

PA DEP-BAMR Planned Active Mine Drainage Treatment Projects



Cresson



Blacklick Creek



Little Conemaugh



Quakake



Gladden



Tioga / Morris Run



Audenried / Green Mt.

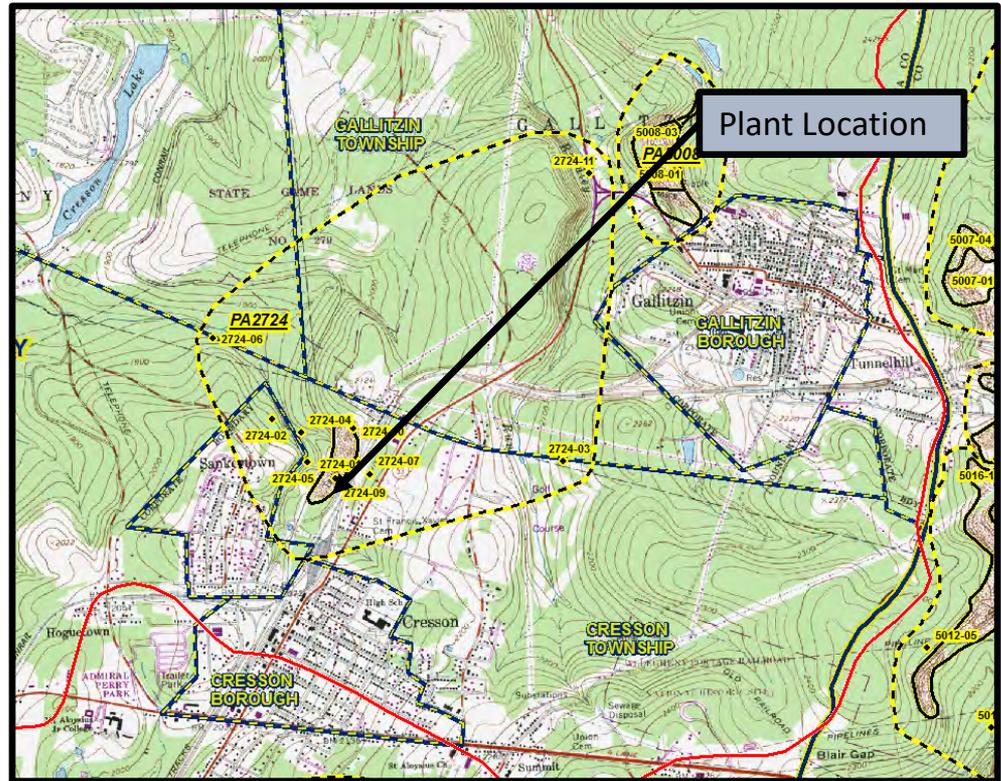
PA DEP-BAMR Planned Active Mine Drainage Treatment Facilities

Facility	Design or Construction Status	Treatment Process	Receiving Stream / Watershed	Anticipated Average Annual Flow	Projected Stream Miles Recovered
Cresson	Construction to be Completed June 2020	Decarbonation & Hydrogen Peroxide Pretreatment _ Lime (CaOH ²) _ Solids Contact Clarifier _ Polishing Wetlands	Clearfield Creek _ West Branch Susquehanna River	2,200 gpm (3.2 mgd)	22
Blacklick Creek	Design Completion Summer 2020	Decarbonation _ Lime (CaOH ²) _ HDS Clarifier _ Polishing Wetlands *	Blacklick Creek _ Conemaugh River	2,800 gpm (4.0 mgd)	22
Little Conemaugh	Conceptual Design - Development	Lime (CaOH ²) _ Clarifier *	Little Conemaugh _ Conemaugh River	5,000 gpm (7.2 mgd)	22
Quakake	Design Completion 2020	Lime (CaOH ²) _ Clarifier*	Wetzel Run _ Black Creek _ Lehigh River	6,000 gpm (8.6 mgd)	8
Gladden	Design Completion 2020	Hydrogen Peroxide _ Sodium Hydroxide _ Inclined Plate Clarifier *	Millers Run _ Chartiers Creek _ Ohio River	700 gpm (1.0 mgd)	8
Tioga / Morris Run	Conceptual Design - Development	Lime (CaOH ²) _ Clarifier*	Morris Run _ Tioga River	4,000 gpm (5.8 mgd)	20
Audenried / Green Mt.	Conceptual Design - Development	Lime (CaOH ²) _ Clarifier*	Catawissa Creek _ Susquehanna River	15,000 gpm (21.6 mgd)	40
Total				51.4	142

* Subject to final design evaluation

Cresson Treatment Facility

- Located in Cresson Township, Cambria County
(AML Problem Area, PA 2724)
- Facility construction began July 10, 2017. Planned completion date January 2019
 - Project Number AMD 11(2724)102.1
 - Contractor: HRI, Inc.
 - Bid Amount: \$12,671,212
- Receiving Stream Sequence:
 - Trapp Run _ Clearfield Creek _ West Branch Susquehanna River
 - AMD discharges in Sugar Run and Bradley Run will be eliminated by plant and mine pool management operations



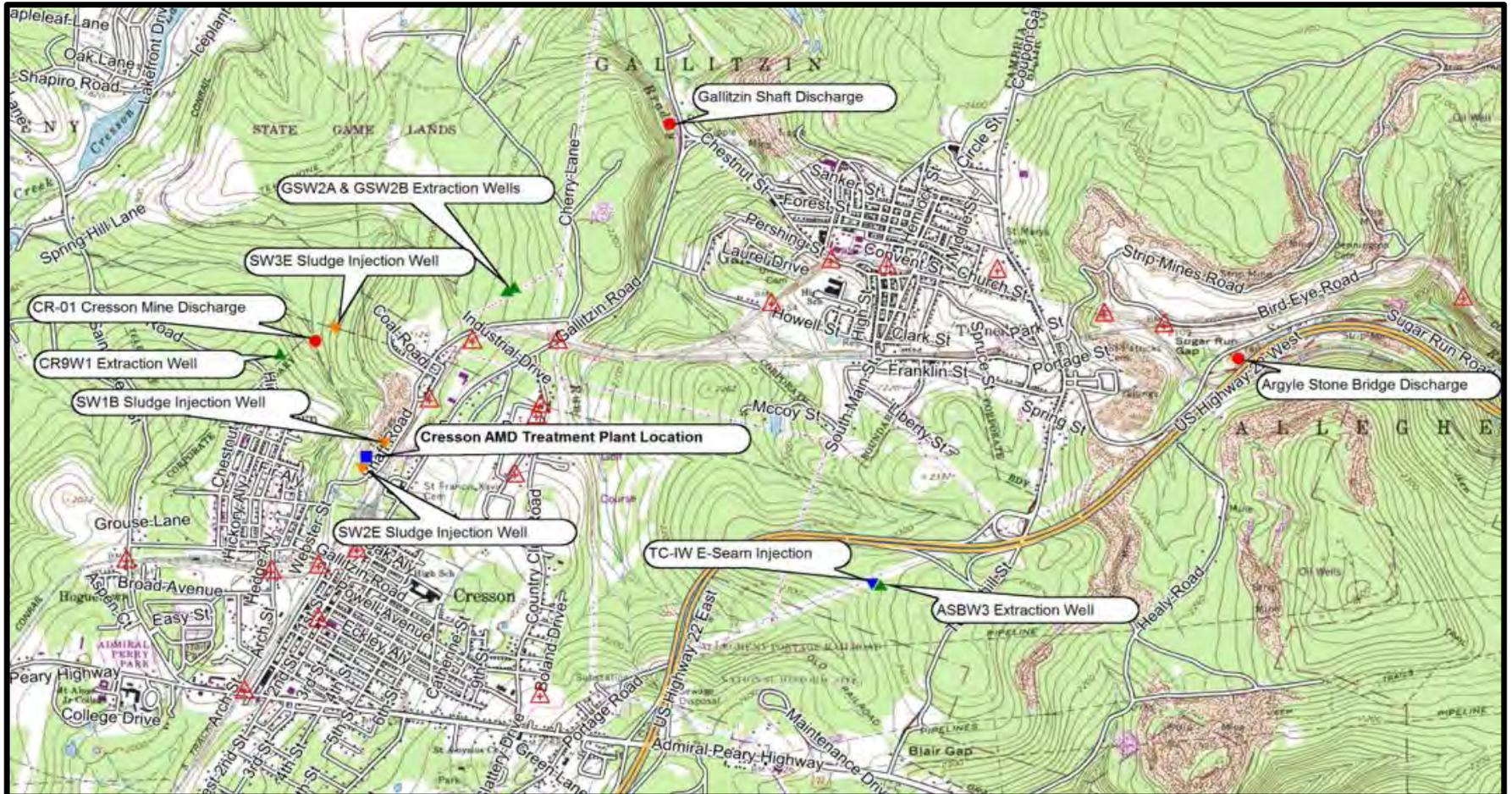
Cresson AMD Treatment Plant Project

Restoration Goals:

- **Treatment of AMD to eliminate three discharges from the Cresson No. 9, Gallitzin Shaft, and Argyle Stone Bridge Mine Pools**
- **Supply supplemental treated water to the Susquehanna River Basin during conditions of low flow**
- **Funding Sources:**
 - **Construction**
 - **Capital Budget Funding - \$10 Million**
 - **2016 AML Pilot Funding - \$2 Million**
 - **AMD Set-Aside Program (As Needed)**
 - **Operation and Maintenance**
 - **SRBC Consumptive Use Legislation (\$2.4 Million)**
 - **AMD Set-Aside Program**

Cresson AMD Treatment Plant Project

Location of Plant Facilities and Discharges to be Abated



Cresson AMD Treatment Plant Project

- **Treatment Capacity**
 - 4,400 Gallons per Minute (gpm) or 6.3 Million Gallons per Day (mgd)
- **Mine Pool Management**
 - Lower the three Mine Pools to Eliminate Discharges
 - Maintain Mine Pool Operating Level
 - Provide 30 days of Emergency Storage
 - Maintain Mine Pool Capacity to supply water for SRBC



Cresson AMD Treatment Plant Project

TREATMENT PLANT COMPONENTS

- **Extraction Wells**
 - Four (4) Extraction Well Submersible Pumps
 - Vertical Turbine Pumps Convey Mine Water to Plant through Pipelines
- **De-Carbonation System**
 - Blowers Inject Air into mine water to remove CO₂
- **Chemical Oxidation with Hydrogen Peroxide**
 - 50% Hydrogen Peroxide System
 - Spill/Leak Containment and Safety Eyewash/Shower Station



Cresson AMD Treatment Plant Project

TREATMENT PLANT COMPONENTS

- **High-Density Hydrated Lime System (37%) – pH Adjustment**
 - Hydrated Lime Silo, High-Density Lime Slurry Mix Tank
 - Mixed with Plant Treated Mine Water
- **Solids Contact Clarifier – Recirculated Flow at 10 times the Influent flow Rate**
- **Polishing Wetland – To Remove Remaining Low Levels of Iron**



Cresson AMD Treatment Plant Project

MINE DISCHARGES

- **Argyle Stone Bridge**
 - Average Flow of 860 gpm
 - Impacts Sugar Run – Tributary of the Juniata River
- **Gallitzin Shaft**
 - Average Flow of 760 gpm
 - Impacts Bradley Run – Tributary of Clearfield Creek
- **Cresson No. 9**
 - Average Flow of 500 gpm
 - Impacts Trapp Run – Tributary of Clearfield Creek



Cresson AMD Treatment Plant Project

Pollution Loading To Be Removed

Mine Discharge	Acid (lbs/day)	Iron (lbs/day)	Aluminum (lbs/day)	Manganese (lbs/day)
Argyle Stone Bridge	560	48	46	10
Cresson No.9	685	235	32	7
Gallitzin Shaft	185	7	27	6
TOTAL	1,430	290	105	23

Cresson AMD Treatment Plant Project

21.5 Miles of Expected Stream Restoration

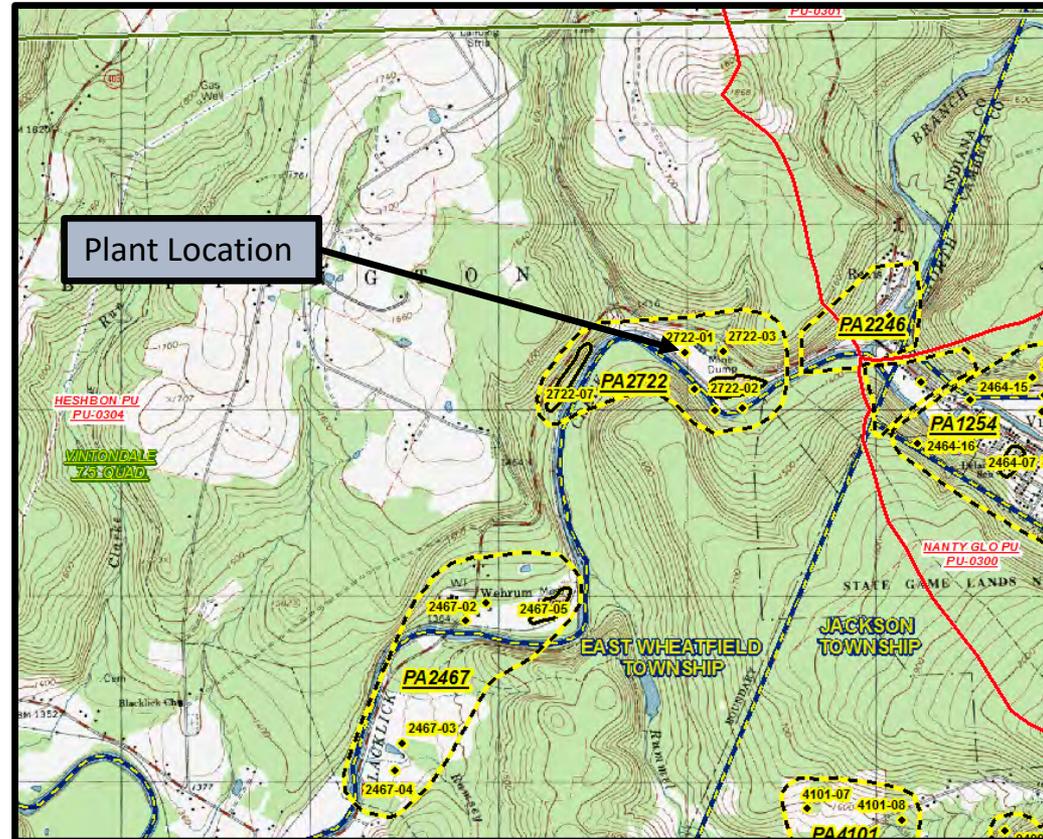
- **15 Miles of Clearfield Creek from Treatment Plant Effluent to Brubaker Run**
- **6.5 Miles of Sugar Run – Removing the largest source of AMD to Sugar Run**

Cresson AMD Treatment Plant Project



Blacklick Creek Treatment Facility

- Located in Buffington Township, Indiana County (AML Problem Area, PA 2722)
- Facility Design Initiated in May 2017
Planned completion date Spring 2019
 - Project Number AMD 11(2722)102.1
 - Design Firm: Tetra Tech
- Receiving Stream Sequence:
 - North Branch Blacklick Creek _
 - Blacklick Creek _ Conemaugh River



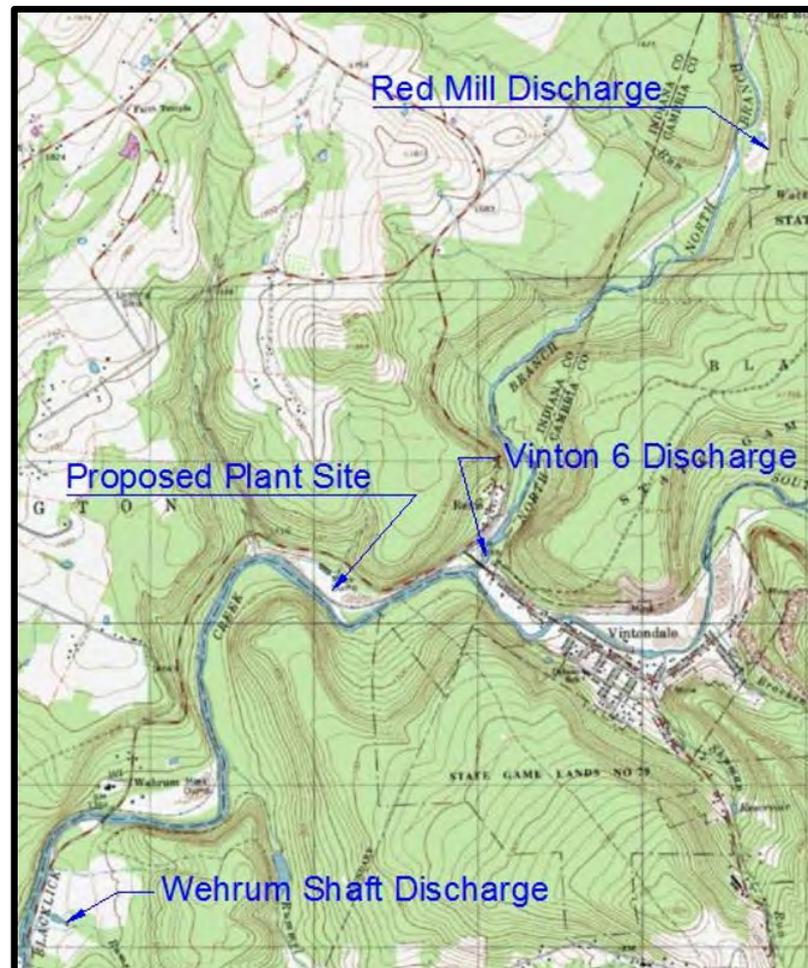
Blacklick Creek Treatment Plant Project

Restoration Goals:

- Treatment of AMD to eliminate three major AMD discharges to Blacklick Creek and restore approximately 22 miles of the North Branch and main stem of Blacklick Creek to a Trout Stocked fishery

Funding Sources:

- Construction
 - Capital Budget Funding - \$14 Million
 - AMD Set-Aside Program (As Needed)
- Operation and Maintenance
 - AMD Set-Aside Program



Blacklick Creek Treatment Plant Project

- **Red Mill (Commercial No. 16)** — 744 gpm average flow into the North Branch of Blacklick Creek
- **Vinton No. 6 Boreholes** — 1,080 gpm average flow into the North Branch of Blacklick Creek
- **Wehrum Shaft** — 711 gpm average flow into the main stem of Blacklick Creek



Blacklick Creek Treatment Plant Project



**Wehrum Shaft discharge
entering Blacklick Creek**

Blacklick Creek Treatment Plant Project

**Blacklick Creek five miles
downstream near Dilltown, PA**



Blacklick Creek Treatment Plant Project

**Blacklick Creek downstream –
re-suspended iron precipitate
following rain event**



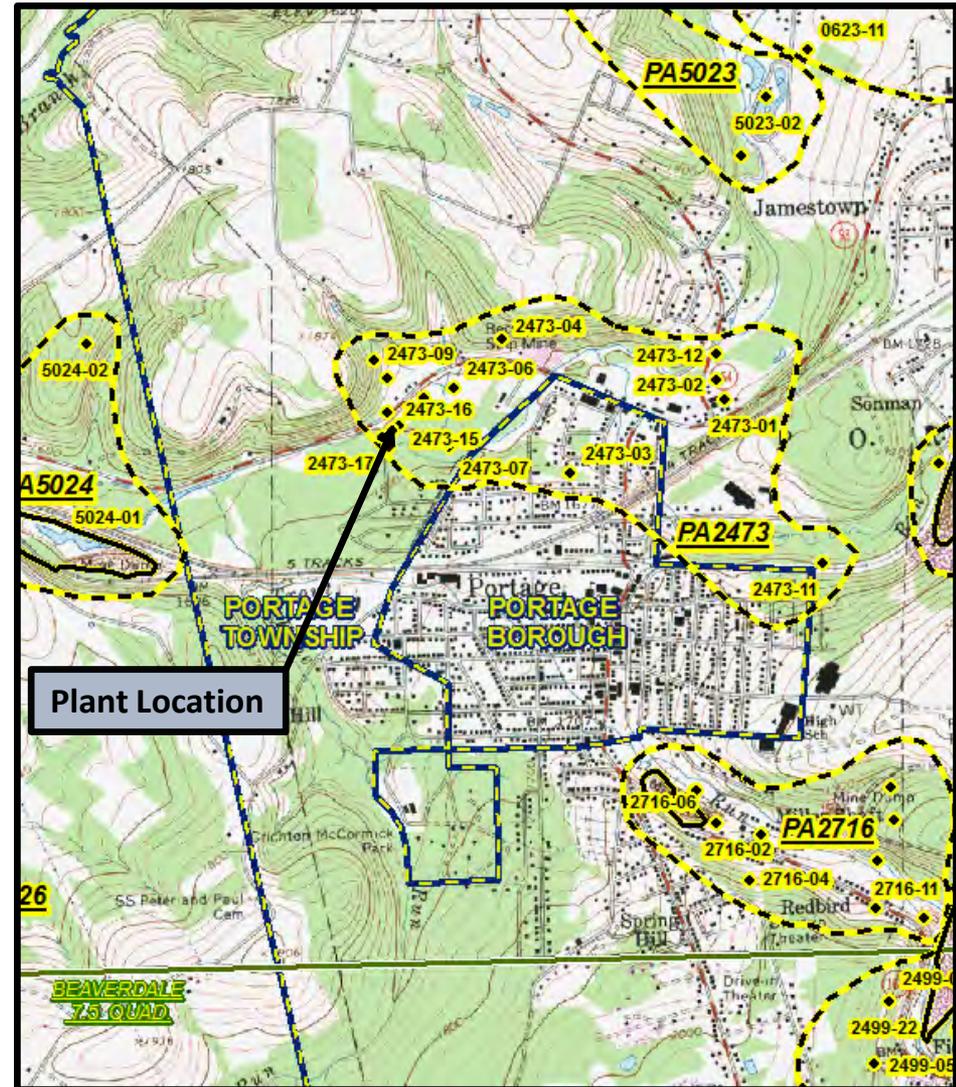
Blacklick Creek Treatment Plant Project

Pollution Loading to be Removed (lbs/day)

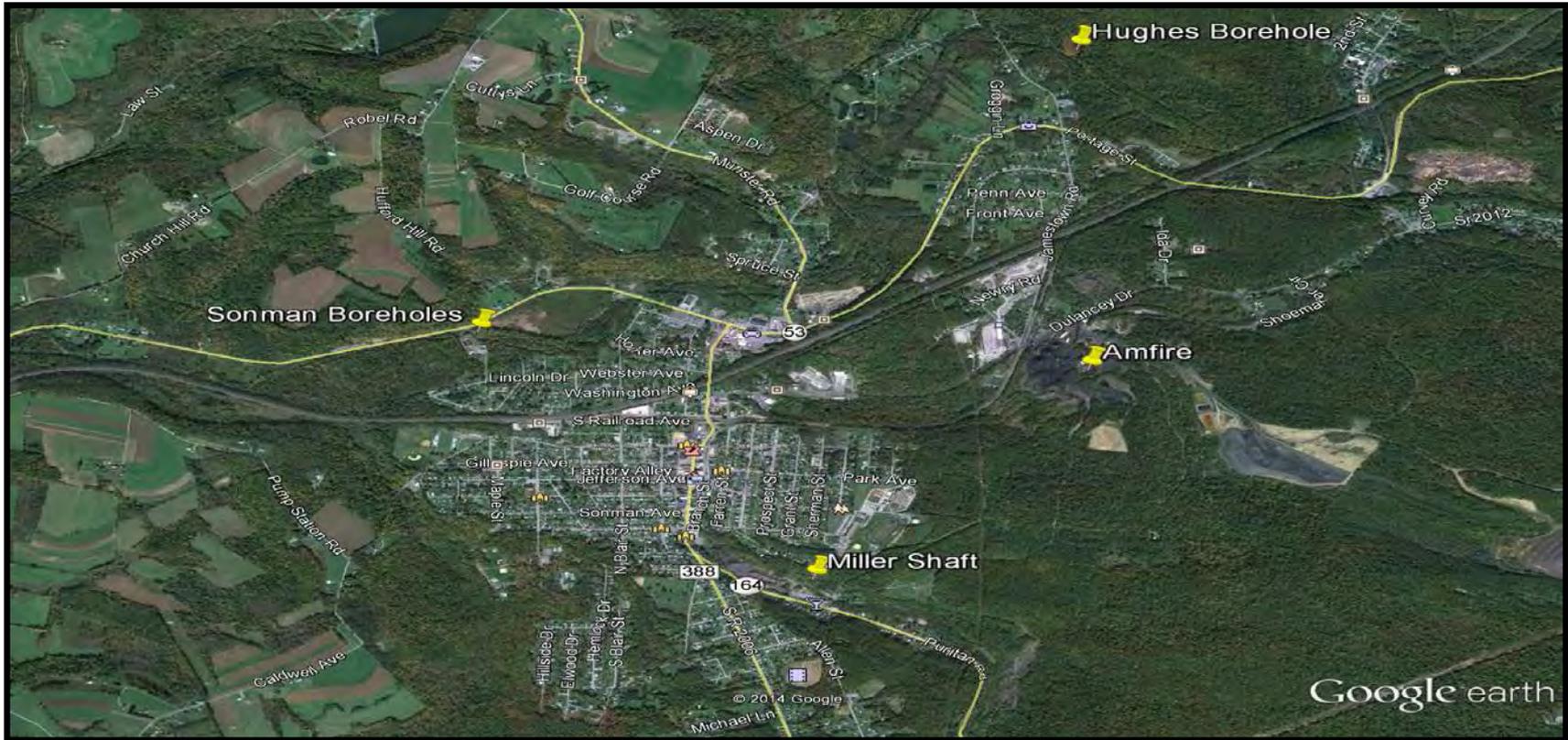
	Acidity	Aluminum	Iron	Manganese
Red Mill	1,532	72	484	17
Vinton No. 6	5,423	42	3,098	30
Wehrum Shaft	1,832	146	416	13

Little Conemaugh Treatment Facility

- Located in Portage Township, Cambria County (AML Problem Area Nos. PA 0623 and PA 2473)
- Facility Development Initiated in 2016
 - Project Number: AMD 11(0623,2473)101.1
- Receiving Stream Sequence:
 - Little Conemaugh River
- Restoration of 20 miles of the Little Conemaugh River is anticipated



Little Conemaugh Treatment Plant Project



Little Conemaugh Treatment Plant Project

Hughes Borehole



Miller Shaft



Sonman Boreholes



Little Conemaugh Discharge Flow Analysis

Flow Summary (gpm)	Sonman D11 and D12	Sonman D13	Miller Shaft	Hughes Borehole	Total
10 th percentile	459	901	456	410	2,226
25 th percentile	707	1,367	755	620	3,449
Median	950	1,934	998	840	4,722
Mean	910	1,816	1,099	944	4,769
75 th percentile	1,154	2,288	1,304	1,120	5,866
90 th percentile	1,265	2,528	1,759	1,840	7,392

Discharge Raw Water Quality Characteristics

	Sonman D11	Sonman D12	Sonman D13	Miller Shaft	Hughes Borehole
Acid Load (lb/day)	3.8	0	1,872	468	2,040
pH	6.1	6.3	5.2	6.0	4.1
Acidity (mg/L)	4	0	80	39	200
Alkalinity (mg/L)	58	80	10	39	0
Dis. Iron (mg/L)	28.5	29.3	40.4	30.8	77.6
Dis. Al (mg/L)	0.29	0.28	4.23	1.2	8.6
Sulfate (mg/L)	558	592	623	460	570

Little Conemaugh Treatment Plant Project

Lower Tier Restoration Goal

- * **Biological Recovery with a Recreational Fishery**
- * **Water Quality Goals:**
 - pH between 6.0 and 9.0
 - Alkalinity greater than acidity
 - Total Iron less than 1.5 mg/L
 - Total Aluminum less than 0.5 mg/L
 - TDS less than 1,500 mg/L during normal stream flow



Little Conemaugh Treatment Plant Project

Significant Accomplishments to Date:

- Exploratory drilling completed in October 2017 with five new monitoring wells installed
- Pump down/draw down test of Sonman D13 borehole discharge confirmed that “B” and “E” seams are communicating
- Purchase option agreement for one potential plant location secured and geotechnical drilling of the potential plant location completed
- Scope of work completed for the geotechnical investigation of second potential plant location

Funding for the Little Conemaugh Project

- Capital Budget – 19.5 million for construction
- GenOn Settlement – 2.2 million for development
- Set-Aside Funding (QHU) – operation and maintenance

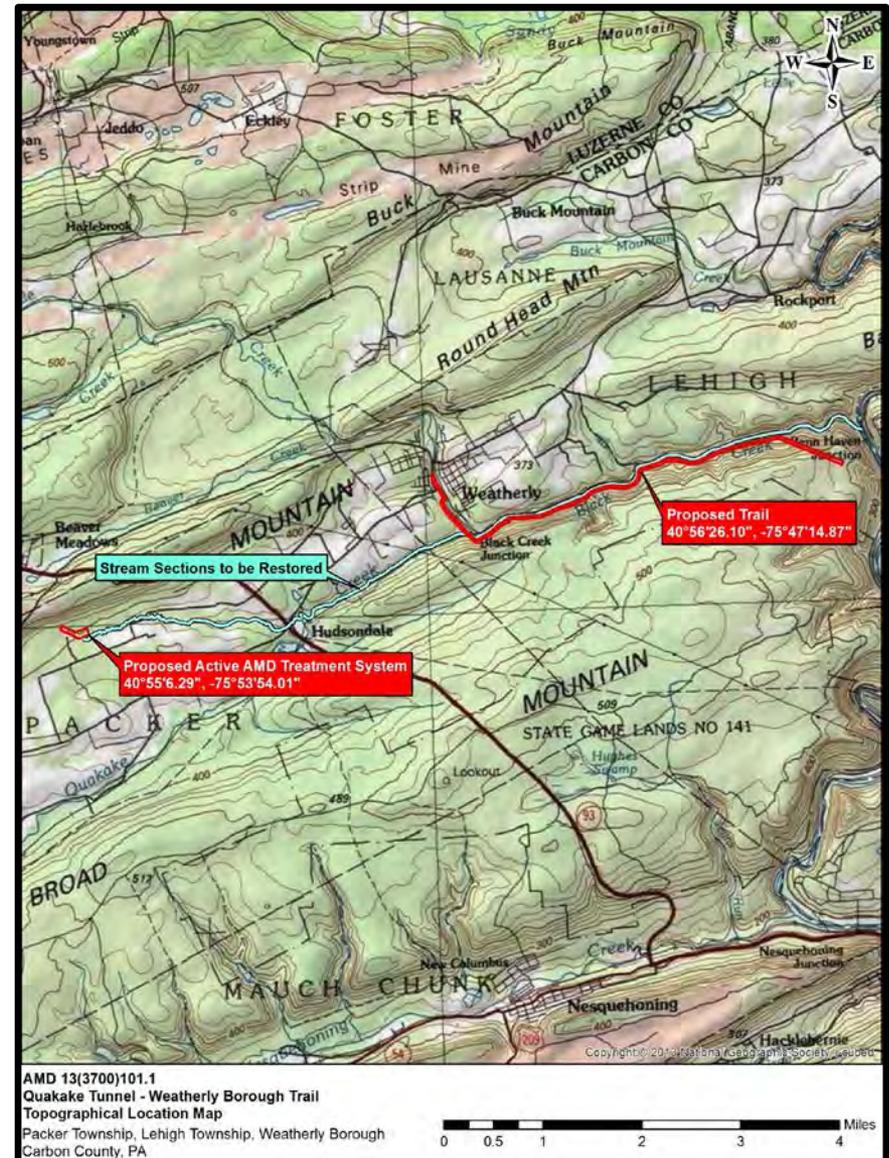
Little Conemaugh Treatment Plant Project

Restoration of the Little Conemaugh River by a Collaborative Effort of Community Organizations, Local Government, State and Federal Agencies, Non-Profit Organizations, and Mining Companies

- Cambria County Conservation District
- Cambria County Recreation Authority
- Portage Borough
- Portage Township
- Summerhill Township
- Western PA Coalition for Abandoned Mine Reclamation
- Community Foundation for the Alleghenies
- Foundation for PA Watersheds
- Richard King Mellon Foundation
- St. Francis University
- Stonycreek-Conemaugh River Improvement Project (SCRIP)
- Kiski Conemaugh Stream Team
- Rosebud Mining Company
- Arcelormittal Pristine Resources
- PA Fish and Boat Commission
- Office of Surface Mining, Reclamation and Enforcement
- PA DEP- Bureau of Abandoned Mine Reclamation
- US Environmental Protection Agency

Quakake Tunnel Treatment Facility

- Located in Packer and Lehigh Townships, Carbon County (AML Problem Area, PA 3700)
- Facility Design Initiated in 2018
 - Project Number AMD 13(3700)101.1
 - Design Firm: Tetra Tech
- Receiving Stream Sequence:
 - Wetzel Run _ Quakake Creek _ Black Creek _ Lehigh River
- Black Creek flows into the Lehigh Gorge State Park Recreation Area
- Approximately eight miles of stream would be restored as a trout fishery



Quakake Tunnel Treatment Facility

- **AML Pilot funding, in combination with other funding, will design and construct an active treatment system to treat the Quakake Tunnel discharge**
- **Funding will also be used to create approximately five miles of new trail beginning at the existing Weatherly Borough building and extending into the Lehigh Gorge State Park**
- **The new trail will traverse the restored stream**



▶ Quakake Tunnel & Weatherly Borough Trail

Typical flow: 13 CFS (6,000 gpm)
Low pH and Elevated Metals
– Primarily Aluminum



Hazel Creek upstream of Quakake Creek Confluence



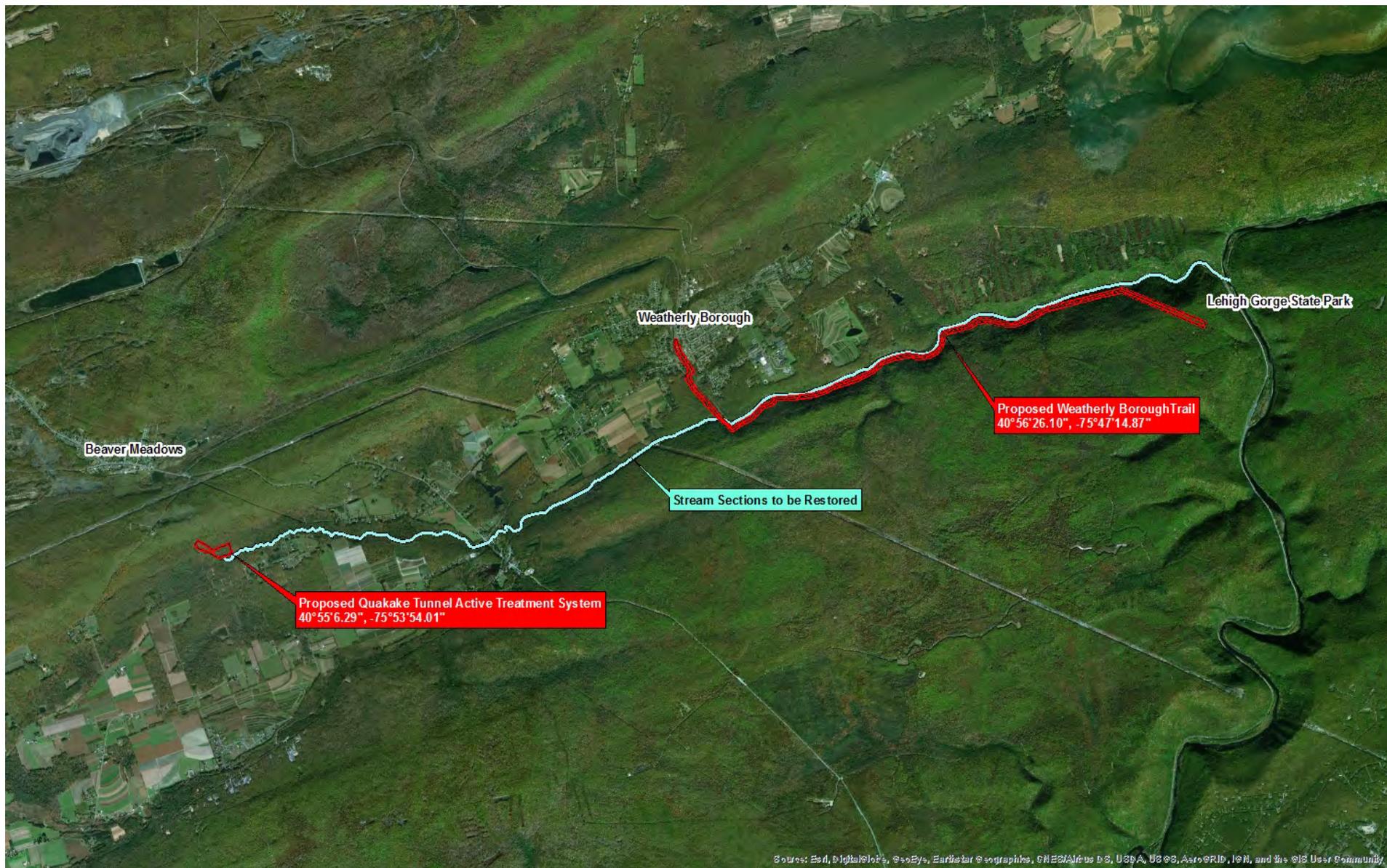
Black Creek Downstream of Quakake and Hazel Creeks



Lehigh Gorge State Park at Black Creek



▶ Quakake Tunnel & Weatherly Borough Trail



Significant Benefits

The Quakake Tunnel and Weatherly Borough Trail will have significant benefits, including:

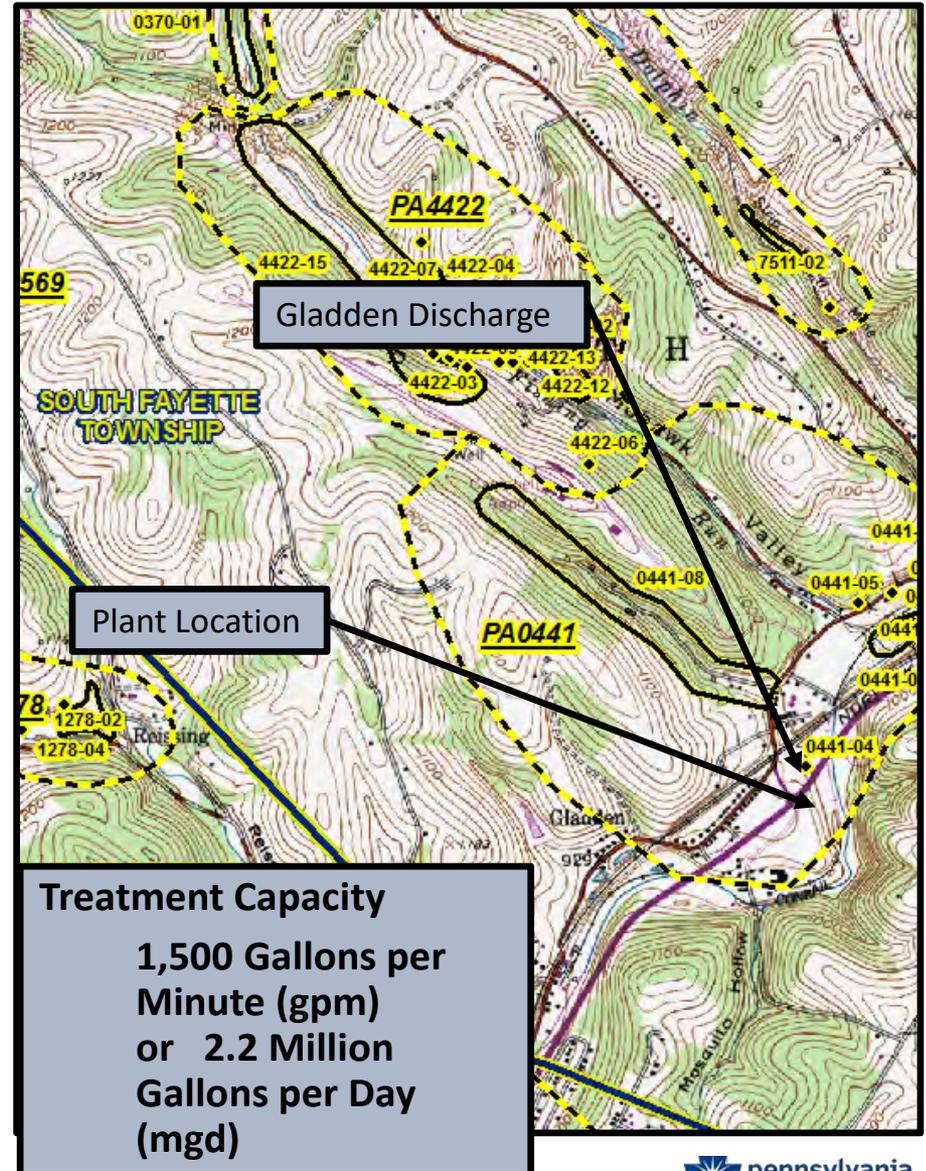
- Eight miles of wild trout stream restored
- Improved water quality within the Black Creek Watershed
- Newly created trail will connect Weatherly Borough to the Lehigh Gorge State Park
- Increased tourism to the area
- Improved opportunities for fishing, hiking, and sightseeing

Project Partners

- Weatherly Borough
- Carbon County Commissioners
- Wildlands Conservancy
- United States Geological Survey (USGS)
- Department of Community and Economic Development (DCED)
- Pennsylvania Department of Conservation and Natural Resources (DCNR)

Gladden Treatment Facility

- Located in South Fayette Township, Allegheny County (AML Problem Area, PA 0441)
- Facility Design Initiated in 2018
 - Project Number AMD 02(0441)101.1
 - Design Firm: Tetra Tech
- Receiving Stream Sequence:
 - Millers Run _ Chartiers Creek_ Ohio River
- Upstream of the Gladden Discharge Millers Run is a Trout Stocked Fishery
- The discharge impacts four miles of Millers Run, as well as 4.2 miles of Chartiers Creek



Gladden Treatment Facility

- The discharge originates from an abandoned Pittsburgh Seam underground mine
- It is net alkaline (pH ~ 6.4) exhibiting an average flow rate of 700 gallons per minute and a dissolved iron concentration of 90 mg/l
- It is one of the largest discharges in the Chartiers Creek Watershed accounting for 40 percent of the iron load



Gladden Treatment Facility

- The Gladden AMD Treatment Plant will restore four miles of Millers Run and be instrumental in restoring 4.2 miles of Chartiers Creek to the confluence with the Ohio River
- The facility will employ active treatment technology and utilize a chemical oxidizer, 50 percent hydrogen peroxide, to achieve treatment of the iron laden net alkaline mine water. This facility will be the first plant in Pennsylvania designed from inception to utilize this technology



Confluence of Millers Run
and Chartiers Creek

Significant Benefits

- The Gladden AMD Treatment Plant will restore four miles of Millers Run and be instrumental in restoring 4.2 miles of Chartiers Creek to the confluence with Robinson Run
- Millers Run is on the PA Fish and Boat Commission's trout stocking list upstream of the Gladden Discharge, and the plant will enable the remaining four miles of Millers Run to also be stocked with trout

Significant Benefits

- This section of Millers Run flows past Morgan Park and through the Newberry Market development, both of which would provide good access points for fishing
- Chartiers Creek flows past Meyer and Middleton Park, which also could serve as a fishing/recreational access for the stream

Significant Benefits

- Chartiers Creek is also a common place for canoes and kayaks, with seven boat launches along its banks between Canonsburg Lake and the Ohio River
- Restoring this section of Millers Run would provide an aesthetically pleasing stream for this development and existing residential areas and provide a stream with a high potential for recreational visitation

Significant Benefits

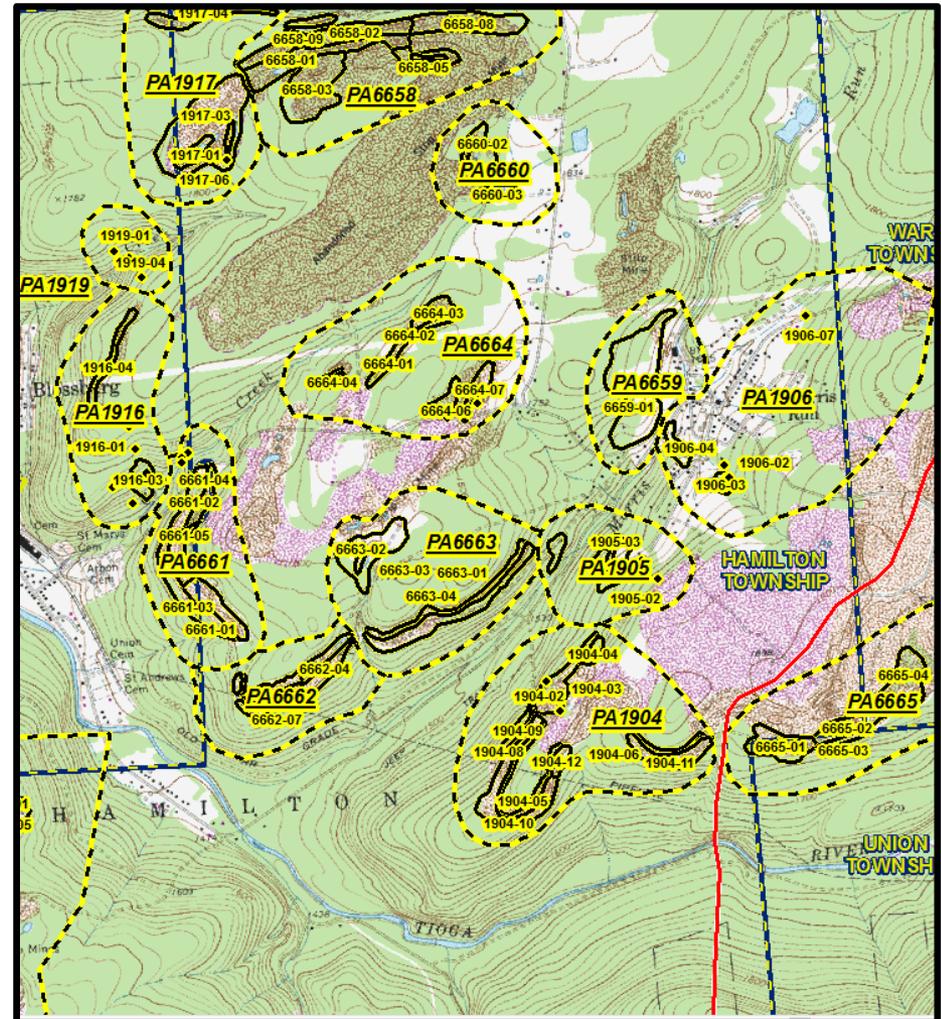
- The Gladden AMD treatment plant will be utilized as an educational tool for local schools and universities
- DEP-BAMR routinely receives and accommodates requests from high schools and colleges to tour existing AMD treatment facilities
- Chartiers Valley High School is located along Chartiers Creek, South Fayette High School is located within five miles of the proposed Gladden Treatment Plant, and Robert Morris University is located within 20 miles of the plant site
- Tours of the plant and the improved water quality of the streams will provide these schools with excellent educational opportunities

Project Partners

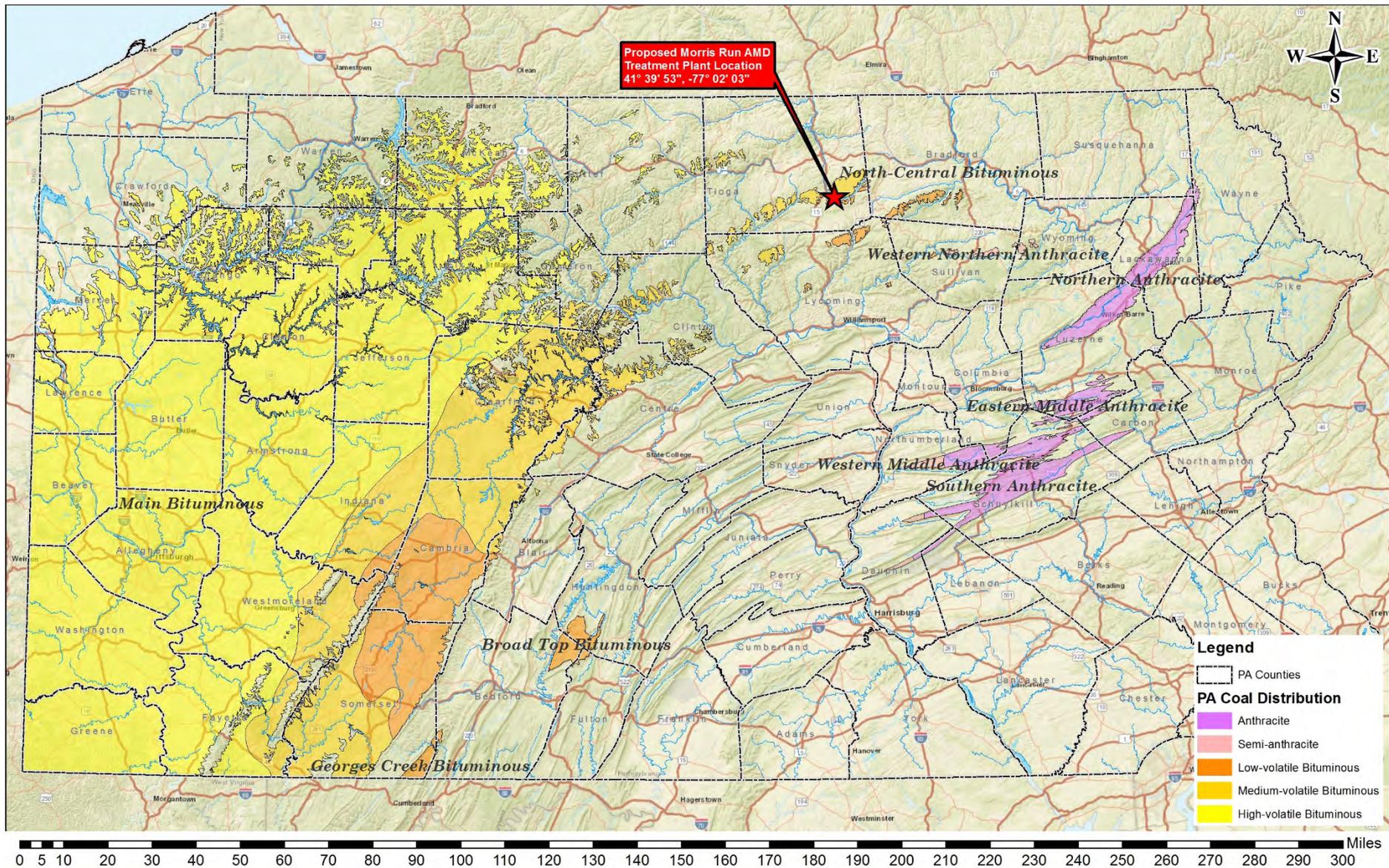
- South Fayette Conservation Group (SFCG)
- Tetra Tech Consultants
- John Kotsky (Primary Landowner)
- Pennsylvania Department of Environmental Protection
- Office of Surface Mining Reclamation and Enforcement
- Pennsylvania Turnpike Commission

Morris Run Treatment Facility

- Located in Hamilton and Ward Townships, Tioga County (AML Problem Area Nos. PA 1906 and PA 6661)
- Facility Development Initiated in 2018
 - Project No. AMD 59(1906,6661)101.1
- Receiving Stream Sequence:
 - Morris Run and Coal Creek _ Tioga River
- AMD will be collected from discharges along Morris Run, Coal Creek and adjacent mine pools via directional-drilled bores, then conveyed to a centralized treatment plant near Morris Run



Morris Run AMD Treatment Plant



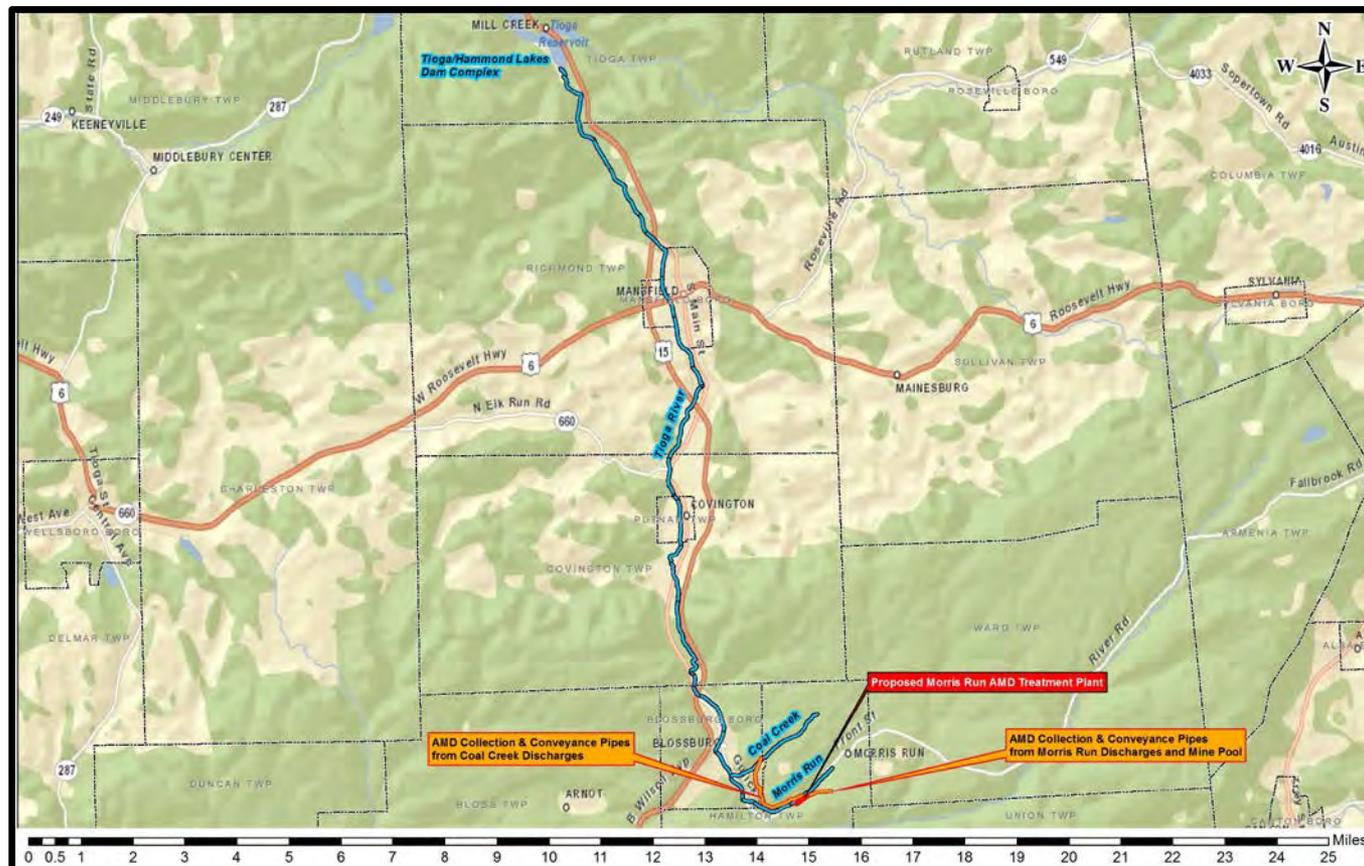
Morris Run AMD Treatment Plant

- **Tioga River is severely impacted from acid mine drainage, and there is little to no aquatic life in the river**
- **AML Pilot funding will be used to design and construct an active AMD treatment system with the intent of restoring the Tioga River**
- **Along with improved water quality at the Tioga/Hammond Dam Complex, approximately \$875,000 per year in revenue will be generated for the local economy**



Morris Run AMD Treatment Plant

20 miles of streams will be restored, along with improved water quality at the Tioga/Hammond Dam Complex



Morris Run AMD Treatment Plant



AMLF No. 1906-01 (WA): This feature in Morris Run identified as the East Mine Discharge is a continuous AMD discharge from mine opening AMLF No. 1906-02 (MO). Average flow is 300 gpm. Average water chemistry values: pH=2.9, Al=40 mg/l, Fe=10 mg/l, Mn=30 mg/l, acidity=400 mg/l, alkalinity=0 mg/l.

Morris Run AMD Treatment Plant



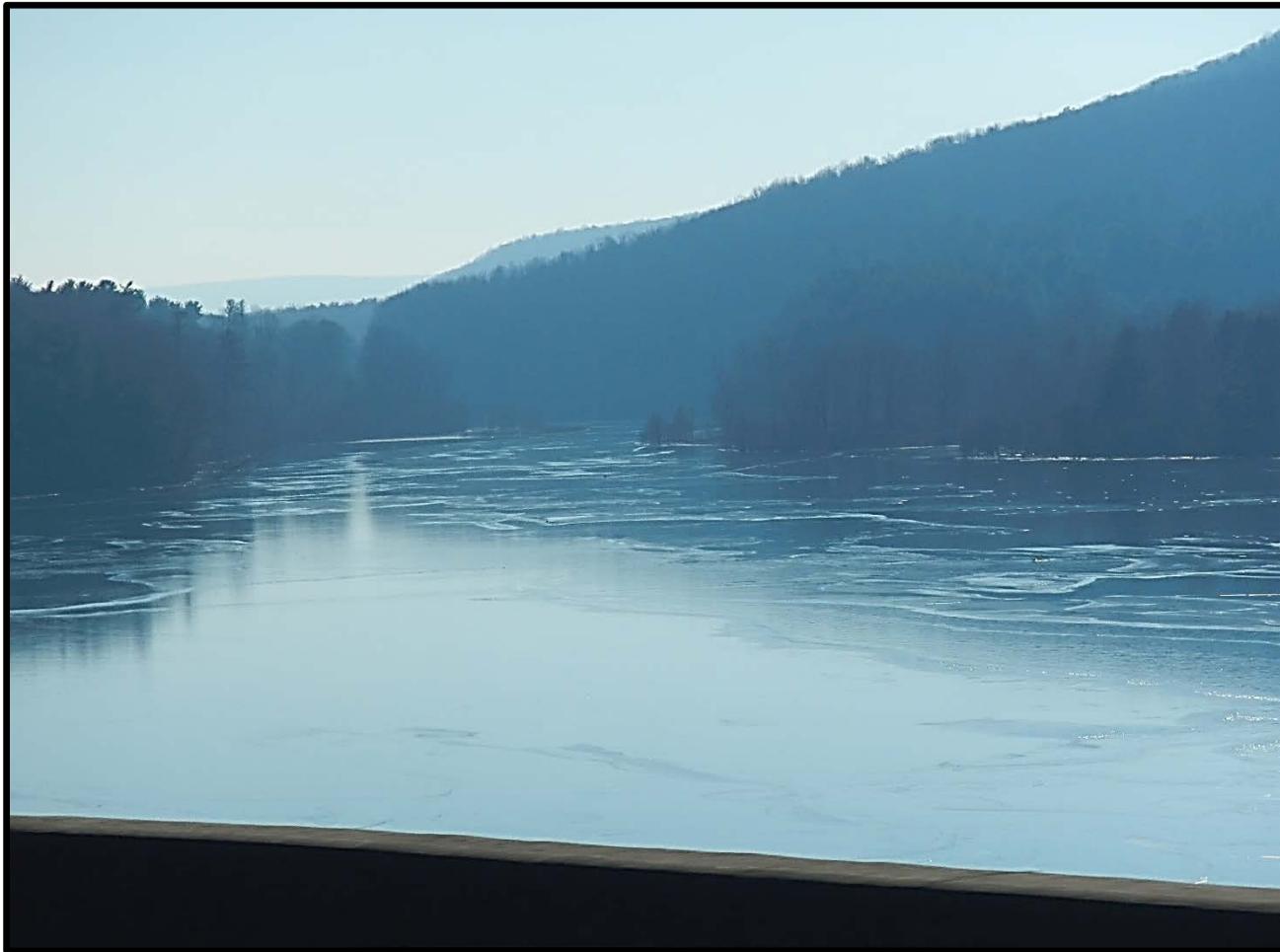
AMLF No. 1906-07 (WA): This feature near Morris Run is a continuous AMD discharge from the Lake Mine Complex. Average flow is 1,300 gpm. Average water chemistry values: pH=3.2, Al=20 mg/l, Fe=8 mg/l, Mn=25 mg/l, acidity=230 mg/l, alkalinity=0 mg/l.

Morris Run AMD Treatment Plant



AMLF No. 6661-06 (WA): The Coal Creek acid mine discharge is the largest volume discharge within the Tioga River Watershed. It has the most degraded water quality and is responsible for 45 percent of the total acidity load to the Tioga River. Average flow is 2,500. Average water chemistry values: pH=2.8, Al=33 mg/l, Fe=43 mg/l, Mn=10 mg/l, acidity=440 mg/l, alkalinity=0 mg/l.

Morris Run AMD Treatment Plant



Tioga River meets the Tioga/Hammond Dam Complex: As the acid mine drainage from the Tioga River is mixed with the alkaline water of the lakes, it slowly becomes neutralized and the high levels of dissolved metals begin to precipitate. The unnatural blue-green color that is visible in Tioga Lake is due to precipitation of these metals, such as aluminum.

Significant Benefits

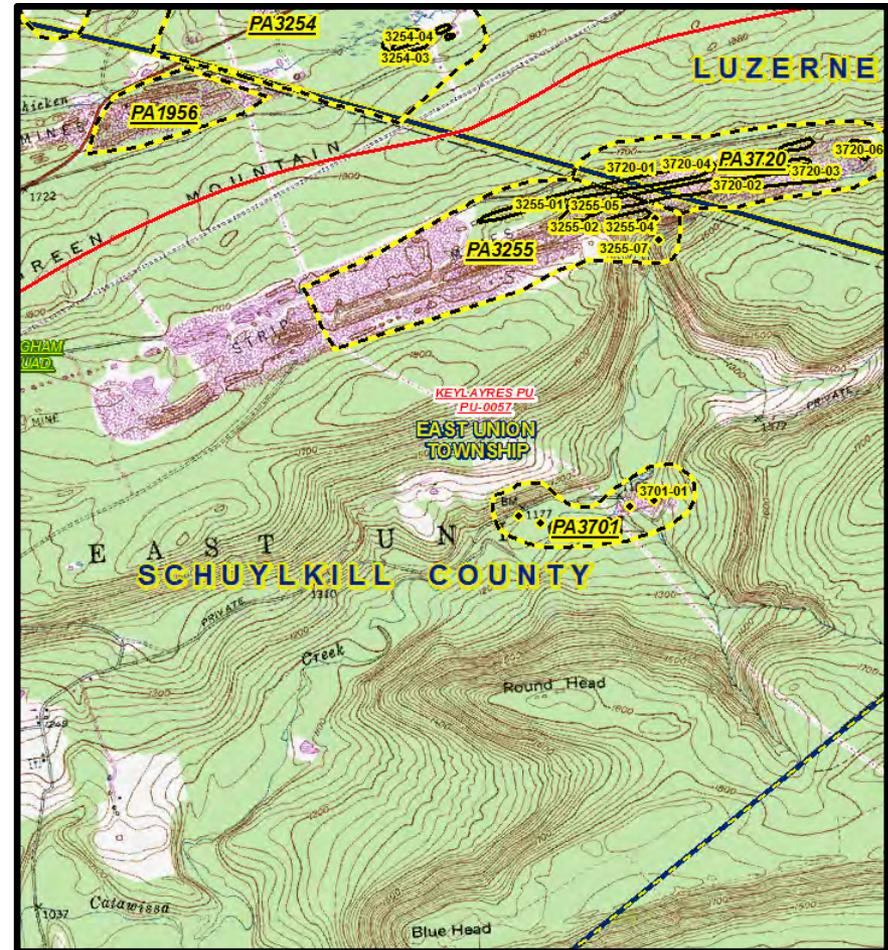
- Restore a total of 20 miles of streams back to a natural state as a wild trout and stocked trout fishery
- Improve water quality within 500-acre Tioga Lake and ultimately the entire 1,200-acre Tioga/Hammond Dam Complex; only half of the complex is good water quality
- Produce positive economic benefits to the Tioga/Hammond Dam Complex recreation area
- Increase the number of visitors to this rural area in the form of fishing, boating, camping, tourism, and sightseeing
- Establish new businesses in the area, create jobs and fuel economic growth
- Generate approximately \$875,000 per year in revenue for the local economy

Project Partners

- Pennsylvania Department of Conservation and Natural Resources
- Susquehanna River Basin Commission
- Tioga County Conservation District
- Tioga County Concerned Citizens Committee
- Office of Surface Mining Reclamation and Enforcement
- Pennsylvania Department of Environmental Protection

Green Mountain /Audenried Treatment Facility

- Located in East Union Township, Schuylkill County (AML Problem Area, PA 3701)
- Facility Development Initiated in 2018
- Receiving Stream Sequence:
 - Catawissa Creek _ Susquehanna River
- Both discharges result from turn of the 20th century mine drainage tunnels
- The resultant high volume discharges impair over 40 miles of Catawissa Creek



Green Mountain Discharge/Audenried Discharge

Audenried Tunnel Discharge

Median Flow 15 CFS
Max Flow > 30 CFS
Aluminum 4 – 10 mg/L
Acidity 40 – 90 mg/L
pH ~ 4.0



Green Mountain Discharge/Audenried Discharge

Median Flow 3 CFS
Aluminum 2-5 mg/L
Acidity 20 – 50 mg/L
pH ~ 4.2



Green Mt. Tunnel Discharge

Green Mountain Discharge/Audenried Discharge



pH ~4.6
Total Aluminum > 0.5 mg/l

Catawissa Creek 17 miles downstream

Significant Benefits

- Treat the Green Mountain Tunnel discharge
- Upgrade the treatment of the Audenreid Tunnel discharge to an active system utilizing some of the existing infrastructure from the existing failed passive system
- Facilitate the sustainable recovery of the upper Catawissa Creek Watershed while developing the water and energy assets to provide a source of revenue to fund the ongoing AMD treatment cost
- Deploy Microhydro technology for electricity generation
- Restore approximately 40 miles of Catawissa Creek to a Wild Trout or Stocked Trout fishery
- With a restored Catawissa Creek, it is estimated \$2,500,000 can be contributed to the local economy per year

Project Partners

- Eastern Middle Anthracite Regional Recovery (EMARR)
- Natural Lands Trust (NLT)
- Eastern PA Coalition for Abandoned Mine Reclamation (EPCAMR)
- Schuylkill/Columbia County Conservation Districts
- Catawissa Creek Restoration Association
- Pennsylvania Department of Environmental Protection
- Pennsylvania Department of Conservation and Natural Resources
- Office of Surface Mining Reclamation and Enforcement
- Hazleton Environmental
- Schumacher Engineering