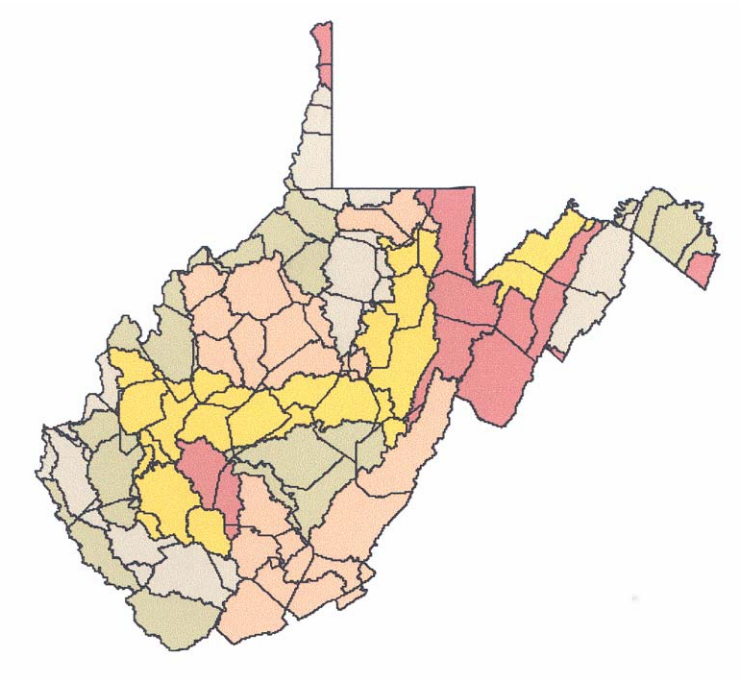
Groundwater Programs and Activities Biennial Report to the West Virginia 2006 Legislature

Joe Manchin III, Governor
State of West Virginia



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Editor's Notes

This biennial report was compiled and edited by the Division of Water Resources' Groundwater Program staff from information submitted by those agencies with ground water regulatory authority. Copies of this report can be obtained on-line at www.wvdep.org or from:

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Rules promulgated by West Virginia State Agencies mentioned in this report can be obtained from:

Secretary of State
Administrative Law Division
Building 1, Capitol Complex
1900 Kanawha Boulevard East
Charleston, WV 25305
(304) 558-6000

Copies of documents and educational information mentioned in this report can be obtained from the individual programs with groundwater regulatory responsibilities. For more program activity information, please contact the respective regulatory agency. A list of these agencies is included in Appendix A.

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GROUNDWATER BIENNIAL REPORT TO THE 2006 LEGISLATURE

I. EXECUTIVE SUMMARY

The Groundwater Protection Act, West Virginia Code Chapter 22, Article 12, Section 6.a.3, requires the West Virginia Department of Environmental Protection (WVDEP) to submit a biennial report to the Legislature on the status of the state's groundwater and groundwater management program, including detailed reports from each agency that holds groundwater regulatory responsibility. This is the seventh Groundwater Biennial Report to the Legislature since the passage of the Act in 1991 and covers the period from July 1, 2003 through June 30, 2005.

The WVDEP Division of Water and Waste Management (DWWM) Groundwater Program is responsible for compiling and editing the information contained in this report. The West Virginia Department of Environmental Protection (WVDEP), the West Virginia Department of Agriculture (WVDOA), and the West Virginia Department of Health and Human Resources (WVDHHR) all have groundwater regulatory responsibility and have contributed to this report. The boards and standing committees that share the responsibility for developing and implementing rules, policies, and procedures for the Ground Water Protection Act are: the Environmental Quality Board, the Groundwater Coordinating Committee, the Ground Water Protection Act Committee, the Groundwater Monitoring Well Drillers Advisory Board, the Well Head Protection Committee, and the Non-Point Source Coordinating Committee.

The purpose of this report is to provide a concise, yet thorough, overview of the programs charged with the responsibility of protecting and insuring the continued viability of groundwater resources in West Virginia and to express the challenges faced and the goals accomplished as the agencies, programs, and committees work together to protect and restore West Virginia's water resources. Crucial to this collaboration is the existence of an accessible statewide electronic data system, which was implemented by WVDEP's Information Technologies Office through the Environmental Resource Information System (ERIS) and Environmental Quality Information System (EQuIS). This data system also greatly facilitates the coordination of agencies having groundwater protection responsibilities in the investigation of complaints.

One difficulty in achieving the goals of the Act is the lack of specific hydrogeologic information about the state's groundwater, such as regional and local potentiometric surfaces (water levels), groundwater quality, groundwater flow studies, and access to statewide dedicated groundwater monitoring data. A centralized database linked to the geographic information system (GIS) coverages that is accessible to the various agencies and the public will greatly facilitate resolving this problem.

Also needed is greater outreach to the citizens of West Virginia on issues such as nonpoint source pollution, the protection of individual groundwater and drinking water sources, and the creation of toll-free help lines to enhance statewide consistency and a unified approach to the implementation of groundwater rules. Much of this need is addressed by five-year cooperative studies performed jointly between the Division of Water and Waste Management (DWWM) and the United States Geological Survey (USGS). The current DWWM/USGS study is presented in Section D of this report.

The Ambient Groundwater Quality Monitoring Network was established by DWWM in cooperation with the USGS in 1992 and is an ongoing project. This Network provides critical data critical to the management of West Virginia's groundwater resources. The major objective of the study is the assessment of the ambient groundwater quality of major systems (geologic units) within the State and the characterization of the individual systems. Characterization of the quality of water from the major systems will help to (1) determine which water quality constituents are problematic, (2) determine which systems have potential water quality problems, (3) assess the severity of water quality problems in respective systems, and (4) prioritize these concerns. Only by documenting the present ambient groundwater quality of the major systems can regulatory agencies assess where water quality degradation has occurred and where potential degradation is a result of natural processes or human activity.

Spatial variability in water quality is determined for specific geologic units based on the annual sampling of approximately 30 wells. This sampling will continue over a period of approximately five years and will provide a database of more than 175 wells. Wells will be sampled in specific drainage basins in given years, rotating annually to new basins, thus providing sampling of groundwater in all watersheds of the state over the five year period. The watershed samples will correspond to those from which DWWM will be collecting stream water samples as part of its Watershed Initiative and will provide a linked dataset of groundwater and surface water data that can be used to assess water quality conditions throughout the state.

Upon completion of the five-year sampling program, some wells may be resampled as necessary, then comprehensive statistical analyses of all groundwater quality data will be conducted. DWWM will prepare an interpretative report summarizing ambient groundwater quality in West Virginia, which will include an assessment of future data needs. All associated groundwater quality data for each sampled well and summaries of groundwater quality for each respective watershed will be published in the USGS Water Resources Data for West Virginia Annual Report and the results reported to the DWWM. These results will be incorporated into reports submitted by the DWWM.

The 30 sampling sites in the Group C and E watersheds that were also sampled in the ambient groundwater quality study are listed in the data tables in Appendix B of this report. These tables provide a detailed analysis of geochemical parameters, ionic

concentrations, concentrations of metals, radon, nutrients, organic carbon, volatile organic compounds, and pesticides.

While many challenges remain, much has been done to provide protection and continued viability of the groundwater resources of the state of West Virginia. The WVDEP, WVDOA, and WVDHHR continue to work closely to fulfill the mission of the Department of Environmental Protection, “To use all available resources to protect and restore West Virginia’s environment in concert with the needs of present and future generations”.

II. Groundwater Protection and Watershed Management

Under the guidance of the United States Environmental Protection Agency (EPA) and the signing of the West Virginia Watershed Management Framework Document (signed in 1997), a new approach to management of the state's groundwater has begun. Total watershed management strives to bring a holistic approach to protecting the waters of the state. The signing of this document by those agencies that chose to participate as partners indicates their understanding that, by collective agreement and cooperation, stakeholders can better achieve the goals of individual water quality programs. WVDEP has chosen to participate as a partner and stakeholder in watershed management in West Virginia.

The groundwater program has included in the document maps of the fourteen West Virginia watershed groups for 2004-2005, indicating the time frame in which the Watershed Assessment Program (WAP) characterized those watersheds. However, WAP is charged primarily with characterizing surface waters, using recent water quality data. The maps of the watersheds illustrate the activities and facilities found in those watersheds and provides a clear picture of the environmental stressors affecting the ground and surface waters in those watersheds.

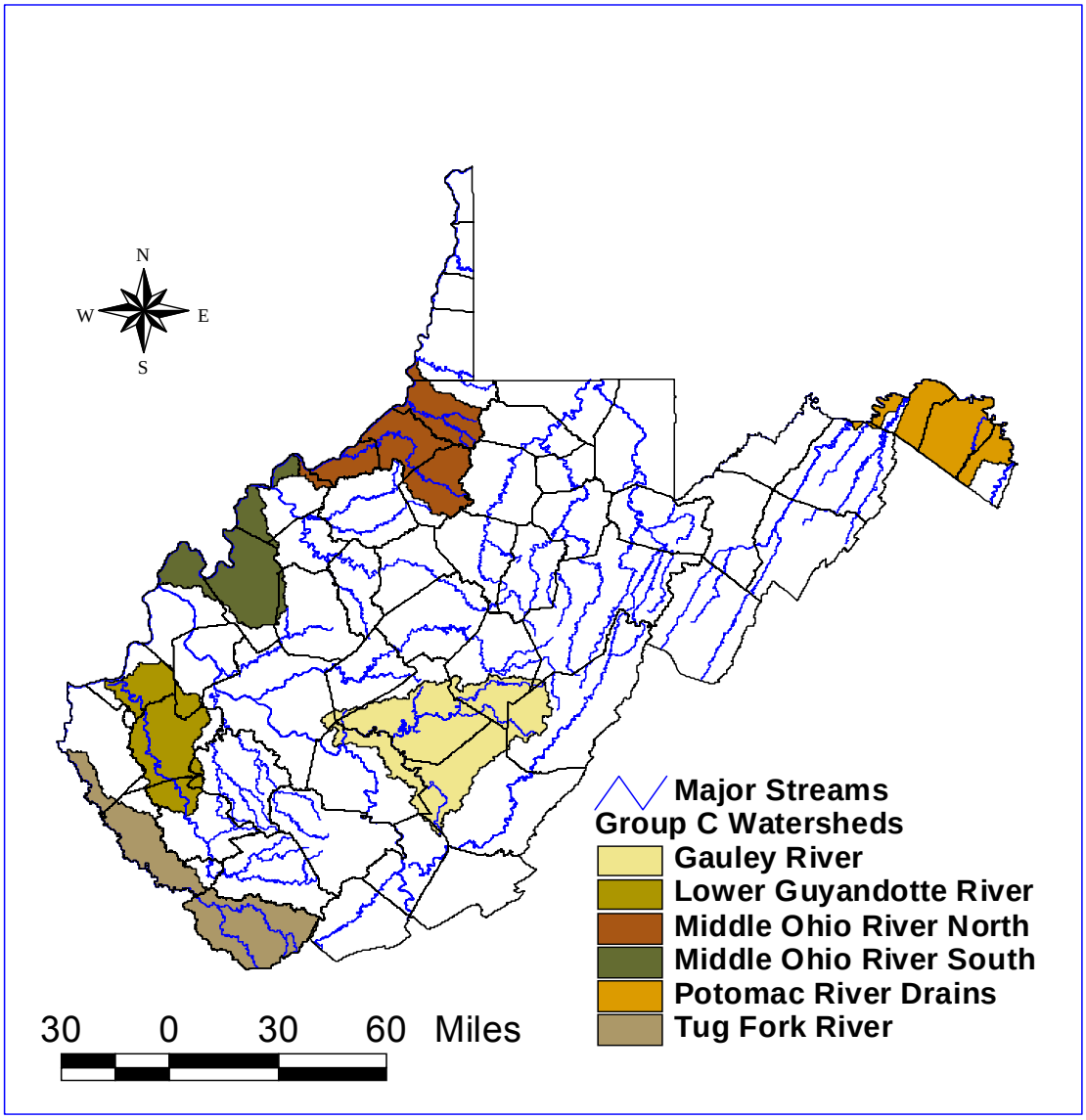
Agencies having groundwater regulatory authority and responsibility provide repositories for ground and surface water data collected about those facilities under their authority. As stated in this report's Executive Summary, compilation of the available groundwater data into a collective database continues as a work in progress, providing a picture of the State's groundwater protection activities and the contributions of the associated programs.

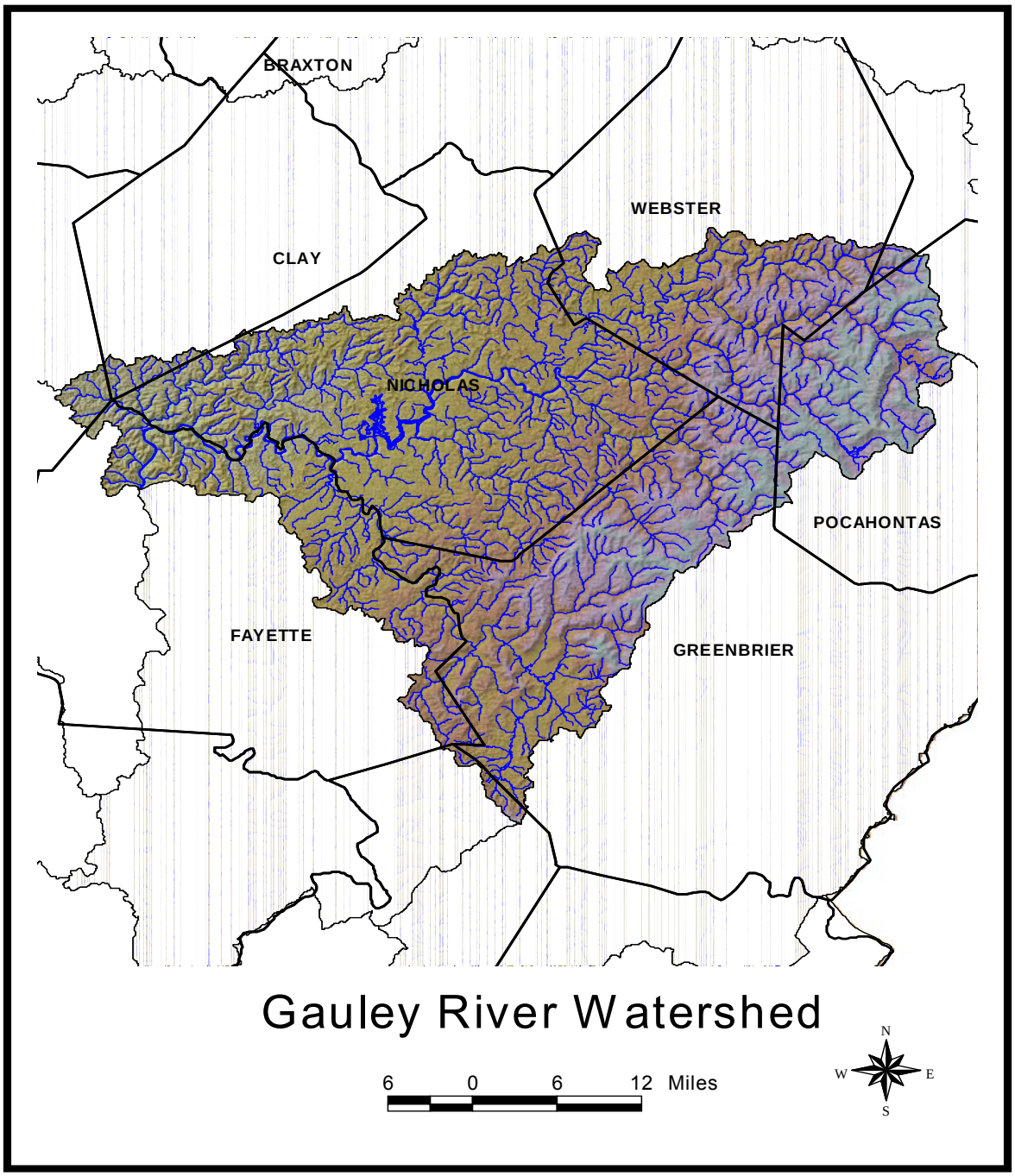
Eventually, all groundwater data that is generated by these activities and facilities will be housed in a central data repository overseen by senior scientists from each agency under the guidance of the WVDEP's Groundwater Coordinating Committee and Information Technology Office. We anticipate that population of the central database will be implemented using a watershed approach. Each watershed is comprised of smaller divisions called sub-watersheds from which data will be gathered and entered systematically until the larger picture emerges.

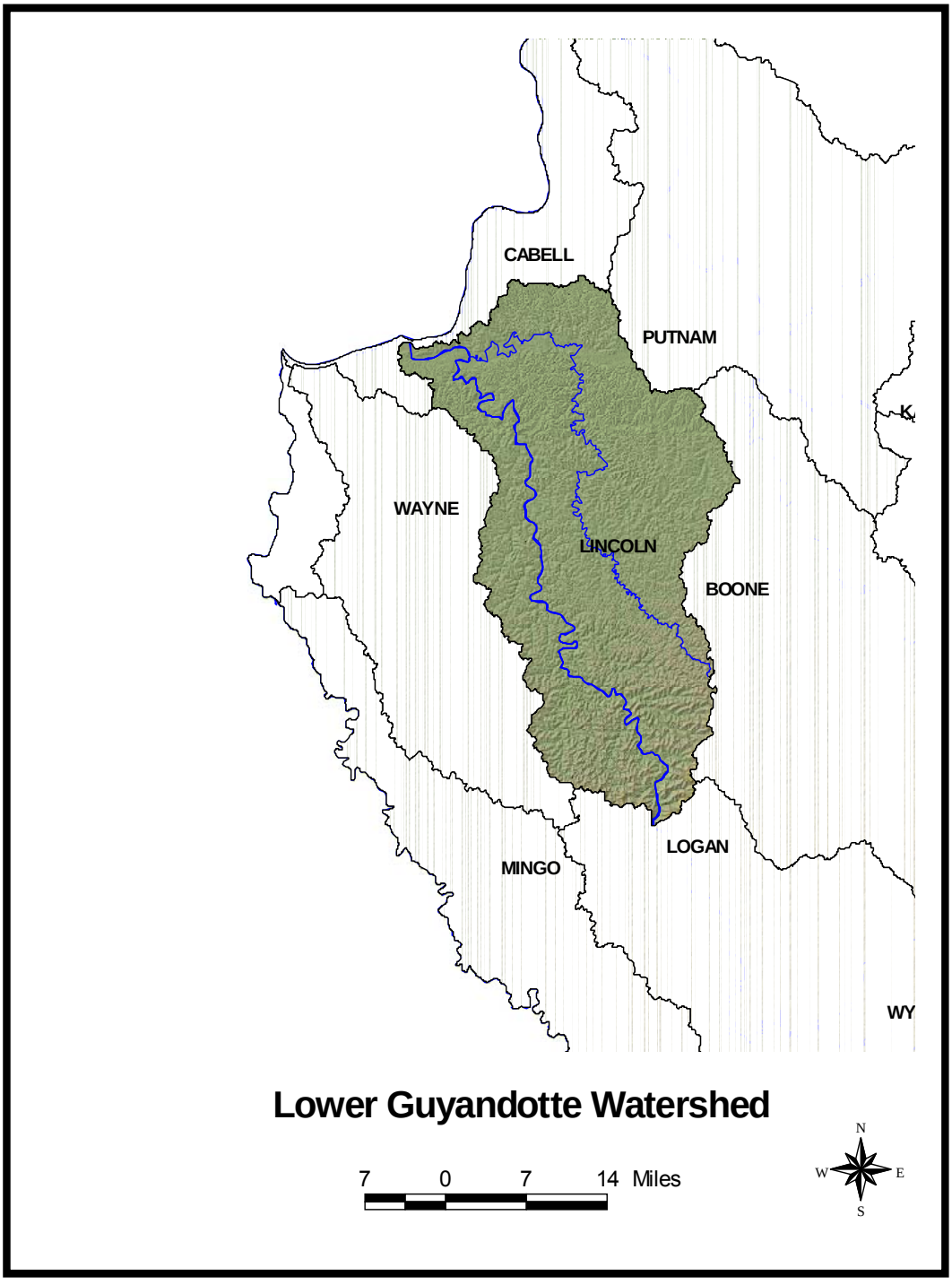
Maps of Watershed Groups for 2004-2005

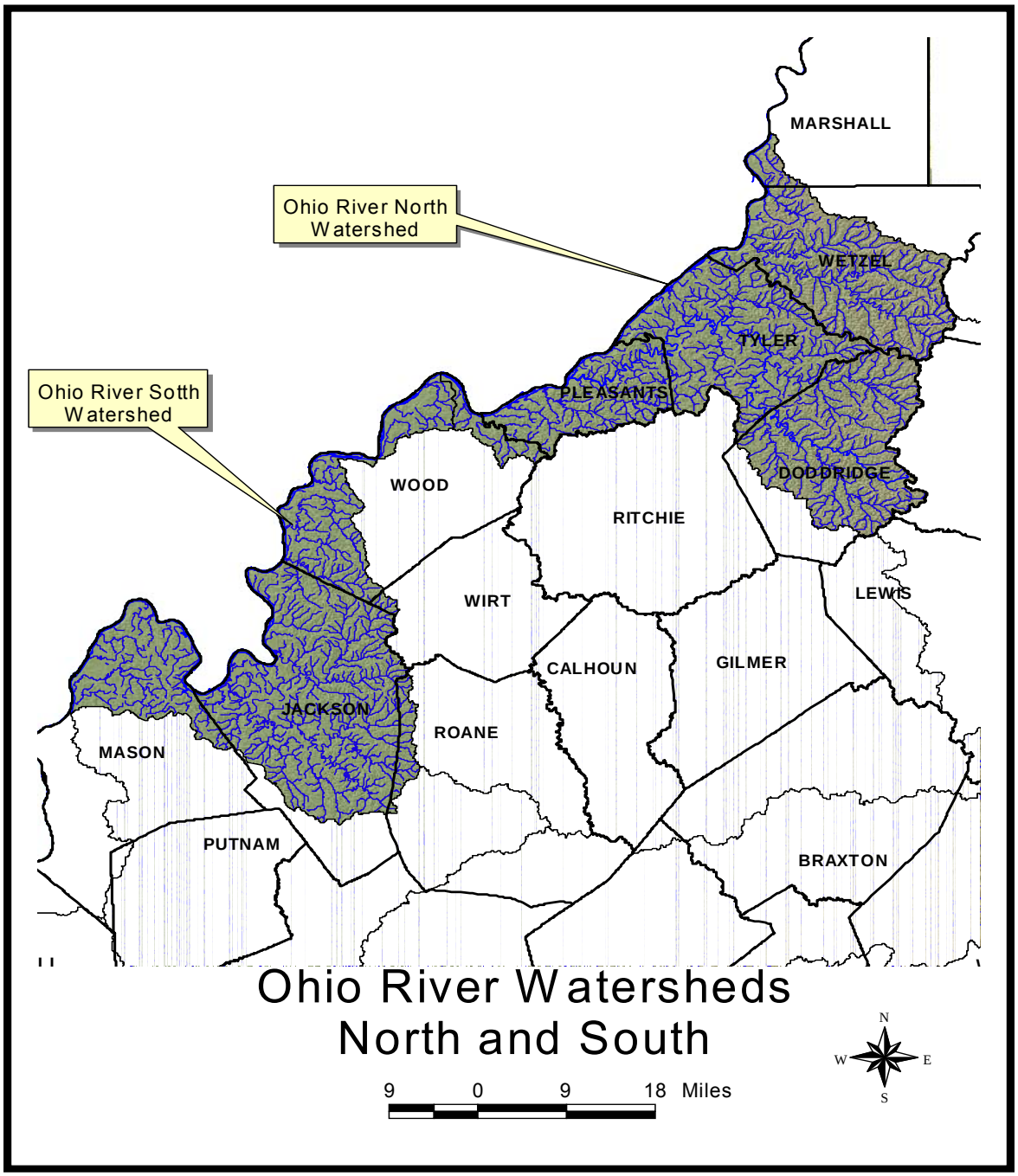
Watershed Groups D and E from the WV Priority Watersheds list, and individual maps of these watersheds, are shown on the following pages. A list of the major rivers in each watershed group appears in the following table.

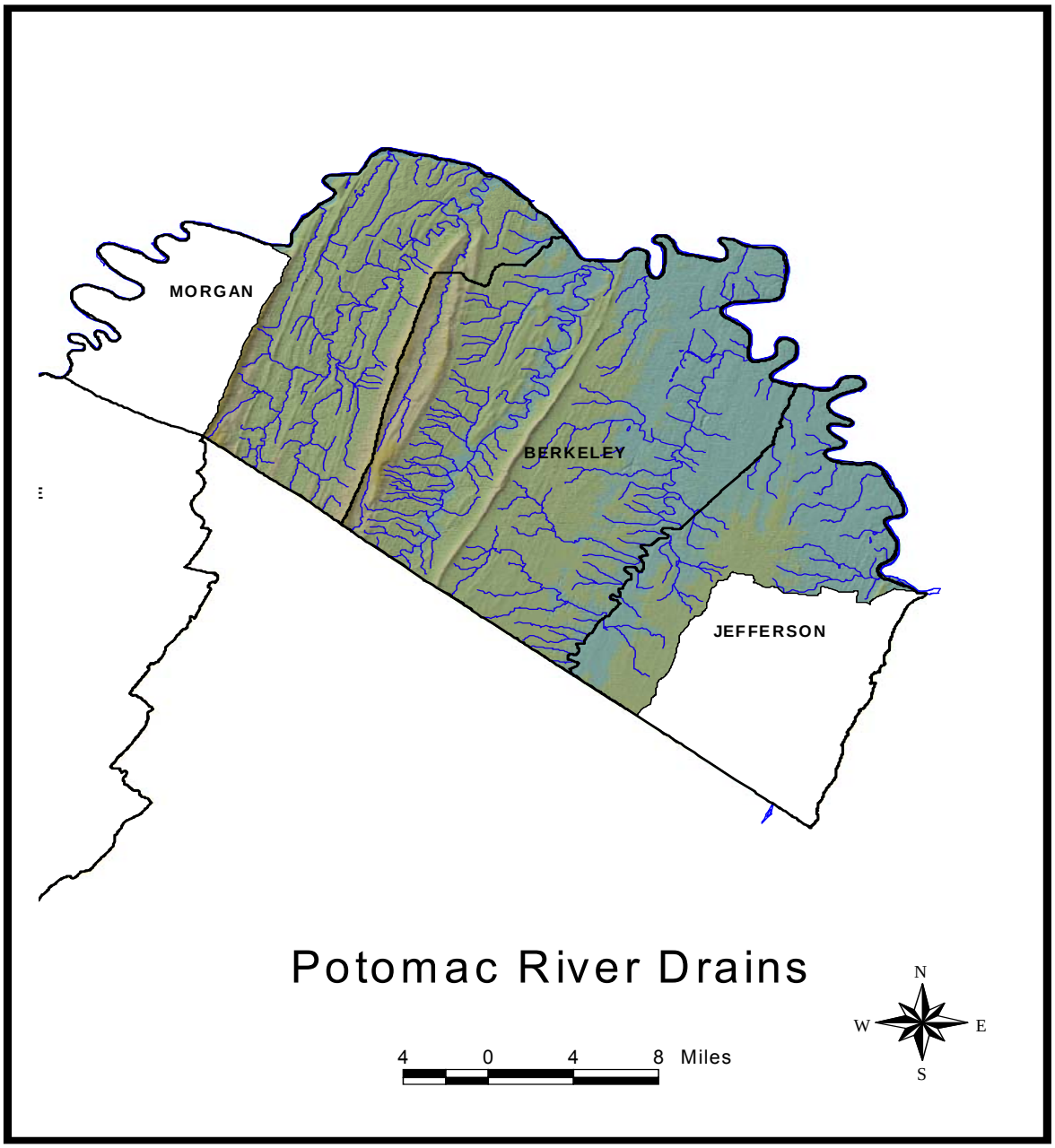
WEST VIRGINIA WATERSHED GROUPS	
Group C - 2004	***Group E - 2005***
Gauley River	Big Sandy River
Lower Guyandotte River	Cacapon River
Middle Ohio North River	Dunkard Creek
Middle Ohio South River	Lower Ohio River
Potomac Drains	Twelvepole Creek
Tug Fork River	Upper Guyandotte River
	Upper Ohio River South
	West Fork River

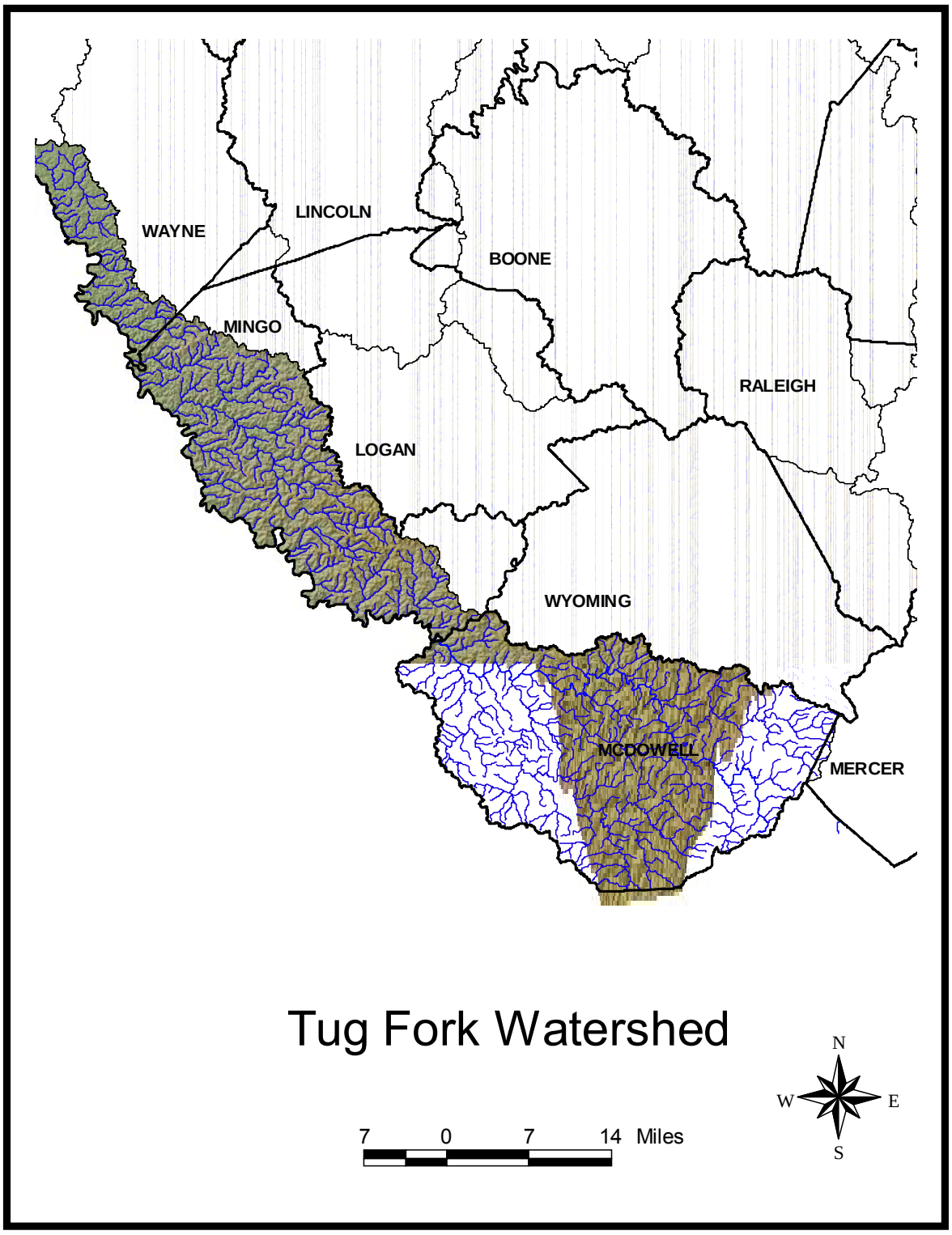

N
W
E
S
30 0 30 60 Miles
Major Streams
Group C Watersheds
Gauley River
Lower Guyandotte River
Middle Ohio River North
Middle Ohio River South
Potomac River Drains
Tug Fork River


BRAXTON
WEBSTER
CLAY
NICHOLAS
POCAHONTAS
FAYETTE
GREENBRIER
Gauley River Watershed
6 0 6 12 Miles
N
W
E
S

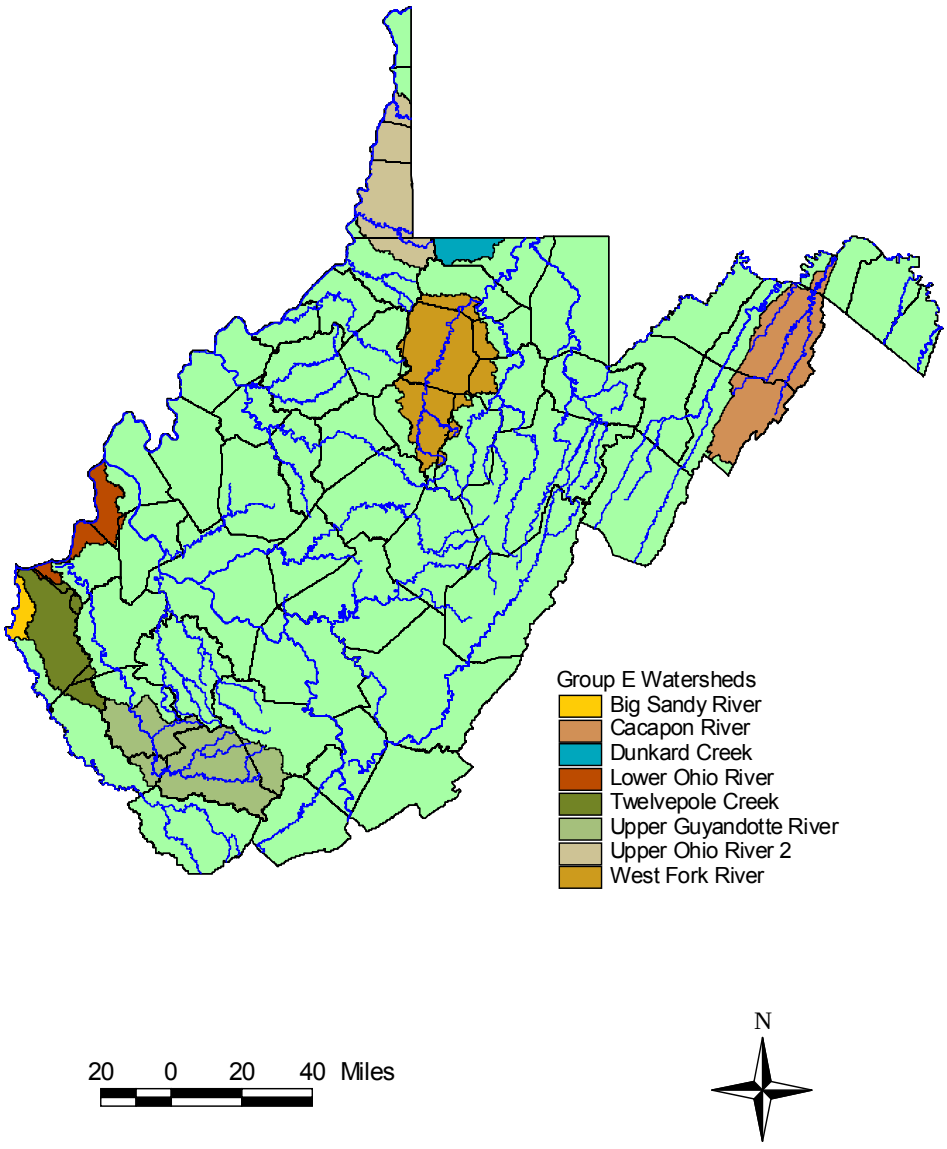

CABELL
PUTNAM
WAYNE
LINCOLN
BOONE
LOGAN
MINGO
Lower Guyandotte Watershed
7 0 7 14 Miles
N
W
E
S

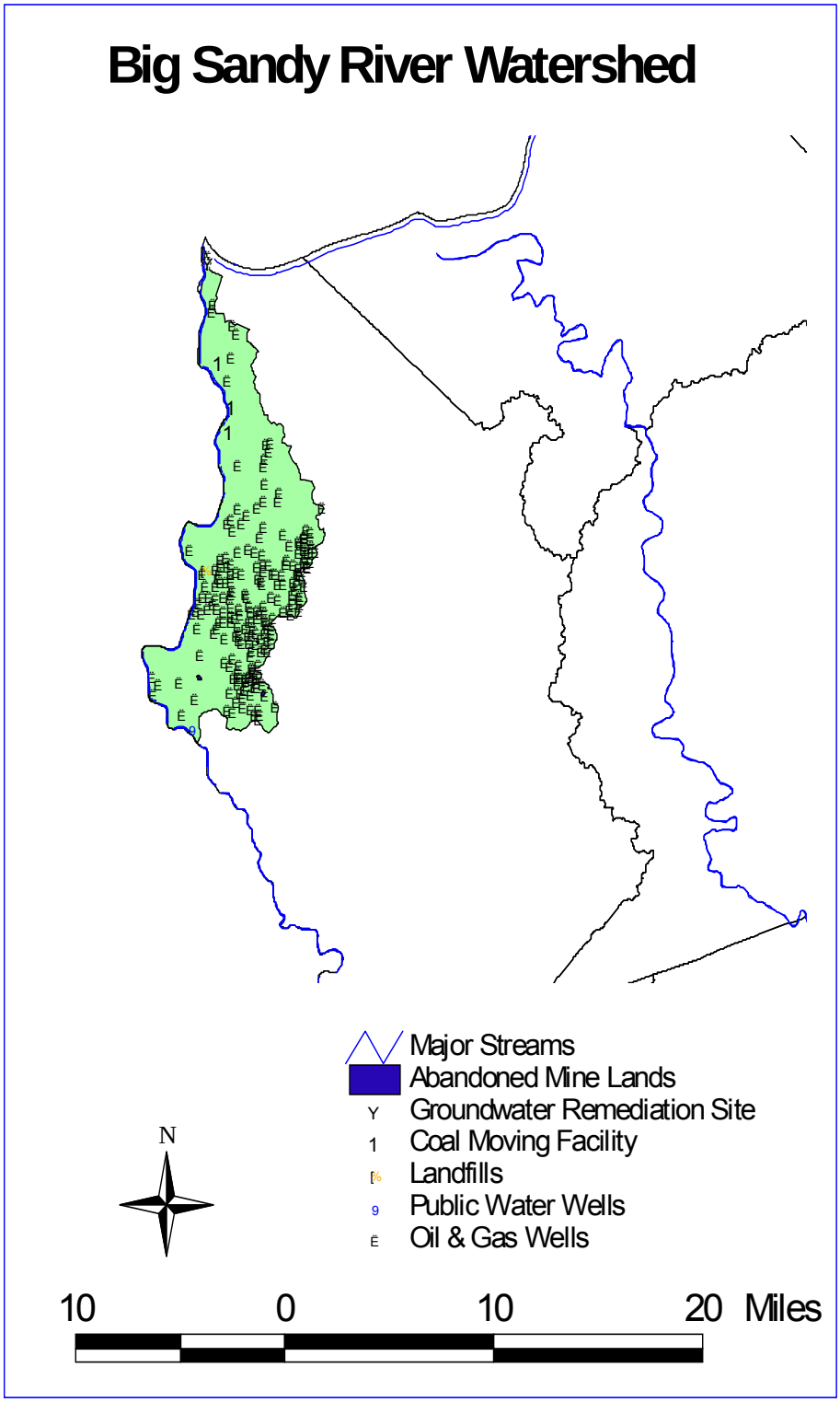

MARSHALL
Ohio River North Watershed
WETZEL
TYLER
Ohio River Sotth Watershed
PLEASANTS
DODDRIDGE
WOOD
RITCHIE
WIRT
LEWIS
CALHOUN
GILMER
JACKSON
ROANE
MASON
PUTNAM
BRAXTON
Ohio River Watersheds North and South
N
W
E
S
9 0 9 18 Miles

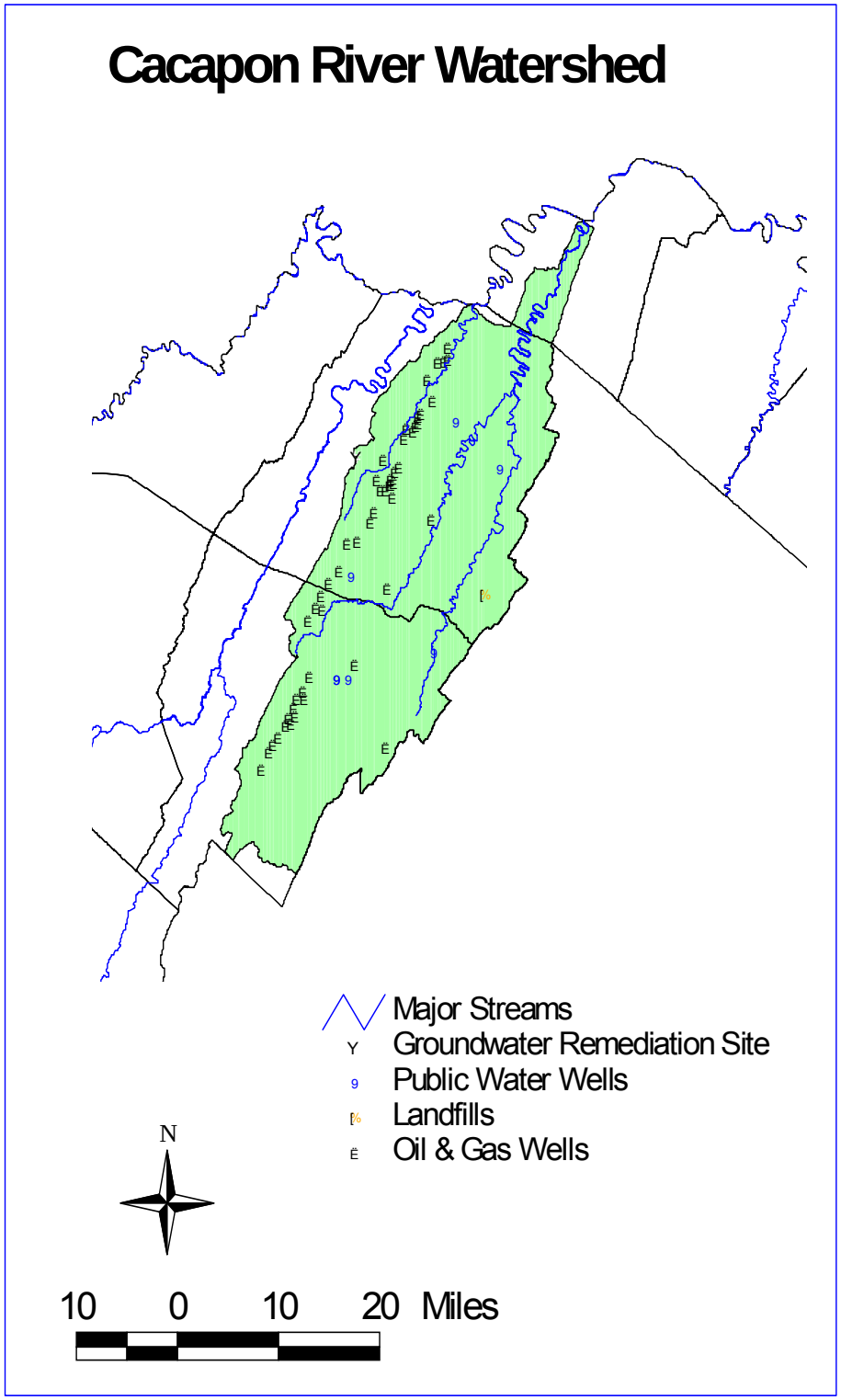

MORGAN
BERKELEY
JEFFERSON
Potomac River Drains
4 0 4 8 Miles
N
W
E
S


WAYNE
LINCOLN
BOONE
MINGO
RALEIGH
LOGAN
WYOMING
MCDOWELL
MERCER
Tug Fork Watershed
7 0 7 14 Miles
N
W
E
S

Group E Watersheds

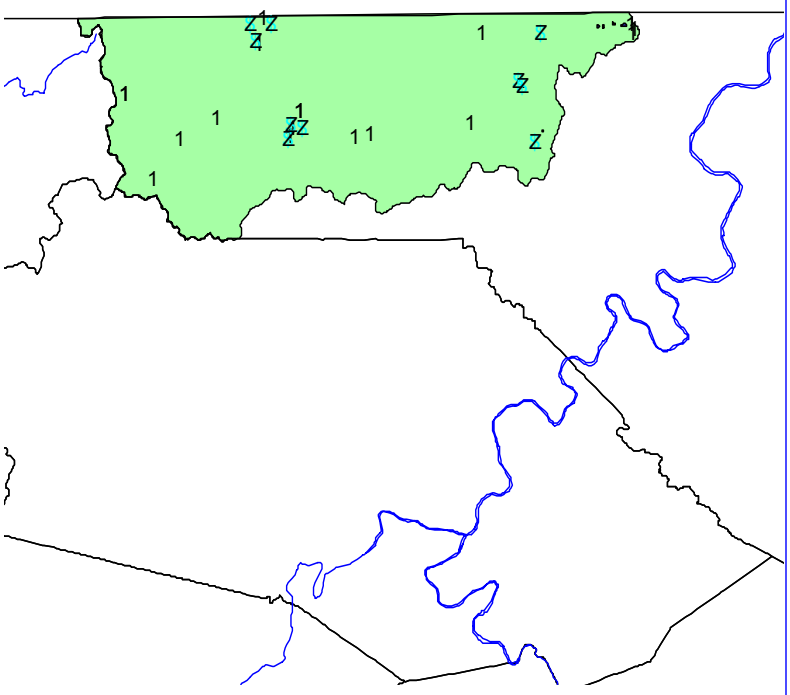



Big Sandy River Watershed
Major Streams
Abandoned Mine Lands
Groundwater Remediation Site
Coal Moving Facility
Landfills
Public Water Wells
Oil & Gas Wells
N
10 0 10 20 Miles


Cacapon River Watershed
Major Streams
Groundwater Remediation Site
Public Water Wells
Landfills
Oil & Gas Wells
N
10 0 10 20 Miles

Dunkard Creek Watershed

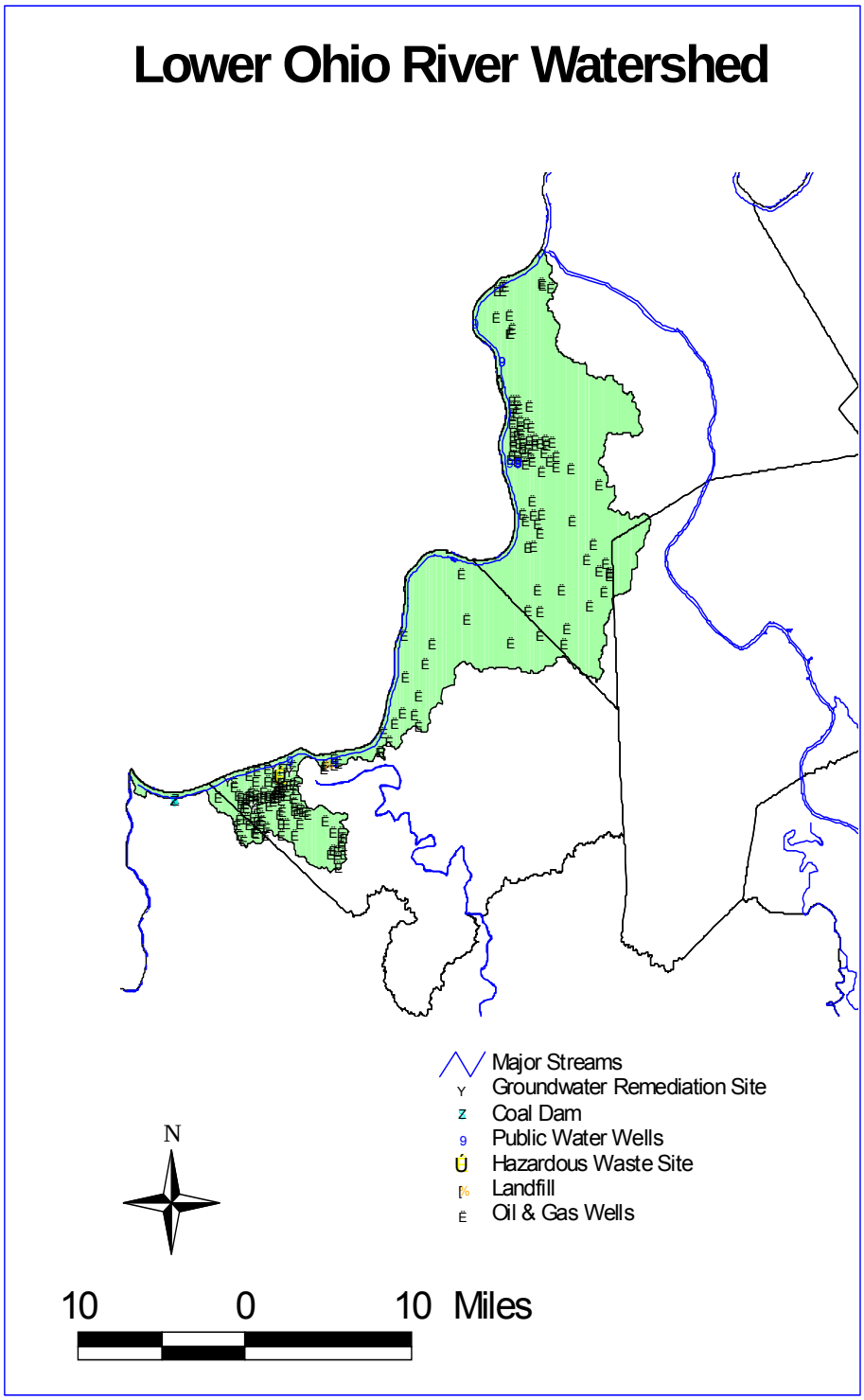
Note: Oil & Gas Wells could not be displayed due to the concentration. There are 2303 Oil & Gas Wells in this watershed.

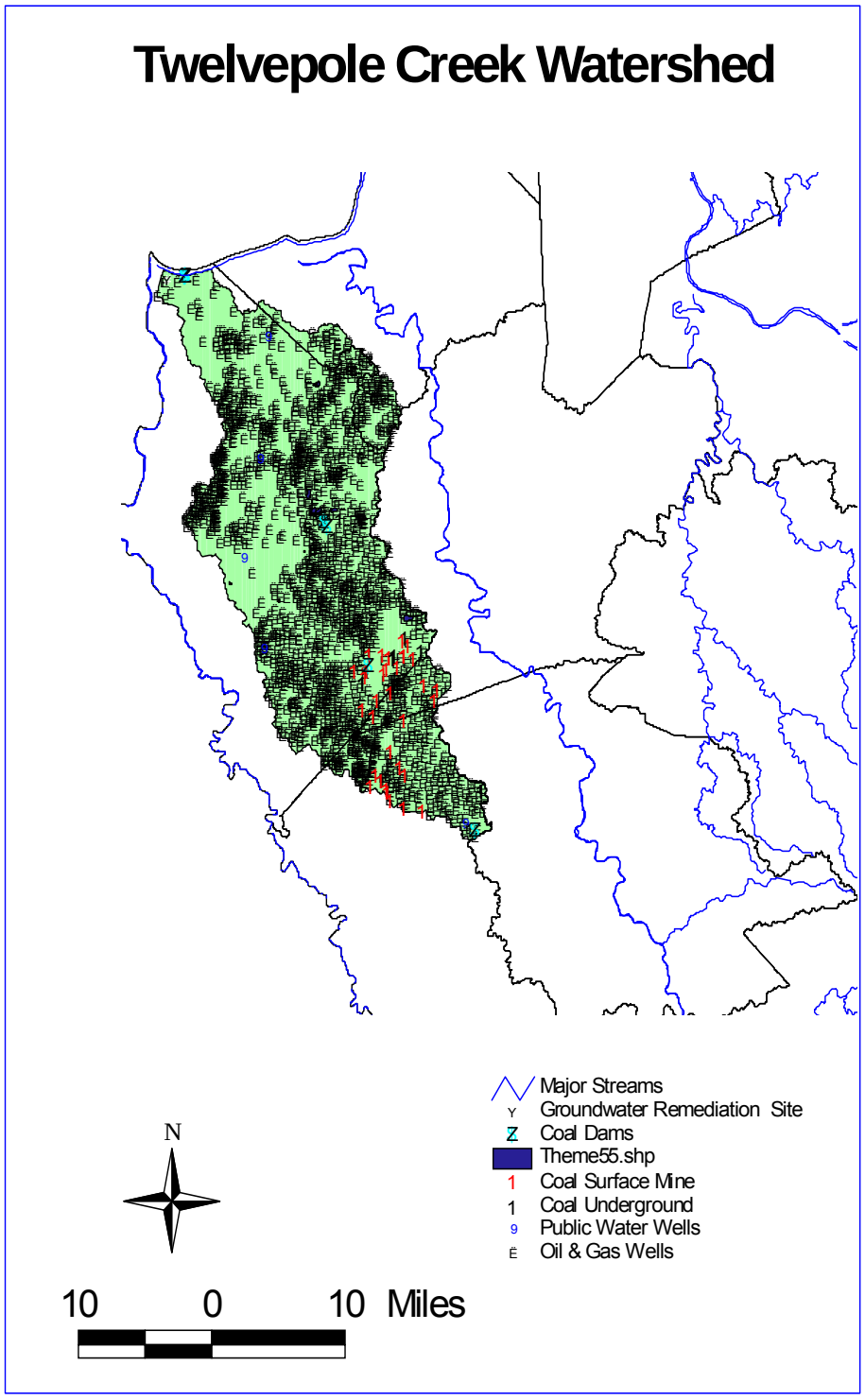


Major Streams
Abandoned Mine Lands
Coal Dams
Coal Surface Mine

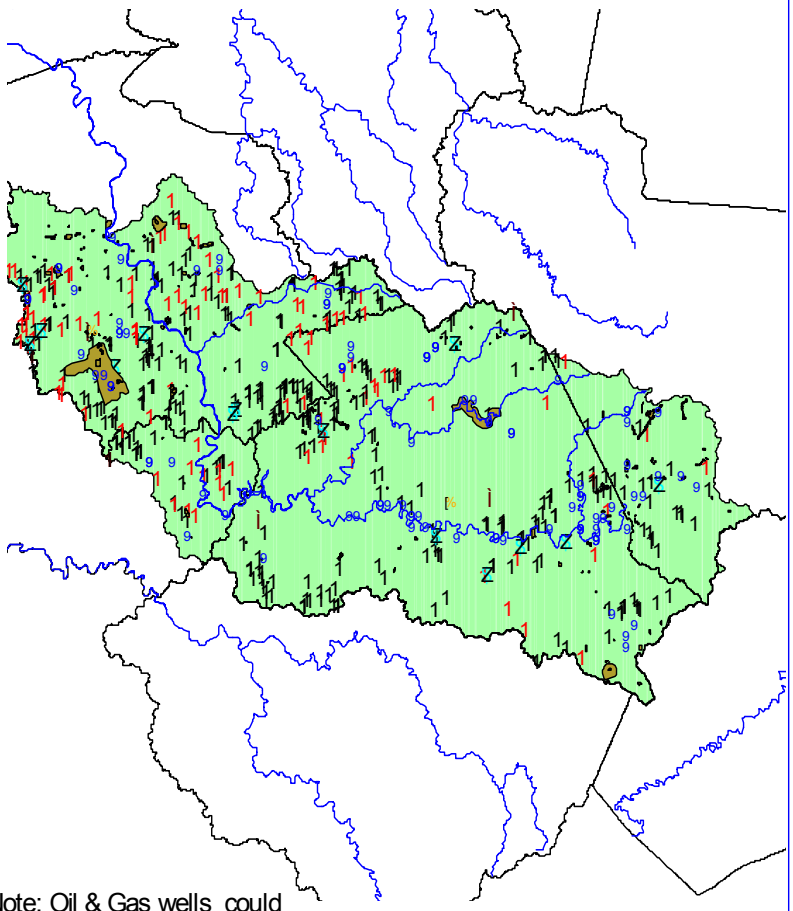
N

10 0 10 Miles


Lower Ohio River Watershed
Major Streams
Groundwater Remediation Site
Coal Dam
Public Water Wells
Hazardous Waste Site
Landfill
Oil & Gas Wells
N
10 0 10 Miles


Twelvepole Creek Watershed
Major Streams
Groundwater Remediation Site
Coal Dams
Theme55.shp
Coal Surface Mine
Coal Underground
Public Water Wells
Oil & Gas Wells
N
10 0 10 Miles

Upper Guyandotte River Watershed



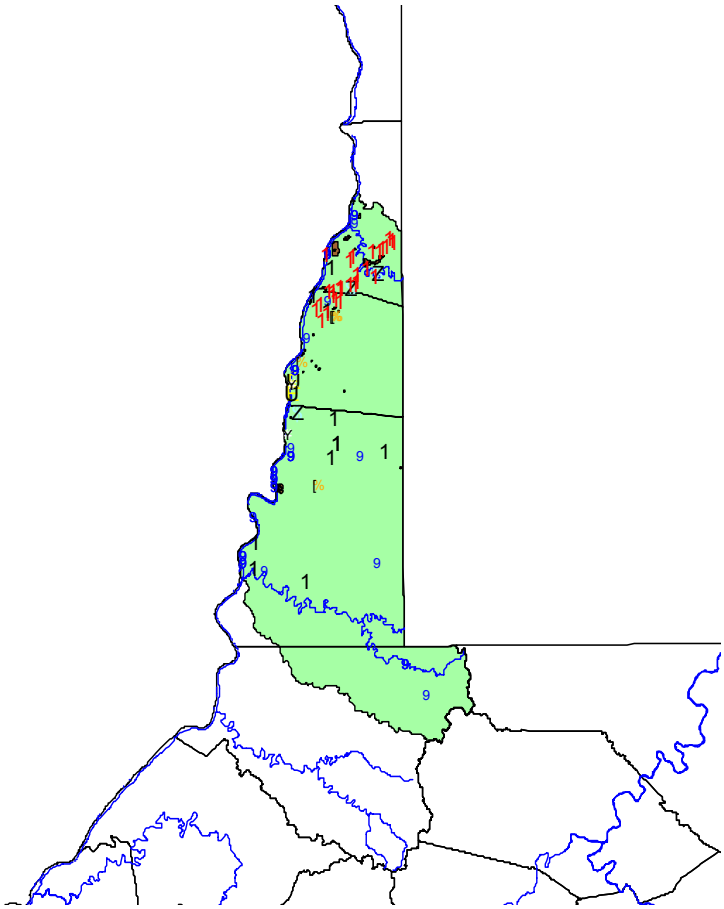
Note: Oil & Gas wells could not be displayed due to the concentration. There are 2380 Oil & Gas wells in this watershed.

N

10 0 10 Miles

Major Streams
Public Water Wells
Landfills
Abandoned Mine Lands
Coal Dams
Coal Surface Mine
Coal Underground
Quarry

Ohio River South Watershed



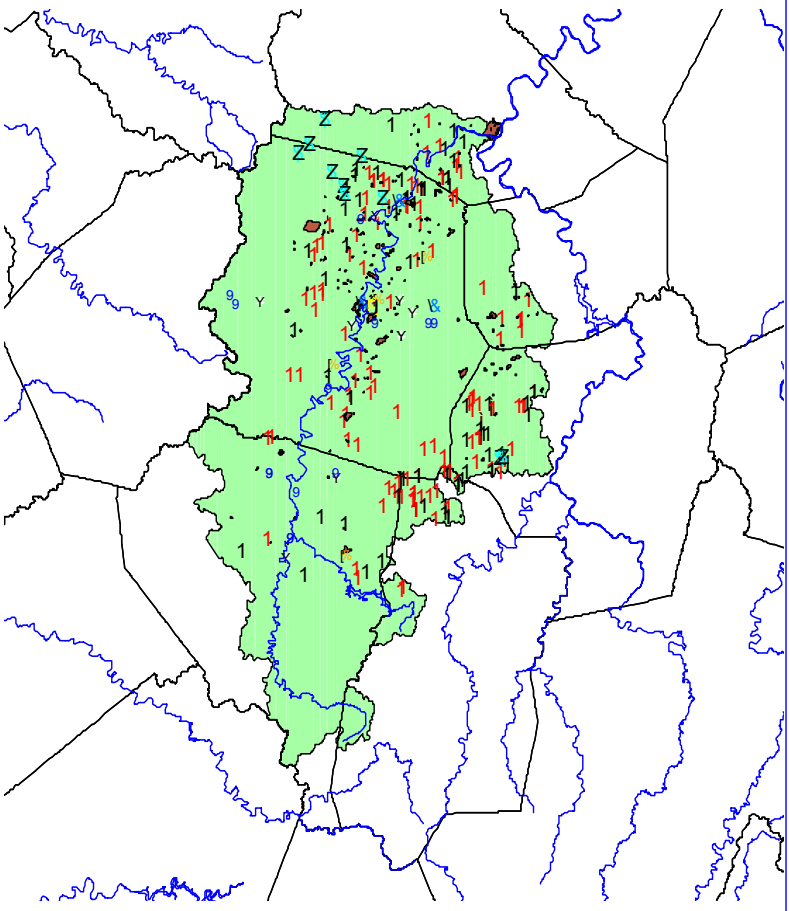
Note: Oil & Gas wells could not be displayed due to the concentration. There are 3769 Oil & Gas wells in this watershed.

N

10 0 10 Miles

Major Streams
9 Public Water Wells
Y Groundwater Remediation Site
Ú Hazardous Waste Site
Landfills
Abandoned Mine lands
1 Coal Surface Mine
1 Coal Underground

West Fork River Watershed



Note: Oil & Gas wells could not be displayed due to the concentration. There are 14382 Oil & Gas wells in this watershed.

N

10 0 10 Miles

Major Streams
Public Water Wells
Shallow Injection Wells
Groundwater Remediation Site
Hazardous Waste Site
Landfills
Coal Dams
Abandoned Mine lands
Coal Surface Mine
Coal Underground
Quarry

III. BOARDS AND COMMITTEES

The following boards and committees are responsible for developing and implementing policies, procedures and rules to ensure proper application of the Groundwater Protection Act (GWPA).

A. Environmental Quality Board

1. Appellate Activities

a. Permit Appeals

The Board is authorized by WV Code 22-11-21 to hear appeals of agency decisions concerning groundwater protection. The following are administrative appeals which were filed with or addressed by the Board during the last biennial reporting period and include issues arising under provisions of the Groundwater Protection Act:

1). Terry Eagle Coal et.al. - Appeal 04-02-EQB
Filed 1-21-04
Withdrawn 3-10-04

2). J. David Rapp fdba Rapp Dairy - Appeal 04-18-EQB
Filed 8-4-04
Dismissed 1-14-05

3). American Bituminous Power - Appeal 04-28-EQB
Filed 12-22-04
Withdrawn 2-25-05

4). Paul Burke, et. al. - Appeal 05-10-EQB
Filed 4-7-05
Pending

b. Review of Civil Administrative Penalties

WV Code 22-12-10 establishes procedures for review of the assessment of civil administrative penalties. This provision provides for an informal hearing to review the penalty, and gives the Board appellate authority for review of the final decision. The Board has received no appeals filed pursuant to this provision.

c. Groundwater Variance Review

In 1994, the DEP promulgated and was drafted by a subcommittee of the Groundwater Coordinating Committee, which establishes procedures for applicants

seeking variances from groundwater standards. The duties established for the Board by that rule are twofold.

The rule provides that any person adversely affected by the Director's decision to deny a variance may appeal that decision to the Board within 30 days of the date of publication of the denial decision in the State Register.

Section 6.9 of the rule provides that, when a variance is proposed to the legislature, if the terms and conditions of the variance include alternative groundwater standards the Director is required to consult with the Water Resources Board (now the Environmental Quality Board) in establishing such alternative standards. No appeals or requests for consultation were received by the Board during this reporting period.

2. Rulemaking Activities

a. Requirements Governing Groundwater Standards, 46 CSR 12

The Board was authorized through June 30, 2005, by Section 22 of the Groundwater Protection Act to promulgate standards of purity and quality for groundwater, accomplished by the promulgation of legislative rule 46 CSR 12, "Requirements Governing Groundwater Standards." This responsibility transferred from the West Virginia Environmental Quality Board to the West Virginia Department of Environmental Protection, effective July 1, 2005.

3. Other Authorized Activities

B. Groundwater Coordinating Committee

Section 22-12-7 of the groundwater Protection Act provides for the continuation of the Groundwater Coordinating Committee. That section further provides that the chair of the EQB is a member of that committee. The committee is responsible for review and consultation regarding implementation of the programs developed by each of the groundwater regulatory agencies.

It is authorized and empowered to promulgate legislative rules as may be necessary to implement the GWPA, reviews programs for compliance, and recommends necessary changes.

This committee is comprised of senior managers from the various groundwater regulatory agencies which includes:

Commissioner of the Bureau for Public Health,
Commissioner of the Department of Agriculture,
Secretary of the Department of Environmental Protection,
Director of the Division of Water and Waste Management, and

Chairman of the Environmental Quality Board.

The Board has received no notices of coordinating committee meetings since 1994.

C. Ground Water Protection Act Committee

This committee deals with the development of groundwater policies and groundwater protection practices, and addresses past, present, and future rule-making issues. It consists of program managers from groundwater regulatory agencies.

D. Groundwater Monitoring Well Drillers' Advisory Board

This board was created to advise WVDEP on the certification of monitoring well drillers and assist in the development of Groundwater Monitoring Well Design Standards. It is comprised of representatives from the drilling and coal industries, the Division of Water and Waste Management, the Office of Oil and Gas, the Division of Water and Waste Management's Underground Storage Tank Section, the Bureau for Public Health, and the West Virginia Geologic and Economic Survey.

The Board coordinates with WVDEP Division of Water and Waste Management - Groundwater Program's Monitoring Well Driller Section in the development of policies regarding monitoring well design standards, documentation, testing, and other drilling related issues.

The Board has been instrumental in the development of electronic submission of the *Monitoring Well Construction Documentation Form* and the *Abandonment of Monitoring Wells/Boreholes Forms* via the Internet. This service has been available to all certified monitoring well drillers since 2002.

E. Well Head/Source Water Protection Committees

These committees deal with groundwater and source water issues in Source Water Protection Areas. They consist of the same members as the Groundwater Protection Act Committee plus representatives from the Public Service Commission, the Rural Water Association, Division of Highways, and the Division of Emergency Services and Homeland Security.

F. Nonpoint Source (NPS) Coordinating Review Board

Due to the large number of State agencies involved in coordinating and/or regulating nonpoint sources, the various technical advisory committees must assure that state requirements are understood and met. This is especially important since funding sources, other than National Clean Water Act Section 319 funds, are available to support implementation of Best Management Practices (BMPs).

To maximize utilization of these funds, requirements of the various agencies that manage the funds must be addressed during the evaluation, priority watershed selection, planning, and implementation phases. This requires an interagency mechanism for review of individual agency requirements and to discuss conflicting objectives for specific types of nonpoint source control. Therefore, an interagency NPS Coordinating Review Board comprised of representatives from each of the NPS Technical Advisory Committees has been created to integrate the efforts of all category agencies into a unified NPS watershed management approach. It will be the responsibility of the NPS Coordinating Review Board to guide implementation, identify specific BMPs for multi-category targeted watersheds, and resolve conflicts in accordance with Section 319(b)(2)(F), “Federal Consistency Requirements.”

IV. DEPARTMENT OF AGRICULTURE
A. Overview of Groundwater Protection Activities

1. Groundwater Protection Goals and Principles

Environmental Stewardship is a fundamental principle of the agricultural community. The protection of groundwater resources through prudent development and use and the control of contributing environmental factors are the goals of the Department of Agriculture. The maintenance and protection of current and future groundwater quality through enforcement of State and Federal regulations, cooperative outreach and education programs, and support and investigation of Best Available Technologies are continuing objectives in the promotion and expansion of agriculture in the State. The Commissioner shall utilize any and all existing regulatory authority available and shall petition additional regulatory authority, if needed, to insure the protection of the groundwater resource.

The Commissioner may develop chemical-specific regulations or generic mandatory Best Management Practices (BMPs) pertaining to any and all aspects of pesticide use. The Commissioner finds that the existing categorization and distribution of soils within the state combined with the accepted properties of pesticides known or suspected to be highly mobile in the soil profile, do not warrant the promulgation of additional area-specific or regional regulations other than those required by the products registration program. Although empowered by both Federal and State statute, the Commissioner finds that the existing use restrictions have protected the existing quality of this resource. The Department has maintained a cooperative and evolving pesticide management process under the Federal Groundwater Protection Initiative. There have been no significant changes in pesticide use in the State during the current report period. Retirement, loss of profit margins, and urban encroachment have resulted in some reduction in size and intensity of certain agricultural facilities.

Contamination sources not regulated by Federal statute but deemed detrimental to the current or future quality of groundwater will be addressed through educational outreach and, when possible, through cooperative implementation of BMPs. In response to the need for comprehensive strategies for the protection of groundwater and surface water quality, the Department has initiated and supported state-of-the-art technologies. Research and demonstration projects in the areas of biogeneration of alternate fuels and genetic identification of bacterial contamination are ongoing.

Priorities in groundwater protection are established by the identification of areas where suspected or detected chemicals are used. Intensive agricultural production is restricted to readily identifiable areas of the state, further facilitating the establishment of priorities. The Department of Agriculture's Plant Industries Division/Pesticide Regulatory Programs operates within the parameters delineated in the West Virginia Groundwater Protection Act and is the lead State agency for enforcement of the Federal

Fungicide, Insecticide, and Rodenticide Act (FIFRA). Operation of the Department as the State lead agency for FIFRA is closely monitored by regional and national offices of the Environmental Protection Agency. This close supervision has insured that the Department has maintained and exercised the mandates of Federal Pesticide Statutes and related environmental health directives. State regulations have, in fact, anticipated and preceded Federal regulations (section II).

The registration of pesticides and the regulation of commercial pesticide application businesses, commercial applicators, and private applicators is approved under the WVDEP's Groundwater Certification Program (GCP). The certification of pesticide applicators parallels the licensing strategy used in other agencies. The initial certification process of pesticide applicators requires that an applicant demonstrate an understanding of the State Groundwater Protection Act and the specific groundwater protection regulations promulgated the Department, i.e. Title 61 SCR 6B, 12A, 12H, 12I and 22A. Approximately 2300 applicators are certified.

In order to maintain certification, private applicators must attend five hours of pre-approved update training over a three year period and commercial applicators must attend ten hours. Updates on groundwater protection programs and revisions of pesticide use relative to groundwater protection were included in the update training programs. Two hundred and fifty applicators were recertified in 2004 and a similar number is anticipated for 2005.

The Department has been in full compliance with the Federal pesticides in groundwater management initiative as administered by the Environmental Protection Agencie's (USEPA) Office of Pesticide Programs (OPP). Although the OPP program predates the State Groundwater Protection Act, the mechanisms of compliance and enforcement are mutually supportive. A final ruling by EPA/OPP and project guidance is expected in the fall of 2005.

2. Pesticide Groundwater Fee Collection; Recycling and Disposal Activities

Every product qualifying as a pesticide as defined under the West Virginia Pesticide Control Act must be registered with WVDA prior to release in commercial channels. Under the West Virginia Groundwater Protection Act each of these products is assessed an annual fee of fifteen dollars by WVDEP. Approximately 8,800 products were registered during each of the past two years. A portion of the fee is transferred to WVDA to support groundwater protection programs.

WVDA has continued the pesticide container collection and recycling program. This program diverts pesticide containers from permitted landfills and illegal disposal and reduces the potential for pesticide contamination of ground water resources. Approximately eight thousand containers were collected and recycled during the report period. Collection sites were located in the lower Kanawha Valley and Eastern

Panhandle. Containers are ultimately reprocessed and used in the production of shipping pallets, fence posts, and other structural components.

Improper disposal of large quantities of pesticides is a threat to the State's groundwater. Proper disposal is usually cost prohibitive and alternate environmentally unsound methods of disposal are typically utilized. WVDA has identified and disposed of fourteen thousand pounds of waste and obsolete pesticides. The diversion of this material from the regular waste stream is a significant reduction of the threat to ground water reserves in the State.

3. Groundwater Rules

The West Virginia Department of Agriculture is monitoring fertilizer through legislative and procedural rules. These rules include:

61 CSR 6B	Primary and Secondary Containment of Fertilizer
61 CSR 6C	General Groundwater Protection Rules for Fertilizer and Manures
61 CSR 22B	Best Management Practices for Fertilizers and Manures

61 CSR 6B. The Primary and Secondary Containment of Fertilizer rule establishes standards for the purpose of protecting the groundwater resources of the State of West Virginia.

Facilities regulated by this rule must submit a design plan and specifications for construction to the Commissioner for approval. This applies to both liquid and dry fertilizers. The operator of a storage facility shall prepare a written Discharge Response Plan for the storage facility for each type of bulk fertilizer stored that includes procedures used in controlling and recovering, or otherwise responding, to a discharge.

61 CSR 6C. The General Groundwater Protection Rules for Fertilizer and Manures establishes practices to prevent or minimize the entry of nutrients from fertilizers and manures into groundwater while maintaining and improving the soil and plant resources of this State. The Department encourages the education of all users of fertilizers and manures so they will have the knowledge and technical means to respond independently and voluntarily in addressing environmental concerns. The Department also encourages the development of training and educational programs for those who make recommendations for application rates for fertilizers and manures and for those who apply fertilizers and manures.

Agricultural Best Management Practices (BMPs) and comprehensive environmental management plans are promoted through the United States Department of Agriculture's Natural Resource Conservation Service (NRCS). The NRCS has no regulatory authority in the administration or enforcement of State or Federal pesticide

regulation. The NRCS has effectively used Federal cost-share programs to promote and establish low chemical input production practices and chemical handling facilities.

The environmental impact of agricultural fertilizers and soil amendments are not determined by the Department of Agriculture. The Department does maintain a quality assurance and label compliance monitoring program for commercial fertilizers. Bulk fertilizer dealers are required to register with the Department and are subject to inspections as outlined in the regulation. These duties are delegated to the Department of Agriculture's Field Services Section of the Regulatory Protection Division.

The establishment of priorities is partially independent of sub-regional hydrogeologic parameters. The preliminary data on groundwater contamination by pesticides indicates that areas of gross vulnerability, such as karst geology, in conjunction with established and repetitive production of row crops, are equally vulnerable. Assessment of vulnerability at a sub-regional scale is beyond the resources and jurisdiction of the Department. The Department will consult with appropriate Federal and State agencies in the establishment of protection and monitoring priorities to insure the continued protection of public health.

61 CSR 22B. BMPs for Fertilizers and Manures is a procedural rule to prevent or minimize the entry of nutrients from fertilizers and manures into groundwater while maintaining and improving the soil and plant resources of the State. Best Management Practices for Fertilizers and Manures calls for fertilizers to be stored inside a sound structure or device having a cover or roof top, side walls, and a base sufficient to prevent contact with precipitation and surface water. Manure is to be stored in a facility that meets or exceeds the standards of the Soil Conservation Service Field Office Technical Guide.

On July 1, 1993, Non-Bulk Pesticide Rules for Permanent Operational Areas (Title 61 Series 12 I) became effective. This regulation, which contains a four-year implementation period, became enforceable July 1, 1997. The activities of the Department of Agriculture during the report period which pertain to the enforcement of this regulation have focused on review and approval of facility design and construction. The regulation addresses agricultural production, golf course maintenance, right-of-way applications, ornamental and turf production, and some general pest control operations. As part of the routine inspections of operations, evaluation and documentation of secondary containment, when applicable, is included in the inspection report. To date there have been no enforcement actions resulting from the regulation.

The Department has worked closely with the regulated community in the maintenance of existing demonstrational containment and the construction of permanent facilities. All bulk pesticide dealers and commercial agricultural application businesses are in compliance with the secondary containment regulation. A majority of the tree fruit industry is in compliance by means of permanent loading areas or modification to operational procedures as specified by 61 CSR 12I and CSR 22A.

The Department has consulted with the U.S. Department of Agriculture and Natural Resource Conservation Service (NRCS) in the design and construction of secondary containment facilities funded through cost-share monies. The structures were approved under provisions of the Groundwater Certification Program.

Since groundwater contamination due to chemical accumulations at pesticide handling and application equipment maintenance areas has not been identified in West Virginia, the promulgation of 61 CSR 22A was seen as a preventive measure. Federal label amendments and increased restrictions on the use of prime groundwater contaminants have, in effect, duplicated this regulation. The Department anticipated Federal restrictions and obtained significant lead time in the implementation and acceptance of the restrictions.

Related regulations, which have been described in previous reports, include:

61 CSR 22	Generic State Management Plan for Pesticides and Fertilizers in Groundwater
61 CSR 12G	General Groundwater Protection Rules for Pesticides
61 CSR 22A	Best Management Practices Act - Temporary Operational Areas for Non-Bulk Pesticide Mixing and Loading Locations
61 CSR 12H	Bulk Pesticide Operational Rules
61 CSR 12I	Non-Bulk Pesticide Rules for Permanent Operational Areas

The increasing use of new products, restrictions on product labels, increasing use of commercial applicators, and the low frequency and level of detection of pesticides in groundwater do not necessitate promulgation of additional regulations at this time. The Department has maintained its role in the Wellhead Protection Program and Source Water Advisory Committee. Program specialist and compliance officers are working closely with the regulated community to improve compliance with existing regulations by means of practice and cost-effective methods.

4. Groundwater Projects

Several programs are in place at the Moorefield Agricultural Center to monitor and improve existing water quality. Best Management Practices (BMPs) are utilized in an effort to reduce pollution and nutrient runoff. All poultry producers and integrators are required to have Nutrient Management Plans (NMP) which specify cropping recommendations for all acreage to which commercial fertilizer, litter or manure is applied. Results of soil tests, coupled with specific crop yields or soil utilization, are used to develop recommendations concerning amounts of fertilizers to be applied to each field. Several government agencies make recommendations and participate with

landowners on developing NMP. To further assist poultry growers, additional meetings and workshops are routinely conducted by representatives of the West Virginia Department of Agriculture (WVDA) and the West Virginia University Cooperative Extension Service (WVUCES). To facilitate NMP development, Moorefield's Nutrient Management Laboratory of the WVDA routinely analyzes over 200 litter/manure samples per year.

In an effort to incorporate nutrient management into all existing poultry operations, the staff of the West Virginia Conservation Agency and USDA Natural Resources Conservation Service provides technical assistance to local integrators in developing nutrient management plans. These plans supplement plans written under the PL-534 Potomac Headwaters Land Treatment Project. There are currently over 90 certified Nutrient Management Planners in the State of West Virginia.

Despite nutrient management efforts, several streams and tributaries in the Potomac Highlands Region of West Virginia have been identified as being contaminated with excessive amounts of fecal material. Consequently, identification of point and nonpoint sources of contamination is being addressed by the WVDA. Intensive sampling during FY99 confirmed the presence of fecal contamination and the WVDA worked with Marshall University's Forensics Department to fingerprint *E. coli* from the various regions.

DNA studies utilizing pulse gel electrophoresis are continuing in an effort to identify the source(s) of pollution. Microbiologists at Moorefield are specifically examining the *E coli* from humans, deer, bovines, chickens, and Canada geese in an effort to match them with the *E. coli* found in water samples. Once the source(s) is determined, efforts will commence to minimize the contamination.

The Moorefield Agricultural Center will be participating in a study funded by the United States Geological Survey, Department of Environmental Protection, and other agencies to compare various biological source tracking techniques. The intent of the study is to document the usefulness of several methods for identifying bacterial source contamination in groundwater.

5. Groundwater Data Collection and Management

During this report period no additional data have been collected or generated by monitoring or enforcement relative to groundwater quality. Monitoring and survey data from previous programs are maintained as hard copy site evaluations program reports, as well as laboratory and analysis reports, at the Gus R. Douglass Agriculture Center at Guthrie, near Charleston, WV. A preliminary electronic database has been initiated in dBASE format.

The Department has been actively involved in the development of a centralized groundwater database as required under the Groundwater Protection Act. Existing data

supports the Department's efforts in pesticide collection and disposal initiatives in the Eastern Panhandle. There have been no current applications of Global Positioning System/Geographic Information System (GPS/GIS) systems in the program. Initial inquiries have been made toward establishing either a dedicated or shared GPS/GIS within the Plant Industries Division.

Efficient data sharing among groundwater-related programs would be facilitated by the creation of a centralized database by the WV DEP as mandated under the Groundwater Protection Act.

6. Deficiencies

Currently, the Department of Agriculture sees the following deficiencies, which need to be corrected in order to improve West Virginia's groundwater protection efforts:

- Lack of specific hydrogeologic information e.g. potentiometric surface mapping and groundwater flow studies
- Lack of access to dedicated monitoring wells
- Lack of resources for dedicated area or site evaluations

7. Public Participation and Education

Public participation in the Department's efforts to protect groundwater is best represented by the increase in participation in the pesticide container recycling program. It has increased dramatically over the reporting period due to the voluntary participation of growers. All regulations promulgated by the Department are open to a public comment period as directed by State Code.

Groundwater protection, in both regulated and non-regulated communities, has been integrated into a general pesticide safety program for civic and social clubs, agricultural awareness and promotional displays (West Virginia State Fair, Legislative Ag-Day), and commercial and private certification and training programs.

All data collected during monitoring or quality assessment programs are available to regulators, the regulated community, and to the public. Data collected as part of an official enforcement or investigation activity is available after the final disposition of the case. The Department utilizes every opportunity to address groundwater and related environmental issues in the course of producer visits or compliance assistance programs.

8. Proposed Groundwater Activities

Areas have been identified in which additional funding would result in increased protection and quality assessment of the groundwater resource. These areas include:

- WVDA review of data generated by the WVDEP ambient groundwater monitoring program. Because of the cyclic nature of the data, a dedicated monitoring system in some areas of the state would be beneficial to the agricultural community. WVDA would like to explore opportunities to analyze groundwater samples on a bi-annual basis to augment the groundwater quality database.

- Identifying and securing funding for continued pesticide collection and disposal programs. WVDA has received inquiries as to the possibility of expanding the pesticide collection and disposal program to include disposal of small quantities of household pesticides.

IV. DEPARTMENT OF AGRICULTURE
B. Pesticides Section

As a recognized enforcement agency under the West Virginia Groundwater Protection Act, the West Virginia Department of Agriculture (WVDA) regulates agricultural practices and materials that have been demonstrated, or may be reasonably expected to, affect ground water. The Department has maintained and promoted an open dialog with the West Virginia Department of Environmental Protection (WVDEP) and the West Virginia Department of Health and Human Resources (WVDHHR).

Although groundwater contamination by pesticides and fertilizer is not common in West Virginia, these materials have been identified as potential groundwater contaminants. The State of West Virginia does not require site-specific permitting for the application of pesticides, fertilizers or soil amendments. Site-specific pesticide applications are regulated by the product registration process and subsequent product labeling. Application and use restrictions relative to groundwater protection are outlined in the products' labeling.

The WVDA has primacy in the enforcement and investigation of all aspects of pesticide use. The WVDEP and the United States Environmental Protection Agency may conduct additional or supporting investigations consistent with their authority. During this report period, there were no reported or suspected groundwater contaminations due to pesticide use.

The registration of pesticides and the regulation of commercial pesticide application businesses, commercial applicators, and private applicators is approved under the WVDEPs' Groundwater Certification Program (GCP). The certification of pesticide applicators parallels the licensing strategy used in other agencies. The initial certification process of pesticide applicators requires that an applicant demonstrate an understanding of the State Groundwater Protection Act and the specific groundwater protection regulations promulgated the Department, i.e. Title 61 SCR 6B, 12A, 12H, 12I and 22A. Approximately 2300 applicators are certified.

In order to maintain certification, private applicators must attend five hours of pre-approved update training over a three year period and commercial applicators must attend ten hours. Updates on groundwater protection programs and revisions of pesticide use relative to groundwater protection were included in the update training programs. Two hundred and fifty applicators were recertified in 2004 and a similar number is anticipated for 2005.

The Department has been in full compliance with the Federal pesticides in groundwater management initiative as administered by the Environmental Protection Agencies (EPA) Office of Pesticide Programs (OPP). Although the OPP program predates the State Groundwater Protection Act, the mechanisms of compliance and

enforcement are mutually supportive. A final ruling by EPA/OPP and project guidance is expected in the fall of 2005.

Areas in which bulk agricultural materials and pesticides are stored, transferred, or prepared for application are regulated under Title 61 of the Code of State Regulations, Series 12H "Bulk Pesticide Operational Rules" and 6B "Primary and Secondary Containment of Fertilizers".

The use of non-bulk pesticides, as defined under the West Virginia Pesticide use and Application Act is regulated under CSR title 61 Series 12I "Non–Bulk Pesticide Rules for Permanent Operational Areas." This regulation requires secondary containment in areas where pesticides are routinely mixed or transferred prior to application. There were no violations during the reporting period.

1. Pesticide Groundwater Fee Collection; Recycling and Disposal Activities

Every product qualifying as a pesticide as defined under the West Virginia Pesticide Control Act must be registered with WVDA prior to release in commercial channels. Under the West Virginia Groundwater Protection Act each of these products is assessed an annual fee of fifteen dollars by WVDEP. Approximately 8,800 products were registered during each of the past two years. A portion of the fee is transferred to WVDA to support groundwater protection programs.

WVDA has continued the pesticide container collection and recycling program. This program diverts pesticide containers from permitted landfills and illegal disposal and reduces the potential for pesticide contamination of ground water resources. Approximately eight thousand containers were collected and recycled during the report period. Collection sites were located in the lower Kanawha Valley and Eastern Panhandle. Containers are ultimately reprocessed and used in the production of shipping pallets, fence posts, and other structural components.

Improper disposal of large quantities of pesticides is a threat to the State's groundwater. Proper disposal is usually cost prohibitive and alternate environmentally unsound methods of disposal are typically utilized. WVDA has identified and disposed of fourteen thousand pounds of waste and obsolete pesticides. The diversion of this material from the regular waste stream is a significant reduction of the threat to ground water reserves in the State.

2. Proposed Groundwater Activities

Areas have been identified in which additional funding would result in increased protection and quality assessment of the groundwater resource. These areas include:

- WVDA review of data generated by the WVDEP ambient groundwater monitoring program. Because of the cyclic nature of the data a dedicated monitoring system in some areas of the state would be beneficial to the agricultural community. WVDA would like to explore opportunities to analyze groundwater samples on a bi-annual basis to augment the groundwater quality database.

- Identifying and securing funding for continued pesticide collection and disposal programs. WVDA has received inquiries as to the possibility of expanding the pesticide collection and disposal program to include disposal of small quantities of household pesticides.

IV. DEPARTMENT OF AGRICULTURE
C. West Virginia Conservation Agency

The West Virginia Conservation Agency undertook the following activities that either directly or indirectly protect West Virginia's groundwater resources.

1. Management of Organic Animal Waste and Chemical Fertilizers

45 nutrient management plans were developed on 3,587 acres of agriculture land. Through these plans, approximately 708,411 pounds of nitrogen and 707,486 pounds of phosphorus were properly managed and applied to agriculture lands, reducing the potential for leaching of these nutrients into groundwater resources.

28 animal feeding areas were stabilized or relocated.

20 farmers were assisted with problem identification and best management practice selection related to streambank erosion and nutrient management.

WVCA NPS staff serves as a technical resource on the West Virginia Concentrated Animal Feeding Operations Committee that worked to develop rules to reduce or eliminate the NPS pollution to surface and groundwater due to animal agriculture operations.

WVCA NPS staff serves on the WV Nutrient Management Committee that oversees planner certification and develops resource management practices for chemical fertilizer, livestock manure, and poultry litter utilization.

Soil Samples from a 160-acre golf course were taken for urban nutrient management planning.

2. Pesticide Management

Integrated pest management plans were developed on 102 acres of farmland, reducing the potential for over application and leaching of pesticides.

2 educational programs were provided to farmers, as well as homeowners, on pesticide usage.

450 containers were collected in the Pesticide Container Recycling/Unused Chemical Disposal Programs.

3. Educational Programs

West Virginia State Conservation Camp - Watershed Management Class, 200 students.

Moorefield Elementary School - Water Journey Education Activity/Lesson, 115 third grade students.

Hardy County Younger 4-H Camp-Stream Exploration, 35 participants.

North Fork 319 Project for National Envirothon Coaches - tour, with emphasis on water quality and BMPs to improve water quality in the North Fork Watershed.

East Hardy Early Middle School - "My Watershed Community" Field Day, 120 students.

West Virginia Poultry Festival – Backyard gardens and lawns, 20 adults.

Potomac valley Conservation District (in cooperation with) – developed and distributed "Mortality Composting" brochure.

Baker's Run Conservation Society – assisted with stream cleanup day, 50 youth.

Watershed Working Lands Summit (April 18-19, 2005, Raleigh, NC) presented North Fork 319 Project Success Story.

42 presentations on Nonpoint Source (NPS) pollution using interactive models and visuals to explain, identify, and prevent NPS pollution, children K-12.

Chesapeake Bay Program

WVCA is a full partner in the Chesapeake Bay Program. Chesapeake Bay efforts by WVCA include:

- *A Homeowners Guide to Nutrient Management* was developed and distributed through the Chesapeake Bay Program to homeowners as well as displayed at the local chemical fertilizer dealerships.

- A new stream table was purchased to demonstrate the process of surface water flow. This table has been used to educate more than 350 students.

- West Virginia hosted Urban Nutrient Management Conference Day in Martinsburg, WV for 45 attendees ranging from landscapers to golf course superintendents.

- The Program facilitated the AMA Poultry Litter Transfer Program; 10,000 tons of litter moves through the program annually.

- Annual submission by WVCA of BMPs to the Bay Program Office to be used in "The Model".

- Sponsored multiple educational field days and stream cleanups in cooperation with local watershed associations and community groups.

    - Over 10 tons of solid waste removed from local streams and their banks
    - Over 1,000 students ranging from K-12 grade have been educated on environmental issues.

- Displayed table top "Conservation Districts Working To Protect the Chesapeake Bay" at legislative and educational field days.

- Presented "Backyard Conservation 101" to area Women's Club, 60 attendees.

- Sponsored three regional Sediment & Erosion hands-on field days. 120 attendees

- Installation of Natural Stream Restoration Project on the South Branch River in Hampshire County protecting 800 feet of eroding stream bank. This site is estimated to be contributing 3000 tons of sediment to the river annually.

- Designed website advertising excess poultry litter within the Potomac Valley.

- Managed three year water quality study on Spring Run, concentrating on the effects of a point source upgrade on a wild trout stream.

- Modified existing Conservation Reserve Enhancement Program video to the West Virginia landscapers and producers.

4. The West Virginia Conservation Agency's Watershed Resource Center

- An EnviroScape presentation was given to over 45 4th – 8th grade students. The EnviroScape Watershed/Nonpoint Source model demonstrates how different land uses affect water quality. The EnviroScape allows the students to visually understand how they contribute to water quality problems and how they can be part of the solution. The students were also provided with educational fact sheets on "Who is Helping the Watershed? Pollution Solutions You Can Do at Home".

- Publishes and distributes the *Waternet Newsletter* to approximately 250

Watershed Associations and agencies statewide four times a year. The *Waternet Newsletter* is an informative publication designed to keep watershed groups up to date on BMPs, upcoming workshops and conferences offered statewide, and to showcase the efforts of volunteers working for water quality.

- Developed and distributed over 500 educational brochures describing the benefits of riparian buffers and what is required to establish functional riparian areas.

- Displayed sediment and erosion information at the 2005 EXPO. A workshop on "Proper Sediment Control Techniques During Construction of Temporary/Permanent Roadways" was also hosted. The workshop was a huge success with over 140 attendees. The "Roads to Rivers" educational video on sediment was distributed to 100 attendees with additional requests for mailings.

- Distributed 200 "Stormwater Runoff" educational placemats to the Upper Ohio Conservation District for outreach.

- Distributed 100 Agriculture BMP books to the Elk Conservation District for outreach/education.

- Distributed five *Pond Management Manuals* to individuals requesting information.

5. Biosolids Land Application

10 plan reviews were performed as requested by a landowner in the program for 750 Acres.

Provided technical advice to 3 landowners and 5 wastewater treatment plants regarding the management of land-applied biosolids.

6. Agriculture Pesticide, Chemical, and Petroleum Storage

Provided technical advice to agriculture producers in a Wellhead Protection Area for proper storage, use, and handling procedures for pesticides, chemicals and petroleum.

7. West Virginia Source Water Protection

The West Virginia Bureau of Public Health invited a representative of WVCA to be on the West Virginia Source Water Assessment/Wellhead Protection Program's Review and Liaison Committee. The committee is working to coordinate agencies and their programs in an effort to protect ground and surface water used for public drinking water.

WVCA cooperated with the WV Bureau of Public Health and local stakeholders in organizing a Source Water Protection Committee in Preston County.

A “Environmental Management Plan” was developed for a dairy farmer whose farm is located in the wellhead protection zone for a municipal water supply.

8. Sediment/Construction and Development

- Stabilized 5,000 feet of severely eroding stream banks; reduction of 2T of sediment/year.

- Presented “Landscape Challenges in West Virginia” during the Joint Southeastern Storm Water Management and Erosion Conference, held in Atlanta, GA.

- Provided 3 contractor/developers with technical advice for the development of Groundwater Protection Plans for their site development permits.

Sediment and Erosion Control Plans were reviewed on 13 properties of less than 1 acre. These plans are reviewed to check the erosion controls and BMPs on construction sites to prevent sedimentation of the State’s waters.

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
A. Division of Mining and Reclamation

1. Environmental Goals of the Groundwater Protection and Underground Injection Control Programs for Mines and Quarries

Because, as stated in Chapter 22 Article 12, *Groundwater Protection Act*, "Over fifty percent of West Virginia's overall population, and over ninety percent of the state's rural population, depend on groundwater for drinking water" (§22.12.2.a.2), and because mineral mining, both coal and non-coal, are ubiquitous in West Virginia, protecting the quality and quantity of the groundwater from adverse impacts due to these activities is imperative to both the environment and to human health and safety. These programs' goals are identical and twofold: to ensure the future chemical and biological quality of the groundwater of the state, and to prevent adverse changes in the quantity of the groundwater, *e.g*. the dewatering of existing aquifers or the excessive flooding of underground mine voids.

2. Protecting Private and Public Water Supplies

Groundwater protection at mine sites was begun more than ten years ago in West Virginia with the passage of Legislative Rule Title 38 CSR 2F, *Groundwater Protection Regulations for Coal Mining Operations*, and the policies and practices established by WVDEP's DWWM and DMR to enforce it. The resulting changes in the handling of surface activities and substances at mine sites have already protected many public and private water sources, both existing and potential, from damage due to mining, and have greatly minimized the impacts that occurred prior to or despite the changes. An early and thorough policy of providing information for agency personnel, the regulated industries and the public resulted in a smooth transition in a spirit of cooperation.

Today, the Groundwater Protection Program is an integral part of WVDEP's permitting/inspection/enforcement procedures for mine sites. Groundwater Protection Plans are incorporated in and essential to mining permits, both SMCRA (Chapter 22 Article 3) and NPDES (Chapter 22 Article 11); further, all such permits contain terms and limits that provide for protection of the subsurface environment. Violations of the groundwater protection conditions of a permit can incur penalties ranging from administrative to criminal and can even result in revocation of the permit.

The Underground Injection Control (UIC) Program, as established under Legislative Rule Title 47 CSR 13, *Underground Injection Control*, applies to mining primarily through the permitting of Class 5 Type X13 injection wells, typically for the disposal of coal preparation plant slurry or acid mine drainage treatment sludge into abandoned underground mine voids. The UIC 5X13 permitting process is designed to

ensure that the injectate meets Federal Safe Drinking Water Standards at the point of injection and that the additional volume of fluid will not endanger human safety or the environment.

3. Challenges

Mining operations are typically remote, not easily accessible by the public, and usually involve large surface areas. These factors can make the monitoring of small details difficult, making the scrupulous enforcement of the Groundwater Protection Act and UIC permit terms an on-going challenge. The programs are constantly adjusted to provide as much control as possible under the circumstances for assuring compliance on a day-to-day basis.

Because no two mine sites are exactly alike, each UIC permit application is approached as a unique entity. Development of a general permit for these operations, such as the NPDES general permits for mines and quarries, is not a viable option. Furthermore, WVDEP relies on just one employee, the Geologist III for DWWM's Mining Groundwater Protection/UIC Programs, to conduct all activities associated with mining-related groundwater protection and underground injection, from conducting pre-permitting field inspections to protocol development, permit writing to filing, data entry, and the assessment and arbitration of Groundwater Protection Fee waiver requests. As the universe of mine sites involved with underground injection expands, time allotment for the geologist/permit writer becomes more problematic.

4. Proposed Programs and Projects

Along with other types of environmental permitting, UIC – Mining is anticipating the development of electronic application procedures in the near future, thus streamlining and standardizing the submission of data for review. Additionally, the electronic submittal of Discharge Monitoring Reports from UIC – Mining permits will be instituted as soon as possible, because reviewing and tracking the 17 or 18 parameters plus mine pool level for every injection point for every month is becoming increasingly labor-intensive.

When time constraints allow, especially after the above-referenced electronic programs are fully functional, the UIC geologist/permit writer will also begin conducting unannounced inspections of permitted sites to confirm compliance. Nevertheless, since the UIC – Mining Program became specific to the industry nearly six years ago, interaction among DWWM, DMR and DMR's Inspection and Enforcement personnel has increased, adding several layers of oversight to the issuance and inspection of permits.

Additionally, all UIC – Mining draft permits are submitted to the West Virginia Geologic and Economic Survey, the West Virginia University Hydrology Research Center, and the Federal Mine Safety and Health Administration (MSHA) for review and

comments. Copies of permits issued prior to beginning these submittals have also been sent to the appropriate MSHA office.

The first reissuances of existing 5-year permits began in June 2004. Prior to that time, a reissuance protocol was developed allowing for both the redress of problems encountered with the early permits and for the smooth transition into the new terms and conditions.

5. Achievements

The practice of injecting mine wastes into abandoned mine voids has been going on for decades. A continuing challenge has been to locate and identify pre-existing injection sites and either bring them into the permitting process or stop the injection activities. Assistance from the WVDEP DMR field office personnel (permit writers, geologists, engineers, and inspectors) has been invaluable in this endeavor. In the six years since UIC – Mining began as an independent permitting program, nearly all such sites in the state have been identified and are now at some stage of the UIC permitting process or have ceased injecting.

As inevitable concerns arise from the public, the industry, or other agencies, Discharge Monitoring Reports from issued permits and chemical analyses submitted in applications are re-examined and data collected to assure that Federal Safe Drinking Water Standards for the parameters in question are being met and that this program is succeeding in its goal of protecting public health. In 2005, Mercury, Antimony, and Silver were studied and found to be consistently within required limits.

In 2005, the question arose of allowing the use of RCRA-listed products in some of the processes producing injectate. Since the chemicals in question are listed due to corrosivity, as opposed to toxicity, the injectate is still capable of meeting all required standards. However, DWWM GW/UIC personnel worked closely with the USEPA and established a protocol for such sites ensuring full compliance with all regulations.

A singular honor was afforded WVDEP's UIC – Mining Program in 2004 and 2005 as the USEPA sought information both for themselves and for other states, e.g. the Commonwealth of Virginia, to develop similar mining underground injection control programs and practices for themselves.

6. Sources of Data Collection

Initial information about an existing injection site usually comes from the DMR I & E Inspector assigned to the mine; he or she will require the operator to begin the process of obtaining a UIC permit or cease injection activities at the site. Applicants proposing to inject underground initiate the permitting process by providing basic details about the site prior to receiving an application number and form. All applicants must be

WVBEP compliant and not in arrears for any WVDEP fee; otherwise, the process is halted until compliance is proven.

Further information about the proposed injection activity comes from the operator or consultant via the ten-page UIC – Mining application form. This required data includes maps, drawings, narratives and laboratory analyses, among other information. A field inspection by the geologist/permit writer, along with the DMR I & E inspector and representatives of the applicant confirms the submitted data and adds further information.

Finally, input from the public via the 30-day public comment period and from the WVGES, MSHA, or WVU completes the data necessary to issue the permit. After issuance, continued monitoring as required by the permit plus observations by the DMR I & E Inspector assure a continuous influx of information about the site.

7. Use of the ERIS Database

Every UIC – Mining application, once the tracking number has been assigned, is entered into the ERIS Database. As information is received, especially the data in the completed application, it is logged into the database. Activities on the application are thereby available to all WVDEP personnel. Also, the UIC geologist/permit writer may easily access pertinent information about the mine site and/or applicant from ERIS entries made by DMR field office and headquarters personnel.

8. What the Programs Need to Protect/Remediate groundwater

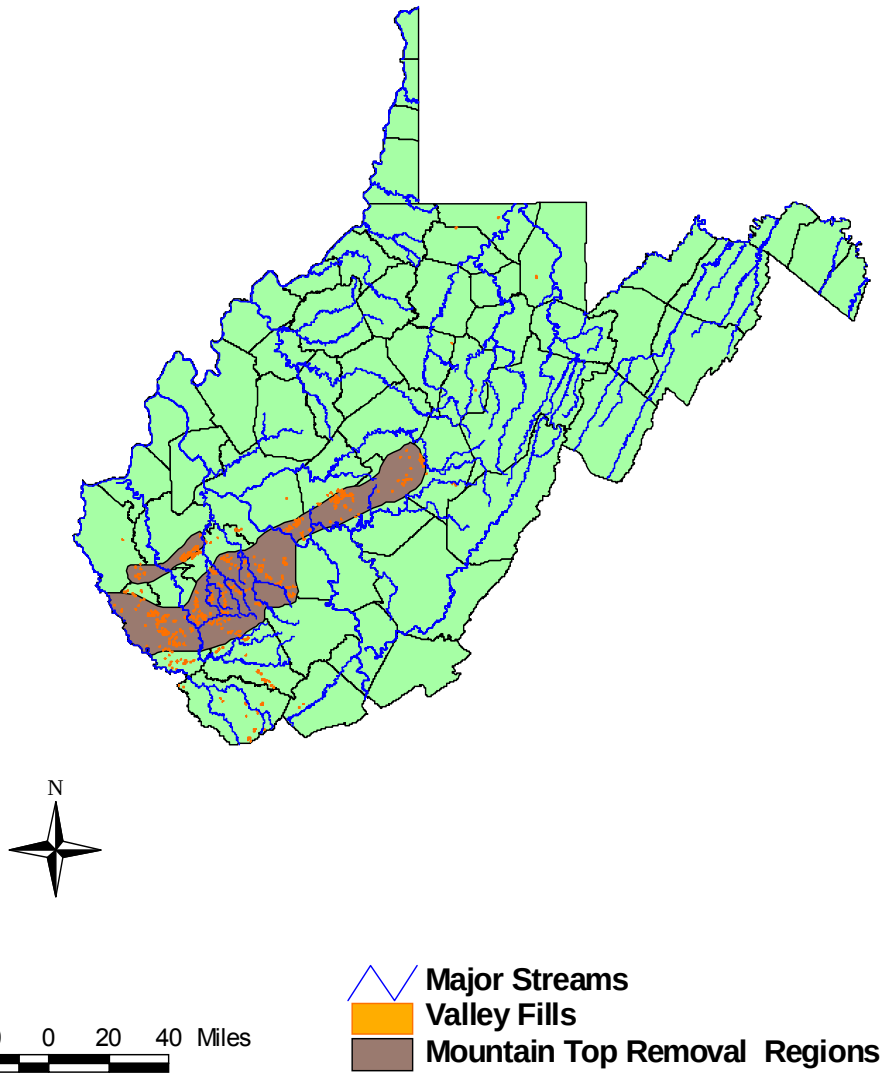
The most critical need, at present, is for materials, assistance and procedures to alleviate some of the time-consuming logistical or clerical tasks that increasingly burden the geologist/permit writer. A full-time file clerk serving DWWM would alleviate wasted man-hours for all professionals. Electronic UIC permit application and, especially, the electronic submittal of Discharge Monitoring Reports would free up time for more technical activities, such as unannounced field inspections and assessment of trends in permit violations.

9. Statistics

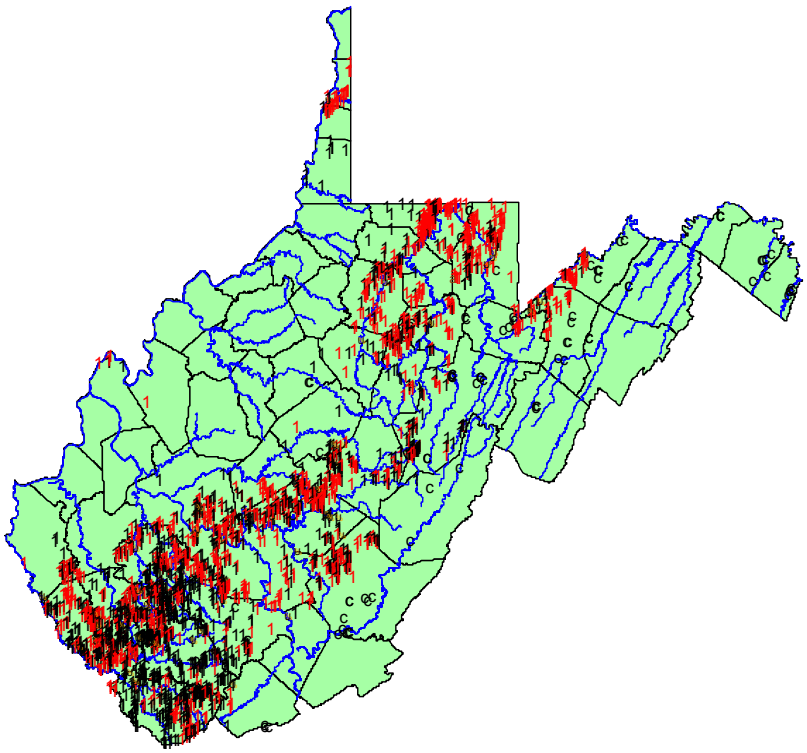
Mine Sites Known, Suspected or Proposing to Inject Underground…….. 72
Injection Points Known, Suspected, or Proposed…….…… 478
Sites Presently in the Application/Permitting Process…..……. 19
Permits (or Modifications) Issued or Reissued……. 69
Injection Points Permitted…… 417
Permits Closed/Abandoned…… 1
Permits/Injection Points Denied…….. 7/35
Permits/Injection Points Invalidated…… 1/20
Applications Voluntarily Withdrawn……. 16

Applications/Injection Points presently “On Hold” (Pending Resolution of Groundwater Problems……	0/0
Applications/Injection Points presently “On Hold” (Pending Resolution of Fee Problems ……	1/1

Mountain Top Removal Activity in West Virginia



Mining Activity in West Virginia



N

20 0 20 40 Miles

1 Underground Coal Mines
u Prep Plant
c Quarry
a Wildcat Operation
1 Surface Coal Mine
Major Streams

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
B. Office of Oil and Gas

The Office of Oil and Gas (OOG) regulates West Virginia's oil and natural gas industry. Protection of groundwater is of utmost importance and is achieved through the permitting, inspection, and enforcement of exploration, production, plugging and injection activities of the industry. Over 47,000 active wells are maintained by the OOG. Regulations aimed at protecting groundwater have been in existence since 1929. Additional regulations have been added in the years that followed to further aid in the protection of groundwater. OOG believes that groundwater protection is maximized by conforming to these existing regulations and practices. The following is a summary of selected regulatory functions and activities the OOG conducts in protecting groundwater.

1. Fresh Water Casing and Drilling Practices 35 CSR 4.11.3 and 11.7

Fresh water casing must be set by the operator to at least 30 feet below the deepest fresh water horizon and then cement circulated to surface prior to drilling into any oil, gas, or salt water bearing strata. The operator shall use practices and procedures necessary to minimize damage or disturbance to strata containing groundwater until casing has been set.

2. Plugging Methodology 35 CSR 4.13 and 22-6-24

During plugging and abandonment operations of a well, the operator is required to separate oil, gas, and water bearing strata with 100-foot cement plugs to completely seal the hole and prevent communication with zones containing groundwater.

3. Water Supply Testing 35 CSR4.19

Operators are required to notify landowners within 1000 feet of a proposed well drilling site. At the request of the landowner, the operator shall sample and analyze water from any wells or springs within this radius. If no requests are made, then the operator shall choose an existing well or spring from within the radius to sample and analyze. Results are submitted to the landowner as well as the OOG and results are kept on file for groundwater quality purposes should a problem arise.

4. Underground Injection Control Program 35 CSR 4.7

The OOG administers Class 2 and 3 injection wells under the Underground Injection Control (UIC) Program. Class 2 wells include brine disposal and secondary recovery gas and water injection wells. Class 3 wells include solution mining wells. The active inventory consists of approximately 70 brine disposal wells, 550 secondary recovery wells, and 35 solution mining wells.

The primary focus of this program is the protection of groundwater from injection operations. Operators are required to submit reports monthly on each injection well's daily activity. UIC permits are issued for five-year periods and must be renewed for injection to continue. During permitting, operators are required to sample and analyze water wells, springs, and surface water bodies within a ¼ mile radius of the injection well or facility. Solution mining permits require that groundwater be sampled, analyzed, and charted on a quarterly basis. Mechanical Integrity Tests (MITS) are required to be conducted by the operator at least once every five years to ensure that injected fluid is not migrating into any Underground Source of Drinking Water (USDW). The OOG is required to conduct field compliance reviews of all injection wells.

5. Abandoned Well 35 CSR 6

Abandoned wells are the most problematic area for groundwater, especially wells drilled 75 to 100 years ago when technology and concern for groundwater protection were not as advanced as today. These wells, which are throughout the state, now pose potential and actual threats to groundwater quality, as aquifers penetrated by these wells are typically not cased to protect them from contaminants within the borehole of the well. Some of the contaminants that may affect groundwater quality include hydrocarbons, chlorides, and metals. The OOG works with both industry and the federal government to locate, prioritize, and plug or produce abandoned wells. The OOG has a priority ranking of abandoned wells and those which pose a significant and/or immediate threat to human health or the environment are scheduled for evaluation first.

6. Annual Inspection 35 CSR 4.11.6

Operators are required to visually inspect all their wells which are not plugged and which have been drilled for more than five years. Any significant leakage or well integrity failure is reported to the OOG and measures are taken

to remedy the problem. Operators are required to submit certification to the OOG that the inspections have been conducted.

7. General Water Pollution Control Permit

Operators applying for a permit involving the use of a pit for holding wastes generated during well work must also register this site and indicate the method for treating and disposing of the pit contents. Most pit contents are land applied after proper treatment and aeration. Primary function of this general permit is the prevention of pollution to the waters of the state from the handling and disposing of these wastes.

8. Spill Prevention and SPCC Plans 35 CSR 1

All operators must have adequate containment or diversionary structures in place at each well or facility to prevent discharged oil from reaching waters of the state. Operators are also required to have a Spill Prevention Control Countermeasure (SPCC) Plan for these facilities. This requirement was devised as a result of the passage of the Clean Water Act to protect waters of the state from discharged oil.

9. Groundwater Data Collection

Groundwater data is collected primarily from three activities regulated by the OOG:

Operators proposing a new drilling location must provide notice to every dwelling within 1000 feet of this location and offer to sample and analyze their well water and/or spring. This data then represents the groundwater quality standard for the area of proposed drilling. Parameters include, but are not limited to pH, iron, chlorides, total dissolved solids, and detergents (MBAS). Results are currently submitted in paper form and kept on file with the corresponding permit.

Operators applying for an Underground Injection Control (UIC) Permit are required to sample and analyze all water wells, springs, and surface water bodies within ¼ mile radius of the proposed facility. Parameters are the same as those mentioned above. Results are submitted in paper form and kept in the corresponding UIC file.

The OOG investigates numerous water well contamination cases yearly. Sampling and analytical work have become routine tasks during such investigations. Parameters vary from case to case, but, usually at a minimum, include those which have already been mentioned. Again, the analyses are submitted in paper form and kept in the corresponding investigation file.

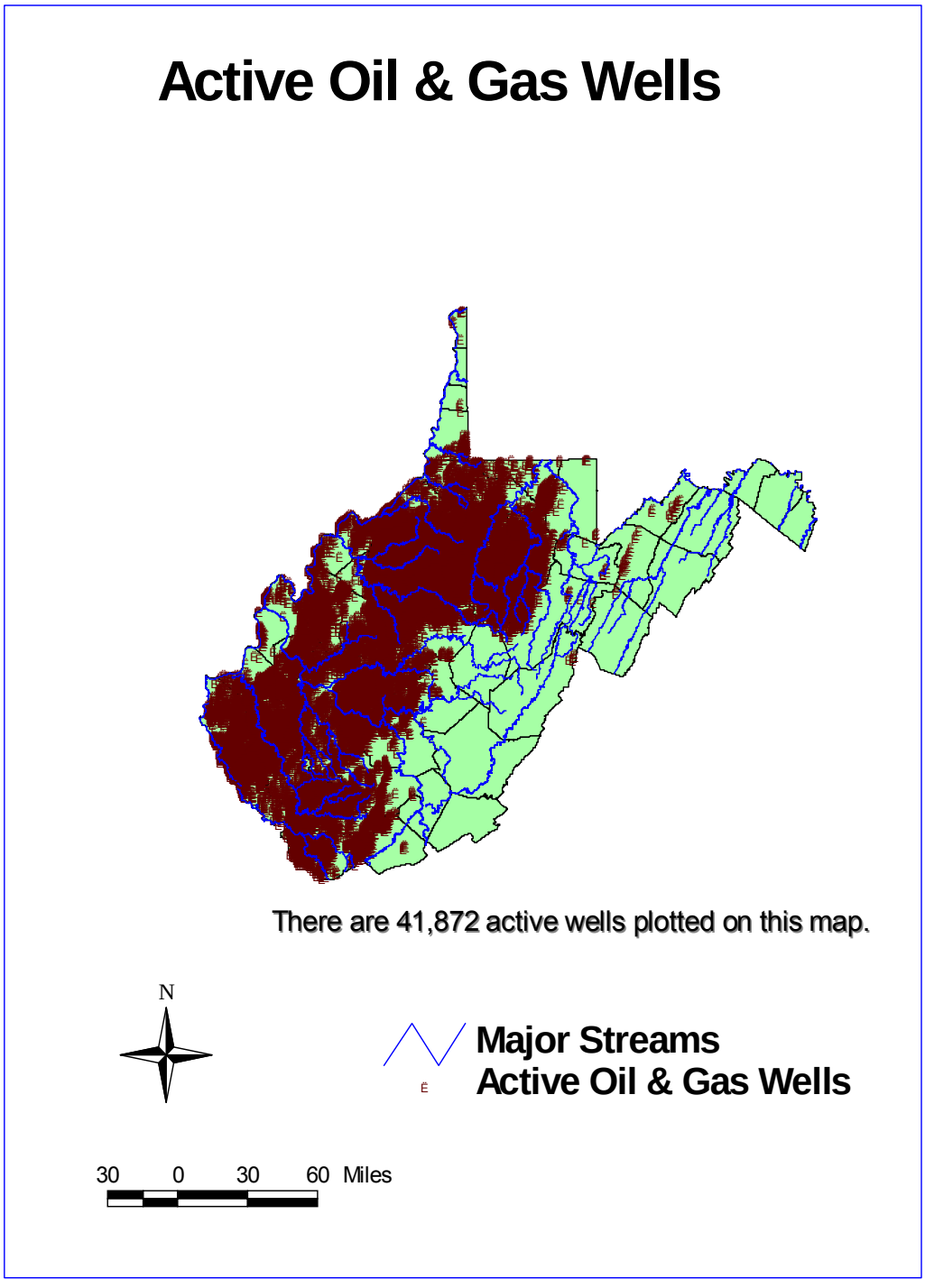
A computer tracking system has been established for the chloride content of streams receiving discharges of produced water associated with stripper oil wells. National Pollutant Discharge Elimination (NPDES) permits require the chloride content and stream flow be checked and submitted monthly. Under this permit, the operator of the permitted facilities must also sample and analyze the effluent every month for pH, iron, chlorides, total dissolved solids, and oil and grease. The monthly analytical data is currently submitted in paper form on a Discharge Monitoring Report. However, electronic filing will be encouraged in the near future. The point at which the effluent enters the stream has been identified by GPS for all active facilities.

To date, the OOG has collected GPS data on over 3,000 wells. This data is first corrected for various external degredational effects, the largest of which is intentionally imposed by the U.S. Department of Defense. After correction, the data is placed on the GIS server for incorporation with other GPS data. Over time, we will be able to develop a more complete and accurate (within 2-5 meters) locational database.

Presently, in our GPS work, we are focusing on the abandoned well population, as many of these wells are not mapped and tend to be sources of groundwater contamination. The GIS provides us the capability of relating our well locational information with such basic coverages as topography, roads, and streams. A vast amount of other, more area-specific, coverages are also accessible on this system. This data can be pulled together into a map to be used in the field for environmental investigations and presentations.

Often, the citizens of West Virginia encounter contamination of their water wells, possibly due to oil and gas wells or their operations or other unrelated surface or underground activities. An alliance should be formed between the offices within DEP and other state and county agencies such as the Department of Health, the Public Service Commission, and County Public Service Districts to pool talents and resources for providing relief to the families whose drinking water has been adversely affected. While the offices within DEP and outside agencies may not have the funding to provide the total solution to a particular situation, some funding from each, as well as a review of possible alternatives

may help the family. Currently, there is no such alliance, but the need for one is certainly obvious and the benefits will more effectively help the citizens of West Virginia.



V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division of Water and Waste Management

1. Hazardous Waste Section

The Hazardous Waste Permitting Unit (Permits) was established by Chapter 22, Article 18 of the West Virginia Code and the rules promulgated there under. Legislative Rule, Title 33, Series 20, known as the Hazardous Waste Management Rule (HWMR), are the regulations promulgated to regulate the storage, treatment, and disposal of hazardous wastes generated and managed in West Virginia. The HWMR has incorporated by reference the Code of Federal Regulations (CFR) promulgated under the Resource Conservation and Recovery Act (RCRA) amendments of 1984. All provisions of 40 CFR 264 Subpart F and 40 CFR 265 Subpart F, which pertain to groundwater protection and any releases from a Solid Waste Management Unit (SWMU), have been incorporated by reference in their entirety.

Permits and the State of West Virginia coordinate this regulatory effort with the United States Environmental Protection Agency (EPA). In general, as a summary of the relationship between the two agencies, West Virginia has authorization to assume the lead role in the groundwater protection and monitoring at the permitted units in West Virginia while EPA has the lead for implementing corrective action activities.

a. Groundwater Protection Goal and Priorities

The goal of Permits is to identify all permitted sites with groundwater contamination or potential for groundwater contamination due to a release, remediate the site, and return the site to its original condition.

The priority objectives are as follows:

Identify all sites with contaminated groundwater or potential for groundwater contamination.

Define the contaminants, source, and extent of contamination.

By 2005, have 75% of all contaminated sites with contamination under engineering control and stabilized to prevent additional contamination to groundwater and eliminate further migration of contaminated groundwater.

b. Mechanisms to Regulate and Protect Groundwater at Permitted Units

The groundwater monitoring regulations in 40 CFR Part 264/265, Subpart F, is one part of an overall strategy to reduce the likelihood of environmental contamination resulting from hazardous waste treatment, storage, and disposal. This strategy includes

restrictions on disposal of untreated hazardous waste, unit-specific standards for land-based hazardous waste management units, and monitoring groundwater below these units. The land disposal restrictions program requires the treatment of hazardous wastes before disposal to reduce the mobility or toxicity of hazardous constituents. The unit-specific standards for land-based hazardous waste management units seek to prevent the release of hazardous waste to the environment.

Groundwater monitoring is the final link in this strategy to prevent environmental contamination. Owners and operators of all land-based units must institute a groundwater monitoring program that is able to detect and characterize any releases of hazardous waste or hazardous constituents to the groundwater underlying the facility. Should the other elements of the strategy fail, groundwater monitoring will detect the release so it can be remedied.

The regulations in Subpart F of Part 264/265 are general requirements, establishing performance-based standards that state what a successful groundwater-monitoring program must accomplish; they do not dictate specific technical standards. Each facility's groundwater monitoring program is unique because no two Treatment, Storage, or Disposal Facilities (TSDF) are the same. Individual groundwater monitoring programs are based on site-specific conditions, including the underlying geology and hydrology, as well as the properties of wastes managed on site.

Regulatory authority is available to require the owner and operator of a TSDF to remediate releases of hazardous waste or hazardous constituents to the environment. All permitted facilities must comply with Part 264, Subpart F, for releases from SWMU's. There are three stages to the Part 264, Subpart F, groundwater monitoring and follow-up activities:

- Detection monitoring - to detect if a release has occurred
- Compliance monitoring - to determine whether regulatory standards have been exceeded once a release has occurred
- Corrective action - to remediate a release to the groundwater

Section 264.97 sets out the basic requirements that apply to all groundwater monitoring programs under Part 264, Subpart F. The specific requirements that apply to each of the three phases of groundwater monitoring are found in 264.98, 264.99, and 264.100.

The general requirements for groundwater monitoring programs at permitted facilities are found in 264.97. These general requirements apply to all three phases of groundwater monitoring: detection monitoring, compliance monitoring, and corrective action. A groundwater monitoring program established pursuant to Part 264, Subpart F,

must have a sufficient number of monitoring wells, installed at appropriate locations and depths, to yield water samples that:

- Represent the background conditions of the site.
- Represent the quality of groundwater passing the point of compliance.
- Detect any contamination of the uppermost aquifer at the point of compliance.

The goal of a detection monitoring program is to detect and characterize any release of hazardous constituents from a regulated unit into the uppermost aquifer. The detection monitoring system must be installed at the point of compliance and adhere to the task requirements applicable to all groundwater monitoring systems. The owner and operator must monitor for certain indicator parameters and any other specific waste constituents or reaction products that would provide a reliable indication of the presence of hazardous constituents in groundwater at the point of compliance.

Once it is established that a release has occurred, the owner and operator must institute a compliance monitoring program. The goal of the compliance monitoring program is to ensure that the amount of hazardous constituents released into the uppermost aquifer does not exceed acceptable levels. Once those levels are exceeded, the owner and operator must initiate corrective action. The compliance monitoring program establishes routine monitoring, at least semiannually.

The goal of the Subpart F corrective action program is to bring regulated units back into compliance with the required standards at the point of compliance. The Subpart F corrective action program seeks to accomplish this goal by requiring that the owner and operator either remove the hazardous constituents or treat them in place. Examples of corrective measures include excavation, stabilization, solidification, and source control. The owner and operator must also conduct corrective action to remove or treat in place any hazardous constituents that exceed the required standards between the point of compliance and the downgradient property boundary, and beyond the facility boundary where necessary to protect human health and the environment.

c. Mechanisms for Corrective Action

The Hazardous and Solid Waste Act of 1984 (HSWA) requires corrective action for all releases of hazardous waste or constituents from any SWMU at a facility seeking a permit, regardless of when the waste was placed in the unit. An SWMU is any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. This definition includes any area at a facility where solid wastes have been routinely and systematically released. This authority is applied to any facility seeking a permit,

including an operating permit, post-closure permits, or permits-by-rule after November 8,1984.

Under HSWA, Congress also gave EPA the authority to Issue orders requiring cleanups at interim status facilities. For interim status TSDFs that were already in operation when the applicable RCRA standards were established, and that are operating under the standards in 40 CFR Part 265 until they receive a permit under 3008(h), as added by HSWA, EPA can issue an administrative order or file a civil action whenever it determines, on the basis of any information, that there is or has been a release of hazardous waste into the environment. This applies to facilities that are currently operating under interim status, that formerly operated under interim status, or that should have obtained interim status. It also applies to any release of hazardous waste or constituents from the facility. In addition to requiring cleanup, EPA has the authority under 3008(h) to revoke or suspend interim status. Finally, as with 3004(v), EPA may use 3008(h) to require corrective action beyond the facility boundary and to require proof of financial assurance for cleanup.

One of the keys to understanding the RCRA corrective action program is knowing when a facility becomes subject to the corrective action. A facility can enter the corrective action program in a variety of ways. There are primarily four ways a facility becomes subject to corrective action. Facilities can enter the corrective action program under statutory authorities, by enforcement orders, by volunteering to perform cleanups, or after detecting statistically significant increases of contamination according to the groundwater monitoring requirements in 40CFR264, Subpart F.

In the past, EPA has used the corrective action process to evaluate and document the nature and extent of contamination, identify the physical and geographic characteristics of the facility, and identify, develop, and implement appropriate corrective measures. The conditions at contaminated sites vary significantly, making it difficult to adhere to one rigid process. Consequently, the corrective action process is designed to be flexible.

The original corrective action process of investigation and remedy selection and implementation comprises several activities. These activities are not always undertaken as a linear progression towards final facility cleanup, but can be implemented flexibly to most effectively meet site-specific corrective action needs. These activities are:

RCRA Facility Assessment (RFA) - identifies potential or actual releases from SWMU's

Interim/Stabilization Measures - implements measures to achieve high-priority, short-term remediation needs

RCRA Facility Investigation (RFI) - compiles information to fully characterize the release

Corrective Measures Study (CMS) - identifies appropriate measures to address the release

Once the implementing agency has selected a remedy, the facility enters the corrective measures implementation (CMI) phase of corrective action. During the CMI, the owner and operator of the facility implement the chosen remedy. This phase includes design, construction, maintenance, and monitoring of the chosen remedy, all of which are performed by the facility owner and operator with agency oversight, a remedy may be implemented through a phased approach. Phases could consist of any logically connected set of actions performed sequentially over time or concurrently at different parts of a site.

d. Facilities with On-going Corrective Action

The following chart lists the West Virginia facilities that are currently performing corrective actions. It lists the facility, if the facility has human health (HH) and groundwater (GW) under control, and where each facility stands with its cleanup status.

This chart is on the internet at:

http://www.epa.gov/reg3wcmd/ca/wv.htm

Additional information can be seen about site history and project detail if you go to the web site and click on the facility name.

West Virginia

RCRA Baseline Facilities

EPA Region 3

Facility fact sheets and the Environmental Indicator forms are Adobe Acrobat PDF files.

For additional facility information, go to the following links:
- Click on the facility name to view the facility fact sheet
- Click on the "YES" to view the facility's completed Environmental Indicator form
- Click on the location name to view a map of the area

	Cleanup Initiated	Done	**Complete Without Controls**
R	**Remedy Selected**	Done	**Complete With Controls**
	Construction Complete		

Facility Name	EPA ID#	Location	Environmental Indicators		Cleanup Status
			HE	GW	
AEP Kanawha River Plant (Appalachian Power)	WVD980554588	Glasgow	**YES**	**YES**	Done
Airco Welding	WVD980554760	Chester	**YES**	**YES**	
Appalachian Timber Service	WVD063461958	Sutton	YES	YES	R
Bayer Cropscience LP (Rhone Polenc,Aventis)	WVD005005509	Institute	**YES**	**IN**	
Bayer Polymers LLC (Miles)	WVD056866312	New Martinsville	**YES**	**YES**	
Beazer-Colliers (Koppers-Colliers)	WVD980707178	Colliers	**YES**	**YES**	
Crompton Corporation - South Plant (G E Specialty Chemicals 1)	WVD061776977	Morgantown	**YES**	IN	
Crompton Corporation - North Plant (G E Specialty Chemicals 2)	WVD980552384	Morgantown	**YES**	IN	
Cytec	WVD004341491	Willow Island	**YES**	IN	
Dupont - Belle	WVD005012851	Belle	**YES**	**IN**	

Dupont Martinsburg - Potomac River Works	WVD041952714	Martinsburg	**YES**	**YES**	
Dupont - Washington	WVD045875291	Washington	**YES**	**YES**	
Flexsys America L.P. (Solutia Inc., Monsanto)	WVD039990965	Nitro	**YES**	IN	
FMC - So. Charleston	WVD005005079	South Charleston	**YES**	**YES**	
GE Silicones (Crompton, Witco Corp,, CK Witco, OSi)	WVD004325353	Friendly	**YES**	**YES**	
General Electric Co (GE Plastics, GE Chemicals)	WVD088911854	Washington	**YES**	**YES**	
General Motors Corp. (G M C Martinsburg)	WVD044145209	Martinsburg	**YES**	**YES**	
Great Lakes Chemicals Corp (FMC)	WVD005005087	Nitro	**YES**	**YES**	
KACC Spl. Pile (Kaiser Aluminum & Chemical Co. - Spent Potliner Pile)	WVD988766127	Ravenswood	**YES**	**YES**	
Koppers-Follans (Beazer East)	WVD004336749	Follansbee	**YES**	**YES**	
Koppers - Green Spring (CSXT)	WVD003080959	Green Spring	YES	**YES**	
Occidental Chem Corp	WVD005010277	Belle	**YES**	IN	
P P G Industries	WVD004336343	New Martinsville	**YES**	**YES**	
Pechiney Rolled Products Inc. (Century Alum., Ravenswood)	WVD009233297	Ravenswood	**YES**	**YES**	
PTO-UCC-Dow (Union Carbide - PTO)	WVD000739722	Nitro	**YES**	IN	
Quaker State-Congo	WVD057634776	Newell	**YES**	IN	
SMR Technologies (BF Goodrich)	WVD980555395	Fenwick	**YES**	**YES**	
St. Mary's Refining (Quaker State)	WVD004337135	St. Mary's	**YES**	YES	
UCC-South Charleston (Union Carbide-So. Charleston	WVD005005483	South Charleston	IN	IN	
UCC Tech Center (Union	WVD060682291	South	**YES**	IN	

Carbide Tech Center)		Charleston			
Weirton Steel	WVD000068908	Weirton	IN	IN	
Wheeling - Pittsburgh Steel	WVD004319539	Follansbee	**IN**	**IN**	
XSYS Print Solutions, LLC (BASF - Huntington)	WVD000068601	Huntington	**YES**	**YES**	

DEFINITIONS:

HE = Current Human Exposures Under Control Environmental Indicator (CA725)
GW = Migration of Contaminated Groundwater Under Control Environmental Indicator (CA750)
YES = YES, The Environmental Indicator has been met
IN = More information is neededCleanup Started - Initiation of a facility-wide investigation and cleanup.
Cleanup Initiated = Initiation of a facility-wide investigation and cleanup.
Remedy Selected = The regulator has selected final cleanup objectives to address contamination and exposures.
Construction Complete = All components of the final remedy are in place and operating as designed.
Complete without Controls = Final cleanup objectives are met for all media, and no further activity or controls are necessary.
Complete with Controls = Final cleanup objectives are met but but on-going operation, maintenance and/or monitoring of controls are necessary to ensure protection of human health and the environment.

e. Groundwater Data Collection and Management

Most groundwater data is collected by facilities or environmental firms on the facilities' behalf. Occasionally samples are collected by DWWM personnel for the purpose of comparison. Regardless of who is collecting groundwater samples, sampling methodology and analytical testing procedures must comply with the protocols prescribed by the appendices to 40 CFR 261. All samples must be analyzed by laboratories certified by the DWWM.

The Hazardous Waste Permitting Unit does not have a database for the management of groundwater data. Currently, facility groundwater data is submitted in paper form and reviewed by Hazardous Waste personnel assigned to the facility. In the future, groundwater data will be submitted electronically and managed in EQuIS. EQuIS will allow data to be stored, managed, and shared among the divisions of DEP and other agencies with groundwater certification. Some access will be available to the

public as well. In addition to data screening and management, EQuIS links a wide variety of other scientific software such as GIS. During the reporting period, Hazardous Waste has acquired groundwater modeling software and a GPS unit and associated software. Hazardous Waste needs GIS software such as ArcView.

The Division of Water and Waste Management, as a whole, needs more GPS units and the necessary training to obtain accurate locational data.

f. Program Consideration and Needs

There are difficulties inherent in trying to clean areas to pristine condition where industry has been associated with business activities for decades. There are economic and technical obstacles that need to be considered in areas that will probably never be utilized for drinking water. However, that must be balanced with the ideal that our groundwater is a valuable resource not to be taken for granted. There are many who have a stake in the decisions on how best to manage the environment. In the future, policy and decision-making must be addressed by Administration in a manner that each operating unit is clear as to the direction and the manner in which these issues are to be decided.

As with any bureaucracy, there is a problem with communications between divisions concerning their operational decisions and requirements. EQuIS and ERIS will help, to a large extent, to provide a universal data system and uniform terminology. From there, communications between divisions need to be increased on a regular basis.

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division of Water and Waste Management

2. Underground Storage Tank (UST) Unit

The Underground Storage Tank Unit (UST) of the Division of Water and Waste Management is responsible for the implementation of the provisions of the Underground Storage Tank Act (USTA), Chapter 22 Article 17, of the West Virginia Code.

The UST Unit regulates tanks that are included in the federal UST law and maintains a database with a total of 24,570 registered USTs, 18,344 of which have been permanently closed. The remaining 6,226 are either active or temporarily out of service. The UST Inspectors perform UST installation, closure, and compliance monitoring inspections.

The UST Unit also administers the UST worker certification program to certify those who install, repair, retrofit, upgrade, tightness test, or permanently close UST systems or who install, repair, or test UST cathodic protection systems. In the past the unit oversaw claims processing for the UST Insurance Trust Fund.

a. Goals

The UST Unit's goal is to protect human health and the environment by requiring UST systems to have release detection, corrosion protection, overfill protection, and spill prevention. Priority for inspections is given to facilities that the database indicates still remain with bare steel tanks and/or piping.

Double-walled UST systems would be advisable in sensitive groundwater areas such as the Well Head Protection Areas. The USTA does not allow state regulations to be more stringent than the federal regulations, which do not require double-walled systems. However, the federal energy bill which was signed by President Bush on August 8, 2005, has increased the requirements for USTs installed within 1,000 feet of existing community water systems or potable drinking water wells.

The energy bill also requires states to perform on-site inspections at every facility that has not been inspected since December 22, 1998, within two years after enactment and, once that is completed, all facilities every three (3) years.

b. Staffing

There are currently seven inspectors in regional offices throughout the state. The UST Unit currently has one vacant office assistant position and one vacant environmental technician position.

c. Public Outreach

The USTA created a UST Advisory Committee consisting of petroleum industry representatives, the Insurance Commissioner, the DEP Secretary, and a citizen at large that meets to discuss UST related issues.

The UST Inspectors provide one-on-one training to the UST owners/operators during their compliance monitoring inspections.

An *O & M Manual for West Virginia UST Owners and Operators* has been developed and distributed to the regulated community. The UST Unit has, in the past, held owner/operator seminars to inform the regulated community of the UST regulations. The unit also has mailed instructional manuals, pamphlets, and fliers on UST regulations and the effects that a release can have on the environment and the public. Two videos, *LUST in A Small Town* and *Tank Time*, were mailed to all of the public libraries in West Virginia several years ago.

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division of Water and Waste Management

3. Site Investigation and Response Section (SIR) Site Remediation Program

The Site Remediation Program (SRP) is required to address any groundwater contamination at a Comprehensive Environmental Response and Compensation Liability Act (CERCLA, Superfund) site, even if the final recommendation is “no further action”.

Some quantitative data is collected and kept on file for the individual sites. Generally, this data is of limited geographic coverage and usually addresses the local contaminant plumes. The data is not maintained in an electronic format, but as hard copies in files. This limits its availability to other agencies. A centralized data management system for all groundwater data is needed to improve the accessibility of information.

The Site Remediation Program also recommends that regulations be developed to address non-National Priority List sites. Currently there are no provisions in the Site Remediation Program or the Site Investigation and Response Section requiring remediation for a site, that is not listed on the National Priority List (NPL).

4. Site Investigations and Cleanups

a. Allegheny Ballistics Laboratory (ABL)

Site Description

ABL is a 1,628-acre facility in West Virginia in the flood plain of the North Branch of the Potomac River, along the West Virginia and Maryland border. The land surrounding the site is primarily agricultural with some forestry. The facility began operations in 1942, including research, development, and testing of solid propellants and motors for rockets, ammunition, and armaments for the Navy.

There are two operating plants at ABL. 'Plant 1' is owned by the Navy and consists of 1,576 acres. Since 1995 Alliant Tech Systems Inc. ('ATK') has operated the plant under contract with the Navy. The remaining 52 acres of ABL ('Plant 2') are owned and operated by ATK. 'Plant 2' is not included as part of EPA's National Priority List (NPL).

Many explosives, metals, and solvent wastes have been generated at ABL. Until 1978, the majority of these wastes were disposed of on-site. Due to waste disposal and handling practices at the facility, there are several source areas of concern.

Several areas within the Active Burning Ground were aggregated (as 'Site 1') due to their proximity to each other and similarity of hazardous substances. Other contaminated areas include two former burning grounds ('Sites 2 & 3'), a spent photographic solution disposal area ('Site 4B'), the inert landfill ('Site 5'), a sensitivity test area/surface water impoundment ('Site 6'), a beryllium landfill ('Site 7'), an acid neutralization pit ('Site 9'), a contaminated ground-water production well ('Site 10'), contaminated groundwater in production well "F" ('Site 11'), and adjacent contamianted soil ('Site 12').

Contaminants in soil and groundwater include explosives, volatile organic compounds ('VOCs'), acids, bases, laboratory and industrial wastes, solvent and metal plating sludge, paints, and thinners. Some contaminants had moved off-site and were detected in the North Branch of the Potomac River. Five ABL water supply wells, which were found to contain VOCs, were taken out of service. Recent testing of these wells, as well as numerous monitoring wells in the developed area, shows consistent VOC contamination in the groundwater.

Cleanup Progress

In the past, the Navy had implemented remedial actions at four contaminated sites at the facility and investigated potential contamination at several additional sites.

Active Burning Ground ‘Site 1’: In May, 1997, the Navy and EPA signed a Record of Decision (ROD), followed by a pump-and-treat facility starting operation in October, 1998. Within eight weeks of start-up the groundwater gradients were reversed and the system was capturing and treating contaminated groundwater beneath Site 1. Long-term monitoring of the groundwater and the surface waters near Site 1 since 1999 have shown an improvement in these media.

Innert Landfill ‘Site 5’: In February, 1997, the Navy and EPA signed a ROD, and a landfill cap was completed by November, 1997. Long-term monitoring at the site is ongoing. Additional investigation of the groundwater at Site 5 helped define the extent of contamination; a proposed plan was issued in March, 2005 to address groundwater with an innovative preferred alternative, consisting of passive treatment with a permeable reactive barrier and monitored natural attenuation.

Former Beryllium Landfill ‘Site 7’: In September, 2001, the Navy and EPA signed a ROD for No Further Action at this site after contaminated soil had been excavated and disposed of.

Former TCE Still and Plant Production Wells ‘Site 10’: In June, 1998, the Navy and EPA signed an Interim ROD, and three extraction wells were installed at the site. The extraction wells were connected to the Site 1 treatment system and started operation in May, 1999. An additional extraction well was put in operation in the Fall of 2000. A Proposed Plan was issued for Site 10 groundwater in February 2002. Soils at

Site 10 and at the Spent Photographic Developing Solutions Disposal Site ‘Site 4B’ were investigated in the Fall of 2000 and risk evaluations were developed. Final RODs for these sites are planned for 2005.

Product Well "F" ‘Site 11’: Groundwater associated with a former production well is contaminated with volatile organic compounds (VOCs). A Remedial Investigation is ongoing, as of March, 2005.

Site 12: An area of soil contamination is located adjacent to Site 11, where a Remedial Investigation is ongoing, as of March 2005.

Solid Waste Management Units ('SWMUs): A number of areas of potential contamination are undergoing evaluation to determine the whether further investigation is warranted, or no further action, including areas of the existing storm sewer system and associated oil-water separators. A Background Soil Investigation Study was completed in 2002 to document background conditions.

b. Hanlin-Allied-Olin

Site Description

The Hanlin-Allied-Olin Site is located approximately three miles south of Moundsville, West Virginia, and bounded by the Ohio River, WV Route 2, and the Moundsville Golf Course. The site is in the mid-northern portion of Round Bottom, a sickle shaped bottom land alluvial deposit along the inside of a sharp meander in the Ohio River. Round Bottom encompasses an area approximately four miles in length and one-half mile at its widest point.

AlliedSignal operated the site from 1953 until 1980. In 1980, the southern portion of the site, also known as the South Plant, was sold to LCP Chemicals-West Virginia. LCP Chemicals-West Virginia underwent a name change in 1990 to Hanlin Chemicals-West Virginia. In 1981, AlliedSignal sold the northeast portion of its facility to Olin. AlliedSignal kept the northwest potion of the site called Allied Park. AlliedSignal, Inc. also underwent a name change and is now known as Honeywell International Inc. The Allied Park and Olin Areas, make up the North Plant Area. The property is divided into three areas described below:

- Hanlin Area (South Plant) -207 acres in the southern portion of the site;
- Olin Area (North Plant) - 137 acres in the northeastern portion of the site; and
- Allied Park Area (North Plant) -44 acres in the northwestern potion of the site.

The North Plant and the South Plant had distinctly different chemical processes. At the North Plant, the primary activities were the production of aniline, nitrobenzene, methylene dianiline, dinitrotolune, tolu toluenediamine, and toluend diisocyanate. The South Plant produced chloromethane compounds using the chlor-alkali (mercury cell)

process; other products included chlorine and sodium hydroxide. Mercury and chloromethane have been identified in the groundwater in the area and threaten the Washington Public Lands Well which is down-gradient of the site.

The EPA has entered into several agreements with the Potentially Responsible Parties (PRPs). In September 1994, EPA and Olin entered into an administrative order to perform work and conduct an Engineering Evaluation/Cost Analysis (EE/CA) at the North Plant in the Olin Area. After the fieldwork was completed, Olin prepared and submitted an EE/CA report for the Olin portion of the site in February 2005. The report is currently under review by the EPA.

During March 1995, EPA and Honeywell, formally AlliedSignal, entered into an administrative order for the Hanlin-Allied portion of the site. Honeywell demolished the mercury cell building and removed tons of solid and hazardous waste material from the South Plant in the Hanlin Area. An investigation of the former disposal units and soils in the former process areas was completed in February 2002.

In September 2001, the Olin Corporation and Honeywell International Inc. entered into an administrative order with the EPA to conduct a Remedial Investigation/ Feasibility Study (RI/FS). This investigation addresses groundwater and any soils that may not be examined under the other investigations. Under an Administrative Order with the West Virginia Department of Environmental Protection (WVDEP), Honeywell constructed a new wastewater treatment plant to treat groundwater prior to discharge to the Ohio River. The plant began operating in October 2002 and treats over 300,000 gallons per day with 99% contaminant removal efficiency.

Cleanup Progress

The new source area extraction wells are preventing ground water from migrating off-site. The wastewater treatment plant treats over 300,000 gallons per day with a 99% contaminant removal efficiency significantly reducing the load of contaminants to the Ohio River. The south cell of the landfill is near capacity and will be capped. The north cell is currently under construction. All of the Hanlin-Allied production buildings including chloro-methyl and mercury cell buildings have been removed. All of the production facilities on the northeast portion of the site in the Olin Area were demolished and removed in 1989. Investigations and removal actions are ongoing.

c. Big John's Salvage

Site Description

Big John's Salvage Hoult Road Site is located on the east side of Fairmont, Marion County, on the east bank of the Monongahela River. The site is approximately 20 acres, with deciduous forest surrounding the site to the south and west. The Sharon Steel/Fairmont Coke Superfund Site borders the site to the east, Hoult Road borders to

the north, and the Monongahela River borders the site to the west. The area surrounding the site is residential and light industrial.

The site was owned by Reilly Tar and Chemical Corporation (RTCC) from 1932 to 1973. Approximately 12,000 gallons of crude tar waste from the nearby Domestic Coke Corporation and DuPont Coke plant were processed at the site daily from 1932 until 1957. Crude tar was pumped from tank cars to storage tanks, and later separated by distillation and condensation processes. The creosote product was removed, stored, and sold as a wood preserving compound. Acid oil was removed and treated in an extraction unit to remove phenol, and the tar was sold to the state road commission for road construction. The oil would then be cooled to remove naphthalene and other compounds which were then sold as a product. Any remaining crude acids were shipped to other Reilly plants for final processing.

Wastes generated during the above-mentioned years were retained in a pond near the southern property line or disposed of in various areas on-site. The pond also received wastes from the three on-site sewers and several drainage ditches. All cooling waters, acid wastes, and tar wastes were supposed to pass through the pond. Discharge from the retention pond flowed through a pipe into an unnamed tributary which emptied into the Monongahela River. Coal tar seeps and constituents of the coal tar refining process have been found to be actively releasing from the site.

In January 1973, the RTCC sold its property on Hoult Road to Big John's Salvage. Big John's Salvage owned and operated a salvage facility at the site until 1997. During its operation, Big John's Salvage accepted various scrap and salvageable materials as well as waste materials at the site.

In 1997, the land was purchased by Steel Fabricators, Inc. apparently for timber operations.

Cleanup Progress

The imminent and substanial endangerment posed by conditions related to the work called for in the AOC, has been abated and the final report approved. EPA has taken over and is currently implementing actions necessary to fully address conditions outlined in the UAO.

d. Fairmont Coke Works (Sharon Steel)

Site Description

The Fairmont Coke Works Site is located in Fairmont, Marion County, West Virginia. The Site consists of approximately 100 acres of adjoining parcels of land. Approximately 50 acres of the site were utilized for coke plant operations, waste treatment, and disposal practices. The remaining 50 acres consist of a wooded hillside

which descends to the Monongahela River at the southern portion of the Site. A church is located approximately 50 feet to the south of the southeast boundary of the Site. The eastern portion of the Site is adjacent to a trucking company and several private residences. Site operations included manufacturing coke and refining coke by-products. These by-products included: phenol, ammonium sulfate, benzene, coal tar, toluene, xylene, and coke oven gas.

Cleanup Progress

During August and September of 1990, the owner of the Site at that time removed 2.2 million pounds of waste tar from the on-site sludge impoundments which were disposed of at an off-site facility. Due to the State's dissatisfaction with this action, the West Virginia Division of Environmental Protection (WVDEP) requested EPA involvement. Following a preliminary removal assessment, an EPA Emergency Removal Action was initiated in May of 1993 and was completed in August of 1996.

The primary source areas were identified as follows: North and South Landfills, Oxidation Ponds #1 and #2, the Redeposited and the Upper Sludge Ponds, the Breeze Washout Area, and the Light Oils Storage Area. Secondary source areas included the Breeze Pile, the Main Tar Pit, and the Coke and Coal Storage Areas.

During the Removal Action the following hazardous wastes were removed and properly disposed of off-site: 976 tons of coke works sludges, 112,514 gallons of tank liquids, 1,280 cubic yards of process solid wastes, 23 lab packs, 168 cubic yards of asbestos-containing material, 60 pounds of pourable mercury, 221,955 gallons of wastewater, and 34,382 tons of oxidation pond sludges.

The following actions were also accomplished during the Removal Action: an extent-of-contamination survey was conducted to facilitate completion of a Remedial Investigation/Feasibility Study (RI/FS), extensive storm water controls were installed throughout the Site, acidic tar sludges from both on-site oxidation ponds were stabilized, 11,850 cubic yards of acidic breeze material was removed from the breeze washout area (which included portions of some citizens' back yards) and staged in the upper sludge impoundment on-site, 50,000 cubic yards of material from the North Landfill was stockpiled by the west end of the landfill to allow discharge of clean stormwater from the Site, and the North Landfill was covered with a temporary soil cap.

EPA executed a Consent Order on September 17, 1997, with the potentially responsible party (Exxon) for implementation of an RI/FS (RI/FS Order) to determine what additional cleanup actions are appropriate.

In November of 1997, Exxon approached EPA with a proposal to do a Project XL pilot at this Site. Project XL was created by EPA Headquarters to test innovative environmental management strategies for the 21st century and, through this process, foster excellence and leadership in environmental protection. Following a year of

developing this Project XL pilot, EPA approved Exxon's proposal and this Site became the first Superfund site in the country to be cleaned up under Project XL. In May of 1999, EPA, WVDEP, Exxon, and the Fairmont Community Liaison Panel signed the Final Project Agreement for Project XL, which outlined how the project will proceed.

As part of Project XL, EPA executed a Consent Order (Removal Order) with Exxon on December 11, 1998 for implementation of a Non-time Critical Removal Action. The Removal Order suspends the requirements of the RI/FS Order until after the removal activities are completed. The field investigation portion of the removal action began in September, 1998 and was completed in 1999.

A phased cleanup approach was adopted under the Project XL Pilot at the Site. The first portion of the Site to be addressed will be the Waste Management Area. The United States Environmental Protection Agency (EPA) selected a removal response action in an Action Memorandum in the spring of 2000. Kipin Industries, Inc. is excavating and processing the contents of the North and South Landfills to produce a non-hazardous artificial coal product that is being burned as a fuel in a nearby power plant. Appropriate health and safety precautions are being taken to protect site workers and the surrounding community during Kipin's operations, which began onsite in early 2003. Recycling of the two landfills in the waste management area is underway and will continue into 2005.

In addition to cleanup actions, activities related to the redevelopment of the site have also begun.

e. Fike-Artel

Site Description

The Fike Chemical site, located in Nitro, West Virginia, consists of two parcels: an 11-acre parcel, which was a small volume batch operation that specialized in custom chemical processing, and a one-acre parcel containing the former CST plant, which treated storm water and wastewater generated at the Fike Chemical plant. The owner of the site disposed of hazardous materials by burying them in the ground or placing them in one of the three on-site lagoons. The plant was purchased by Artel Chemical in 1986 and was subsequently abandoned in 1988. An estimated 1,500 to 2,500 people reside within a one-mile radius of the site.

Cleanup Progress

At the request of the state, EPA initiated a removal action to eliminate immediate threats in June 1988. Immediate threats included a methyl mercaptan storage tank, an estimated 10,000 drums of labeled and unlabeled hazardous materials, approximately 300 tanks and reactor vessels with associated piping, about 200 drums containing sodium metal in a nitrogen-purged building, and the Cooperative Sewage Treatment

(CST) plant. During this removal action, a cylinder of uninhibited hydrogen cyanide was discovered, which was successfully detonated without incident. Approximately 774,000 gallons, 34,000 pounds and 1,000 cubic yards of hazardous and poisonous material were shipped off-site as part of this removal action.

Due to the complexity and the severity of the contamination, EPA organized the remaining cleanup activities into seven sections, known as operable units or OUs. Note, OU1 through OU7 contain work orders, except for OU5. OU5 is not a designated section of the site and therefore does not have work assigned. OU1 addressed the off-site disposal of the remaining 722 surface drums and other containers, as well as the contents of 17 tanks, in addition to the operation of the CST plant. This work was completed by EPA in 1993. OU2 and OU7 included the dismantling, decontamination, and removal of all remaining tanks, equipment, and structures at the site as specified in EPA's 1990 Record of Decision (ROD). Thirteen PRPs completed this work, including the supplemental off-site disposal of dioxin contaminated sludges (OU7) in 1995.

In the winter of 1993, fifty-four PRPs began the design work for the excavation of the buried drums and cylinders (OU3 & OU7). Of particular concern during this OU was the potential of a catastrophic release of vapors and toxic gases during excavation activities which required detailed planning and coordination with local emergency response groups. Waste materials shipped off-site included 1,310 over-packed drums, 311 intermodal boxes, 616 roll-off containers, and 5 cylinders. A new wastewater treatment plant was constructed to manage all surface water. This replaced the CST Plant. The work was completed in the winter of 1997.

Fifty-four PRPs conducted the removal action to dismantle the CST Plant (OU8), which was completed in September 1997. EPA issued a ROD for OU4 on September 28, 2001, which addresses groundwater and soils. The PRPs began implementing the remedy in October 2002.

f. Morgantown Ordnance Works

Site Description

The Ordnance Works Disposal Areas site, located in Monongalia County, West Virginia, consists of a six-acre disposal area and a manufacturing plant area which is over 100 acres. The site is in a relatively rural location; the population within one mile is approximately 100. The adjacent Monongahela River supplies drinking water to approximately 60,000 residents and the water intake is less than a mile downstream of the site.

Many private companies operated chemical production facilities at this site since 1941, including ammonia and methanol production, operation of a coke plant, and production of various other organic chemicals. These companies became PRPs for the site.

Contaminated materials from the manufacturing processes were disposed of in the disposal area which includes: a landfill, former lagoons, and contaminated soils and sediments. The disposal area is referred to as OU1. Evidence of contamination was also found in a number of locations throughout the manufacturing plant area. The manufacturing plant area is referred to as OU2.

Cleanup Progress

In 1989, EPA selected cleanup actions in a ROD for the disposal area of the plant, referred to as Operable Unit (OU) 1. The remedy calls for: construction of a Resource Conservation and Recovery Act (RCRA)-type cap on the landfill; bioremediation of soils and sediments contaminated with (PAHs), solidification of soils contaminated with heavy metals, and post-remediation monitoring to ensure the effectiveness of the cleanup action.

Treatability studies for bioremediation were completed in March of 1997. At that time, it was determined that bioremediation could not meet the cleanup standards set in the ROD within a reasonable time frame and was not cost effective. In the spring of 1997, the Potentially Responsible Parties (PRPs) submitted a proposal to conduct a Focused Feasibility Study (FFS) to identify a more effective remedy for OU1. This FFS was approved by EPA in September of 1998. EPA issued a Proposed Remedial Action Plan identifying a new remedy for OU1 on June 7, 1999. In September 1999, EPA formalized the new remedy in a ROD.

A Remedial Investigation (RI) of the manufacturing plant area (OU2) was completed in 1995. The RI report included a proposal to do a removal action. EPA executed a Consent Order for a Removal Action with the PRPs (September, 1996). The removal action work was completed in June of 1997. The removal action included: off-site disposal of soils/sediments; removal of water/debris from on-site sumps and pits; backfilling/re-vegetating excavated areas; and eliminating physical hazards. No further Superfund activity is anticipated for OU2.

g. Pantasote (West Virginia Ordnance Works - Operable Unit 13)

Trichloroethene (TCE) contamination in the Pt. Pleasant public water supply was traced to the abandoned Pantasote Chemical Plant on the WVOW NPL site. Further characterization of the chlorinated solvent plume is being conducted by GenCorp, which is a responsible party at the site. Field investigations began in September 2000. The chlorinated solvent plume originates from unlined ponds, lagoons, wastewater sewer lines and ditches formerly utilized on the Pantasote property. USEPA plans to address the continuing threat to the municipal well field through their Removal Section.

h. Ravenswood PCE Site

Site Description

The Ravenswood PCE Site consists of a municipal drinking water plant with five wells clustered together near the center of the City of Ravenswood and much of the wellhead protection area to the south and west of the water plant. The site is bounded by Sandy Creek to the south, Water Street to the west, Plaza Drive to the north, and Henrietta Street to the east. The overall area of the site is approximately 30 city blocks. The plant supplies water to approximately 5,500 persons in the Ravenswood Public Service District (PSD). Water is also supplied to the Silverton PSD. Total capacity is 1.1 million gallons per day (gpd) and the average demand is 700,000/gpd.

Cleanup Progress

The City of Ravenswood has tetrachloroethylene (PCE) contamination in two of its five municipal wells. Records from the past eight years show increasing PCE contamination in the well field. Well #3 has consistently shown the highest level of contamination. In September 1998, PCE was observed at 73.3 parts per billion (ppb) in well #3, and 8.3 ppb in well #2. The maximum contaminant level (MCL) for PCE is 5 ppb. Currently, well #3 is being pumped continuously to the Ravenswood wastewater treatment plant in an effort to protect the remaining wells from contamination. The source of the contamination is suspected to be one or more of three defunct dry cleaners to the south and west of the water wells. However, numerous potential sources of PCE contamination exist in the well head protection area. EPA has planned two new wells for city water well outside of the contamination plume. Construction was completed and the wells brought online in 2004.

i. Vienna TCE Site

Site Description

The city of Vienna is a residential and commercial community approximately three square miles in area with a population is 10,862. The population and the majority of businesses in Vienna receive their water from the Vienna municipal water supply, which originally consisted of 12 wells located in clusters in various areas of the city. Presently, only eight wells produce potable water due to PCE contamination.

Cleanup Progress

On September 19, 2000 EPA began the field portion of the Remedial Investigation/Feasibility Study (RI/FS). A team of hydrologists and geologists began mapping the underground PCE plume utilizing Cone Pentrometer Technology (CPT) rigs. These rigs pushed a hole 60 to 80 feet below the ground surface and then sampled the groundwater for contamination. All groundwater samples were analyzed for

trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-dichloroethene, and trans-1,2-dichloroethene (cis- and trans-1,2-DCE) by the onsite mobile laboratory. Analytical data was reviewed on a daily basis in order to select additional locations for CPT groundwater collection. This approach provided “real time” screening data for quickly estimating the extent of the PCE groundwater contamination.

Once the CPT was collected and analyzed, EPA was able to locate the placement of monitoring wells with a great deal of accuracy. These wells will allow more accurate data to be generated about the plume as well as allow EPA to monitor the plume, long term. EPA began installing these wells in November 2000 and all wells were completed as of January 2001.

On September 27, 2002 EPA issued the Record of Decision for the Vienna PCE Site. This ROD chose an Air Sparging/Soil Vapor Extraction Remedy for the Site. The selected remedy has been installed and is operational.

j. West Virginia Ordnance Works

Site Description

The West Virginia Ordnance Works (WVOW) National Priority List (NPL) Site is located near Point Pleasant, West Virginia. It is a 8,320-acre site used by the Department of Defense from 1942 to 1945 to produce trinitrotoluene (TNT). Soils around the operation's industrial area, process facilities, and industrial wastewater disposal system were contaminated with TNT and its by-products and by asbestos.

When the site was decontaminated and decommissioned in 1945, the U.S. Government deeded the industrial portion to the State of West Virginia, stipulating that it be used for wildlife management. The State created the McClintic State Wildlife Management Area on this 2,785 acre parcel and the area is now used for recreational purposes. Other non-industrial portions of the original parcel are owned by Mason County or by private citizens.

In 1981, Red Water seepage (liquid waste produced during the TNT manufacturing process) was observed near Pond 13 on the wildlife station. EPA and State investigations revealed that the groundwater and surface water were contaminated with TNT and its by-products 2,4-DNT and 2,6-DNT. Buried wastewater lines associated with TNT manufacturing also contain crystalline TNT.

Cleanup Progress

The selected Remedial Actions (RAs) for OUs 1 and 2 were implemented by the U.S. Army Corps of Engineers as the PRP for this site. The remedies selected to address the source of contamination are: (1) in-place flaming of reactive TNT residue on soil surfaces and installation of a 2-foot soil cover over highly contaminated areas, (2) disposal of asbestos off-site, and (3) excavation of reactive sewer lines, flashing of

explosives, and backfilling of trenches from which lines are removed. These site cleanup activities are now complete. After completing these cleanup activities, the Army conducted an investigation and determined that damages occurred to natural resources (wetlands) during cleanup. As a result, replacement wetlands have been constructed on a portion of the Site.

In 1991, cleanup activities began at the Red Water and Yellow Water Reservoir. Remedies include relocating Ponds 1 and 2, filling and capping the original Ponds 1 and 2, and extracting and treating the groundwater. The groundwater pump and treat system is installed and operational. The final inspection was completed February of 1997.

The remedies originally selected to treat the Pond 13 wet well contamination have been determined to be technically impracticable. Subsequent investigations have determined that the contamination in this area is localized in discrete areas and remediation is being planned as a removal action.

A ROD for OU-11 (Sellite Manufacturing Area) was completed during 2000. The risk assessment for OU-11 determined the risk to be within the acceptable EPA risk range, which resulted in a “No Action” ROD. The ROD for OU-12 (North and South Power houses) was completed and signed during 2002. Additionally, the Point Pleasant Landfill has been identified as OU-7 by EPA, and is being considered for a remedial investigation. EPA worked with the Corps and the WV DEP to prepare a Proposed Plan/ROD for OU-10, the South Acids Area. This ROD was completed and signed on September 29, 2003.

Additional early actions that have been completed at the site include: (1) removal of drums, soil, and debris from the "Toxic Swamp" area completed in 1994, (2) removal of asbestos from the North and South Power Houses, (3) demolition of the Power Houses, and filling in of open pits and manholes completed in January of 1995, and (4) removal of 32 drums from the OU-11 Sellite Mfg. Area in 1999.

Recently, Decision Documents were completed which indicated no further investigation or remedial actions will be necessary at five sites, including the Tract 21 Area, Refueling Depot, Sewage treatment plant outfall, classification yards, and the Washout Area. A partial delection action was completed in 2002 which removed these areas, along with the OU-11 and OU-12 areas, from the WVOW NPL Site boundary. Following that, four more decision documents were completed fot the Magazine area, Red Water outfall Sewer line, Motor pool/Maintenance area, and the Former Sewage Treatment plant. These four areas, along with the South Acids Area (OU-10), were deleted from the NPL site boundary on April 26, 2004.

Site Assessment

The Site Assessment program is performing environmental assessments at several potential hazardous waste sites. Priority is being given to National Priority List (NPL) caliber sites and/or those sites that present an imminent danger to human health or the environment. Samples of groundwater are being taken at some sites where pathways or receptors are present or where the nature of the groundwater is unknown.

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division of Water and Waste Management

4. Solid Waste Permitting Unit (SWPU)

The SWPU regulates solid waste facilities under the Solid Waste Management Rule, 33 CSR 1. This includes the review of applications for various permitting activities for new and existing facilities such as permit issuance, renewal, or closure. The SWPU reviews applications to accept special waste or alter groundwater monitoring systems and also reviews statistical groundwater monitoring reports, conducts construction quality assurance and quality control inspections, and compliance assistance to waste generators.

Description	Permitted Facilities
Active Municipal Solid Waste Landfills (Class A & B)	20
Closed Municipal Solid Waste Landfills (Class A & B)	32
Construction/Demolition Waste Facilities (Class D and D-1)	29
Yard Waste Composting Facilities	23
Transfer Stations	20
Waste Tire Facilities	3
Recycling Facilities (Class E)	1
Sewage Sludge Processing Facilities	0
Mixed Waste Processing Facilities	0

Permitted landfills must sample groundwater-monitoring wells twice each year and perform statistical tests to determine whether groundwater has been contaminated. The statistical reports are reviewed by the SWPU and the Office of Environmental Enforcement takes any necessary enforcement action.

In an effort to protect groundwater, the Solid Waste Management Rule requires an impermeable liner system for solid waste municipal solid waste landfills. This multiple layer liner system that includes a leak detection zone which will alert the facility should there be a failure in the liner. If contamination has been detected by routine detection monitoring, the landfill may be required to begin corrective action to clean up the groundwater. There are currently two facilities (one operating and one closed) that are in assessment monitoring due to detection of potential contamination.

Although some releases have been detected, the statistical groundwater-monitoring program is in need of improvement. The Division of Water and Waste Management has prepared a guide to groundwater sampling, but no State training or certification of groundwater samplers exists. As improved statistical methods are

introduced, contamination caused by poor sampling techniques will become more apparent. Currently the SWPU does not have regulatory authority to address the problem of inadequate sampling. To remedy this problem, 33 CSR 1 would need to be modified to require adherence to the American Society for Testing Materials (ASTM) Standard D 6312-98, "Standard Guide for Developing Appropriate Statistical Approaches for Ground-Water Detection Monitoring Program."

Groundwater monitoring wells must sometimes be replaced because they have caved in, gone dry, or are located where the disposal area is expanding. The SWPU reviews well replacement plans to ensure that the new wells are properly placed to detect potential groundwater contamination as soon as possible.

Groundwater monitoring reports are submitted to the SWPU on paper. The Environmental Quality Information System (EQuIS), which is being developed by DEP, will accept groundwater-monitoring data electronically and provide an interface to statistical and mapping software that will allow the SWPU to check statistical calculations.

The proper management of waste reduces the likelihood of groundwater contamination by reducing the amount and controlling the types of contaminants in leachate. This is achieved by special waste requests which are reviewed by the SWPU and either approved or denied for disposal.

The SWPU is responsible to ensure that facilities are properly designed by reviewing plans and granting permit modifications for expansion. During construction at these facilities, the SWPU conducts quality assurance/quality control (QA/QC) inspections to assure that facilities are built according to specifications and accepted industry practices.

Oil and other chemicals, primarily from vehicles, and leachate can contaminate stormwater flowing from solid waste facilities. Plans for structures and procedures for managing stormwater are a part of the detailed plans reviewed by the SWPU. Proper design, construction, and management prevent contaminated stormwater from infiltrating into the groundwater.

Through the Landfill Closure Assistance Program (LCAP), the DEP is currently monitoring the 29 closed solid waste landfills in West Virginia. Under this Program, the emphasis is upon the capping of these facilities to minimize groundwater impact. Active solid waste landfill facilities have an on-going program to identify and address any groundwater releases. The LCAP Program utilizes consultants who follow the procedures outlined in 33 CSR 1 to sample, analyze, and identify groundwater and any associated problems. The SWPU has assisted LCAP by providing geological assistance on program priorities.

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division Of Water and Waste Management

5. Groundwater Program

a. Introduction: SUMMARY OF GROUNDWATER QUALITY IN WEST VIRGINIA

Prepared by the Division of Water and Waste Management - Groundwater Program in conjunction with the U.S. Geological Survey

1. Background

Water quality data from locations in the Group C and E Watersheds were collected during the period 2004 - 2005 from the ambient groundwater quality network. The report also summarizes groundwater quality data stored in the USGS National Water Information System (NWIS) water quality database for West Virginia.

Water quality data for the 30 sites in the West Virginia ambient groundwater quality network and for wells in the U.S. Geological Survey National Water Information System (NWIS) database for West Virginia were analyzed statistically to identify any water quality trends and relations and to compare data from the two data sets. Site selection was concentrated in areas of high priority or special interest to the West Virginia Department of Environmental Protection - Division of Water and Waste Management - Groundwater Program.

2. Parameters

Data for selected properties and constituents were grouped by geologic unit, topographic setting, geologic age, well depth, and season. The constituents include field and laboratory parameters such as specific conductance, pH, oxidation-reduction potential, turbidity, dissolved oxygen and other gases, bacterial counts of fecal coliform, total coliform, and E. coli, organic carbon, hardness, and acidity, ionic concentration of calcium, magnesium, sodium, potassium, bicarbonate, alkalinity, chloride, fluoride, bromide, sulfate, and dissolved solids, nutrients such as nitrogen including nitrate plus nitrite, and phosphorus, concentration of metals such as aluminum, antimony, arsenic, barium, beryllium, cadmium, iron, lead, manganese, zinc, radon, a variety of hydrocarbons, volatile organic compounds, and 47 pesticides.

Data from the ambient network did not show any significant seasonal variations in groundwater quality.

3. The Geochemistry of West Virginia's Water

Groundwater quality is affected by human activities and can be degraded as a result of industrial waste disposal, coal mining, oil and gas drilling, agricultural activities, domestic or municipal waste disposal, transportation, and rural development. Waters sampled at the 30 locations show that background levels of pesticides, hydrocarbons, volatile organic compounds, and other chemicals that were tested occur at concentrations far below action levels set by groundwater quality standards.

4. Abundance of Groundwater

Although there seems to be adequate supplies of groundwater for public and private use, industry must usually rely on other sources of water. Groundwater quantity is highly variable throughout the State. Yields range considerably, even from location to location within the same water-bearing formation. Water-bearing formations in areas of fractured limestone in the southeastern and eastern part of the State and wells drilled in alluvium along the Ohio River tend to have the greatest yields. Water-bearing formations produce from a few gallons per minute (gpm) to more than 2300 gpm in some sand and gravel aquifers along the Ohio River. Average yields throughout the State are around 260 gpm.

5. Concerns

Two major concerns are the high concentrations of radon in certain watersheds and the presence of pharmaceuticals and endocrine disrupting chemicals in groundwater. Radon is a naturally occurring element found in many soils and rock types. While no official groundwater quality standard has been finalized for radon, the USEPA has proposed a maximum contaminant level for radon at 300 pCi/L.

Data collected by the USGS for the Ambient Groundwater Quality study show concentrations of radon above the 300 pCi/L were found at approximately half of the sites sampled. These high concentrations of radon were found in diverse geological settings and well depths.

The discovery of the presence of pharmaceuticals and endocrine disrupting chemicals in groundwater has raised concerns regarding their effects on human health and the continued viability of antibiotic medications. Endocrine disrupting chemicals are found in a wide variety of products; their presence appears to be ubiquitous in the environment. Bioassays of fish in the Potomac River found intersex characteristics in the fish sampled. One such mutation is the presence of eggs in the testes of male fish. Another concern is the presence of certain antibiotics in ground and surface waters. At this time, more study needs to be done in this area to determine the appropriate course of action needed to address this concern.

Although not a threat to public health, high concentrations of iron and manganese may render groundwater unsuitable for domestic use due to aesthetic reasons in some locations. These concentrations of dissolved iron and dissolved manganese are naturally occurring and are found sporadically throughout the State. Approximately one third of wells sampled contained concentrations of iron above secondary standards for drinking water.

Bacterial contamination continues to be a concern in many areas, especially in the eastern panhandle and other areas where large poultry farms, feedlots, and the practice of maintaining manure ponds may be found. However, the most likely source of bacterial contamination is failing or inadequately sited septic systems. Some improvement in reducing bacterial contamination has been noted.

This study also noted an increase in volatile organic compounds (VOCs). There are two reasons for this: a lower detection limit, and increasing atmospheric contamination. Specifically, an increase was seen in four tri-halomethanes, bromoform, chloroform, bromodi-chloromethane, and chlorodi-bromo methane. These compounds can be products of chlorinated hydrocarbon breakdown, or may be disinfection by-products from chlorinization of wells. Also noted was an increase in concentration of BTEX compounds (benzene, toluene, ethylbenzene, and xylene) and the gasoline additive MTBE (methyl tertiary butyl ether) in groundwater. These are most likely from gasoline residues, and are attributed to local land use or atmospheric contamination. As recent sampling studies are now detecting the presence of these compounds in groundwater for the first time, it is prudent that their presence be monitored closely.

Pesticides were also found in ambient groundwater samples of this study; however these concentrations were very low, and only sporadically found. As many of these compounds are known endocrine disruptors, their presence even at the low concentrations observed may warrant additional scrutiny.

b. Groundwater Quality Standard Variances - Title 47 Series 57

Title 47 Series 57 established procedures for facilities to petition the Secretary for a variance from groundwater protection standards for an individual source or for a class of sources. If the Secretary agrees that a variance is appropriate, the rulemaking procedures will be initiated in accordance with Chapter 29 Article 3 of the W. Va. Code. The Secretary may deny a variance; however, only the legislature may grant a variance.

Variances may be granted by the legislature to allow groundwater quality standards to be exceeded for a single source or class of sources, which by their nature cannot be conducted in compliance with the requirements of W. Va. Code 22-12-5. The benefits of granting the variance must outweigh the benefit of complying with existing groundwater quality standards and demonstrate that there is no technologically feasible alternative available. The request must also show that granting the variance is more in the public interest than adherence to existing groundwater quality standards.

During this reporting period, there have been no requests for any Groundwater Quality Standard Variances.

c. Groundwater Protection Regulations - Title 47 Series 58

Groundwater Protection Plans (GPPs) for 329 facilities in West Virginia have been received (184 approved) by the Groundwater Program. Memoranda identifying their deficiencies or approving the GPP were prepared and sent to the Permits Section where these deficiencies will be addressed during the permitting process. Facilities that do not have permits were mailed letters identifying the deficiencies in their GPPs, or received letters approving the document. These 184 facilities are listed in the table at the end of this section.

Underground Storage Tank (UST) facilities that distribute only gasoline or diesel fuel are adequately regulated by the Underground Storage Tank Section of the Division of Waste Management. Therefore, some facilities have received a waiver from the requirement to develop and maintain a GPP. In lieu of a site specific GPP, the facility must complete and submit a registration form certifying that they do not have service bays, do not provide mechanical service, do not have above ground storage tanks, and do not have outside bulk storage of materials with the potential to harm groundwater.

As of June 30, 1999, 802 underground storage tank facilities have submitted registration forms. 616 of these facilities qualify for the waiver based on the information submitted. One 175 of these facilities do not qualify for the waiver based on the information submitted. The status of 6 facilities cannot be determined from the information submitted. A database to identify gasoline dealers who have received waivers has been developed. Data entry is currently in progress on this project.

Guidance documents have been developed to aid in the preparation and implementation of Groundwater Protection Plans (GPP). These are the *Groundwater Protection Plan Guidance* and the *Groundwater Protection Plan for Small Businesses*. Other technical assistance documents are the *Salt Storage Guidelines*, the *Above Ground Storage Tank Guidance*, the *Site Evaluation for Land Application of Industrial Sludge Guidance Document*, the *Groundwater Sampling QA/QC/SOP*, and the *Guidance Document for the Use of Monitored Natural Attenuation at Contaminated Sites*. Short descriptions of these documents are presented below.

Groundwater Protection Plan Guidance Document

This document summarizes and explains all of the elements required in a GPP for an industrial facility.

Groundwater Protection Plan for Small Businesses

This document is a “fill in the blank” style GPP for small businesses which are unfamiliar with environmental regulation. It helps them be in compliance with and understand groundwater protection measures as required by 47 CSR 58.

Salt Storage Guidelines

This is a guidance document to enable consistency in the environmental regulation of salt storage facilities that includes sections on salt pile configuration, storage pad construction, covering salt during storage periods, runoff handling, best management practices, groundwater monitoring, and permitting.

Above Ground Storage Tank Guidance

This guidance outlines the groundwater protection requirements for Above Ground Storage Tanks (ASTs). It also includes sections on AST construction, operation, safety, closure procedures, and post fuel storage use.

Site Evaluation for Land Application of Industrial Sludge

This is a manual designed to enable the choosing of sites that are capable of receiving land applied industrial sludge. Chapters include soil evaluation, geology and hydrogeology, hydrology, climate, vegetation, application method and rate, and land ownership.

Groundwater Sampling QA/QC/SOP

This is a guidance document intended to standardize groundwater sampling practices in West Virginia. It includes chapters on equipment, field data collection, well purging, filtering, sample preservation, and sampling monitoring and drinking water wells.

3. Vulnerable Groundwater Use Areas

Two areas of the state have been identified as areas that are “areas of karst, wetlands, faults, subsidence, delineated wellhead protection areas or other areas determined by the director to be vulnerable based on geologic or hydrogeologic information…,” These areas are the Berkeley – Jefferson area in Berkeley and Jefferson counties, and the Deer Creek Valley area around Green Bank and Boyer in Pocahontas County.

The following is a list of Groundwater Protection Plans reviewed by the WV DEP’s Groundwater Program.

Site	Site Name, Location	Date	Date reviewed	Field	Comment

No.		received		review date	or approval date
1	Davis WTP, Tucker County	10/98	2/3/99	5/5/99	
2	GM, Martinsburg	10/15/98	2/5/99	4/86	3/15/99 4/19/99
3	Koppers, Follansbee	10/28/98 4/21/99	3/25/99		3/26/99 4/23/99
4	Norfolk Southern, Bluefield	11/13/98	9/15/98 3/25/99	8/24/98	9/29/98 3/26/99
5	Summersville Hydro. Project	12/1/98	3/26/99		3/29/99
6	Mountain Transit Authority, Summersville	12/23/98	3/29/99		3/29/99
7	American Fiber Resources, Fairmont	1/4/99 4/12/99	3/29/99		3/29/99 5/25/99
8	Reiss Viking Magnetite, Poca	1/25/99	4/1/99	5/17/99	
9	Schott Scientific Glass, Parkersburg	1/28/99			5/13/99
10	Air Products, Proctor	1/31/99	7/7/99		7/16/99
11	Appalachian Log Structures, Mercer County	2/1/99	7/7/99	1/22/99	7/16/99
12	Republic Paperboard, Halltown	2/5/99	7/21/99		App.- 10/1/01
13	Wampler, Moorefield	2/17/99	7/23/99		8/2/99
14	DOH, Parkersburg	2/18/99			
15	Albright Power Sta., Preston Co.	2/8/99			
16	DuPont, Martinsburg	2/8/99	10/22/99		
17	North Branch Power Sta., Bayard	2/10/99	3/19/99		3/19/99
18	Kosmos, Ceredo	2/10/99			
19	P.B.&S., Proctor	2/25/99	3/25/99		
20	WVANG, Martinsburg	2/22/99	10/18/99		10/19/99
21	Wheeling A A Support Facility	8/31/99	10/22/99		10/22/99
22	Camp Dawson, Kingwood	2/24/99 6/10/99	3/15/99 6/14/99		App.- 6/14/99
23	Flat Top Compressor Station, Flat Top	2/26/99	10/22/99		

24	WVANG, Beckley	2/26/99	10/15/99		10/22/99
25	WVANG, Alloy	2/26/99			
26	New Martinsville Hydro. Plant	3/5/99	3/19/99		3/19/99
27	Lamb's Concrete, Oak Hill	3/2/99			
28	Lamb's Concrete, Summersville	3/2/99			
29	Alcon Labs., Inc., Huntington	3/3/99			3/23/99
30	Reiss Viking, Fairmont	3/16/99 8/5/99	5/25/99		
31	CM Tech, New Cumberland	3/18/99			
32	Flexsys, Nitro	3/22/99			
33	FMC, Nitro	3/24/99			
34	Fenton Glass, Williamstown	3/26/99 4/7/99	3/30/99	3/30/99	3/31/99 4/12/99
35	APCO, Ripley	4/3/99	5/13/99		
36	Morgantown Machine & Hydraulics, Inc.	4/5/99			
37	DOH, Mill Run	4/21/99	7/24/99		10/6/99
38	A.L. Lee, Lester	4/21/99			
39	Morton Salt, Morgantown	4/22/99			
40	SMC Electrical, Barboursville	5/7/99 7/2/99	6/10/99		6/10/99 7/7/99
41	Blennerhassett Island S. P.	5/24/99			
42	Weirton Steel	6/95 5/25/99	7/28/98		11/2/98
43	Gulf Energy, Weston	6/1/99			
44	GE Plastics, Washington	6/10/99			
45	ABL-Alliant Techsystems	6/16/99	6/24/99		
46	DTC Environmental, Newell	6/17/99			
47	Enaloc – Chauncey WTP	4/15/99			6/17/99
48	Shell Chemical, Apple Grove	6/29/99			
49	Judy's Fencecraft, Bartow	7/13/99			
50	B.F.Goodrich, Union	7/18/99			
51	Davis-Lynch Glass, Star City	7/20/99			
52	White Armature, Mallory	7/20/99	8/24/99		8/24/99
53	Corning Glass,	5/98			3/2/99

	Martinsburg	7/21/99			
54	Acme Wood, Princeton	7/29/99	8/23/99		8/24/99
55	Mountaineer Park, Chester	8/4/99			9/28/00
56	Simpkins' Mine Supply, Newtown	6/30/99			
57	Vecellio & Grogan-Beckley	8/19/99	10/20/99		10/20/99
58	A-1 Service Shop, Stollings	8/23/99			
59	Bluewell PSD	8/31/99	10/6/99		10/6/99
60	Celco, Inc. Lewisburg	9/14/99			
61	SMR Technologies, Fenwick	9/15/99			
62	Logan WTP, Logan County	9/14/99	12/16/99		12/16/99
63	O. Ames, Parkersburg	9/98 9/20/99	1/26/99		2/1/99
64	Mingo Co./Naugatuck	10/19/99	1/4/00		1/4/00
65	Resource, L.L.C., Bens Run, Tyler Co.	3/7/00	3/7/00		3/14/00
66	Parks Corp., Lesage, Cabell Co.	3/30/00 4/28/00	4/10/00		App.- 4/11/00 App.- 6/22/00
67	Koppers, Green Spring	2/14/00	2/17/00		2/17/00 4/24/00
68	Rheox, Charleston	5/10/00			6/22/00
69	Ark Land - Quikrete	10/23/00	10/25/00		App.- 10/25/00
70	Matewan WTP	10/24/00	10/26/00		App.- 10/26/00
71	GE Specialty Chemicals	11/15/00	11/15/00		App.- 11/15/00
72	Dun Glen – New River Gorge N.R.	3/28/01	4/6/01		App. – 4/6/01
73	Callaway Car Wash	4/5/01	4/5/01		App. – 4/6/01
74	AEP – Mountaineer Plant, New Haven	4/7/00			
75	Burke-Parsons-Bowlby Corp., Reedy	4/6/01	4/13/01	5/23/01	App. – 6/12/01
76	Warwood Amoco	3/28/01	4/25/01		4/25/01
77	Verizon – Fairmont	1/30/01	2/14/01		3/19/01

				App.- 5/21/01
78	Verizon – Lorentz	1/30/01	2/13/01	3/19/01 App.- 5/21/01
79	Verizon – Summersville	1/30/01	2/13/01	3/19/01 App.- 5/21/01
80	Davy, McDowell Co. WTP	3/27/01	4/30/01	App.- 4/30/01
81	Cacapon SP	2/21/01	5/2/01	5/8/01 App.- 6/18/01
82	PC WV Synthetic Fuels, Chelyan	4/01 5/7/01	4/ /01 5/8/01	4/ /01 App.-5/8/01
83	Appalachian Timber Sutton	5/8/01	5/8/01	App.-5/8/01
84	WVAWC Kanawha Valley WTP Residuals Handling	5/3/01	5/3/01	App.-5/3/01
85	Vinetta–Rt. 46 Car Wash Keyser	4/5/01	5/4/01	App.- 6/13/01
86	Grandview – New River Gorge N.R.	11/29/00	11/30/01	App.- 12/5/00
87	American Rock Salt, Fairmont	6/22/01	6/28/01	App.- 6/28/01
88	Panda Energy	7/27/01	8/2/01	App.- 8/10/01
89	O'Dells Exxon	7/31/01	8/9/01	App.- 8/10/01
90	Crystal Car Wash	7/27/01	8/3/01	App.- 8/10/01
91	J's Hillbilly Mart, Red House	9/18/01	9/21/01	App.- 9/24/01
92	A.E., Inc., Buckhannon	4/17/02	4/30/02	App.- 5/17/02
93	American Fiber Resources, Fairmont	5/18/02	6/1/02	App.- 6/18/02
94	Amma DOH HQ, Amma	3/22/02		App.- 3/22/02
95	Apex Demolition, Kanawha Co.	3/15/02		App.- 3/18/02 App.-6/2/03
96	Aristech Chemical, Neal,	1/19/01		App.-

	Wayne Co.			11/16/01
97	National Guard Shop #6, Pt. Pleasant	9/11/01		App.- 1/23/02
98	Ashland Chem., Neal, Wayne Co.	10/15/01	10/29/01	App.- 11/15/01
99	Auto Bath and Body Wash, Lewisburg	2/15/01		App.- 6/13/01
100	Belt Paving, Mineral Co.	1/17/03		App.- 2/10/03
101	Bingamon Corp., Monongalia Co.	1/23/02		App.-2/6/02
102	Boxley Concrete, Summersville	11/6/02		App.- 11/7/02
103	Brandywine WTP, Pendleton Co.	3/19/01		App.- 10/18/01
104	Briar Patch Development, Harpers Ferry	10/11/02		App.- 10/16/02
105	Bridge Haven GC, Fayette Co.	5/9/00		App.- 7/25/00
106	Century Aluminum, Ravenswood	6/4/02		App.- 6/12/02
107	City of Beckley, Raleigh Co.	3/8/02 4/18/03		App.-3/8/02 App.-5/8/03
108	City of Bluefield, Mercer Co.	1/23/02 1/23/03		App.-2/6/02 App.- 2/25/03
109	City of Clarksburg, Harrison Co.	3/6/02 2/28/03		App.-3/6/02 App.-3/4/03
110	City of St. Albans, Kanawha Co.	2/22/02 2/25/03		App.- 2/25/02 App.- 2/28/03
111	Clearon Corp., South Charleston	1/11/01		App.- 11/6/01
112	Copely Run Gas Processing, Lewis Co.	12/7/99		App.- 12/14/99
113	Charleston Composting Facility	11/29/01		App.- 2/13/02
114	Cossin's Car Wash, Red House	2/28/02		App.- 2/28/02
115	Crystal Car Wash, Roderfield	8/3/01		App.- 8/10/01
116	Cunningham Exc.,	1/22/02		App.-

	Montrose	2/28/03		1/23/02 App.- 2/28/03
117	DuPont – Belle Class D, Belle	2/13/02 4/11/03		App.- 2/19/02 App.- 4/15/03
118	DuPont Blennerhassett Warehouse, Wood Co.	10/16/01		App.- 10/18/01
119	Empire Salvage, Mercer Co.	2/20/02 2/26/03		App.- 2/25/02 App.- 2/26/03
120	Flexsys, Nitro	5/29/01		App.-2/8/02
121	FMC Steam Plant, South Charleston	10/15/01		App.-2/7/02
122	Osage Class D, Monongalia Co.	2/19/02		App.- 2/19/02
123	GM, Martinsburg	4/5/99		App.- 4/19/99
124	Grantsville PSD, Calhoun Co.	10/5/99		App.- 11/17/99
125	High Wall Park Class D, Mercer Co.	2/5/02 3/19/03		App.- 2/11/02 App.- 3/20/03
126	Harper Class D, Beverly	3/14/02		App.- 3/14/02
127	J.C. Bosley Const. Class D	12/20/01		App.- 1/11/02
128	Joe Blosser Const. Class D, Monongalia Co.	2/7/03		App.- 2/21/03
130	R. Loftis Class D, Kanawha Co.	3/11/02 4/11/03		App.- 3/11/02 App.- 4/15/03
131	Lumberport WTP, Harrison Co.	6/14/02		App.- 6/14/02
132	Markle's Inc. Class D, Berkeley Co.	3/15/02		App.- 3/18/02
133	Marmet Lock project, Marmet	11/13/02		App.- 11/13/02
134	Masteller Coal Class D, Mineral Co.	2/10/03		App.- 2/21/03

135	McDowell Logging, Alta	2/17/99		App.-3/5/99
136	Morgantown Exc.Class D, Monongalia Co.	3/28/02 4/1/03		App.- 3/29/02 App.-3/3/03
137	Mountaineer Park, Chester	8/28/00		App.- 9/28/00
138	Mountaineer Raceway, Inwood	9/13/01		App.- 10/22/01
139	Mountain Transit Auth., Summersville	3/15/99		App.- 3/29/99
140	New Martinsville Hydro Plant, NM	1/15/03		App.- 2/24/03
141	Grandview Unit, New River Gorge N.R.	11/29/00		App.- 12/5/00
142	Noah Perry Class D, Putnam Co.	1/16/03		App.- 1/21/03
143	Norfolk Southern, Mullens	8/11/03		App.- 8/12/03
144	Orange Const. Class D, Morgantown	4/12/02		App.- 4/23/02
145	Peer's Sanitation, Mill Gap Class D	2/1/02		App.-2/7/02
146	Preston Co. PSD #4, Bruceton Mills	2/19/02		App.-4/3/02
147	R&L Carriers, Gallipolis Ferry, Mason Co.	4/24/02		App.- 4/25/02
148	Raze Int. Class D, Triadelphia, Ohio Co.	3/19/02		App.- 3/21/02
149	Red Dawson Class D	2/8/02 4/22/03		App.-2/8/02 App.- 4/22/03
150	Rolfe's Meats	3/12/03		App.- 3/14/03
151	Roseland Guest House & Campground, Proctor	3/20/02		App.- 3/21/02
152	Ryder's Rest. & Chevron, Arbovale	11/29/00		App.- 12/5/00
153	Shannon Br. Class D, McDowell Co.	6/11/02 5/29/03		App.- 6/12/02 App.- 5/29/03
154	Sistersville CC, Tyler Co..	1/21/00		App.-2/7/00
155	Slack's Class D, Kanawha	3/14/02		App.-

	Co.	3/12/03		3/14/02 App.- 3/12/03
156	Spelter Smelter Class D, Spelter	1/24/02		App.-2/6/02
157	St. Marys Wood Products, St. Marys	12/12/02		App.- 12/12/02
158	Upper Tract WTP, Pendleton Co.	3/19/01		App.- 10/18/01
159	Price Br. Class D, Boone Co.	2/21/02		App.- 2/25/02
160	West Hamlin, Lincoln Co.	6/12/02		App.- 6/13/02
161	Whitten Const. Class D	1/24/02		App.-2/6/02
162	WVAWC WTP, Beckwith, Fayette Co.	3/17/99		App.- 3/22/99
163	WVU Motor Pool, Morgantown	10/1/01		App.- 11/13/01
164	National Radio Astronomy Observatory, Grren Bank	4/01/03		App.- 4/15/03
165	Custom Fuel Services, Pt. Pleasant	3/24/05	3/24/05	No GPP Required
166	Lewisburg Readiness Center, Lewisburg	3/30/05	4/6/05	App.-4/6/05
167	Chapel View Subdivision	1/5/04		App.- 4/29/04
168	Bunker Hill Townhomes	1/5/04		App.-2/6/04
169	New Life Community Church	1/5/04		App.-2/6/04
170	Ropp Lots 1-4	1/13/04		App.- 2/26/04
171	Citizens National Bank	2/20/04		App.-4/2/04
172	West Run Apt. Complex	3/1/04		App.-4/2/04
173	Baker Heights Townhomes	3/9/04		App.-4/2/04
174	Inwood Interstate Center	2/10/04		App.-4/2/04
175	River Hills Development	1/28/04		App.-4/2/04
176	Ridgefield Subdivision	2/10/04		App.-4/2/04
177	Middle Creek Manor	3/26/04		App.-4/2/04
178	F&M Bank, Inwood	4/1/04		App.-4/2/04
179	Fernwood-Section 2	4/2/04		App.- 4/29/04
180	Riverside Subdivision	4/14/04		App.-

				4/29/04
181	TRW Rentals	4/16/04		App.- 4/28/04
182	Millay Retail Building	4/22/04		App.- 4/28/04
183	Woodridge Development	1/26/04		App.- 4/28/04
184	Thistle Landing	5/4/04		App.- 12/15/04
185	Midway Self Storage	5/6/04		App.- 5/20/04
186	Brookfield Subdivision	5/6/04		
187	Rankin Homes	5/12/04		App.- 7/22/04
188	Swift Transportation	5/12/04		App.- 7/14/04
189	Associated Asphalt, Inc.	5/17/04		App.- 5/24/04
190	Jackson Hills	6/2/04		App.- 6/16/04
191	Mike Scott Townhouses	6/7/04		App.- 5/20/05
192	Manor Park	Martinsburg		7/22/04
193	Martinsburg Service Center	Martinsburg		7/22/04
194	Mason Farms	S of Martinsburg, near Tablers Station – Martinsburg Shale	1/13/05	1/13/05
195	Tyson's Tree Service	S Jefferson Co. – near Rippon		7/22/04
196	Old Heck's Plaza Addition	Martinsburg	8/13/04	8/3/04
197	Archer's Rock – Section 1	N Berkeley Co. – near Cumbo Yard		
198	Windmill Crossing	Just east of Charles Town		2/3/05
199	Burr Industrial Park	Jefferson Co.		1/27/05
200	Vicki Douglas Juvenile	Martinsburg,		5/20/05 -NO

	Detention Center	Berkeley Co.		GPP REQUIRED
201	Prentiss Point, Phases III & IV	Martinsburg, Berkeley Co. Martinsburg Shale	10/26/04	12/3/04
202	Quarter Farm	Middleway, Jefferson Co.	11/18/04	
203	Stoney Ridge Estate-Sec. 1	Inwood, Berkeley Co.		12/17/04
204	Elizabeth Station-Sec.D, Phase 3	Inwood, Berkeley Co.		12/17/04
205	Heather Crest, Phase III	Berkeley, north Berkeley Co.		
206	Edgewood Estates	Bunker Hill, Berkeley Co.		12/20/04
207	Windermere	N Berkeley Co.	1/21/05	
208	Tall Oaks	Baker Heights, Berkeley Co.	10/5/04	10/7/04
209	Fairways West	East of Martinsburg (Martinsburg Shale)	2/7/05	2/9/05
210	Cogar-Dulyea Commercial Center	Martinsburg – south end		
211	Fairways West	NO MAPS OR PLANS	2/7/05	2/9/05
212	Thos. Somerville Co.	Martinsburg		
213	Premier Bank	Shepherdstown (plans with Jeff. Crossing)	1/19/05	2/9/05
214	Jefferson Crossing II	Charles Town	1/19/05	
215	Spruce Hill North, Lots 1-118	Charles Town – WRONG FORM NO MAPS	1/18/05 2/15/05	

		OR PLANS		
216	Thos. Somerville Co.	Martinsburg		
217	Centra Bank	Inwwod		
218	Al's Body Shop	Martinsburg	11/29/04	
219	K.D. Rentals, LLC	Marlowe, north Berkeley Co.		
220	Pine Grove Estates	Berkeley Co. NO MAPS OR PLANS		
221	Seaside Tan & Spa	Martinsburg		
222	Yorkshire Glen	Martinsburg		1/26/05
223	Eastland Subdivision	Jefferson Co. (just S of Charles Town)		
224	Tomahawk MX, LLC	Near Hedgesville		
225	Bunker Hill Estates 3/15/05 – Boyd's Crossing Sections 2 & 3	Bunker Hill (liners proposed)		12/7/04 – T. Carr 1/3/05
226	The Woods Subdivision II, Section 20	W. Berkeley Co. NO permanent SWM structure		12/15/04 – NO GPP REQUIRED
227	Redyns Subdivision, Section 2	Eastern Berkeley Co.		
228	Advance Auto Parts	Martinsburg		
229	Dirting Farm	~ 1 mi. E of Hedgesville		1/13/05
230	Mills Farm Phase V	Tablers Station, Berkeley Co.		2/4/05
231	WildflowerRidge Townhomes	Martinsburg		2/4/05
232	Dr. Rauch DPM Office	Martinsburg		7/8/05
233	Stoney Ridge Estates-Section A	Inwood, Berkeley Co.		
234	The Vineyards	Just E of Martinsburg		

235	American Homes Complex	Martinsburg		
236	The Preserve at Barleywood	W Jefferson Co.	2/8/05	2/8/05
237	Lowe's	Buckhannon, Upshur Co.		
238	The Village at Samuel Station	Charles Town, Jefferson Co.	6/9/05	8/22/05
239	84 Lumber	Ranson, Jefferson Co.		
240	Quail Ridge Section II, Phase II	Kearneysville, Jefferson Co.		
241	The Villages at Rolling Hills	Pikeside, Berkeley Co.	4/21/05	4/25/05
242	Webber Springs, Section 2	E of Bunker Hill, Berkeley Co.		2/4/05
243	Valley Farm Credit	Martinsburg		
244	Pine Grove Estates	North Berkeley Co.		
245	The Village at Fox Run	Baker Heights, Berkeley Co.		
246	Shanghai Storage	Shanghai, SW Berkeley Co.		3/23/05
247	Benview	E Jefferson Co.		4/29/05
248	BB&T Bank	Hedgesville		4/29/05
249	Ridges of Tuscarora	NW of Exit 13, Berkeley Co.		4/11/05
250	Willowby Estates	SE Berkeley Co.		
251	Jefferson Security Bank	Shepherdstown		
252	American Heritage East	Ranson		
253	Arden Manor II	Martinsburg (next to		

		Capital Cement)		
254	Colonial Hills Phase II	Shepherdstown		3/7/05
255	Greensburg Estates	Scrabble, Eastern Berkeley Co. NO MAPS OR PLANS		
256	Bradstone-Shenandoah Casting Plant	Millville, E. Jefferson Co.		
257	Townes at Oakhurst	E of Inwood (Martinsburg Shale)		
258	Washington Heights	Darkesville		4/11/05
259	Fort Hill Farms, Phase 3, 4 & 5	Hedgesville		4/29/05
260	Lakeland Place at Fairfax Crossing	Charles Town	9/12/05	
261	Morning Dove Estates	E of Bunker Hill (Martinsburg Shale?)		
262	Summit Hill	W side of North Mtn.		
263	Inwood Meadows Phase Three	E of Inwood (Martinsburg Shale?)		4/29/05
264	Bridle Creek	Martinsburg		
265	Centra Bank	Martinsburg		
266	Vintage Mototcar Co.	Central Berkeley Co.		5/4/05
267	Rock Ferry Station	Jefferson Co. (E of Shenandoah R.)		
268	Food Lion 759	Martinsburg		
269	McCauley Crossing Townhomes	Bunker Hill		
270	Rock Hill Subdivision	E Berkeley Co.		
271	North Ridge, Section 2	N of Hedgesville		

272	T, B & H Ready-mix Concrete	Baker Heights		5/13/05
273	Opequon Overlook	Baker Heights		9/27/05
274	Summit Pt. Raceway	Summit Pt., Jefferson Co.		
275	Berkeley Gateway	Falling Waters, Berkeley Co.		6/24/05
276	Springdale Farms	Gerrardstown		6/24/05
277	Forest Heights, Section 6	Martinsburg		
278	Briarwood Professional Park	Martinsburg		
279	Tabler Station Manor, Section 4	Tablers Station		8/28/05
280	Rt. 9W R.O.C.S.	Martinsburg		
281	Amberfield	N Berkeley Co.		
282	South Villas	Ridgeway		6/24/05
283	Fairfax Farms, Section 2	Martinsburg		9/7/05
284	Pebble Ridge Phase 3	N Central Berkeley Co.		7/20/05
285	Willowby Estates	SE of Inwood		7/8/05
286	Blackbird Village Townhomes	Lewisburg		10/11/05
287 – same as 92	Carrera Medical Court – same as Dr. Rauch	Martinsburg		7/8/05
288	Westview Baptist Church	Martinsburg		
289	Yorkshire Glen Phase 1-Section2	Martinsburg		8/26/05
290	Middle Cr. Manor Phase II	Central Berkeley Co.		
291	Townes of Ridgeway	Ridgeway		8/28/05
292	Shepherstown Specialty Storage	Shepherdstown		
293	Premier Bank	Martinsburg		
294	Air-Row Sheet Metal	Martinsburg		
295	Pikeside Meadows, Section E	Martinsburg		

296	Topaz Lane III	Inwood		
297	Nestle Wood Subdivision	N Berkeley Co.	9/2/05	
298	Virginia Honey	Tablers Station		
299	Broad Lane Townhomes	N Berkeley Co.		
300	Shepherdstown Specialty Storage	N Jefferson Co.		
301	Four Oaks	Martinsburg		
302	Elizabeth Station,Section F	Bunker Hill		8/31/05
303	The Gallery Subdivision	Martinsburg		10/7/05
304	Otterbein UM Church	Martinsburg		10/3/05
305	Village Makers	Baker Heights (E of Martinsburg)		
306	Stonebrook Village–Phase 2	Hedgesville		
307	Sader Point	Inwood		
308	Fellowship Bible Church	Jefferson Co.		
309	Liberty Run	E. Berkeley Co.		
310	Eastern WV Regional Airport	Martinsburg		
311	Jackson Forge Townhomes	N. Berkeley Co.		
312	Eastpoint Subdivision	Morgantown, Monongalia Co.		
313	Willowbrook, Section II	SW Berkeley Co.		
314	Boyds Crossing Section Four Townhouses	Bunker Hill		
315	Potomack Mews Neighborhood	N. Berkeley Co.		
316	Squared Circle	Inwood		
317	Jackson Forge Apartments	N. Berkeley Co.		
318	Jackson Forge Single Family Homes	N. Berkeley Co.		
319	Willow Ridge	N. Berkeley		

		Co.		
320	West Ranson Townhomes	Ranson, Jefferson Co.		
321	Rock Village Townhouses	Martinsburg		
322	Honeywood South	N. Berkeley Co.		
323	Lord Fairfax Estates	Unknown		
324	Thorn Hill	SE Jefferson Co.		
325	Brookside Subdivision	Nollville, W of Martinsburg		10/13/05
326	Universal Forest Products	Ranson		
327	Flowing Springs North Basin	Ranson		
328	Shallow Creek Acres	Shanghai – Third Hill Mtn.		
329	Rock Spring Church	Leetown, Jefferson Co.		

d. Monitoring Well Driller Certification/Recertification Program

The Monitoring Well Driller Program (MWDP) instructs and certifies monitoring well drillers in the design, construction, alteration, and abandonment of monitoring wells and boreholes. This program, as authorized by 47 CSR 59 *Monitoring Well Regulations*, was established to ensure industry, well owners, and the regulatory community that all monitoring wells installed or abandoned meet a minimum set of standards.

Although the Department of Environmental Protection (DEP) is responsible for the certification of monitoring well drillers, the Bureau for Public Health's Office of Environmental Health Services (OEHS) conducts the training and testing for certification of these drillers. OEHS has a long established water well driller certification program and is ideally suited for providing these services to DEP, eliminating the need for increased staffing.

As of December 31, 2005, the Monitoring Well Driller Program (MWDP) has certified 408 monitoring well drillers. There are currently 216 active monitoring well drillers, forty-seven (47) of which were certified during this reporting period.

The monitoring well driller certification information is available on the Internet. The web site address is http://www.wvdhhr.org/bph/monwell/. This site provides information on testing requirements and testing dates, and an application for the testing and training. The recertification of the monitoring well drillers is handled directly by the Monitoring Well Driller Program. Recertification requires a fee and the completion of an address verification form.

To track the driller certification and recertification process the DEP's Information Technology Office developed a monitoring well driller module to the Environmental Resource Information System (ERIS). ERIS is a flexible client/server system of Windows programs, which allows DEP offices to track and manage a wide variety of environmental information.

At this time the environmental information that can be tracked includes permitting activities, complaints, violations, inspections and the licensing of technical capabilities, e.g. the monitoring well driller modular. The driller database contains a listing of drillers who are currently certified and those whose certification has expired. As of December 31, 2005 there are 216 active drillers and 192 drillers that have been placed on inactive status. This database is capable of generating invoices for the recertification fees, related certification and recertification correspondences, certification cards, and address verification forms. Reports can be generated from this database containing all drillers' addresses, initial certification date, certification expiration date, driller registration numbers, and fee invoicing information.

e. Monitoring Well Installation and Abandonment

Concerns from the drilling industry, the desire to protect well owners, and an overwhelming need by groundwater regulatory agencies for quality control of data from monitoring wells led to the enactment of 47 CSR 60, *Monitoring Well Design Standards,* in May, 1996. This rule established the minimum acceptable documentation and standards for the design, installation, construction, and abandonment of monitoring wells and the abandonment of boreholes. This rule does not eliminate nor supersede the more stringent aspects of well design criteria as established by federal programs such as RCRA or CERCLA but only stipulates that, at a minimum, monitoring wells must be constructed and abandoned in accordance with 47 CSR 60.

As is the case of any rule, there are unforeseen circumstances that require alternatives and exceptions when compliance with the rule is infeasible or unnecessary. The alternatives and/or exceptions are handled through written variance requests on an individual basis.

The rule has resulted in the need for electronic files to capture the well installation and abandonment and high-risk borehole abandonment information. The electronic submission of the *Monitoring Well Construction Documentation Forms* and *Abandonment Documentation for Monitoring Well/Borehole Forms* became available as of 2003. The format for the electronic submission consists of drop-down menus for choices of materials and procedures and areas for written comments. The information is now being stored in EQuIS along with water quality and site information.

During this reporting period the following documentation forms were received and reviewed:

Forms Received and Reviewed Between January 1, 2004 and December 31, 2005	Totals
Monitoring Well Construction Forms	1448
Monitoring Well Abandonment Forms	238
High Risk Borehole Abandonment Forms	24

The forms were reviewed for completness and correct information. The major deficiencies noted were incomplete or incorrect latitudes and longitudes, incomplete physical site information, incorrect or missing installation materials and procedures. The electronic submission of the forms has eliminated several of these problem areas.

The following table details the number of wells constructed and abandoned and high-risk boreholes abandoned by county during this reporting period.

Monitoring Well & Borehole Count from January 1, 2004 through December 31, 2005			
Counties	**MW Installed**	**MW Abandoned**	**Boreholes Installed and Abandoned**
Barbour	1	6	0
Berkeley	9	15	0
Boone	17	0	0
Braxton	0	0	0
Brooke	26	0	0
Cabell	63	19	0
Calhoun	22	1	0
Clay	0	0	0
Doddridge	4	0	0
Fayette	11	6	0
Gilmer	16	0	0
Grant	10	1	0

Greenbrier	29	1	0
Hampshire	9	6	0
Hancock	25	3	1
Hardy	0	1	0
Harrison	47	15	0
Jackson	0	1	0
Jefferson	29	4	1
Kanawha	349	33	0
Lewis	13	10	0
Lincoln	6	0	2
Logan	15	0	0
Marion	12	5	2
Marshall	35	17	0
Mason	26	2	0
McDowell	5	6	0
Mercer	31	14	0
Mineral	39	6	0
Mingo	19	7	0
Monongalia	21	10	0
Monroe	4	2	0
Morgan	3	4	0
Nicholas	6	2	6
Ohio	23	8	0
Pendleton	3	0	0
Pleasants	63	0	0
Pocahontas	11	0	0
Preston	5	1	0
Putnam	106	4	3
Raleigh	31	5	2
Randolph	5	4	5
Ritchie	36	0	0
Roane	8	0	0
Summers	0	0	0
Taylor	7	0	0
Tucker	7	0	0
Tyler	7	0	0
Upshur	17	1	0
Wayne	30	14	0
Webster	0	0	0
Wetzel	9	2	2
Wirt	0	0	0
Wood	167	0	0

Wyoming	11	8	0
TOTALS	**1448**	**238**	**24**

f. Complaints and Calls

The Division of Water and Waste Management's Monitoring Well Drillers Program responded to approximately 1370 calls/requests for information concerning monitoring well drillers certification and recertification, monitoring well design standards, documentation, variances, and enforcement. This does not include minor telephone call requests for basic information.

g. Public Outreach

Personnel from the Groundwater Program have conducted training sessions for Braxton, Hardy, McDowell, Tucker, and Webster County health department sanitarians and staff members on the use of their Global Positioning System (GPS) for the location of septic tanks and water well installations. The GPS information, septic tank system permit number, septic tank seal number, owner's mailing address, and written directions to the site where the well and/or tank is located is in the ERIS database that became operational in 2002.

County health departments issued a total of 10,291 septic tank permits from January 1, 2004 through December 31, 2005. Although permits were issued, not all septic tanks have been installed. The following table details the number by county that have been issued septic tank registrations.

Septic Tank Registrations from January 1, 2004 – December 31, 2005	
County	**# of Registrations**
Barbour	149
Berkeley	1002
Boone	112
Braxton	120
Brooke	90
Cabell	412
Calhoun	65
Clay	70
Doddridge	31
Fayette	31
Gilmer	26
Grant	175
Greenbrier	378
Hampshire	738

Hancock	80
Hardy	367
Harrison	30
Jackson	168
Jefferson	373
Kanawha	131
Lewis	122
Lincoln	126
Logan	27
Marion	236
Marshall	161
Mason	188
McDowell	150
Mercer	181
Mineral	249
Mingo	0
Monongalia	533
Monroe	206
Morgan	633
Nicholas	288
Ohio	1
Pendleton	142
Pleasants	51
Pocahontas	170
Preston	372
Putnam	20
Raleigh	339
Randolph	229
Ritchie	80
Roane	130
Summers	141
Taylor	126
Tucker	122
Tyler	38
Upshur	161
Wayne	92
Webster	89
Wetzel	57
Wirt	65
Wood	217
Wyoming	1
Totals	**10, 291**

Note: 0 indicates no information was available/submitted.

h. Underground Injection Control (UIC) Program

The federal Safe Drinking Water Act of 1974 established the UIC program to ensure that fluids injected underground will not endanger drinking water sources. Applying the UIC regulations (47 CSR 13) promulgated under the authority of Chapter 22, Article 11 of the State Code, the Division of Water and Waste Management's UIC program mainly regulates the subsurface emplacement of effluents into or above underground sources of drinking water by permitting the siting, construction, operation, and abandonment of Class 5 shallow injection wells.

The Class 5 category includes 32 types of injection wells ranging from high-tech aquifer remediation wells to low-tech septic systems. Two types of Class 5 injection wells have recently been banned by the federal government and subsequently by the state UIC program. New large capacity cesspools (well code 5W10) were prohibited nationwide as of April, 2000. Existing large capacity cesspools has been phased out nationwide as of April, 2005. Motor vehicle waste disposal wells (well code 5X28) have also been banned as of April, 2000. When such injection wells (usually a floor drain disposing waste into a subsurface distribution system, e.g. septic tank with leach field) are encountered by UIC personnel, the facility owner is instructed to permanently plug and abandon the injection point and devise alternative appropriate disposal methods for such waste. 122 floor drains in vehicle service areas were abandoned by plugging with cement during this reporting period.

The Underground Injection Control Program takes great pride in pointing to the many improvements made in the last two years. Although the UIC Program operates with minimal staffing, tremendous progress has been made in clearing the backlog of UIC permit applications. Currently, the only bottle neck in the permitting process comes from the occasional lack of information submitted by applicants, resulting in placing the application on hold pending information submittal. Integration of UIC data into the ERIS database has commenced and will enhance the efficiency of the permitting process, fee tracking, and sharing of data with other DEP programs and the public.

In addition to the greatly improved flow of the actual permitting process, and perhaps of greater importance, is the refining of the UIC permit itself. UIC industrial permits have been improved to assure a higher level of regulatory compliance in terms of compliance, fee collection, and reporting. UIC industrial permits require that constituents of the waste stream are identified, and each permit stipulates that the appropriate EPA approved testing method is used in the analysis of the injected fluids. Discharge limits are set to insure that all injected fluids meet WV DEP groundwater quality standards, maximum concentration levels (MCL's) established by the federal Environmental Protection Agency, health advisory limits, or other risk-based limits as appropriate. These refinements in UIC permits insure the greatest degree of protection to human health and the environment.

Improvements to the UIC industrial permit also include greater regulatory control over sampling, reporting schedules, construction details regarding the subsurface distribution system, and how the subsurface distribution system is to be properly closed.

One of the greatest challenges faced by the UIC program has been to design an environmentally sound method of permitting storm water disposal in karst and other environmentally sensitive areas. The UIC program has worked closely with state and local government officials to develop best management practices that keep potential contamination from entering the subsurface distribution systems to the greatest extent possible. This has included the development of an Emergency Response Plan to close off the injection point in case of fuel spills or other accidents. The Emergency Response Plan is integrated with local emergency response personnel. UIC storm water permits insure groundwater protection by requiring adequate monitoring, sampling and the routine cleaning and maintenance of the injection points.

The UIC program has achieved a greater degree of regulatory compliance with the addition of an enforcement and inspection person. Since this position has been filled, 766 UIC inspections have been performed. This has resulted in finding and correcting potential environmental problems.

The UIC program continues to refine and improve its role in the protection of our water resources. Works in progress include the development of environmentally sound methods of permitting wastewater disposal from smaller commercial/industrial operations in unsewered areas that depend on subsurface injection of wastewater. Locations of UIC shallow injection wells permitted during this reporting period are shown on page 112.

a. Groundwater/UIC Program – Mining and Quarrying

Environmental Goals of the Groundwater Protection and Underground Injection Control Programs for Mines and Quarries

Because, as stated in Chapter 22 Article 12, Groundwater Protection Act, “Over fifty percent of West Virginia’s overall population, and over ninety percent of the state’s rural population, depend on groundwater for drinking water” (§22.12.2.a.2), and because mineral mining, both coal and non-coal, are ubiquitous in West Virginia, protecting the quality and quantity of the groundwater from adverse impacts due to these activities is imperative to both the environment and to human health and safety. These programs’ goals are identical and twofold: to ensure the future chemical and biological quality of the groundwater of the state, and to prevent adverse changes in the quantity of the groundwater, *e.g*. the dewatering of existing aquifers or the excessive flooding of underground mine voids.

Protecting Private and Public Water Supplies

Groundwater protection at mine sites was begun more than ten years ago in West Virginia with the passage of Legislative Rule Title 38 CSR 2F, Groundwater Protection Regulations for Coal Mining Operations, and the policies and practices established by WVDEP's DWWM and DMR to enforce it. The resulting changes in the handling of surface activities and substances at mine sites have already protected many public and private water sources, both existing and potential, from damage due to mining, and have greatly minimized the impacts that occurred prior to or despite the changes. An early and thorough policy of providing information for agency personnel, the regulated industries and the public resulted in a smooth transition in a spirit of cooperation.

Today, the Groundwater Protection Program is an integral part of WVDEP's permitting/inspection/enforcement procedures for mine sites. Groundwater Protection Plans are incorporated in and are essential to mining permits, both SMCRA (Chapter 22 Article 3) and NPDES (Chapter 22 Article 11); further, all such permits contain terms and limits that provide for protection of the subsurface environment. Violations of the groundwater protection conditions of a permit can incur penalties ranging from administrative to criminal and can even result in revocation of the permit.

The Underground Injection Control (UIC) Program, as established under Legislative Rule Title 47 CSR 13, Underground Injection Control, applies to mining primarily through the permitting of Class 5 Type X13 injection wells, typically for the disposal of coal preparation plant slurry or acid mine drainage treatment sludge into abandoned underground mine voids. The UIC 5X13 permitting process is designed to ensure that the injectate meets Federal Safe Drinking Water Standards at the point of injection and that the additional volume of fluid will not endanger human safety or the environment.

Mining operations are typically remote, not easily accessible by the public, and usually involve large surface areas. These factors can make the monitoring of small details difficult, making the scrupulous enforcement of the Groundwater Protection Act and UIC permit terms an on-going challenge. The programs are constantly adjusted to provide as much control as possible under the circumstances for assuring compliance on a day-to-day basis.

Because no two mine sites are exactly alike, each UIC permit application is approached as a unique entity. Development of a general permit for these operations, such as the NPDES general permits for mines and quarries, is not a viable option. Furthermore, WVDEP relies on just one employee, the Geologist III for DWWM's Mining Groundwater Protection/UIC Programs, to conduct all activities associated with mining-related groundwater protection and underground injection, from conducting pre-permitting field inspections to protocol development, permit writing to filing, data entry,

and the assessment and arbitration of Groundwater Protection Fee waiver requests. As the universe of mine sites involved with underground injection expands, time allotment for the geologist/permit writer becomes more problematic.

Proposed Programs and Projects

Along with other types of environmental permitting, UIC – Mining is anticipating the development of electronic application procedures in the near future, thus streamlining and standardizing the submission of data for review. Additionally, the electronic submittal of Discharge Monitoring Reports from UIC – Mining permits will be instituted as soon as possible, because reviewing and tracking the 17 or 18 parameters plus mine pool level for every injection point for every month is becoming increasingly labor-intensive.

When time constraints allow, especially after the above-referenced electronic programs are fully functional, the UIC geologist/permit writer will also begin conducting unannounced inspections of permitted sites to confirm compliance. Nevertheless, since the UIC – Mining Program became specific to the industry nearly six years ago, interaction among DWWM, DMR and DMR's Inspection and Enforcement personnel has increased, adding several layers of oversight to the issuance and inspection of permits.

Additionally, all UIC – Mining draft permits are submitted to the West Virginia Geologic and Economic Survey, the West Virginia University Hydrology Research Center, and the Federal Mine Safety and Health Administration (MSHA) for review and comments. Copies of permits issued prior to beginning these submittals have also been sent to the appropriate MSHA office.

The first reissuances of existing 5-year permits began in June 2004. Prior to that time, a reissuance protocol was developed allowing for both the redress of problems encountered with the early permits and for the smooth transition into the new terms and conditions.

Achievements

The practice of injecting mine wastes into abandoned mine voids has been going on for decades. A continuing challenge has been to locate and identify pre-existing injection sites and either bring them into the permitting process or stop the injection activities. Assistance from the WVDEP DMR field office personnel (permit writers, geologists, engineers, and inspectors) has been invaluable in this endeavor. In the six years since UIC – Mining began as an independent permitting program, nearly all such sites in the state have been identified and are now at some stage of the UIC permitting process or have ceased injecting.

As inevitable concerns arise from the public, the industry, or other agencies, Discharge Monitoring Reports from issued permits and chemical analyses submitted in applications are re-examined and data collected to assure that Federal Safe Drinking Water Standards for the parameters in question are being met and that this program is succeeding in its goal of protecting public health. In 2005, Mercury, Antimony, and Silver were studied and found to be consistently within required limits.

In 2005, the question arose of allowing the use of RCRA-listed products in some of the processes producing injectate. Since the chemicals in question are listed due to corrosivity, as opposed to toxicity, the injectate is still capable of meeting all required standards. However, DWWM GW/UIC personnel worked closely with the USEPA and established a protocol for such sites ensuring full compliance with all regulations.

A singular honor was afforded WVDEP's UIC – Mining Program in 2004 and 2005 as the USEPA sought information both for themselves and for other states, e.g. the Commonwealth of Virginia, to develop similar mining underground injection control programs and practices for themselves.

Sources of Data Collection

Initial information about an existing injection site usually comes from the DMR I & E Inspector assigned to the mine; he or she will require the operator to begin the process of obtaining a UIC permit or cease injection activities at the site. Applicants proposing to inject underground initiate the permitting process by providing basic details about the site prior to receiving an application number and form. All applicants must be WVBEP compliant and not in arrears for any WVDEP fee; otherwise, the process is halted until compliance is proven.

Further information about the proposed injection activity comes from the operator or consultant via the ten-page UIC – Mining application form. This required data includes maps, drawings, narratives and laboratory analyses, among other information. A field inspection by the geologist/permit writer, along with the DMR I & E inspector and representatives of the applicant confirms the submitted data and adds further information.

Finally, input from the public via the 30-day public comment period and from the WVGES, MSHA, or WVU completes the data necessary to issue the permit. After issuance, continued monitoring as required by the permit plus observations by the DMR I & E Inspector assure a continuous influx of information about the site.

Use of the ERIS Database

Every UIC – Mining application, once the tracking number has been assigned, is entered into the ERIS Database. As information is received, especially the data in the completed application, it is logged into the database. Activities on the application are

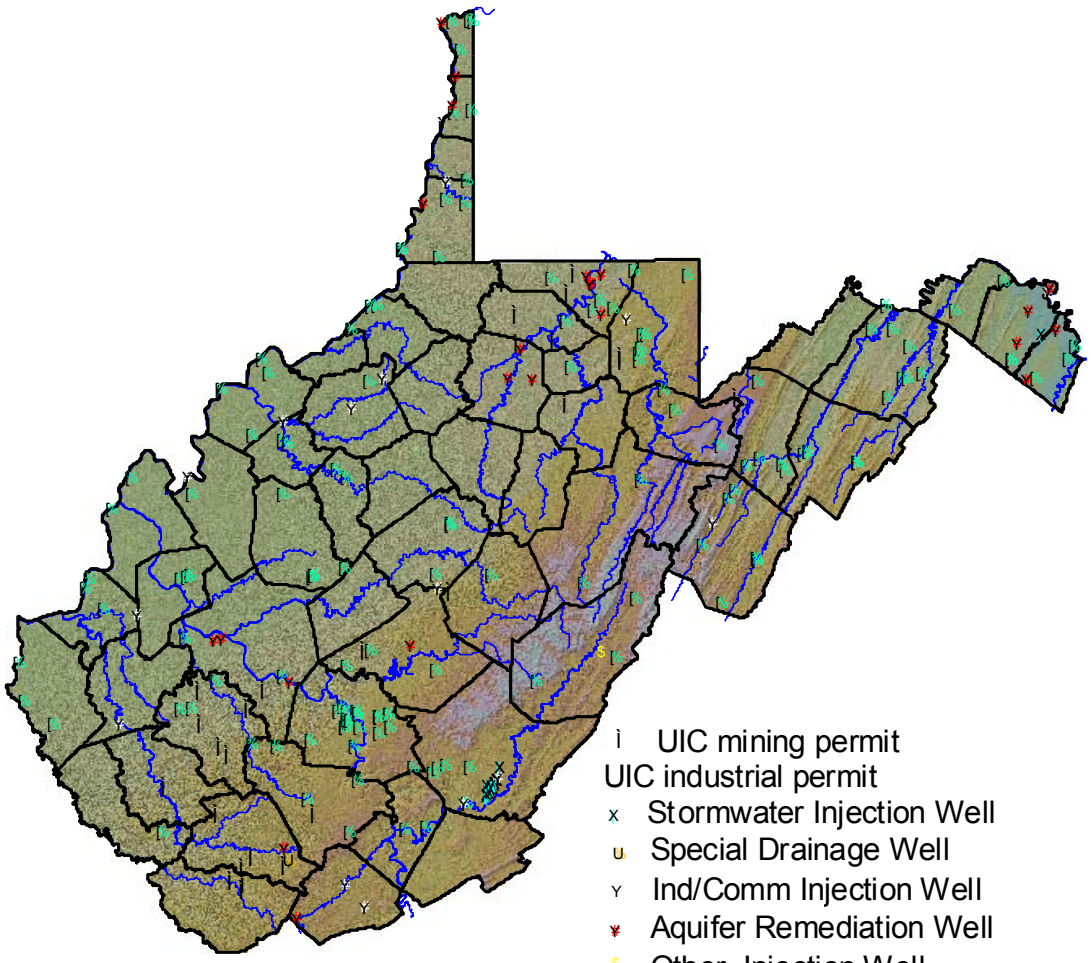
thereby available to all WVDEP personnel. Also, the UIC geologist/permit writer may easily access pertinent information about the mine site and/or applicant from ERIS entries made by DMR field office and headquarters personnel.

What the Programs Need to Protect/Remediate groundwater

The most critical need, at present, is for materials, assistance and procedures to alleviate some of the time-consuming logistical or clerical tasks that increasingly burden the geologist/permit writer. A full-time file clerk serving DWWM would alleviate wasted man-hours for all professionals. Electronic UIC permit application and, especially, the electronic submittal of Discharge Monitoring Reports would free up time for more technical activities, such as unannounced field inspections and assessment of trends in permit violations.

Statistics:

Mine Sites Known, Suspected or Proposing to Inject Underground ……. 72
Injection Points Known, Suspected, or Proposed …… 478
Sites Presently in the Application/Permitting Process …… 19
Permits (or Modifications) Issued or Reissued …… 69
Injection Points Permitted …… 417
Permits Closed/Abandoned …… 1
Permits/Injection Points Denied ……. 7/35
Permits/Injection Points Invalidated …….. 1/20
Applications Voluntarily Withdrawn …….. 16
Applications/Injection Points presently “On Hold” (Pending Resolution of Groundwater Problems) ……. 0/0
Applications/Injection Points presently “On Hold” (Pending Resolution of Fee Problems) …… 1/1



Underground Injection Control Program
Active Permits

N
W E
S

30 0 30 60 Miles

b. UIC and Rule Authorizations

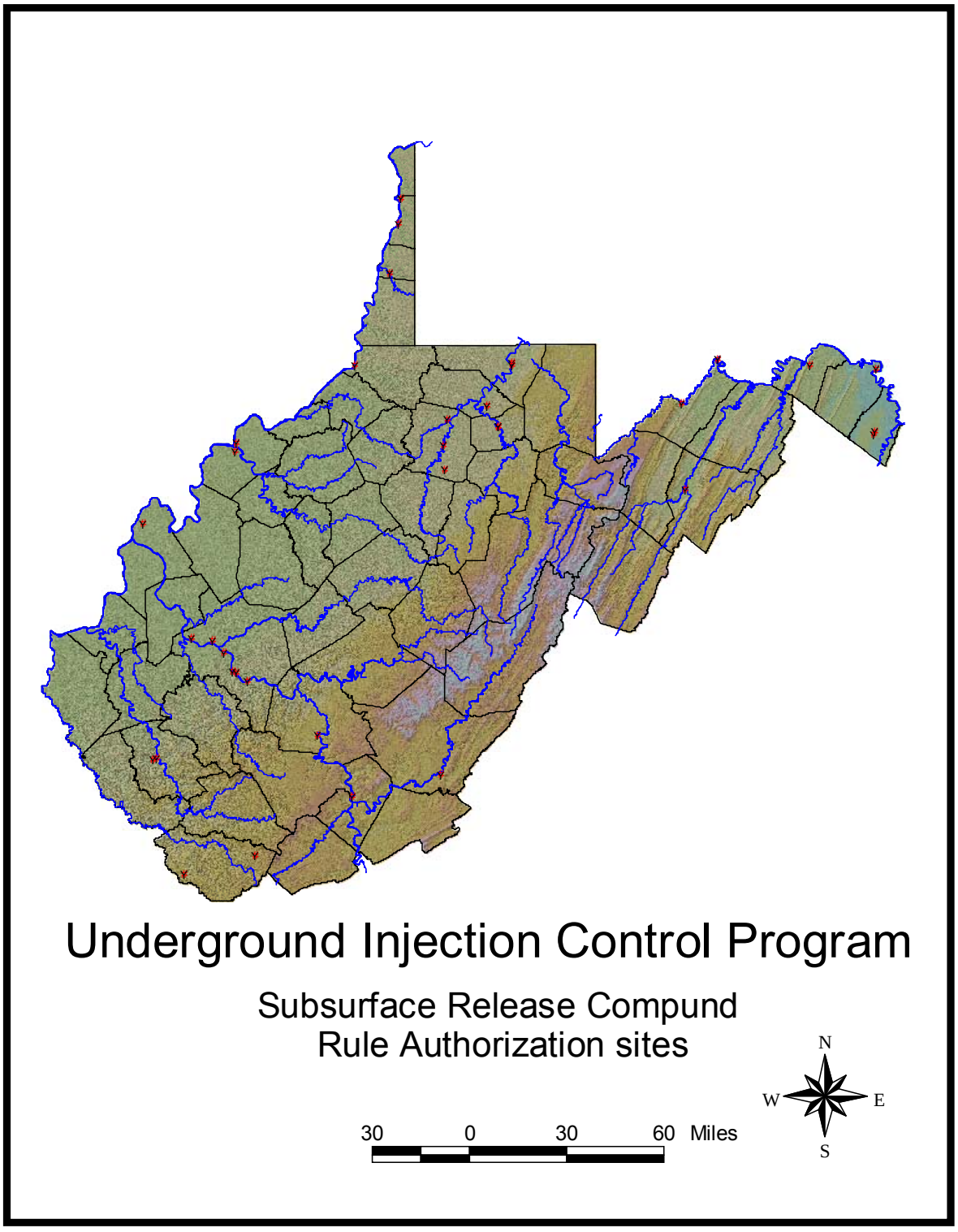
The permitting of UIC wells provides for minimum standards and technical requirements for the proper siting, construction, operation, monitoring, and abandonment of injection wells. When UIC permit applications are received and reviewed, they are accepted, accepted with modifications, or denied. Upon acceptance, an individual permit is issued in draft form and placed in public notice for a 30-day comment period. If no significant comments are received, a final permit is issued 30 days after the end of the comment period. Public hearings are held if necessary. Permits for facilities at 131 locations have been issued during this reporting period. A map showing locations of UIC wells permitted during this reporting period is shown on page 112. Permits for facilities at 8 locations have been closed during this reporting period.

In addition to issuing UIC permits, Rule Authorizations for the injection of fluids into the subsurface are granted for situations where coverage under a UIC permit is not needed. Typically, these Rule Authorizations, issued for one year, are issued to permit the injection of subsurface releasing compounds (SRC) used in the bioremediation of contaminated groundwater.

The most common application of SRC is in remediation of hydrocarbon contaminated waters where oxygen releasing compounds, sometimes mixed with a microbial agent, is injected into the shallow subsurface. The addition of oxygen is often necessary to enhance the natural chemical and biological processes that break down hydrocarbons and certain other compounds *in situ*. Usually there is no need for the addition of other microbial agents, as the native bacteria in the soil are sufficient for bioremediation purposes as long as there is sufficient oxygen to fuel this process.

In addition to remediating some metals and hydrocarbons, other subsurface releasing compounds may be used to remediate chlorinated hydrocarbons, other metals, and chlorinated biphenyls using hydrogen releasing compounds. Rule Authorizations for 28 sites have been granted during this reporting period. The locations of these Rule Authorizations are shown on the map on page 115.

Oxygen releasing compounds are being pumped into several injection points at a facility in Institute in an effort to clean up carbon tetrachloride, chloroform, and fluorocarbons.


Underground Injection Control Program
Subsurface Release Compund
Rule Authorization sites
N
W
E
S
30
0
30
60
Miles

Subsurface Release Compound Rule Authorizations by Watersheds		
Group A Watersheds		
	number of sites	number of injection points
Upper Ohio River North	1	6
Cheat River		
Youghiogheny River		
S. Branch Potomac River	1	6
Shenandoah River	3	59
Upper Kanawha River	6	191
Group B Watersheds		
	number of sites	number of injection points
N. Branch Potomac River	4	14
Tygart Valley River	3	15
Lower Kanawha River	4	21
Elk River		
Coal River		
Group C Watersheds		
	number of sites	number of injection points
Middle Ohio River North	2	41
Potomac River Drains	3	21
Middle Ohio River South	5	13
Lower Guyandotte River	2	5
Gauley River	1	1
Tug Fork River	2	77
Group D Watersheds		
	number of sites	number of injection points
Monongahela River	3	17
Little Kanawha River	1	28
Greenbrier River	1	1
James River		
Lower New River	2	32
Upper New River		
Group E Watersheds		
	number of sites	number of injection points
Upper Ohio River South	6	50
Dunkard Creek		
Cacapon River		
West Fork River	5	30
Lower Ohio River		
Big Sandy River		
Twelvepole Creek	2	48
Upper Guyandotte River	1	17

c. Inspections

The UIC inspections are conducted at business facilities, residential multiple dwellings (i.e. trailer parks and apartment complexes), schools not served by public sewage disposal plants and campgrounds. Single-family dwellings with no co-mingled waste streams (sanitary waste only) are exempt from UIC regulation. Some inspections are conducted as multimedia inspections with other programs or agencies. Priority is given to inspections conducted in selected watershed areas, which rotate on a 5-year basis.

The regional Environmental Enforcement Inspector and local sanitarians are contacted to gather useful information regarding areas that are not served by a public sewage disposal system and may contain facilities that require a UIC permit. The regional Environmental Enforcement Inspector and local sanitarians are given the opportunity to coordinate inspections in the area if they wish to accompany the UIC inspector. Inspections are focused on wellhead protection areas.

In addition to the routine inspection of permitted facilities, facilities that are found to require a UIC permit are inventoried and a determination is made regarding the proper injection well classification. In addition to Class 5 wells discovered during routine inspections, information on suspected injection wells may come from the Class 5 inventory database, complaints, request for permits, and referrals from other agencies.

During the inspections, a UIC inspection form is completed on site. The owner/operator is verbally informed of the status of his well and informed of what actions are to be taken to come into compliance with UIC regulations. The UIC Program has conducted 440 UIC inspections during this reporting period.

If the facility has a Class 5 well that is not permitted, the owner/operator is given the option to apply and obtain a UIC permit for the well or submit a plan for the UIC Program's approval to close the well. All injection wells must be properly abandoned according to UIC regulations. If there are other environmental concerns the owner/operator is given the information necessary to come into compliance with DEP regulations. During this reporting period, 154 verbal enforcements were given to owners/operators of facilities.

Groundwater Protection Plans (GPPs) and Best Management Practices (BMPs) are reviewed with the facility owner/operator. Working with facility owners in the implementation of these practices not only helps protect the environment, but also assists the owner/operator of the facility in reducing the amount of waste generated.

d. Enforcement

The enforcement of UIC regulations is primarily dependent on UIC staff with some assistance from DEP enforcement personnel. Although the major enforcement

steps are outlined in 47 CSR 13, “Underground Injection Control”, DWWM will often informally deal with problems on an individual basis to achieve a quick solution based on characteristics unique to the situation with a success rate of nearly 100%. When an informal enforcement has failed or is not likely to succeed, a Notice of Violation or an Administrative Order is issued instructing the violator to take appropriate action within a specified amount of time. If a satisfactory resolution has not been achieved within a reasonable time frame, civil and criminal actions may be filed.

e. UIC Outreach

The UIC program personnel provide technical assistance to State agencies, business and industrial personnel, and concerned citizens throughout the state. UIC program personnel are working with and educating county sanitarians on the types of injection wells that require oversight by the UIC program. An agreement has been reached with local Health Departments to forward any and all potential UIC concerns to the UIC Program. This will enable the UIC Program to determine if a UIC permit is required at a particular site and will lessen the potential for the dissemination of misinformation to the prospective permittee. This communication between the UIC Program and county sanitarians will benefit the regulatory community and citizens alike.

Active UIC permits by Watersheds	UIC Industrial / Commercial permits issued				UIC Mining permits issued	UIC Sewage permits issued
	storm water	aquifer remediation	industrial / commercial	other		
Group A Watersheds						
Upper Ohio River North		2				7
Cheat River						15
Youghiogheny River						
S. Branch Potomac River			1			16
Shenandoah River						4
Upper Kanawha River		1			4	2
Group B Watersheds						
N. Branch Potomac River					5	4
Tygart Valley River					4	6
Lower Kanawha River		2				8
Elk River			1	1	2	10
Coal River					8	15
Group C Watersheds						
Middle Ohio River North			1			8
Potomac River Drains	2	5	1			11
Middle Ohio River South			1			6
Lower Guyandotte River			2			2
Gauley River					2	10
Tug Fork River					3	5

Group D Watersheds						
Monongahela River		5	1		4	6
Little Kanawha River			4			14
Greenbrier River	7		3	1		16
James River						
Lower New River					1	21
Upper New River		1	3			1
Group E Watersheds						
Upper Ohio River South		2	1		1	5
Dunkard Creek					1	1
Cacapon River						9
West Fork River		3			1	
Lower Ohio River						3
Big Sandy River						3
Twelvepole Creek						4
Upper Guyandotte River		1		1	5	3

i. Groundwater Remediation

To date, the remediation section of the Groundwater Program has worked on 186 sites, approximately 75 (40%) of which were active during this reporting period. These sites vary between equipment yards, above-ground tank releases, hydraulic lift problems, petroleum bulk terminals and refineries, railyards, and manufacturing plants. Some of the sites are active facilities, but many are physically abandoned (as opposed to legally abandoned) and are nothing more than empty lots or fields. Most of the contamination is a hydrocarbon, usually diesel fuel or fuel oil; however, other sites have benzene or chlorinated solvent contamination. Our Program is the lead state agency at most of these locations, while we give advice to other DEP programs at others. In general, the Groundwater Program handles those sites with subsurface contamination that do not fit easily under some other regulatory authority.

Locations of the sites are shown on the map on the following page.

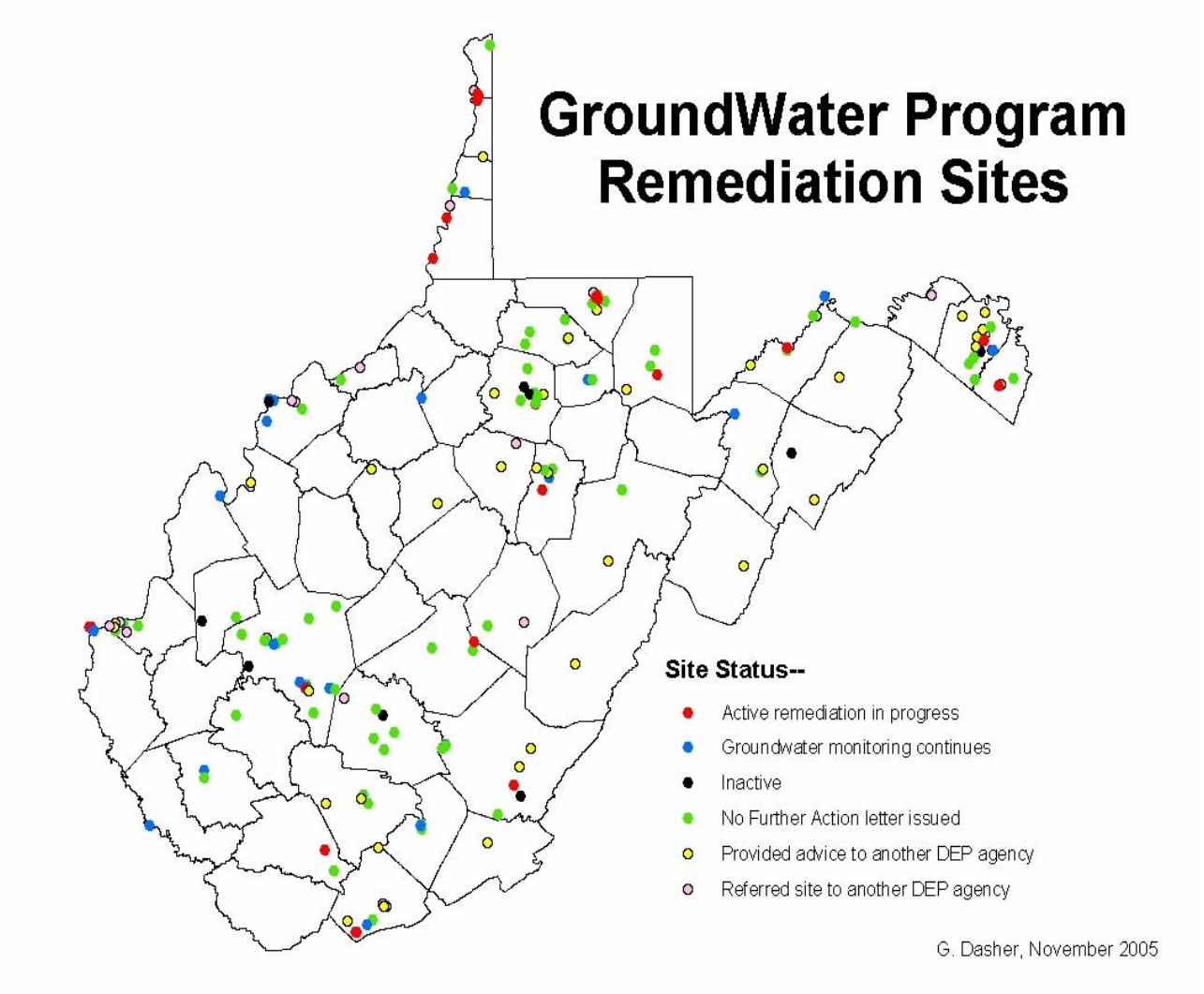

GroundWater Program
Remediation Sites
Site Status--
Active remediation in progress
Groundwater monitoring continues
Inactive
No Further Action letter issued
Provided advice to another DEP agency
Referred site to another DEP agency
G. Dasher, November 2005

Table of Groundwater Program Remediation Sites

Site *(active sites are in bold)*	*County* *River Basin* *7.5' USGS Quad*	*Type of site* *Contamination* *Type of aquifer*	*Status*
Abbott Site in Elk Grove	Ohio Upper Ohio Wheeling	Old train station Benzene Alluvium	Cabinet Secretary is requiring annual groundwater monitoring
ABL—Building 341	Mineral North Branch Potomac Cresaptown	Rocket center Hydrocarbon Alluvium over karst	Referred site to Waste Management
ABL—Steam Plant #2	Mineral North Branch Potomac Cresaptown	Rocket center Fuel Oil Alluvium over karst	No further action letter issued on 25 May 1998
AE, Inc. Buckhannon	Upshur Monongahela Buckhannon	Metal manufacturing Hydraulic oil Alluvium	Company is continuing to sample small unnamed creek
AEP Belmont Substation	Pleasants Middle Ohio Willow Island	Vehicle maintenance Hydraulic oil Colluvium	No further action letter issued on 5 June 2002
AEP Clarksburg Service Center	Harrison Monongahela Clarksburg	Vehicle maintenance Hydraulic oil Colluvium	No further action letter issued on 29 April 2005
AEP Morgantown Service Center	Monongalia Monongahela Morgantown North	Vehicle maintenance Hydraulic oil Colluvium	No further action letter will be issued in July of 2005
Alabama Properties	Fayette Lower New Fayetteville	Abandoned railroad siding Oil hydrocarbon Colluvium	Site is inactive

Anchor Industries Martinsburg	Berkeley Lower Potomac Martinsburg	Industrial site Hydrocarbon Colluvium	Site is inactive
ATF Building Martinsburg	Berkeley Lower Potomac Martinsburg	Federal office building Hydrocarbon Colluvium	Site requires Groundwater Protection Plan, but refuses to comply with state law
Ace Tank Buckhannon	Upshur Monongahela Century	Bulk fuel terminal Hydrocarbon Alluvium	No further action letter issued on 9 May 2003
Anderson of West Virginia	Harrison Monongahela Weston	Manufacturing plant Diesel fuel Alluvium	No further action letter issued on 12 June 1999
Anderson Equipment	Kanawha Lower Kanawha Alum Creek	Vehicle maintenance Diesel fuel Fill	Site investigation required, but site has gone inactive
Appalachian Oil Purchasers	Harrison Monongahela Salem	Bulk fuel terminal Crude oil Colluvium	Provided advice to Environmental Enforcement
Arrow Concrete Scary Creek	Putnam Lower Kanawha Saint Albans	Bulk fuel terminal Benzene Alluvium	No further action letter issued on 16 January 2003
Ashland Caldwell Bulk Terminal	Greenbrier Greenbrier Lewisburg	Bulk fuel terminal Fuel oil Colluvium	No further action letter issued on 30 October 2002
Ashland Coal Huntington	Cabell Lower Ohio Huntington	Old underground tanks Fuel oil Colluvium	No further action letter issued on 3 February 2000
Avis Rent a Car Yeager Airport	Kanawha Lower Kanawha Charleston East	Vehicle refueling Hydrocarbon Colluvium	No further action letter issued on 31 August 1995
Axerod property Martinsburg	Berkeley Lower Potomac Martinsburg	Abandoned property Hydrocarbon Karst	Provided advice to Environmental Enforcement

Berkeley Building	Berkeley Lower Potomac Martinsburg	Building for sale Solvents Karst	Provided advice to Environmental Enforcement
Big John Salvage Yard	Marion Monongahela Fairmont West	Old salvage yard Solvents Colluvium	Provided advice to Waste Management
Bluewell Church of God	Mercer Upper New Bramwell	Church Hydrocarbon Alluvium	Provided advice to Environmental Enforcement
Bowen Tools Clarksburg	Harrison Monongahela Clarksburg	Vehicle maintenance Hydraulic oil Colluvium	No further action letter issued on 8 May 2000
Brandywine Diesel Spill	Pendleton South Branch Potomac Fort Seybert	Truck wreck Diesel fuel Alluvium	Provided advice to Environmental Enforcement
Bridgeport (City of)	Harrison Monongahela Clarksburg	Oil gasoline station Hydraulic Oil Alluvium	Referred site to Environmental Remediation
Brooke County airplane crash site	Brooke Upper Ohio Bethany	Airplane crash site Gasoline Colluvium	Provided advise to Environmental Enforcement
Charles Town Cave	Jefferson Lower Potomac Middleway	Cave Kerosene Karst	Site is inactive
Chevron Caldwell Bulk Terminal	Greenbrier Greenbrier Lewisburg	Old bulk fuel terminal Fuel Oil Colluvium	Site is inactive
Chevron Huntington Bulk Terminal	Cabell Lower Ohio Huntington	Old bulk fuel terminal Hydrocarbon Alluvium	Referred site to Environmental Remediation
Chevron North Charleston Bulk Terminal	Kanawha Lower Kanawha Charleston West	Old bulk fuel terminal Diesel fuel Alluvium	Referred site Environmental Remediation

Citgo Cabin Creek Bulk Terminal	Kanawha Upper Kanawha Cedar Grove	Old bulk fuel terminal Hydrocarbon Alluvium	No further action letter issued on 22 November 2002
Columbia Gas Flat Top Compressor Station	Raleigh Lower New Flat Top	Natural gas compressor Hydrocarbon Colluvium	Provided NPDES Permits with advice
Columbia Gas Mathias Compressor Station	Hardy Cacapon Lost City	Natural gas compressor Hydrocarbon Alluvium	Provided NPDES Permits with advice
Columbia Chemicals Company	Marshall Upper Ohio Wheeling	Chemical company Carbon black Alluvium	Company has excavated soils; our office is waiting on the closure report
Continental Bakery Wheeling	Ohio Upper Ohio Wheeling	Old bakery Hydraulic Oil Alluvium	No further action letter issued 9 September 2002
Cowabunga Holsteins	Monroe Upper New Union	Dairy farm Manure Karst	Provided advice to Environmental Enforcement
Craigsville Fuel Oil Site	Nicholas Gauley Craigsville	Private home Fuel oil Colluvium	No further action letter was issued on 14 February 2005
CREO Manufacturing	Jefferson Lower Potomac Inwood	Manufacturing plant TCE Karst	Pump and treat system on line; continued groundwater monitoring
CSX Benwood Railyard	Marshall Upper Ohio Moundsville	Old railyard Diesel fuel Alluvium	Referred site to Environmental Remediation
CSX Cane Fork Railyard	Kanawha Upper Kanawha Eskdale	Old railyard Diesel fuel Alluvium	No further action letter issued on 19 September 2000

CSX Cowen Railyard— engine house	Webster Gauley Cowen	Old railyard None found Alluvium	No contamination was found at this site
CSX Cowen Railyard— refueling area	Webster Gauley Cowen	Old railyard Diesel fuel Alluvium	No further action letter issued on 28 October 2003
CSX Danville Railyard	Boone Coal Madison	Active Railyard Diesel fuel Alluvium	No Further action letter was issued in February of 1996
CSX Elkins Railyard	Randolph Tygart Valley Elkins	Old railyard Diesel fuel Alluvium	No further action letter issued on 1 December 1997
CSX Elkins Railyard— hotel site	Randolph Tygart Valley Elkins	Old railyard Diesel fuel Alluvium	No further action letter was issued on 29 September 2004
CSX Elkins Railyard— unnamed site	Randolph Tygart Valley Elkins	Old railyard Diesel fuel Alluvium	No further action letter was issued on 10 February 2005
CSX Fairmont Railyard	Marion Monongahela Fairmont East	Old railyard Diesel fuel Alluvium	Company is planning to excavate contaminated soils
CSX Fairmont Railyard	Marion Monongahela Fairmont East	Old railyard Solvents Alluvium	No further action letter was issued on 17 January 2002
CSX Grafton Railyard locomotive shop	Taylor Tygart Valley Grafton	Active railyard Solvents Alluvium	Continued groundwater monitoring; reducing agent placed in wells
CSX Grafton Railyard locomotive shop	Taylor Tygart Valley Grafton	Active railyard Diesel fuel Alluvium	Bioremediation with continued groundwater monitoring
CSX Grafton Railyard car repair shop	Taylor Tygart Valley Grafton	Old railyard Diesel fuel Alluvium	No further action letter issued 26 January 2004

CSX Green Springs Railyard	Hampshire North Branch Potomac Patterson Creek	Old railyard Heavy oils Alluvium	No further action letter issued 27 September 1996
CSX Handley Railyard	Kanawha Upper Kanawha Montgomery	Old railyard Solvents Alluvium	Continued groundwater monitoring
CSX Handley Railyard	Kanawha Upper Kanawha Montgomery	Old railyard Diesel fuel Alluvium	Air venting and product recovery, with continued groundwater monitoring
CSX Hinton East Railyard	Summers Lower New Hinton	Active railyard Hydrocarbon Alluvium	No further action letter issued 28 November 1993
CSX Hinton West Railyard	Summers Lower New Hinton	Old railyard Diesel fuel Alluvium	No further action letter issued 7 December 2001
CSX Huntington Railyard	Cabell Lower Ohio Huntington	Active railyard Diesel fuel Alluvium	No further action letter issued 4 February 2005
CSX Keyser Railyard	Mineral North Branch Potomac Keyser	Old railyard Diesel fuel Alluvium	No further action letter issued 18 April 2001
CSX Keyser Railyard	Mineral North Branch Potomac Keyser	Old railyard solvents Alluvium	Natural attenuation with groundwater monitoring
CSX Martinsburg Railyard	Berkeley Lower Potomac Martinsburg	Old railyard Diesel fuel Alluvium	No further action letter issued on 20 March 1998
CSX Martinsburg Railyard	Berkeley Lower Potomac Martinsburg	Old railyard Solvents Alluvium	No further action letter issued on 20 March 1998

CSX Maryland Junction Railyard	Mineral North Branch Potomac Cumberland	Old railyard Diesel fuel Alluvium	Bioremediation and soil removal, with continued groundwater monitoring
CSX MacDougal Oil Spill	Fayette Lower New Fayetteville	Train wreck Lube oil Track ballast	No further action letter issued on 15 October 2004
CSX Parkersburg Railyard	Wood Little Kanawha Parkersburg	Active railyard Diesel fuel Alluvium	High vacuum system on line with continued groundwater monitoring
CSX Peach Creek Railyard	Logan Guyandotte Logan	Active railyard Diesel fuel Alluvium	Product recovery with continued groundwater monitoring
CSX Rainelle Car Repair Shop	Greenbrier Gauley Rainelle	Old railyard None found Fill	No contamination was found
CSX Rainelle Railyard	Greenbrier Gauley Rainelle	Active railyard Diesel fuel Alluvium	Soil removal planned; continued groundwater monitoring
CSX Raleigh Railyard	Raleigh Lower New Beckley	Old railyard Diesel fuel Alluvium	No further action letter issued on 3 July 2001
CSX Ronceverte Railyard	Greenbrier Greenbrier Ronceverte	Old railyard None found Alluvium	No further action letter issued on 18 August 1998
CSX Rowlesburg Railyard	Preston Cheat Rowlesburg	Active railyard Diesel fuel Alluvium	Bio-vent system on line with continued groundwater monitoring
CSX Saint Albans Railyard	Kanawha Lower Kanawha Saint Albans	Old railyard Diesel fuel Alluvium	No further action letter issued on 6 November 2001

CSX South Charleston Car Repair Shop	Kanawha Lower Kanawha Charleston West	Car Repair Shop Diesel fuel Fill	No further action letter issued on 29 September 2003
CSX South Charleston Railyard	Kanawha Lower Kanawha Charleston West	Active railyard Diesel fuel Alluvium	No further action letter issued on 19 March 2001
CSX Thurmond Railyard	Fayette Lower New Thurmond	Old railyard Diesel fuel Alluvium	No further action letter issued on 7 May 2003
DeVault Brothers Orphan Tank	Monongalia Monongahela Morgantown North	Orphan underground tank Diesel fuel Colluvium	No further action letter issued on 8 September 2003
DOH Buckhannon equipment yard	Upshur Monongahela Berlin	Active equipment yard Heavy oil Alluvium	No futher action letter issued on 16 November 1999
DOH Buckhannon equipment yard	Upshur Monongahela Berlin	Active equipment yard Heavy oil Soil piles	No further action letter were issued on 3 July 2002
DOH Huntington equipment yard	Mason Lower Ohio Huntington	Active equipment yard Hydrocarbon Alluvium	Referred site to Environmental Remediation
DOH Hurricane equipment yard	Putnam Lower Kanawha Hurricane	Old equipment yard unknown unknown	Site is inactive
DOH Greenwood equipment yard	Doddridge Middle Ohio Pennsboro	Active equipment yard Chloride Colluvium	First investigation is completed and groundwater wells installed
DOH Marshall County equipment yard	Marshall Upper Ohio Businessburg	Active equipment yard Tar oil Alluvium	Site inspection planned for July 2005

DOH Oak Hill equipment yard—chloride	Fayette Lower New Oak Hill	Old equipment yard Chloride Colluvium	Additional soil excavation planned; continued groundwater monitoring
DOH Oak Hill equipment yard—hydrocarbon	Fayette Lower New Oak Hill	Old equipment yard Hydrocarbon Colluvium	Remediation complete; no further action letter not issued to date
DOH-Oak Hill equipment yard—Jessie Bane	Fayette Lower New Oak Hill	Old equipment yard Chloride Colluvium	No further action letter issued on 6 December 2004
DOH Piedmont equipment yard	Kanawha Lower Kanawha Charleston West	Old equipment yard Hydrocarbon Fill	No further action letter issued on 29 April 2002
DOH Weston equipment yard	Lewis Monongahela Weston	Active equipment yard Diesel fuel Alluvium	Provided advice to Environmental Enforcement
DOW Petersburg	Grant South Branch Potomac Petersburg East	Old manufacturing facility Solvents Alluvium	No further action letter issued on 25 April 1997
D&R Bulk Terminal Elk Garden	Mineral North Branch Potomac Kitzmiller	Old fuel bulk terminal Hydrocarbon Colluvium	Provided advice to Environmental Enforcement
Dunn Residence in Hedgesville	Berkeley Lower Potomac Martinsburg	Private residence Fuel oil Karst	Provided advice to Environmental Enforcement
Dupont Dry Run Landfill	Wood Lower Ohio Lubeck	Active landfill C8 Colluvium	Continued groundwater monitoring under NPDES permit
Dupont Letart Landfill	Mason Lower Ohio New Haven	Old landfill C8 Colluvium	Continued groundwater monitoring under NPDES permit

Dupont Local Landfill	Wood Lower Ohio Little Hocking	Old landfill C8 Colluvium	Continued groundwater monitoring under NPDES permit
Dupont Washington Works	Wood Lower Ohio Little Hocking	Active chemical plant C8 Alluvium	Continued groundwater monitoring under NPDES permit
Edray Diesel Spill	Pocahontas Greenbrier Edray	Truck wreck Diesel fuel Karst	Provided adviced to Environmental Enforcement
Exit 13 Diesel Spill	Berkeley Lower Potomac Martinsburg	Truck wreck Diesel fuel Karst	Provided advice to Environmental Enforcement
Exit 16 Diesel Spill	Berkeley Lower Potomac Martinsburg	Truck wreck Diesel fuel Karst	Provided advice to Environmental Enforcement
Exxon Boomer Bulk Terminal	Fayette Upper Kanawha Montgomery	Old bulk fuel terminal Hydrocarbon Alluvium	Referred site to Environmental Remediation
Exxon Huntington Bulk Terminal	Cabell Lower Ohio Huntington	Old bulk fuel terminal Hydrocarbon Alluvium	Referred site to Environmental Remediation
Exxon Parkersburg Bulk Terminal	Wood Little Kanawha Parkersburg	Old bulk fuel terminal Hydrocarbon Alluvium	Referred site to Environmental Remediation
Exxon Sharon Fairmont	Marion Monongahela Fairmont East	Old manufacturing plant Metals Colluvium	Provided advice to Waste Management
Exxon Westover Bulk Terminal	Monongalia Monongahela Morgantown North	Old bulk fuel terminal Hydrocarbon Alluvium	Referred site to Environmental Remediation

Frito-Lay Huntington	Cabell Lower Ohio Huntington	Manufacturing plant Hydrocarbon Alluvium	Provided advice to Waste Management
Fryer Oil Bulk Terminal	Hancock Upper Ohio East Liverpool South	Old bulk fuel terminal Kerosene Alluvium and fill	No further action letter issued 6 December 2004
FWA Drilling	Kanawha Lower Elk Blue Creek	Old equipment yard Hydrocarbon Colluvium	No further action letter issued on 31 May 2002
GW Washington Plant	Wood Lower Ohio Little Hocking	Active chemical plant Butadiene Alluvium	Air sparging system in operation
GSA Site Parkersburg	Wood Little Kanawha Parkersburg	Vacant lot Hydrocarbon Colluvium	Referred site to Environmental Remediation
Halltown Paperboard Plant	Jefferson Lower Potomac Charles Town	Active manufacturing plant Hydraulic oil Karst	No further action letter issued on 11 January 1991
Hampshire Distributor Bulk Terminal	Hampshire South Branch Potomac Augusta	Old bulk fuel terminal Diesel fuel Colluvium	Provided advice to Environmental Enforcement
Handy and Harman	Berkeley Lower Potomac Hedgesville	Old manufacturing plant Fuel oil Karst	No further action letter was provided on 21 August 1997
Harrison Power Plant	Harrison Monongahela Shinneston	Coal-fired power plant Fuel oil Fill	Problem has been resolved by the company
Harrison Recycling Center	Harrison Monongahela Clarksburg	Active recycling center Hydrocarbon Colluvium	Company has moved car crusher; site may now be inactive

Hawkins Lumber	Marion Monongahela Shinneston	Old lumber mill Hydrocarbon Alluvium	No further action letter issued on 22 October 2003
Hedgesville Fuel Oil Problem	Jefferson Lower Potomac Hedgesville	Private residence Fuel Oil Colluvium	Provided advice to Environmental Enforcement
Hester Industries Moorefield	Hardy South Branch Potomac Moorefield	Old industrial site Hydrocarbon Alluvium	Asked for additional information; no record of company complying
Huttsonville Diesel Spill	Randolph Monongahela Mill Creek	Truck wreck Diesel fuel Colluvium	Provided advice to Environmental Enforcement
Ike Morris Bulk Terminal	Gilmer Little Kanawha Glenville	Old bulk fuel terminal Hydrocarbon Alluvium	Provided advice to Environmental Enforcement
Imation Middleway	Jefferson Lower Potomac Inwood	Active manufacturing plant Fuel oil Karst	No further action letter issued on 9 September 1999
J&N Coal at Bolt	Raleigh Coal Eccles	Old coal prep plant Hydrocarbon Gob and colluvium	Provided advice to Enforcement and Environmental Remediation
Kable Oil Company	Jefferson Lower Potomac Middleway	Active bulk fuel terminal Fuel oil Karst	Company has been asked for additional remediation
Keesee Jeep Huntington	Cabell Guyandotte Barboursville	Car dealership Diesel fuel Colluvium	No further action letter was issued on 11 June 1997
Larew Salvage Yard	Preston Tygart Valley Fellowsville	Salvage yard Hydrocarbon Alluvium	Provided advice to Environmental Enforcement

Little Whitesitck Creek	Raleigh Lower New Beckley	Creek remediation project Diesel fuel Alluvium	Neither creek sampling found any contamination
Logan General Hospital	Logan Guyandotte Logan	Hospital Fuel oil Colluvium	No further action letter issued on 14 August 2002
Lowes Green Valley	Mercer Upper New Bluefield	Large hardware store Hydrocarbon Alluvium	No further action letter issued on 20 January 1998
Marathon-Ashland Bulk Terminal	Kanawha Upper Kanawha Charleston West	Active bulk fuel terminal Hydrocarbon Alluvium	Vacuum system discontinued; continued groundwater monitoring
Marathon Kenova Bulk Terminal	Wayne Lower Ohio Catlettsburg	Active bulk fuel terminal Hydrocarbon Alluvium	First site inspection completed
Mathews Brothers Bulk Terminal	Harrison Monongahela Clarksburg	Old bulk terminal Hydrocarbon Colluvium	Company is removing a massive amount of contaminated soil
Maxwelton Dead Cattle Problem	Greenbrier Greenbrier Williamson	Sinkhole Dead cattle and trash Karst	Provided advice to Environmental Enforcement
Michael Spring Problem	Marion Monongahela Grant Town	Private residence Fecal bacteria Colluvium	Provided advice to the Director
Midas Muffler Bridgeport	Harrison Monongahela Clarksburg	Vehicle service center Hydrocarbon Colluvium	A no further action letter was issued on 1 May 1001
Morgantown Ordnance	Monongalia Monongahela Morgantown South	Old ammunition plant Solvents Colluvium	Provided advice to Waste Management

Murphy (C.G.) Building	Greenbrier Gauley Rainelle	Old business Fuel foil Basement	A no further action letter was issued on 30 October 2002
Mountaineer Raceway	Berkeley Lower Potomac Martinsburg	Motorcycle race track None Karst	Provided advice to NPDES Permits
NS Bluefield Railyard— fuel transloading	Mercer Upper New Bluefield	Active railyard Diesel fuel Alluvium over karst	Product removal and groundwater monitoring continues
NS Bluefield Railyard— locomotive area	Mercer Upper New Bluefield	Active railyard Diesel fuel Alluvium over karst	Product removal and groundwater monitoring continues
NS Dickinson Railyard	Kanawha Upper Kanawha Belle	Active railyard Diesel fuel Alluvium	Planned soil remediation; groundwater monitoring has just begun
NS Kenova Railyard	Cabell Lower Ohio Catlettsburg	Inactive railyard Diesel fuel Alluvium	Soil removal completed; groundwater monitoring continues
NS Mullens Railyard	Wyoming Guyandotte Mullens	Inactive railyard Diesel fuel Alluvium	Remediation system refurbishing underway; monitoring continues
NS Princeton Railyard	Mercer Upper New Athens	Old railyard Diesel fuel Alluvium	Referred site to Environmental Remediation
NS Williamson Railyard	Mingo Tug Fork Williamson	Active railyard Diesel fuel Alluvium	Product removal and groundwater monitoring continues

Owens Brockway Huntington	Cabell Lower Ohio Huntington	Manufacturing facility Hydrocarbon Colluvium	Provided advice to Waste Management
Pantry Store Anmore	Harrison Monongahela Clarksburg	Active gasoline station Gasoline Colluvium	Continued vacuum extraction and groundwater monitoring
Pantry Store Anmore	Harrison Monongahela Clarksburg	Active gasoline station Diesel fuel Colluvium	No further action letter issued on 28 September 2001
Payne Auto Recycling Center	Fayette Lower New Beckwith	Auto salvage yard Hydrocarbon Alluvium	Provided advice to Environmental Enforcement
Pennzoil Huntington Bulk Terminal	Cabell Lower Ohio Huntington	Old bulk fuel terminal Hydrocarbon Alluvium	Referred site to Environmental Remediation
Pennzoil Mannington Compressor Station	Marion Monongalia Mannington	Old gas compressor station Hydrocarbon Soil	A no further action letter was issued on 3 July 2002
Pennzoil Star City Bulk Terminal	Monongalia Monongahela Morgantown North	Old bulk fuel terminal Benzene Alluvium	Referred site to Environmental Remediation
Petersburg Motors	Grant South Branch Potomac Petersburg East	Car dealership Motor oil Alluvium	Provided advice to Environmental Enforcement
Princeton Petroleum Bulk Plant	Mercer Upper New Princeton	Old bulk fuel terminal Hydrocarbon Colluvium	No further action letter issued on 3 February 2005
Quaker State Refinery	Pleasants Middle Ohio Ravens Rock	Old petroleum refinery Benzene and MTBE Alluvium	Referred site to Waste Management

Rapps Dairy Farm	Greenbrier Greenbrier Anthony	Dairy Farm Manure Karst	Provided advice to Environmental Enforcement
Ravenswood (City of)	Jackson Lower Ohio Ravenswood	City water supply PCE Alluvium	Provided advice to Environmental Remediation
Reynolds Bulk Terminal	Greenbrier Greenbrier Lewisburg	Active bulk fuel terminal Hydrocarbon Karst	Company has removed some soils; needs to remove more
Roach (R.M.) Bulk Terminal	Berkeley Lower Potomac Martinsburg	Active bulk fuel terminal Hydrocarbon Karst	No action as yet by company; order required
Rogers (R.T.) Bulk Terminal	Summers Lower New Hinton	Active bulk terminal Hydrocarbon Alluvium	Previous remediation ineffective; have asked for a new plan
Ryder Truck	Wood Middle Ohio South Parkersburg	Vehicle maintenance facility Diesel fuel Colluvium	A no further action letter was issued in the Spring of 2003
SBA Towers	Fayette Upper Kanawha Monomers	Radio antenna site Lead Alluvium	A no further action letter was issued on 5 December 2000
Sears Auto Mall One	Mercer Upper New Bluefield	Vehicle maintenance facility Hydraulic oil Colluvium	A no further action letter was issued on 31 January 2003
Sears Auto Mall Two	Mercer Upper New Bluefield	Vehicle maintenance facility Hydraulic oil Colluvium	Soil removal is completed; groundwater monitoring continues
South Capterton Mine site	Fayette Lower New Fayetteville	Old coal mine site Diesel fuel Alluvium	A no further action letter was issued on 15 October 2004

South High Street Service Center	Monongalia Monongahela Morgantown North	Old gasoline station Benzene Colluvium	A no further action letter was issued on 20 December 2002
State Auto Clarksburg	Harrison Monongahela Clarksburg	Vehicle maintenance facility Diesel fuel unknown	Company has removed contaminated soils; we are waiting on their report
S.S. Beucher Princeton	Mercer Upper New Princeton	Old junk yard Metals Alluvium	Provided advice to Waste Management
Talon Manufacturing	Wyoming Guyandotte Rhodell	Ammunition manufacturing None was found Alluvium	No further action letter was issued on 31 August 2004
Tomahawk Raceway	Berkeley Lower Potomac Big Bool	Motorcycle raceway None was found Alluvium	Provided advice to NPDES Permits
Union Drilling, Inc.	Upshur Monongahela Berlin	Oil and gas company Diesel fuel Colluvium	A no further action letter was issued on 23 November 1998
Unocal Cabin Creek East Refinery	Kanawha Upper Kanawha Cedar Grove	Old refinery site Benzene Alluvium	Phytroremediation with continued groundwater monitoring
Unocal Cabin Creek Speedway Site	Kanawha Upper Kanawha Cedar Grove	Old spill site Hydrocarbon Alluvium	Waiting on bio-vent system; groundwater monitoring continues
Unocal Cabin Creek West Bulk Terminal	Kanawha Upper Kanawha Cedar Grove	Old bulk fuel terminal Hydrocarbon Alluvium	Phytroremediation with continued groundwater monitoring
VA Hospital Martinsburg	Berkeley Lower Potomac Martinsburg	Hospital Fuel oil Karst	Soil removal complete; continued groundwater monitoring

VEPCO Mount Storm Power Plant	Grant North Branch Potomac Mount Storm Lake	Coal-fired power plant Fuel oil Colluvium	Continued groundwater monitoring
Verizon Lorentz	Upshur Monongahela Berlin	Telephone pole storage PAHs Alluvium	Provided advice to NPDES Permits
Verizon Summersville	Nicholas Gauley Summersville	Telephone pole storage PAHs Alluvium	A no further action letter was issued on 12 August 2002
Warren (D.H.) Bulk Terminal	Raleigh Lower New Beckley	Old bulk fuel terminal Hydrocarbon Colluvium	Provided advice to Waste Management
Weathford-Enterra	Harrison Monongahela Weston	Vehicle maintenance facility Diesel fuel Alluvium	Referred site to Environmental Remediation
Weirton Steel—Browns Island	Hancock Upper Ohio Weirton	Steel mill Coal compounds Alluvium	Referred site to Waste Management
Weirton Steel—locomotive service area	Hancock Upper Ohio Weirton	Steel mill Diesel fuel Alluvium	Company plans to remove contaminated soil
Weirton Steel—Oil House	Hancock Upper Ohio Weirton	Steel mill Oil Alluvium	Company has removed the contaminated soil
Weirton Steel—Scale Pit	Hancock Upper Ohio Weirton	Steel mill Hydrocarbon Alluvium	Company plans to remove contaminated soil
Weirton Steel—Walnut Street and Track 222	Brooke Upper Ohio Weirton	Steel mill Diesel fuel Alluvium	Company has removed contaminated soil
West Virginia Northern Railroad	Preston Cheat Kingwood	Old railyard Diesel fuel Colluvium	A no further action letter was issued on 14 April 1994

World Kitchen One	Berkeley Lower Potomac Tablers Station	Old manufacturing facility Fuel oil Karst	A no further action letter was issued on 18 December 2003
World Kitchen Two	Berkeley Lower Potomac Tablers Station	Old manufacturing facility Metals Karst	Provided advice to Environmental Enforcement
WVU-PRT Beechurst Station	Monongalia Monongahela Morgantown North	Student transportation Propylene glycol Colluvium	Long-term replacement and refurbishing of glycol lines
WV-PRT Towers Site	Monongalia Monongahela Morgantown North	Student transportation Propylene glycol Colluvium	Long term replacement and refurbishing of glycol lines
WV-USANG Camp Dawson	Preston Cheat Kingwood	U.S. Army base JP8 jet fuel Alluvium	A no further action letter was issued on 1 August 1997
Wet Branch Elementary School	Kanawha Upper Kanawha Cedar Grove	Vehicle maintenance facility Hydrocarbon Alluvium	Provided advice to Environmental Enforcement

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division of Water and Waste Management

6. Education and Outreach

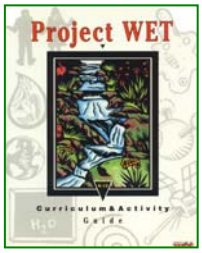
a. Project WET (Water Education for Teachers) Program
January 1, 2004 – December 31, 2005

Introduction

The DEP's Division of Water and Waste Management conducts outreach activities and environmental education training for teachers and other education professionals through the **West Virginia Project WET Program.**

Project WET (Water Education for Teachers) is a national water education program that provides all educators with effective K-12 classroom materials through training workshops. Project WET materials guide students through a process that begins with awareness, moves toward understanding, and instills the skills and motivation to be responsible stewards of water resources.

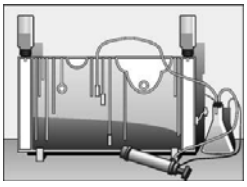
How does the Project WET program work?



The *Project WET Curriculum and Activity Guide* is the main publication distributed at no-cost teacher training workshops. The *Guide* is a collection of over 90, K-12 activities easily integrated into chemistry, physics, language arts, life science, earth systems, natural resources, history, social studies, fine arts, and culture. Additional publications include *WOW! The Wonders of Wetlands* and *Healthy Water - Healthy People.*

Groundwater Flow Model

The model is a teaching tool that is used at outdoor events, conventions, and at Project WET workshops to increase understanding of groundwater. In addition, the model is lent to schools or individuals.



RESULTS IN BRIEF

Teacher Training Workshops.

Four hundred seventy (470) K-12 teachers attended 22 Project WET workshops. A breakdown of workshops is provided in Table A.

Outreach Events

More than 2,000 people including students and adults received information about groundwater and surface water at 30 events throughout the state.

A breakdown of the events is provided in Table B

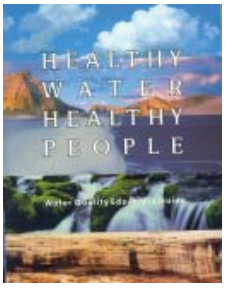
Left. Chad Board, DEP geologist, answers questions at the Groundwater booth displayed at the state Capitol for DEP's Public Relations Day at the2004 Legislature.

Awards – The groundwater exhibit displayed at the Clay Center in Charleston won the 2004 Garden Club's Marion Fuller Thompson Award for "*an exhibit of exceptional merit which increases the knowledge and awareness of our environment.*"

New Initiatives

◆ An exhibit titled, *Who is helping the Watershed,* was completed and displayed for the first time on February 5, 2004, at the State Capitol. The 7 by 8 foot exhibit focuses on people whose actions prevent pollution and protect the environment. The exhibit is displayed in public libraries and events throughout the state.

2004 - Morgan County Fair. In the background is the exhibit, "*Who is Helping the Watershed"*



◆ *Healthy Water, Healthy People*, an innovative water quality education program sponsored by Project WET, was launched during the reporting period with the first workshop conducted on June 25, 2004, at PPG Industries in New Martinsville. The program consists of a hands-on activity guide for educators of students in grades 6

through university level. The focus of the publication is water quality issues and their relationship to personal, public, and environmental health.

◆ A fact sheet titled *From the Land to Your Water* provides practical suggestions about what people can do around the home to prevent water pollution. The 2005 publication promotes the awareness that peoples' actions have an impact on water quality and that everyone has a role in pollution prevention.

Governor's Environmental Stewardship Awards – Environmental Education
Barbara Dofka and Frank Gilmore were the 2004 award recipients in the environmental education leadership category. Barbara serves as the Science Resource Coordinator at the West Virginia Liberty State College SMART Center. Frank works as the government and community relations manager with PPG Industries in New Martinsville. The 2005 recipient of the award was Toni Lynne DeVore, Science Curriculum Director for Wood County Schools.

Children's Water Festivals – 2004 & 2005
The number of water festivals tripled during the reporting period thanks to the National Park Service and the watershed association, Friends of the Cheat. The two organizations joined Project WET West Virginia in celebrating the National Project WET Water Education Day with festivals at the New River National Park at Grandview, the Aurora School in Preston County and at Marshall University Graduate College in South Charleston. The combined events reached over 1200 students.

Students gather around the groundwater flow model at the 2004 Children's Water Festival at Marshall University in South Charleston

Water Festivals are held annually in September and October. They consist of structured learning stations and exhibits where students engage in hands-on water activities and investigations.

Table A. Project WET Teacher Training Workshops. January 1, 2004 – December 31, 2005

Workshop Location (Community)	Date	No. Participants	Participant Breakdown
WV State College, Institute	March 1, 2004	16	Preservice teachers
Monroe County Public Library, Union	June 15, 2004	16	Classroom Teachers - 1 non-formal educator
New Martinsville, PPG Industries, WOW! The Wonders of Wetlands	June 24, 2004	32	Classroom Teachers
New Martinsville, PPG Industries. (Healthy Water – Healthy People Workshop)	June 25, 2004	31	Classroom Teachers
Riverside High School, Belle, Kanawha County	September 25, 2004	16	Classroom Teachers
West Virginia University, Morgantown	October 26-27, 2004	52	Preservice Teachers
Concord University, Athens	November 29, 2004	9	Preservice Teachers

West Virginia University, Morgantown	March 23, 2005	18	Preservice Teachers
West Virginia State University	April 4, 2005	9	Preservice Teachers
Moorefield, South Branch Inn	April 6, 2005	27	Classroom teachers and water resources agencies
Edison Elementary, Charleston	May 10, 2005	12	Classroom Teachers 6th grade
Edison Elementary, Charleston	May 23, 2005	4	Classroom Teachers 7th grade
Edison Elementary, Charleston	May 24, 2005	9	Classroom Teachers 8th grade
Lewisburg, New River Community and Technical College	May 31	19	Classroom teachers and watershed association volunteers
Shinnston, Harrison Power Plant WOW! The Wonders of Wetlands Workshop	June 16, 2005	7	Classroom Teachers
West Virginia State University	August 3, 2005	10	Teachers and Resource Agency
Charleston, DEP Headquarters in Kanawha City	August 15-17, 2005	38	Classroom Teachers
Princeton, Pikeview High School	August 24, 2005	34	Classroom Teachers
Lewisburg, New River Community and Technical College	October 21, 2005	15	Classroom Teachers and Volunteers

West Virginia University, Morgantown	October 25-26	55	Preservice Teachers
Lewisburg, New River Community and Technical College. WOW! The Wonders of Wetlands	October 28, 2005	13	Classroom Teachers and Volunteers
Concord University, Athens	November 8, 2005	14	Preservice Teachers
Total		470	

Table B. Outreach Events and Student Programs. January 1, 2004 – December 31, 2005

Location	Date	Event	Participants Approximate No.
State Capitol, Charleston	Feb. 5, 2004	DEP Public Relations Day at he State Legislature	200 - General public and legislators
Coolfont, Berkeley Springs	February 20-21, 2004	Winter Festival of the Waters 14th annual International Water Tasting Competition	100 – Bottled water industry representatives. General public.
State Capitol, Charleston	February 26, 2004	Wildlife Diversity Day	200 – students in grades 5-8. General public
Maxwell Hill Elementary, Beckley	March 3, 2004	Groundwater presentation	40 students in grades 5-6.
Salvation Army Charleston	March 31, 2004	Presentation Boys & Girls Club	20 students in grades 4-6
Preston County, Kingwood	May 1, 2004	Cheat River Fest Watershed Celebration	100 – General public
Wirt County, Elizabeth	May 7, 2004	Wetlands Field Day	55 – 6th grade students
Jefferson County Shepherdstown	May 11, 2004	Jefferson County Science Olympiad	45 – 6th grade students

Greenbrier County, White Sulphur Springs National Fish Hatcheries	June 5, 2004	DOES (discovering our environmental surroundings)	100 girl scouts
Morgan County, Berkeley Springs	July 31-August 1, 2004	Morgan County Fair	400 general public
Pittsburg, Pennsylvania	September 16, 2004	Ohio River Celebration	200 – home schooled students
Charleston, Marshall University Graduate College	September 24, 2004	Water Festival – Make a Splash with Project WET	250 students – 20 adults
New River Gorge National Park at Grandview	October 1, 2004	Water Festival	220 students, 10 teachers
Aurora Elementary	October 7, 2004	Water Festival	150 students
Morgantown	November 4, 2004	Science Teachers Convention, Presentation re: Healthy Water, Healthy People Program	45 educators
Duvall High School, Lincoln County	February 25 & 28, 2005	60 students	6 sessions – 8th and 9th grades.
DEP Public Relations Day at the WV Legislature, State Capitol, Charleston	March 9, 2005	Elected officials and general public	Approximately 100 – general public
Wildlife Heritage Day, State Capitol, Charleston	March 23, 2005	Students and general public	Approximately 200 students and general public
Wirt County, Elizabeth	May 6, 2005	Wetlands Field Day	50 – 6th grade students
Jefferson County Shepherdstown	May 26, 27, 2005	Jefferson County Science Olympiad,	55 – 6th grade students
National Fish Hatcheries White Sulphur Springs	June 4, 2005	Girl Scouts (discovering our environmental	90 girl scouts

Greenbrier County		surroundings)	
Putnam County Hunting and fishing club	June 30, 2005	Boy Scouts	80
Dunbar, Shawnee Community Center	July 13, 2005	Soil & Water Education Week	45
Snowshoe,	July 30, 2005	Snowshoe Institute - Presentation	30
Shepherdstown, NCTC	Sept. 15, 2005	Conference, Growing Communities on Karst. - Presentation	100
Marshall University Graduate College, Charleston	September 23, 2004	Water Festival – Make a Splash with Project WET	250 students – 20 adults
Lewisburg	October 18, 2005	Conference, Growing Communities on Karst - Presentation	90
New River Gorge National Park at Grandview	September 30, 2005	Water Festival (organized by the National Park Service)	220 students, 10 teachers
Riverside High School Charleston	October 6, 2005	Groundwater flow model Presentation	35 - 9th grade students
Aurora Elementary, Preston County	October 21, 2004	Water Festival (organized by Friends of the Cheat)	100 students 3rd, 4th and 5th grades

b. Groundwater - Public Information Program

Speakers Bureau

The Department of Environmental Protection has dozens of accomplished speakers available to speak at events statewide. Speakers are available on environmental topics to educate the public about the importance of the protection and restoration of our state's environment and how they can become involved.

For more information, contact Jessica Greathouse, 601 57th Street SE, Charleston, WV 25304, by phone at (304) 926-0499 Ext. 1549 or by e-mail at jgreathouse@wvdep.org.

The Public Information Office also manages the Youth Environmental Program, which targets kids K-12. The program offers speakers and learning opportunities for kids of all ages about the importance of conservation and environmental protection. To learn more about what the program has to offer, call (304) 926-0499 Ext. 1114.

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

C. Division of Water and Waste Management

7. West Virginia Nonpoint Source Program

The Nonpoint Source Program (NPSP) is funded by Clean Water Act Section 319 grants administered by the U.S. Environmental Protection Agency (EPA). The Program supports the efforts of four West Virginia state agencies to reduce nonpoint source pollution from various land use activities; the Department of Environmental Protection, the Conservation Agency, Division of Health and Human Resources and the Division of Forestry. The Programs' goals are to:

- Provide technical assistance in the proper installation and maintenance of Best Management Practices (BMPs).
- Educate the public and land users on nonpoint source issues
- Support citizen-based watershed organizations
- Support enforcement of nonpoint source water quality laws
- Restore impaired watersheds.

The goals of the Programs were spelled out in the *Nonpoint Source Program Management Plan 2000.*

The mission of the NPSP is to both support efforts to prevent nonpoint source pollution and to restore watersheds impaired by such pollution. This requires a wide range of activities and so there are two types of CWA 319 funds used in the Program, base and incremental. The base funds are used for supporting education, outreach, technical support, volunteer monitoring, and support for the statewide watershed management stakeholder process. Activities supported by base grant funds include agricultural workshops, logging workshops, oil and gas workshops, volunteer monitoring training sessions, and general nonpoint source education. The NPSP staff supported by the base grant has become an integral part of the entire watershed management effort. West Virginia relies heavily on the base program to foster watershed groups and agencies to prepare them for, and support them through, the challenging process of developing and implementing watershed based plans. In addition the NPSP has used some of the base funding to support special projects in watersheds that are threatened, but not part of a TMDL.

In watersheds with a TMDL the NPSP's incremental funds are used on water quality restoration of impaired waters. Choosing priority watersheds to target these funds and other resources is the role of West Virginia's Watershed Management Framework (WMF). When the WMF chooses a priority watershed a project team is established including all interested parties.

During 2004 the NPSP focused on developing Watershed Based Plans (WBPs) and implementing Clean Water Act Section 319 projects. The NPSP took the lead in establishing and coordinating watershed project teams, stakeholder committees whose

goals are to develop WBPs and design the projects included in the plans. The pace of project development increased significantly.

Some major accomplishments in the incremental program include the completion of the first two phases of projects in the Cheat River restoration effort. This involved a total of eight different acid mine drainiage (AMD) source sites. The first project in the effort to restore Deckers Creek, another AMD impaired watershed, has been completed. The North Fork of the South Branch of the Potomac and Spring Creek agricultural projects are nearing completion. In addition, three new WBPs have been approved and three more are revising the first drafts to submit the final draft.

a. Special Projects

Projects	319 Funds	Construction Status
North Fork (2 grants)	$565,670	On Schedule
Spring Creek (2 grants)	$300,850	On Schedule
Upper Buckhannon (2 grants)	$820,004	On Schedule
Robinson Run	$80,000	On Schedule
Perennial Grass Buffers	$130,352	Completed
Cheat River II	$420,774	Completed
Blaser AMD	$240,000	Completed
Mudlick Refuse & AMD	$90,000	2005
Long Branch AMD	$116,808	2005
Watershed Based Plans	$100,000	75% Completed
Inwood	$106,800	2005
Lower Elk	$125,854	2005
Upper Elk (Base)	$107,090	On Schedule
Slab Camp #2 AMD	$186,500	Completed
Morris Creek AMD	$341,060	2005
Total 15 projects 18 grants	$3,731,762	

The purpose of these incremental projects is to reduce the pollutant load in the rivers. Load reduction estimates can be made for the agricultural and other non-AMD projects based on modeling of BMP efficiency. Non-point source pollution is generally viewed as surface water pollution, however groundwater contamination can occur, especially in karst regions. This form of non-point source pollution usually involves nutrients and fecal coliform contamination in predominantly agricultural areas. The table below shows the tracked load reductions from 2004 in projects working in agricultural areas.

b. Load Reductions for Non-AMD Projects

Project	Nitrogen lbs/yr	Phosphorus lbs/yr	Sediment lbs/yr	Aluminum lbs/yr	Iron lbs/yr
North Fork South Branch	1,056,000	1,276,000			
Upper Buckhannon	484,000	622,000	1,150,000		
Robinson Run	28,894	10,667			
Spring Creek	34,999	10,769	2,479,400	208,272	2,511
Totals	1,603,893	1,919,436	3,629,400	208,272	2,511

The North Fork of the South Branch River has been determined to now be in compliance with water quality standards above criteria standards for listing the stream on the state's 303(d) list. The North Fork has been documented as a major success story for the Program and has been included in national nonpoint source publications. The Spring Creek project is in its final year and the WVDEP monitored the watershed in 2004. The results should be available in 2005. The Robinson Run Project is another project in its final year of implementation. Monitoring on it should be conducted in 2005. The Upper Buckhannon, Finks Run and Pecks Run Project was funded from FY 01 and FY 03 grants and is about 50% completed. However it is expected that additional proposals will be submitted.

West Virginia's NPSP maintains an active outreach, education and technical assistance component. NPS staff presented a wide variety of educational programs to hundreds of individuals and dozens of groups. Through environmental field days at local schools, over 2,000 youth and adults were informed of the importance of conserving their natural resources. The West Virginia Save Our Streams (WVSOS) Program, the volunteer monitoring component of the NPSP, held 42 workshops for education and training for citizens. The WVSOS program has expanded its types of training to include volunteer monitor assessment of sediment impacts.

In 2004 West Virginia hosted the *Canon Envirothon* for North America. The program was held at West Virginia Wesleyan College July 26 through August 1, 2004. Fifty-one teams, 43 from the U.S. and 8 from Canada, competed. The *2004 Canon Envirothon* is North America's largest high school environmental competition. NPSP staff helped with planning, logistical support, training and testing during the week and the aquatics section was supported by a 319 grant.

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division of Water and Waste Management

8. National Pollutant Discharge Elimination System (NPDES) Permit Program

The NPDES Permit Program is continuing its efforts in implementing the requirements of the Groundwater Protection Act and the rules promulgated under it. For existing and new industrial facilities, submission of a Groundwater Protection Plan with a permit application is required. Upon receipt of the plan, it is forwarded to a Groundwater Program staff geologist for review and follow-up actions.

For groundwater related issues at industrial facilities, the staff members closely work with the groundwater section personnel to provide necessary technical assistance. For discharge of groundwater generated because of groundwater clean-up activities, the section issues the required permit modifications or permits.

The General WV/NPDES Water Pollution Control Permit for Discharges Associated with the Remediation of Petroleum Contaminated Sites, which was reissued in 2003 and expires in August of 2008, helps to expedite groundwater cleanup by providing the permit coverage.

The General WV/NPDES Water Pollution Control Permit for Discharges from the Water Treatment Plants was issued in 2000 to provide permit coverage for discharges from water treatment plants. This general permit requires submission of Groundwater Protection Plans from the applicants.

NPDES permits for industrial facilities also require submission of Best Management Practices (BMPs) plans which promote improved housekeeping practices, improved diking for storage facilities, improved loading/unloading practices for chemicals, etc. Thus, BMP plans help to protect groundwater at industrial sites. Similarly, in case of storm water discharges from industrial sites, Storm Water Pollution Prevention Plans (SWPPP) are required in NPDES permits and in the Storm Water General Permit. These plans also help indirectly to protect groundwater at industrial sites.

The statistical data for the Permit Section for the fiscal year of 2005 (July 1, 2004 - June 30, 2005) is as follows:

1. Number of individual WV/NPDES permits issued: 116
2. Number of General Permit Registrations issued: 3357
3. Number of modifications of individual WV/NPDES permits and General Permits Registrations issued: 185

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division of Water & Waste Management

9. Watershed Branch

The Watershed Branch was created in March 2002 from the joining of two existing programs, the Watershed Assessment Program (WAP) and the Total Maximum Daily Load (TMDL) Program.

The WAP was designed to study tributaries, drainage areas and entire watersheds instead of specific streams or stream segments. WAP has chosen a specific combination of physical, chemical, and biological variables to help determine the streams' health and what types of stressors may be operating on the benthic (aquatic bottom-dwelling) community.

The streamside and instream habitats and the benthic macroinvertebrates (bottom-dwelling animals that do not have backbones) are the center of the ecological assessment. Habitat evaluations are important to the assessment because they reflect the physical conditions that support the benthic community. The benthic community is crucial because it reflects environmental conditions over an extended period of time. Other parameters, such as dissolved oxygen concentration, are important, but may reflect recent fluctuations in environmental conditions. A contaminant that flowed through the reach a week ago, for example, would be reflected by the impaired benthos, but probably, would not be revealed in a water sample.

Assessments are performed on a watershed basis. To better manage the state's water resources, West Virginia has been divided into 32 watersheds, or hydrologic regions. Each watershed is assessed every five years, according to the state's watershed management framework.

Each year WAP will assess the water quality in approximately one fifth of the watersheds in West Virginia. All thirty-two (32) watersheds will be assessed in a five-year period (see table below). These assessments will be used to develop and modify plans for protecting and enhancing West Virginia's water quality.

In September, 2005, the program completed its second five-year cycle. However, the analysis of data and drafting of reports is proceeding slower than the collection of samples. As of September, 2005, reports had been completed for only group A and B watersheds utilizing data collected during 1996 and 1997, respectively, and two group C watersheds, the Lower Guyandotte utilizing data collected in 1998, and the Potomac Direct Drains watershed, utilizing data collected in 1998 and 2003.

Beginning with the Potomac Direct Drains watershed, future watershed reports will combine two cycles worth of data. The Tug Fork River watershed, sampled in 1998 and 2003, will be published in the fall of 2005. Work has also begun on the Middle Ohio North and South Watersheds, which will be combined into one report covering the years 1998 and 2003.

West Virginia Watershed Assessment Schedule				
Group A-2001	Group B-2002	Group C-2003	Group D-2004	Group E-2005
Cheat River	Elk River	Tug Fork River	Greenbrier River	Cacapon River
Shenandoah River 1 & 2	Coal River	Lower Guyandotte River	James River	Upper Guyandotte River
South Branch of Potomac River	Lower Kanawha River	Gauley River	Little Kanawha River	Twelvepole Creek
Upper Kanawha River	North Branch of Potomac River	Middle Ohio River North	Upper New River	Upper Ohio River South
Northern Upper Ohio River	Tygart Valley River	Middle Ohio River South	Lower New River	Lower Ohio
Youghiogheny River		Potomac River Direct Drains	Monongahela River	Big Sandy River
				West Fork River
				Dunkard Creek

A number of sites are selected for duplicate sampling to provide for quality assurance/quality control checks on sampling techniques, sample handling procedures and sample analysis procedures. In addition, WAP holds a spring refresher training session before the sampling season each year to ensure that all field staff are obtaining water quality and biological samples in a consistent manner at all sites.

WAP tries to identify sources, both regulated and non-regulated, and the severity of impacts on streams in watersheds throughout the state. For instance, fecal coliform bacteria from open pipe discharges, failing septic systems, failing sewer lines, inappropriate animal waste management techniques, and "collect and dump" sewage treatment activities is a major stressor on the groundwater and surface waters in West Virginia. By identifying streams with violations of the criteria for fecal coliform bacteria, WAP has identified sub-watersheds with groundwater that is likely impaired by fecal

coliform bacteria. Since fecal coliform bacteria is usually filtered out by groundwater seeping through soil, sand and rock, additional studies must be conducted to confirm the potential impairment of groundwater. However, in karst areas, where groundwater is not subjected to as much filtering, the presence of fecal coliform bacteria in streams is a clear indicator that groundwater pollution has occurred "upstream".

By identifying streams impacted by acid mine drainage, WAP has identified areas where the groundwater also is likely impaired. By helping identify these areas WAP has made it possible to target remediation efforts in areas before massive "blow-outs" of mine water occur with the resulting destruction of fish and benthic communities.

WAP has developed and maintains the 303(d) list of impaired waters. These impaired waters have, in some cases, been linked to contaminated groundwater. This, perhaps, is the single greatest contribution to groundwater protection by WAP. For example, dioxin found in the Lower Kanawha River has been traced to groundwater seeping through abandoned hazardous waste dumps. The United States Environmental Protection Agency completed a Total Maximum Daily Load (TMDL) for dioxin on this river segment in September 2000.

TMDLs are required by the federal Clean Water Act. In simple terms, a Total Maximum Daily Load is a plan of action used to clean up streams that are not meeting water quality standards. The plan includes pollution source identification and strategy development for contaminant source reduction or elimination. Additionally, TMDLs are being conducted under the 1997 settlement of the lawsuit, *Ohio Valley Environmental Coalition, Inc., West Virginia Highlands Conservancy, et. al. v. Browner, et. al.*, which sought state and federal aid to improve and maintain West Virginia's water quality. The lawsuit resulted in a consent decree between the plaintiffs and the U.S. Environmental Protection Agency (EPA). The consent decree established a rigorous schedule for TMDL development, requiring the federal agency to develop over 500 TMDLs from West Virginia's 303(d) list of impaired streams by March 2006.

After settlement of the lawsuit in 1997 and the resulting consent decree, the EPA began developing TMDLs for West Virginia streams, with the DEP providing onsite logistical and technical support. However, beginning with the Upper Kanawha River in 2001, the DEP took the lead in developing TMDLs for state waters.

The DEP secured an initial appropriation of $195,000 from the 2000 legislature for the TMDL program. This appropriation enabled the DEP to hire a core staff of professionals to oversee the transition of TMDLs from the EPA to the state. The most recent appropriation from the legislature for TMDLs (FY2006) was $1.4 million dollars. This level of funding will enable the DEP to complete TMDLs that were mandated by the 1997 consent decree, as well as initiate future TMDLs on impaired waters in accordance with Clean Water Act requirements.

In future years, it is likely that additional cases of stream contamination documented on the 303(d) list will be traced back through groundwater to their original sources. WAP will then be able to propose remediation and restoration activities to improve groundwater and surface water quality in West Virginia.

WAP does not directly collect data on groundwater quality or quantity. However, WAP has an agreement with the U. S. Geological Survey to work with the *Ambient Groundwater Quality Monitoring Network*. This data is collected by USGS and stored in the STORET database on the Internet for access by interested parties. WAP currently uses Microsoft Access and the EPA's STORET database to manage surface water quality information.

WAP uses ESRI/Arcview software to identify the location of sampling sites, geologic and land use patterns upstream from the sampling sites, and similar data. WAP also uses this program to print maps showing the geographic distribution of violations in a watershed.

Data collection and management could be improved by developing a series of shared "read-only" databases on the internal network accessible to all DEP employees. Development of separate databases available only to selected programs or selected people within programs will never be an acceptable option.

WAP is cooperating with the rest of DEP in the development and implementation of a database (EQuIS) that will provide a clear picture of the water quality based on the physical and chemical characteristics and the biological life existing in all of West Virginia's waters, both groundwater and surface waters.

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
D. Information Technology Office (ITO)

Technical Applications and Geographic Information Systems (TAGIS) Application Development and Support (ADS)

DEP's Information Technology Office (ITO) provides DEP with a wide variety of support for the acquisition, storage, evaluation, and transfer of environmental information. This support ranges from technicians installing and repairing hardware through programmers deploying custom applications to networking engineers providing the infrastructure for the exchange of information of all kinds.

DEP's Environmental Resource Information System (ERIS) is a custom tracking system developed in-house by ITO to handle permitting, inspection and enforcement activities of many of DEP's regulatory programs, including the aspects of those programs that affect the monitoring and protection of groundwater of the state. ERIS also allows the agency to invoice and collect groundwater protection fees that fund the ongoing work of the program offices that are directly responsible for protecting the environment.

ERIS also directly tracks a growing number of specific groundwater-related entities, including 1,774 registered groundwater-monitoring wells and 301 permitted underground injection wells.

ITO has also worked closely with EarthSoft, Inc. to deploy the Environmental Quality Information System (EQuIS), a system that tracks geological and chemical environmental monitoring data. EQuIS was, at first, a desktop application for tracking environmental data from a single project at a time. Over the past 3 years, EarthSoft and ITO have worked together to re-engineer EQuIS into an enterprise-wide system which allows environmental workers to use all existing information about any specific location of interest across departmental boundaries.

By implementing a central data repository and a uniform format for the information collected, WVDEP's goal is to expedite the transfer of information and data between WVDEP personnel and WVDEP data providers. For the first time in the history of the agency, all of the environmental programs will be able to evaluate or cross reference each program's data for a given facility or project. This will increase efficiency by allowing WVDEP data providers to fully understand WVDEP requirements, and to communicate these requirements to its employees and contractors.

Along with being a central repository for data and information, EQuIS acts as an interface with many third-party software packages. Frequently, effective management does not occur due to poor communication between involved parties or the disparity of

tools used to get the work accomplished. The EQuIS system uses ESRI's ArcView as a "data broker" to serve data to several different analysis applications within a GIS environment. (ESRI's ArcView is an industry standard system for visualizing geographic and geologic data as layers of a display.)

The EQuIS ArcView GIS Interface provides a flexible yet simple means of accessing, analyzing, and viewing geology and environmental chemistry from within ESRI's ArcView GIS. EarthSoft's EQuIS Chemistry and EQuIS Geology extensions make available many options for 1D, 2D, and 3D visualization and modeling, as well as reporting and enhanced labeling options. The EQuIS interface will allow managers to make effective and timely decisions without the complication of needing to process data for the modeling and forecasting programs used to analyze the chemistry data.

The size of the EQuIS database is expected to grow exponentially as more users are brought online. To date, 531 facilities are registered in the database. These facilities have 8,441 sampling locations. There have been 1,300,770 test results recorded in the EQuIS database. This will be one of the largest environmental information databases in the agency which will be accessible to DEP employees and the public, and all this data relates to the condition of and protection of groundwater resources throughout West Virginia.

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
E. State Water Pollution Control Revolving Fund (SRF)

The SRF began operation in 1991 as a financial assistance program to help municipalities and public service districts comply with state and federal water quality laws. Prior to 1991 a federal construction grants program provided most of the needed funding for wastewater collection and treatment systems. These “point source” pollution control problems continue today to be the primary focus of the SRF program. Over $474 million has been committed to 193 community sewer projects since the program began over 14 years ago.

In addition, Federal law allows the SRF program to address other water quality problems, within certain limits. Non point sources of pollution fall into this category. In 1997 the West Virginia Agriculture Water Quality Loan Program was established after a successful pilot program addressed the poultry industry and its contribution to water quality problems in the eastern panhandle. In 1999 this program was expanded statewide and included other animal best management practices eligible for funding. As of June 30, 2005, over $4.2 million in SRF funds have been loaned to local participating banks that, in turn, make individual loans to eligible borrowers.

Currently, the program is looking at ways to fund on-site septic system improvements, repairs, or replacements for homeowners. Decentralized systems are also being reviewed for funding.

One of the long-term goals in the SRF is to address the issue of other non point source pollution problems in West Virginia and to use SRF dollars, if possible, to correct existing problems that cause groundwater and surface water contamination. This is truly a total team effort among the many programs within the Division of Water and Waste Management. The SRF can be a useful tool in the future for addressing priority watersheds where water quality standards are not being met.

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
F. Environmental Enforcement

The Environmental Enforcement (EE) office is primarily responsible for inspection and enforcement of the state and federal solid waste and water pollution control laws. EE's groundwater objective is to investigate all reports of contamination that fall within its jurisdiction and to refer all reports of contamination that are not under its jurisdiction to the appropriate authority.

The Compliance Monitoring Unit of the Environmental Enforcement Section of DEP has been assigned the responsibility to conduct Groundwater Sampling Inspections (GSI's) at various facilities throughout the State. Primarily, these facilities are active and inactive municipal and industrial landfill sites. The sites selected for sampling come from requests from DEP's permitting staff, regional inspectors/supervisors and the discretion of the Compliance Monitoring unit.

At present, only one position has been funded to do Groundwater Sampling Inspections (GSIs). Additional staffing is needed to adequately address all the groundwater sites within the State. DEP's present grant commitment is for 6 GSIs per year. With the low level of staffing in the Monitoring Unit, it will be difficult to do any more than just the commitment numbers with all the other job responsibilities assigned to this unit.

The Department of Environmental Protection's *Quality Assurance/Quality Control Plan for Standard Operating Procedures for Groundwater Sampling 2000* is used by the Monitoring Unit as a guide when conducting GSIs.

Generally, all landfill sites will have a minimum of 4 groundwater monitor wells. The number of wells per site will depend on the size of the landfill and could be as high as 20 or more. Data collected from these wells depend upon whether it is an industrial or a municipal landfill. Municipal landfills generally have the same parameters (Phase I) as outlined in 33 CSR Appendix I.

Groundwater data collection methods are primarily by compressed air operated bladder pumps or bailers. All samples for organics analysis are collected by teflon bailers. All samples are collected, preserved, and analyzed in accordance with 49 CFR. Groundwater samples are analyzed by State certified laboratories.

The groundwater collection equipment has been recently upgraded. The old style bladder pumps were replaced by micro-purge electric pumps. Additional training on this equipment will be completed this fall.

The Pre-Closure Program continues the review of industrial facilities that are in the process of ceasing operations. The review process allows EE to ensure that all known contamination is remediated. All groundwater wells present at the sites are sampled during this process. When contaminated soil is identified at the facility, remediation is required under the Groundwater Protection Act.

The complex interaction of groundwater, geology, and chemistry needs to be addressed on a more frequent basis with technical training to all staff, and newer staff in particular. Hands on experience with groundwater monitoring and sample preservation would be of assistance.

EE recognizes the need for a centralized database system that is accessible to all inspectors and other agency staff. EE maintains hard copy files on groundwater complaints, investigations, Notices of Violation (NOVs), enforcement actions, spills, Well Head Protection Areas, reports on groundwater flow mapping, groundwater quality data, and monitoring well data for landfills and industrial sites. Due to storage limitations, this information cannot be maintained in accessible files for extended periods of time. Currently, the only utilization of the ERIS database is for permit information. EE plans to utilize the EQuIS database to store data generated by EE personnel.

Additional groundwater related activities include evaluation and corrective action of certain Animal Feeding Operations (AFO) in the eastern panhandle and the Greenbrier River Valley and corrective action associated with the Allied/Honeywell groundwater remediation project.

In addition, EE personnel responded to 433 spills and complaints that had the potential to impact our groundwater.

V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
G. Division of Land Restoration

In reviewing surface mining legislation in the mid–1970's, Congress found that more than 1.5 million acres of land had been directly disturbed by coal mining and more than 11,500 miles of stream had been polluted by sedimentation or acidity from surface or underground mines. In response to the problems associated with inadequate reclamation of coal mining sites, Congress enacted the Surface Mining Control and Reclamation Act of 1977 (SMCRA).

The two main purposes of SMCRA are (1) to establish a nationwide program to protect society and the environment from the adverse effects of surface mining operations while assuring that the coal supply essential to the Nation's energy requirement is provided and (2) to promote the reclamation of mined areas left without adequate reclamation before SMCRA was passed. Title V of SMCRA deals with active mining; Title IV deals with specifically with the problems associated with inadequate reclamation of Abandoned Mine Lands (AML).

In Title IV, Congress established the Abandoned Mine Reclamation Fund (Fund) to be used for the reclamation and restoration of areas affected by past mining. The Fund is derived from a reclamation fee collected from coal mining operators on each ton of coal mined since SMCRA was passed. Collection of the reclamation fee was authorized for 15 years after the date of enactment of SMCRA, to August 3, 1992. Subsequent amendments to SMCRA contained in The Abandoned Mine Reclamation Act of 1990 (AMRA) and in The Energy Policy Act of 1992 (EPACT) changed certain aspects of Title IV. AMRA extended the fee until September 30, 1995, EPACT extended it to September 30, 2004 and the recent FY2005 congressional appropriation processes extended the program to September 30, 2005. Another extension was authorized through June 30, 2006.

West Virginia received primacy of the AML program February 21, 1981 and the Department of Environmental Protection, formerly the Department of Natural Resources, was designated by our Governor to operate this program with funding provided from the AML Reclamation Fund. The Office of Abandoned Mine Lands and Reclamation (AML&R) was established within the Department of Environmental Protection.

The Mission Statement of the West Virginia Office of Abandoned Mine Lands and Reclamation is "To Protect public health, safety, and property from past coal mining and enhance the environment through reclamation and restoration of land and water resources".

Along with our Vision Statement that states, “The Abandoned Mine Lands and Reclamation Program efficiently and effectively uses all available resources to achieve a long term benefit to public health, safety, property and general welfare while restoring the environment to pre–mining conditions.”

The Strategic Goals are to (1) improve proficiency of resources, (2) increase resources, (3) develop and improve employees conditions and (4) cooperation.

The AML&R organizational structure is divided into the following groups:

1. Administration & Financial - This group performs the accounting function for the Office. They track expenditures related to administrative and construction functions responsible for management of grants, budgets and financial administration of AML&R.

2. Realty - Tasks performed by this group include gaining Rights of Entry from property owners so that exploration and construction can be conducted to address abandoned mine land problems. Also, the group's responsibility includes determining if before-and-after appraisals are necessary for the purposes of lien actions.

3. Planning The Planning segment of this group is responsible for identifying abandoned mine land problems. Various tasks must be performed for each project including preparation of an Environmental Assessment in compliance with the National Environmental Policy Act (NEPA), a description of each project, and a preferred alternative for correcting the problem. Another responsibility is maintenance of the West Virginia Abandoned Mine Land Inventory.

4. Emergency - This group is responsible for administering and conducting the Emergency Reclamation Program.

5. Construction - The main task of the Construction group involves Contract Administration and overseeing actual construction of abandoned mine land projects. This includes inspection of sites during construction. Other tasks include conducting pre-bid and pre-construction conferences and final inspections.

6. Design & Internal Design - This group approves all consultant plans and specifications involving abandoned mine land projects. They also evaluate and select a design consultant to perform all necessary preparation of plans and specifications for projects. This group also administers exploratory drilling, aerial mapping and surveying contracts.

SMCRA defined eligible sites under Title IV as those sites which were mined for coal and left in an inadequate state of reclamation prior to August 4, 1977, and for which there is no continuing reclamation responsibility under State or Federal law. The definition of eligibility was extended in 1992 to sites that were mined for coal after August 4, 1977 and abandoned before the date the Secretary of the Interior approved a

regulatory program for the State in which the site is located. West Virginia received approval of its regulatory program January 21, 1981.

The expenditures of moneys from the Fund on lands and water eligible for the above shall reflect the following priorities in the order stated:

1. Protection of public health, safety, general welfare, and property from extreme danger of adverse effects of coal mining practices;

2. Protection of public health, safety, and general welfare from adverse effects of coal mining practices;

3. Restoration of land and water resources and the environment previously degraded by adverse effects of coal mining practices;

4. Protection, repair, replacement, construction, or enhancement of public facilities such as utilities, roads, recreation, and conservation facilities adversely affected by coal mining practices; and

5. Development of publicly owned land adversely affected by coal mining practices.

The Office of Surface Mining (OSM) developed and maintains an inventory of abandoned mine problems. OSM maintains the system to provide information to meet the objectives of Title IV of SMCRA. AMLIS has been and will continue to be the planning tool of the program.

When a problem area is entered into AMLIS, the estimated cost of repairing the damage is included. (Costs related to design, inspection, and program administration are not included.) When a problem area on the inventory is funded, it is moved to the funded category. Later, when the actual construction is completed, the problem is again moved, this time to the completed category. In this manner, a complete history of the abandoned mine land problems are maintained in AMLIS. The total unfunded costs of all priorities in West Virginia as of September 30, 2005 are $1,231,231,176.

Our Mission Statement for AML&R states, “To protect public health, safety, and property from past coal mining and enhance the environment through reclamation and restoration of land and water resources.” The AML&R must restore, reclaim, abate, control, or prevent the adverse effects past coal mining practices as referenced in the AMLIS for West Virginia using “The AML Process” in achieving the success and the continuing success in the Abandoned Mine Lands Program. The “Summary of Problem Types” below shows the strong trend of the program in protection of the public health and safety from priority 1, & 2.

PROBLEM TYPES	UNITS	January 1, 2004	September 30, 2005	TOTAL
Clogged Streams	Miles	48.4	53.2	4.8
Clogged Stream Lands	Acres	160.3	177.3	17
Dangerous Highwall	Feet	234143	256505	22362
Dangerous Impoundments	Count	589	655	66
Dangerous Piles & Embankments	Acres	5286	5586.2	300.2
Dangerous Slides	Acres	519.6	567.2	47.6
Gases: Hazardous/Explosive	Count	5.3	5.3	0.0
Hazardous Equipment & Facilities	Count	620.8	671.8	51
Hazardous Water Body	Count	11	12	1
Industrial/Residential Waste	Acres	35.8	37.3	1.5
Portals	Count	2469	2600	131
Polluted Water: Agric. & Industrial	Count	53.1	68.3	15.2
Polluted Water: Human Consumption	Count	9878	11084	1206
Subsidence	Acres	316.8	387.1	70.3
Surface Burning	Acres	473.1	494.1	21
Underground Mine Fire	Acres	20.3	28.3	8
Vertical Opening	Count	145.3	156.3	11

The goals, objectives, and measures are representative of the success that the AML program has achieved. Proof of that success is demonstrated by four main goals: eliminating health and safety hazards related to past mining, enhancing the well being of people in mined areas, improving the mine-scarred land and water resources, and improving the use of financial resources dedicated to protecting the public from adverse effects of past mining.

VI. DEPARTMENT OF HEALTH AND HUMAN RESOURCES
Office of Environmental Health Services

A. Public Health Sanitation Division

Two Groundwater Protection Programs are operated by the Public Health Sanitation Division. These include the permitting and approval of individual water supplies and individual sewage systems. The goal of the individual water supply program is to insure that individual water wells are properly constructed and located at the required distances from potential pollution sources. This program is carried out through local health departments and includes permitting, inspections, and water sampling. The Public Health Sanitation Division provides technical assistance to local health departments by assisting with complaint investigations and design of remedial systems for the correction of failures.

Individual Water Supply Program

Local health departments collect water samples upon request to determine bacteriological and chemical conditions of individual and public water groundwater supplies. Complaints related to groundwater protection which are not regulated by state or local health departments are referred to the appropriate agency for response.

Individual Sewage Program

The individual on-site sewage program involves the plan review, site evaluation, inspection, and complaint investigation of on-site sewage systems in West Virginia. The goal of this program is threefold: 1) protect the groundwater, 2) insure all new building sites utilizing on-site sewage disposal have a suitable on-site sewage disposal reserve area that will accommodate the initial system and have space for future repairs, and 3) correct failing systems to prevent a public health hazard. Local health departments are responsible for on-site systems up to 3,000 gallons per day (plan review, site evaluation, permitting, inspection, and approval). The Public Health Sanitation Division issues permits for surface discharge systems (under 600 gallons per day) that qualify for an N.P.D.E.S. permit, conducts training and certification of septic installers, develops and interprets rules and design standards, develops operating procedures and guidelines, investigates complaints, and reviews new technology.

The Public Health Sanitation Division revised the individual sewer system design standards, which were presented to the Legislature and were approved. These design standards became effective on July 1, 2003 and include the following groundwater protection measures:

- Eliminates homemade septic tanks and metal septic tanks, which are prone to leaking into the groundwater.

- ❖ Prohibits standard soil absorption systems in rapidly permeable soils, which would not properly filter the effluent before discharging to groundwater.

- ❖ Addresses new treatment technologies not contained in the 1983 Design Standards.

The Individual Sewage Program will be faced with many new challenges in the coming year. The use of new treatment technologies coupled with the fact that most of the good sewage sites are already occupied creates a tremendous taxation on the minds and creative abilities of the Health Department personnel employed to address these problems. Diligence and perseverance will be needed to meet these challenges.

VI. DEPARTMENT OF HEALTH AND HUMAN RESOURCES
Office of Environmental Health Services

B. Well Head Protection Program

1. Ground Water Protection Goals

West Virginia's Wellhead Protection (WHP) and the Source Water Assessment and Protection (SWAP) programs are innovative programs to protect West Virginia ground and surface water from future contamination. The Environmental Engineering Division (EED) of the Office of Environmental Health Services (OEHS), Bureau for Public Health (BPH) of the West Virginia Department of Health and Human Resources (DHHR) is the lead agency for implementation and administration of these federally mandated programs. The EED relies on participation and involvement of federal, state, and local agencies, industry, agriculture, environmental groups, public water supplies, and the public at many levels to protect the surface and ground waters of the State and the health of the people of West Virginia.

The federal *Safe Drinking Water Act* (SDWA) amendments of 1986 required states to develop and implement the WHP program for all groundwater public water supply wells. West Virginia WHP program was approved by the United States Environmental Protection Agency (US EPA) on December 17, 1992. The WHP program will continue during and after the SWAP program inventories and assessment reports are completed.

In 1996, amendments to the SDWA required states to develop and implement the SWAP program requiring assessments for both surface and ground water sources of all public drinking water supplies. The US EPA in November 1999 approved West Virginia's SWAP program. The SWAP program mandates that source water assessments will be conducted for nearly 1215 public water systems using groundwater and surface water. The SWAP/WHP programs do not impose any new mandates or regulations for protecting sources of public drinking water. However, the completed assessment reports will be used to encourage local communities to develop protection activities to protect their drinking water supplies.

The overall goal of the SWAP/WHP programs is to gather and utilize meaningful information to assist source water protection efforts and the overall drinking water program in the State. There are approximately 1344 (1095 groundwater) surface and groundwater intakes serving the State's public water systems. Efforts to identify significant potential sources of contamination will focus on the greatest threats to drinking water and guide future source water protection efforts. The SWAP/WHP programs maximize the use of existing information, require integration with existing state and federal programs and use Geographic Information System (GIS) to map delineations and assessments with the emphasis on the local partnerships.

2. Program Milestones and Future Priorities

A SWAP/WHP water assessment provides information on the potential contaminant threats to public water sources. Each source water assessment:

- defines the part of the watershed or groundwater area that may contribute water to the water supply (source area delineation);

- identifies the potential significant contaminant sources of drinking water contamination in those areas (contaminant source inventory);

- determines the likelihood of the water supply becoming contaminated (susceptibility analysis). The finished susceptibility assessment will indicate the direction and intensity of subsequent source water protection efforts; and

- local communities and water supply systems, working in cooperation with state agencies, can use the information gathered through the assessment process to create a broader source water protection program to address current problems and prevent future threats to the quality of the drinking water supplies (emergency planning and land management).

A new procedure implemented and required by SWAP is the susceptibility analysis, defined as the potential likelihood for a public water supply to draw water contaminated at concentrations that would pose a drinking water concern. The susceptibility analysis should provide an indicator for actions a public water system should take to further define and present the result to the public in a summary assessment report. The results of the assessment are to be used as a basis for developing contingency/ emergency and land management plans.

West Virginia WHPP/SWAP accomplishments for currently active groundwater systems are:

- local wellhead protection programs have been initiated for 733 of the currently active 748 systems;

- wellhead protection areas have been delineated for 733 systems;

- contaminant surveys have been approved 723 of the currently active systems; and

- 126 Emergency/Contingency and land Management Plans have been approved for the 207 active community groundwater systems.

Some public water supply systems have already initiated protection activities,

such as the Wellhead Protection Program, to protect their source water areas. Capitalizing on efforts already implemented will enable the community to achieve a greater level of detail, revisions to their existing plans, and a more accurate delineation. Direct participation with the activity will place the community in a key position to lead local efforts designed to safeguard the source water facility investment.

Several aspects of the SWAP/WHPP plans are of interest to local officials:

- Source water assessments will help municipalities that own or operate public water systems plan source water protection efforts;

- Completing source water assessments may support relief from certain water monitoring requirements, thereby reducing associated costs; and

- Completing source water assessments will better define source water areas, including those that transect political and/or other inter jurisdictional boundaries.

The SWAP/WHPP programs have continued to participate in joint groundwater protection efforts with the following groups:

- West Virginia Rural Water Association (WVRWA). Working under a US EPA grant through the National Rural Water Association, groundwater technicians from WVRWA continue to support many local wellhead protection programs.

- The Underground Injection Control (UIC) Program of the WV Department of Environmental Protection (DEP) in inspecting and inventorying any potential Class 5 injection wells and underground storage tanks within the wellhead or source water protection area.

- Volunteer groups have been another significant source of assistance in the development of local WHP programs. Volunteers have contributed much valuable time in completing potential contaminant surveys. Many community leaders have donated their time on local wellhead protection committees. Without their assistance, the local WHP programs could not have progressed beyond the initiation stage.

- A Memorandum of Understanding (MOU), consigned by a number of state groundwater regulatory agencies, has resulted in coordinated efforts by all of the agencies to protect ground water in the delineated WHP area. These areas are top priorities in the regulatory efforts of the various agencies. The MOU has thus enhanced the WHP program ability to protect the ground water used by potable water supply systems. The existing MOUs have been updated to include the addition of the Source

Water Protection Plan.

- Both the SWAP and WHP programs have technical and citizen committees comprised of agency representatives and other affiliates from various Department of Environmental Protection (DEP) Offices, such as Water and Waste Management, Oil and Gas, Mining and Reclamation, and Environmental Enforcement. Also represented on the committee are the Department of Agriculture/Pesticide Division, the Division of Highways, the Public Service Commission, the Office of Emergency Services, the West Virginia Rural Water Association, private citizens, manufacturing, public water suppliers, and the Bureau for Public Health's Office of Environmental Health Services.

In addition, the WHPP/SWAP programs have helped protect the integrity of the State's groundwater sources in a number of other ways:

- Participate or developed regulations and design standards for water supply wells and monitoring wells.

- Certification program for water well drillers, based upon driller experience, examinations, and bonding/letter of credit requirements.

- Permits for new public water wells now require an initial survey for potential sources of contamination within 2000 feet of proposed well location with site specific information used when available.

- Developed a method for determining whether groundwater sources are under the direct influence of surface water (GWUDI).

- Developed a new procedural guide template for the WHP and SWAP process to assist communities and consultants in preparing plans for both ground and surface water Public water Supply Systems (PWSS). The templates describe what level of detail should be provided for an acceptable plan.

- Established web site that contains a list of available publications and a copy of the SWAP program plan. The EED plans to put the assessments on the web site as they become available. This will be an important way for the public to find out about the susceptibility of their community water supply.

- The EED is committed to working with interested communities to protect their water supplies. Particularly as the source water assessments are completed, the EED will make the information available to each community and make staff available to discuss the results of the assessments and the need for additional protection efforts. The

assessment reports will help prioritize those communities where protection efforts are most critical. The EED also intends to explore ways to get counties involved in the WHP process.

- The EED is supporting efforts to develop advanced WHP delineations for communities in the state. The US Geological Survey has been instrumental in development of Modflow groundwater models in the state where there have been suitable geologic conditions for modeling.

- Continue to support the efforts of the West Virginia DEP, Division of Water and Waste Management and the United States Geological Survey with its groundwater ambient water quality studies. This program has strived to benchmark raw water quality data for West Virginia aquifers. West Virginia is trying to identify the impacts of various land uses on water quality. This information will help West Virginia avoid future contamination events.

3. Ground Water Data Collection and Management

The WHP/SWAP programs acquire a variety of data, including locations and characteristics of public water supply sources, point of entry, potential contaminant sources, description of watersheds, hydrogeologic settings, and aquifer parameters. This data continues to be collected through field data collection activities, contractor services, and programs within federal, state, and local agencies.

4. Future Program Needs

West Virginia BPH, to date, has hired additional staff and spent a significant amount of time in developing the WHP/SWAP programs, creating a GIS for collection and storage of geologic/hydrologic data, the regulatory site data, delineations, and existing significant contaminant source inventories. Potential future Source Water Protection program needs are as follows:

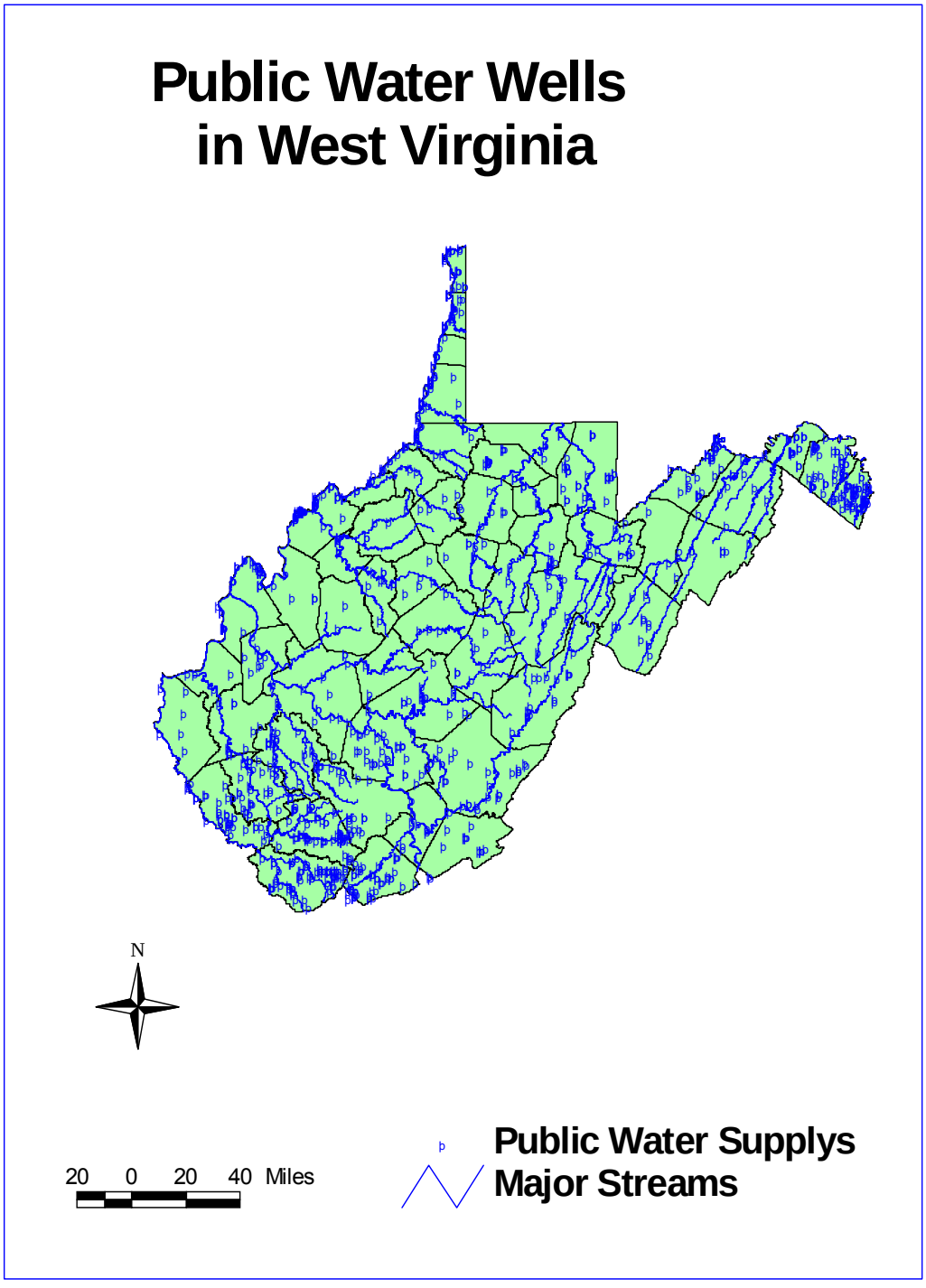
- Grants to local communities for groundwater protection activities such as establishment of Wellhead Protection Programs and pursuing protection plan development and implementation. Protection strategies are the most critical aspect of the program and need to be funded in the future**.**

- Pollution prevention technical assistance to small businesses located within wellhead protection areas to balance Brownfields redevelopment with local water protection/restoration efforts.

- Public education efforts such as groundwater components for natural resource curriculum for grades K-12.

- Groundwater quality monitoring to support activities mandated by the

SDWA and the Clean Water Act.


Public Water Wells
in West Virginia
N
20 0 20 40 Miles
Public Water Supplys
Major Streams

Appendix A

Regulatory Agencies with Groundwater Responsibility and Authority

Department of Agriculture

1900 Kanawha Blvd., E.
Charleston, WV 25305
(304) 558-3708

Department of Environmental Protection

Division of Mining and Reclamation
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0490

Office of Abandoned Mine Lands and Reclamation
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0480

Office of Oil and Gas
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0450

Office of Waste Management
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0465

Office of Environmental Remediation
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0455

Rehabilitation Environmental Action Plan (REAP)
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0455

Solid Waste Management Permitting Unit
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0448

Appendix A (continued)

Regulatory Agencies with Groundwater Responsibility and Authority

Department of Environmental Protection

Division of Water and Waste Management
601 57th St., S.E.
Charleston, WV 25304

DWWM/Groundwater Program
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0495

Public Information Office
Youth Environmental Program
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0495

Non-point Source Program
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0495

National Pollutant Discharge
Elimination System (NPDES)
Permit Program
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0495

Watershed Assessment Section
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0495

Appendix A (continued)
Regulatory Agencies with Groundwater Responsibility and Authority

Department of Environmental Protection

Office of Administrative Services
Information Technology Office
601 57th St., S.E.
Charleston, WV 25304
(304) 926-1615

Environmental Enforcement
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0470

Department of Health and Human Resources

Office of Environmental Health Services
Capitol and Washington Sts.
1 Davis Square, Suite 200
Charleston, WV 25301
(304) 558-2981

Environmental Engineering Division
Capitol and Washington Sts.
1 Davis Square, Suite 200
Charleston, WV 25301
(304) 558-2981

Public Health Sanitation Division
Capitol and Washington Sts.
1 Davis Square, Suite 200
Charleston, WV 25301
(304) 558-2981

Appendix B

Division of Water and Waste Management - Groundwater Program, Department of Health and Human Resources - Office of Environmental Health Services, and the United States Geological Survey Study of Ambient Groundwater Quality in West Virginia

Data Tables From 2004

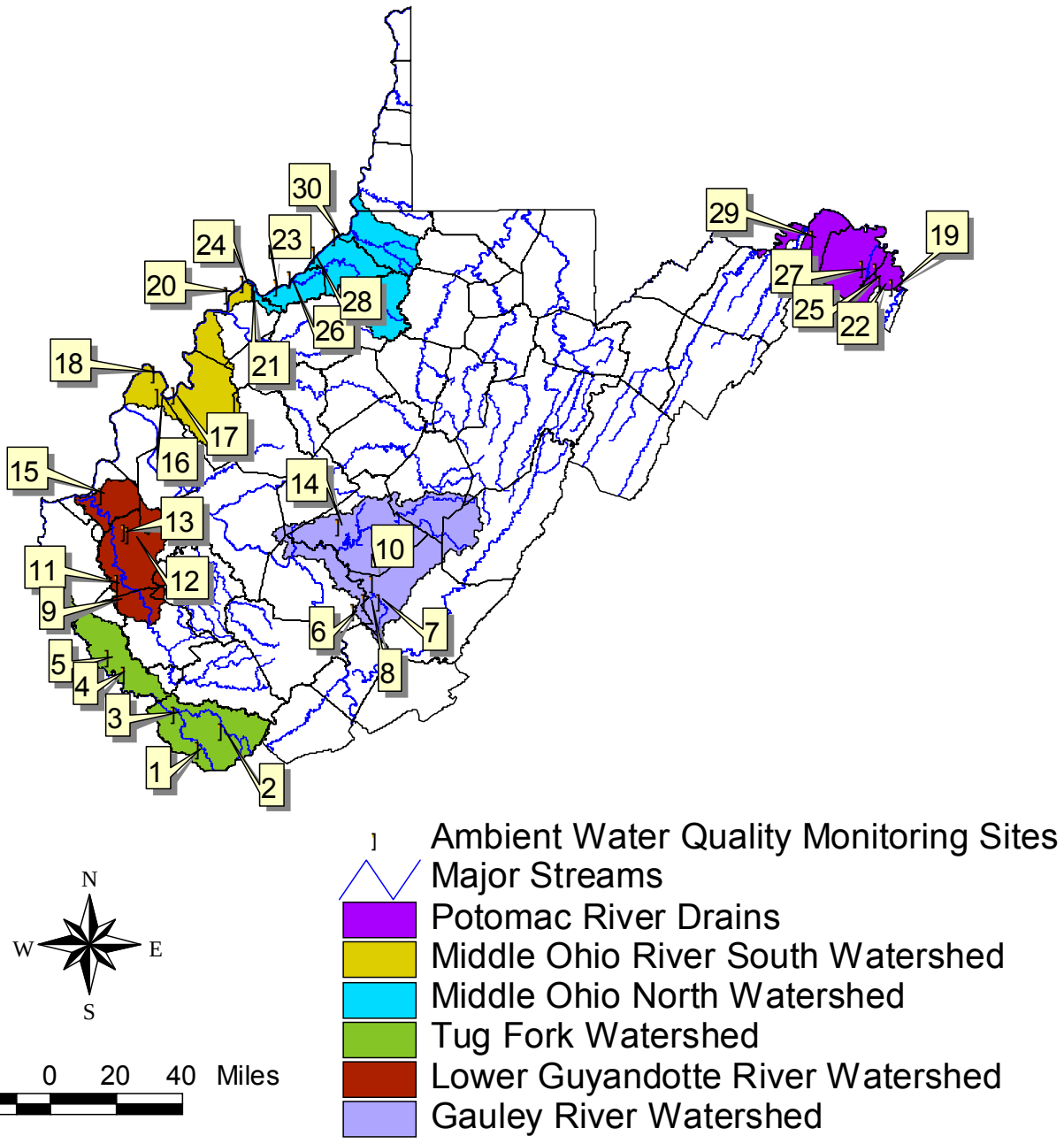
Note: Groundwater Quality Standards are noted where such standards have been established for a particular parameter. Groundwater Quality Standards are standards of quality and purity, established by the Environmental Quality Board in 46 CSR 12.

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Key to the sampling sites-2004

Site	County	Watershed	Geologic Unit	Geologic Age	Total Depth of Well (feet)	Elevation (feet above mean sea level)
1	Jackson	Middle Ohio South	Dunkard Group	Permian	150	580
2	Wood	Middle Ohio South	Alluvium	Quaternary	85	630
3	Wetzel	Middle Ohio North	Alluvium	Quaternary	58	630
4	Tyler	Middle Ohio North	Dunkard Group	Permian	109.5	720
5	Doddridge	Middle Ohio North	Dunkard Group	Permian	70	780
6	Tyler	Middle Ohio North	Dunkard Group	Permian	30	670
7	Wayne	Tug Fork	Pottsville	Pennsylvanian	102	640
8	McDowell	Tug Fork	Pottsville	Pennsylvanian	100	1070
9	Mingo	Tug Fork	Pottsville	Pennsylvanian	200	1390
10	Jefferson	Potomac Drains	Tomstown Dolomite	Cambrian	100	300
11	Berkeley	Potomac Drains	Elbrook	Cambrian	186	727
12	Berkeley	Potomac Drains	Beekmantown	Ordovician	115	480
13	Morgan	Potomac Drains	Tonoloway	Silurian	219	830
14	Morgan	Potomac Drains	U-M Devonian	Devonian	186	1010
15	Jefferson	Potomac Drains	Martinsburg Shale	Ordovician	185	549
16	Lincoln	Lower Guyandotte	Conemaugh	Pennsylvanian	80	780
17	Lincoln	Lower Guyandotte	Conemaugh	Pennsylvanian	140	940
18	Lincoln	Lower Guyandotte	Conemaugh	Pennsylvanian	50	780
19	Lincoln	Lower Guyandotte	Conemaugh	Pennsylvanian	44	730
20	Webster	Gauley	Kanawha	Pennsylvanian	80	3100
21	Nicholas	Gauley	Pottsville	Pennsylvanian	223	1326
22	Greenbrier	Gauley	Mauch Chunk	Mississippian	170	2460
23	Jackson	Middle Ohio South	Dunkard Group	Permian	220	660
24	Mason	Middle Ohio South	Alluvium	Quaternary	56	583
25	Mason	Middle Ohio South	Alluvium	Quaternary	72	620
26	McDowell	Tug Fork	Mauch Chunk	Mississippian	70	1500
27	Greenbrier	Gauley	Pottsville	Pennsylvanian	220	3446
28	Greenbrier	Gauley	Bluestone	Mississippian	74	2380
29	Tyler	Middle Ohio North	Alluvium	Quaternary	47	615
30	Jackson	Middle Ohio South	Dunkard Group	Permian	440	656

Office of Water Resources
Groundwater Program
- USGS Ambient Water Quality Study
Sampling Locations



Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Field Parameters-2004

Site	Oxidation-Reduction Potential (MV)	Water Temp. (Deg C)	Barometric Pressure (mm of Hg)	Turbidity (NTU)	Specific Conductance (Us/Cm)	Water pH (Whole Field, Standard Units)
1	296	13.7	752	< 1	1190	8.7
2	203	14.7	753	< 1	673	7
3	216	14.4	750	< 1	482	6.4
4	4	14.9	746	< 1	784	7.6
5	-232	14	743	< 1	247	7.9
6	314	14.3	748	< 1	70	5.1
7	-215	14.6	754	< 1	438	7.7
8	-218	14	742	< 1	315	7.1
9	-180	14.9	750	< 1	731	6.9
10	103	13.7	764	< 1	726	6.8
11	154	12.6	752	< 1	729	6.7
12	149	13.2	756	< 1	637	6.8
13	10	13.8	746	< 1	502	7.3
14	-60	13.8	742	2.4	252	6.3
15	83	14.1	759	48	650	6.9
16	-285	15	740	1.5	666	9
17	70	19.1	740	21	460	6.8
18	-187	11.8	743	< 1	237	6.4
19	-148	12.7	751	2	373	6.5
20	9	11.3	690	650	48	5.9
21	-117	14.2	734	2.5	286	6.5
22	70	12.2	706	3	283	7.6
23	-96	16.8	749	4	897	8.7
24	82	16.3	750	3	381	6.8
25	86	13.8	750	3	555	6.5
26	-268	15	729	1.9	352	7.5
27	103	12.5	676	2.3	96	5.9
28	-97	13.1	703	1.4	333	6
29	17	18.3	748	< 1	459	6.7
30	-131	16.9	748	< 1	1340	8.3

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Field Parameters, Bacteria, Acidity, and Ions-2004

Site	Dissolved Oxygen, (mg/L)	Total Coliform, (Colonies/ 100 ml)	Fecal Coliform, (Colonies/ 100 ml)	E. Coli (Colonies/ 100 ml)	Hardness Noncarb. (mg/L as $CaCO_3$)	Acidity (mg/L as H^+)	Acidity (mg/L as $CaCO_3$)	Total Recoverable Calcium (mg/L as Ca)	Total Recoverable Magnesium, (mg/L as Mg)
1	0.2	< 1	< 1	< 1	--	< 0.1	--	1.9	0.28
2	0.6	< 1	< 1	< 1	109	0.4	20	103	9.5
3	1.9	< 1	< 1	< 1	56	0.6	30	60	8.5
4	0.4	3	< 1	< 1	--	0.1	5	28	5.4
5	0.2	< 1	< 1	< 1	--	< 0.1	--	17	3.1
6	3	< 1	< 1	< 1	6	0.4	20	4.3	1.6
7	0.1	< 1	< 1	< 1	--	0.1	5	13	2.4
8	0.2	< 1	< 1	< 1	--	0.2	9.9	10	2.6
9	1.6	< 1	< 1	< 1	--	0.4	20	41	12
10	5.8	< 1	< 1	< 1	65	0.4	20	85	39
11	7.7	220	< 1	< 1	52	0.5	25	85	36
12	7.9	42	< 1	< 1	184	0.3	15	101	17
13	13	--	--	--	47	0.1	5	51	23
14	0.8	< 1	< 1	< 1	--	0.6	30	12	15
15	1.6	4	< 1	< 1	124	0.4	20	97	15
16	0.2	5	< 1	< 1	--	< 0.1	--	1.5	0.25
17	4	45	1	< 1	14	0.4	20	61	10
18	0.8	31	< 1	< 1	--	0.1	5	33	3.4
19	0.7	10	< 1	< 1	8	0.3	15	42	6.7
20	1.1	< 1	< 1	< 1	12	0.3	15	3.7	2.4
21	0.9	< 1	< 1	< 1	--	0.2	9.9	18	4.4
22	1.8	< 1	< 1	< 1	2	< 0.1	--	34	11
23	1.7	< 1	< 1	< 1	--	< 0.1	--	0.86	0.14
24	1.6	< 1	< 1	< 1	89	0.3	15	85	10
25	3.7	5	< 1	< 1	59	0.4	20	60	7.9
26	0.2	17	< 1	< 1	--	0.1	5	34	7.5
27	1.9	48	< 1	< 1	--	0.2	9.9	11	3.6
28	1.2	< 1	< 1	< 1	15	0.5	25	11	3.6
29	0.9	10	< 1	1	54	0.2	9.9	49	7.9
30	0.4	270	< 1	< 1	--	< 0.1	--	1.5	0.32

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Ions-2004

Site	Total Recoverable Sodium (mg/L as Na)	Total Recoverable Potassium, (mg/L as K)	Bicarbonate (mg/L as HCO_3)	Carbonate (mg/L as CO_3)	Alkalinity (mg/L as $CaCO_3$)	Dissolved Carbon Dioxide (mg/L as CO_2)	Dissolved Sulfate (mg/L as SO^-_4)
1	280	0.6	450	13	381	1.5	16
2	20	1.4	282	< 1	231	36	54
3	20	1.4	151	< 1	124	99	70
4	130	1.8	257	< 1	211	11	7
5	33	1	146	< 1	120	3.1	0.57
6	4.9	0.8	11	< 1	9	169	8.5
7	77	2.6	177	< 1	145	5.7	< 0.07
8	52	1.7	151	< 1	124	20	0.78
9	84	2.6	200	< 1	164	41	73
10	7.2	2.3	384	< 1	315	95	55
11	4.2	1.8	416	< 1	346	119	27
12	2.7	1.5	378	< 1	310	42	7.1
13	5.7	0.8	214	< 1	176	17	27
14	12	0.7	119	< 1	98	114	1.4
15	23	1.7	354	< 1	290	44	24
16	160	1		--	300	0.6	1.4
17	8.5	2.3	208	< 1	171	55	30
18	8.7	1.4	99	< 1	81	77	15
19	19	1.6	134	< 1	110	77	54
20	0.2	1.2	23	< 1	19	17	2.8
21	28	4.1	132	< 1	108	61	0.88
22	8.4	0.6	146	< 1	120	6.2	15
23	220	0.5		--	335	1.6	37
24	8.2	1.1	187	< 1	153	51	21
25	3.9	1	198	< 1	162	75	61
26	28	0.6	173	< 1	142	9.3	17
27	2.2	0.7	50	< 1	41	105	6.5
28	21	1	117	< 1	96	54	5.7
29	21	2.3	122	< 1	100	39	61
30	330	0.5	690	22	630	6	0.32

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Ions-2004

Site	Dissolved Chloride (mg/L as Cl)	Total Fluoride (mg/L as F) GQS = 4.0 mg/L	Dissolved Bromide (mg/L as Br)	Total Dissolved Solids Residue At 180 Deg. C (mg/L)	Total Solids Residue at 105 Deg. C, (mg/L)
1	140	3.1	0.74	709	705
2	31	0.2	0.11	413	415
3	24	0.3	0.11	297	298
4	109	0.4	1	433	437
5	3.8	0.2	< 0.05	151	145
6	3	< 0.1	0.14	57	55
7	48	0.6	0.36	245	248
8	20	0.3	0.2	178	178
9	77	0.2	0.42	409	417
10	15	0.1	< 0.1	427	422
11	14	0.2	0.06	402	419
12	6.8	0.1	0.05	358	282
13	17	< 0.1	< 0.05	275	285
14	6.6	0.2	0.12	133	139
15	30	0.2	0.05	375	551
16	26	1.3	0.22	384	390
17	5.8	< 0.1	0.05	252	276
18	2.5	0.1	< 0.05	132	131
19	2.4	0.2	< 0.05	223	231
20	0.4	< 0.1	< 0.05	19	945
21	23	0.2	0.14	146	148
22	4.6	0.1	< 0.05	159	159
23	20	3.9	0.12	542	530
24	5.6	0.2	0.05	222	229
25	14	0.2	0.26	365	357
26	10	0.2	< 0.05	193	199
27	0.3	0.1	< 0.05	60	65
28	45	< 0.1	0.11	125	178
29	35	0.2	0.12	259	276
30	82	4.7	0.45	824	826

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Ions and Metals-2004

Site	Total Nitrogen, Nitrite (mg/L as N)	Total Nitrogen, NO_2+NO_3 (mg/L as N) GQS = 10 mg/L	Total Nitrogen, Ammonia (mg/L as N)	Total Nitrogen, Ammonia (mg/L as Nh_4)	Total Phosphorus (mg/L as P)	Total Recoverable Aluminum, (µg/L as Al)	Total Antimony, (µg/L as Sb) GQS = 6 µg/L
1	< 0.01	< 0.02	0.13	0.17	0.02	11	< 1
2	< 0.01	3.6	< 0.01	--	< 0.02	< 3	< 1
3	< 0.01	2.4	0.02	0.03	0.04	< 3	< 1
4	0.01	0.05	0.22	0.28	< 0.02	< 3	< 1
5	< 0.01	< 0.02	0.07	0.09	< 0.02	< 3	< 1
6	< 0.01	2.5	< 0.01	--	0.04	16	< 1
7	< 0.01	< 0.02	0.57	0.73	0.03	< 3	< 1
8	< 0.01	< 0.02	0.2	0.26	0.13	< 3	< 1
9	< 0.01	< 0.02	0.45	0.58	0.06	< 3	< 1
10	< 0.01	0.14	< 0.01	--	< 0.02	< 3	< 1
11	< 0.01	8.3	< 0.01	--	< 0.02	< 3	< 1
12	< 0.01	6.4	< 0.01	--	< 0.02	4	< 1
13	< 0.01	< 0.02	0.02	0.03	< 0.02	< 3	< 1
14	< 0.01	< 0.02	< 0.01	--	0.06	< 3	< 1
15	0.01	1.1	< 0.01	--	0.11	2600	< 1
16	< 0.01	< 0.02	0.16	0.21	0.06	10	< 1
17	< 0.01	1.5	0.02	0.03	0.08	414	< 1
18	< 0.01	< 0.02	0.1	0.13	0.03	6	< 1
19	< 0.01	< 0.02	0.13	0.17	0.05	< 3	< 1
20	0.05	0.03	0.14	0.18	0.64	25800	< 1
21	< 0.01	< 0.02	0.52	0.67	0.08	< 3	< 1
22	< 0.01	0.1	< 0.01	--	0.03	< 3	< 1
23	< 0.01	< 0.02	0.1	0.13	0.04	5	< 1
24	< 0.01	0.66	< 0.01	--	< 0.02	< 3	< 1
25	< 0.01	11	< 0.01	--	< 0.02	< 3	< 1
26	< 0.01	< 0.02	0.2	0.26	0.03	4	< 1
27	< 0.01	< 0.02	< 0.01	--	< 0.02	< 3	< 1
28	0.01	< 0.02	0.24	0.31	0.3	7	< 1
29	< 0.01	0.69	0.02	0.03	< 0.02	< 3	< 1
30	< 0.01	< 0.02	0.1	0.13	0.03	< 3	< 1

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Metals-2004

Site	Total Arsenic (µg/L as As)	Total Recoverable Barium, (µg/L as Ba)	Total Recoverable Beryllium, (µg/L as Be) Total	Recoverable Cadmium (µg/L as Cd) Total	Recoverable Iron, (µg/L as Fe)	Total Recoverable Manganese, (µg/L as Mn)
		GQS = 2000 µg/L	GQS = 4 µg/L	GQS = 5 µg/L		
1	7	150	< 1	< 0.5	9	7
2	< 4	60	< 1	< 0.5	< 2	36
3	< 4	59	< 1	< 0.5	< 2	11
4	6	510	< 1	< 0.5	90	65
5	6	330	< 1	< 0.5	74	77
6	< 4	60	< 1	< 0.5	30	18
7	< 4	380	< 1	< 0.5	214	17
8	< 4	360	< 1	< 0.5	1110	163
9	< 4	520	< 1	< 0.5	2340	328
10	< 4	54	< 1	0.7	16	28
11	< 4	66	< 1	< 0.5	< 2	< 1
12	< 4	38	< 1	< 0.5	8	< 1
13	< 4	76	< 1	< 0.5	152	17
14	8	150	< 1	< 0.5	3370	1190
15	< 4	75	< 1	< 0.5	5420	146
16	< 4	59	< 1	< 0.5	52	4
17	< 4	220	< 1	< 0.5	593	667
18	< 4	110	< 1	< 0.5	2390	607
19	< 4	64	< 1	< 0.5	5230	450
20	5	110	< 1	2.2	29700	631
21	< 4	980	< 1	< 0.5	4050	291
22	5	190	< 1	< 0.5	3	< 1
23	< 4	56	< 1	< 0.5	5	3
24	< 4	55	< 1	< 0.5	8	1
25	< 4	47	< 1	< 0.5	8	< 1
26	< 4	950	< 1	< 0.5	84	29
27	< 4	88	< 1	< 0.5	208	25
28	5	330	< 1	1.7	39400	810
29	< 4	40	< 1	< 0.5	55	281
30	< 4	87	< 1	< 0.5	9	3

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Metals and Volatile Organic Compounds-2004

Site	Total Recoverable Lead, (µg/L as Pb)	Total Recoverable Zinc, (µg/L as Zn)	Total Radon (pCi/L)	Total Organic Carbon, (Mg/L as C)	Total 1,1,1, Trichloro-ethane (µg/l)	Total ,1-1 Dichloro-ethane µg/L)	Total 1,1 Dichloro-ethene µg/L)
	GQS = 15 µg/L				GQS = 200 µg/L		GQS = 7 µg/L
1	< 2	3	1040	0.5	< 0.1	< 0.1	< 0.1
2	< 2	5	290	0.3	< 0.1	< 0.1	< 0.1
3	< 2	8	770	0.3	< 0.1	< 0.1	< 0.1
4	< 2	8	920	0.4	< 0.1	< 0.1	< 0.1
5	< 2	7	1370	0.2	< 0.1	< 0.1	< 0.1
6	< 2	12	1760	0.2	0.1	< 0.1	< 0.1
7	< 2	9	80	1.1	< 0.1	< 0.1	< 0.1
8	< 2	10	160	1.1	< 0.1	< 0.1	< 0.1
9	< 2	3	60	0.6	< 0.1	< 0.1	< 0.1
10	3	200	610	2.1	< 0.1	< 0.1	< 0.1
11	< 2	4	1450	2.7	< 0.1	< 0.1	< 0.1
12	< 2	3	980	2.6	< 0.1	< 0.1	< 0.1
13	< 2	< 2	340	< 0.1	< 0.1	< 0.1	< 0.1
14	< 2	3	250	< 0.1	< 0.1	< 0.1	< 0.1
15	3	10	220	< 0.1	< 0.1	< 0.1	< 0.1
16	< 2	< 2	1200	0.6	< 0.1	< 0.1	< 0.1
17	4	382	280	3.4	< 0.1	< 0.1	< 0.1
18	< 2	5	1520	0.6	< 0.1	< 0.1	< 0.1
19	< 2	16	2670	< 0.1	< 0.1	< 0.1	< 0.1
20	71	971	100	0.5	< 0.1	< 0.1	< 0.1
21	< 2	3	60	0.7	< 0.1	< 0.1	< 0.1
22	< 2	< 2	1540	0.2	< 0.1	< 0.1	< 0.1
23	< 2	130	360	0.8	< 0.1	< 0.1	< 0.1
24	< 2	4	430	0.7	< 0.1	< 0.1	< 0.1
25	< 2	6	580	0.4	< 0.1	< 0.1	< 0.1
26	< 2	3	160	1	< 0.1	< 0.1	< 0.1
27	< 2	24	190	0.7	< 0.1	< 0.1	< 0.1
28	< 2	47	150	0.7	< 0.1	< 0.1	< 0.1
29	< 2	< 2	440	1	0.4	0.1	< 0.1
30	< 2	34	300	32	< 0.1	< 0.1	< 0.1

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds-2004

Site	Total 1,2-Di-Chloroethane (µg/L)	Total 1,2-Di-Chloropropane	Total Benzene (µg/L)	1,3-Di-Chloro-benzene (µg/L)	1,4-Di-Chloro-benzene (µg/L)	O-Di-Chloro-benzene (µg/L)
	GQS = 5 µg/L	GQS = 5 µg/L	GQS = 5 µg/L			GQS = 6 µg/L
1	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
3	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
5	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
6	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
7	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
8	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
9	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
10	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
11	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
12	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
13	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
14	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
15	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
16	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
17	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
18	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
19	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
20	< 0.2	< 0.1	< 0.1	< 0.1	0.4	< 0.1
21	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
22	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
23	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
24	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
25	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
26	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
27	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
28	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
29	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
30	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds-2004

Site	Bromo Di-Chloro-Methane (µg/L)	Total 1-1-1-Trichloro-ethane (µg/L) GGS = 200 µg/L	Total 1-1-Dichloro-ethene (µg/L) GQS = 7 µg/L	Total Chloro-benzene (µg/L)	Total Di-Chloro-Bromo-methane (µg/L)	1-2-Dichloro-benzene (µg/L)
1	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
2	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
3	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
4	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
5	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
6	< 0.2	0.1	< 0.1	< 0.1	< 0.2	< 0.1
7	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
8	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
9	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
10	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
11	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
12	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
13	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
14	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
15	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
16	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
17	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
18	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
19	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
20	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
21	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
22	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
23	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
24	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
25	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
26	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
27	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
28	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
29	< 0.2	0.4	< 0.1	< 0.1	< 0.2	< 0.1
30	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds-2004

Site	Total Cis-1,2, -Di-Chloroethene (µg/L)	Total 1-2-Dichloro-ethane (µg/L)	Total Di-Iso-Propyl Ether, (µg/L)	Total Ethyl-Benzene (µg/L)	Total Diethyl Ethyl (µg/L)	Total Methylpentyl et (µg/L)
	GQS = 7 µg/L	GQS = 5 µg/L		GQS = 7 µg/L		
1	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
2	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
3	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
4	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
5	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
6	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
7	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
8	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
9	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
10	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
11	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
12	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
13	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
14	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
15	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
16	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
17	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
18	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
19	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
20	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
21	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
22	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
23	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
24	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
25	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
26	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
27	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
28	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
29	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2
30	< 0.1	< 0.2	< 0.2	< 0.1	< 0.2	< 0.2

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds-2004

Site	Total m-p- Xylene (µg/L)	Total t-Bytyl ethyl et (µg/L)	Total Tribromo-methane (µg/L)	Total Tetrachloro-methane (µg/L)	Methyl Tertiary Butyl Ether (µg/L)	Total o-Xylene (µg/L)	Total Styrene (µg/L)
					GQS = 20 µg/L	GQS = 10 µg/L	GQS = 100 µg/L
1	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
2	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
3	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
4	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
5	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
6	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
7	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
8	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
9	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
10	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
11	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
12	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
13	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
14	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
15	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
16	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
17	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
18	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
19	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
20	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
21	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
22	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
23	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
24	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
25	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
26	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
27	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
28	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
29	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1
30	< 0.2	< 0.1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds-2004

Site	Total Tetrachloro-ethylene (µg/L)	Total Toluene (µg/L)	Total Trans-1,2, Di-chloroethene (µg/L)	Total Trichloro-ethylene (µg/L)	Total Trichloro-fmethane (µg/L)	Total Vinyl Chloride (µg/L)
	GQS = 5 µg/L	GQS = 1000 µg/L	GQS = 10 µg/L	GQS = 5 µg/L		GQS = 2 µg/L
1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
2	< 0.1	< 0.1	< 0.1	< 0.1	1.7	0.2
3	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
4	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
7	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
9	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
11	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
12	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
13	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
14	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
15	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
16	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
17	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
19	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
20	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
21	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
22	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
23	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
24	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
25	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
26	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
27	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
28	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
29	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
30	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2004

Site	2,6, Di-Ethyl Aniline (µg/L)	Acetochlor (µg/L)	Alachlor (µg/L) GQS = 2 µg/L	Alpha BHC Dissolved (µg/L)	Atrazine (µg/L) GQS = 3 µg/L	Benfluralin (µg/L)	Butylate (µg/L)
1	< 0.006	< 0.006	< 0.005	< 0.005	< 0.007	< 0.01	< 0.04
2	< 0.006	< 0.006	< 0.005	< 0.005	< 0.007	< 0.01	< 0.04
3	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	< 0.006	< 0.006	< 0.005	< 0.005	< 0.007	< 0.01	< 0.04
12	< 0.006	< 0.006	< 0.005	< 0.005	0.006	< 0.01	< 0.04
13	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--
15	< 0.006	< 0.006	< 0.005	< 0.005	0.045	< 0.01	< 0.04
16	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--
19	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--
21	< 0.006	< 0.006	< 0.005	< 0.005	< 0.007	< 0.01	< 0.04
22	< 0.006	< 0.006	< 0.005	< 0.005	< 0.007	< 0.01	< 0.04
23	< 0.006	< 0.006	< 0.005	< 0.005	< 0.007	< 0.01	< 0.04
24	< 0.006	< 0.006	< 0.005	< 0.005	< 0.007	< 0.01	< 0.04
23	--	--	--	--	--	--	--
26	< 0.006	< 0.006	< 0.005	< 0.005	< 0.007	< 0.01	< 0.04
27	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2004

Site	Carbaryl (µg/L)	Carbofuran (µg/L)	Chlor-Pyrifos, Dissolved (µg/L)	Cyanazine (µg/L)	DCPA (µg/L)	
		GQS = 4 µg/L				
1	< 0.041	< 0.02	< 0.005	< 0.018	< 0.03	
2	< 0.041	< 0.02	< 0.005	< 0.018	< 0.03	
3	--	--	--	--	--	
4	--	--	--	--	--	
5	--	--	--	--	--	
6	--	--	--	--	--	
7	--	--	--	--	--	
8	--	--	--	--	--	
9	--	--	--	--	--	
10	--	--	--	--	--	
11	< 0.041	< 0.02	< 0.005	< 0.018	< 0.03	
12	< 0.041	< 0.02	< 0.005	< 0.018	< 0.03	
13	--	--	--	--	--	
14	--	--	--	--	--	
15	< 0.041	< 0.02	< 0.005	< 0.018	< 0.03	
16	--	--	--	--	--	
17	--	--	--	--	--	
18	--	--	--	--	--	
19	--	--	--	--	--	
20	--	--	--	--	--	
21	< 0.041	< 0.02	< 0.005	< 0.018	< 0.03	
22	< 0.041	< 0.02	< 0.005	< 0.018	< 0.03	
23	< 0.041	< 0.02	< 0.005	< 0.018	< 0.03	
24	< 0.041	< 0.02	< 0.005	< 0.018	< 0.03	
25	--	--	--	--	--	
26	< 0.041	< 0.02	< 0.005	< 0.018	< 0.03	
27	--	--	--	--	--	
28	--	--	--	--	--	
29	--	--	--	--	--	
30	--	--	--	--	--	

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2004

Site	Dissolved Diazinon (µg/L)	Dissolved Di-Eldrin (µg/L)	Disul-Foton (µg/L)	EPTC (µg/L)	Ethal-Fluralin (µg/L)	Etho-Prop (µg/L)	Dissolved Fonofos (µg/L)	Dissolved Lindane (µg/L)
								GQS = 0.2 µg/L
1	< 0.005	< 0.009	< 0.02	< 0.004	< 0.009	< 0.005	< 0.003	< 0.004
2	< 0.005	< 0.009	< 0.02	< 0.004	< 0.009	< 0.005	< 0.003	< 0.004
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	< 0.005	< 0.009	< 0.02	< 0.004	< 0.009	< 0.005	< 0.003	< 0.004
12	< 0.005	< 0.009	< 0.02	< 0.004	< 0.009	< 0.005	< 0.003	< 0.004
13	--	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--	--
15	< 0.005	< 0.009	< 0.02	< 0.004	< 0.009	< 0.005	< 0.003	< 0.004
16	--	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--	--
19	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
21	< 0.005	< 0.009	< 0.02	< 0.004	< 0.009	< 0.005	< 0.003	< 0.004
22	< 0.005	< 0.009	< 0.02	< 0.004	< 0.009	< 0.005	< 0.003	< 0.004
23	< 0.005	< 0.009	< 0.02	< 0.004	< 0.009	< 0.005	< 0.003	< 0.004
24	< 0.005	< 0.009	< 0.02	< 0.004	< 0.009	< 0.005	< 0.003	< 0.004
25	--	--	--	--	--	--	--	--
26	< 0.005	< 0.009	< 0.02	< 0.004	< 0.009	< 0.005	< 0.003	< 0.004
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2004

Site	Linuron (µg/L)	Dissolved Malathion (µg/L)	Methyl Parathion (µg/L)	Dissolved Metolachlor (µg/L)	Metribuzin Sencor (µg/L)	Moliunate (µg/L)
1	< 0.035	< 0.027	< 0.015	< 0.013	< 0.006	< 0.003
2	< 0.035	< 0.027	< 0.015	< 0.013	< 0.006	< 0.003
3	--	--	--	--	--	--
4	--	--	--	--	--	--
5	--	--	--	--	--	--
6	--	--	--	--	--	--
7	--	--	--	--	--	--
8	--	--	--	--	--	--
9	--	--	--	--	--	--
10	--	--	--	--	--	--
11	< 0.035	< 0.027	< 0.015	< 0.013	< 0.006	< 0.003
12	< 0.035	< 0.027	< 0.015	< 0.013	< 0.006	< 0.003
13	--	--	--	--	--	--
14	--	--	--	--	--	--
15	< 0.035	< 0.027	< 0.015	< 0.013	< 0.006	< 0.003
16	--	--	--	--	--	--
17	--	--	--	--	--	--
18	--	--	--	--	--	--
19	--	--	--	--	--	--
20	--	--	--	--	--	--
21	< 0.035	< 0.027	< 0.015	< 0.013	< 0.006	< 0.003
22	< 0.035	< 0.027	< 0.015	< 0.013	< 0.006	< 0.003
23	< 0.035	< 0.027	< 0.015	< 0.013	< 0.006	< 0.003
24	< 0.035	< 0.027	< 0.015	< 0.013	< 0.006	< 0.003
25	--	--	--	--	--	--
26	< 0.035	< 0.027	< 0.015	< 0.013	< 0.006	< 0.003
27	--	--	--	--	--	--
28	--	--	--	--	--	--
29	--	--	--	--	--	--
30	--	--	--	--	--	--

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2004

Site	Napropamide (µg/L)	Dissolved Parathion (µg/L)	Pebulate (µg/L)	Pendimethalin (µg/L)	Phorate (µg/L)
1	< 0.007	< 0.01	< 0.004	< 0.022	< 0.011
2	< 0.007	< 0.01	< 0.004	< 0.022	< 0.011
3	--	--	--	--	--
4	--	--	--	--	--
5	--	--	--	--	--
6	--	--	--	--	--
7	--	--	--	--	--
8	--	--	--	--	--
9	--	--	--	--	--
10	--	--	--	--	--
11	< 0.007	< 0.01	< 0.004	< 0.022	< 0.011
12	< 0.007	< 0.01	< 0.004	< 0.022	< 0.011
13	--	--	--	--	--
14	--	--	--	--	--
15	< 0.007	< 0.01	< 0.004	< 0.022	< 0.011
16	--	--	--	--	--
17	--	--	--	--	--
18	--	--	--	--	--
19	--	--	--	--	--
20	--	--	--	--	--
21	< 0.007	< 0.01	< 0.004	< 0.022	< 0.011
22	< 0.007	< 0.01	< 0.004	< 0.022	< 0.011
23	< 0.007	< 0.01	< 0.004	< 0.022	< 0.011
24	< 0.007	< 0.01	< 0.004	< 0.022	< 0.011
25	--	--	--	--	--
26	< 0.007	< 0.01	< 0.004	< 0.022	< 0.011
27	--	--	--	--	--
28	--	--	--	--	--
29	--	--	--	--	--
30	--	--	--	--	--

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2004

Site	Prometon (µg/L)	Pronamide (µg/L)	Propanil (µg/L)	Propargite (µg/L)	Propchlor (µg/L)	Simazine (µg/L) GQS = 4 µg/L	Tebuthiuron (µg/L)
1	< 0.01	< 0.004	< 0.011	< 0.02	< 0.025	< 0.005	< 0.02
2	< 0.01	< 0.004	< 0.011	< 0.02	< 0.025	< 0.005	< 0.02
3	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	< 0.01	< 0.004	< 0.011	< 0.02	< 0.025	0.055	< 0.02
12	< 0.01	< 0.004	< 0.011	< 0.02	< 0.025	0.032	< 0.02
13	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--
15	0.01	< 0.004	< 0.011	< 0.02	< 0.025	0.016	< 0.02
16	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--
19	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--
21	< 0.01	< 0.004	< 0.011	< 0.02	< 0.025	< 0.005	< 0.02
22	< 0.01	< 0.004	< 0.011	< 0.02	< 0.025	< 0.005	< 0.02
23	< 0.01	< 0.004	< 0.011	< 0.02	< 0.025	< 0.005	< 0.02
24	< 0.01	< 0.004	< 0.011	< 0.02	< 0.025	< 0.005	< 0.02
25	--	--	--	--	--	--	--
26	< 0.01	< 0.004	< 0.011	< 0.02	< 0.025	< 0.005	< 0.02
27	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--

GQS = Groundwater Quality Standard

Appendix B (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2004

Site	Terbacil (µg/L)	Terbufos (µg/L)	Thiobencarb (µg/L)	Triallate (µg/L)	Trifluralin (µg/L)
1	< 0.034	< 0.02	< 0.01	< 0.002	< 0.009
2	< 0.0.34	< 0.02	< 0.01	< 0.002	< 0.009
3	--	--	--	--	--
4	--	--	--	--	--
5	--	--	--	--	--
6	--	--	--	--	--
7	--	--	--	--	--
8	--	--	--	--	--
9	--	--	--	--	--
10	--	--	--	--	--
11	0.024	< 0.02	< 0.01	< 0.002	< 0.009
12	0.062	< 0.02	< 0.01	< 0.002	< 0.009
13	--	--	--	--	--
14	--	--	--	--	--
15	< 0.034	< 0.02	< 0.01	< 0.002	< 0.009
16	--	--	--	--	--
17	--	--	--	--	--
18	--	--	--	--	--
19	--	--	--	--	--
20	--	--	--	--	--
21	< 0.034	< 0.02	< 0.01	< 0.002	< 0.009
22	< 0.034	< 0.02	< 0.01	< 0.002	< 0.009
23	< 0.034	< 0.02	< 0.01	< 0.002	< 0.009
24	< 0.034	< 0.02	< 0.01	< 0.002	< 0.009
25	--	--	--	--	--
26	< 0.034	< 0.02	< 0.01	0.002	< 0.009
27	--	--	--	--	--
28	--	--	--	--	--
29	--	--	--	--	--
30	--	--	--	--	--

Appendix C

Division of Water and Waste Management - Groundwater Program, Department of Health and Human Resources - Office of Environmental Health Services, and the United States Geological Survey Study of Ambient Groundwater Quality in West Virginia

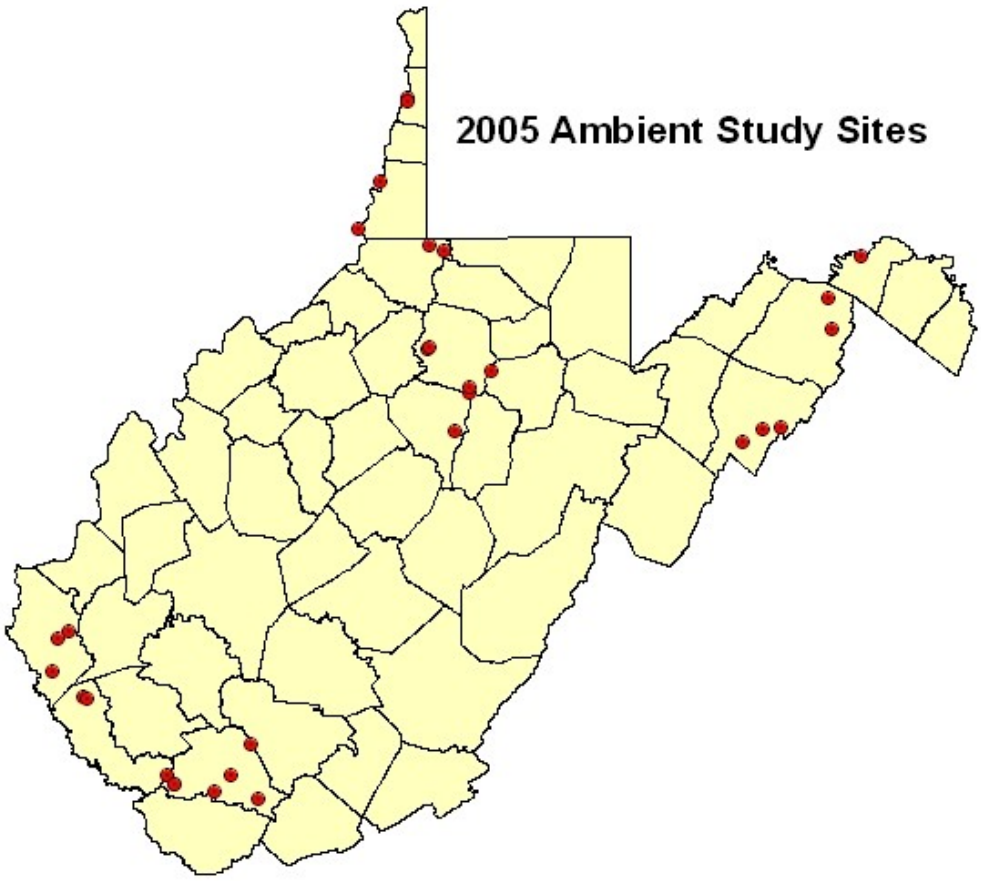
Data Tables From 2005

Note: Groundwater Quality Standards are noted where such standards have been established for a particular parameter. Groundwater Quality Standards are standards of quality and purity, established by the Environmental Quality Board in 46 CSR 12.

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Key to the sampling sites-2005

Site	County	Watershed	Geologic Unit	Geologic Age	Total Depth of Well (feet)	Elevation (feet above mean sea level)
1	Wyoming	Upper Guyandotte	New River Formation	Pennsylvanian	130	960
2	Mingo	Twelvepole	Kanawha Formation	Pennsylvanian	114	880
3	Mingo	Twelvepole	Kanawha Formation	Pennsylvanian	34	600
4	Hardy	Cacapon	Hampshire Formation	Devonian	200	19980
5	Hardy	Cacapon	U-M Devonian Series	Devonian	170	1440
6	Hardy	Cacapon	Middle Silurian	Silurian	175	2100
7	Hampshire	Cacapon	Hampshire Formation	Devonian	365	1540
8	Hampshire	Cacapon	Middle Silurian	Silurian	100	990
9	Morgan	Cacapon	Helderberg Group	Devonian	135	520
10	Wyoming	Upper Guyandotte	New River Formation	Pennsylvanian		1080
11	Wyoming	Upper Guyandotte	New River Formation	Pennsylvanian	720	1840
12	Wayne	Twelvepole	Pottsville Group	Pennsylvanian	105	700
13	Wayne	Twelvepole	Kanawha Formation	Pennsylvanian	152	810
14	Marshall	Upper Ohio South	Alluvium	Holocene	74	650
15	Wetzel	Upper Ohio South	Dunkard Group	Permian	126	940
16	Wetzel	Upper Ohio South	Dunkard Group	Permian	70	1080
17	Marshall	Upper Ohio South	Alluvium	Holocene	90	655
18	Brooke	Upper Ohio North	Alluvium	Holocene	69	660
19	Brooke	Upper Ohio North	Alluvium	Holocene	74	680
20	Wyoming	Upper Guyandotte	New River Formation	Pennsylvanian	118	1540
21	Wyoming	Upper Guyandotte	New River Formation	Pennsylvanian	133	1080
22	Wyoming	Upper Guyandotte	New River Formation	Pennsylvanian	700	2480
23	Wyoming	Upper Guyandotte	New River Formation	Pennsylvanian	75	1320
24	Wayne	Twelvepole	Kanawha Formation	Pennsylvanian	33	720
25	Lewis	West Fork	Conemaugh Group	Pennsylvanian	100	1110
26	Harrison	West Fork	Dunkard Group	Permian	70	1080
27	Harrison	West Fork	Dunkard Group	Permian		1070
28	Harrison	West Fork	Conemaugh Group	Pennsylvanian	45	1160
29	Harrison	West Fork	Conemaugh Group	Pennsylvanian	100	1160
30	Barbour	West Fork	Conemaugh Group	Pennsylvanian	180	1160



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Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Field Parameters-2005

Site	Dissolved Oxygen, % Saturation	Barometric Pressure (mm of Hg)	Turbidity (NTU)	Specific Conductance (Us/Cm @ 25° C)	Water pH (Whole Field, Standard Units)
1	16	742	< 1	474	7.1
2	15	743	6.1	787	8.5
3	14	741	45	643	7.2
4	13	713	< 1	152	7.3
5	37	726	43	576	7.0
6	80	705	2.8	63	6.0
7	15	725	1	219	8.1
8	59	735	30	394	7.1
9	25	746	1.4	697	6.9
10	14	732	26	692	6.8
11	10	715	28	310	6.8
12	10	745	2.6	323	7.6
13	11	742	4.4	623	7.0
14		746	< 1	759	7.7
15	35	735	2.6	593	9.7
16		730	3.6	418	8.9
17	48	740	< 1	700	6.8
18	90	747	18	529	8.0
19	10	746	9.4	1230	6.6
20		726	< 1	271	7.6
21		737	< 1	646	7.7
22		702	< 1	1200	8.0
23		730	37	326	6.9
24		748	< 1	2470	8.2
25		735	< 1	449	8.2
26		737	< 1	679	8.8
27		738	1.4	355	7.3
28		734	< 1	507	8.4
29		734	< 1	593	9.7
30		732	< 1	670	7.4

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Field Parameters, Bacteria, Acidity, and Ions-2005

Site	Dissolved Oxygen, (mg/L)	Nitrate (mg/l as N)	Ortho-Phosphate (mg/L as P)	Organic Carbon (mg/L)	Total Recoverable Calcium (mg/L as Ca)	Total Recoverable Magnesium, (mg/L as Mg)
1	1.6	E 0.006	0.014	2.5	26.9	5.76
2	1.5	< 0.008	0.123	1.8	5.11	1.36
3	1.3	< 0.008	0.045	2.7	69.1	16.2
4	1.3	E 0.004	0.021	E 0.3	14.4	6.22
5	3.6	< 0.008	<0.006	4.3	111	17.3
6	7.9	< 0.008	0.052	0.4	2.15	5.4
7	1.5	<0.008	E0.003	0.8	20.7	8.17
8	6.0	<0.008	0.031	5.8	78.3	11
9	2.5	<0.008	<0.006	0.8	109	31.6
10	1.3	E 0.004	0.016	1.6	78.8	24.9
11	1.0	<0.008	<0.006	0.8	21.8	6.02
12	1.0	<0.008	0.073	4.3	28.5	5.67
13	1.1	E 0.004	E 0.004	10.2	47.4	11.3
14	E.9	E 0.004	<0.006	4.2	107	14.4
15	3.5	<0.008	0.063	4.5	1.93	0.3
16	E.9	<0.008	0.015	6.3	30.5	3.64
17	4.7	<0.008	0.013	0.7	103	13.3
18	9.1	E 0.004	0.013	0.9	148	14.3
19	1.0	<0.008	0.006	0.8	195	39.9
20	E.9	E 0.005	0.044	1.3	14.5	3.36
21	E.8	E 0.006	0.009	0.9	66	18.6
22	E.7	<0.008	E 0.004	14.2	17.2	2.9
23	E.7	E 0.006	0.015	1.7	26.6	4.67
24	E.7	<0.008	0.068	5.6	42.2	8.79
25	E.7	<0.008	0.011	4.4	60.5	9.57
26	E.7	<0.008	0.085	5.8	2.93	0.51
27	E.8	.01	E 0.005	E 4.7	45.7	8.64
28	E.6	<0.008	0.067	E 0.3	29.3	4.72
29	E.7	<0.008	0.043	6.8	1.25	0.21
30	E.8	E 0.007	E 0.005	1.1	46.7	4.52

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Ions-2005

Site	Total Recoverable Sodium (mg/L as Na)	Total Recoverable Potassium, (mg/L as K)	Dissolved Carbon Dioxide (mg/L as CO_2)	Dissolved Sulfate (mg/L as SO^{-}_{4})
1	67.6	1.4	21	<2
2	170	2.1	1.4	0.6
3	49	4.2	24	E.2
4	8	0.9	6.5	15.7
5	11.2	0.7	23	70.4
6	E.5	0.8	57	4
7	16.3	1.1	1.9	4.7
8	1.2	0.9	15	10.3
9	13.7	0.6	28	40.1
10	47.4	2.1	25	238
11	35.9	1.5		23.9
12	28.4	3.1		4
13	68.7	3.7	36	102
14	39.5	3.1	4.8	162
15	139	0.4	0.1	12.5
16	63.1	1.0	0.5	8.8
17	32.8	2.0	42	86.6
18	29.2	2.6		73.8
19	40.1	2.6	58	313
20	40.2	0.9	5.5	E.2
21	46.7	1.7	5	125
22	291	2.6	13	20.6
23	43	1.2	25	32.1
24	428	5.6	2.8	<0.9
25	20.2	1.7		<0.2
26	161	0.9	1	.3
27	13.2	2.1	15	1.5
28	91.6	1.0	1.6	38.7
29	141	0.3	0.1	4.4
30	107	0.9	17	60.1

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Ions-2005

Site	Dissolved Chloride (mg/L as Cl)	Total Fluoride (mg/L as F) GQS = 4.0 mg/L	Dissolved Bromide (mg/L as Br)	Total Solids Residue at 105 Deg. C, (mg/L)
1	64.9	0.2		286
2	118	0.9	0.37	467
3	100	0.1		388
4	1.36	E.1	0.08	108
5	2.87	0.1	0.17	353
6	0.73	0.1	0.04	38
7	0.83	E.1		142
8	<0.2	0.1		221
9	44.1	0.1		401
10	40.7	0.1		552
11	7.12	0.2	0.18	192
12	21.1	0.4	0.2	183
13	8.97	0.2		392
14	40.9	0.2	0.28	514
15	19.9	0.2	0.24	364
16	8.46	0.8	0.23	239
17	42.2	0.4		449
18	54.5	0.1		316
19	74.5	0.3	0.18	835
20	17.7	0.3	0.16	162
21	44.1	0.1		430
22	6.24	0.1	0.28	795
23	27.6	E.1	0.22	205
24	689	0.8		1380
25	23.1	0.2		254
26	29.3	0.6		413
27	15.6	0.2		214
28	1.84	0.3		335
29	5.39	1		378
30	10	0.8	0.21	417

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Ions and Metals-2005

Site	Total Nitrogen, Nitrite (mg/L as N)	Total Nitrogen, NO_2+NO_3 (mg/L as N) GQS = 10 mg/L	Total Nitrogen, Ammonia (mg/L as N)	Total Nitrogen, Ammonia (mg/L as Nh_4)	Total Phosphorus (mg/L as P)	Total Recoverable Aluminum, (µg/L as Al)	Total Antimony, (µg/L as Sb) GQS = 6 µg/L
1	E 0.006	<0.06	0.25	0.25	0.116	<2	<0.2
2	<0.008	<0.06	0.49	0.5	0.147	107	<0.2
3	<0.008	<0.06	0.81	0.83	0.178	682	<0.2
4	E 0.004	<0.06	E.03	E 0.05	0.053	<2	<0.2
5	<0.008	0.1	0.23	0.32	0.052	170	0.5
6	<0.008	<0.06	<0.04	<0.06	0.085	8	<0.2
7	<0.008	1.05	<0.04	E 0.03	0.036	<2	<0.2
8	<0.008	<0.06	<0.04	1.04	0.027	1800	<0.2
9	<0.008	0.51	<0.04	0.51	<0.004	E2	<0.2
10	E 0.004	<0.06	0.42	0.43	0.17	5	<0.2
11	<0.008	<0.06	0.36	0.43	0.095	E2	<0.2
12	<0.008	<0.06	0.86	0.92	0.114	5	<0.2
13	E 0.004	<0.06	0.49	0.54	0.014	<2	<0.2
14	E 0.004	0.43	0.42	0.92	E 0.003	E1	<0.2
15	<0.008	<0.06	0.08	0.15	0.073	135	<0.2
16	<0.008	<0.06	0.2	0.24	0.023	34	<0.2
17	<0.008	3.31	<0.04	3.42	0.016	<2	<0.2
18	E 0.004	0.47	0.23	0.69	0.085	699	<0.2
19	<0.008	2.7	<0.04	2.78	0.008	3	<0.2
20	E 0.005	<0.06	0.14	0.16	0.094	3	<0.2
21	E 0.006	<0.06	0.5	0.47	0.156	<2	<0.2
22	<0.008	<0.06	0.08	0.19	0.012	8	E 0.2
23	E 0.006	<0.06	0.2	0.26	0.102	2	<0.2
24	<0.008	<0.06	1.14	1.19	0.095	E2	<0.2
25	<0.008	<0.06	0.19	0.22	0.036	2	<0.2
26	<0.008	<0.06	0.14	0.19	0.096	E1	<0.2
27	0.001	<0.06	1.22	1.4	0.2	<2	<0.2
28	<0.008	<0.06	0.23	0.31	0.096	<2	<0.2
29	<0.008	<0.06	0.14	0.2	0.05	16	<0.2
30	E 0.007	0.15	<0.04	0.12	0.012	6	<0.2

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Metals-2005

Site	Total Arsenic (µg/L as As)	Total Recoverable Barium, (µg/L as Ba)	Total Recoverable Beryllium, (µg/L as Be) Total	Recoverable Cadmium (µg/L as Cd) Total	Recoverable Iron, (µg/L as Fe)	Total Recoverable Manganese, (µg/L as Mn)
		GQS = 2000 µg/L	GQS = 4 µg/L	GQS = 5 µg/L		
1	<2	515	E 0.06	<0.04	2800	218
2	<2	353	<0.06	<0.04	2020	45
3	<2	2630	0.17	0.57	2570	122
4	9	201	<0.06	<0.04	1020	290
5	3	100	E 0.06	E 0.02	3120	73
6	<2	2	<0.06	<0.04	2320	747
7	15	200	<0.06	<0.04	<6	M
8	<2	34	0.1	<0.04	780	39
9	<2	67	<0.06	<0.04	40	2
10	E1	125	0.09	<0.04	24100	2270
11	<2	211	<0.06	<0.04	2120	322
12	<2	300	<0.06	<0.04	930	138
13	<2	85	E 0.05	<0.04	10200	990
14	<2	83	<0.06	<0.04	10	262
15	<2	83	<0.06	<0.04	120	17
16	<4	344	<0.06	0.2	230	70
17	<4	67	<0.06	<0.04	M	M
18	<2	111	<0.06	0.05	730	1490
19	E1	34	<0.06	<0.04	1260	234
20	<2	465	E 0.04	<0.04	2600	301
21	<2	195	E 0.03	<0.04	10600	842
22	3	310	E 0.03	<0.04	1660	89
23	<2	732	0.08	<0.04	5440	475
24	<2	2160	<0.06	0.11	480	30
25	E1	1110	<0.06	<0.04	600	191
26	<2	412	<0.06	<0.04	30	6
27	4	927	0.09	<0.04	4900	800
28	2	210	<0.06	<0.04	860	106
29	<2	21	<0.06	<0.04	10	3
30	<2	66	<0.06	<0.04	10	1

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Metals and Volatile Organic Compounds-2005

Site	Total Chromium (µg/L as Cr)	Mercury, (µg/L as Hg)	Selenium (µg/L as Se)	Nickel (Mg/L as Ni)	Thallium (µg/l)	Rn-222 pCi/L
	GQS = 100 µg/L	GQS = 2 µg/L	GQS = 50 µg/L	GQS = 100 µg/l	GQS = 2 µg/l	
1	<0.8	<0.01	0.7	0.27	<0.2	160
2	E.7	<0.01	0.9	1.38	<0.2	100
3	3	<0.01	1.1	2.78	<0.2	70
4	<0.8	<0.01	0.4	<0.16	<0.2	190
5	<0.8	<0.01	0.4	1.59	<0.2	50
6	<0.8	<0.01	E 0.3	0.72	<0.2	800
7	<0.8	<0.01	1	0.2	<0.2	1440
8	<0.8	0.02	E 0.3	2.07	<0.2	660
9	<0.8	<0.01	0.7	0.86	<0.2	230
10	<0.8	<0.01	E 0.3	2.48	<0.2	250
11	<0.8	<0.01	E 0.2	0.9	<0.2	40
12	E.5	<0.01	E 0.3	0.36	<0.2	160
13	E.4	<0.01	0.5	0.89	<0.2	160
14	<0.8	<0.01	0.9	4.76	<0.2	80
15	<0.8	<0.01	0.6	0.27	<0.2	1180
16	E.5	<0.01	0.5	1.39	<0.2	1500
17	E.5	<0.01	1.2	3.21	<0.2	480
18	0.9	<0.01	0.4	5.56	<0.2	60
19	<0.8	<0.01	E 0.3	9.13	<0.2	3240
20	<0.8	<0.01	<0.4	0.66	<0.2	70
21	E.4	<0.01	<0.4	1.39	<0.2	90
22	<0.8	<0.01	0.5	1.39	<0.2	M
23	<0.8	<0.01	E 0.2	3.21	<0.2	30
24	<0.8	<0.01	2.3	1.58	<0.2	100
25	<0.8	<0.01	0.7	0.93	<0.2	820
26	<0.8	<0.01	0.9	0.19	<0.2	390
27	<0.8	<0.01	0.8	0.76	<0.2	340
28	E.4	<0.01	E 0.4	0.62	<0.2	900
29	E.5	<0.01	E 0.4	<0.16	<0.2	830
30	E.5	<0.01	0.6	0.84	<0.2	770

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Metals and Volatile Organic Compounds-2005

Site	Total Recoverable Lead, (µg/L as Pb)	Total Recoverable Zinc, (µg/L as Zn)	Total 1,1,1, Trichloro-ethane (µg/l)	Total ,1-1 Dichloro-ethane µg/L)	Total 1,1 Dichloro-ethene (µg/L)	Total Benzene (µg/L)
	GQS = 15 µg/L		GQS = 200 µg/L		GQS = 7 µg/L	GQS = 5 µg/L
1	<0.06	6	<0.1	<0.1	<0.1	<0.1
2	0.18	E2	<0.1	<0.1	<0.1	<0.1
3	5.06	3250	<0.1	<0.1	<0.1	<0.1
4	<0.06	11	<0.1	<0.1	<0.1	<0.1
5	1.06	10	<0.1	<0.1	<0.1	<0.1
6	0.1	7	<0.1	<0.1	<0.1	<0.1
7	E 0.05	<2	<0.1	<0.1	<0.1	<0.1
8	1.75	6	<0.1	<0.1	<0.1	<0.1
9	0.7	8	<0.1	<0.1	<0.1	<0.1
10	0.47	4	<0.1	<0.1	<0.1	<0.1
11	0.16	5	<0.1	<0.1	<0.1	<0.1
12	0.4	16	<0.1	<0.1	<0.1	<0.1
13	0.12	321	<0.1	<0.1	<0.1	<0.1
14	0.23	11	<0.1	0.6	<0.1	<0.1
15	0.13	<2	<0.1	<0.1	<0.1	<0.1
16	3.69	502	<0.1	<0.1	<0.1	<0.1
17	1.54	3	<0.1	<0.1	<0.1	<0.1
18	0.12	3	<0.1	<0.1	<0.1	<0.1
19	0.31	2	<0.1	<0.1	<0.1	<0.1
20	0.2	6	<0.1	<0.1	<0.1	<0.1
21	0.17	9	<0.1	<0.1	<0.1	<0.1
22	1.85	20	<0.1	<0.1	<0.1	<0.1
23	E 0.04	28	<0.1	<0.1	<0.1	<0.1
24	0.42	29	<0.1	<0.1	<0.1	<0.1
25	0.26	4	<0.1	<0.1	<0.1	<0.1
26	< 0.06	<2	<0.1	<0.1	<0.1	<0.1
27	E 0.03	11	<0.1	<0.1	<0.1	<0.1
28	E 0.04	<2	<0.1	<0.1	<0.1	<0.1
29	< 0.06	<2	<0.1	<0.1	<0.1	<0.1
30	0.41	3	<0.1	<0.1	<0.1	<0.1

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds-2005

Site	1-3-Dichloro-benzene (µg/L)	1-4-Dichloro-benzene (µg/L)	Bromo-dichloro-Methane (µg/L)	Total Dilsopropyl Ether (µg/L)	Total Ethyl-Benzene (µg/L) GQS = 7 µg/L	Total Diethyl Ethyl (µg/L)
1	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
2	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
3	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
4	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
5	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
6	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
7	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
8	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
9	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
10	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
11	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
12	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
13	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
14	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
15	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
16	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
17	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
18	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
19	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
20	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
21	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
22	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
23	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
24	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
25	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
26	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
27	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
28	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
29	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2
30	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds-2005

Site	1-2-Dichloroethane (µg/L)	1-1-2-Dicloropropane (µg/L)	Chloro-benzene (µg/L)	cis-1-2-Dichlorothene (µg/L)	Dibromo-chloro-methane (µg/L)
	GQS = 5 µg/L			GQS = 70 µg/L	GQS = 5 µg/L
1	<0.2	<0.1	<0.1	<0.1	<0.2
2	<0.2	<0.1	<0.1	<0.1	<0.2
3	<0.2	<0.1	<0.1	<0.1	<0.2
4	<0.2	<0.1	<0.1	<0.1	<0.2
5	<0.2	<0.1	<0.1	<0.1	<0.2
6	<0.2	<0.1	<0.1	<0.1	<0.2
7	<0.2	<0.1	<0.1	<0.1	<0.2
8	<0.2	<0.1	<0.1	<0.1	<0.2
9	<0.2	<0.1	<0.1	<0.1	<0.2
10	<0.2	<0.1	<0.1	<0.1	<0.2
11	<0.2	<0.1	<0.1	<0.1	<0.2
12	<0.2	<0.1	<0.1	<0.1	<0.2
13	<0.2	<0.1	<0.1	<0.1	<0.2
14	<0.2	<0.1	<0.1	<0.1	<0.2
15	<0.2	<0.1	<0.1	<0.1	<0.2
16	<0.2	<0.1	<0.1	<0.1	<0.2
17	<0.2	<0.1	<0.1	<0.1	<0.2
18	<0.2	<0.1	<0.1	0.5	<0.2
19	<0.2	<0.1	<0.1	<0.1	<0.2
20	<0.2	<0.1	<0.1	<0.1	<0.2
21	<0.2	<0.1	<0.1	<0.1	<0.2
22	<0.2	<0.1	<0.1	<0.1	<0.2
23	<0.2	<0.1	0.2	<0.1	<0.2
24	<0.2	<0.1	<0.1	<0.1	<0.2
25	<0.2	<0.1	<0.1	<0.1	<0.2
26	<0.2	<0.1	<0.1	<0.1	<0.2
27	<0.2	<0.1	<0.1	<0.1	<0.2
28	<0.2	<0.1	<0.1	<0.1	<0.2
29	<0.2	<0.1	<0.1	<0.1	<0.2
30	<0.2	<0.1	<0.1	<0.1	<0.2

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds-2005

Site	Total m-p- Xylene (µg/L)	Total t-Bytyl ethyl et (µg/L)	Total Tribromo-methane (µg/L)	Total Tetrachloro-methane (µg/L)	Methyl Tertiary Butyl Ether (µg/L)	Total o-Xylene (µg/L)	Total Styrene (µg/L)
					GQS = 20 µg/L	GQS = 10 µg/L	GQS = 100 µg/L
1	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
2	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
3	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
4	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
5	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
6	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
7	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
8	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
9	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
10	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
11	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
12	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
13	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
14	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
15	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
16	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
17	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
18	<0.2	<0.1	<0.2	0.4	<0.2	<0.1	<0.1
19	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
20	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
21	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
22	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
23	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
24	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
25	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
26	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
27	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
28	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
29	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1
30	<0.2	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds-2005

Site	Total Tetrachloro-ethylene (µg/L)	Total Toluene (µg/L)	Total trans-1-2-Dichloroethene (µg/L)	Total Trichloro-ethylene (µg/L)	Total Trichloro-methane (µg/L)	Total Vinyl Chloride (µg/L)
	GQS = 5 µg/L	GQS = 1000 µg/L	GQS = 10 µg/L	GQS = 5 µg/L		GQS = 2 µg/L
1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
11	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
13	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
14	<0.1	<0.1	<0.1	<0.1	0.6	<0.2
15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
16	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
17	<0.1	<0.1	<0.1	1.2	<0.1	<0.2
18	<0.1	<0.1	<0.1	0.1	0.2	<0.2
19	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
21	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
22	<0.1	<0.1	<0.1	<0.1	8.4	<0.2
23	<0.1	<0.1	<0.1	0.2	6.9	<0.2
24	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
26	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
27	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
29	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2
30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2005

Site	2,6, Diethyl Aniline (µg/L)	Acetochlor (µg/L)	Alachlor (µg/L) GQS = 2 µg/L	Alpha HCHBHC Dissolved (µg/L)	Atrazine (µg/L) GQS = 3 µg/L	Azin-phosmethyl (µg/L)	Benflural (µg/L)
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	<0.006	<0.006	<0.005	<0.005	<0.007	<0.007	<0.05
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--
14	<0.006	<0.006	<0.005	<0.005	<0.007	<0.007	<0.05
15	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--
17	<0.006	<0.006	<0.005	<0.005	<0.007	<0.007	<0.05
18	<0.006	<0.006	<0.005	<0.005	<0.007	<0.007	<0.05
19	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--
25	<0.006	<0.006	<0.005	<0.005	<0.007	<0.007	<0.05
26	<0.006	<0.006	<0.005	<0.005	<0.007	<0.007	<0.05
27	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2005

Site	Butylate (µg/L)	Carbaryl (µg/L)	Carbofuran (µg/L) GQS = 4 µg/L	Chlorpyrifos (µg/L)	Cis-Permethrin (µg/L)	Cyanazine (µg/L)
1	--	--	--	--	--	--
2	--	--	--	--	--	--
3	--	--	--	--	--	--
4	--	--	--	--	--	--
5	--	--	--	--	--	--
6	--	--	--	--	--	--
7	<0.004	<0.041	<0.02	<0.005	<0.006	<0.018
8	--	--	--	--	--	--
9	--	--	--	--	--	--
10	--	--	--	--	--	--
11	--	--	--	--	--	--
12	--	--	--	--	--	--
13	--	--	--	--	--	--
14	<0.004	<0.041	<0.02	<0.005	<0.006	<0.018
15	--	--	--	--	--	--
16	--	--	--	--	--	--
17	<0.004	<0.041	<0.02	<0.005	<0.006	<0.018
18	<0.004	<0.041	<0.02	<0.005	<0.006	<0.018
19	--	--	--	--	--	--
20	--	--	--	--	--	--
21	--	--	--	--	--	--
22	--	--	--	--	--	--
23	--	--	--	--	--	--
24	--	--	--	--	--	--
25	<0.004	<0.041	<0.02	<0.005	<0.006	<0.018
26	<0.004	<0.041	<0.02	<0.005	<0.006	<0.018
27	--	--	--	--	--	--
28	--	--	--	--	--	--
29	--	--	--	--	--	--
30	--	--	--	--	--	--

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2005

Site	DCPA (µg/L)	Desul-finylfipro (µg/L)	Diazinon (µg/L)	Dieldrin (µg/L)	Disulfoton (µg/L)	EPTC (µg/L)	Ethalflurlin (µg/L)	Ethoprop (µg/L)
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	<0.003	<0.012	<0.005	<0.009	<0.02	<0.004	<0.009	<0.005
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	<0.003	<0.012	<0.005	<0.009	<0.02	<0.004	<0.009	<0.005
15	--	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--	--
17	<0.003	<0.012	<0.005	<0.009	<0.02	<0.004	<0.009	<0.005
18	<0.003	<0.012	<0.005	<0.009	<0.02	<0.004	<0.009	<0.005
19	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--	--
25	<0.003	<0.012	<0.005	<0.009	<0.02	<0.004	<.0.009	<0.005
26	<0.003	<0.012	<0.005	<0.009	<0.02	<0.004	<0.009	<0.005
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2005

Site	Desul-fironil (µg/L)	Fipronil sulfide (µg/L)	Fipronil Sulfone (µg/L)	Fipronil (µg/L)	Fonofos (µg/L)	Lindane (µg/L) GQS = 0.2 µg/L	Malathion (µg/L)	Methyl Parathion (µg/L)
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	<0.003	<0.013	<0.024	<0.016	<0.003	<0.035	<0.004	<0.015
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	<0.003	<0.013	<0.024	<0.016	<0.003	<0.035	<0.004	<0.015
15	--	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--	--
17	<0.003	<0.013	<0.024	<0.016	<0.003	<0.035	<0.004	<0.015
18	<0.003	<0.013	<0.024	<0.016	<0.003	<0.035	<0.004	<0.015
19	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--	--
25	<0.003	<0.013	<0.024	<0.016	<0.003	<0.035	<0.004	<0.015
26	<0.003	<0.013	<0.024	<0.016	<0.003	<0.035	<0.004	<0.015
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2005

Site	Meto-lechior (µg/L)	Metri-buzin (µg/L)	Molinate (µg/L)	Napro-pamide (µg/L)	p-p-DDE (µg/L)	Parathion (µg/L)	Pebuiate (µg/L)	Pendi-methalin (µg/L)
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	<0.006	<0.006	<0.003	<0.007	<0.003	<0.01	<0.004	<0.022
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	<0.006	<0.006	<0.003	<0.007	<0.003	<0.01	<0.004	<0.022
15	--	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--	--
17	<0.006	<0.006	<0.003	<0.007	<0.003	<0.01	<0.004	<0.022
18	<0.006	<0.006	<0.003	<0.007	<0.003	<0.01	<0.004	<0.022
19	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--	--
25	<0.006	<0.006	<0.003	<0.007	<0.003	<0.01	<0.004	<0.022
26	<0.006	<0.006	<0.003	<0.007	<0.003	<0.01	<0.004	<0.022
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2005

Site	Phorate (µg/L)	Prometon (µg/L)	Propyzam (µg/L)	Pro-pachior (µg/L)	Propanil (µg/L)	Pro-pargite (µg/L)	Simazine (µg/L)	Tebut-hiuron (µg/L)
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	<0.011	<0.01	<0.004	<0.025	<0.011	<0.02	<0.005	<0.02
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	<0.011	<0.01	<0.004	<0.025	<0.011	<0.02	<0.005	<0.02
15	--	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--	--
17	<0.011	<0.01	<0.004	<0.025	<0.011	<0.02	<0.005	<0.02
18	<0.011	<0.01	<0.004	<0.025	<0.011	<0.02	<0.005	<0.02
19	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--	--
25	<0.011	<0.01	<0.004	<0.025	<0.011	<0.02	<0.005	<0.02
26	<0.011	<0.01	<0.004	<0.025	<0.011	<0.02	<0.005	<0.02
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides-2005

Site	Terbacil (µg/L)	Terbufos (µg/L)	Thio-bencarb (µg/L)	Triallate (µg/L)	Trilurain (µg/L)
1	--	--	--	--	--
2	--	--	--	--	--
3	--	--	--	--	--
4	--	--	--	--	--
5	--	--	--	--	--
6	--	--	--	--	--
7	<0.034	<0.02	<0.01	<0.006	<0.009
8	--	--	--	--	--
9	--	--	--	--	--
10	--	--	--	--	--
11	--	--	--	--	--
12	--	--	--	--	--
13	--	--	--	--	--
14	<0.034	<0.02	<0.01	<0.006	<0.009
15	--	--	--	--	--
16	--	--	--	--	--
17	<0.034	<0.02	<0.01	<0.006	<0.009
18	<0.034	<0.02	<0.01	<0.006	<0.009
19	--	--	--	--	--
20	--	--	--	--	--
21	--	--	--	--	--
22	--	--	--	--	--
23	--	--	--	--	--
24	--	--	--	--	--
25	<0.034	<0.02	<0.01	<0.006	<0.009
26	<0.034	<0.02	<0.01	<0.006	<0.009
27	--	--	--	--	--
28	--	--	--	--	--
29	--	--	--	--	--
30	--	--	--	--	--

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Semi Volatile Organic Compounds-2005

Site	1-2-Dip-henylydra (µg/L)	Trichloro-phene (µg/L)	Dichloro-phene (µg/L)	2-4-Dichloro-phene (µg/L)	2-4-Dinitrio-pheno (µg/L)	2-4-Dinitro-toluene (µg/L)	2-6-Dinitro-toluene (µg/L)	2-Chloro-naphthal (µg/L)
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	<2	<1	<2	<2	<3	<1	<2	<1
15	<2	<1	<2	<2	<3	<1	<2	<1
16	--	--	--	--	--	--	--	--
17	<2	<1	<2	<2	<3	<1	<2	<1
18	<2	<1	<2	<2	<3	<1	<2	<1
19	<2	<1	<2	<2	<3	<1	<2	<1
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	<2	<1	<2	<2	<3	<1	<2	<1
24	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--
26	--	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Semi Volatile Organic Compounds-2005

Site	2-Chloro-phenol (µg/L)	Nitro-phenol (µg/L)	3-3-Dici-benziden (µg/L)	4-Bromo-diphenyl (µg/L)	4-Chloro-3-methylph (µg/L)	4-Chloro-diphenyl (µg/L)	4-Nitro-phenol (µg/L)	9-h-Fluorene (µg/L)
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	<1	<1	<0.9	<2	<2	<1	<2	<1
15	<1	<1	<0.9	<2	<2	<1	<2	<1
16	--	--	--	--	--	--	--	--
17	<1	<1	<0.9	<2	<2	<1	<2	<1
18	--	<1	<0.9	<2	<2	<1	<2	<1
19	<1	<1	<0.9	<2	<2	<1	<2	<1
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	<1	<1	<0.9	<2	<2	<1	<2	<1
24	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--
26	--	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Semi Volatile Organic Compounds-2005

Site	Acenaph-thene (µg/L)	Acenaph-thylene (µg/L)	Anthra-cene (µg/L)	Benz(a) anth-racene (µg/L)	Benzo(a) Pyrene (µg/L) GQS = 0.2 µg/L	Benzo(b) Fluorant (µg/L)	Benzo (g-h-i) perylene (µg/L)	Benzo(k) Fluorant (µg/L)
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	<2	<2	<2	<2	<1	<2	<2	<1
15	<2	<2	<2	<2	<1	<2	<2	<1
16	--	--	--	--	--	--	--	--
17	<2	<2	<2	<2	<1	<2	<2	<1
18	<2	<2	<2	<2	<1	<2	<2	<1
19	<2	<2	<2	<2	<1	<2	<2	<1
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	<2	<2	<2	<2	<1	<2	<2	<1
24	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--
26	--	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--

GQS = Groundwater Quality Standard

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Semi Volatile Organic Compounds-2005

Site	Butyl-benzylph-tane (µg/L)	2-Chloro-ethoxy-met (µg/L)	2-Chloro-ethylethe (µg/L)	Chloroiso-propyle (µg/L)	2-Ethyl-hexylph-tha (µg/L)	Cheysene (µg/L)	Dibenz (a-h) anthrane (µg/L)	Diethyl-Phthalate (µg/L)
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	<2	<1	<1	<1	<2	<1	<2	<2
15	<2	<1	<1	<1	<2	<1	<2	<2
16	--	--	--	--	--	--	--	--
17	<2	<1	<1	<1	<2	<1	<2	<2
18	<2	<1	--	<1	<2	<1	<2	<2
19	<2	<1	<1	<1	<2	<1	<2	<2
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	<2	<1	<1	<1	<2	<1	<2	<2
24	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--
26	--	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Semi Volatile Organic Compounds-2005

Site	Dimethyl Phthalate (µg/L)	Dibutyl Phthalate (µg/L)	Dioctyl Phthalate µg/L)	Fluoran-thene (µg/L)	Hexa-chloro-benzene (µg/L)	Hexcl-cyclo-pentad (µg/L)	Indeno-pyrene (µg/L)	Iso-phorone (µg/L)
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	<2	<2	<2	<1	<1	<1	<2	<2
15	<2	<2	<2	<1	<1	<1	<2	<2
16	--	--	--	--	--	--	--	--
17	<2	<2	<2	<1	<1	<1	<2	<2
18	<2	<2	<2	<1	<1	<1	<2	<2
19	<2	<2	<2	<1	<1	<1	<2	<2
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	<2	<2	<2	<1	<1	<1	<2	<2
24	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--
26	--	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Semi Volatile Organic Compounds-2005

Site	Nitro-benzene (µg/L)	Nitrosodi-methyla (µg/L)	Nitrosodi-propylene (µg/L)	Nitrosodi-Phenyla (µg/L)	Penta-chloro-pheno (µg/L)	Phenan-threne (µg/L)	Phenol (µg/L)	Trichloro-ben (µg/L)
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	<1	<2	<2	<2	<2	<1	E 0.3	<1
15	<1	<2	<2	<2	<2	<1	<1.6	<1
16	--	--	--	--	--	--	--	--
17	<1	<2	<2	<2	<2	<1	E 0.1	<1
18	<1	--	<2	<2	<2	<1	--	<1
19	<2	<2	<2	<2	<2	<1	<1.6	<1
20	--	--	--	--	--	--	--	--
21	--	--	--	--	--	--	--	--
22	--	--	--	--	--	--	--	--
23	<1	<2	<2	<2	<2	<1	<1.6	<1
24	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--
26	--	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--

Appendix C (continued)

Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Semi Volatile Organic Compounds-2005

Site	Hexa-chloro-butadi (µg/L)	Hexa-chloro-ethane (µg/L)	Naph-thalene (µg/L)
			GQS = 20 µg/L
1	--	--	--
2	--	--	--
3	--	--	--
4	--	--	--
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--
13	--	--	--
14	<1	<2	<2
15	<1	<2	<2
16	--	--	--
17	<1	<2	<2
18	<1	<2	<2
19	<1	<2	<2
20	--	--	--
21	--	--	--
22	--	--	--
23	<2	<2	<2
24	--	--	--
25	--	--	--
26	--	--	--
27	--	--	--
28	--	--	--
29	--	--	--
30	--	--	--

GQS = Groundwater Quality Standard