPA has set a national goal for the year 2005 that 50 percent of the population served by public drinking water will receive water from sources covered by source water protection programs.

To avoid duplication and increase efficiency, Congress urged states to make use of state wellhead protection programs. Pennsylvania's Wellhead Protection (WHP) Program was submitted to EPA in March 1998 and serves as the cornerstone of the SWAP Program.

The 1998/1999 state budget included authorization for implementing the SWAP Program. Funding for the SWAP is from the State Revolving Fund (SRF) Set-Aside Grant. EPA awarded the grant to DEP in July 1998, which includes funding for development and implementation of the state's SWAP.

Pennsylvania has developed the state's SWAP through a vigorous public participation process. Pennsylvania utilized two public advisory committees to help develop the program: the Small Water Systems Technical Assistance Center Board and the Water Resources Advisory Committee. These committees have been meeting on the program since May 1998. A series of public workshops called *Tap Into Watersheds* was held in six locations across the state during the Summer and Fall of 1998 and were designed to gather public input and foster public participation in the development of Pennsylvania's SWAP Program.

The assessments will provide rigorous delineation of wellhead protection areas for groundwater sources or critical watershed areas for surface water sources, a base inventory of existing and potential sources of contamination in each source water protection area, and a susceptibility analysis of the drinking water source to contamination. The assessments are to be completed for the most part with existing information. Public meetings and surveys of PWS information will be conducted to initiate the assessments. DEP is primarily responsible for completing the assessments. Source water assessments for the larger community water systems (CWSs) supplied primarily by surface water sources will be conducted through contracted services. Source water assessments for CWSs supplied primarily by groundwater and serving a population of 3,300 or greater will be conducted by DEP staff. The groundwater sources of PWSs serving less than 3,300 will be initially assessed from readily available data through a terrain analysis using the safe drinking water program's geographic information system. DEP staff will also conduct source water assessments for high priority sources on an as needed basis.

The most important purpose for conducting the source water assessments as identified by Congress is to support the development of local, voluntary source water protection programs. DEP's plan includes measures to support and promote development and implementation of these plans. Local source water protection programs for surface water sources will be supported in a similar way to WHP with public education, program promotions, local grants for protection program development and implementation, federal and state agency coordination, and technical assistance. Essentially, the program expands the concept of Wellhead Protection under the Safe Drinking Water Program to all sources of public drinking water. Pennsylvania's program has been actively assisting the development of local WHP programs for six years through grant programs, technical

assistance and public education. To date, there are over 160 community water systems in Pennsylvania that are involved in developing local wellhead protection programs.

Upon completion of the source water assessments, public meetings will also be held to discuss; 1) the results and the recommendations of the source water assessments, and 2) ways to enhance or develop source water protection plans. The results of the source water assessments will be made available in many ways. The Consumer Confidence Report required to be provided to all consumers by all CWSs is to contain a summary of the Source Water Assessments when available. Copies of the full source water assessment reports will be on file in various places in the community, such as, with the water supplier, with the local library, and with the local planning agency. In addition, results of all source water assessments and most data will be made available on the Internet.

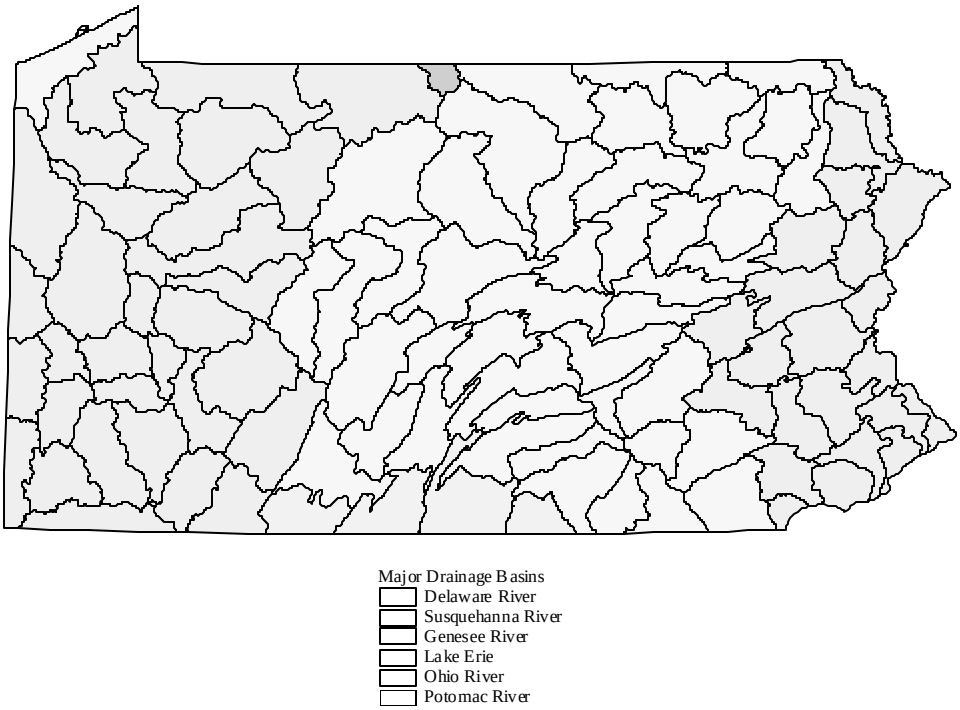
Introduction

The 1996 Safe Drinking Water Act (SDWA) reauthorization established a new requirement under Section 1453 for states with primacy for the public water system supervision program to conduct source water assessments (SWA). A state assessment program is required to: (1) delineate the boundaries of the areas providing source waters for public water systems, and (2) identify (to the extent practicable) the origins of regulated and certain unregulated contaminants in the delineated area to determine the susceptibility of public water systems to such contaminants. These are assessments of raw water sources for public drinking water and not assessments of performance or compliance of public water systems.

The state's Wellhead Protection Program (WHPP) will serve as the cornerstone of the state's Source Water Assessment and Protection Program (SWAPP). Pennsylvania's WHPP was submitted to EPA in March 1998. It was completed and presented in the context of the pending SWAPP development. Congress encouraged states to make use of other programs and efforts to complete this task in an efficient manner. This document will defer to the Wellhead Protection Program for delineation and potential contaminant inventory approaches. Areas of the SWAPP not included in the development of the WHPP are the susceptibility analysis of the drinking water source to sources of contamination within the delineated area.

The state is to use all reasonably available hydrogeologic information, water flow, recharge and discharge, and any other information the State deems necessary to accurately delineate the source water assessment areas. Source water assessments are to be completed for all public water systems (PWS) within two years after EPA approval of the State's program which would occur the end of 2001. In this plan Pennsylvania is proposing an 18-month extension which, under the statute, can be granted by EPA for completion of the assessments. This would set the deadline in mid-2003 for completion of the assessments.

The intent of Congress in requiring SWAs was to show water suppliers, municipalities and the public what threats faced their sources of public drinking water, and support development of voluntary local source water protection programs. A vulnerable drinking water source puts a system and the community at a disadvantage in planning and building future capacity for economic growth. Source water assessment and protection is an efficient way to improve or maintain raw water quality to protect public health and safety and reduce or maintain treatment costs.

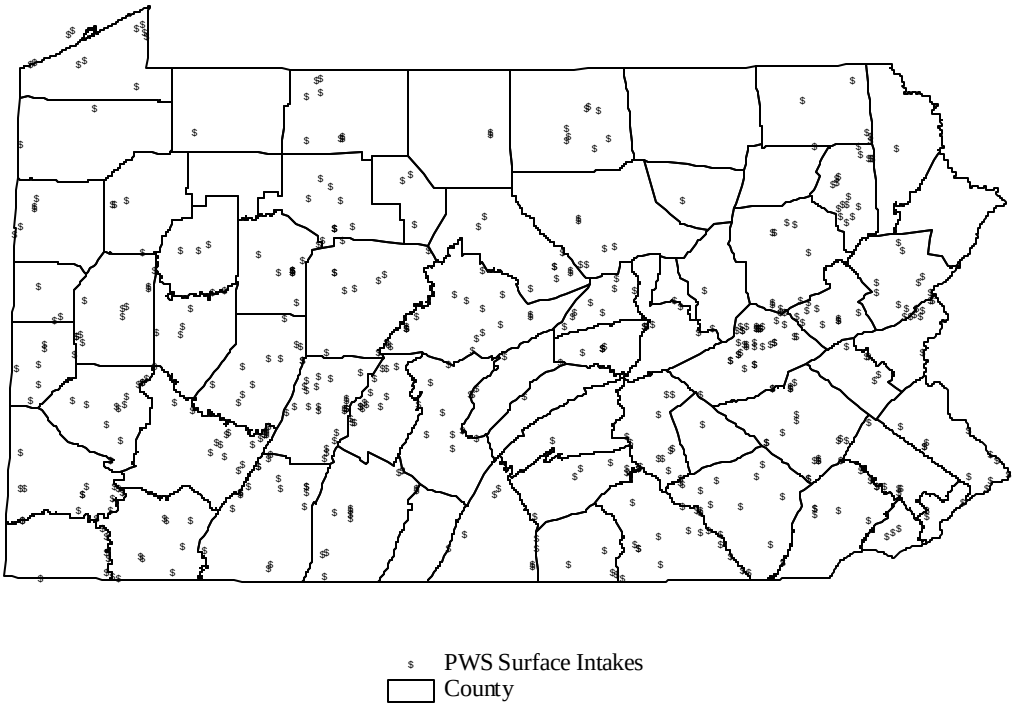


Map 1. Major River Basins of Pennsylvania with the 104 State Water Plan Watersheds

Pennsylvania has a diverse hydrography with three major river basins accounting for most of the drainage of the state (see Map 1.). Much of the state is within the drainage areas of source intakes for Pennsylvania water systems or that of a neighboring state. Interstate cooperation is an important element in the development and implementation of a state SWAP program. Key to this coordination are the Great Lakes and river basin commissions. Pennsylvania will be cooperating with other states and the District of Columbia to provide source water data and assist in protection efforts.

Pennsylvania has approximately 14,000 water sources serving 10,400 PWSs at the writing of this document. Of these, there are approximately 2,400 community water systems (CWSs) including 327 CWSs using primarily surface water sources. The 540 active surface water sources serving these systems are shown on Map 2. CWSs using primarily surface water sources serve approximately 8,900,000 people or 84 percent of the population in Pennsylvania. The remaining 16 percent or 1,640,000 people on CWSs are on systems using primarily groundwater from approximately 4,500 wells and springs.

There are 115 surface water intakes from watersheds over 100 square miles. These include 60 surface water intakes on the Delaware River, the Susquehanna River, Allegheny River and the Youghiogheny. There is only one PWS with surface water intakes on Lake Erie.



Map 2. Active Surface Water Sources Serving CWSs.

The intent of Congress in requiring source water assessments was to show water suppliers, municipalities and the public what threats faced their sources of public drinking water, and support development of voluntary local source water protection programs. Public participation in the development of the local SWAP program is imperative for success. Many of the approaches for improving and maintaining source water quality depend on public involvement and action. Much of the authority and responsibility to protect public health and safety through protection of the water supply source is already in place in Pennsylvania. Not all, but many of the management approaches for a local SWP program would require local government action, cooperation or support. In Pennsylvania, there are nearly 2,600 municipalities. Only about half of these municipalities have passed zoning ordinances for their jurisdictions. However, the Pennsylvania Municipalities Planning Code and a local government's power to protect public health and safety provides authority for local governments to plan and to act to protect water supply sources.

Public Participation

The development of this program was accomplished with extensive opportunity for public participation. In addition to the public involvement in the development of this plan, a similar and equally successful process was used in 1996 and 1997 in completion of the state's Wellhead Protection Program (WHPP), which was submitted to EPA in March 1998. With the exception of the susceptibility element of this plan, all elements of the SWAP for groundwater sources were discussed, reviewed and commented upon at that time. The authorized State Revolving Fund set-aside allotment for the SWAP was subject to publication in the *Pennsylvania Bulletin* and a formal public hearing was held by the Pennsylvania Infrastructure Investment Authority (PENNVEST) on November 26, 1997. The SRF set-aside grant was approved by EPA in July 1998.

A series of three public workshops on the WHPP were held across the state in the fall of 1997. In addition, the WHPP was formally presented to Small Water Systems Technical Assistance Center Board, the Water Subcommittee of the Air and Water Quality Technical Advisory Committee (now known as the Water Resources Advisory Committee) and Agricultural Advisory Board, along with the Pennsylvania Association of Conservation Districts. The WHPP was publicized via official notification in the *Pennsylvania Bulletin* on October 11, 1997 (27 Pa. B. 5311), and public comments were requested. Areas not included in the development of the WHPP are the susceptibility analysis of the drinking water source to sources of potential contamination within the delineated area.

Public participation for development of SWAP included the use of two standing advisory committees to DEP. The Small Water Systems Technical Assistance Center Board was established in March 1992 under the Small Water Systems Assistance Act. The Small Water Systems Technical Assistance Center Board with source water assessment and protection program adjunct members served as the citizens advisory committee for SWAP. The Water Resources Advisory Committee with source water assessment and protection program adjunct members served as the technical advisory committee for SWAP. The members of these committees and the groups they represent are listed on Appendix A. These committees will receive regular reports on the implementation of the SWA and progress in developing local SWP programs.

Table 1. Advisory Committee Meetings

COMMITTEE	DATE
Technical	May 12, 1998
Citizens	May 13, 1998
Technical	July 8, 1998
Citizens	September 9, 1998
Technical	September 9, 1998
Joint	October 13, 1998
Joint	February 18, 1999
Joint	June 7, 1999

The committee meeting agendas, meeting minutes, working points for this document and the draft of this document were posted on DEP's web page (www.dep.state.pa.us). Notice of this document's availability for review and comment was published in the *Pennsylvania Bulletin* on January 16, 1999. The published document was released on February 27, 1999. All public participation in the development of this document was conducted under DEP's policy on public participation.

A series of public workshops for the SWAPP was held across the state during the summer and fall of 1998. The workshops, called *Tap Into Watersheds*, were conducted by Clean Water Action of Pennsylvania under a grant from DEP. The workshops are listed in Table 1.

Table 2. Dates and Location of the SWAP Program Workshops *Tap Into Watersheds*

DATE	LOCATION	FACILITY
06/27/1998	Rosemont, PA	Rosemont College
09/12/1998	Pittsburgh, PA	University of Pittsburgh
09/19/1998	Wilkes-Barre, PA	Kings College
10/03/1998	Williamsport, PA	Genetti Hotel
10/17/1998	Erie, PA	Villa Maria Conference Center
10/24/1998	Shippensburg, PA	Shippensburg University

SWAP promotion and public education were supported by presentations to local groups, other agencies, and professional and special interest organizations. These organizations include PA American Water Works Association, American Water Resources Association, PA Planners Association, Water Works Operators Association of Pennsylvania, Water Resources Education Network and others. Materials, fact sheets and regular articles were made available for organization publications, and public inquiries and were posted on DEP's web page.

Public water suppliers and state safe drinking water administrators alike agree that source water protection is a cost-effective way to maintain drinking water quality according to a survey conducted for AWWA on source water protection by the Robert Hurd & Associates, Inc. The majority of the people questioned in the survey agreed that public education, involvement, and support will be critical to achieving source water protection success.

Source Water Assessment Plan

Due to the time frames provided in the statute and the limited resources available for the project, the SWAPs for Pennsylvania's PWS will be accomplished using readily available information and will utilize a combination of delineation approaches found in EPA guidance (US EPA 1997, Page 8 & 9 and US EPA 1997(b). Variable delineation methodologies will be used to provide the most accurate source water assessment areas for the highest priority PWS to complete the required assessments within the funding limits and within the time frame required by the statute. The goal will be to apply the most accurate methodology to all PWS by continually refining the delineations based on set priorities and flexibility in emerging federal Safe Drinking Water Rules. These refinements and refinements to the contaminant inventory will continue after the assessments are complete to satisfy the statute. The assessments are extensions of existing safe drinking water methods such as sanitary surveys, which will continue to update and refine the source water assessments well after 2003.

The advisory committees for SWAP have accepted that, given the large number of systems and the available resources, priorities and variable methodologies must be adopted for completion of the task. The priorities reviewed by and accepted by the committees are included in the elements of delineation, contaminant inventories and susceptibility analysis proposed in this document. An initial statewide assessment will be conducted of all water sources serving PWS. From these results, priorities for resources will be established for each type of water source. This initial assessment also establishes the watershed areas for critical area analysis in delineating source water protection areas (SWPA) for surface water sources. The initial statewide assessments will be conducted through a GIS analysis to identify drinking water source vulnerability and at-risk drinking water sources. The initial assessment will be based on previous nonpoint source analysis, land use and available point source.

The initial assessments, planning and program implementation will utilize GIS. SWAP will be based primarily on readily available GIS databases. GIS is a computer system capable of representing and analyzing geographically referenced databases. Appendix B represents the basic, existing or developing GIS data for SWAP. Other databases from DEP programs, EPA and other agencies will be used as available and, if geographic present, will be developed as GIS data. If no geographic available, the database will be attached to a related existing GIS database for a qualitative analysis until geographic locations are identified in the database.

The primary water agencies with data and/or jurisdiction for water quality in Pennsylvania are listed on Appendix C. These agencies and others identified during the SWA process and public meetings will be asked to contribute data and coordinate with local SWAP efforts. This cooperation is needed to meet the goal of improving and maintaining raw water quality to protect public health and safety.

The assessments will rely on public water supplier's thorough knowledge of the raw water quality problems the PWS faces and knowledge of what areas of the watershed are most critical to the system's raw water quality. A survey will be sent to the water suppliers who will attempt to capture what the water supplier knows about the system's water source and what the raw water quality problems are for the system. The source water assessment conducted directly by DEP staff or contractor will begin with a review of the initial assessment data, the PWS survey information, the sanitary surveys, raw water quality and quantity information, the emergency response plan, and existing source water protection activities. A kickoff meeting will be advertised in the local newspaper and will be held in the local area to plan the assessment. The meeting will be held with the water suppliers, the public, local agencies, local organizations and municipalities that have knowledge of the source water protection area, or that are directly affected by the outcome of the source water assessments. A series of working meetings will be held through out the assessment to gather information, complete the susceptibility analysis and initiate the Source Water Protection Program. If available, local resources will be used to enhance the assessments.

DEP will employ the assessments conducted under its obligation to EPA to assess 34,000 miles of unassessed streams and to develop Total Maximum Daily Loads (TMDLs) for all impaired waters on DEP's 303(d) list of impaired waters in the surface water SWA. These stream assessments will help identify areas and contaminants of concerns in the critical watershed areas. This will involve coordination of surface water quality assessments and identification of critical stream segments upstream of PWS surface water intakes. It will also link such assessments with watershed management or TMDL development activities. This stream assessment effort will help provide a basis for implementing remediation projects to support local SWP programs. It will also help to coordinate state, federal and local programs for watershed remediation and source water protection.

Since Pennsylvania has only one PWS using Lake Erie as a drinking water source, this source can be treated as a special case. The assessment approach will be conducted under contract utilizing the assessment protocol being developed by the Great Lakes states and EPA. Likewise, the Philadelphia Water Department utilizes a source designed to capture water from tidal influences in the Delaware. This source is a special case and the assessment will be conducted by contract with the water supplier.

Source Water Protection Area Delineation

The funding to delineate and assess source water protection areas is 10 percent of the State Revolving Fund from the 1996 and 1997 federal appropriation for Pennsylvania. Because of the recognized limitation of resources and time, EPA's guidelines allow, and Pennsylvania intends to employ, differential methods to be used in the task based on state priorities and resources (US EPA, 1997; page 2-11). Furthermore, large watersheds are recommended to be segmented into areas where specific inventories of significant potential contaminant sources should be conducted (US EPA, 1997; page 2-16).

Delineation of Ground Water Sources

The wellhead protection areas (WHPA) as defined in the state drinking water regulations and the state WHPP are the source water assessment areas for the groundwater sources serving PWSs. The focal point of a local WHP program is the WHPA delineation and the resulting map. On October 8, 1994, revisions to 25 Pa. Code Chapter 109.1 of DEP's rules and regulations defined a three-tiered WHP area approach for wells, springs and infiltration galleries. The first (Zone I) is a 100 to 400 feet radius based on site specific source and aquifer characteristics. The Bureau of Water Supply Management (BWSM) has completed an assistance document for compliance with this regulation. The second (Zone II) is the capture zone of the source which is a ½ mile radius unless a more rigorous delineation is conducted. The third (Zone III) area is the land area beyond Zone II that contributes recharge to the aquifer within the first two areas via surface water or groundwater. Collectively, Zones II and III constitute the contributing area of a well.

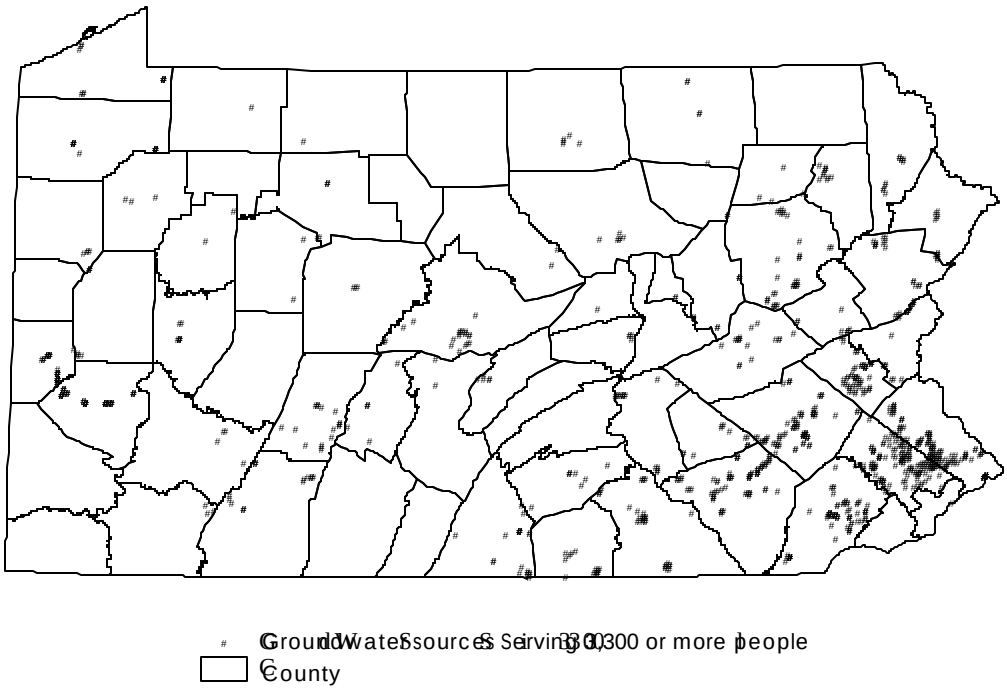
The WHPA Zone II (1/2 mile radius), set by regulation, is delineated in a GIS coverage each quarter for all sources serving PWSs based on data from the Pennsylvania Drinking Water Information System (PADWIS). These WHPA delineations will be used to define priorities and identify applicable delineation methodology. A more rigorous delineation will be completed for all PWSs. Rigorous delineations completed for local WHP programs will be adopted as SWA areas under this program unless it is determined by DEP staff that the delineation needs to be revised to adequately complete the assessments. Eventually, only new ground water sources will have the 1/2 mile WHPA Zone II delineated prior to a more rigorous delineation.

The United States Geological Survey (USGS) is completing a joint study with the BWSM to evaluate the WHPA delineation methods described in EPA's guidelines (EPA, 1987) as applied to Pennsylvania's various hydrogeologic settings. The first report addresses methodologies for the unconsolidated aquifers of the glacial outwash and the river valley deposits and is titled *Evaluation of Methods for Delineating Areas that Contribute Water to Wells Completed in Valley-Fill Aquifers in Pennsylvania* (Risser and Madden, 1994; USGS Open File Report 92-635). The second report addresses methodologies for fractured bedrock settings and is titled *A Strategy for Delineating the Area of Ground Water Contribution to Wells Completed in Fractured Bedrock Aquifers in Pennsylvania* (Risser and Barton, 1995; USGS Water-Resources Investigations Report 95-4033). Subsequent reports will address specific studies of fractured bedrock aquifer behavior as applied to WHP area delineation in siliciclastic, crystalline and carbonate aquifers.

The results of these joint studies and existing EPA guidelines will serve as the technical criteria and guidance to determine suitable methodologies for rigorous WHPA delineations. The WHPA delineation methodology will be chosen based on the hydrogeologic setting of the groundwater source, and the advantages and effort

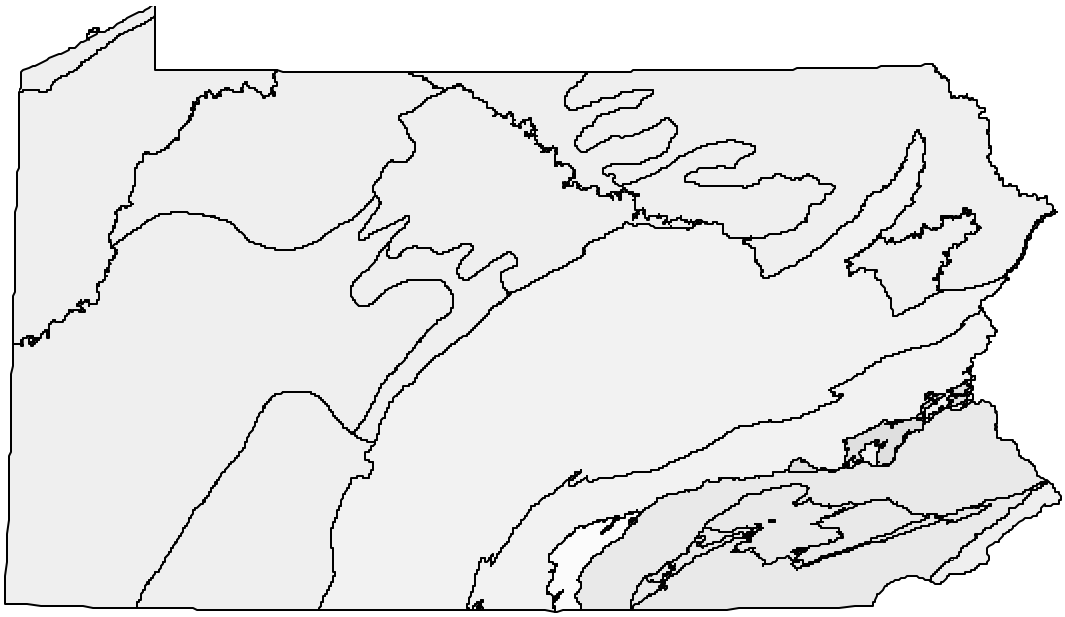
needed to apply the different delineation methods to that setting. The guidance will allow selecting a delineation method that is best suited to the available or needed data, available expertise and the level of effort to be dedicated to the WHPA delineation.

To meet the statutory deadline for completion of the SWA, differential methods will be applied to groundwater sources serving PWS based on the population served. The method applied for WHPA delineation will differ by the amount of research and application of site specific data to the study. For groundwater sources of PWS serving a population of 3,300 people or more, site-specific studies and individual delineations will be developed for each source. There are approximately 1,100 groundwater sources under this definition.



Map 3. GroundWater Sources for CWSs Serving 3,300 or More people

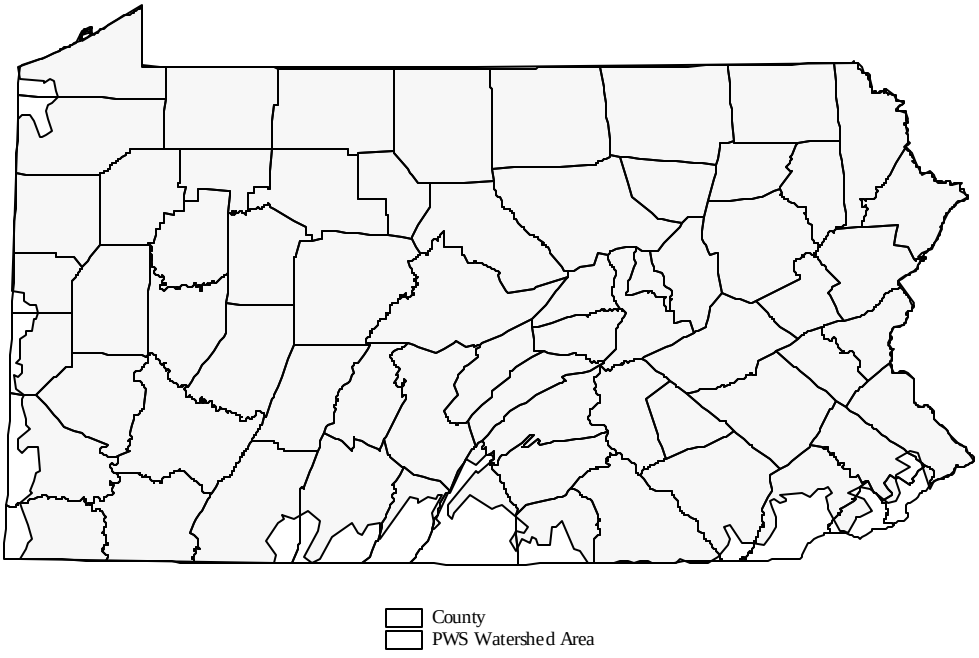
For groundwater sources of PWSs serving a population less then 3,300 people, improvements on the ½ mile Zone II will be made based on available data in databases and in GIS. Data on well production, construction and water quality will be used with data on topography, geology, soils, streams, etc. through a conceptual groundwater flow model developed for each physiographic section (Map 4). More rigorous delineations and assessments will be completed as staff time is available. Priority will be given to wells serving small CWSs with high protection priorities and NTNCWSs serving sensitive populations such as schools and hospitals. The assessments from the more rigorous delineations shall be used as applicable for other sources that fall in or near the delineated area.



Map 4. Physiographic Provinces of Pennsylvania

Delineation of Surface Water Protection Areas

The entire watershed Area for all surface water intakes serving PWS has been delineated. (Map 5) This area represents over 90 percent of the entire area of the state. For this delineated area, available databases will be utilized to identify existing and potential sources of contamination and conduct analysis of critical areas to the intakes.



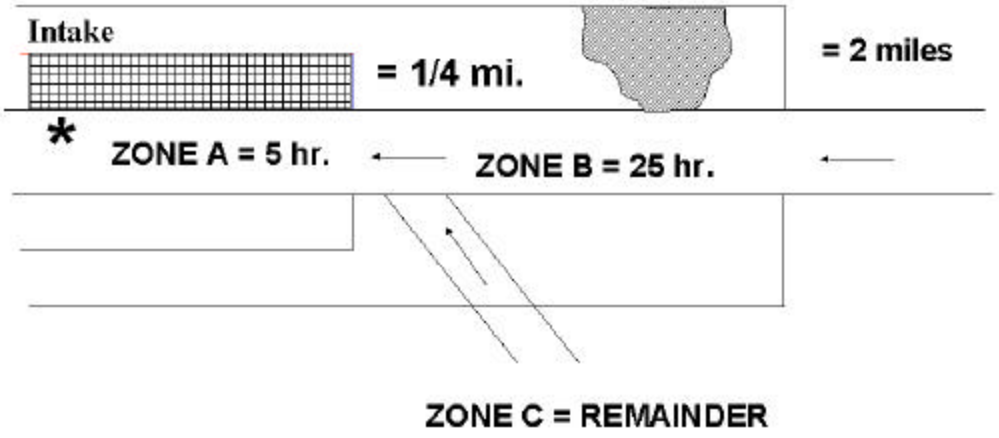
Map 5. Watershed Areas Draining to PWS Surface Water Intakes

There are 115 watersheds over 100 square miles serving PWS. These include about 60 surface water intakes in the main stems of the major river basins in Pennsylvania. Watersheds over 100 square miles serving PWS will be segmented for the inventory and susceptibility analysis of non-conservative, potential contaminant sources primarily to address spills. The model for the segmentation approach was the ORSANCO SWAP Plan. This model was reviewed, discussed and revised by the advisory committees. The segmentation for these large watersheds will be three tiered (Map 6): Zone A will be a ¼ mile wide area on either side of the river or stream from an area ¼ mile downstream of the intake to a 5-hour time of travel (TOT) upstream the (3 year average, using maximum local river velocities from February 1995 to February 1998); Zone B will be a two mile wide area on either side of the river or stream extending upstream to a 25-hour TOT (3 year average using maximum local river velocities from February 1995 to February 1998); and Zone C will be the remainder of the watershed. This delineation will be refined by consideration of river hydraulics to determine channeled flow and critical contributing tributaries. Critical contributing tributaries are tributaries that contribute significant flow to the surface water intake; and, therefore, significant contaminant loading. The major effort for contaminant inventories should be in these critical areas. By contrast, some tributaries may be upstream but have virtually no impact on water quality at the surface water intake. For watersheds with an area less than 100 square miles, a Zone A will be delineated but the remainder of the watershed will be inventoried as a Zone B.

For non-point source and microbiological contaminants of concern, a critical area analysis will be conducted for each surface water intake based on existing water quality data for the drinking water source and the watershed, and on physical characteristics of the watershed. Assessments for stream impairment and TMDL determinations will be used to locate critical areas when available. This analysis will include critical areas for nitrate, pathogens, sediment loading and metals. These critical areas may include areas of high potential sources of contamination such as urbanized areas.

Map 6.

Surface Water Delineation
≥ 100 square mile watersheds



(Not to Scale)

Potential Contaminant Source Inventory

Potential contaminant source inventories will include activities that use, store, transport or dispose of the following types of contaminants (see lists):

- Regulated Contaminants = with Federal Primary and Secondary Maximum Contaminant Levels (MCLs) (Appendix D)
- The EPA Contaminant Candidate List, contaminants with EPA lifetime health advisories or cancer risk numbers (Appendix D) most of these are on the Clean Water Act Priority Pollutant List
- Giardia & Cryptosporidium
- Turbidity
- Disinfection by-products precursors
- Taste & Odor precursors
- Other contaminants as necessary based upon known potential contaminant sources

Ranked Significance of Contaminant:

Certain contaminants are found to be a more common cause of pollution than others. To identify the level of concern for potential sources of contamination to a water source serving a PWS, the occurrences of contaminants causing MCL violations or detection of organic compounds found in DEP records and water quality impairment from DEP's CWA 305(b) reports were reviewed. The contaminant types are listed below by water system and source type from more common occurrence to less common with a consideration for the relative health risk.

CWS

Groundwater Sources:

1 Microbiological Pathogens: Total/Fecal Coliform, Viruses, Protozoa (if GW source is under the “direct influence of surface water.”)
2 Nitrate / Nitrite
3 Volatile Organic Compounds and Petroleum Hydrocarbons
4 Heavy Metals
5 Metals
6 Synthetic Organic Compounds
7 Radionuclides (anthropogenic)

Surface Water:

1 Microbiological Pathogens: Total/Fecal Coliform, Viruses, Protozoa
2 Turbidity
3 Nitrate / Nitrite
4 Disinfection by-product precursors
5 Synthetic Organic Compounds
6 Volatile Organic Compounds
7 Taste & Odor precursors
8 Radionuclides (anthropogenic)

NTNCWS

1 Microbiological Pathogens: Total/Fecal Coliform, Viruses, Protozoa (if GW source is under the “direct influence of surface water.”)
2 Nitrate/Nitrite
3 Heavy Metals
4 Metals
5 Volatile Organic Compounds and Petroleum Hydrocarbons
6 Synthetic Organic Compounds

TNCWS

1 Microbiological Pathogens: Total/Fecal Coliform, Viruses, Protozoa (if GW source is under the "direct influence of surface water.")
2 Nitrate / Nitrite
3 Volatile Organic compounds

The potential contaminant source impacts by activity are listed on Appendix E. The appendix identifies types of potential contaminants that may result from these activities. SWPAs will be inventoried at different levels of detail according to the delineated zones (segments) of the SWPA described previously. In the methods described below, the "significant potential sources of contamination" are the activities with potential contaminants from the list above. This ranking will also be used to prioritize potential contaminant sources with the same protection priority from the results of the susceptibility analysis. The following are inventory approaches by source water type and system type assessment priority previously identified.

Groundwater Sources:

The Safe Drinking Water Act specifies that a state's Wellhead Protection Program (WHPP) will suffice for the Source Water Assessment and Protection Program for PWSs using groundwater sources. Pennsylvania's WHPP has been approved by EPA.

Method 1:

1. Area-wide inventory from available databases and land uses.
2. Zone I = all potential sources of contamination.
3. Zone II = all significant potential sources of contamination.
4. Zone III = all significant potential sources of contamination for contiguous area (Zone III).

Method 2: GIS Analysis

1. Area-wide inventory from available databases and land uses.
2. Refine inventory over time with sanitary survey data (see method 1).

Surface Water Sources:

Method 1: Watershed $\leq$ 100 mi^2

1. All Zones = Area-wide inventory from available databases and land uses
2. Zone A (critical segment) = All potential sources of contamination
3. Zone B (remainder) = All significant potential sources of contamination

Method 2: Watershed > 100 mi^2

1. All Zones = Area-wide inventory from available databases and land uses
2. Zone A (critical segment) = All potential sources of contamination
3. Zone B (second segment) = All significant potential sources of contamination
4. Zone C (remainder) = Area-wide inventory only

Susceptibility Analysis of Drinking Water Sources to Contamination

The susceptibility of a drinking water source serving a PWS is the potential for that source to draw water contaminated by inventoried sources of contamination at concentrations that would pose a concern. This susceptibility is determined at the point in the waterbody immediately preceding collection for the PWS. A drinking water source, as a whole, is considered highly sensitive to contamination if at this point an MCL has been exceeded for a regulated contaminant, 50 percent of an MCL has been reached for nutrients or heavy metals, or detections have been made of VOCs or SOCs above the detection limit. This does not complete the analysis of the individual potential sources of contamination for drinking water source susceptibility. The intent of the statute, as determined by EPA, is for the susceptibility analysis to "narrow down" the potential contaminant sources of concern to assist the effectiveness of local voluntary SWP programs.

The susceptibility analysis is a qualitative measure of relative priority for concern of the different potential and existing sources of contamination based on the following:

1. Drinking water source sensitivity
2. Potential impacts posed by sources of contamination to the PWS source

   (This is a qualitative assessment of the impact on a PWS source if an uncontrolled contaminant release were to occur from a specific activity.)
3. Potential for release of contaminants of concern

The process is described on Flowchart 1.

The susceptibility analysis uses a series of matrices to determine high, medium and low values for the various factors in the process (matrix A – D). The parameters used in these matrices include time of travel (TOT), persistence and quantity. Although some of these parameters will be set for base assessments, the parameters for quantity and the "potential for release" table will be discussed at the public meetings and set for the site specific assessments conducted by DEP staff or DEP contractors to reflect local public concern. The changes in the threshold values for the parameters must be consistent with setting high, medium and low values for the resulting factors and must apply to the entire group of potential contaminant sources (i.e. Volatile organic chemicals).

The time of travel (TOT) to the drinking water intake from a source of a potential contaminant is measured in terms of short, medium, or long. For groundwater sources, WHP areas I, II, and III are synonymous with short, medium, or long TOT, respectively. For surface water intakes, the definitions of the segmented delineations are based on TOT (zone delineations: A = 5 hours, B = 25 hours, and C represents the remainder of the watershed). Accordingly, the TOT for Zones A, B and C are short, medium and long, respectively.

The persistence of a potential contaminant will be measured as high, medium or low. This will be based on the contaminant ability to move in the environment and is determined on the adsorption and/or half-life (or rate of removal). If the contaminant has been known to contaminate water supply sources with concentrations greater than the MCL or in significant concentrations it will have a high to medium persistence. For ground water sources, the soils and geologic materials ability to remove the contaminant will be factored in as well. This will be based on the clay content and the hydraulic conductivity of the material.

Quantity will be measured as high, medium and low. Low quantities are those that are clearly on a domestic scale and can be categorized as non-reportable or non-regulated releases, volumes or events. Medium quantities are those that can be categorized as reportable releases, regulated minimum volumes, or events, or equivalent, up to 10X such a quantity, or those quantities that are associated with commercial- or industrial-sized operations and distribution. High quantities are those that are clearly associated with commercial- or industrial-sized operations and distribution, with a minimum 10X a reportable release, regulated minimum volume, event, or the equivalent.

The sensitivity of a drinking water source is most critical in a groundwater source where the aquifer and overlying geologic materials above are expected to provide some treatment of infiltrating water. Surface water sources are highly susceptible because of short travel times of contaminants and limited processes for mitigation of contaminants other than dilution, settling, oxidation and volatilization. By definition, there is a higher susceptibility of contamination by potential sources within Zone I (Zone A) then Zone II (Zone B).

Determining the potential for impact of a contaminant source on a drinking water source is related to the properties of the contaminant of concern, the amount that could be released, the distance or travel time of the contaminant and contaminant concentration reduction that can be expected. Some of these factors are represented in a practical way in the rank of significance of the identified contaminant types ranked in the previous section. If the potential or existing potential sources of contamination are considered to be of a high density, their potential impact should be analyzed cummulatively.

One of the more important considerations in the susceptibility analysis is the potential for release of the contaminant of concern. This would include containment measures for stored potential contaminants. Of primary concern is the level of treatment, monitoring and quality assurance of any treatment process before release of a contaminant. This is the purpose of most permitting programs related to water quality and can be a measure of drinking water source susceptibility. If the activity or a contaminant potentially released from that facility or activity is not regulated, susceptibility can be related to the use of best management practices established voluntarily or as accepted practice. The definition of Best Management Practices here is broader then for agriculture and is the combination of practices accepted in the industry or supported by the department to protect surface and groundwater from contamination. This will include pollution prevention measures. Another tool for determining the potential for release of a contaminant is the establishment and implementation of emergency management plans to protect against release.

Susceptibility Analysis of Groundwater Sources to Contamination

The first step is to assess the potential for contamination of the drinking water source if all the contaminant were released from the potential contaminant source without consideration of any source protection (See Flowchart 1). Factors controlling the potential for contamination from a release are the fate and transport of the contaminant, the amount of contaminant of concern that might be released and the time of travel (or distance) to the drinking water source. The relative value for this potential are determined from Matrix A and Matrix B.

Groundwater sources of drinking water have the benefit of a level of protection from contamination relative to their integrity and the vulnerability of their source aquifer. This defines the sensitivity of the groundwater sources to contamination. Factors related to the integrity of the well are the construction standards, depth of the well, pumping rate, and the rate of infiltration and movement of the groundwater. If the aquifer is confined, the drinking water source should be well protected from man-induced contamination. DEP has used a relative ranking of aquifer vulnerability by the DRASTIC method by Aller *et al.* (1987). DRASTIC stands for: **D**epth to ground water, aquifer **R**echarge, **A**quifer media, **S**oil permeability, **T**opography, **I**mpact of the vadose zone, and hydraulic **C**onductivity. The higher the DRASTIC score the more vulnerable the groundwater. Site-specific factors that increase aquifer sensitivity such as sinkholes can be included in the site-specific assessments.

The potential for impact can be assessed by considering the intrinsic sensitivity of the drinking water source Flowchart 2 and the potential for contamination or the value from Matrix B.

The potential for release is determined from the potential for release table and is based upon the following factors:

1 Containment
2 Regulatory control of the potential source of contamination
3 Compliance
4 Best Management Practices &/or Emergency Response Plan

If there is no control on the potential for release of the contaminant, the potential for release would be high.

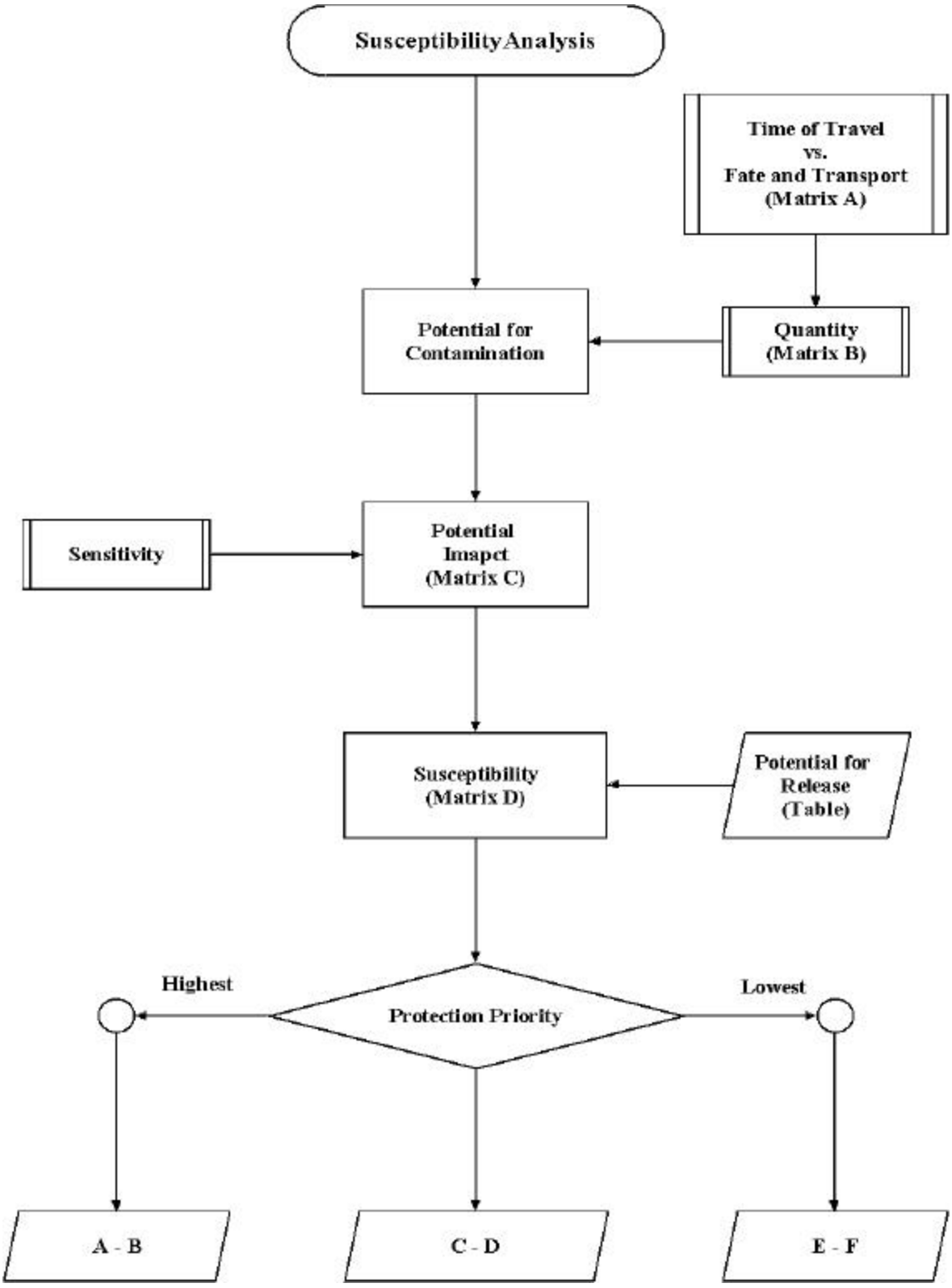
By relating the potential for impact described above to the potential for release, the susceptibility rating is determined from Matrix D. A potential source of contamination with a high potential for impact and a high potential for release would have an high susceptibility rating or priority.

Susceptibility Analysis of Surface Water Sources to Contamination

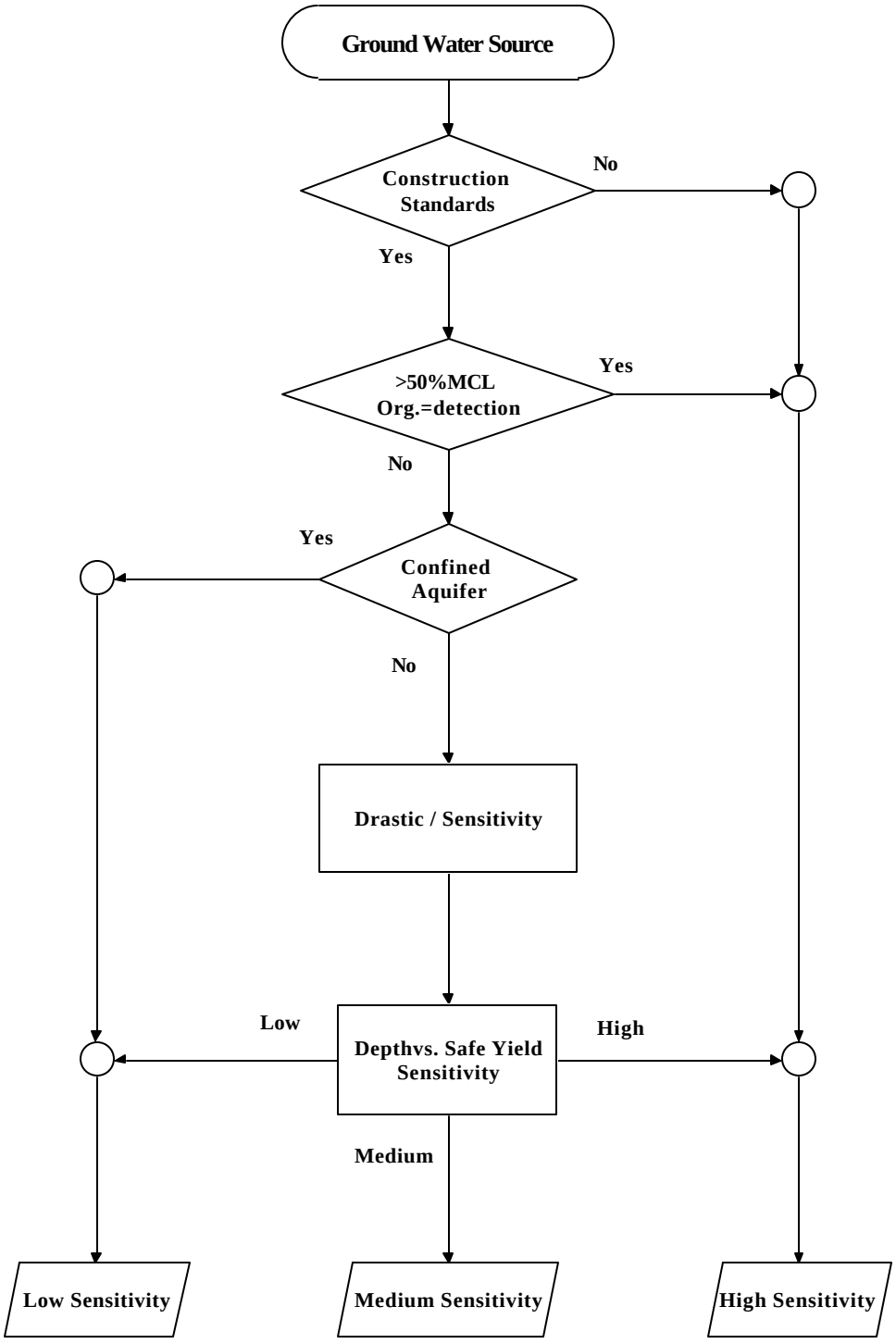
The susceptibility analysis for a surface water source of drinking water would not be substantially different from an analysis of a groundwater source except for the limited protection and resulting high sensitivity of surface water sources to contamination. Large reservoirs with at least a one month detention time at high flows could offer a medium sensitivity to upstream or distant potential sources of contamination.

Flow Chart 1

Susceptibility Analysis



Flow Chart 2
Susceptibility Analysis



Potential for Contamination

Matrix A (Step 1)

Time of Travel (TOT) vs. Fate & Transport (persistence)

\ Persistence TOT \	High	Medium	Low
Short	High	High	Medium
Medium	High	Medium	Low
Long	Medium	Low	Low

Matrix B (Step 2)

Matrix A vs. Quantity

\ Quantity Matrix A Result\	High	Medium	Low
High	High	High	Medium
Medium	High	Medium	Low
Low	Medium	Low	Low

Potential Impact

Matrix C

Potential for Contamination vs. Sensitivity

\ Sensitivity Potential for Contamination \ (from Matrix B)	High	Medium	Low
High	High	High	Medium
Medium	High	Medium	Low
Low	Medium	Low	Low

Potential for Release
Table

Potential for Release Control Practice \	Low	Medium	Medium-High	High
Regulated Containment &/or ERP	X			
Unregulated Containment / no ERP		X		
Regulated Discharge in Compliance			X	
“ “ Not in Compliance				X
NPS w/ Best Management Practices		X		
BMPs Not Operating			X	
No Control Practices				X

(ERP = Emergency Response Plan, NPS = Non-Point Source, BMP = Best Management Practice)

Susceptibility Rating
Matrix D

Potential for Release vs. Potential Impact

\ *Potential Impact* **(from Maxtrix C)** **Pot. For Release \ (from Table)**	**High**	**Medium**	**Low**
High	A	B	C
Medium High	B	C	D
Medium	C	D	E
Low	D	E	F

Distribution and Availability of Source Water Assessments

The source water assessment results must be made available to the public and a summary is to be included in the Annual Consumer Confidence Report prepared by each CWS. DEP is proposing several avenues for presenting the assessment results to the consuming public. Copies of the completed SWAP for CWSs (with maps) will be provided to the CWS, the libraries in communities served by the CWS, local municipalities and planning agencies and the DEP regional offices. For the larger CWSs served primarily by groundwater and the CWSs served by surface water, a presentation will be made by DEP staff to a public meeting in the communities served by the CWS. A summary of the SWAP with a map will be in a GIS format and be available on the DEP web page or by request for a preparation fee. A summary of the SWAP will be provided to the PWS for distribution to consumers, local municipalities and emergency management personnel. An example of Source Water Assessment summary to be developed is in Appendix F.

The final source water assessment and protection report will contain the following:

SOURCE WATER ASSESSMENT REPORT

EXECUTIVE SUMMARY: Overview of the objectives and tasks relative to completing the Source Water Assessment (SWA) report for the target sources. Includes a brief description of the key water quality concerns, conclusions drawn and protection priorities from the study.

1.0 INTRODUCTION

The context for conducting the source water assessment. The focus of SWAP is on maintaining or improving the raw water quality of water sources serving public water supplies. A federal/state/local government partnership approach can work towards assisting the water supplier in protecting their surface or groundwater supplies.

1.1 NEW REQUIREMENTS UNDER THE SAFE DRINKING WATER ACT

This section references requirements for source water assessments through source water assessment area delineation, potential contaminant inventory, susceptibility analysis, and public participation.

2.0 THE DRINKING WATER SYSTEM AND THE WATERSHED

2.1 THE DRINKING WATER SYSTEM

The name of the system as well as the location (include county name). The system's sources including wells, springs, and surface water intakes are described in terms of general construction, yield, and location (include a site map in the Appendix).

2.2 WATERSHED (or WELLHEAD PROTECTION AREA)

A description of the location of the watershed (or general location of the wellhead protection area). Provide the size in square miles of the watershed and relevant hydrologic information. Provide a table of the municipalities with jurisdiction within this area.

2.3 GEOLOGY

A description of the regional and local geology from available Pa.Topographic and Geologic Survey geologic or water resource reports. If a groundwater source, a conceptual flow model should be described. Geology plays an important role in defining the hydrologic system.

2.4 TOPOGRAPHY

A description of the elevation differences and landscape characteristics such as karst terrain within the watershed.

2.5 SOILS

A brief summary of the major soil types in the watershed or wellhead protection area and relationship to source water quality.

2.6 LAND USE

A description of major land uses. Using GIS, each assessment will include a table showing the distribution in percent total of the various land use categories.

2.7 RAW WATER QUALITY

All raw water quality data serving or related to the groundwater or surface water sources will be provided in tables with sample points referenced to a map. The source of this information may be from the water supplier, DEP, the USGS, or from private studies. Such information can highlight water quality concerns and benefit protection efforts in the watershed.

3.0 PUBLIC PARTICIPATION

A description of the public participation in development of the assessment and results of the public meetings. This must include the major topics or decisions rendered during public SWAP meetings and the public's goal of the assessments.

4.0 METHODOLOGY

The components of a source water assessment are discussed in this section.

4.1 DELINEATION OF SOURCE WATER PROTECTION AREA

4.1.1 GROUNDWATER SOURCE

A delineation for a groundwater source includes the calculation of Zones 1, 2, and 3. Describe the methodology used, assumptions made, data used, calculations and results.

4.1.2 SURFACE WATER SOURCE

For a surface water source delineation, include the delineation of Zones A, B, and C as appropriate. Includes a description of the identified critical tributaries.

4.2 CONTAMINANT INVENTORY

4.2.1 CURRENT AND POTENTIAL SOURCES OF WATER QUALITY DEGRADATION

4.2.1.1 POINT SOURCES

Description of singular or discrete sources of potential surface water or groundwater contamination. Discuss effects of high density of potential contaminant point sources.

4.2.1.2 NON-POINT SOURCES

Description of the potential sources of contamination associated with agricultural activities, mining, suburban or urban settings in the wellhead protection area or watershed. Includes discussions of critical areas of concern. Land use maps are useful in identifying areas of probable non-point source discharges.

4.2.2 WATER SUPPLY CONTAMINANT ISSUES

This section discusses major water quality concerns a system may have and how water treatment operations or system maintenance are impacted.

4.3 SUSCEPTIBILITY ANALYSIS

A protection priority of the potential sources of contamination that is determined by utilizing matrices and flow charts referenced in Pennsylvania's Source Water Assessment and Protection Program document as applied to this assessment.

5.0 DISTRIBUTION AND AVAILABILITY OF SOURCE WATER ASSESSMENTS

Contacts and addresses of the locations where the final report are on file. Includes a statement that the summary report is available on DEP's web site (www.dep.state.pa.us).

6.0 SUMMARY

Provides a summary of the findings of the report and a description of available support for development of local, source water protection programs.

APPENDIX – References, Map of SWAP Area, Map of critical areas, Map(s) of potential contaminant sources, Map of susceptibility analysis, Data tables.

Source Water Protection Program

The most important objective for conducting the SWA is to support the development of local, voluntary source water protection programs. DEP's plan includes measures to support and promote development and implementation of these plans. Local source water protection programs for surface water sources will be supported in a similar way to WHP with public education, program promotions, local grants for protection program development and implementation, federal and state agency coordination, and technical assistance. Essentially, the program expands the concept of Wellhead Protection under the Safe Drinking Water Program to all sources of public drinking water. Pennsylvania's program has been actively and successfully assisting the development of local WHP programs for six years through grant programs, technical assistance and public education.

DEP through the BWSM has primary responsibility for regulating PWSs. In addition, DEP has primary authority to regulate most point and non-point source discharges of potential contaminants (see Appendix C). The role of the state in SWP is to provide technical support and guidance to the local governments and the water supply purveyor for the development and implementation of local SWP programs, and to coordinate environmental protection programs with these programs.

New DEP regional staff that have been retained for the SWAP Program have the expertise and are tasked to assist in promotion and development of local SWP programs. Upon initiation and completion of the assessments, this staff will present the relationship of the source water assessment to the local SWP programs and approaches for managing existing and potential sources of contamination. They will also coordinate with existing programs that can address the local concerns and possible funding for development and implementation of the local SWP programs.

Several other organizations are being funded to provide support for local SWP program development and promotion. The League of Women Voters through the Water Resource Education Network will provide training and mini-grants for local coalition building to promote local education and dialogue on the issues of source water protection. Secondly, various groups and projects will be funded to develop educational materials, provide forums for education and promote identified source water protection needs. The educational materials will include fact sheets which water suppliers can distribute to explain to and invite the public to be involved in the Source Water Assessment and Protection Program. Press releases will be developed for the local assessment and protection effort. Education material on the SWAP will be developed to meet public school environmental education standards. A goal of the protection program is to develop radio spots and others mass media vehicles to promote source water protection programs. In addition, the "water supply area" road signs designed and approved for marking the state's WHP areas were also designed to apply to surface water protection areas as well as WHPAs. These markings will be encouraged to be part of any local SWP program.

Groundwater Sources

The primary responsibilities for development and implementation of the WHPP in Pennsylvania is shared between the state, local governments and the PWS. Both government levels may have direct control over potential contaminants, and should be consistent in their administration of these sources and should adhere to the concepts of WHP. In the case of the state government, it has control over many potential contaminants applied or collected on or beside Pennsylvania highways, on state parks and state forest lands, on lands associated with state facilities and on construction and remediation projects conducted by or under contract by the state. Coordination of state groundwater programs and resolution of groundwater issues are provided under the Comprehensive State Groundwater Protection Program (CSGWPP).

To address the issues of numerous municipal governments and multiple jurisdiction for a WHP area, the BWSM has promoted and supported the development of county WHP plans. Since 1993, the BWSM has awarded grants to 16 counties under the County Water Supply Planning/WHP Grant Program for the preparation of water supply and wellhead protection plans. The county plans provide a multiple jurisdictional structure for WHP area delineation, management approaches, contingency planning, new well development and program implementation. Wellhead protection is included as part of water supply planning which may include regionalization and other remedies for small water systems. This grant program is pending revisions that will split in into two separate grants. Funding for county-wise water supply planning will continue, but funding for WHP activities will shift toward local program implementation.

These county plans can serve as models for other counties developing wellhead protection plans or source water protection plans. The programs developed as part of this and other pilot projects also can serve to assist

the development of local WHP Programs. A portion of the funding under Section 1452 of the SDWA is to be used for grants to support the development and implementation of local WHP Programs.

Numerous medium and small PWS have benefited from the support given for local WHP Program development by the Pennsylvania Rural Water Association through their ground water technician and wellhead protection program. DEP is enhancing this program by funding an additional ground water technician. This will realize development of more local WHP Programs and assistance in fully implementing existing programs.

Surface Water Sources

With the assistance of EPA and their contractor, the Cadmus Group, three public water systems are serving as demonstration projects for development of local SWAP programs. They are Chester County Water Authority, Reading Water Authority, and the Allentown City Bureau of Water. Funding for the demonstration projects was provided by the US EPA. Technical assistance to the participating systems is provided by DEP, US EPA, other government agencies, the Cadmus Group, and various non-profit organizations. The outcome of these demonstration projects will provide a variety of watershed management programs that can be applied to other water systems.

In addition, regional approaches are being developed by a project being conducted by the Susquehanna River Basin Commission and funded under Section 1452 of the SDWA. The project will assist and promote in the development of local WMP programs that will serve as pilots for other river basin regions.

As with groundwater based PWS, a portion of the set-aside funds is to be used for grants to support the development and implementation of local watershed management programs.

Implementation of Source Water Assessment and Protection Program

Pennsylvania is requesting an 18-month extension to complete the SWAs as allowed in the statute. There are approximately 14,000 sources serving PWS in the state. Given the funds available under Section 1452 of the SDWA to delineate and assess source water protection areas, there is approximately $380/source for the SWA. With other funding sources allowed under this section, an additional $58/source/year is available for source water assessments. With the new staff added by DEP for the SWAP Program and staff in the BWSM performing related duties such as sanitary surveys, DEP can only complete the proposed program with the extension.

Contracting for SWA for surface water sources will begin in 1999 and all 540 sources will be completed by mid-2003. The GIS analysis for SWA of small groundwater sources is already underway and will be completed by 2001. The approximately 1100 groundwater sources for larger PWSs will be assessed by DEP staff beginning in 1999 and completed in mid 2003.

Pennsylvania has been implementing the WHP program since 1989 and about 160 CWSs that have developed or are developing local WHP Programs. Many of the CWSs with existing local WHP Programs are in this category. The initial effort in 1999 is to complete the assessments by implementing a susceptibility analysis for these systems.

Table 3
Source Water Assessment Timeline – Estimated # of sources to be completed.

QT TYPE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
GW															
≥3300															
WHPP	5	35	40	50	60	50	40	40							320
			20	40	50	60	70	70	100	100	100	100	70		780
<3300															
%CWS				25	25	25	25								2716
%NTNCWS							50	50							1657
%TNCWS								25	25	25	25				7707
SW															
All	4	20	25	35	46	55	55	55	55	55	55	55	25		540

(QT = Quarters of a year from EPA approval of SWAP Plan, GW = groundwater sources, SW = surface water sources, 3300 = population served by system, WHPP = water systems with wellhead protection plans)

DEP will directly coordinate SWAP programs with other state SWAP contacts and through the various river basin commissions. To facilitate consistent approaches on the same body of water, the following commissions have begun development of basin wide SWAP programs in collaboration with the member states including Pennsylvania:

Delaware River Basin Commission
Susquehanna River Basin Commission
Ohio River Sanitation Commission
Interstate Commission on the Potomac River Basin
Great Lakes Commission

DEP will coordinate with neighboring states and the District of Columbia directly by providing readily available data on the sources of public drinking water and source water inventories to the level described in this

document. DEP will work with EPA in coordinating with other states on protection programs, data transfers and program coordination.

Since Pennsylvania has only one PWS using Lake Erie as a drinking water source, this source can be treated as a special case. The assessment approach will be conducted under contract utilizing the assessment protocol being developed by the Great Lakes states and EPA. Likewise, the Philadelphia Water Department utilizes a source designed to capture water from tidal influences in the Delaware. This source a special case and the assessment will be conducted by contract with the water supplies.

DEP will utilize the PA Drinking Water Information System (PADWIS) for reporting progress in completing the SWAs. The data to be included in the report are:

1 The number of PWS by source categories (Groundwater & Surface Water).
2 The number of PWS which have completed delineations, inventories, and & susceptibility determinations.
3 The population served by PWS with completed assessments.
4 How the SWA was made available to the public.

To capture the protection efforts made by local, voluntary programs, DEP will develop a surface water version of the WHP Program Biennial Report. This report includes the PWS progress in completing various levels of the local SWP program.

Assessments will be reviewed and updated in conjunction with the sanitary surveys conducted at regular intervals by DEP staff and the water suppliers. Local coordination between planning agencies, PWS and municipalities will be an important element of local SWP programs. Major changes in the SWA will be distributed in accordance with the original plan. New and emerging rules will be evaluated for analysis and data needs that can be included in the SWA process for full implementation of program flexibility. For example, data gathered during the Surface Water Identification Protocol at NCWS will be applied during the assessment process or in an update to the SWA to allow for flexibility in the pending Groundwater Rule, which may allow for disinfection avoidance for protected groundwater sources serving NCWS.

References

Aller, L., T. Bennett, J. H. Lehr, R. J. Petty, and G Hackett. 1987, *DRASTIC: A standardized system for evaluating ground water pollution potential using hydrogeologic settings.* EPA 600/2-87/035. Ada, OK.

Nizeyimana, E., *et al.,* 1997, *Quantification of NPS Loads Within Pennsylvania Watersheds.* Final Report ER9708 to the PADEP, Bureau of Water Quality Protection, The Pennsylvania State University, Environmental Resources Research Institute. University Park, PA.

Pennsylvania Department of Environmental Protection, Bureau of Water Quality Management, 1996, *Commonwealth of Pennsylvania 1996 Water Quality Assessment (Section 305(b), Federal Clean Water Act):* 94 p.

Petersen, G. W., *et al.,* 1991, *Evaluation of Agricultural Nonpoint Pollution Potential in Pennsylvania Using a Geographic Information System.* Final Report ME89279 to the PADER, Bureau of Soil and Water Conservation. The Pennsylvania State University. Environmental Resources Research Institute. University Park, PA.

Risser, D. W., and Barton, G. J., 1995, *A strategy for delineating the area of ground-water contribution to wells completed in fractured bedrock aquifers in Pennsylvania:* U.S. Geological Survey Water-Resources Investigations Report 95-4033, 30 p.

Risser, D. W., and Madden, Jr., T. M., 1994, *Evaluation of methods for delineating areas that contribute water to wells completed in valley-fill aquifers in Pennsylvania:* U. S. Geological Survey Open-File Report 92-635, 82 p.

U.S. Environmental Protection Agency, 1987, *Guidelines for delineation of wellhead protection areas:* EPA 440/6-87-010, 185 p.

U.S. Environmental Protection Agency, 1997(b), *State Methods for Delineating Source Water Protection Areas for Surface Water Supplied Sources of Drinking Water:* EPA 816-R-97-008, 40 p.

U.S. Environmental Protection Agency, 1997, *State Source Water Assessment and Protection Programs Guidance (Final Guidance):* EPA 816-R-97-009, 246 p.

U.S. Environmental Protection Agency, 1988, *Developing a state wellhead protection program*: EPA 440/6-88-003, 44 p.

U.S. Environmental Protection Agency, 1989, *Wellhead protection programs: tools for local governments:* EPA 440/6-89-002, 50 p.

U.S. Environmental Protection Agency, 1991, *Protecting local ground-water supplies through wellhead protection:* EPA 570/9-91-007, 18 p.

U.S. Environmental Protection Agency, 1996, *Benefits and costs of prevention: case studies of community wellhead protection - Volume 2*: EPA 813-B-95-006, sections paginated separately.

Witten, J., Horsley, S., Jeer, S. and Flanagan, E., 1995, *A guide to wellhead protection*: American Planning Association Planning Advisory Service Report 457/458, 102 p.

APPENDIX A

Advisory Committee Members

Technical Advisory Committee

ORGANIZATION	MEMBER	ALTERNATE
Chester Engineers	James Whitaker, Committee Chair 600 Clubhouse Dr. Moon Township, PA 15108 412-269-5848 412-269-5865 (Fax)	
Environmental Scientist Chesapeake Bay Foundation	Barbara L. Kooser, Committee Vice-Chair 614 N. Front St. Suite G Harrisburg, PA 17101 717-234-5550 717-234-9632 (Fax)	
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Consol, Inc.	Buddy Beach PE Consol Plaza 1800 Washington Rd. Pittsburgh, PA 15241 412-831-4530 412-831-4571 (Fax)	
	Richard M. Boardman 4302 Meadow Crest Road Harrisburg, PA 17112 717-545-3249 717-545-0749 (Fax)	
Duquesne Light Co.	Dale Flaherty PO Box 1930 Pittsburgh, PA 15230-1930 412-605-6162 412-605-6261 (Fax)	
	Paul Hess Ph D 163 Forest Ave. Hershey, PA 17033 717-533-6195 717-533-5925 (Fax)	
Environmental Resources Research Institute	Archie McDonnell Ph D 103 Land & Water Research Bldg. University Park, PA 16082 814-863-0291 814-865-3378 (Fax)	

ORGANIZATION	MEMBER	ALTERNATE
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Critical Path Project Inc.	Kiyoshi Kuromiya 2062 Lombard St. Philadelphia, PA 19146 215-545-2212	
Clean Water Action	Bob Wendelgass 1128 Walnut St. Philadelphia, PA 19107 215-629-4022	

B. Citizens Advisory Committee Members

ORGANIZATION	MEMBER	ALTERNATE
Department of Environmental Protection	James M. Seif Secretary PO Box 2063 16th Floor, Rachel Carson State Office Bldg. Harrisburg, PA 17105-2063 717-787-2814 717-705-4980 (Fax)	Mr. Glenn E. Mauer Director Bureau of Water Quality Protection PO Box 8465 11th Floor, Rachel Carson State Office Bldg. Harrisburg, PA 17105-8465 717-787-2666 717-772-5156 (Fax)
Pennsylvania Rural Water Association	Mr. Stephen Krchnavy Executive Director PA Rural Water Association 138 West Bishop St. Bellefonte, PA 16823 814-353-9302 814-353-9341 (Fax) *Board Vice Chair	Mr. David Quinn White Haven Municipal Authority 50 E. Wood Haven Drive White Haven, PA 18661 717-443-7099 717-443-9784 (Fax)
Pennsylvania Municipal Authorities Association	Mr. Stephen Kerbacher Northampton Borough Municipal Authority P.O. Box 156 1717 Main Street Northampton, PA 18067-0156 610-262-6711 610-262-6796 (Fax)	Ms. Jennifer Case Pennsylvania Municipal Authorities Association 1000 North Front Street, Suite 401 Wormleysburg, PA 17043 717-737-7655 717-737-8431(Fax)
American Water Works Association Pennsylvania Chapter	Mr. Chris Shutt 156 Sweikert Street Williamstown, PA 17098 814-353-9302 717-647-9928 (Fax)	Mr. Dale Kratzer Spotts, Steven & McCoy, Inc. 1402 Independence Drive Reading, PA 19609 610-376-6581 610-376-6950 (Fax)
The Water Works Operators' Association of Pennsylvania	Ms. Serena A. DiMagno DiMagno Associates, Inc. 16-A Park Avenue Hershey, PA 17033 717-534-8544 717-534-8546 (Fax) *Vice Chair for the Education and Training Committee	Mr. David Long David Long Associates 1009 Metz Avenue State College, PA 16801-4125 814-237-2271 814-863-7304 (Fax)

ORGANIZATION	MEMBER	ALTERNATE
Pennsylvania Manufactured Housing Association	Mr. Mike Sienkiewicz Carlisle Pike Associates PO Box 124 Carlisle, PA 17013 717-258-1812 717-249-2407 (Fax)	Ms. Mary T. Gaiski Exec. Vice President, PMHA PO Box 248 New Cumberland, PA 17070 717-774-3440 717-774-5596 (Fax)
Pennsylvania State Association of Township Supervisors	Mr. Elam Herr PA. State Assoc. of Township Supervisors 3001 Gettysburg Road Camp Hill, PA 17011 717-763-0930 717-763-9732 (Fax)	Mr. James Wheeler PA State Assoc. of Township Supervisors 3001 Gettysburg Road Camp Hill, PA 17011 717-763-0930 717-763-9732 (Fax)
Pennsylvania State Association of County Commissioners	Mr. Douglas Hill Executive Director PA State Assoc. of County Commissioners 17 North Front Street Harrisburg, PA 17101 717-232-7554 717-232-2162 (Fax)	VACANT
Pennsylvania Association of Realtors	Mr. Larry Hatter RE/MAX Realty Associates 3425 Market Street Camp Hill, PA 17011 717-761-6300 717-761-1455 (Fax)	Mr. Ronald A. Fitzgerald Century 21 - Grosse & Quade 66 S. County Line Road Souderton, PA 18964 215-723-5594 215-855-5832 (Fax)
Pennsylvania Builders Association	Mr. Roger Zimmer Dauphin Homes 5851 Union Deposit Road Harrisburg, PA 17111 717-657-8479 717-652-2672 (Fax)	Ms. Megan Milford Regulatory Affairs Specialist 600 N. Twelfth St. Lemoyne, PA 17043 717-730-4380 717-730-4396 (Fax)
The League of Women Voters of Pennsylvania	Ms. Betty Conner 2 East High Street Lebanon, PA 17042 717-274-3826 717-228-2403 (Fax) *Vice Chair for the Legislation/Regulation & Policy Review Committee	Ms. Edith D. Stevens RD 1 Cresco, PA 18326 717-839-8130 717-839-7016 (Fax)
Pennsylvania Environmental Council	PA Environmental Council 1211 Chestnut Street Suite 900 Philadelphia, PA 19107 215-563-0250 215-563-0528 (Fax)	Mr. Andrew Johnson Vice-President PA Environmental Council 1211 chestnut Street Suite 900 Philadelphia, PA 19107 215-563-0250 215-563-0528 (Fax)

ORGANIZATION	MEMBER	ALTERNATE
Public Utility Commission	Mr. Stanley Brown Public Utility Commission PO Box 3265 Room 203, North Office Building Harrisburg, PA 17105-3265 717-783-2810 717-783-3458 (Fax)	Ms. Judith A. Koch Carlson Public Utility Commission PO Box 3265 Room 200, North Office Building Harrisburg, PA 17105-3265 717-783-5392 717-787-4193 (Fax) Co-Vice Chair for the Capability Enhancement Committee
Pennsylvania Infrastructure Investment Authority	Mr. Brion Johnson Deputy Executive Director, PENNVEST Keystone Building, Fourth Floor 22 South Third Street Harrisburg, PA 17101 717-783-6798 717-787-0804 (Fax) Co-Vice Chair for the Capability Enhancement Committee & the Ad Hoc Committee	Ms. Vickie Johnson Project Specialist Keystone Building, Fourth Floor 22 South Third Street Harrisburg, PA 17101 717-783-8618 717-787-0804 (Fax)
Sewage Treatment Plant and Water Works Operators Certification Board	Mr. Robert Croker PA American Water Company 800 West Hersheypark Drive Hershey, PA 17033 717-533-3303 717-531-3295 (Fax)	Mr. Melvin Hook 40 Oak Spring Drive Pittsburgh, PA 15238 412-967-0449 412-967-0449 *0 after the tone (Fax)
Center for Rural Pennsylvania	Mr. Barry L. Denk, Director Center for Rural Pennsylvania 212 Locust Street, Suite 604 Harrisburg, PA 17101 717-787-9777 717-772-3587 (Fax)	Mr. Bruce Wilkins Research Analyst 212 Locust Street, Suite 604 Harrisburg, PA 17101 717-787-9555 717-772-3587 (Fax)
Rural Housing Improvement, Inc.	Mr. Donald Schwartz Senior Water Resources Specialist Northeast RCAP Old City Hall Building 454 Pine Street Williamsport, PA 17701 717-321-7375 717-321-7375 *51 after the tone (Fax) *Board Chair	Mr. James Kello Water Resources Specialist Northeast RCAP Old City Hall Building 454 Pine Street Williamsport, PA 17701 717-321-7195 717-321-7375 *51 after the tone (Fax)

ORGANIZATION	MEMBER	ALTERNATE
Office of Consumer Advocate	Ms. Christine Maloni Hoover Assistant Consumer Advocate Office of Consumer Advocate 555 Walnut Street 5th Floor Forum Place Harrisburg, PA 17101-1923 717-783-5048 717-783-7152 (Fax)	Ms. Marilyn Kraus Senior Regulatory Analyst Office of Consumer Advocate 555 Walnut Street 5th Floor Forum Place Harrisburg, PA 17101-1923 717-783-5048 717-783-7152 (Fax)
	Kim Benjamin Bradford City Water Authority 28 Kennedy St. Bradford, PA 16701 814-362-3004 814-362-3811 (Fax)	
	Cory Miller University Area Joint Authority 1576 Spring Valley Road State College, PA 16801 814-238-5361 814-238-1531 (Fax)	
	Gabrielle Giddings Clean Water Action 1128 Walnut St., Suite 300 Philadelphia, PA 19107 215-629-4022 215-629-3973 (Fax)	
	Nancy Wimmer CanPLAN (Cancer Patient Legal Advocacy Network) PO Box Merion, PA 19066 610-668-4255 610-668-4295 (Fax)	
	Kathie Shelly Rescue RR #1 Box 25 Thompson, PA 18465 717-756-2429	
	Ron Freed Conodoguinet Creek Watershed Association 421 Grahams Woods Road Carlisle, PA 17013 717-243-8081 717-241-2175 (Fax)	
	Eric Young We the People Living with HIV/AIDS 425 S. Broad St. Philadelphia, PA 19147 215-545-6868	

APPENDIX B

Available and Developing GIS Data for Assessments

Coverage	Scale	Avail.	From
Public Water Systems - Groundwater Sources	1:24,000	y	DEP/BWSM
Public Water Systems - Surface Water Sources	1:24,000	y	DEP/BWSM
Public Water Systems - Treatment Facilities	1:24,000	y	DEP/BWSM
Public Water Systems - Entry Points	1:24,000	y	DEP/BWSM
Public Water Systems - Storage Facilities	1:24,000	y	DEP/BWSM
Public Water Systems - Service Areas (>50K pop.	1:24,000	y	DEP/BWSM
Public Water Systems - Wellhead Protection Areas (Default	1:24,000	y	DEP/BWSM
Public Water Systems - Wellhead Protection Areas (Rigorous)	1:24,000	p	DEP/BWSM
Public Water Systems - Watersheds from PWS Intakes	1:24,000	p	DEP/ERRI
Agricultural DRASTIC	1:250,000	y	ERRI/DEP
7.5 Quadrangle Boundaries	1:24,000	y	DEP/ERRI
Streams (corrected w/attributes)	1:24,000	p	DEP/ERRI
Streams	1:100,000	y	DEP/ERRI
Roads	1:24,000	y	DEP/ERRI
Railroads		y	DEP/ERRI
Small watersheds - 14 digit HUC code		y	USGS/PASDA
Agricultural DRASTIC		y	DEP/ERRI
Land Use	30 m	y	DEP/ERRI
Soils (State)		y	DEP/ERRI
Soils (county)		p	DEP/ERRI
Surface Geology		y	DEP/ERRI
Physiographic provinces		y	DCNR/DEP
Terrabyte (LandSat derived land cover		y	DEP/ERRI
Minor Civil Divisions		y	DEP/ERRI
State & County Boundaries		y	DEP/ERRI
Voting Districts		Y	DEP/
Census Tract		y	DEP/ERRI
Census Bloc		y	ERRI
PA Digital Elevation Model		y	USGS
PA Digital Raster Graphics (7.5' quads)		y	USGS
PA Orthophotos		p	USGS
Surface Water gaging stations		y	USGS
Floodplains		y	DEP/ERRI
Dams		y	DCNR/ERRI
State Parks		y	DCNR/ERRI
State Forests		y	DCNR/ERRI
PCS - NPDES points		y	EPA/ DEP
Toxic Release Inventory (TRI)		y	EPA/ DEP
STORET - gw & sw WQ Monitoring Points		y	DEP
Agr. Census data by Zip code		y	ERRI/DEP
Septic Systems by Zip code		y	ERRI/DEP
Depth to groundwater	1:250,000	y	ERRI/DEP
National Wetland Inventory (DLGs)	1:24,000	y	US FWS
Act 2 Sites		p	DEP
Storage Tanks with releases (by municipality)		y	DEP
Hazardous waste sites		u	DEP

y = yes, n = no, p = partially complete, u = under development
DEP = PA Dept. of Env. Prot., ERRI = Env. Res. Research Inst., USGS = US Geological Survey
US FWS = US Fish & Wildlife Service, DCNR = PA Dept. of Consv. & Natural Res.

Coverage	Scale	Avail.	From
Wastewater Act 537 Municipal Sewage Planning		u	DEP
Abandoned Mines		p	DEP
Acid Mine Drainage sites		p	DEP
Anthracite Mines		p	DEP
Areas Unsuitable for Mining		p	DEP
Bituminous Mining		p	DEP
Deep Mines		p	DEP
Oil & Natural Gas Wells		y	DEP
Cemeteries		u	
Golf Courses		u	
Nuclear Power Plants		p	DEP
Sinkholes		p	DCNR

y = yes, n = no, p = partially complete, u = under development
DEP = PA Dept. of Env. Prot., ERRI = Env. Res. Research Inst., USGS = US Geological Survey
US FWS = US Fish & Wildlife Service, DCNR = PA Dept. of Consv. & Natural Res.

APPENDIX C
Water Program With Activities and Jurisdiction Related to SWAP

BUREAU	WATER MANAGEMENT ACTIVITY	STATUTORY AND REGULATORY CITATIONS
WATER QUALITY PROTECTION	On-lot sewage disposal systems Permitting of Pt source discharges Land disposal/treatment of nonhazardous wastes Industrial and sewage waste impoundments; response to pollution incidents Underground injection of nonhazardous wastes; discharges to dry swales Nutrient Management; CAFOs Wetlands	The Clean Streams Law of PA; the PA Sewage Facilities Act; 25 Pa. Code Chapters 71-73 The Clean Streams Law of PA The Clean Streams Law of PA; 25 Pa. Code Chapter 101 The Clean Streams Law of PA; 25 Pa. Code Chapter 97; Clean Water Act The Nutrient Management Act; 25 Pa. Code Chapter 83; Clean Streams Law of PA. Dam Safety and Encroachments Act; 25 Pa. Code Chapter 105; Clean Water Act, Section 404
WATERWAYS ENGINEERING	Encroachment and Obstruction, Dam Safety, Chesapeake Bay, E&S Control	Dam Safety and Encroachments Act; 25 Pa. Code Chapter 105; Clean Water Act, Section 401, Flood Plain Management Act, Limited Power Act, Clean Stream Laws, the Nutrient Management Act; 25 Pa. Code Chapter 83; 25 Pa. Code Chapter 102
WATERSHED CONSERVATION	Underground Storage Tanks/Above Ground Storage Tanks Nonpoint Source Programs including Chesapeake Bay, Delaware Estuary, Coastal Zone Management, Section 319-NPS Implementation, E&S Control, and Stormwater Management Watershed Management/Assessment/ Standards/ Great Lakes Initiative/Surface water quality monitoring	Act 32 (Storage Tank and Spill Prevention Act); 25 Pa. Code Chapter 245 The Clean Streams Law of PA; the Nutrient Management Act; 25 Pa. Code Chapter 83; 25 Pa. Code Chapter 102; Federal Clean Water Act; Act 167 (Stormwater Management Act); Coastal Zone Act Reauthorizaton Amendments The Clean Streams Law of PA; 25 Pa. Code Chapters 16, 93; Clean Water Act

BUREAU	WATER MANAGEMENT ACTIVITY	STATUTORY AND REGULATORY CITATIONS
WATER SUPPLY MANAGEMENT	Regulates and monitors public surface and groundwater supplies; Wellhead Protection Program, groundwater quality monitoring, groundwater quality protection program	Fed. Safe Drinking Water Act of 1974 and amendments, PA Safe Drinking Water Act, The Clean Streams Law of PA; 25 Pa. Code Chapter 109
LAND RECYCLING AND WASTE MANAGEMENT	Municipal and Residual Waste Management facilities Hazardous Waste Management facilities Hazardous Site Cleanup Program Land Recycling Program Multi-Site Remediation Agreements Program Storage Tank Cleanup Program	PA Solid Waste Management Act; PA Municipal Waste Planning, Recycling & Waste Reduction Act; 25 Pa. Code Chapters 271-285; 287-299. 25 Pa. Code Chapters 260-270 PA Hazardous Sites Cleanup Act (Act 108 of 1988) PA Land Recycling and Environmental Remediation Standards Act (Act 2 of 1995); The Clean Streams Law of PA; RCRA; The Storage Tank and Spill Prevention Act; 40 CFR Part 280; 25 Pa. Code Chapter 245; Act 2 of 1995
MINING AND RECLAMATION	Surface mining of coal and noncoal, underground mining operations, coal prep plants, coal refuse disposal	Surface Mining Conservation and Reclamation Act; Non-coal Surface Mining Conservation and Reclamation Act, Bituminous Mine Subsidence and Land Conservation Act, Coal Refuse Disposal Act, 25 Pa. Code Chapters 77 and 86-90; The Clean Streams Law of Pennsylvania
OIL AND GAS MANAGEMENT	Regulates oil and gas wells and brine disposal	The Oil and Gas Act, the Coal and Gas Resource Coordination Act, the Oil and Gas Conservation Law, the Clean Streams Law of PA, and the PA Solid Waste Management Act, 25 Pa. Code Chapters 78, 79, & 97
RADIATION PROTECTION	Low Level Radioactive Waste Program	Low Level Radioactive Waste Disposal Act of 1980, 1985 amendments; Radiation Protection Act; Appalachian States Low Level Radioactive Waste Compact Act

BUREAU	WATER MANAGEMENT ACTIVITY	STATUTORY AND REGULATORY CITATIONS
TOPOGRAPHIC AND GEOLOGIC SURVEY	Performs groundwater surveys and prepares reports of findings, oversees the Water Well Drillers License Program, maintains an inventory of water wells drilled in PA, and responds to well abandonment concerns	The Water Well Drillers License Act 17; 25 Pa. Code Chapter 47
DEPARTMENT OF AGRICULTURE	Responsible for developing Pesticide State Management Plans	Federal Insecticide Fungicide and Rodenticide Act
OFFICE OF POLLUTION PREVENTION AND COMPLIANCE ASSISTANCE	Provides site visit service to assist in the prevention of pollution by identifying ways the regulated industries can reduce or eliminate the creation of pollutants through more efficient use of water, raw materials, energy and other resources	Voluntary initiative

APPENDIX D
Contaminants for Source Water Assessments

Volatile Organic Chemicals (VOCs):

Benzene	0.005 mg/L	Styrene	0.1 mg/L
Carbon Tetrachloride	0.005 mg/L	Tetrachloroethylene	0.005 mg/L
o-Dichlorobenzene	0.6 mg/L	Toluene	1 mg/L
para-Dichlorobenzene	0.075 mg/L	1,2,4-Trichlorobenzene	0.07 mg/L
1,2-Dichloroethane	0.005 mg/L	1,1,1-Trichloroethane	0.2 mg/L
1,1-Dichloroethylene	0.007 mg/L	1,1,2-Trichloroethane	0.005 mg/L
cis-1,2-Dichloroethylene	0.07 mg/L	Trichloroethylene	0.005 mg/L
trans-1,2-Dichloroethylene	0.1 mg/L	Vinyl Chloride	0.002 mg/L
Dichloromethane	0.005 mg/L	Xylenes (Total)	10 mg/L
1,2-Dichloropropane	0.005 mg/L		
Ethylbenzene	0.7 mg/L		
Monochlorobenzene	0.1 mg/L		

Synthetic Organic Chemicals (SOCs):

Alachlor	0.002 mg/L	Glyphosate	0.7 mg/L
Acrylamide	treatment	Heptachlor	0.0004 mg/L
Atrazine	0.003 mg/L	Heptachlor Epoxide	0.0002 mg/L
Benzo(a)pyrene	0.0002 mg/L	Hexachlorobenzene	0.001 mg/L
Carbofuran	0.04 mg/L	Hexachlorocyclopentadiene	0.05 mg/L
Chlordane	0.002 mg/L	Lindane	0.0002 mg/L
2,4-D	0.07 mg/L	Methoxychlor	0.04 mg/L
Dalapon	0.2 mg/L	Oxamyl (Vydate)	0.2 mg/L
Dibromochloropropane (DBCP)	0.0002 mg/L	PCBs	0.0005 mg/L
Di(2-Ethylhexyl) Adipate	0.4 mg/L	Pentachlorophenol	0.001 mg/L
Di(2-Ethylhexyl) Phthalate	0.006 mg/L	Picloram	0.5 mg/L
Dinoseb	0.007 mg/L	Simazine	0.004 mg/L
Diquat	0.02 mg/L	2,3,7,8-TCDD (Dioxin)	0.00000003 mg/L
Endothall	0.1 mg/L	Toxaphene	0.003 mg/L
Endrin	0.002 mg/L	2,4,5-TP (Silvex)	0.05 mg/L
Ethylene Dibromide (EDB)	0.00005 mg/L		

Total Trihalomethanes (TTHMs):

Total Trihalomethanes (chloroform, chlorodibromomethane, bromoform & bromodichloromethane)	0.1 mg/L

PRIMARY CONTAMINANTS

Inorganic Chemicals (IOCs):

Antimony	0.006 mg/L	Fluoride	2 mg/L
Arsenic	0.05 mg/L	Lead	treatment
Asbestos	7 million fibers/L	Mercury	0.002 mg/L
Barium	2 mg/L	Nitrate (as Nitrogen)	10 mg/L
Beryllium	0.004 mg/L	Nitrite (as Nitrogen)	1 mg/L
Cadmium	0.005 mg/L	Nitrate + Nitrite (as Nitrogen)	10 mg/L
Chromium	0.1 mg/L	Selenium	0.05 mg/L
Copper	treatment	Thallium	0.002 mg/L
Cyanide (free CN)	0.2 mg/L		

Radionuclides:

Gross Alpha *	15 pCi/L	Beta Particle & Photon Activity **	4 mrem/yr
Combined Radium (226 + 228)	5 pCi/L		

* Gross Alpha MCL excludes Radon and Uranium particle activity.
** Beta Particle & Photon Activity MCL is for man-made radionuclides.

Microbiological Contaminants:

Presence or absence of total coliforms based on	
Number or percentage of total coliform positive samples/month	Or Fecal coliform or E. coli positive routine or check samples.

Turbidity:

Turbidity	1 NTU
(applicable only to unfiltered surface water sources)	

SECONDARY CONTAMINANTS

Aluminum	0.2 mg/L	Odor	3 T.O.N.
Chloride	250 mg/L	pH (reasonable goal) ***	6.5 - 8.5
Color	15 color units	Silver	0.1 mg/L
Corrosivity	non-corrosive	Sulfate	250 mg/L
Foaming Agents	0.5 mg/L	Total Dissolved Solids	500 mg/L
Iron	0.3 mg/L	Zinc	5 mg/L
Manganese	0.05 mg/L		

*** The pH MCL represents a "reasonable goal for drinking water quality.";
mg/L = milligrams per liter = parts per million;
um = micrometers;
T.O.N. = threshold odor number
pCi/L = picocuries per liter (particle activity);
mrem/yr = millirems/yr (annual dose equivalent).

NTU = nepholene turbidity units

Aldicarb

Aldicarb Sulfone
Aldicarb Sulfoxide
Aldrin
Bromobenzene
Bromodichloromethane
Bormoform
Bromomethan
Butchlor
Carbaryl
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
o-Chlorotoluene
p-Chlorotolune
Dibromomethane
m-Dichlorobenzene
1,1-Dichloroethane
1,3-Dichloropropane
2,2-Dichloropropane
1,1-Dichloropropene
1,3-Dichloropropene
Dieldrin
Dicamba
3-Hydroxycarbonfuran
p-Isopropyltoluene
Metachlor
Methomyl
Metribuzin
Propachlor
Sulfate
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
1,2,3-Trichloropropane

Monitoring for the following compounds is required at the discretion of the state:

Bromochloromethane
n-Butylbenzene
sec-Butylbenzene
tert-Butylbenzene
Dichlorodiflouromethane
Flourotrichloromethane
Hexachlorobutadiene
Isopropylbenzene
p-Isopropyltoluene
Naphthalene
n-Propylbenzene
1,2,3-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene

(Source: Environmental Protection Agency, Office of Water, State Reporting Guidance for Unregulated Contaminant Monitoring. EPA-812-B-94-001. August 1994)

THE SAFE DRINKING WATER CONTAMINANT CANDIDATE LIST

Chemical Contaminants	CASRN	Chemical Contaminants	CASRN
1,1,2,2-tetrachloroethane	79-34-5	Manganese	7439-96-5
1,2,4-trimethylbenzene	95-63-6	Methyl bromide	74-83-9
1,1-dichloroethane	75-34-3	Metolachlor	51218-45-2
1,1-dichloropropene	563-58-6	Metribuzin	21087-6409
1,2-diphenylhydrazine	122-66-7	Molinate	2212-67-1
1,3-dichloropropane	142-28-9	MTBE	1634-04-4
1,3-Dichloropropene	542-75-6	Naphthalene	91-20-3
2,4,6-trichlorophenol	88-06-2	Nitrobenzene	98-95-3
2,2,-dichloropropane	594-20-7	Organotins	N/A
2,4-dichlorophenol	120-83-2	Perchlorate	N/A
2,4-dinitrophenol	51-28-5	Prometon	1610-18-0
2,4-dinitrotoluene	121-14-2	RDX	121-82-4
2,6-dinitrotoluene	606-20-2	Sodium	7440-23-5
2-methyl-Phenol	95-48-7	Sulfate	14808-79-8
Acetochlor	34256-82-1	Terbacil	5902-51-2
Alachlor ESA and other degradation products of acetanilide pesticides	N/A	Terbufos	13071-79-9
Aldrin	309-00-2	Triazine & degradation products (including, but no limited to Cyanazine, and atrazine-desethyl)	
Aluminum	7429-90-5	Vanadium	7440-62-2
Boron	7440-42-8		
Bromobenzene	108-86-1	**Microbiological Contaminants**	
DCPA mono-acid degradate	887-54-7	Acanthamoeba (guidance expected for contact lens wearers)	
DCPA di-acid degradate	2136-79-0	Adenoviruses	
DDE	72-55-9	Aeromonas hydrophila	
Diazinon	333-41-5	Cyanobacteria (Blue-green algae), other freshwater algae, and their toxins	
Dieldrin	60-57-1	Caliciviruses	

Disulfoton	298-04-4	Coxsackieviruses
Diuron	330-54-1	Echoviruses
EPTC	759-94-4	Helicobacter pylori
Fonofos	944-22-9	Microsporidia (Enterocytozoon & Septata)
Hexachlorobutadiene	87-68-3	Mycobacterium avium intracellulare (MAC)
p-Isopropyltoluene	99-87-6	
Linuron	330-55-2	

CONTAMINANTS WITH HEALTH ADVISORIES AND CANCER RISK NUMBERS

Chemical (CAS Number)	Qualifer
Radium 226 7440-14-4	Proposed MCL
Radium 228 7440-14-4	Proposed MCL
Sulfate 14808-79-9	Proposed MCL
Uranium 7440-61-1	Proposed MCL
Aldicarb[a] 116-06-3	Lifetime HA
Aldicarb Sulfone[a] 1646-88-4	Lifetime HA
Aldicarb Sulfoxide[a] 1646-87-3	Lifetime HA
Ametryn 834-12-8	Lifetime HA
Ammonia 7664-41-7	Lifetime HA
Ammonium Sulfamate 7773-06-6	Lifetime HA
Baygon 114-26-1	Lifetime HA
Bentazon 25057-89-0	Lifetime HA
Boron 7440-42-8	Lifetime HA
Bromacil 314-40-9	Lifetime HA
Bromochloromethane 74-97-5	Lifetime HA
Bromomethane 74-83-9	Lifetime HA
Butylate 2008-41-5	Lifetime HA
Carbaryl 63-25-2	Lifetime HA
Carboxin 5234-68-4	Lifetime HA
Chloral hydrate 302-17-0	Lifetime HA
Chloramben 133-90-4	Lifetime HA
Bis-2-Chloroisopropyl Ether 108-60-1	Lifetime HA
Chloromethane 74-87-3	Lifetime HA
2-Chlorophenol 95-57-8	Lifetime HA
o-Chlorotoluene 95-49-8	Lifetime HA
p-Chlorotoluene 106-43-4	Lifetime HA

Chemical (CAS Number)	Qualifer
Chlorpyrifos (Dursban) 2921-88-2	Lifetime HA
Cyanazine 21725-46-2	Lifetime HA
Dacthal (DCPA) 1861-32-1	Lifetime HA
Diazinon 333-41-5	Lifetime HA
Dibromoacetonitrile 3252-43-5	Lifetime HA
Dicamba 1918-00-0	Lifetime HA
Dichloroacetonitrile 2018-12-0	Lifetime HA
Dichlorodifluoromethane 75-71-8	Lifetime HA
2,4-Dichlorophenol 120-83-2	Lifetime HA
Diethyl phthalate 84-66-2	Lifetime HA
Diisopropyl methylphosphonate 1445-75-6	Lifetime HA
Dimethrin 67239-16-1	Lifetime HA
Dimethyl methylphosphonate 756-79-6	Lifetime HA
1,3-Dinitrobenzene 99-65-0	Lifetime HA
Diphenamid 957-51-7	Lifetime HA
Diphenylamine 122-39-04	Lifetime HA
Disulfoton 298-04-4	Lifetime HA
1,2-Dithiane 505-29-3	Lifetime HA
Diuron 330-54-1	Lifetime HA
Ethylene glycol 107-21-1	Lifetime HA
Fenamiphos 22224-92-6	Lifetime HA
Flurmeturon 2164-17-2	Lifetime HA
Flurortrichloromethane (Freon 11) 75-69-4	Lifetime HA
Fonofos 944-22-9	Lifetime HA
Formaldehyde 50-00-0	Lifetime HA
Hexachlorobutadiene 87-68-3	Lifetime HA
Hexachloroethane 67-72-1	Lifetime HA
Hexazinone 51235-04-2	Lifetime HA

Chemical (CAS Number)	Qualifer
HMX 2691-41-0	Lifetime HA
Isophorone 78-59-1	Lifetime HA
Isopropyl methylphosphonate 6838-92-3	Lifetime HA
Malathion 121-75-5	Lifetime HA
Maleic Hydrazide 123-33-1	Lifetime HA
Methomyl 16752-77-5	Lifetime HA
Methylchlorophenoxyacetic acid (MCPA) 94-74-6	Lifetime HA
Methyl parathion 298-00-0	Lifetime HA
Methyl tert-butyl ether (MtBE) 1634-04-4	Lifetime HA
Metolachlor 51218-45-2	Lifetime HA
Metribuzin 21087-64-9	Lifetime HA
Mollllllybdenum 7439-98-7	Lifetime HA
Maphthalene 91-20-3	Lifetime HA
Nickel 7440-02-0	Lifetime HA
Nitroguanidine 556-88-7	Lifetime HA
p-Nitrophenol 100-27-1	Lifetime HA
Paraquat 1910-42-5	Lifetime HA
Phenol 108-95-2	Lifetime HA
Prometon 1610-18-0	Lifetime HA
Pronamide 23950-58-5	Lifetime HA
Propachlor 1918-16-7	Lifetime HA
Propazine 139-40-2	Lifetime HA
Propham 122-42-9	Lifetime HA
RDX 121-82-4	Lifetime HA
Silver 7440-22-4	Lifetime HA
Sodium 7440-23-5	Lifetime HA
Strontium 7440-24-6	Lifetime HA
Tebuthiuron 34014-18-1	Lifetime HA

Chemical (CAS Number)	Qualifer
Terbacil 5902-51-2	Lifetime HA
Terbufos 13071-79-9	Lifetime HA
1,1,1,2-Tetrachloroethane 630-20-6	Lifetime HA
1,3,5-Trichlorobenzene 180-70-3	Lifetime HA
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T) 93-76-5	Lifetime HA
Trifluralin 1582-09-8	Lifetime HA
Trinitroglycerol 55-63-0	Lifetime HA
2,4,6-Trinitrotoluene 118-96-7	Lifetime HA
White Phosphorus 7723-14-0	Lifetime HA
Zinc 7440-66-6	Lifetime HA
Acifluorfen 5094-66-6	Cancer Risk Number
Acrylonitrile 107-13-1	Cancer Risk Number
Aldrin 309-00-2	Cancer Risk Number
Chlorothalonil 1897-45-6	Cancer Risk Number
1,3-Dichloropropene 542-75-6	Cancer Risk Number
Dieldrin 60-57-1	Cancer Risk Number
2,4-Dinitrotoluene 121-14-2	Cancer Risk Number
2,6-Dinitrotoluene 606-20-2	Cancer Risk Number
p-Dioxane 123-91-1	Cancer Risk Number
Ethylene Thiourea 96-45-7	Cancer Risk Number
Radon 222 14859-67-7	Cancer Risk Number
2,4,6-Trichlorophenol 88-06-2	Cancer Risk Number
1,2,3-Trichloropropane 96-18-4	Cancer Risk Number

APPENDIX E
Potential Contaminant Source Impact Table

The following table is a guide to the potential contaminants associated with particular activities. The activities are grouped by land use categories. These categories include agriculture, commercial, industrial, residential and miscellaneous. In most instances, the potential contaminants are for groundwater and surface water, although for some activities, the threat to one medium (ground water or surface water) might be more of a concern. Also, the potential contaminants for an activity may not be limited to those listed. Often the potential contaminant depends on the specific chemicals and processes being used in the activity.

ABBREVIATIONS FOR POTENTIAL CONTAMINANTS

MP	Microbiological Pathogens: Total/Fecal Coliform, Viruses, Protozoa
NN	Nitrate / Nitrite
VOC	Volatile Organic Compounds
HM	Heavy Metals
M	Metals
SOC	Synthetic Organic Compounds
T	Turbidity
D	Disinfection by product precursors
TO	Taste & Odor precursors
R	Radionuclides (anthropogenic)
PH	Petroleum Hydrocarbons

AGRICULTURAL	**Potential Contaminant**
Animal feedlots	MP, NN, SOC, M
Dairy farms	MP, SOC, NN,
Fertilizer storage or use	SOC, NN
Manure-spreading or storage	MP, NN
Pesticide storage or use	SOC
Silviculture	T, SOC
Slaughterhouses	MP, NN

COMMERCIAL	Potential Contaminant
Airports	VOC, M, HM, PH
Auto repair shops	VOC, HM, PH, M
Bus and Truck terminals	VOC, HM, SOC, PH
Construction areas	VOC, HM, M
Car washes	T, M
Dry cleaners	VOC
Funeral homes	VOC, SOC, MP
Furniture Refinishing	HM, VOC,
Gas/service stations	VOC, PH, M
Golf courses	SOC, NN, T, HM, M
Junk yards	VOC, HM, M, PH
Laundromats	T
Lumber yards	VOC, HM
Medical facilities	VOC, HM, M, SOC, R
On-lot Wastewater Disposal	MP, NN
Paint shops	VOC, HM
Photo processors	VOC, SOC, HM
Printer and Blueprint shops	VOC, SOC, HM,
Railroad tracks and Yards	VOC, SOC, HM, PH
Repair shops(engine, appliances, etc.)	VOC, HM, PH
Research laboratories	VOC, SOC, HM, M
Rust proofers	HM, VOC
Sand and gravel mining/ washing	T, M, VOC, HM

INDUSTRIAL	Potential Contaminant
Asphalt, Coal tar, and Concrete plants	VOC, PH
Chemical manufacture	VOC, SOC, HM, M
Deep Coal Mining	HM, M, T,
Deep Non-coal Mining	M, HM, T
Electronics manufacture	VOC, SOC, HM, M
Electroplaters	VOC, SOC, HM, M
Food processors	HM, VOC, M,
Foundries or Metal fabricators	HM, VOC, PH
Fuel oil distributors	PH, VOC
Hazardous materials storage, treatment and recycling	VOC, SOC
Industrial lagoons and pits	VOC, HM, M
Industrial parks	VOC, SOC, HM, M, PH, O
Jewelry or Metalplating	VOC, HM, M, SOC,
Machine/metalworking shops	VOC, HM, M, SOC
Metal & Drum reconditioning	VOC, HM, M, SOC
Oil and gas wells/production	M, PH, VOC
Oil Refineries	VOC, PH, HM, M
Plastics Manufacturing	PH, VOC, SOC, HM
Power plants	HM, M
RCRA facilities	VOC, SOC
Storage facilities (petroleum and chemical)	VOC, SOC, PH
Surface Coal Mining	T, M, HM
Surface Non-coal Mining	T, M, HM
Tanneries	HM, M, VOC
Wood preserving facilities	SOC, HM
Quarries	T, M, VOC, HM

RESIDENTIAL	Potential Contaminant
Fuel oil storage	VOC, PH
Household hazardous materials	VOC, SOC
Lawn care	SOC, NN, M
On-lot waste disposal	MP, NN
Swimming Pools	VOC

MISCELLANEOUS	Potential Contaminant
Aboveground storage tanks	VOC, PH
Air Pollution/local sources	N, VOC, M
Aquatic animal production	MP, NN
Combined sewer outfalls	VOC, SOC, MP, NN, HM, TO
Composting facilities	TO
Dredge disposal	T, VOC, SOC, M, HM
Drinking water treatment plants	M, T
Fire training facilities	VOC, PH, M, HM
Boating yards and marinas	PH, VOC, SOC
Landfills and Dumps	VOC, HM, SOC, NN, MP, M
Land application of sewage sludge	MP, NN, M, HM
Large quantity hazardous waste generators	VOC, SOC, HM
Military facilities (past and present)	VOC, SOC, HM, R, PH
NPDES locations	MP, NN, HM
Pipelines - petroleum	VOC, PH
Pipelines - sewer	MP, NN, T
Recycling or Reduction facilities	VOC
River barges / shipping	VOC, SOC, PH
Road and Maintenance depots	VOC, SOC, M
Road Salt Storage	M
Small quantity hazardous waste generators	VOC, SOC, HM
Snow dumps	M, T
Stormwater facilities	T, VOC, SOC, NN, M
Transportation corridors	SOC, M, T
Underground petroleum storage tank	VOC
Utility substation	SOC, VOC, HM
Waste incinerators	HM, VOC, SOC
Wastewater treatment plants	D, MP, NN, VOC, SOC, M
Road deicing	M
Abandoned wells	SOC, VOC
Wells/Borehole drilling	SOC, VOC, M, T

APPENDIX F
Example of Source Water Assessment Summary for Surface Water

Source Water Assessment Public Summary
Reading Water Authority
December 1998

Introduction

The Pennsylvania Department of Environmental Protection (DEP), Bureau of Water Supply Management, is completing assessments of the contaminant threats to the raw water quality of all public drinking water sources as required by the 1996 Safe Drinking Water Act. DEP has prepared this *Source Water Assessment Public Summary* to provide information to support local and state efforts to protect the raw water quality of Reading Water Authority's drinking water source. The information in this assessment pertains to the watershed that provides water to the Reading Water Authority which is then treated for drinking water use. The assessment is of "source" (river water) rather than "tap" water. Information on "tap" water quality is available in Reading Water Authority's *Annual Water Supply Report* that can be obtained by calling 610-655-6253.

What is the Source of Your Drinking Water?

The source of water for the Reading Water Authority is surface water from Lake Ontelaunee, which is fed primarily by Maiden Creek (see attached map). An average of 14 million gallons of water is withdrawn from the reservoir per day. The water system serves a population of approximately 86,000 customers. The location of the Authority's water supply intake is located at the Lake Ontelaunee dam as shown on the attached map. The map also depicts the boundaries of the watershed that is composed of 127,318 acres covering parts of Berks, Lehigh, and Schuykill counties. Maiden Creek is the largest stream in the watershed and is fed by Sacony Creek as well as numerous smaller tributaries. Approximately 39percent of the watershed is forested, 48 percent is used for agriculture (pasture and row crops), 1% of the area is developed for residential, commercial or industrial uses, and the remaining 2% is wetlands and water (lakes). There are approximately 23,000 people living within the watershed.

Water Quality and Water Treatment Information

Water withdrawn from Lake Ontelaunee is filtered and disinfected with chlorine prior to distribution to customers. Water quality testing performed by the Reading Water Authority indicated that results of tap water sampling done in 1997 were acceptable.

For further information regarding the quality of the system's finished (tap) water, please refer to the Annual Water Supply Report.

Evaluation of Significant Potential Sources of Contamination

This assessment evaluates contaminants that **may** enter the water drawn directly from Lake Ontelaunee before treatment. The contaminants addressed in this assessment include those regulated under the federal Safe Drinking Water Act as well as those DEP has determined may present a concern to health. A description of the **significant potential** sources of contamination associated with the Maiden Creek watershed are provided below. Each significant potential source of contamination has been analyzed and given a qualitative susceptibility rating (A = high priority through F = low priority) according to its potential to impact the water supply. Potential sources of contamination are summarized below.

Potential Sources of Contamination	Contaminants of Concern	Description	Protection Priority
Sewage discharges (see map)	bacteria, virus pathogens, including giardia and cryptosporidium	Water discharged from wastewater treatment plants and untreated wastewater from failing septic tank systems	A
Agricultural Activities	nitrogen and phosphorus	fertilizer: phosphorus causes algal bloom and eutrophication in Lake Ontelaunee, nitrates and phosphorus assoc. with agricultural use	B
(same as above)	pesticides, herbicides, insecticides	weed control and insect control applied to crop lands	D

As indicated above, both treated and untreated sewage discharges into the watershed are significant sources of pathogens (germs) that can cause waterborne diseases. A combination of filtration and disinfection at the authority's water treatment plant removes and/or destroys most of these pathogens. A concern remains about cryptosporidium and giardia to a lesser extent since these pathogens cause intestinal diseases which can be very serious for people with a weakened immune system, such as chemotherapy, dialysis or transplant patients, and people with Crohn's disease or HIV infection. Fortunately, filtration removes about 99% prior to reaching tap water.

Both giardia and cryptosporidium pathogens have been found in Maiden Creek and its tributaries. This is mainly attributable to sewage discharges from wastewater treatment facilities and failed septic systems, fecal matter from farm animals entering the waterways, and perhaps wildlife. Levels of these pathogens appear to increase in stream water following a heavy precipitation event. Elevated levels of fecal coliform (a form of bacteria from human waste) were detected downstream of sewer treatment plants within the watershed, and in Maiden Creek immediately downstream of the villages of Lenhartsville and Virginville.

In terms of nutrient contaminants in the watershed, phosphorus levels were generally normal with the exception of elevated levels in streams below waste water treatment facilities and small unsewered villages. Elevated levels of nitrates were linked to sewage, agricultural activities, and possibly fertilizer applications at golf courses in the watershed.

Ongoing Watershed Protection Activities

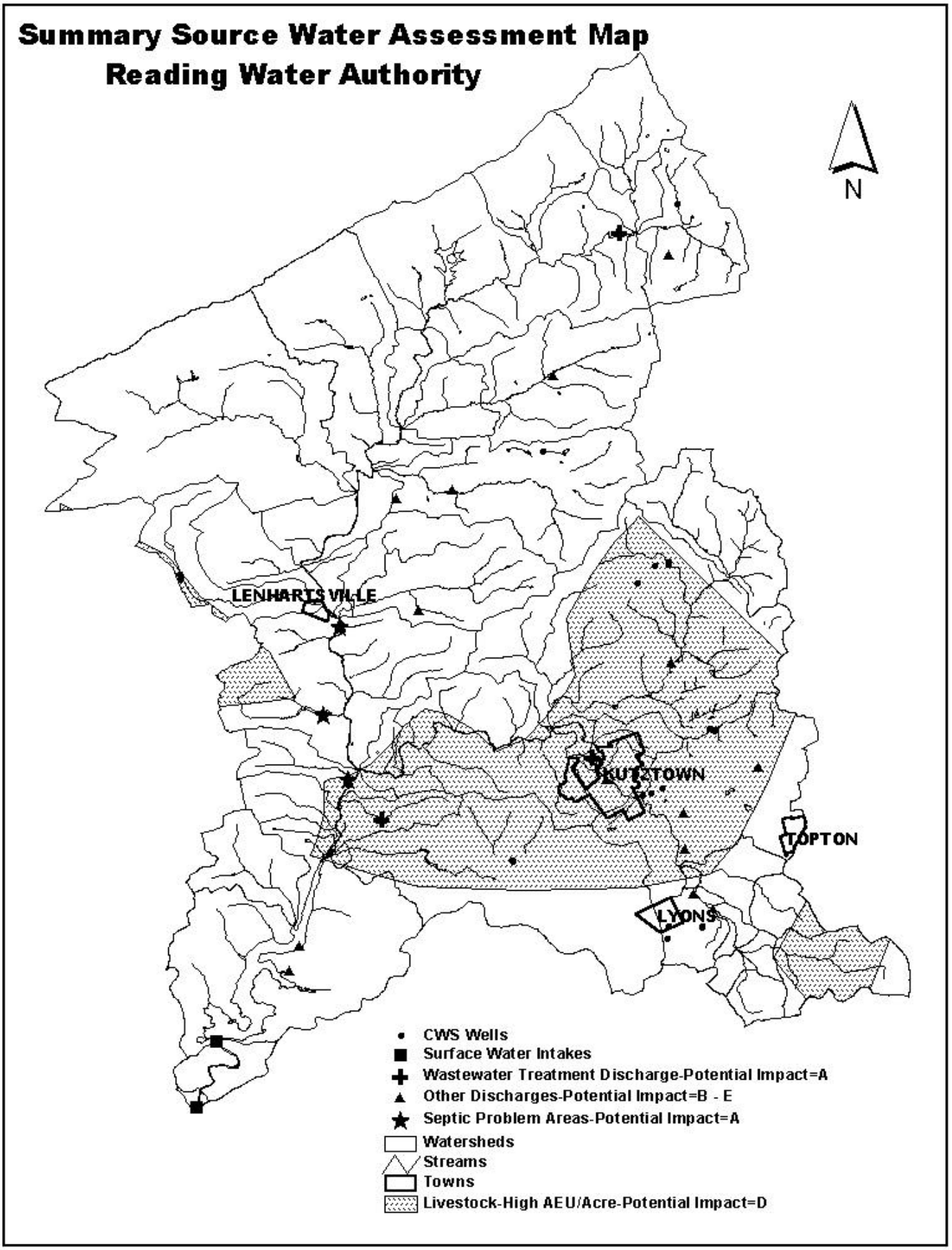
Direct discharge of regulated contaminants in this watershed are addressed by state and federal regulations. The Berks County Conservancy (a non-profit environmental organization) is active in further characterizing water quality within the watershed and recommending measures to reduce contaminants that may adversely impact the quality of Reading's water supply. Other volunteer and government agencies are working cooperatively to address contamination within the Maiden Creek watershed.

Source Water Protection Needs

Based on the evaluation that was completed as part of this Source Water Assessment, DEP has determined that existing state and local programs should provide adequate protection of this drinking water source. Several "hot spots" in the watershed, however warrant special attention to reduce levels of pathogens in stream water. Emphasis should be placed on addressing poorly functioning septic systems and optimizing wastewater treatment plant performance to minimize the discharge of fecal contaminants and pathogens such as cryptosporidium. Better understanding of the risks associated with cryptosporidium may result in the need to enhance protection (or treatment).

How to Obtain Additional Information

This *Source Water Assessment Public Summary* was completed in December 1998. Individuals interested in learning more about this water system and watershed can contact the Reading Water Authority at 610-655-6253.


Summary Source Water Assessment Map
Reading Water Authority
N
LENHARTSVILLE
KUTZTOWN
TOPTON
LYONS
CWS Wells
Surface Water Intakes
Wastewater Treatment Discharge-Potential Impact=A
Other Discharges-Potential Impact=B - E
Septic Problem Areas-Potential Impact=A
Watersheds
Streams
Towns
Livestock-High AEU/Acre-Potential Impact=D

Example of Source Water Assessment Summary for Groundwater

Source Water Assessment Public Summary
New Berlin Municipal Authority, Union County
December 1998

Introduction

The Pennsylvania Department of Environmental Protection (DEP), Bureau of Water Supply Management, is completing assessments of the contaminant threats to all public drinking water sources as required by the Safe Drinking Water Act. DEP has prepared this *Source Water Assessment Public Summary* to provide information to support local and state efforts to protect New Berlin's drinking water sources. The information in this assessment pertains to the groundwater basin that provides water to New Berlin's public water supply wells. The emphasis of this assessment is on "source" (groundwater prior to entry into the distribution system) rather than "tap" (finished or treated) water. Information on tap water quality is available in New Berlin Municipal Authority's *Consumer Confidence Report* which can be obtained by calling 717-966-2938.

What is the Source of Your Drinking Water?

The New Berlin Municipal Authority serves a population of 900 customers. The Authority has three primary sources of drinking water; two wells north of the borough located on the south flank of Shamokin Mountain and a well located adjacent to Penns Creek. Well #1 is a flowing artesian well (no pump is required) with a total depth of 146 feet that discharges 8,000 to 15,000 gallons per day (gpd). Well #5 has a total depth of 298 feet and provides about 17,000 gpd to the water system. Both of these wells produce from water-filled fractures in an interbedded sandstone and shale formation. The contributing area for these wells extends to the crest of Shamokin Mountain. Well #6 is situated about 70 feet to the north of Penns Creek and supplies approximately 46,000 gpd.

In accordance with Pennsylvania's Safe Drinking Water regulations, an investigation of Well #6 was conducted to determine if water serving this source is under the direct influence of surface water. Because Well #6 is located within 200 feet of Penns Creek and produces from a carbonate aquifer with a water-table depth of 90 feet, it meets the Surface Water Identification Protocol criteria for special source monitoring. A statistical analysis of daily water quality monitoring parameters compared to precipitation events indicates that Well #6 is not drawing "surface" water from nearby Penns Creek.

Of the wells serving New Berlin, Well #6 is the most vulnerable to potential sources of contamination. The community of New Berlin lies directly upgradient of the well and has a number of industries and businesses as well as private homes which could be potential sources of groundwater pollution. A sewage treatment plant located next to Well #6 is a potential source of bacteria, virus and pathogen contaminants such as cryptosporidium.

Water Quality and Water Treatment Information

The water withdrawn from the New Berlin wells is chlorinated prior to entering the distribution system. After chlorination, the water passes through an aeration system to reduce odor levels caused by naturally-occurring hydrogen sulfide. An incidental benefit of aeration is the reduction of iron and manganese levels. Water quality testing performed by the Authority indicated that results of routine compliance sampling done in 1998 were all within the limits set by DEP. For further information regarding the quality of the system's finished (tap) water, please refer to New Berlin Municipal Authority's *Consumer Confidence Report.*

Evaluation of Significant Potential Sources of Contamination

This assessment evaluates contaminants that **may** enter the water drawn directly from the Authority's wells. The contaminants addressed in this assessment include those regulated under the federal Safe Drinking Water Act as well as those which DEP has determined may present a concern to public health. A description of the **significant potential** sources of contamination associated with the watershed is provided below. Each significant potential source of contamination has been analyzed and prioritized (A = high priority through F =

low priority) in accordance with their potential to impact the water supply. Potential sources of medium and high priority are summarized below.

Potential Sources Of Contamination	Contaminants of Concern	Description	Protection Priority
Sewage discharges	bacteria, virus Pathogens, including Giardia and	Water discharged from wastewater treatment Cryptosporidium	C to D
Underground Storage tanks	petroleum products	leakage from underground storage tanks and piping	A to B
Lawn care	pesticides	infiltration into groundwater	E to D

Well #6 is the most vulnerable source as it is situated downgradient of the community of New Berlin and any potential sources of contamination. A sewage treatment plant which discharges into Penns Creek is a likely source of pathogens (germs) such as cryptosporidium, however there has not been any reported occurrences of this organism in the Authority's drinking water supply.

Other potential sources of contamination (and contaminants of concern) that were evaluated as part of the Source Water Assessment of Well #6 include: commercial activities (solvents, petroleum products, and hazardous waste material); residential activities (pesticide application to lawn); and naturally-occurring minerals in the aquifer.

Ongoing Source Water Protection Activities

As part of a wellhead protection study completed for Union County, a wellhead protection (WHP) plan was performed for the New Berlin Municipal Authority. The WHP plan consists of the following:

1. Prepare rigorous wellhead protection delineations for the New Berlin water supplies.
2. Develop a wellhead protection management approach for the water supply.
3. Develop contingency plans for potential well contamination.
4. Develop a future well site identification and protection plan.
5. Develop site-specific wellhead protection procedures.

Source Water Protection Needs

The New Berlin Municipal Authority currently meets water supply demands for it's customers; however, with projected population growth, a contingency plan should be in place. There are areas to the northeast and southwest of New Berlin where a new well could be sited, preferably on a fracture in carbonate bedrock which generally results in increased well yields.

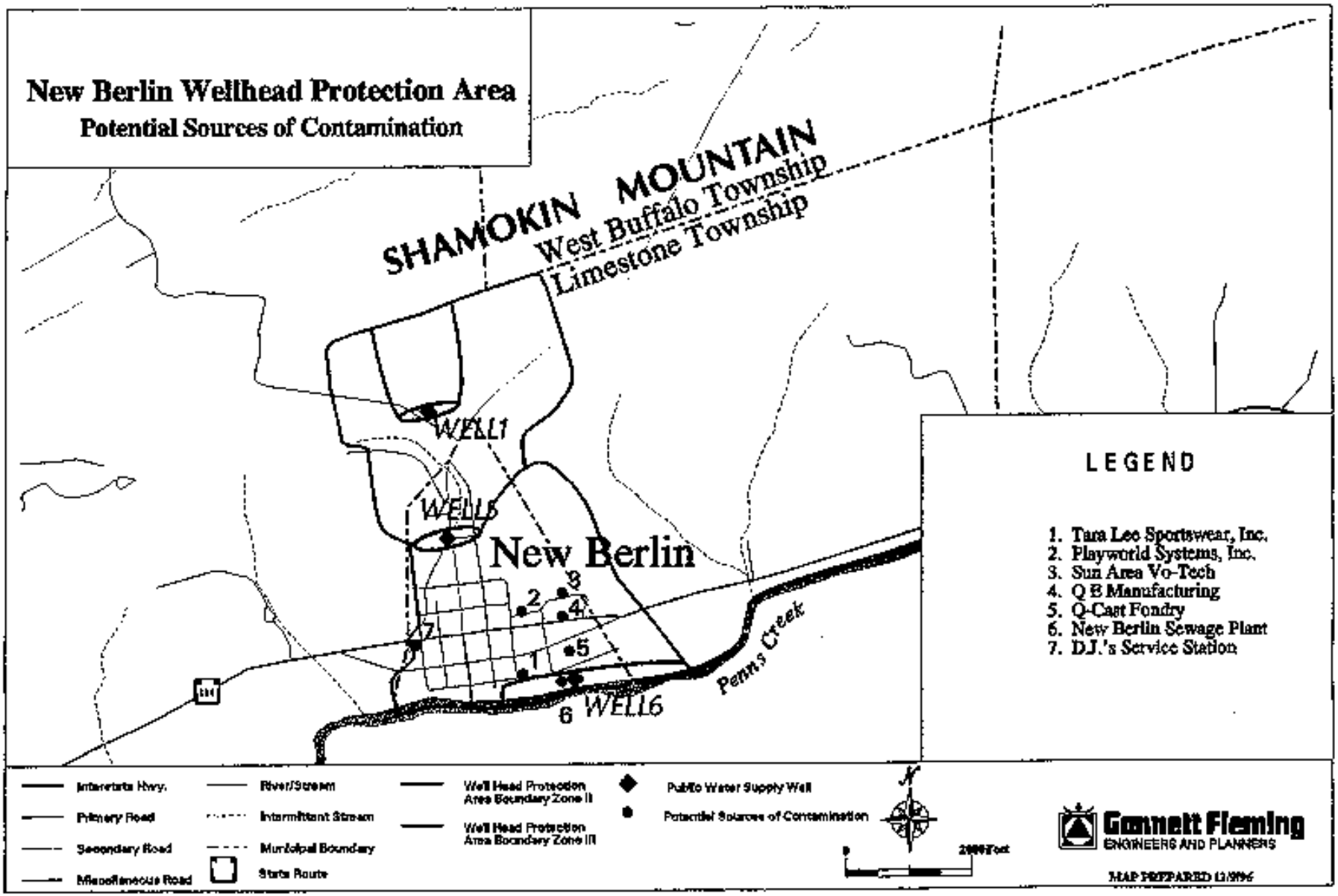
Although there are many approaches to local WHP area management, zoning can be an effective method for protecting a WHP area. Consideration needs to be given to the types of land use and potential contaminants present in the contributing area of a well that may adversely impact groundwater quality at the wellhead. Both local and county government should cooperatively address this issue, possibly through implementation of land-use ordinances. Other means of managing WHP areas can involve land acquisition, educational programs, groundwater monitoring and household hazardous waste collection programs.

The carbonate aquifer in which Well #6 produces from should be designated as a unique environmental resource in Union County for possible future well sites. The carbonate aquifer could be protected under the Natural Resource Area Protection Ordinance and the proposed overlay zoning ordinance.

How to Obtain Additional Information

This *Source Water Assessment Summary* was completed in December 1998. Individuals interested in learning more about this water system and local water resources can contact the New Berlin Municipal Authority at 717-966-2938.

(from Nittany Geoscience, 1997, Water supply plan and wellhead protection program: Volume II - Wellhead protection plan for Union County, Pennsylvania; 43 p.)



APPENDIX G
List of Acronyms for Source Water Assessment and Protection Program

bwsm	Bureau of Water Supply Management
CSGWPP	Comprehensive State Groundwater Protection Program
CWS	Community Water System
DAG	Department of Agriculture
DEP	Department of Environmental Protection
DOH	Department of Health
EPA	U.S. Environmental Protection Agency
FIX	Foundation for Information Exchange - datasystem
GIS	Geographic Information System
IOC	Inorganic Contaminant
MCL	Maximum Contaminant Level
NCWS	Non-Community Water Systems
NPS	Non-Point Source of Contamination
NPDES	National Pollution Discharge Elimination System
NTNCWS	Non-Transient Non-Community Water Systems
PADWIS	Pennsylvania Drinking Water Information System
PWS	Public Water Systems
SDWA	Safe Drinking Water Act
SOC	Synthetic Organic Contaminants
SRF	State Revolving Fund
SWA	Source Water Assessment
SWAP	Source Water Assessment & Protection
SWAPP	State Source Water Assessment and Protection Program
SWP	Source Water Protection
SWPA	Source Water Protection Area
SWPP	Source Water Protection Program
TMDL	Total Maximum Daily Load
TNCWS	Transient Non-Community Water Systems
USGS	U.S. Geological Survey
VOC	Volatile Organic Contaminant
WHP	Wellhead Protection
WHPA	Wellhead Protection Area
WHPP	State Wellhead Protection Program

This and related environmental information are available electronically via Internet. For more information, visit us through the Pennsylvania homepage at http://www.state.pa.us or visit DEP directly at http://www.dep.state.pa.us (choose directLINK “Drinking Water Publications”).

www.GreenWorksChannel.org - A web space dedicated to helping you learn how to protect and improve the environment. The site features the largest collection of environmental videos available on the Internet and is produced by the nonprofit Environmental Fund for Pennsylvania, with financial support from the Pennsylvania Department of Environmental Protection, 800 334-3190.

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