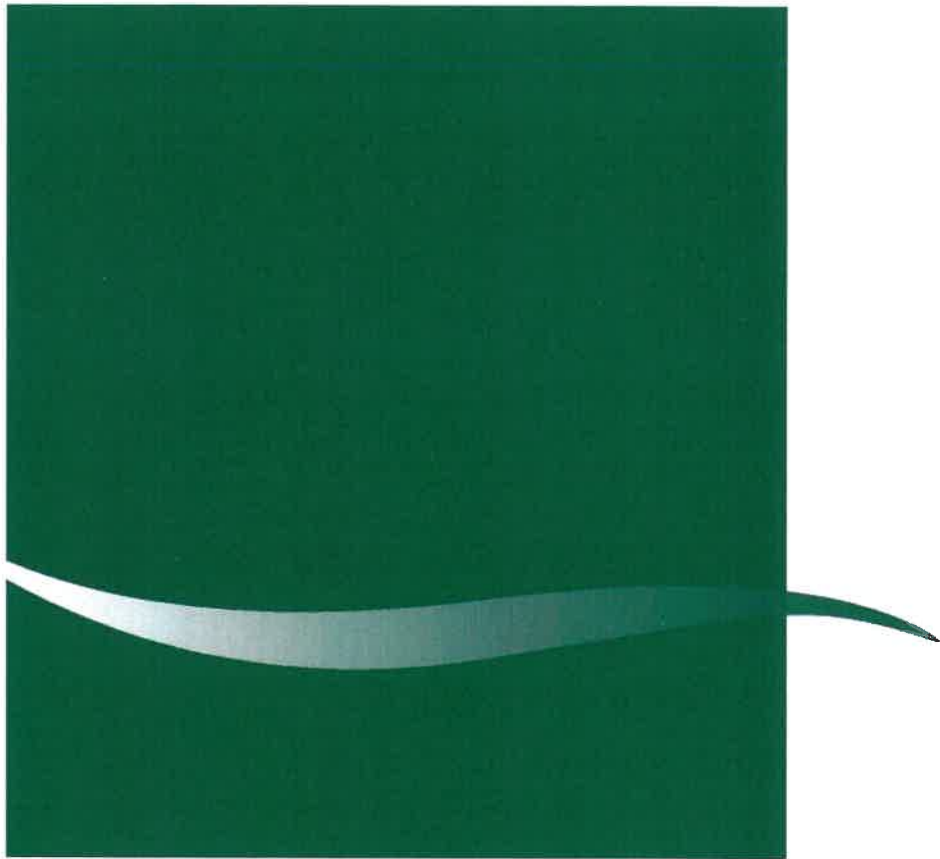


GROUNDWATER
BIENNIAL REPORT TO THE
2020 LEGISLATURE



west virginia department of environmental protection



west virginia department of environmental protection

Groundwater Programs and Activities Biennial Report to the West Virginia 2020 Legislature

**Jim Justice, Governor
West Virginia**

**Austin Caperton, Secretary
West Virginia Department of Environmental Protection**

**Katheryn D. Emery, Acting Director
Division of Water and Waste Management**

**Yogesh P. Patel,
Assistant Director
Division of Water and Waste Management**

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GROUNDWATER BIENNIAL REPORT TO THE 2020 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 thirteenth Groundwater Biennial Report to the legislature since the passage of the Act in 1991 and covers the period from July 1, 2017 through June 30, 2019.

The WVDEP Division of Water and Waste Management (DWWW) 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/or 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.

Research regarding 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 continues.

The Ambient Groundwater Quality Monitoring Network was established by DWWW in cooperation with the United States Geological Survey (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.

Topical studies are conducted in the four years between rounds of sentinel well sampling. In topical studies water-quality samples are collected, analyzed, and the results presented in a USGS Scientific Investigation Report. Since 2011 the USGS has collected samples to determine baseline water-quality conditions in Upper Monongahela River Basin, an area of Marcellus Shale gas development. Groundwater samples from 41 wells and baseflow samples from 50 surface-water sites were collected and analyzed for major ions, metals, trace elements, and naturally occurring radioactive materials. The results of these analyses were published in a USGS report *Water quality of groundwater and stream base flow in the Marcellus Shale Gas Field of the Monongahela River Basin, West Virginia, 2011–12* (Chambers and others, 2014, available at <http://dx.doi.org/10.3133/sir20145233>).

While many challenges remain, much has been done to provide protection and continued viability of West Virginia's groundwater resources. The WVDEP, WVDA, WVDHHR, and USGS continue to work closely to fulfill the mission of the Department of Environmental Protection, "Promoting a healthy environment".

II. GROUNDWATER PROTECTION and WATERSHED MANAGEMENT

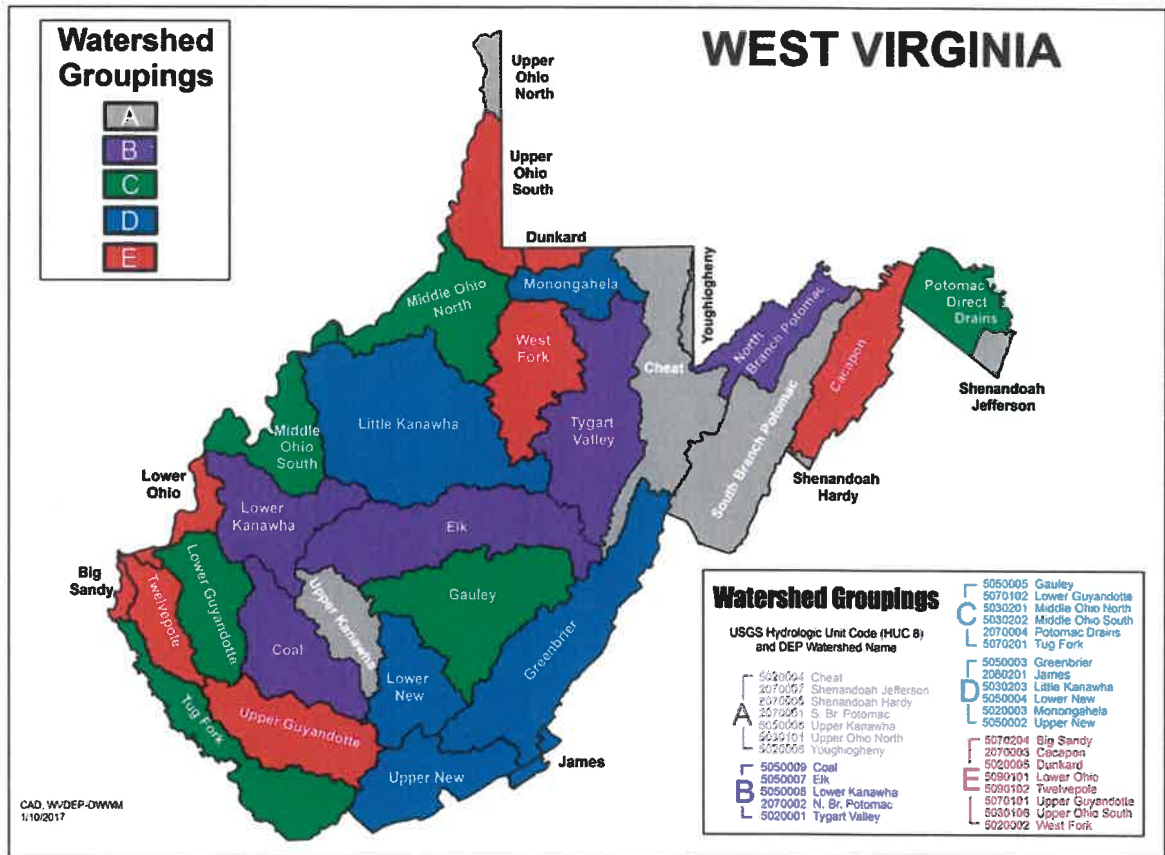
Under the guidance of the United States Environmental Protection Agency (EPA) and the signing of the West Virginia Watershed Management Framework Document (signed in 1997), a new approach to management of the state's groundwater has begun. Total watershed management strives to bring a holistic approach 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.

A map depicting the 32 watersheds and the hydrologic groupings is shown below in Figure 1.



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).

West Virginia Environmental Quality Board

Appellate Activities

The Environmental Quality Board is authorized by *W. Va. Code §22-11-21* to hear appeals of agency decisions concerning groundwater protection. The Environmental Quality Board continues to hear appeals with groundwater protection issues and applies and/or implements rules, policies and procedures. 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:

CONSOL Mining Company, LLC

Appeal No. 16-07-EQB

Filed: November 23, 2016

Consent Order: September 21, 2017

RBS, Inc.

Appeal No. 17-01-EQB

Filed: January 25, 2017

Final Order: February 23, 2018

Jill Fischer

Appeal No. 17-02-EQB

Filed: February 13, 2017

Final Order: February 23, 2018

Paul Ashbaugh

Appeal No. 17-03-EQB

Filed: February 22, 2017

Final Order: February 23, 2018

Tom Rhule

Appeal No. 17-09-EQB

Filed: June 23, 2017

Dismissed: February 23, 2018

WV Rivers Coalition and WV Highlands Conservancy

Appeal No. 17-10-EQB

Filed: June 23, 2017

Withdrawn: January 30, 2018

Cow Run, LLC

Appeal No. 17-11-EQB

Filed: June 26, 2017

Withdrawn: January 5, 2018

Mainline, LLC

Appeal No. 17-13-EQB

Filed: July 30, 2017

Pending Final Order

H.A.M. Sanitary Landfill, LLC

Appeal No. 17-17-EQB

Filed: December 18, 2017

Pending Evidentiary Hearing

Mercer County Solid Waste Authority

Appeal No. 18-04-EQB

Filed: April 4, 2018

Pending Final Order

WV Environmental Services, Inc.

Appeal No. 18-09-EQB

Filed: June 14, 2018

Pending Evidentiary Hearing

Town of Eleanor

Appeal No. 18-11-EQB

Filed: August 10, 2018

Agreed Order: June 14, 2019

The Chemours Company, FC, LLC

Appeal No. 18-12-EQB

Filed: August 21, 2018

Agreed Order: April 29, 2019

Kokosing Construction Company, Inc.

Appeal No. 18-16-EQB

Filed: October 30, 2018

Pending Evidentiary Hearing

Peabody Energy Corporation and Peabody Holding Company

Appeal No. 19-01-EQB

Filed: January 3, 2019

Pending Evidentiary Hearing

**WV Oil and Natural Gas Association and
Independent Oil and Gas Association of WV, Inc.**

Appeal No. 19-05-EQB

Filed: February 28, 2019

Agreed Order: July 24, 2019

David C. Tabb

Appeal No. 19-08-EQB

Filed: April 29, 2019

Pending Evidentiary Hearing

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 were three appeals filed during the reporting period pursuant to this section.

IV. WEST VIRGINIA DEPARTMENT OF AGRICULTURE

Regulatory and Environmental Affairs Division Water Quality Protection

A. Pesticide Regulatory Programs

A pesticide is defined as any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest. Often misunderstood to refer only to insecticides, the term pesticides also applies to herbicides, fungicides, rodenticides and various other substances used to control pests. Pesticides can cause harm to humans, animals, or the environment because they are designed to kill potential disease-causing organisms and control insects, weeds, and other pests. This presents a risk benefit scenario where humans, animals and the environment, including water are at risk to be adversely affected. Therefore, it is deemed necessary to regulate and control pesticides by their registration, use and application.



The Pesticide Regulatory Programs Unit regulates and controls pesticides through [ARTICLE 16A- WEST VIRGINIA PESTICIDE CONTROL ACT](#) and the following legislative and procedural rules:

[TITLE 61 SERIES 12 - FEE STRUCTURE FOR THE PESTICIDE CONTROL ACT OF 1990](#)

[TITLE 61 SERIES 12A -CERTIFIED PESTICIDE APPLICATOR RULES AND REGULATIONS](#)

[TITLE 61 SERIES 12B -LICENSING OF PESTICIDE BUSINESSES](#)

[TITLE 61 SERIES 12C -WOOD DESTROYING INSECT TREATMENT STANDARDS](#)

[TITLE 61 SERIES 12D -AERIAL APPLICATION OF HERBICIDES TO UTILITY RIGHTS-OF-WAY](#)

[TITLE 61 SERIES 12E -REGISTRY OF PERSONS WITH HEALTH SENSITIVITY TO PESTICIDE DRIFT](#)

[TITLE 61 SERIES 12F -ASSESSMENT OF CIVIL PENALTIES AND PROCEDURES FOR CONSENT AGREEMENT OR NEGOTIATED SETTLEMENT](#)

[TITLE 61 SERIES 12G - GENERAL GROUNDWATER PROTECTION FOR PESTICIDES](#)

[TITLE 61 SERIES 12H -BULK PESTICIDE OPERATIONAL RULES](#)

[TITLE 61 SERIES 12I - NON-BULK PESTICIDE RULES FOR PERMANENT OPERATIONAL AREAS](#)

[TITLE 61 SERIES 12J -INTEGRATED PEST MANAGEMENT PROGRAMS IN SCHOOLS AND DAY CARE CENTERS](#)

[TITLE 61 SERIES 22 - GENERIC STATE MANAGEMENT PLAN FOR PESTICIDES AND FERTILIZERS IN GROUNDWATER](#)

[TITLE 61 SERIES 22A -BEST MANAGEMENT PRACTICES AT TEMPORARY OPERATIONAL AREAS FOR NON-BULK PESTICIDE MIXING AND LOADING LOCATIONS](#)

CHAPTER 22 ARTICLE 12. GROUNDWATER PROTECTION ACT

In addition to enforcing the above regulations, the Pesticide Regulatory Programs works with the United States Environmental Protection Agency (USEPA) Office of Pesticide Programs (OPP) and the Office of Enforcement and Compliance Assurance (OECA) through a cooperative agreement to enforce the [Federal Insecticide Fungicide and Rodenticide Act \(FIFRA\)](#). As outlined in guidance and written in the agreement, the Pesticide Regulatory Programs works with EPA Region 3 to establish priorities for the protection of water resources from pesticides. This program is known as the Pesticides in Water Program. Jennifer Hathaway, Environmental Programs Specialist oversees this program as well as the others referenced in this report.

The goal of West Virginia Department of Agriculture's (WVDA) Pesticides in Water Program is to ensure pesticides do not adversely affect the nation's water resources. The Pesticides Regulatory Programs utilizes a three-tier approach to manage pesticides in water:

1. Evaluate Pesticides of Interest over time to identify pesticides of concern.
2. Take actions (actively manage beyond the pesticide label) to reduce or prevent contamination from pesticides of concern over time.
3. Demonstrate the progress of the management strategy in reducing or maintaining concentrations below reference points.

Tier 1 Pesticides of Interest: Pesticides of interest are those pesticides that have been identified by State Regulatory Agencies for pesticide enforcement through a National survey conducted by the States FIFRA Issues Research and Evaluation Group (SFIREG) in 2005 (Appendix 1). Other pesticides of interest could be added if they cause water quality impairments under the Clean Water Act §303(d) as listed or become an interest of the WVDA.

Pesticides of interest are those pesticides that have the potential to occur in ground or surface water at concentrations approaching or exceeding a human health or ecological reference point. It may be based on a Maximum Contaminant Level (MCL), drinking water health advisory, surface or ground water quality standard (which can address human or aquatic life toxicity), EPA reference dose, EPA drinking water level of concern, or another benchmark adopted by regulation or policy. A pesticide of interest could be an active ingredient alone or the active ingredient collectively with degradates of toxicological concern.

Monitoring our State's surface and groundwater for pesticide residues is the best measure to determining when an active ingredient(s) should be moved to **Tier 2**. See **Groundwater Monitoring Program** description below.

Tier 2 Pesticides of Concern: Pesticides that are identified as a concern from Step 1 must be managed. A pesticide is actively "managed" when activities are carried

out to prevent or reduce contamination of water by a particular active ingredient so that it is prevented from reaching a specific reference point as mentioned above.

The herbicide Atrazine is an example of a Tier 2 pesticide. Atrazine's widespread use on corn and high solubility in water chemistry led to detections nationwide of the parent compound and its break down products (also known as degradants) in both surface and ground water.

WVDA relies heavily on public outreach and user education to manage pesticides of concern. The pesticide applicator certification process continuously addresses concerns of pesticides in water. This includes study material supplied for written examinations as well as initial certification training sessions. All commercial applicators using general or restricted use pesticides and all private applicators must maintain certification by attending recertification training sessions. Recertification training sessions are another opportunity to manage pesticides of concern.

Routine agricultural use inspections by Pesticide Regulatory Officers address existing water quality-related label restrictions and State regulations. Adherence to label specified setbacks from surface water and field drainage sites is emphasized. Under the existing enforcement process first time violators are notified by letter. Additional violations can result in monetary fines or license revocation.

WVDA works very closely with the West Virginia Conservation Agency in the promotion of and adoption of voluntary Best Management Practices (BMP) shown to reduce impacts by pesticides. Examples include riparian buffer zones, filter strips and no till cultivation.

Tier 3 Demonstration of Progress: After a pesticide has advanced through the first two tiers, progress toward reductions in concentrations below a previously exceeded reference point should be demonstrated in Tier 3. At this stage the steps taken to manage a pesticide of concern to keep or return pesticide concentrations in water to below a reference point should be outlined or the certification if widespread adoption of control measures should be demonstrated. Progress toward reduction of maintenance of concentrations below the reference point could be demonstrated by:

- ❖ Targeted monitoring of water samples from vulnerable use areas that determines that mitigation measures are preventing residue levels from approaching or exceeded a reference point.
- ❖ Downward trends in concentration levels established by monitoring data in geographic areas where the pesticide of concern is being used (data from WVDA, USGS, USDA, registrant or other sources).
- ❖ The results of targeted surveys or inspections that document the wide adoption of voluntary or regulatory measures which have been proven via research to protect water quality.

- ❖ While monitoring is not required under Tier 3 it is the most representative method of showing a decrease in a particular pesticide's occurrence in water. WVDA has historically referenced studies from allied agencies such as the United States Geological Survey. In addition, WVDA closely observes the data provided by the West Virginia Department of Environmental Protection's Ambient Water Quality Monitoring (AWQM) Network.
- ❖ Cancellation of a pesticide's use in the state would be the most severe action taken under Tier 3. Historically, Tier 3 actions have involved the re-classification of a general use pesticide (as classified by the USEPA) to a State restricted use pesticide (RUP). Use of State RUPs require that applicators become certified under state licensing programs before the product can be purchased for use. Other conditions could be placed on the restricted use license such as product specific training program completion prior to renewal of license.
- ❖ WVDA is confident that the uniformity of the development of its environmental programs, the continued interagency cooperation, and the reliance on successfully demonstrated management practices will facilitate the accountability tier of the management program.

Pesticides in Water Program – Reporting Requirements

Activities related to the Pesticides in Water Program are reported under the web-based Pesticides of Interest Tracking System (POINTS). POINTS is a national reporting funded by USEPA and can be found at <http://points.wsu.edu>. WVDA updates the system as analytes of interest or concern are revised or managed.

From the POINTS system data, USEPA on a national level expects to be able to:

- ❖ Determine how pesticides of interest were evaluated.
- ❖ Identify pesticides of concern (pesticides that approach or exceed reference points).
- ❖ Identify pesticides of concern that are being actively managed, and which may need more effective management at the national level (e.g., label changes, special studies).
- ❖ Identify pesticides for which national water quality standards, aquatic life criteria, or other national regulatory standards or reference points are needed.
- ❖ Demonstrate that state and tribal water quality management programs are effective at reducing pesticide risks to water quality locally.

- ❖ Identify states in which the FIFRA lead agency is using its resources to address pesticide impaired waters under CWA §303(d).

Other activities that advance the goal of developing and carrying out programs to protect water resources from pesticide risks:

Plastic Pesticide Container Recycling Program

More than 50,000 lbs. of plastic pesticide containers have been collected for recycling over that last seven growing seasons, including an estimated 4000 lbs. in 2018. WVDA maintains pesticide collection container facilities in Berkeley, Greenbrier, Hardy, Hampshire, Kanawha, Lewis, Jefferson, Mason, Ohio and Raleigh Counties. Sea containers are utilized to store the plastic containers for recycling. As this program continues to grow, we hope to offer more pesticide collection facilities in areas where there is heavy pesticide usage. This program requires containers to be triple or pressure rinsed to be accepted for recycling. This reduces the number of plastic pesticide containers that may enter the waste stream containing pesticide residues, therefore protecting ground water sources. Containers are shredded and remanufactured into shipping pallets, drainage tile, composite lumber or other low contact nonfood grade plastic items.



Properly rinsed pesticide containers are stored in sea containers at 11 locations around the state.

Pesticide Waste Disposal Program

The ongoing collection and annual disposal of waste and unwanted pesticides is another program aimed at reducing the potential of pesticides to reach water. The program specialist fields phone calls and emails to pick up waste and unwanted pesticides from private pesticide applicators and homeowners. In addition to individual pickups, WVDA also coordinates with county solid waste authorities to hold pesticide drop off events around the state. There have been 3 collections between March 2018 and

March 2019 in Berkeley, Kanawha and Harrison Counties, with more planned for 2019. A total of 23,186 lbs. of waste pesticides were collected between March 2018 and March 2019.



Waste pesticides collected at a drop off event for disposal.

Groundwater Monitoring Program

In collaboration and with financial support from the WVDEP and groundwater protection fees, we have created a five-year groundwater monitoring program. The objective of this program is to monitor groundwater for pesticides and respond as necessary to manage concentrations that exceed reference points. When residues are found that threaten water quality standards or other reference points, WVDA will respond to pesticide water contamination events by proposing risk mitigation. Leading up to the start of the program the environmental programs specialist contacted and visited various sites around the state to determine at least 10 sample collection sites. The groundwater sampling program began in March 2019. Samples are collected once per month from 12 sites in Berkeley, Greenbrier, Harrison, Jefferson and Mason Counties. No results are available at the time of this report.



One of the 12 groundwater collection sites.

Bulk Pesticides Storage Facilities

Bulk pesticides storage facilities are inspected annually. In addition to the secondary containment having an adequate capacity to capture a catastrophic spill the Bulk Operational Rules (§61-12H) require that pumps, transfer lines and other appendages be inspected and maintained in good operational condition. Written emergency and discharge response plans must be in place. Appropriate enforcement action is taken when facilities are found to be non-compliant.



Secondary containment at a bulk facility.

Appendix 1

State List of Pesticides of Water Quality Concern

Includes chemicals of concern for both ground and surface water

Source: State Survey for Water Resource Monitoring Programs and Analytical Parameters
October 2005 – Conducted by the SFIREG Environmental Quality Issues Working Committee

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

**WVDA Regulatory and Environmental Affairs Division
Environmental Programs and Environmental Laboratories**



The West Virginia Department of Agriculture's Regulatory and Environmental Affairs Division Environmental Programs section is headquartered at the Moorefield Agricultural Center in Moorefield, WV. This section focuses on monitoring, protecting and improving water quality.

- ❖ Anderson Run
- ❖ Bullskin Run
- ❖ Cacapon River
- ❖ Elk Run
- ❖ Elks Branch
- ❖ Lost River
- ❖ Lunice Creek
- ❖ Mill Creek (Grant County)
- ❖ New Creek
- ❖ North Fork of the South Branch
- ❖ Opequon Creek
- ❖ Patterson Creek
- ❖ Rockymarsh Run

- ❖ Sleepy Creek
- ❖ South Branch of the Potomac River
- ❖ South Fork of the South Branch

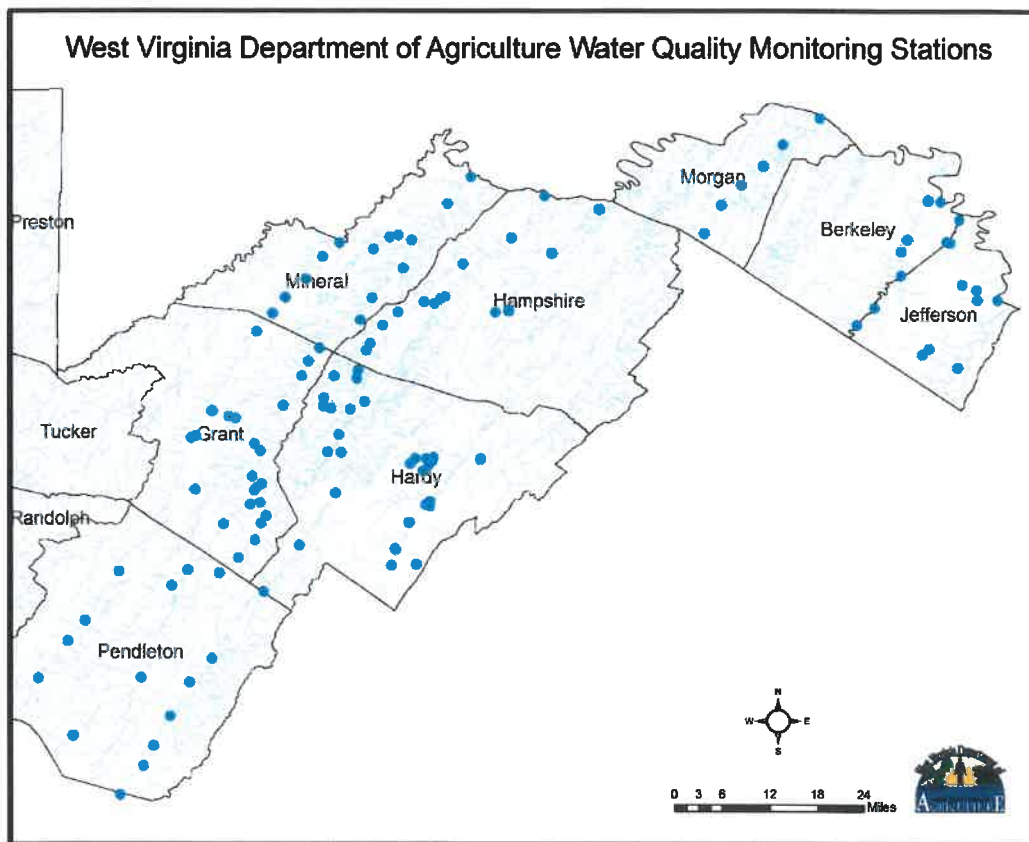
Water samples are analyzed in the field for pH, temperature, conductivity and dissolved oxygen and then transported to WVDA's Laboratory in Moorefield. The Water Quality Laboratory tests samples for nitrate, nitrite, ammonia, orthophosphate, total phosphorous, turbidity, total suspended solids and fecal coliform.



The WVDA water monitoring program's direction continues to evolve and improve. The WVDA is currently in the process of purchasing new field equipment to replace some of the aging equipment that is currently in use. One of the purchases is two new state-of-the-art water testing field meters to replace the existing meters that have become outdated. The new equipment will give the WVDA the option to perform tests in the field that are currently performed in the lab, therefore increasing efficiency and reducing costs. The purchases likely will be finalized in the first quarter of the 2019-2020 fiscal year.

Water quality analysis and related maps of sampling sites are often provided to watershed organizations and state and federal agencies. The WVDA utilizes Arc GIS to create these maps. This past year, a data QA process was performed on existing data that will help make it more readily available to other agencies or entities. The Department has recently shared data with groups such as Trout Unlimited, Friends of the Cacapon, and the West Virginia Conservation Agency (WVCA). The WVCA has assisted the WVDA with the statistical analysis of the water quality data in the Anderson Run, Lost River, South Branch of the Potomac River, Mill Creek (Grant) watersheds.

One thing that hasn't changed over time is the Environmental Programs staff's ability to work with area farmers to promote best management practices designed to reduce nutrient and sediment runoff and increase farm productivity. The WVDA is continuing in the development of a verification program which will help to document expired cost share and non-cost share BMPs that currently exist on agricultural operations. It will allow the WVDA to collect data and verify that these BMPs were installed and are currently functioning as intended. This program, which is in its final stages of development, utilizes ArcGIS Pro, Survey 1-2-3 and Collector for mapping and storing detailed data on best management practices for verification purposes relating to the Chesapeake Bay Initiative.



One of the areas that the Department excels in is its Nutrient Management Program. The Department strongly promotes a Nutrient Management Plan (NMP) as a keystone best management practice when dealing with nutrient reduction in local waterways. The NMP specifies cropping recommendations for all acreage to which commercial fertilizer, litter, or other types of manure are applied. Results from soil tests, coupled with specific crop yields or soil utilization, are used to develop recommendations regarding the amounts of nutrients to be applied to each field. To facilitate Nutrient Management Plan implementation, the WVDA Nutrient Management Laboratory in Moorefield routinely analyzes over 200 litter and manure samples per year. As of 2019, West Virginia has proudly maintained its goal of 90,000 acres under Nutrient Management Plans. The nutrient management staff is working diligently to maintain these Nutrient Management Plans for this amount of acreage as the Department continues to expand this program.

Each year the Environmental Programs Section participates in several educational and outreach events. These events include local county fairs and festivals in which the staff educate and inform citizens about topics such as water quality and best

management practices. Additionally, the staff proactively participates in Chesapeake Bay workgroup meetings, conferences and forums to understand critical issues while asserting West Virginia's water quality goals.



WVDA's Agriculture Outreach Program has been busy with new ideas for bringing environmental education to WV residents. The WV Conservation Agency's Soil Tunnel Trailer has been a focal point of outreach for the WVDA. The use of this trailer allows us to teach participants about the importance of good soil quality and fertility, which in turn allows the promotion of the importance of using best management practices for conservation.

The Outreach Program is continually traveling to various areas of the State to promote use of best management practices, soil, and water quality education. Some of the prior involvement includes:

- ❖ North Fork Elementary Ag Awareness Day
- ❖ WV Poultry Festival and Convention in Moorefield, WV
- ❖ Ag Innovation Showcase at Eastern WV Community and Technical College
- ❖ "Down on The Farm" at the Mineral County Fair
- ❖ Mineral County 6th Grade Camp – Focusing on BMP's
- ❖ Tri-County Fair Educational Booth



The WVDA staff attends 4-H camps and the WV Senior Conservation Camp and works throughout the school year to inform youth about point and non-point source pollution and how pollution affects ground and surface waters.



Through the aforementioned programs and activities, along with a dedicated, hardworking staff, the WV Department of Agriculture continues to make an impact on local streams as well as the Chesapeake Bay Watershed. We feel that our consistently excellent scores on certifications, water quality data that is being used by multiple organizations, and continuing efforts made to educate the public about water quality are all quantifiable evidence that we have made a significant impact to the region.

Through unified efforts, the WVDA will continue to encourage the adoption of Best Management Practices to meet the nutrient and sediment reductions required by the Chesapeake Bay TMDL. Moreover, education must continue to inform citizens of all ages on the importance of maintaining a strong agriculture industry while minimizing negative impacts to the environment, allowing agriculture to continue to flourish throughout this beautiful state.

IV. DEPARTMENT of AGRICULTURE

B. West Virginia Conservation Agency

The West Virginia Conservation Agency (WVCA) focuses its resource conservation efforts on the maintenance and/or improvement of water quality relative to natural resource use with a primary focus on agriculture and construction activities. The main concern is for surface water quality but activities impacting groundwater resources are addressed through conservation programs that implement Best Management Practices (BMPs), provide technical support, and involve educational outreach to the citizens throughout the state. The goal is to inspire and empower the people of West Virginia to value and work for clean water.

The WVCA continues its "Conservation Partnerships" with state, federal and local agencies as well as the private sector and many non-profit organizations. This cooperative approach provides benefits such as funding for projects, technical expertise and enables citizen input assisting our agency to pinpoint and target specific problems in specific areas. "Conservation Partnerships" continue to be an effective way to address West Virginia's concerns and provide 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 West Virginia Conservation Agency (WVCA) undertook the following activities which either directly or indirectly protect West Virginia's groundwater resources during the reporting period of July 1, 2017 through June 30, 2019.

Agricultural Activities

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

- ❖ Implement watershed projects via Clean Water Act section 319 funding in: Second Creek, Howards Creek, Anthony Creek, and Spring Creek of the Greenbrier River Watershed; Sewell Creek of the Meadow River Watershed; and Indian Creek of the New River Watershed. These projects accounted for 69 alternative watering systems that provided water access to livestock without relying on natural waterways. These systems included 72,400 feet of pipeline and 11 wells. 89,078 feet of exclusion fence also prevented livestock from watering out of natural waterways. 32,953 feet of pasture division fence

provided enhancements to grazing systems that allow livestock to distribute waste through grasslands as organic fertilizer so it would not concentrate and runoff into the groundwater. 24,275 square feet of heavy use area protection was installed to prevent erosion and store livestock waste until it could be appropriately spread over pasture land. Eight septic system rehabilitation projects were also conducted to prevent direct runoff of untreated sewage. These practices accounted for a reduction in fecal coliform bacteria of 1.84539E+14 counts per year, 388.89 tons of sediment per year, 16,474 lbs. of nitrogen per year, and 2,197 lbs. of phosphorus per year.

- ❖ 2100 foot of eroded streambank were restored saving 763 tons of sediment from entering the stream. (this footage includes projects on both Anthony Creek and Wades Creek, but the sediment reduction only includes figures for Anthony Creek as the appropriate data to calculate this was not collected on Wades Creek)
- ❖ CREP Reporting is completed each federal fiscal year, October 1- September 30.

Fiscal Year 2017 (October 1, 2016 – September 30, 2017)

- ❖ 30 contracts covering 401.27 acres
- ❖ Practice breakdown:
 - ❖ Acres in permanent grasses and legumes 31.7
 - ❖ Acres in filter strip 52.1
 - ❖ Acres in riparian forest buffer 317.47

Fiscal Year 2018 (October 1, 2017 – September 30, 2018)

- ❖ 41 contracts covering 361.58 acres
- ❖ Practice breakdown:
 - ❖ Acres in filter strip 1.30 acres
 - ❖ Acres in riparian forest buffer 363.28 acres

Nutrient Management Plans

A nutrient management plan is a written site-specific plan which describes how the major plant nutrients (nitrogen, phosphorus and potassium) are to be managed annually. The goal of nutrient management planning is to minimize adverse environmental effects, primarily upon water quality, by preventing over application nutrients.

# Nutrient Management Plans	BMPs in Plans	# N Managed	#P Managed	Acres
1	1	67,504.81	68,826.66	948.1
1	1	8,022	11,948.96	103.4
1	1	2,336.78	1,727.94	27.7
1	1	1,470.61	782.17	21.4
1	1	6,496	6,090	81.2
1	1	3,300	1,135	32.8
1	1	13,020	None recommended	130.2
1	1	16,059	23,028	187
1	1	28,387.2	17,742	469.1



The Agriculture Enhancement Program (AgEP)

West Virginia Agricultural Enhancement Program's (AgEP) mission is to assist the agriculture cooperators of West Virginia Conservation Districts with the voluntary implementation of best management practices (BMPs) on agricultural

lands to conserve and improve land and water quality. The program offers technical and financial assistance as an incentive to implement suggested BMPs.

Practices Completed in FY18		Practices Completed in FY 19	
Practice	Unit Totals	Practice	Unit Totals
Cover Crop	40 acres	Cover Crop	29.5 acres
Exclusion Fence	50,675 feet	Exclusion Fence	49,461 feet
Frost Seeding	2,263 acres	Frost Seeding	1,325 feet
Heavy Use Protection Areas	51 areas/88,560 sq.ft.	Heavy Use Protection Area	66 areas/99,343 sq.ft.
Invasive Species Management*	893 acres	Invasive Species Management*	251 acres
Lime	10,731 acres/ 23,014 tons	Lime	7,952 acres/ 16,827 tons
Nutrient Management	1,176 acres	Nutrient Management	1,743 acres
Pasture Division Fence	111,350 feet	Pasture Division Fence	110,946 feet
Pasture Seeding	364.82 acres	Pasture Seeding	
Pollinator Planting	6 plots	Pollinator Planting	6 plots
Pond Clean Out	5 ponds	Pond Clean Out	4 ponds
Urban Agriculture	17 components	Urban Agriculture	17 components
Watering System	68 components/systems	Watering System	53 components/systems
Winter Grazing	336 acres	<i>*ISM acres include brush acres.</i>	



Education & Outreach

The West Virginia Soil Tunnel Trailer, or for a better understanding, is simply “a look at life below our feet”. This mobile classroom illustrates our living soil and expresses the negative impacts pollution present to our groundwater and our soil. This unit serves at an educational tool to approximately 25,000+ adults and children in the state of West Virginia.





Fall Field Day at Triangle T Farm

Approximately 200 professionals and producers attended a field day that was held at Triangle T Farm in Grant County in September 2018. The training focused on nutrient application, forage stockpiling, and rotational grazing.

Aquatics Envirothon Trainings

WVCA held Envirothon Training and conducted the aquatics portion of the training throughout the state. Students received training in water chemistry, aquatic habitat, biological assessment, water quality laws and regulations and other sub-topics.



Stormwater Management

Conservation Specialists serve as direct service providers or help coordinate assistance from other sources to watershed organizations and landowners. WVCA supports statewide efforts to address nonpoint pollution with education and outreach, coordination and implementation of projects addressing runoff, erosion and sediment control, stormwater management, nutrient and pest management, stream cleanup, riparian demonstrations, stream bank stabilization, pre and post project monitoring, watershed assessments, agriculture BMP selection and installation, the availability and types of conservation programs, financial assistance, and water quality improvements.

Additional stormwater projects

WVCA Conservation Specialist Functions as 319 Watershed Project Managers

WVCA's Conservation Specialists (CS) support volunteer watershed associations, educate citizens on non-point source pollution issues, identify local stakeholders, partners and funding sources, and take the lead for Project Teams (PTs) consisting of community stakeholders to place projects on the ground. Watershed Project Proposal funds are used to install specific projects designed to remedy or decrease contributions to the impairment of the priority watershed in which the projects are installed.

Sleepy Creek Watershed Project-Morgan County

The goal of the Sleepy Watershed Project is to reduce fecal coliform loads within the watershed, Projects completed between 7/1/17 and 6/30/19 include:

- ❖ 45 septic systems pumped
- ❖ 11 septic systems repaired
- ❖ Outreach and Education
- ❖ Installation of Pet Waste Stations
- ❖ Riparian Buffer Plantings
- ❖ Installation of Rain Garden
- ❖ Outreach and Education
- ❖ Water Quality Monitoring and USGS source tracking

Sleepy Creek riparian buffer planting pictures:





Elks Run 319 Watershed Project- Jefferson County

The goal of the Elks Run Phase II 319 Watershed Project is to reduce fecal coliform and sediment loads within the watershed from failing septic systems and stormwater runoff from urban and agricultural land uses. Projects completed between 7/1/17 and 6/30/19 include:

- ❖ Water Quality Monitoring and USGS source tracking
- ❖ 2 septic systems repaired
- ❖ Riparian Buffer Plantings
- ❖ Urban Tree Plantings
- ❖ Installation of Pet Waste Stations
- ❖ 56 septic systems pumped
- ❖ Outreach and education

Elks Run urban tree planting:



Elks Run riparian buffer planting:



Back Creek Protection 319 Watershed Project- Berkeley County

The goal of the Back Creek Phase II 319 Watershed Project is to promote land conservation and reduce sediment loads within the watershed from eroding streambanks. Projects completed between 7/1/17 and 6/30/19 include:

- ❖ Placement of 155 acres into conservation easement
- ❖ Outreach and education

Back Creek Protection 319 Additional Grant Opportunity Watershed Project- Berkeley County

The goal of the Back Creek AGO 319 Watershed Project is to promote land conservation and reduce sediment, nitrogen, and phosphorous loads within the watershed from eroding surfaces and from runoff from impervious surfaces. Projects completed between 7/1/17 and 6/30/19 include:

- ❖ Installation of 1,100 square feet of porous pavers
- ❖ Outreach and education

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

The West Virginia Chesapeake Bay Program is an effort by the West Virginia Conservation Agency, West Virginia Department of Environmental Protection, West Virginia Department of Agriculture, and several other state, federal, and local partners to implement the Chesapeake Bay Total Maximum Daily Load (TMDL), released by EPA on December 29, 2010.

The Chesapeake Bay TMDL is a comprehensive “pollution diet” to restore the health of the Bay and all its tributary streams, creeks, and rivers by setting limits for nitrogen, phosphorous, and sediment pollution. The TMDL is historic in that it is the largest clean-up ever initiated by EPA, encompassing a 63,000-square mile watershed. It is designed to ensure that all pollution control measures needed to fully restore the Bay and its tidal rivers are in place by 2025. Each of the six Bay states and the District of Columbia have developed Watershed Implementation Plans (WIPs) that detail how and when they will meet their pollution allocations.

West Virginia is in the final phases of developing its Phase III WIP, which will address reductions needed to reach 2025 goals. The WIP describes how federal, state, and local governments will achieve required pollution load reductions and sets a timeline for when reductions will occur. It describes in detail how pollution reduction strategies will be undertaken in each major load sector: Wastewater, Developed Lands, Agriculture, Forest, and Other. Reducing nitrogen, phosphorous, and sediment in local creeks and rivers will mean healthier water resources to better sustain tourism, fishing, drinking water supplies, wildlife habitat, and other uses.

Agricultural BMP Implementation

Chesapeake Bay Implementation Grant funds have been allocated to assist agricultural producers with the installation of cover crops, stream bank exclusion fencing, alternative watering sources, riparian buffer development, heavy use area protection around areas such as feeding and watering troughs and walkways, and the transfer of poultry litter outside of the Bay watershed. With the assistance of these funds, WVCA and conservation districts have

helped the state reduce nutrient and sediment loads from entering the state's streams, rivers, and the Chesapeake Bay Watershed through the implementation of BMPs.

Cover Crop-

A total of 8,096.87 acres of cover crops were planted during this time. Cover crops improve water quality by reducing the soil erosion and nutrient runoff entering groundwater. Some examples of cover crops are clover, barley, rye, alfalfa and triticale. Often, when farmers harvest their cash crops (corn, soy beans, etc.), the fields will lay bare in the winter. By establishing a cover crop during the winter months, the soil is held in place as opposed to being washed off the field into streams and rivers during heavy rains. Producers can improve their operations while addressing environmental concern.



Litter Transfer-

9,163.1 tons of poultry litter were transferred out of the Chesapeake Watershed watershed! The Potomac Valley is rich with poultry production, and therefore has a large surplus of poultry litter. Transferring this litter out of the watershed prevents nutrient run off from entering rivers, streams, and groundwater.

Stormwater-

Rain barrels are an excellent way to collect rain water from rooftop runoff and prevent it from contributing to storm water that carries pollutants into streams, rivers, and groundwater. Several rain barrel workshops have been held across the state.

Rain Barrel Workshop

When: Saturday April 13th, 8:30 & 10:30am

Where: Hampshire County Co-op —Romney, WV

Cost: \$20, cash

Includes: 55 gallon food grade barrel, complete rain barrel kit, and refreshments.

****Limited spots available****



Contact Andrea Mongold
WVCA to register
(304) 790-6475.



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 62,000 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- 35 CSR 4-11.3; 35 CSR 8-9.2

For conventional wells, operators must set freshwater casing at least 30 ft. below the deepest freshwater horizon and circulate cement to surface prior to drilling into any oil, gas or saltwater bearing strata. With the passage of W. Va. Code § 22-6A, the Horizontal Well Act, in December 2011, and its corresponding legislative rule, 35CSR8, going into effect in July 2013, at least 300 ft. of freshwater casing must be run and cemented to surface on applicable horizontal wells, known as H6A wells. The freshwater casing may be extended deeper to cover known aquifers or to cover a coal seam prior to drilling below sea level (elevation) and must always be cemented to surface. The operator must also employ practices and procedures necessary to minimize damage or disturbance to strata including groundwater until casing has been set.

Plugging Methodology – 35 CSR 4-13, W. Va. Code § 22-6-24, 35 CSR 8 – 19, 35 CSR 8 - 20

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

Water Supply Testing- 35 CSR 4-19 and 35 CSR 8-15

For conventional wells, operators are required to notify landowners within 1,000 ft. 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 ft. radius. If no requests are made, then the operator shall choose an existing well or spring from within the 1,000 ft. to sample and analyze. Operators are required to move out to 2,000 ft. if there are no wells or springs within 1,000 ft. Sampling parameters include, but are not limited to pH, iron, chlorides, total dissolved solids

and detergents (MBAS). 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.

The operator shall sample and analyze water from any existing water wells or developed springs within 1500 ft. from the center of the proposed pad for all wells permitted under W. Va., Code § 22-6A. Under 35 CSR 8-15.3b, the Chief can require the operator to sample and analyze out to 2000 feet. Parameters include, but are not limited to: total petroleum hydrocarbons, (GRO, DRO, ORO), BTEX, chloride, sodium, total dissolved solids (TDS), aluminum, arsenic, barium, iron, manganese, pH, calcium, sulfate, detergents (MBAS), dissolved methane, dissolved ethane, dissolved butane, dissolved propane, and bacteria (total coliform).

Underground Injection Control Program – 35 CSR 4-7

The OOG administers the Underground Injection Control (UIC) Program for Class II and III injection wells. Class II wells include brine disposal and secondary recovery gas and water injection wells. Class III wells include solution mining wells. The current active inventory of Class II and III wells consists of approximately 27 private and 11 commercial brine disposal wells, 480 secondary recovery wells and 13 solution mining wells. The primary focus of this program is the protection of groundwater from injection operations

During the permitting process, operators are required to sample and analyze all water wells, springs and surface water bodies within at least a quarter-mile radius of the injection well or facility. Solution mining permits further require that groundwater be sampled, analyzed and charted on a quarterly basis. To ensure well integrity, mechanical integrity tests (MITs) are required to be conducted on every injection well by the operator at least once during the 5-year permit term to ensure that injected fluid is not migrating into any Underground Source of Drinking Water (USDW). Operators are required to submit reports monthly of daily activity for each injection well.

Abandoned Well – 35 CSR 6

Abandoned wells are the most problematic regulatory area relating to groundwater, especially for wells drilled 75 to 100 years ago when technology and concern for groundwater protection were not as advanced as today. These wells, which are found 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 typical contaminants that may affect groundwater quality include hydrocarbons, chlorides and metals. The OOG works with both industry and the federal government to locate, prioritize and plug or produce abandoned wells. The OOG has a priority ranking of abandoned wells and those that pose a significant and/or

immediate threat to human health or the environment are scheduled for evaluation first.

Annual Inspection – 35 CSR 4-11.6

Operators are required to visually inspect all their unplugged wells on an annual basis. Any significant leakage or well integrity failure is to be reported to the OOG and measures should be 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, GP-WV-1-88, GP-WV-1-07

The primary function of the land application general permit, GP-WV-1-88, is the prevention of pollution to the waters of the state relating to the handling and disposal of drilling wastes. Operators applying for a conventional well work 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. If land application is the chosen method of disposal, a groundwater protection plan (GPP), must be filed as part of the permit packet. Generally, most pit contents (excluding those generated from an H6A well) may be land applied after proper treatment and aeration procedures.

Another general permit, GP-WV-1-07, allows for produced water from certain coalbed methane wells to be applied directly to the ground. To qualify for coverage under this permit, candidate wells must meet strict water quality criteria. Analyses of surface water, and in some cases, groundwater, must be presented to OOG on a semi-annual basis for review.

Spill Prevention and SPCC Plans -- 35 CSR 1, 35 CSR 8 - 18

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 Clean Water Act (CWA) to protect waters of the state from discharged oil.

For horizontal wells permitted under W. Va. Code § 22-6A-1, operators must further ensure that all site equipment is positioned and used in a manner that will prevent spills into waters of the state. Provisions also exist that describe the use of pad liners, containment structures, catchment basins, and bulk chemical storage on site.

Miscellaneous

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. The analyses are submitted on paper and kept in the corresponding investigation file.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

1. Office of Waste Management

a. 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 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)	18
Closed Municipal Solid Waste Landfills (Class A & B)	33
Construction/Demolition Waste Facilities (Class D and D-1)	30
Yard Waste Composting Facilities	23
Transfer Stations	20
Waste Tire Facilities	3
Recycling Facilities (Class E)	9
Incinerator	1
Mixed Waste Processing Facilities	1

Five landfills are currently allowed to accept drill cuttings and associated drilling waste for proper disposal. Those facilities had to obtain modifications to their permits, which require that the leachate from the cells holding this waste be monitored separately from rest of the landfills waste through dedicated monitoring wells and that the leachate emanating therefrom be treated by publicly owned treatment works (POTWs).

Oil and other chemicals, primarily from vehicles, and leachate can contaminate stormwater flowing from solid waste facilities. Plans, form 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 ground water.

In an effort to protect groundwater, the Solid Waste Management Rule requires an impermeable liner system for 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.

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.

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 Technical Applications and Geographical Information System (TAGIS) 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

Through the Landfill Closure Assistance Program (LCAP), the WVDEP is currently monitoring the 33 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.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

1. Office of Waste Management

b. 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 System (HWMS), are the regulations promulgated to regulate the storage, treatment, and disposal of hazardous wastes generated and managed in West Virginia. The HWMS 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 follow-up 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 section 264.98, 264.99, and 264.100.

The general requirements for groundwater monitoring programs at permitted facilities are found in Subpart 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 down gradient 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:

<https://www.epa.gov/hwcorrectiveactionsites>

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
R Remedy Selected	Complete With Controls
Construction Complete	

Facility Name	EPA ID#	Location	Environmental Indicators		Cleanup Status
			HE	GW	
AEP Kanawha River Plant (Appalachian Power)	WWD980554588	Glasgow	<u>YES</u>	<u>YES</u>	
Airco Welding	WWD980554760	Chester	<u>YES</u>	<u>YES</u>	
Appalachian Timber Service	WWD063461958	Sutton	<u>YES</u>	<u>YES</u>	R
Bayer Cropscience LP (Rhone Polenc, Aventis)	WWD005005509	Institute	<u>YES</u>	IN	
Bayer Polymers LLC (Miles)	WWD056866312	New Martinsville	<u>YES</u>	<u>YES</u>	
Beazer-Colliers (Koppers-Colliers)	WWD980707178	Colliers	<u>YES</u>	<u>YES</u>	
Crompton Corporation - South Plant (G E Specialty Chemicals 1)	WWD061776977	Morgantown	<u>YES</u>	IN	
Crompton Corporation - North Plant (G E Specialty Chemicals 2)	WWD980552384	Morgantown	<u>YES</u>	IN	
Cytec	WWD004341491	Willow Island	<u>YES</u>	IN	
Dupont - Belle	WWD005012851	Belle	<u>YES</u>	IN	
Dupont Martinsburg - Potomac River Works	WWD041952714	Martinsburg	<u>YES</u>	<u>YES</u>	
Dupont - Washington	WWD045875291	Washington	<u>YES</u>	<u>YES</u>	
Flexsys America L.P. (Solutia Inc., Monsanto)	WWD039990965	Nitro	<u>YES</u>	IN	R
FMC - So. Charleston	WWD005005079	South Charleston	<u>YES</u>	<u>YES</u>	
GE Silicones (Crompton, Witco Corp., CK Witco, OSi)	WWD004325353	Friendly	<u>YES</u>	<u>YES</u>	
General Electric Co (GE Plastics, GE Chemicals)	WWD088911854	Washington	<u>YES</u>	<u>YES</u>	

**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	
General Motors Corp. (G M C Martinsburg)	WVD044145209	Martinsburg	YES	YES	
Great Lakes Chemicals Corp (FMC)	WVD005005087	Nitro	YES	YES	
KACC Spl. Pile (Kaiser Aluminum & Chemical Co. - Spent Potliner Pile)	WVD988766127	Ravenswood	YES	YES	
Koppers-Follans (Beazer East)	WVD004336749	Follansbee	YES	YES	
Koppers - Green Spring (CSXT)	WVD003080959	Green Spring	YES	YES	
Occidental Chem Corp	WVD005010277	Belle	YES	IN	
P P G Industries	WVD004336343	New Martinsville	YES	YES	
Pechiney Rolled Products Inc. (Century Alum., Ravenswood)	WVD009233297	Ravenswood	YES	YES	
PTO-UCC-Dow (Union Carbide - PTO)	WVD000739722	Nitro	YES	IN	
Quaker State-Congo	WVD057634776	Newell	YES	IN	
SMR Technologies (BF Goodrich)	WVD980555395	Fenwick	YES	YES	
St. 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' behalfs. Occasionally samples are collected by DWWWM 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 40CFR261. All samples must be analyzed by laboratories certified by the DWWWM.

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. The electronic data will be stored, managed and shared among the divisions of WVDEP and other agencies with groundwater certification. The electronic data will be available to the public as well. In the future the data will be submitted by e-permitting system.

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.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

2. Water Use Section

The Water Use Section operates under the authority of the 2008 Water Resources Protection and Management Act (W.Va. Code §22-26). The Section's formative publication, the West Virginia Water Resources Management Plan, provides a comprehensive review of the state's waters and was adopted by the Legislature in 2014. The Water Use Section has continued to implement the provisions and recommendations of both the Act and Plan with several ongoing programs, projects, and studies relevant to the state's groundwater resources.

Water Use Section - Current Groundwater Related Programs and Projects:

- ❖ Large Quantity Water User Survey
- ❖ GIS Internet Based Water Information Tools
- ❖ Geophysical Well Logging - Groundwater Aquifer Study
- ❖ Mine Pool Study – Location, Quantity, Quality and Sustainability

Water Use Section – Large Quantity Users (LQU) Survey:

Any entity that withdraws more than 300,000 gallons in 30 days from state water resources (including groundwater) is considered a Large Quantity User (LQU) under the Water Resources Protection and Management Act. These LQUs use the WV DEP Electronic Submission System to report their withdrawals annually to the Water Use Section. The Section has been collecting LQU information since 2010 and monitoring trends in water use. We share water withdrawal information with the State Legislature and research partners including universities and the U.S. Geological Survey.

In general, total water use has been on a slight decline, due primarily to the decrease in water used by thermoelectric operations, the largest water use sector overall. However, water used by the public supply and oil & gas operations continues to rise. Groundwater withdrawals remain relatively consistent, comprising approximately 5% of the total water use in West Virginia. Public water supply is the single largest user of groundwater (contributing 20% of all PWS withdrawals), followed by the chemical and industrial sectors. Groundwater use is concentrated in the alluvial aquifers along the Ohio River, southern coalfields, and karst aquifer systems of eastern WV.

Table 1. Total water withdrawals (WD) from the 2017 and 2018 WVDEP LQU database.

Water Use Sector	2017		2018	
	Total Gallons WD	% of Total WD	Total Gallons WD	% of Total WD
Agriculture/Aquaculture	6,307,739,354	0.94%	7,342,326,962	1.18%
Chemical	136,476,622,628	20.25%	134,058,672,936	21.47%
Industrial	14,457,724,869	2.15%	14,795,031,981	2.37%
Mining	15,182,346,411	2.25%	14,755,098,334	2.36%
Oil & Gas	3,263,431,717	0.48%	4,321,192,565	0.69%
Petroleum	279,681,809	0.04%	303,734,621	0.05%
Public Water Supply	60,801,078,169	9.02%	67,903,655,278	10.87%
Recreation	1,282,155,998	0.19%	1,264,305,547	0.20%
Thermoelectric	434,693,313,114	64.51%	378,664,719,354	60.63%
Timber	1,137,305,642	0.17%	1,120,874,025	0.18%
TOTAL	673,881,399,711		624,529,611,603	

Table 2. Groundwater withdrawals (GW WD) from the 2017 and 2018 WVDEP LQU database.

Water Use Sector	2017		2018	
	Groundwater WD	% of GW WD	Groundwater WD	% of GW WD
Agriculture/Aquaculture	109,449,000	0.35%	237,266,400	0.77%
Chemical	9,348,791,798	30.18%	9,313,098,455	30.14%
Industrial	859,853,496	2.78%	843,395,236	2.73%
Mining	6,899,713,873	22.27%	6,077,313,418	19.67%
Oil & Gas	74,252,646	0.24%	67,393,438	0.22%
Petroleum	279,668,501	0.90%	303,677,459	0.98%

Water Use Sector	2017		2018	
	Groundwater WD	% of GW WD	Groundwater WD	% of GW WD
Public Water Supply	13,006,414,334	41.98%	13,365,067,035	43.26%
Recreation	33,515,796	0.11%	330,408,833	1.07%
Thermoelectric	359,600,100	1.16%	350,958,650	1.14%
Timber	8,065,594	0.03%	8,408,728	0.03%
TOTAL	30,979,325,138		30,896,987,652	

Water Use Section – GIS Internet Based Water Information Tools:

In cooperation with the TAGIS group, the Water Use Section maintains a suite of internet-based tools that display water resources management data in a Geographic Information System (GIS). The Water Resources Management Mapping Tool acts as a clearinghouse for all manner of data relevant to groundwater management, including LQU withdrawals, watershed delineations, karst, monitoring wells, springs, mine pools, NPDES, geology, and more. Link: <http://tagis.dep.wv.gov/WVWaterPlan/>

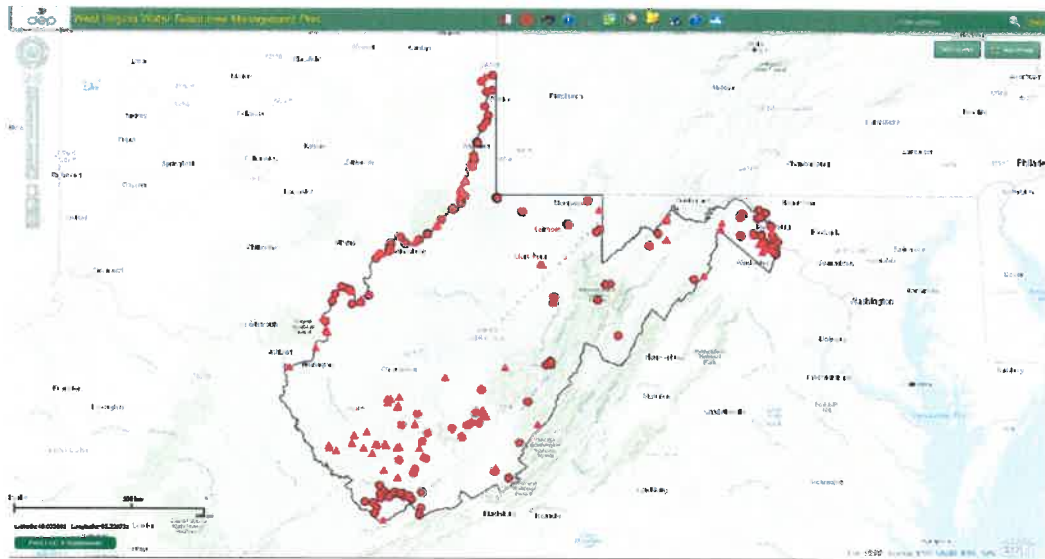


Figure 1. WV’s groundwater based LQUs from the Water Resources Mapping Tool.

TAGIS and the Water Use Section also maintain a Water Withdrawal Guidance Tool. Developed in 2009, this tool helps direct potential water withdrawals towards only those surface waters with sufficient flow. The Section is currently investigating

improvements to this tool, including the incorporation of groundwater resources, stream ecology, and higher spatial resolutions. Link: <https://tagis.dep.wv.gov/wwts/>

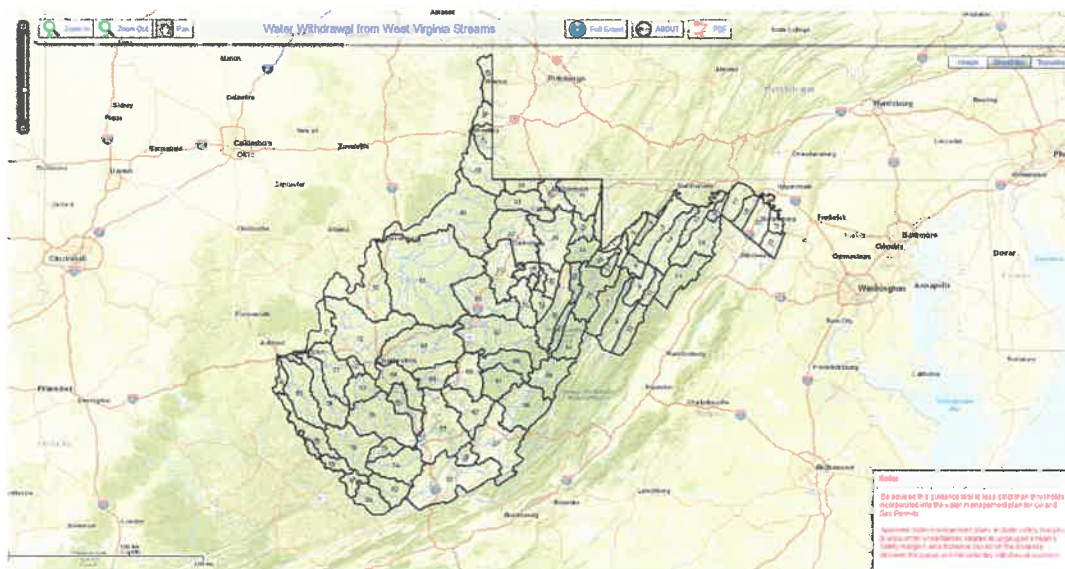


Figure 2. The 86 hydrologic zones of the Water Withdrawal Guidance Tool.

Water Use Section – Geophysical Groundwater Well Logging:

The Water Use Section and the United States Geological Survey (USGS) have continued a collaborative five-year project to assess geophysical and hydrologic properties of groundwater wells throughout West Virginia. The data from this project will be used to characterize the aquifers within the State through a better understanding of the bedding planes, joints, faults, and other fractures through which most of our groundwater flows or is stored. This research will increase knowledge of the depth and location of these water-bearing fractures throughout the state.

Fieldwork for the project should be complete on September 30, 2019 with over 120 well logs completed with geological and hydrological data. At the conclusion of the fieldwork, the Water Use Section and USGS will collaborate on the final report and data models, expected in fall 2021.

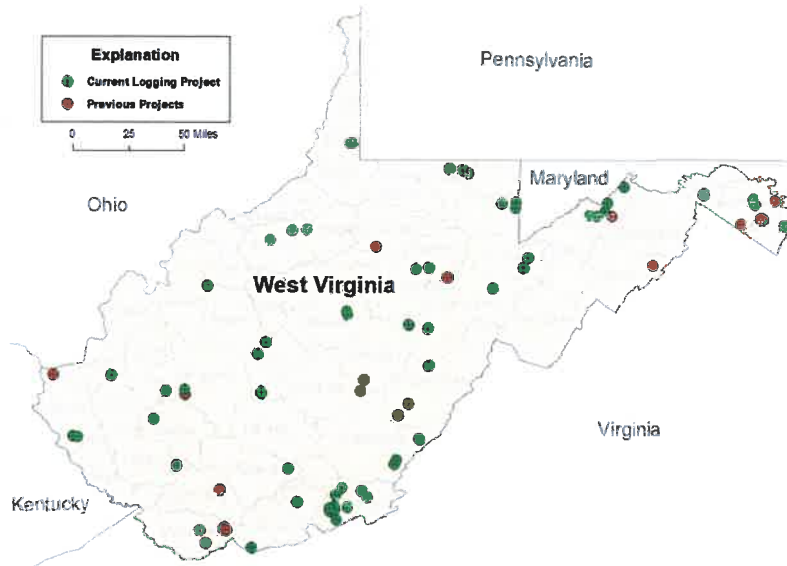


Figure 3. Location of USGS-WVDEP borehole geophysics well logs 2014-2018.

Water Use Section – Mine Pool Study

The Water Use Section has been involved in many projects to determine quantity and quality of water within Abandoned Underground Coal Mine Aquifers (AUCMA), also known as Mine Pools. Several municipalities and PSDs in southern West Virginia obtain their water supply from groundwater in mine pools. In 2012 we collaborated with the WV Geological and Economic Survey to map the extent of potential mine pools. Since then, the WV DEP has worked with the U.S. Geological Survey to obtain data from more than 770 water samples from 294 mines. A final report summarizing mine pool water quality and hydrogeology is expected in February 2020. Future research could focus on sustainable yield of this water resource and inter-basin flow resulting from mine pools that transcend surface watershed boundaries.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

3. Groundwater Program

a. 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. Nine current variance well facilities/sites were inspected during this period for compliance and status. Several remedial action plans were submitted per regulation by variance well owners and reviewed to determine variance well compliance status.

b. Groundwater Protection Regulations - Title 47 Series 58

The Groundwater Protection Rule, 47 C.S.R. 58, requires Groundwater Protection Plans (GPPs) for all facilities that have the potential to affect groundwater. They are preventative maintenance documents that cover all processes and materials at a facility that may reasonably be expected to influence groundwater quality. The facility must make an inventory of all potentially contaminating processes and materials and have structures and practices in place to prevent groundwater contamination from these processes and materials. Groundwater protection practices include, at a minimum, quarterly inspections and maintenance by facility personnel and spill cleanup procedures. The Groundwater Protection Rule also sets out instructions for how to prepare and implement GPPs.

Groundwater Protection Plans (GPPs) for 980 West Virginia facilities were received by the Groundwater Program during this reporting period. Of these, 899 were approved and sent to the Permits Section, or facility, where appropriate. Facilities that do not have permits were mailed approval letters or letters identifying deficiencies in their GPP's that need addressed. Inspectors visited 597 facilities during the reporting period to check on the efficacy of the applicable GPPs.

Underground Storage Tank (UST) facilities that distribute only gasoline or diesel fuel are regulated by the Underground Storage Tank Section of the DWWWM. 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.

Inspectors use the Groundwater Protection Plans (GPP) in the field to increase awareness and introduce Best Management Practices (BMPs) at facilities where a UIC permit may or may not be needed. Facilities visited during the reporting period are listed in the table below.

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Barbour County
Former Exxon
J&M Quick Pit
Amtower Auto Supply
Smoker Friendly
Berkeley County
Jack Rabbits
Chemours (Former Dupont) Potomac River Works - Sprayfield
Chemours (Former Dupont) Potomac River Works - Dynamite Mound Area
Chemours (Former Dupont) Potomac River Works - Warehouse
Brown Funeral Home
LKQ Ernie's Auto Enterprises
Al's Auto
Chemours - Falling Waters
Boone County
Beautiful You
Madison Street Dept.
Whispering Pines Mobile Home Park
Chambers Rental
Little General Store #5120
Kanawha Eagle Mining
Stahura Conveyor Products
Tyler Trucking
Tyler Trucking (Warehouse)
Tyler Trucking (Shop)
A & H Storage and Truck Rental
Black Hawk Mining
Big Earls Campground
The Jim C. Hamer Company (Mill)
The Jim C. Hamer Company (Warehouse)
Coal River Inn
Jim C. Hamer Company

**Site Visits to Facilities Obtaining Groundwater Protection
Plans approved July 1, 2017 through June 30, 2019**

Boone County

Boone County Technical Center
Southern West Virginia Community and Technical College

Braxton County

Appalachian Timber Services, LLC
Blue Bird Bus Sales of West Virginia
Blue Bird Bus Sales of WV
Jason Jackson
Blue Bird Bus Sales of WV
Rt. 19 Yard - Mt. Valley Pipeline
CBJ Campground
Weyerhaeuser
Flatwoods KOA
Southern States
Sawmill Campground

Brooke County

Mt. State Carbon
WISE Services
Al's Auto Service

Cabell County

Pharmerica
Curtain Concepts
Resolutions 2
Church of Christ
B & L Exhaust - Rim and Tire
G and G Nursery
B & L Exhaust - Rim and Tire
Shaffers Drive Inn
Adkins Service center
K and Auto Detail
Braskem
Bare Arms
Richwood Investment Castings
Lamar
Carter Inc.
KOA Campground
Jim's Camping and Storage
Mohr's Tire Farm Campground
Sonshine Timber and Lawn
R & R Automotive
Shawn's RV Park
Henkel and McCoy (Milton Yard)
Rex Donahue
Randy Dandy Campground
Carter Campground (Pipefitters)
Carter Campground

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Cabell County
Mountain State Waste
Andy's Rebuilders
Lower Coach Road-Sinkhole
B and L Exhaust and Rim / Tire
Clark's Pump and Shop
Calhoun County
Calhoun Auto Care
Clay County
JG Bradley Campground
Primary Care Systems, Inc.
Bullards Exxon / Quick Stop
Salisbury Auto Salvage
J/G Bradley Campground
Ferrebee's Auto Body
Cunningham Motors
Ronie Spencer, Inc.
Carol's Crossroads Best
Popatop Bar and Grill
Doddridge County
MarkWest Liberty Midstream Resources, LLC
Antero-Clearwater
Fayette County
National Scout Reserve Complex (Field Office)
Ace Adventure
Midway T&C Motel
Ponderosa Lodge
Jan Care Ambulance - Alloy Station
CSX Tank Car Yard
Midway Exxon
Gilmer County
Glenville Inn
Lignetics, Inc.
Grant County
Mt. Storm Power Station
Moorefield Potomac Highlands KOA
Petersburg Oil Company - Petersburg
C9C Automotive
Detinburg Transport
Bob's Muffler Center
Valley Welding / Hydraulic Works
Country Cars and Trucks
Mike's Auto Sales
7-11
Little Caesars

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Greenbrier County
Hampton's Summer Wind RV Park
State Fair Grounds
City of Lewisburg
Mon-Power Office
Callaghan Mobile Home Park
Ricks Horse Parks, LLC
Classic Used Cars
Lynch Construction Co, Inc.
Mullican Flooring
Mullican Flooring
BP (Former Little General 2150)
Callison Trucking
Dean Farm
Mott Manufacturing Company
National Guard Readiness Center
Greenbrier Valley Airport
JOI Properties
Mott Manufacturing
Hampshire County
Koppers, Inc.
Petersburg Oil Company - Romney
Hancock County
Linde, LLC
Linde, LLC
Hancock County
Hoopers Rock Springs
Chany's Auto Repair
Hardy County
Poultry Facility (WCW)
Tri-County Tools
7-11
Gary's Auto Repair
Moorefield Collision Center
Harrison County
Harrison Power Station
Harrison's Exxon
Wholesale Tire
T-Body Shop

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Jackson County
Sam's Truck Parts
R & L Preowned Auto
Mountdive Compressor Station
R & L Auto Sales
Hilltop Pizza
Blue Heron Landing RV Park
Price Gregory (Warehouse)
Blue Heron Way
Constellium (Cold Roll Mill)
Constellium (Oil Reclamation Building)
Constellium (Maintenance Shop)
Camden Sharp
Mitchell Sharp
Pink Flemingo
Melissa Wilkerson
Rons Campground
Pierson Automotive
Trademark Campground
Brierwood RV Park
Brierwood Village MHP
Fairplane MHP (Section 2)
Ruby Lake Campground
Ruby Lake Campground
David Young Used Cars
Clendenin Used Cars
Jackson County
BCA Fabrication, LLC
Jackson County Jr. Fairgrounds
I-77 Ford
Roane-Jackson Technical Center
Pipeline Supply and Service
Jackson County Jr. Fairground
Bridgeport Equipment and Tool
Hinzman's Auto Repair
Truck Equipment Service and Repair
Jackson's Signs
Engineer and Contractors
Jim Auto Repair
Jim Auto Care Pre-Used Cars

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Jackson County
Roane-Jackson Technical Center
Fisher Mobil Home Park
B&G Heating and Cooling
Alpha Air
Jefferson County
Rainbow Diner/Truck Stop
UFP Ranson, LLC
Former Lithographic Plating
EZ Mart (Former Marty Mart)
Magnolia Springs Site
Bardane Industrial Park – Sinkhole
Bardane Industrial Park - Lagoon
Kanawha County
Appalachian Tire (Office)
Appalachian Tire (Tire Shop)
Mountain State Pre-Owned Vehicles
Marty's Tire
Great American Home Care Center
Pulmonary Associates
Boice's Auto
Brown's Body Shop
Viking Well Service
Viking Well Service
Noel's Outdoor Power Equipment
McClanahan Service
Eye Center Optical
Kanawha County
Matador Barber Shop
Pro 1 Automotive
Jimmy A. Dunn Excavating
Jones Excavating
Rt. 21 Truck & Auto
Quality Exhaust
J & J Auto Glass
Elk River Automotive
J. Wood Contracting
D N Tanks (Construction Office)
Center Hardware
O'Reilly Auto Parts

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Kanawha County
St. Albans Dry Cleaners
St. Albans Cleaners (Coin Operated)
Medcare Therapy Center
Mountaineer Building
Keith G. Asbury DDS
Elgin Industries
Tolley' Amish Country
Mountain State Oral & Facial Surgery
So. Charleston Dermatology
Jimmy A. Dunn Excavating
Jimmy A. Dunn Excavating
Pro 1 Automotive
McClanahan Services
Kanawha River Power Station
CAMC Physical Therapy Center
CAMC Therapy Center
Peoples Federal Credit Union
Jeff's Appliances
Nitro Police Department
Wildlifeworks LLC
Safety Zone Car Wash
Safety Zone Car Wash
Safety Zone
Andrew's Boots and Workwear
WV Merchandise Pallet Liquidators
Brenntag Mid-South
Kanawha River Campground
Big Bend Golf Course
Custom Trucks Unlimited
Coonskin Park
Lorobi's Pizza
Carl Teel
Coonskin Park
Oliver Fuels and Oils (Office)
Maranatha Fellowship Church (Activities Building)
Maranatha Fellowship Church (Bethel House)
Maranatha Fellowship Church (Family Life Center)
Maranatha Fellowship Church (Garage)
Maranatha Fellowship Church (The White House)

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Kanawha County
Maranatha Fellowship Church (Pasion Play House)
Maranatha Fellowship Church (Worship Center)
Mazzella Quarries, Inc.
Former FMC Chemical - Waste Water Pond
Miller Transporters, Inc.
WV Spring and Radiator
Viking Well Service
Ken's Auto Service
Ditch Witch of WV
The Welding Shop
Former FMC Plant
Kanawha River Campground
Schilling's Towing and Recovery, LLC
Schilling's Towing
Clearon
Valley Supply
Occidental Chemical
Chemours
Kureha
Go Mart Store #61B
Little General Store #7570
West Virginia Parkways Authority
Jayden's Auto
Greg Chandlers Frame and Body
BB&T
One Stop #129
G., Keith Asbury, Jr. - DDS
Loop Pharmacy
WVDNR (District 5 Headquarters)
WVDNR (District 5 Warehouse)
S and S Industries
Oliver Fuels, Inc. (Fuel Storage Area)
Jefferson Volunteer Fire Department
Husson Pizza
Appalachian Tire Products, Inc.
Seven Eleven
Quinn Computers
Kanawha Valley Fine Jewelry and Loans
The UPS Store

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Kanawha County
Kanawha Terrace Hardware
U-Haul
Mark Plants Attorney at Law
Woodbury Financial Services
Veterans of Wars
Harper Engineering
Butcher's Black Angus
Mary C. Snow West Side Elementary School
Trucks, Inc.
Shafers Equipment, Inc.
WV Consolidated Public Retirement Board
AEP Amma Yard
Kanawha County Schools (Board Office)
Moses Lexus and Toyota
WVDNR-South Charleston Office
WVPEIA
Orders Construction
Central Contracting
Gateway Animal Hospital
Hayes Middle School
St. Albans High School
Brenntag
Shafer Equipment
Napa Auto Parts
Hooten Equipment Company
Shafer Equipment
West Virginia Auto Center
West Virginia Auto Center
Dirt Masters, LLC
United Rentals
7-11 #35915
Cross Lanes Auto Transport
Tribute Contracting Pipeyard (Brannon Oil)
ABC Auto Repair
Camp Virgil Tate
Raocat Rubber, Inc.
Evans Auto Body Shop
Cabin Creek Chevron
MarkWest

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Kanawha County
City of Marmet
Lewis County
Miller Supply
ST & E - Summit
ST&E - Summit
Fisher Auto Parts
Weston Dairy Mart
Garrett Industrial Supply
The Oil Spot
Toland's Auto and Towing
Rinker's Automotive
Steve's Welding and Fabrication
Lincoln County
Tom's Building Supply
4B Services
J&E Auto Repair
Sheradon Yard - AEP
HG Energy
Hair Image Salon
B&B Automotive
Little General #4075
7-11
Logan County
Barnette Development
Barnette Development
Holden Machine and Fabrication
MAYO Manufacturing Company
Rich Oil #3959
Stollings Auto Parts
Ashland Fast Lube
Tire Pros
Marion County
Rivesville Power Station
Marshall County
Kammer Power Station
Covesto
Mason County
Philip Sporn Power Station
Kanawha Valley Dragway Park

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Mercer County
Kristi Montgomery Property
Long Run Transport
Poor Boys Tires
Rose's Pet Grooming and Boarding
Kanawha River Campground
Kanawha River Campground
RV Campground
Precisioned Components-Shop#1
Precisioned Components-Shop#2
Scenic Campground
Elenor Tire and Service
Samual Williamson
I.V. Cunningham #1
I.V. Cunningham #2
Letard Corporation Machine & Fabrication
Smith's Market
Kanawha River Campground
McDowell County
Spikes Dog House
Pendrys Body Shop, Inc.
Welch Community Hospital
Thompson Gas
ACME Wood Preserving, Inc.
One Stop #8531 (Former S and S Mart)
King Coal Highway Improved Sinkhole Project
Brushcreek Falls RV Resort
DOH - Sinkhole
Bluefield Area Transit
Bluefield Area Transit
Bluefield Area Transit
DOH-Highway Project
King Coal Highway Improved Sinkhole
Mineral County
Timbrook Ford/Mercury
CSX Maryland Junction Railyard
Timbrook Ford/Mercury

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Mingo County
Tire Man Auto Repair
KARS Auto Repair
Mike's Tire
Norfolk Southern -Williamson Yard
Western Auto
A & B Service Center
Monongalia County
Ft. Martin Power Station
Circle K
Auto Outlet
Brown Mills, LLC
Roberts Streets
Touchdown City
Touchdown City
Touchdown City Pre-owned Auto's
Chestnut Ridge Park
Addivant
Pikewood National Golf Club
Pikewood National Golf Course
Monroe County
Ham Sanitary Landfill
Walt's Auto
Wilson Farm Equipment
Monroe Service
Pickaway Pickens
New Pickaway Store
Pickaway Weld Shop
Nicholas County
Brownstone Village
Tractor Bar
The Tractor Bar
Little General Store #2455
US Post Office
B&A Tire LLC
Mid-State Automotive
Carper's Auto Garage

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Monroe County
Monroe Service
Pickaway Pickens
New Pickaway Store
Pickaway Weld Shop
Nicholas County
Brownstone Village
Tractor Bar
The Tractor Bar
Little General Store #2455
US Post Office
B&A Tire LLC
Mid-State Automotive
Carper's Auto Garage
Ohio County
Former-Consolidated Truck Stop
PETTA Enterprises
Former Consolidated Truck Stop
TA Truck Stop
Former Consolidated Truck Stop
Former BP
Bleifus Tire, Alignment & Brakes
Former Consolidated Trucking
Bleifus Tire
Taylor's Pre-owned Auto
The Auto Shop
Automation-X
Amerilube Express Care
Fort Henry Transmission
ACE Garage
Mountaineer Auto Repair
B&P Used Auto Sales
Assaro's Garage and Towing
Wheeling Mack Trucks
Wheeling Tire Center

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Pleasants County
Pleasants Power Station
Sistersville Tank Works
Cottrills Auto Detail Service
Pocahontas County
Judy Fencecraft, Inc.
Snowshoe RV Park
Ray of Hope
Preston County
Albright Power Station
Double Image Styling Salon
Blown Away Hair Salon
Mane Tamer
Silver Scissors
Roth Apartment
Nicholas Enterprises
Nicholas Enterprises
Putnam County
Gill's Automotive
Complete Auto Service
Front Porch General Store
Payne Controls (Manufacturing)
Payne Controls (Engineering/Shipping)
Payne Controls (Office)
Ridgeview Kennel
J Lake Bait Shop
The Bargain Hut
Route 34 Last Stop
Dave's Complete Auto Repair
Gill's Tire
Dave's Complete Auto Repair LLC
Greg Chandler's Frame and Body
C Adam Toney Discount Tire
Enterprise Rent a Car
Bizzack
Specialized Engineering
TRC
WW DOH
GPI

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Putnam County
Stantec
Tucker Creek Campground
Dave Hobba Campground
US Bearing and Power Corporation
Johnson's Garage
Johnson's Garage
Johnson's Garage
WV Cashin Recyclables
Precision Transmission
Mark's Mirror Finish
Hurricane Tire
Kevin's Autobody, LLC
J Turner Automotive
MoZak Ready Mix
Teays Valley Baptist Church
Burdette Camping Center
Claxton-Smith Concrete
Claxton-Smith Concrete (Maintenance Garage)
J Lake Bait Shop and Campground
Scary Creek Tactical
Scary Creek Cycle Supply
Kanawha Valley Construction and Erection Company
Kanawha Valley Construction and Erection Company
Meadows Body Shop
Gary Jarvis
Valley Endodontics
O'Reilly Auto Parts
City of Hurricane - Ball Field
Former AZZ Galvanizing
Spirit Services
Hopkins Incorporated
Signs and Engraving
Foster Supply
Foster Supply
Eleanor Tire
Buffalo Tire and Brake, LLC
Lehigh Hanson
Rumble Ready Mix

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Raleigh County
Creager Tire
Gordinho, JJ
Little General Store #302
Alpha Natural Resources (Office)
Alpha Natural Resources (Mine Rescue Storage Building)
Appalachian Tire
W.V Electric, Inc.
Eastern Concrete
Allegheny Wood Products
Eastern Concrete
One Stop #6
Jan Care Ambulance Maintenance Garage
Allegheny Wood Products
Eastern Concrete
Street Dreams
Powell Construction / Maintenance
Ambassador Taxi
Davis Auto Paints and Repair Shop
Eagle Enterprise
Autos For Less
Green Goose Garage
Rt 3 Auto Body
Mountain Marketing
WV Paint and Decorating
AT & T Mobility
Randolph County
Hoover Treated Wood Products, Inc.
Daily RV Park
Bell RV Park
JF Allen Aggregates
JF Allen Aggregates
Johnny B's Campground (A)
Johnny B's Campground (B)
Johnny B's Campground (C)
Ritchie County
Central Supply - Pennsboro
Ritchie Center Campground
Central Supply-Pennsboro
WV DOH Ritchie County Garage

Site Visits to Facilities Obtaining Groundwater Protection Plans approved July 1, 2017 through June 30, 2019
Roane County
Amma Lay Down Yard
Odell's Exxon
WVDNR Wallback Wildlife Mgt. Area
Sure-Fix Automotive Repair
Reed's Auto Service
Summers County
Bass Lake Campground
Camp Summers 4-H
Pipestem Creek Campground
Taylor County
West Taylor WWTP
Tucker County
Kingsford Manufacturing Company
Adams Mobile Home Park
Upshur County
Ed Arey and Sons, Inc.
Weyerhaeuser-Buckhannon Plant
Wayne County
Dunlow Elementary School
Sugarwood Golf Course
Zims Innovative Packaging
WV Trucking
Berry's Save and Mower
Wirt County
Villars RV Park
Wood County
Williamstown Auto Service
Former BP # 6015
Travel Trailer Center
Mini-Giant #3
JABO Supply
United Welding Service
Ohio River Outfitters
Wyoming County
Wyoming Co. Youth Camp
Hatfield/McCoy Regional Recreation Authority
Little General #5210

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

3. Groundwater Program

c. 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. While the overall quality of West Virginia's water resources are very good, there are many concerns to be addressed, more than the scope of this report will allow here. The Groundwater program is pursuing development of a Needs Assessment to begin a comprehensive database of groundwater quality. Two main concerns expressed by many are pharmaceuticals and endocrine disrupting chemicals in groundwater and hydraulic fracturing in oil and gas production.

Concerns

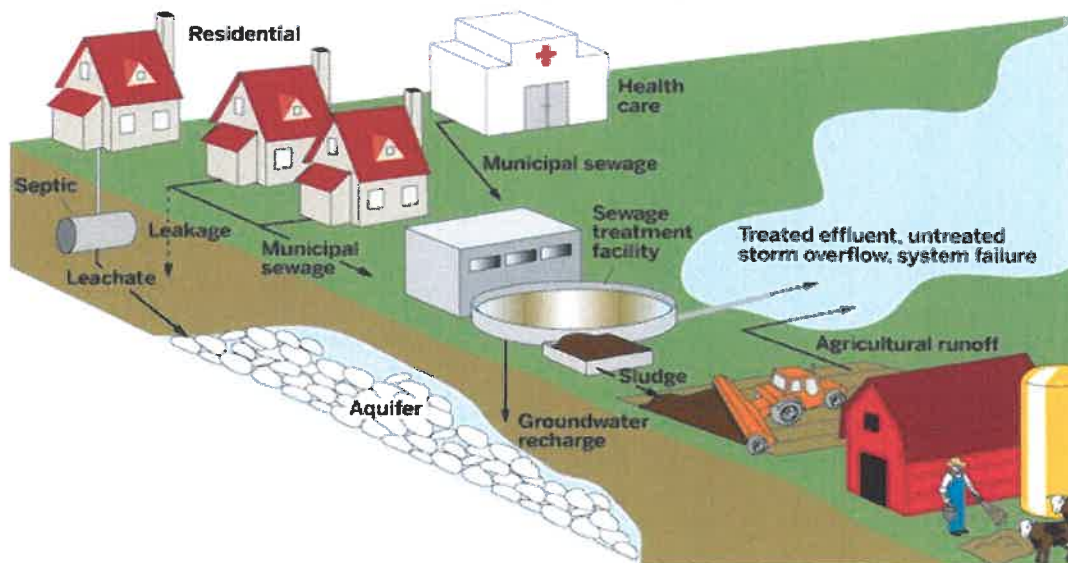
Pharmaceuticals and Endocrine Disrupting Chemicals in Groundwater

The presence of pharmaceuticals and endocrine disrupting chemicals in groundwater continues to be major concern as these chemicals are used in so many products consumed in everyday life. Endocrine disrupting chemicals are found in such products as antimicrobial soaps and disinfectants, flame retardants, plasticizers, linings in food containers (such as bisphenol A), food preservatives, shampoos, sunscreen, bug sprays, cosmetics, and many other personal care products. In addition to these products, pharmaceuticals and endocrine disrupting chemicals also enter drinking water supplies as they pass through septic tank and leach field systems, and water treatment plants. The source comes from many over-the-counter medications, veterinary drugs, prescription drugs such as cholesterol medications, natural and synthetic estrogens compounds, heart medications, steroids, and pain medications to name but a few.

The presence of pharmaceuticals and endocrine disrupting chemicals in groundwater has raised concerns regarding their effects on human health including the continued viability of antibiotic medications. Endocrine disruptors can mimic or partly mimic naturally occurring hormones in the body like estrogens (the female sex hormone), androgens (the male sex hormone), and thyroid hormones, potentially producing overstimulation. They also bind to a receptor within a cell and block the endogenous hormone from binding. The normal signal then fails to occur and the body fails to respond properly. Examples of chemicals that block or antagonize hormones are anti-estrogens and anti-androgens. Endocrine disruptors also interfere or block the way natural hormones or their receptors are made or controlled, for example, by altering their metabolism in the liver.

Because endocrine disrupting chemicals are found in such a wide variety of products; their presence appears to be ubiquitous in the environment. Bioassays of fish in the Potomac River and other bodies of water routinely find 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. Agricultural industry uses some eighty percent of antibiotics manufactured. At this time, more study needs to be done in this area to determine the appropriate course of action needed to address this concern. Given the amount of pharmaceuticals and endocrine disrupting chemicals entering the environment, recent exemptions for the agricultural industry regarding regulation of land applying biosolids from waste treatment facilities and livestock operations must be perceived as a step in the wrong direction.



Pharmaceuticals and Personal Care Products in the Environment

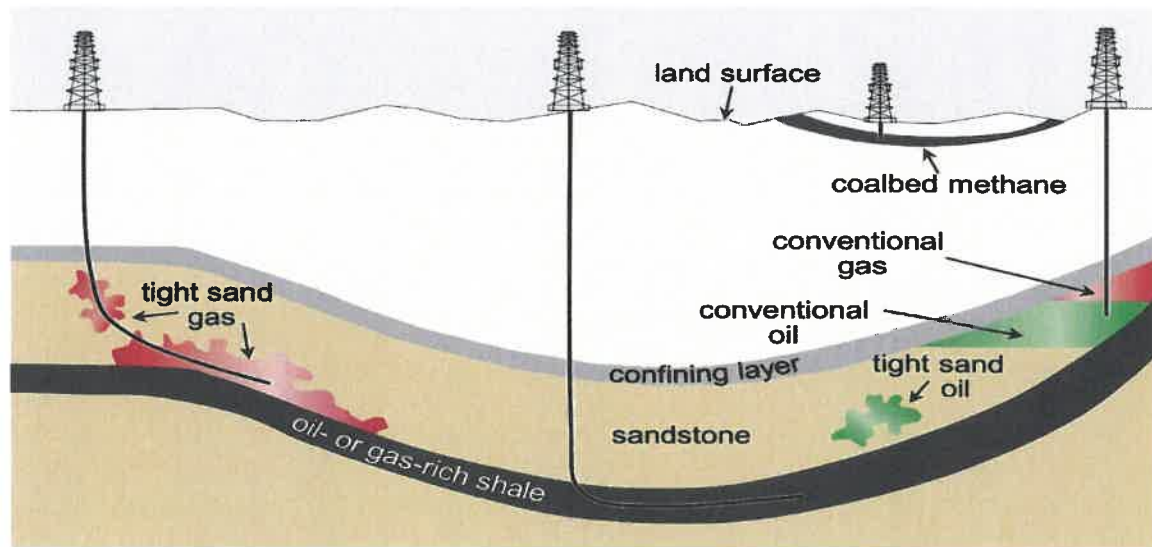
Hydraulic Fracturing in Oil and Gas Production

Hydraulic fracturing is a stimulation technique used to increase oil and gas production from underground rock formations. Hydraulic fracturing involves the injection of fluids under pressures great enough to fracture the oil and gas producing formations, primarily in tight geological formations such as the Marcellus Shale. The fluid generally consists of water, chemicals, and proppant (commonly sand). The proppant holds open the newly created fractures after the injection pressure is

released. Oil and gas flows through the fractures and up the production well to the surface.

Hydraulic fracturing has been used since the late 1940s and, for the first 50 years, was mostly used in vertical wells in conventional formations. Hydraulic fracturing is still used in these settings, but the process has evolved; technological developments (including horizontal and directional drilling) have led to the use of hydraulic fracturing in unconventional hydrocarbon formations that could not otherwise be profitably produced.

Although proximity of hydraulic fracturing activities to a drinking water resource is not in itself sufficient for an impact to occur, it does increase the potential for impacts. Residents and drinking water resources in areas experiencing hydraulic fracturing activities are most likely to be affected by any potential impacts, should they occur. However, hydraulic fracturing can also affect drinking water resources outside the immediate vicinity of a hydraulically fractured well; a truck carrying wastewater could spill or a release of inadequately treated wastewater could have downstream effects.



Schematic cross-section of general types of oil and gas resources and the orientations of production wells used in hydraulic fracturing.

Shown are conceptual illustrations of types of oil and gas wells. A vertical well is producing from a conventional oil and gas deposit (right). In this case, a gray confining layer serves to “trap” oil (green) or gas (red). Also shown are wells producing from unconventional formations: a vertical coalbed methane well (second from right); a horizontal well producing from a shale formation (center); and a well producing from a tight sand formation (left). Note: Figure not to scale. Modified from [USGS](#)

Possible Impacts of Water Withdrawals for Hydraulic Fracturing on Water Quality

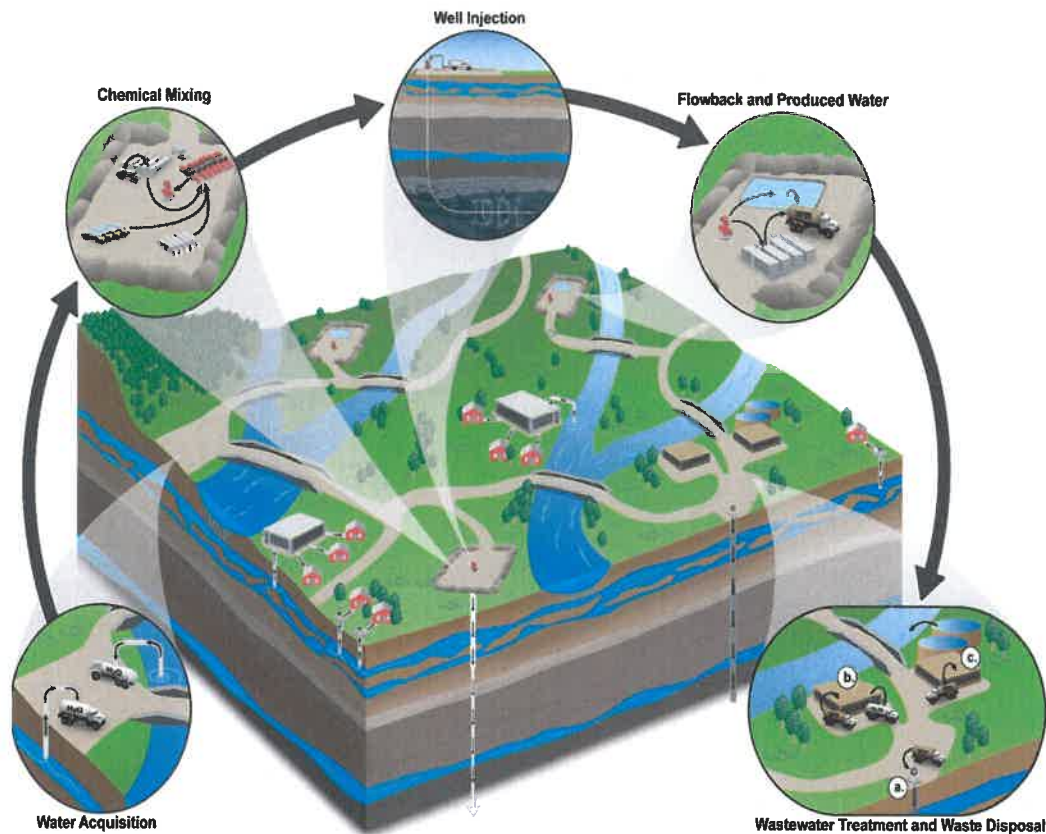
Water withdrawals for hydraulic fracturing, similar to all water withdrawals, have the potential to alter the quality of drinking water resources. Ground water withdrawals exceeding natural recharge rates decrease water storage in aquifers, potentially mobilizing contaminants or allowing the infiltration of lower quality water from the land surface or adjacent formations. Withdrawals could also decrease ground water discharge to streams, potentially affecting surface water quality. Areas with large amounts of sustained ground water pumping are most likely to experience impacts, particularly drought-prone regions with limited ground water recharge, although this is not a primary concern in West Virginia.

Surface water withdrawals also have the potential to affect water quality. Withdrawals may lower water levels and alter stream flow, potentially decreasing a stream's capacity to dilute contaminants. Case studies by the US EPA show that streams can be vulnerable to changes in water quality due to water withdrawals, particularly smaller streams and during periods of low flow. Management of the rate and timing of surface water withdrawals has been shown to help mitigate potential impacts of hydraulic fracturing withdrawals on water quality.

Chemical Mixing

Hydraulic fracturing fluids are developed to perform specific functions, including: create and extend fractures, transport proppant, and place proppant in the fractures. The fluid generally consists of three parts: (1) the base fluid, which is the largest constituent by volume and is typically water; (2) the additives, which can be a single chemical or a mixture of chemicals; and (3) the proppant. Additives are chosen to serve a specific purpose (e.g., adjust pH, increase viscosity, limit bacterial growth). Chemicals generally comprise a small percentage (typically 2% or less) of the overall injected fluid volume. Because over one million gallons of fluids are typically injected per well, thousands of gallons of chemicals can be potentially stored on-site and used during hydraulic fracturing activities.

On-site storage, mixing, and pumping of chemicals and hydraulic fracturing fluids have the potential to result in accidental releases, such as spills or leaks. Potential impacts to drinking water resources from spills of hydraulic fracturing fluids and chemicals depend on the characteristics of the spills, and the fate, transport, and the toxicity of chemicals spilled.



The Stages of the Hydraulic Fracturing Water Cycle.

Shown here is a generalized landscape depicting the activities of the hydraulic fracturing water cycle and their relationship to each other, as well as their relationship to drinking water resources. Arrows depict the movement of water and chemicals. Specific activities in the “Wastewater Treatment and Waste Disposal” inset are (a) underground injection control (UIC) well disposal, (b) wastewater treatment and reuse, and (c) wastewater treatment and discharge at a centralized waste treatment (CWT) facility. Note: Figure not to scale

Identities and Volumes of Chemicals Used in Hydraulic Fracturing Fluids

There have been 1,076 chemicals identified that are used in hydraulic fracturing fluids. This is a cumulative list over multiple wells and years. These chemicals include acids, alcohols, aromatic hydrocarbons, bases, hydrocarbon mixtures, polysaccharides, and surfactants. According to the EPA’s analysis of disclosures, the number of unique chemicals per well ranged from 4 to 28, with a median of 14 unique chemicals per well.

Analysis indicates that chemical use varies and that no single chemical is used at all well sites across the country, although several chemicals are widely used. Methanol, hydrotreated light petroleum distillates, and hydrochloric acid were reported as used in 65% or more of wells, according to disclosures analyzed

by the EPA. Only 32 chemicals, excluding water, quartz, and sodium chloride, were used in more than 10% of wells according to the EPA's analysis.

Well Injection

Hydraulic fracturing fluids are injected into oil or gas wells under high pressures. The fluids flow through the well (commonly thousands of feet below the surface) into the production zone (i.e., the geologic formation being fractured) where the fluid injection pressures are sufficient to create fractures in the rock. There are two major subsurface mechanisms by which the injection of fluid and the creation and propagation of fractures can lead to contamination of drinking water resources: (1) the unintended movement of liquids or gases out of the production well or along the outside of the production well into a drinking water resource via deficiencies in the well's casing or cement, and (2) the unintended movement of liquids or gases from the production zone through subsurface geologic formations into a drinking water resource. Combinations of these two mechanisms are also possible.

Impacts to drinking water resources from subsurface liquid and gas movement may occur if casing or cement are inadequately designed, inadequately constructed or fail.

SUMMARY OF GROUNDWATER QUALITY IN WEST VIRGINIA
United States Geological Survey
West Virginia Department of Environmental Protection Cooperative

Projects FY 2018 and 2019

Introduction

The U. S. Geological Survey (USGS) and the West Virginia Department of Environmental Protection (WVDEP) had 5 active groundwater cooperative projects during Fiscal Years 2018 and 2019. These projects were designed to provide the WVDEP with hydrologic and geologic data and included interpretative projects with respect to groundwater quality and hydrogeologic assessments to support the mission and activities of the WVDEP, and to fulfill requirements of the West Virginia Groundwater Protection Act. Projects include 1) a statewide groundwater level network operated by the USGS in cooperation with the WVDEP used for assessment of groundwater storage and drought prediction and monitoring for West Virginia, 2) a statewide borehole logging project operated cooperatively by the USGS and the WVDEP to provide critical information related to groundwater flow processes of the state's fractured-bedrock aquifers, 3) a statewide mine-pool assessment project operated by the USGS cooperatively with the WVDEP to provide the WVDEP, the Governor's Office, and other state, federal, and local agencies information related to the location, quality and quantity of groundwater available from the vast underground pools of groundwater stored in abandoned underground coal-mine aquifers, 4) a project to assess groundwater used by rural residential homeowners in areas of current and past coal mining and oil and gas development to assess the quality of groundwater available to rural homeowners that are dependent on these water sources, a project which is part of a long-term on going ambient groundwater quality project operated by the USGS in cooperation with the WVDEP and the West Virginia Department of Health and Human Resources (WVDHHR), and 5) an assessment of the hydrogeologic framework of complex fractured-rock and karst limestone aquifers in Monroe County, West Virginia. Additionally, The USGS has been working with WVDHHR on assessment of public-water supply wells in surface-water-influenced alluvial aquifers along the Ohio River.

Background

The USGS has a long history of cooperative data collection, monitoring efforts, and hydrologic studies with the WVDEP and other state, federal, county, and local agencies to provide critical data on surface- and groundwater quality, streamflow discharge, groundwater levels, aquatic health, and to better understand complex groundwater flow processes. These topics have been assessed by long-term data-collection networks and interpretative scientific studies and assessments. These data-collection efforts, long-term networks, and hydrologic assessments help to provide information that the WVDEP requires to fulfill its mission. Some of the projects date back to the inception of the West Virginia Department of Environmental Protection. Detailed descriptions of the various projects and monitoring networks follows, with associated maps and tables of sites monitored or assessed as part of on-going projects.

Statewide Groundwater-Level Network

The statewide groundwater level network is comprised of 17 wells (Table 1) with at least 2 wells in each of West Virginia’s six major climatological zones (Fig. 1), and provides state, federal, and local water-resource managers data on the current condition of groundwater levels throughout the State of West Virginia. Two new wells, one in Monroe County and one in Marshall County, were added to the network in FY 2019, and two additional wells are planned to be added in FY 2020. The data are commonly used to assess current conditions of groundwater storage, to predict the onset of a drought, and in times of drought to assess the severity of the drought with respect to groundwater storage. In many states the data are used by regulatory agencies to issue drought proclamations, and to serve as the basis for issuing voluntary or mandatory water conservation orders. During the last major drought, the data from the network were used to assess the magnitude of the drought with respect to groundwater levels statewide. At that time the statistical analysis of the data had to be computed manually, but at present the data is all automated and easily accessed in a USGS online database titled “Groundwater Watch”

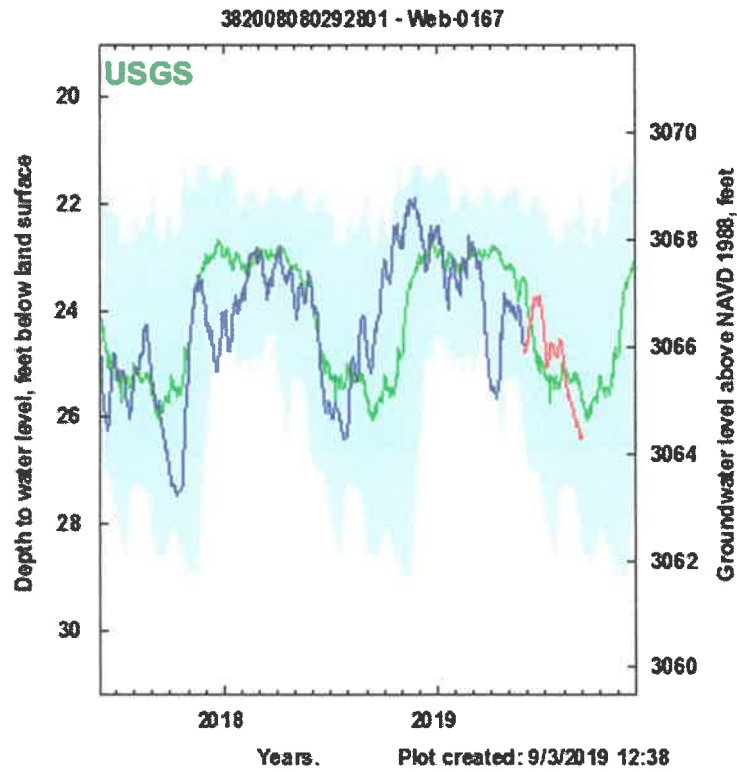
(<https://groundwaterwatch.usgs.gov/NetMapT1L2.asp?ncd=rtn&sc=54>).

Table 1. List of wells that comprise the Statewide Groundwater-Level Monitoring Network. The USGS operates the network, which is funded by the USGS and the WVDEP Division of Water and Waste Management as part of a long-term cooperative project.

USGS Station Number	USGS Well Number	Location of Well
372322081241501	Mcd-0204	McDowell County
373839081255201	Wyo-0148	Wyoming County
380653080155301	Poc-0256	Pocahontas County
381447081393101	Kan-0946	Kanawha County
382008080292801	Web-0167	Webster County
382205082304501	Way-0144	Wayne County
385849079563901	Bar-0136	Barbour County
390333078370801	Hrd-0301	Hardy County
391020080244101	Har-0165	Harrison County
391308081064201	Rit-0116	Ritchie County
391920078032201	Ber-0840	Berkeley County
392200078532001	Min-0173	Mineral County
392725077582401	Ber-0445	Berkeley County
392757077501001	Jef-0797	Jefferson County
393814079484601	Mng-0585	Monongalia County
401216080362703	Brk-0066	Brooke County
401216080362703	Jef-0526	Jefferson County
373234080320101	Mnr-0162	Monroe County
394943080342601	Mal-0413	Marshall County

Graphs in figures 2 A & B, retrieved from the USGS Groundwater Watch website, illustrate how the statistical data for long-term water levels can be used to assess current

groundwater levels across the State of West Virginia, and, in turn, how the data may be used to predict the onset of drought and assess the magnitude of a drought. Figure 2A shows long-term groundwater levels for the past 2 years in context with long-term statistical trends (maximum, minimum, and median daily water levels). Likewise, figure 2B shows daily water levels in context with statistical percentile classes. For example, the orange boxes in Figure 2B show the 10th to 24th percentiles of water levels, and the brown boxes show historical groundwater levels less than the 10th percentile, both of which may be used to assess the onset and magnitude of drought conditions.



2 A

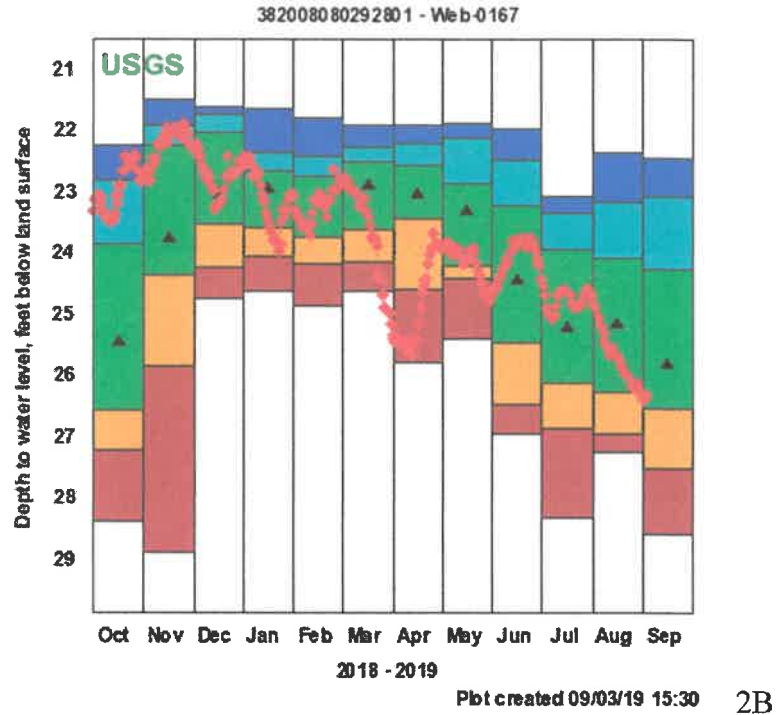


Figure 2. Graphs showing A) daily groundwater levels and B) statistical water-level trends for the Pocahontas County monitoring well with respect to long-term data.

West Virginia Aquifer Characterization and Borehole Geophysics Program

The West Virginia Water Resources Protection Act required the WVDEP to develop a plan to characterize the groundwater aquifers within the state. The West Virginia Water Resources Management Plan of 2013 identified fractured-rock aquifers in the state as an area where more information was needed to fulfill the requirements of the Act. To address these data and information gaps, the WVDEP and USGS cooperatively developed the WV Borehole Geophysics program with the purpose of collecting and analyzing data that will fulfill the requirements of the Act.

The objectives of the program are to collect borehole geophysical data within the state and use this information to calculate and understand the distribution of aquifer properties for a wide variety of fractured-rock aquifers. To complete these objectives, personnel from the USGS and WVDEP have been collecting geophysical data from groundwater wells in West Virginia since 2015. Table 2 lists the types of borehole geophysical tools employed for the study and the types of assessments that are derived from each geophysical tool. The USGS has invested approximately \$300,000 in the equipment and vehicles required for the project, and the tools purchased were specifically selected for characterization of the state’s fractured rock aquifers.

Table 2. Table listing the types of borehole geophysical tools employed for the logging project and the types of data provided by the respective tool.

Borehole Geophysical Tool	Types of data available from the tool
Downhole camera	Provides a downhole video of the borehole
3-arm caliper tool	Measures diameter of the borehole and used to assess locations of fractures within a well
EM induction tool	Measures formation conductivity and used to assess borehole lithology, and differentiate saline zones
Multi-parameter electrical tool	Measures a wide range of formation and fluid properties such as fluid resistivity, formation resistivity, water temperature, formation gamma radiation, spontaneous potential and other properties and used to assess fresh and saline water zones and differentiate formation lithology
Acoustic televiewer	Uses acoustic waves to produce an image of the borehole and used to determine fracture properties
Optical televiewer	Provides a 360-degree image of the borehole and used to determine fracture properties
EM flowmeter	Measures the flow of water in the borehole and used to assess water bearing fractures
Full wave sonic porosity	Uses sound waves to determine formation and fracture porosity.

As of June 30, 2019, There was a total of 123 wells logged with Geo-Physical Instruments. Thirty-One wells were from a previous study and 92 wells were from the borehole geophysics project that will conclude on September 30, 2019. In the report for the analysis for all wells will be available in the fall of 2021.

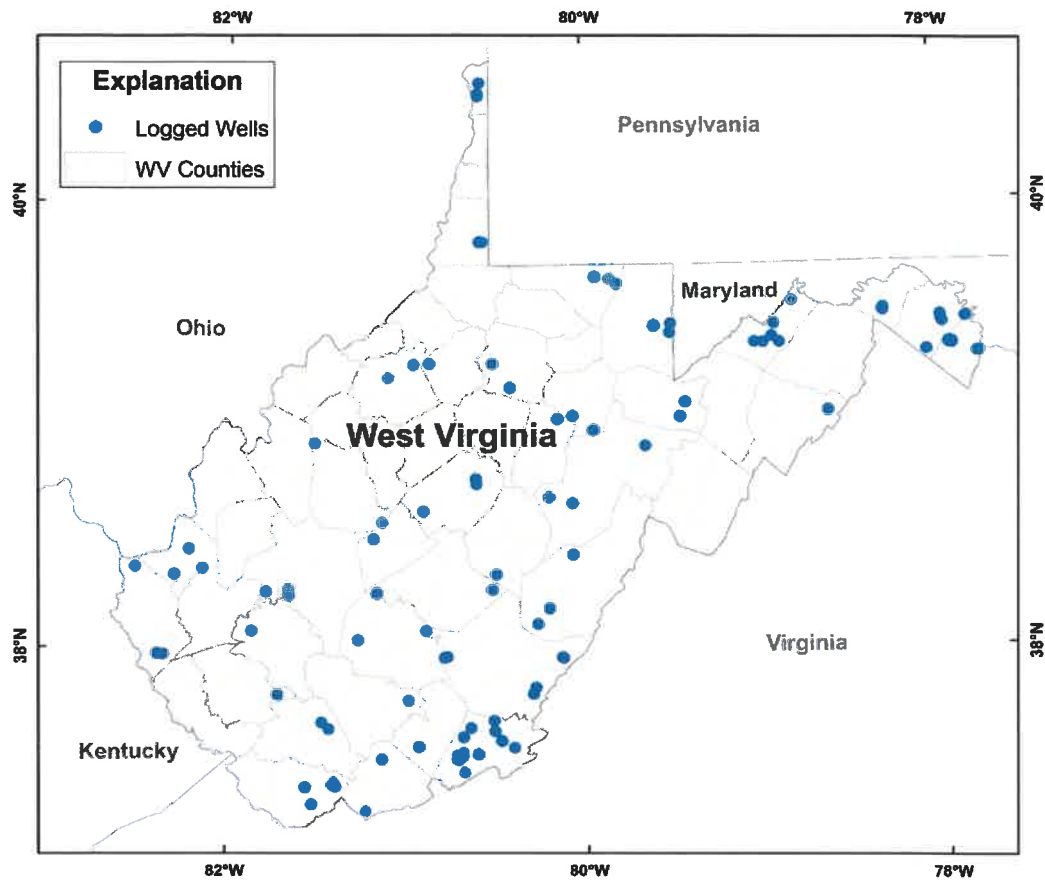


Figure 3. Map showing locations of wells logged as part of the Statewide Borehole Geophysics Program and previous USGS projects through August 2019.

Statewide Water-Quality Assessment of Underground Coal Mine Aquifers

In the West Virginia Water Resources Management Plan of 2013, abandoned underground coal mine aquifers (AUCMA; also referred to as “mine pools”) were identified as an important water resource. AUCMA’s in West Virginia are not fully understood on a statewide basis and further investigation is needed to determine their applicability and spatial distribution. As a result of numerous investigations on AUCMAs over the past several decades, a multitude of water-quality data have been collected (Fig. 4) and were compiled in a USGS Data Release in 2017.

With these data published in a standard format, it was possible for the USGS and WVDEP to develop a cooperative project to investigate the quality of groundwater in AUCMAs throughout the state and use previously collected data to characterize, develop, and protect this resource. Specific objectives of this project include determining AUCMA suitability for different uses, understanding the resources spatial distribution, and providing a basis for future needs. Statistical and geospatial techniques will be applied to

investigate the data set and achieve the objectives of the project. After completion of the initial USGS Data Release, this project began in March of 2018. Final reports and products are scheduled to be completed by the end of March 2020.

The expected benefits from this project include the ability to focus further investigations to 1) determine the suitability of the resource for different uses such as public supply, agricultural use, underground injection, and industrial use, 2) understand the resource for more efficient development of water resource infrastructure, 3) gain an increased understanding of the resources spatial distribution to help focus efforts in resource protection, and 4) provide a basis for future characterization needs.

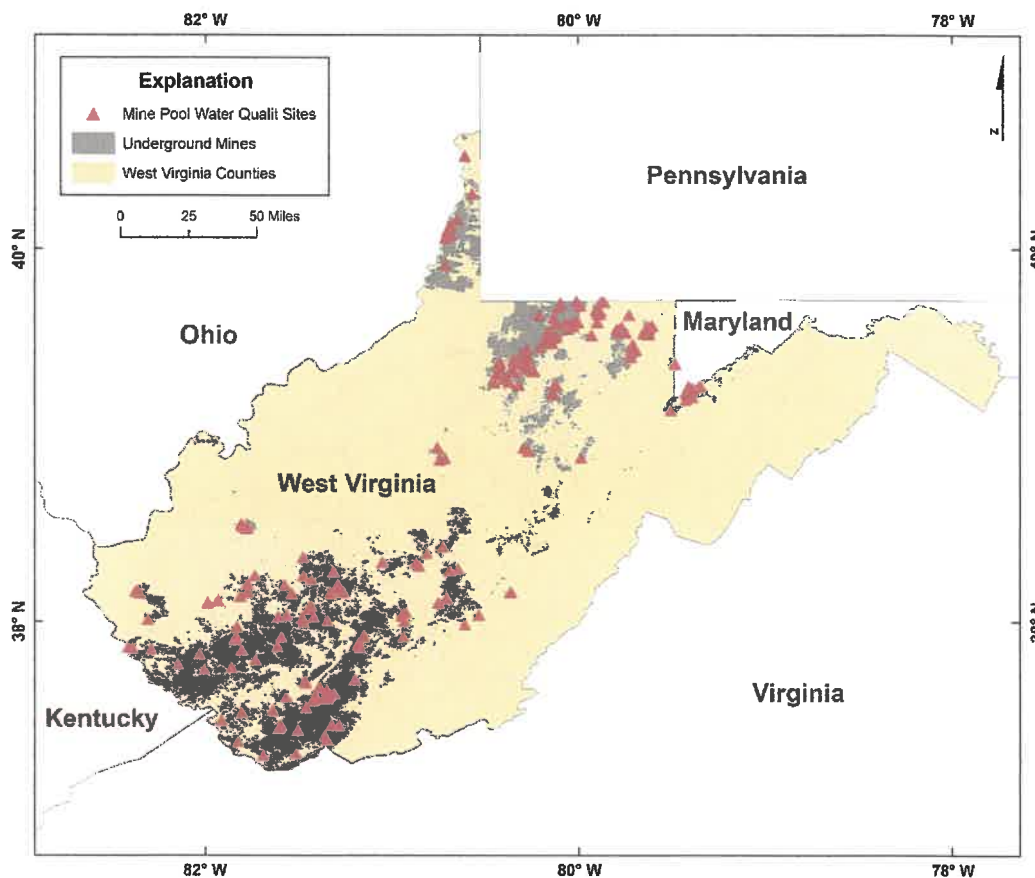


Figure 4. Map showing point locations of abandoned underground coal mine aquifer water-quality sites.

Assessment of Drinking Water Quality in Rural Areas with Active or Legacy Coal Mining or Oil and Gas Development

This project consists of two primary objectives: 1) to assess groundwater quality in a 7-county (Fig. 5) area in West Virginia’s southern coalfields and determine the quality of water available to rural residential homeowners in areas of past or current coal mining, and 2) to assess groundwater quality in an area of heightened Marcellus Shale “wet gas” development (Fig. 6). In addition to examining relations among groundwater quality with respect to coal mining and

shale gas production, this study will provide a benchmark of current conditions for future comparisons. A tertiary but equally important objective is to collect groundwater-quality data in areas of the state that have been under represented in previous studies.

This project is currently on-going and is scheduled to be completed in FY 2020. At present, all water-quality sampling activities, both the southern coalfields and the “wet gas” area, are complete and all analytical results have been received by the Center. Analytes assessed for each respective study are listed in Table 3. A report summarizing the groundwater quality of southern West Virginia’s coal mining region will be released in the Fall of 2019. The report for the “wet gas” study is currently in preparation and will be available to the public in the Spring of 2020.

Table 3. Water-quality characteristics, major ions, metals, trace elements, nutrients, radon-222, and fecal indicator bacteria and method detection limits for samples to be collected for the coal mining region water-quality assessment¹, the Marcellus Shale wet gas region water-quality assessment², or both assessments³. [mg/L, milligrams per liter; µg/L, micrograms per liter, pCi/L, picocuries per liter; col/100 mL, colonies per 100 milliliters of sample; µS/cm, microsiemens per centimeter, ng/L, nanograms per liter].

Analyte	Method reporting limit	Analyte	Method reporting limit	Analyte	Method reporting limit
Aluminum ³	3 µg/L	Molybdenum ³	0.05 µg/L	Uranium-234 ²	0.1 pCi/L
Antimony ³	0.027 µg/L	Nickel ³	0.2 µg/L	Uranium-235 ²	0.1 pCi/L
Arsenic ³	0.1 µg/L	Nitrogen, ammonia ³	0.01 mg/L	Uranium-238 ²	0.1 pCi/L
Barium ³	0.25 µg/L	Nitrogen, nitrite ³	0.001 mg/L	Zinc ³	2 µg/L
Beryllium ³	0.02 µg/L	Nitrogen, nitrite + nitrate ³	0.04 mg/L	Alkalinity ³	0.1 mg/L
Bromide ³	0.03 mg/L	Nitrogen, total ³	0.05 mg/L	Bicarbonate ³	0.1 mg/L
Cadmium ³	0.03 µg/L	Phosphorus, phosphate, ortho ³	0.004 mg/L	Carbonate ³	0.1 mg/L
Calcium ³	0.022 mg/L	Potassium ³	0.03 mg/L	Dissolved oxygen ³	0.1 mg/L
Chloride ³	0.02 mg/L	Radon-222 ³	20 pCi/L	pH ³	0.1 units
Chromium ³	0.3 µg/L	Radium-224 ²	1 pCi/L	Specific conductance ³	1 µS/cm
Cobalt ³	.050 µg/L	Radium-226 ²	1 pCi/L	Total coliform ¹	1 col/100mL

Analyte	Method reporting limit	Analyte	Method reporting limit	Analyte	Method reporting limit
Copper ³	0.8 µg/L	Radium-228 ²	1 pCi/L	<i>E. coli</i> ¹	1 col/100mL
Fluoride ³	0.01 mg/L	Selenium ³	0.05 µg/L		
Gross radioactivity ¹	3 pCi/L	Silver ³	0.02 µg/L	Methane ²	0.16 ng/L
Gross radioactivity ¹	4 pCi/L	Sodium ³	0.06 mg/L	Ethane ²	0.30 ng/L
Iron ³	4 µg/L	Strontium ³	0.2 µg/L	Propane ²	0.44 ng/L
Lead ³	0.04 µg/L	Sulfate ³	0.02 mg/L	Butane ²	0.58 ng/L
Magnesium ³	0.011 mg/L	Thallium ³	0.03 µg/L	Pentane ²	0.72 ng/L
Manganese ³	0.2 µg/L	Total Dissolved Solids ³	20 mg/L	Hexane ²	0.86 ng/L
Mercury ²	0.005 µg/L	Uranium ³	0.014 µg/L		

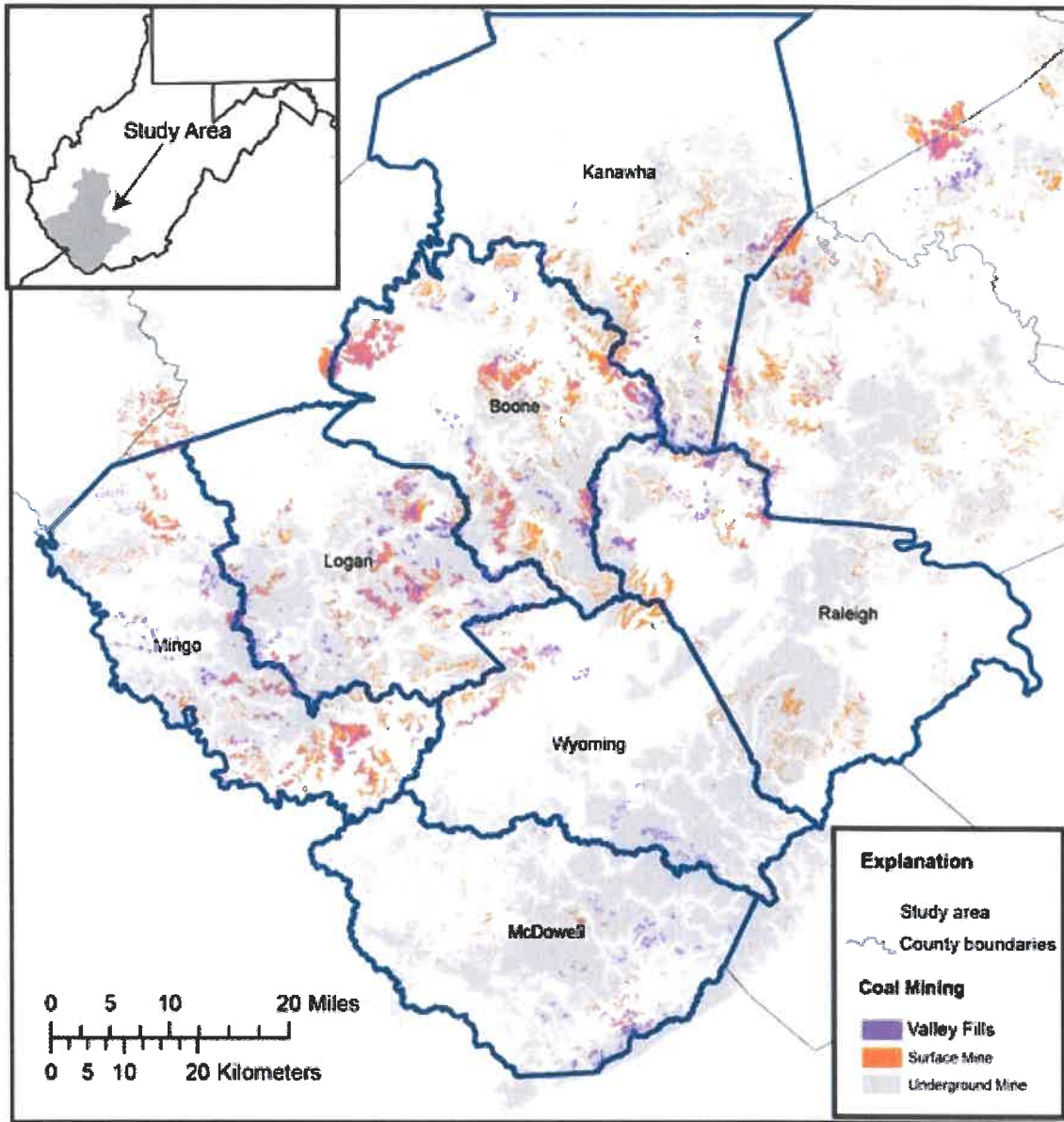


Figure 5. Map showing area of study for the coal mining region water-quality assessment.

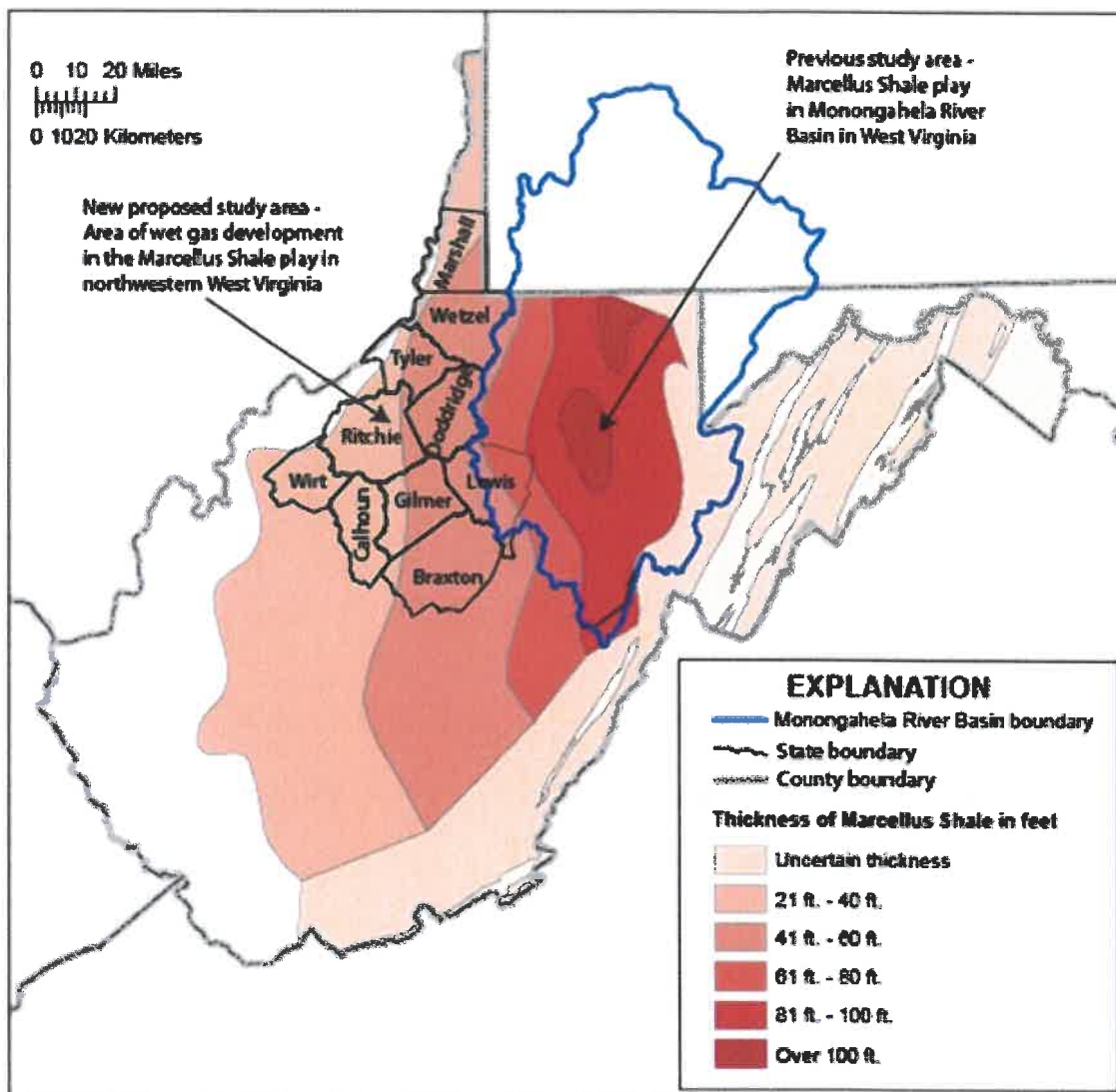


Figure 6. Map showing area of study for the Marcellus Shale “wet gas” region water-quality assessment.

Monroe County Groundwater Resource Assessment and Monitoring Project

A countywide assessment of the groundwater resources in Monroe County was initiated in October of 2017 and is in the final stages of field data collection activities. Major objectives of the project include 1) development of a hydrogeologic framework for Monroe County including sinkhole mapping and fracture trace and lineament analysis, 2) determining directions of groundwater flow by development of a countywide water table (potentiometric surface) map and by conducting tracer tests with fluorescent dyes, 3) water budget assessment and analysis of the availability of groundwater resources in the

County by interpreting soil water budget recharge estimates and correlating those estimates with similar recharge estimates made for key index stream gaging stations, 4) assessing groundwater flow velocities and potential for contaminant transport by conducting two groundwater tracer tests using fluorescent tracers, and 5) characterizing fracture, bedding plane, and lithologic controls on groundwater flow by collecting borehole geophysical data for as many unused wells as can practically be located within the county.

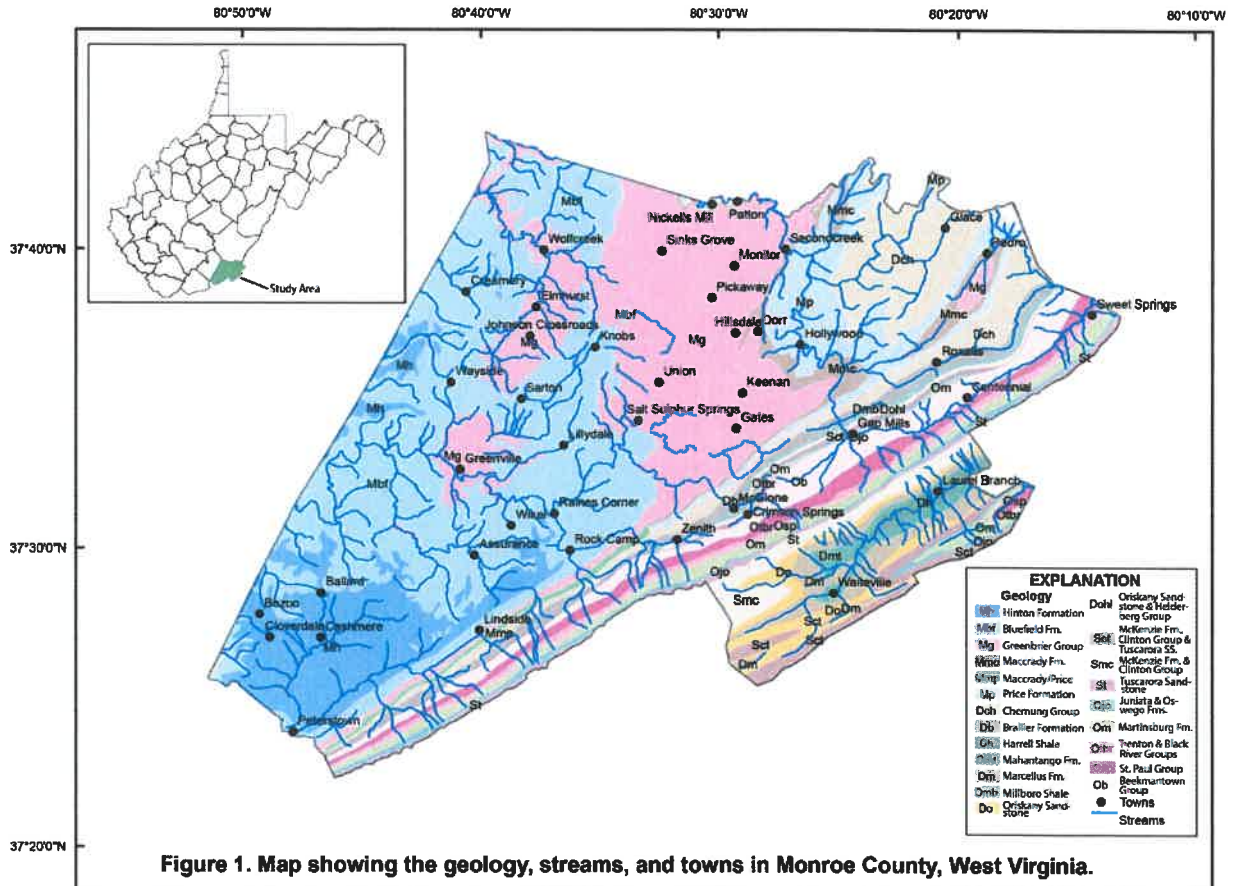


Figure 7. Map showing area of study and geology for the Monroe County Groundwater Resources Assessment.

All field activities will be completed by the end of September 2019. Data analysis will be completed in 2020, and a report summarizing the findings of the study is scheduled to be available in the Fall of 2020.

Susceptibility of Surface-Water-Influenced Groundwater Supplies in the Ohio River Alluvial Aquifer

Surface-water-influenced groundwater (SWIG) systems include any underground public-water supply (PWS) which is heavily influenced by the quality and quantity of surface water in the immediate area of a well. Despite the fact that alluvial aquifers have a relatively small footprint in comparison to other aquifers in West Virginia, these sand

and gravel aquifers are the primary water supply for numerous large communities along the Ohio River (Wheeling, Parkersburg, Point Pleasant, etc.). Protection of PWSs requires an understanding of aquifer interactions with the Ohio River and tributary streams that contribute to the chemistry of groundwater from pumping wells.

To address questions concerning SWIG systems in the Ohio River alluvial aquifer, the USGS and WVDHHR have developed a project to understand the spatial differences in aquifer susceptibility to contamination and surface water infiltration. The purpose is to characterize the ground water-quality, determine recharge sources, and estimate age of groundwater in the Ohio River alluvial aquifer in the State of West Virginia. The results of this study will be used to identify field locations for further investigations into the heterogeneities controlling riverbank filtration.

Several groundwater wells from PWSs along the Ohio River have already been sampled this year as part of the USGS National Water Quality Assessment Project. At least 10 additional groundwater wells, and 4 surface water sites, are scheduled to be sampled this winter. The analyte list (Table 4) supplies the necessary water-quality data to characterize groundwater quality, determine groundwater age, identify source water contributions to PWSs, and assess PWS susceptibility to surface contamination. This project began in July of 2019 and reports and products for this study are scheduled to be completed by the end of 2021.

Table 4: Analyte groups planned to be sampled for the Ohio River alluvial project
 *Each analyte group may contain multiple individual analytes

WV DHHR Groundwater Analyte Groups
Major Inorganics
Nutrients
Dissolved Organic Carbon
Trace Elements
Bacteria
Age Dating
Stable Isotopes
Per-polyfluorinated alkyl substances
Radon
Pesticides
Volatile Organic Compounds
Semi Volatile Organic Compounds

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

C. Groundwater Program

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, authorized by 47 CSR 59 Monitoring Well Regulations, was established to ensure industry, well owners, and the regulatory community that all monitoring wells and boreholes are to be installed and abandoned by knowledgeable drillers.

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 the certification of monitoring well 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, 2019, the Monitoring Well Driller Program has certified 637 monitoring well drillers. There are currently 217 active monitoring well drillers, and 420 inactive monitoring well drillers, 41 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, testing dates, an application for the testing and training and the required address verification form. The recertification of the monitoring well drillers is handled directly by the Monitoring Well Driller Program. Recertification requires a fee and the completion of an address verification form.

To track the driller certification and recertification process, the 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.

The driller module of ERIS contains a listing of drillers who are currently certified and those whose certification has expired. This module is capable of generating and tracking certification and recertification correspondences, invoices for fees, certification card, and address verification forms. Reports can be generated from this module containing drillers' addresses, initial certification date, certification date, certification expiration date, driller registration numbers, and fee invoicing information.

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V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

3. Groundwater Program

e. Monitoring Well Installation and Abandonment

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

As is the case of any rule, there are unforeseen circumstances that require alternatives and exceptions when compliance with the rule is unfeasible 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 both electronic and paper files to document the installation, completion, and abandonment and groundwater monitoring wells, boreholes, and geoprobe locations. The electronic submission software became available as of 2003, with a format that consists of drop-down menus areas for written comments.

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

Year	Completion Forms	Abandonment Forms	Modification Forms	Comments	Total	Approved
2017 July to Dec	101	98	0	3 units rejected for non-compliance	199	196
2018 Jan to June	79	143	1	15 units rejected for non-compliance	223	208
2018 July to Dec	153	139	0	8 units rejected for non-compliance	292	284
2019 Jan to June	179	205	0	3 units rejected; 15 approved for waiver	384	366

Year	Completion Forms	Abandonment Forms	Modification Forms	Comments	Total	Approved
Total from July 2017 till June 2019	512	585	1	29 rejected for non-compliance 15 approved for waiver	1098	1054

All forms are reviewed for completeness and correct information. The major deficiencies noted are casing and screen depths that are out of order and data that was reported after the 60-day required reporting period.

Complaints and Calls

The Groundwater Program of the Division of Water and Waste Management has responded to numerous requests for information. These usually concern monitoring well design standards, documentation, variances, and the location of old wells. 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 not 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. UIC permit applications are promptly processed and no current backlog of applications exist. 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.

The UIC program now requires submitting discharge monitoring reports (eDMRs) electronically for required reports and water samples beginning July 1, 2011. Work continues on the new electronic data submission system. Information regarding the ePermitting system can be found at the DEP website: <https://apps.dep.wv.gov/eplogin.cfm>.

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 ensure that all injected fluids meet WVDEP groundwater quality standards, maximum contaminant levels (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 an 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 best management practices (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 ensure 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.

Groundwater/UIC Program – Division of Mining and Reclamation

The Division of Mining and Reclamation (DMR) oversees all mining activities. This includes reviewing permit applications for surface and underground coal mines, preparation plants, coal loading facilities, haulage ways, and coal related dams. DMR also reviews permit applications for non-coal quarry operations (sand, gravel, limestone, etc.) and for National Pollutant Discharge Elimination System (NPDES) permits for coal and non-coal mining operations. DMR enforces compliance through regular inspections and oversees site reclamation to ensure the integrity of land and water resources when disturbed by mining operations and related activities.

Groundwater Protection Rule for Coal Mining Operations — 38 C.S.R. 2F

Because mineral mining, both coal and non-coal, is ubiquitous in West Virginia, protecting the quality and quantity of the groundwater from adverse impacts from these activities is imperative to both the environment and to human health and safety. Groundwater protection at mine sites was established more than 20 years ago in West Virginia with the passage of the Legislative Rule entitled *Groundwater Protection Regulations for Coal Mining Operations* (38 C.S.R. 2), and the policies and practices established by DEP's DWWM and DMR to enforce it. The resulting changes in the handling of surface activities and substances at mine sites have already protected many public and private water sources, both existing and potential, from damage due to mining.

Today, the Groundwater Protection Program is an integral part of DMR's Permitting and Inspection & Enforcement procedures for mine sites. Groundwater Protection Plans (GPPs) are incorporated in and essential to mining permits. Further, all such permits contain terms and limits that provide for protection of the subsurface environment. The operator is required to submit GPPs, where applicable, with its initial

permit application, which, when approved, becomes an enforceable part of its mining permit. These GPPs must be updated, if necessary, at each permit reissuance.

Where required, Groundwater Protection Plans are included in the National Pollutant Discharge Elimination Systems (NPDES) permit application. The GPP module requires the applicant to provide specific information, such as:

- ❖ All manmade potential contaminants and at the facility;
- ❖ The areas of the site where potential contaminants are stored and the type and size of container or storage system used;
- ❖ Existing protective controls for the contaminants at each site;
- ❖ Spill Response Plan that will be followed should a leak or spill of a potential contaminant be detected at the facility;

- ❖ Training requirements with procedures and schedules for initial and refresher training for employees, contract workers, and site visitors concerning their involvement and the requirements of the Spill Response Plan for the site; and

- ❖ Inspection procedures for inspections and routine maintenance operations to insure the Groundwater Protection Plan is in place and in good working order.

West Virginia Surface Mining Reclamation Rule — 38 C.S.R. 2

Each mining permit application contains baseline groundwater information used in the determination of the proposed operation's probable hydrologic consequences (PHC). The PHC identifies currently used or significant groundwater resources that may be impacted through the mining process. If the PHC indicates that adverse impact may occur to the hydrologic balance or that acid forming or toxic forming material is present that may result in contamination of surface or groundwater supplies, then the operator shall provide additional information to evaluate such probable hydrologic consequences and to plan remedial and reclamation activities.

The location, ownership, and use of known existing wells, springs, and other groundwater resources, including discharges from other active or abandoned mines on the proposed permit area and adjacent areas, are identified in permit applications to make a reasonable approximation of the baseline groundwater conditions and use. The permit application also includes a groundwater monitoring plan consisting of parameters based on current and approved postmining land uses and all hydrologic balance protection objectives. Monitoring and analysis shall occur no less frequently than quarterly.

The PHC information is used to develop Hydrologic Reclamation Plans (HRPs), which identify remedial and reclamation activities concerning both surface and groundwater resources. The plan is specific to the local hydrologic conditions and

addresses the potential adverse hydrologic consequences identified in the PHC determination. The HRP contains a description of the steps to be taken during the mining and reclamation phases to minimize disturbances to the hydrologic balance within the permit and adjacent areas, to prevent material damage outside the permit area, to meet applicable federal and State water quality laws and regulations, and to protect the rights of present water users. Components of the HRP include:

- ❖ Avoiding acid or toxic drainage;
- ❖ Preventing additional contributions of suspended solids;
- ❖ Providing for water treatment facilities when needed;
- ❖ Controlling drainage;
- ❖ Restoring, protecting or replacing water supply of present water users;
- ❖ Describing measures that will be taken to replace water supplies that are contaminated, diminished or interrupted; and
- ❖ Identifying water replacement, which includes quantity and quality descriptions including discharge rates or usage and depth to water

DMR completes a Cumulative Hydrologic Impact Assessment (CHIA) for each new mining operation. This evaluation determines whether the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area. "Material damage to the hydrologic balance outside the permit area" means any long term or permanent change in the hydrologic balance caused by surface mining operations, which has a significant adverse impact on the capability of the affected water resource(s) to support existing conditions and uses.

Underground Injection Control Program — 47 C.S.R. 13

The Underground Injection Control (UIC) Program, as discussed above for non-coal industries and below for the oil and gas industry, also applies to mining, primarily through the permitting of Class 5 injection wells. Type 5x13 wells are used for the disposal of coal preparation plant slurry or acid mine drainage treatment sludge into abandoned underground mine voids, and Type 5G30 wells are used for the transfer of mine water. Information about the proposed injection activity comes from the permittee via the UIC — Mining Application form. This required data includes maps, drawings, narratives and laboratory analyses, among other information. When necessary, a field inspection by DMR's UIC personnel, accompanied by a DMR inspector and the applicant, confirms the submitted data and adds further information.

DMR has placed great emphasis on coordinated permit review across all Permitting and Inspection & Enforcement programs where underground injection control is concerned. All new proposed UIC permits as well as existing permit reissuances involve a coordinated review of the application. This involves the UIC staff located in the agency's headquarters location, as well as staff in the regional

field office(s) from both the Inspection & Enforcement section and the Permitting section.

The operator is required to include Groundwater Protection Plans with its UIC permit application. This is the same plan as submitted with the associated Mining and NPDES permits and it is reviewed concurrently by these sections during permit review. Additionally, all draft UIC — Mining permits are submitted to the West Virginia Geologic and Economic Survey (WVGES), the West Virginia University Hydrology Research Center (WVU), and the Federal Mine Safety and Health Administration (MSHA) for review and comment. Finally, input from the public via the 30-day public comment period and from the WVGES, MSHA, and WVU completes the data necessary to issue the permit. After issuance, continued monitoring as required by the permit plus observations by DMR's inspectors assure a continuous influx of information about the site so that adjustments can be made to GPPs, if necessary.

Proposed Programs and Projects

Currently, DMR is working with the agency's Information Technology Office to implement a central data repository, which will provide access to data across divisions within DEP. This will streamline data analysis and reporting functions for comprehensive permit review.

UIC Industrial/Commercial & Stormwater Permitting

The growing infrastructure and economy of West Virginia is a pleasant sight. 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 groundwater moves very 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 also spread to the surface water through its natural outlets. The exception to this is contamination in areas underlain by limestone, which may contain numerous voids ranging in size from small fissures to large caverns. This area is referred to as karst terrain. In these areas, groundwater may travel very rapidly, even flowing under mountains, carrying contamination that can swiftly spread into sources of drinking water.

The permitting of Underground Injection Control (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 regard 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 geologist and one environmental resource analyst. As the number of industrial/commercial permits increases, 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. Four (4) UIC Industrial/commercial permits and sixteen (16) UIC Stormwater permits have been issued during this reporting period.

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.

A major challenge is a lack of groundwater mapping. A major achievement has been the groundwater team's focus on groundwater protection plans for campgrounds. Due to the upsurge in drilling of natural gas wells, the number of campgrounds has skyrocketed. Many of the campgrounds fall outside the UIC permitting criteria due to the number of people served by the septic system. UIC Program personnel worked closely to gather information that led to whether or not a UIC permit would be needed, and what comprised the combined waste stream of sanitary and chemical waste.

UIC regulations require completed groundwater protection plans (GPPs) for each UIC permit and or other facilities that don't require a UIC permit but discharge class V

waste underground. An example of a facility needing a GPP that doesn't meet the criteria for a UIC permit would be an auto-repair garage with an on-site sewage disposal system that serves less than 20 people in a day, has floor drains in the garage bays, and the drains lead to oil water separators that do not discharge but are regularly pumped out. The GPP assists the permittee in understanding potential harm to groundwater resources based on their operations and how to reduce harmful impact to groundwater from sewage discharge. In the GPP, permittees describe the types of wastes that are disposed to the underground and into their leachfield and how they plan to keep fats, oils and grease out of the system where operations are cooking or washing dishes.

Sanitarians and developers were educated regarding UIC Program requirements and research was conducted regarding the potential contamination of recreational vehicle (RV) waste. The result was the development of GPPs that keep chemicals out of the groundwater. The UIC Program is developing a standard operating procedure, in conjunction with the state health department wherein it describes the role of UIC Program and sanitarians and possible situations to ensure consistency of decisions regarding the application of UIC regulations. Data is collected from sanitarians, manufacturers, waste disposal system installers, designers, labs, concerned citizens, applicants, and potential permittees. UIC field inspectors and applicants supply GIS info which goes to the health department database for source water protection purposes. A challenge we face in the groundwater program is mapping known permitted sites and comparing this data to drinking water sources.

The program sends out reminder letters informing permittees that it is time or past time to remit payment for UIC invoices or fees and to reapply for permit renewal or the need to pump their septic tanks. The UIC program reviews annual reports and grease trap inspections on a monthly basis to assure that permittees are maintaining cleaning schedules and maintaining their septic tanks and grease traps.

During this reporting period the UIC program participated in a successful project that provides permittees a safe, online portal to use when paying fees by credit card. Payments go directly to the Treasurer's office, saving time on the part of DEP staff, and provides permittees with receipts.

The UIC Program uses ERIS to manage large amount of information related to responsible parties, financial matters, environmental reports, permit transfers, and to track applications and approved/closed permitted activities. The UIC Program continues implementing refinements in providing information to potential applicants from the DEP.

The Groundwater Program is currently undergoing a groundwater database (GWDB) project in which all programs under the groundwater team will be utilized in the creation of this database. The project is anticipated to incorporate all functions to be electronically based whereas currently most of the groundwater programs are handled manually on paper. The GWDB will be able to move electronic files into the ApplicationXtender program and generate several kinds of reports to get a more detailed picture of what is occurring at a site, how certain pollutants react with groundwater and

how they move throughout the substrate to better understand where remediation and clean-up of spills need to occur. Tracking systems will be incorporated into the GWDB whereas now most tracking is done manually. The GWDB will be interactive and save time from having to look up general information and will facilitate history feedback.

Six (6) new UIC sewage permits were issued during this reporting period. Four (4) UIC sewage permits were modified during this reporting period. Eighty (80) UIC sewage permits were renewed during this reporting period, and five (5) UIC sewage permits were transferred during this reporting period.

Enforcement

The enforcement of Groundwater/UIC regulations is primarily dependent on Groundwater/UIC staff with some assistance from the Office of Environmental Enforcement (OEE). Although the major enforcement steps are outlined in 47CSR13, "Underground Injection Control" and 47CSR58 "Groundwater Protection Rule", 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 Groundwater / UIC inspections and UIC enforcement actions. Duties include making sure facility owners and operators are in compliance with all applicable rules and regulations. The EPA UIC reporting definition for high priority wells has been changed to state wide instead of well head protection areas. WV has primacy over the federal UIC program. During this reporting period, the USEPA has recently streamlined and modernized UIC reporting to a web-based system (UIC Data Application) which the WVDEP Groundwater/UIC program has adopted.

Inspections

Groundwater/UIC inspections are conducted at businesses and industrial facilities such as factories, mills, quarries, electric power generating facilities, and sites not serviced by public sewage disposal plants such as non-residential/multiple dwellings i.e. trailer parks, campgrounds, schools and apartment complexes. Inspections are conducted based on a statewide strategic geographic plan developed during this reporting period which involves a bi-weekly rotation of county groupings. On occasion, county sanitarians in selected watersheds are contacted for areas that are not serviced by a public sewage disposal plant. Inspections may focus on wellhead-protected areas. The regional Environmental Enforcement Inspector is sometimes contacted to let him / her know that the Groundwater/UIC program will be conducting inspections in a particular area and arrange for him / her to accompany the inspector if desired.

In addition to routine UIC inspections of permitted facilities, suspected Class 5 UIC wells are inventoried and inspected to determine proper classification. Information on suspected disposal wells comes from the Class 5 UIC inventory and database, complaints, request for permits, referrals from other agencies, or discovered upon routine

inspections. During Groundwater/UIC inspections, which are sometimes multimedia with other programs or agencies, a Groundwater/UIC inspection form is completed on site. The owner/operator is verbally informed of the status of any UIC well observed during an inspection. If the facility has a Class 5 UIC 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. Best Management Practices (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 Groundwater/UIC inspector collects GPS locational data on underground storage tanks (USTs) and aboveground storage tanks (ASTs) for the Bureau of Public Health for wellhead protected areas and for the Tank Program at WVDEP. A Review of a facility's Groundwater Protection Plan (GPP) or collection of information for the facility to obtain a GPP is also done during an inspection.

As part of the inspection process, GPS locational data is downloaded, and databases updated. Other programs or agencies may be notified if environmental concerns exist that may fall under another purview. The permitting process and/or enforcement actions are initiated as necessary.
During this reporting period:

- ❖ 597 Groundwater/UIC inspections conducted, GPS coordinates recorded for inspections conducted
- ❖ 52 Motor Vehicle Waste Disposal Wells (MVWDWs) were discovered and plugged with concrete
- ❖ 21 Motor Vehicle Waste Disposal Wells (MVWDWs) were discovered and verified connected to PSD systems
- ❖ 212 GPPs reviewed
- ❖ 83 verbal enforcements actions were given to owner/operators of facilities with follow-ups to ensure compliance. Five were for truck wash basins that adopted leak detection and 7seven were for sumps that were lined for secondary containment to meet groundwater regulations.
- ❖ Two written enforcement actions for UIC compliance
- ❖ Collected data on 490 Above Ground Storage Tanks (ASTs) and 54 Underground Storage Tanks (USTs)
- ❖ Four sinkhole mitigations inspected for compliance, one was an immediate public safety concern
- ❖ Nine Groundwater Monitoring Variance well facilities were inspected for compliance

- ❖ Seven Wood Treating facilities and associated groundwater monitoring wells were inspected for compliance
- ❖ Conducted groundwater sampling at five existing remediation sites to help verify groundwater quality status. Observed groundwater sampling events at eight other sites.
- ❖ Assisted the WV Dept. of Agriculture sampling various private water wells in the eastern panhandle (Jefferson and Berkeley Counties) testing for potential pesticide issues.

Groundwater/UIC Outreach

The Groundwater/UIC program personnel provide technical assistance to all owners/operators of facilities, WVDEP, OEHS, and WVDA personnel throughout the state. The Groundwater/UIC program personnel continues to work with and educate county sanitarians, the regulated community, and the public on all groundwater and UIC issues.

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, permit the injection of subsurface releasing compounds (SRC) used in the remediation of contaminated soil and groundwater. Other Rule Authorizations may be issued for use of approved septic systems in process of obtaining a class V UIC sewage permit.

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 or the addition of electron acceptors or donors. Other sites are treated with injections of food grade molasses, lecithin, or other nutrients may be used.

In addition to remediating hydrocarbons, other SRCs may be used to remediate chlorinated hydrocarbons, metals, and chlorinated biphenyls using hydrogen releasing compounds or other reducing agents. Thirty-one Rule Authorizations have been issued 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.

g. Groundwater Program Remediation Activities

Since 1991, the remediation section of the Groundwater Program has worked on more than 500 sites. There are approximately fifty-two active remediation projects which were active during this reporting period. This includes those remediation sites that have been issued Rule Authorizations for the injection of subsurface releasing compounds for groundwater remediation.

These sites vary between equipment yards, above-ground releases (such as from truck wrecks), 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, metals or chlorinated solvent contamination.

The Groundwater Program is the lead state agency at many of these locations. At other sites, the Groundwater Program advises other DEP programs regarding remediation efforts. In general, the Groundwater Program handles those sites with groundwater and soil contamination that do not fit under some other regulatory authority. Compliance with the remedial strategies suggested by the Groundwater Program depends a great deal on the responsible party's willingness to complete the work.

During this reporting period, twenty-three No Further Action letters have been provided by the Groundwater Program to those sites where the contamination has been successfully remediated. The Groundwater Program has also provided advice to numerous other sites and has referred sites to other WVDEP groups. As of the end of June 2019, twenty-one sites are active with on-going investigation or remediation.

The following is a list of the sites that the Groundwater Program worked on between July 1, 2017 and June 30, 2019.

County	Facility	Watershed	Contaminant(s)	Comments
Berkeley	Al's Auto 2904 Charles Town Road Kearneysville WW	Potomac River Drains	Petroleum Hydrocarbons, Volatile Organic Compounds	Continuing remediation, gauging, recovery, and monitoring.
Monongalia	Brock Oil Brock Resources Inc 3479 Earl Core Road, Morgantown	Monongahela	Petroleum Hydrocarbons, Volatile Organic Compounds	Continuing remediation, gauging, recovery, and monitoring.
Kanawha	Chevron Phytoremediation Cabin Creek	Lower Kanawha	Petroleum Hydrocarbons	Continuing remediation, and monitoring.
Wood	City of Vienna 12th St. AST tanks	Middle Ohio South	Petroleum Hydrocarbons	Soil sampling, further remediation may be needed
Taylor	CSX Grafton Railyard Engine House Shop Former Roundhouse Area, Grafton	Tygart Valley	Solvents	Continuing remediation, gauging, recovery, and monitoring.
Taylor	CSX Grafton Railyard Locomotive Shop, Grafton	Tygart Valley	Diesel Fuel	Continuing remediation, gauging, recovery, and monitoring.
Mineral	CSX Keyser Railyard, Keyser	North Branch Potomac	Solvents	Continuing remediation, gauging, recovery, and monitoring.
Mineral	CSX Maryland Junction Railyard, Maryland Junction	North Branch Potomac	Petroleum Hydrocarbons	Continuing remediation, gauging, recovery, and monitoring.
Logan	CSX Peach Creek Railyard, Peach Creek	Guyandotte	Diesel Range Organic Compounds	Continuing remediation, gauging, recovery, and monitoring.
Wood	Fenton Glass cullet disposal area Williamstown	Middle Ohio South	Metals	Remediation, gauging, recovery, and monitoring have begun.

County	Facility	Watershed	Contaminant(s)	Comments
Lincoln	Little General #4075 403 Midway Road, Alum Creek	Coal	Petroleum Hydrocarbons	Remediation, gauging, recovery, and monitoring have begun.
Wyoming	Little General #5210 State Route 971, Oceana	Upper Guyandotte	Petroleum Hydrocarbons	Remediation, gauging, recovery, and monitoring have begun.
Wayne	Marathon Petroleum Terminal 227	Lower Ohio	Petroleum Hydrocarbons	Continuing remediation, gauging, recovery, and monitoring.
Mercer	Norfolk Southern Bluefield Railyard, Bluefield	Upper New	Diesel Range Organic Compounds	Continuing remediation, gauging, recovery, and monitoring.
Mercer	Norfolk Southern Bluefield Railyard, Bluefield	Upper New	Petroleum Hydrocarbons	Continuing remediation, gauging, recovery, and monitoring.
Kanawha	Norfolk Southern Dickinson Railyard, Dickinson	Upper Kanawha	Petroleum Hydrocarbons	Continuing remediation, gauging, recovery, and monitoring.
Wyoming	Norfolk Southern Mullens Railyard, Mullens	Lower Guyandotte	Diesel Range Organic Compounds	Continuing remediation, gauging, recovery, and monitoring.
Grant	Petersburg Oil bulk plant	South Branch Potomac	Petroleum Hydrocarbons	Site characterization report to be completed.
Grant	Vepco Mount Storm Power Plant, Mount Storm	North Branch Potomac	Diesel Range Organic Compounds	Continuing remediation, gauging, recovery, and monitoring.
Berkeley	Veterans Administration Hospital Martinsburg	Potomac River Drains	Solvents	Continuing remediation, gauging, recovery, and monitoring.

In addition to the sites where remediation efforts are ongoing, the Groundwater Program has provided advice to other DEP programs. Sites where contamination has been successfully remediated are issued letters stating no further action is required at

this time and closed out. The following is a list of closed or inactive sites that the Groundwater Program worked on between July 1, 2017 and June 30, 2019.

County	Facility	Watershed	Contaminant(s)	Comments
Mercer	ACME Wood Preserving 200 Roseland Ave. Princeton	Upper New	Creosote release	Environmental Enforcement states that Groundwater Program will not be involved at this time on Oct. 25, 2018
Jefferson	Browns Residence Drinking Water Well 107 Great Oak Lane, Harpers Ferry	Shenandoah	Home Heating Oil Spill	Groundwater Program provided Advice to Environmental Enforcement regarding cleanup. "No Further Action at this time" letter issued on April 4, 2018.
Ritchie	Brushy Fork Pipeline Break, Brushy Fork	Little Kanawha	Petroleum Hydrocarbons, Volatile Organic Compounds	The removal of contaminated soils was proved successful by groundwater monitoring. "No Further Action at this time" letter issued on May 2, 2018.
Kanawha	Hooten Equipment Co. 961 Virginia St. West Charleston	Lower Kanawha	Lead	"No Further Action at this time" letter issued on Oct. 29, 2018
Cabell	Cabell Huntington Hospital fuel leak, Huntington	Lower Ohio	Diesel Range Organic Compounds	No Further Action at this time" letter issued on Feb.20, 2019
Fayette	CSX Mount Carbon Derailment, Mount Carbon	Upper Kanawha	Bakken Crude Oil	Mt Carbon site has been accepted into the WV Voluntary Remediation Program.
Kanawha	CSX Handley railyard	Upper Kanawha	Petroleum Hydrocarbons, Volatile Organic Compounds	Accepted into WV Voluntary Remediation Program Sept.28, 2018
Monroe	Fischer Spring, Union	Upper New	Petroleum Hydrocarbons	Environmental Enforcement states that Groundwater Program will not be involved August 9, 2018
Berkeley	General Hydroponics 10612 Apple Harvest Drive, Martinsburg,	Potomac River Drains	Chloride, Metals, Nitrogen Compounds	Was determined that the Groundwater Program will not be active at this site Nov. 19, 2018.
Kanawha	CSX Handley railyard	Upper Kanawha	Petroleum Hydrocarbons, Volatile Organic Compounds	Accepted into WV Voluntary Remediation Program Sept.28, 2018
Monroe	Fischer Spring, Union	Upper New	Petroleum Hydrocarbons	Environmental Enforcement states that Groundwater Program will not be involved August 9, 2018

Closed/Inactive Groundwater Program Remediation Projects

County	Facility	Watershed	Contaminant(s)	Comments
Berkeley	General Hydroponics 10612 Apple Harvest Drive, Martinsburg,	Potomac River Drains	Chloride, Metals, Nitrogen Compounds	Was determined that the Groundwater Program will not be active at this site Nov. 19, 2018.
Kanawha	Hardee's, 1506 Bigley Ave., Charleston	Elk	Petroleum Hydrocarbons, Volatile Organic Compounds, Lead	Office of Environmental Remediation states work completed March 5, 2018
Berkeley	LKQ Ernie's Auto Enterprises, 4590 Williamsport Pike, Martinsburg	Potomac River Drains	Petroleum Hydrocarbons, Volatile Organic Compounds	Environmental Enforcement states that Groundwater Program will not be involved Aug. 9, 2018
Doddridge	Markwest Sherwood gas plant, Sherwood	Middle Ohio North	Petroleum Hydrocarbons, Volatile Organic Compounds	"No Further Action at this time" letter issued on April 10, 2019
Marion	Monongahela Iron & Metal, Foothills Lane, Bellview	Monongahela	Perchlorinated Hydrocarbons, Petroleum Hydrocarbons, Metals	Environmental Enforcement states that Groundwater Program will not be involved Aug. 18, 2018
Harrison	Morris Pad Water treatment facility, Sardis-Katy Lick Run Road	Middle Ohio North	Volatile Organic Compounds	Groundwater Program reviewed Plan of Corrective Action -cleanup criteria has been met Oct. 31, 2017
Wyoming	Mounts Funeral Home, Gilbert	Upper Guyandotte	Polycyclic Aromatic Hydrocarbons	"No Further Action at this time" letter issued on Oct. 11, 2018
Grant	Petersburg Builders 1468 Lunice Creek Highway, Petersburg	South Branch Potomac	Petroleum Hydrocarbons, Metals, Polycyclic Aromatic Hydrocarbons	"No Further Action at this time" letter issued on Aug. 21, 2018
Barbour	Purvis Brothers Jet Fuel Spill/ Barbour Co Airport	Tygart Valley	J8 Jet Fuel	"No Further Action at this time" letter issued on Jan. 19, 2018
Jefferson	Robinson Residence 163 Hale Road, Charles Town	Shenandoah	Home Heating Oil Spill	The Groundwater Program provided advice to Environmental Enforcement - says cleanup complete Aug. 9, 2018.

Closed/Inactive Groundwater Program Remediation Projects

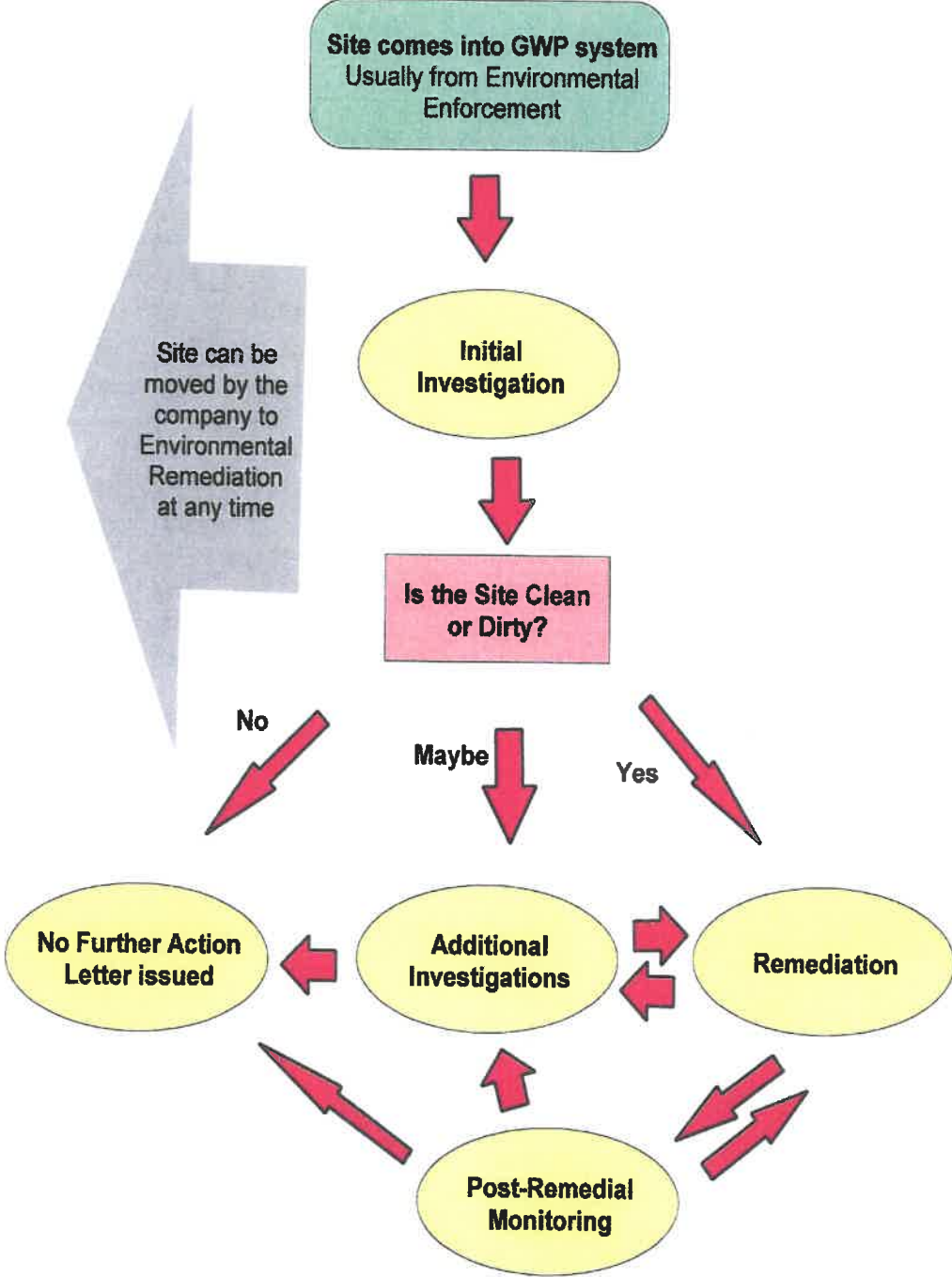
County	Facility	Watershed	Contaminant(s)	Comments
McDowell	R. T. Rogers truck wreck - Burger Residence, Eckman	Tug Fork	Gasoline Spill	The Groundwater Program provided advice to Environmental Enforcement - says cleanup complete Aug. 9, 2018.
Nicholas	Summersville Post Office 949 Waters St., Summersville	Gauley	Chlorinated Volatile Organic Compounds	"No Further Action at this time" letter issued on Jan.31, 2019
Braxton	Sutton Fuel Airport Road, Sutton	Elk	Diesel Range Organic Compounds	No Further Action at this time" letter issued for landfarmed soil site Feb. 6, 2019
Wood	Walker Machinery, Parkersburg	Middle Ohio South	Petroleum Hydrocarbons, Metals, Polycyclic Aromatic Hydrocarbons	"No Further Action at this time" letter was issued on April 10, 2019
Berkeley	Townhouse At 15 Lopez Drive; Martinsburg, WV.	Potomac River Drains	Petroleum Hydrocarbons	Groundwater Program Provided Advice to Environmental Enforcement Regarding Cleanup. Site is closed
McDowell	R. T. Rogers truck wreck - Burger Residence, Eckman	Tug Fork	Gasoline Spill	The Groundwater Program provided advice to Environmental Enforcement - says cleanup complete Aug. 9, 2018.
Nicholas	Summersville Post Office 949 Waters St., Summersville	Gauley	Chlorinated Volatile Organic Compounds	"No Further Action at this time" letter issued on Jan.31, 2019
Braxton	Sutton Fuel Airport Road, Sutton	Elk	Diesel Range Organic Compounds	No Further Action at this time" letter issued for landfarmed soil site Feb. 6, 2019
Wood	Walker Machinery, Parkersburg	Middle Ohio South	Petroleum Hydrocarbons, Metals, Polycyclic Aromatic Hydrocarbons	"No Further Action at this time" letter was issued on April 10, 2019
Berkeley	Townhouse At 15 Lopez Drive; Martinsburg, WV.	Potomac River Drains	Petroleum Hydrocarbons	Groundwater Program Provided Advice to Environmental Enforcement Regarding Cleanup. Site is closed



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



GROUNDWATER PROGRAM REMEDIATION SITES



Site can be moved by the company to Environmental Remediation at any time



Groundwater Sampling



Employing air sparging at a groundwater cleanup site



Employing bio-venting at groundwater cleanup site



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.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

4. Non-Point Source Program

Non-Point Source Program (NPS) Overview

In 2018 West Virginia's NPS Program provided technical and financial support to more than 100 programs and projects ranging from general administration to outreach, planning, monitoring and a wide variety of implementation. Most of the projects focus on priority areas identified within our watershed based plans (WBPs), but other partners and stakeholders implement projects in non-priority areas using their required matching funds, or by taking advantage of [additional grant opportunities](#) (AGOs).

Executive Summary

Best management practices (BMPs) implementation and nonpoint source (NPS) pollutant reduction are the major goals of our watershed projects. The efforts of our dedicated staff, partners and local stakeholders have made significant impacts in restoring and protecting our watersheds impacted and threatened by NPS pollution. In 2018, BMP implementation occurred in 44 different HUC12 watersheds with 50 percent of the implementation occurring in priority watersheds. The remaining are a result of WV Conservation Agency (WVCA) statewide [agriculture enhancement programs \(AgE\)](#). *Table 1* shows BMP implementation in 2018. Additional details are available in the 2018 NPS Annual Report at: <http://bit.ly/wvnps2018>.

Table 1. 2018 BMP implementation

BMPs	Q	U
AMD treatment systems	3	
AMD components	23,839	sqft.
Channel stabilization	3,864	ft
Erosion control	1,259.5	ac
Fencing	3,220	ft
Nutrient management	2,713.8	ac
Riparian buffer	10	ac
Septic systems	33	
Water systems	13	
Water system components	4,308	ft
Outreach/education	14,648	

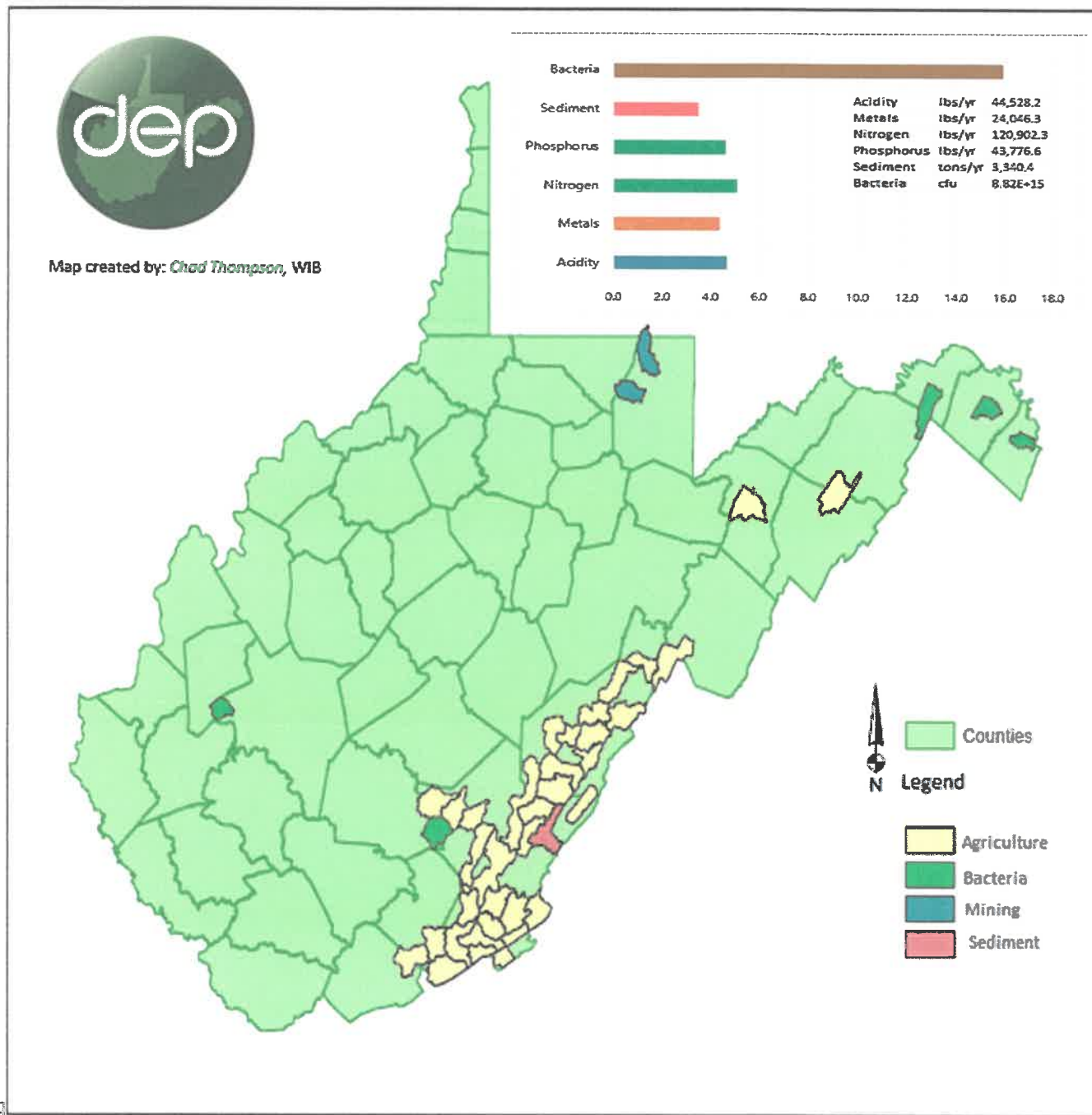
Acid mine drainage (AMD) treatment systems are listed as complete systems and components. The components include vertical flow treatment, limestone channels, limestone beds, upflow well and catchment basins. Septic systems include new installation, repairs and pumping. Fencing includes pasture and streamside. Nutrient management often includes a wide variety of practices specific to the situation. These can include heavy use protection, liming, irrigation etc. Water systems include a variety of alternate water options and their components such as piping and trenches. More specifics can be found in the appendices of this report and in USEPA's Grant Record Tracking System (GRTS).

Pollutant load reductions

In West Virginia bacteria and pollutants associated with AMD are the two largest contributors of nonpoint sources accounting for approximately 70 percent of the impairments. Most of the bacteria loads come from agriculture and failing septic, whereas the AMD pollutants (acidity and heavy metals etc.) are associated with abandoned mining.

USEPA's National §319 Program promotes the reduction of nutrients and sediment, which are the leading causes of NPS impairment nationwide. Although nutrients and sediment are not our primary focus, we have exceeded our Management Plan (MP) goals prior to the five-year revision schedule. Nutrient reductions are important for restoration of the Chesapeake Bay (CB) watershed, and West Virginia is on track to meet the goals and objectives of its [*Watershed Implementation Plan*](#) (WIP).

Figure 1. provides a snapshot of \$319 and AgE pollutant reductions from projects completed in 2018. The bar graph compares the amount of reduction from each major



Alphabetized list of HUC12 implementation: Browns Creek-Coal River, Brush Run-Greenbrier River, Burnside Branch, Clover Creek-Greenbrier River, Elks Run, Headwaters Deckers Creek, Headwaters Lunice Creek, Laurel Fork-North Fork South Branch, Laurel Run-Greenbrier River, Lick Creek-Bluestone Lake, Little Clear Creek, Locust Creek-Greenbrier River, Lower Anthony Creek, Lower Big Sandy Creek, Lower Indian Creek, Lower Second Creek, Meadow Creek-Meadow River, Meadow Run-North River, Middle Indian Creek, Middle Second Creek, Mill Creek-Meadow River, Mill Creek-Opequon Creek, Milligan Creek-Greenbrier River, Muddy Creek, Outlet East Fork Greenbrier River, Outlet Knapp Creek, Outlet Spring Creek, Rich Creek, Rock Camp Creek, Sewell Creek, Slabcamp Run-Greenbrier River, South Fork Potts Creek, Stamping Creek-Greenbrier River, Stirlington Creek, Stoney Creek, Sweet Springs Creek-Cove Creek, Thorny Creek-Greenbrier River, Tuscarora Creek, Upper Anthony Creek, Upper Indian Creek, Upper Second Creek, Upper Sleepy Creek, Upper Williams River, Wolf Creek

Figure 1. Load reductions in priority and non-priority watersheds

Watershed project highlights

In 2018, nine watershed and 16 AGO projects were completed. This section will highlight two completed projects; an AMD remediation and bacteria reductions. Summaries of additional projects are available in the 2018 NPS [Annual Report](#) and USEPA's GRTS [public access portal](#). Also highlighted is the most recent Success Story, which is an annual program requirement.

Valley Point 12

Friends of Deckers Creek

Contact(s): [Sarah Clayton](#) and [Martin Christ](#)

Watershed information

HUC8	05020003 - Monongahela River
HUC12	050200030201 - Headwaters Deckers Creek
Stream code	WWM-8-F

Introduction

The Deckers Creek Watershed drains approximately 64 square miles throughout Preston and Monongalia Counties in northern West Virginia (*Figure 3*). Kanes Creek, a tributary to Deckers Creek is polluted by acid mine drainage (AMD). AMD, coming mostly from abandoned mines, impairs human health and aquatic life by causing pH, iron, and aluminum levels to violate state standards in the main stream and many tributaries. Kanes Creek is the tributary farthest upstream that adds a significant load of AMD to the creek. A substantial decrease in the pollution from Kanes Creek will greatly improve the water quality in parts of Deckers as well as Kanes Creek. The uppermost part of Kanes Creek has two branches; this project was to treat the water from Valley Point #12, the site that contributes the largest load to the uppermost part of the creek. Valley Point #12 is located on the Northern Branch of Kanes Creek.

Project highlights

FODC originally constructed the Valley Point #12 project in 2008 to treat AMD entering Kanes Creek. Unfortunately, due to mine seepage that could not be collected, as well as overall wear-and-tear on the project itself, the site needed upgrades. The Valley Point #12 Revitalization project demonstrates how this old project site was upgraded and became functional once again.

The treatment site consists of water entering an iron oxidation terrace, then being piped for several hundred feet to a series of treatment ponds including a flushing limestone bed, two settling ponds, an open limestone channel, and finally an aerobic wetland. The issue addressed in the repurpose is the decline in effectiveness of the iron

oxidation terrace. The limestone fines put there in the original construction have since washed out leaving the structure ineffective and the pipes scaled and clogged with debris. In the repurpose FODC replaced limestone on the terrace with larger limestone. After consulting with professionals at the WVDEP's AML it was decided that adding more limestone would only increase scaling in the pipes and decrease the longevity of the system. To prevent that from happening it was suggested that FODC utilize the repurposed limestone to collect AMD seeping from the hill surrounding the location of the terrace. This will treat the otherwise neglected run off on the hill and channels where it runs and bypasses the treatment system. FODC believes this fix will be a better treatment solution than the one originally proposed.

Results

Analysis from samples taken show that water flowing into the system from the uptake wells is entering at a 2.93 pH. When exiting the system, the pH is up to a 7.82. When the water exits the treatment system and combines with other runoff from another outlet in the hillside, the combined pH is 7.16 when it finally runs under the road into the tributary leading to Deckers. The total load of iron exiting Valley Point 12 treatment system is 476.2 lbs per year. The total load of aluminum exiting the system is 94.2 lbs per year.

Input	pH	Acidity (mg/L)	Al (mg/L)	Fe (mg/L)
Entering system	2.93	263.56	24.34	29.60
Exiting system	7.16	< 8.16	0.55	2.75

Partners and funding

This project was supported by the USEPA and WVDEP's Watershed Improvement Branch (\$163,100) and Office of Surface Mining (OSM) WCAP Program (\$90,000). FODC contributed \$19,628 as an in-kind match.

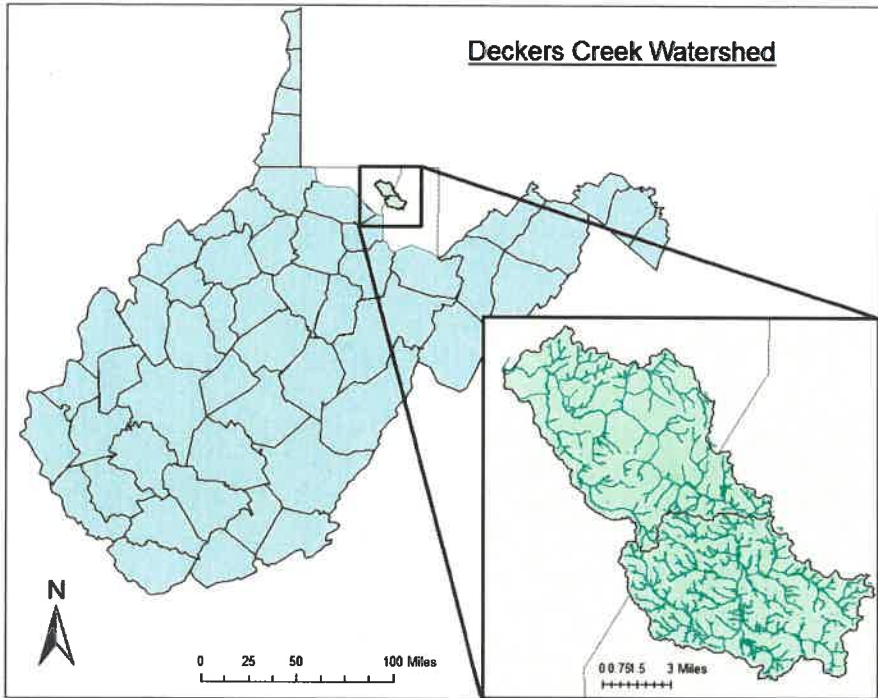


Figure 2. Map of the Deckers Creek watershed located in northern WV.

Figure 3. Site photos



Sewell Creek of Meadow River

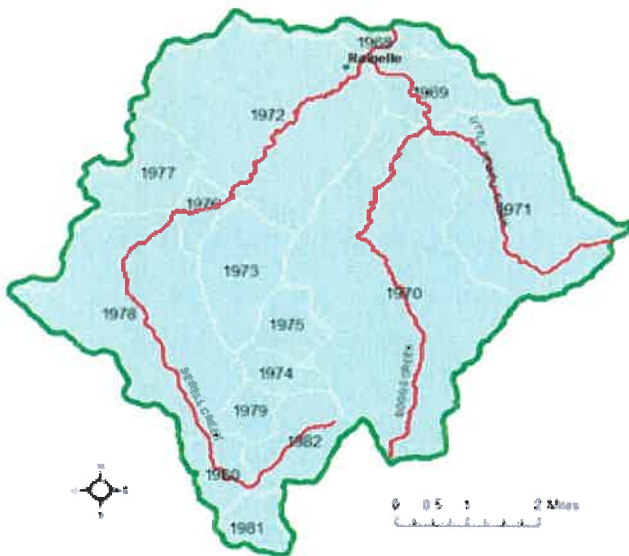
WV Conservation Agency
 Contact(s): [Dennis Burns](#) and [Pamela Russell](#)

Watershed information

HUC8	05050005 - Gauley River
HUC12	050500050604 - Sewell Creek
Stream code	WVKG-19-Q, Q1, Q-1A

Introduction

Figure 4. Sewell Creek watershed



Sewell Creek, Little Sewell (WVKG-19-Q-1) and Boggs Creeks (WVKG-19-Q-1A) are identified in the TMDL as being contaminated with fecal coliform from failing septic systems. All but three of its subwatersheds are identified in the TMDL as needing on-site wastewater load reductions. These streams are included in the 2012 Upper Meadow River WBP.

Beginning in the spring of 2016, funding was made available for homeowners in this watershed to receive assistance fixing failing septic systems. To promote the program, mailers were sent to every resident, and two public meetings were held. Initially, the program began well and was expected to be a quick success, but progress was abruptly halted in late June 2016 as the area was hit with a one thousand year rain event that caused catastrophic flooding. It was more than a year after this event before anyone would participate in the program as they had bigger issues to address.

Project highlights

The most important highlight of this project has been the overall partnership between various forms of government and private individuals to accomplish the goal of the project. Officials with the City of Rainelle which is located near the mouth of the stream, went to great effort to promote the program and provide necessary applications to interested landowners. Additionally, the contractors in the area who repair, install, and pump septic systems also promoted the program and kept applications on hand to provide to potential customers. Since this watershed crossed conservation district lines, the

Greenbrier Valley Conservation District and the Southern Conservation District worked together to approve applications and reimburse landowners for the cost share as quickly as possible.

Results

Due to construction in the area, the 2016 flood, high water levels, and other stream conditions that deemed it unsafe in addition to poor sampling conditions, water quality monitoring for Sewell Creek did not occur until the last month of the project. To compensate for loss of time and still allow for the data to be useful, samples were taken twice a week during the month of June 2018. This project resulted in pumping of 14 seasonal failing systems and repairing of 13 completely failing systems - a modeled load reduction of 2.74E+15. In-stream monitoring determined a load reduction of 8.84E+15. This accounts for 98% of the required load reduction of 8.94E+15. While these figures are still slightly higher than state water quality requirements, it does provide significant evidence to support the fact that BMPs installed under this program have made a significant positive impact on the water quality of the Sewell Creek watershed.

Partners and funding

Funding for this project was provided by Clean Water Act §319 for \$53,100. Total cost was \$88,500. Homeowners and state sources funded the remaining balance. Homeowners provided 50% of the funding for seasonally failing systems, and 25% of the funding for completely failing systems. Cost share amounts were capped at \$500 for septic system pumping and \$5,000 for septic system repairs. Additional in-kind support was provided in the form of technical support by WVCA and the Local Health Departments.

§319 Success Story



Tuscarora Creek restoration improves biodiversity

Waterbody Improved

Tuscarora Creek was added to West Virginia's Clean Water Act section 303(d) list of impaired waters in 2002 for not meeting the state's biological water quality standard. Sediment and organic enrichment were identified as the key stressors to aquatic life in the Total Maximum Daily Load (TMDL, 2008). Project partners re-routed the creek around

an obsolete dam to adjust profile and pattern to transport sediment more effectively through a 950-foot reach. Abundance and diversity of benthic macroinvertebrates have improved in the first year. Thanks to the generous cooperation of the landowners, the site has served as a demonstration to the community through articles, videos and tours to inspire more streamside vegetation and general awareness about pollution in Tuscarora Creek watershed.

Problem

Tuscarora Creek is a tributary of Opequon Creek in Berkeley County West Virginia. At one site, a dam was built in the 1920s to provide irrigation water for an orchard operation, now gone.

A local group of fishermen, Creekside Anglers, identified the removal of the dam as an important next step for improving habitat for trout, because the slack water behind the dam was causing an increase in water temperature. The dam was also a barrier to aquatic organism passage and capture sediment being naturally transported by the stream. West Virginia Department of Environmental Protection (WVDEP) staff sampled above and below the dam in April 2013 for benthic macroinvertebrates and found that the community had a combined score of “marginal.”

In addition to stream restoration and dam removal, multiple riparian species were planted within the reach to improve overall conditions.



Project Highlights

Through a \$319 grant, Canaan Valley Institute designed a stream restoration project that would adjust the stream’s path to avoid the dam and approach the road culvert at a better angle. The new design added shallow riffles, deep pools, and vegetative bank stabilization to improve the benthic habitat for organisms as well. Canaan Valley Institute obtained a Chesapeake Stewardship Fund grant from National Fish and Wildlife Foundation to implement the dam removal portion of the project. In 2016 a portion of the spillway was removed, the stream rerouted to flow around the abandoned dam and remaining portion was buried.

Results

Metric	Pre	Post	% Difference	Expected response
Total Taxa	18	15	18.2	< increase
EPT Taxa	4	6	40.0	> increase
Biotic index	8.33	6.42	25.9	< decrease
% Tolerant	87.6	41.3	71.8	< decrease
% EPT abundance	3.8	37.0	162.7	> increase
% Dominance	71.3	37.9	61.2	< decrease
IBI	31.5	57.4	58.3	> increase

One year after completion benthic macroinvertebrates collections showed significant improvements. The IBI score taken prior to the removal on April 23, 2013 was 31.5. The IBI score from the most recent collection was 57.4, a 58% increase. Nitrate-nitrogen level and the abundance of certain organisms indicate there are still challenges from the watershed influencing this

reach. The Tuscarora Creek Project Team continues to implement the Watershed Based Plan to reduce nonpoint sources of pollution such as leaking septic systems, livestock access to surface water, and residential fertilizer over-use. Streambank stabilization work at upstream sites may also decrease excess sediment delivered to the creek.

Partners and Funding

This work was implemented with funding from the National Fish and Wildlife Foundation, WVDEP’s §319 Program and local contributions. Total cost was approximately \$150,000 and §319 funding included multiple §319 watershed projects. Canaan Valley Institute designed and managed the project with help from the Roach Family, Eastern Panhandle Conservation District, West Virginia Department of Environmental Protection, West Virginia Division of Forestry, US Environmental Protection Agency, Appalachian Stream Restoration, and the Opequon Creek Project Team. Previous stories at:

<https://dep.wv.gov/WWE/Programs/nonptsources/Pages/319SuccessStories.aspx>

Groundwater influence

West Virginia’s NPS Program’s projects do not focus specifically on our groundwater resources; however, many projects such as septic repair/replacements, certain stormwater BMPs, source water and acid mine drainage projects may have indirect influences. *Table 2* provides a list of nonpoint projects that have most or part of those components.

Table 2. §319 projects with possible groundwater influence

2014	NPS#	End-date	319-funds	Spent	Basin
Nonpoint funds					
FOB restoration planning	1546	30-Sep-17	\$10,000	\$10,000	N
Source Water Protection Planning - Fayette County	1551	30-Sep-17	\$10,000	\$10,000	S
WVCA Back Creek Porous Pavers	1601	30-Sep-17	\$20,000	\$20,000	P
Watershed project funds					
Sovern England AMD - FOC	1500	30-Sep-17	\$252,368	\$216,831	N
Kanes Creek South Upgrade	1502	30-Sep-17	\$122,750	\$120,874	N
Sleepy Creek - Phase 3	1504	30-Sep-17	\$74,600	\$74,600	P
Finley Run - FOB	1569	30-Sep-17	\$5,402	\$5,402	
Meadow River Sewell Creek Septics - WVCA	1570	30-Sep-17	\$53,100	\$32,898	S
Coketon Mine FOB	1615	30-Sep-17	\$69,988	\$69,988	N
2015					
Nonpoint funds					
WVRC Source Water Protection Planning	1548	30-Sep-17	\$15,000	\$15,000	SW
AMD and WW research - WVU	1550	30-Sep-17	\$18,000	\$17,994	N
Friends of Hughes Source Water Monitoring	1607	30-Sep-17	\$20,000	\$20,000	W
Piney Creek WSA Pet Waste Campaign	1600	30-Jun-18	\$4,000	\$4,000	S
Watershed project funds					
Tuscarora Creek Phase 2 - CVI	1540	30-Jun-19	\$56,523	\$38,749	P
Mill Creek Opequon Phase 2 - CVI	1541	30-Jun-19	\$161,801	\$77,158	P
Morris Creek Upper Mainstem	1529	31-Dec-17	\$49,265	\$48,664	W
Pase Active Treatment - FOC	1530	31-Dec-18	\$101,387	\$87,587	N
Valley Highwall Upgrade - FODC	1532	30-Jun-19	\$170,500	\$22,260	N
YMCA land restoration - Piney Creek	1535	30-Jun-18	\$20,145	\$19,141	S
Elks Run Watershed Phase 2 - WVCA	1536	30-Jun-19	\$68,200	\$17,211	P
Herods Run, Buckhannon - WVU	1533	30-Jun-19	\$226,145	\$144,403	N

Table 2 continued

2016					
Nonpoint funds					
Goodnews Mtneer Garage rain gardens	1599	1-Dec-17	\$3,000	\$2,906	W
WVRC Source Water Community Engagement	1604	30-Sep-17	\$17,000	\$17,000	SW
WVCA Sleepy Creek septic mini grant	1677	30-Sep-21	\$21,000		P

Watershed project funds					
Beaver Creek AMD - FOC	1584	30-Sep-19	\$175,100	\$67,399	N
Sandy Run Renovation - FODC	1585	30-Jun-20	\$223,500	\$7,224	N
Beckley Little League - PCWA	1586	30-Sep-18	\$54,291	\$37,001	S
Second Creek WSA - WVCA	1587	30-Sep-18	\$127,600	\$127,600	S
Back Creek - WVCA	1588	30-Sep-18	\$209,450		P
Swamp Run #2 - WRI	1589	30-Jun-20	\$183,954	\$46,039	N
Browns Creek - Coal River thru WVCA	1619	31-Dec-19	\$94,000	\$43,330	W

2017					
Nonpoint funds					
WV Rivers Coalition	1610	30-Sep-19	\$100,000	\$20,729	SW
GWF Lamberts Run Study	1671	31-Dec-19	\$9,000		N
Watershed project funds					
Summerlee AMD Phase 3A - PAN	1611	31-Dec-19	\$169,392		S
New River Drive Soil Erosion - Piney Ck	1612	30-Sep-18	\$32,500		S
Muddy Creek Dream Mountain Improvements - FOC	1633	30-Sep-20	\$176,800	\$1,397	N
Hartman Run AMD - FODC	1641	30-Sep-20	\$185,000		N
WALD treatment - Phase 1 - FOB	1632	30-Sep-19	\$149,594	\$16,388	N
Cane Fork Treatment - Phase 1 - WVU	1642	30-Sep-20	\$155,882	\$16,076	W
Spring Creek - Phase 1 - WVCA	1643	30-Apr-21	\$180,000		S
2018					
Nonpoint funds Watershed project funds					
WALD Passive Treatment 2 - FOB	1680	31-Dec-20	\$134,000		N
Beaver Creek McElroy Seep - FOC	1681	30-Sep-21	\$130,000		N
Dillan Creek Remediation 1 - FODC	1682	30-Sep-20	\$207,000		N

Table 2 continued

2018					
Nonpoint funds Watershed project funds					
Summerlee AMD Treatment 3B – PAN	1683	30-Sep-20	\$186,894		S
Barlow Portal 1 - WVU	1684	30-Sep-21	\$212,716		N
Upper Indian Creek - WVCA	1650	30-Sep-21	\$100,000		S
Second Creek Tall Hickory Farms - WVCA	1686	30-Sep-21	\$100,000		S
Legend					
BC regions	N	Northern			
	P	Potomac			
	W	Western			
	S	Southern			
Statewide	S	2018 completed projects			
	W				

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

5. 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 consists of biologists, environmental specialists, and analysts whose primary focus is to measure and assess the physical, chemical, and biological integrity of WV's streams, rivers, and lakes. Although this water quality information is used for a myriad of purposes, a major effort is placed on the preparation of The West Virginia Integrated Water Quality Monitoring and Assessment Report (IR) http://www.dep.wv.gov/WWE/watershed/IR/Pages/303d_305b.aspx. This report, required by U.S. EPA every 2 years, combines the 303(d) list of impaired waterbodies with the 305(b) assessment, a report that focuses on the overall quality of West Virginia's waters.

The WAB utilizes a specific combination of physical, chemical, and biological variables to help assess the health of streams and lakes in WV. These measures also help identify potential stressors and how they may be affecting the aquatic life communities of these waterbodies.

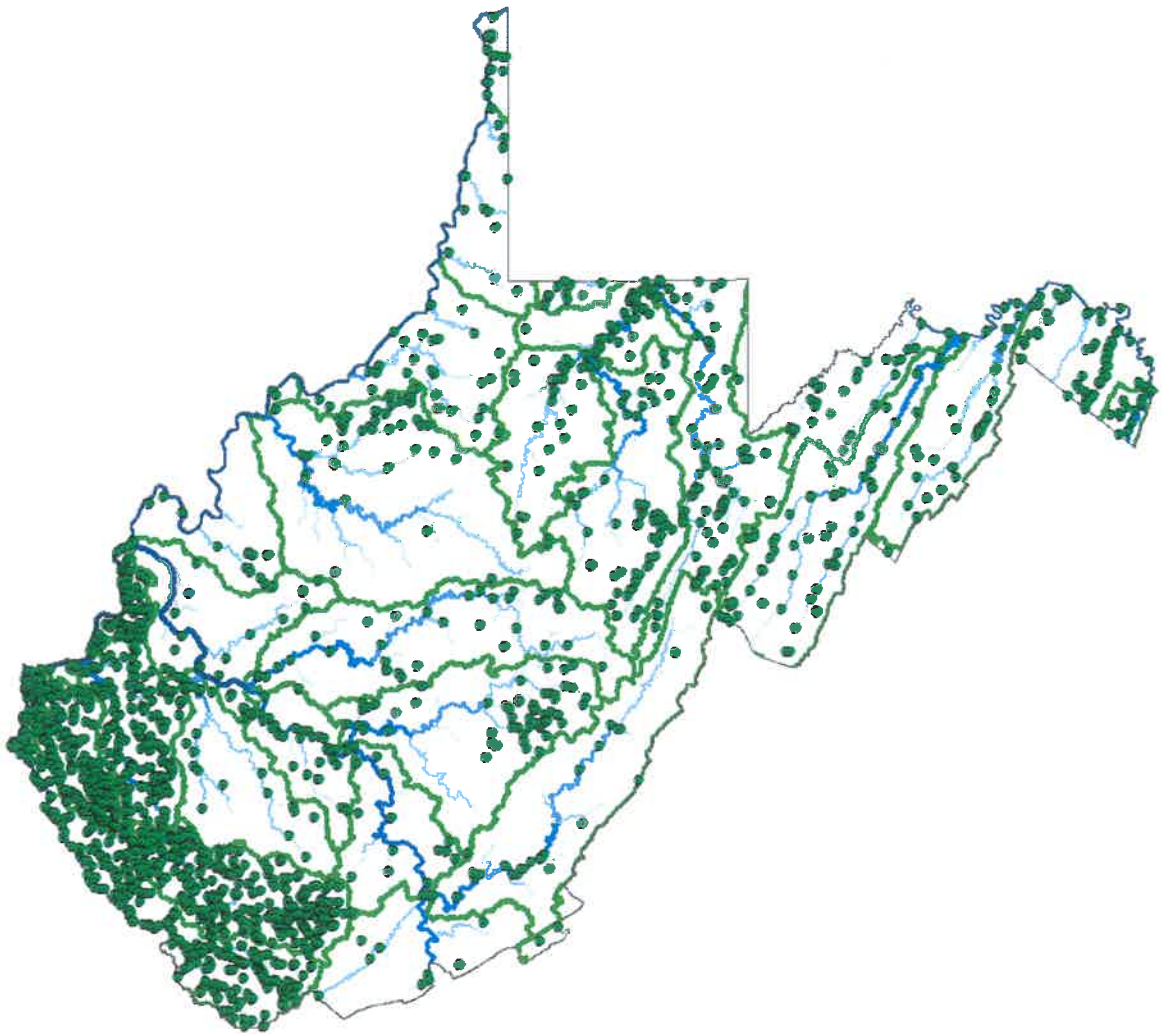
The WAB uses a variety of programs to assess and monitor WV's waterbodies. These include a stratified probabilistic monitoring design or "random" sampling design; a targeted sampling design; a long-term or "ambient" site network (mainly in WV's largest streams and rivers); a continuous monitoring design using deployable water quality meters (dataloggers); and a thorough pre-TMDL development monitoring effort – all designed to meet the objective of assessing the water quality of waterbodies throughout WV. In 2007, WAB 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 with different stressors.

In 2012, the LiTMuS program was expanded to include research to monitor water quality, biology, and flow changes over time at several minimally impacted streams in WV. This research is a collaborative effort with the United States Environmental Protection Agency (US EPA) Global Change Assessment group, along with other states and US EPA offices from various regions, to develop Regional Monitoring Networks (RMNs) that can detect small, progressive changes in stream aquatic life communities that may be associated with climate change. Two major components of this study are the collection of temperature and stream discharge data, each being significantly related to groundwater. It is predicted that groundwater will help buffer streams from increases in air temperatures, at least in the near future. Furthermore, it is believed that streams with more groundwater contribution during base flow will be less sensitive to temperature increases. The WAB has established five RMN monitoring stations on five different WV

streams, all with exceptional water quality, that are being monitored for temperature, discharge, and aquatic life status as part of this collaborative study.

In general, 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.

From January 1, 2016 through December 30, 2018, WAB personnel conducted assessments that resulted in the collection of 18,351 water quality samples from 2,405 sites on 1,643 distinct streams, rivers, and lakes. These sites are shown below.



The WAB measures a variety of physicochemical parameters in waterbodies that are evaluated in the field or determined via laboratory analysis. Stream temperature, dissolved oxygen, pH, and specific conductance are collected at nearly every site visit. The more common lab parameters analyzed include alkalinity, acidity, hardness, aluminum, iron, manganese, selenium, basic ions and nutrients. Other parameters are collected when pollutants are determined to be potentially present. Thirty five (35) parameters are measured at sites monitored as part of our Probabilistic Monitoring Program, and 41 parameters are measured at our Ambient Sites.

Habitat evaluations are important to waterbody assessments because they reflect the physical conditions that support aquatic life communities. WAB utilizes U.S. EPA's Rapid Bioassessment Protocol (RBP) for measuring the quality of in-channel and riparian habitat in streams and rivers. Channel flow status is evaluated as part of the RBP protocol. During drought conditions, groundwater discharges are important for maintaining a healthy channel flow status, and therefore the water levels necessary to support aquatic life.

The physical and chemical properties of water, as well as habitat quality are important in the overall assessment of waterbody health. However, the biological monitoring of aquatic life communities such as benthic macroinvertebrates and fishes, provides WAB a more comprehensive evaluation of ecological integrity. This is especially true for benthic macroinvertebrates (animals without backbones that live on the bottom of streams such as insects, crayfish, snails, worms) because they are diverse in species, live in all stream sizes, have a wide range of tolerances to pollutants and stressors, and unlike a grab samples of water that represent an instant in time, reflect past water quality conditions. For example, water quality measures like dissolved oxygen are important, but, only provide information about the specific current environmental conditions. A sudden spill or periodic discharge of toxic substances, which flowed past an assessment site a week ago, for example, would likely be revealed in an impaired benthic macroinvertebrate community, but likely would not be detected in the analysis of a water sample.

The WAB tries to identify pollutants and their sources, both regulated and non-regulated, and the severity of impacts on streams in watersheds throughout the state. For instance, fecal coliform bacteria from open pipe discharges, failing septic systems, failing sewer lines, inappropriate animal waste management techniques, and "collect and dump" sewage treatment activities 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".

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.

TMDLs (Total Maximum Daily Load) 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. Originally, TMDLs were developed 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 watershed in 2001, WVDEP assumed the lead in developing TMDLs for state waters. In 2009, WVDEP completed TMDL development for all remaining streams listed in the 1997 consent decree.

We continue to develop TMDLs in-house with the assistance of contractors for water quality model development. Comprehensive TMDLs that have recently been approved include those for impaired waters in the Hughes River Watershed (of Little Kanawha) and for the Monongahela River. TMDL development is underway in the Upper Guyandotte River, Twelvepole Creek, Big Sandy River, Lower Ohio River, Lower Guyandotte River, and Tug Fork River watersheds.

In future years it is possible 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.

Although not a significant portion of its assessment and monitoring activities, the WAB does coordinate and participate with wetland monitoring activities in WV. Such monitoring activities include; 1) National Wetland Condition Assessment (USEPA), 2) Wetland Delineations, 3) support of the WWRAP – West Virginia Wetland Rapid Assessment Protocol (WV DNR), & 4) communication with wetland alteration permitting agencies (WV DEP/WV DNR/US ACOE).

Currently, all assessment and monitoring data is stored and managed in a database called WABbase. WABbase is a custom, in-house designed database that utilizes Oracle as a back-end with multiple Microsoft Access front-ends. Currently, a portion of the data is entered manually. However, most certified laboratories have been submitting lab analyzed water quality results electronically. Additionally, WAB is in the process of resuming submitting surface water quality information to EPA's STORET database via their Water Quality Portal.

WAB uses ArcGIS (ArcMap) to strategically plan the location of sampling sites, to identify the geologic and land use patterns upstream from the sampling sites, and to establish a list of potential waterbody stressors associated with both surface and underground activities and disturbances. WAB also uses this program to print maps showing the geographic distribution of violations in a watershed.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

6. 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 FY2018 and FY2019 approximately \$80 million dollars of assistance was expended from the SRF program to build and replace wastewater collection and treatment systems. In many of these projects, unsewered areas of West Virginia were provided with centralized or, in some cases, decentralized sewer 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.

The majority of the funding continues to be used for actual construction while the remaining portion was used for planning, design, and administrative expenses related to the projects.

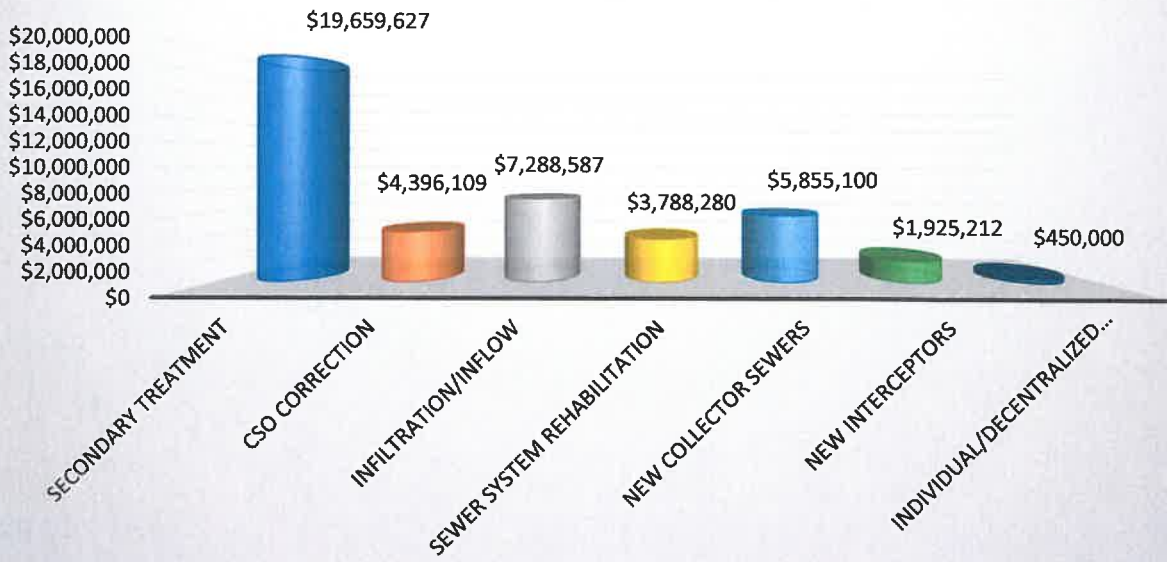
West Virginia's CWSRF program provides financial assistance to improve and maintain water quality throughout the State. The projects financed are vital in protecting and improving water quality in rivers, lakes, and streams throughout the State used for drinking water, recreation, cold water fisheries, warm water fisheries, wildlife use, industrial use, and agricultural use. In addition to the normal projects addressing wastewater issues, the CWSRF provided funding to projects to reduce stormwater impacts.

During FY 2018 and FY 2019, the CWSRF program contributed to the joint State/EPA mission of achieving clean and safe water by using the following goals:

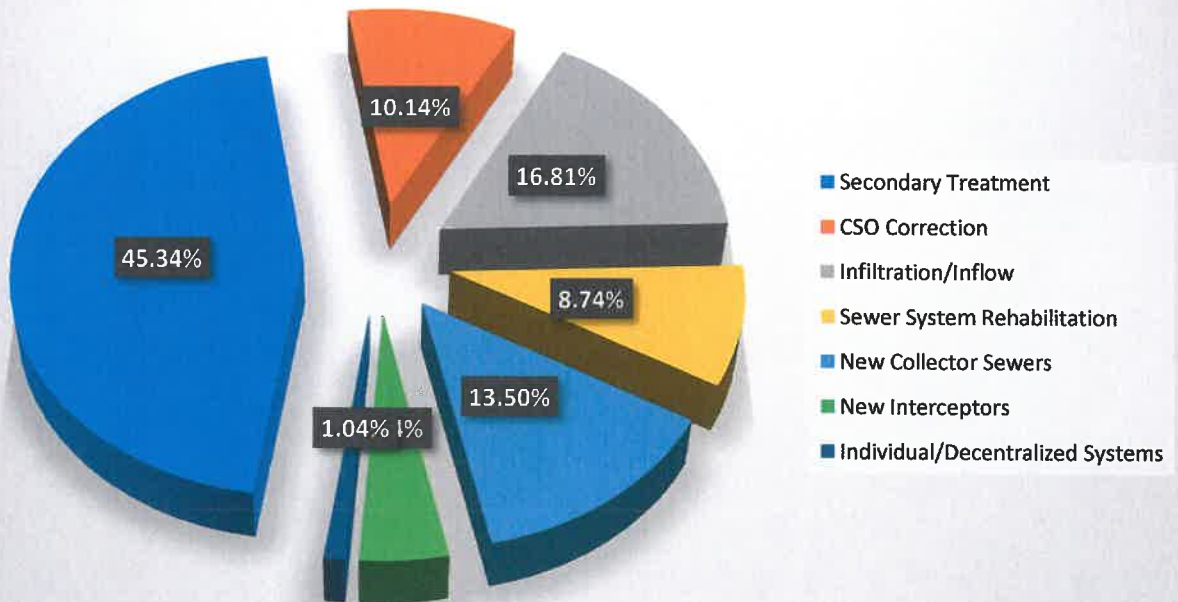
- ❖ Eliminate sewage overflows from combined sewer overflows (CSOs) and from separate sewer system overflows (SSOs),
- ❖ Improve and protect designated uses of water bodies and achieve and maintain CWA compliance.

Loan and Principal Forgiveness dollars closed in FY2018 were predominately in the Secondary Treatment needs category (45.34%), leaving the rest of the dollars to be spread over six other needs categories. Most of the remainder was distributed in: Infiltration/Inflow (16.81%), New Collector Sewers (13.50%), and CSO Correction (10.14%). Loan and Principal Forgiveness dollars closed in FY2019 were predominately in the New Interceptors category (35.1%), leaving the rest of the dollars spread over six other needs categories. The majority of the remaining projects were distributed as follows: Secondary Treatment (15.2%), Sewer System Rehabilitation, and Advanced Treatment (14.7%). (See graphs)

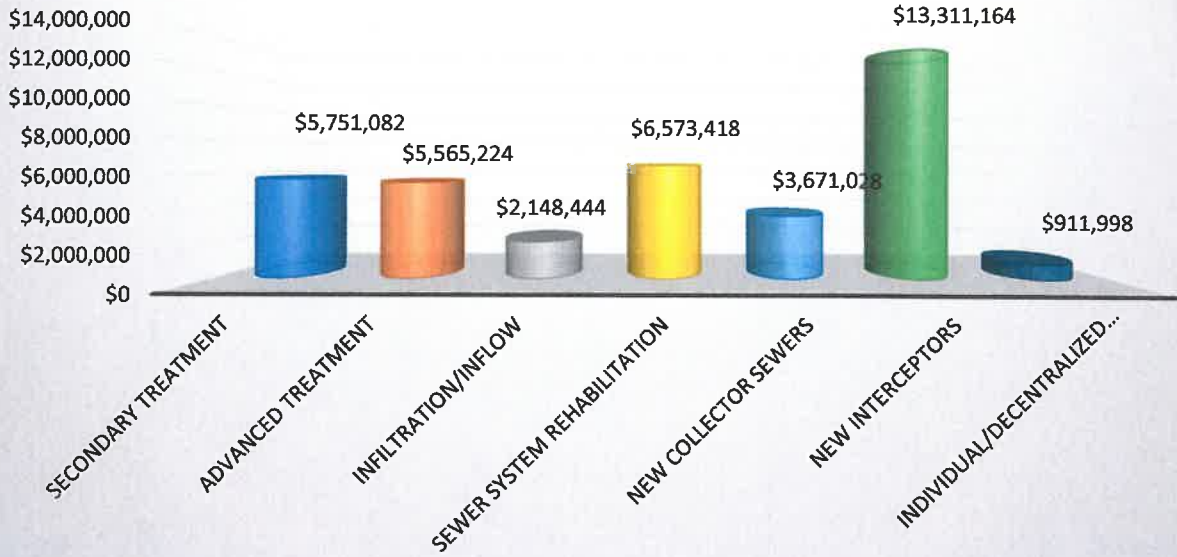
FY2018 Needs Categories by \$ Closed



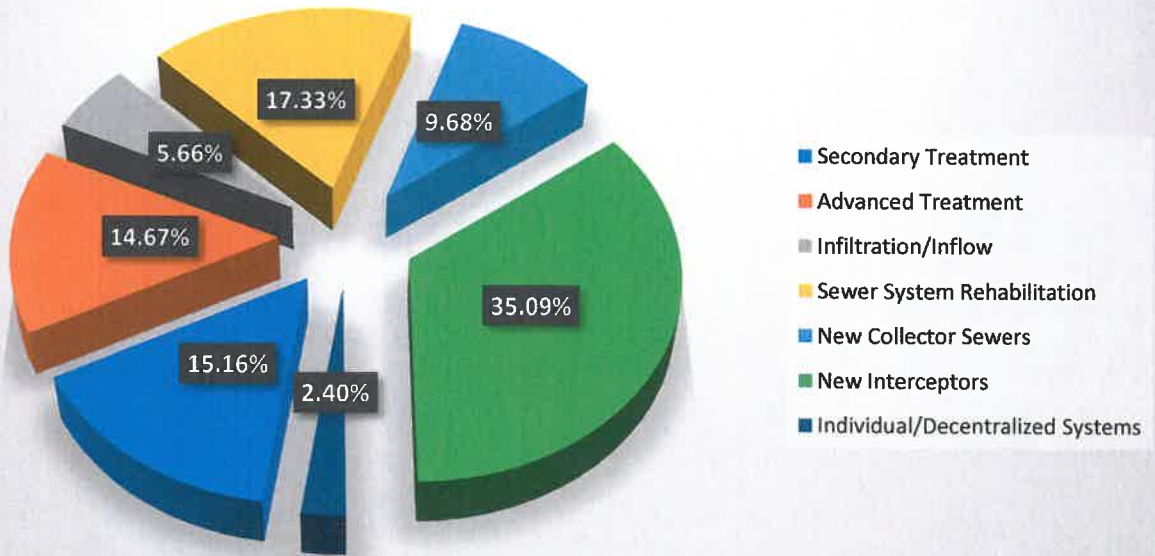
FY2018 % by Needs Category



FY2019 Needs Categories by \$ Closed



FY2019 % by Needs Category



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. This program was established in 1997 and continues to offer loans to correct nonpoint source pollution. The program is set up as a cooperative effort between the WVDEP, WV Soil Conservation Agency (SCA), USDA Natural Resources Conservation Service (NRCS), local Soil Conservation Districts (SCD) and local banking institutions. As of June 30, 2018, more than \$13 million had been loaned under this program for installation of best management practices. No new loans were made under this program during FY2018 and FY2019. This program is dependent on grant funds provided to the NRCS with a match provided by the CWSRF. The SRF will provide \$150,000 as a set-aside for this program for FY2020.

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 30 loans totaling \$234,098 in FY 2018 and 38 loans totaling \$294,724 in FY2019 from this program and will provide \$300,000 as a set-aside for this program for FY2020.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION

B. Division of Water and Waste Management

7. Environmental Enforcement

The Environmental Enforcement (EE) office is primarily responsible for inspection and enforcement of the state and federal solid waste, hazardous waste, underground and aboveground 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.

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

Generally, all landfill sites will have a minimum of four (4) groundwater monitor wells. The number of wells per site will depend on the size of the landfill and could be as high as twenty (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 40 CFR. 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. Sampling of all groundwater wells present at the sites is required as a part of 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 is included in the Core Training List for EE inspectors. Courses on the Core Training List are available to all inspection staff but are focused on newer inspectors in the training progression. These courses include classroom style training accompanied with ample practical (hands on) training exercises with a focus on sample collection and

preservation. This training program results in environmental inspectors that are both effective and safety conscious in their field work.

EE utilizes the WVDEP centralized database system that is accessible to all inspectors and other agency staff. WVDEP maintains files on groundwater complaints, investigations, Notice of Violations (NOV's), enforcement actions, spills, and monitoring well data for landfills and industrial sites in that system.

The Hazardous Waste Management Act, Underground Storage Tank (UST) Act and Aboveground Storage Tank Act are, in part, groundwater protection acts. The Hazardous Waste Management Act requires long term groundwater monitoring at permitted disposal sites. EE Inspectors conduct Operation and Maintenance inspections every three years at every hazardous waste land disposal facility in the State. These inspections involve evaluating the facility's groundwater monitoring methods and sampling protocols. Inspectors may split samples with the permit holder to conduct an independent analysis of the groundwater that has been sampled.

The UST Act and associated rule protect groundwater through imposing prevention and corrective action requirements. The UST program administers leak prevention activities and the leaking UST (LUST) program administers corrective action activities to ensure protection of the groundwater.

UST prevention activities include requirements for release detection, corrosion protection, overfill protection, and spill prevention at UST sites to ensure protection of the groundwater. West Virginia adopted the most recent Federal UST Rule on June 1, 2018. The modified rule provides additional protections for groundwater by requiring all new UST systems to have secondary containment, under dispenser containment, and additional testing of spill buckets, sumps and dispensers. Additionally, the rule requires all tank owners and operators to be trained concerning proper operation of their UST systems and requires them to perform monthly inspections of their UST systems and release prevention devices.

LUST corrective action activities include the oversight of cleanups of petroleum releases by responsible parties and enforces cleanups by recalcitrant parties to ensure protection of the groundwater. The LUST section may utilize limited federal funds to pay for cleanups at sites where the owner or operator is unknown, unwilling, or unable to respond, or at sites which require emergency action. Remediation of sites may prevent groundwater contamination and/or return contaminated groundwater to beneficial usage.

The Aboveground Storage Tank (AST) Act was promulgated in 2014 in response to the Freedom Industries spill. The AST Act focuses on tanks that present the highest threat to water resources by virtue of the tanks size, contents and location. Protection of groundwater as well as surface water through comprehensive tank regulation is the focus of this statute and rule. The AST Act and associated rule protect groundwater and surface water through imposing prevention and corrective action requirements. The AST program

administers prevention activities and the Leaking AST (LAST) program administers corrective action activities to ensure protection of the groundwater.

AST prevention activities include requirements for tank registration, release detection, corrosion protection, overfill protection and spill prevention at AST sites to ensure protection of the surface water and groundwater.

LAST corrective action activities include the oversight of cleanups of releases from regulated ASTs by responsible parties and enforces cleanups by recalcitrant parties to ensure protection of the groundwater. The LAST section may utilize funds to pay for cleanups at sites where the owner or operator is unknown, unwilling, or unable to respond, or which require emergency action. Remediation of sites may prevent groundwater contamination and/or return contaminated groundwater to beneficial usage.

Additionally, in fiscal years 2017 and 2018, EE personnel investigated 930 spills and 1,553 complaints. These spills and complaints included potential or actual impacts to groundwater.

V. DEPARTMENT of ENVIRONMENTAL PROTECTION

C. Office of 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 is maintained in AMLIS. The total unfunded cost of all priorities in West Virginia as of June 5, 2019 is \$1,619,135,815.40.

AML&R Accomplishments

AML&R has completed the problem areas (PA) and the associated problem types from July 1, 2017 through June 5, 2019. The PA and the problem type accomplishments have been entered into AMLIS and moved from the funded to completed category. The Problem Types, Completed Units and Completion Costs are shown below.

Problem Type	Completed Units	Completion Costs
Clogged Streams (Miles)	476.23	\$772,716.88
Dangerous Highwalls (Feet)	14,880	\$2,270,026.27
Dangerous Impoundments (Count)	54	\$1,258,260.46
Dangerous Piles & Embankments (Acres)	11	\$2,429,868.71
Dangerous Slides (Acres)	24.01	\$6,292,984.64
Hazardous Equipment & Facilities (Count)	2	\$3,387.00
Hazardous Water Bodies (Count)	1	\$10,000.00
Polluted Water: Human Consumption (Count)	145	\$11,445,763.70
Portals (Count)	75	\$1,586,475.00
Subsidence (Acres)	11.4	\$1,440,965.37
Surface Burning (Acres)	17.75	\$2,742,500.79
Underground Mine Fires (Acres)	5	\$4,125,322.08
Vertical Opening (Count)	7	\$591,603.92
Water Problems (Gallons)	416,301.5	\$915,397.66
Equipment/Facility (Count)	3	\$25,000.00
Gobs (Acres)	2	\$20,000.00
Highwall (feet)	1,115	\$175,000.00
Industrial/Residential Waste (Acre)	0.6	\$32,952.69
Total Cost		\$36,178,225.17

V. DEPARTMENT of ENVIRONMENTAL PROTECTION

D. Division of Land Restoration

The Division of Land Restoration's mission is to reclaim and remediate contaminated and disturbed land to a condition protective of public health and safety and suitable for productive reuse and economic development

Office of Environmental Remediation

Through its various environmental cleanup programs outlined below, the Office of Environmental Remediation (OER) provides for clean, safe, and productive West Virginia communities by assessing and remediating environmental resources and restoring contaminated properties to beneficial use.

Voluntary Remediation Program - The Voluntary Remediation Program encourages voluntary cleanup and redevelopment of abandoned or under-utilized contaminated properties by providing certain environmental liability protections under West Virginia law to parties completing remediation under WVDEP oversight. During FY18 and FY19, the program:

- ❖ Accepted nineteen (19) new applications for voluntary remediation projects.
- ❖ Issued thirty-three (33) Certificate of Completion for 968.48 remediated acres of land ready for reuse.

Cumulatively, 201 Certificate of Completion have been issued for 2,655 remediated acres of land.

UECA-LUST Program - The Uniform Environmental Covenants Act–Leaking Underground Storage Tank (UECA-LUST) Program is an alternative remediation option for releases from underground storage tanks (USTs). Similar to the Voluntary Remediation Program, responsible parties may remediate LUST sites to risk-based standards utilizing engineering and institutional controls, such as covers, caps, and land use restrictions, in accordance with the Uniform Environmental Covenants Act. However, this program only addresses contaminants associated with the LUST release, rather than all contaminants associated with historic use of the site.

During FY18 and FY19, the program:

- ❖ Accepted twenty (20) LUST sites to participate in the program.
- ❖ Issued nine (9) No Further Action letters to sites which successfully completed risk-based remediation.

Superfund Program - The West Virginia Department of Environmental Protection is a support regulatory agency for the U.S. Environmental Protection Agency at removal, pre-remedial, and remedial sites subject to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which requires meaningful state participation. The WVDEP Superfund Program represents state interests; ensures compliance with applicable state laws and regulations; provides oversight of data and data collection activities; and acts as a liaison between the U.S. EPA and the citizens of West Virginia, local officials, community representatives, property owners, industry, and nonprofit organizations. During FY18 and FY19, the program:

- ❖ Supported EPA's Remedial Program and led O&M efforts at ten (10) Superfund National Priorities List (NPL) sites.
- ❖ Assisted EPA Response Program On-Scene Coordinators with removal assessments and actions at seven (7) sites.
- ❖ Led or supported pre-remedial assessments for EPA's Site Assessment Program at thirteen (13) sites.

Federal Facilities Restoration Program - WVDEP serves as the lead regulatory agency at Department of Defense (DOD) restoration sites not on the Superfund NPL. The Federal Facilities Restoration Program oversees the investigation and cleanup of active, closing, and formerly used military installations at which hazardous substances and/or petroleum products were used, stored, or disposed of during past operations, as well as military munitions response sites known or suspected to contain unexploded ordnance, discarded military munitions, or munitions constituents. During FY18 and 19, the program:

- ❖ Collaborated with the U.S. Air Force, U.S. Army, U.S. Army Corps of Engineers, U.S. Army National Guard, and U.S. Navy to actively assess and remediate six (6) Formerly Use Defense Sites (FUDS), Military Munitions Response Program (MMRP) sites, and Installation Restoration (IR) sites.

Long-Term Monitoring of Institutional Controls

Institutional controls are administrative and legal controls (such as restrictive covenants or city ordinances) that minimize the potential for human exposure or contamination and protect the integrity of the cleanup. WVDEP generally utilizes Land Use Covenants (LUCs)—also referred to as environmental covenants—as institutional controls on sites where removal and treatment of all contamination is not possible or practical. LUCs are legal instruments that impose activity and use limitations (AULs) where residual contamination is present on a property. AULs may include use or extraction of groundwater for any purpose, except for groundwater monitoring and/or remediation; any activity that may interfere with the groundwater monitoring well network; and construction of a building without a sub-slab vapor barrier and/or ventilation system adequate to prevent exposure to vapors in soil and groundwater.

WVDEP continuously monitors and regularly inspects properties with recorded LUCs to protect citizens from coming in contact with contamination at a site. During FY18 and FY19, WVDEP:

- ❖ Received and processed 2,741 notifications of excavation from WV811 to monitor sites with established environmental controls that contain AULs and/or engineering controls.

V. DEPARTMENT of ENVIRONMENTAL PROTECTION

E. Office of Environmental Advocate

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.

During the FY 2018 and 2019 period (July 1, 2017-June 30, 2019), REAP has accomplished the following:

The REAP Program eliminated 1,909 dumps from West Virginia's landscape. This led to the proper disposal of over 4,943 tons of litter/waste. REAP was also responsible for the proper disposal of over 287,055 waste tires. Many of these tires were pulled from the 222 miles of rivers and streams that REAP cleaned during this time.

- ❖ REAP's Pollution Prevention Open Dump Program (PPOD) reclaimed 1,164 acres of land through the eradication of 1,909 dumps. PPOD also removed over 72 appliances from the landscape and recycled more than 2,092 tons of scrap metal.
- ❖ REAP's Make It Shine Program coordinated the efforts of 10,606 volunteers. These volunteers worked to remove more than 298 tons of litter and debris. The volunteers removed litter from 591 acres of park, 248 miles of streams, and 155 miles of trails.
- ❖ REAP's Adopt-A- Highway Program had 15,942 volunteers in 1,170 active groups. They worked to remove more than 434 tons of litter from more than 4,500 miles of roadway.
- ❖ The REAP Litter Control Grant Program, which provides grants to counties and municipalities for litter control and cleanup programs, funded 49 projects totaling \$133,386.40.
- ❖ The REAP West Virginia Recycling Assistance Grant Program, which provides grants for recycling to public and private entities, awarded 60 grants totaling \$3,281,685.54.
- ❖ 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 21 grants totaling \$218,054.25.
- ❖ The REAP West Virginia Public Employees Office Paper Collection Program collected over 477 tons of paper from state offices.

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.

- ❖ Closure of the City of Clarksburg Landfill began on April 1, 2019 and is expected to be completed in March 2021.

V. DEPARTMENT of ENVIRONMENTAL PROTECTION

F. Information Technology Support

Technical Applications and Geographical Information Systems (TAGIS) Unit

The TAGIS unit provides central support for all DEP units involved in groundwater activities in the form of geographical database creation and update, analysis, web-based services and applications, and software support.

TAGIS maintains the agency ArcGIS license server that provides access to advanced desktop GIS software. It also has developed automated processes for creating and updating geographical datasets critical for agency programs, including NPDES permits and outlets (which also include underground injection permits), voluntary remediation sites, oil and gas development permits, active mining operations, above ground storage tanks, and others. TAGIS also has developed or obtained a wide range of additional GIS data products related to stream networks, flow estimation, high resolution surface elevation data, soil data used for runoff analysis, public water sources and protection areas, toxics release inventory, and others. Additional work has extended the National Hydrology Dataset to allow stream network traversal in karst areas by linking sinking streams and emergent springs based on dye trace data and karst basin maps.

The TAGIS unit continues to expand the agency's web-based mapping capability, maintaining and developing a range of interactive mapping applications and 'story maps' that quickly bring together data resources from many organizations to a single place, which then can be shared with anyone via a simple web address. Over the last year, TAGIS has become increasingly involved with the use of UAVs to create detailed and accurate maps to support investigation and remediation of contaminated sites, as well as supporting reclamation of mine sites. TAGIS will soon take delivery of a multispectral camera to support mapping and monitoring wetlands.

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

Well Head Protection Program

As of June 30, 2019, the Wellhead Protection (WHP) program continues to work with the 556-groundwater community, non-community transient and transient public water supply systems on developing WHP programs.

In West Virginia, the Source Water Assessment and Protection (SWAP) Program encompasses both the wellhead "groundwater" protection and surface water protection efforts. Implementation of the wellhead protection program began in the early 1990's, as part of West Virginia ground water protection strategy. This protection strategy was extended to surface water sources with the 1996 Safe Drinking Water Act Amendments. The Act require states to develop and implement a SWAP program designed to evaluate the vulnerability of public drinking water systems to possible sources of contamination and encourages states to work with these systems in developing protection and management plans. The Source Water Protection Plan (SWPP) was enacted by WV Senate Bill 373 during the 2014 WV Legislative Session and revision of the 64CSR3, Public Water Supply System regulations to include requirements for utility water systems to update their existing, or file a new comprehensive SWPP for surface water and surface water influenced groundwater (SWIG) systems.

The WHP program targets groundwater 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 WHP program includes public participation, source delineations, the potential contaminant survey, contingency planning and management directives complementing the SWAP program. WHP program is 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 West Virginia Bureau for Public Health (WVBPH) Office of Environmental Health Services (OEHS) staff continues to complete 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 WHP builds on other environmental assessment and protection programs and requires integrated linkage and cooperation of the WV Department of Environmental Protection (DEP). Moving to a voluntary 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 WHP builds on other environmental assessment programs and requires an 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 WHP program maximizes the use of existing information, requires integration with existing state and federal programs and the use of a Geographic Information System (GIS) to map delineations and assessments.

Program Milestones and Future Priorities

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

Building Partnerships-Inter-agency cooperation and other alliances:

- ❖ 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 Underground Injection Control (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 (DWSPP). 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* (SDWA) and the *Clean Water Act* (CWA) 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 (WVWRA), through a joint project with the U.S. Department of Agriculture (USDA) Farm

Service Agency (FSA), working with the local SWAP and WHP areas within the state.

- ❖ Continue to use hydrogeologic information provided from the United States Geological Survey (USGS) to help define WHP delineation areas.

Public Outreach/Educational Activities:

- ❖ OEHS Staff provides help in developing a protection program, and assessing potential sources of contamination.
- ❖ The 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. In addition, a link is available to a website that provides copies of the initial SWAP/WHP susceptibility assessment reports for the community water systems.
- ❖ WVBPH Source Water Protection GIS website (<https://oehsportal.wvdhhr.org/webportal/>) disseminates relevant source water information to public water supplies, state agencies, federal agencies and local governments to further source water protection.
- ❖ Installation of protection signage along the perimeter of wellhead protection areas. PWSs can use the signs for municipality and non-highway use.

Other Actions for Protection of Sources of Drinking Water

- ❖ 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 2,000 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) and/or SWIG.

- ❖ Continue to support the efforts of the WVDEP - Division of Water and Waste Management (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.

Ground Water Data Collection and Management:

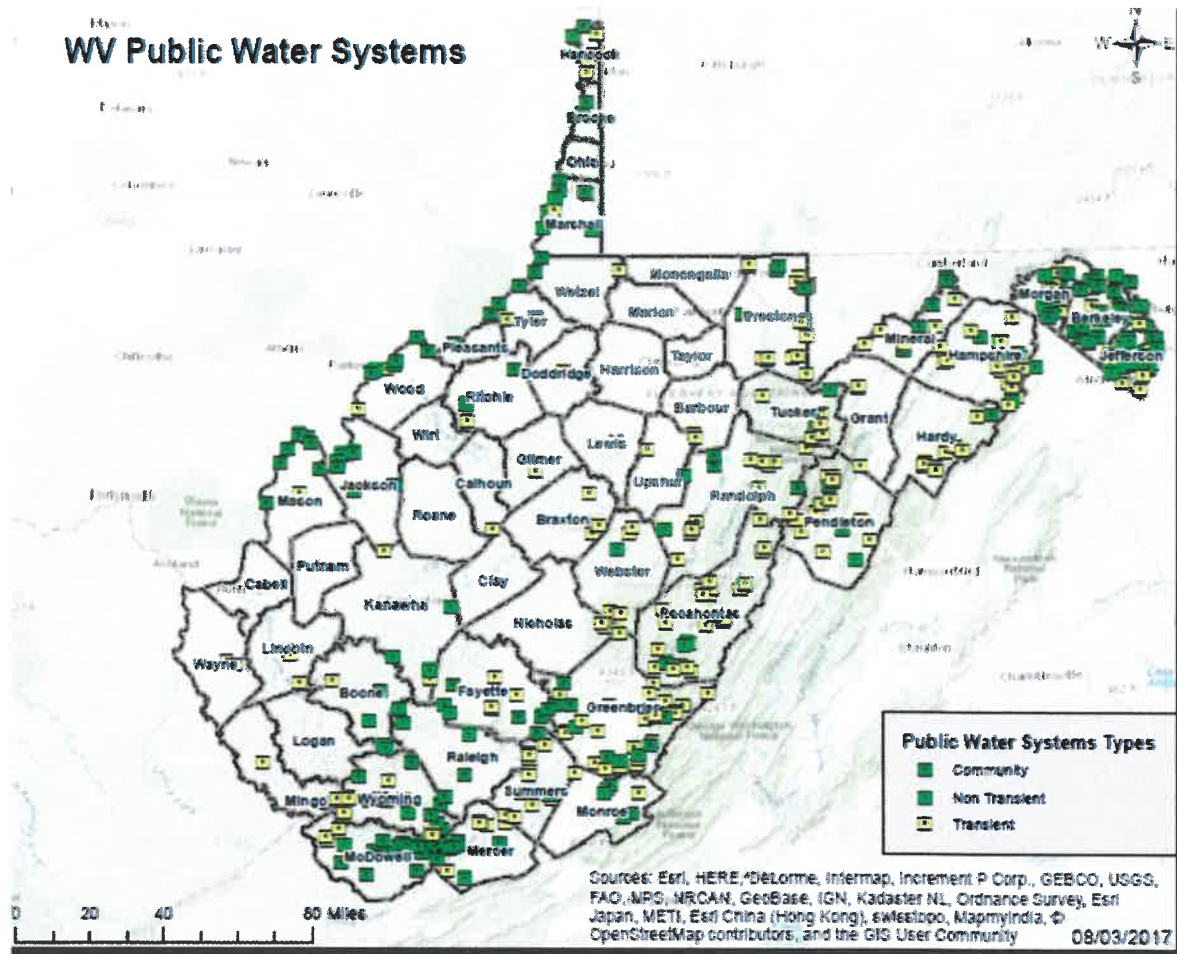
The WHP program acquires a variety of data, including locations and characteristics of public water supply sources, point of entry, potential contaminant sources, and description of watersheds, hydrogeologic settings, and aquifer parameters. This data continues to be collected through field data collection 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 programs, creating a GIS program for the storage and display of geologic/hydrologic and regulatory site data, delineations, and existing significant contaminant source inventories. Potential future WHP 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 Safe Drinking Water Act and the Clean Water Act.
- ❖ Funding to continue to sustain a grant program for PWSs that utilize groundwater to assist and focus appropriate source water protection efforts, increase resistance and provide security to source water protection areas and new water facilities.

WV Public Water Systems



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

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:

Division of Water and Waste Management
Groundwater Program
601 57th Street SE
Charleston WV 25304
(304) 926-0495
FAX (304) 926 0496
TDD (304) 926-0489

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

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

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