west virginia department of environmental protection

Groundwater Programs and Activities

Biennial Report to the West Virginia 2012 Legislature

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Promoting a healthy environment.

Editor's Notes

This biennial report was compiled and edited by the Division of Water and Waste Management's Groundwater Program staff from information submitted by those agencies with groundwater regulatory authority. Copies of this report can be obtained on-line at www.dep.wv.gov or from:

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

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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 2012 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 tenth Groundwater Biennial Report to the legislature since the passage of the Act in 1991, and covers the period from July 1, 2009 through June 30, 2011.

The WVDEP Division of Water and Waste Management (DWWM) Groundwater Program is responsible for compiling and editing the information contained in this report. The WVDEP, the West Virginia Department of Agriculture (WVDA), 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 Groundwater 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 ensuring 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.

One difficulty in achieving the goals of the Act has been 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. As more regulated development occurs, especially pertaining to stormwater discharge, it is hoped that the WVDEP will compile a database of constituents found in stormwater that can be utilized to protect groundwater resources. As more stormwater discharge sites come under regulation, a clearer picture begins to emerge of potential contaminants found in stormwater. A centralized database linked to the geographic information system (GIS) coverages that are accessible to the various agencies and the public will greatly facilitate resolving this problem.

Also needed is continuing outreach to West Virginia citizens 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 DWWM and the United States Geological Survey (USGS). The current DWWM/USGS study is presented in Section B 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 valuable 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 25 wells. From 1999-2008, 300 wells were sampled in West Virginia as part of the Ambient Groundwater Project. In 2009-2010, an interpretive report was prepared to present this data. Beginning in 2010, a new approach was undertaken for this study. The decision was made to establish a sentinel network of groundwater sample sites that would be resampled on a five year cycle to detect trends in groundwater quality. Sample sites were selected from previously sampled wells or springs in an effort to cover a variety of aquifer types, topographic settings, and land uses. These sites include 19 wells, mostly public supply wells, but also USGS monitoring wells, and six springs.

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. The results will be reported to the DWWM, and incorporated into reports submitted by the DWWM.

The 25 sampling sites in the watersheds that were 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, and 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 West Virginia's groundwater resources. The WVDEP, WVDA, and WVDHHR continue to work closely to fulfill the mission of the Department of Environmental Protection, "Promoting a healthy environment".

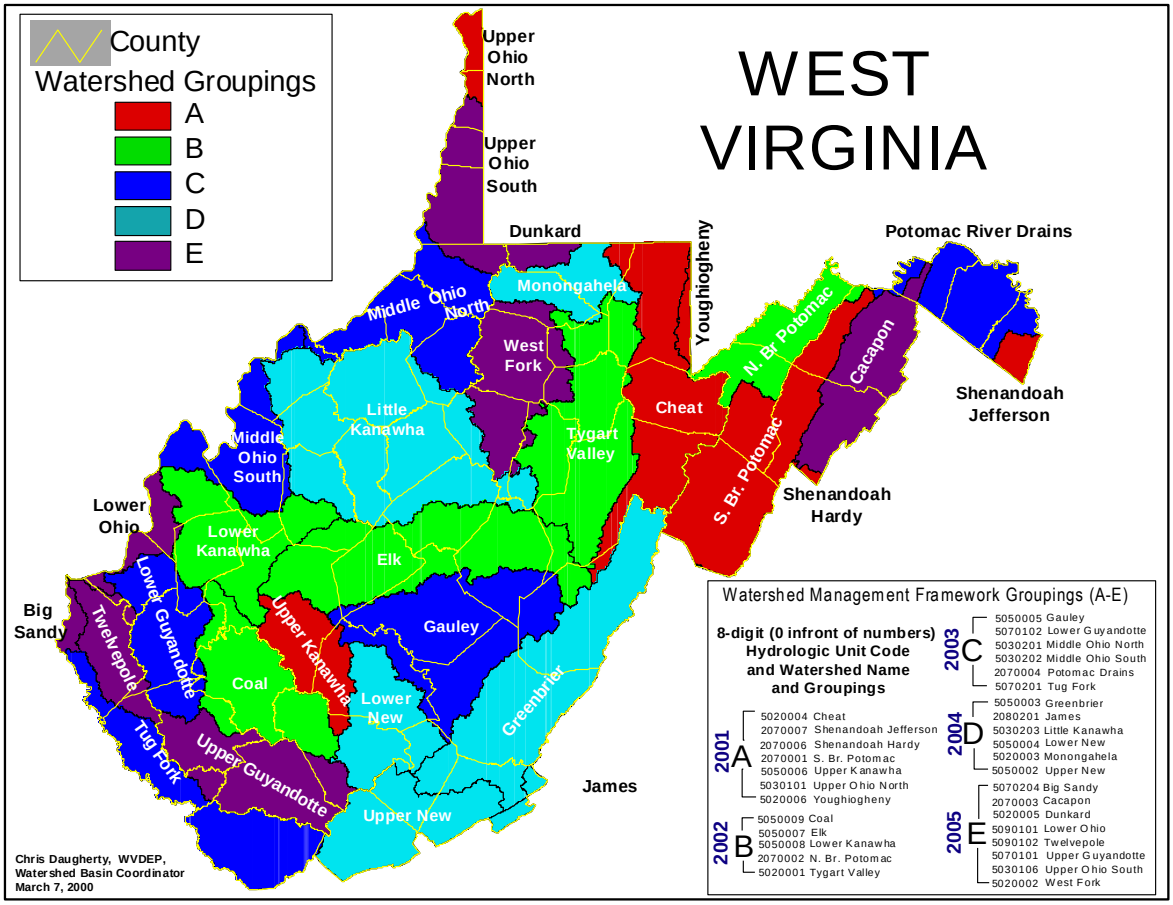
II. GROUNDWATER PROTECTION and WATERSHED MANAGEMENT

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 the 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.

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.

West Virginia Watershed Groups



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

Appellate Activities

The Board is authorized by *W.Va. Code* § 22-11-21 to hear appeals of WVDEP 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:

Andrew and Karen Zetts
Appeal No. 08-02-EQB
Filed: January 3, 2008
Pending

Appalachian Power Company/dba American Electric Power
Appeal No. 08-30-EQB
Filed: November 5, 2008
Pending

Go-Mart, Inc
Appeal Nos. 09-07-EQB and 09-17-EQB
Filed: June 5, 2009
Dismissed: August 17, 2009

Pennzoil-Quaker State Company
Appeal No. 09-11-EQB
Filed: July 16, 2009
Dismissed: August 25, 2010

Arthur W. Dodds, Jr., and Pamela C. Dodds, Ph.D.
Appeal No. 09-15-EQB
Filed: July 21, 2009
Final Order: June 18, 2010

M & G Polymers, USA, Inc.
Appeal No. 09-21-EQB
Filed: November 12, 2009
Withdrawn: December 21, 2010

Cecil I. Walker Machinery Company
Appeal No. 10-02-EQB
Filed: February 19, 2010
Dismissed: August 19, 2010

Mingo Logan Coal Company, Inc.
Appeal No. 10-04-EQB
Filed: February 25, 2010
Dismissed: May 28, 2010

Deepwater, LLC
Appeal No. 10-11-EQB
Filed: March 24, 2010
Dismissed: July 23, 2010

Monongahela Power Company - Rivesville Power Station
Appeal No. 10-15-EQB
Filed: March 31, 2010
Withdrawn: July 1, 2010

Sierra Club
Appeal No. 10-34-EQB
Filed: September 3, 2010
Final Order: March 25, 2011

Gypsy, LLC
Appeal No. 10-35-EQB
Filed: September 9, 2010
Pending

Cytec Industries, Inc.
Appeal No. 11-05-EQB
Filed: January 25, 2011
Agreed Order: June 8, 2011

Jim Probst
Appeal No. 11-06-EQB
Filed: February 7, 2011
Pending

Stevan Hudock
Appeal No. 11-10-EQB
Filed: February 22, 2011
Pending

Heritage Crystal Clean, LLC1
Appeal No. 11-11-EQB
Filed: March 21, 2011
Agreed Order: August 10, 2011

Appeal No. 11-11-2011 was the only appeal filed during this reporting period pursuant to W.Va. Code 22-12-10 related to a civil penalty assessment under the Groundwater Protection Act.

WVA Manufacturing LLC
Appeal No. 11-23-EQB
Filed: June 29, 2011
Pending

Review of Civil Administrative Penalties

W. Va. 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 of the agency. There was only one appeal filed during the reporting period pursuant to this section.

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 WVDA. Maintaining and protecting current and future groundwater quality through enforcement of state and federal regulations, cooperative outreach and education programs, and supporting and investigating 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 ensure 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 WVDA has maintained a cooperative and evolving pesticide management process under the Federal Groundwater Protection Initiative.

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 WVDA 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.

Several programs are in place at the Moorefield Agricultural Center to monitor and improve existing water quality. BMPs are utilized in an effort to reduce pollution and nutrient runoff. All poultry producers are encouraged to have nutrient management plans (NMP) while some poultry integrators require a current nutrient management plan and provide technical assistance of a certified planner. All nutrient management plans 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. To further assist poultry growers, representatives of the WVDA and the West Virginia University Cooperative Extension Service (WVUCES) conduct meetings and workshops. Cost share programs from USDA-Natural Resources Conservation Service (NRCS) also provide farmers with the opportunity to install BMPs on their operations to reduce runoff of nutrients and sediment. 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 encourage nutrient management on all existing poultry operations, the staff of the West Virginia Conservation Agency (WVCA) and NRCS provides technical assistance to local farmers in developing nutrient management plans. In order to participate in cost share programs, farmers must have a current nutrient management plan written by a certified nutrient management planner.

Several streams and tributaries in the West Virginia's Potomac Highlands Region have been identified as being contaminated with excessive amounts of fecal material. These streams are located in agricultural and non-agricultural parts of the region. Because of the ongoing efforts of the agricultural community to prevent runoff of nutrients into the streams, identification of point and nonpoint sources of contamination is being addressed by the WVDA.

The Moorefield Agricultural Center will also be participating in a study funded by the USGS, WVDEP, 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.

IV. DEPARTMENT of AGRICULTURE

B. Pesticides Section

A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest. Insecticides are the most commonly recognized “pesticides”, but compounds marketed as killing or controlling weeds, fungus or plant pathogens are also classified as pesticides. Rodents that present threats to human health, and termites that damage housing are also controlled or eliminated by using pesticides. The regulation of pesticides is often confused with the standards used to maintain food safety as established by the United Stated Department of Agriculture (USDA). The USDA approach is to eliminate or minimize contamination of food by establishing tolerances for contaminates, and in common parlance is often referred to as a “thou shall not contaminate” doctrine.

The Environmental Protection Agency (EPA) regulates all pesticides through the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) as administered by the Environmental Protection Agency’s Office of Pesticide Programs (EPA/OPP). The regulation of pesticides is similar to the strategy used in the protection of the environment, and environmental resources. An industrial society impacts the environment by the production of potentially harmful by-products. The advantages of affordable power, food, transport and consumer goods places modern society in a risk-verses-benefits situation. This shifts the regulatory strategy of pesticides by the EPA/OPP to a risk management system or “risk-benefit” balance analogy. This strategy is the lynchpin of pesticide regulations. The release of a known toxin into the environment for the control of a greater threat is a unique situation in environmental regulations.

Every three years, the EPA/OPP and the Office of Enforcement and Compliance Assurance (OECA) release a guidance document that establishes the priorities and minimum requirements for the enforcement of FIFRA at the State level. The WVDA is currently operating under a guidance document that will expire in 2013. In most states the respective department of agriculture is the state lead agency for enforcement. The West Virginia Department of Agricultures’ regulations mirror FIFRA, but do not limit the State from enacting stricter regulation if needed. Failure of a state agency to meet the minimum requirements or “core activities” listed in the EPA/OPP guidance document may result in forfeiture of the WVDA’s primacy in the enforcement of FIFRA to the EPA. If it is determined that the WVDA’s actions are inefficient or inadequate to protect water quality issues The WVDEP is also authorized to take enforcement action.

EPA’s protection of groundwater from pesticides can be traced back to the early 1980’s. The goal of the EPAs’ Pesticides in Water Program is to ensure that pesticides do not adversely affect the nation’s water resources. Reducing the

concentration of pesticides in urban and agricultural watersheds is a strategic target in the program.

Federal Water Quality Initiatives

The current Pesticides of Interest and Tracking System (POINTS) program has evolved from the National Water Quality Assessment Program initiated in the early eighties, the Generic Pesticides' Management Plan of the 90's and the stalled State Specific Management Plan of the following decade. See *Table 1* for total listing of POINTS pesticides.

The POINTS program addresses both surface and groundwater. The program is divided into three distinct sections or tiers, each of which operates under the realization that identification, investigation and the measurement of the effectiveness of each tier will have to be done over a period of time. The overall strategy of the program is to prevent pesticides from reaching concentrations in surface or ground water above levels referred to as benchmarks. Benchmarks are levels of pesticide concentration well below current or proposed Clean Water Act (CWA) or Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs). Benchmarks pertaining to the current list of POINTS compounds can be found in *Table 3 and a* full listing of benchmarks can be found at http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.htm#benchmarks.

Current EPA/OPP guidance sets 2013 as the deadline for a demonstration of progress in this assessment and management strategy. Progress will be measured by a system of metrics. Each metric is expressed as a percentage of the chemicals of the initial chemical listing that has met the requirements of review or management under its respective tier.

Tier 1 Pesticides of Interest: As defined by the guidance; are pesticides that a State has deemed require individual appraisals regarding their ability to impact water. This probability can be based on historic detections, use patterns or simply the percentage of the product as indicated by the number of individual product registrations. A current example would be that of glyphosate. Most commonly known as Round up, it is one of the most widely used and aggressively marketed commercial and home use herbicides. The WVDA has no record of an aquatic impact resulting from the use of this herbicide but its share of the market place, an estimated 10 percent of all herbicides currently registered in the State, is a legitimate criterion under which it is "identified" or listed as a "Tier 1: Pesticide of Interest".

A state may, at this time, dismiss any or all of the listed chemicals as being of no interest but the state must be able to make a reasonable argument for this action. Little or no use of the pesticide in the state, or no histories of the product exceeding regulatory benchmarks have been acceptable arguments. The

WVDA has, to a limited extent, followed this line of reasoning but is currently doing a more extensive query into its pesticide registration data base. An additional advantage of the cooperative USGS program is the concern that home owner products are less stringently regulated and more susceptible to misuse. The analytical resources of the USGS laboratories and the ability to utilize state of the art contaminate modeling and GIS layered data bases and soil makes this approach extremely useful in prioritization of pesticides under POINTS.

Tier 2 Pesticides of Concern: An Example of tier 2 pesticides is the herbicide Atrazine. Atrazine represented approximately 75 percent of the herbicides used in commercial corn production since the mid 60's and can legitimately be called the progenitor of the Pesticides in Groundwater Program. The herbicide's widespread use and high solubility in water chemistry led to detections nationwide of the parent compound and its break down products (also known as degradates) in both surface and groundwater. In the early 1980s, a dedicated groundwater sampling program for Atrazine was performed by the WVDA utilizing DEP106 (non-point source program) funding over a three year period. Results were consistent with national data and no negative impacts to human health were identified. The most recent sampling program targeting Atrazine was completed in 2005, the results of which were consistent with detections nationwide and in compliance with existing CWA national standards. These studies and proposed re-introduction of Atrazine into the EPAs Registration Eligibility Decision Process (RED) warrants its inclusion as a pesticide of concern. The current status of each POINTS pesticide is listed in *Table 2.*

As a result, Atrazine label rates were reduced, setbacks were increased from surface water, and the product was classified as a restricted use pesticide. All of these actions are examples a state may initiate during the tier 2 review to remediate environmental impacts, but could also be integrated into the final tier of management and measurement (Tier 3).

Tier 3 Demonstration of progress: After a pesticide has advanced through the first two tiers, a state is required to initiate or prove that previous restrictions have been effective in assuring that the pesticide does not exceed a reference concentration/benchmark. Cancellation of a pesticide's use in the state would be the most severe action, but given that pesticides can be environmentally persistent, immediate results may not be evident. The environmental persistence of some pesticides is the reason that benchmarks are set at fractions of what existing or anticipated maximum contaminant levels (MCL) under the CWA or SDWA. Cancellation can also be contested by the products manufacturer commonly referred to as the registrant. More likely tier 3 actions would be the re-registration of the product to a restricted use pesticide (RUP). Use of RUPs requires that applicators become certified under state training programs before the product can be bought and used.

The certification and training section of the WVDA's Pesticides Regulatory Programs generates and oversees the initial certification, testing and the approval of subsequent continuing education training as required by the West Virginia Pesticide Control Act of 1990, Chapter 19 Article 16A. The certification and training section is the preliminary venue for the introduction of restrictions and additional requirements or restrictions of a pesticide's use for commercial and private applicators. Public outreach either through initial applicator certification programs, continuing education programs, or programs targeting the general public such as the West Virginia Extensions Service Master Gardener program and training are recognized management strategies.

A state may also supplement an existing pesticide label with additional restrictions regardless of its status as a general use (GU) or RUP. Options available to the state include: reductions in label rates, identification of areas within the state in which the product cannot be used, or cancellation of the product, as previously mentioned which are successful in reducing or maintaining concentrations at or below benchmarks.

While there are no current examples of this stage of management, an historic example is illustrated by the WVDA's regulation of the herbicide picloram in the late 70's. Picloram, under the trade name Tordon 10 K was a pelletized herbicide formulated and promoted for the control of multiflora rose. While extremely effective in the control of this invasive plant, the efficacy of the product was not evident until the following season. Due to the delay of visual evidence of efficacy, applicators would routinely treat plants a second time in the same season. A second application did not accelerate the effect of the herbicides but increased the likelihood of the herbicide being carried into waterways in runoff. Through the WVDA's certification program the product was classified as an RUP and additional certification and training was required for private applicators to continue use of the product. In addition to a current certification card, an orange sticker indicating that the holder had attended the Picloram specific training was required before the product could be purchased. Subsequent re-sampling in the problem watersheds proved that this course of action had been effective. If needed, a similar program could be initiated for many of the POINTS compounds. Although there are few current registrations of Picloram, due to its history it remains a pesticide of concern.

Active sampling for pesticides listed in the POINTS initiative is not required under any tier of the EPA/OPP guidance. Sampling is acknowledged as an investigative tool that can be used to prioritize resources or demonstrate progress of management under Tier 3 criteria. While many states have extensive groundwater monitoring networks, the WVDA monitors information from the existing monitoring network maintained by WVDEP. Base flow of surface water and samples taken from rural domestic wells are indicators but may not be sufficient to meet future EPA sampling requirements. This report is an opportune time to request an expansion of the existing monitoring network, the expansion of

analytes and perhaps the integration of the WVDA's analytical resources. A closer consultation between the Department of WVDA and the WVDEP could improve the results from both entities limited resources.

Activities to Support Implementation of Pesticide National Pollutant Discharge Elimination System Permits (NPDES)

EPA has developed an NPDES general permit for point source discharges from the application of pesticides to U.S. waters, also known as the Pesticide General Permit (PGP), in response to a 2009 decision by the Sixth Circuit Court of Appeals (*National Cotton Council, et al. v. EPA*). The court vacated EPA's 2006 Final Rule on Aquatic Pesticides that said NPDES permits were not required for applications of pesticides to U.S. waters. As a result of the court's decision, discharges to U.S. waters from the application of pesticides will require NPDES permits when the court's mandate takes effect. On March 28, 2011, the Sixth Circuit of Appeals granted EPA's request for an extension to allow more time for pesticide operators to obtain permits for pesticide discharges into U.S. waters. The court's decision extends the deadline for when permits will be required from April 9, 2011 to October 31, 2011. Pesticide application use patterns not covered by EPA's Pesticide General Permit (PGP) may need to obtain coverage under an individual permit or alternative general permit if they result in point source discharges to U.S. waters. This general permit will provide coverage for discharges where EPA is the NPDES permitting authority. For discharges in NPDES authorized states, state NPDES authorities will be issuing their permit. As of October 2011, people who apply pesticide products to: a) control of mosquitoes and other aquatic insect species, b) control of aquatic weeds or algae, c) wide-area pest control and control of vegetation along ditch banks, and d) control of aquatic animal pests, will be required to operate under an NPDES permit. While the EPA Office of Water and the State Water Agencies had the lead in developing, implementing and providing outreach on these new pesticide NPDES permits, the WVDA remained involved in the process. The Plant Industries Division's gypsy moth suppression program and black fly control program are activities that would require an NPDES PGP.

State Water Quality Initiatives

Widely used products such as glyphosate, which is commonly used by home owners, are the impetus to pursue funding to support a joint study with the USGS to evaluate surface water impacts from home owner pesticide use in residential settings. The initial response from USGS is highly encouraging and a model project has been prepared that is extremely compatible with the WVDA intentions. The program would extend over two years and target residential water sheds in the Hurricane Creek basin in Putnam County. Total cost of the program is estimated at $154,000 which would be split equally between the USGS and the WVDA.

Former and continuing water testing programs for surface water have focused on the Potomac watershed. This study would be the first to address the WVDA's concerns and commitment under the Ohio River protection program and the Gulf of Mexico Hypoxia assessment. Doug Chambers of the USGS Charleston office was initially contacted about this project. Discretionary monies are available from EPA Region III and will be pursued in the upcoming fiscal year.

As previously mentioned, the EPA cooperative agreement guidance does not negate State regulations promulgated concurrently with the States Groundwater Protection Act. Pertinent regulations, which have been addressed, are as follows:

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

During this reporting period, four inspections of bulk pesticides storage facilities were performed. These inspections were performed in accordance with the WVDA regulation 61 CSR12H "Bulk Pesticide Operational Rules" which was granted concurrence and equivalency to the Federal Secondary Containment regulation.

In addition to the secondary containment having an adequate capacity to capture a catastrophic spill the Bulk Operational Rules (61 CSR 12H) require that pumps, transfer lines and other appetencies be inspected and maintained in good operational condition.

The current guidance recognizes both the pesticide container recycling program and the waste pesticide collection and disposal projects as being acceptable groundwater protection activities but no longer considers them as core activities that must be met. In order to continue these programs utilizing EPA funds, these specific commitments were negotiated with the EPA regional office. These programs are a legitimate protection of groundwater in that they reduce the number of pesticide containers and pesticide residues in landfills and that potentially could be disposed of illegally.

Figure 1
Properly rinsed pesticides containers being put into storage for subsequent recycling.

The WVDA maintains pesticide container collection facilities in Greenbrier, Kanawha, Lewis, Hardy, Berkeley, Jefferson and Ohio counties, and recently installed a storage unit in Romney at the Department of Transportation Division of Highways Garage. Over 32,000 pounds of high density polyethylene has been collected over this reporting period. The program is still highly dependent on milk run pickups by Departmental staff (*Figure 1*). Recycled plastic is currently being used to make field drain tile for agricultural operations.

Between June of 2009 and June 2011, WVDA collected and disposed of seven thousand five hundred pounds of waste and surplus pesticides from sites across the State. Approximately 30 percent of this waste was collected from home owners (*Figures 2 and 3)*. More than 1,000 pounds were collected from Federal research facilities (*Figure 4*). The balance was collected from abandoned agricultural operations, outdated materials from active farms and golf courses.

Figure 2 Typical home owner clean out disposal request solid, liquids and unknowns.

Figure 3 Typical home owner clean out disposal request, aerosols.

Figure 4 *Portion of waste pesticides collected from USDA research station.*

Figure 5 *Collection of obsolete pesticide from golf course.*

Table 1
State List of Pesticides of Water Quality Concern
Source: State Survey for Water Resource Monitoring Programs and Analytical Parameters October 2005 - Conducted by the SFIREG WQ/PD Working Committee

2,4-D
Acetochlor (+ ESA, OXA
Alachlor (+ ESA)
Aldicarb (+ degradates)
Atrazine (+ DEA, DIA, DACT, Hydroxy)
Azinphos-methyl
Bentazon
Bromacil
Carbaryl
Carbofuran (Cancellation being prepared)
Chlorothalonil
Chlorpyrifos (+ TCP)
Clopyralid
Copper Pesticides
Dacthal (+ degradates) (Cancellation being prepared)
DBCP
Diazinon
Dicamba
Dimethenamid
Diuron
Endosulfan
Esfenvalerate
Ethoprop
Glyphosate (+ AMPA)
Hexazinone (+ Metabolite B)
Imazamethabenz
Imazapyr
Imidacloprid
Isoxaflutole
Lambda-cyhalothrin
Lindane (Voluntarily cancelled, use of existing stocks permitted until October 1, 2009)
Malathion
Mesotrione
Metalaxyl
Metsulfuron Methyl
Metolachlor (+ ESA, OXA, S-etolachlor)
Metribuzin (+ DA, DADK, DK)
MSMA + other arsenical herbicides
Napropamide
Norflurazone (+ degradates)
Pendimethalin
Phenoxy herbicide group
Phosmet
Picloram
Prometon
Prometryn
Propazine
Propiconazole
Simazine (+ DACT, DIA)
Sulfometuron (et. al.)
Tebuthiuron
Terbacil
Thiamethoxam
Tralkoxydim
Triallate
Triclopyr
Trifluralin

Table 2
Current status of Pesticides of Concern under POINTS for the State of West Virginia
http://www.points.wsu.edu/reports/fullreport.aspx

2,4-D	No	Not evaluated as of this time	None
Acetochlor (+ ESA, OXA)	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Alachlor (+ ESA)	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Aldicarb (+ degradates)	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Atrazine (+ DEA, DIA, DACT, Hydroxy)	No	Evaluated: pesticide of concern ; Initial evaluation: 2009; Re-evaluated: 2010	Not actively managed; No demonstrated progress
Azinphos-methyl	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Bentazon	No	Not a concern	None
Bromacil	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2009; Re-evaluated: 2010	No reasonable exposure expected; not registered for use in State or Tribe; insignificant level of use;
Carbaryl	No	Under review, no conclusion has been reached	None
Carbofuran (Cancellation being prepared)	No	Not a concern	None
Chlorothalonil	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;

Table 2 continued
Current status of Pesticides of Concern under POINTS for the State of West Virginia

Chlorpyrifos (+ TCP)	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2009; Re-evaluated: 2010	No reasonable exposure expected drastic; reduction in home owner use ; insignificant level of use; other;
Clopyralid	No	Under review, no conclusion has been reached	None
Copper Pesticides	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Dacthal (+ degradates) (Cancellation being Prepared)	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected pending cancellation no interest in pursuing historical use ; insignificant level of use; other;
DBCP	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Diazinon	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2009; Re-evaluated: 2010	None
Dicamba	No	Under review, no conclusion has been reached	None
Dimethenamid	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Diuron	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Endosulfan	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Esfenvalerate	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;

Table 2 continued
Current status of Pesticides of Concern under POINTS for the State of West Virginia

Ethoprop	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Glyphosate (+ AMPA)	No	Evaluated: pesticide of concern ; Initial evaluation: 2009; Re-evaluated: 2010	Not actively managed; No demonstrated progress
Hexazinone (+ Metabolite B)	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Imazamethabenz	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Imazapyr	No	Not evaluated as of this time	None
Imidacloprid	No	Not evaluated as of this time	None
Isoxaflutole	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Lambda-cyhalothrin	No	Not evaluated as of this time	None
Lindane (Voluntarily cancelled, use of existing stocks permitted until October 1, 2009)	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Malathion	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Mesotrione	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;

Table 2 continued
Current status of Pesticides of Concern under POINTS for the State of West Virginia

Metalaxyl	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Metsulfuron Methyl	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Metolachlor (+ ESA, OXA, S-Metolachlor)	No	Not evaluated as of this time	None
Metribuzin (+ DA, DADK, DK)	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
MSMA + other arsenical herbicides	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Napropamide	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Norflurazon (+ degradates)	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Pendimethalin	No	Not evaluated as of this time	None
Phenoxy herbicide group	No	Under review, no conclusion has been reached	None
Phosmet	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Picloram	No	Not evaluated as of this time	None
Prometon	No	Not evaluated as of this time	None

Table 2 continued
Current status of Pesticides of Concern under POINTS for the State of West Virginia

Prometryn	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Propazine	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Propiconazole	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Simazine (+ DACT, DIA)	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Sulfometuron (et. al.)	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Tebuthiuron	No	Not evaluated as of this time	None
Terbacil	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Thiamethoxam	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Tralkoxydim	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Triallate	No	Evaluated: not a pesticide of concern ; Initial evaluation: 2008	No reasonable exposure expected; insignificant level of use;
Triclopyr	No	Not evaluated as of this time	None
Trifluralin	No	Not evaluated as of this time	None

Table 3
Current bench marks used in EPAs' Pesticides of Interest (POINTS) water quality Imitative (all concentrations expressed as µg/L)
http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.htm

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Acephate[9]	30560-19-1	416,000	5,760	550	150	> 50,000	—	—	—
Acequinocyl	57960-19-7	33,500	520	1.2	0.98	960	—	—	—
Acetochlor	34256-82-1	190	130	4,100.0	22.10	1.43	3.4	—	—
Acetochlor degradate Ethanesulfonic acid (ESA)[8]	187022-11-3	> 90,000	—	> 62,500	—	9,900	—	—	—
Acifluorfen (Sodium)	62476-59-9	8,500	< 1,500	14,050	—	> 265	378	—	—
Acrolein[10, 13]	107-02-8	7	11.4	< 15.5	7.1	28	72	—	—
Alachlor	15972-60-8	900	187	1,250	110	1.64	2.3	—	—
Alachlor degradate Ethane sulfonic acid	- -	52,000	—	52,000	—	—	—	—	—
Alachlor degradate Oxanilic acid	- -	50,000	—	47,500	—	—	—	—	—
Aldicarb[9]	116-06-3	26	0.46	10	1	> 5,000	—	—	—
Aldicarb sulfone	1646-88-4	21,000	—	140	—	—	—	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Aldicarb sulfoxide	1646-87-3	3,570	—	21.5	—	—	—	—	—
Ametryn	834-12-8	1,800	700	14,000	240	3.67	10	—	—
Atrazine[7]	1912-24-9	2,650	65	360	60	1	37	—	—
Atrazine degradate DACT[8]	- -	> 50,000	—	> 50,000	—	—	—	—	—
Atrazine degradate DEA	- -	—	—	—	—	1,000	—	—	0.17
Atrazine degradate DIA[8]	- -	8,500	—	> 63,000	—	2,500	—	—	—
Atrazine degradate HA[8]	2163-68-0	> 1,500	—	> 2,050	—	> 10,000	—	—	—
Azinphos methyl[9]	86-50-0	0.18	0.055	0.08	0.036	—	—	—	—
Azoxystrobin	13860-33-8	235	147	130	44	49	3,400	—	—
Benfluralin[8]	1861-40-1	15.9	1.9	1,090	15.5	> 100	—	—	—
Bensulide[10]	741-58-2	360	374	290	—	1,500	—	—	—
Bentazon[8]	50723-80-3	> 50,000	—	> 50,000	—	4,500	5,350	—	—
Bifenthrin	82657-04-3	0.075	0.04	0.8	0.0013	—	—	—	—
Boric Acid Salts	10043-35-3	>	—	66,50	—	—	—	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
		400,000		0					
Bromacil	314-40-9	18,000	3,000	60,500	8,200	6.8	45	—	—
Butylate[10]	2008-41-5	105	300	5,500	—	—	4.6	—	—
Captan[10]	133-06-2	13.1	16.5	4,200	560	320	> 12,700	—	—
Carbaryl[9]	63-25-2	110	6.8	0.85	0.5	660	1,500	—	—
Carbofuran	1563-66-2	44	5.7	1.12	0.75	—	—	—	—
Carboxin	5234-68-4	600	—	42,200	—	370	670	—	—
Chlorantraniliprole	500008-45-7	> 600	110	4.9	4.5	1,800	2,000	—	—
Chlormequat chloride	00999-81-5	> 50,000	—	8,450	5,000	> 207,000	2,800	—	—
Chloropicrin[13]	76-06-2	< 8.49	—	< 36	—	—	—	—	—
Chlorothalonil	1897-45-6	5.25	3	1.8	0.6	6.8	630	—	—
Chlorpyrifos	2921-88-2	0.9	0.57	0.05	0.04	140	—	0.083	0.041
Clethodim	99129-21-2	7,500	—	2,850	—	11,000	1,100	—	—
Clofentezine	74115-24-5	> 7.3	6	> 40	26.2	—	—	—	—
Clomazone	81777-89-1	1,450	350	2,700	2,200	167	30,200	—	—
Clopyralid	57754-85-5	984,000	—	56,500	—	—	—	—	—
Copper	7440-50-8	14.55	9.01	1.8	1.11	3.1	2,300	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Coumaphos[10]	56-72-4	140	11.7	0.037	0.037	—	—	—	—
Cyanamide	420-04-2	23,000	< 507	1,650	100	650	2,330	—	—
Cycloate	1134-23-2	2,250	—	1,300	—	—	—	—	—
Cyfluthrin	68359-37-5	0.034	0.01	0.0125	0.007	—	—	—	—
Cypermethrin	52315-07-8	0.195	0.14	0.21	0.069	—	—	—	—
Cyphenothrin	39515-40-7	0.17	—	0.22	—	—	—	—	—
Cyromazine	66215-27-8	44,850	14,000	46,400	310	—	—	—	—
Dacthal (DCPA)[8]	1861-32-1	15,000	—	13,500	—	> 11,000	> 11,000	—	—
Daminozide	1596-84-5	224,000	—	35,500	—	> 99,800	—	—	—
2,4-DB[11]	94-82-6	1,000	—	7,500	—	932	—	—	—
2,4-DB-DMAS[11]	- -	1,567	—	10,150	—	—	—	—	—
Deltamethrin	52918-63-5	0.29	0.017	0.055	0.0041	—	—	—	—
Diazinon[10, 13]	333-41-5	45	< 0.55	0.11	0.17	3,700	—	0.17	—
Diazinon degradate Oxypyrimidine[8]	4562-27-0	> 50,500	—	> 51,000	—	> 109,000	—	—	—
Dicamba, acid[8, 11]	1918-00-9	14,000	—	17,300	—	61	> 3,250,000	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Dicamba, dimethylamine salt	2300-66-5	500,000	—	800,000	—	—	—	—	—
Dicamba, sodium salt	1982-69-0	279,000	—	19,050	—	—	—	—	—
Dichlobenil[13]	1194-65-6	2,465	< 330	1,850	560	1,000	30	—	—
Dichlorvos (DDVP)	62-73-7	79.5	5.2	0.035	0.0058	14,000	—	—	—
Dicofol	115-32-2	26.5	4.4	70	19	> 5,000	—	—	—
Dicrotophos	141-66-2	3,150	—	6.35	0.99	—	—	—	—
Difenacoum	56073-07-5	32	—	305	—	320	—	—	—
Difenzoquat	43222-48-6	23,250	—	1,265	—	630	120	—	—
Diflubenzuron	35367-38-5	64,500	100	0.0014	0.00025	200	190	—	—
Dimethenamid	163515-14-8	3,150	300	6,000	1,020	14	8.9	—	—
Dimethoate[9]	60-51-5	3,100	430	21.5	0.5	84	—	—	—
Diquat Dibromide	85-00-7	7,400	122	385	< 36	9.4	0.75	—	—
Disulfoton[9]	298-04-4	19.5	4	1.95	0.01	—	—	—	—
Disulfoton sulfone	2497-06-5	> 4,600	—	17.5	0.14	—	—	—	—
Disulfoton sulfoxide[8]	- -	30,000	—	32	1.53	—	—	—	—
Diuron[10]	330-54-1	200	26	80	200	2.4	15	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Dodine	2439-10-3	285	99	8.9	7.3	0.95	—	—	—
Endosulfan	115-29-7	0.05	0.11	0.3	0.01	428	—	0.22	0.056
Endosulfan sulfate	1031-07-8	1.9	—	150	—	—	—	—	—
Endothall (acid)	145-73-3	24,500	1,300	46,000	< 2,200	—	—	—	—
Endothall (dipotassium salt)	145-73-3	4,576	1,790	31,900	—	—	610	—	—
Endothall (N,N-dimethylalkylamine salt)	145-73-3	7.5	56	6	2.3	2.3	740	—	—
EPTC	759-94-4	7,000	—	3,245	810	1,400	5,600	—	—
Esfenvalerate[9]	66230-04-4	0.035	0.035	0.025	0.017	—	—	—	—
Ethalfluralin	55283-68-6	16	0.4	30	24	25	—	—	—
Ethofenprox	80844-07-1	1.35	23	0.4	0.17	> 18.8	> 26	—	—
Ethoprop	13194-48-4	150	24	22	0.8	8,400	—	—	—
Fenbutatin-oxide	13356-08-6	0.85	0.31	15.5	16	—	—	—	—
Fenitrothion	122-14-5	860	46	1.15	0.087	—	—	—	—
Fenoxaprop-p-ethyl	71283-80-2	155	22	> 529	—	430	> 3,000	—	—
Fenoxycarb	72490-01-8	800	48	200	0.0016	—	—	—	—
Fenpropathrin	64257-84-7	1.1	0.091	0.265	0.064	—	—	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Fenthion[8]	55-38-9	415.0	7.5	2.60	0.013	400	> 2,800	—	—
Fipronil	120068-37-3	41.5	6.6	0.11	0.011	140	> 100	—	—
Fipronil degradate MB46136	- -	12.5	0.67	0.36	0.037	140	> 100	—	—
Fipronil degradate MB46513	- -	10	0.59	100	10.3	140	> 100	—	—
Fipronil degradate MB45950	- -	41.4	6.6	1.07	0.11	140	> 100	—	—
Florasulam	145701-23-1	> 50,000	119,000	> 146,000	38,900	3.45	1.18	—	—
Fluazinam	79622-59-6	18	0.69	90	68	9,200	—	—	—
Flubendiamide	272451-65-7	> 32.55	60.5	> 27.4	41.5	> 69.3	> 54.6	—	—
Flumetsulam	98967-40-9	> 150,000	197,000	125,000	111,000	3.21	3.1	—	—
Flumiclorac-pentyl	87546-18-7	550	—	> 19,000	—	—	—	—	—
Fluometuron	2164-17-2	320	—	110	—	30	220	—	—
Fluridone	59756-60-4	2,800	480	650	—	—	—	—	—
Flurprimidol	56425-91-3	8,600	944	5,900	2,960	840	10,400	—	—
Flutolanil	66332-96-5	1,250	233	> 3,400	530	8,010	8,010	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Fomesafen Sodium	72178-02-0	63,000	9,400	188,000	50,000	92	210	—	—
Fosthiazate	98886-44-3	55,500	2,320	130	61	> 4,500	—	—	—
Gamma-cyhalothrin	- -	0.0145	—	0.00024	—	> 2,850	—	—	—
Glufosinate	77182-82-2	> 160,000	—	334,000	32,000	7,800	1,470	—	—
Glyphosate[10]	1071-83-6	21,500	1,800	26,600	49,900	12,100	11,900	—	—
Glyphosate degradate aminomethyl phosphoric acid (AMPA)	1066-51-9	249,500	—	341,500	—	—	—	—	—
Glyphosate isopropylamine salt	38641-94-0	42,450	—	—	—	—	—	—	—
Hexaflumuron	86479-06-3	> 127.8	—	0.0555	—	—	—	—	—
Hexazinone	51235-04-2	137,000	17,000	75,800	20,000	7	37.4	—	—
Hexythiazox	78587-05-0	265	—	370	6.1	—	—	—	—
Imazapyr[8, 10]	81334-34-1	> 50,000	43,100	50,000	97,100	11,500	18	—	—
Imazamox[8]	114311-32-9	> 59,500	—	> 61,000	—	> 40	11	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Imidacloprid[8]	105827-78-9	> 41,500	1,200	35	1.05	> 10,000	—	—	—
Iodomethane	74-88-4	665	—	285	—	—	—	—	—
Ipconazole	125225-28-7	765	0.18	850	—	—	—	—	—
Iprodione[8, 10]	36734-19-7	1,550	260	120	170	330	> 12,640	—	—
Isoxaben	82558-50-7	> 550	400	> 650	690	> 1,400	—	—	—
Isoxaflutole[8]	141112-29-0	> 850	—	> 750	—	110	4.9	—	—
Isoxaflutole - rpa202248[8]	- -	> 15,300	—	> 29,800	—	5,000	75	—	—
Kresoxim methyl	143390-89-0	95	87	166	55	29.2	> 305	—	—
Lactofen	77501-63-4	230	1.4	2,425	—	0.99	0.6	—	—
Lambda-cyhalothrin	91465-08-6	0.105	0.031	0.0035	0.002	> 310	—	—	—
Lindane (gamma HCH)	58-89-9	0.850	2.900	0.500	54	—	—	0.95	—
Linuron[9]	330-55-2	1,500	5.58	60	0.09	13.7	2.5	—	—
Malathion	121-75-5	16.4	8.6	0.3	0.035	2,400	—	—	0.1
Mancozeb	8018-01-7	230	—	290	—	47	—	—	—
Mandipropamid	374726-62-2	—	220	3,550	—	> 2,500	> 7,900	—	—
Maneb	12427-38-2	21	—	60	—	13.4	—	—	—
Mancozeb and Maneb	- -	>	37,320	134,5	2	—	—	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
degradate ETU[8]		251,000		00					
MCPA acid[11]	94-74-6	—	—	—	—	300	170	—	—
MCPA DMAS[11]	- -	48,000	12,000	41,000	11,000	160	130	—	—
MCPA EHE[11]	- -	380	—	90	—	170	20	—	—
MCPA sodium salt[8, 11]	- -	> 34,000	—	> 92,000	—	—	—	—	—
MCPB	6062-26-6	1,950	—	25,000	—	380	210	—	—
MCPP-p acid[10]	16484-77-8	—	—	> 45,500	50,800	—	—	—	—
MCPP-p DMAS[8]	66423-9-4	> 46,500	—	—	—	14	1,300	—	—
Mefenoxam[8]	70630-17-0	> 60,500	—	20,950	100	—	77,000	—	—
Metalaxyl[8]	57837-19-1	65,000	9,100	14,000	100	140,000	92,000	—	—
Metaldehyde	108-62-3	34,500	—	> 38,330	—	—	—	—	—
Metam sodium	137-42-8	25.6	—	27.5	—	254	590	—	—
Methamidophos[8, 9]	10265-92-6	12,500	48.9	13	4.5	> 50,000	—	—	—
Methidathion[10]	950-37-8	1.1	6.3	1.5	0.66	—	—	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Methiocarb	2032-65-7	218	50	3.5	0.1	—	—	—	—
Methomyl[9]	16752-77-5	160	12	2.5	0.7	—	—	—	—
Methoprene	40596-69-8	380	48	165	51	—	—	—	—
Methyl bromide	74-83-9	1,950	100	1,300	—	2,200	—	—	—
Methyl isothiocyanate	556-61-6	26.55	—	38	—	254	590	—	—
Methyl isothiocyanate (MITC) degradate Dazomet	533-74-4 / 556-61-6	25.6	—	27.5	25	254	590	—	—
Methyl paraoxon	950-35-6	—	—	1.15	1	—	—	—	—
Methyl parathion[13]	298-00-0	925	< 10	0.49	0.25	15,000	18,000	—	—
Metolachlor	51218-45-2	1,600	1,000	550	1	8	21	—	0.03
Metolachlor ESA[8]	- -	24,000	—	> 54,000	—	> 99,450	> 95,100	—	—
Metolachlor OA[8]	- -	> 46,550	—	7,700	—	57,100	> 95,100	—	—
Metribuzin	21087-64-9	21,000	3,000	2,100	1,290	8.7	130	—	—
Molinate[10]	2212-67-1	105	390	170	340	220	3,300	—	—
Myclobutanil	88671-89-0	1,200	980	5,500	—	830	—	—	—
Naled	300-76-5	46	2.9	—	0.045	25	> 1,800	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Naled degradate DDVP	- -	50	5.2	0.033	0.0058	—	—	—	—
Napropamide	15299-99-7	3,200	1,100	7,150	1,100	3,400	—	—	—
Norflurazon[8]	27314-13-2	4,050	770	> 7500	1,000	9.7	58.2	—	—
Orthosulfamuron	213464-77-8	> 61,000	6,100	> 48,650	6,500	80	0.7	—	—
Oryzalin[8]	19044-88-3	1,440	220	750	358	42	> 15.4	—	—
Oxadiazon	19666-30-9	440	0.88	1,090	30	5.2	41	—	—
Oxamyl[10]	23135-22-0	2,100	770	90	27	120	30,000	—	—
Oxydemeton methyl[8, 9]	301-12-2	365	5	95	46	> 100,000	—	—	—
Oxyfluorfen	42874-03-3	102	1.3	40	13	0.29	0.35	—	—
Oxytetracycline (hydrochloride salt)	2058-46-0	> 47,450	—	> 51,000	—	—	—	—	—
Paclobutrazol	76738-62-0	11,800	—	8,000	—	41,500	—	—	—
Paraquat (dication)	1910-42-5	6,000	< 369	600	< 36.9	0.396	71	—	—
Pebulate	1114-71-2	3,150	—	3,315	—	230	1,800	—	—
Pendimethalin	40487-42-1	69	6.3	140	14.5	5.2	12.5	—	—
Pentachloronitrobenzene	82-68-8	50	13	385	18	—	—	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Permethrin[16]	52645-53-1	0.395	0.0515	0.01	0.0014	68	—	—	—
Phorate[8]	298-02-2	1.18	0.34	0.3	0.21	> 1,300	—	—	—
Phosmet[8]	732-11-6	35	3.2	1.0000	0.8	34	> 1,800	—	—
Picloram	1918-02-1	6,500	550	34,150	11,800	4,900	—	—	—
Pinoxaden	243973-20-8	10,000	—	—	—	1,200	4,300	—	—
Pinoxaden (NOA 447204)[8]	- -	> 60,000	—	> 60,000	—	95,600	> 93,500	—	—
Pinoxaden (NOA 497854)[8]	- -	> 51,500	> 960	> 50,500	5,800	> 100,000	10,000	—	—
Piperalin	3478-94-2	385	—	945	—	—	—	—	—
Pirimiphos Methyl	029232-93-7	202	180	55	—	1,200	—	—	—
Profenofos	41198-08-7	7.05	2	0.465	0.2	—	—	—	—
Prometon[10]	1610-18-0	6,000	9,500	12,850	3,500	98	624	—	—
Prometryn	7287-19-6	1,450	620	9,295	1,000	1	11.8	—	—
Propachlor	1918-16-7	85	—	395	—	13.5	—	—	—
Propanil	709-98-8	1,150	9.1	600	86	16	110	—	—
Propargite	2312-35-8	59	16	37	9	66.2	75,000	—	—
Propetamphos	31218-83-4	94	—	1.65	—	—	—	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Propiconazole	60207-90-1	425	95	2,400	—	93	4,828	—	—
Propionic Acid	79-09-4	25,500	—	11,350	—	—	—	—	—
Propoxur	114-26-1	1,850	—	5.5	—	—	—	—	—
Propyzamide[8,9]	23950-58-5	36,000	7,700	> 2,800	600	> 4,000	1,180	—	—
Pyrasulfotole	365400-11-9	> 48,000	580	> 47,900	12,800	8,300	28	—	—
Pyridalyl	179101-81-6	250	49	2.1	4.4	—	—	—	—
Pyriproxyfen	95737-68-1	> 163	4.3	200	0.015	56	> 180	—	—
Pyroxsulam	422556-08-9	> 43,500	10,100	> 49,500	10,400	111	2.57	—	—
Quinclorac	84087-01-4	15,800	16,000	14,900	110,000	> 500	> 500	—	—
Quizalofop-p-ethyl	76578-14-8	230	11	1,060	—	> 1,770	> 82.8	—	—
Resmethrin	10453-86-8	0.14	0.32	1.550	—	—	—	—	—
Rotenone[10]	83-79-4	0.97	1.01	1.850	1.25	—	—	—	—
Sethoxydim	74051-80-2	85,000	—	39,050	—	—	> 281	—	—
Siduron	1982-49-6	4,050	15	6,850	6	212	212	—	—
Simazine	122-34-9	3,200	960	500	2,000	36	140	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
S-Metolachlor	51218-45-2 / 87392-12-9	1,600	30	1,900	4,900	8	21	—	—
S-Metolachlor degradate ESA (CGA-354743)	- -	21,500	—	54,000	—	—	43,000	—	—
S-Metolachlor degradate OA (CGA-51202)	- -	> 48,150	—	7,700	—	57,100	—	—	—
Sodium Tetrathiocarbonate	7345-69-9	3,350	—	3,300	—	17,000	—	—	—
Sodium Tetrathiocarbonate degradate Carbon disulfide	75-15-0	435	—	430	—	520	—	—	—
Spirotetramat	20313-25-5	705	534	330	100	4,050	4,490	—	—
Spirotetramat degradate enol	- -	> 50,000	—	37,450	—	> 100,000	5,400	—	—
Spirotetramat degradate keto hydroxy	- -	—	—	> 50,000	—	—	—	—	—
Sulfentrazone	122836-35-5	46,900	2,950	30,200	200	1.8	28.8	—	—
Sulfosulfuron[8]	141776-32-1	> 45,000	100,000	> 48,000	102,000	400	1	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Sumithrin	26002-80-2	7.9	1.1	2.2	0.47	—	—	—	—
Tebufenozide	112410-23-8	1,500	< 48	1,900	4.3	> 740	—	—	—
Tebupirimphos	96182-53-5	44.5	130	0.039	0.011	630	8,800	—	—
Tebuthiuron	34014-18-1	53,000	9,300	148,500	21,800	50	135	—	—
Telone	542-75-6	540	—	45	70	7,900	20,000	—	—
Telone degradate 3-chloroacrylic acid	- -	34,750	—	27,500	—	430	220	—	—
Telone degradate 3-chloroallyl alcohol	- -	493	—	1,150	—	32,900	1,694	—	—
Temephos	3383-96-8	1,745	—	5	—	—	—	—	—
Terbacil	5902-51-2	23,100	1,200	32,500	640	11	140	—	—
Terbufos[10]	13071-79-9	0.385	0.64	0.1	0.03	—	—	—	—
Thiencarbazone-methyl	317815-83-1	> 52,000	4,800	> 47,000	3,540	298	0.8	—	—
Thiobencarb	28249-77-6	280	—	50	1	17	770	—	—
Thiodicarb	59669-26-0	605	25	2.7	9	> 8,300	—	—	—
Thiophanate methyl	23564-05-8	4,150	2	2,700	3	930	> 4,700	—	—

OPP Aquatic Life Benchmarks (µg / L) (freshwater)									
Pesticide	CAS number	Fish		Invertebrates		Non-vascular Plants	Vascular Plants	Office of Water Aquatic Life Criteria	
		Acute[1]	Chronic[2]	Acute[3]	Chronic[4]	Acute[5]	Acute[6]	Maximum Concentration (CMC)	Continuous Concentration (CCC)
Thiram[10]	137-26-8	21	530	105	170.6	140	1,600	—	—
Tralkoxydim[8]	87820-88-0	> 3,750	—	> 87,000	2,100	7,700	2,600	—	—
Triallate	2303-17-5	600	38	45.5	13	120	2,400	—	—
Triasulfuron[8, 10]	82097-50-5	> 50,000	68,600	> 50,000	105,000	—	—	—	—
Tribufos	78-48-8	122.5	3.5	3.4	1.56	148	1,100	—	—
Trichlorfon	52-68-6	79	110	2.65	0.0057	—	—	—	—
Triclopyr[14]	55335-06-3	180	104,000	850	80,700	100	880	—	—
Trifloxystrobin	141517-21-7	7	4.3	12.5	2.8	37	> 1,930	—	—
Trifloxystrobin degradate CGA-321113	- -	> 53,000	—	> 47,500	3,200	78,800	—	—	—
Triflumizole	686994-11-1	290	33	700	67	140	720	—	—
Trifluralin	1582-09-8	20.5	1.14	280	2.4	7.52	43.5	—	—
Urea sulfate	21351-39-3	40,000	—	—	—	11,500	—	—	—
Ziram[10]	137-30-4	9.7	101	24	39	67	370	—	—

Benchmarks are not completed for all of the points compounds.

- [1] Benchmark = Toxicity value x LOC. For acute fish, toxicity value is generally the lowest 96-hour LC50 in a standardized test (usually with rainbow trout, fathead minnow, or bluegill), and the LOC is 0.5.

- [2] Benchmark = Toxicity value x LOC. For chronic fish, toxicity value is usually the lowest NOEAC from a life-cycle or early life stage test (usually with rainbow trout or fathead minnow), and the LOC is 1.

- [3] Benchmark = Toxicity value x LOC. For acute invertebrate, toxicity value is usually the lowest 48- or 96-hour EC_{50} or LC_{50} in a standardized test (usually with midge, scud, or daphnids), and the LOC is 0.5.

- [4] Benchmark = Toxicity value x LOC. For chronic invertebrates, toxicity value is usually the lowest NOAEC from a life-cycle test with invertebrates (usually with midge, scud, or daphnids), and the LOC is 1.

- [5] Benchmark = Toxicity value x LOC. For acute nonvascular plants, toxicity value is usually a short-term (less than 10 days) EC_{50} (usually with green algae or diatoms), and the LOC is 1.

- [6] Benchmark = Toxicity value x LOC. For acute vascular plants, toxicity value is usually a short-term (less than 10 days) EC50 (usually with duckweed) and the LOC is 1.

- [7] Chronic Aquatic Community Benchmark for Atrazine = 17.5 µg / L. Exceedence of this benchmark concentration, as an average for any 60-day period, could cause community-level effects based on changes in plant community diversity and indirect effects on fish and aquatic invertebrates.

- [8] Because the underlying toxicity value is a "greater-than" value (such as >265,000), this benchmark may overestimate toxicity.

- [9] The chronic benchmark is based on the acute toxicity value (which was lower than the lowest available chronic toxicity value), and therefore may underestimate chronic toxicity.

- [10] Although the underlying acute toxicity value is greater than or equal to the chronic toxicity value, the acute benchmark is lower than the chronic benchmark because acute and chronic toxicity values were multiplied by LOC values of 0.5 and 1, respectively.

- [11] Original toxicity values are in micrograms of acid equivalents per liter. For 2,4-D and 2,4-DB, the toxicity values selected were the lowest available values for the acid or salt forms. For MCPA, acute toxicity values were the lowest for the acid, salt or ester forms, and chronic toxicity values were the lowest of the acid and salt forms. For Dicamba the toxicity values were the lowest of the acid or salt forms. (Selection was consistent with risk quotients in the cited USEPA references.)

- [13] Because the underlying toxicity value is a "less-than" value (such as <1,500), this benchmark may underestimate toxicity.

- [14] The acute toxicity values were the lowest of the acid, salt or ester forms, and the chronic toxicity values were the lowest of the acid and salt forms of triclopyr. (Selection was consistent with risk quotients in the cited USEPA reference.)

- [16] Toxicity values and benchmarks apply to permethrin. If monitoring data represent only the *cis* isomer of permethrin in water, comparison with benchmarks may underestimate potential toxicity.

Definitions

- CCC = Criterion continuous concentration
- CMC = Criterion maximum concentration
- EC_{50} = 50 percent effect concentration
- LC_{50} = 50 percent lethal concentration
- LOC = level of concern
- NOAEC = no-observed-adverse-effects concentration
- µg/L = microgram per liter

— = no benchmark available

Fertilizer Rules

The WVDA is monitoring fertilizer through legislative and procedural rules. These rules include:

61 CSR 6B	Primary and Secondary Containment of Fertilizer
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 was repealed as a result of the passage of The Department of Environmental Protection's Concentrated Animal Feeding Operations Rule.

61 CSR 22B. Best Management Practices for Fertilizers and Manures 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.

The environmental impact of agricultural fertilizers and soil amendments are not determined by the WVDA. The WVDA does maintain a quality assurance and label compliance monitoring program for commercial fertilizers. Bulk fertilizer dealers are required to register with the WVDA 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 and Environmental Protection Division.

Groundwater Projects

Several programs are in place at the Moorefield Agricultural Center to monitor and improve water quality. The Environmental Programs section continues to monitor surface water quality in West Virginia. Environmental staff

collects approximately 2,500 water quality samples per year on fifteen (15) streams in West Virginia's eastern panhandle including Lost River, Bears Hell Run, Anderson Run, Opequeon Creek, Sleepy Creek, South Branch of the Potomac River, Mill Creek (Hampshire County), North Fork of the South Branch of the Potomac River, South Fork of the South Branch of the Potomac River, Mill Creek (Grant County), Patterson Creek, Bullskin Run, Elk Branch, Elks Run, and Rockymarsh Run.

These water quality samples are analyzed for parameters such as pH, Temperature, Conductivity, Dissolved Oxygen, Nitrate, Nitrite, Ammonia, Orthophosphate, Total Phosphorous, Turbidity, and Total Suspended Solids. Water quality analysis has been provided to interested watershed organizations and other state agencies.

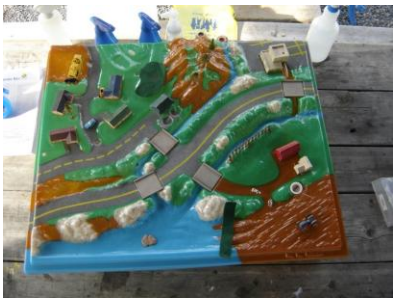
The staff in Environmental Programs works with area farmers to promote BMPs that reduces nutrient and sediment runoff and increase farm productivity. They are also working with farmers to identify and report non cost share BMPs that currently exist on agricultural operations.

One BMP that the WVDA specifically promotes is a Nutrient Management Plan (NMP) which specifies 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. To facilitate Nutrient Management Plan implementation, the WVDA Nutrient Management Laboratory in Moorefield routinely analyzes over 200 litter/manure samples per year.

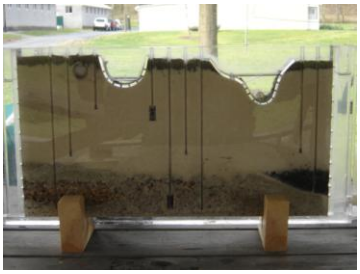
To assist poultry growers, educational meetings and workshops are routinely conducted by Environmental Programs staff and the WVUCES. In an effort to incorporate nutrient management into all existing poultry operations, the staff of the WVCA and NRCS provides technical assistance to local integrators in developing nutrient management plans. There are currently over 100 certified Nutrient Management Planners in the State of West Virginia.

The Environmental Programs Section participates in several education and outreach events each year. Staff attends County fairs in the Eastern Panhandle to inform citizens about environmental issues related to local waters and the Chesapeake Bay.

Staff also attends 4-H camps and works throughout the school year to inform youth about point and non-point source pollution and how pollution affects ground and surface waters. This is accomplished by using hands on activities such as the EnviroScape and the Groundwater Model.



The EnviroScape shows students where pollution can come from and the difference between point and non-point source pollution. The model shows students how pollution can be reduced from reaching our streams, our groundwater and the Chesapeake Bay.



The Groundwater Model shows a cross section of soil and shows how groundwater moves through the soil profiles. The Groundwater Model is used to show students how a leaking polluted lake, septic tank, lagoon or groundwater can pollute not only the water in our streams but also the water that we consume.

IV. DEPARTMENT of AGRICULTURE

C. West Virginia Conservation Agency

The WVCA focuses resource conservation efforts on the maintenance and/or improvement of water quality relative to natural resource utilization with a primary focus on agriculture and construction activities. The main concern is for surface water quality but activities impacting groundwater resources directly and indirectly are addressed through conservation programs that implement BMPs, provide technical support, and involve educational outreach to the citizens throughout the state.

The WVCA continues it's "Conservation Partnerships" with state, federal, and local agencies as well as the private sector, businesses, and many organizations. Utilizing a cooperative approach provides benefits such as funding sources for projects, technical expertise and enables citizen input assisting our agency to pinpoint and target specific problems in specific areas. Utilizing our "Conservation Partnerships" continues to be a very effective approach to addressing West Virginia's concerns and providing the resources vital in the solutions and/or prevention of water quality degradation issues.

Our state has a diversity of terrain and geology that challenges natural resource conservationists with a multitude of issues that must be confronted by methods that are both effective and sensitive to the specific location and individuals affected.

The WVCA undertook the following activities which either directly or indirectly protect West Virginia's groundwater resources:

Agricultural Activities

Cost share programs have been a significant contributor to encourage landowners to develop conservation practices on their property.

- The WV Lime Incentive Program provides assistance for landowners to apply lime to their land which decreases the acidy of the soil and increases the plant nutrient uptake. Consequently, the overall vigor of the grassland species is increased thus promoting efficient infiltration of stormwater and nutrient uptake. Over 158,120 tons of lime was applied to over 60,275 acres through the WV Lime Incentive Program. This program also mandates education for farmers on proper pesticide application.

- WVCA working with NRCS and farmers assisted with riparian buffers through CREP on 71 farms protecting 101,149 linear feet of stream bank,

2608 acres of karst geology with estimated sediment load reduction of 182,053.98 tons/year. Sixty agricultural conservation plans were written and 116 nutrient management plans for were written or reviewed for 5,261.1. Through these plans approximately 274,062 pounds of nitrogen and 397,711 pounds of phosphorus were properly managed and applied to agriculture lands, reducing the potential for leaching of these nutrients into groundwater resources.

- ❖ WVCA serves as a technical resource role on the West Virginia Concentrated Animal Feeding Operation Committee.

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

Sediment / Construction and Development

In construction assistance, the WVCA reviewed 26 sediment and erosion control plans for construction sites less than one acre; facilitating the conservation of an estimated 286.91 tons of soil. Plans are reviewed for utilization of appropriate BMPs to prevent sedimentation of the state's waters and underground aquifers.

The WVCA provided technical stormwater management assistance to 144 construction projects by providing recommendations for BMPs to alleviate problem areas. BMP's include various sediment catchment and erosion prevention systems utilized on small construction sites so that water is contained as long as possible and released slowly into natural waterways or allowed to infiltrate into the ground. Reduction of these pollutants reduces the overall need for filtration and potential contamination of pathogens in both public and private water supplies.

Additionally, a total of 2,795 feet of severely eroding streambanks were restored saving 161.17 tons of sediment from entering the streams and underground aquifers each year. Twenty-one watershed associations throughout the state were provided technical and educational outreach support for sediment and construction related issues.

Management of Organic Animal Waste and Chemical Fertilizers

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

WVCA serves on the WV Nutrient Management Committee that oversees planner certification and develops resource management practices concerning chemical fertilizer, livestock manure and poultry litter utilization. By properly applying chemicals and fertilizers and managing animal waste, it assures that only what can be utilized by pasture plants at one time is applied and no leaching of excess material is available to the groundwater.

393 Soil Samples were pulled on 24 farms

Pesticide Management

The Integrated Pest Management and Pesticide Management Programs focus on pesticides effect on the environment and alternatives to pesticide use, including how to understand pesticide labeling and understanding pest species to minimize total amounts of pesticides used. Many pesticides have soil residual effects and can leach into underground aquifers if not properly applied; this program focuses on proper application to prevent this from offering.

- 2 Educational programs on Pest Management were provided to commercial pesticide applicators.

- Integrated Pest Management workshop for the public.

- Provided information to Conservation District Cooperators on the control of invasive plants and herbicide use precautions to prevent non-target and water pollution problems.

- Reviewed environmental compliance plan for Greenbrier Sporting Club golf course for their certification from the Audubon Society, as well as general BMPs on the golf course

Preside Dress Nitrogen Program

Soil sampled to determine application rates of additional nitrogen to achieve yield goals for corn farmers. Nitrogen is often over applied in cropping situations and can leach into both ground and surface water sources. This program provides farmers with information regarding exactly how much nitrogen is needed to achieve their yield goal without over applying.

- 41 samples taken on 397 acres, recommended Nitrogen application rates reduced by 48,067 pounds

- Pre-plant NT Sampling for corn on 158 acres

- ❖ Proper application of manure on 158 acres

The Agriculture Enhancement

The purpose of the Agriculture Enhancement Program is to promote the wise use of resources and improve water quality within watersheds impacted by agricultural activities. Technical and cost-share assistance is offered as an incentive to encourage producers to implement sound soil conservation practices that benefit production as well as environmental quality. These practices have direct and indirect beneficial effects on groundwater quality by promoting healthier pastures and crop areas that reduce surface runoff and allow for greater infiltration of rain water. Practices that the program offers are:

Lime Application: 2065.612 tons
Poultry Litter Transfer: 1446 tons
Cover Crops planted: 848 acres
Stream Bank fencing: 7264 feet
Pasture Seeding: 85 acres
Frost Seeding: 112 acres
Fertilizer Application: 174.1 acres

Educational Activities Specific to Groundwater

WVCA held 42 educational programs attended by 1,124 students, 910 members of the general public and 231 producers, agency personnel and watershed association members. Eight agricultural field days were held with 1,124 attendees. Other outreach activities included sediment and erosion control training for 75 people, still leading the WVSOS monitoring on 35 stations, and instructing a watershed management class at the WV Conservation Camp for 200 students.

Presentation	Presented To	Attendees
2 Soil Erosion – Positive Agronomy Conditions for the Prevention of Soil Erosion	High School FFA Chapters	54 students
: 5 Stream Bank Restoration / Biological Stream Assessment	Agency staff, public, Conservation District Boards, and Contractors	172 people
5 Enviroscape	Elementary School, Cub Scout Troop, Art Club, Conservation Field Days	654 students
Rain Barrel / Stormwater Presentation	Pressley Ridge	28 attendees

Presentation	Presented To	Attendees
12 NPS Pollution and Its Management	Public Libraries / Community Centers / Schools / Partnership Conference	556 attendees
6 Envirothon Training Workshops in aquatics, Ag NPS and Conservation of Natural Resources	High School Students / Teachers	171 students / 26 teachers
Erosion and Sediment Control	Contractors	40
2 Available Conservation Programs & WV's 319 Program	Cabell County Farm Bureau, Ag Producers County Commission	85
General Conservation	High School FFA Students	200
: 2 Stream Explorations / Nature Walk	Community Members	114
Water Pollution / Ecology	Elementary School Students	45 students / teachers
Rain Garden / Lawn Care	Community Group	40
Guide to Communicating with Media	Opequeon Creek Project Team	10 volunteers
New Technology such as Litter Digester	Local Poultry Growers	15
Nutrient Cycling in Pastures, Values & Growth of Various Pasture Forbs, Pasture Water Supplies, Pasture Rotation & Intensive Grazing, Using Solar Power to Move Water, Soil Sampling & Nutrient Management	Landowners	48
Training in Aquatics that covers biological stream assessment, stream impairments, BMPs, water sampling and water quality legislation.	Students intending to participate in the West Virginia Envirothon Competition.	Not Reported

West Virginia Source Water Protection

The WVBPH invited WVCA to be on the WV 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.

The WVCA cooperated with the WVBPH and local stakeholders with the organization of a Source Water Protection Committee in Preston County.

WVCA Conservation Specialist Functions as 319 Incremental Project Managers

Kitchen Creek of Second Creek 319 Incremental Project – Monroe County

Kitchen Creek of Second Creek Incremental provides a targeted watershed approach to reducing livestock influence on a major tributary to heavily karst topography. Two miles of Riparian buffers, three waste storage facilities, 60 acres of managed grazing, and livestock relocation have prevented animal waste from entering sink holes and caves as well as the water table that influences drinking water for many residences, cave springs along Second Creek, and the Greenbrier River. At the time of this report, approximately 60 percent of the annual fecal coliform bacteria load to the stream and water table had been reduced as a result of these conservation practices.

Sleepy Creek 319 Incremental – Morgan County

The goal of the Sleepy Creek 319 Incremental Project is to reduce the fecal coliform loads within the watershed. Projects completed:

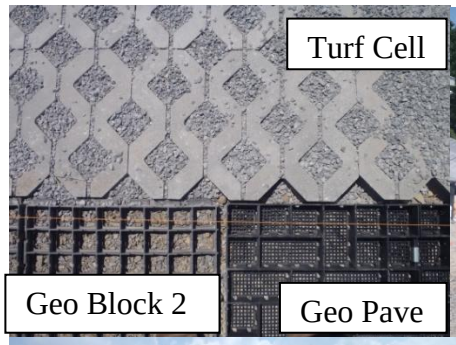
28 septic systems upgraded
56 septic systems pumpings
7 septic upgrade contracts to be completed very soon

Trees were planted to reduce and manage stormwater runoff

220 trees planted at Industrial Business Park
520 trees were planted by 68 volunteers in the Cacapon East and South Subdivisions under the Riparian Buffer Establishment section.

Urban Stormwater

This project consisted of the installation of 5,000 square feet of permeable pavement in an area that will be used as an over flow parking lot. The permeable materials allow water to percolate through areas that would traditionally be impervious. This will help decrease the amount of stormwater generated from the parking area during precipitation events as well as improve groundwater recharge.



Morris Creek 319 Incremental – Kanawha County

The goal of the Morris Creek 319 Incremental was to do post construction riparian plantings. Riparian buffers play an important role in the storage and filtering of groundwater. During the spring and summer of 2010 the WVCA Conservation Specialist served as project manager to help complete Morris Creek Watershed projects that sought to stabilize four urbanized reaches of this Kanawha River tributary. After the reaches were stabilized, the CS produced a planting list recommending appropriate riparian species and planting requirements. Riparian vegetation was planted in the spring of 2011 using WVCA funds to purchase trees.

WVCA Is A Full Partner In The Chesapeake Bay Program. Chesapeake Bay Efforts Include:

The West Virginia Conservation Agency is one of the three lead agencies responsible for working with the EPA to coordinate the Chesapeake Bay Program within West Virginia. Along with the WV WVDEP and the WVDA, the agency's Watershed Program Coordinator has diligently been involved in planning for the upcoming Watershed Implementation Plan (WIP) which will be the State's recipe to achieve the required pollution reductions to assist in restoring local waters and the Chesapeake Bay. These reductions are anticipated to come from a variety of sectors including point sources such as municipal wastewater treatment plants and industry, and nonpoint sources such as agriculture,

forestry, urban, and suburban land uses. Many of the actions which will be outlined are expensive and/or are not part of any regulations. To overcome these hurdles, project teams have begun working in targeted watersheds. These groups build partnerships, gather funding, and identify priority projects that are most important to their local communities. Reducing nitrogen, phosphorus, and sediment in local creeks and rivers will mean healthier water resources that are better able to sustain tourism, fishing, drinking water supplies, wildlife habitat, and other uses. WVCA staff is currently leading three non-point source incremental projects that will directly impact this process. They include projects in Sleepy Creek, Mill Creek of the South Branch of the Potomac and Lost River.

The WVCA's Watershed Program Coordinator is involved in annual BMP reporting to the Chesapeake Bay Program. WVCA works alongside our conservation partners to identify and prioritize nutrient and sediment reduction projects. State and Federal cost-share opportunities are promoted as appropriate.

The WVCA coordinated and funded a two-day workshop for our partners within the West Virginia Division of Highways (WVDOH) on the latest sediment and erosion technology and applications. Over 260 of WV DOH's field employees participated in the hands-on training at the District 5 Headquarters where they were exposed to the most current and effective sediment reducing applications available for construction and facility management.

Demonstration funds were utilized in cooperation with the local Conservation District and Potomac Headwaters RC&D Council to demonstrate low impact stormwater control through a bioretention infiltration feature to provide water quality and quantity control. The site was originally designed with a traditional stormwater detention pond. The dry pond would have taken up the center of the field, and was not visually pleasing for a park setting. In addition, with the park being used primarily by youth, there were safety concerns with the riser in the pond. A bioretention basin was designed to highlight a more progressive approach to stormwater control and serves to educate the community about stormwater control on small areas and the importance of groundwater recharge.

A strong empowerment and ownership message is promoted through WVCA's Chesapeake Bay funding. Trainings, workshops and supplies were offered within the drainage and resulted in educating over 152 stakeholders on stream sampling methods and local water quality education. The WVCA assisted in funding Cacapon Institute's Stream Scholars Program for the fourth consecutive year. This program is a hands-on exploration of stream ecology and conservation. The Scholars spent the final two days of camp on an overnight trip to the Chesapeake Bay. The WVCA has directly funded four small community improvement grant projects that entailed volunteers installing riparian buffers or

providing educational opportunities for small communities. Over 250 volunteer hours resulted from this project.

West Virginia Project CommuniTree is one of the most successful urban forestry programs in the state and was formed two years ago by WVCA and the West Virginia Division of Forestry (WVDF). It has been supported in part by Chesapeake Bay Program funding. The program is entirely volunteer based and involves stakeholders in the process of conserving and enhancing riparian areas, resolving stormwater management issues and engaging local leadership in watershed management problems. The program's mission is to *"promote urban tree planting and environmental education through volunteerism on a regional scale".* Over the past two years the program has seen the formation of two chapters encompassing six counties. Combined, these chapters have hosted seven large events and delivered hands-on environmental education to 800 volunteers resulting in 3,200 volunteer hours. Project funding has allowed for procurement of the necessary tools for chapters to host the events and to purchase tree/shrub stock to plant.

The West Virginia Conservation Agency's Watershed Resource Center

The Watershed Resource Center (WRC) focuses resources toward providing training, information transfer, and assistance to all aspects of water quality efforts throughout West Virginia. WRC provides specific training and educational needs identified as necessary to understand watershed and nonpoint source and point source impacts and solutions.

During the WV Contractors Exposition, the WRC presented an educational display and workshop geared toward sediment and erosion control. The workshop and display is specifically designed to educate the attendees on reducing both the direct and indirect environmental consequences associated with construction. The workshop was a one hour session on: "Watershed Planning for Sustainable Water Resource in the Ohio River Basin" with 60 contractors, agency staff, and general public in attendance.

Watershed Planning for Sustainable Water Resource in the Ohio River Basin Workshop Description:

The Ohio River Basin is an ecologically-diverse hydrologic system covering 15 states and 528,357 square kilometers. The Ohio River contributes 60 percent of the flow in the Mississippi River at Cairo, IL. Over 2,600 incorporated communities and 548 counties administer various land use controls and programs for economic growth within the basin. The Corps' Ohio River Basin Comprehensive Reconnaissance Study identified numerous issues including aging public infrastructure with reliability

concerns during extreme weather events, concerns for sufficient water supplies for at least 5 million people and optimum channel depths for the navigation industry - a $30 billion dollar industry along the Ohio River. Uncontrolled land cover change, deteriorating water quality, modified flows and lack of stormwater management pose significant threats to the ecology and economy of the region. Using a watershed approach, the Corps has recommended a series of planning actions that will address the issues of sustainability, reliability and resilience of water resources in the basin.

The WRC maintains a website dedicated to the education and training on nonpoint source pollution problems and solutions. The website includes upcoming trainings, links to participating agencies and organizations, Water Net publications, funding opportunities, riparian resources, available outreach materials, and a showcase gallery for successful projects across the state.

The WRC provides support to the annual Mid-Atlantic Chapter of International Erosion Control Association (MAC/IECA) Environmental Conference, Workshop & Trade Show. The MAC/IECA disseminates information to over 200 members and public attendees in the fields of sediment and erosion control, stormwater management, wetland mitigation, and stream stabilization through technical workshops and the attendance of approximately 30 vendors at their annual conference.

The WRC provides educational outreach on nonpoint source pollution at educational field days, community events, and expositions. During this reporting period, the WRC updated the WV Best Management Practices of Conservation Practice Standards. The book will be distributed to all Conservation Districts and at all relevant events.

The WRC Publishes the Water Net Newsletter quarterly to over 400 volunteers and agency staff statewide. The newsletter features pertinent information on the latest news of watershed activities around West Virginia, technical resource and contact information, upcoming trainings, and available resources for water quality related issues throughout the state.

- Distributed 100 Nonpoint Source Fact booklets and 100 Protecting Water Quality from Urban Runoff to the Moundsville Sanitary Board.

- Distributed 70 Rain Barrel Fact Sheets and 70 rain barrel brochures at gardener’s event.

- Distributed 12 soil testing kits, 250 each of Water Conservation Ideas books, rain barrel fact sheets, rain chain fact sheets, soil testing and phosphorus free fertilizer brochures at the Lawn & Garden EXPO.

- 1000 Ag BMP Manuals, 500 Water Conservation Ideas, 500 Nonpoint Source Pollution fact sheets, distributed at the WV State Fair for hand outs.

- 200 Groundwater brochures distributed at field days across the state. Outreach/education package included information on nonpoint source pollution put together for the Point Pleasant Library Summer Reading program which is focusing on water quality.

- Distributed 1,250 Water Conservation Ideas books statewide.

- Distributed 500 Rain Garden brochures to watershed associations.

- 1000 WV Best Management Practices for Conservation Standards distributed statewide.

- Enviroscape presentation to 50 students/25 teachers at Camp Virgil Tate two times during this period for the Annual Conservation Field Day.

Earth Day at the Clay Center

In 2010, the WRC helped celebrate the earth, and teach children how to make it a better place with a day of hands-on activities at the Clay Center's third annual Earth Day family fun day. Over 200 children had the opportunity to create their own Grass head from recycled baby food jars while their parents were educated on Water Conservation Ideas, soil testing, and phosphorus free fertilizer.

In 2011, the WRC displayed a tap vs. plastic bottle water campaign with information on the effects on the environment, along with reusable water bottles for the children. Over 500 Plastic Bottles Effects on the Environment fact sheets were distributed at the event.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

A. 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 59,000 active wells are maintained by the OOG. Regulations aimed at protecting groundwater have been in existence since 1929. Additional regulations have been added in subsequent years to further aid in the protection of groundwater. The 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.

Fresh Water Casing and Drilling Practices-35CSR4-11.3 and 11.7

Operators must set fresh water casing at least 30 feet below the deepest fresh water horizon and 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 including groundwater until casing has been set.

Plugging Methodology-35CSR4-13 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 other zones, including groundwater.

Water Supply Testing-35-CSR4-19

Operators are required to notify landowners within 1,000 feet of a proposed drill site for a well. At the request of the landowner, the operator shall sample and analyze water from any wells or springs within this 1,000 feet. If no requests are made, then the operator shall choose an existing well or spring from within the 1,000 feet to sample and analyze. Operators are required to move out to 2,000 feet if there are no wells or springs within 1,000 feet. Results are to be submitted to the landowner as well as the OOG. Results are kept on file for groundwater quality purposes should a problem ever arise.

Underground Injection Control Program-35CSR4-7

The OOG administers the Class II and III injection wells under the Underground Injection Control (UIC) Program. Class II wells include brine disposal and secondary recovery gas and water injection wells. Class III wells include solution mining wells. The active inventory consists of approximately 52

private and 12 commercial brine disposal wells, 635 secondary recovery wells and 12 solution mining wells. Primary focus of this program is the protection of groundwater from injection operations. Operators are required to submit reports monthly of daily activity for each injection well. UIC permits are issued for five-year periods and must be renewed for injection to continue. During the permitting process operators are required to sample and analyze water wells, springs and surface water bodies within a quarter-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.

Abandoned Well-35CSR6

Abandoned wells are the most problematic area relating to groundwater, especially for wells drilled 75 to100 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 such things as 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 that pose a significant and/or immediate threat to human health or the environment are scheduled for evaluation first.

Annual Inspection-35CSR4-11.6

Operators are required to visually inspect all their wells which are not plugged and that 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.

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. The primary function of the general permit is the prevention of pollution to the waters of the state relating to the handling and disposing of these wastes.

Spill Prevention and SPCC Plans 35CSR1

To prevent discharged oil from reaching waters of the state, all operators are to have adequate containment or diversionary structures in place at each well or facility. 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 CWA to protect waters of the state from discharged oil.

Groundwater Data Collection

Groundwater data is primarily collected from three activities regulated by the OOG. Operators proposing a new drilling location must provide notice to every dwelling within 1,000 feet and /or 2,000 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 being submitted on paper form and kept on file with its corresponding permit.

Operators applying for an UIC permit are required to sample and analyze all water wells, springs and surface water bodies within quarter- mile radius of the proposed facility. Parameters are the same as those mentioned above. Results are submitted on paper 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 on paper 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. NPDES permits require the chloride content and stream flow be checked and submitted monthly. Under this permit, the operator of these 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 on a paper 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 used on the GIS data viewer to allow for incorporation with other GIS data to assist with well locations and investigations of all types.

Presently, the GPS work is focusing on the abandoned well population, as many of these wells are not mapped and often tend to be sources of groundwater contamination. The GIS system provides the capability of relating well locational information with such basic information as topography, roads and streams. A vast amount of other, more area specific characteristics 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.

At times, the citizens of West Virginia encounter contamination of their water wells, possibly due to oil and gas wells or their operations or other surface or underground activities. An alliance should be formed between the offices within DEP and other state and county agencies such as WVDHHR, 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 the WVDEP 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 result in helping 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.

35-4-21 Pits and Impoundments

Pits and impoundments with a capacity greater than 5,000 barrels must be constructed in accordance with the plans designed and certified by a WV registered professional engineer. Notice of construction shall be provided to the OOG prior to construction. Placement of fluid into a pit or impoundment shall not begin until a WV registered professional engineer certifies that it was built according to the design. Pits and impoundments are to be inspected every two weeks for the life of the pit or impoundment and within twenty four (24) hours of a rain event.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

1. Office of Waste Management Solid Waste Permitting Unit (SWPU)

The SWPU regulates solid waste facilities under the Solid Waste Management Rule, 33CSR1. 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, to 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)	19
Closed Municipal Solid Waste Landfills (Class A & B)	33
Construction/Demolition Waste Facilities (Class D and D-1)	15
Yard Waste Composting Facilities	23
Transfer Stations	19
Waste Tire Facilities	3
Recycling Facilities (Class E)	33
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 (OEE) 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 includes a leak detection zone that 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 (DWWM) 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, 33CSR1 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 Groundwater 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 WVDEP, 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 for ensuring 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 WVDEP is currently monitoring the 32 closed solid waste landfills in West Virginia. Under this program, the emphasis is on 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 33CSR1 to sample, analyze, and identify groundwater and any associated problems. The SWPU has assisted LCAP by providing geological assistance on program priorities.

2. Hazardous Waste Permitting 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 40CFR264 Subpart F and 40CFR265 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 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.

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.

All RCRA facilities will have chosen remedies and remediation, and construction completion by 2020, with contamination under engineering control and stabilized to prevent additional contamination to groundwater and eliminate further migration of contaminated groundwater.

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, disposal and any SWMU under the Corrective Action Program. 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 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, contaminants in the groundwater, 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 SWMUs. There are three stages to the Part 264, Subpart F, groundwater monitoring and followup activities:

- Detection monitoring - to detect if a release has occurred
- Compliance monitoring - to determine if 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 semi-annually).

The goal of the Subpart F corrective action program is to bring regulated units and/or SWMU 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.

Mechanisms for Corrective Action

The Hazardous and Solid Waste Act of 1984 (HSWA) required 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. A 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 operating permit, post-closure permits, and 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 TSDF's 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, the 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 from the facility. 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 one of primarily four ways. 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 comprise several activities. These activities are not always undertaken as a linear progression toward 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 SWMUs

- ❖ 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 and phases could consist of any logically connected set of actions performed sequentially over time or concurrently at different parts of a site.

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 periodically updated and can be viewed 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	Complete Without Controls
Remedy Selected	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	Complete Without Controls
Airco Welding	WVD980554760	Chester	YES	YES	Construction Complete
Appalachian Timber Service	WVD063461958	Sutton	YES	YES	Remedy Selected
Bayer Cropscience LP (Rhone Polenc, Aventis)	WVD005005509	Institute	YES	IN	Cleanup Initiated
Bayer Polymers LLC (Miles)	WVD056866312	New Martinsville	YES	YES	Cleanup Initiated
Beazer-Colliers (Koppers-Colliers)	WVD980707178	Colliers	YES	YES	Construction Complete
Crompton Corporation - South Plant (G E Specialty Chemicals 1)	WVD061776977	Morgantown	YES	IN	Cleanup Initiated
Crompton Corporation - North Plant (G E Specialty Chemicals 2)	WVD980552384	Morgantown	YES	IN	Cleanup Initiated
Cytec	WVD004341491	Willow Island	YES	IN	Cleanup Initiated
Dupont - Belle	WVD005012851	Belle	YES	IN	Cleanup Initiated
Dupont Martinsburg - Potomac River Works	WVD041952714	Martinsburg	YES	YES	Cleanup Initiated
Dupont - Washington	WVD045875291	Washington	YES	YES	Cleanup Initiated
Flexsys America L.P. (Solutia Inc., Monsanto)	WVD039990965	Nitro	YES	IN	Remedy Selected
FMC - So. Charleston	WVD005005079	South Charleston	YES	YES	Complete Without Controls
GE Silicones (Crompton, Witco Corp,, CK Witco, OSi)	WVD004325353	Friendly	YES	YES	Complete Without Controls
General Electric Co (GE Plastics, GE Chemicals)	WVD088911854	Washington	YES	YES	Cleanup Initiated

General Motors Corp. (G M C Martinsburg)	WVD044145209	Martinsburg	YES	YES	Done
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	Done
St. Marys Refining (Quaker State)	WVD004337135	St. Marys	YES	YES	
UCC-South Charleston (Union Carbide-So. Charleston	WVD005005483	South Charleston	IN	IN	
UCC Tech Center (Union Carbide Tech Center)	WVD060682291	South Charleston	YES	IN	
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 - The Environmental Indicator has been met

IN - More information is needed

Cleanup 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 on-going operation, maintenance and/or monitoring of controls are necessary to ensure protection of human health and the environment.

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 40CF261. All samples must be analyzed by laboratories certified by the DWWM.

Permits do 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 WVDEP 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 to 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 DWWM as a whole needs more GPS units and the necessary training to obtain accurate locational data.

Program Consideration and Needs

There are difficulties inherent with trying to clean areas to pristine levels 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 in the manner these issues are to be decided.

3. **Groundwater Program**

a. 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

From 1999-2008, 300 wells were sampled in West Virginia as part of the Ambient Groundwater Project with the WV DWWM. In 2009-2010, an interpretive report was prepared to present this data. Beginning in 2010, a new approach was undertaken for this study. The decision was made to establish a sentinel network of groundwater sample sites that would be resampled on a five-year cycle to detect trends in groundwater quality. Sample sites were selected from previously sampled wells or springs in an effort to cover a variety of aquifer types, topographic settings, and land uses. These sites include 19 wells, mostly public supply wells, but also include USGS monitoring wells, and six springs.

Twenty-five samples were collected during the period from May 4 to June 21, 2010. All 25 sites were sampled for a base set of analytes that included major ions, metals, nutrients, field determinations, and fecal indicator bacteria. The collection of other analytes that may have included radon-222, VOCs, semi-volatile compounds, and pesticides, was based primarily on local land use, but also on whether or not that data had been collected during the first 10 years of the study. If data already existed for a given site, it was not resampled for a given analyte group.

2. Parameters

Data for selected properties and constituents were grouped by geologic unit, topographic setting, geologic age, well depth, and season. Twenty-five samples were collected during the period from May 4 to June 21, 2010. All 25 sites were sampled for a base set of analytes that included major ions, metals, nutrients, field determinations, and fecal indicator bacteria. The collection of other analytes, that may have included radon-222, VOCs, semi-volatile compounds, and pesticides, was based primarily on local land use, but also on whether or not that data had been collected during the first 10 years of the study. If data already existed for a given site, it was not resampled for a given analyte group.

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

3. 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 2,300 gpm in some sand and gravel aquifers along the Ohio River. Average yields throughout the state are around 260 gpm.

4. 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, with a few exceptions.

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.

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. As many of these compounds are known endocrine disruptors, their presence even at low concentrations warrant additional scrutiny.

The practice of land applying biosolids from waste treatment facilities and livestock operations on agricultural areas must be reevaluated in light of recent research, as these biosolids have been shown to be laden with a wide variety of pharmaceuticals, endocrine disrupting chemicals, and especially, antibiotics. At

this time, more study needs to be done in this area to determine the appropriate course of action needed to address this concern.

Data collected by the USGS for the ambient groundwater quality study show concentrations of aluminum above the 200 µg/L Secondary Drinking Water Regulation (SWDR) limit were found in two of the 25 sites sampled and iron above the 300 µg/L Secondary Drinking Water Regulation (SWDR) limit were found in 13 of the sites sampled. Manganese concentrations of above the 50 µg/L Secondary Drinking Water Regulation (SWDR) limit were found in 14 of the 25 sites sampled. Although not a threat to public health, high concentrations of iron, manganese, and aluminum may render groundwater unsuitable for domestic use due to aesthetic reasons in some locations. These concentrations of dissolved iron and dissolved aluminum are naturally occurring and are found sporadically throughout the state.

Concentrations of lead above the 15 µg/L maximum contaminant level (MCL) limit were found at one site sampled and radon above the proposed maximum contaminant level (MCL) was found in four of the sites sampled. No other exceedences of the MCL's or SWDR's for any other metals were found.

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 collected at four sites. Three of the four sites sampled contained at least one pesticide. Five pesticides were detected above detection limits.

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 new requests for any groundwater quality standard variances. The five year variances granted to American Electric Power and Allegheny Energy has now expired and is currently under review.

c. Groundwater Protection Regulations - Title 47 Series 58

Groundwater Protection Plans (GPP) for 88 facilities in West Virginia have been received and 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 GPP's, or received letters approving the document. These 88 facilities and the date(s) of their GPP approval(s) 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 DWWM. Therefore, some facilities have received a waiver from the requirement to develop and maintain GPPs. In lieu of a site-specific GPP, the facility must complete and submit a registration form certifying that it does not have service bays, does not provide mechanical service, does not have above ground storage tanks, and does not have outside bulk storage of materials with the potential to harm groundwater.

Guidance documents have been developed to aid in the preparation and implementation of GPP. The title and a short description of each document 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 47CSR58.

Salt Storage Guidelines

This is a guidance document to enable consistency in the environmental regulation of salt storage facilities, which 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 choosing sites which are capable of receiving land applied 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, preservation, and sampling monitoring and drinking water wells.

Vulnerable Groundwater Use Areas

Two areas of the state have been identified as areas which 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.

Groundwater Protection Plans Approved July 1, 2009 through June 30, 2011

FACILITY	DATE(S) APPROVED
City of St. Albans Municipal Utility Commission WTP	7/15/09
ICL Supresta Inc.	7/15/09
M & G Polymers USA, LLC - Apple Grove Plant	7/15/09
Automatic Recycling	7/16/09
Robert B. Creel WTP	7/16/09
Empire Builder's Inc. Class D LF	10/14/2009, 11/9/2010
McDowell County Commission's Class D LF	10/14/2009, 6/29/10
Quality Metal Roof MFG & Sales	11/24/09
Kessler Excavating Class D LF	11/24/2009, 2/9/2011
Osage Class D LF	11/24/2009, 3/30/2011
Echo Inc.	12/3/2009, 1/5/2011
American Environmental Services	2009
Dwayne Carter	2009
MHW Willow Island Site	2009
Warwood Tool Company	2009
Watters Smith Memorial State Park Pool Renovate	2009
Raze International, Inc. Class D LF	2/4/10
Kingsford Manufacturing Comp.	2/18/10
Solutia Nitro Site / NPDES	2/18/10
Solo Crane Inc. Class D LF	2/18/2010, 3/28/2011
MEI Opekiska LF	3/17/10
Bio-Tech Environmental Services, Inc.	04/07/10, 6/13/11
Hess Roofing Company Inc. Class D LF	04/07/10, 4/19/11
Laurita Excavating Inc.	04/07/10, 3/30/11
Cunningham Excavating	5/5/10
BCPSWD Office	5/20/10
City of Bluefield	5/20/10

FACILITY	DATE(S) APPROVED
Craftwork Cool Springs	5/20/10
Lowe Products Co.	6/29/10
Reclaim Co.	6/29/10, 6/15/2011
Clarksburg Class D LF	6/30/10
Fredrick D. Grant Parcels	7/20/10
AMI LF	7/20/10
Peer's Sanitation	7/20/10
Ballards Farm	8/9/10
Highland Mining	8/9/10
Shentel	8/9/10
Scale's Law Office	8/12/10
Riverside Marketplace	8/24/10
Joe Blosser Class D LF	9/22/10
Berkeley 2010 Addition	10/21/10
Hospice of the Panhandle	10/21/10
High Wall Park LF	10/21/10
TLR Civic Center	10/21/10
WV Demolition	11/1/10
City of Salem, WWTP	11/8/10
Calhoun-Gilmer Career Center	11/9/10
City of Richwood Class D LF	11/9/10
R.O.C.S	11/9/10
Shepherdstown Estates	11/9/10
S.P.A.R.C.	12/15/10
STASIS	12/15/10
Summit Point Tower	12/15/10
Albright Power Station	2010
Allegheny Energy	2010
Beech Bottom Plant	2010
Calhoun County BOE	2010
Kureha	2010
Norfolk Southern Railway	2010
Portfolio Hair Design Studio	2010
WAW	2010
Morgan Co. Courthouse	2010, 2/9/11
Foxshire Villas	1/5/11
Guardian Fiberglass	1/5/11
Savages Services Corporation	1/5/11

FACILITY	DATE(S) APPROVED
U.S. Customs & Borders	1/5/11
Kiah Creek Transport	2/9/11
Louis Niebergall Ice Co., Inc.	2/9/11
Macy's Center	2/9/11
Peacemaker Shooting Range	2/9/11
Poseys Auto Wrecking	2/9/11
Shenendoah Bible Church	2/9/11
Martinsburg 7th Day Church	3/29/11
Bingamon Corporation	3/30/11
Sundance Valley Phase 2	3/30/11
Winchester & Western RR	3/31/11
Mock Rd Fill Site	4/22/11
Plum Run Disposal	5/19/11
Municipal Water Works	6/13/11
Opekiska Landfill	6/14/11
NewChem, Inc.	6/15/11
Tractor Supply @ Windmill Crossing	6/24/11
Summit Point Tactical Training Center Phase 2	6/27/11
Wellsburg Municipal Water Works	6/27/11
WV Retreat Center	6/27/11
Panhandle Builders and Excavators Shale Pit	6/30/11
Bowden Hatchery	2011
Ox Paperboard LLC	2011

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 meets a minimum set of standards.

Although the WVDEP 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. The OEHS has a long established water well driller certification program and is ideally suited for providing these services to WVDEP, eliminating the need for increased staffing.

As of June 30, 2009, the MWDP has certified 513 monitoring well drillers. There are currently 263 active monitoring well drillers, 35 of which were certified during this reporting period.

The monitoring well driller certification information is available on the Internet at 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 MWDP. Recertification requires a fee and the completion of an address verification form.

To track the driller certification and recertification process, the WVDEP'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 WVDEP 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 June 30, 2009 there are 263 active drillers and 250 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 47CSR60, *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 47CSR60.

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 July 1, 2009 and June 30, 2011	Totals
Monitoring Well Construction Forms	520
Monitoring Well Abandonment Forms	557
High Risk Borehole Abandonment Forms	0

The forms were reviewed for completeness 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.

Complaints and Calls

The MWDP responded to approximately 483 calls/requests for information concerning monitoring well driller's certification and recertification, monitoring well design standards, documentation, variances, and enforcement. This does not include minor telephone call requests for basic information.

f. Underground Injection Control (UIC) Program

The SDWA of 1974 established the UIC program to ensure that fluids injected underground will not endanger drinking water sources. Applying the UIC regulations (47CSR13) promulgated under the authority of Chapter 22, Article 11 of the state code, the DWWM'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. UIC permits for Class 5 wells fall into four broad categories:

- **Industrial/Commercial**
  This includes groundwater remediation re-injection wells, where contaminated groundwater is pumped out, treated to meet groundwater quality standards, then re-injected. It also includes various industrial/commercial facilities that dispose of certain types of wastewater into subsurface distribution systems, including facilities that inject sanitary waste from restrooms co-mingled with other wastewater constituents into a septic tank and leachfield system.
- **Stormwater**
  Disposal of stormwater into a well or directed into a naturally occurring sinkhole may be permitted if it can be reasonably demonstrated that no underground sources of drinking water will be adversely impacted.
- **UIC septic permits**
  These class 5 wells typically dispose of solely sanitary waste into a septic tank and leachfield system (solely sanitary waste <u>not</u> co-mingled with any other fluid).
- **UIC Mining**
  These class 5 wells typically dispose of fluids associated with mining into underground mine pools.

Most all non-residential facilities injecting fluids into the subsurface fall under the regulation of the UIC Program. This includes small business injecting fluids into the subsurface through a septic tank and leachfield system, or other such subsurface waste disposal system. This includes any place other than a private residential home, even if the waste stream is comprised of solely sanitary

waste, provided the system has the capacity to serve 20 or more persons per day. Residential dwellings are exempt from UIC regulations with the exception of residential multiple dwellings. Examples of residential multiple dwellings include: garage apartments not connected to the residence, mobile homes, trailer parks, apartment complexes, campgrounds, etc.; or two or more single family residences sharing a common septic system.

The UIC 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 is complete and has enhanced the efficiency of the permitting process, fee tracking, and sharing of data with other WVDEP 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 WVDEP groundwater quality standards, MCLs established by the EPA, health advisory limits, or other risk-based limits as appropriate. 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. These refinements in UIC permits insure the greatest degree of protection to human health and the environment.

One of the greatest challenges faced by the UIC program continues to be in designing environmentally sound methods of permitting stormwater disposal in karst and other environmentally sensitive areas. During the past two years, the UIC Program has again seen a large increase in the number of permit applications for disposal of stormwater underground. The UIC program has worked closely with state and local government officials to develop BMPs that keep potential contamination from entering the subsurface distribution systems to the greatest extent possible. This has included the development of emergency response plans 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 continues to refine and improve its role in the protection of the state's 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. The UIC program is regarded among its peers in other states and the EPA as a model of excellence despite challenges faced by a lack of staff and funding. The UIC staff consists of one geologist permit writer, one Environmental Resources Specialist permit writer, and two UIC field inspectors for the entire state.

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 50 percent of West Virginia's overall population, and over 90 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, is ubiquitous in West Virginia, protecting the quality and quantity of the groundwater from adverse impacts due to these activities is imperative both to 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 Water Supplies and the Environment:

Groundwater protection at mine sites was started over 15 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 management of surface activities and substances at mine sites have protected many public and private water sources, both present and potential, from damage due to mining, and have mitigated many of the impacts that occurred prior to or despite those changes.

The UIC Program, as established under Legislative Rule Title 47CSR13, 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.

SCR*-15 *and UIC:

In 2006 the West Virginia Legislature authorized SCR-15, a comprehensive two-phase study on the potential effects of underground injection of coal slurry on the environment (Phase 1) and human health (Phase 2). A team whose members include personnel from DMR (Division of Mining and Reclamation) and DWWM, the West Virginia Department of Health and Human Resources-Bureau of Public Health, and Office of Surface Mining Reclamation and Enforcement conducted the first phase of this study.

An analysis of the chemical composition of coal slurry, including an inventory of organic and inorganic constituents, was conducted at six locations across the state. With input from the environmental and industry groups, six sites were selected from the 13 active coal slurry injection sites in the state. The study sites included were: Southern Minerals, Panther LLC, Marfork Coal Company, Power Mountain, Loadout LLC, and Coresco, LLC.

A detailed hydrogeologic evaluation of the migration of coal slurry and its constituents from injection wells into the ground and surface waters was conducted at four of the six sites. The assessment sites included the coal preparation facilities where the underground injection of coal slurry took place. The sites were Southern Minerals, Panther LLC, Loadout LLC and Power Mountain. All four assessment sites are located in the southern coal fields and have mines which are considered below or mostly below-drainage (mines workings are located below surface drainage features). Water samples collected from surrounding surface and ground water were analyzed for over 170 organic and inorganic chemical constituents. All the sites sampled reflect a “snapshot” of the site-specific hydrologic conditions that surround the slurry injection sites.

The completed Phase I SCR-15 study can be found at http://www.dep.wv.gov/dmr/studies%20and%20investigations/Documents/Slurry%20UIC%20Investigation.pdf. The findings of this study have been officially presented to the Senate Committees on “Government and Finance” and “Water Resources”.

As part of the implementation on the recommendations of the SCR-15 study the management of mining related UIC permits is being taken over by the DMR and will no longer reside in the WVDEP Groundwater program. This includes all mining related UIC permitting activity and all tracking and enforcement of UIC related violations. Two full-time mining UIC employees have been hired by DMR and are presently being trained. More details on the WVDEP plans to improve mining related UIC issues can be found in the “Recommendations” section of SCR-15 at http://www.dep.wv.gov/dmr/studies%20and%20investigations/Documents/Slurry%20UIC%20Investigation.pdf.

The second part of SCR-15 was conducted by the WVDHHR, which contracted West Virginia University (WVU). SCR-15 Phase II will concentrate on the human health aspects of the underground injection of coal slurry. This study was finished in July of 2010 and can be found at its official website maintained by WVU at http://www.coalslurry.net/.

Use of the ERIS Database:

Every UIC-Mining application will continue to be tracked in the ERIS Database. As information is received, it will be added into the database by members of the DMR.

Use of the TAGIS Database:

Every UIC-Mining application has been digitized as a Shapefile. This includes all injection points, monitoring points and mine pools receiving injection for all permits approved under the modern UIC program.

Statistics:

12 Permitted Coal Slurry Injection Sites
34 Permitted AMD Sludge Injection Sites
A full summary of all known historic underground injection of Coal Slurry can be found in SCR-15 Phase I.

UIC Industrial/Commercial permitting

Without abundant resources of clean groundwater, there will be no economic growth, no industrial base, and no preservation of the quality of life that is the foundation of our culture. Limiting and controlling underground injection ensures that groundwater and underground sources of drinking water will remain viable for future use. Once groundwater becomes contaminated, it is very difficult or even impossible to remove the pollution. The cost of groundwater remediation can be enormous, with no certain outcome of how effective the final results will be. Since the water moves so slowly, the pollutant is able to stay very concentrated in higher levels in certain areas instead of dispersing over the entire area as surface water does. The pollutants could remain in an area, making the water unusable for a period of many years or decades. After a period of time, the contamination in the groundwater will spread to the surface water as well through its natural outlets.

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.

Significant improvements to UIC industrial/commercial permits continue to be made by close scrutiny of each application in regards to injection well design and maintenance, potential toxicity of proposed injectates, fate and transport of the injectate, site hydrogeology, and a careful attention to monitoring the sites discharge reports on an ongoing basis. All such sites are currently the responsibility of one hydrogeologist. As the number of industrial/commercial permits continues to increase, support for this portion of the UIC Program must also increase to keep pace with growing development and the need for oversight to ensure responsible methods of fluid injection into the subsurface. Thirty five industrial/commercial permits and 16 UIC stormwater permits have been issued during this reporting period, in addition to nine Rule Authorizations for the injection of ambient air and injection of subsurface releasing compounds at groundwater remediation sites.

Rule Authorizations

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*. In many situations, 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 other situations, active bioremediation is enhanced by the addition of sulfate, magnesium, and ferric compounds. Other sites are treated with injections of food grade molasses, or other nutrients may be used.

In addition to remediating hydrocarbons, other SRCs may be used to remediate chlorinated hydrocarbons, other metals, and chlorinated biphenyls using hydrogen releasing compounds. Rule Authorizations for eight sites have been granted during this reporting period.

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.

UIC Sewage Permitting

The UIC program promotes new technology to make on-site wastewater cleaner, more efficient and environmentally friendly. UIC staff works closely with the county health departments and the Office of Environmental Health to achieve this goal. If a UIC permit is needed for a facility, UIC staff assists applicants in the completion of the UIC permit application process. All sewage tanks involved with sewage systems, with the exception of holding tanks and receptacles, privy vaults and self-contained excreta disposal facilities, must be registered with WVDEP. The WVDEP has a program that offers the county health departments the option of processing the registration fees under a contract and receiving a portion of the money back to the county.

UIC staff participates and interacts with the State Sewage Advisory Board, which makes recommendations to the Bureau of Public Health (BPH) on technical and procedural issues relating to West Virginia's Sewage Disposal Program, mediates unresolved issues between the sewage industry and regulatory agencies and makes recommendations in other areas of policy modification or development as so directed by the Commissioner of the BPH.

The UIC Program realizes the need for continued public education in regards to the UIC Program and the separate, but equally important issues of each component of the program, such as issues regarding sewage systems, industrial and mining permits. Seventy-seven UIC sewage permits were issued during this reporting period.

Enforcement

The enforcement of UIC regulations is primarily dependent on UIC staff with some assistance from the Office of Environmental Enforcement (OEE). Although the major enforcement steps are outlined in 47CSR13, “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 percent. When an informal enforcement does not result in a satisfactory outcome, WVDEP has other enforcement tools at its disposal. Currently, two Environmental Resources Specialists conduct all UIC inspections and UIC enforcement actions. Duties include reviewing and updating Standard Operating Procedures (SOP) for UIC inspections. During this reporting period the EPA UIC reporting definition for high priority wells was changed to state wide instead of well head protection areas.

Inspections

The UIC inspections are conducted at all business facilities (non-residential/multiple dwellings i.e. trailer parks, campgrounds, schools and apartment complexes not serviced by public sewage disposal plants). These inspections are conducted in selected watershed areas, which rotate on a five - year basis. The county sanitarians in selected watersheds are contacted for the areas that are not serviced by a public sewage disposal plant. Inspections are focused on wellhead-protected areas. The regional Environmental Enforcement Inspector is contacted to let him/her know that the UIC program will be conducting UIC inspections in the area and arrange for him/her to accompany the inspector if desired.

In addition to the routine inspection of permitted facilities, suspected Class 5 wells are inventoried and inspected to determine proper classification. Information on suspected disposal wells comes from the Class 5 inventory and database, complaints, request for permits, referrals from other agencies, or discovered upon the routine inspection. During the inspections, which are sometimes multimedia with other programs or agencies, a UIC inspection form is completed on site. The owner/operator is verbally informed of the status of the well. If the facility has a Class 5 well that is not permitted, the owner/operator is given the option to apply and obtain a permit for the well or a closure plan will be implemented. If there are other environmental concerns the owner/operator is given guidelines to obtain compliance. BMPs are reviewed with the facility owner/operator for groundwater protection. BMP implementation not only helps protect the environment, it also enables the facility to operate more efficiently by reducing the amount of waste generated. The UIC inspector collects locational data on UST’S and AST’S for Health Department (info. for wellhead protected areas) and Waste Management Underground Storage Section. A Review the

facility GPP/ or collection of information for facility to obtain a GPP is also done during the inspection.

The UIC Program collects location data on underground storage tanks and above ground storage tanks for the BPH and the Underground Storage Tank Section. As part of the inspection process, GPS locational data is downloaded and data bases updated. Even though the facility may not have a UIC well, other programs or agencies are notified if other environmental concerns exist. The permitting process or enforcement actions are initiated as necessary. UIC inspectors also review the facility's GPP or collects information for the facility to obtain a GPP.

During this reporting period:

- 495 UIC inspections were conducted
- Data on 136 UST'S and 296 AST'S at 112 facilities were collected
- 98 Motor Vehicle Waste Disposal Wells (MVWDWs) were eliminated in vehicle service areas by plugging with cement
- 10 MVWDWs were connected to Public Service District Wastewater Treatment Plant
- A total of 226 verbal/written enforcements were given to owners/operators of facilities.
- Information was collected for 180 Class 5 UIC permits
- Information was collected for 194 Groundwater GPPs

UIC Outreach

The UIC program personnel provide technical assistance to all Owners/Operators of Facilities, WVDEP, OEHS, and WVDA personnel throughout the state. UIC program personnel are working with county sanitarians and educating them on the types of injection wells that require oversight by the UIC program.

g. Groundwater Program Remediation Activities

Since 1991, the remediation section of the Groundwater Program has worked on 294 sites, 76 of which were active during this reporting period.

These sites vary between equipment yards, above-ground tank releases, 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 some type of hydrocarbon, usually diesel fuel or fuel oil; however, other sites have benzene, chloride, or chlorinated solvent problems.

This contamination usually consists of one (or more) of three phases. Free phase (or free product) is a relative pure pool of the contaminant in the subsurface, and is usually a layer of some kind of liquid hydrocarbon on top of the groundwater table. Absorbed phase is that contamination which has been absorbed in the soil, and dissolved phase is that contamination which has dissolved in the groundwater. The geological substrate at these sites is usually alluvium (or water deposited), colluvium (or the breakdown of hillsides and ridges), or karst (which is the formation of voids and caves by the dissolution of limestone).

The remediation section is the lead state agency at many of these locations, while advice is given to other WVDEP programs at others. To date, 119 No Further Action letters have been provided by the Groundwater Program to those sites where the contamination has been successfully remediated, and where the property can be used for other purposes. In addition, the Groundwater Program has also provided advice on 87 other sites and has referred 30 sites to other WVDEP Programs.

The sites worked on between July 1, 2009 to June 30, 2011.

Abbs Valley (*Mercer County, Upper New River Basin, karst, no contamination*): This is a site where the Groundwater Program provided geological advice regarding the drinking water for Pocahontas, Virginia.

AEP Wyle Ridge substation (*Hancock County, Upper Ohio River Basin, colluvium, mineral oil contamination*): The Groundwater Program provided advice to OEE.

Anderson Car Dealership (*Jackson County, Middle Ohio River Basin, colluvium, no contamination*): A report was submitted regarding this site, which was then reviewed by the Groundwater Program. No significant contamination was found, and a No Further Action letter was provided to the company on October 9, 2009.

Anmore Truck Stop (*Harrison County, Monongahela River Basin, colluvium, diesel contamination*): This is a site where No Further Action was requested but denied, as the contamination remains at significant concentrations. Personnel from the Groundwater Program inspected the site during the reporting period.

Bartley Fuel Spill (*McDowell County, Tug Fork Basin, roadside ditch, diesel contamination*): This was a site where a large truck dropped a wheel into a deep roadside ditch and then ruptured its fuel tank on a set of concrete steps. OEE had originally investigated the problem and the trucking company had removed some contaminated soils; however, the incident was not fully resolved. The site was referred to the Groundwater Program, who visited the site and then required that additional soil samples be collected. This work was completed, and no signification contamination was found. A No Further Action letter was then provided on August 18, 2010.

Big Bubbles Car Wash (*Monroe County, Greenbrier River Basin, karst, fluorescein dye*): This was a facility where the owner was allowing biodegradable soap containing fluoroscein dye to enter a nearby sinkhole. This dye was reappearing at Dickson Spring, the largest spring in the county, and was contaminating that spring. Personnel from the Groundwater Program spoke to both the facility operator and the soap distributor, and both agreed to discontinue the use of that particular soap. Subsequent testing found the spring clean of dye.

Big Springs Fork (*Pocahontas County, Upper Elk River Basin, karst, no contamination*): The Groundwater Program provided geological advice on this area to a consultant evaluating sewage-treatment plant locations for the State Revolving Fund.

Bonded Carriers (*Berkeley County, Lower Potomac River Basin, karst, diesel contamination*): The company provided several reports regarding this facility, and personnel from the Groundwater Program visited the site and suggested the contaminated soils be excavated. This was done, with the proper soil sampling, and a No Further Action letter was provided on January 13, 2010.

Brushy Fork sinkhole (*Mercer County, Upper New River Basin, karst, no contamination*): The Groundwater Program provided geological advice on this newly formed sinkhole to OEE.

Bungers Cave (*Greenbrier County, Greenbrier River Basin, karst, trash*): This is a cave located west of Lewisburg into which trash had been dumped. The Groundwater Program provided geological advice about this cave to OEE.

C&J Gas Field Services: (*Upshur County, Monongahela River Basin, colluvium, hydrocarbon contamination*): Personnel from the Groundwater Program inspected this site and provided advice to OEE.

Cave and Karst Management Workshop: Personnel from the Groundwater Program were asked by the Monongahela National Forest to participate and assist in leading this week-long workshop, which was held in Elkins in June of 2011. Two PowerPoint presentations were presented on inventorying karst (and caves) and on cave rescue, assistance was provided on a field trip into a nearby cave, and a small class was taught on cave surveying.

Chrysler Saberton Former Dealership (*Monongalia County, Monongahela River Basin, colluvium, hydrocarbon contamination*): Personnel from the Groundwater Program evaluated a report on this facility at the request of OEE. A small amount of liquid hydrocarbon that had escaped from two underground tanks and the environmental consultant had removed both the tanks and some contaminated soil (with the proper soil sampling). The Groundwater Program agreed the problem had been resolved, and a No Further Action letter was provided on December 10, 2010.

Corburn Spring (*Monroe County, Upper New River Basin, karst, no contamination*): Personnel from the Groundwater Program provided geological advice to the Water Assessment Program regarding this spring.

CSX Brooklyn Junction Railyard (*Wetzel County, Upper Ohio River Basin, alluvium diesel contamination*): This was a site where a locomotive wrecked and spilled a large amount of diesel fuel. OEE originally investigated the problem and had CSX remove some contaminated soils; however, this did not resolve the problem, as there are other contaminated soils under a main line track. The site was referred to the Groundwater Program, and we asked for a year of groundwater monitoring. Personnel from the Groundwater Program also visited the site.

CSX Fairmont Railyard (*Marion County, Monongahela River Basin, alluvium, diesel contamination*): This is an old B&O railyard (that is no longer in use) with free-, absorbed-, and dissolved-phase hydrocarbon contamination. CSX has excavated a large amount of contaminated soils and resolved the free product problem; however, some soil and groundwater contamination remains. CSX attempted to use vacuum extraction to resolve this problem, but this strategy has not been successful (because the site has very little subsurface permeability). Quarterly groundwater monitoring continues. Personnel from the Groundwater Program inspected this site during the reporting period.

CSX Grafton Railyard Engine House Area (*Taylor County, Tygart Valley River Basin, alluvium, solvent contamination*): This is a part of a railyard (that is no longer in use) where several subsurface investigations have been completed, and where sulfate-releasing compounds have been released to reduce the contamination concentrations. This strategy appears to be working, and quarterly groundwater monitoring continues.

CSX Grafton Railyard Locomotive Refueling Area (*Taylor County, Tygart Valley River Basin, alluvium, hydrocarbon contamination*): This is an active railyard where contaminated soils have been removed and an oxygen-releasing compound applied. Soil and groundwater contamination remains, and quarterly groundwater monitoring continues.

CSX Handley Railyard Engine House Area (*Kanawha County, Upper Kanawha River Basin, alluvium, solvent contamination*): This is an old C&O railyard (that is no longer in use) where air sparging has been attempted and sulfate-releasing compounds applied; however, the tight nature of the soils rendered both processes ineffective. CSX has asked for no further action (as they feel they have done everything practical to resolve the problem), but our office has asked for additional groundwater monitoring (to which CSX has agreed).

CSX Handley Railyard Locomotive Refueling Area (*Kanawha County, Upper Kanawha River Basin, alluvium, diesel contamination*): This is an old C&O railyard (that is no longer in use) with free, absorbed, and dissolved-phase contamination. Contaminated soils have been removed, an automatic free product recovery system installed, a soil vapor extraction system operated, and an oxygen releasing compound applied. The hydrocarbon seeps into the Kanawha River and Upper Creek have been eliminated; however, soil and groundwater contamination remains (as well as some free product). Free product recovery, soil venting, and quarterly groundwater monitoring continues, and CSX is currently assessing future options.

CSX Keyser Railyard (*Mineral County, North Branch (Potomac) River Basin, alluvium, solvent contamination*): This is an old B&O railyard (that is no longer in use) which had both hydrocarbon and solvent groundwater and soil contamination, contaminated soils have been removed and sulfate releasing compounds have been applied. The hydrocarbon problem has been mostly resolved, and quarterly groundwater monitoring continues to assess the effectiveness of the solvent remedial strategies.

CSX Maryland Junction Railyard (*Mineral County, North Branch (Potomac) River Basin, alluvium, diesel contamination*): This is an old Western Maryland railyard with soil and groundwater contamination. Contaminated soils have been removed and oxygen-releasing compounds applied, and quarterly groundwater monitoring continues to assess the effectiveness of these strategies.

CSX Peach Creek Railyard (*Logan County, Guyandotte River Basin, alluvium, hydrocarbon contamination*): This is an active railyard with continued free product and groundwater and soil contamination. Several subsurface investigations have been completed, a free product recover system installed, and

contaminated soils removed. CSX continues to assess their remedial options, and quarterly groundwater monitoring continues.

CSX Rowlesburg Railyard (*Preston County, Cheat River Basin, alluvium, hydrocarbon contamination*): This is an old B&O railyard with soil contamination. Contaminated soils were removed (with the proper sampling), a soil vapor system installed, and oxygen-releasing compounds applied, while quarterly groundwater monitoring was used to assess the effectiveness of the remediation. This monitoring proved that the contamination problem had been successfully resolved, and a No Further Action letter was issued on November 29, 2010.

Dobbins Spring (*Clay County, Lower Elk River Basin, colluvium, insecticide contamination*): This is a spring that was contaminated by pentachlorophenol, which resulted from the storage of several electric poles up the hill above the spring. The power company removed the poles and sampled the spring and the adjacent soils on several occasions. Personnel from the Groundwater Program and the Health Department visited the site on two occasions. No contamination has been found after the two original water samplings, and the site was provided with a No Further Action letter on October 12, 2010.

DOH Glen Dale Equipment Yard (*Marshall County, Upper Ohio River Basin, alluvium, oil contamination*): This is an active yard that had soil contamination. The DOH removed some soils (on three occasions); however, they were unsuccessful in completely eliminating all of the contamination. Personnel from the Groundwater Program met with the WVDOH, and quarterly groundwater monitoring was implemented. This monitoring determined that the soil-removal strategy had been successful, and a No Further Action letter provided on July 7, 2010.

DOH Greenwood Equipment Yard (*Doddridge County, Middle Ohio River Basin, colluvium, hydrocarbon and chloride contamination*): This is an active yard with soil contamination. Quarterly groundwater and surface water monitoring continues to assess the chloride problem; however, the WVDOH has been unsuccessful in implementing any kind of effective remediation strategy.

DOH New Martinsville Equipment Yard: (*Wetzel County, Middle River Basin, alluvium, chloride contamination*): This is an active site with both soil and groundwater contamination, and where quarterly groundwater monitoring has been started. Groundwater Program personnel visited the sites and met with the WVDOH, there are plans to discontinue the use of the salt shed and excavate at least some of the contaminated soils. Quarterly groundwater monitoring continues at the site.

DOH Oak Hill Equipment Yard (*Fayette County, Lower New River Basin, colluvium chloride contamination*): This is a yard that is no longer in use, and

which had both hydrocarbon and chloride contamination. Soil with both contaminants has been removed, and this was successful in remediating the hydrocarbon part of the problem, but not the chloride. Quarterly groundwater monitoring continues.

DOH Sisterville Equipment Yard: (*Tyler County, Middle River Basin, alluvium, chloride contamination*): This is a site (that is no longer in use) with soil and groundwater contamination, and where quarterly groundwater monitoring has been started. Groundwater Program personnel visited the sites and met with the WVDOH, which plans to excavate at least some of the contaminated soils. Quarterly groundwater monitoring continues.

Energy Contractors (*Lewis County, Monongahela River Basin, alluvium, chloride and hydrocarbon contamination*): Personnel from the Groundwater Program visited this site at the request of OEE. Contaminated soils have been removed at two locations at this site in one area with hydrocarbon contamination and in a second area with chloride contamination. Two reports have been provided (both of which are incomplete), and requests for additional information have gone unfilled to date.

Excel Transportation Truck Wreck (*Ohio County, Upper Ohio River Basin, colluvium, diesel contamination*): The Groundwater Program provided advice to OEE regarding this spill on I-70 east of Wheeling. The Groundwater Program also provided a draft No Further Action letter that was then used by OEE.

Gordy Oil Marcellus Shale Natural Gas Well near Pickaway (*Monroe County, on the divide between the Greenbrier and New River Basins, karst, no contamination*): Personnel from the Groundwater Program provided geological advice to the Oil and Gas Program, and attended two in-house meetings. This well site was later abandoned by the company for a location to the west near Wayside.

Gordy Oil Marcellus Shale Natural Gas Well near Wayside (*Monroe County, New River Basin, colluvium over karst, no contamination*): Personnel from the Groundwater Program provided geological advice to the OOG, and attended a field trip to the proposed well site and the surrounding area.

Growing Communities on Karst: Personnel from the Groundwater Program attended both the 2009 and 2010 “Growing Communities on Karst” symposiums, held each year in the Shepherdstown area. These conferences last three days, and the 2009 conference included a field trip to a local cave, while the 2010 conference included a dye-tracing field trip to the mouth of Opequeon Creek.

Hampshire Distributor Bulk Terminal (*Mineral County, South Branch (Potomac) River Basin, colluvium, hydrocarbon contamination*): This was a site with a long history of hydrocarbon soil contamination and of ineffective remediation strategies. The Groundwater Program provided advice to OEE and personnel from the Program visited the site. The company removed some additional soils, with the proper soil sampling, and a No Further Action letter was issued on December 3, 2010.

Harpers Ferry Middle School (*Jefferson County, Lower Potomac River Basin, colluvium, fuel oil contamination*): Personnel from the Groundwater Program visited this site, per the request of OEE, and provided advice. The Program is currently waiting on a report that should document what work was completed.

Harpers Ferry National Park (*Jefferson County, Lower Potomac River Basin, colluvium, fuel oil contamination*): Personnel from the Groundwater Program visited this site, per the request of OEE, and provided advice.

Hazwopper Class: Personnel from the Groundwater Program attended annual recertification Hazwopper classes in both 2010 and 2011.

Hinkleville General Store (*Upshur County, Monongahela River Basin, colluvium, gasoline contamination*): This is a site with a history of hydrocarbon spillage, where contaminated soils have been removed. Quarterly groundwater monitoring continues to determine the effectiveness of the soil removal.

Jonas Landing Sinkhole (*Greenbrier County, Greenbrier River Basin, alluvium over karst, no contamination*): Personnel from the Groundwater Program visited this site, because of a citizen's complaint, and provided geological advice.

Key Energy (*Upshur County, Monongahela River Basin, colluvium, hydrocarbon contamination*): Personnel from the Groundwater Program visited this site, at the request of OEE, and provided advice. The contaminated soils were successfully removed, with the proper soil sampling, and a No Further Action letter was provided on August 27, 2010.

LeMac Mine (*Monongalia County, Monongahela River Basin, strip bench, hydrocarbon contamination*): The Groundwater Program reviewed a report on this site, at the request of OEE, and provided advice. The contaminated soils had been successfully removed, with the proper soil sampling, and a No Further Action letter provided on October 5, 2009.

Lin Electric (*Mercer County, Upper New River Basin, karst, solvent contamination*): This is a site where the EPA successfully removed PCB-contaminated soils. Unfortunately, solvent-contaminated groundwater remains.

The Groundwater Program had provided advice to OEE; however, the Program assumed the oversight for the site in 2010 and has since asked the owner to complete a subsurface investigation to determine the extent and severity of the contamination.

Liquid Transport Corporation Facility (*Kanawha County, Upper Kanawha River Basin, alluvium, hydrocarbon contamination*): Personnel from the Groundwater Program attended a meeting regarding this site, and provided advice so that the company could decide how to pursue any remedial work. They ultimately decided to work with the Voluntary Remediation Program (VRP).

Liquid Transport Truck Wreck (*Raleigh County, Upper New River Basin, colluvium diesel and phosphorus chloride contamination*): This was a site where a truck wrecked on the West Virginia Turnpike, spilling both diesel fuel and phosphorus trichloride. OEE investigated the problem and required the trucking company remove the contaminated soils, with the proper sampling, and the Groundwater Program was asked to evaluate the work and provide a No Further Action letter. This last was done on March 7, 2011.

Lost World Karst Trail: The Groundwater Program provided a large map of the dye traces completed within the Davis Spring Basin of Greenbrier County, so that a local citizen could construct a “karst trail” at Lost World Caverns to educate the public about the sensitive nature of karst and its vulnerability to groundwater contamination.

Lowes Green Valley facility (*Mercer County, Upper New River Basin, colluvium, no contamination*): This was a site where the Groundwater Program provided a No Further Action letter in 1998; however, additional data was collected in a subsequent subsurface investigation and a new owner asked the Program to evaluate this data. This was done, and no significant contamination was found. A second No Further Action letter was provided on January 11, 2010.

Marathon Krout Creek Site (*Wayne County, Lower Ohio River Basin, alluvium, benzene contamination*): This is a location where a full tan car spilled coal tar light oil into a drainage ditch, storm sewer, and surface water. The company excavated contaminated soils and installed approximately four dozen groundwater monitoring wells. Many of these wells originally had benzene contamination in excess of the Hazardous Waste limit of 500 mg/l; however, all of these concentrations have decreased to the point that no groundwater contamination remains above the WVDEP 47CSR12 limit of 5 µg/l for benzene. Quarterly groundwater monitoring continues to insure that the remediation was successful. Personnel from the Groundwater Program inspected this site during the reporting period.

Marathon Ohio River Pipes Site (*Wayne County, Lower Ohio River Basin, alluvium, hydrocarbon contamination*): This is a site with free product, as

well as both soil and groundwater contamination. Some infrastructure and contaminated soils have been removed, and an automatic free product recovery system has been installed. Quarterly groundwater monitoring continues. Personnel from the Groundwater Program visited this site during the reporting period.

Marlinton Bulk Terminal at Durbin (*Pocahontas County, Greenbrier River Basin, colluvium, hydrocarbon contamination*): This is an old site (that is no longer in use) that contains both soil and groundwater contamination. The individual who inherited the site had only limited money to perform any investigations or remedial work, and this money has since run out. The Groundwater Program attempted, without success, to locate additional funding so that the required remediation could be completed. This site is inactive at present.

Marlinton Bulk Terminal at Marlinton (*Pocahontas County, Greenbrier River Basin, alluvium, hydrocarbon contamination*): This is an old site (that is no longer in use) in downtown Marlinton that has both soil and groundwater contamination, as well as free product. The individual who inherited the site had only limited money to perform any investigations or remedial work, and this money has since run out. The Groundwater Program attempted, without success, to locate additional funding so that the required remediation could be completed. This site is inactive at present.

Matthews Brothers Bulk Terminal (*Harrison County, Monongahela River Basin, colluvium, hydrocarbon contamination*): This is an old site (that is no longer in use) that contains soil contamination. The owner has removed soils and land farmed on site, turning the soil at regular intervals, to provide oxygen to the hydrocarbons and lower the contamination concentrations. This strategy has been for the most part successful, but some significant contamination remains. The owner asked for a No Further Action during this reporting period, but the Groundwater Program, after visiting the site and consulting with OEE, denied their request and asked for additional remediation.

Meadows Stone and Gravel (*Randolph County, Tygart Valley River Basin, karst, unknown contamination*): This is a site with an undetermined type of contamination, and where the Groundwater Program provided advice to OEE on how to proceed with their preliminary investigations.

Moore Property (*Berkeley County, Lower Potomac River Basin, colluvium, fuel-oil contamination*): This is a home where a leaking fuel oil tank contaminated a large area adjacent to the home. Some contaminated soils were removed, but the remedial work then stalled. Personnel from the Groundwater Program visited the site and have provided advice to OEE on several occasions, and had said that the on-site groundwater monitoring wells are substandard and that significant contaminated soils and groundwater remain.

Morrison home (*Jefferson County, Lower Potomac River Basin, karst, fuel-oil contamination*): This is a private residence where fuel oil contamination occurred after a buried underground tank leaked. The property owner was very anxious to sell the property, but could not get a definitive answer on whether the contamination had been successfully remediated in a previous attempt. The Groundwater Program asked for a summary report, and once it had arrived evaluated the report, visited the site, and decided that no significant contamination remained. A No Further Action letter was provided on September 30, 2010.

North Star Spill (and OX Paperboard): (*Jefferson County, Lower Potomac River Basin, karst, hydrocarbon contamination*): This was a site of a spill (at the North Star facility), that may have contaminated a nearby water well (at Ox Paperboard). The Groundwater Program was first requested to provide advice to OEE, but was later asked to become the lead on this problem. The site was visited by program personnel, the contaminated well was sampled on several occasions, and a summary report was submitted to the Groundwater Program showing that the problem had been resolved. A No Further Action letter was then issued on December 17, 2010; however the contamination has reoccurred and it is going to be necessary to reopen this issue and ask for an additional investigation (which may entail dye tracing).

NS Bluefield Railyard Fuel Transloading Area *(Mercer County, Upper New River Basin, karst, diesel contamination*): This is an active railyard with free product and soil and groundwater contamination. The infrastructure has been modernized, an automatic product recovery system installed, contaminated soils have been removed, and a new refueling system installed. Free product recovery and quarterly groundwater monitoring continues. NS asked for a No Further Action letter during this reporting period; however, the Groundwater Program suggested that the remedial efforts continue, as the contamination is decreasing.

NS Bluefield Railyard Locomotive Refueling Area (*Mercer County, Upper New River Basin, karst, diesel contamination*): This is an active railyard with soil and groundwater contamination. The infrastructure has been modernized, contaminated soils have been removed, and a new refueling system installed. Quarterly groundwater monitoring continues. NS asked for a No Further Action letter during this reporting period; however, the Groundwater Program suggested that the remedial efforts continue, as the contamination is decreasing.

NS Dickinson Railyard (*Kanawha County, Upper Kanawha River Basin, alluvium, diesel contamination*): This is an old New York Central Railyard with free product and groundwater contamination. Free product recovery and quarterly groundwater monitoring continues.

NS Mullens Railyard (*Wyoming County, Guyandotte River Basin, alluvium, hydrocarbon contamination*): This is an old Norfolk and Western railyard (that is inactive) that had free product, as well as soil and groundwater contamination. NS has attempted several remedial strategies, including collection sumps, free product recovery, vapor extraction, and pump-and-treat systems. Some of these have been effective, but others have not. However, the overall contamination has been greatly reduced and the hydrocarbon seeps into the adjacent Guyandotte River have been halted. Quarterly groundwater monitoring continues.

NS Williamson Railyard (*Mingo County, Tug Fork Basin, alluvium, hydrocarbon contamination*): This is an active railyard with free product, as well as soil and groundwater contamination. The yards infrastructure has been modernized, an automatic product recovery system installed, and the hydrocarbon seep into the nearby Tug Fork stopped. The Groundwater Program recently asked for additional groundwater remediation at this site, and the company has responded by saying it wishes to move the yard into the VRP however, this has not been done to date. Free product recovery and quarterly groundwater monitoring continues.

Pantry Store #2 (*Harrison County, Monongahelia River Basin, colluvium, hydrocarbon contamination*): This is a site with continued groundwater contamination for both heavy and light weight hydrocarbons. Oxygen releasing compounds have been applied to the upstream wells, and quarterly groundwater monitoring continues. Personnel from the Groundwater Program visited this site during the reporting period.

Patrick Street Dodge (*Kanawha County, Lower Kanawha River Basin, alluvium, hydrocarbon contamination*): This is a site that had soil contamination from hydraulic lift leakage. Groundwater Program and OEE personnel visited the site and suggested that the contaminated soils be removed. This work was completed (with the proper soil sampling); however, it was unsuccessful in removing all of the contamination. Groundwater Program personnel again visited the site and suggested that additional soils be removed. This was done, and the follow up soil sampling proved that the significant contamination had been removed. A No Further Action letter was provided on September 29, 2010.

R.D. Bailey Lake (*Wyoming County, Guyandotte River Basin, alluvium, PAH contamination*): This is a site where the U.S. Army Corps of Engineers had been allowing local citizens to use soils dredged from the lake as fill. These soils were contaminated with PAHs [polycyclic aromatic hydrocarbons], and the Groundwater Program was asked to evaluate these concentrations and render a decision on whether the soils could be continued to use as clean soils. The program's decision was that this contamination was indeed significant, and that the soils should be disposed of in a proper manner and not used as fill.

Roach Oil Bulk Terminal (*Berkeley County, Lower Potomac River Basin, alluvium over karst, hydrocarbon contamination*): This is an old Groundwater Program remediation site with soil contamination. The Groundwater Program was never successful in getting the company to complete any significant remedial work, and the company moved the site to the VRP. The Groundwater Program did continue to give advice on the site during the reporting period.

Roach Oil Spill (*Berkeley County, Lower Potomac River Basin, karst, fuel-oil contamination*): This is a site where fuel oil was inadvertently pumped into the basement of a home. The Groundwater Program provided advice to Office of Environmental Remediation (OER) on how to proceed with the clean-up.

R. T. Rogers Bulk Terminal (*Summers County, Lower New River Basin, alluvium, hydrocarbon contamination*): This is an active bulk terminal with soil and groundwater contamination, and where some contaminated soils have been removed and an oxygen releasing compound applied. To date, none of these remedial strategies have proven effective in completely removing the contamination. Quarterly groundwater monitoring continues.

Ryder Truck Parkersburg (*Wood County, Middle Ohio River Basin, colluvium, no contamination*): This is a site with underground floor drains, where the company was concerned that they may have contaminated the property with liquid hydrocarbons via these drains. They completed a round of soil sampling and submitted a report to the Groundwater Program. It was determined that no significant contamination had occurred, and a No Further Action letter was provided on November 8, 2010.

Sam Black Church Quick Stop (*Greenbrier County, Lower New River Basin, alluvium, hydrocarbon contamination*): This is a site with hydrocarbon contamination that is under the oversight of the VRP, and where the Groundwater Program has been asked to attend an onsite meeting and give advice on the proposed remedial strategies.

Savin Lumber (*Upshur County, Monongahela River Basin, old strip bench, metals and chloride contamination*): This is a site with groundwater contamination, and where the Groundwater Program provided advice to OEE.

Scherr Spring (*Grant County, South Branch (Potomac) River Basin, karst, no contamination*): This is a spring where the Groundwater Program provided geological advice to the VRP.

Sinking Streams: The Water Assessment Branch asked the Groundwater Program advice on where several of the state's sinking streams were reappearing on the surface, so that they could more accurately determine what stream and river basins these sinking streams were a part of. The Groundwater Program put together a database of West Virginia's sinking

streams, which totals (at present) 296 documented dye traces. In addition, personnel from the Groundwater Program completed approximately 12 dye traces near the divide between the Greenbrier and New Rivers in Greenbrier and Monroe counties. Cooperation and assistance was obtained from the local communities with all of the traces, and the dyes, traps, and laboratory work was supplied by the Department of Agriculture's Appalachian Farms System Research Center at Beaver.

Springdale Farms Subdivision (*Berkeley County, Lower Potomac Basin, karst, no contamination*): This is a site where a sinkhole had reportedly opened in the stormwater pond of a new housing development. Personnel from the Groundwater Program visited the site on two occasions, and found that the pond was no longer holding water, but that no sinkholes had formed within it.

Stoney Glen Subdivision (*Greenbrier County, Greenbrier River Basin, karst, no contamination*): The Groundwater Program answered several questions from a concerned citizen regarding this proposed housing development, which is located in a mature karst area in the community of Organ Cave.

Superior Well Services (*Lewis County, Monongahela River Basin, alluvium, acid contamination*): Personnel from the Groundwater Program visited this site at the request of OEE. Requests for additional information have been made to the company, but have gone unfilled to date.

unnamed spring near Greenwood (*Mineral County, South Branch (Potomac) River Basin, alluvium, no contamination*): Personnel from the Groundwater Program provided geological advice to the Water Assessment Program regarding this spring.

Unocal Cabin Creek Refinery (*Kanawha County, Upper Kanawha River Basin, alluvium, hydrocarbon contamination*): This is an old refinery site with groundwater contamination, and where Chevron (which is now the responsible party) is using phytroremediation as the remediation strategy. The site also has a limited free product problem. The company is continuing to remove the free product, and the lighter end hydrocarbons appear to be deceasing; however, little effect has been noticed on the heavier end hydrocarbons. Quarterly groundwater monitoring continues.

Unocal-Speedway Pipeline Site (*Kanawha County, Upper Kanawha River Basin, alluvium, hydrocarbon contamination*): This is the site of an old pipeline spill (which is adjacent to a gasoline station's old underground tanks, which have been removed), where Chevron (which is now the responsible party) is using vapor extraction as a remediation strategy. Quarterly groundwater monitoring continues.

Unocal Cabin Creek Bulk Terminal Site (*Kanawha County, Upper Kanawha River Basin, alluvium, hydrocarbon contamination*): This is an old bulk terminal site with groundwater contamination, and where Chevron (which is now the responsible party) is using phytroremediation as the remediation strategy. The lighter end hydrocarbons appear to be deceasing; however, little effect has been noticed on the heavier end hydrocarbons. Quarterly groundwater monitoring continues.

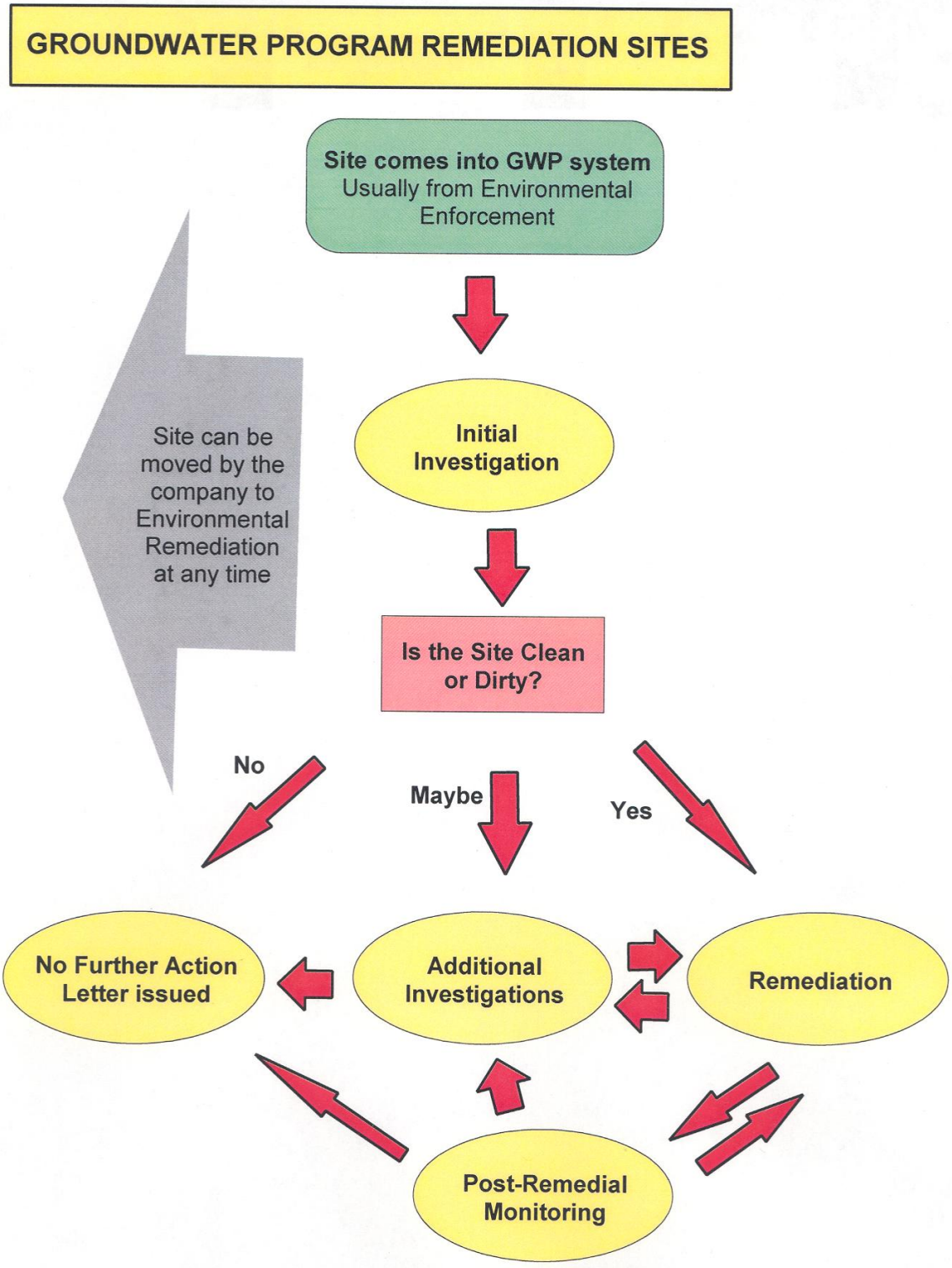
VA Hospital Martinsburg Fuel Tank Area (*Berkeley County, Lower Potomac River Basin, karst, hydrocarbon contamination*): This is a site with soil and groundwater contamination, which originated from a leaking underground pipe. The hospital has removed some soils, applied an oxygen releasing compound to the remainder, and has completed several vacuum extraction events (to little effect, because of a lack of permeability in the soils). Groundwater Program personnel made three site inspections during the reporting period, and attended one onsite meeting. Quarterly groundwater monitoring continues.

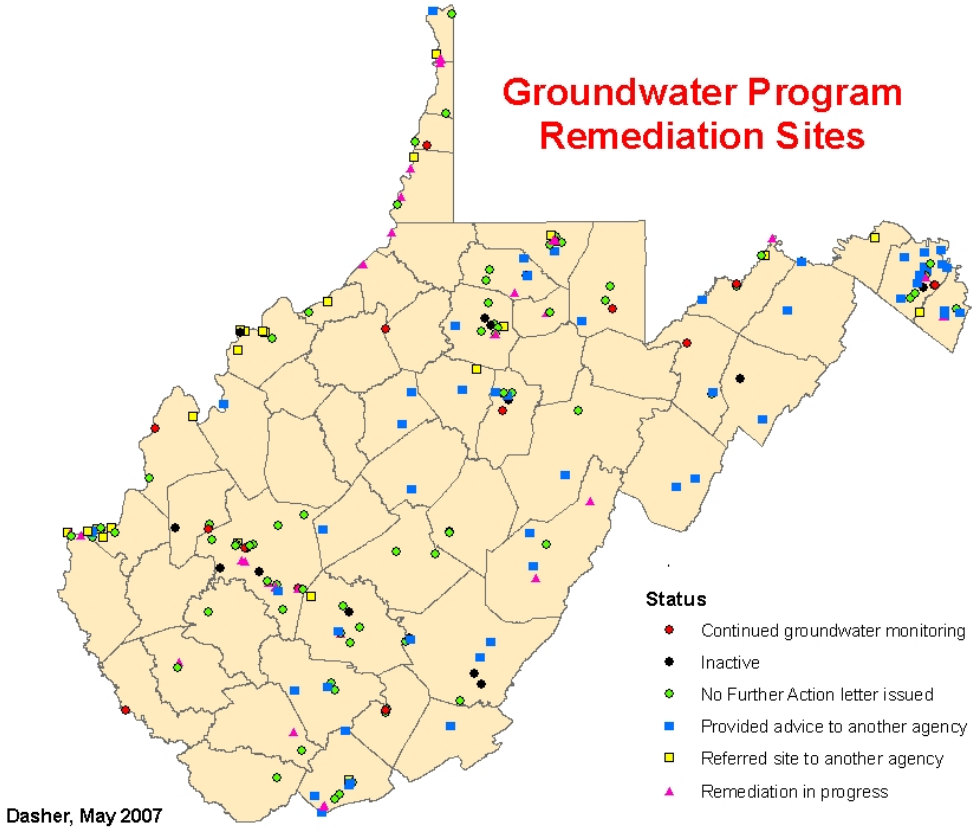
VA Hospital Martinsburg (*Berkeley County, Lower Potomac Basin, karst, solvent contamination*): This is a site with contaminated groundwater, which is appearing in the hospital's drinking-water wells. The hospital has completed two subsurface investigations and installed several groundwater monitoring wells to locate the source of this contamination. Treatment of the drinking water (via vapor extraction) continues to completely remove the solvents from the finished water. Additional investigations are planned and quarterly groundwater monitoring continues. Groundwater Program personnel made three site inspections during the reporting period, and attended one on-site meeting.

VEPCO Mountain Storm Power Plant (*Grant County, North Branch (Potomac) River Basin, colluvium, hydrocarbon contamination*): This is a site with a continuing free product problem, and where a sump was installed to collect the free product. Groundwater monitoring continues.

West Virginia University (*Monongalia County, Monongahela River Basin, alluvium and colluvium, glycol contamination*): These are three individual sites where there have been intermittent releases of propylene glycol, resulting from leaks of the deicing piping for the University's Personal Rapid Transit System. WVU is continuing to upgrade its infrastructure to prevent these releases.

Youth Environmental Conference: Personnel from the Groundwater Program attended this conference at Cacapon State Park and gave a PowerPoint presentation on West Virginia's geology, karst, and caves.

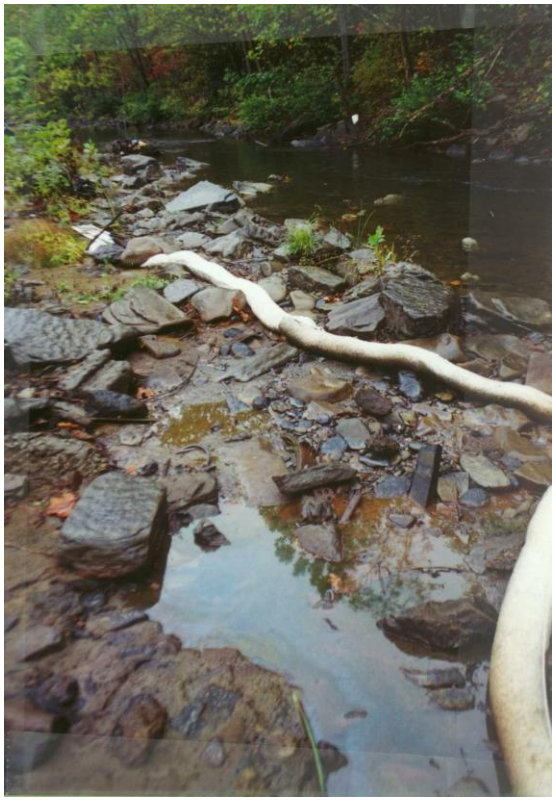

GROUNDWATER PROGRAM REMEDIATION SITES
Site comes into GWP system
Usually from Environmental Enforcement
Initial Investigation
Is the Site Clean or Dirty?
Site can be moved by the company to Environmental Remediation at any time
No
Maybe
Yes
No Further Action Letter issued
Additional Investigations
Remediation
Post-Remedial Monitoring


Groundwater Program
Remediation Sites
Status
Continued groundwater monitoring
Inactive
No Further Action letter issued
Provided advice to another agency
Referred site to another agency
Remediation in progress
Dasher, May 2007

Groundwater Sampling

Employing air sparging, left and a bio-venting, right at groundwater cleanup sites

At left, a Geoprobe unit injects oxygen release compounds at a bio-remediation site. At right, a high vacuum pump truck extracts hydrocarbons.



Hydrocarbon sheen on a stream with absorbent pads being used to keep the contamination from entering the stream.

A sinkhole filled with trash - a direct conduit for contamination to enter groundwater in Karst areas.

4. **Project WET (Water Education for Teachers) Program**

Introduction

The WVDEP works with classroom teachers, non-formal educators, and natural resources agencies to foster understanding and appreciation of groundwater and water quality through the Project WET (Water Education for Teachers) program.

Project WET provides K-12 teachers and other non-formal educators with hands-on classroom activities through training workshops. The activities included in the *Project WET Curriculum and Activity Guide* incorporate important surface and groundwater related lessons into all disciplines including the sciences, mathematics, fine arts, social studies, language arts, and music.

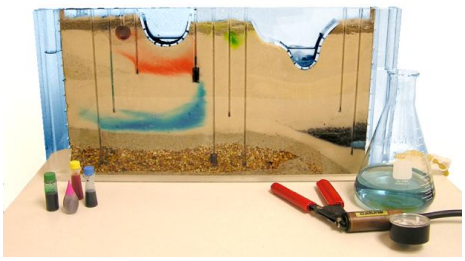
Program activities:

Project WET's scope of activities include six-hour and two-day long teacher training workshops, water festivals for students in fourth and fifth grade, and education activities conducted in cooperation with natural resources agencies. Project WET staff also works to develop publications to further understanding of basic water management issues with the connection between land and water, and people's role in pollution prevention.

Project WET Workshops

Engaging, motivating, interactive, and activity-oriented is how participants describe Project WET workshops that are offered at no cost to the West Virginia education community. The workshops include demonstrations of a groundwater flow model and a watershed model. A breakdown of Project WET workshops is provided in Table 1.

EnviroScape (watershed model) and Groundwater Flow Model loan program.



An interactive watershed model shows non-point pollution sources and the effects of polluted runoff on a waterbody. The groundwater model is a Plexiglas tank filled with sand, gravel, and clay to represent a slice of the earth. The model simulates how water and contaminants move through different water-bearing rocks allowing people to "see" groundwater. Teaching students how land use activities may impact groundwater

quality and/or quantity leads to increased awareness, stewardship and pollution prevention.

The models were loaned to the following schools and organizations: McKinley Middle School in St. Albans, Kanawha County; Mountain Ridge Intermediate School in Berkeley County; J Robins Elementary school and Elkview Middle School in Kanawha County; the Flow Program in Kanawha County: the Web of Life organization in Logan County; and the City of Vienna in Wood County.

Highlights for the reporting period include:

Martinsburg Public Library- DEP staff uses a groundwater flow model and the model of a watershed on the library plaza to raise awareness of groundwater and non-point source pollution.

Water Education Fairs in Public Libraries

The WVDEP teamed up with the Martinsburg Berkeley County Public Library to provide a two-day water education program for children, parents, and library patrons. The July 29-30, 2009, event featured hands-on activities, storytelling, and demonstrations of models such as the watershed model and the groundwater flow model. A water jeopardy game and the water cycle activity, *The Incredible Journey,* were also included in the list of sessions that made up the program.

Similar efforts followed in July 2010 at the South Charleston and Nitro public libraries in Kanawha County.

Children's Water Festivals:

During the reporting period, Project WET staff organized water festivals at the Marshall University Graduate College, Kanawha County; Hurricane, Putnam County; and participated at the National Park Service Festival at Grandview, Raleigh County.

The WVDEP and the National Park Service have cooperated since 2000 to offer children's water festivals that deliver effective and meaningful water education to fourth and fifth grade students. The festivals take place at the Marshall University Graduate College in South Charleston and at New River Gorge, National River in Grandview. The educational experience enables students to explore various water-related

topics through interactive and dynamic activities that empower them to protect West Virginia's environment.

The following are excerpts from thank you notes written by Ms. Bodnar's class at Flinn Elementary, Kanawha County: *"Dear DEP……I learned so many things on my field trip…thank you for helping me learn about what we are doing to damage the world. I will tell people what you taught me. I hope that we can really make a difference. Thank you for everything. Your Friend, Jennifer."*

"Dear DEP, thank you so much for letting us come. I had a blast. My favorite things were the lemonade pucker effect, storm water obstacle course, and the tragic story of Freddie the fish. I like the Pucker effect because we got to work in the sand, and I was the chemist. I liked the tragic story because it entertained me. Last but not least my most favorite thing was the storm water obstacle course. I love the obstacle course because it was active, fun, and we learned about how we can save our environment. You DEP guys did change my life and my families. Ever since I went home and told parents, I honestly think that they listened. Once again thank you so much for letting us come. Madison Crain Flinn Elementary."

DEP employee, Greg Rote, conducts the activity "Pollution Prevention and You" at the 2009 Annual Children's Water Festival.

City of Hurricane 2011 Children's Water Festival

The WVDEP staff helped organize and provided presenters for the March 28, 2011, City of Hurricane Children's Water Festival. The City of Hurricane partnered with the WVDEP to increase public awareness on the importance of protecting our waterways and reducing storm water pollution. Through a variety of hands-on activities students learned about the interconnection of storm water, people, and water quality. The event proved to be very successful with teachers and students. The City of Hurricane intends to repeat the event annually.

Man's Impact on Water – A workshop for science and social studies teachers.

Close to 40 Kanawha County middle and high school teachers participated in the August 4-5, 2009, Project WET teacher training workshop entitled *Man's Impact on Water*. The workshop provided the science and social studies educators with hands-on instructional activities they could take back to the classroom. Field trips to the Charleston landfill, wastewater treatment facility, drinking water plant, and Kanawha State Forest were also included to enhance learning and discuss emerging water-quality issues such as proper disposal of medical waste. The workshop was organized in close cooperation with Rosie Rhodes and Nancy

McCoy of Kanawha County Schools, whose collaboration was essential to recruit the participating educators.

Tim Haapala, operating manager for the North Charleston sewage treatment plant, gives Kanawha County middle and high school social studies and science teachers a tour of the facility during DEP's two-day Project WET workshop.

*Canaan Valley, 2010. In the foreground, **workshop participants display their own "Wetlands in a Pan"***

Wetlands Workshops: Four workshops that focused on wetlands took place at following locations: Canaan Valley National Wildlife Refuge in Tucker County; the Ohio River Islands National Wildlife Refuge, Williamstown, Wood County; West Virginia State University, Kanawha County; and the Union Carbide Technology Center in South Charleston, Kanawha County.

The workshops emphasized awareness of local wetlands, groundwater, water quality, and riparian areas. The day-long training featured activities from the publication, *WOW! The Wonders of Wetlands* and field trips led by local experts.

The May 28, 2010, workshop at the Canaan Valley National Wildlife Refuge Headquarters brought together 24 professionals with environmental expertise as well as classroom teachers. Cathy Johnson of the U.S. Forest Service, Monongahela National Forest, coordinated the workshop logistics and the recruiting of workshop participants. In addition, the West Virginia Chapter of Ducks Unlimited assisted with the training and provided some of the materials for a wetlands education trunk that the Forest Service makes available to area schools.

The workshop at the Union Carbide Technology Center was organized by Rosie Rhodes and Nancy McCoy, science and social studies curriculum directors

for the Kanawha County school system. Twenty-three educators attended the training that included a field trip to the Ward Hollow wetland. The site is owned by Union Carbide and open to area schools for teacher-led field trips.

The West Virginia Chapter of Ducks Unlimited provided assistance with workshops conducted at Canaan Valley, West Virginia State University, and the Union Carbide Technology Center.

Governor's Environmental Excellence Awards

The 2009 and 2010 award recipients for the Education and Community involvement category included Amanda Sullivan, an Environmental Specialist with the Department of Agriculture in Moorefield; Melissa Stewart, Education Specialist with the West Virginia State University Extension Service; and Sara Wurttemberg, Education Outreach Specialist for the Eastern Panhandle Conservation District in Martinsburg. Amanda and Melissa received the 2009 award. Sara was the award recipient for work completed in 2010.

New Publication

The fact sheet "Water Quality Standards" provides information about the many uses of our waterways and explains the connection between uses and the determination of water quality standards. The publication has proved to be very successful and has been widely distributed at WVDEP district offices and through cooperating organizations.

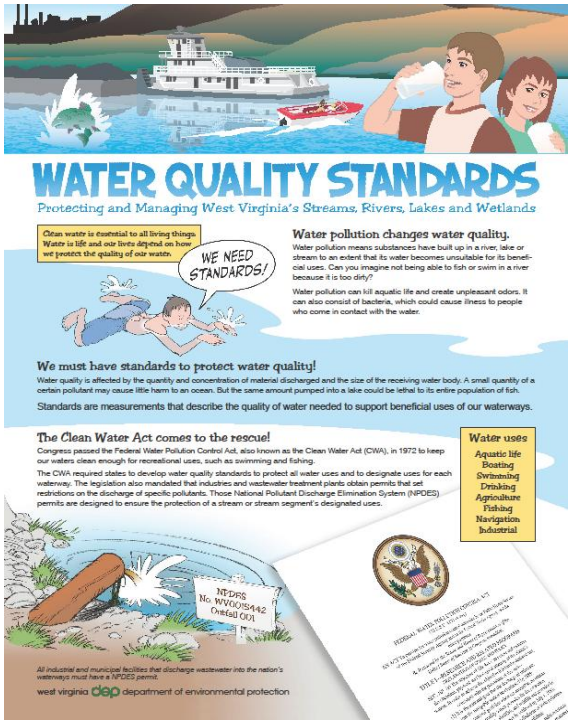


TABLE 1. PROJECT WET WORKSHOPS

Workshop Location	July 2007 June 2009	No. of Participants	Participant Breakdown By Occupation
DEP Headquarters, Charleston	August 4-5, 2009	35	19 middle, 16 high school
Mountain Institute, Spruce Knob	August 6, 2009	11	2 elementary, 6 middle, 3 high school
WV State University, Institute	August 12, 2009	3	2 non-formal, 1 homeschooler
Camp Pinnacle, Hardy County	September 19, 2009	10	1 Non-formal, 3 elementary, 3 middle, 3 high school
West Virginia University, Morgantown	Oct 20-21-22, 2010	51	Preservice teachers
Shepherd University, Shepherdstown	October 31, 2010	12	Preservice teachers
Department of Environmental Protection, Oak Hill	November , 2010	5	Non-formal educators
WV Conservation Agency, Martinsburg	March 6, 2010	10	4 classroom teachers, 6 non-formal educators
Morris Creek Watershed Association, Montgomery	March 18, 2010	12	Non-formal
Canaan Valley Refuge, Tucker County	May 20, 2010	24	3 elementary, 1 middle school, 1 high school, 19 natural resources agency personnel involve in education and outreach
Ohio River Islands National Wildlife Refuge, Wood County	June 15, 2010	8	3 elementary, I middle school, 4 non-formal
Widmyer School, Berkeley Springs, Morgan County	July 13, 2010	6	5 elementary, 1 non-formal
WV State University, Institute, Kanawha County	July 29, 2010	5	4 elementary, 1 University
Alderson, Greenbrier County	August 9, 2010	8	3 elementary, 1 high school, 4 non-formal educators

Workshop Location	July 2007 June 2009	No. of Participants	Participant Breakdown By Occupation
Kenna Elementary, Jackson County	August 31, 2010	21	21 elementary
Seneca Trail, Ronceverte	October 22, 2010	10	8 elementary 2 middle school
Shepherd University, Shepherdstown	October 23, 2010	15	Preservice teachers
Fairlea, Lewisburg	November 11, 2010	2	Non-formal educators
Widmyer Elementary, Berkeley Springs	November 22, 2010	8	3 elementary, I middle, I high school, 3 non-formal
Musselman High School, Inwood	December 20, 2010	11	I elementary, I high school, 9 non-formal educators
Flatwoods	March 24, 2011	12	Librarians
Mountain Institute	June 11, 2011	11	4 elementary, 1 middle, 2 high school, 4 non-formal educators
Technology Center, Charleston	June 13, 2011	23	I elementary, 7 middle, 10 high school, 5 non-formal
Total participants 308			

TABLE 2. EDUCATION OUTREACH EVENTS

Location	**Date**	**Event**	**Participants** (Approximate Number)
Poca Hunting and Fishing Club Putnam County	July 17, 2009	Boy Scout Camp/Pioneer District	90 Boy Scouts
Martinsburg Berkeley Public Library	July 29-30, 2009	Water Education with Project WET	100+ young people and parents
Marshall University Graduate College	September 25, 2009	Children's Water Festival	275 4th & 5th grade students
Freshwater Folk Festival, White Sulphur Springs	October 3, 2009	Festival	300 general public and children
For the Love of the Children Center (FLOC)	October 7, 2009	Science Olympiads	60 students in 6th grade
Stonewall Jackson Middle School	February 8, 2010	Groundwater Presentations	80 middle school students
Clay Center, Charleston	February 20,2010	Discover Engineering Day	200 general public and children
West Virginia State Capitol, Charleston	March 2, 2010	DEP public relations day at the Legislature	Over 100 people
WV Environmental Education Association Conference, Harpers Ferry	March 12-13, 2010	Environmental Education Conference	150 educators
Earth Day, DEP at the Clay Center Outdoor event	April 22, 2010	Earth Day	100 students
Clay Center, Charleston	April 24, 2010	Earth Day	150 students
Elizabeth, Wirt County	May 7, 2010	Wetlands Field Day	60 5th grade students
North Bend State Park	May 15, 2009	Youth Environmental Day	90 young people
Habitat for Humanity, Charleston	May 22, 2010	Sustainability Fair	200 general public
Summer of Service, Charleston	July 22-23, 2010	Educational Sessions	25 middle school students
South Charleston Public Library, Kanawha County	July 6, 2010	Make A Splash - READ! (Water Education with Project WET)	40 young people
Nitro Public Library, Kanawha County	July 15, 2010	Make A Splash - READ (Water Education with Project WET)	60 young people and parents

Location	Date	Event	Participants (Approximate Number)
Marshall University Graduate College	September 17, 2010	Children's Water Festival	280 4th and 5th graders
Children's' Water Festival National Park Service, Grandview	October 1, 2010	Festival for 5th grade students	250
Freshwater Folk Festival, White Sulphur Springs	October 2, 2010	Festival	Over 150 children and adults
For the Love of the Children Center (FLOC)	October 4-5, 2010	Science Olympiads	55 students in 6th grade
Girl Scouts of Black Diamond Learn to Lead Conference Flatwoods	October 29-30, 2010	Project WET booth	100 girl scout leaders
West Side Elementary	November 18, 2010	Presentation	60 students
West Virginia State Capitol, Charleston	March 2, 2011	DEP public relations day at the Legislature	Over 80 people
WV Environmental Education Association Conference, Canaan Valley institute, Davis	March 25-26, 2011	Environmental Education Conference	150 educators
Elizabeth, Wirt County	May 6, 2011	Wetlands Field Day	55 5th grade students
City of Hurricane Water Festival	April 21. 2011	Water Festival	250 4th & 5th grade students
Earth Day at Fayetteville	April 23, 2011	Earth Day – outdoor education	50 general public and children
Clay Center, Charleston	April 24, 2010	Earth Day	150 students
Elizabeth, Wirt County	May 6, 2011	Wetlands Field Day	60 5th grade students

5. West Virginia Nonpoint Source Program

The Nonpoint Source (NPS) Program is funded by Clean Water Act §319 grants administered by the EPA. The NPS Program supports the efforts of three partner state agencies and several divisions and offices within WVDEP. Our goal is to reduce nonpoint source pollution from various land use activities. In fiscal year 2010 our partner and supported agencies included:

- WVDEP Abandoned Mine Lands (AML) Program
- WVDEP Division of Mining and Reclamation (DMR)
- WVDEP Office of Oil and Gas (OOG)
- WV Conservation Agency (WVCA)
- WV Division of Forestry (WVDOF)

The NPS Program's goals are to:

- Provide technical assistance in the proper installation and maintenance of 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.

Mission of the NPS Program

The mission of the NPS Program 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 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 NPS Program 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 NPS Program has used some of the base funding to support special projects in watersheds that are threatened, but not part of a Total Maximum Daily Load (TMDL).

In watersheds with a TMDL the NPS Program'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 which includes all interested parties. The NPS Basin Coordinators facilitate or lead these teams.

The NPS Program and its component programs, §319 base and incremental grants, WV Save Our Streams Program, Chesapeake Bay Program and Stream Partners Program, are funded primarily through federal funds from EPA with the exception of the Stream Partners Program, which is funded by the WV Legislature. The challenges of protecting or restoring state waters from nonpoint source pollution are many, but the lack of funding from state sources makes matching the federal grant funds difficult. The NPS Program's activities are focused on protecting or restoring the surface waters of the state. None of the program's projects are focused on groundwater although indirect groundwater improvements are assumed. No monitoring of groundwater occurs in the program; however in the near future we plan to work closely with WVDEP's UIC Program to develop acceptable monitoring protocols for our decentralized and other alternative wastewater systems that have been and are being currently installed with Section §319 funds. Additionally many of our acid mine drainage (AMD) incremental projects treat direct discharges (portals and seeps) from groundwater, therefore helping to restore their surface water connections.

The national goals of the program set by the EPA focus on TMDL implementation and removal of impaired streams from the 303(d) list. There is no documentation of the effects of these activities on public or private water supplies but restoring the designated use of drinking water is a part of TMDL implementation. For additional information download the most recent annual report from the website below. The table on the next page provides a list of our active project's from the 2010 annual report.

http://www.dep.wv.gov/WWE/Programs/nonptsource/NPSReports/Pages/NPSReports.aspx

Year	Grant Recipient	Project	Nutrients (tons/yr)		Coliform	Sediment	Metals (tons/yr)			Acidity	Watersheds	Monies spent		Status
			N	P	(CFU)	(tons/yr)	Al	Fe	Mn	(tons/yr)		319 $	Match $	
2006	WVCA	Lost River	2.4	5.1	12.3E+12	6,775					Cacapon	$137,739	$74,022	Complete
2007	WVCA	Lost River Project 2	6.5	2.4	5.6E+16	782					Cacapon	$9,380		On-schedule
2006	FOC	Sovern Run					7.8	6.8	1.4	69.2	Cheat	$150,000		Complete
2007	FOC	Albert Highwall					6.7	9.1			Cheat	$62,050	$128,850	On-schedule
2008	FOC	Upper Muddy Creek					2.8	0.3	-	18.8	Cheat			On-schedule
2008	FOC	North Fork Greens Run					1.3	3.4	0.3	16.7	Cheat	$1,583		On-schedule
2008	FOC	Pringle Run					2.7	0.2	0.2	16.7	Cheat	$8,831		On-schedule
2010	FOC	Jeff Eanes Beech Run Rd.					3.6	0.9	0.5	30.4	Cheat			On-schedule
2006	DEP-OG	Little Sandy				12					Elk	$5,679	$5,600	Complete
2009	WVCA	Kitchen Creek	1.0	0.3	1.7E+12	15[E]					Greenbrier	$81,870	$9,347	On-schedule
2010	WVCA	Back Creek of Second Creek			4.8E+13[E]						Greenbrier			On-schedule
2010	PAN	Summerlee Bioremediation					5.6	8.2			Lower New	$14,888	$7,581	On-schedule
2006	FODC	Valley Highwall					0.8	2.2			Monongahela	$237,694		Complete
2007	FODC	Kanes Creek/Morgan Mine					8.5	7.6		36.9	Monongahela	$237,694	$45,003	On-schedule
2008	FODC	Sandy Run					4.2	0.5			Monongahela			On-schedule
2010	FODC	Slabcamp Run					2.5[E]	0.1[E]	0.1[E]	31.5[E]	Monongahela			On-schedule
2010	WRWA	West Run Phase 1					4.9[E]	9.2[E]	1.9[E]		Monongahela			On-schedule
2006	CVI	Conley NSCD				205[E]					Potomac Direct	$107,994	$44,399	Complete
2008	WVCA	Sleepy Creek			9.2E+12						Potomac Direct	$170,195	$31,124	On-schedule
2009	CVI	Mill Creek Opequon			4.5E+13[E]	85[E]					Potomac Direct	$41,102	$4,884	On-schedule
2009	WVCA	Mill Creek of South Branch	5.0	0.5	5.7E+13						South Branch	$25,838		On-schedule
2010	WWCMC	North Fork Elkhorn			1.2E+14[E]						Tug Fork			On-schedule
2007	BRWA	Smooth Rock Lick					0.1	1.2			Tygart Valley	$73,227		On-schedule
2007	STT	Raccoon Creek					22.7	35.8		0.5	Tygart Valley			On-schedule
2008	BRWA	Smooth Rock Lick #2					0.3	0.3		4.3	Tygart Valley	$122,930		On-schedule
2010	GWA	Winding Gulf			2.5E+13[E]						Upper Guyandotte			Not started
2006	MCWA	Morris Creek Stabilization				487					Upper Kanawha	$277,600	$426,659	Complete
2009	CCWA	Cane Fork					0.7[E]	0.1[E]	0.1[E]		Upper Kanawha	$746		Behind schedule
2009	GWF	Guinn Portal (Lamberts Run)					0.3[E]	6.4[E]	0.9[E]	17.1[E]	West Fork	$2,256		On-schedule
2006	DEP	WBP Development									Statewide	$38,045	$16,002	On-schedule
2007	DEP	Losing Ground Outreach									Statewide	$33,525		Complete
2007	DEP	WBP Development									Statewide	$63,019	$1,003	On-schedule
2008	DEP	WBP Development									Statewide	$36,357		On-schedule
2009	DEP	WBP Development									Statewide	$25,585	$8,392	On-schedule
2010	DEP	WBP Development									Statewide			On-schedule
Total load reductions (actual and estimated [E])			12.5	8.3	5.6E+16	8361	73	98.4	6.3	240.4				

Acronyms: WVCA (WV Conservation Agency); FOC (Friends of the Cheat); DEP-OG (Office of Oil and Gas); PAN (Plateau Action Network); FODC (Friends of Deckers Creek); WRWA (West Run Watershed Assoc); CVI (Canaan Valley Institute); WWCMC (Wastewater Coalition of MacDowell County); BRWA (Buckhannon River Watershed Assoc); STT (Save the Tygart Watershed Assoc); GWA (Guyandotte Watershed Assoc); MCWA (Morris Creek Watershed Assoc); CCWA (Cabin Creek Watershed Assoc); GWF (Guardians of the West Fork); DEP (WV Dept. of Environmental Protection; WBP (Watershed Based Plans)

6. **Watershed Assessment Branch**

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

The WAB has chosen a specific combination of physical, chemical and biological variables to help determine streams' health and what types of stressors may be operating on the benthic (aquatic bottom-dwelling) community.

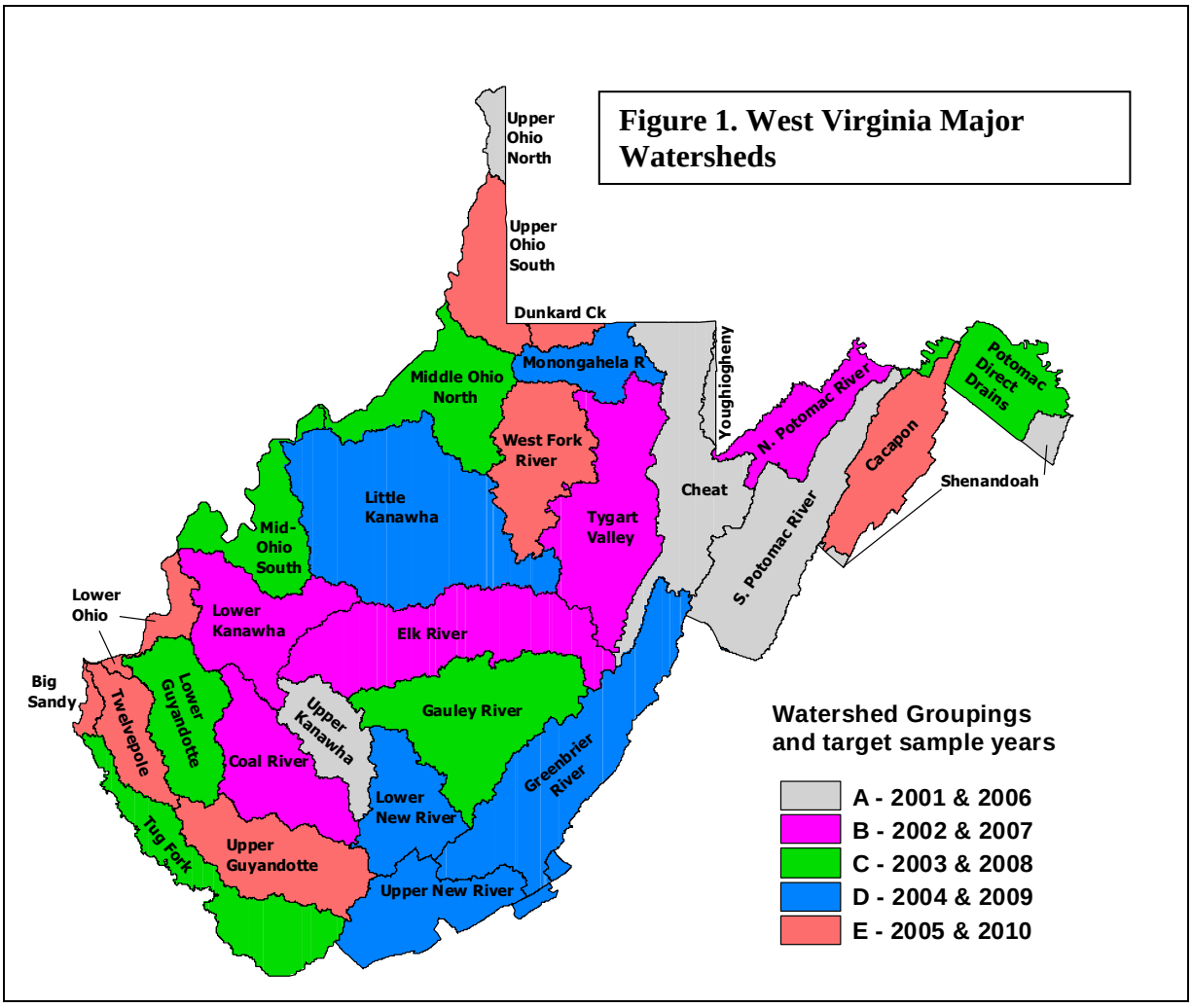
West Virginia utilizes a combination of: a stratified probabilistic monitoring design; targeted sampling; long-term or "ambient" site network (largest streams and rivers); deployable water quality meters to collect continuous data; and a thorough pre-TMDL development sampling design to meet the objectives of assessing the water quality of waterbodies throughout WV. In 2007, WVDEP added the 'LiTMuS' monitoring program, which entails annual sampling of wadeable streams throughout the state to better understand annual variation and track changes in different stream types.

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.

The targeted and pre-TMDL sampling programs are based on this five-year rotating basin schedule, whereas the Ambient, Probabilistic and LiTMuS programs collect data statewide annually. A map depicting the 32 watersheds and the hydrologic groupings is shown below in Figure 1.

From July 1, 2009 through June 30, 2011, WAB personnel collected 7,385 samples from 1,329 sites that are on 878 distinct streams and rivers. These sites are shown in Figure 2.

The streamside and instream habitats, and the benthic macroinvertebrates (bottom-dwelling animals that do not have backbones) in addition to water quality analysis, 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, like dissolved oxygen concentration, are important, but may reflect recent fluctuations in environmental conditions. A contaminant, which 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.



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, WAB holds a spring refresher training session before the sampling season each year to ensure all field staff are obtaining water quality and biological samples in a consistent manner at all sites.

WAB tries to identify the source, 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 are major stressor on the groundwater and surface waters in West Virginia. By identifying streams with violations of the criteria for fecal coliform bacteria, WAB 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 dirt, 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".

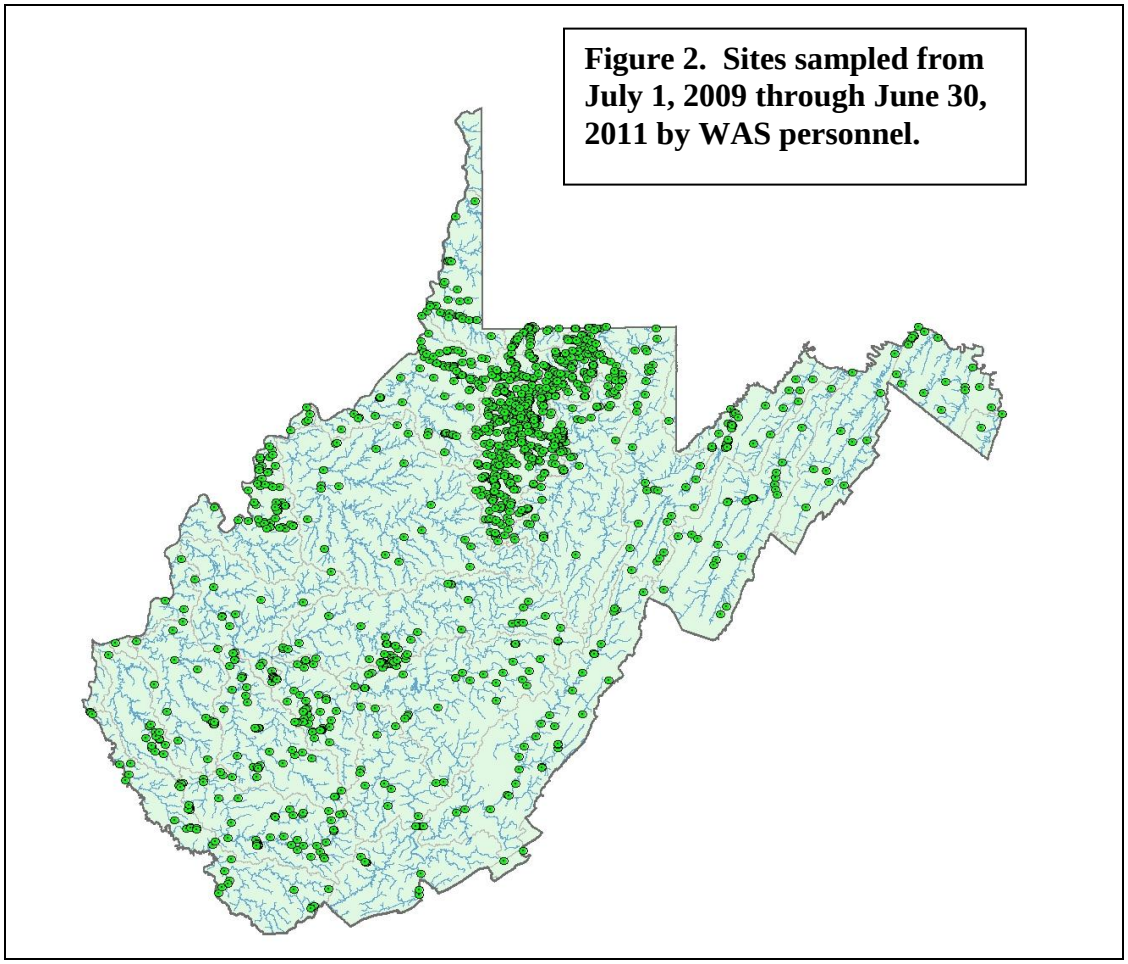


Figure 2. Sites sampled from July 1, 2009 through June 30, 2011 by WAS personnel.

By identifying streams impacted by acid mine drainage, WAB has identified areas where the groundwater also is likely impaired. By helping identify these areas, WAB has made it possible to target remediation efforts lessening the negative effects on fish and benthic communities.

The WAB 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 WAB.

West Virginia Watershed Assessment Schedule				
Group A - 2006 & 2011	Group B - 2007 & 2012	Group C - 2008 & 2013	Group D - 2009 & 2014	Group E - 2010 & 2015
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

TMDLs are required by the federal CWA. In simple terms, a TMDL 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 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 (extended to September 30, 2009).

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 WVDEP took the lead in developing TMDLs for state waters.

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. WAB will then be able to suggest remediation and restoration activities to improve groundwater and surface water quality in West Virginia.

Currently all targeted, probabilistic, and TMDL monitoring data, is managed in an ORACLE database (using previous Access 'front end') that was developed in-house. WAPBASE stores all water quality, habitat, watershed characteristics, macroinvertebrate data – both raw data and calculated metrics. At present some data is still entered manually, however we have been receiving the laboratory derived water quality results electronically, and eventually all WVDEP certified labs will be providing results electronically. WAB currently also uses EPA's STORET database to store surface water quality information.

WAB uses WCMS, an application developed for ESRI/ArcView software to identify the location of sampling sites, geologic and land use patterns upstream from the sampling sites, and similar data. WAB also uses this program to print maps showing the geographic distribution of violations in a watershed.

WAS has cooperated with the rest of WVDEP in the development and implementation of a database (EQuIS) that was intended to 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. Discussions are currently ongoing regarding a new agency wide database that will organize / centralize all of the agency's water quality related information.

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

The NPDES Individual Permit Program is continuing its efforts in implementing the requirements of its recently adopted Combined Sewer Overflow (CSO) Policies. The new policies provide specific requirements and direction to the CSO communities in developing and implementing their nine minimum controls and long-term control plans. New requirements are being implemented in permits and administrative orders.

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 was reissued in 2003, and expired in August of 2008, helps to expedite groundwater cleanup by providing the permit coverage. This permit will be reissued by the end of 2011.

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. The permit was reissued in June of 2007. This general permit requires submission of a GPP from the applicants.

NPDES permits for industrial facilities also require submission of GPP plans which promote improved housekeeping practices, improved diking for storage facilities, improved loading/unloading practices for chemicals etc. Thus, GPP plans help to protect groundwater at industrial sites. Similarly, in the case of storm water discharges from industrial sites, stormwater pollution prevention plans (SWPPP) are required for NPDES permits and in the stormwater 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 2010 (July 1, 2009 - June 30, 2010) is as follows:

1. Number of individual WV/NPDES permits issued: 93
2. Number of General Permit Registrations issued: 1,792
3. Number of modifications of Individual WV/NPDES Permits and General Permits Registrations issued: 262

8. State Water Pollution Control Revolving Fund (SRF)

The SRF program environmental goals are to reduce and/or eliminate water quality violations caused by sanitary wastewater and nonpoint sources in surface waters and groundwater. In FY2010 and FY2011 approximately $146 million dollars of assistance was expended from the SRF program (including additional funds from the American Recovery and Reinvestment Act) to build and replace wastewater collection and treatment systems. In many of these projects, unsewered areas of West Virginia were provided with central sewer collection systems that eliminated direct wastewater discharges and failing or marginally functional onsite septic systems. The failing systems and direct discharges contribute to polluting the groundwater in the state. For example, the Flatwoods Canoe Run Public Service District extended service to 178 new customers eliminating the failing septic systems and/or straight pipe discharges into the Elk River which is considered impaired.

Design standards for the SRF program are included in the Legislative Rules, Title 47 Series 31 and include restrictions on constructing sewer lines within 10 horizontal feet of a drinking water reservoir, 50 feet of any well or spring utilized for a public drinking water system, 50 feet of a private or individual homeowner's drinking water system, or within 10 feet of a homeowner's well. The enforcement of these regulations helps protect public and private water supplies.

The DEP's Agriculture Water Quality Loan Program is also administered through the SRF program and provided five loans totaling $261,033 in FY2010 and four loans totaling $92,112 in FY2011. This program was established in 1997 and continues to provide loans to correct nonpoint source pollution. Most of the loans are made to the poultry industry in the Eastern Panhandle to assist in alleviating groundwater pollution from the poultry farms. The SRF will provide $100,000 as a set-aside for this program for FY2012.

A pilot program was started in 2000 called the Onsite Systems Loan Program. The purpose of this nonpoint source program is to eliminate existing health hazards and water quality problems due to direct sewage discharges from houses and malfunctioning septic tank systems. Many problems and barriers have prevented this program from being successful to date, but program revisions have been made to make it a more viable program. During the 2007 legislative session, the SRF statute was amended to allow other entities to act as an intermediary lender for this program. The WV Housing Development Fund and the SAFE Housing and Economic Development, Inc. (SHED) have entered into an agreement with the SRF to provide low interest loans to homeowners to correct failing onsite sewage systems. The program provided 53 loans totaling $266,850 in FY 2010 and 25 loans totaling $151,737 in FY2011 from this program and will provide $300,000 as a set-aside for this program for FY2012.

9. Environmental Enforcement

The Environmental Enforcement (EE) office is primarily responsible for inspection and enforcement of the state and federal solid waste, hazardous waste, underground storage tank 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 which are not under its jurisdiction to the appropriate authority.

EE's Compliance Monitoring unit 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

WVDEP'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. Additional staffing is needed to adequately address all the groundwater sites within the State. WVDEP's present grant commitment is for six GSI's per year. With the low level of staffing in the Compliance Monitoring unit, it will be hard to do any more than the commitment numbers with all the other job responsibilities assigned to this unit.

The Department of Environmental Protection's Quality Assurance/Quality Control Plan and Standard Operating Procedures for Groundwater Sampling Revision No. 1 (effective August 5, 2009) is used by the Compliance Monitoring unit as a guide when conducting GSIs.

Generally, all landfill sites will have a minimum of four 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. All municipal landfills generally have the same parameters (Phase I) as outlined in 33CSR Appendix I.

Collection of groundwater samples is accomplished by compressed air operated bladder pumps as well as bailers. All organics are collected by Teflon bailers. All samples are collected, preserved and analyzed in accordance with 40CFR. Groundwater samples are analyzed by state certified laboratories.

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 any contaminated soil is identified at the facility, remediation is required under the Groundwater Protection Act.

Training that focuses on the complex interaction of groundwater, geology, and chemistry must be provided to EE staff. This training must include all staff, but prioritize newly hired inspectors. Classroom style training accompanied with ample practical (hands on) training exercises with a focus on sample collection and preservation would be most beneficial. This training program will result in environmental inspectors that are both effective and safety conscious in their field work.

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, notice of violations (NOV's), 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 data base is for permit information.

Both the Hazardous Waste Management Act and the Underground Storage Tank (UST) Act are, in part, groundwater protection acts. The Hazardous Waste Management Act requires long term groundwater monitoring at permitted disposal sites. EE inspectors conduct Groundwater Monitoring Inspections every three years at every hazardous waste land disposal facility in the state. These inspections involve evaluating the facility's sampling protocols and "splitting" samples with the company to conduct an independent analysis of the groundwater.

The UST act requires release detection, corrosion protection, overfill protection and spill prevention at UST sites to ensure protection of the groundwater. The Energy Policy Act of 2005 has increased the regulations applicable to USTs installed within 1,000 feet of existing community water systems or potable drinking water wells. The act requires states to perform on-site inspections at all UST facilities every three years. This is a significant increase in the required frequency of inspections. In addition, the act includes additional regulations related to secondary containment, delivery prohibition and operator training at UST sites.

Additionally, in fiscal years 2010 and 2011, EE personnel investigated 987 spills and 2,185 complaints that had the potential to impact groundwater.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

C. Abandoned Mine Lands and Reclamation

In reviewing surface mining legislation in the mid-1970s, 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 streams were 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 specifically with the problems associated with inadequate reclamation of abandoned mine lands (AML).

In Title IV, Congress established the Abandoned Mine Reclamation 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 enacted.

West Virginia received primacy of the AML program February 21, 1981, and the WVDEP was designated by the 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 WVDEP.

The mission statement of the Office of AML&R 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".

The program's vision statement is to, "efficiently and effectively use 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.

AML&R Organizational Structure

AML&R is divided into groups: Administration & Financial, Realty, Planning, Design and In - House Design, Construction and Emergency. The state is divided into northern and southern regional offices. The responsibilities of those groups are:

1. *Administration & Financial* - This group performs the accounting function for the office. The group tracks expenditures as they relate to administrative and construction functions responsible for management of grants, budgets and financial administration of AML&R. Furthermore, the group oversees the Stream Restoration section that is mandated to perform all program, pre-construction, post-construction and compliance, and water monitoring functions.

***2. Realty* -** This group gains 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 group identifies abandoned mine land problems. Each requires preparation of environmental assessments to be in compliance with the National Environmental Policy Act (NEPA), creation of a description of each project, and development of a preferred alternative for correcting the problem. The group also maintains the West Virginia Abandoned Mine Land Inventory.

***4. Design & In - House Design* -** This group approves all consultant plans and specifications involving abandoned mine land projects. It also evaluates and selects a design consultant to perform all necessary preparation of plans and specifications for projects. This group also administers exploratory drilling, aerial mapping, surveying contracts, and prepares plan and specification on selected projects in-house.

***5. Construction* -** The main task of the Construction group is contract administration and oversight of abandoned mine land construction projects. This includes site inspections during construction. The group conducts pre-bid and pre-construction conferences and performs final inspections.

***6. Emergency* -** This group administers and conducts the Emergency Reclamation program.

AML Public Health and Safety Issues

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 mined for coal after August 4, 1977. These sites were abandoned before the date the secretary of the U.S. Department of the Interior approved a regulatory program for the state in which the sites are located.

The expenditures of monies from the fund on lands and water eligible shall reflect the following priorities stated in Section 403 (a) in the Surface Mining Control and Reclamation Act Amendments of 2006:

1. (A) The protection of public health, safety, and property from extreme dangers of adverse effects of coal mining practices;

(B) the restoration of land and water resources and the environment that –

(i) have been degraded by the adverse effects of coal mining practices; and

(ii) are adjacent to a site that has been or will be remediated under subparagraph (A)

2. (A) The protection of public health and safety from adverse effects of coal mining practices;

(B) the restoration of land and water resources and the environment that -

(i) have been degraded by the adverse effects of coal mining practices; and

(ii) are adjacent to a site that has been or will be remediated under subparagraph (A); and

3. The restoration of land and water resources and the environment previously degraded by adverse effects of coal mining practices including measures for the conservation and development of soil, water (excluding channelization), woodland, fish and wildlife, recreation resources, and agricultural productivity.

The SMCRA Amendments of 2006 stated that any state or tribe may extend funds allocated to such state and tribe in any year through the grants for the purpose of protecting, repairing, replacing, constructing, or enhancing facilities related to water supply, including water distribution facilities and treatment plants, to replace water supplies adversely affected by coal mining practices.

The U.S. Office of Surface Mining (OSM) maintains an inventory of abandoned mine problems known as the Abandoned Mine Lands Inventory System (AMLIS). OSM maintains the system to provide information to meet the objectives of Title IV specified in Section 403(a).

When a problem area is entered into AMLIS along with the estimated cost of repairing the area, not including design, inspection, and program administration costs, the estimated cost is entered in the unfunded category. 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 unfounded costs of all priorities in West Virginia as of October 1, 2011 are $1,397,606,032.

AML&R Accomplishments

AML&R has completed the problem areas (PA) and the associated problem types. The PA and the problem type accomplishments have been entered into AMLIS and moved from the funded to completed category.

Problem Type	Total Accomplishment
Clogged Streams (Miles)	14
Dangerous Highwall (Feet)	261,794
Dangerous Impoundments (Count)	1,183
Dangerous Piles & Embankments (Acres)	5,838
Dangerous Slides (Acres)	630
Hazardous Equipment & Facilities (Count)	700
Industrial/Residential Waste (Acres)	44
Portals (Count)	2,813
Polluted Water: Agriculture. & Industrial (Count).	90
Polluted Water: Human Consumption (Count)	19,092
Subsidence (Acres)	509
Surface Burning (Acres)	507
Vertical Opening (Count)	182

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

D. Division of Land Restoration

1. Office of Environmental Remediation

The Office of Environmental Remediation (OER) was created in 1997 to consolidate the agency's remediation programs. The organizational structure allows the office to focus its energy and technical talent on the remediation sciences and procedures used to restore contaminated sites. The office is primarily organized along a project management function, which oversees site activities, and a technical support function, which provides specialized technical support.

OER operates five sections:

Voluntary Remediation/Brownfield - This section encourages voluntary remediation activities and brownfield revitalization. The Voluntary Remediation and Redevelopment Act (VRRA) was one of the first voluntary cleanup or brownfield laws in the nation. The VRRA section is characterized by uniform, predictable processes with flexible cleanup standards based on future land uses that are protective of human health and the environment.

Leaking Underground Storage Tanks (LUST) - This section provides oversight of the cleanup from leaking underground storage tanks, including release from the tanks, their piping, spills or overfills. This section also administers the federal and state leaking underground storage tank response funds. These funds enable state cleanups, where the responsible party is unwilling or does not have the financial means to respond to the leak. The agency received authorization from the EPA in 1997 to assume the regulatory lead for the leaking underground storage tank program in West Virginia.

Superfund - This section coordinates with the EPA and as applicable, the U.S. Department of Defense, at Superfund cleanups. Recent federal efforts have also focused on recognizing and supporting the successful state brownfield and voluntary cleanup programs.

Rehabilitation Environmental Action Plan (REAP) - This was a strategic initiative signed into law by Governor Joe Manchin in 2005. The governor's bill combined elements of the WVDEP and the Division of Natural Resources into a more effective and streamlined system for the direction of environmental remediation programs. The program provides oversight of litter removal, statewide recycling, and open dump cleanups.

Landfill Closure Assistance Program (LCAP) - This program provides landfill closure assistance to owners/permittees of landfills which were required to cease

operations pursuant to certain statutory closure deadlines for non-composite lined facilities. The program designs and constructs all closure-related activities necessary to provide sufficient leachate management, sediment and erosion control, gas management, groundwater monitoring and a final cover cap on non-composite lined landfills.

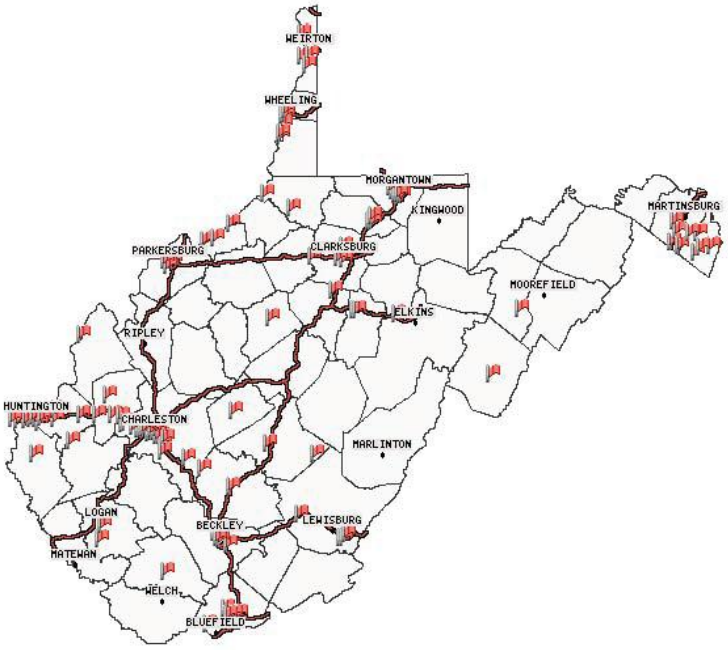
OER accomplishments in FY 2010 & 2011 (July 1, 2009 – June 30, 2011)

The REAP Program eliminated 2,616 dumps from West Virginia's landscape. This led to the proper disposal of over 18,638 tons of litter/waste. REAP was also responsible for the proper disposal of over 681,552 waste tires. Many of these tires were pulled from the 557 miles of rivers and streams that REAP cleaned during this time.

- REAP's Pollution Prevention Open Dump Program (PPOD) reclaimed 2,190 acres of land through the eradication of 2,556 dumps. PPOD also removed over 679 appliances from the landscape and recycled more than 387 tons of scrap metal.
- REAP's Make It Shine Program coordinated the efforts of more than 7,676 volunteers. These volunteers worked to remove 365 tons of litter and debris. The volunteers removed litter from 5,827 acres of park, 310 miles of streams, and 113 miles of trails.
- REAP's Adopt-A- Highway Program had more 42,172 volunteers in more than 2,311 active groups. They worked to remove more than 703 tons of litter from more than 7,539 miles of roadway.
- The REAP Litter Control Grant Program, which provides grants to cities, counties, and municipalities for litter control and cleanup programs, funded 56 projects totaling $114,297.57.
- The REAP West Virginia Recycling Assistance Grant Program, which provides grants for recycling to public and private entities, awarded 78 grants totaling $3,099,837.19.
- The REAP Covered Electronic Device Grant Program, which offers grants to counties and municipalities wishing to implement electronic device recycling programs or e-cycling events, issued 41 grants totaling $506,877.77.
- The REAP West Virginia Public Employees Office Paper Collection Program collected over 666 tons of paper from state offices.
- The Voluntary Remediation and Redevelopment Act program accepted 17 new applications for properties to participate in the program. The program issued 23 Certificates of Completion for voluntary remediation sites, which opened more than 212 acres of land ready for reuse. Cumulatively, the program has issued 110 Certificates of Completion, which opened more than 1,342 acres.
- OER completed brownfield targeted site investigation work at the Rahall Transportation property in Cabell County and the Adamston Flat Glass site in Harrison County. OER completed a petroleum brownfields assessment at the former Lusk Lumber treatment plant in Wyoming County.

- OER provided oversight of the investigation and cleanup of 133 new leaking underground storage tank sites, in addition to completing investigations and closing the active files on 226 leaking underground storage tank sites. OER also removed 110 abandoned underground storage tanks from 40 different sites.
- OER continued working with EPA Region 3 and ExxonMobil Corp. on the Sharon Steel/Fairmont Coke Project XL Superfund cleanup, while ExxonMobil Corp. and the city of Fairmont continued to work collaboratively on redevelopment plans to return the site to productive use.
- OER continued working with EPA Region 3 on the Superfund actions at Morgantown Ordnance Works, the Big John's Salvage site near Fairmont, the Fike-Artel Chemical site in Nitro, the Pantasote site in Point Pleasant, the Onlin-Hanlin Chemical site near New Martinsville, the Vienna well field in Wood County, the Ravenswood PCE site, and Allegheny Ballistics Laboratory in Mineral County. OER worked collaboratively with EPA Region 3 and the U.S. Army Corps of Engineers at West Virginia Ordnance Works in Point Pleasant (WVOW).
- In addition to WVOW, OER continued to work with the U.S. Army Corps of Engineers on other Formerly Used Defense Sites (FUDS) in the former West Virginia Maneuver Area located in the north-central highlands, including Dolly Sods.
- OER continued working collaboratively with EPA Region 3 on 36 RCRA Corrective Action sites, including eight sites on the 2020 list.
- OER initiated site assessment activities at six priority hazardous substance sites and continued site assessment activities at 10 other sites.
- OER completed closure construction activities at Pine Creek Omar Landfill in Logan County under the Landfill Closure Assistance Program, and closure work was initiated at the Morgan County Landfill, Moundsville Landfill in Marshall County, and Big Bear Lake Landfill in Preston County.
- OER received and processed 3,248 notifications of excavations from Miss Utility of West Virginia, to provide protections from uncontrolled exposures at properties with established environmental covenants under the Voluntary Remediation and Superfund programs.

Voluntary Remediation and Redevelopment Act Sites



V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

E. Information Technology Office (ITO)

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

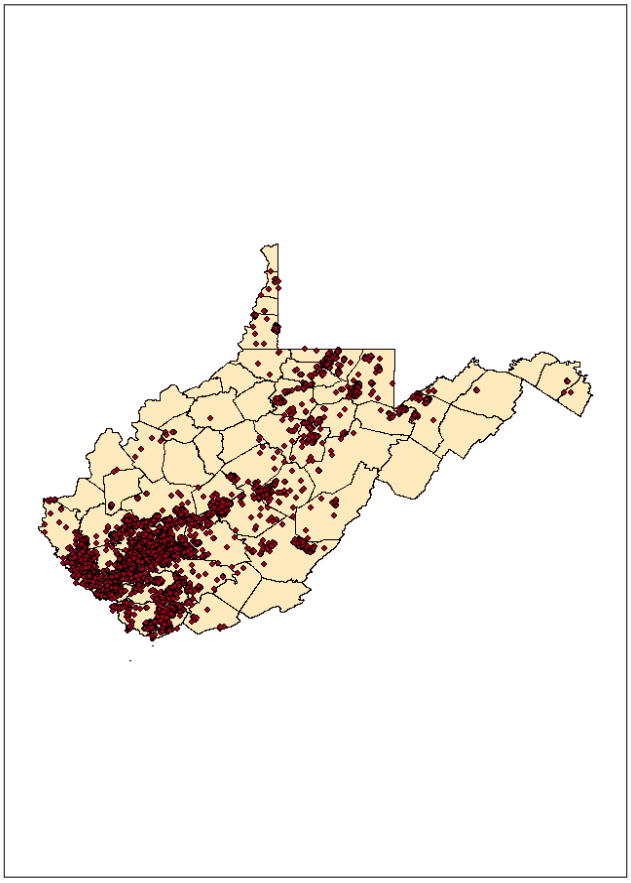
EarthSoft's Environmental Quality Information System (EQuIS -- written for the Microsoft Windows operating system provides an integrated suite of applications and a common database management system for all organizations involved in the data collection, processing, management and evaluation aspects of environmental project work. EQuIS has historically resided on a desktop platform. EQuIS is now an Enterprise system residing on an Oracle platform. Earthsoft's EQuIS is the world's most widely used environmental sample data management system.

Currently, all data collected and analyzed by WVDEP resides in a myriad of places and formats. By developing a central repository and a uniform format for the data 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 parties involved or the disparity of tools they employ (or do not employ) to get their 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. 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 management to make effective and timely decisions without the complication of needing to process data for the modeling programs used.

A new feature of the Enterprise version is the EQuIS Dashboard. The Dashboard allows users to load data via an Internet Interface. The Dashboard also allows users to subscribe to facilities they wish to keep update about. It will notify the user of when new data is added and push predefined reports to the user when scheduled or triggered.

The size of the database is expected to grow exponentially as more users are brought online. To date, 1,058 facilities are registered in the database. The facilities have a total of 173,371 sampling locations, a mixture of surface and groundwater locations. There are 2,265,836 test results recorded in the EQuIS database. This will be one of the largest databases in the agency which will be accessible to WVDEP employees and the public. The map below shows EQuIS Locations.



To date, the Division of Mining and Reclamation has the most data stored in EQuIS. One project, OMR Trendstation, is the single largest facility in EQuIS. Data has been collected at 235 locations monthly since October 2002 and currently has 533,715 test results. Other groups within the WVDEP storing data in EQuIS are the Closed Landfill Program and the Voluntary Remediation Program (VolRem).

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

A. Well Head Protection Program

Groundwater Protection Goals

As of June 30, 2011, the Source Water Assessment and Protection (SWAP) / Wellhead Protection (WHP) program has completed assessments for 100 percent (delineation through public availability) of the community and non-community public water supply systems of the approximate 1,191 surface and groundwater intakes serving the State's 1,263 public water systems. The SWAP/WHP programs target water systems for protection on a county or local basis. In many communities, ground water is the only source of drinking water. Once ground water is contaminated it is very expensive to treat or replace.

The EPA approved the WHP program in 1992 and Department of Health and Human Resources / Bureau for Public Health/Office of Environmental Health Services (OEHS) staff have been working with ground water systems since that time. The WHP program includes public participation, source delineations, the potential contaminant survey, and management directives complementing the SWAP program. SWAP/WHP programs are the practice of assessing the quality of our water resources, and implementing programs that reduce pollutants and chemical contaminants which could potentially negatively impact these resources. Protecting water resources from contaminants also can eliminate the need for supplementary treatment procedures, and can delay the cost of new infrastructure and related increases in water rates. It is our hope that this work accomplished in West Virginia and across the United States will be a valuable tool to a public water supply/community and will help in planning and building future capacity for economic growth.

The OEHS staff continues to complete SWAP/WHP studies for new Public Water Supply systems and helps revise existing plans within the state by prioritizing efforts, program resources, education and outreach efforts in developing and implementing protection measures. Implementation of the SWAP /WHP builds on other environmental assessment and protection programs, and requires integrated linkage and cooperation of the WVDEP. Moving to a protection plan phase will require a multifaceted approach that will require continued financial support within West Virginia. OEHS relies on participation and involvement of federal, state, local agencies, industry, agriculture, environmental groups, public water supplies, and the public at many levels to protect the surface and groundwater of the state and the health of the people of West Virginia. Implementation of the SWAP/WHP builds on other environmental assessment and protection programs and requires integrated linkage and

cooperation with many associated entities. Follow up assistance and a continuing source of funding for activities will likely be required for sustainability.

The SWAP/WHP programs maximize the use of existing information, require integration with existing state and federal programs and use Geographic Information System to map delineations and assessments and the emphasis on the local partnerships.

Program Milestones and Future Priorities

During this reporting cycle, the SWAP/WHP programs continued to pursue the following:

Building Partnerships-Inter-agency cooperation and other alliances:

- Continuation of the SWAP/WHP Memorandum of Understanding (MOU) that has been signed by a number of state groundwater regulatory agencies. The MOU establishes a coordinated effort by all agencies to protect ground water in delineated SWAP/WHP areas. The MOU enhances the SWAP/WHP program's ability to protect groundwater utilized by public water systems.
- Continue to participate and build voluntary protection efforts by prioritizing efforts, program resources, education and outreach efforts in developing and implementing voluntary protection measures not only to the local water systems but also to local governments, councils, planners, and other stakeholders.
- Provide funding for the WVDEP's UIC Class 5 program to locate UIC Class 5 wells in source water protection and sensitive hydrological areas within West Virginia. This work also includes an inventory of underground and above ground storage tanks in the SWAP/WHP area.
- Continue participation and provide funding for the Potomac Drinking Water Source Protection Partnership. This partnership is composed of water utilities and the various governmental agencies responsible for drinking water protection in the Potomac River Basin.
- Continue participation with the Ohio River Valley Water Sanitation Commission (ORSANCO) work group on source water protection. This work group is composed of water utilities and the various governmental agencies responsible for drinking water protection in the Ohio River basin.
- Continue a working relationship between the federal *Safe Drinking Water Act* and the *Clean Water Act* programs within the state to provide the most accurate and representative assessment of

source waters, based on available data which the state believes best reflects the quality of the resources.

- ❖ Continue to work with the West Virginia Rural Water Association (WVRWA), under an EPA grant through the National Rural Water Association, working with the local SWAP and WHP areas within the state.
- ❖ Continue to use hydrogeologic information provided from the USGS to help define SWAP/WHP delineation areas.

Public Outreach/Educational Activities:

- ❖ OEHS Staff provides help in developing a protection program, and assessing potential sources of contamination.
- ❖ Participation with the WVDEP on Project WET (Water Education for Teachers), a nonprofit water education program for educators and young people ages 5-18. In conjunction with this program, the SWAP program has developed a program to loan groundwater models to schools that complete the Project Wet training. The SWAP group uses a groundwater flow model within Project WET workshops and other educational outreach events to demonstrate groundwater and surface water and how both can be affected by precipitation, the pumping of wells, and human activities above or below the land surface. It is the intent that within the public school platform, more teachers and more students will have the tools and content to learn about water resources effectively.
- ❖ For the past 11 years, the SWAP program has participated in the annual WV Children's Water Festival. Kanawha County students in fourth and fifth grade attend this festival which consists of structured learning stations where students actively engage in hands-on water activities and investigations.
- ❖ The West Virginia Bureau for Public Health (WVBPH) website (http://www.wvdhhr.org/oehs/eed/swap/) continues to provide information on the SWAP/WHP programs (educational materials, posters and brochures) and guide municipalities, water suppliers, or other groups through developing a local SWAP program. This website provides links to a secure GIS website that provides the wellhead SWAP areas for use by water utilities, state, emergency management, and federal agencies. In addition, a link is available to a website that provides copies of the initial SWAP/WHP susceptibility assessments reports for the community water systems.

Other Actions for Protection of Sources of Drinking Water

- Continue to provide funding to the Source Water Protection Grants Program that allows municipalities and water suppliers to enhance local protection programs and to implement programs to protect existing groundwater sources of public drinking water. An example of a grant project would be the River Alert Information Network (RAIN), through fiduciary, Riverside Center for Innovation. The grant will be utilized for the provision of 10 source water monitoring panels to be installed in 10 facilities in or just outside of the Monongahela River Basin. These monitors will serve as early detection and warning of degradation of source water for public water supply member systems, as well as the general public.
- Continue to evaluate new public water supply water wells or intakes to assure they are located in areas where contamination threats are minimal. 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.
- Continue to use the Alternative Monitoring Strategy Program (AMSP), which determines future monitoring frequency reductions, is dependent on having a SWAP/WHP program in place, which requires consistent revisions and updates.
- Continue to participate in the development of regulations and design standards for water supply wells, private water wells and monitoring wells for the prevention of groundwater contamination.
- Continue to evaluate public water supply wells to determine whether groundwater sources are under the direct influence of surface water (GWUDI).
- Continue to support the efforts of the WVDEP, DWWM and the USGS 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.
- Continue to implement the revised regulations and design standards for private water wells, approved April 2, 2008, for the protection of groundwater. Staff participated with the Centers for Disease Control (CDC) in collecting water samples from 144 private residences from August through September 2010 to conduct a water quality assessment study of private wells in selected areas within WV. Findings of this study will help understand the quality of groundwater in WV. A final report is currently being reviewed by the CDC.

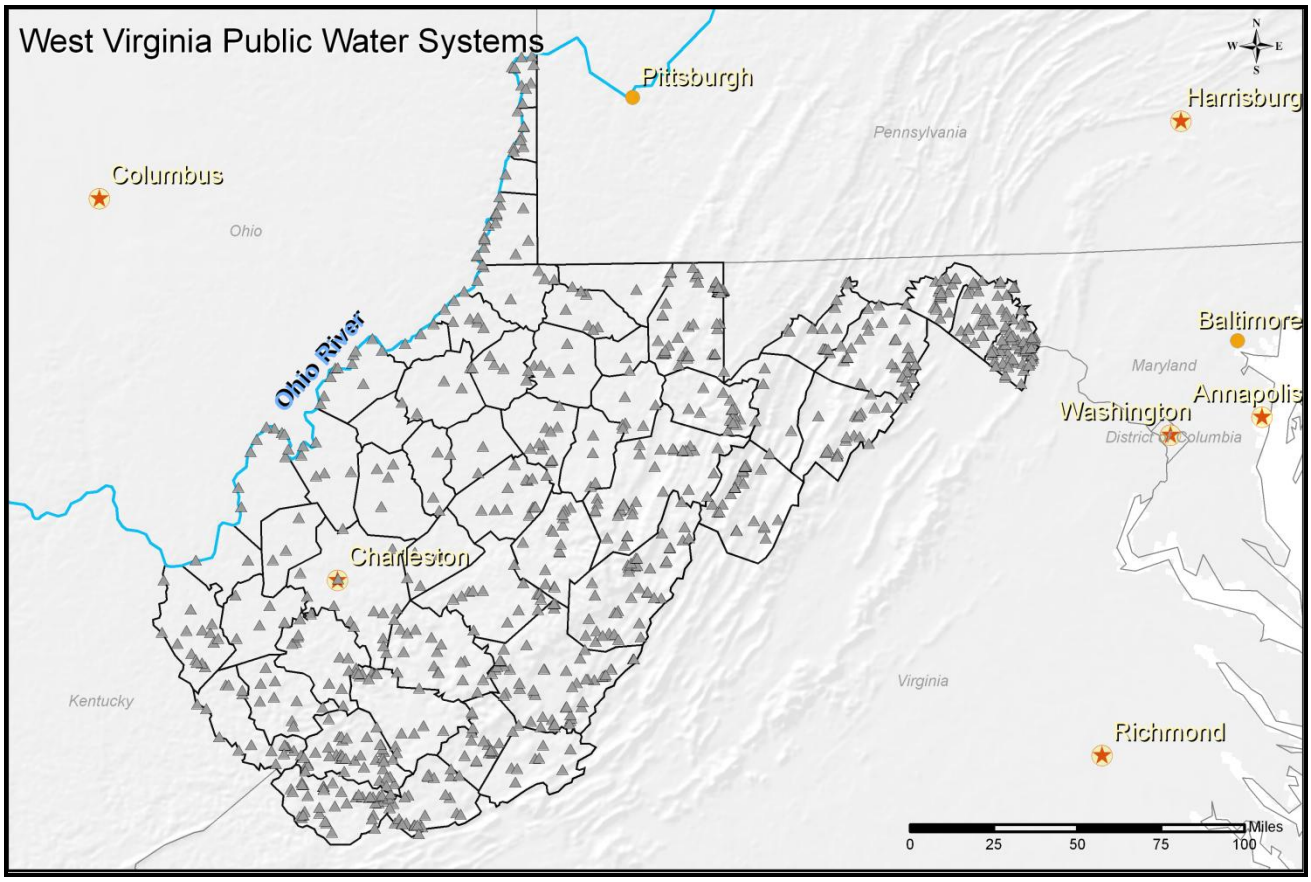
Ground Water Data Collection and Management:

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

Future Program Needs

OEHS 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:

- Source water education materials designed to identify, assess, prioritize, and address local needs in the area of source water protection and contamination prevention.
- Pollution prevention technical assistance to small businesses located within wellhead protection areas to balance Brownfield redevelopment with local water protection/restoration efforts.
- Continued groundwater quality monitoring to support activities mandated by the SDWA and the CWA.


West Virginia Public Water Systems
Pittsburgh
Harrisburg
Pennsylvania
Columbus
Ohio
Ohio River
Baltimore
Maryland
Annapolis
Washington
District of Columbia
Charleston
Kentucky
Virginia
Richmond
N
W
E
S
0
25
50
75
100
Miles

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

601 57th Street, SE
Charleston, WV 25304

Office of Oil and Gas
(304) 926-0450

Division of Land Restoration
(304) 926-0455

Division of Water and Waste Management
(304) 926-0495

Office of Information Technology
(304) 926- 0499, Ext. 1615

Department of Health and Human Resources

350 Capital Street
Charleston, WV 25301

Office of Environmental Health Services
(304) 558-2981

Environmental Engineering Division
(304) 558-2981

Public Health Sanitation Division
(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 2010

Note: Maximum Contaminant Levels are noted where such standards have been established for a particular parameter. Maximum Contaminant Levels are standards of quality and purity, established by the WVDEP in 47CSR12.

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- 2010

Site	County	Watersheds	Watershed Group	Sampling Location
1	Harrison	West Fork	E	Watters Smith State Park Monitoring Well
2	Hardy	So. Br. Potomac	A	Wardensville Monitoring Well
3	Berkeley	Potomac River Drains	C	LeFevre Spring - Martinsburg
4	Tucker	Cheat	A	Sand Spring in Canaan Valley
5	Randolph	Cheat	A	Bowden Fish Hatchery
6	Webster	Gauley	C	Holly River State Park
7	Kanawha	Upper Kanawha	A	Kanawha State Forest CG Monitoring Well
8	Pocahontas	Greenbrier	D	Edray Fish Hatchery
9	Pocahontas	Greenbrier	D	White Sulphur Springs Fish Hatchery
10	Pocahontas	Greenbrier	D	Davis Spring near Lewisburg
11	Summers	Upper New River	D	Pipestem State Park
12	McDowell	Tug Fork	C	City of Welch
13	Webster	Gauley	C	Bishop Knob Monitoring Well
14	Monongalia	Cheat	A	Chestnut Ridge Water Plant
15	Hancock	Upper Ohio North	A	City of Follansbee

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- 2010

Site	County	Watersheds	Watershed Group	Sampling Location
16	Hancock	Upper Ohio North	A	Oakland Public Service District
17	Wetzel	Middle Ohio North	C	City of New Martinsville
18	Fayette	Lower New River	D	Danese PSD Well #2
19	Gilmer	Little Kanawha	D	Cedar Creek State Park Well #3
20	Wood	Middle Ohio South	C	Lubeck PSD Well B
21	Mason	Middle Ohio North	C	Letart Well #2
22	Wayne	Twelvepole	E	East Lynn Lake-Lick Run Well
23	Wyoming	Upper Guyandotte	E	R.D. Bailey Lake-Visitors Center Well
24	Mineral	North Br. Potomac	B	Fountain PSD
25	Ritchie	Little Kanawha	D	North Bend SP Monitoring Well

Appendix B (continued)

Field Parameters sampling sites- 2010

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

Site	Water Temp. (Deg C)	Barometric Pressure (mm of Hg)	Turbidity (NTU)	Specific Conductance (Us/Cm)	Water pH (Whole Field, Standard Units)	Dissolved Oxygen, (mg/L)
1	15.5	735	2.6	372	7.5	3.9
2	13.3	732	1.9	155	6.6	<1.0
3	12.5	747	0.2	661	6.8	6.1
4	9.1	680	0.7	188	7	8.6
5	9.6	709	0.7	87	7.1	6
6	12	724	0.1	121	6.6	<1.0
7	15.5	738	>1000	203	6.9	1.5
8	10.1	669	5	104	7.7	9.9
9	10.2	714	0.6	289	7.8	5.6
10	12	720	18	300	7.5	9.2
11	13.6	727	0.3	447	7.9	<1.0
12	17.2	727	2	1090	7.8	<1.0
13	11.2	688	34	44	6.1	<1.0
14	14.8	713	5	201	6.5	6.1
15	14.7	751	0.2	679	6.9	3.4
16	11.6	739	0.2	538	7.3	<1.0
17	15.7	747	0.1	623	7.1	1.5
18	12.8	694	1.1	519	7	<1.0
19	14.3	737	0.2	401	8.8	<1.0
20	13.7	748	0.6	493	7.4	<1.0
21	15.6	753	0.2	665	7.1	2.1
22	14.8	744	1.7	285	7.6	<1.0
23	15.2	739	0.2	507	7.2	<1.0
24	15.8	738	0.2	388	7.4	2.1
25	13.4	742	2.3	566	7	<1.0

Appendix B (continued)

Field Parameters, Acidity and Ions sampling sites- 2010

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

Site	Total Coliform, (Colonies/ 100 ml) MCL= max. 5%/ month	E. Coli (Colonies/ 100 ml)	Hardness Non-carbonate (mg/L as $CaCO_3$)	Acidity (mg/L as H^+)	CO_2 (mg/L)	Organic Carbon (mg/L)	Calcium (mg/L as Ca)
1	50	1		0.00003	9.6	<.6	19.7
2	<1	<1		0.00025	37	<.6	16.9
3	36	2	13	0.00016	95	<.6	101
4	140	1	2	0.0001	17	<.6	32.4
5	60	<1	3	0.00008	5.5	E.5	13.4
6	<1	<1		0.00025	26	<.6	8.1
7	45	<1		0.00013	28	9	17.4
8	1600	80	0	0.00002	1.8	1.4	17.3
9	22	<1	83	0.00002	1.4	0.7	37.2
10	>2400	240	7	0.00003	7.6	2	46.8
11	<1	<1		0.00001	4	<.6	27
12	1	<1		0.00002	18	1.5	8.34
13	<1	<1		0.0008	47	E.3	2.38
14	3	<1	2	0.00032	58	E.3	24.4
15	<1	<1	122	0.00013	29	E.6	65.3
16	<1	<1	14	0.00005	14	E.3	53.3
17	<1	<1	41	0.00008	35	<.6	84.5
18	<1	<1		0.0001	46		7.68
19	4	<1		M	0.6	1.1	3.37
20	<1	<1	55	0.00004	11		65.1
21	<1	<1	67	0.00008	39	0.6	110
22	1	<1		0.00003	6.6	0.9	20.8
23	<1	<1		0.00006	16	0.7	24.9
24	<1	<1		0.00004	12	<.6	55.9
25	45	<1	27	0.0001	40	E.3	65.6

MCL = Maximum Contaminant Level; E. = estimated

Appendix B (continued)

Acidity and Ions sampling sites- Group A 2006

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

Site	Magnesium, (mg/L as Mg)	Sodium (mg/L as Na)	Potassium, (mg/L as K)	Bicarbonate (mg/L as HCO_3)	Carbonate (mg/L as CO_3)	Alkalinity (mg/L as $CaCO_3$)
1	4.22	55	0.89	188	171	154
2	4.69	5.9	0.23	91	72	75
3	17.9	8.8	1.97	371	314	304
4	2.32	1.3	0.41	105	88	86
5	1.23	1.3	0.36	43	35	35
6	2.34	4	1.07	64	36	52
7	3.15	20.6	1.6	139	111	114
8	1.29	0.9	0.49	56	48	46
9	7.66	2.7	1.09	56	42	46
10	4.61	4.3	1.18	149	128	122
11	4.91	60.6	0.41	196	167	161
12	3.24	248	1.15	684	588	561
13	1.1	E.2	0.49	37	11	30
14	7.24	1.9	1.39	113	89	93
15	12.1	41.2	2.68	144	91	118
16	11.7	33.2	2.71	171	168	140
17	7.06	29.6	1.72	271	199	222
18	3.12	101	1.08	283	236	232
19	0.508	85.8	0.6	250	211	205
20	8.66	20.3	1.83	173	143	142
21	15.4	10.7	1.24	302	270	248
22	5.21	28.3	2.58	162	132	133
23	5.79	60.4	1.35	158	126	130
24	12.7	5.3	0.71	191		157
25	17.1	24.7	1.17	244	207	200

MCL = Maximum Contaminant Level; SWDR = Secondary Drinking Water Reg. E. = estimated

Appendix B (continued)

Acidity and Ions sampling sites- Group A 2006

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

Site	Sulfate (mg/L as SO^{-}_{4})	Chloride (mg/L as Cl)	Fluoride (mg/L as F)	Bromide (mg/L as Br)	Total Dissolved Solids Residue At 180 Deg. C (mg/L)	Total Solids Residue at 105 Deg. C, (mg/L)
		SWDR = 250 mg/L	SWDR = 2.0 mg/L			
1	25.7	2.66	0.21	E.02	229	226
2	8.56	0.62	<.08	E.01	116	310
3	20.2	19	0.18	E.02	392	343
4	6.06	2.33	<.08	0.03	109	111
5	5.79	2.12	<.08	<.02	49	53
6	<.18	8.28	0.09	E.02	68	65
7	1.95	1.35	0.27	E.02	124	368
8	4.8	0.86	<.08	<.02	73	65
9	91.4	2.76	0.14	E.01	168	189
10	14.2	8.23	0.1	<.02	176	201
11	14.2	35.6	0.19	0.28	254	239
12	5.55	29.9	0.71	<.02	685	661
13	3.5	0.39	<.08	E.01	23	29
14	10.6	3.65	0.09	0.02	120	121
15	86.8	103	0.39	0.14	394	455
16	31.3	49.9	0.29	0.04	290	294
17	37.9	51.2	0.24	0.06	388	391
18	34.1	6.24	0.32	0.03	320	318
19	7.54	3.82	0.54	0.03	251	
20	55.5	29.8	0.22	0.09	295	300
21	58.1	18.3	0.21	0.08	411	429
22	0.78	13.9	0.42	0.09	161	168
23	1.69	80.2	0.2	0.38	281	275
24	32.8	2.76	0.13	0.03	234	240
25	85	6.48	0.15	0.05	361	

MCL = Maximum Contaminant Level; SWDR = Secondary Drinking Water Reg. E. = estimated

Appendix B (continued)

Acidity and Ions sampling sites- Group A 2006

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

Site	Nitrogen, Nitrite (mg/L as N)	Total Nitrogen, NO_2+NO_3 (mg/L as N)	Nitrogen, Ammonia (mg/L as N)	Nitrogen, Ammonia (mg/L as NH_4)	Nitrogen, (mg/L as N)	Ortho-Phosphate (mg/L)
	MCL = 1.0 mg/L	MCL = 10 mg/L				
1	E.001	E.04	E.018	E.023		0.036
2	<.002	<.04	0.125	0.161		0.031
3	<.002	2.6	<.020	<.026		0.026
4	<.002	0.47	<.020	<.026	<.02	0.036
5	<.002	0.23	<.020	<.026	<.03	E.014
6	<.002	<.04	0.154	0.199	<.003	E.014
7	<.002	<.04	0.644	0.83	<.35	0.058
8	E.001	0.62	<.020	<.026	<.07	E.017
9	E.001	0.14	<.020	<.026	<.02	E.017
10	E.001	1.27	<.020	<.026	<.14	0.044
11	<.002	<.04	E.019	E.024	<.08	E.019
12	<.002	<.04	0.429	0.552	<.08	0.069
13	<.002	<.04	E.015	E.019	<.09	<.025
14	<.002	0.34	<.020	<.026	<.01	0.029
15	<.002	1.14	0.107	0.138	0.06	E.019
16	<.002	<.04	0.166	0.213	<.01	0.037
17	0.003	3.93	0.359	0.463		0.077
18	<.002	<.04	0.187	0.241	<.04	0.14
19	<.002	<.04	0.136	0.175	<.03	0.149
20	E.002	1.72	0.217	0.28	0.07	0.032
21	E.002	2.07	E.015	E.019	E.11	0.075
22	<.002	<.04	0.944	1.22	<.04	0.094
23	<.002	<.04	0.238	0.306	<.01	0.054
24	<.002	0.49	<.020	<.026	<.004	0.076
25	E.001	<.04	0.25	0.321	<.01	0.062

MCL = Maximum Contaminant Level; E. = estimated

Appendix B (continued)

Ions and Metals sampling sites- Group A 2006

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

Site	Ortho-Phosphate, (mg/L as P)	Phosphorus (mg/L as P)	Aluminum, (µg/L as Al)	Antimony, (µg/L as Sb)	Arsenic (µg/L as As)	Barium (µg/L as Ba)
			SWDR = Max. 200 µg/L	MCL = 6 µg/L	MCL = 10 µg/L	MCL = 2000 µg/L
1	0.012	0.016	69	<.4	0.31	94.2
2	0.01	0.077	14	<.2	<.18	114
3	0.008	<.008	<6	<.2	0.26	60.5
4	0.012	0.011	E4	<.2	0.18	61.1
5	E.004	E.004	15	<.2	<.18	22.9
6	E.005	0.095	<6	<.2	<.18	172
7	0.019	1.57	78	<.2	2.3	779
8	E.006	0.011	102	<.2	0.23	22.5
9	E.006	<.008	10	<.2	E.10	24.9
10	0.014	0.034	267	<.2	0.39	23.9
11	E.006	E.006	<6	E.2	3.8	467
12	0.023	0.029	10	<.2	1.3	322
13	<.008	0.037	1300	<.2	3.8	12.2
14	0.009	0.014	114	<.2	0.55	56.8
15	E.006	E.005	<6	<.2	0.92	31.3
16	0.012	0.039	<6	<.2	1	152
17	0.025	0.024	<6	<.2	1.1	75.5
18	0.046	0.09	8	<.2	1.1	93.2
19	0.049	0.048	<6	<.2	2	111
20	0.01	0.025	<6	<.2	1.7	43.4
21	0.024	0.015	<6	<.2	2.6	85.3
22	0.031	0.08	35	E.1	0.62	283
23	0.018	0.106	<6	<.2	0.48	541
24	0.025	0.018	<6	<.2	1.6	49.5
25	0.02	0.129	<6	<.2	3.6	180

MCL = Maximum Contaminant Level; SWDR = Secondary Drinking Water Reg. E. = estimated

Appendix B (continued)

Metals sampling sites- Group A 2006

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

Site	Beryllium, (µg/L as Be)	Cadmium (µg/L as Cd)	Chromium (µg/L)	Iron, (µg/L as Fe)	Lead, (µg/L as Pb)	Manganese, (µg/L as Mn)
	MCL = 4 µg/L	MCL = 5 µg/L	MCL = 100 µg/L	SWDR = 300 µg/L	MCL = 15 µg/L	SWDR = 50 µg/L
1	<.04	<.04	1.2	218	0.35	59.4
2	<.04	<.04	E.41	2840	0.16	92.2
3	<.04	<.04	E.37	<9	E.04	<.8
4	<.04	<.04	E.29	E5	<.06	<.8
5	<.04	<.04	<.42	15	<.06	E.6
6	<.04	<.04	<.42	8640	<.06	375
7	0.19	0.84	5.3	81700	41.8	138
8	<.04	<.04	E.25	113	0.11	5.5
9	<.04	<.04	<.42	14	<.06	<.8
10	E.02	<.04	0.48	372	0.43	15.2
11	<.04	<.04	<.42	40	E.03	39.7
12	E.03	<.04	<.42	534	0.6	61.5
13	0.07	0.27	2.7	7330	6.01	338
14	<.04	<.04	3.3	155	0.59	121
15	<.04	E.02	<.42	23	0.11	468
16	<.04	<.04	<.42	939	0.09	123
17	<.04	<.04	<.42	<9	0.18	38.1
18	<.04	<.04	<.42	3010	0.51	234
19	<.04	<.04	<.42	10	E.03	28.7
20	<.04	<.04	<.42	720	<.06	399
21	<.04	<.04	<.42	E8	0.34	<.8
22	E.03	<.04	0.43	600	0.21	69.5
23	0.06	<.04	E.37	2940	<.06	254
24	<.04	<.04	<.42	<9	0.14	1
25	<.04	E.02	<.42	5810	0.65	546
26	<.04	<.04	1.2	218	0.35	59.4
27	<.04	<.04	E.41	2840	0.16	92.2
28	<.04	<.04	E.37	<9	E.04	<.8
29	<.04	<.04	E.29	E5	<.06	<.8
30	<.04	<.04	<.42	15	<.06	E.6

MCL = Maximum Contaminant Level; SWDR = Secondary Drinking Water Reg. E. = estimated

Appendix B (continued)

Metals and Radionuclides sampling sites- Group A 2006

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

Site	Mercury (µg/L Hg)	Nickel, (µg/L as Ni)	Selenium, (µg/L as Se)	Thallium (µg/L as Th)	Zinc, (µg/L as Zn)	Radon (pCi/L)
	MCL = 2 µg/L		MCL = 50 µg/L	MCL = 2 µg/L	SWDR = 5000 µg/L	MCL = 300 pCi/L
1	0.028	1.1	E.06	<.12	14.6	900
2	<.010	0.94	<.10	<.12	7.1	28
3	<.010	E.19	0.11	<.12	2.7	
4	<.010	<.36	<.10	<.12	<2.0	
5	<.010	<.36	<.10	<.12	<2.0	
6	<.010	<.36	<.10	<.12	E1.9	
7	<.010	3.1	E.08	<.12	4760	14
8	<.010	E.28	E.06	<.12	<2.0	
9	<.010	E.23	E.09	<.12	<2.0	
10	<.010	0.6	0.2	<.12	E1.7	
11	<.010	<.36	E.06	<.12	3.6	
12	<.010	0.69	<.10	<.12	E1.1	
13	Broken	9.3	E.06	<.12	238	
14	<.010	2.7	0.21	<.12	36.1	
15	<.010	0.72	0.7	<.12	5.4	
16	<.010	1.6	<.10	<.12	28.5	
17	<.010	0.5	0.14	<.12	E1.6	
18	<.010	0.8	E.05	<.12	5.2	
19	<.010	<.36	<.10	<.12	4.1	
20	<.010	0.78	<.10	<.12	3.8	450
21	<.010	0.66	E.09	<.12	7.3	
22	<.010	E.20	<.10	<.12	17.7	
23	<.010	<.36	<.10	<.12	4.4	
24	<.010	E.25	0.21	<.12	7.6	
25	<.010	E.36	<.10	<.12	98.9	620
26	0.028	1.1	E.06	<.12	14.6	900
27	<.010	0.94	<.10	<.12	7.1	28
28	<.010	E.19	0.11	<.12	2.7	
29	<.010	<.36	<.10	<.12	<2.0	
30	<.010	<.36	<.10	<.12	<2.0	

MCL = Maximum Contaminant Level; SWDR = Secondary Drinking Water Reg.; E. = estimated

Appendix B (continued)

Volatile Organic and Semi-Volatile Compounds sampling sites 2010

Volatile organic compounds and semi-volatile organic compounds were collected at seven sites. Five different compounds were detected at two sites. Compounds detected were:

1,1,1-Trichloroethane
0.1 µg/L at sampling site 17, City of New Martinsville in Wetzel County.

Acenaphthene
M µg/L at sampling site 15, City of Follansbee in Brooke County.

Tetrachloroethene
0.6 µg/L at sampling site 15 in Brooke County and 1.0 µg/L at sampling site 17, City of New Martinsville in Wetzel County.

Trichloroethene
0.2 µg/L at sampling site 15, City of Follansbee in Brooke County

Trichloromethane
0.1 µg/L at sampling site 15, City of Follansbee in Brooke County, and
0.5 µg/L at sampling site 17, City of New Martinsville in Wetzel County.

Pesticides sampling sites 2010

Pesticides were collected at 4 sites. Three of the 4 sites sampled contained at least 1 pesticide. Five pesticides were detected and included:

CIAT
E0.057 µg/L at sampling site 3, LeFevre Spring-Martinsburg in Berkeley County, E0.001 µg/L at sampling site 4, Sand Spring in Canaan Valley in Tucker County, and E0.009 at sampling site 10, Davis Spring near Lewisburg in Greenbrier County

Atrazine
0.013 µg/L at sampling site 3, LeFevre Spring-Martinsburg in Berkeley County,
E0.001 µg/L at sampling site 4 in Tucker County, and
E0.005 µg/L at sampling site 10, Davis Spring near Lewisburg in Greenbrier County

Metalochor
E0.002 µg/L at sampling site 10, Davis Spring near Lewisburg in Greenbrier County

Appendix B (continued)

Prometon
M µg/L at sampling site 3, LeFevre Spring-Martinsburg in Berkeley County

Simazine
0.01 µg/L at sampling site 3, LeFevre Spring-Martinsburg in Berkeley County, and E0.001 µg/L at sampling site 10, Davis Spring near Lewisburg in Greenbrier County