



2008 Pennsylvania Integrated Water Quality Monitoring and Assessment Report

Clean Water Act Section 305(b) Report and 303(d) List

Contents

Executive Summary -----	2
<u>Part A: Introduction</u> -----	7
 <u>Part B: Background</u>	
Total Water -----	9
Pollution Prevention -----	9
NPDES-----	11
Compliance and Enforcement -----	12
Mining-----	12
Oil and Gas-----	13
Stormwater Discharge-----	13
Construction and Urban Runoff-----	14
Stormwater Permits Conservation Districts-----	15
Combined Sewer Overflow-----	15
Nonpoint Source Control Program-----	15
Highlights of Pennsylvania’s Current NPS Program -----	16
Total Maximum Daily Load Development (TMDL)-----	20
 <u>Part C: Surface Water Quality Monitoring and Assessment</u>	
Water Quality Standards Program-----	22
Plan for Achieving Comprehensive Assessments -----	23
Intensive -----	24
Ambient Fixed Station Monitoring -----	24
Lake Water Quality Assessments-----	26
Citizen’s Volunteer Monitoring-----	28
Existing and Readily Available Information-----	29
Assessment Methodology-----	30
Streams Use -----	31
Record of Changes to the 2006 Integrated List-----	35
Lakes Use Support-----	36
Excluding the Fishable Swimmable -----	39
Lake Trophic Status-----	39
Lake Control Methods-----	41
Wetlands Protection Program-----	43
Trend Analysis for Surface Waters-----	44
 <u>Part D: Groundwater</u>	
Groundwater Assessment-----	45
USGS Groundwater Data-----	46
Sources of Groundwater Contamination-----	47
Statewide Groundwater Protection Program-----	50
Source Water Assessment Program-----	51

EXECUTIVE SUMMARY

Pennsylvania has a population of 12,406,292 in an area of 45,333 square miles. There are six major river basins Delaware, Susquehanna, Genesee, Potomac, Ohio, and Lake Erie with an estimated 86,000 stream and river miles and 161,455 lake acres. Seventeen square miles of Delaware Estuary and 512 acres of tidal wetlands exist in the southeast corner. In the northwest corner, are 63 miles of Lake Erie shoreline. Scattered throughout the state are 403,924 freshwater wetlands. These numbers illustrate the magnitude and complexity the Pennsylvania of Department of Environmental Protection (DEP) faces in assessing, protecting, and managing its water resources.

The goals of the 2008 Integrated List are several. Foremost is to report on the condition of the waters in the Commonwealth. Other goals include describing the water pollution control and assessment/monitoring programs. Pollution control programs are discussed in detail in Part B and Assessment and Monitoring in Part C. The report concludes with a discussion of groundwater in Part D.

Part A tables and discussion of stream and lake assessments are found on pages 30 to 43. Individual waterbodies are reported in the five part list described in the introduction. These lists are separate from the narrative because of their size and are available on DEP's website.

In April 2007 DEP completed a ten year program to assess all wadable streams. The census utilized a biological assessment of the aquatic life use. Other designated uses and non-wadable waters were assessed to a lesser extent as resources and time permitted. As of this report 84,021 miles of streams and rivers are assessed for aquatic life use with 68,670 miles listed as attaining that water use. Of the impaired miles, 11,276 require development of a Total Maximum Daily Load (TMDL) to reduce pollutant inputs and 3,283 have an approved TMDL. An additional 57 miles are under compliance agreements and expected to improve within a reasonable amount of time. The two largest problems are agriculture and abandon mine drainage. The largest stressors are siltation and metals. However, other problems should not be minimized because in local areas they may impact a relatively large percentage of waters. For example, urban runoff/stormsewers is a minor problem in rural areas but major in metropolitan regions.

There are 74,652 acres of lakes assessed for aquatic life use and 36,295 acres are attaining that use. Of the impaired acres, 5,593 require a TMDL, 11,898 have an approved TMDL and 20,866 acres are impaired by pollution but do not require a TMDL. The largest problem source is agriculture and largest stressors nutrients, suspended solids, and organic enrichment/low D.O. As discussed above, smaller problems should not be minimized because they still have regional importance.

To protect the health of those who consume fish caught in the Commonwealth, DEP monitors fish flesh for possible contaminants. When concentrations of substances known to be harmful to humans reach action levels, fish consumption advisories are issued to inform people of the possible dangers and the actions they can take to protect themselves. Currently there are approximately 1,080 miles of fish consumption advisories in need of TMDLs and 711 with approved TMDLs. Lake listings include 27,587 acres requiring TMDLs and an additional

5,483 with approved TMDLs. There is a statewide fish consumption advisory of no more than one meal per week for all waters to protect against the ingestion of unconfirmed contaminants. The fish consumption listings in this report have triggered action levels more restrictive than the one meal per week. It should be noted DEP directs much of its fish tissue sampling to areas where there is a greater chance of problems. As a result, it is not surprising to see a higher number of stream miles and lake acres impaired for this use compared to the stream miles (711) and lake acres (2,987) attaining this use.

Aquatic life use was the original focus of the statewide surveys because with a rapid and efficient biological assessment of the macroinvertebrates (insects, snails, clams, etc.) it was possible to canvas the state over a ten year period. In addition, the aquatic life use is a good measure because it is reliable as an indicator of long term pollution problems. Since completing the statewide census for aquatic life use, DEP is emphasizing developing assessment methodologies, programs, and partnerships to increase recreational and potable water supply use assessments.

Of the 627 stream miles assessed for recreational use, 365 were attaining. There are 244 impaired miles requiring a TMDL and 8 with an approved TMDL. Lake recreational use was assessed for 70,306 acres with 68,657 attaining, and 1,649 impaired requiring a TMDL. The potable water supply use was assessed in 1,569 stream miles with 1,445 attaining, 88 impaired requiring a TMDL, and 36 with approved TMDLs. The 11,469 acres of lake potable water supply assessments were all attaining.

Part B is the narrative describing the Commonwealth's water pollution control programs. The section begins with a description of progressive efforts to prevent pollution before it becomes a problem. The Alternate Energy Portfolio Standard (AEPS) was passed into law. This law shifts energy dependence from polluting non-renewable energy sources to clean renewable sources. With the success of AEPS, other energy legislative initiatives are scheduled for 2008. On other fronts, DEP has programs to encourage reduction in pollution that also provide cost savings to the treatment facilities. Examples of these successes are provided.

As evident in the Part B narrative, the Commonwealth's permitting and NPDES program is complex and deals with a large number of inspections and permits including regulating and permitting 4,548 industrial and sewage treatment facilities. Pennsylvania is a large producer of coal and natural gas and all mining and extraction activities require permits and inspection. It is DEP's responsibility to issue permits that assure stormwater from earthmoving and construction activities is managed properly so as not to cause damage to streams or adversely affect the hydrology. County Conservation Districts work with DEP on stormwater protection. DEP also regulates Combined Sewer Overflows (CSO) and wetlands must be managed and protected.

Part B also includes a discussion of non-point source programs. Pennsylvania's Nonpoint Source (NPS) Program was developed in response to Section 319 of the federal Clean Water Act to address problems caused by pollution from nonpoint sources. Unlike point source pollution, which comes from pipes, the causes of nonpoint source pollution can be difficult to define or quantify. Sometimes referred to as "polluted runoff," nonpoint source pollution is

generally caused by stormwater runoff across the land or infiltration of pollutants into the groundwater.

Non-point source problems require treating and controlling runoff from large areas. Treatment and control is accomplished through what are known as best management practices (BMP). BMP's are often specifically adapted to a particular locations and problems. Examples include improving farming practices, reclamation of abandoned mines, installation of sediment ponds, and planting riparian buffers. BMPs are often specifically adapted to a location and problem. A major function of the non-point source program is to identify the need for and initiate funding of BMP projects. Some examples of successful projects are described in the narrative.

The non-point program works with the TMDL program. A TMDL model outputs a load reduction of, for example, sediment. That sediment load reduction must be achieved to meet water quality goals and the reductions are achieved through the use of non-point BMPs. The non-point program provides technical assistance, education, and funding necessary to put the BMPs in place. Education is an important facet of the non-point program. It often takes a consortium of interested and active people concerned about their watershed to achieve non-point source controls. The purpose and goals of the TMDL program are outlined following the section on the non-point program.

In 2005 Commonwealth voters approved Growing Greener II (Act 45 of 2005). This bond issue made available over the next five years \$230 million to DEP of Environmental Protection to clean up rivers and streams, take on serious environmental problems at abandoned mines and contaminated industrial sites, and finance the development and deployment of advanced energy projects. Growing Greener funds are important to the success of non-point source controls and programs as illustrated in the Part B narrative.

The combined efforts of the NPDES and non-point programs to identify and correct problems have resulted in many water quality improvements. In 2007, DEP began an ongoing process of identifying areas where restoration efforts were underway and targeting them for monitoring. When monitoring indicates the waters are restored, Department biologists document the improvements and remove the problem from List 5 (impaired waters requiring a TMDL) and place it on List 2 (waters attaining at least one use). Thirty-eight such sites were identified and sampled in 2007.

Part C is the Surface Water Quality Monitoring and Assessment discussion. It begins with a discussion of the Water Quality Standards Program including proposed changes to water quality criteria as part of the triennial review and EPA approval of Pennsylvania's Antidegradation Implementation Guidance.

The next three sections discuss monitoring programs including intensive surveys, ambient fixed station monitoring at Water Quality Network (WQN) sites, and lake monitoring. Of special note is the plan to phase out old survey methods and strategies with the completion of the initial ten year aquatic life use census in favor of new methods and strategies for statewide assessments.

Citizen Volunteer Monitoring Program (CVMP) is an important outreach program with the goal of getting citizens actively involved in monitoring water quality and other watershed activities. The Pine Creek project serves as a model of how citizen volunteer groups and DEP can work together in gathering assessment information.

EPA's Integrated Listing guidance requires states to gather and use all existing and readily available data generated by sources outside DEP. This data must meet quality assurance and procedural guidelines outlined by DEP. Data solicitations were sent to over 500 outside sources in an effort to satisfy this requirement.

The Assessment and Listing Methodology is a collection of protocols used to conduct field surveys and evaluate information for assessments. The Methodology was public participated summer of 2007. These protocols are the basis for the streams and lakes information contained in the Integrated List narrative and the five part list. Many of these protocols are new and were subjected to peer review. Before being adopted, the entire methodology was made available for public review during the summer of 2007. The methodology is lengthy and as a result is reported separately from this narrative and is available on DEP's website along with the comment/response to the public review.

The next several sections present detailed tables summarizing stream and lake use support. These tables formed the basis for the discussions already presented at the beginning of the Executive Summary. The lakes section also contains discussions on restoration and control efforts. Some funding is available from DEP to restore and/or protect lakes. Control measures are codified in DEP's Rules and Regulations at Section 96.5 - Discharges to Lakes, Ponds and Impoundments, which sets forth treatment requirements for point source discharges necessary to control eutrophication. Both efforts are important in protecting and restoring the Commonwealth's lakes. Section C ends with an overview of wetlands. It describes the types of wetlands found, DEP's jurisdiction and responsibility to protect wetlands, and other wetland related activities.

Finally, Part D provides an overview of the groundwater program including assessment activities and wellhead and source water protection.

PART A: INTRODUCTION

This report is the nineteenth in a series of reports prepared in response to Section 305(b) of the federal Clean Water Act that requires states to provide an assessment of water quality. These reports are prepared on a biennial basis.

DEP uses an integrated format for Clean Water Act Section 305(b) reporting and Section 303(d) listing. The “2008 Pennsylvania Integrated Water Quality Monitoring and Assessment Report” satisfies the requirements of both Sections 305(b) and 303(d). The narrative that follows contains summaries of various water quality management programs including water quality standards, point source control and nonpoint source control. It also includes descriptions of programs to protect lakes, wetlands, and groundwater quality. A summary of the use support status of streams and lakes is also presented in the narrative report.

In addition to this 305(b) narrative, the water quality status of Pennsylvania’s waters is presented using a five-part characterization of use attainment status. The listing categories are:

Category 1: Waters attaining all designated uses.

Category 2: Waters where some, but not all, designated uses are met. Attainment status of the remaining designated uses is unknown because data are insufficient to categorize the water.

Category 3: Waters for which there are insufficient or no data and information to determine if designated uses are met.

Category 4: Waters impaired for one or more designated use but not needing a total maximum daily load (TMDL). These waters are placed in one of the following three subcategories:

- *Category 4A*: TMDL has been completed.
- *Category 4B*: Expected to meet all designated uses within a reasonable timeframe.
- *Category 4C*: Not impaired by a pollutant and not requiring a TMDL.

Category 5: Waters impaired for one or more designated uses by any pollutant. Category 5 includes waters shown to be impaired as the result of biological assessments used to evaluate aquatic life use. Category 5 constitutes the Section 303(d) list EPA will approve or disapprove under the Clean Water Act.

Each waterbody must be assessed for four different uses as defined in DEP 's rules and regulations at 25 Pennsylvania Code Chapter 93 (Water Quality Standards) in Section 93.3 Protected water uses. The four include Aquatic Life, Water Supply, Fish Consumption, and Recreation. Generally Aquatic Life pertains to maintaining flora and fauna indigenous to aquatic habitats, Water Supply relates to the protection of ambient water quality for possible use as a potable water supply, Fish Consumption protects the public from consuming tainted fish, and Recreation relates to water contact and boating. Each use may have different water quality

criteria for individual chemical constituents and each use requires a different type of stream or lake assessment.

DEP encourages use of the Internet to view the Integrated List documents electronically on its website at www.dep.state.pa.us . Use the following keywords Water, Water Quality, and finally Integrated Water Quality List for 2008. Because of the size of the five-part list, it will only be available electronically.

PART B: BACKGROUND

Part B1 Total Waters

Table 1
Atlas of Surface Waters in Pennsylvania

The following information is presented to provide a perspective on Pennsylvania's water resources:

State Population	12,406,292 [†]
State Surface Area (square miles)	45,333
Number of Water Basins (major basins)	6
Total Miles of Rivers and Streams	86,000*
Number of Lakes/Reservoirs/Ponds**	3,956
-Number of Significant, Publicly Owned Lakes (subset)	215
Acres of Lakes/Reservoirs/Ponds**	161,445 ^{††}
-Acres of Significant, Publicly Owned Lakes (subset)	98,942
Square Miles of Estuaries/Harbors/Bays	
-Delaware Estuary	17
-Presque Isle Bay	6
Miles of Great Lakes Shore	63 ^{†††}
Acres of Freshwater Wetlands	403,924
Acres of Tidal Wetlands	512

[†] US Census estimate 2004

^{††} Lakes and ponds greater than two acres

^{†††} Lake Erie - Fourteen miles comprise the Presque Isle Peninsula.

*DEP estimate based on 1:24,000 scale National Hydrography Data (NHD) GIS stream coverage. This 86,000 may change as the NHD is quality assured and corrected.

** "Total Water Estimates for United States Streams and Lakes", EPA, August 1993

Part B2.1 Pollution Prevention and Energy Efficiency Program

DEP recognizes the value of multi-media pollution prevention in providing environmental protection. Not only does preventing pollution create a healthy, sustainable environment, it also saves money, contributing to a stronger economy. Programs throughout DEP are built upon the premise that not generating waste in the first place is preferable to dealing with waste after it is generated. Since energy usage and generation has major impacts economically and environmentally to businesses, industry, and state and local governments, Governor Edward Rendell and Secretary McGinty recognized the need to direct efforts related to energy and alternative fuel issues and were integral in passing the Alternative Energy Portfolio Standard (AEPS) legislation and developing the Energy Independence Strategy. The AEPS law is a two-tiered standard ensuring that in 15 years, 18 percent of all the electricity sold in Pennsylvania will come from clean sources. Tier I requires 8 percent of electricity sold at retail in the state to come from traditional renewable resources such as solar, photovoltaic energy, wind power and

low-impact hydro, and Tier II requires 10 percent of Pennsylvania retail electricity to be generated from resources such as waste coal, distributed generation systems, and demand-side management. At least 0.5 percent of Tier I must be met by electricity from solar photovoltaic cells. The Energy Independence Strategy is a proposal that was introduced into legislation in the Spring Legislative Session 2007 that includes funding for green buildings, energy efficiency, and demand-side response programs designed to reduce Pennsylvania's energy consumption. The package also includes proposed legislation for a biofuels mandate. The Strategy was not signed into law; however, components of it were re-introduced for a Special Fall Legislative Session 2007 and are still pending at this time.

DEP's pollution prevention programs help government and businesses move beyond compliance-based, end-of-pipe thinking to preventing pollution before it is created, effectively reducing adverse impacts to the environment. The Office of Energy and Technology Development (OETD) has programs for helping small businesses, industry, government, and schools to better manage their environmental impacts, reduce energy usage, and save money. Some major focus areas of OETD are economic development, indigenous energy, hydrogen economy, market barriers, distributed power, and green buildings. Implementation is currently underway for an Energy Efficiency and Demand Side Response plan developed by OETD to coordinate and facilitate their efforts.

The Small Business Pollution Prevention Assistance Account (PPAA) loan program has funded a variety of pollution prevention/energy efficiency projects. Reported results for some of these projects are as follows:

During the last five years, Custom Castings Northeast, Inc. has reported saving 422,000 pounds of cement, 75,000 pounds of gypsum, and 66,000 pounds of wood. In addition, the company has reported a reduction of 348,000 pounds of waste as well as reduced labor costs. The company has realized a savings of \$297,000 in addition to an increase in production in the five years since implementing their project.

During the last three years, Gautier Steel, Ltd. has reported saving 10,836 MWH (megawatt hours) of electricity, 48,614 MCF (thousand cubic feet) of natural gas and 121,021 MGALS (megagallons) of water. Combined, these savings have given the company savings of \$1,300,888 in the three years since implementing their project.

During the last seven years, Reynoldsville Casket has reported saving 7,745 gallons of paints and thinners as well as 2,540 gallons of waste paint. In addition, Reynoldsville has reduced their air emissions and waste disposal costs. The company has realized a savings of \$92,226 in addition to an increase in production in the seven years since implementing their project.

DEP works with The Pennsylvania Technical Assistance Program (PENNTAP) and other groups to support technology-based economic development in helping Pennsylvania companies to improve competitiveness by providing a limited amount of free technology assistance to help resolve specific technical needs. These efforts result in an annual average of 48 facilities receiving assistance; 388,478 lbs. reduction in hazardous waste; 318,431 lbs. reduction in non-hazardous waste; 6.8 million lbs. reduction in air emissions; 1.5 million lbs. reduction in water

pollution; 120.9 billion BTUs of energy conserved; 1,156 MWh of electricity conserved; 86 billion gallons of water conserved; and \$1.5 million saved.

Government is leading by example, integrating pollution prevention and energy efficiency measures throughout the Commonwealth. Examples of this include the work of the Governor's Green Government Council (GGGC) to implement green planning throughout the state to go towards purchases of environmentally friendly green buildings and electricity from renewable sources like wind and solar power. DEP is building strategic partnerships with businesses and organizations throughout the Commonwealth, promoting pollution prevention and energy efficiency, fostering environmental and energy technologies, and providing compliance assistance to help organizations protect the environment while saving money. To lead the way, the Governor issued executive order 12-04 requiring all state agencies to reduce energy usage. Building energy usage was reduced by 9.5% from calendar year 2005 to 2006, using 2004 as the base year. The state fleet was reduced by 1,000 vehicles, will tend towards smaller vehicle purchases, and work towards a 2011 goal of hybrids comprising 25 percent of vehicle purchases. In addition, the Guaranteed Energy Savings program has been streamlined. Twenty-eight major building retrofits will return major energy savings to seven agencies and cover the capital costs out of the savings. The first seven projects to be completed will save taxpayers \$59 million on a capital outlay of \$42.5 million. Future energy bills will be reduced by specifying stringent performance goals for new construction. Out of the 38 high performance green buildings in Pennsylvania certified under the US Green Building Council's LEED® rating system, nine are occupied by state agencies, an increase of four from 2005.

The Commonwealth is now the only state on the U.S. Environmental Protection Agency's Top 25 Green Power Partnership list. By modifying its existing contract, the Commonwealth will purchase 277,399 megawatt hours a year, or 28 percent of state government's electricity, from renewable wind and hydroelectric sources. The contract calls for electricity that is generated 57 percent from wind power and 43 percent from hydroelectric sources.

Part B2.2 (a) NPDES

Pennsylvania carries out the EPA delegated point source National Pollutant Discharge Elimination System (NPDES) permitting program. The point source control program is implemented through DEP's six regional field offices and six district mining operations offices. While program development and evaluation occurs in DEP's central office, the field offices and district mining offices conduct site-specific permitting, monitoring, compliance, and enforcement activities. The central office also provides specialized assistance in the areas of policy, regulatory development, complex permitting, laboratory audits, safety training, treatment plant operations, enforcement, and data management.

The Toxics Management Strategy provides for a consistent statewide approach for addressing EPA priority pollutants and other toxic substances in the NPDES permit program. The strategy, parts of which are codified in a Statement of Policy, Chapter 16, is a support document to DEP's toxic regulation, Section 93.8a of the rules and regulations.

In FY 06-07, field office staff issued 194 new, 1065 renewals, and 263 amendments for NPDES permits for municipal or private sewage treatment plants, industrial discharges and solid or

hazardous waste facilities, as well as 146 new, 543 renewals, and 10 amendments for coverage under stormwater general permits.

Water Quality Management (WQM) permits authorize construction and operation of sewage collection and conveyance systems and sewage and industrial wastewater treatment facilities. The field offices issued 959 WQM permits for sewage and industrial waste treatment plants in federal FY 06-07.

Part B2.2 (b) Compliance and Enforcement

The DEP point source control program regulates approximately 4,548 sewage and industrial dischargers in Pennsylvania. Approximately 387 of these are considered major dischargers based on EPA criteria. DEP's field offices have a staff of field inspectors in addition to hydrogeologists, biologists, compliance specialists, supervisors, and managers to carry out field activities. This staff conducts inspections of both NPDES and non-NPDES wastewater treatment facilities, responds to emergencies, pollution incidents and complaints, and conducts routine stream monitoring.

Approximately 8,352 facilities inspections were conducted during federal FY 06-07. Generally, if environmental damage or willfulness is not involved in violations, an attempt is made to obtain voluntary compliance. In more serious situations, criminal, civil, or administrative actions may be used. DEP field offices completed 184 such actions in state FY 06-07, resulting in approximately \$3.225 million in penalties. The Water and Wastewater Operator Outreach program is continuing to have a positive impact on effluent quality by providing on-site training for wastewater treatment plant operators. This program has expanded to the point where training was conducted at an average of 40 sites per federal fiscal year from 2001-2007. As a result of this training, most sites show substantial improvement in compliance with permit requirements. Monitoring of effluent data for major dischargers is accomplished through EPA's Permit Compliance System (PCS). There has been an ongoing effort to enhance the compliance monitoring program by automating the effluent limits data and discharge monitoring data to PCS.

There has also been increased DEP emphasis on laboratory audits to improve the quality of self-monitoring data. Some of these audits have revealed incompetence or falsification of monitoring data. These issues have been addressed through appropriate criminal or administrative action.

Part B2.2(c) Mining

District mining operations offices, under the direction of DEP's Bureau of Mining and Reclamation (BMR), issue NPDES discharge permits for active mining operations. During federal FY 06-07, the following new permits were issued: 59 coal surface, one coal underground, two coal refuse reprocessing, one coal refuse disposal, and 31 industrial mineral surface permits.

Part B2.2 (d) Oil and Gas

There are 12 active NPDES permits for brine treatment facilities in Pennsylvania. During federal FY 07, the Bureau of Oil and Gas Management (BOGM) oversaw the issuance of one new NPDES discharge permit. The program also oversaw one new NPDES permit for coalbed methane wastewater treatment facilities. There are 12 active NPDES permits for coalbed methane treatment facilities, 8 pending NPDES permit applications, and 5 pending NPDES renewals. In addition, four stripper oil well discharges are covered by the general permit, with two receiving Water Quality Management Part II permits and one pending a Water Quality Management Part II permit.

Part B2.2 (e) Stormwater Discharge Permits

The 1990 federal stormwater regulations require NPDES permits for discharges of stormwater from certain industrial activities and municipalities. Initially, there were four cities (Philadelphia, Pittsburgh, Allentown, and Erie) on the EPA list of municipalities needing stormwater permits. Later, Pittsburgh and Erie were exempted from the stormwater permitting requirements because of large areas of combined sewers in these cities. Permits have been issued to Philadelphia and Allentown.

DEP began implementing the Phase II stormwater regulations on December 8, 2002. The new requirements require construction activities consisting of earth disturbance activities between one and five acres to obtain permits. In addition approximately 940 small municipalities (including those that were initially exempted), must obtain NPDES permits to operate their municipal separate storm sewer systems (MS4s).

DEP administers a reimbursement and grant program under the Storm Water Management Act (Act 167) for counties to prepare comprehensive stormwater management watershed plans to regulate activities and development that may cause accelerated stormwater runoff. Municipalities implement the plans through the enactment or amendment of local ordinances. One hundred and four (104) stormwater management plans have been approved by DEP across Pennsylvania (as of November 2007). All plans approved since 2001 include specific components to enhance protection of water quality, groundwater recharge, and groundwater recharge areas. Sixty-two (62) watersheds have plans that include water quality components. Forty-one (41) new plans are currently underway.

On September 28, 2002, DEP released a new stormwater policy that addresses the need to improve water quality, sustain water quantity (including groundwater recharge and stream base flow), and integrate upcoming federal stormwater management regulatory obligations. DEP proposes a best management practices (BMP) approach to stormwater management that generally encourages the minimization of runoff by allowing stormwater to infiltrate into the ground whenever possible and requires the management of any net increase in quantity of runoff. This approach will reduce pollution to streams, provide for groundwater recharge, enhance stream flow during times of drought, and reduce the threat of flooding and stream bank erosion resulting from accelerated runoff.

Final policies were published on June 3, 2006 for compliance and enforcement of both Act 167 and the MS4 permitting program (DEP documents 363-4000-003 and 363-4000-004, respectively).

Part B2.2 (f) Construction and Urban Runoff

This category includes two major subcategories: highway construction and new land development including residential, industrial, commercial, institutional, and recreational construction. Uncontrolled runoff from these sites has the potential to cause significant soil erosion and localized sediment pollution in streams.

Standards and criteria for minimizing erosion and preventing sediment pollution are contained in Chapter 102 rules and regulations. These regulations apply to any earth disturbance activity, including land development and road, highway or bridge construction. Requirements for control measures and facilities are written to utilize best management practices, primarily by establishing design and performance standards.

Pennsylvania's program is administered by DEP and county conservation districts through a delegation of DEP authorities to the conservation districts. Joint responsibilities for program implementation include the processing and issuance of permits, complaint investigations, site inspection, compliance, and enforcement. BMPs are reviewed for design and performance effectiveness through permit plan reviews and periodic monitoring at the construction site. Both DEP and the county conservation districts facilitate implementation of BMPs by conducting numerous training seminars and workshops for individuals, municipalities, and other parties engaged in undertaking earth disturbance activities.

DEP's comprehensive stormwater management policy document, finalized on September 28, 2002, uses existing authority to provide a framework for the integration of all Department stormwater management programs and promotes a comprehensive watershed approach to stormwater management in the Commonwealth. Fundamentally, the policy emphasizes the reduction of stormwater runoff generated by development and other activities by encouraging minimization of impervious cover, use of low impact development designs, and use of innovative stormwater BMPs that provide infiltration, water quality treatment, and otherwise more effectively manage the volume and rate of stormwater discharges. These stormwater BMPs and planning practices will be advanced through increased emphasis on DEP's Act 167 stormwater management planning program and implementation of the new (Phase II) and existing (Phase I) NPDES Stormwater Discharge Associated with Construction Activity Permit programs, and the new NPDES MS4 permits.

Because of increased need and emphasis on improving water quality and protecting water resources through improved stormwater runoff management, DEP developed the Pennsylvania Stormwater Management Best Management Practices (BMP) Manual to support the implementation of stormwater management requirements and water quality antidegradation requirements. The BMP Manual provides the design standards and planning concepts to guide local authorities, planners, land developers, contractors, and others involved with planning, designing, reviewing, approving, and constructing land development projects. The BMP Manual also advances the most recent innovations in stormwater management, focusing on preserving

on-site and off-site pre-construction hydraulic conditions. Volume and rate management through ground water infiltration, porous surfaces, and other onsite management are emphasized. Water quality components such as oil separators, passive wetland treatment, and other advanced technologies are also being emphasized and integrated into the BMP Manual.

Part B2.2 (g) Stormwater Permits Conservation Districts

DEP and county conservation districts jointly administer issuance of NPDES permits for stormwater discharges associated with construction activities. During calendar years 2005 and 2006, conservation districts received, reviewed and acknowledged 4,471 Notices of Intent (NOI) for coverage under the statewide general permit. DEP issued 845 individual NPDES permits authorizing stormwater discharges from construction activities. In addition, conservation districts conducted 26,813 compliance-monitoring inspections at both permitted and non-permitted sites. Conservation districts also conducted 5,596 complaint investigations in addition to routine compliance inspections.

Part B2.2 (h) Combined Sewer Overflows

Combined sewer overflows (CSOs) to waters of the Commonwealth are considered point sources and are subject to NPDES permitting, compliance and enforcement requirements like any other discharge. EPA has been regulating CSOs through the 1989 and 1994 national CSO policies that require each state to develop and implement a state CSO control strategy. DEP revised its policy in September, 2007. The revised policy reiterated the need for permittees to have their Nine Minimum Controls (NMC) in place and to continue implementing their Long-Term Control Plan (LTCP). LTCP milestones will be placed in the permit with dates for completing them. The revised policy also made clearer the need for a post-construction monitoring plan.

DEP has continued to place a high priority on the permitting and inspection program to deal with requirements for implementation of nine minimum controls and long-term control plans.

Part B2.3 (a) Nonpoint Source Control Program

Pennsylvania's Nonpoint Source (NPS) Program was developed in response to Section 319 of the federal Clean Water Act to address problems caused by pollution from nonpoint sources. Unlike point source pollution, which comes from pipes, the causes of nonpoint source pollution cannot be easily defined or quantified. Sometimes referred to as "polluted runoff," nonpoint source pollution is generally caused by stormwater runoff across the land or infiltration of pollutants into the groundwater. The three main sources of nonpoint runoff that result in degraded water quality in Pennsylvania are agriculture, abandoned mine drainage and urban runoff. Other sources include abandoned oil and gas wells, construction activities, land disposal, habitat modification, hydromodification, and silviculture (logging practices).

The Clean Water Act requires each state to prepare a Management Plan for the state nonpoint source program. The Management Plan outlines the program components to be used to address nonpoint source problems. The NPS Management Plan includes a variety of regulatory, non-regulatory, financial, and technical assistance programs needed to improve and maintain surface

and groundwater quality and outlines the Commonwealth's plans to address nonpoint source pollution. Pennsylvania currently is in the process of updating its NPS Management Plan for the next 5-year period.

Pennsylvania has received more than \$72 million from the federal Section 319 Grant Program (FY 90 through FY 07). This money has been used to institutionalize a nonpoint source program, implement various innovative technologies to treat nonpoint source pollution problems, develop an educational program, and begin several comprehensive watershed initiatives. Other funding sources for nonpoint source pollution management include: Pennsylvania's Chesapeake Bay Program, the Nutrient Management Act, the County Conservation District Assistance Funding program, the Stormwater Management Act Fund, the Coastal Zone Resources program, USDA's Environmental Quality Incentives and Conservation Reserve Enhancement programs, and the Environmental Stewardship and Watershed Protection Grant, also known as Growing Greener.

Growing Greener has provided \$235.6 million in watershed grants since 1999. Local partners have added another \$467 million from their own resources. The impact Growing Greener has made reaches beyond environmental improvement and extends into the General Assembly. The tremendous value of the program became clear to legislators and Growing Greener funding has been extended through 2012. This increases total funding to \$547.7 million from the original \$241.5 million allocated to DEP. The funding is being made possible through a \$4-per ton tipping fee on solid waste disposed in Pennsylvania's municipal waste landfills.

Monitoring for a five to ten year period of both land treatment and water quality is the best way to document the effectiveness of nonpoint source pollution efforts. Pennsylvania hosts 4 of the 24 EPA Section 319 National Monitoring Projects (NMP) across the country. Pennsylvania NMPs are: the Swatara Creek NMP monitoring abandoned mine drainage (completed in September, 2007 and report is in progress), the Stroud Water Research Center NMP monitoring a riparian reforestation project in an agricultural watershed (completed in December, 2007 and report is in progress), the Pequea and Mill Creek NMP using a paired watershed approach to monitor the effectiveness of agricultural best management practices (<http://pubs.usgs.gov/sir/2006/5141/>), and the Villanova Urban Stormwater Best Management Practices Demonstration site monitoring stormwater practices, which is still actively being monitored.

Four watersheds in Pennsylvania have been awarded EPA Targeted Watershed grants: Dunkard Creek Watershed, Christina River Basin Initiative, Upper Susquehanna River Basin Restoration, and Schuylkill River Watershed Initiative. The Targeted Watershed Grant is a relatively new EPA program designed to encourage successful community-based approaches and management techniques to protect and restore the nation's waters.

B2.3 (b) Highlights of Pennsylvania's Current NPS Program

Education and Outreach

Some of the Section 319 Grant Program involves projects either entirely or partially directed towards NPS education and outreach. Two initiatives entirely directed at education and outreach

at the grassroots level are funded through the Pennsylvania League of Women Voters (LWV) and the Pennsylvania Association of Conservation Districts (PACD). The LWV Water Resources Education Network (WREN), with funds from the Section 319 Grant program, funded ten \$5,000 mini-grants in 2007 to enable groups of local citizens and officials to build community support for water resource protection. PACD's Nonpoint Source Pollution Prevention Educational Mini-Projects program provided funding of up to \$2,500 each for 22 projects. The funding was provided by Pennsylvania's Section 319 Grant program and Pennsylvania's Chesapeake Bay program. The projects included the development of audio-visual products, exhibits or models, production of special events, marketing tools, publications, actual stream reclamation projects, hands-on water studies, and educational workshops.

Since 1999, the Growing Greener Program has funded 168 education/outreach projects for a total of \$9.6 million.

Building Capacity

DEP is working to establish a network of technical assistance providers to help watershed organizations effectively and efficiently achieve their watershed protection goals. These providers offer technical services to groups embarking on projects aimed at protecting and enhancing their local watersheds. Growing Greener funds 7 technical providers.

County conservation district watershed specialists help local groups protect and improve their watersheds, provide expert advice to farmers and landowners for conservation practices, work with DEP regional watershed managers, and help support local grant funded restoration projects. There are 67 Growing Greener - funded watershed specialists covering 66 of the state's 67 counties.

Pennsylvania's Watershed Approach

Pennsylvania is committed to a watershed approach for water resource management. Locally managed and monitored watershed improvement projects are essential to enhancing, maintaining, and reclaiming the Commonwealth's water resources.

More and more people are working to improve and protect Pennsylvania's watersheds by learning about their watersheds and sharing that information with their neighbors, restoring water quality through hands-on projects, and planning for the future through water resources management.

DEP has initiated a project to assist local groups planning to implement restoration measures in watersheds where one or more TMDLs have been identified. The goal of the project is to help such groups develop implementation plans more expeditiously and in a manner that fully complies with EPA requirements for additional funding under the Section 319 Grant program.

Thirty-three watersheds across the state containing waterbodies with water quality impairments caused by nonpoint source pollution have been targeted to have watershed - based implementation plans developed with funding from the Section 319 Grant program. The watershed - based plans identify what, how many, and an estimated cost of best management practices and treatment systems that are needed to remove the water quality from impairment.

This work, in turn, qualifies local sponsors to receive Section 319 Grant program construction funds for restoration projects that implement the TMDLs.

Abandoned Mine Reclamation

Eliminating drainage from abandoned mines and restoring rivers and streams to a healthy state represent significant challenges. The vast majority of impacts are from mines and mining practices of the past, predating the 1977 federal Surface Mining Control and Reclamation Act (SMCRA).

It's estimated that in Pennsylvania alone, the cost of addressing all of the environmental impacts of mining activities prior to the passage of SMCRA will exceed several billion dollars. Therefore, it's unlikely that public funds alone will ever be sufficient to tackle this monumental set of problems. Considering the scope of the challenge and the resources required to mount a successful clean-up program, it is widely recognized that an active, cooperative partnership between involved citizens, academia, industry, and public agencies is essential in attacking acid mine drainage, or abandon mine drainage (AMD).

Growing Greener has contributed a significant amount of funds toward addressing AMD issues. The projected accomplishments of these grants include 5,599 acres of abandoned mine reclamation and 605 miles of stream improvements. Additionally, the Bureau of Abandoned Mine Reclamation awarded reclamation contracts using Growing Greener and Abandon Mine Land (AML) Program funds. The projected accomplishments of these contracts include 2,129 acres of abandon mine reclamation and 28 projects to reduce or treat Acid Mine Drainage (AMD).

The State's Section 319 Grant Program has also made a significant contribution toward correcting AMD problems using passive treatment systems to treat AMD. A total of 20 projects costing more than \$3.5 million to treat AMD through passive treatment were funded through the Section 319 Grant Program in the past two years.

The Western Pennsylvania Coalition for Abandoned Mine Reclamation (WPCAMR) was formed in 1982 by six western Pennsylvania conservation districts. Today 24 county conservation districts make up WPCAMR. In 1996, the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR) was formed covering 16 counties in the anthracite coal region and the northern bituminous region. Today EPCAMR represents a coalition of watershed organizations, reclamation partners, co-generation plants, the active anthracite mining industry and regional non-profit organizations

The goal of the coalitions is to provide leadership for building local watershed-based support and partnerships with grassroots organizations whose primary focus is abandoned mine drainage abatement and abandoned mine land reclamation.

An important event in the battle to address AMD occurred in 2006. On December 9th, the Abandon Mine Lands (AML) Program was reauthorized in the final hours before Congress adjourned. The AML Reauthorization, which amends the 1977 Surface Mining Control and Reclamation Act (SMCRA), extends the AML Program for at least 15 years and will triple AML

funds Pennsylvania receives from reclamation fees collected from every ton of coal produced. In the next 15 years Pennsylvania should receive at least \$1.5 billion to clean up Priority 1 and 2 AML sites. States can also set aside up to 30% of this funding to address AMD problems not associated with Priority 1 and 2 sites. This extra funding will increase the amount of AML problems that can be remediated; however, it will not be enough money to address all of the problems in Pennsylvania.

Agriculture and Nutrient Management

During the past two years Pennsylvania's Section 319 Nonpoint Source (NPS) program provided over \$850,000 to farmers (FFY2004 through FFY2007 grants) for agricultural projects and technical assistance designed to reduce sediments and nutrients in runoff. Section 319 NPS program funded agricultural projects were targeted to TMDL-approved watersheds and 303(d) listed stream segments in Bucks, Centre, Dauphin, Fulton, Lancaster, Lebanon, Mifflin, Schuylkill, and Tioga counties. Projects are being implemented in specific watersheds impacted by nutrients, sedimentation-siltation, organic enrichment/low dissolved oxygen, and other causes of agricultural impairment. NPS agricultural projects also funded the development of nutrient management plans (NMP) and implementation of best management practices identified in farm conservation plans (CP). Partnerships with local county conservation districts and USDA-NRCS offices assist in NMP and CP implementation.

Act 55 of 2007 created the Resource Enhancement and Protection Program (REAP). REAP allows farmers and businesses to earn tax credits in exchange for BMP on agricultural operations that will enhance farm production and protect natural resources. The program is administered by the State Conservation Commission and the tax credits will be granted by the Pennsylvania Department of Revenue. Eligible applicants may receive between 25% and 75% of project costs as state tax credits for up to \$150,000 per agricultural operation. The amount of tax credit available to a recipient is dependent on the type of BMP implemented. Up to \$10 million in credits may be issued in fiscal year 2007-2008.

Pennsylvania's Growing Greener program has invested millions of dollars to implement agricultural practices through statewide initiatives including the Susquehanna River and Ohio River Conservation Reserve Enhancement Programs (CREP), Chesapeake Bay Foundation Farm Stewardship Programs, and Pastureland Improvement Projects through USDA-NRCS and Project Grass. Statewide Growing Greener initiatives partner with Section 319 NPS program agricultural implementation projects, regional Growing Greener projects, NRCS Farm Bill Conservation Programs, Pennsylvania's Agriculture Conservation and Rural Environment (ACRE) program, and local conservation initiatives.

Stream Corridor Protection and Restoration

Natural stream channel design addresses the entire stream system. It is based on fluvial geomorphology, or FGM, which is the study of a stream's interactions with the local climate, geology, topography, vegetation, and land use - how a river carves its channel within its landscape. All successful natural stream channel designs achieve sediment transport, habitat enhancement, and bank and channel stabilization. Natural stream channel design (NSCD) is relatively new to Pennsylvania. Our understanding of what works best to restore a channel's natural stability is still evolving, particularly across a state as diverse in geography and land use

as Pennsylvania. The *Guidelines for Natural Stream Channel Design for Pennsylvania Waterways* were developed with funding through a Section 319 grant by the Keystone Stream Team, an informal group comprised of government and environmental resource agencies, university researchers, sportsmen, citizen-based watershed groups, and private companies. These guidelines are aimed at watershed organizations and professionals involved in stream restoration design, construction, and permitting. The guidelines can be found at <http://www.canaanvi.org/nscdguidelines/>.

The Keystone Stream Team used a Section 319 grant to develop a web-based database for reference reach information collected on NSCD projects. A Section 319 grant also enabled the U.S. Geological Survey to develop Regional Curves. More information on both projects is available on the Keystone Stream Team's website at: www.keystonestreamteam.org.

In addition, the 319 Grant Program has provided over \$1.5 million in the past four years to fund fourteen projects on selected streams using NSCD techniques. Since 1999 Growing Greener has funded 39 FGM implementation projects for a total of \$5.1 million.

Documenting Restored Waterbodies

Significant funding has been provided over the past several years from nonpoint source funding programs such as Growing Greener and Section 319 Grant programs supporting stream and lake assessment, planning, and restoration activities. Hundreds of projects have been successfully completed. Those activities are beginning to show water quality improvements, but efforts to document them have generally been localized and inconsistent.

During 2007, DEP launched a coordinated effort to identify waterbodies across the state in which significant improvements to water quality have been observed. Stream names and locations were solicited from DEP watershed managers, conservation district watershed specialists, and citizen volunteer monitoring groups. DEP biologists then surveyed these waterbodies to determine the extent of their recovery and their potential to be removed from the State's impaired list. A total of 38 streams were surveyed during the summer of 2007. Analysis of the survey results is ongoing and changes to the Integrated List will be made as they become available. To date, Semiconon and Step Run have been removed from List 5 as the designated uses are now being attained as the result of abandon mine drainage remediation projects in these watersheds.

Many other waterbodies have shown improved water quality, but have not improved enough to be removed from the impaired lists. As more nonpoint source funding goes into these watersheds, it is anticipated that more waterbodies will be removed from the impaired lists or demonstrate water quality improvement.

Part B2.3(c) Total Maximum Daily Load Development (TMDL)

The process for identifying and correcting water impairments under the federal Clean Water Act Section 303(d) involves three distinct phases. First, the water is assessed to determine if it is or is not meeting water quality standards; second, TMDLs are developed to correct pollution problems; and third, implementation is carried out to meet the TMDL objectives. DEP has the responsibility of identifying the impairments, determining the necessary objectives, and requiring

that point source discharges meet the TMDL requirements. With adequate technical assistance and funding, DEP also leads local groups or agencies in implementing the TMDL to correct nonpoint source impairments. Implementation is the most important part of the process.

Impaired waters are those waterbodies that do not or will not meet water quality standards even after the application of all required technology-based treatment and other pollutant control requirements. DEP assesses Commonwealth waters and places impaired waters in Category 5 of Pennsylvania's Integrated Water Quality Monitoring and Assessment Report. Impaired waters require the development of a TMDL. A TMDL is the amount of pollutant loading that a waterbody can assimilate and still meet water quality standards. A TMDL is the sum of individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources, and a margin of safety. DEP uses mathematical models to develop the TMDLs.

TMDLs are planning tools that set water quality objectives for impaired waters. Meeting the water quality objectives of the TMDL will result in the attainment of water quality standards. If, however, a waterbody was found to still be impaired after meeting the TMDL objective, the TMDL would be reconsidered and new objectives would be set.

TMDLs are developed for the sources and causes of impairment that are identified in Category 5 of Pennsylvania's Integrated Water Quality Monitoring and Assessment Report. In the years 2006 and 2007, DEP completed 76 TMDLs. This means that allocations are made to the appropriate sources of pollutant loading. Individual WLAs are the amounts of the load allocated to point sources. WLAs are the basis for setting limits in National Pollutant Discharge Elimination System (NPDES) permits, which are the implementation procedures used to correct pollution problems attributed to point source discharges. The LA portion of the TMDL is the amount of the load that is allocated to categories of nonpoint sources. The LAs are the basis of future watershed restoration plans, which are the first part of correcting nonpoint source pollution problems.

The development of an implementation (or restoration) plan begins with a more detailed assessment of a watershed. The detailed assessment includes an analysis of the known water quality, identification of quantities and locations of pollution sources, and selection of priorities. It concludes with a description of the management measures needed to restore and maintain water quality, and it provides for public input concerning water quality problems and the restoration measures needed. The result of these activities is a management plan that includes the goals and objectives for improving water quality, an estimate of the technical and financial resources needed to implement the plan, an education program, and monitoring to demonstrate the success of the plan. The document also includes a budget and a timetable for implementation that identifies interim milestones. DEP will encourage local groups, watershed associations, or county conservation districts to take the lead and/or play an active role in completing detailed assessments and developing the implementation plan. Grant monies from the CWA Section 319 Nonpoint Source Program and the Commonwealth's Growing Greener program can be used to complete these assessments. The final plan should meet the objective set in the TMDL.

Part C: Surface Water Quality Monitoring and Assessment

Part C1.1 Water Quality Standards Program

Water Quality Standards (WQS) are the combination of water uses to be protected, the criteria (i.e. levels of substances) that need to be maintained or attained to support the uses, and an antidegradation policy. WQS are important elements of Pennsylvania's water quality management program because they set the general and specific goals for the quality of our waters. WQS are instream water quality goals that are implemented by imposing specific regulatory standards, such as treatment requirements and effluent limitations on individual sources of pollution and best management practices on nonpoint sources.

Pennsylvania's WQS are found in DEP's rules and regulations at 25 Pennsylvania Code Chapter 93 (Water Quality Standards). General or narrative criteria applicable to all waters are designed to control those substances that are not identified by specific criteria but may be harmful to protected water uses or to human, animal, plant or aquatic life. Specific water quality criteria are also included in Chapter 93. Criteria for toxic substances identified as EPA priority pollutants, as well as other substances, are currently in 25 Pa. Code Chapter 16, Water Quality Toxics Management Strategy Statement of Policy (available electronically at www.pacode.com).

Water quality standards implement the provisions of Pennsylvania's Clean Streams Law (35 P.S. Section 691.1 *et seq.*) and Section 303 of the federal Clean Water Act (33 U.S.C.A. § 1313). The authority of the Environmental Quality Board to promulgate and amend water quality standards is found in Sections 5 and 402, of the Clean Streams Law and in Section 1920-A of the Administrative Code of 1929 (71 P.S. Section 510-20).

Section 303(c) of the Federal Clean Water Act requires that "... the state shall from time to time (but at least once every three year period) hold public hearings for the purpose of reviewing applicable water quality standards and, as appropriate, modifying and adopting standards..." The review and revisions to WQS are part of Pennsylvania's continued planning process and water quality management program. The development and review of WQS and the complementary water quality assessment program consider the fundamental policies that are set forth in state and federal law which includes the national goal to achieve "fishable/swimmable" waters. The previous triennial review of Pennsylvania's WQS was approved by the US EPA Region 3 Administrator on June 17, 2005 following approval for final rulemaking at the August 17, 2004 Environmental Quality Board (EQB) meeting, and publication in the Pennsylvania Bulletin on February 12, 2005.

Pennsylvania's current triennial review includes amendments to Chapter 93 to incorporate updated and revised criteria for toxic substances that were previously contained in Chapter 16 Water Quality Toxics Management Strategy – Statement of Policy. Other amendments include clarifications of terms and definitions, drainage list corrections, a review of waterbody segments that do not meet the fishable or swimmable uses, and other corrections of typographic, format, and grammatical errors. In addition, DEP of Environmental Protection is

proposing revisions to Chapter 16 for updates to the human health criteria methodologies and updates or corrections to the approved analytical methods. The current triennial review was approved for proposed rulemaking at the October 16, 2007 EQB meeting, and is expected to be published in the Pennsylvania Bulletin in early 2008. The proposed rulemaking includes provisions for a 45-day public comment period and at least one public hearing. It is anticipated that the final rulemaking for this triennial review will be concluded during the summer of 2008.

The Antidegradation Implementation Guidance, completed in 2003, is designed to apply DEP's antidegradation regulation, partially approved by EPA in 2000 and finally approved in 2007. With the completion of the guidance, U.S. Environmental Protection Agency (EPA) is in the process of removing its promulgation of an antidegradation regulation for Pennsylvania. The antidegradation policy, which applies to all waters, mandates that existing uses are maintained and protected, and that the existing qualities of High Quality and Exceptional Value waters are also protected.

In Pennsylvania, water uses that are protected statewide include warm water fisheries aquatic life; public, industrial, livestock, wildlife, and irrigation water supply; and boating, fishing, water contact sports, and esthetics recreational uses. Other uses, such as cold-water fisheries, High Quality or Exceptional Value waters, navigation, and others, are protected as applicable to site-specific conditions.

Portions of only two waterbodies in the Commonwealth have been shown to not fully support the federal "fishable/swimmable" goal. The water contact (swimmable) use is excluded from RM 108.4 to RM 81.8 in the Delaware Estuary because of significant impacts from combined sewer overflows, and from the outer Erie Harbor/Presque Isle Bay harbor basin and central shipping channel due to the hazards to recreational users posed by shipping traffic.

Part C1.2 Plan for Achieving Comprehensive Assessments

In 1996, DEP developed a strategy for the statewide assessment of wadeable free-flowing streams involving a basic field-level biological screening assessment. After completing the first-ever statewide assessment of the state's wadeable surface waters in April 2007, DEP has replaced the original protocol with a new, more intensive assessment protocol for the second statewide assessment. DEP's new plan for achieving comprehensive, statewide assessment of its surface waters is based on the implementation of the Instream Comprehensive Evaluation (ICE) program.

The ICE program is designed to assess the water quality of previously assessed streams with a more rigorous methodology. It is based on a survey design that includes both probability-based and targeted sampling within one major sub-basin in each DEP region. Initial fieldwork began in 2005 in the Delaware drainage and was expanded to include the first set of six regional sub-basins in the rest of the state. A new set of six sub-basins will be surveyed upon completion of the previous six basins and repeated on a rotating-basin schedule thereafter. This is a cooperative effort led by Office of Water Management, with assessments being conducted by Department field and central office staff with support from the

Susquehanna River Basin Commission, the Interstate Commission on the Potomac River Basin, and the Delaware River Basin Commission.

The ICE methodology uses a biological assessment protocol to determine impairment of aquatic life uses. The ICE program uses an intensive biological assessment that is a modification of EPA's RBP III method, which includes laboratory identification of benthic macroinvertebrates to genus level and an RBP habitat assessment. Each biological assessment results in an Assessment Summary for input to the 305(b) assessment database and GIS that identifies waters with obvious water quality impairment and those with no obvious impairment. In addition to these stream assessment projects, a lake assessment element is also being implemented. Lake sampling efforts are described in the Lakes Water Quality Assessment section.

Part C1.3 Intensive Surveys

Intensive surveys have been a key element of DEP's water quality assessment program since their inception in 1965. These chemical and biological stream and lake investigations are conducted to gather background or baseline data on specific streams or lakes to: determine the effects of point and/or nonpoint source discharges on receiving water quality, to provide data in support of administrative or enforcement actions, determine the source of spills of pollution materials and evaluate their effect on water quality, and assess the distribution and accumulation of trace metals and selected organics in fish tissue or sediments. These surveys can include any combination of chemical sampling of water, effluent, sediment, or fish tissue; flow measurement; qualitative, quantitative, or semi-quantitative EPA Rapid Bioassessment Protocol (RBP) macroinvertebrate sampling; qualitative or quantitative (RBP) habitat assessment; or qualitative (and sometimes quantitative) fish sampling. While the current emphasis is on evaluation of unassessed waters (discussed in the previous section), other types of intensive surveys remain important to the Commonwealth's water quality management program.

An important element of the program is evaluation of candidate waters for designation as High Quality (HQ) or Exceptional Value (EV) Waters. These targeted, intensive surveys involve field studies of habitat and the aquatic community, observation of land use, and file searches to determine if a basin or stream segment qualifies for inclusion in the Antidegradation program. Streams receiving HQ or EV designation are protected to maintain their existing quality.

Part C1.4 Ambient Fixed Station Monitoring

The Pennsylvania Water Quality Network (WQN) is a statewide, fixed station water quality sampling system operated by Bureau of Water Standards and Facility Regulation. It is designed to assess both the quality of the Commonwealth's surface waters and the effectiveness of the water quality management program by accomplishing four basic objectives:

1. Monitor temporal water quality trends in major surface streams (routine stations)
2. Monitor temporal water quality trends in selected reference waters (reference stations)
3. Monitor temporal water quality trends in major tributaries entering the Chesapeake Bay
4. Monitor temporal water quality trends in selected lakes

Major streams are considered to be interstate and intrastate waters with drainage areas of roughly 200 square miles or greater. These waters receive both point and non-point source pollutants and are sampled at or near their mouths to measure overall quality before flows enter the next higher order stream. In this way, trends can be established and the effectiveness of water quality management programs can be assessed by watershed. In addition, reference stations are selected to represent: 1) “ambient” waters of natural quality minimally affected by human activities; and 2) “typical” waters with quality representative of that normally found in the region of the state being sampled.

The WQN consists of 104 routine stations generally sampled bi-monthly for stream discharge measurements and physical/chemical analysis, and every other year for biological evaluation. Twenty-five reference stations are generally sampled monthly for stream discharge and physical/chemical analysis and annually for biological evaluation. Also, 27 Chesapeake Bay loading stations are sampled monthly for stream discharge and physical/chemical analysis and every other year for biological evaluation. In addition, these bay loading stations are sampled 8 times/year during storm events.

Single mid-channel or spatially composite, depth-integrated samples are collected from each stream depending on stream size. Stream discharge (flow volume) is measured or calculated each time a water sample is collected. United States Geological Survey (USGS) stream gauging facilities and/or extrapolation equations are utilized whenever possible. Where no USGS facilities/equations exist, stream discharge is measured by U.S. Army Corps of Engineers and private facilities, or calculated according to methods outlined by USGS. At a minimum, macroinvertebrate samples are collected every other year at both routine and Chesapeake Bay load monitoring stations between August 1 and October 31 and annually at reference stations during fall (November 1 – December 30) or spring (March 1 – April 30) utilizing modified EPA Rapid Bioassessment Protocols.

Fish tissue is sampled periodically at the rate of about 35 WQN samples per year. Sampling locations are determined annually. Sampling is rotated through the network to provide periodic complete coverage and to maintain surveillance on problem waters. Fillets are sampled for appropriate pollutants in order to assess suitability for human consumption.

Lakes included in the WQN (except for Lake Erie and Presque Isle Bay that are part of the base network) are selected after consideration of size, public access, intensity of use, and availability of existing data. Large lakes with heavy public use and/or historical data are favored for inclusion because changing trends in the water quality of these resources have the potential for serious impacts on water uses.

In the past, lakes have been scheduled for annual sampling in groups of 15 to 20. Lake groups are sampled once a year for five consecutive years before initiating a new group. The

five-year data blocks were then used to assess lake water quality trends. Sixteen lakes are currently being sampled in addition to Lake Erie and Presque Isle Bay. Lake levels for Lake Erie and Presque Isle Bay stations are measured at the U.S. Coast Guard station at the entrance to Erie Harbor.

Lake Erie and Presque Isle Bay samples are collected at mid-depth. Two samples are collected from one site on each of the other lake monitoring sites during mid-summer stratification. These sites correspond to the deepest point in each lake, with one sample collected one meter below the surface and the second sample one meter above the lake bottom. A temperature/dissolved oxygen profile is recorded through the vertical water column and an aliquot from the shallow sample is filtered for chlorophyll a analysis.

Qualitative plankton samples and chlorophyll a are collected annually from Lake Erie and Presque Isle Bay. Quantitative invertebrate or plankton sampling and qualitative or quantitative fish sampling is optional at other lakes and may be conducted at the discretion of the collector.

Part C1.5 Lake Water Quality Assessments (LWQA)

Lake assessments include data from the Lake Water Quality network sampling noted above, Lake Trophic Status (TSI) studies conducted to determine the need for point source phosphorus controls, and a cooperative DEP/DCNR program that follows the same protocol as the TSI studies. TSI lake surveys results, along with fish and aquatic macrophyte survey data are used to determine lake use attainment status. Citizen volunteer monitors are trained to collect data on both public and private lakes to contribute to the lake assessment databases. In 2007, PA participated in EPA's National Lake Survey, sampling 18 randomly chosen lakes across the state for ecological, biological, and water quality indicators. EPA contractors are analyzing the data, and the final report is due in 2009.

Lake watershed assessments since 1995 have been funded under EPA Section 319 grants and under Pennsylvania's Growing Greener grant program, as well as through EPA's special 106 appropriation funds. Several statewide LWQA projects have been funded to assess the status of some important Pennsylvania lakes and to help refine the lakes database. The most recent statewide survey was the assessment of 18 randomly chosen PA lakes, as part of EPA's National Lake Survey conducted in 2007. This data will be assembled in 2008, and the final report will be available in 2009.

Statewide, lake impairment screening is done to determine the Trophic State Index (TSI), identify water quality violations and determine impacts on recreational uses and aquatic life. These studies identify waterbodies in need of more in-depth (Phase I type) studies. Phase I assessment studies evaluate existing water quality conditions in the lake and watershed, identify sources and magnitude of pollutants; formal Phase I evaluations also include a review of feasible control and restoration methods, and recommend lake and watershed management plans to restore or protect water quality. These formal studies result in "Watershed Implementation (or Management) Plans". Phase II projects continue documentation of water quality conditions and also implement lake and watershed BMPs as recommended in the Phase I management plan.

Institutional BMPs, (environmental education efforts, such as workshops and outreach), are integral components of successful projects, as well as a gamut of structural BMPs. Continued water quality studies are recommended to monitor the success of control efforts. Also, our TMDL lakes are targeted for monitoring on a continuing basis, post-BMP installation, so that water quality improvements may be detected and reported.

Pennsylvania's definition of a "significant lake" is a waterbody with public access and a hydraulic residence time of 14 days or more. Pennsylvania has 220 verified significant lakes totaling 100,928 acres. Another 150 public waterways are used as lakes but may not have a 14-day retention time. Lake assessments are done on "significant lakes" and other lakes by DEP and various partners including USGS, EPA, citizen volunteers, DEP of Conservation and Natural Resources (DCNR), Morris Arboretum, Conservation Districts, ACOE and consultants. Since 1997, 280 (174 significant) lakes have been assessed using DEP's lake water quality protocol. In the past 4 years, other data on lakes (i.e., aquatic macrophyte coverage, fishery data, and Department of Health beach bacteria data) have been incorporated into the assessment report. Lakes assessed through the 2006 field season are included in this report. Continued lake sampling, along with regional office efforts, is part of DEP's plan for achieving comprehensive assessment.

Basic water quality assessments are done on lakes under three main programs in Pennsylvania:

- LWQN – a statewide set of lakes is sampled by field office biologists once each summer for 5 years. A new set of 16 lakes was selected in 2006 for the next five-year sampling round in the WQN program. These lakes will be included in the 2010 or 2012 Integrated Report.
- Lake TSI studies – As of 2007, all six Regional field offices have incorporated TSI lake studies in Regional surveys to determine if phosphorus controls are needed for point source discharges in the watershed or to determine current trophic status on a lake with older or no data. Samples are collected three times in 1 year (spring, summer and fall), at a minimum of two stations at surface and bottom locations. Each Region samples at least two lakes per year under this program.
- Lake Citizen Volunteer Monitoring Program - Citizen volunteer monitors were recruited and trained to collect lake data in 2001, and they continue to contribute to lake assessments through the Citizen Volunteer Monitoring Program. To date (2007), volunteer monitoring data for 36 lakes have been included in the assessed lakes tally.

A smaller but significant program is conducted through DEP of Conservation and Natural Resources (DCNR) and the state Department of Health (DOH) to obtain bacteria beach monitoring information for state park and private beaches respectively. This provides a means of assessing recreational use at lake bathing beaches.

Lakes assessed under the 1997 Memorandum of Understanding with EPA were completed in 2002, but lakes continue to be assessed using the same (TSI) protocol (as above). Funding for this program, provided by EPA under a special appropriation grant in 1997, helped fund about 170 lake water quality assessments. That grant closed March 2003.

Lake data from these programs are reviewed to evaluate support of designated uses and compliance with water quality criteria. The results of these assessments are presented in the integrated 305(b)/303(d) listings and are summarized in this section.

All lake acreages are standardized to the acres reported in the National Hydrography Data (NHD) layer

Part C1.6: Citizens' Volunteer Monitoring

DEP has an ongoing program that provides support and technical assistance to volunteer monitoring efforts. Involvement of individuals and organizations in monitoring water quality of streams, rivers, and lakes enables them to become active participants in watershed programs and activities. Volunteer monitoring can create an informed constituency that understands the powers and limitations of scientific information. Numerous groups are involved statewide in monitoring activities.

Program goals include:

1. Helping citizens know their water resources better
2. Showing that volunteers collect quality data that is credible
3. Acting as a liaison between volunteers, service providers, and DEP

The program has provided workshops, training, and quality assurance sessions for volunteer monitors throughout the state. The technical handbook includes a study design process, numerous protocols for monitoring at differing levels of expertise, and a volunteer monitoring code of ethics that provides specific monitoring guidance for volunteers in designing their monitoring plan. The handbook includes useful information to help volunteers determine how the data they collect might be used to meet their monitoring goals.

To help meet DEP needs, the program has worked in partnership with various groups to collect data. A bacteria-monitoring partnership resulted in data that can be used to determine recreational use attainment of streams for the Integrated Water Quality and Monitoring Assessment Report. A volunteer lake monitoring project also provides data for use in this process. Working both internally and with volunteers, the program is taking part in restoration monitoring to gauge the effectiveness of restoration projects including stream restoration and Conservation Reserve Enhancement Projects.

The program continues to provide guidance and technical assistance to the Senior Environment Corps throughout the state. The Corps uses standardized protocols to assess physical, chemical and biological indicators in streams. These data can be used as a screening tool to determine where further study is needed and to check on the success or failure of restoration efforts. The data are housed in a database, Monitor Anything, and includes an open component with fields for a limited number of parameters that can be utilized by other volunteer monitoring groups not following the Corps' standardized protocols. Under the guidance of program staff, most Corps member groups have developed or are developing study designs to guide and broaden their monitoring efforts.

Watershed Snapshot, an education and awareness event originally started by the Delaware River Basin Commission in 1996, is an activity the program offers to interested groups during a ten-day period in April. Watershed Snapshot provides volunteers with the option to collect water chemistry, biological or physical data, habitat criteria and buffer information. Field sheets are available for participants on the DEP website.

Another outreach activity that the program often takes part in with volunteers is World Water Monitoring Day. This happens every year during World Water Monitoring Month, September 18 through October 18. September 18 is World Water Monitoring Day, which is modeled after Watershed Snapshot and hopes to get people involved with their watersheds throughout the world.

Another program project includes working with 319 program staff and volunteers to monitor sections of streams to assess impacts from natural stream channel design structures, which are supported by 319 monies. Additionally, monitoring Conservation Reserve Enhancement Program (CREP) activities are in place to assess the effectiveness of these practices. By working with citizens and partnering with DEP programs, the hope is to integrate more volunteers into projects like TMDL implementation, restoration monitoring, and riparian buffer monitoring, as well as the above-mentioned projects. The program strives to meet both volunteer and DEP needs through these and other activities and projects.

Part C1.7 Existing and Readily Available Information

In an effort to utilize all existing and readily available data, DEP contacted about 500 potential outside data sources (federal, state and local governments; universities; advisory groups; citizen monitoring groups; watershed associations; public interest groups; and sportsmen's groups) to request information regarding water quality. Each group on the mailing list received materials that briefly explained the reasons why DEP was soliciting information from them. Minimum quality assurance standards for the data were made available on DEP's website. Those groups with data and/or information regarding water quality limited segments were requested to fill out a data submission form and return it, along with any pertinent supporting documentation, to DEP.

For any given listing cycle, DEP determines the accuracy and validity of existing and readily available data and information provided by the outside groups based on a set of minimum quality assurance requirements. These requirements include the specific location of the reported impairment, identification of the particular water quality standards violation(s), data to substantiate the conclusion of impairment, identification of the source(s) and cause(s) of impairment, and the presence of a quality assurance/quality control plan. Acceptable data from these sources are then included in the assessment database to prepare the use support summary in this narrative report and the five-part list of waterbody-specific use support decisions. More detail on this process is provided in the assessment and listing methodology document associated with the five-part list. No new information was received from outside sources or the 2008 Integrated Report.

DEP works with DEP of Conservation and Natural Resources (DCNR) and the state Department of Health (DOH) to obtain bacteria beach monitoring information for state park and private beaches respectively. This provides a means of assessing recreational use attainment for water bodies with bathing beaches. The results were evaluated and the assessments are included in the 2008 report. This cooperation will continue and efforts are being made to make data transfer more efficient.

A large sampling effort that included several agencies and volunteer monitors was completed in 2007. It is hoped this will serve as a model for similar future efforts. An intensive year long pilot program was conducted in the Pine Creek Watershed to determine recreational use. Pine Creek is a tributary to the Allegheny River in the greater Pittsburgh area. The project was completed in conjunction with EPA Region 3, 3 Rivers Wet Weather, Allegheny County Sanitary Authority (Alcosan), and Pine Creek Watershed Association. Samples were collected from November 2006 through October 2007. Volunteers who completed PA DEP training collected samples at twenty five locations throughout the watershed each week. Samples were analyzed at the Alcosan laboratory to determine fecal coliform and E.coli densities. A five sample geometric mean over 30 days for fecal coliform was utilized to determine recreational use attainment.

The 25 sampling locations were dispersed throughout the Pine Creek watershed to ensure that an accurate depiction of the water quality would be represented. Stations were located in areas impacted by combined sewer overflows, sanitary sewer overflows, sewage treatment plant discharges, high development areas, and recreational parks.

Site 18 located on Willow Run was the only location that met recreational use attainment requirements and the remaining twenty-four sites were all determined to be impaired for recreational use. The impaired sites all had at least two months during the bathing season in which the geometric mean exceeded the impairment standard of 200cfu/100ml.

The final phase of the pilot involves the modeling of the dynamics of bacteriological fate in flowing waters using the Pine Creek samples as input. Results will be used to develop a sampling plan with associated quality assurance documents and initiate a pilot sampling effort to generate data to test the efficacy of the model. If the approach proves to be effective, it will be applied statewide in an effort to enhance the effectiveness of future recreational use assessments.

Part C2.1: Assessment Methodology

Because of its length the 2007 Assessment Methodology is not included with this report but rather is posted separately on DEP's website. It is available electronically at www.dep.state.pa.us Use the following keywords: Water, Water Quality, and, finally, 2007 Assessment Methodology.

The Methodology describes the collection and analytical methods used to evaluate stream assessment information. The resulting assessments comprise the stream miles, lake acreages, and attained/impaired status reported in the 2008 Integrated List.

The 2007 Assessment Methodology contains the following protocols:

Watershed Assessments

Instream Comprehensive Evaluations (ICE)

Macroinvertebrate Stream Protocols

Limestone Streams

Multi-Habitat (Pool/Glide Streams)

Riffle/Run Freestone Streams

Riffle/Run Summer Freestone Streams

Lake Protocols

Aquatic Plant Macrophyte Cover

Lake Fisheries

Lake Chemistry and Trophic Status

Chemistry and Bacteria

Chemistry Evaluations

Fish Tissue Sampling

Bacterial Sampling

Outside Agency

Outside Agency Data

Appendices

Appendix A – Source and Cause Definitions

Appendix B – Taxa Tolerance Values

Part C3.1 Streams Use Support

Table 2 is a summary of the four use support categories used in listing. Miles “supporting” are the number of miles not impaired for as assessed water use; impaired not supporting the assessed use and requiring a TMDL; “approved TMDL” refers to impaired for which an approved TMDL is in place to address the problem(s), and “compliance” lists miles impaired but expected to improve in a reasonable amount of time because formal agreements are in place obligating responsible parties to take corrective action. Pollution is a special category of impairment where there is a problem but it will not be addressed through a TMDL because the problem is not caused by pollutant loading. “Assessed” represents the total miles surveyed for that use.

Table 3 summarizes the sources of impairment problems and Table 4 the causes. Note that totaling the sources or causes will not equal the miles summarized in Table 2 because a given waterbody may have multiple sources and/or causes. The tables are statewide summaries. The individual source/cause pairs for each waterbody are found on List5, 4b, and 4c. The lists are large and, as a result, are separate from this narrative in electronic format.

Table 2
Statewide Assessment Summary
A statewide summary of use support status for four water uses in assessed streams

	Aquatic Life Use	Fish Consumption Use	Recreational Use	Potable Water Supply Use
<i>Streams (miles)</i>				
Assessed	84,021	2,381	627	1,569
Supporting	68,670	590	365	1,445
Impaired	11,276	1,080	244	88
*Approved TMDL	3,283	711	8	36
Compliance	57	---	---	---
**Pollution	2,311	---	---	---

* TMDL miles reported here are only those overlapping impaired segments. A TMDL allocation may include an entire watershed including streams listed as attained.

** 1,576 miles have both pollution and pollutant problems

Table 3
Statewide Assessment Summary
Sources of Impairment: Streams
Totals Include List 4a, 4b, 4c, and 5
(Mile totals will not equal Table 2 because a waterbody can have multiple impairments)

<u>Source</u>	<u>Designated Use (Miles)</u>				<u>Total</u>
	<u>Aquatic Life</u>	<u>Fish Consumption</u>	<u>Recreation</u>	<u>Water Supply</u>	
Abandoned Mine Drainage	5505		8	33	5546
Agriculture	5229		48	38	5315
Source Unknown	450	1581	199	46	2276
Urban Runoff/Storm Sewers	2119		16		2135
Road Runoff	846				846
Small Residential Runoff	707				707
Habitat Modification	575				575
Removal of Vegetation	394				394
Municipal Point Source	380		3	8	391
Atmospheric Deposition	370				370
Other	318			1	319
Channelization	319				319
Bank Modifications	266				266
Land Development	235				235
On site Wastewater	205				205
Erosion from Derelict Land	195				195
Construction	169				169
Natural Sources	163				163

Upstream Impoundment	154			154
Industrial Point Source	123	29		152
Surface Mining	119			119
Flow Regulation/Modification	117			117
Hydromodification	102			102
Combined Sewer Overflow	87			87
Subsurface Mining	80			80
Golf Courses	51			51
Petroleum Activities	51			51
Package Plants	20			20
Silviculture	19			19
Land Disposal	14			14
Highway, Road, Bridge Const.	11			11
Draining or Filling	10			10
Recreation and Tourism	3			3
Logging Roads	2			2
Dredging	1			1

Table 4
Statewide Assessment Summary
Causes of Impairment: Streams
Totals Include List 4a, 4b, 4c, and 5

(Mile totals will not equal Table 2 because a waterbody can have multiple impairments)

Cause	Use Designation (Miles)				Total
	Aquatic Life	Fish Consumption	Recreation	Water Supply	
Siltation	7934		1	3	7938
Metals	5068		6	33	5107
pH	2770			11	2781
Nutrients	2603			34	2637
Organic Enrichment/Low D.O.	1338			2	1340
Water/Flow Variability	1308				1308
Cause Unknown	1015				1015
PCB		940			940
Other Habitat Alterations	869				869
Mercury		835			835
Flow Alterations	692				692
Suspended Solids	539			2	541
Pathogens	30		250	56	336
Turbidity	224				224
Salinity/TDS/Chlorides	176		4		180
Chlordane		169			169
Excessive Algal Growth	128				128
Unknown Toxicity	89				89
Thermal Modifications	83				83
Other Inorganics	44				44
Dioxins		41			41
Oil and Grease	39				39

Nonpriority Organics	30				30
DO/BOD temp	23			4	27
Pesticides	25				25
Priority Organics	19				19
Unionized Ammonia	18				18
Color	10				10
Chlorine	9				9
Taste and Odor	7				7
Filling and Draining	5				5
Noxious Aquatic Plants	5				5

Monitoring information indicates that 68,670 miles support designated aquatic life use. A total of 11,276 miles are reported as impaired and still requiring a TMDL and 3,283 miles are impaired but have an approved TMDL. There are 2,311 miles with pollution problems not requiring a TMDL and 57 miles impaired but expected to improve in a reasonable time pending agreed upon corrective action.

The three largest sources of reported impairment are abandoned mine drainage, agriculture, and urban runoff/storm sewers. The leading causes are siltation, metals, pH, nutrients, and organic/enrichment. While direct source/cause linkages cannot be made at the level of detail presented in Tables 3 and 4, these causes are known to be associated with abandoned mine drainage, agriculture, and urban runoff/storm sewers. Agricultural impairments are generally caused by nutrients and siltation associated with surface runoff, groundwater input and unrestricted access of livestock to streams. Low pH, elevated concentrations of metals, and siltation are the result of abandon mine drainage runoff from mine lands and refuse piles. Increased levels of nutrients and siltation, along with flow variability, are associated with urban runoff.

There are 590 assessed miles supporting the fish consumption use and 1,080 miles impaired and still requiring a TMDL. There are approved TMDLs for 711 miles. The 590 supporting miles is a conservative estimate. As a rule, when fish tissue samples are clean the results are only extrapolated to represent two miles on small streams and ten on larger. To protect the public, larger extrapolations are made when the fish tissue samples are tainted.

The major source of contamination resulting in fish consumption advisories is listed as unknown because it is difficult to trace the sources. The contamination can be in the soil, groundwater, stream sediment, or point sources. The contaminants do not readily breakdown and can linger for decades. In addition fish can move considerable distances. Only with careful study can the location of contamination be determined with certainty. The contaminants documented are mercury, PCB, chlordane, and dioxin in decreasing order. Atmospheric deposition is the most likely source of the mercury. There is a statewide advisory limiting fish consumption of recreational caught fish to one fish meal per week. If fish tissue mercury concentrations are greater than the one meal per week level (higher concentrations), they are placed on List 5 of waters impaired for fish consumption.

Recreational use is assessed primarily by measuring bacteria levels. High bacteria levels indicate conditions that might cause sickness from contact with the water. Many of the waters targeted for

sampling were suspected of having bacteria problems so the 244 miles of impaired miles versus the 365 miles attaining is not unexpected. There are 8 miles with an approved pathogen TMDL. The major source of pathogens is listed as source unknown followed by agriculture. If there are several potential sources of bacteria in the watershed or varied land use the assessor lists the source as unknown until better information becomes available.

Potable water supply use was supported in 1,569 miles, not in 88, and 36 had approved TMDLs. This potable water supply use is measured before the water is treated for consumption. The primary assessment measures are nitrate+nitrite levels and bacteria. There are some records listed for pH and metals coming from abandon mine drainage.

Part C3.2 Record of changes to the 2006 Integrated List 5 made in the 2008 Integrated List

The Integrated List is a biennial report. The previous list included data gathered through 2005. In the two year period leading up to this report, a number of waterbodies listed as impaired on the 2006 Integrated Report were resurveyed. Impaired waters may be resurveyed for a number of reasons. TMDLs require the collection of additional information and biologists must return, sometimes years later, to gather additional information. A local biologist may be aware of changes in land use or water quality improvements and will target those areas for new surveys. Areas where watershed improvement projects are in place are also targeted. The purpose of the projects is to remediate problems negatively impacting the stream so the water quality should improve after installation and a period of recovery. Appendix F tracks changes in the status of waters impaired in 2006 but revised in 2008.

Seaks Run was listed as a compliance problem in 2006. Since that time the treatment problems have been resolved. The wastewater treatment plant was upgraded, is now in compliance, and the receiving water is listed attaining.

A treatment plant discharging to an unnamed tributary of the Schuylkill River was issued a compliance schedule and upgraded the summer of 2007. A stream survey will be conducted to evaluate the receiving water after the new systems have been functioning several months and the stream has had adequate time to recover. This record appeared on List 5 in 2006 but was moved to List 4b (compliance problem) in 2008.

Surveys in the Dents Run watershed, unnamed tributary to Ontelaunee Creek, and unnamed tributary to Maiden Creek were refinements of older survey. The new surveys took a closer look at the unnamed tributaries and found they were attaining their uses even though they were listed as impaired in 2006. The changes were not due to changes in the water but the use of a more refined assessment spatial scale.

The Piney Fork, Black Creek, Shoeneck Creek, and Unnamed Tributary to Walnut Creek surveys refined the understanding of the pollutant stressors but the streams remain impaired. The waterbodies remain on List 5 but the pollutants were revised to reflect a better understanding of the problems.

Pre-TMDL chemistry sampling indicated the metals criterion was being met in Sinnemahoning Creek but the habitat was still impaired by the iron sulfide encrusted sediment. The metals problem was removed from category 5 and the habitat problem moved to category 4c.

A survey of Streets Creek indicated siltation was an additional problem to the already listed metals. Red Run was re-surveyed and the pH problem remains unchanged.

The Pine Run, Big Sandy, South Branch Wyalusing, and Kistler Run surveys found these previously impaired streams were now attaining their uses. The reasons for the improvements are unknown.

Semiconon and Step Run improved and now attain their uses. The improvement is attributed to abandoned mine drainage treatment facilities and remediation projects in the watersheds. These treatment facilities were supported with public funds.

Part C3.3 Lakes Use Support

Table 5 is a summary of the four use support categories for lakes. Acres “supporting” is the number of acres not impaired for the assessed use. “Impaired” acres (List 5) do not support the assessed use and still require a TMDL. “Approved TMDL” includes impaired waters where a TMDL has been completed and approved by EPA. “Impaired (List 4c)” is a special category of use impairment where a problem is documented but it will not be addressed through a TMDL. “Assessed” refers to the total acres surveyed for that use. Pollution is a special category of impairment where there is a problem but it will not be addressed through a TMDL because it does not involve pollution loadings. “Assessed” refers to the total acres surveyed for that use.

Table 6 summarizes the sources of impairment problems and Table 7 the causes. Note that totaling the sources or causes will not equal the acres summarized in Table 5. This is because a waterbody may have multiple sources and causes. The individual source/cause pairs for each waterbody are found on List 5, 4b, and 4c. The lists are large and as a result are presented only in electronic format separate from this narrative.

Table 5
 Statewide Lake Assessment Summary
 A statewide summary of use support status for four water uses in assessed lakes

	Aquatic Life Use	Fish Consumption Use	Recreational Use	Potable Water Supply Use
<i>Lakes (acres)</i> Note: In 2008 lake acres were standardized to the National Hydrography Data (NHD) layer.				
Assessed	74,652	36,057	70,306	11,469
Supporting	36,295	2,987	68,657	11,469
Impaired (List 5)	5,593	27,587	1,649	---
Impaired (List 4c)	20,866	---	---	---
Approved TMDL	11,898	5,483	---	---

Table 6
 Statewide Assessment Summary
 Sources of Impairment: Lakes
 Totals Include List 4a, 4b, 4c, and 5
 (Acre totals will not equal Table 5 because a waterbody can have multiple impairments)

<u>Source</u>	<u>Use Designation (Acres)</u>				<u>Total</u>
	<u>Aquatic Life</u>	<u>Fish Consumption</u>	<u>Recreation</u>	<u>Water Supply</u>	
Atmospheric Deposition	677	33,048			33,725
Other	20,865				20,865
Agriculture	13,565		1,266		14,831
Source Unknown	3,930	22	383		4,344
Urban Runoff/Storm Sewers	3,615				3,615
On site Wastewater	3,408		87		3,495
Municipal Point Source	2,439				2,439
Natural Sources	417				417
Abandoned Mine Drainage	365				365
Small Residential Runoff	273				273
Hydromodification	95				95
Construction	89				89
Golf Courses	25				25

Table 7
 Statewide Assessment Summary
 Causes of Impairment: Lakes
 Totals Include List 4a, 4b, 4c, and 5
 (Acre totals will not equal Table 5 because a waterbody can have multiple impairments)

<u>Cause</u>	<u>Aquatic Life</u>	<u>Use Designation (Acres)</u>		<u>Water Supply</u>	<u>Total</u>
		<u>Fish Consumption</u>	<u>Recreation</u>		
Mercury (Lakes)		33,048			33,048
pH	17,995				17,995
Nutrients	13,770		87		13,857
Organic Enrichment/Low D.O.	10,762				10,762
Suspended Solids	10,747				10,747
Pathogens			1,562		1,562
Metals	365				365
Noxious Aquatic Plants	291				291
DO/BOD	140				140
Siltation	95				95
Unionized Ammonia	25				25
PCB		22			22

A total of 74,652 acres of Commonwealth lakes have been assessed for aquatic life use. Of these, 36,295 acres support the use. There are 5,593 assessed lake acres that are impaired and still require a TMDL. Approved TMDLs are in place for 11,898 acres. Pollution problems that do not require TMDLs impair 20,866 acres. The major sources of aquatic life use impairment in lakes are “other”, and agriculture. “Other” is the source used for lakes on List 4c which are impaired but not requiring a TMDL. These lakes show short term fluctuations in DO or pH but support a healthy fish community. The primary stressors are nutrients, suspended solids, organic enrichment/low DO, and pH. Low DO and high pH problems are associated with summer lake stratification.

Fish consumption assessments covered 36,057 lake acres (excluding Lake Erie but not Presque Isle Bay). Of these, 2,987 acres are assessed as supporting, 27,587 acres are reported as requiring a TMDL, and 5,483 acres have approved TMDLs. The reason for the large proportion of impaired acres is the implementation of a risk-based mercury fish consumption advisory methodology in 2001. Nearly all of the lake advisories are due to mercury with atmospheric deposition listed as the source.

In addition, fish consumption advisories are in place for a number of species in the Pennsylvania portion of Lake Erie. These advisories are due to PCB and mercury. There are 63 miles of Lake Erie shoreline in Pennsylvania fourteen of which comprise the Presque Isle Peninsula.

A total of 70,306 lake acres have been assessed for recreation use support and only 1,649 of those acres require TMDLs. Pathogens and nutrients from agriculture and unknown sources are responsible for the impairments.

All 11,469 acres assessed for potable water supply use were found to be attaining that use.

Part C3.4 Excluding the Fishable and Swimmable Uses

DEP routinely re-evaluates, as part of its triennial review of water quality standards, the two water bodies where the fishable or swimmable uses specified in Section 101(a) (2) of the federal Clean Water Act uses are not being met: (1) the Harbor Basin and entrance channel to Outer Erie Harbor/ Presque Isle Bay and (2) several zones in the Delaware Estuary.

The swimmable use designation was deleted from the Harbor Basin and entrance channel demarcated by U.S. Coast Guard buoys and channel markers on Outer Erie Harbor/ Presque Isle Bay because boat and commercial shipping traffic pose a serious safety hazard in this area. This decision was based on a Use Attainability study completed in 1985. Because the same conditions and hazards exist today, no change to the designated use for Outer Erie Harbor/ Presque Isle Bay is proposed.

DEP cooperated with the Delaware River Basin Commission (DRBC), EPA and other DRBC signatory states on a comprehensive Use Attainability study in the lower Delaware River and Delaware Estuary. This study resulted in appropriate restrictions relating to the swimmable use, which DRBC included in water use classifications and water quality criteria for portions of the tidal Delaware River in May 1991. These changes were incorporated into Sections 93.9e and 93.9g (Drainage Lists E and G) in 1994. The primary water contact use remains excluded from the designated uses for river miles 108.4 to 81.8 because of continuing significant impacts from combined sewer overflows and other hazards.

Part C3.5 Lakes Trophic Status

Lake trophic status is based on Carlson's Trophic State Index (TSI) and is used as a tool to monitor lake status. In Pennsylvania, lakes with a TSI of less than 40 are considered oligotrophic (nutrient poor); 40-50 TSI lakes are considered mesotrophic. Eutrophic (nutrient rich) lakes yield TSIs of 50 to 65. Lakes with TSI values greater than 65 are hypereutrophic. TSIs for Pennsylvania lakes are based on seasonal mean values of phosphorus, secchi depth and chlorophyll a. Table 8 summarizes lake trophic status data of significant lakes sampled through 2007.

Table 8
Lake Trophic Status Summary of Significant Lakes (Minimum Detention Time of 14 Days)

	Number of Lakes	Acreage of Lakes
Total (Significant)	220	100,928
Assessed for TSI (since 1997)	174	78,242
Oligotrophic	6	1,607
Mesotrophic	68	25,622
Eutrophic	82	31,916
Hypereutrophic	14	21,888
Unknown TSI	50	19,895

Part C3.6 Lake Restoration Efforts

The Commonwealth's lake protection and restoration program is mainly supported by EPA's Nonpoint Source Program, Section 319 of the Clean Water Act and the state's Environmental Stewardship Program, through Growing Greener grants. Other funding sources include EPA Section 104(b)3 grants, the Natural Resources Conservation Service (NRCS) PL566 program, and other programs such as the Chesapeake Bay Program, and PENNVEST (Clean Water State Revolving Funds). DCNR also funds in-lake restoration practices for State Park lakes where needed. Various partners are engaged in lake and lake watershed restorations, not limited to the lake owners; important watershed partners include the county Conservation Districts which implement many DEP program initiatives and also serve as grant and project managers. Program goals to restore and/or protect lake water quality are based on studies that identify impairments, pollution sources and the course of remediation. Public use and benefit of the lake, and watershed priority based on impairment are important criteria in prioritizing lakes to be funded.

Restoration techniques implemented through Phase II or restoration grants include various watershed and in-lake best management practices (BMPs) such as agricultural BMPs, riparian corridor protection and restoration (buffers and in-stream structures), lake shoreline protection, dredging, stormwater management and control techniques, point source controls, aquatic macrophyte controls, lake and watershed liming, alum treatments, biomanipulation to benefit fisheries, lake drawdowns, septic management, control of geese, and institutional BMPs such as public education efforts and enacting protective municipal ordinances. Sewage treatment plant upgrades are also an important control technique that improves lake water quality.

Table 9 provides information on current Phase I (assessments) and Phase II (restoration/implementation) lake work being conducted in the Commonwealth. Expenditures on active lake projects or lake watershed projects in Pennsylvania currently amount to about \$2.7 million. Table 10 summarizes techniques used in lake restoration projects in Pennsylvania's public lakes.

Part C3.7 Lake Control Methods

Pennsylvania's lake management regulation is codified in DEP's Rules and Regulations at Section 96.5 - Discharges to Lakes, Ponds and Impoundments, which sets forth treatment requirements for point source discharges necessary to control eutrophication. It is a technology-based approach that results in increasingly stringent effluent requirements based on an assessment of the water quality benefits of such controls. The need for and extent of point source controls for a specific lake are determined by field studies conducted during spring overturn, summer stratification and fall overturn. Appropriate nutrient limitations and monitoring requirements are included in NPDES permits based on the trophic conditions found during these studies. In most cases, follow-up monitoring is conducted to evaluate the adequacy of the effluent limitations.

Nonpoint source pollution can also impact lake water quality. Phase I diagnostic studies on Pennsylvania lakes identified nonpoint source impacts from acid deposition, agricultural runoff, streambank erosion, malfunctioning septic systems, construction, stormwater runoff, and pathogens. Mitigation from these sources is highlighted in the previous section. Acidity problems, stemming mostly from acid deposition, but also in a few cases mining runoff, may be mitigated with lime treatments, although funding for these types of projects is very limited. Lakes with naturally low pH (swamps and bogs) are not considered for treatment, but may be listed on part 4C of the Integrated List. Liming is the state-of-the-art method to mitigate low pH in lakes, and is used in PA on both public and private lakes. Some lakes (reservoirs) have been identified as impaired by metals from mine drainage, or more commonly by mercury (mainly via fish tissue) and none have been identified as impacted by "high acidity," based on high concentrations of dissolved metals. Restoration efforts in the watershed are the best way to reduce mining effects in waterbodies (i.e. treating the source of the problem). In-lake mitigation could be explored by using alum treatments to bind metals into the lake sediments. Some "toxics" can be removed by dredging but again, funding for dredging is limited. Most efforts have focused on source control (mining BMPs or AMD BMPs) and natural recovery rather than in-lake mitigation.

Table 9. Current Lake Projects in Pennsylvania as of 2006. Projects Are Listed in Chronological Order.

Table xx. Current Lake Projects in Pennsylvania as of 2006. Does not include assessments done by DEP. Final reports available from the Bureau of Watershed Management.

Projects are listed in chronological order.

Lake or Study Name	County	Study Type	Study Period	Federal Funds	Fund Source	GG totals	319 totals	Match	Sponsor
Lake Jean	Luzerne, Sullivan	Phase II	1995 - yearly		DCNR	\$1,500			Bureau of State Parks
Harveys Lake	Luzerne	Phase II and III	2005-2007	\$85,000	319		\$85,000		Harveys Lake Borough
Lake Placida	Lancaster	Phase II	2000-2003	\$90,000	GG	\$90,000		\$322,500	Elizabethtown College
		Phase II	2004-2006		GG	\$40,100			Elizabethtown College
Lake Erie/Presque Isle watershed	Erie	Institutional	2003-2006	\$98,221	GG	\$98,221		\$46,000	Earth Force, Inc
		Phase II	2003-2006	\$50,000	GG	\$50,000		\$4,890	Presque Isle Partnership, Inc.
		Phase II	2003-2006	\$40,000	GG	\$40,000		\$37,000	Erie-Western PA Port Auth.
Lake Wallenpaupack	Pike, Wayne	Phase II	2001-2006	\$2,100,000	EPA 104b				Lake Wallenpaupack Wtrshd Mngmt Dst.
Lake Luxembourg	Bucks	Phase II	2004-2006	\$97,627	319		\$97,627		Bucks CCD
		Phase III	2004, 2006	\$4,000	319		\$4,000		Bucks CCD
Magnolia Lake	Bucks	Phase II	2005-2007	\$19,500	319		\$19,500		Bucks CCD
Frances Slocum Lake	Luzerne	Phase I	2005,	\$2,000	319		\$2,000		Luzerne CCD
		Phase I	2006-2008	\$48,627	319		\$48,627		Luzerne CCD
Stephen Foster Lake	Bradford	Phase II	2007-2009	\$99,070	319		\$99,070		Bradford CCD
		Phase III	2004 - 2007	\$6,000	319		\$4,000		
Shawnee Lake	Bedford	Phase I	2007	\$10,000	319		\$10,000		DCNR
Total Funds				\$2,750,045		\$319,821	\$369,824		
Total 319 + GG									\$689,645

319 = Nonpoint Source Program

DCNR = PA Dept. Conservation & Natural Resources

GG = Growing Greener Program, PA Environmental Stewardship Funds

CCD = County Conservation District

Not included is funds for dam repairs

Phase I = lake & watershed assessment/monitoring & management plan

Phase II = restoration BMPs, including Educational

Phase III = monitoring for efficacy, post-TMDL

Table 10
Lake Rehabilitation Techniques Used in Public Lakes

Technique	Number of Lakes Where Technique Used	Acres of Lakes Where Technique Used
In-Lake Treatment		
Aeration	2	212
Aquatic herbicide treatment	27	2,124
Aquatic macrophyte harvesting	3	1,424
Lake drawdowns	15	5,688
Liming	1	245

Watershed Treatments		
Sediment traps/detention basins	6	8,128
Shoreline erosion controls/bank stabilization	11	13,907
Conservation tillage	5	7,633
Animal waste management practices installed	7	9,787
Riprap installed	4	7,334
Road or skid trail management	3	14,650
Stream restoration (natural channel design)	3	1665
Created wetlands	3	1575

Other Lake Protection/Restoration Controls		
Local lake management program in place	18	14,670
Public information/education program/activities	45	46,645
Local ordinances/regulations to protect lake	2	6,350
Point source controls	14	13,834

Part C4 Wetlands Protection Program

Pennsylvania has 403,924 acres of wetlands and 412,905 acres of deep-water habitats such as ponds and lakes. About 1.4 percent of the Commonwealth's land surface is represented by wetlands, with 97 percent classified as palustrine wetlands. Approximately 76 percent of the palustrine wetlands are further classified as forested and scrub/shrub wetlands. Lacustrine wetlands, mainly composed of the shallow zone (less than 6.6 feet deep) of Lake Erie, represent about two percent of the total, while riverine wetlands make up the remaining one percent. Pennsylvania has 512 acres of tidal wetlands in the Delaware Estuary.

Wetlands are most abundant in the glaciated portions of northeastern and northwestern Pennsylvania. Crawford, Mercer, Erie, Monroe, Pike, Wayne and Luzerne counties contain 40 percent of the Commonwealth's wetlands. Pike and Monroe counties have the highest percentages of land covered by wetlands with 6.7 percent and 6.4 percent, respectively.

DEP's jurisdiction for the protection of wetlands is primarily established by the Dam Safety and Encroachments Act of 1978. The Environmental Quality Board adopted Chapter 105, Dam Safety and Waterway Management rules and regulations effective September 27, 1980. Amended regulations became effective October 12, 1991. Since March 1, 1995, DEP has been given authority to attach federal Section 404 authorization along with state permit approvals for most projects through the Pennsylvania State Programmatic General Permit (PASPGP-3). This provides "one-stop shopping" for approximately 80 percent of the state and federal permit applications received. PASPGP-3 will expire on June 30, 2011.

Thirty (30) of Pennsylvania's 66 county conservation districts have Chapter 105 Delegation Agreements with DEP to register Bureau of Watershed Management General Permits within their counties. The basic duties of each district are to provide information and written materials to the general public on the Dam Safety and Encroachments Act and Chapter 105 regulations, register general permits, and perform on-site investigations as the first step to gain voluntary compliance. The Office of Water Management coordinates this program.

An Environmental Review Committee, consisting of representatives of the U.S. Fish and Wildlife Service (USFWS), Pennsylvania Game Commission (PGC), Pennsylvania Fish and Boat Commission (PFBC), EPA, U.S. Army Corps of Engineers (COE) and DEP, meets monthly to review select applications submitted to DEP. A similar committee has been established that meets semi-annually to review ongoing enforcement actions. Through these committees, lead agencies are designated for taking action or providing field support to resolve violations or to provide data for permit reviews. This coordination economically utilizes limited staff of both state and federal agencies.

DEP, in cooperation with Penn State's Cooperative Wetlands Center completed a pilot wetland condition assessment in an area of south central Pennsylvania in 2006. The pilot was to test a wetland condition assessment methodology that could be expanded to the entire Commonwealth. Evaluation of the results could lead to a standardized wetlands condition assessment methodology. DEP staff are participating in the Mid-Atlantic Wetland Workgroup efforts to plan a 2008 probabilistic wetlands assessment of all EPA Region III states and foster coordination between wetland programs and existing water quality monitoring and reporting activities. DEP staff are also participating in the National Wetland Assessment Workgroup to plan the 2011 national wetland assessment.

Part C5 Trend Analysis for Surface waters

The Pennsylvania Department of Environmental Protection (DEP) periodically conducts analyses of surface water quality trends in the Commonwealth. These analyses are based on chemical water quality data collected at a series of fixed water quality network (WQN) stations located throughout the Commonwealth. A WQN trend analysis was reported in the 2006 Integrated List. The next trend analysis will be conducted the summer of 2008 and reported in the 2009 305(b) update and 2010 Integrated List.

PART IV: GROUNDWATER ASSESSMENT

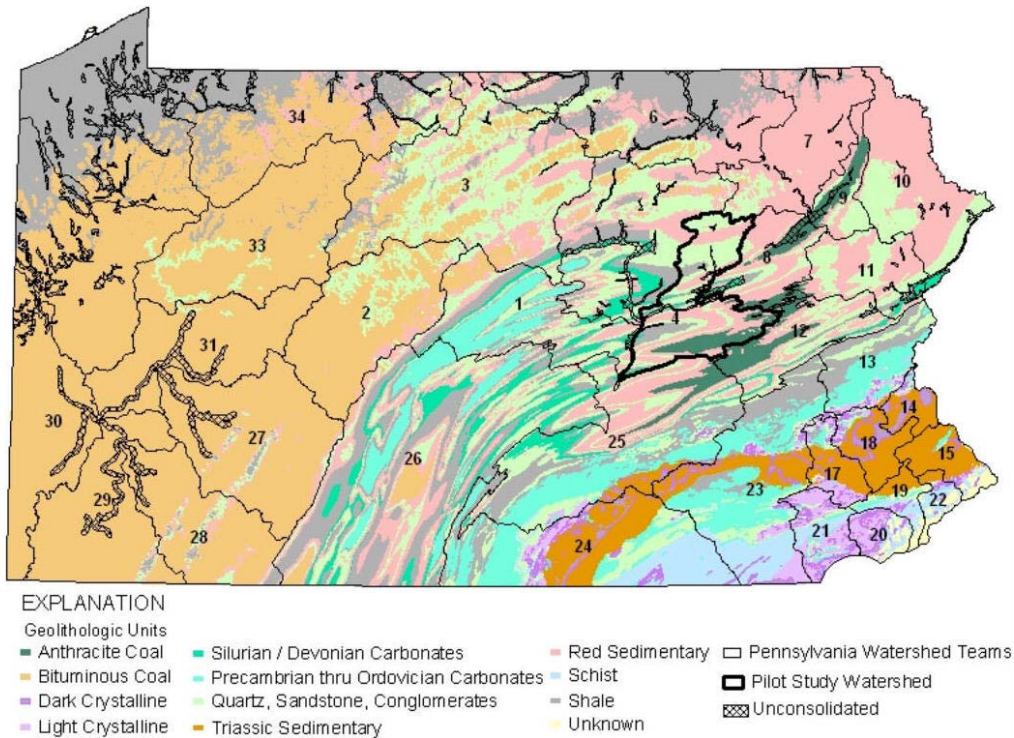
Part D1 Groundwater Assessment

Progress with the ambient monitoring program has been limited because of resource constraints and emerging priorities that have shifted personnel. Groundwater data based on the 20 state water plan subbasins presented in the 2002 305(b) report continue to apply.

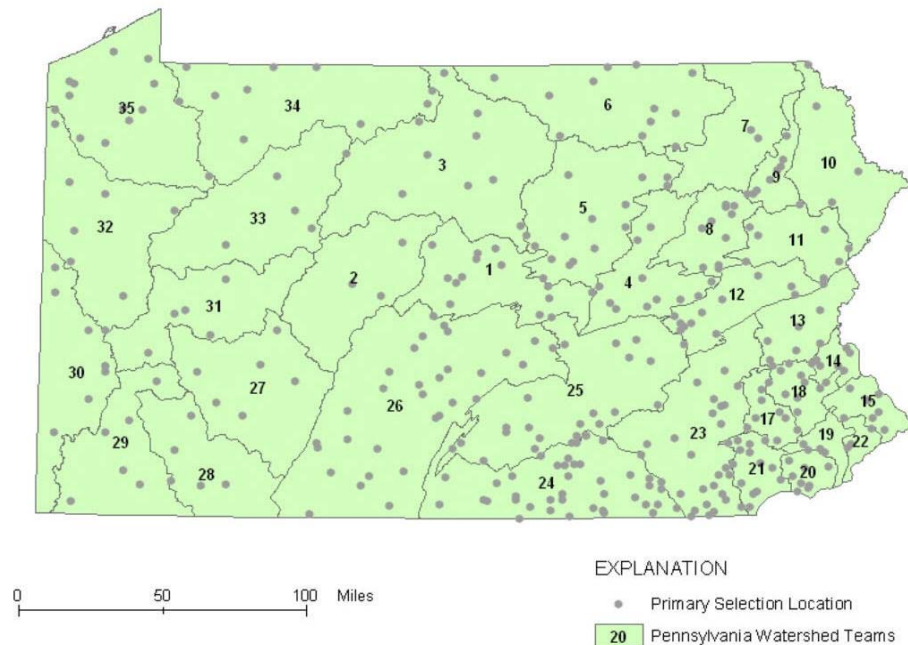
Ambient/Fixed Station and Statewide Monitoring Networks

A new ambient ground water-quality monitoring network was designed and monitoring initiated in the Kirkwood Basin (upper Octoraro Creek) in 2005. The development of the network was, in part, due to high nitrate concentrations reported in Octoraro Creek which have limited its use by community water systems during certain periods of the year and resulted in its inclusion on the Impaired Waters list for potable water supply use. Those results were reported in the 2006 Integrated Report. Ambient Ground Water Monitoring basins active for 2008 include Lancaster basin (191), Kirkwood Basin (196), Pottstown Basin (58), and Telford Basin (61).

To address the need for increased ground water quality monitoring coverage of the state to meet program goals, DEP has worked with the USGS to design a statewide, watershed-based ground water quality network using the stratified approach applied in the USGS National Water Quality Assessment project for the lower Susquehanna River. There have been 13 major aquifer categories identified for the network based on dominant rock type or geolithologies. The distribution of these geolithologic units (except for the glacial outwash) are shown on the following map.



To develop the groundwater network, 30 groundwater monitoring points are selected within each geolithologic unit. This network is then related to the planning watersheds previously used by DEP for watershed management. The network is flexible and can be configured for various sub-watershed definitions. The following map depicts a selection of groundwater monitoring points for development of a statewide network.



Part D2 USGS Releases GroundWater Quality Data Compilation for Pennsylvania

Under a joint funding agreement with the DEP, the USGS has issued a digital Data Series report that provides a compilation of ambient groundwater quality data for a 25-year period based on water samples from wells throughout Pennsylvania. Eight data sources from local, state, and federal agencies were used in the compilation that covers 12 different analyte groups. The data are presented both in terms of the 35 watershed-based planning teams used by DEP as well as the 13 major geolithologic units described above. Over 8,000 wells were included in the project and the number of analyses ranged from several thousand for nutrients and other inorganic compounds to a few hundred for wastewater compounds. The number of wells sampled varies considerably across the state with most being concentrated near major urban centers. Minimal data exists for about a third of the state. When compared to maximum contaminant levels, the analyte group with the highest MCL exceedance was microbiological (53%), followed by major ions (34%). The lowest MCL exceedances were for wastewater compounds (0 %) and herbicides/pesticides (0.3%). MCL exceedances for volatile organic compounds and nutrients were 14% and 8.8%, respectively. With limited monitoring of ambient ground water underway in only a handful of basins under the Ambient/Fixed Station Monitoring Networks, this compilation will help fill in data gaps and shed light on how to establish a true statewide groundwater monitoring network. An addendum to the report which will include additional DEP data is already underway and will include the results from nearly 20,000 wells. The report (Low, D.J. and Chichester, D.C., 2006, *Ground-water-quality data in Pennsylvania - A compilation of computerized [electronic] databases, 1979-2004*: USGS Data Series 150, 22 p.) is available on-

line at <http://pubs.usgs.gov/ds/ds150/>. The data is also can be compiled and displayed by chemical and watershed. Further review and analysis of the data will be made to develop a water quality profile of each geolithologic unit and watershed in the state based on this network.

Part D3 Sources of Groundwater Contamination

Each DEP regional office defined its highest priority sources of groundwater contamination for the 2002 report, all of which still apply for the 2008 report. Table 11 shows the composite of this information. The priorities include industrial facilities, underground storage tanks, hazardous waste sites, abandoned landfills, aboveground storage tanks, manure/fertilizer applications, chemical facilities, and septic systems. The contaminants associated with these sources are also shown. Multiple regional studies have indicated 30% to 90% of private water wells have total coliform contamination. In addition, one study showed up to 30% *E. coli* contamination. The USGS study *Relation Between Selected Well Construction Characteristics And Occurrence Of Bacteria In Private Household Supply Wells, South-Central And Southeastern Pennsylvania*, WRIR 01-4206, stated that either or both well construction and aquifer contamination could be responsible for the results but problems were more likely to occur where the well was poorly constructed.

Table 11
Major Sources of Groundwater Contamination

Contaminant Source	Highest-Priority Sources (√)	Factors Considered in Selecting Contaminant Sources (1)	Contaminants (2)
Agricultural Activities			
Animal feedlots			
Chemical facilities	√	ADCEFG	ABCDE
Drainage wells			
Manure/fertilizer applications	√	ABCDEFGH	DEIK
On site pesticide mixing/loading			
Pesticide applications			
Storage/Treatment Activities			
Land application of biosolids			
Lawn maintenance/pest treatment			
Material stockpiles			
Storage tanks (above ground)	√	ABCDEFGF	ABC
Storage tanks (underground)	√	ABCDEFGH	ABCDEGIJK
Surface impoundments			
Waste piles or tailings			
Disposal Activities			

Abandoned landfills	√	ABCDE	ADGJ
Landfills (current)			
Septic systems	√	ABCDEFGH	EIK
Underground injections wells			
Resource Extraction			
Abandoned/existing oil/gas wells			
Abandoned/poorly built water wells			
Coal mining/acid mine drainage			
Quarries (non coal)/borrow pits			
Other			
Atmospheric deposition			
Industrial facilities	√	ABCDEFG	ABCG
Hazardous waste generators			
Hazardous waste sites	√	ABCDEFG	ABCDEFGHIJK
Natural groundwater conditions (3)			
Petroleum/fuel pipelines			
Sewer lines			
Salt storage and road deicing			
Spills/transportation of materials			
Urban runoff			

(1) Factors in Selecting a Contaminant Source

- A. Human health and/or environmental risk (toxicity)
- B. Size of the population at risk
- C. Location of the source relative to drinking water sources
- D. Number and/or size of contaminant sources
- E. Hydrogeologic sensitivity
- F. State findings, other findings
- G. Documented from mandatory reporting
- H. Geographic distribution/occurrence
- I. Other criteria (please describe)

- (3) This could include natural occurring contaminants such as radium, radon, sulfate, iron, manganese, salt, etc.

(2) Contaminants

- A. Volatile organic chemicals
- B. Petroleum compounds
- C. MTBE/TBA
- D. Pesticides
- E. Nitrates
- F. Salinity/brine
- G. Metals
- H. Radionuclides
- I. Microbiological
- J. Sulfates, manganese and/or iron
- K. Total dissolved solids
- L. Other contaminant (please describe)

Part D4 Statewide Groundwater Protection Programs

A summary of state groundwater protection programs is presented in Table 12. Important groundwater protection programs are summarized following the table. Pennsylvania does not have statewide, private water well construction standards.

Table 12

Summary of State Groundwater Protection Programs

Programs or Activities	Check (√)	Implementation Status	Responsible State Agency
Active SARA Title III Program	√	Fully established	BLRWM
Ambient groundwater monitoring system	√	Continuing efforts	BWM
Aquifer vulnerability assessment (pesticides)	√	Continuing efforts	PDA
Aquifer mapping	√	Continuing efforts	BTGS
Aquifer characterization	√	Continuing efforts	BTGS
Comprehensive data management system	√	Under development	BWM*
EPA-endorsed Core Comprehensive State Groundwater Protection Program (CSGWPP)	√	Under revision	BWM*
Groundwater discharge permits	√	Continuing efforts	RWM
Groundwater Best Management Practices	√	Continuing efforts	BWM*
Groundwater legislation (remediation)	√	Fully established	BLRWM
Groundwater classification (remediation)	√	Continuing efforts	BLRWM
Groundwater quality standards (remediation)	√	Fully established	BLRWM
Interagency coordination for groundwater protection initiatives	√	Continuing efforts	BWM*
Nonpoint source controls	√	Continuing efforts	BWM*
Pesticide State Management Plan	√	Continuing efforts	PDA
Pollution Prevention Plan	√	Continuing efforts	OPPCA
Resource Conservation and Recovery Act (RCRA) Primacy	√	Fully established	BLRWM
Source Water Assessment Program (EPA approved 2000)	√	Fully established	BWM
State Superfund	√	Fully established	BLRWM
State RCRA Program incorporating more stringent requirements than RCRA primacy		Not applicable	
State septic system regulations	√	Fully established	BWSFR
Underground storage tank installation requirements	√	Fully established	BLRWM
Underground storage tank remediation fund	√	Fully established	BLRWM
Underground storage tank permit program	√	Fully established	BLRWM
Underground Injection Control program		Not applicable; EPA direct implementation	
Vulnerability assessment for drinking water/wellhead protection	√	Under development	BWM*
Well abandonment guidelines	√	Fully established	BTGS*
Wellhead Protection Program (EPA approved 1999)	√	Continuing efforts	BWM

Well installation regulations (Public Water Supplies)	√	Fully established	BWSFR
Others:			
Monitoring well installation guidance	√	Fully established	BWM*
Nutrient management program	√	Continuing efforts	BWM
Private well installation guidance	√	Continuing efforts	BWM
Voluntary site remediation program	√	Fully established	BLRWM

BLRWM DEP Bureau of Land Recycling and Waste Management

BTGS Bureau of Topographic and Geologic Survey, Department of Conservation and Natural Resources

BWM DEP Bureau of Watershed Management

BWSFR DEP Bureau of Water Standards and Facility Regulation

OPPCA DEP Office of Pollution Prevention and Compliance Assistance

PDA Bureau of Plant Industry, Department of Agriculture

RWM DEP Regional Water Management Program

* Indicates lead agency

Part D5 Groundwater Protection Program

DEP's *Principles for Groundwater Pollution Prevention and Remediation* (DEP ID: 383-0800-001), is available on DEP's website at www.dep.state.pa.us, and has been in place since 1996. This document sets forth the principles for a consistent statewide program for prevention of groundwater pollution and remediation of contaminated groundwater. The ultimate goal for groundwater protection, as set forth in the *Principles*, is prevention of groundwater contamination whenever possible.

Part D6 Wellhead Protection and Source Water Protection Programs

Pennsylvania's Wellhead Protection Program (WHP) is the cornerstone of the Source Water Assessment and Protection (SWAP) Program for groundwater resources serving public water systems. Pennsylvania's wellhead protection (WHP) program was developed in 1989. EPA approved the program in 1999. The Pennsylvania Safe Drinking Water regulations direct public water suppliers to find and utilize the best sources available and take measures necessary to protect those sources. The state regulations define wellhead protection, set permitting requirements for groundwater resources and set forth requirements for state approval of local WHP programs.

More than 400 municipalities or water suppliers are developing or implementing local WHP programs and / or watershed protection programs. DEP has awarded 97 Source Water Protection Grants worth 4.3 million dollars, provided direct technical assistance and supported partnerships to assist communities and water systems to protect community drinking water sources from contamination. The grants funded the voluntary development of local (SWP) programs that meet DEP's minimum requirements. In addition to protecting public health and infrastructure investment by avoiding costly contamination, local SWP efforts complement watershed protection and management through sound land-use planning and pollution prevention activities.

As of July 2007, direct technical assistance to community water systems and municipalities will be provided through the Source Water Protection Technical Assistance Program.

Part D7 Source Water Assessment and Protection (SWAP) Program

The 1996 Safe Drinking Water Act reauthorization requires that states develop a Source Water Assessment and Protection (SWAP) Program. The SWAP program assesses the drinking water sources that serve public water systems for their susceptibility to pollution. This information is used as a basis for building voluntary, community-based barriers to drinking water contamination. The states are required to assess all sources (both groundwater and surface water) serving public water systems. In Pennsylvania, this represents about 14,000 permanent drinking water sources. EPA approved Pennsylvania's SWAP program in March 2000. Pennsylvania has completed the source water assessments for 98% of systems in the state. Under the plan, Pennsylvania will continue to conduct assessments for new sources and update completed assessments as needed.

For the assessments that have been completed, the SWAP program has delineated the boundaries of the areas providing source waters for all public water systems and has identified (to the extent practicable) the origins of regulated and certain unregulated contaminants in the delineated area to determine the susceptibility of the water sources to such contaminants. These assessments are of the raw water quality, not finished water compliance.

The SWAP program provides prioritized information on the potential sources of contamination that will be the basis for coordination of restoration efforts and development of local source water protection programs. These efforts will lead to improvements in raw water quality and may also result in reduced treatment costs for the public water system.

Source water assessments support emergency response, improved land use planning and municipal decisions, and prioritize and help coordinate actions by federal and state agencies to better protect public health and safety. Spill detection and emergency response networks for public water systems in Pennsylvania have been established on the Allegheny, Monongahela, Susquehanna, Schuylkill and Delaware Rivers. They include a variety of on-line detectors to alert operators to changes in the raw water from surface water intakes. Water systems with surface water intakes downstream will be alerted to any changes in raw water conditions. Long-term trends in raw water conditions may be the basis for restoration and protection efforts or changes in water treatment schedules. The core of these programs is the Internet based communication network for sharing raw water data, incidents information and response efforts.