Source Water Protection Plan
Armstrong Public Service District

PWSID WV3301004

Fayette County

June 2016

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In cooperation with Armstrong PSD

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I certify the information in the source water protection plan is complete and accurate to the best of my knowledge.

Signature of responsible party or designee authorized to sign for water utility:

Print Name of Authorizing Signatory:

Title of Authorizing Signatory:

Date of Submission:

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APPENDICES

SOURCE WATER PROGRAM ACRONYMS

AST	Aboveground Storage Tank
BMP	Best Management Practices
ERP	Emergency Response Plan
GWUDI	Ground Water Under the Direct Influence of Surface Water
LEPC	Local Emergency Planning Committee
OEHS/EED	Office of Environmental Health Services/Environmental Engineering Division
PE	Professional Engineer
PSSCs	Potential Source of Significant Contamination
PWSU	Public Water System Utility
RAIN	River Alert Information Network
RPDC	Regional Planning and Development Council
SDWA	Safe Drinking Water Act
SWAP	Source Water Assessment and Protection
SWAPP	Source Water Assessment and Protection Program
SWP	Source Water Protection
SWPA	Source Water Protection Area
SWPP	Source Water Protection Plan
WARN	Water/Wastewater Agency Response Network
WHPA	Wellhead Protection Area
WHPP	Wellhead Protection Program
WSDA	Watershed Delineation Area
WVBPH	West Virginia Bureau for Public Health
WVDEP	West Virginia Department of Environmental Protection
WVDHHR	West Virginia Department of Health and Human Resources
WVDHSEM	West Virginia Division of Homeland Security and Emergency Management
ZCC	Zone of Critical Concern
ZPC	Zone of Peripheral Concern

1.0 PURPOSE

The goal of the West Virginia Bureau of Public Health (WVBPH) source water assessment and protection (SWAP) program is to prevent degradation of source waters which may preclude present and future uses of drinking water supplies to provide safe water in sufficient quantity to users. The most efficient way to accomplish this goal is to encourage and oversee source water protection on a local level. Many aspects of source water protection may be best addressed by engaging local stakeholders.

The intent of this document is to describe what Armstrong Public Service District (PSD) has done, is currently doing, and plans to do to protect its source of drinking water. Although this water system treats the water to meet federal and state drinking water standards, conventional treatment does not fully eradicate all potential contaminants, and treatment that goes beyond conventional methods is often very expensive. By completing this plan, Armstrong PSD acknowledges that implementing measures to minimize and mitigate contamination can be a relatively economical way to help ensure the safety of the drinking water.

1.1 WHAT ARE THE BENEFITS OF PREPARING A SOURCE WATER PROTECTION PLAN?

- Fulfilling the requirement for the public water utilities to complete or update their source water protection plan.
- Identifying and prioritizing potential threats to the source of drinking water; and establishing strategies to minimize the threats.
- Planning for emergency response to incidents that compromise the water supply by contamination or depletion, including how the public, state, and local agencies will be informed.
- Planning for future expansion and development, including establishing secondary sources of water.
- Ensuring conditions to provide the safest and highest quality drinking water to customers at the lowest possible cost.
- Providing more opportunities for funding to improve infrastructure, purchase land in the protection area, and other improvements to the intake or source water protection areas.

2.0 BACKGROUND: WV SOURCE WATER ASSESSMENT AND PROTECTION PROGRAM

Since 1974, the federal Safe Drinking Water Act (SDWA) has set minimum standards on the construction, operation, and quality of water provided by public water systems. In 1986, Congress amended the SDWA. A portion of those amendments were designed to protect the source water contribution areas around ground water supply wells. This program eventually became known as the Wellhead Protection Program (WHPP). The purpose of the WHPP is to prevent pollution of the source water supplying the wells.

The Safe Drinking Water Act Amendments of 1996 expanded the concept of wellhead protection to include surface water sources under the umbrella term of Source Water Protection. The amendments encourage states to establish SWAP programs to protect all public drinking water supplies. As part of this initiative states must explain how protection areas for each public water system will be delineated, how potential contaminant sources will be inventoried, and how susceptibility ratings will be established.

In 1999, the WVBPH published the West Virginia Source Water Assessment and Protection Program, which was endorsed by the United States Environmental Protection Agency. Over the next few years, WVBPH staff completed an assessment (i.e., delineation, inventory and susceptibility analysis) for all of West Virginia's public water systems. Each public water system was sent a copy of its assessment report. Information regarding assessment reports for Armstrong PSD can be found in **Table 1**.

3.0 STATE REGULATORY REQUIREMENTS

On June 6, 2014, §16 1 2 and §16 1 9a of the Code of West Virginia, 1931,was reenacted and amended by adding three new sections, designated §16 1 9c, §16 1 9d and §16-1-9e. The changes to the code outlines specific requirements for public water utilities that draw water from a surface water source or a surface water influenced groundwater source.

Under the amended and new codes each existing public water utility using surface water or ground water influenced by surface water as a source must have completed or updated a source water protection plan by July 1, 2016, and must continue to update their plan every three years. Existing source water protection plans have been developed for many public water utilities in the past. If available, these plans were reviewed and considered in the development of this updated plan. Any new water system established after July 1, 2016 must submit a source water protection plan before they start to operate. A new plan is also required when there is a significant change in the potential sources of significant contamination (PSSC) within the zone of critical concern (ZCC).

The code also requires that public water utilities include details regarding PSSCs, protection measures, system capacities, contingency plans, and communication plans. Before a plan can be approved, the local health department and public will be invited to contribute information for consideration. In some instances, public water utilities may be asked to conduct independent studies of the source water protection area and specific threats to gain additional information.

4.0 SYSTEM INFORMATION

Armstrong PSD is classified as a state regulated public utility and operates a community public water system. A community public water system is a system that regularly supplies drinking water from its own sources to at least 15 service connections used by year round residents of the area or regularly serves 25 or more people throughout the entire year. For purposes of this source water protection plan, community public water systems are also referred to as public water utilities. Information on the population served by this utility is presented in **Table 1** below.

Table 1. Population Served by Armstrong PSD

Administrative office location:	PO Box 156, Kimberly, WV 25118		
Is the system a public utility, according to the Public Service Commission rule?	Yes		
Date of Most Recent Source Water Assessment Report:	June 2003		
Date of Most Recent Source Water Protection Plan:	September 2010		
Population served directly:	The utility directly serves approximately 2,187 people.		
Bulk Water Purchaser Systems:	**System Name**	**PWSID Number**	**Population**
	None	-	-
Total Population Served by the Utility:	The utility serves a total population of around 2,187 people, including those customers that used to be served by Deepwater PSD, which was purchased by Armstrong PSD.		
Does the utility have multiple source water protection areas (SWPAs)?	No		
How many SWPAs does the utility have?	1		

5.0 WATER TREATMENT AND STORAGE

As required, Armstrong PSD has assessed their system (e.g., treatment capacity, storage capacity, unaccounted for water, contingency plans) to evaluate their ability to provide drinking water and protect public health. **Table 2** contains information on the water treatment methods and capacity of the utility. Information about the surface sources from which Armstrong PSD draws water can be found in **Table 3**. If the utility draws water from any groundwater sources to blend with the surface water the information about these ground water sources can be found in **Table 4**.

Table 2. Armstrong PSD Water Treatment Information

Water Treatment Processes (List All Processes in Order)	Water treatment processes consist of coagulation, sedimentation, filtration, and disinfection.
Current Treatment Capacity (gal/day)	The approximate treatment plant capacity is 393,000 gallons/day.
Current Average Production (gal/day)	The current average production is 280,000 gallons/day.
Maximum Quantity Treated and Produced (gal)	The maximum amount produced in a single day in the last year was around 360,000 gallons.
Minimum Quantity Treated and Produced (gal)	The minimum amount produced in a single day in the last year was around 229,320 gallons.
Average Hours of Operation	The plant is typically operated around 16 hours/day.
Maximum Hours of Operation in One Day	The maximum hours of operation in a single day in the last year was around 22 hours.
Minimum Hours of Operation in One Day	The minimum hours of operation in a single day in the last year was around 14 hours.
Number of Storage Tanks Maintained	The utility maintains four treated water storage tanks and three booster stations.
Total Gallons of Treated Water Storage (gal)	The utility has a total of 432,000 gallons of treated water storage.
Total Gallons of Raw Water Storage (gal)	The utility does not have any raw water storage.

Table 3. Armstrong PSD Surface Water Sources

Intake Name	SDWIS #	Local Name	Describe Intake	Name of Water Source	Date Constructed / Modified	Frequency of Use (Primary/ Backup/ Emergency)	Activity Status (Active/ Inactive)
Kanawha River Intake	IN001	Kanawha Intake	The intake pipe is an unscreened straight pipe that extends from the bank into the Kanawha River. The intake pumps are located on the bank at the same level as the intake.	Kanawha River	Unknown	Primary	Active

Table 4. Armstrong PSD Groundwater Sources

Does the utility blend with groundwater?					No				
Well/Spring Name	SDWIS #	Local Name	Date Constructed/ Modified	Completion Report Available (Yes/No)	Well Depth (ft.)	Casing Depth (ft.)	Grout (Yes/No)	Frequency of Use (Primary/ Backup/ Emergency)	Activity Status (Active/ Inactive)
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

6.0 DELINEATIONS

For surface water systems, delineation is the process used to identify and map the drainage basin that supplies water to a surface water intake. This area is generally referred to as the source water protection area (SWPA). All surface waters are susceptible to contamination because they are exposed at the surface and lack a protective barrier from contamination. Accidental spills, releases, sudden precipitation events that result in overland runoff, or storm sewer discharges can allow pollutants to readily enter the source water and potentially contaminate the drinking water at the intake. The SWPA for surface water is distinguished as a Watershed Delineation Area (WSDA) for planning purposes; and the Zone of Peripheral Concern (ZPC) and Zone of Critical Concern (ZCC) are defined for regulatory purposes.

The WSDA includes the entire watershed area upstream of the intake to the boundary of the State of West Virginia border or a topographic boundary. The ZCC for a public surface water supply is a corridor along streams within the watershed that warrants more detailed scrutiny due to its proximity to the surface water intake and the intake's susceptibility to potential contaminants within that corridor. The ZCC is determined using a mathematical model that accounts for stream flows, gradient and area topography. The length of the ZCC is based on a five-hour time-of-travel of water in the streams to the water intake, plus an additional one-quarter mile below the water intake. Ohio River ZCC delineations are based on ORSANCO guidance and extend 25 miles above the intake. The width of the zone of critical concern is 1,000 feet measured horizontally from each bank of the principal stream and five hundred feet measured horizontally from each bank of the tributaries draining into the principal stream. Ohio River ZCC delineations are based on ORSANCO guidance and extend 25 miles above the intake and one-quarter mile below the intake. The Ohio River ZCC delineations include 1,320 feet (one-quarter mile) measured from the bank of the main stem of the Ohio River and 500 feet on tributary.

The ZPC for a public surface water supply source and for a public surface water influenced groundwater supply source is a corridor along streams within a watershed that warrants scrutiny due to its proximity to the surface water intake and the intake's susceptibility to potential contaminants within that corridor. The ZPC is determined using a mathematical model that accounts for stream flows, gradient and area topography. The length of the zone of peripheral concern is based on an additional five-hour time-of-travel of water in the streams beyond the perimeter of the zone of critical concern, which creates a protection zone of ten hours above the water intake. The width of the zone of peripheral concern is one thousand feet measured horizontally from each bank of the principal stream and five hundred feet measured horizontally from each bank of the tributaries draining into the principal stream.

For groundwater supplies there are two types of SWPA delineations: 1) wellhead delineations and 2) conjunctive delineations, which are developed for supplies identified as groundwater under the direct influence of surface water, or GWUDIs. A wellhead protection area is determined to be the area contributing to the recharge of the groundwater source (well or spring), within a five year time of travel. A conjunctive delineation combines a wellhead protection area for the hydrogeologic recharge and a connected surface area contributing to the wellhead.

Information and maps of the WSDA, ZCC, ZPC and Wellhead Protection Area for this public water supply were provided to the utility and are attached to this report. See **Appendix A. Figures**. Other information about the WSDA is shown in **Table 5**.

Table 5. Watershed Delineation Information

Size of WSDA (Indicate units)	The watershed delineation area covers approximately 8,438 square miles.
River Watershed Name (8-digit HUC)	Upper Kanawha River Watershed- 05050006
Size of Zone of Critical Concern (Acres)	The updated zone of critical concern covers approximately 16,018 acres.
Size of Zone of Peripheral Concern (Acres) (Include ZCC area)	The zone of peripheral concern covers approximately 68,529 acres, including the ZCC.
Method of Delineation for Groundwater Sources	N/A. The utility does not have any groundwater sources.
Area of Wellhead Protection Area (Acres)	N/A

7.0 PROTECTION TEAM

One important step in preparing a source water protection plan is to organize a source water protection team who will help develop and implement the plan. The legislative rule requires that water utilities make every effort to inform and engage the public, local government, local emergency planners, the local health department and affected residents at all levels of the development of the protection plan. WVBPH recommends that the water utility invite representatives from these organizations to join the protection team, which will ensure that they are given an opportunity to contribute in all aspects of source water protection plan development. Public water utilities should document their efforts to engage representatives and provide an explanation if any local stakeholder is unable to participate. In addition, other local stakeholders may be invited to participate on the team or contribute information to be considered. These individuals may be emergency response personnel, local decision makers, business and industry representatives, land owners (of land in the protection area), and additional concerned citizens.

The administrative contact for Armstrong PSD is responsible for assembling the protection team and ensuring that members are provided the opportunity to contribute to the development of the plan. The acting members of the Protection Team are listed in **Table 6.**

The role of the protection team members will be to contribute information to the development of the source water protection plan, review draft plans and make recommendations to ensure accuracy and completeness, and when possible contribute to implementation and maintenance of the protection plan. The protection team members are chosen as trusted representatives of the community served by the water utility and may be designated to access confidential data that contains details about the local PSSCs. The input of the protection team will be carefully considered by the water utility when making final decisions relative to the documentation and implementation of the source water protection plan.

Armstrong PSD will be responsible for updating the source water protection plan and rely upon input from the protection team and the public to better inform their decisions. To find out how you can become involved as a participant or contributor, visit the utility website or call the utility phone number, which are provided in **Table 6.**

Table 6. Protection Team Member and Contact Information

Name	Representing	Title	Phone Number	Email
Judson Wallace	Armstrong PSD	Commissioner	304-442-8302	
Joe Burdett	Armstrong PSD	Chief Operator	304-442-5044	wpo1960@aol.com
Jim Truman	Armstrong PSD	Operator/General Manager		
Randy Bowen	Armstrong PSD	Commissioner	304-206-7154	
Steve Cruikshank	Fayette County Office of Emergency Services	Director	304-574-3285	fcoessmc@verizon.net
Shannon Estep	Armstrong Creek Fire Department	Chief	304-442-9157	
	Fayette County Health Department		304-574-1617	
Beverley Middleton	Armstrong PSD	Office Manager		
Date of first protection Team Meeting		There were two meetings in which the public could be informed about the source water protection plan. No formal protection team meeting was held.		
Efforts made to inform and engage local stakeholders (public, local government, local emergency planners, local health department, and affected residents) and explain absence of recommended stakeholders:		No efforts were made to engage the local emergency planners or local health department prior to the submission of this plan. These individuals will be invited to review the draft plan and comment before the plan is finalized for approval.		

8.0 POTENTIAL SOURCES OF SIGNIFICANT CONTAMINATION

Source water protection plans should provide a complete and comprehensive list of the PSSCs contained within the ZCC based upon information obtained from the WVBPH, working in cooperation with the West Virginia Department of Environmental Protection (WVDEP) and the West Virginia Division of Homeland Security and Emergency Management (WVDHSEM). A facility or activity is listed as a PSSC if it has the potential to release a contaminant that could potentially impact a nearby public water supply, and it does not necessarily indicate that any release has occurred.

The list of PSSCs located in the SWPA is organized into two types: 1) SWAP PSSCs, and 2) Regulated Data. SWAP PSSCs are those that have been collected and verified by the WVBPH SWAP program during previous field investigations to form the source water assessment reports and source water protection plans. Regulated PSSCs are derived from federal and state regulated databases, and may include data from WVDEP, US Environmental Protection Agency, WVDHSEM, and out-of-state data sources.

8.1 CONFIDENTIALITY OF PSSCS

A list of the PSSCs contained within the ZCC should be included in the source water protection plan. However, the exact location, characteristics and approximate quantities of contaminants shall only be made known to one or more designees of the public water utility and maintained in a confidential manner. In the event of a chemical spill, release or other related emergency, information pertaining to the contaminant shall be immediately disseminated to any emergency responders reporting to the site. The designees for Armstrong PSD are identified in the communication planning section of the source water protection plan.

PSSC data from some agencies (ex. WVDHSEM, WVDEP, etc.) may be restricted due to the sensitive nature of the data. Locational data will be provided to the public water utility. However, to obtain specific details regarding contaminants, (such as information included in Tier II reports), water utilities should contact the local emergency planning commission (LEPC) or agencies, directly. While the maps and lists of the PSSCs and regulated sites are to be maintained in a confidential manner, these data are provided in **Appendix A. Figures** for internal review and planning uses only.

8.2 LOCAL AND REGIONAL PSSCS

For the purposes of this source water protection plan, local PSSCs are those that are identified by the water utility and local stakeholders and are not already identified in the PSSCs lists distributed by the WVBPH and other agencies. Local stakeholders may identify local PSSCs for two main reasons. The first is that it is possible that threats exist from unregulated sources and land uses that have not already been inventoried and do not appear in regulated databases. For this reason each public water utility should investigate their protection area for local PSSCs. A PSSC inventory should identify all contaminant sources and land uses in the delineated ZCC. The second reason local PSSCs are identified is because public water utilities may consider expanding the PSSC inventory effort outside of the ZCC into the ZPC and WSDA if necessary to properly identify all threats that could impact the drinking water source. As the utility considers threats in the watershed they may consider collaborating with upstream communities to identify and manage regional PSSCs.

When conducting local and regional PSSC inventories, utilities should consider that some sources may be obvious like above ground storage tanks, landfills, livestock confinement areas, highway or railroad right of ways, and sewage treatment facilities. Others are harder to locate like abandoned cesspools, underground tanks, French drains, dry wells, or old dumps and mines.

Armstrong PSD reviewed intake locations and the delineated SWPAs to verify the existence of PSSCs provided by the WVBPH and identify new PSSCs. If possible, locations of regulated sites within the SWPA were confirmed. Information on any new or updated PSSCs identified by Armstrong PSD and not already appearing in datasets from the WVBPH can be found in Table 7.

Table 7. Locally Identified Potential Sources of Significant Contamination

PSSC Number	Map Code	Site Name	Site Description	Relative Risk Score	Comments
None	-	-	-	-	-

8.3 PRIORITIZATION OF THREATS AND MANAGEMENT STRATEGIES

Once the utility has identified local concerns, they must develop a management plan that identifies specific activities that will be pursued by the public water utility in cooperation and concert with the WVBPH, local health departments, local emergency responders, LEPC and other agencies and organizations to protect the source water from contamination threats.

Depending on the number identified, it may not be feasible to develop management strategies for all of the PSSCs in the SWPA. The identified PSSCs can be prioritized by potential threat to water quality, proximity to the intake(s), and local concern. The highest priority PSSCs can be addressed first in the initial management plan. Lower ranked PSSCs can be addressed in the future as time and resources allow. To assess the threat to the source water, water systems should consider confidential information about each PSSC. This information may be obtained from state or local emergency planning agencies, Tier II reports, facility owner, facility groundwater protection plans, spill prevention response plans, results of field investigations, etc.

In addition to identifying and prioritizing PSSCs within the SWPA, local source water concerns may also focus on critical areas. For the purposes of this source water protection plan, a critical area is defined as an area that is identified by local stakeholders and can lie within or outside of the ZCC. Critical areas may contain one or more PSSCs which would require immediate response to address a potential incident that could impact the source water.

A list of priority PSSCs was selected and ranked by the Armstrong PSD Protection Team. This list reflects the concerns of this specific utility and may contain PSSCs not previously identified and not within the ZCC or ZPC. **Table 8** contains a description of why each critical area or PSSC is considered a threat and what management strategies the utility is either currently using or could use in the future to address each threat.

9.0 IMPLEMENTATION PLAN FOR MANAGEMENT STRATEGIES

Armstrong PSD reviewed the recommended strategies listed in their previous source water protection plan, to consider if any of them should be adopted and incorporated in this updated plan. **Table 9** provides a brief statement summarizing the status of the recommended strategies. **Table 9** also lists strategies from a previous plan that are being incorporated in this plan update

When considering source management strategies and education and outreach strategies, this utility has considered how and when the strategies will be implemented. The initial step in implementation is to establish responsible parties and timelines to implement the strategies. The water utility, working in conjunction with the Protection Team members, can determine the best process for completing activities within the projected time periods. Additional meetings may be needed during the initial effort to complete activities, after which the Protection Team should consider meeting annually to review and update the Source Water Protection Plan. A system of regular updates should be included in every implementation plan.

Proposed commitments and schedules may change but should be well documented and reported to the local stakeholders. If possible, utilities should include cost estimates for strategies to better plan for implementation and possible funding opportunities. Armstrong PSD has developed an implementation plan for priority concerns listed in **Table 8**. The responsible team member, timeline, and potential cost of each strategy are presented in **Table 9**. Note: Because timelines may change, future plan updates should describe the status of each strategy and explain the lack of progress. The responsible team member, timeline, and potential cost of each strategy was estimated and is presented in **Table 9**.

Table 8. Priority PSSCs or Critical Areas

PSSC or Critical Area	Priority Number	Reason for Concern
Industrial Sites	1	Several regulated permit sites are at the industrial facilities on the opposite banks of Kanawha River within the ZCC (Globe Specialty Metals, Alloy Manufacturing) and in a nearby tributary, Jarrett Branch (WV Environmental Services, Inc. Jarrett Branch Landfill). The sites are permitted through: DEP Regulated Coal, DEP Oil and Gas, NPDES Outlets, and RCRA. Some chemicals associated with the metal fabrication, classified as volatile organic compounds, synthetic organic compounds, petroleum hydrocarbons, metals, and heavy metals could migrate into water and endanger human health if one were exposed to high enough concentrations. These chemicals, as well as water from the manufacturing process and draining from the surface of the site, may potentially impact the source water if not managed properly. Historically, Union Carbide and other companies that have operated at the industrial site have utilized land along Jarrett Branch as a dump site. It is currently permitted as a NPDES and is managed by WV Environmental Services, Inc. There have been no violations in their effluent within the past three years.
Public Waste Water Outflow	2	The waste water plant located approximately 1 mile upstream of the intake could release untreated sewage into the Kanawha River.
Barge, Railroad and Highway Traffic	3	While traffic does not extend much beyond the system, barges may come as far upstream as the industrial facility across the Kanawha River from Armstrong PSD. The railroad tracks and highway run parallel to the Kanawha River through the ZCC. If an accident were to occur on or along the river, it may be difficult to contain spill materials and these could potentially contaminate the surface water.
Other PCSs/Critical Areas Upstream of Current ZCC	4	The current ZCC was created using a mathematical formula with limitation. The ZCC appears to be truncated upstream and may not be properly representing a five hour time of travel, the recommended timeframe to be included in the ZCC. Accidental spills or releases from upstream PCSs, including those that may occur on highways, railways, municipal activities, etc. are a concern given that they fall outside of the Armstrong PSD's jurisdiction and the current ZCC.
Gas Wells	5	Gas wells, when properly drilled in accordance with their permits, do not pose an imminent danger. However, brine removed from the wells must be handled properly to prevent contamination to the

PSSC or Critical Area	Priority Number	Reason for Concern
		surface and ground waters. Also, road cuts to access gas well sites may create erosion issues that can cause increased sediments and turbidity in surface waters.
Power line, pipeline, highway and railway right-of-ways (ROWs) maintenance	6	ROWs are typically maintained with herbicides that can migrate into the water supply. In addition to herbicides, electrical substations may have components, such as transformers, containing polychlorinated biphenyl (PCBs) that if spilled and not properly cleaned up could contaminate water. Highway road salt use can also migrate into the water supply.
Security	7	Water system facilities without proper security measures can endanger public health and personal safety.

Table 9. Priority PSSC Management Strategies

PSSC or Critical Area	Management Activity	Responsible Protection Team Member	Status/ Schedule	Comments	Estimated Cost
Previous Plan Status	There were 10 management strategies recommended in the existing plan. These are ongoing or continue to be a concern. These are incorporated in this plan update and listed below.	-	-	-	-
Industrial Sites	Become more familiar with the activities at the industrial sites, particularly storage and transport of hazardous materials. Also, review the groundwater protection plans for Globe Specialty Metals. These plans are required for industry that may impact groundwater and will contain measures that are also protective of the surface water. Coordinate with company emergency preparedness personnel to insure that they are aware of the water intake and what to do in case of an emergency, including notification so that the intake can be shut down to prevent contamination of the treatment plant. Also contact WV Environmental Services, Inc. to	PSD board and/or operator	Within 1 year	Ask Director of Emergency Services to include WV Alloy in emergency preparedness activities and meetings.	No cost to communicate and raise awareness. May take time to review groundwater protection plans and insure BMPs are being observed.

PSSC or Critical Area	Management Activity	Responsible Protection Team Member	Status/ Schedule	Comments	Estimated Cost
	communicate with them the protection area and likelihood that NPDES violations could impact the drinking water source				
Public Waste Water Outflow	Coordinate with Kanawha Falls PSD staff to be alerted if an accidental release were to occur, so that the intake can be shut down while the contamination plume passes.	PSD board and/or operator	Ongoing communication and coordination	-	Minimal cost associated with staff time
Barge, Railroad and Highway Traffic	Continue to coordinate with emergency officials from the county, railroad, and industrial site to be better prepared in the event of a spill or accident.	PSD board and/or operator	Ongoing communication and coordination	In the event that contaminants do find their way into the public water supplies, the system will monitor and react according to standard operation procedures.	Cost associated with participation in training activities. Also costs associated with monitoring if contaminant were to be drawn into the water system.
Barge, Railroad and Highway Traffic	Explore the possibility of erecting signs within the ZCC to alert carriers of the emergency number(s) to call should a spill occur.	-	If funding becomes available	-	Minimal cost associated with staff time
Barge, Railroad and Highway Traffic	Contact carriers that transport materials within the ZCC and identify the types of materials commonly transported and how the materials are typically transported (truck, rail, barge, etc.). This information will be used to inform and properly prepare emergency response personnel.	PSD board and/or operator	Within 1 year	Contact utilities, railroad, and WVDOH to determine the type of herbicides that are used on right-of-ways and when they are used. The system can occasionally sample for those herbicides.	Staff time and cost of additional sampling
Other PCSs/Critical Areas Upstream of Current ZCC	Communicate with the upstream public water systems, municipalities, and emergency services personnel so that incidents upstream are reported to Armstrong PSD in time to prepare for a contamination plume to pass by.	Utility Staff	Ongoing	-	Minimal cost associated with staff time

PSSC or Critical Area	Management Activity	Responsible Protection Team Member	Status/ Schedule	Comments	Estimated Cost
Gas Wells	Further investigate the gas wells to verify their location and examine if the wells are being properly maintained, for example if brine is present in significant amounts, is it being contained and disposed of properly.	Utility Staff/PSD Board	By 2019 Update	-	Minimal cost associated with staff time
Power line, pipeline, highway and railway right-of-ways (ROWs) maintenance	Contact the utilities, WVDOH, and railroad company to determine the herbicides used within the ROWs and any other chemicals used. Herbicide labeling is developed with guidance from the USEPA providing information on application. This guidance has been developed with public health in mind and may list restrictions for application to prevent herbicide migration into water supplies. Communicate the boundaries of the ZCC to raise awareness with utility company to ensure best management practices (BMPs).	Utility Staff/PSD Board	By 2019 Update	-	Minimal cost associated with staff time
Security	Maintain security measures as described in the system Sanitary Survey.	PSD board and operator	Within 5 years	Grant funding may be available from the WVDHHR. Contact SWAP program staff at (304)558-2981 for more information.	Minimal cost associated with staff time
Source Water Protection Plan	Update this Source Water Protection Plan at least every 3 years as required by the State Code of West Virginia.	Source Water Protection Team	Every 3 years. Next update in 2019	The Protection Plan should also be updated any time there is a significant change within the protection area or in utility staff. Yearly meetings of the protection team are recommended to ensure all members are up to date and informed about any developments within the protection area.	Minimal costs associated with team members' time

PSSC or Critical Area	Management Activity	Responsible Protection Team Member	Status/ Schedule	Comments	Estimated Cost
Future Development and Other Activities Within the Watershed	Water utility staff will perform a yearly "windshield survey" of the zone of critical concern. They will note changes in land use, water quality, and other developments that may have occurred since the previous year's survey. These changes will be documented and reflected in future source water protection plan updates.	Water utility staff	Yearly, next survey in 2017	Document the date of the survey and any changes that may have occurred within the ZCC that could impact water quality.	Minimal cost associated with staff time
Yearly Source Water Protection Team Meetings	The Protection Team for Armstrong PSD will meet on a yearly basis to discuss any changes that might have occurred within the watershed or to find replacements for members who can no longer participate on the team.	Source Water Protection Team	Yearly, next meeting in 2017	-	Minimal cost associated with staff time
Regular Coordination with Emergency Managers	Local emergency planners have access to confidential chemical contaminant information in Tier II reports from facilities in the SWPA. The utility should coordinate with the local emergency planners to gain an understanding of potential contaminants to better prepare for a spill event. Utility staff will continue to communicate with these emergency services groups on a regular basis, especially when there is not an ongoing emergency. They will meet yearly as part of the Source Water Protection Team.	Water utility staff and emergency response personnel	Yearly, during regular Protection Team Meetings	Armstrong PSD staff have worked in the past with Fayette County Office of Emergency Services to respond to emergencies effectively and maintain water service to customers. -	Minimal cost associated with staff time
Create a Communication Team	Identify individuals from Armstrong PSD and local emergency management agencies to serve on the Communication Team. Team members will distribute accurate information in a timely manner to water customers and the media in the case of a source water contamination event.	Water utility staff and emergency response personnel	Within 1 year of plan final approval	-	Minimal cost associated with staff time
Detect Contamination	Begin building capacity to detect potential contamination if notified of a spill. First find out what chemicals are likely to occur in the SWPA, research devices to sense them like a photoionization detector	Water utility staff and emergency	Ongoing	-	Minimal cost associated with staff time

PSSC or Critical Area	Management Activity	Responsible Protection Team Member	Status/ Schedule	Comments	Estimated Cost
	(PID). Also contact your laboratory and see make sure they test for the chemicals of concern. Research container type and volume is needed to sample for chemicals of concern, and consider having bottles on hand. Also investigate what personal protective equipment (PPE) and other supplies would be needed to facilitate sampling safely.	response personnel			

10.0 EDUCATION AND OUTREACH STRATEGIES

The goal of education and outreach is to raise awareness of the need to protect drinking water supplies and build support for implementation strategies. Education and outreach activities will also ensure that affected citizens and other local stakeholders are kept informed and provided an opportunity to contribute to the development of the source water protection plan. Armstrong PSD has created an Education and Outreach plan that describes activities it has either already implemented or could implement in the future to keep the local community involved in protecting their source of drinking water. This information can be found in **Table 10**.

Table 10. Education and Outreach Implementation Plan

Education and Outreach Strategy	Description of Activity	Responsible Protection Team Member	Status/ Schedule	Comments	Estimated Cost
Public Meeting	Utility staff from Armstrong PSD participated in a public event hosted by Fayette County and the WV Rivers Coalition. The event took place at Hawks Nest State Park on March 22, 2016. Customers from several utilities attended the event, including Armstrong PSD. Attendees received information about source water protection and the requirements for public water systems. Informational booths were set up for each utility to allow the customers the opportunity to speak with utility staff and review the draft source water protection plans. In addition, utility staff posted a flyer around town and in the PSD office informing customers of their ability to review and comment on the plan.	Utility Staff	March 22, 2016	Utility staff from Armstrong PSD attended the public event and made themselves available to answer any questions their customers might have. They advertised the meeting for several weeks by posting flyers around Kimberly in the PSD Office. In all, approximately 30-40 people attended the meeting. The sign-in sheet from the event is attached in **Appendix E**. Tetra Tech staff developed an informational poster for the public event that is attached in **Appendix E. Supporting Documentation**.	Minimal cost related to operator time.
Consumer Confidence Report	Publish a Consumer Confidence Report (CCR) annually, as required by the Safe Drinking Water Act, which is sent to all water customers. Information concerning the Source Water Assessment is included in the CCR. Also include reference to this source water protection plan and how customers can access a copy.	PSD board member or staff and/or operator	Annually	This would be in addition to required Source Water Assessment information, including source of water and susceptibility to contamination.	CCR required by SDWA, included in annual budget.
Brochures, Pamphlets, and Letters	Send a letter and/or brochure providing educational information to residences and businesses. These will alert the recipients of the need for source water protection and conservation. Businesses that use greater-than-household quantities of regulated substances may receive a different letter. See Appendix E for example letters and a brochure that can be customized. Funding for the brochures may be available through the Wellhead and Source Water Protection Grant Program.	PSD board member or staff and/or operator	Within 1 year	An example brochure is included in **Appendix E**. Funding may be available to print and mail through the grant program.	Cost of brochure printing and mailing.
School Curricula	Work with the school system to incorporate source water activities into the school curricula. One example of school curricula is Project WET. For more information regarding free workshops to educate area teachers on Project WET, visit: http://www.dep.wv.gov/WWE/getinvolved/WET/Page	PSD board member or staff and/or operator	Within 1 year	Will initiate effort by locating the appropriate individuals in school and/or on local school board. Can provide websites with free educational materials to promote source water protection and conservation. Also	Minimal costs. Would require time to coordinate, visit classroom

Education and Outreach Strategy	Description of Activity	Responsible Protection Team Member	Status/ Schedule	Comments	Estimated Cost
	s/default.aspx , or contact the WV DEP at 304-926-0495.			operator may visit school or invite students for a plant tour to tie in with classroom materials.	and provide tour.
Drinking Water Protection Signs	Posting Drinking Water Protection Signs along highways is a common awareness strategy in some states and recommended by the USEPA. Signs are placed to alert the public to the SWPA and about what to do in case of accidental spills. However, be aware that at this time, the WV Division of Highways (WVDOH) has not approved the placement of signs along or adjacent to state highway right of ways for the purposes of source water protection. Therefore, WVDHHR does not approve or recommend such signs. WVDHHR has asked for WVDOH to consider and allow an official and approved source water protection sign. If approved the WVDOH may place and maintain signs along highways at mutually acceptable locations. If interested in erecting Drinking Water Protection Signs, determine the desired location for signs and contact the WVDHHR SWAP program at 304-558-2981 for up to date information on possible financial support and information regarding WVDOH approval.	PSD Staff	Within 1 year	If interested in erecting Drinking Water Protection Signs, determine desired sign locations and contact the WVDHHR SWAP program at 304-558-2981 for up to date information regarding WVDOH approval	If approved, signs will be erected at no cost to water system.
Partner with Watershed Association	Partner with local watershed associations or other civic groups. These groups may have similar goals and available volunteers that can integrate source water protection into their efforts. One such active watershed group is Morris Creek Watershed Associates. While this association represents a stream below Armstrong PSD, the association members may have an interest in protecting the Kanawha River and teaming with Armstrong PSD and other water systems in public outreach.	PSD board and/or operator	If needed.	Watershed members may have similar goals related to water protection and may volunteer time to support water system source water program. Watershed Associations have monthly meetings and conduct public outreach on a yearly basis	Cost associated with participation in activities

11.0 CONTINGENCY PLAN

The goal of contingency planning is to identify and document how the utility will prepare for and respond to any drinking water shortages or emergencies that may occur due to short and long term water interruption, or incidents of spill or contamination. During contingency planning, utilities should examine their capacity to protect their intake, treatment, and distribution system from contamination. They should also review their ability to use alternative sources and minimize water loss, as well as their ability to operate during power outages. In addition, utilities should report the feasibility of establishing an early warning monitoring system and meeting future water demands.

Isolating or diverting any possible contaminant from the intake for a public water system is an important strategy in the event of an emergency. One commonly used method of diverting contaminants from an intake is establishing booms around the intake. This can be effective, but only for contaminants that float on the surface of the water. Alternatively, utilities can choose to pump floating contaminants from the water or chemically neutralize the contaminant before it enters the treatment facility.

Public utilities using surface sources should be able to close the intake by one means or another. However, depending upon the system, methods for doing so could vary greatly and include closing valves, lowering hatches or gates, raising the intake piping out of the water, or shutting down pumps. Systems should have plans in place in advance as to the best method to protect the intake and treatment facility. Utilities may benefit from turning off pumps and, if possible, closing the intake opening to prevent contaminants from entering the piping leading to the pumps. Utilities should also have a plan in place to sample raw water to identify the movement of a contaminant plume and allow for maximum pumping time before shutting down an intake (See Early Warning Monitoring System). The amount of time that an intake can remain closed depends on the water infrastructure and should be determined by the utility before an emergency occurs. The longer an intake can remain closed in such a case, the better.

Raw and treated water storage capacity also becomes extremely important in the event of such an emergency. Storage capacity can directly determine how effectively a water system can respond to a contamination event and how long an intake can remain closed. Information regarding the water shortage response capability of Armstrong PSD is provided in **Table 11**.

11.1 RESPONSE NETWORKS AND COMMUNICATION

Statewide initiatives for emergency response, including source water related incidents, are being developed. These include the West Virginia Water/Wastewater Agency Response Network (WV WARN, see http://www.wvwarn.org/) and the Rural Water Association Emergency Response Team (see http://www.wvrwa.org/). Armstrong PSD has analyzed its ability to effectively respond to emergencies and this information is also provided in **Table 11**.

Table 11. Armstrong PSD Water Shortage Response Capability

Can the utility isolate or divert contamination from the intake or groundwater supply?	Yes
Describe the utility's capability to isolate or divert potential contaminants:	The utility staff can close the intake to divert potential contaminants from the raw water intake.
Can the utility switch to an alternative water source or intake that can supply full capacity at any time?	No
Describe in detail the utility's capability to switch to an alternative source:	The utility has no means of switching to an alternative source of raw water that can support the water treatment plant at full capacity.

Can the utility close the water intake to prevent contamination from entering the water supply?	Yes
How long can the intake stay closed?	If the tanks were full when the intake was closed, the Kimberly tank would likely be the first tank to run dry. This tank would likely last around 24 hours. The other three tanks see much less usage and could likely supply water for several additional days.
Describe the process to close the intake:	The operators can shut down the raw water pumps in a few seconds to stop pumping water into the plant. They can also climb into the raw water intake pit and manually close a valve to shut the intake.
Describe the treated water storage capacity of the water system:	The utility has four treated water storage tanks and three booster pump stations (BPS). Powellton Tank- 110,000 gal. Kimberly Tank- 132,000 gal. Elk Ridge Tank- 30,000 gal. (68,000 gal.)* Deep Water Tank- 122,000 gal. **Total treated water storage- 394,000 gal.** The water system does not have any raw water storage.
Is the utility a member of WVRWA Emergency Response Team?	The water system is a member of WV Rural Water Association but is not a member of the WVRWA Emergency Response Team.
Is the utility a member of WV-WARN?	No
List any other mutual aid agreements to provide or receive assistance in the event of an emergency:	The utility has informal mutual aid agreements with several other local water utilities. They have loaned and borrowed equipment, parts, and assistance from operators with these systems.

* The Elk Ridge tank has a total storage volume of 68,000 gallons; however, PWS personnel have indicated that it can only be filled about 30,000 gallons before the pressure in the distribution system gets too high.

11.2 OPERATION DURING LOSS OF POWER

Armstrong PSD analyzed its ability to operate effectively during a loss of power. This involved ensuring a means to supply water through treatment, storage, and distribution without creating a public health emergency. Information regarding the utility's capacity for operation during power outages is summarized in **Table 12**.

Table 12. Generator Capacity

What is the type and capacity of the generator needed to operate during a loss of power?	The utility owns one 75 kW generator that is located at the treatment plant and one 65 kW generator that is located at the raw water intake. They also have a smaller 20 kW generator that is located at the Deep Water BPS. This allows them to pump and treat raw water and supply the Deep Water zone during a power outage. The rest of the

		distribution area can be supplied by gravity if the other booster stations are bypassed. Some customers may experience low pressure but should have access to water. All three generators are natural gas powered and are plumbed to the local gas line and would have a sufficient fuel supply as long as the gas line was active.	
Can the utility connect to generator at intake/wellhead? If yes, select a scenario that best describes system.		Yes- The raw water intake pump is hardwired to a 65 kW natural gas generator that is plumbed to the local gas utility.	
Can the utility connect to generator at treatment facility? If yes, select a scenario that best describes system.		Yes- The treatment facility is hardwired to a 75 kW natural gas generator that is plumbed to the local gas utility.	
Can the utility connect to a generator in distribution system? If yes, select a scenario that best describes system.		Yes- The Deep Water BPS is hardwired to a 20 kW natural gas generator that is plumbed to the local gas utility. The rest of the distribution system does not require a generator because it can supplied by gravity, although the utility managers are considering purchasing another generator to improve water pressure in these areas during a power outage.	
Does the utility have adequate fuel on hand for the generator?		Yes	
What is your on-hand fuel storage and how long will it last operating at full capacity?		**Gallons**	**Hours**
		All generators are plumbed to the local gas utility.	The fuel supply would be unlimited as long as the gas line was active.
Provide a list of suppliers that could provide generators and fuel in the event of an emergency:		**Supplier**	**Phone Number**
	Generator	Sunbelt Rentals- St. Albans, WV	304-766-6224, pcm217@sunbeltrentals.com
	Generator	Walker Caterpillar- Summersville, WV	304-872-4303
	Fuel	Southern Public Gas	304-442-2311
	Fuel	Sunoco-Montgomery, WV	304-442-8900
Does the utility test the generator(s) periodically?		Yes- The utility tests the generators weekly.	
Does the utility routinely maintain the generator?		Yes- The utility regularly checks fluid levels in the generators and keeps them in working condition.	

If no scenario describing the ability to connect to generator matches the utility's system or if utility does not have ability to connect to a generator, describe plans to respond to power outages:	N/A

11.3 FUTURE WATER SUPPLY NEEDS

When planning for potential emergencies and developing contingency plans, a utility needs to not only consider their current demands for treated water but also account for likely future needs. This could mean expanding current intake sources or developing new ones in the near future. This can be an expensive and time consuming process, and any water utility should take this into account when determining emergency preparedness. Armstrong PSD has analyzed its ability to meet future water demands at current capacity, and this information is included in **Table 13**.

Table 13. Future Water Supply Needs for Armstrong PSD

Is the utility able to meet water demands with the current production capacity over the next 5 years? If so, explain how you plan to do so.	Yes- The water system is not expecting any major changes in population or demand in the service area, which has only experienced a decrease in population in recent years. The water system's opinions concerning the demand for the next five years are generally supported by population trends projected based on US Census Bureau 2000 and 2010 data. According to the 2005 Interim State Population Projections (1), WV as a whole will see a population decline between 2010 and 2030. In addition, researchers at the WVU College of Business and Economics specifically project that populations within Fayette County will decrease from population of 46,039 in 2010 to a projected population of 44,611 in 2020 (2). Census data and projections cannot account for increases in daily demand due to water line extensions. No water line extensions are planned for the next five years. If in the future water line extension projects are proposed the daily demands will be reassessed to determine if the source and treatment facilities can support increased demand.
If not, describe the circumstances and plans to increase production capacity:	N/A

(1)US Department of Commerce, United State Census Bureau. 2005 Interim State Population Projections. Table 1. http://www.census.gov/population/projections/data/state/projectionsagesex.html. Accessed June 10, 2015.

(2) Christiadi, Ph.D., Deskins, John, Ph.D., Lego, Brian. WVU College of Business and Economics, Bureau of Business and Economic Research. March 2014. WVU Research Corporation. http://be.wvu.edu/bber/pdfs/BBER-2014-04.pdf Accessed June 10, 2015.

11.4 WATER LOSS CALCULATION

In any public water system there is a certain percentage of the total treated water that does not reach the customer. Some of this water is used in treatment plant processes such as back washing filters or flushing piping, but there is usually at least a small percentage that goes unaccounted for. To measure and report on this unaccounted for water, a public utility must use the method described in the Public Service Commission's rule, *Rules for the Government of Water Utilities*, 150CSR7, section 5.6. The rule defines unaccounted for water as the volume of water introduced into the distribution system less all metered usage and all known non-metered usage which can be estimated with reasonable accuracy.

To further clarify, metered usages are most often those that are distributed to customers. Non-metered usages that are being estimated include usage by fire departments for fires or training, un-metered bulk sells, flushing to maintain the distribution system, and water used for backwashing filters and cleaning settling basins. By totaling the known metered and non-metered uses the utility calculates unaccounted for water. Note: To complete annual reports submitted to the PSC, utilities typically account for known water main breaks by estimating the amount of water lost. However, for the purposes of the source water protection plan, any water lost due to leaks, even if the system is aware of how much water is lost at a main break, is not considered a use. Water lost through leaks and main breaks cannot be controlled during a water shortages or other emergencies and should be included in the calculation of percentage of water loss for purposes of the source water protection plan. The data in **Table 14** is taken from the most recently submitted Armstrong PSD PSC Annual Report.

Table 14. Water Loss Information

Total Water Pumped (gal)		87,718,000
Total Water Purchased (gal)		0
Total Water Pumped and Purchased (gal)		87,718,000
Water Loss Accounted for Except Main Leaks (gal)	**Mains, Plants, Filters, Flushing, etc.**	500,000
	Fire Department	800,000
	Back Washing	500,000
	Blowing Settling Basins	500,000
Total Water Loss Accounted For Except Main Leaks		2,300,000
Water Sold- Total Gallons (gal)		37,931,000
Unaccounted For Lost Water (gal)		39,487,000
Water lost from main leaks (gal)		8,000,000
Total gallons of Unaccounted for Lost Water and Water Lost from Main Leaks (gal)		47,487,000
Total Percent Unaccounted For Water and Water Lost from Main Leaks (gal)		54%
If total percentage of Unaccounted for Water is greater than 15%, please describe any measures that could be taken to correct this problem:	The utility regularly fixes any leaks as they are detected in the distribution system. In 2015, the utility crews found and fixed a leak that was losing approximately 20,000 GPD. This should improve water loss in the future. In addition, utility staff believe there is an issue with the master meter that measures water leaving the plant. The meter likely indicates that the plant is producing more treated water than it actually is, which could inflate the unaccounted-for water.	

*This information was taken from the 2014 Public Service Commission Annual Report for Armstrong PSD

11.5 EARLY WARNING MONITORING SYSTEM

Public water utilities are required to provide an examination of the technical and economic feasibility of implementing an early warning monitoring system. Implementing an early warning monitoring system may be approached in different ways depending upon the water utility's resources and threats to the source water. A utility may install a continuous monitoring system that will provide real time information regarding water quality conditions. This would require utilities to analyze the data to establish what condition is indicative of a contamination event. Continuous monitoring will provide results for a predetermined set of parameters. The more parameters that are being monitored, the more sophisticated the monitoring equipment will need to be. When establishing a continuous monitoring system, the utility should consider the logistics of placing and maintaining the equipment, and receiving output data from the equipment.

Alternately, or in addition, a utility may also pull periodic grab samples on a regular basis, or in case of a reported incident. The grab samples may be analyzed for specific contaminants. A utility should examine their PSSCs to determine what chemical contaminants could pose a threat to the water source. If possible, the utility should plan in advance how those contaminants will be detected. Consideration should be given to where samples will be collected, the preservations and hold times for samples, available laboratories to analyze samples, and costs associated with the sampling event. Regardless of the type of monitoring (continuous or grab), utilities should collect samples for their source throughout the year to better understand the baseline water quality conditions and natural seasonal fluctuations. Establishing a baseline will help determine if changes in the water quality are indicative of a contamination event and inform the needed response.

Every utility should establish a system or process for receiving or detecting chemical threats with sufficient time to respond to protect the treatment facility and public health. All approaches to receiving and responding to an early warning should incorporate communication with facility owners and operators that pose a threat to the water quality, with state and local emergency response agencies, with surrounding water utilities, and with the public. Communication plays an important role in knowing how to interpret data and how to respond.

Armstrong PSD has analyzed its ability to monitor for and detect potential contaminants that could impact its source water. Information regarding this utility's early warning monitoring system capabilities is provided in **Table 15** and in **Appendix B.**

Table 15. Early Warning Monitoring System Capabilities

Does your system currently receive spill notifications from a state agency, neighboring water system, local emergency responders, or other facilities? If yes, from whom do you receive notices?	The utility receives daily alert emails from the West Virginia Health Department about any spills that have occurred around the state. They have also received notifications from the Kanawha Falls sewage treatment plant and from CSX during the 2015 train derailment.
Are you aware of any facilities, land uses, or critical areas within your protection areas where chemical contaminants could be released or spilled?	Yes. The utility is aware of the facilities upstream that could be a contamination threat to the water system. These include several industrial sites along the Kanawha River, a wastewater treatment plant, bridges, and railroads.
Are you prepared to detect potential contaminants if notified of a spill?	Yes. If notified of a spill the utility would immediately begin taking grab samples from the source water. They also take regular samples from a raw water faucet in the plant every 4 hours to monitor turbidity and chlorine levels, and would likely notice any change in conditions.

<table>
<tr><td rowspan="4">List laboratories (and contact information) on whom you would rely to analyze water samples in case of a reported spill.</td><td colspan="4">Laboratories</td></tr>
<tr><td colspan="2">Name</td><td colspan="2">Contact</td></tr>
<tr><td colspan="2">REIC Laboratory- Beaver, WV</td><td colspan="2">800-999-0105, 304-255-2500, info@reiclabs.com</td></tr>
<tr><td colspan="2">WV State Laboratory, Environmental Chemistry Section- Charleston, WV</td><td colspan="2">304-965-2694</td></tr>
<tr><td colspan="2">Do you have an understanding of baseline or normal conditions for your source water quality that accounts for seasonal fluctuations?</td><td colspan="4">Yes. The operators have an understanding of baseline water quality conditions in the Kanawha River through daily sampling and observations.</td></tr>
<tr><td colspan="2">Does your utility currently monitor raw water (through continuous monitoring or periodic grab samples) at the surface water intake or from a groundwater source on a regular basis?</td><td colspan="4">No. See Form B in Appendix A.</td></tr>
<tr><td rowspan="3">Provide or estimate the capital and O&M costs for your current or proposed early warning system or upgraded system.</td><td>Monitoring System</td><td>YSI EXO 2 (B-1)</td><td>Hach sc1000 (B-2)</td><td>Real Tech Full Scanning Monitoring System (B-3)</td></tr>
<tr><td>Capital</td><td>Total Capital Cost- $19,000</td><td>Approximate Capital Cost- $18,907</td><td>Approximate Capital Cost- $24,155</td></tr>
<tr><td>Yearly O & M</td><td>Parts and calibration- Approximately $1,000

Data management and telemetry- $1,000</td><td>Full service contract with Hach Service Representative- $2,258

Online Viewer-$600</td><td>Replacement Lamps- $1,480

Smart-Sense Monitoring Service- $499</td></tr>
<tr><td colspan="3">Do you serve more than 100,000 customers? If so, please describe the methods you use to monitor at the same technical levels utilized by ORSANCO.</td><td colspan="2">No</td></tr>
</table>

12.0 SINGLE SOURCE FEASIBILITY STUDY

If a public water utility's water supply plant is served by a single–source intake to a surface water source of supply or a surface water influenced source of supply, the submitted source water protection plan must also include an examination and analysis of the technical and economic feasibility of alternative sources of water to provide continued safe and reliable public water service in the event that its primary source of supply is detrimentally affected by contamination, release, spill event or other reason. These alternatives may include a secondary intake, two days of additional raw or treated water storage, an interconnection with neighboring systems, or other options identified on a local level. Note: a suitable secondary intake would draw water supplies from a substantially different location or water source.

To accomplish this requirement, utilities should examine all existing or possible alternatives and rank them by their technical, economic, and environmental feasibility. To have a consistent and complete method for ranking alternatives, WVBPH has developed a feasibility study guide. This guide provides several criteria to consider for each category, organized in a Feasibility Study Matrix. By completing the Feasibility Study Matrix, utilities will demonstrate the process used to examine the feasibility of each alternative and document scores that compare the alternatives. The Feasibility Study matrix and summary of the results are presented in an alternatives feasibility study attached as **Appendix D**.

13.0 COMMUNICATION PLAN

Armstrong PSD has also developed a Communication Plan that documents the manner in which the public water utility, working in concert with state and local emergency response agencies, shall notify the local health agencies and the public of the initial spill or contamination event and provide updated information related to any contamination or impairment of the system's drinking water supply. The initial notification to the public will occur in any event no later than thirty minutes after the public water system becomes aware of the spill, release, or potential contamination of the public water system. A copy of the source water protection plan and the Communication Plan has been provided to the local fire department. Armstrong PSD will update the Communication Plan as needed to ensure contact information is up to date.

Procedures should be in place to effectively react to the kinds of catastrophic spills that can reasonably be predicted at the source location or within the SWPA. The chain-of-command, notification procedures and response actions should be known by all water system employees.

The WVBPH has developed a recommended communication plan template that provides a tiered incident communication process to provide a universal system of alert levels to utilities and water system managers. The comprehensive Communication Plan for Armstrong PSD is attached as **Appendix C** for internal review and planning purposes only.

The West Virginia Department of Environmental Protection is capable of providing expertise and assistance related to prevention, containment, and clean-up of chemical spills. The West Virginia Department of Environmental Protection Emergency Response 24-hour Phone is 1-800-642-3074. The West Virginia Department of Environmental Protection also operates an upstream distance estimator that can be used to determine the distance from a spill site to the closest public water supply surface water intake.

14.0 EMERGENCY RESPONSE SHORT FORM

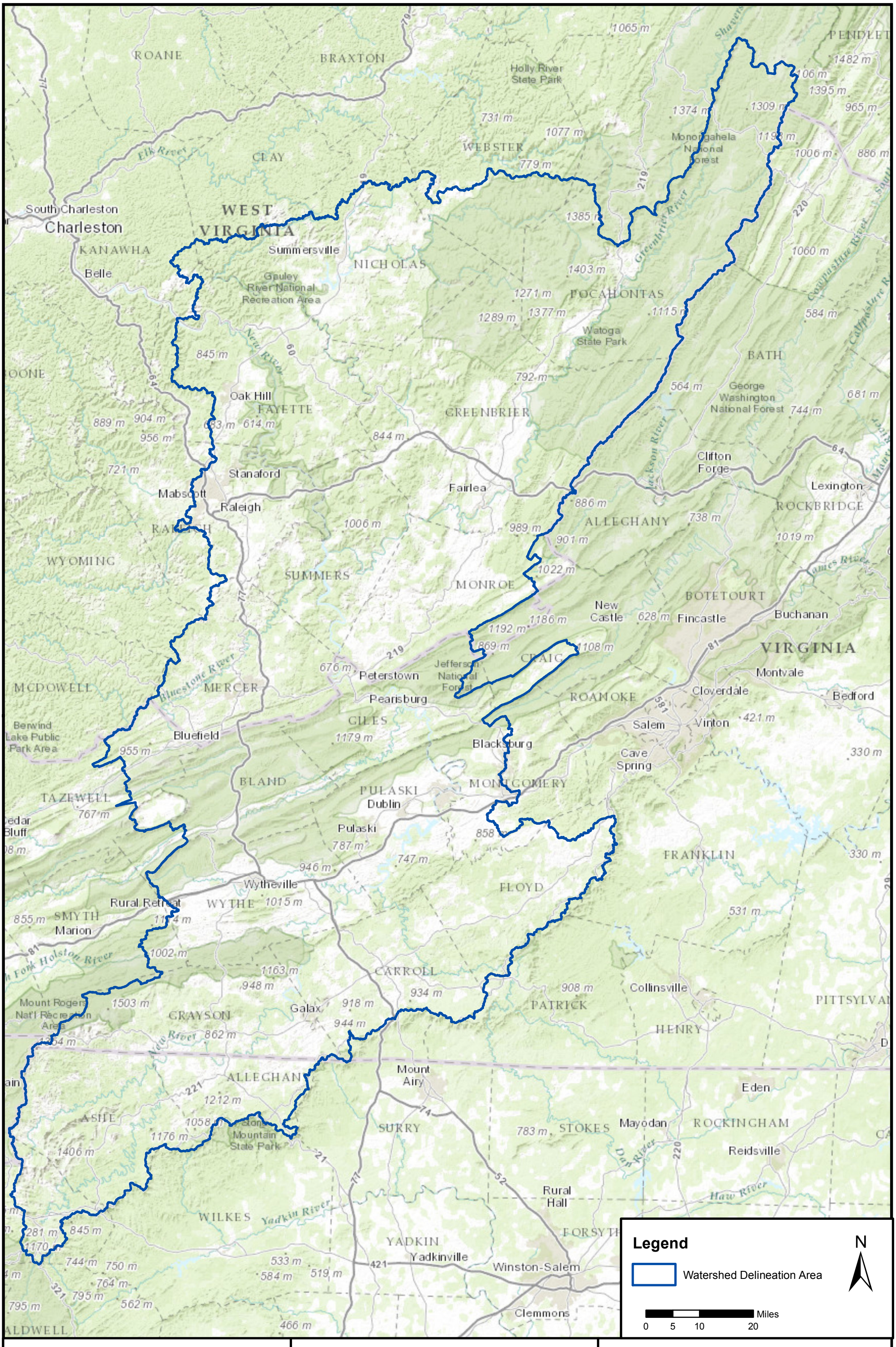
A public water utility must be prepared for any number of emergency scenarios and events that would require immediate response. It is imperative that information about key contacts, emergency services, and downstream water systems be posted and readily available in the event of an emergency. Elements of this source water protection plan, such as the contingency planning and communication plan, may contain similar information to the utility's emergency response plan. However, the emergency response plan is to be kept confidential and is not included in this source water protection plan. An Emergency Short Form is included in **Appendix C** to support the Communicate Plan by providing quick access to important information about emergency response and are to be used for internal review and planning purposes only.

15.0 CONCLUSION

This report represents a detailed explanation of the required elements of Armstrong PSD's Source Water Protection Plan. Any supporting documentation or other materials that the utility considers relevant to their plan can be found in **Appendix E**.

This source water protection plan is intended to help prepare community public water systems all over West Virginia to properly handle any emergencies that might compromise the quality of the system's source water supply. It is imperative that this plan is updated as often as necessary to reflect the changing circumstances within the water system. The protection team should continue to meet regularly and continue to engage the public whenever possible. Communities taking local responsibility for the quality of their source water is the most effective way to prevent contamination and protect a water system against contaminated drinking water. Community cooperation, sufficient preparation, and accurate monitoring are all critical components of this source water protection plan, and a multi-faceted approach is the only way to ensure that a system is as protected as possible against source water degradation.

APPENDIX A. FIGURES



TETRA TECH
803 Quarrier Street, Suite 400
Charleston, WV 25301

Armstrong PSD
PWSID: WV3301004
Source Water Protection Plan

Figure A-1. Watershed Delineation Area

CREATED BY: CEM

DATE: 03/17/16

Legend

Zone of Critical Concern

Zone of Peripheral Concern

Watershed Delineation Area

N

Miles

0 1 2 4

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Charleston, WV 25301

Armstrong PSD
PWSID: WV3301004
Source Water Protection Plan

Figure A-2. Zone of Critical Concern/ Zone of Peripheral Concern

CREATED BY: CEM

DATE: 03/17/16

*Note: Waterline Extensions have been excluded from the Abandoned Mine Land Highwalls layer displayed in this figure. Additionally, the Mining Outlets layer only shows those records where the inspectable unit type is OUTLT. Aboveground Storage Tank locations do not appear on the figure and are to be kept confidential.

N

Legend

- Abandoned Mine Land Points
- Abandoned Mine Land Highwalls
- Abandoned Mine Land Areas
- Bond Forfeiture Sites
- Coal Refuse Sites
- EPA FRS Data for Virginia
- Leaking Underground Storage Tanks
- Landfill Closure Assistance Program Sites
- Mining Outlets
- NPDES Permits
- Oil and Gas Wells
- USEPA Regulated Sites
- Volunteer Remediation

Field Verified PSSCs

- Agriculture
- Commercial
- Industrial
- Municipal
- Residential
- Points of Interest
- Zone of Critical Concern
- Zone of Peripheral Concern
- Watershed Delineation Area

Miles
0 5 10 20

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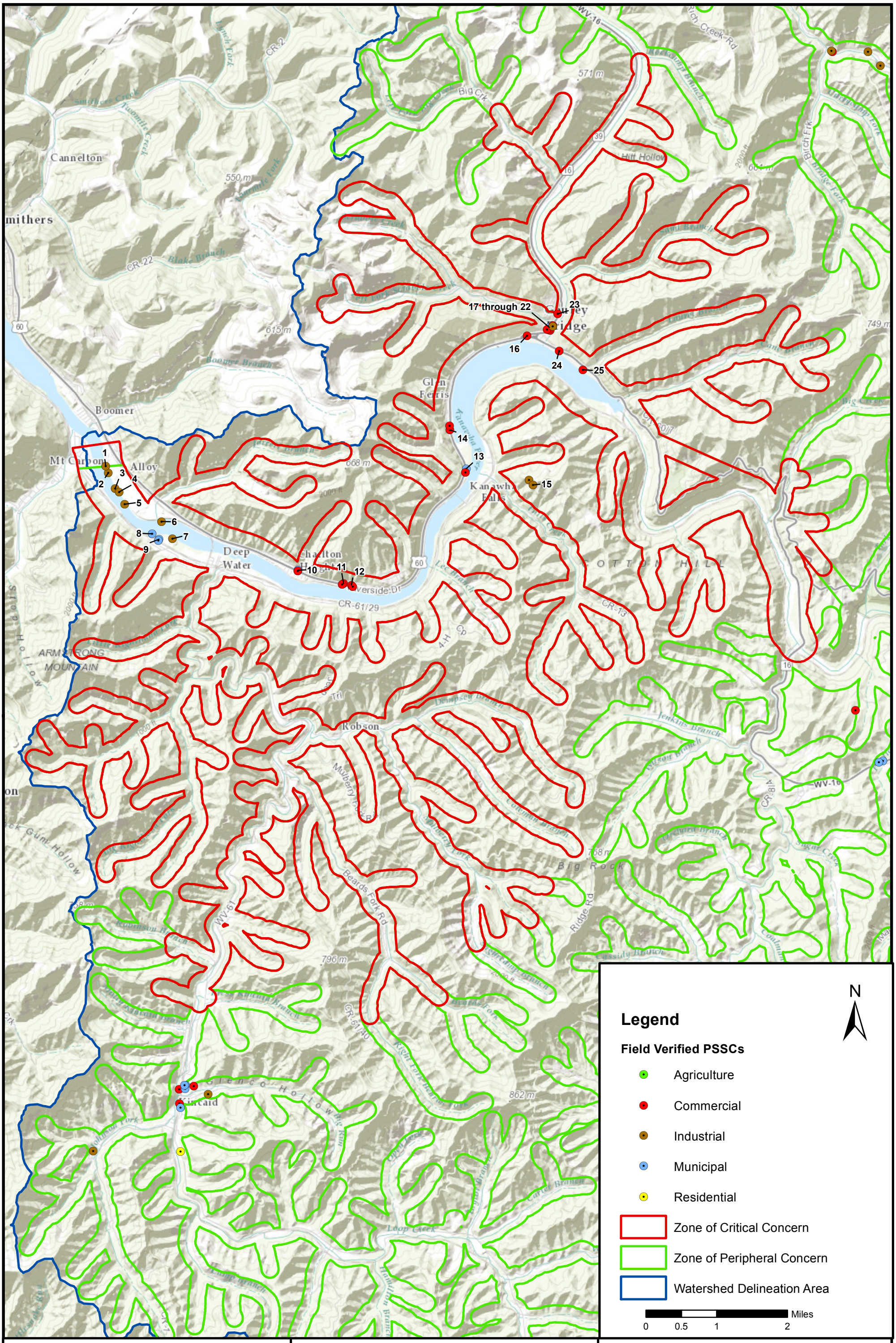
Armstrong PSD
PWSID: WV3301004
Source Water Protection Plan

Figure A-3. All PSSCs in the Watershed Delineation Area

CREATED BY: CEM

DATE: 03/21/16



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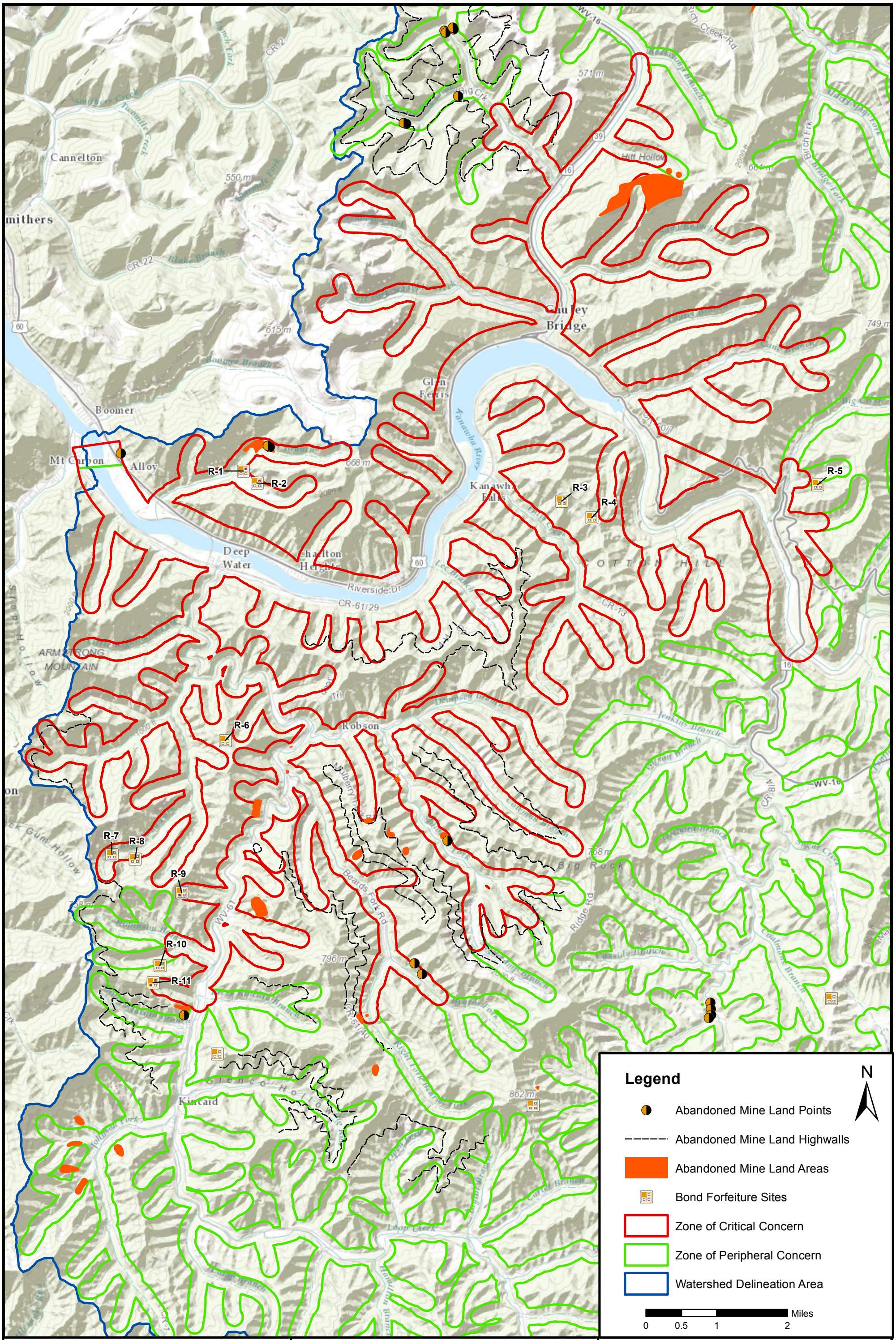
Armstrong PSD
PWSID: WV3301004
Source Water Protection Plan

Figure A-4. Field Verified PSSCs

CREATED BY: CEM

DATE: 03/17/16



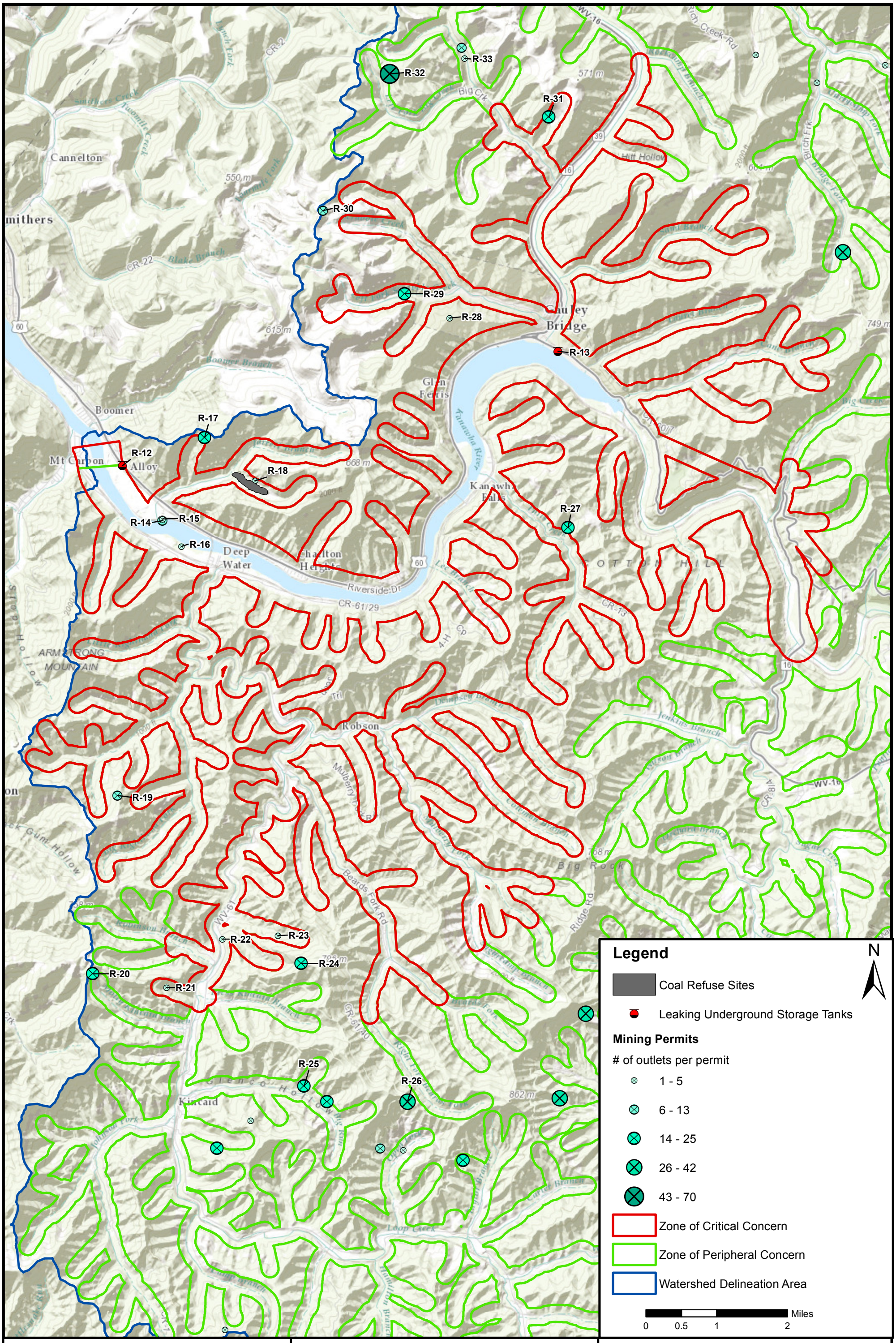
TETRA TECH
803 Quarrier Street, Suite 400
Charleston, WV 25301

Armstrong PSD
PWSID: WV3301004
Source Water Protection Plan

Figure A-5. Abandoned Mine Land Points, Highwalls, and Areas, and Bond Forfeiture Sites

CREATED BY: CEM

DATE: 03/17/16



TETRA TECH
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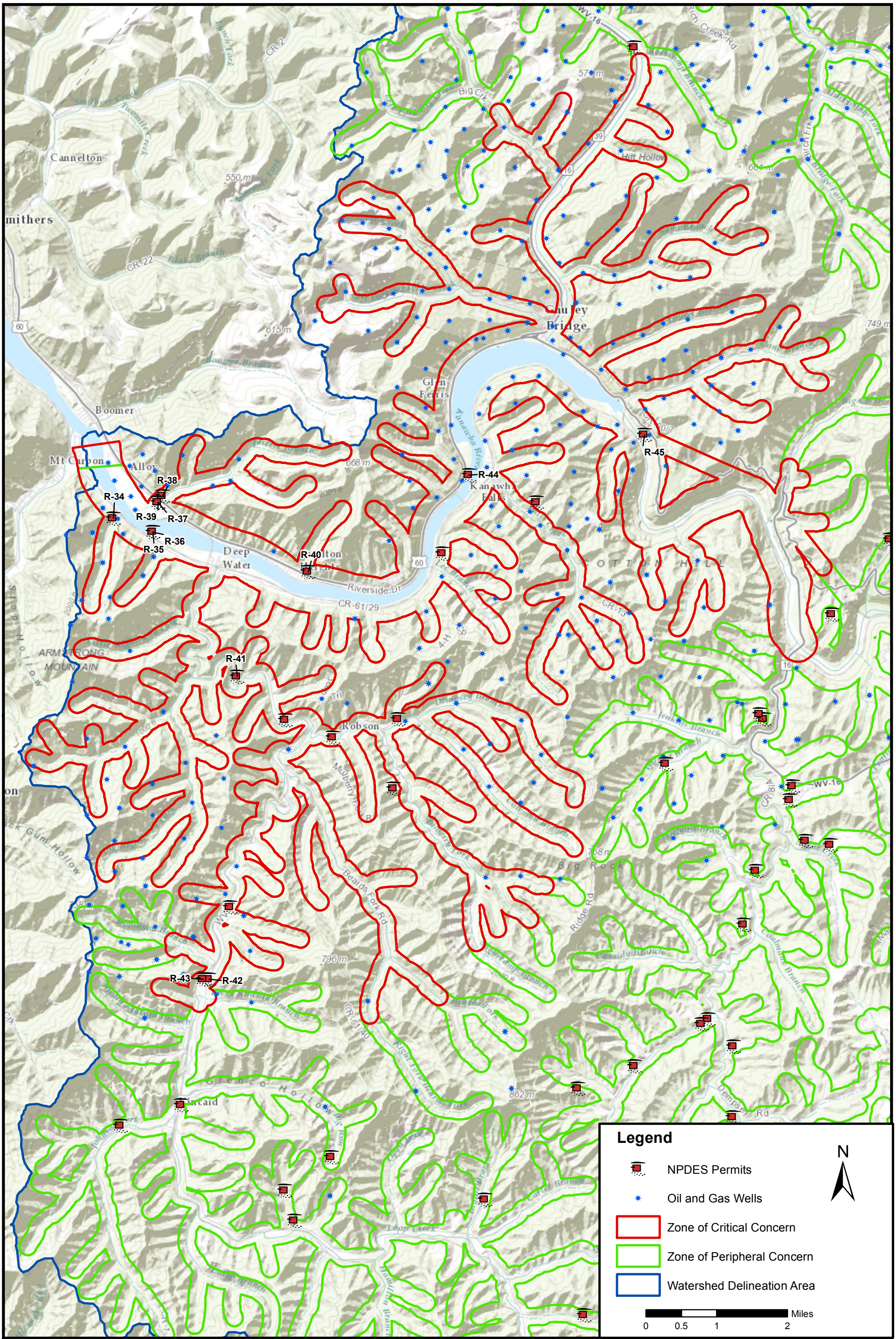
Charleston, WV 25301

Armstrong PSD
PWSID: WV3301004
Source Water Protection Plan

Figure A-6. Coal Refuse Sites, Leaking Underground Storage Tanks, and Mining Permits

CREATED BY: CEM

DATE: 03/17/16



TETRA TECH
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Armstrong PSD
PWSID: WV3301004
Source Water Protection Plan

Figure A-7. NPDES Permits and Oil/Gas Wells

CREATED BY: CEM

DATE: 03/17/16

R-46
R-49
R-48
R-55
R-50
R-54
R-47
R-52 and R-53
R-51
R-60
R-57
R-56
R-62
R-64
R-61
R-58 and R-59
R-63
R-65
R-66
R-67
R-68
R-69
R-70
R-71
R-72
R-73
R-74
R-75
R-76 and R-77
R-78
R-79
R-80
R-81
R-82
R-83 and R-84
R-85
R-86

Cannelton
Boomer
Mt Carbon
Alloy
Glen Ferris
Kanawha Falls
Robson
Kincaid
Riverside Dr
CR-61/29
WV-16
WV-61
CR-22
CR-2
Blake Branch
Boomer Branch
Big Creek
Hitt Hollow
Rich Creek Rd
Birch Fork
Beards Fork Rd
Ridge Rd
Dempsey Rd
Big Rock
Gum Hollow
Stencil Hollow
ARMSTRONG MOUNTAIN
OTTON HILL
571 m
615 m
550 m
668 m
796 m
862 m

Legend

- USEPA Regulated Sites
- Zone of Critical Concern
- Zone of Peripheral Concern
- Watershed Delineation Area

N

0 0.5 1 2 Miles

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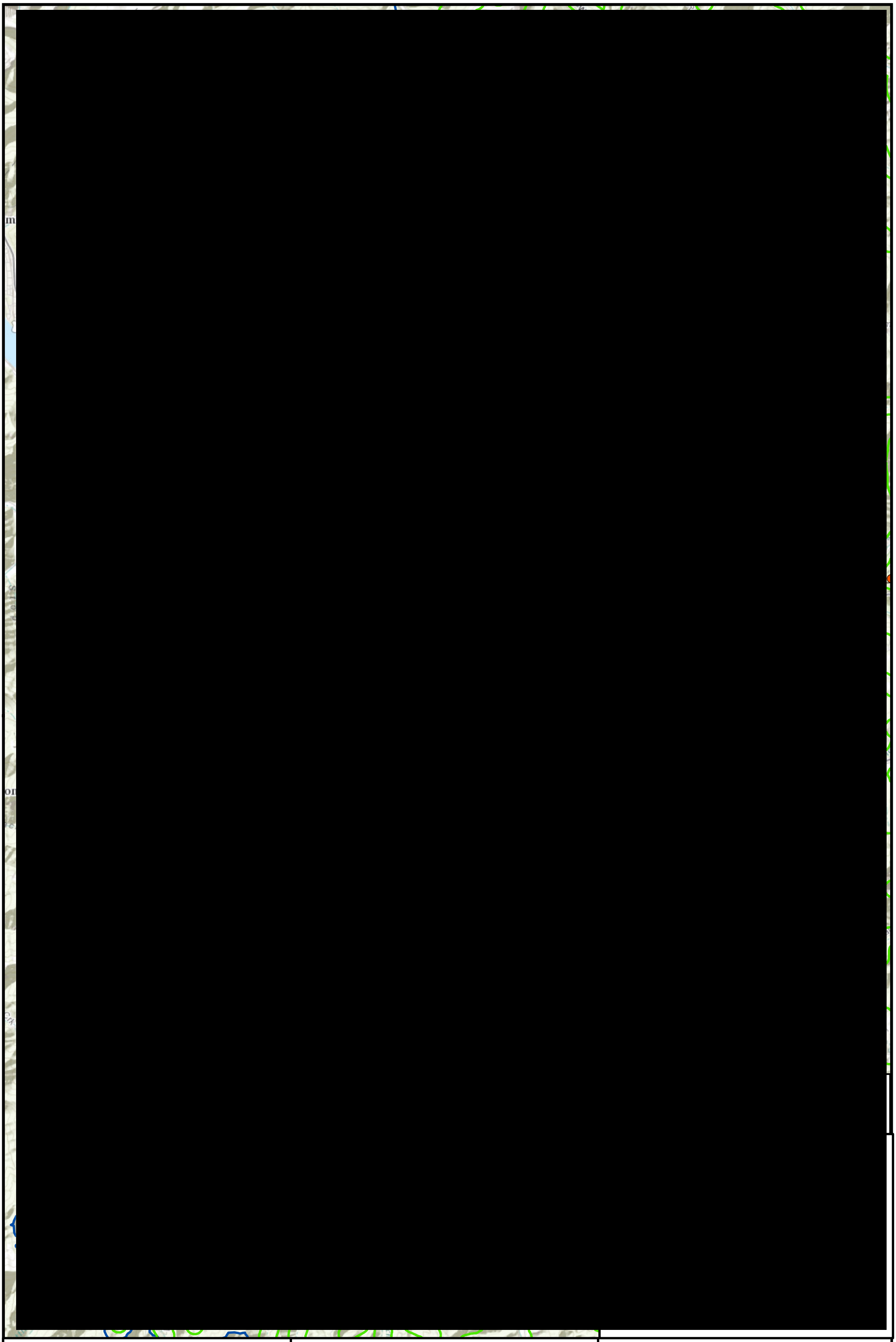
Charleston, WV 25301

Armstrong PSD
PWSID: WV3301004
Source Water Protection Plan

Figure A-8. USEPA Regulated Sites

CREATED BY: CEM

DATE: 03/17/16



TETRA TECH
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Charleston, WV 25301

Armstrong PSD
PWSID: WV3301004
Source Water Protection Plan

Figure A-9. Aboveground Storage Tanks

CREATED BY: CEM

DATE: 03/21/16

List of Regulated PSSCs

Armstrong PSD – PSSC Summary

PSSC Layer	In ZCC	Around ZCC	In ZPC	Around ZPC	In Watershed	Total Records
LUST	2	0	1	7	129	139
NPDES Permits	17	2	85	195	2438	2737
Mining Outlets	79	68	364	576	4196	5283
Bond Forfeiture	5	6	15	38	243	307
USEPA Regulated Sites	35	6	69	154	2408	2672
Oil/Gas Wells	153	148	325	572	1864	3062
Volunteer Remediation	0	0	0	2	24	26
Above Ground Storage Tanks	92	46	100	260	1448	1946
Field Verified PSSCs	30	2	55	23	964	1074
Closed Landfills	0	0	0	1	1	2
Landfill Monitoring Wells	0	0	0	4	0	4
Virginia Field Verified PSSCs	0	0	0	0	153	153
Points of Interest	0	0	0	0	25	25
Total Records	413	278	1014	1832	13893	

Field Verified PSSCs (SWAP_PCS) – Figure A-4

PSSC Number	Site Name	Site Description	Map Code	Relative Risk	Comments
1	Metals Fabricators	Foundries and metal fabricators	I-11	3.32	Corresponds to HPU permit WV1009974 outlet 006
2	WV Alloys Wastewater outlet	Foundries and metal fabricators	I-11	3.32	Corresponds to permit WV0000167 outlet 012
3	WV Alloys Wastewater outlet	Foundries and metal fabricators	I-11	3.32	Corresponds to permit WV0000167 outlet 011
4	WV Alloys Wastewater outlet	Foundries and metal fabricators	I-11	3.32	Corresponds to permit WV0000167 outlet 010
5	WV Alloys Wastewater outlet	Foundries and metal fabricators	I-11	3.32	Corresponds to permit WV0000167 outlet 009
6	WV Alloys Wastewater outlet	Foundries and metal fabricators	I-11	3.32	Corresponds to permit WV0000167 outlet 008
7	Fayette Dock, Inc.	Other	I-44	0.00	Site visited. Seeded down, not sure what had been active before and if remediated.

PSSC Number	Site Name	Site Description	Map Code	Relative Risk	Comments
8	POTW outlets	Wastewater Treatment Plant	M-29	4.03	WV0034991 multiple permitted outlets also storage yard
9	Kanawha Falls PSD POTW	Wastewater Treatment Plant	M-29	4.03	WV0034991
10	Division of Highways Falls View Substation	Road maintenance depots/deicing operations	M-20	3.08	Former National Guard armory
11	Car Wash - Closed	Car washes	C-8	1.70	Now closed
12	Napa Care Center and Cogar's Tire Service	Auto repair shops	C-3	2.73	none
13	Division of Highways maintenance garage	Road maintenance depots/deicing operations	M-20	3.08	Same as R-12. Still used to store gravel. A raised berm surrounds site to prevent runoff.
14	LKM Auto Sales, LLC	Car dealerships	C-7	1.20	No auto mechanic shop presently. Wash cars, runoff into sewer system.
15	Kanawha Falls Community Water	Permitted Discharge Pipe (outfall)	I-27	5.07	G & L Coal Company
16	Pennington Funeral Home	Funeral services and crematories	C-15	1.68	
17	Three River Auto Car Lot	Car dealerships	C-7	1.20	
18	Go Mart Gas Station	Gas Stations	C-18	2.88	
19	Active Car Wash	Car washes	C-8	1.70	info from operator and manager
20	Gauley Bridge Fire Department	Fire Stations	M-6	1.19	
21	Gas Well with brine tank	Wells: oil and gas	I-40	2.79	
22	Car Washes	Car washes	C-8	1.70	
23	Gauley Auto Care	Auto repair shops	C-3	2.73	
24	Little General Sunoco Station	Gas Stations	C-18	2.88	
25	PCS #1	Camp grounds	C-6	1.62	NEW RIVER CAMPGROUND; NEAR RIVER
26	Evangel Fellowship SBC	Other	M-32	0.00	Formerly Beckwith School
27	MIKES CAR WASH (CW1)	Car washes	C-8	1.70	LOCATED ON MOUNTAIN DR.
28	Kincaid Cemetery	Cemeteries	C-9	1.24	none
29	Sonoco gas station now closed	Historic gas stations	C-23	3.00	none
30	Norfolk Southern railroad tracks across from PSD campus	Railroad Tracks and Yards	C-41	10.00	none
31	Frasure Creek Mining permits U-3008-01 and U-3002-01	Mining: Surface	I-24	5.22	none
32	Exposed sewer lines not found	Sewer Lines *	M-23	6.00	No evidence of exposed or leaking lines. We did not show in SWP Plan.
33	Appalachian Power electrical substation	Public Utilities (phone, gas, electric power)	I-30	3.10	none

PSSC Number	Site Name	Site Description	Map Code	Relative Risk	Comments
34	Raw Sewage Discharge	Septic Systems (discharging to stream or surface)	R-5	5.70	
35	D and L Packette	Historic gas stations	C-23	3.00	duplicate of 1682
36	Fayette Recycling Center	Recycling/reduction facilities	M-19	2.40	Old drinking water plant
37	Sherry's Car wash now closed	Car washes	C-8	1.70	duplicate of 1683
38	Fayetteville wastewater treatment plant	Wastewater Treatment Plant	M-29	4.03	
39	Campground Complex	Camp grounds	C-6	1.62	
40	Historic gas station	Historic gas stations	C-23	3.00	
41	AEP Fayetteville Utility Substation Transformers	Utility Substation Transformers	C-49	2.95	
42	Huse Memorial Park cemetery	Cemeteries	C-9	1.24	
43	Railroad tracks near river	Railroad Tracks (right of way)	M-17	4.88	
44	New River Gorge parking lot, commercial parking, rest rooms	Park lands	M-15	1.47	
45	Discharge pipe not found	Permitted Discharge Pipe (outfall)	I-27	5.07	Not found, not reported in plan or shown on figure.
46	CANYON RIM GIFT SHOP	Cemeteries	C-9	1.24	
47	Car washes	Car washes	C-8	1.70	Car Wash
48	PCS #5 Photo processing/printing	Photo processing/printing	C-38	1.61	PHOTO PROCESSING/PRINTING WHITEWATER PHOTOGRAPHY
49	Sherry's Beer and Wine City	Historic gas stations	C-23	3.00	Historic Gas Station
50	PCS #6 Camp grounds	Camp grounds	C-6	1.62	CAMPGROUNDS - RIVERS WHITEWATER RAFTING BASE CAMP
51	PCS #2	Car washes	C-8	1.70	SHERRY'S CAR WASH (LOCATED NEXT TO SHERRY'S BEER CITY)
52	PCS #1	Gas Stations	C-18	2.88	SHERRY'S BEER CITY GAS STATION
53	MILL CREEK LUXURY CABINS INC.	Above Ground Storage Tanks	C-1	6.75	
54	WILDWATER EXPEDITIONS	Camp grounds	C-6	1.62	
55	FACTORY DISCOUNT STORE	Junk yards, scrap and auto	C-25	3.36	
56	New River Foodland #1	Heating oil companies	C-22	3.20	
57	Gas Well with brine tank	Wells: oil and gas	I-40	2.79	
58	Rich Creek Cemetery	Cemeteries	C-9	1.24	
59	Well #3 XTO Energy	Wells: oil and gas	I-40	2.79	
60	Gas Well with brine tank	Wells: oil and gas	I-40	2.79	

PSSC Number	Site Name	Site Description	Map Code	Relative Risk	Comments
61	PCS #28 Illegal Dump	Illegal Dump	M-10	6.38	DUMP SITE AT JODIE
62	PCS #26	Mining: Surface	I-24	5.22	POWELLTON COAL CO., LLC
63	AUTO REPAIR (ARS3)	Auto repair shops	C-3	2.73	DEAN TIRES, 2 BAYS
64	Gas Well with brine tank	Wells: oil and gas	I-40	2.79	
65	Clonch Industries	Wood preserving/treatment facilities	I-41	4.72	
66	Dixie Grade School	Schools	M-21	1.47	
67	Wells: oil and gas	Wells: oil and gas	I-40	2.79	Gas Well
68	PCS #21 Confined Animal Feeding Operations	Confined Animal Feeding Operations	A-3	4.93	CONFINED ANIMAL FEEDLOT IN BENTREE
69	BrownÆs Service Station	Gas Stations	C-18	2.88	
70	D & D Auto and Tire Shop	Auto repair shops	C-3	2.73	
71	Appalachian Power - Belva Substation	Utility Substation Transformers	C-49	2.95	
72	Auxier Welding, Inc.	Welding Shops	C-52	1.17	
73	B-J Used Auto Sales	Car dealerships	C-7	1.20	
74	Clonch Industries	Sawmills	I-32	3.74	
75	Elswick Lumber Company	Sawmills	I-32	3.74	
76	PCS #17	Mining: Surface	I-24	5.22	SMIS ON BELLS CREEK ROAD (TERRY EAGLE COAL CO.)
77	Wells: oil and gas	Wells: oil and gas	I-40	2.79	Gas Well Across Twenty Mile Creek from point.
78	West Virginia American Water New River Regional drinking water plant	Drinking Water Treatment Plants	M-5	1.50	
79	Drinking Water Treatment Plant	Drinking Water Treatment Plants	M-5	1.50	

*Only 79 of 1067 points were prioritized and labeled due to their potential threat or proximity to the intake. The remaining points should still be considered by the water system, but were not prioritized in this analysis.

Bond Forfeiture Sites – Figure A-5

R-Value	Company	Permit Number	Date Revoked
R-1	APPALACHIAN FUELS, LLC.	P-3055-06	10/23/2012
R-2	APPALACHIAN FUELS, LLC.	P-3019-08	10/23/2012
R-3	G & L COAL CO.	U-3036-87	5/21/1996

R-Value	Company	Permit Number	Date Revoked
R-4	G & L COAL CO.	S-3035-87	5/21/1996
R-5	CHICOPEE COAL COMPANY, INC.	O-6021-89	1/31/2003
R-6	GREAT MTN. COAL CO.	136-78	7/19/1991
R-7	GREAT MTN. COAL CO.	H-295	7/19/1991
R-8	GREAT MTN. COAL CO.	160-77	7/19/1991
R-9	GREAT MTN. COAL CO.	114-79	7/19/1991
R-10	EAGLE RIDGE COAL CO.	S-21-78	7/1/1982
R-11	LOGAN EAGLE	UO-57	3/1/1980

*Only 11 of 307 points were prioritized and labeled due to their potential threat or proximity to the intake. The remaining points in the watershed should still be considered by the water system, but were not prioritized in this analysis.

Leaking Underground Storage Tanks – Figure A-6

R-Value	WV ID	Leak Number	Facility	Cleanup Complete
R-12	1000944	91-002-L10	GO MART STORE #028	
R-13	1006918	03-016	LITTLE GENERAL STORE - GAULEY BRIDGE #3060	03/14/2007

*Only 2 of 139 points were prioritized and labeled due to their potential threat or proximity to the intake. The remaining points in the watershed should still be considered by the water system, but were not prioritized in this analysis.

Mining Outlets – Figure A-6

R-Value	Permit Number	Responsible Party	Status	Count of Permits
R-14	WV1009974	VANDALIA RESOURCES INC	C	6
R-15	WV1022415	PERIAMA HANDLING LLC	O	4
R-16	WV1001264	FAYETTE DOCK INC	C	3
R-17	WV1009346	KANAWHA ENERGY COMPANY	O	14
R-18	WV1022351	KANAWHA ENERGY COMPANY	O	3
R-19	WV1001949	CYPRUS KANAWHA CORP	C	9

R-Value	Permit Number	Responsible Party	Status	Count of Permits
R-20	WV1001221	MAPLE COAL CO.	C	21
R-21	WV1012975	MAPLE COAL CO LLC	O	1
R-22	WV0051748	KANAWHA RIVER MINING COMPANY	C	1
R-23	WV1014722	NORTH PAGE COAL CORP	C	2
R-24	WV1021931	FRASURE CREEK MINING, LLC	O	22
R-25	WV1022083	FRASURE CREEK MINING, LLC	O	22
R-26	WV1012738	NO. 10 COAL MINE INC	C	40
R-27	WV1000951	G & L COAL CO	C	17
R-28	WV0097110	APPALACHIAN MINING INC	C	5
R-29	WV0097144	KANAWHA ENERGY COMPANY	O	14
R-30	WV1015176	KANAWHA ENERGY COMPANY	O	6
R-31	WV1001442	APPALACHIAN MINING INC	C	16
R-32	WV1002376	KANAWHA ENERGY COMPANY	O	70
R-33	WV0056006	KANAWHA DEVELOPMENT CORP	O	4

*Only 20 of 558 points were prioritized and labeled due to their potential threat or proximity to the intake. In addition, only one site was labeled per unique permit number. The number of sites represented by each label is provided in the table above. The remaining points in the watershed should still be considered by the water system, but were not prioritized in this analysis.

NPDES Permits – Figure A-7

R-Value	Permit ID	Facility Name	Status	Permit type
R-34	WV0000167	WVA Manufacturing, LLC	O	Industrial
R-35	WV0102563	Armstrong PSD (Deepwater)	O	Sewage
R-36	WV0034991	KANAWHA FALLS PSD	O	Sewage
R-37	WV0111732	Jarrett Branch Landfill	O	Industrial
R-38	WVG611028	Kanawha Cartage Co.	O	Industrial
R-39	WV0117129	Jarrett Branch Landfill	O	Industrial
R-40	WVG980103	Falls View Substation	O	Industrial
R-41	WVR105907	Raynes Meter Station	O	Industrial
R-42	WVR105402	JOHNSON BRANCH/ NORTH PAGE SEWER EXT PROJECT - PHASE 2A	O	Industrial

R-Value	Permit ID	Facility Name	Status	Permit type
R-43	WV0084425	Page-Kincaid PSD	O	Sewage
R-44	WVG980105	Glen Ferris Stockpile	O	Industrial
R-45	WV0116301	Hawks Nest Hydroelectric Facility	O	Industrial

*12 of 2737 points were prioritized and labeled due to their potential threat or proximity to the intake. The remaining points in the watershed should still be considered by the water system, but were not prioritized in this analysis

USEPA Regulated Sites – Figure A-8

R-Value	Registry ID	Primary Name	Registry Number
R-46	110002000000	APPALACHIAN FUELS, LLC	110001932758
R-47	110011000000	ARMSTRONG PSD	110010860522
R-48	110041000000	ALLOY	110041430662
R-49	110011000000	WV ALLOYS FORMERLY CHIPPER	110010874535
R-50	110001000000	ELKEM METALS COMPANY	110000585849
R-51	110055000000	DEEPWATER-MT CARBON ROAD, S310	110054988420
R-52	110002000000	KANAWHA FALLS PSD	110002321425
R-53	110011000000	ARMSTRONG PSD (DEEPWATER)	110010858964
R-54	110054000000	ALLOY	110054238384
R-55	110008000000	KANAWHA CARTAGE CO.	110007892129
R-56	110046000000	DEEPWATER PROJECT	110046140341
R-57	110055000000	CHARLES BRACKEN	110054958854
R-58	110055000000	POST OFFICE AND STORE	110054945592
R-59	110055000000	S & W STORE	110054999551
R-60	110055000000	ADENA MOBILE HOME PARK	110054964730
R-61	110055000000	MONTGOMERY ARMORY	110054935326
R-62	110055000000	FAYETTE CO.-SUBHEADQUARTERS	110054951904
R-63	110042000000	FALLS VIEW SUBSTATION	110041949498
R-64	110021000000		110020977898
R-65	110046000000	RAYNES METER STATION	110046125705

R-Value	Registry ID	Primary Name	Registry Number
R-66	110046000000	ROBSON-DEEPWATER ROAD, S310-61	110046128999
R-67	110006000000	KANAWHA MOTIVE POWER INC	110005554257
R-68	110011000000	PAGE-KINCAID PSD	110010860201
R-69	110046000000	JOHNSON BRANCH/ NORTH PAGE SEW	110046134893
R-70	110055000000	INGRAM BRANCH WASTEWATER SYSTE	110054964990
R-71	110055000000	DEEPWATER AT KANAWHA FALLS	110055012141
R-72	110038000000	GLEN FERRIS STOCKPILE	110037938943
R-73	110055000000	G & L COAL COMPANY (S-3035	110054953163
R-74	110055000000	RIVER RIDGE AT KANAWHA FALLS	110054997152
R-75	110046000000	GAULEY BRIDGE	110046140948
R-76	110040000000	J C BAKER - GAULEY BRIDGE UST PULL	110039589022
R-77	110042000000	GAULEY BRIDGE VFD / FORMER SERVICE STATION / JC BAKER & SON (USTS)	110041687467
R-78	110022000000	GAULEY BRIDGE ELEMENTARY	110021735069
R-79	110008000000	JOHN'S GAULEY AUTO CARE	110007890274
R-80	110033000000	LITTLE GENERAL STORE #3060	110033161548
R-81	110046000000	CARBONDALE TOWER 117 69 KV LIN	110045520539
R-82	110046000000	CSX TRANSPORTATION BRIDGE REPL	110046133698
R-83	110028000000	HAWKS NEST HYDRO	110028045960
R-84	110038000000	HAWKS NEST HYDROELECTRIC FACIL	110037519726
R-85	110055000000	HONEY CREEK BRIDGE, S310-16-23	110055011589
R-86	110055000000	CHIMNEY CORNER - TURKEY CREEK	110054990907

*41 of 2672 points were prioritized and labeled due to their potential threat or proximity to the intake. The remaining points in the watershed should still be considered by the water system, but were not prioritized in this analysis

Aboveground Storage Tanks – Figure A-9

R-Value	Tank Label	Responsible Party	Capacity	Year
R-87	010-00000016	CNX GAS COMPANY LLC	[redacted]	1991
R-88	010-00000015	CNX GAS COMPANY LLC		1992
R-89	010-00000002	WVA MANUFACTURING, LLC		1997

R-Value	Tank Label	Responsible Party	Capacity	Year
R-90	010-00000001	WVA MANUFACTURING, LLC	[redacted]	1988
R-91	010-00000176	CNX GAS COMPANY LLC		1992
R-92	010-00000017	CNX GAS COMPANY LLC		1994
R-93	010-00000162	GARLETTS, RANDY		2011
R-94	010-00000164	GARLETTS, RANDY		1987
R-95	010-00000166	GARLETTS, RANDY		2011
R-96	010-00000165	GARLETTS, RANDY		2013
R-97	010-00000163	GARLETTS, RANDY		1988
R-98	010-00000171	GARLETTS, RANDY		1988
R-99	010-00000169	GARLETTS, RANDY		1986
R-100	010-00000167	GARLETTS, RANDY		1986
R-101	010-00000173	GARLETTS, RANDY		1986
R-102	010-00000172	GARLETTS, RANDY		2003
R-103	010-00000170	GARLETTS, RANDY		1986
R-104	010-00000160	GARLETTS, RANDY		1986
R-105	010-00000161	GARLETTS, RANDY		1971
R-106	010-00000168	GARLETTS, RANDY		1992
R-107	010-00000023	WV ENVIRONMENTAL SERVICES, INC.		1991
R-108	010-00000024	WV ENVIRONMENTAL SERVICES, INC.		1991
R-109	010-00000022	WV ENVIRONMENTAL SERVICES, INC.		1991
R-110	010-00000174	CNX GAS COMPANY LLC		1992
R-111	010-00000624	KANAWHA ENERGY COMPANY		2004
R-112	010-00000191	WVDOH-EQUIPMENT DIVISION		2005
R-113	010-00000427	MAXUM PETROLUEM PRODUCTS, INC.		2010
R-114	010-00000012	ENERVEST OPERATING L. L. C.		1997
R-115	010-00000101	EQT PRODUCTION COMPANY		2005
R-116	010-00000113	EQT PRODUCTION COMPANY		2003
R-117	010-00000066	EQT PRODUCTION COMPANY		1965
R-118	010-00000117	EQT PRODUCTION COMPANY		2003
R-119	010-00000139	EQT PRODUCTION COMPANY		2009

R-Value	Tank Label	Responsible Party	Capacity	Year
R-120	010-00000144	EQT PRODUCTION COMPANY	[redacted]	2002
R-121	010-00000068	EQT PRODUCTION COMPANY		1996
R-122	010-00000142	EQT PRODUCTION COMPANY		2005
R-123	010-00000119	EQT PRODUCTION COMPANY		2006
R-124	010-00000036	COAL RIVER MINING, LLC		2010
R-125	010-00000025	COAL RIVER MINING, LLC		2010
R-126	010-00000026	COAL RIVER MINING, LLC		2005
R-127	010-00000027	COAL RIVER MINING, LLC		2005
R-128	010-00000028	COAL RIVER MINING, LLC		2005
R-129	010-00000035	COAL RIVER MINING, LLC		2010
R-130	010-00000038	COAL RIVER MINING, LLC		2010
R-131	010-00000040	COAL RIVER MINING, LLC		2010
R-132	010-00000041	COAL RIVER MINING, LLC		2010
R-133	010-00000029	COAL RIVER MINING, LLC		2005
R-134	010-00000030	COAL RIVER MINING, LLC		2005
R-135	010-00000032	COAL RIVER MINING, LLC		2005
R-136	010-00000037	COAL RIVER MINING, LLC		2010
R-137	010-00000031	COAL RIVER MINING, LLC		2005
R-138	010-00000039	COAL RIVER MINING, LLC		2010
R-139	010-00000146	EQT PRODUCTION COMPANY		2002
R-140	010-00000126	EQT PRODUCTION COMPANY		2005
R-141	010-00000149	EQT PRODUCTION COMPANY		2002
R-142	010-00000210	HAYDEN HARPER ENERGY		1995
R-143	010-00000090	EQT PRODUCTION COMPANY		1999
R-144	010-00000118	EQT PRODUCTION COMPANY		2013
R-145	010-00000077	EQT PRODUCTION COMPANY		2013
R-146	010-00000065	EQT PRODUCTION COMPANY		1999
R-147	010-00000145	EQT PRODUCTION COMPANY		1960
R-148	010-00000339	MAXUM PETROLUEM PRODUCTS, INC.		2008
R-149	010-00000064	EQT PRODUCTION COMPANY		1999

R-Value	Tank Label	Responsible Party	Capacity	Year
R-150	010-00000138	EQT PRODUCTION COMPANY	[redacted]	2005
R-151	010-00000095	EQT PRODUCTION COMPANY		2000
R-152	010-00000150	HAYDEN HARPER ENERGY		1994
R-153	010-00000155	HAYDEN HARPER ENERGY		1996
R-154	010-00000502	HAYDEN HARPER ENERGY		1994
R-155	010-00000051	EQT PRODUCTION COMPANY		2005
R-156	010-00000208	HAYDEN HARPER ENERGY		1994
R-157	010-00000209	HAYDEN HARPER ENERGY		1994
R-158	010-00000129	EQT PRODUCTION COMPANY		2006
R-159	010-00000353	MAXUM PETROLUEM PRODUCTS, INC.		2010
R-160	010-00000057	EQT PRODUCTION COMPANY		1964
R-161	010-00000087	EQT PRODUCTION COMPANY		1999
R-162	010-00000048	EQT PRODUCTION COMPANY		2000
R-163	010-00000098	EQT PRODUCTION COMPANY		2001
R-164	010-00000197	HAYDEN HARPER ENERGY		1992
R-165	010-00000205	HAYDEN HARPER ENERGY		1992
R-166	010-00000156	HAYDEN HARPER ENERGY		1992
R-167	010-00000151	HAYDEN HARPER ENERGY		1992
R-168	010-00000152	HAYDEN HARPER ENERGY		1992
R-169	010-00000504	HAYDEN HARPER ENERGY		1992
R-170	010-00000154	HAYDEN HARPER ENERGY		1991
R-171	010-00000200	HAYDEN HARPER ENERGY		1992
R-172	010-00000201	HAYDEN HARPER ENERGY		1992
R-173	010-00000202	HAYDEN HARPER ENERGY		1992
R-174	010-00000198	HAYDEN HARPER ENERGY		1992
R-175	010-00000507	HAYDEN HARPER ENERGY		1994
R-176	010-00000199	HAYDEN HARPER ENERGY		1997
R-177	010-00000193	HAYDEN HARPER ENERGY		1994
R-178	010-00000207	HAYDEN HARPER ENERGY		1992
R-179	010-00000317	HAYDEN HARPER ENERGY		1994

R-Value	Tank Label	Responsible Party	Capacity	Year
R-180	010-00000203	HAYDEN HARPER ENERGY	[redacted]	1997
R-181	010-00000204	HAYDEN HARPER ENERGY		1992
R-182	010-00000563	GARLETTS, RANDY		2013
R-183	010-00000562	GARLETTS, RANDY		2011
R-184	010-00000564	GARLETTS, RANDY		1930
R-185	010-00000565	GARLETTS, RANDY		1930
R-186	010-00000566	GARLETTS, RANDY		1998
R-187	010-00000175	CNX GAS COMPANY LLC		1987
R-188	010-00000070	EQT PRODUCTION COMPANY		1974
R-189	010-00000594	LOADOUT, LLC		1992
R-190	010-00000190	CNX GAS COMPANY LLC		1993
R-191	010-00000104	EQT PRODUCTION COMPANY		1996
R-192	010-00000072	EQT PRODUCTION COMPANY		1996
R-193	010-00000388	HAYDEN HARPER ENERGY		2000
R-194	010-00000188	CNX GAS COMPANY LLC		1987
R-195	010-00000187	CNX GAS COMPANY LLC		1987
R-196	010-00000185	CNX GAS COMPANY LLC		1987
R-197	010-00000186	CNX GAS COMPANY LLC		1987
R-198	010-00000463	HAYDEN HARPER ENERGY		1992
R-199	010-00000464	HAYDEN HARPER ENERGY		1992
R-200	010-00000206	HAYDEN HARPER ENERGY		1997
R-201	010-00000386	HAYDEN HARPER ENERGY		1992
R-202	010-00000222	HAYDEN HARPER ENERGY		1991
R-203	010-00000617	KANAWHA ENERGY COMPANY		2004
R-204	010-00000461	CABOT OIL & GAS CORPORATION		1998
R-205	010-00000196	HAYDEN HARPER ENERGY		1991
R-206	010-00000387	HAYDEN HARPER ENERGY		1991
R-207	010-00000501	HAYDEN HARPER ENERGY		1985
R-208	010-00000575	HAYDEN HARPER ENERGY		2003
R-209	010-00000078	EQT PRODUCTION COMPANY		2007

R-Value	Tank Label	Responsible Party	Capacity	Year
R-210	010-00000075	EQT PRODUCTION COMPANY	[redacted]	2009
R-211	010-00000076	EQT PRODUCTION COMPANY		2009
R-212	010-00000219	HAYDEN HARPER ENERGY		2004
R-213	010-00000573	HAYDEN HARPER ENERGY		2004

*127 of 1951 points were prioritized and labeled due to their potential threat or proximity to the intake. The remaining points in the watershed should still be considered by the water system, but were not prioritized in this analysis.

APPENDIX B. EARLY WARNING MONITORING SYSTEM FORMS

Form B - Proposed Early Warning Monitoring Systems

Armstrong PSD

Primary Surface Water Source:

There are many possible solutions for designing and installing an early warning monitoring system. Over time, this technology changes and improves and it is difficult to determine the type of equipment that will be useful and effective in the long term. These plans are proposed systems that would work for Armstrong PSD using current technology and the current plant and intake configuration.

The primary source of raw water for Armstrong PSD is the Kanawha River. The intake is located across the train tracks from the water treatment plant on the other side of Mt. Carbon, about 3,500' away.

B-1. YSI EXO 2 Monitoring System Proposal
Describe the type of early warning detection equipment that could be installed, including the design.
This plan uses the YSI EXO 2 Multiport Sonde, which can accommodate 6 different sensors and has an automatic wiper mechanism to remove biofouling from the sensor tips, which reduces maintenance time. The sonde is built to be resilient and low maintenance, and is capable of providing online water quality monitoring that can be transmitted real time to a designated PC or website that can be accessed by any designated user. The sonde can hold up to 6 sensors, but this plan recommends 4 of the more basic sensors that would be sufficient to detect any sudden shifts in water quality in any West Virginia stream or river. These sensors would include: conductivity/temperature, optical dissolved oxygen, pH, and fluorescent dissolved organic matter (fDOM). The fDOM sensor could potentially detect petroleum products in the water but is not entirely reliable for this purpose. At this time, YSI does not make a sensor for petroleum products for the EXO 2 but likely will in the future, at which time it is recommended that the utility purchase it. Other sensors could be purchased in the future as well if deemed necessary by the utility.
Where would the equipment be located?
The sonde would be attached to the intake pipe itself, which extends into the Kanawha River. This would provide a stable foundation for the equipment and also ensure that the device is able to sample the water that is actually entering the intake pipe and not missing potential contaminants because it is located on the wrong side of the stream or too far from the intake. The suggested method of mounting the sonde involves drilling holes in a PVC pipe, capping the end, inserting the sonde and attaching to the intake pipe structure using brackets or chains. This will protect the sensor from debris and hide it from view somewhat. The sonde would be hardwired to the YSI Storm 3 data analysis/telemetry system. The Storm 3 would need to be housed in a sampling shed of some kind on the riverbank. This structure needs to be sturdy and out of the flood plain if possible. The unit is contained in a waterproof case and comes with a solar photovoltaic panel capable of powering both the data analysis unit and the sonde, so long as the sonde is hardwired to the Storm 3. The device can be battery powered as well if this is not an option.
What would the maintenance plan for the monitoring equipment entail?

The maintenance plan for the system would involve replacing the dissolved oxygen sensor cap, replacing the pH electrode cap, and purchasing pH, turbidity, and conductivity calibration solution on a yearly basis. The sonde itself is designed to last from 5-10 years and should be inspected and calibrated once a month.

In addition, there is a recurring yearly fee associated with the real-time data/telemetry package for managing the website and data analysis.

Describe the proposed sampling plan at the monitoring site.

The sonde can be programmed to take regular measurements at any intervals defined by the operator or user. These measurements can also be taken in bursts, averaged over a period of time, or modified automatically as water quality levels change. Data is stored in the Storm 3 and transmitted to the plant computer as it is recorded. This information can be transmitted wirelessly via a cellular modem. The cellular transmitter is powerful enough to work even in areas with poor cell reception.

Describe the proposed procedures for data management and analysis.

The Storm 3 package includes data management software that can generate data reports and presentations and allow the user to modify and adjust sampling schedules remotely from the plant.

The sonde can be programmed to alert the user when any of the water quality parameters exceeds a user-defined level. This will allow the operator to program the system to notify them when their previously observed baseline conditions are exceeded in time for them to shut down the pumps and close off the intake. The operator can receive alerts via text message and email at the treatment plant computer or any designated cell phone.

B-2. Hach sc1000 Monitoring System Proposal

Describe the type of early warning detection equipment that could be installed, including the design.

The Hach sc1000 online monitoring system includes a controller, back panel, display module, and trough. Raw water is pumped into the trough from the source where it can be sampled in real time. The probe module can accommodate up to 6 sensors, which means it can monitor up to 6 parameters at once. This plan suggests the following sensors: conductivity, pH, turbidity, and dissolved oxygen. Hach can also supply a sensor to detect oil in water, which would cost an additional $18,414.00 and would possibly be a good investment for any water system if sufficient funds were available. This sensor is not included in the quoted capital cost. There are several other probes for other parameters that are available from Hach, and these could be purchased as deemed necessary by the utility.

Where would the equipment be located?

The sc1000 Controller, back panel, and trough would need to be housed in a small sampling shed. A small diameter line would run out from this structure the length of the intake pipe to pull raw water back to the controller where it would flow into the trough for sampling. The closer this sampling line can be to the actual intake, the more accurately it will reflect the raw water that is actually entering the plant. This option would require the utility to purchase a line or hose long enough to reach the intake pipe and a small pump. The line and pump could be fairly low- tech and inexpensive, as the sc1000 only requires a minimum of 900 mL/min. of flow.

The controller will be equipped with the MODBUS advanced communications/networking unit, which can transmit readings in real time directly to the SCADA system in the treatment plant to alert the operators in any change in baseline water quality. The sc1000 can either be hardwired to the computer at the treatment plant or it can use a cellular modem to transmit the data if there is sufficient cellular signal.
What would the maintenance plan for the monitoring equipment entail?
The maintenance plan for the system would entail a yearly maintenance contract with the manufacturer. A Hach Service Representative would regularly service the monitoring equipment. This service would take care of all parts, labor, and preventative maintenance and would include 2-3 scheduled maintenance visits per year.
Describe the proposed sampling plan at the monitoring site.
The sc1000 monitors the quality of water flowing through the trough in real time, and can transmit this data back to the plant as it is collected. The actual timing of the sampling plan could be determined by the utility.
Describe the proposed procedures for data management and analysis.
It is recommended that the utility purchase the Hach Universal Data Gateway software, which would help to process and analyze the incoming information into easily interpreted reports. The price of this software is included in the rough capital cost.

B-3. Real Tech Full Scanning UV-VIS Monitoring System
Describe the type of early warning detection equipment that could be installed, including the design.
This plan utilizes the Real Tech Full Scanning UV-VIS monitoring system, which provides full ultraviolet/visible scanning for organics and other specific parameters that may indicate a contamination event. The included PC Controller is pre-loaded with the software needed to store and process this information to establish a “normal” or “baseline” set of conditions for the raw water source. In addition to the UV-VIS sensors, the system can accommodate up to 8 additional sensors that are available from a third party and priced separately. This plan includes pricing and details for a system equipped to measure conductivity, pH, temperature, and dissolved oxygen. Other additional sensors could be purchased and added if deemed necessary by the utility.
Where would the equipment be located?
The UV-VIS Full Monitoring System would need to be located close to the intake, which might mean a small structure would need to be built on the river bank to house the equipment. A small-diameter line or hose would run from this structure to the intake pipe to pull raw water back to the controller where it would flow into the unit for sampling. The closer the end of the sampling line can be to the actual intake, the more accurately it will reflect the raw water that is actually entering the plant. This option would require the utility to purchase enough line to reach the intake as well as a small pump. The line and pump could be fairly small and inexpensive, as the system only requires a minimum of 300-800 mL/min. of flow. The system also includes

the Real Pump Clean System, which provides flow and automatic chemical cleaning of the sensors and reduces maintenance time. This system would require a reliable electrical source, but because the intake is located near an existing neighborhood, supplying it with electricity shouldn't be a problem.
What would the maintenance plan for the monitoring equipment entail?
The maintenance plan for the system would require about 2 hrs/month for scheduled maintenance tasks. It is also recommended that a monthly laboratory reference sample is taken to effectively calibrate the sensors. The Smart-Sense Web Monitoring Service package costs an additional $499/yr., but provides additional support and remote accessibility by Real Tech, and it is recommended. The Deuterium and Tungsten lamps would also need to be replaced every six months at a cost of $740.
Describe the proposed sampling plan at the monitoring site.
The Full Scanning UV-VIS system continuously monitors raw water as it is pumped to through the unit, and is capable of establishing baseline conditions that account for seasonal variability, which can help to reduce false alarms.
Describe the proposed procedures for data management and analysis.
The Real Tech monitoring system is capable of communicating with the treatment plant via Modbus, Ethernet, USB, or cell modem. It can be integrated with the treatment plant's SCADA system to provide real-time information about conditions at the intake and provides full remote monitoring. It is also recommended that the utility take advantage of the Smart-Sense Web Monitoring service offered by Real-Tech to analyze and interpret data taken by the monitoring system. This consultation service requires an additional service fee, which is included in this quote.

APPENDIX C. COMMUNICATION PLAN TEMPLATE

Armstrong PSD

PWSID: WV3301004

Administrative Contact: Judson Wallace

Contact Phone Number: 304-442-8302

Contact Email Address: wpo1960@aol.com

Plan Developed: May 2016

ACKNOWLEDGMENTS:

This plan was developed by Armstrong PSD to meet certain requirements of the Source Water and Assessment Protection Program (SWAPP) and the State of West Virginia, as directed by state laws and regulations.

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INTRODUCTION

Legislative Rule 64CSR3 requires public water systems to develop a Communication Plan that documents how public water suppliers, working in concert with state and local emergency response agencies, shall notify state and local health agencies and the public in the event of a spill or contamination event that poses a potential threat to public health and safety. The plan must indicate how the public water supplier will provide updated information, with an initial notification to the public to occur no later than thirty minutes after the supplier becomes aware that the spill, release or potential contamination of the public water system poses a potential threat to public health and safety.

The public water system has responsibility to communicate to the public, as well as to state and local health agencies. This plan is intended to comply with the requirements of Legislative Rule 64CSR3, and other state and federal regulations.

TIERS REPORTING SYSTEM

This water system has elected to use the *Tiered Incident / Event Reporting System* (TIERS) for communicating with the public, agencies, the media, and other entities in the event of a spill or other incident that may threaten water quality. TIERS provides a multi-level notification framework, which escalates the communicated threat level commensurate with the drinking water system risks associated with a particular contamination incident or event. TIERS also includes a procedural flow chart illustrating key incident response communication functions and how they interface with overall event response / incident management actions. Finally, TIERS identifies the roles and responsibilities for key people involved in risk response, public notification, news media and other communication.

TIERS provides an easy-to-remember five-tiered **A-B-C-D-E** risk-based incident response communication format, as described below. Table 1 provides also associated risk levels.

A = **A**nnouncement. The water system is issuing an announcement to the public and public agencies about an incident or event that may pose a threat to water quality. Additional information will be provided as it becomes available. As always, if water system customers notice anything unusual about their water, they should contact the water system

B = **B**oil Water Advisory. A boil water advisory has been issued by the water system. Customers may use the water for showering, bathing, and other non-potable uses, but should boil water used for drinking or cooking.

C = **C**annot Drink. The water system asks that users not drink or cook with the water at this time. Non-potable uses, such as showering, bathing, cleaning, and outdoor uses are not affected.

D = **D**o Not Use. An incident or event has occurred affecting nearly all uses of the water. Do not use the water for drinking, cooking, showering, bathing, cleaning, or other tasks where water can come in contact with your skin. Water can be used for flushing commodes and fire protection.

E = **E**mergency. Water cannot be used for any reason.

Tier	Tier Category	Risk Level	Tier Summary
A	**A**nnouncement	Low	The water system is issuing an announcement to the public and public agencies about an incident or event that could pose a threat to public health and safety. Additional information will be provided as it becomes available.
B	**B**oil Water Advisory	Moderate	Water system users are advised to boil any water to be used for drinking or cooking, due to possible microbial contamination. The system operator will notify users when the boil water advisory is lifted.

C	**C**annot Drink	High	System users should not drink or cook with the water until further notice. The water can still be used for showering, bathing, cleaning, and other tasks.
D	**D**o Not Use	Very High	The water should only be used for flushing commodes and fire protection until further notice. More information on this notice will be provided as soon as it is available.
E	**E**mergency	Extremely High	The water should not be used for any purpose until further notice. More information on this notice will be provided as soon as it is available.

COMMUNICATION TEAM

The Communication Team for the water system is listed in the table below, along with key roles. In the event of a spill or other incident that may affect water quality, the water system spokesperson will provide initial information, until the team assembles (if necessary) to provide follow-up communication.

Water system communication team members, organizations, and roles.

Team Member Name	Organization	Phone	Email	Role
				Primary Spokesperson
				Secondary Spokesperson
				Member
				Member
				Member
				Member

In the event of a spill, release, or other incident that may threaten water quality, members of the team who are available will coordinate with the management staff of the local water supplier to:

- Collect information needed to investigate, analyze, and characterize the incident/event
- Provide information to the management staff, so they can decide how to respond
- Assist the management staff in handling event response and communication duties
- Coordinate fully and seamlessly with the management staff to ensure response effectiveness

COMMUNICATION TEAM DUTIES

The communication team will be responsible for working cooperatively with the management staff and state and local emergency response agencies to notify local health agencies and the public of the initial spill or contamination event. The team will also provide updated information related to any contamination or impairment of the source water supply or the system's drinking water supply.

According to Legislative Rule 64CSR3, the initial notification to the public will occur no later than thirty minutes after the public water system becomes aware that the spill, release or potential contamination of the public water system poses a potential threat to public health and safety.

As part of the group implementing the Source Water Protection Plan, team members are expected to be familiar with the plan, including incident/event response and communication tasks. Specifically, team members should:

- Be knowledgeable on elements of the Source Water Protection Plan and Communication Plan
- Attend team meetings to ensure up-to-date knowledge of the system and its functions
- Participate in periodic exercises that "game out" incident response and communication tasks
- Help to educate local officials, the media, and others on source water protection
- Cooperate with water supplier efforts to coordinate incident response communication
- Be prepared to respond to requests for field investigations of reported incidents
- Not speak on behalf of the water supplier unless designated as the system's spokesperson

The primary spokesperson will be responsible for speaking on behalf of the water system to local agencies, the public, and the news media. The spokesperson should work with the management staff and the team to ensure that all communication is clear, accurate, timely, and consistent. The spokesperson may authorize and/or direct others to issue news releases or other information that has been approved by the system's management staff. The spokesperson is expected to be on call immediately when an incident or event which may threaten water quality occurs. The spokesperson will perform the following tasks in the event of a spill, release, or other event that threatens water quality:

- Announce which risk level (A, B, C, D, or E) will apply to the public notifications that are issued
- Issue news releases, updates, and other information regarding the incident/event
- Use the news media, email, social media, and other appropriate information venues
- Ensure that news releases are sent to local health agencies and the public
- Respond to questions from the news media and others regarding the incident/event
- Appear at news conferences and interviews to explain incident response, etc.

INCIDENT / EVENT COMMUNICATION PROCEDURE

The flow chart in this section illustrates how the water system will respond when it receives a report that a spill, release, or other contamination event may have occurred. Key elements of the flow chart are described below.

Communication with agencies, the public, and the media during threat incidents

Upon initial notification of the incident/event, system managers and staff will collect information and verify the need for further investigation. Only properly trained personnel will perform onsite investigations if permitted by emergency responders. If further investigation is warranted, and the initial facts support it, the water system spokesperson will issue a public communication statement consistent with the threat level. In addition, water system personnel and partners will be dispatched to conduct reconnaissance, a threat assessment, and a threat characterization, if present. This work may include:

- Verification of the incident/event type (spill, release, etc.)
- Location of incident/event
- Type of material(s) involved in spill, release, etc.
- Quantity of material involved
- Potential of the material to move, migrate, or be transported
- Relevant time factor(s) in the risk assessment (e.g., downstream movement rate)
- Overall level of risk to water system, whether low, moderate, high, or very high
- Development of the initial risk characterization

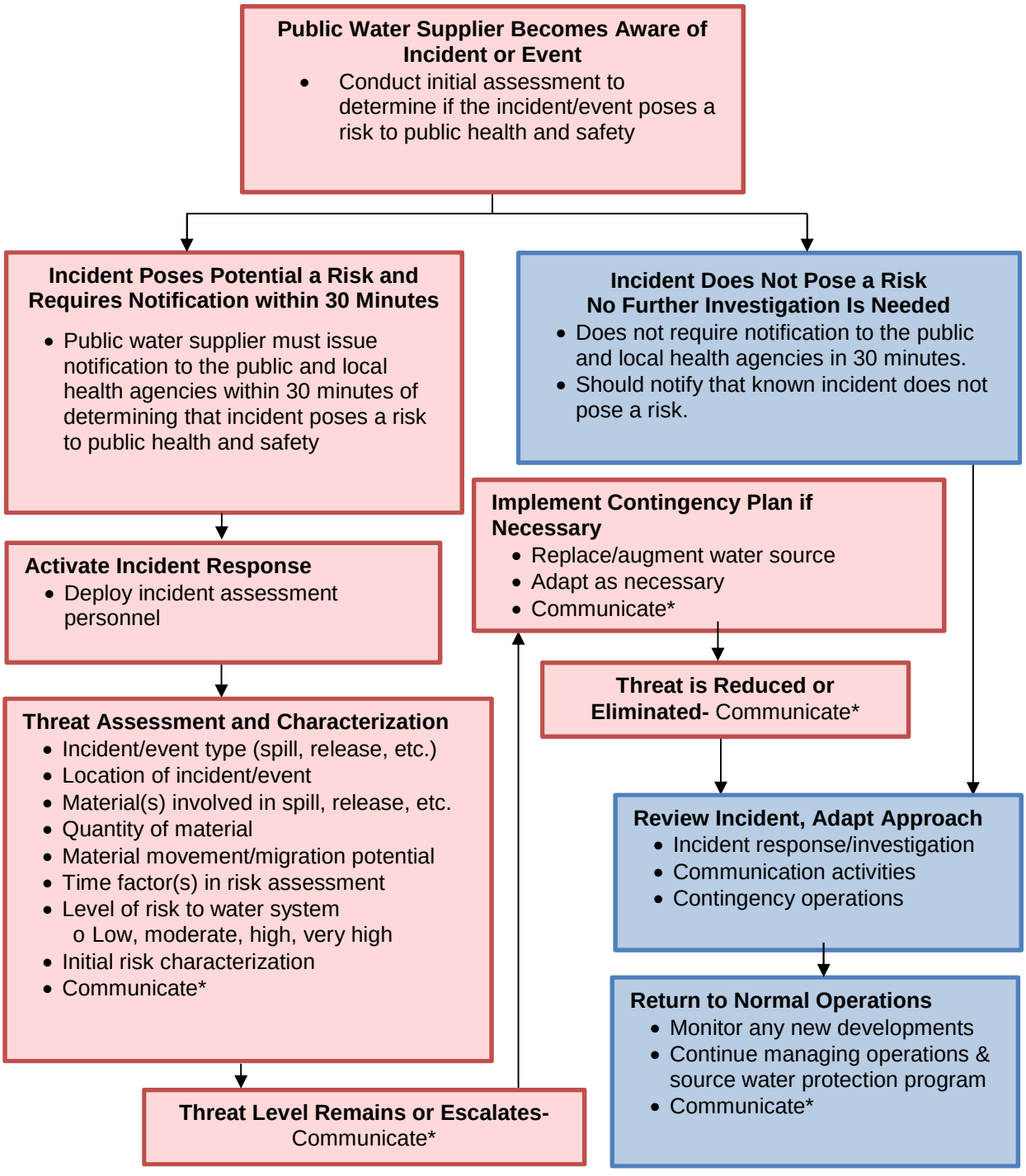
As the flow chart indicates, several iterative cycles will occur after the initial threat assessment, including communication with local agencies and the public, further investigation of the incident, possible implementation of the water system's contingency plan, and eventual elimination of the threat and a return to normal operations. Communication activities during this period will include:

- The initial release (i.e., **A**nnouncement, **B**oil Water Advisory, **C**annot Drink, **D**o Not Use, or **E**mergency)
  - Sent to local health agencies, the public, and the news media within 30 minutes
- Notification of the local water system's source water protection and communication teams
  - If warranted by initial findings regarding the spill, release, or incident
- Notification of the WV Bureau of Public Health
  - As required

- Periodic information updates, as incident response information is received
- Updates to the applicable A-B-C-D-E advisory tier, as necessary

After the threat level is reduced and operations return to normal, the water system staff, as well as the communication and source water protection teams and their partners, will conduct a post-event review and assessment. The purpose of the review is to examine the response to the incident, relevant communication activities, and overall outcomes. Plans and procedures may be updated, altered, or adapted based on lessons learned through this process.

TIERS FLOW CHART



Communicate*

Constant communication with local agencies, public, and the media is critical throughout the entire process. The initial notification should include all pertinent information, depending on the TIERS level. Regular information updates should be provided. The **A-B-C-D-E** TIERS levels should be updated and explained as necessary.

EMERGENCY SHORT FORMS

Emergency Communication Information

	Name	Phone Number	Email
Designated spokesperson:	Judson Wallace	304-442-8302	
Alternate spokesperson:	Joe Burdett	304-442-5044	wpo1960@aol.com
Designated location to disseminate information to media:	Armstrong PSD utility office		
Methods of contacting affected residents:	Armstrong PSD primarily contacts affected residents about important information using word of mouth, posted notices, radio broadcasts, and newspaper.		

	Name	Title	Phone Number	Email
Media contacts:	WVNSTV	59 News CBS Affiliate, Oak Hill, WV	304-929-6420	news@wvnstv.com
	WSAZ	News Channel 3 NBC Affiliate, Charleston, WV	304-344-3521	news@wsaz.com
	WOAYTV 50	ABC Affiliate, Oak Hill, WV	304-469-3361	news@woay.com

Emergency Services Contacts

	Name	Emergency Phone	Alternate Phone	Email
Local Police	Fayette County Sheriff	911	304-574-4304	-
Local Fire Department	Boomer Volunteer Fire Department,	911	304-779-2763	-
	Armstrong Creek Fire Department	911	304-442-9157	-
	Jan Care	911	304-632-1122	

Local Ambulance Service	General Ambulance Service	-	304-779-2166	-
Hazardous Material Response Service	Armstrong Creek Fire Department	911	304-442-9157	-

Sensitive Populations

Other communities that are served by the utility:	Powellton, Columbia, Eckridge, Mount Carbon, Whittaker, Deepwater		
Major user/sensitive population notification:	**Name**	**Emergency Phone**	**Alternate Phone**
	N/A	N/A	N/A
EED District Office Contact:	**Name**	**Phone**	**Email**
	John Stafford/Chris Farrish	Beckley District Office 304-256-6666 Central Office 304-558-2981	john.pb.stafford@wv.gov chris.b.farrish@wv.gov
OEHS Readiness Coordinator	Warren Von Dollen	304-356-4290 (main) 304-550-5607 (cell)	warren.r.vondollen@wv.gov

Downstream Water Contacts:	**Water System Name**	**Contact Name**	**Emergency Phone**	**Alternate Phone**
	WVAW-Montgomery District	Dave Peters	304-340-2999	-
	Town of Pratt	Carl King	304-442-8912	-
	Community of Cedar Grove	Kenneth Barton	Office 304-595-1841	Water Treatment Plant 304-595-2991
Are you planning on implementing the TIER system?	Yes			

Key Personnel

	Name	Title	Phone	Email
Key staff responsible for coordinating emergency response procedures?	Joe Burdett	Chief Operator	304-442-5044	wpo1960@aol.com
	Judson Wallace	Utility Commissioner	304-442-8302	-
Staff responsible for keeping confidential PSSC information and releasing to emergency responders:	Joe Burdett	Chief Operator	304-442-5044	wpo1960@aol.com
	Judson Wallace	Utility Commissioner	304-442-8302	-

Emergency Response Information

	Name	Phone
List laboratories available to perform sample analysis in case of emergency:	REIC Laboratory- Beaver, WV	800-999-0105, 304-255-2500, info@reiclabs.com
	WV State Laboratory, Environmental Chemistry Section- Charleston, WV	304-965-2694
	Analabs- Crab Orchard, WV	1-800-880-6406, analabs@analabsinc.com
Has the utility developed a detailed Emergency Response Plan in accordance with the Public Health Security Bioterrorism Preparedness and Response Pan Act of 2002?	Armstrong PSD will investigate developing or updating its emergency response plan specific to source water protection, water plant operations, and responding to malfunctions in its distribution system.	
When was the Emergency Response Plan developed or last updated?	Unknown	

EMERGENCY CONTACT INFORMATION

State Emergency Spill Notification
1-800-642-3074

Office of Emergency Services
http://www.wvdhsem.gov/
Charleston, WV- (304) 558-5380

WV Bureau for Public Health Office of Environmental Health Services (OEHS)
www.wvdhhr.org/oehs

Readiness Coordinator- Warren Von Dollen
Phone; 304-356-4290
Cell; 304-550-5607
E-mail: warren.r.vondollen@wv.gov

Environmental Engineering Division Staff
Charleston, Central Office (304) 558-2981
Beckley, District 1 (304) 256-6666
St. Albans, District 2 (304) 722-0611
Kearneysville, District 4 (304) 725-9453
Wheeling, District 5 (304) 238-1145
Fairmont, District 6 (304) 368-2530

National Response Center - Chemical, Oil, & Chemical/Biological Terrorism
1-800-424-8802

WV State Fire Marshal's Office
1-800-233-3473

West Virginia State Police
1-304-746-2100

WV Watch – Report Suspicious Activity
1-866-989-2824

DEP Distance Calculator

http://tagis.dep.wv.gov/pswicheck/

PRESS RELEASE ATTACHMENTS

TIERS Levels A, B, C, D, and E

UTILITY ISSUED NOTICE – LEVEL A

PUBLIC WATER SYSTEM ANNOUNCEMENT

A WATER SYSTEM INVESTIGATION IS UNDERWAY

On _____ at ___:____ AM/PM, the _____ Water System began investigating an incident that may affect local water quality.

The incident involves the following situation at this location:

_____

_____

_____

There are no restrictions on water use at this time. As always, if water system customers notice anything unusual about their water – such as abnormal odors, colors, sheen, etc. – they should contact the water system at _____.

At this time there is no need for concern if you have consumed or used the water.

Regular updates will be provided about this Announcement as water system staff continue their investigation. Again, there are no restrictions on water use at this time.

State Water System ID# _____ Date Distributed: _____

UTILITY ISSUED NOTICE – LEVEL B
BOIL WATER ADVISORY
A BOIL WATER ADVISORY IS IN EFFECT

On _____ at ___:____ am/pm, a water problem occurred causing contamination of your water. The areas that are affected are as follows:

□ Entire Water System or □ Other: _____

_____

CONDITIONS INDICATE THERE IS A HIGH PROBABILITY THAT YOUR WATER IS CONTAMINATED. TESTING HAS NOT OCCURRED TO CONFIRM OR DENY THE PRESENCE OF CONTAMINATION IN YOUR WATER.

What should I do?

- **DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST.** Bring all water to a boil, let it boil for one minute, and let it cool before using, or use bottled water. Boiled or bottled water should be used for drinking, making ice, brushing teeth, washing dishes, bathing, and food preparation **until further notice**. Boiling kills bacteria and other organisms in the water.

What happened?

- **The problem is related to** _____

What is being done?

- **The water system is taking the following action:** _____

  _____

What should a customer do if they have consumed or used the water?

- _____

We will inform you when you no longer need to boil your water. We anticipate resolving the problem within _____ hours/days. For more information, please contact _____ at _____ or _____ at _____.

General guidelines on ways to lessen the health risk are available from the EPA Safe Drinking Water Hotline at 1 (800) 426-4791.

Please share this information others who use this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice was distributed by _____

State Water System ID# _____ Date Distributed: _____

UTILITY ISSUED NOTICE – LEVEL C
"CANNOT DRINK" WATER NOTIFICATION
A LEVEL C WATER ADVISORY IS IN EFFECT

On _____ at ___:____ am/pm, a water problem occurred causing contamination of your water. The areas that are affected are as follows:

□ Entire Water System or □ Other: _____

_____

CONDITIONS INDICATE THERE IS A HIGH PROBABILITY THAT YOUR WATER IS CONTAMINATED. TESTING HAS NOT OCCURRED TO CONFIRM OR DENY THE PRESENCE OF CONTAMINATION IN YOUR WATER.

What should I do?

- **DO NOT DRINK THE WATER.** You can't drink the water, but you can use it for showering, bathing, toilet-flushing, and other non-potable purposes.
- **BOILING WILL NOT PURIFY THE WATER.** Do not drink the water, even if it is boiled. The type of contamination suspected is not removed by boiling.

What happened?

- **The problem is related to** _____

What is being done?

- **The water system is taking the following action:** _____

  _____

What should a customer do if they have consumed or used the water?

- _____

We will inform you when the water is safe to drink. We anticipate resolving the problem within _____ hours/days. For more information – or to report unusual water conditions such as abnormal odors, colors, sheen, etc. – please contact _____ at _____ or _____ at _____.

Please share this information others who use this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice was distributed by _____

State Water System ID# _____ Date Distributed: _____

UTILITY ISSUED NOTICE – LEVEL D
"DO NOT USE" WATER NOTIFICATION
A LEVEL D WATER ADVISORY IS IN EFFECT

On _____ at ___:____ am/pm, a water problem occurred causing contamination of your water. The areas that are affected are as follows:

□ Entire Water System or □ Other: _____

_____

CONDITIONS INDICATE THERE IS A HIGH PROBABILITY THAT YOUR WATER IS CONTAMINATED. TESTING HAS NOT OCCURRED TO CONFIRM OR DENY THE PRESENCE OF CONTAMINATION IN YOUR WATER.

What should I do?

- **DO NOT DRINK THE WATER.** The water is contaminated.
- **DO NOT SHOWER OR BATHE IN THE WATER.** You can't use the water for drinking, showering, or bathing. It can be used for toilet flushing and firefighting.
- **BOILING WILL NOT PURIFY THE WATER.** Do not use the water, even if it is boiled. The type of contamination suspected is not removed by boiling.

What happened?

- **The problem is related to** _____

What is being done?

- **The water system is taking the following action:** _____

What should a customer do if they have consumed or used the water?

- _____

We will inform you when the water is safe to drink. We anticipate resolving the problem within _____ hours/days. For more information – or to report unusual water conditions such as abnormal odors, colors, sheen, etc. – please contact _____ at _____ or _____ at _____.

Please share this information others who use this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice was distributed by _____

State Water System ID# _____ Date Distributed: _____

UTILITY ISSUED NOTICE – LEVEL E
EMERGENCY WATER NOTIFICATION
A LEVEL E WATER ADVISORY IS IN EFFECT

On _____ at ___:____ am/pm, a water problem occurred causing contamination of your water. The areas that are affected are as follows:

□ Entire Water System or □ Other: _____

_____

CONDITIONS INDICATE THERE IS A HIGH PROBABILITY THAT YOUR WATER IS CONTAMINATED. TESTING HAS NOT OCCURRED TO CONFIRM OR DENY THE PRESENCE OF CONTAMINATION IN YOUR WATER.

What should I do?

- **DO NOT DRINK THE WATER.** The water is contaminated.
- **DO NOT USE THE WATER FOR ANY PURPOSE!** You can't use the water for drinking, showering, or bathing, or any other use – not even for toilet flushing.
- **BOILING WILL NOT PURIFY THE WATER.** Do not use the water, even if it is boiled. The type of contamination suspected is not removed by boiling.

What happened?

- **The problem is related to** _____

What is being done?

- **The water system is taking the following action:** _____

What should a customer do if they have consumed or used the water?

- _____

We will inform you when the water is safe to drink. We anticipate resolving the problem within _____ hours/days. For more information – or to report unusual water conditions such as abnormal odors, colors, sheen, etc. – please contact _____ at _____ or _____ at _____.

Please share this information others who use this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice was distributed by _____

State Water System ID# _____ Date Distributed: _____

APPENDIX D. SINGLE SOURCE FEASIBILITY STUDY

Source Water Protection Plan

Contingency Plan and Feasibility Study

ARMSTRONG PSD

PWSID 3301004
FAYETTE COUNTY

SEPTEMBER 2015

Prepared by:

Tetra Tech, Inc.
803 Quarrier Street, Suite 400
Charleston, WV 25314

In cooperation with Armstrong PSD

TETRA TECH

Victor D'Amato, PE

9/10/15
Date

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Background

To fulfill the requirements of Senate Bill 373 and Legislative Rule 64 CSR 3, Armstrong PSD has participated in a study to evaluate its existing contingency planning and feasibility of source water alternatives. This Contingency Planning and Feasibility Study report documents the results of the study and provides information about the utility's ability to prevent contaminants from entering the water system if possible, and sufficiently respond to an emergency if necessary. This report represents only a portion of the required elements of the Source Water Protection Plan for Armstrong PSD. The information presented in this report will be included in the final Source Water Protection Plan.

Contingency Plan

The goal of contingency planning is to identify and document how the utility will prepare for and respond to any drinking water shortages or emergencies that may occur due to short and long term water interruption, or incidents of spill or contamination. Utilities should examine their capacity to protect their intake, treatment plant, and distribution system from contamination. They should also review their ability to use alternative sources, minimize water loss, meet future water demands, and operate during power outages. In addition, utilities should report the feasibility of establishing an early warning monitoring system. The following sections address these considerations and present information required for the source water protection plan.

Responding to Water Shortage or Contamination Event

Isolating or diverting any possible contaminant from the intake for a public water system is an important strategy in the event of an emergency. One commonly used method of diverting contaminants from an intake is establishing booms around the intake. This can be effective, but only for contaminants that float on the surface of the water. Alternatively, utilities can choose to pump floating contaminants from the water or chemically neutralize the contaminant before it enters the treatment facility.

Public utilities using surface sources should be able to close the intake by one means or another. However, depending upon the system, methods for doing so could vary greatly from closing valves, lowering hatches or gates, raising the intake piping out of the water, or shutting down pumps. Systems should have plans in place in advance as to the best method to protect the intake and treatment facility. Utilities may benefit from turning off pumps and, if possible, closing the intake opening to prevent contaminants from entering the piping leading to the pumps. Utilities should also have a plan in place to sample raw water to identify the movement of a contaminant plume and allow for maximum pumping time before shutting down an intake (see Early Warning Monitoring System section). The amount of time that an intake can remain closed depends on the water infrastructure and should be determined by the utility before an emergency occurs. The longer an intake can remain closed in such a case, the better.

Raw and treated water storage capacity in the event of such an emergency also becomes extremely important. Storage capacity can directly determine how effectively a water system can respond to a contamination event and how long an intake can remain closed. Information regarding the water shortage response capability of Armstrong PSD is provided in **Table 1**.

Statewide initiatives for emergency response, including source water related incidents, are being developed. These include the West Virginia Water/Wastewater Agency Response Network (WV WARN, see http://www.wvwarn.org/) and the Rural Water Association Emergency Response Team (see http://www.wvrwa.org/). Armstrong PSD has analyzed its ability to effectively respond to emergencies and this information is also provided in **Table 1**.

Table 1. Armstrong PSD Water Shortage Response Capability

Can the utility isolate or divert contamination from the intake or groundwater supply?	No
Describe the utility's capability to isolate or divert potential contaminants:	The utility has no means of isolating or diverting contaminants.
Can the utility switch to an alternative water source or intake that can supply full capacity at any time?	No
Describe in detail the utility's capability to switch to an alternative source:	The utility has no means of switching to an alternative source of raw water that can support the water treatment plant at full capacity.
Can the utility close the water intake to prevent contamination from entering the water supply?	Yes
How long can the intake stay closed?	If the tanks were full when the intake was closed, the Kimberly tank would likely be the first tank to run dry. This tank would likely last around 24 hours. The other three tanks see much less usage and could likely supply water for several additional days.
Describe the process to close the intake:	The operators can shut down the raw water pumps in a few seconds to stop pumping water into the plant. They can also climb into the raw water intake pit and manually close a valve to shut the intake.
Describe the raw and treated water storage capacity of the water system:	The utility has four treated water storage tanks and three booster pump stations (BPS). Powellton Tank- 110,000 gal. Kimberly Tank- 132,000 gal. Elk Ridge Tank- 30,000 gal. (68,000 gal.)* Deep Water Tank- 122,000 gal. **Total treated water storage- 394,000 gal.** The water system does not have any raw water storage.
Is the utility a member of WVRWA Emergency Response Team?	The water system is a member of WV Rural Water Association but is not a member of the WVRWA Emergency Response Team.
Is the utility a member of WV-WARN?	No
List any other mutual aid agreements to provide or receive assistance in the event of an emergency:	The utility has informal mutual aid agreements with several other local water utilities. They have loaned

	and borrowed equipment, parts, and assistance from operators with these systems.

* The Elk Ridge tank has a total storage volume of 68,000 gallons; however, PWS personnel have indicated that it can only be filled about 30,000 gallons before the pressure in the distribution system gets too high.

Operation During Loss of Power

Armstrong PSD analyzed and examined its ability to operate effectively during a loss of power. This involved ensuring a means to supply water through treatment, storage, and distribution without creating a public health emergency. Information regarding the utility's capacity for operation during power outages is summarized in **Table 2**.

Table 2. Armstrong PSD Generator Capacity

What is the type and capacity of the generator needed to operate during a loss of power?	The utility owns one 75 kW generator that is located at the treatment plant and one 65 kW generator that is located at the raw water intake. They also have a smaller 20 kW generator that is located at the Deep Water BPS. This allows them to pump and treat raw water and supply the Deep Water zone during a power outage. The rest of the distribution area can be supplied by gravity if the other booster stations are bypassed. Some customers may experience low pressure but should have access to water. All three generators are natural gas powered and are plumbed to the local gas line and would have a sufficient fuel supply as long as the gas line was active.
Can the utility connect to generator at intake/wellhead? If yes, select a scenario that best describes system.	Yes- The raw water intake pump is hardwired to a 65 kW natural gas generator that is plumbed to the local gas utility.
Can the utility connect to generator at treatment facility? If yes, select a scenario that best describes system.	Yes- The treatment facility is hardwired to a 75 kW natural gas generator that is plumbed to the local gas utility.
Can the utility connect to a generator in distribution system? If yes, select a scenario that best describes system.	Yes- The Deep Water BPS is hardwired to a 20 kW natural gas generator that is plumbed to the local gas utility. The rest of the distribution system does not require a generator because it can supplied by gravity, although the utility managers are considering purchasing another generator to improve water pressure in these areas during a power outage.

Does the utility have adequate fuel on hand for the generator?		Yes	
What is your on-hand fuel storage and how long will it last operating at full capacity?		**Gallons**	**Hours**
		All generators are plumbed to the local gas utility.	The fuel supply would be unlimited as long as the gas line was active.
Provide a list of suppliers that could provide generators and fuel in the event of an emergency:	**Supplier**		**Contact Information**
	Generator	Sunbelt Rentals- St. Albans, WV	(304) 766-6224, pcm217@sunbeltrentals.com
	Generator	Walker Caterpillar- Summersville, WV	(304) 872-4303
	Fuel	Southern Public Gas	(304) 442-2311
	Fuel	Sunoco-Montgomery, WV	(304) 442-8900
Does the utility test the generator(s) periodically?		Yes- The utility tests the generators weekly.	
Does the utility routinely maintain the generator?		Yes- The utility regularly checks fluid levels in the generators and keeps them in working condition.	
If no scenario describing the ability to connect to generator matches the utility's system or if utility does not have ability to connect to a generator, describe plans to respond to power outages:		N/A	

Future Water Supply Needs

When planning for potential emergencies and developing contingency plans, a utility needs not only to consider their current demands for treated water but also account for likely future needs. This could mean expanding current intake sources or developing new ones in the near future. This can be an expensive and time consuming process, and any water utility should take this into account when determining emergency preparedness. Armstrong PSD has analyzed its ability to meet future water demands at current capacity, and this information is included in **Table 3**.

Table 3. Future Water Supply Needs for Armstrong PSD

Is the utility able to meet water demands with the current production capacity over the next 5 years? If so, explain how you plan to do so.	Yes- The water system is not expecting any major changes in population or demand in the service area, which has only experienced a decrease in population in recent years. The water system's opinions concerning the demand for the next five years are generally supported by population trends projected based on US Census Bureau 2000 and 2010 data. According to the 2005 Interim State Population Projections [(1)], WV as a whole will see a population decline between 2010 and 2030. In addition, researchers at the WVU College of Business and Economics specifically project that populations within Fayette County will decrease from population of 46,039 in 2010 to a projected population of 44,611 in 2020 [(2)]. Census data and projections cannot account for increases in daily demand due to water line extensions. No water line extensions are planned for the next five years. If in the future water line extension projects are proposed the daily demands will be reassessed to determine if the source and treatment facilities can support increased demand.
If not, describe the circumstances and plans to increase production capacity:	N/A

(1)US Department of Commerce, United State Census Bureau. 2005 Interim State Population Projections. Table 1. http://www.census.gov/population/projections/data/state/projectionsagesex.html. Accessed June 10, 2015.

(2) Christiadi, Ph.D., Deskins, John, Ph.D., Lego, Brian. WVU College of Business and Economics, Bureau of Business and Economic Research. March 2014. WVU Research Corporation. http://be.wvu.edu/bber/pdfs/BBER-2014-04.pdf Accessed June 10, 2015.

Water Loss

In any public water system there is a certain percentage of the total treated water that does not reach the customer. Some of this water is used in treatment plant processes such as back washing filters or flushing piping, but there is usually at least a small percentage that goes unaccounted for. This can include unmetered uses, leaks, and other losses. To measure and report on this unaccounted for water, a public utility must use the same method used in the Public Service Commission's rule, *Rules for the Government of Water Utilities*, 150CSR7, section 5.6. The rule defines unaccounted for water as the volume of water introduced into the distribution system less all metered usage and all known non-metered usage which can be estimated with reasonable accuracy.

Metered usages are most often those that are distributed to customers. Non-metered usages that are being estimated include uses such as by the fire departments for fires or training, un-metered bulk sells, flushing to maintain the distribution system, and water used for backwashing filters and cleaning settling basins. By totaling the metered and non-metered uses the utility can calculate unaccounted for water. Note: To complete annual reports submitted to the PSC, utilities typically account for known water main breaks by estimating the amount of water lost. However, for the purposes of the source water protection plan, any water lost due to leaks, even if the system is aware of how much water is lost at a main break, is not considered a use. Water lost through leaks and main breaks cannot be controlled during a water shortage or other emergency and

should be included in the calculation of percentage of water loss for purposes of the source water protection plan. The data in **Table 4** is taken from the most recently submitted Armstrong PSD PSC Annual Report.

Table 4. Water Loss Information*

Total Water Pumped (gal)		87,718,000
Total Water Purchased (gal)		0
Total Water Pumped and Purchased (gal)		87,718,000
Water Loss Accounted for Except Main Leaks (gal)	**Mains, Plants, Filters, Flushing, etc.**	500,000
	Fire Department	800,000
	Back Washing	500,000
	Blowing Settling Basins	500,000
Total Water Loss Accounted For Except Main Leaks		2,300,000
Water Sold- Total Gallons (gal)		37,931,000
Unaccounted For Lost Water (gal)		39,487,000
Water lost from main leaks (gal)		8,000,000
Total gallons of Unaccounted for Lost Water and Water Lost from Main Leaks (gal)		47,487,000
Total Percent Unaccounted For Water and Water Lost from Main Leaks (gal)		54%
If total percentage of Unaccounted for Water is greater than 15%, please describe any measures that could be taken to correct this problem:	The utility regularly fixes any leaks as they are detected in the distribution system. In 2015, the utility crews found and fixed a leak that was losing approximately 20,000 GPD. This should improve water loss in the future. In addition, utility staff believe there is an issue with the master meter that measures water leaving the plant. The meter likely indicates that the plant is producing more treated water than it actually is, which could inflate the unaccounted-for water.	

*Information taken from the 2014 Public Service Commission Annual Report for Armstrong PSD

Early Warning Monitoring System

Public water utilities are required to provide an examination of the technical and economic feasibility of implementing an early warning monitoring system. Implementing an early warning monitoring system may be approached in different ways depending upon the water utility's resources and threats to the source water. A utility may install a continuous monitoring system that will provide real time information regarding water quality conditions. This would require utilities to analyze the data in order to establish what condition is indicative of a contamination event. Continuous monitoring will provide results for a predetermined set of parameters. The more parameters being monitored, the more sophisticated the monitoring equipment will be. When establishing a continuous monitoring system, the utility should consider the logistics of placing and maintaining the equipment, and receiving output data from the equipment.

Alternately, or in addition, a utility may pull periodic grab samples on a regular basis, or in case of a reported incident. The grab samples may be analyzed for specific contaminants. A utility should examine their Potential Sources of Significant Contamination (PSSCs) to determine what chemical contaminants could pose a threat to the water source. If possible, the utility should plan in advance how those contaminants will be detected. Consideration should be given to where samples will be collected, the preservation and hold times for samples, available laboratories to analyze samples, and costs associated with the sampling event. Regardless of the type of monitoring (continuous or grab), utilities should collect samples for their source throughout the year to better understand the baseline water quality conditions and natural seasonal fluctuations. Establishing a baseline will help determine if changes in the water quality are indicative of a contamination event and inform the needed response.

Every utility should establish a system or process for receiving or detecting chemical threats with sufficient time to respond to protect the treatment facility and public health. All approaches to receiving and responding to an early warning should incorporate communication with facility owners and operators, with state and local emergency response agencies, with surrounding water utilities, and with the public. Communication plays an important role in knowing how to interpret data and how to respond.

Armstrong PSD has analyzed its ability to monitor for and detect potential contaminants that could impact its source water. Information regarding this utility's early warning monitoring system capabilities can be found in **Table 5** and in **Appendix A.**

Table 5. Early Warning Monitoring System Capabilities

Does your system currently receive spill notifications from a state agency, neighboring water system, local emergency responders, or other facilities? If yes, from whom do you receive notices?	The utility receives daily alert emails from the West Virginia Health Department about any spills that have occurred around the state. They have also received notifications from the Kanawha Falls sewage treatment plant and from CSX during the 2015 train derailment.
Are you aware of any facilities, land uses, or critical areas within your protection areas where chemical contaminants could be released or spilled?	Yes. The utility is aware of the facilities upstream that could be a contamination threat to the water system. These include several industrial sites along the Kanawha River, a wastewater treatment plant, bridges, and railroads.

Are you prepared to detect potential contaminants if notified of a spill?		Yes- If notified of a spill the utility would immediately begin taking grab samples from the source water. They also take regular samples from a raw water faucet in the plant every 4 hours to monitor turbidity and chlorine levels, and would likely notice any change in conditions.		
List laboratories (and contact information) on whom you would rely to analyze water samples in case of a reported spill.		**Laboratories**		
		Name	**Contact**	
		REIC Laboratory- Beaver, WV	800-999-0105, 304-255-2500, info@reiclabs.com	
		WV State Laboratory, Environmental Chemistry Section- Charleston, WV	304-965-2694	
		Analabs- Crab Orchard, WV	1-800-880-6406, analabs@analabsinc.com	
Do you have an understanding of baseline or normal conditions for your source water quality that accounts for seasonal fluctuations?		Yes. The operators have an understanding of baseline water quality conditions in the Kanawha through daily sampling and observations.		
Does your utility currently monitor raw water (through continuous monitoring or periodic grab samples) at the surface water intake or from a groundwater source on a regular basis?		No. See Form B in **Appendix A**.		
Provide or estimate the capital and O&M costs for your proposed early warning monitoring system or upgraded system.	**Monitoring System**	**YSI EXO 2 (Table B-1)**	**Hach sc1000 (Table B-2)**	**Real Tech Full Scanning Monitoring System (Table B-3)**
	Capital	Total Capital Cost- $19,000	Approximate Capital Cost- $18,907	Approximate Capital Cost- $24,155
	Yearly O & M	Parts and calibration- Approximately $1,000 Data management and telemetry- $1,000	Full service contract with Hach Service Representative- $2,258 Online Viewer-$600	Replacement Lamps- $1,480 Smart-Sense Monitoring Service- $499

Do you serve more than 100,000 customers? If so, please describe the methods you use to monitor at the same technical levels utilized by ORSANCO.	No

Single Source Feasibility Study

If a public water utility's water supply plant is served by a single–source intake in a surface water source of supply or a surface water influenced source of supply, the submitted source water protection plan must also include an examination and analysis of the technical and economic feasibility of developing alternative sources of water to provide continued safe and reliable public water service in the event its primary source of supply is detrimentally affected by contamination, release, spill event or other reason. These alternatives may include a secondary intake, two days of raw or treated water storage in addition to what is currently stored to meet water system design standards, interconnection with neighboring systems, or other options identified on a local level. Note that a secondary intake must draw water supplies from a substantially different location on the same water source, or from an entirely different water source.

To accomplish this requirement, the utility has examined existing and possible alternatives and ranked them by their technical, economic, and environmental feasibility according to the West Virginia Department of Health and Human Resources Bureau for Public Health (WVBPH) feasibility study guide. This guide provides several criteria to consider for each category organized in a Feasibility Study Matrix. By completing the Feasibility Study Matrix, the utility has documented the process used to examine the feasibility of each alternative, and has generated scores that compare the alternatives. The Feasibility Study Matrix is attached as **Appendix B**.

In addition to the Feasibility Study Matrix spreadsheet, a brief narrative is also included in **Appendix B** that identifies one or more feasible alternative, provides a summary of data used to make this determination, and briefly summarizes the results of the matrix.

Source Water Protection Plan

Contingency Plan and Feasibility Study

ARMSTRONG PSD

PWSID WV3301004
FAYETTE COUNTY

SEPTEMBER 2015

Prepared by:

Tetra Tech, Inc.
803 Quarrier Street, Suite 400
Charleston, WV 25314

In cooperation with Armstrong PSD

TETRA TECH

_____
Victor D'Amato, PE

_____
Date

Appendix A. Early Warning Monitoring System

Form B - Proposed Early Warning Monitoring Systems

Armstrong PSD

Primary Surface Water Source:

There are many possible solutions for designing and installing an early warning monitoring system. Over time, this technology changes and improves and it is difficult to determine the type of equipment that will be useful and effective in the long term. These plans are proposed systems that would work for Armstrong PSD using current technology and the current plant and intake configuration.

The primary source of raw water for Armstrong PSD is the Kanawha River. The intake is located across the train tracks from the water treatment plant on the other side of Mt. Carbon, about 3,500' away.

B-1. YSI EXO 2 Monitoring System Proposal
Describe the type of early warning detection equipment that could be installed, including the design.
This plan uses the YSI EXO 2 Multiport Sonde, which can accommodate 6 different sensors and has an automatic wiper mechanism to remove biofouling from the sensor tips, which reduces maintenance time. The sonde is built to be resilient and low maintenance, and is capable of providing online water quality monitoring that can be transmitted real time to a designated PC or website that can be accessed by any designated user. The sonde can hold up to 6 sensors, but this plan recommends 4 of the more basic sensors that would be sufficient to detect any sudden shifts in water quality in any West Virginia stream or river. These sensors would include: conductivity/temperature, optical dissolved oxygen, pH, and fluorescent dissolved organic matter (fDOM). The fDOM sensor could potentially detect petroleum products in the water but is not entirely reliable for this purpose. At this time, YSI does not make a sensor for petroleum products for the EXO 2 but likely will in the future, at which time it is recommended that the utility purchase it. Other sensors could be purchased in the future as well if deemed necessary by the utility.
Where would the equipment be located?
The sonde would be attached to the intake pipe itself, which extends into the Kanawha River. This would provide a stable foundation for the equipment and also ensure that the device is able to sample the water that is actually entering the intake pipe and not missing potential contaminants because it is located on the wrong side of the stream or too far from the intake. The suggested method of mounting the sonde involves drilling holes in a PVC pipe, capping the end, inserting the sonde and attaching to the intake pipe structure using brackets or chains. This will protect the sensor from debris and hide it from view somewhat.

The sonde would be hardwired to the YSI Storm 3 data analysis/telemetry system. The Storm 3 would need to be housed in a sampling shed of some kind on the riverbank. This structure needs to be sturdy and out of the flood plain if possible. The unit is contained in a waterproof case and comes with a solar photovoltaic panel capable of powering both the data analysis unit and the sonde, so long as the sonde is hardwired to the Storm 3. The device can be battery powered as well if this is not an option.

What would the maintenance plan for the monitoring equipment entail?

The maintenance plan for the system would involve replacing the dissolved oxygen sensor cap, replacing the pH electrode cap, and purchasing pH, turbidity, and conductivity calibration solution on a yearly basis. The sonde itself is designed to last from 5-10 years and should be inspected and calibrated once a month.

In addition, there is a recurring yearly fee associated with the real-time data/telemetry package for managing the website and data analysis.

Describe the proposed sampling plan at the monitoring site.

The sonde can be programmed to take regular measurements at any intervals defined by the operator or user. These measurements can also be taken in bursts, averaged over a period of time, or modified automatically as water quality levels change. Data is stored in the Storm 3 and transmitted to the plant computer as it is recorded. This information can be transmitted wirelessly via a cellular modem. The cellular transmitter is powerful enough to work even in areas with poor cell reception.

Describe the proposed procedures for data management and analysis.

The Storm 3 package includes data management software that can generate data reports and presentations and allow the user to modify and adjust sampling schedules remotely from the plant.

The sonde can be programmed to alert the user when any of the water quality parameters exceeds a user-defined level. This will allow the operator to program the system to notify them when their previously observed baseline conditions are exceeded in time for them to shut down the pumps and close off the intake. The operator can receive alerts via text message and email at the treatment plant computer or any designated cell phone.

B-2. Hach sc1000 Monitoring System Proposal

Describe the type of early warning detection equipment that could be installed, including the design.

The Hach sc1000 online monitoring system includes a controller, back panel, display module, and trough. Raw water is pumped into the trough from the source where it can be sampled in real time. The probe module can accommodate up to 6 sensors, which means it can monitor up to 6 parameters at once. This plan suggests the following sensors: conductivity, pH, turbidity, and dissolved oxygen. Hach can also supply a sensor to detect oil in water, which would cost an additional $18,414.00 and would possibly be a good investment for any water system if sufficient funds were available. This sensor is not included in the quoted

capital cost. There are several other probes for other parameters that are available from Hach, and these could be purchased as deemed necessary by the utility.
Where would the equipment be located?
The sc1000 Controller, back panel, and trough would need to be housed in a small sampling shed. A small diameter line would run out from this structure the length of the intake pipe to pull raw water back to the controller where it would flow into the trough for sampling. The closer this sampling line can be to the actual intake, the more accurately it will reflect the raw water that is actually entering the plant. This option would require the utility to purchase a line or hose long enough to reach the intake pipe and a small pump. The line and pump could be fairly low- tech and inexpensive, as the sc1000 only requires a minimum of 900 mL/min. of flow. The controller will be equipped with the MODBUS advanced communications/networking unit, which can transmit readings in real time directly to the SCADA system in the treatment plant to alert the operators in any change in baseline water quality. The sc1000 can either be hardwired to the computer at the treatment plant or it can use a cellular modem to transmit the data if there is sufficient cellular signal.
What would the maintenance plan for the monitoring equipment entail?
The maintenance plan for the system would entail a yearly maintenance contract with the manufacturer. A Hach Service Representative would regularly service the monitoring equipment. This service would take care of all parts, labor, and preventative maintenance and would include 2-3 scheduled maintenance visits per year.
Describe the proposed sampling plan at the monitoring site.
The sc1000 monitors the quality of water flowing through the trough in real time, and can transmit this data back to the plant as it is collected. The actual timing of the sampling plan could be determined by the utility.
Describe the proposed procedures for data management and analysis.
It is recommended that the utility purchase the Hach Universal Data Gateway software, which would help to process and analyze the incoming information into easily interpreted reports. The price of this software is included in the rough capital cost.

B-3. Real Tech Full Scanning UV-VIS Monitoring System
Describe the type of early warning detection equipment that could be installed, including the design.
This plan utilizes the Real Tech Full Scanning UV-VIS monitoring system, which provides full ultraviolet/visible scanning for organics and other specific parameters that may indicate a contamination event. The included PC Controller is pre-loaded with the software needed to store and process this information to establish a "normal" or "baseline" set of conditions for the raw water source. In addition to the UV-VIS sensors, the system can accommodate up to 8 additional sensors that are available from a third party and priced separately. This plan includes pricing and details for a system equipped to measure conductivity, pH, temperature, and dissolved oxygen. Other additional sensors could be purchased and added if deemed necessary by the utility.
Where would the equipment be located?
The UV-VIS Full Monitoring System would need to be located close to the intake, which might mean a small structure would need to be built on the river bank to house the equipment. A small-diameter line or hose would run from this structure to the intake pipe to pull raw water back to the controller where it would flow into the unit for sampling. The closer the end of the sampling line can be to the actual intake, the more accurately it will reflect the raw water that is actually entering the plant. This option would require the utility to purchase enough line to reach the intake as well as a small pump. The line and pump could be fairly small and inexpensive, as the system only requires a minimum of 300-800 mL/min. of flow. The system also includes the Real Pump Clean System, which provides flow and automatic chemical cleaning of the sensors and reduces maintenance time. This system would require a reliable electrical source, but because the intake is located near an existing neighborhood, supplying it with electricity shouldn't be a problem.
What would the maintenance plan for the monitoring equipment entail?
The maintenance plan for the system would require about 2 hrs/month for scheduled maintenance tasks. It is also recommended that a monthly laboratory reference sample is taken to effectively calibrate the sensors. The Smart-Sense Web Monitoring Service package costs an additional $499/yr., but provides additional support and remote accessibility by Real Tech, and it is recommended. The Deuterium and Tungsten lamps would also need to be replaced every six months at a cost of $740.
Describe the proposed sampling plan at the monitoring site.

The Full Scanning UV-VIS system continuously monitors raw water as it is pumped to through the unit, and is capable of establishing baseline conditions that account for seasonal variability, which can help to reduce false alarms.
Describe the proposed procedures for data management and analysis.
The Real Tech monitoring system is capable of communicating with the treatment plant via Modbus, Ethernet, USB, or cell modem. It can be integrated with the treatment plant's SCADA system to provide real-time information about conditions at the intake and provides full remote monitoring. It is also recommended that the utility take advantage of the Smart-Sense Web Monitoring service offered by Real-Tech to analyze and interpret data taken by the monitoring system. This consultation service requires an additional service fee, which is included in this quote.

Single Source Alternatives Feasibility Study

ARMSTRONG PSD

PWSID: WV3301004

TETRA TECH

PURPOSE

This Source Water Alternatives Feasibility Study (the Study) is prepared in accordance with legislative rule 64CSR3. The rule provides for numerous source water protection planning activities. As part of these activities, if a secondary source of water supply is not available, public water systems (PWSs) are required to prepare a study to determine the technical and economic feasibility of the following options to provide continued water service in the event the source water becomes contaminated. The options include:

- Constructing or establishing a secondary or backup intake which would draw water supplies from a substantially different location or water source;
- Constructing additional raw water storage capacity and/or treated water storage capacity to provide at least two days of system storage based on the plant's maximum level of production experience in the last year;
- Creating or constructing an operation interconnection(s) between PWS with other PWS plants or another PWS to allow the utility to receive its water from a different source of supply;
- Any other alternative which is available to the PWS to secure safe and reliable alternative water supply.

If one or more of the above options is determined to be feasible, the PWS is required to provide additional detail on the costs, risks and benefits of implementing each feasible alternative.

This Study utilizes the matrix provided by the West Virginia Department of Health and Human Resources, Bureau for Public Health to determine the feasibility of the alternatives for the Armstrong Public Services District (PSD). The matrix provides a systematic method of evaluating alternatives using numerous factors and a system to rank the economic, technical and environmental feasibility of each alternative.

SYSTEM DESCRIPTION

The Armstrong PSD provides water service to approximately 1,930 people. Located in Fayette County, the PWS has an intake on the Kanawha River as its raw water supply. **Figure 1** presents the location of the PWS. The design capacity of the WTP is 0.393 MGD and the WTP uses coagulation, sedimentation, filtration and disinfection to treat the water to potable standards. **Table 1** below provides a summary of the capacity and recent average day and maximum day demands in the Armstrong system.

Table 1. Armstrong PSD Capacity and Demands

Parameter	Value
2014 Average Day Demand (ADD) (MGD)	0.280
2014 Maximum Day Demand (MDD) (MGD)	0.439
WTP Capacity (MGD)	0.393
WTP Utilization	111.7%
MDD to ADD Ratio(1)	1.57

(1) MDD to ADD Ratio calculated using the 2014 average day and maximum day demands

The water treatment plant operationally exceeded its capacity on the maximum day in 2014, which could indicate that the master meter is providing inaccurate measures of their water production. Roughly 50% of the total output from the plant is unaccounted for. Maximum daily demands may be the result of increased water loss due to events such as a major main break, water line breaks due to freezing, or customer usage to avoid freezing lines. Storage in the Armstrong system is provided by ground storage tanks throughout the distribution system. **Table 2** provides a summary of the tanks.

Table 2. Armstrong PSD Storage

Name	Type	Volume (gallons)
Powellton Tank	Ground	110,000
Kimberly Tank	Ground	132,000
Elk Ridge Tank	Ground	30,000*
Deep Water Tank	Ground	122,000
Total		394,000
2014 ADD (MGD)		0.280
Days Storage		1.41 days

* The Elk Ridge tank has a volume of 68,000 gallons; however, PWS personnel have indicated that it can only be filled about 30,000 gallons before the pressure in the distribution system gets too high.

The storage at Armstrong can support about 1.4 days of average day demand and therefore does not meet the minimum 2 day requirement. The Kimberly tank is the main storage tank for the system, and it receives water directly from the WTP. Booster pumps at the Kimberly tank fill the Elk Ridge and Powellton tanks with the Deep Water tank being filled last. Although they do not appear to have trouble meeting the 20% turnover

requirement, the Elk Ridge tank is routinely only partially filled to avoid excessive pressures in the system. The Powellton tank is in poor condition and is scheduled for replacement when funding becomes available.

In the event the WTP is brought off-line the Kimberly tank would be the first to run dry.

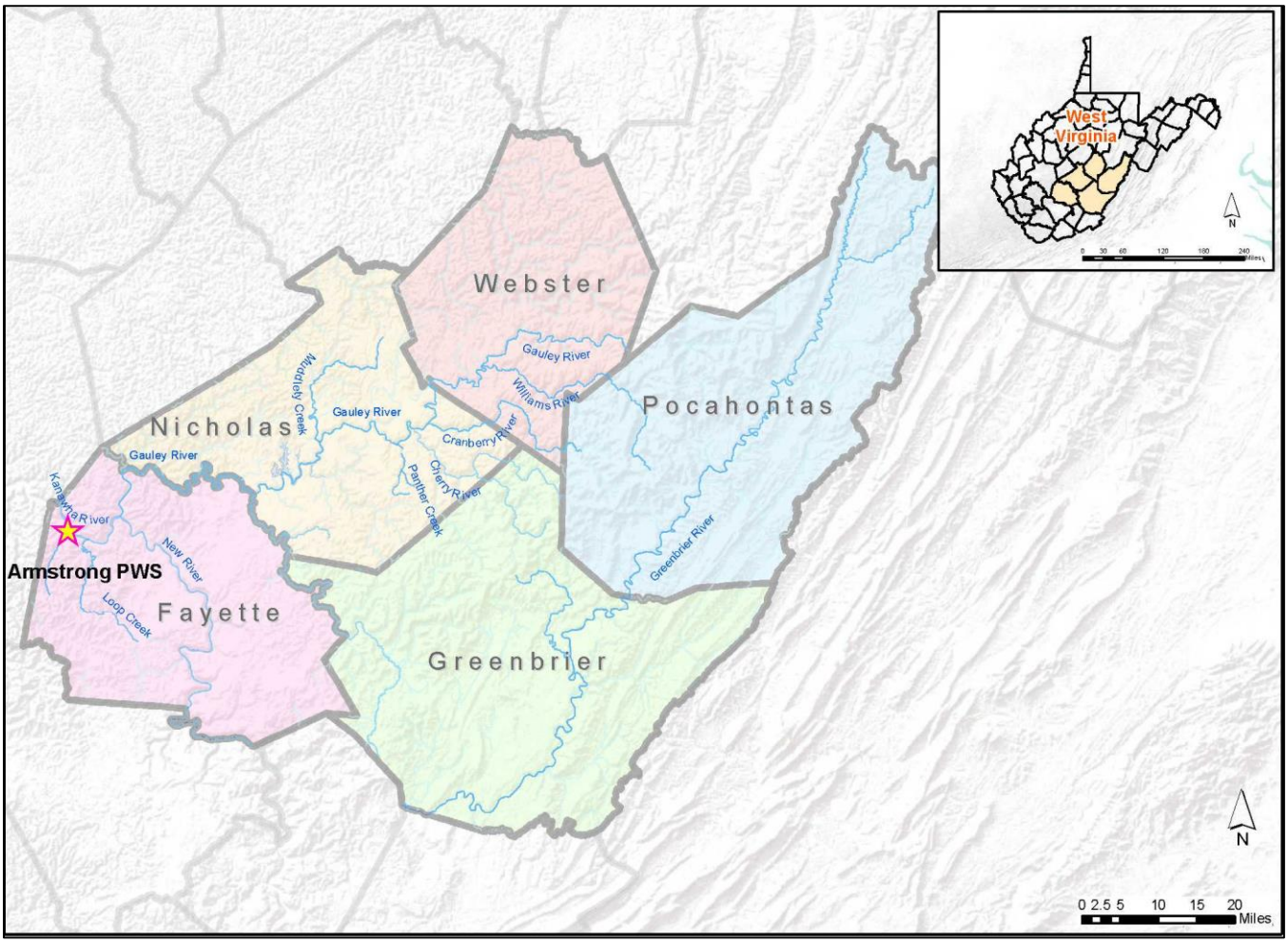

Figure 1. Armstrong PSD Location Map

ALTERNATIVES

The alternatives are evaluated based on their ability to match the capacity of the Armstrong WTP. This will provide a common level of service among all alternatives. **Table 3** below provides the basis for sizing each alternative.

Table 3. Alternatives – Sizing Basis

Alternative	Backup Intake	Raw Storage	Treated Storage	Interconnect
Basis	Max day	2 days of max day demand	2 days of max day demand	Average day(1)
Value	0.432 MGD	0.864 MG	0.864 MG	0.276 MGD

(1) Calculated using the MDD/ADD Ratio

Cost estimates were developed based on a conceptual analysis of each alternative. All costs were reviewed for accuracy and compared with actual costs of similar projects and RSMeans CostWorks 2014. The estimates include materials, installation and contractor's overhead and profit. The estimates are also based on the following assumptions and considerations:

- Piping is priced as mechanical joint ductile iron unless noted otherwise, and includes provisions for road crossings, aerial crossings and site restoration.
- Raw water and treated water storage tanks are priced as steel ground tanks with site work and installation included.
- Pumps are sized and priced based on conceptual level estimates of the required pumping conditions (flow and total dynamic head).
- Precast concrete vaults and metal pump enclosures are sized to house the estimated number of pumps required along with HVAC, electrical, and controls equipment.
- Electrical and controls costs are estimated at 10% of the overall facility costs including pumps.
- Site work is estimated as a lump sum cost based on the approximate size of the disturbed area and other factors that affect level of effort (e.g., whether or not the site is within the 100-yr floodplain).
- Estimates include a 15% engineering allowance and a 30% contingency.
- For purposes of this comparative analysis, costs for land acquisition were estimated at an average $70,000 per acre. This value was used consistently for each alternative and was selected as an average cost to account for unknown site specific variables (e.g. land and structure values, potential remediation costs, acquisition services, etc.).

All capital costs are annualized over a twenty year period using a 2.5% interest rate and 0.50% closing costs.

O&M cost estimates were developed based on the specific operational requirements for each alternative and include labor and materials. Estimates of power consumption of pumps are based on pump size, number of pumps, and estimated hours of operation. O&M tank estimates assume the exterior and interior are repainted every ten years and the raw water tanks are cleaned annually and treated water tanks cleaned every 5 years.

Backup Intake

Armstrong Creek has historically been considered as a potential back up source for the PWS. This option involves the installation of a backup intake, a pump station, and approximately 140 feet of 6-inch pipe. Another backup water source is Loop Creek. Loop Creek flows into the Kanawha River nearly two and a half miles southeast of the Armstrong water treatment plant and could serve as an alternate raw water source. Loop Creek typically has constant flow, although it can run low during hot summer months. This option involves the installation of a backup intake, a pump station, and approximately 12,620 feet of 6-inch pipe along Route 61. Surface mining near both Armstrong Creek and Loop Creek create the potential for water quality issues in both streams. Armstrong Creek is the more feasible of the two alternatives due to its close proximity to the water treatment plant and more easily monitored at the intake. PWS personnel indicate that Armstrong Creek has the capacity to meet demands year round.

Raw Water Storage

The raw water storage alternative includes installing a 1 MG steel ground storage tank on land adjacent to the WTP site and owned by the utility. The tank would require increasing the size of the pumps at the intake structure to fill the tank and installing an additional pump station to transfer raw water from the tank to the WTP through 3,606 feet of 6-inch pipe.

Treated Water Storage

Like the raw water storage alternative this tank would be located adjacent to the WTP and have a similar size and configuration without requiring modifications to the intake pumps. Providing treated water storage over and above the required two days ADD presents some operational challenges for the PWS in meeting the 20% daily turnover requirement. With full tanks, the PWS will be faced with having to drain water during periods of low demand to meet the turnover requirement which will increase the amount of nonrevenue water for the system.

Interconnection

Kanawha Falls PSD and the West Virginia American Water (WVAW) Montgomery facility are both located within 10 miles of Armstrong PSD and were considered for interconnection. Because the WVAW Montgomery facility is downstream of Armstrong's intake, it is likely that their plant would be impacted by a contamination event above Armstrong. Although Kanawha Falls PSD also uses the Kanawha River as its raw water source, its treatment plant is located upstream. The Kanawha Falls intake system is approximately 2.5 miles upstream of Armstrong. Using this interconnection would provide protection from potential contaminant sources in the Deep Water, Alloy and Mt. Carbon communities. This option involves the installation of a pump station and 18,322 feet of 6-inch pipe along Route 61, across the Kanawha River, and along Route 60 to the Kanawha Falls treatment plant.

In the future the WVAW Montgomery facility is expected to be closed and water will be supplied to the area by the WVAW Elk River Facility located on a different source. If this were to occur, Armstrong PSD may consider an interconnection with the Elk River Facility. Kanawha Falls PSD is considering an interconnection with a WVAW facility located in Anstead, WV. This may also be an option in the future for Armstrong PSD.

FEASIBILITY DETERMINATION

The attached matrix and sub-schedules (**Tables 4, 5, 6, and 7**) present the feasibility rankings of the alternatives. All four options generally rank high as possible alternatives.

Treated water storage is the least desirable alternative largely due to problems that may arise with meeting the 20% turnover requirements.

A backup intake on Armstrong Creek ranks as a feasible alternative provided the stream has sufficient capacity to meet Armstrong's demand.

Raw water storage and an interconnection with Kanawha Falls are identified as the most feasible alternatives.

Table 4. Feasibility Matrix

Water Management Strategy Description	Economic Criteria					Technical Criteria							Environmental Criteria						Final Score	Capital Cost	Comments
	45%					45%							10%						100%		
	Operation and Maintenance Costs	Capital Costs	**Total**	**Total %**	**Weighted Total**	Permitting	Flexibility	Resilience	Institutional Requirements	**Total**	**Total %**	**Weighted Total**	Environmental Impacts	Aesthetic Impacts	Stakeholder Issues	**Total**	**Total %**	**Weighted Total**			
Backup Intake Armstrong Creek	3.0	3.0	**6.0**	**100.0%**	**45.0%**	2.0	3.0	1.0	2.0	**8.0**	**66.7%**	**30.0%**	2.0	2.0	2.0	**6.0**	**66.7%**	**6.7%**	**81.7%**	**$973,000**	These alternatives consider a new intake on Armstrong and Loop Creek. The ability of either creek to meet system needs is not documented and requires further study
Backup Intake Loop Creek	3.0	3.0	**6.0**	**100.0%**	**45.0%**	2.0	3.0	1.0	2.0	**8.0**	**66.7%**	**30.0%**	2.0	2.0	2.0	**6.0**	**66.7%**	**6.7%**	**81.7%**	**$1,825,000**	
Interconnect	3.0	3.0	**6.0**	**100.0%**	**45.0%**	2.2	2.5	2.7	2.3	**9.7**	**80.8%**	**36.4%**	3.0	3.0	2.0	**8.0**	**88.9%**	**8.9%**	**90.3%**	**$1,744,000**	Interconnection with Kanawha Falls PSD
Treated water storage	3.0	2.0	**5.0**	**83.3%**	**37.5%**	1.6	1.5	2.3	2.7	**8.1**	**67.5%**	**30.4%**	3.0	2.5	2.0	**7.5**	**83.3%**	**8.3%**	**76.2%**	**$2,358,000**	1.0 MG ground storage tank located on property adjacent to the WTP
Raw Water Storage	3.0	2.0	**5.0**	**83.3%**	**37.5%**	2.4	3.0	2.3	2.7	**10.4**	**86.7%**	**39.0%**	3.0	2.5	2.0	**7.5**	**83.3%**	**8.3%**	**84.8%**	**$2,358,000**	1.0 MG ground storage tank located on property adjacent to the WTP

Table 5. Alternatives Table

Criteria	Question	Backup Intake Armstrong Creek	Feasibility	Backup Intake Loop Creek	Feasibility	Interconnect	Feasibility	Treated Water Storage	Feasibility	Raw Water Storage	Feasibility
Economic Criteria											
What is the total current budget year cost to operate and maintain the PWSU (current budget year)?		$460,133.00		$460,133.00		$460,133.00		$460,133.00		$460,133.00	
O and M Costs	Describe the major O&M cost requirements for the alternative?	Maintenance of intake structure	3	Maintenance of intake structure	3	Labor and materials to maintain pumps	3	Electricity for transfer pumps, labor, maintenance; does not included water flushed	3	Electricity for transfer pumps, labor, recurring maintenance	3
	What is the incremental cost ($/gal) to operate and maintain the alternative?	$2,061.00	3	$2,061.00	3	$2,039.00	3	$10,316.00	3	$12,396.00	3
	Cost comparison of the incremental O&M cost to the current budgeted costs (%)	0.45%	3	0.45%	3	0.44%	3	2.24%	3	2.69%	3
O and M-Feasibility Score			***3.0***		***3.0***		***3.0***		***3.0***		***3.0***
Describe the capital improvements required to implement the alternative.		Intake structure and pump station; 140 ft. of 6" diameter pipe		Intake structure and pump station; 130,000 ft. of 6" diameter pipe		Piping and pump station for supply from Kanawha Falls PSD		1.0 MG ground storage tank and transfer pumps		1.0 MG ground storage tank and transfer pumps	
Capital Costs	What is the total capital cost for the alternative?	$973,000	3	$1,850,000	3	$1,744,000	3	$2,358,000	2	$2,358,000	2
	What is the annualized capital cost to implement the alternative, including land and easement costs, convenience tap fees, etc. ($/gal)	$63,000	3	$118,000.00	3	$112,000.00	3	$152,000.00	2	$152,000.00	2
	Cost comparison of the alternatives annualized capital cost to the current budgeted costs (%)	13.69%	3	25.64%	3	24.34%	3	33.03%	2	33.03%	2
Capital Cost-Feasibility Score			***3.0***		***3.0***		***3.0***		***2.0***		***2.0***

Table 5. Alternatives Table (Cont'd)

Criteria	Question	Backup Intake Armstrong Creek	Feasibility	Backup Intake Loop Creek	Feasibility	Interconnect	Feasibility	Treated Water Storage	Feasibility	Raw Water Storage	Feasibility
Technical Criteria											
Permitting	Provide a listing of the expected permits required and the permitting agencies involved in their approval.	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2
	What is the timeframe for permit approval for each permit?	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2
	Describe the major requirements in obtaining the permits (environmental impact studies, public hearings, etc.)	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2	See Permitting Sub-schedule	2
	What is the likelihood of successfully obtaining the permits?	There may not be sufficient capacity in Armstrong Creek to support a permit	1	There may not be sufficient capacity in Loop Creek to support a permit	1	No identified barriers	2	Potential for nonrevenue water issues	1	No identified barriers	3
	Does the implementation of the alternative require regulatory exceptions or variances?	None identified	3	None identified	3	None identified	3	In order to avoid flushing water additional studies may be required to support a variance from the 20% turnover rule	1	None Identified	3
Permitting-Feasibility Score			***2.0***		***2.0***		***2.2***		***1.6***		***2.4***
Flexibility	Will the alternative be needed on a regular basis or only used intermittently?	Intermittent	3	Intermittent	3	Intermittent	2	Full time operations	2	Full time operations; with ability for intermittent	3
	How will implementing the alternative affect the PWSU's current method of treating and delivering potable water including meeting Safe Drinking Water Act regulations? (ex. In the case of storage, will the alternative increase the likelihood of disinfection byproducts?)	No changes in treatment or water delivery with the backup source	3	No changes in treatment or water delivery with the backup source	3	No identified changes	3	With the requirement to turn over 20% of tank volume the system will be required to flush water during days when demands are low.	1	There will be additional operating requirements for the new equipment but the existing treatment process will be minimally affected.	3
Flexibility-Feasibility Score					***3.0***		***2.5***		***1.5***		***3.0***

Table 5. Alternatives Table (Cont'd)

Criteria	Question	Backup Intake Armstrong Creek	Feasibility	Backup Intake Loop Creek	Feasibility	Interconnect	Feasibility	Treated Water Storage	Feasibility	Raw Water Storage	Feasibility
Resilience	Will the alternative provide any advantages or disadvantages to meeting seasonal changes in demand?	There are some concerns about the true capacity of Armstrong Creek	1	There are some concerns about the true capacity of Loop Creek	1	Yes. Interconnect will provide back up in other emergency situations	3	Yes; only short term	2	Yes; only short term	2
	How resistant will the alternative be to extreme weather conditions such as drought and flooding?	There are some concerns about the true capacity of Armstrong Creek	1	There are some concerns about the true capacity of Loop Creek	1	May act as an additional source of supply	2	Yes; only short term	2	Yes; only short term	2
	Will the alternative be expandable to meet the growing needs of the service area?	There are some concerns about the true capacity of Armstrong Creek	1	There are some concerns about the true capacity of Loop Creek	1	Yes	3	Yes	3	Yes	3
Resilience-Feasibility Score			***1.0***		***1.0***		***2.7***		***2.3***		***2.3***
Institutional Requirements	Identify any agreements or other legal instruments with governmental entities, private institutions or other PWSU required to implement the alternative.	None identified	2	None identified	2	Emergency Usage agreement with Kanawha Falls PSD	2	None identified	3	None Identified	3
	Are any development/planning restrictions in place that can act as a barrier to the implementation of the alternative?	None identified	2	None identified	2	None Identified	3	None identified	3	None Identified	3
	Identify potential land acquisitions and easements requirements.	Easement and/or property purchase for intake and pump stations	2	Easement and/or property purchase for intake and pump stations	2	Easement and/or property purchase for pump station.	2	The tank site would need to be acquired from its current owner	2	None Identified	2
Institutional Requirements-Feasibility Score			***2.0***		***2.0***		***2.3***		***2.7***		***2.7***
Environmental Criteria											
Environmental Impacts	Identify any environmentally protected areas or habitats that might be impacted by the alternative.	Intake structure is likely to require surveys for T&E species	2	Intake structure is likely to require surveys for T&E species	2	None identified	3	None identified	3	None Identified	3
Environmental Impacts-Feasibility Score					***2.0***		***3.0***		***3.0***		***3.0***

Table 5. Alternatives Table (Cont'd)

Criteria	Question	Backup Intake Armstrong Creek	Feasibility	Backup Intake Loop Creek	Feasibility	Interconnect	Feasibility	Treated Water Storage	Feasibility	Raw Water Storage	Feasibility
Aesthetic Impacts	Identify any visual or noise issues caused by the alternative that may affect local land uses?	None identified	2	None identified	2	None identified	3	The storage tank would be a large structure in an area with few comparably sized structures	2	The storage tank would be a large structure in an area with few comparably sized structures	2
	Identify any mitigation measures that will be required to address aesthetic impacts?	None identified	2	None identified	2	None identified	3	None identified	3	None identified	3
Aesthetic Impacts-Feasibility Score					***2.0***		***3.0***		***2.5***		***2.5***
Stakeholder Issues	Identify the potential stakeholders affected by the alternative.	See Stakeholder Sub-schedule	2	See Stakeholder Sub-schedule	2	See Stakeholder Sub-schedule	2	See Stakeholder Sub-schedule	2	See Stakeholder Sub-schedule	2
	Identify the potential issues with stakeholders for and against the alternative.	See Stakeholder Sub-schedule	2	See Stakeholder Sub-schedule	2	See Stakeholder Sub-schedule	2	See Stakeholder Sub-schedule	2	See Stakeholder Sub-schedule	2
	Will stakeholder concerns represent a significant barrier to implementation (or assistance) of the alternative?	Possibly from an environmental perspective	2	Possibly from an environmental perspective	2	No	2	No	2	No	2
Stakeholder Issues-Feasibility Score					***2.0***		***2.0***		***2.0***		***2.0***
Comments		This alternative considers a new intake on Armstrong Creek. The ability of Armstrong Creek to meet system needs is not documented and requires further study		This alternative considers a new intake on Loop Creek. The ability of Loop Creek to meet system needs is not documented and requires further study		Interconnection with Kanawha Falls PSD		1.0 MG ground storage tank located on property adjacent to the WTP		1.0 MG ground storage tank located on property adjacent to the WTP	

Table 6. Permitting Sub-Schedule

	Permits Required							
Agency	**Permit**	**Backup Intake- Armstrong Creek**	**Backup Intake- Loop Creek**	**Interconnect**	**Raw Water Storage**	**Treated Water Storage**	**Other**	**Notes**
WV Bureau Public Health	Construction	yes	yes	yes	yes	yes		
USACOE[(1)]	404 Permit	yes	yes	no	no	no		
Local/State Road Agency	ROW Utilization	yes	yes	yes	no	no		

(1) US Army Corps of Engineers

	Application Period Duration							
Agency	**Permit**	**Backup Intake- Armstrong Creek**	**Backup Intake- Loop Creek**	**Interconnect**	**Raw Water Storage**	**Treated Water Storage**	**Other**	**Notes**
WV Bureau Public Health	Construction	90 days	90 days	90 days	90 days	90 days		
USACOE	404 Permit	180 days	180 days	NA	NA	NA		
Local/State Road Agency	ROW Utilization	90 days	90 days	90 days	NA	NA		

	Application Requirements							
Agency	**Permit**	**Backup Intake- Armstrong Creek**	**Backup Intake- Loop Creek**	**Interconnect**	**Raw Water Storage**	**Treated Water Storage**	**Other**	**Notes**
WV Bureau Public Health	Construction	Engineers Report; Construction Drawings; Specifications	Engineers Report; Construction Drawings; Specifications	Engineers Report; Construction Drawings; Specifications	Engineers Report; Construction Drawings; Specifications	Engineers Report; Construction Drawings; Specifications		
USACOE	404 Permit	Construction Drawings; Construction Plan	Construction Drawings; Construction Plan	NA	NA	NA		
Local/State Road Agency	ROW Utilization	Construction Drawings	Construction Drawings	Construction Drawings	NA	NA		

	Other Considerations							
Agency	**Permit**	**Backup Intake- Armstrong Creek**	**Backup Intake- Loop Creek**	**Interconnect**	**Raw Water Storage**	**Treated Water Storage**	**Other**	**Notes**
WV Bureau Public Health	Construction	Need to document the ability of Loop Creek to meet capacity requirements	Need to document the ability of Loop Creek to meet capacity requirements					
USACOE	404 Permit							
Local/State Road Agency	ROW Utilization			Bridge crossing				

Table 7. Stakeholders Sub-Schedule

	List concerns for each alternative by stakeholder						
Stakeholder Group	**Backup Intake-Armstrong Creek**	**Backup Intake-Loop Creek**	**Interconnect**	**Raw Water Storage**	**Treated Water Storage**	**Other**	**Notes**
Residential Customers	Cost impacts; Improved protection from contamination	Cost impacts; Improved protection from contamination	Cost impacts; Improved protection from contamination	Aesthetic concerns; Cost impacts; Improved protection from contamination	Aesthetic concerns; Cost impacts; Improved protection from contamination		Neutral response
System Owner	Additional operations; Cost impacts	Additional operations; Cost impacts	Additional operations; Cost impacts	Additional operations; Cost impacts	Operational issue with storage turnover; Cost impacts		Positive to meet regulations and improve service; Negative for treated water storage
Industrial/Commercial Customers	Cost impacts; Improved service and protection from contamination	Cost impacts; Improved service and protection from contamination	Cost impacts; Improved service and protection from contamination	Cost impacts; Improved service and protection from contamination	Cost impacts; Improved service and protection from contamination		Neutral to positive response; less sensitive to costs over improved service
Environmental Interest Groups	Minor	Minor	Minor	Minor	Minor		Average to negative response

CONCLUSION

Based on the analysis and findings presented Tetra Tech offers the following conclusions:

1. The existing storage for Armstrong cannot support the minimum required 2 days of average day demand system-wide. Based on conversations with Armstrong staff, the Kimberly tank, which is the main tank for the system, would be the first to empty during a WTP outage.

2. Based on the scoring system, an interconnection with Kanawha Falls PSD, a backup intake on Armstrong or Loop Creek, and raw water storage are the most feasible source water alternatives for the Armstrong PSD, with an interconnect the most preferred. **Figures 2, 3.a, 3.b and 4** provide conceptual layouts for these alternatives and **Tables 8, 9 and 10** present the details of the opinion of capital costs. These three alternatives should be considered for further analysis.

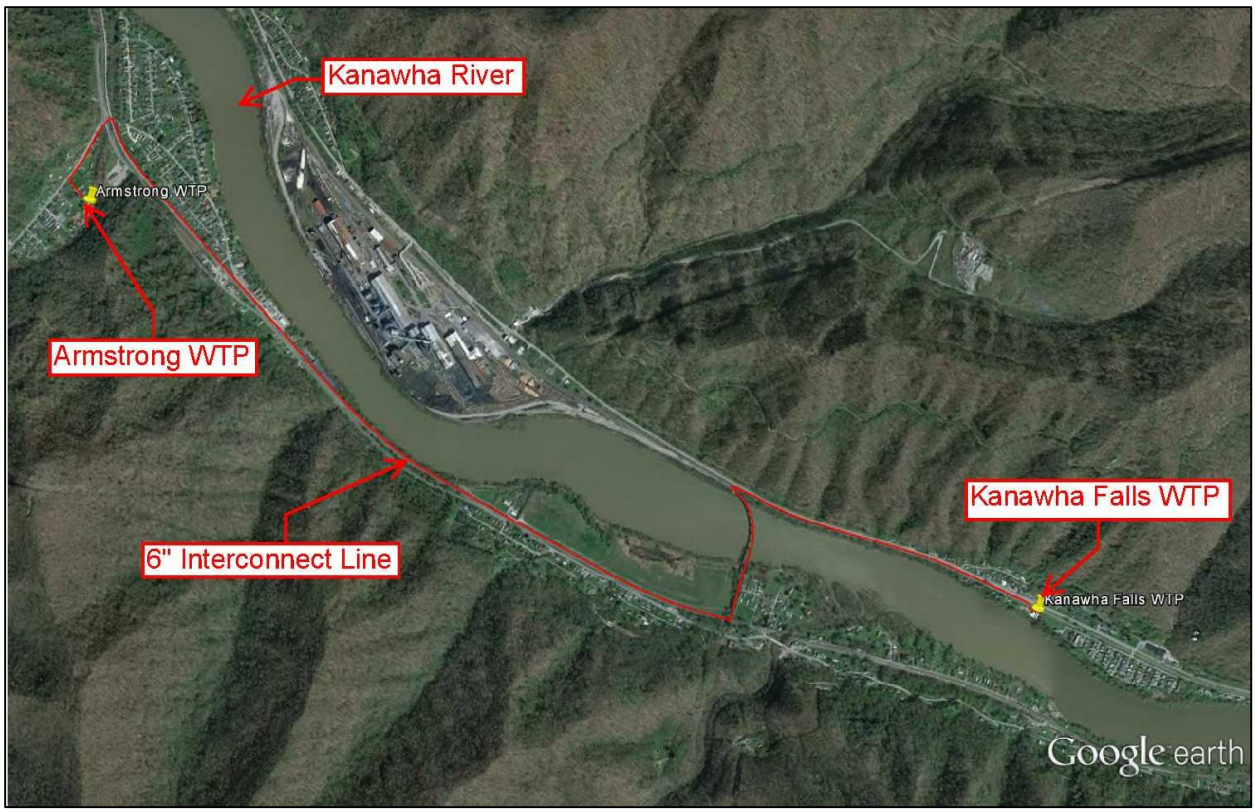

Figure 2. Armstrong PSD Interconnect Conceptual Drawing

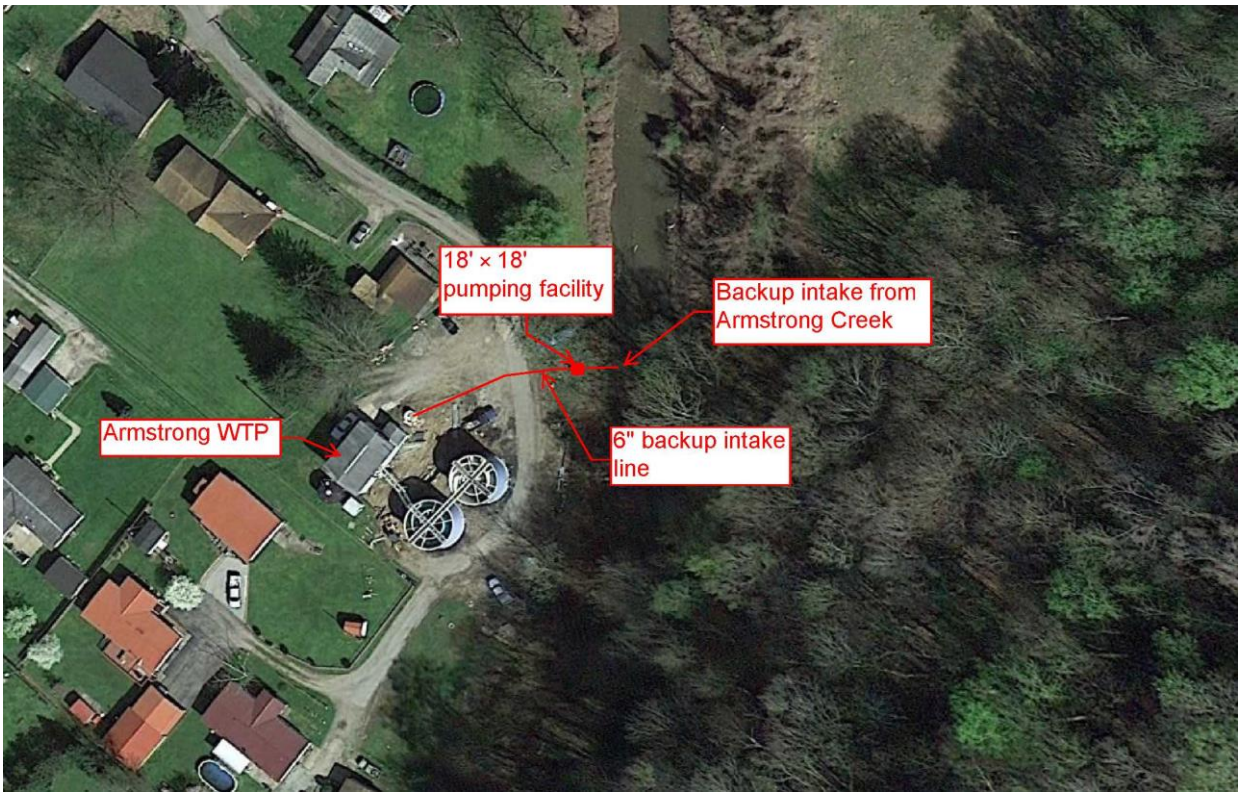

Figure 3.a. Armstrong PSD Backup Intake- Armstrong Creek Conceptual Drawing

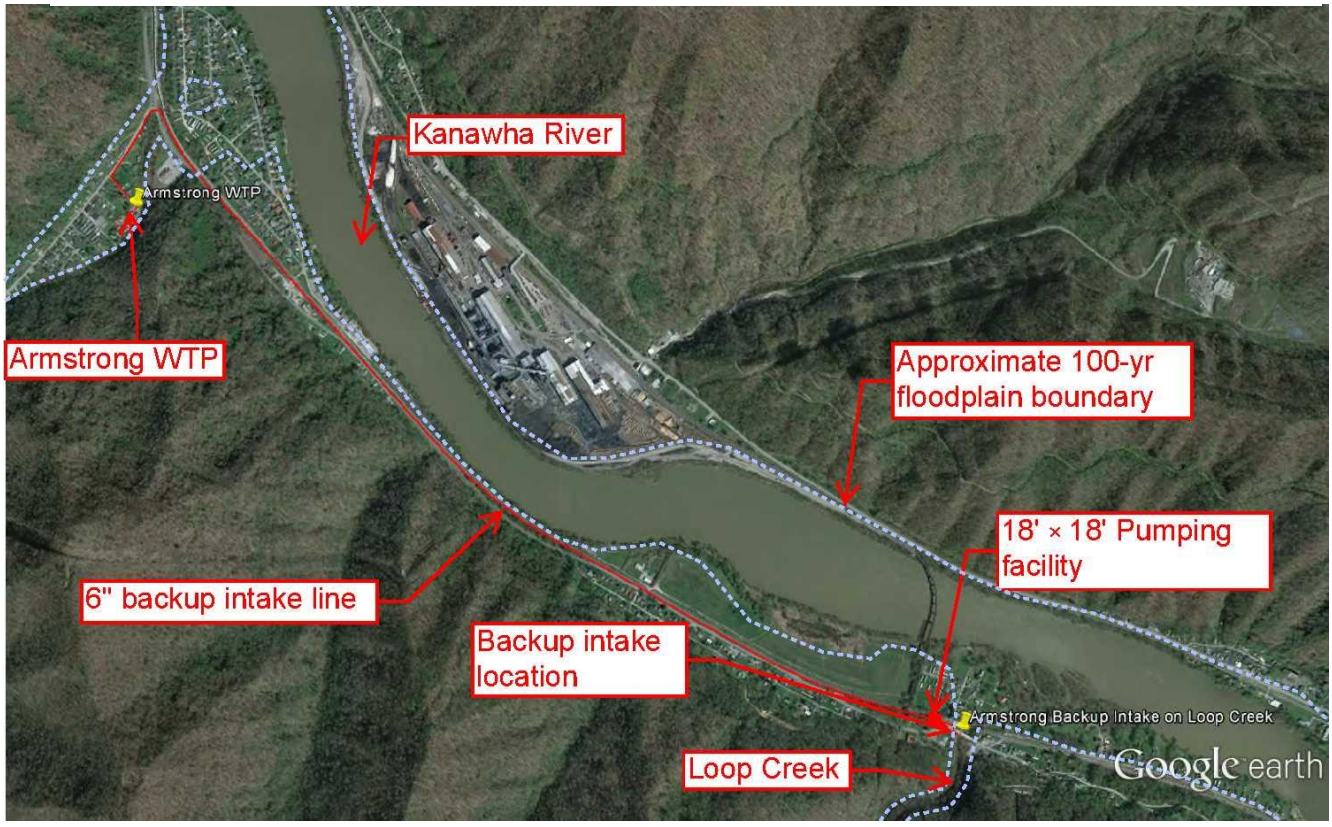

Figure 3.b. Armstrong PSD Backup Intake- Loop Creek Conceptual Drawing

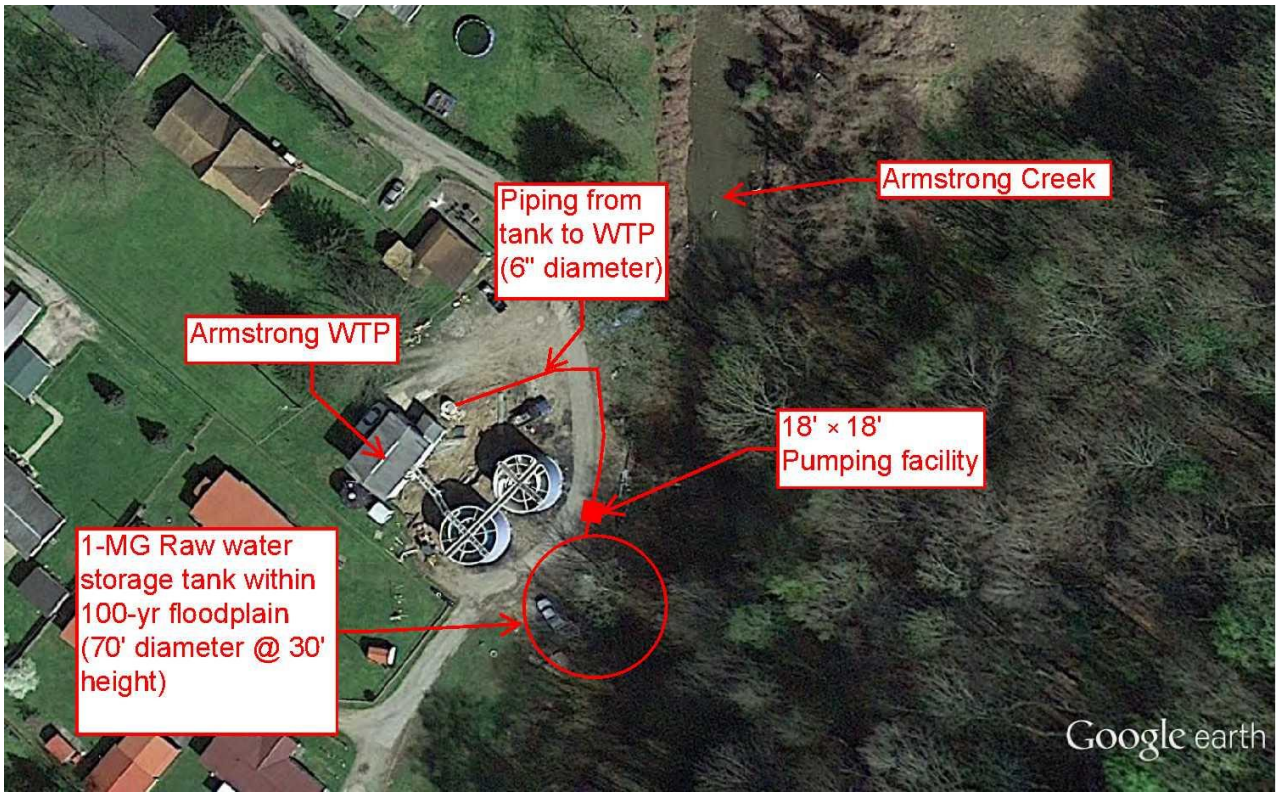

Figure 4. Armstrong PSD Raw Water Storage Conceptual Drawing

Table 8. Interconnect – Opinion of Cost

Facility Description/Capital Cost				
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Piping 6" DIP	18,322	LF	$49	$897,758
Pumps	3	EA	$30,000	$90,000
Pre-Fab Metal Enclosure for PS	1	LS	$78,000	$78,000
PS Electrical and Control	1	LS	10% Pump Station Costs	$16,800.00
Site Work	1	LS	$120,000	$120,000
			Subtotal	**$1,202,558**
			Contingency @ 30%	$360,768
			Eng. Permit, etc. @ 15%	$180,384
			Total	**$1,743,710**

Table 9.a. Backup Intake on Armstrong Creek: Opinion of Cost

Facility Description/Capital Cost				
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Intake Screen 6"	1	EA	$2,000	$2,000
Intake Piping - 6'' RCP	10	FT	$137	$1,370
Piping from tank to plant - 6" DIP	130	FT	$49	$6,370
Raw Water Intake Pumps	3	each	$100,000	$300,000
Pre-Cast Vault for raw water pump station	1	each	$130,000	$130,000
Electrical and Controls	1	LS	10% of Pump Station Costs	$43,000
Sluice Gate	1	each	$20,000	$20,000
Site Work	1	LS	$120,000	$120,000
			Subtotal	**$622,740**
			Contingency @ 30%	$186,822
			Eng. Permit, etc. @ 15%	$93,411
			Land Acquisition and Easement	$70,000
			Total	**$972,973**

Table 9.b. Backup Intake on Loop Creek: Opinion of Cost

Facility Description/Capital Cost				
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Intake Screen 6"	1	EA	$2,000	$2,000
Intake Piping - 6'' RCP	10	FT	$137	$1,370
Piping to plant - 6" DIP	12609.2	FT	$49	$617,851
Raw Water Intake Pumps	3	each	$100,000	$300,000
Pre-Cast Vault for raw water pump station	1	each	$130,000	$130,000
Electrical and Controls	1	LS	10% of Pump Station Costs	$43,000
Sluice Gate	1	each	$20,000	$20,000
Site Work	1	LS	$120,000	$120,000
			Subtotal	**$1,234,221**
			Contingency @ 30%	$370,266
			Eng. Permit, etc. @ 15%	$185,133
			Land Acquisition and Easement	$35,000
			Total	**$1,824,620**

Table 10. Raw Water Storage: Opinion of Cost

Facility Description/Capital Cost				
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Raw Water Ground Storage Tank	1	EA	$972,000	$972,000
All new Pumps (including standby at each pump station)	6	EA	$20,000	$120,000
Pre-cast Vault	1	EA	$130,000	$130,000
Pre-fab metal pump enclosure	1	EA	$78,000	$78,000
Piping from intake to Pump	10	FT	$137	$1,370
Piping from Pump to WTP	3596	FT	$49	$176,204
Piping from tank to WTP	170	FT	$49	$8,330
Sluice Gate	1	EA	$20,000	$20,000
Site Work	1	LS	$120,000	$120,000
			Subtotal	**$1,625,904**
			Contingency @ 30%	$487,771
			Eng. Permit, etc. @ 15%	$243,886
			Land Acquisition	$ -
	Total Raw Water Tank Capital Costs			**$2,357,561**

APPENDIX E. SUPPORTING DOCUMENTATION

NOTE:
The poster presented at the public meeting has been removed from this document for printing purposes. The poster has been submitted as a separate file.

Do your part to keep contaminants out of our children's source water!

Contaminants

Cleaning Products

Automotive Products

Fuel Oil

Furniture Strippers

Oil-based Paints

Sewage

Lawn and Garden Products

Sediments

Pharmaceuticals

Source Water Links

www.wvdhhr.org/oehs/eed/swap/
www.epa.gov/safewater/index.html
www.epa.gov/watersense/
http://orsanco.org

For Kids

www.epa.gov/safewater/kids/index.html
www.epa.gov/watersense/kids/index.html
www.groundwater.org/kids/

Contacts

WV Department of Health and Human Resources
Source Water Assessment and Protection Program
350 Capitol Street, Room 313
Charleston, WV 25301-3713
phone: (304) 558-2981
fax: (304) 558-4322
e-mail: EEDSourceWaterProtection@wv.gov

Armstrong PSD
Kimberly, WV
Phone: 304-442-4957
Email: wpo1960@aol.com

Do Your Part

Protect Your Source Water

Protect Your Health

TETRA TECH

Prepared by Tetra Tech
In cooperation with the WVDHHR Source Water Assessment and Protection Program

Drinking water is essential for life. Learn what you can do to protect your drinking water sources.

Armstrong PSD treats water from the Kanawha River using conventional treatment methods. The Kanawha is used heavily for transportation, electricity generation, and recreation. There are many ways you can help minimize impacts from these and other activities on your source of drinking water.

Making choices to protect and conserve the source of your drinking water will help keep you, your family, and neighbors safe and healthy now and in the future.

Do Your Part to Protect Source Water

- ✓ Recycle used oil and other automotive products at a service center. Don't pour them on the ground or down storm drains. Storm drains can lead directly to your source water.
- ✓ Fix leaks from your automobile and clean up spills.
- ✓ Apply fertilizers and pesticides as directed. Consider natural alternatives to chemicals.

- ✓ Don't flush pharmaceuticals. Dispose by mixing with coffee grounds or kitty litter, sealing in a container, and placing in the trash. Organize a collection day with a pharmacy and local police department.
- ✓ Take unwanted household chemical waste, such as cleaners, oils, and paints to proper waste collection sites. Don't dump down your sink, toilet, or storm drains. Consider organizing a collection day in your community.
- ✓ Check for leaks at heating fuel tanks and install pads to catch accidental leaks or spills.
- ✓ Report unused water wells to your utility or WVDHHR.
- ✓ Inspect your septic system regularly and pump every 5-10 years.

Do Your Part to Conserve Source Water

- ✓ Turn off the water when you brush your teeth and take shorter showers.
- ✓ Wash full loads of clothes and dishes.
- ✓ Don't use your toilet to flush trash.
- ✓ Fix leaking faucets, toilets, and lines. Consider installing toilets, faucets, and appliances designed to save water.
- ✓ Water your lawn and garden in the morning. Consider installing a rain barrel at your downspouts to collect rain to water your lawn and garden, instead of using treated water.

- ✓ Use native plants in landscape that don't need extra watering. Use mulch to hold moisture.
- ✓ Don't let your garden hose run when washing your car.

- ✓ Don't panic if you are asked to conserve during a drought. Your utility will respond to water shortages based on your normal water use. Running extra water in your home during a drought will make it more difficult to respond to the water shortage.

Conserving water saves on your monthly bill now. Protecting your source water will save on treatment costs later.