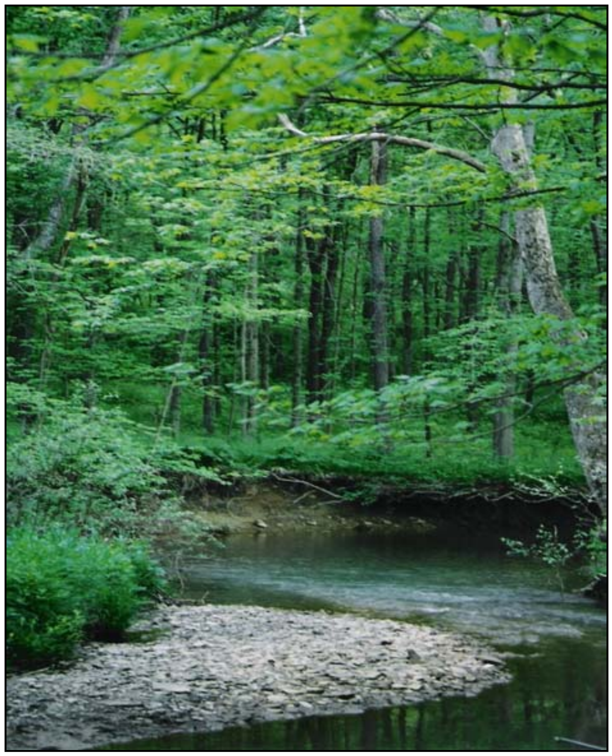
Blacklegs Creek Watershed
Abandoned Mine Drainage Assessment
and Remediation Plan

August 2005



Completed by Western Pennsylvania Conservancy
Watershed Assistance Center
with Reference to the 1974 Blacklegs Watershed Scarlift Report

In cooperation with:

Blackleggs Creek Watershed Association
Pennsylvania Department of Environmental Protection
Office of Surface Mining
Skelly and Loy, Inc.

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Acknowledgements

Most of the introductory information for this report was obtained from a 1974 study of the Blacklegs Watershed, entitled "Blacklegs Creek Mine Drainage Pollution Abatement Project Scarlift Report." The project was completed by the Pennsylvania Department of Environmental Resources (now DEP) Office of Resources Management.

The scenic photo of Blacklegs Creek on the front page of this document was taken by Ann Marie Nagy, volunteer for the Blackleggs Watershed Association.

Introduction

Completed in 1974 by the Pennsylvania Department of Resources, the Blacklegs Scarlift Report provides details of the geology and impacts of mining in the Blacklegs Creek watershed, including locations of mine discharges and remediation options. The purpose of this assessment and remediation plan is to use current water quality information collected since the publication of the 1974 Scarlift Report to prioritize these discharges and develop an implementation strategy that takes into consideration recent remediation efforts. This assessment plan also includes comprehensive information about the extent and character of mining in the watershed adapted from the 1974 Scarlift Report.

This plan has developed as a result of efforts made by Blackleggs Trout Nursery and Watershed Association (BCWA), with the help of many other individuals and groups. Blackleggs Trout Nursery was formed in 1986, and in 1999 evolved into a cooperative trout nursery and watershed group committed to improving the water quality of Blacklegs Creek [1]and its tributaries for wildlife and recreation.

In early 2001, BCWA completed a mine drainage treatment system known as the Kolb Discharge Abandoned Mine Drainage (AMD) Remediation Project at a site near the headwaters of the Blacklegs Creek watershed. Because it was one of the most visible discharges in the watershed, was the first major AMD impact to the watershed, and was located just upstream of a section stocked with trout by BCWA, this was a logical location for a remediation project. What initially started as a small project to install splash dams throughout the stream channel, in order to drop out iron oxide precipitate, was modified to include a $65,500 passive treatment system that would add aeration to the mine water. Due to several unforeseen construction issues, the project required an additional $15,000 for completion, which was provided by the Western Pennsylvania Watershed Program. The treatment system ultimately reduced the discharge on the headwaters of Blacklegs Creek from 5 ppm to 2 ppm, preventing up to eight tons of iron per year from entering the watershed.

Shortly after the construction of the project, BCWA recognized the importance of developing a comprehensive strategy for cleaning up the remainder of the watershed. This would involve the identification of AMDs in the watershed, the collection of updated water chemistry of the discharges, and the development of conceptual treatment designs for priority restoration sites.

Watershed Description

The headwaters of Blacklegs Creek originate near Parkwood, Indiana County, approximately eight miles west of Indiana, Pennsylvania. The main stream continues in a southwesterly direction for 15 miles until it discharges into the Kiskimenitas River near Saltsburg, Pennsylvania. At Saltsburg, the Conemaugh River and Loyalhanna Creek join together and form the Kiskiminetas River, which flows north and receives Blacklegs Creek approximately 1.1 miles downstream of that confluence. The Kiskiminetas River then flows 25 miles and empties into the Allegheny River near Freeport, Pennsylvania.

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[1] The name "Blacklegs" evolved to "Blackleggs" when some members saw the latter spelling on an old map and liked the look of the new name. The organization continues to use the "Blackleggs" spelling, though the creek is still commonly referred to as "Blacklegs" Creek in most cases.

Approximately 88% of the watershed lies within Indiana County. The headwaters of Big Run and Whisky Run, which comprise 12% of the watershed, lie within Armstrong County. The entire watershed is approximately 45 square miles in area.

The principal tributaries of Blacklegs Creek that enter directly into the main stream as it flows southwest are: Whisky Run, Hooper Run, Unnamed Run, Nesbit Run, Harpers Run, Marshall Run, and Big Run (Table 1). The basin is somewhat square in shape with Blacklegs Creek flowing generally near the southeastern perimeter of the basin; and consequently, the bulk of the tributaries and the watershed area lies to the north of the mainstem.

Table 1. Current Subwatershed Area and Mine Drainage Information for the Blacklegs Creek Watershed

Major Tributary	Total Area (Miles)	Main Stream Miles	Total Stream Miles	Moderately Polluted Miles 2000	Severely Polluted Miles 2000	Moderately Polluted Miles 2005	Severely Polluted Miles 2005
Upper Blacklegs	8.6	7.6	21.6	1.6	1.9	3.5	0.0
Whisky Run	5.1	4.3	9.8	0.5	3.8	0.5	3.8
Hooper Run	3.4	4.1	7.5	1.3	0.0	1.3	0.0
Unnamed Run	2.5	2.5	6.8	0.0	0.0	0.0	0.0
Nesbit Run	1.9	3.2	3.7	0.0	0.0	0.0	0.0
Harpers Run	2.5	3.6	5.0	0.0	0.0	0.0	0.0
Marshall Run	4.0	3.4	8.9	0.0	0.0	0.0	0.0
Big Run	8.7	7.1	21.3	1.1	2.6	1.1	2.6
Lower Blacklegs	8.6	7.4	22.5	5.7	0.0	5.7	0.0
Total (mi^2)	45.3	43.2	107.1	10.2	8.3	12.0	6.4

Stream Condition

A number of sections within the Blacklegs Creek watershed are primarily degraded by acidic mine drainage pollution. The 1974 Scarlift Report characterized acidic streams in the watershed as severely acidic (178 mg/L or greater) and moderately acidic (13-178 mg/L). Those classified as severely acidic include a 1.3 mile sector of Big Run ending approximately a mile from its confluence with Blacklegs Creek, and 0.3 miles of an unnamed tributary to Whisky Run at the site of the abandoned Iselin #5 mine. Moderately acid waters included two tributaries and one mile of main stream on Big Run, and 6 tributaries and 2 miles of main stream on Whisky Run. The bulk of acidic mine drainage is concentrated in the northwestern portion of the watershed, south of Elders Ridge and West Lebanon, respectively, where most of the mining activity has been centered over the years.

However, alkaline mine drainage also contributes to the degradation of the watershed. Based on the locations of drainages identified during the watershed assessments, Table 1 shows the miles of streams moderately and severely polluted by mine drainage (both alkaline and acidic) in the watershed, both prior to recent remediation efforts (2000) and after recent remediation (2005).

Geology

The geological structure of the Blacklegs Creek watershed is one of extreme simplicity. It consists primarily of two anticlinal and one synclinal fold of strata, or broad rock waves, the crest lines of which run nearly parallel to each other. Synclines form the convex or trough portion of the rock waves while anticlines refer to the raised or concave portion. These three geologic features are named primarily from localities where they are strongly developed or places near which they pass. The first of these geologic features, the Jacksonville anticline, passes near Jacksonville. The second is the Elders Ridge syncline, which brings the Pittsburgh coal down so that it lies in the hills under several square miles of this territory. The Roaring Run anticline parallels this syncline on the west for a short distance, but is broken up near the Village of Idaho.

These folds and basins in rock structure are represented on the structure and economic geology map (Appendix A) by contour lines using the floor of the Upper Freeport coal as datum. This coal, which is used as a reference horizon, outcrops for a number of miles along Aultman's Run in the region north of Jacksonville. In addition to representing the depth of the reference stratum below the surface of its elevation above sea level, the contour lines show with some degree of accuracy the relation of the various mine slopes to one another and the approximate grade of the mining operations.

Northeast from the Kiskimentas River, the width of the Saltsburg subbasin is steadily diminished by the convergence of the anticlinal sides, thus giving to the trough in this latitude a width of nearly nine miles. From this it can be seen that the Elders Ridge syncline forms a canoe-shaped basin.

Pittsburgh Coal

At Saltsburg, the Pittsburgh coal bed crosses the Conemaugh Valley from Westmoreland into Indiana County. Below Saltsburg on the Kiskimenetas River, more than 100 feet of upper productive rocks can be found in the hills, and this continues northeastward from the river about 10 miles until the coal seam reaches the Elders Ridge syncline.

Pittsburgh coal in the Saltsburg area occupies an area of approximately 9 miles long by 2.5 miles wide. Its limits are geographically defined on the north by Gobbler's Run, on the east by Blacklegs Creek, on the south by the Kiskimenetas River, and on the west by Long Run in Armstrong County. The coal seam ranges from 8 to 11 feet in thickness, with some variation, from the Kiskimenetas River to West Lebanon.

The Pittsburgh coal seam exists in three belts of nearly equal size, all having their limits across the border of Armstrong County, but the majority of the coal area is in Indiana County. The first of these belts extends from the Kisiminetas River to Big Run, the second extends from Big Run northeast to Whisky Run, and the third is located between Whisky Run and the headwaters of Gobbler's Run northeast of West Lebanon.

Project Overview

The purpose of this assessment was to identify the AMDs in the Blacklegs Creek watershed, and to develop a strategy to reduce the impact of these discharges in order to improve water quality for fish and other wildlife.

BCWA recognizes that other impacts, besides AMD, may be contributing to the degradation of Blacklegs Creek and its tributaries. There is some evidence that sedimentation, nutrient pollution, and other impacts exist. Any activities to reduce these sources of pollution in the future would be beneficial. However, the focus of this particular assessment is AMD. Overall, this is the biggest source of impairment to Blacklegs Creek, which significantly outweighs the others by eliminating aquatic life in some reaches. Consequently, improvements in other areas will have minimal success until restoration projects significantly reduce AMD impacts in the watershed. For these reasons, AMD restoration activities are the current focal point of the BCWA.

In 2002, Western Pennsylvania Conservancy Watershed Assistance Center assisted the BCWA in conducting stream walks of all tributaries in the Blacklegs Creek watershed in order to identify all sources of AMD within the watershed. Because limited funding was available, detailed chemistry analysis of every discharge could not be done. Therefore, prioritization was based on estimated flow of the discharges and chemical characteristics deduced from appearance and previous water quality measurements. Using this information, the discharges were categorized as low, medium, or high priority (Figure 1). Photos and GPS coordinates of each discharge were recorded. Detailed chemical analysis was then conducted on discharges labeled as high priority for a period of one year. This supplemented water quality data collected by volunteers with the Pennsylvania Senior Environmental Corps (PASEC) as part of the organization's ongoing water quality monitoring program.

For the purpose of this assessment, low-priority discharges included mildly acidic or net-alkaline discharges with few metals present and/or low flow. Medium-priority discharges included those with moderate levels of acidity, metals, and/or flow, with life still present in the stream. High priority discharges included those with high flows and high acidity and/or metals where aquatic life below the discharges was greatly threatened or absent. Other factors, such as landowner support and suitability of the site for remediation were also taken into consideration. Segments of streams below either low or medium-priority discharges were considered moderately impaired, while stream lengths below high-priority discharges were considered severely impaired.

Names of Sites

Before WPC began collecting samples in the Blacklegs watershed as part of the watershed assessment, names had been assigned to regular sampling points by PASEC. Sampling sites, including discharges and in-stream points, were labeled sequentially from upstream to downstream. For instance, the first upstream site in the Big Run Watershed was BR1, followed by BR2, and so on. Sites were named similarly for the watershed assessment, except that only actual discharges were included. Because of this difference, documents associated with PASEC often have different site names than those associated with the WPC assessment. To confuse matters, the treatment systems are named according to the original site names given by PASEC. Unless otherwise indicated, this report will refer to site names in accordance with WPC's methodology. However, in several cases, the old site names may be referred to in parenthesis. Table 2 shows the original sample site names and current discharge names. Original sites that are located next to WPC sites in the table are at the same geographical location.

Table 2. Comparison of Original Sites and WPC sites

Original Sites	**WPC Sites**	**Original Sites**	**WPC Sites**
	BR1	WR2*	
	BR2	WR3*	
	BR3		WR1*
BR1 (In Stream)*			WR2*
BR2*	BR4*		WR3*
BR3*	BR5*		WR4
BR6*	BR6*		WR5
BR7*	BR7*		WR6*
BR8 (In Stream)*			WR7
BR9*	BR8*		WR8
BR10 (In Stream)*		WR1*	WR9*
			WR10*
			WR11*
			WR12*
			WR13*
			WR14*
			WR15
			WR16
			WR17
			WR18

*denotes a sampling location

Unpolluted Subwatersheds

As the 1974 Scarlift Report indicates, there are five subwatersheds within the Blacklegs Creek watershed that are considered unpolluted by AMD. These include Marshall Run, Hooper Run, Nesbit Run, Harpers Run, and Unnamed Run. During this assessment, an additional discharge was identified in Neal/Hooper Run watershed that was not identified in the Scarlift Report. However, the impacts of this discharge are still considered minimal, with a pH above 7, and for the purposes of this assessment, it is considered an unpolluted subwatershed.

Marshall Run

The headwaters of Marshall Run originate 3 miles east of Clarksburg and flow in a westerly direction for about 3.5 miles where it joins Blacklegs Creek at Clarksburg. The total length of the stream, including all tributaries, is 8.9 miles. The total area of the watershed is approximately 4 square miles. Previous water quality data has shown that the pH of water in the subwatershed is between 7.2 and 8.4. No discharges were identified in this subwatershed during this assessment.

Neal/Hooper Run

The headwaters of Hooper Run originate near Lowry's Station and flow parallel to Route SR 3025 (Park Road) in a southwesterly direction for a distance of 4 miles. The total stream length, including all tributaries, is 7.5 miles. The total area of the watershed is 3.4 square miles. Previous water quality data has shown that the pH of water in the subwatershed is between 6.5 and 7.0. In 2002, a discharge from a constructed treatment system was found. However, pH of the stream below the discharge ranged from 7.0-8.0, and a healthy macroinvertebrate population is present. Therefore, this subwatershed is considered unpolluted by mine drainage.

Unnamed Run

The headwaters of this unnamed run and associated tributaries originate along State Route 286, three miles east of Clarksburg, and flow parallel to the highway in a westerly direction. The total stream length is 6.8 miles, and the total area of the subwatershed is 2.5 square miles.

Previous water quality data has shown that this is an alkaline stream with no indications of AMD pollution. No discharges were identified in this subwatershed during this assessment.

Nesbit Run

The headwaters of Nesbit Run originate 2 miles north of Iselin on Legislative Route 32031. The stream flows to the south for 3.2 miles before discharging into Blacklegs Creek. The total stream length, including all tributaries, is 4.3 miles, and total area of the watershed is 1.9 square miles. The area is undermined by abandoned deep mines and stripped by surface mining. However, previous water quality information as well as visual evaluations performed as part of the assessment show that mining drainage is minimal and is not seriously degrading the subwatershed or Blacklegs Creek watershed.

Harper Run

The headwaters of Harper Run originate approximately one mile northeast of Elders Ridge and flow in the valley past Iselin for 3.6 miles before discharging into Blacklegs Creek at Clarksburg. The total stream length is 5 miles and the total area of the watershed is 2.5 square miles.

Extensive mining operations were conducted in this subwatershed. All that presently remains of two drift mines are large refuse piles and several miles of reclaimed surface mines. In the 1970s, it was found that surface water from an unnamed tributary to Harper Run was infiltrating into one of the mine workings. An abatement project was initiated to prevent this water from entering the mine and to reduce the flow of acid mine drainage. No significant discharges were identified during this assessment.

Polluted Watersheds

A total of four subwatersheds in the Blacklegs Creek watershed were considered polluted in the original Scarlift Report and were also found to be polluted in 2002 field investigations. Two additional discharges are on the mainstem of Blacklegs Creek. Polluted watersheds include Big Run, Whisky Run, Upper Blacklegs Creek, and Lower Blacklegs Creek.

Since the initial identification of high-priority discharges in the watershed, the Kolb and Big Run #2 treatment systems have become operational, reducing the total number of high-priority discharges from 17 to 15 (Tables 3 and 4).

Table 3. Priority Discharges in Blacklegs Creek Watershed, 2001			
Subwatershed	**Level of Priority**		
	High	Medium	Low
Big Run	4	0	5
Whisky Run	12	2	5
Upper Blacklegs	1	8	7
Lower Blacklegs	0	0	1

Table 3. Priority Discharges in Blacklegs Creek Watershed, 2005			
Subwatershed	**Level of Priority**		
	High	Medium	Low
Big Run	3	0	6
Whisky Run	12	2	5
Upper Blacklegs	0	8	8
Lower Blacklegs	0	0	1

Upper Blacklegs Creek

The headwaters of the upper portion of Blacklegs Creek originate near the Village of Parkwood and flow in a southwesterly direction for about 7.5 miles, where water is received from the Whisky Run subwatershed. The 1974 Scarlift Report identified 2 miles of this subwatershed as being moderately polluted by AMD. This acidic section is located in a small headwater tributary of the creek. However, this acidic water is diluted when this headwater tributary meets the mainstem, and the discharges on this tributary do not greatly impact the creek.

In 2001, Kolb AMD Treatment Project was constructed downstream of the most significant metal-producing discharge on Upper Blacklegs Creek. This treatment system, called Kolb, has reduced the iron entering the stream from ~5 ppm to ~1 ppm. Upper Blacklegs Creek below this discharge is now better able to successfully support fish and other aquatic animal populations. Because of the success of the treatment system, this discharge has been downgraded to a low priority and there are no remaining high-priority discharges in this subwatershed. A report completed by Western Pennsylvania Watershed Program in 2003 classified the stretch of Blacklegs Creek downstream of the Kolb AMD Treatment Project as having very good water quality and a healthy macroinvertebrate community.

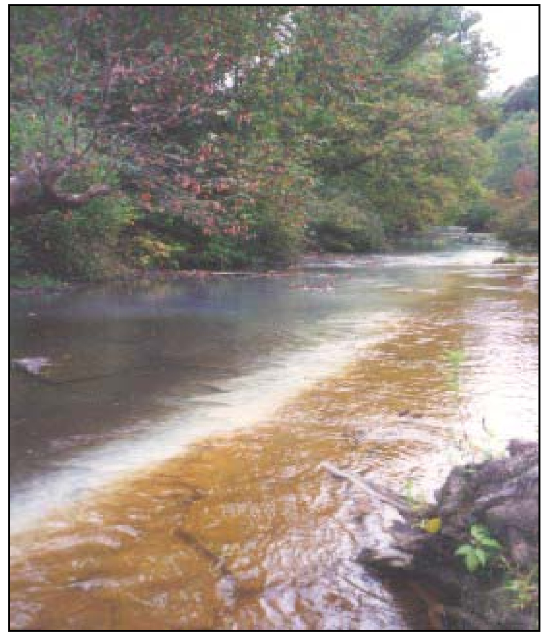
Lower Blacklegs Creek

The lower portion of the mainstem of Blacklegs Creek is located between Clarksburg and the creek's junction with the Kiskiminetas River. Major tributaries discharging into this portion of Blacklegs Creek include Marshall Run (non-polluted) and Big Run (polluted). There is only one discharge, considered a low priority, which has been identified along the mainstem of Blacklegs Creek itself. All 12 small tributaries emptying into this watershed were tested and found to be net-alkaline. However, because of the impacts of Big Run, approximately 4.5 miles of the Lower Blacklegs subwatershed is considered moderately polluted by AMD.

Big Run

Big Run originates 0.5 miles east of the Village of Shady Plain and flows in a southeasterly direction for 7 miles where it discharges into Blacklegs Creek. The total stream length is 21 miles. Approximately 1.2 miles of stream are severely polluted by mine drainage, and 2 miles are moderately polluted.

Though Big Run has a comparatively low number of discharges, it contributes over 50% of the acidity, nearly 25% of the iron, and an estimated 50% of aluminum entering the watershed from abandoned mines. Immediately after Big Run enters the mainstem, aquatic life is severely impacted, with some areas being completely void of aquatic animals.



Confluence of Big Run and Blacklegs Creek

Before the construction of the Big Run #2 Treatment System, there were 4 high-priority discharges in the watershed. Following the construction of this system, discharge BR4 has been downgraded to low priority. Because of the severe impacts from the remaining discharges on Big Run, the treatment system alone has not significantly improved Big Run. However, it removes remove over 245 tons of acidity and 8.5 tons of aluminum per year from the Big Run subwatershed.

Whisky Run

Whisky Run originates 5 miles east of the Village of Shady Plan, in close proximity to State Route 56, and flows in a southeasterly direction for 4.5 miles until it discharges into Blacklegs Creek. Over 5.8 miles of stream are moderately polluted by mine drainage and 0.4 miles are severely polluted.

Whisky Run subwatershed contains both highly acidic discharges with high concentrations of aluminum and iron as well as net-alkaline discharges. The difficulty in treating many of these discharges results from the lack of space available for treatment. Although, in many cases, the chemistry of the Whisky Run discharges shows higher levels of pollutants than Big Run, it has less of an impact on Blacklegs Creek because these discharges are of lower flow.

Conclusions

The 1974 Scarlift Report classified nearly all of Whisky Run and a significant portion of Big Run as severely or moderately acidic. The results of the visual and chemical assessment fieldwork verified that Big Run and Whisky Run contribute the most significant pollution in the watershed. Most of this is in the form of acid mine drainage, though some of the mine drainage is net-alkaline.

Due to the extent of pollution within the Big Run subwatershed, as well as the feasibility of achieving total remediation, it should be the top restoration priority. In addition to this subwatershed's overall impact on the watershed, it also limits the Blackleggs Trout Nursery and Pennsylvania Fish and Boat Commision from stocking several additional miles of Blacklegs Creek with trout. The remediation of Big Run would allow several additional miles of stream to be stocked, which represent the best fish habitat within the watershed. The recreational and water quality improvements that would be realized are substantial. The socioeconomic impact on the communities within the watershed would also be significant.

Using the chemistry information, Skelly and Loy, Inc. was contracted to develop conceptual design recommendations for each of the high-priority discharges, and to complete engineering designs for Big Run #2 and Big Run #7 treatment systems, designed to treat discharges BR4 and BR7. This information, along with general water quality information, is included in the following two sections of this report, Big Run Subwatershed Assessment and Whisky Run Subwatershed Assessment. There may be other methods and technologies that could be applicable, or even more suitable, to treating these discharges. These opportunities may evolve from discussions between BCWA and consultants. However, the current treatment options proposed in the plan are considered to be the most effective and affordable options based on the current information available.

As of the publication date of this report, the Big Run #2 AMD Treatment System has been completed and Big Run #7 AMD Treatment System is under construction. The treatment of BR8 is scheduled to begin in 2006, in conjunction with the completion of BR7. This project will be completed with funding obtained as a result of an agreement with the Norfolk Southern Railroad, which must address several mitigation requirements as a result of a recent railway extension within the watershed.

Due to the proximity of BR4, BR7, and BR8 discharges, there is ongoing discussion that the same settling pond may be designed to handle effluent from limestone ponds for both BR7 and BR8. Additionally, a finishing pond may be designed to accommodate overflow from all three of these discharges. This would be a modification of the existing conceptual designs that would be deemed appropriate as a result of new hydrological and geological information.

Because of the inability to obtain permission from a private landowner, the remediation of BR5 may prove difficult. However, remediation of this AMD remains a priority, and it is the hope of BCWA that creative engineering will make treatment of this AMD possible by 2008. This may include intercepting the discharge near the road so that it may be directed to a treatment pond near Big Run # 2 Treatment System.

Upon achievement of Big Run remediation, the next step will be to begin treatment of discharges in the Whisky Run subwatershed. Chemistry and flow information indicates that WR9 supplies 10-25% of the sulfate loading and 33-50% of the aluminum loading to Whisky Run. This high-priority discharge should be the focus of the first project on Whisky Run. In addition, because of similar chemistry among WR9 and WR1, WR2, WR3, and WR9, it is hypothesized that the same mine pool is the source of these discharges. Hydrological investigations will determine whether it may be possible to divert one or all of these discharges to the WR9 treatment system location.

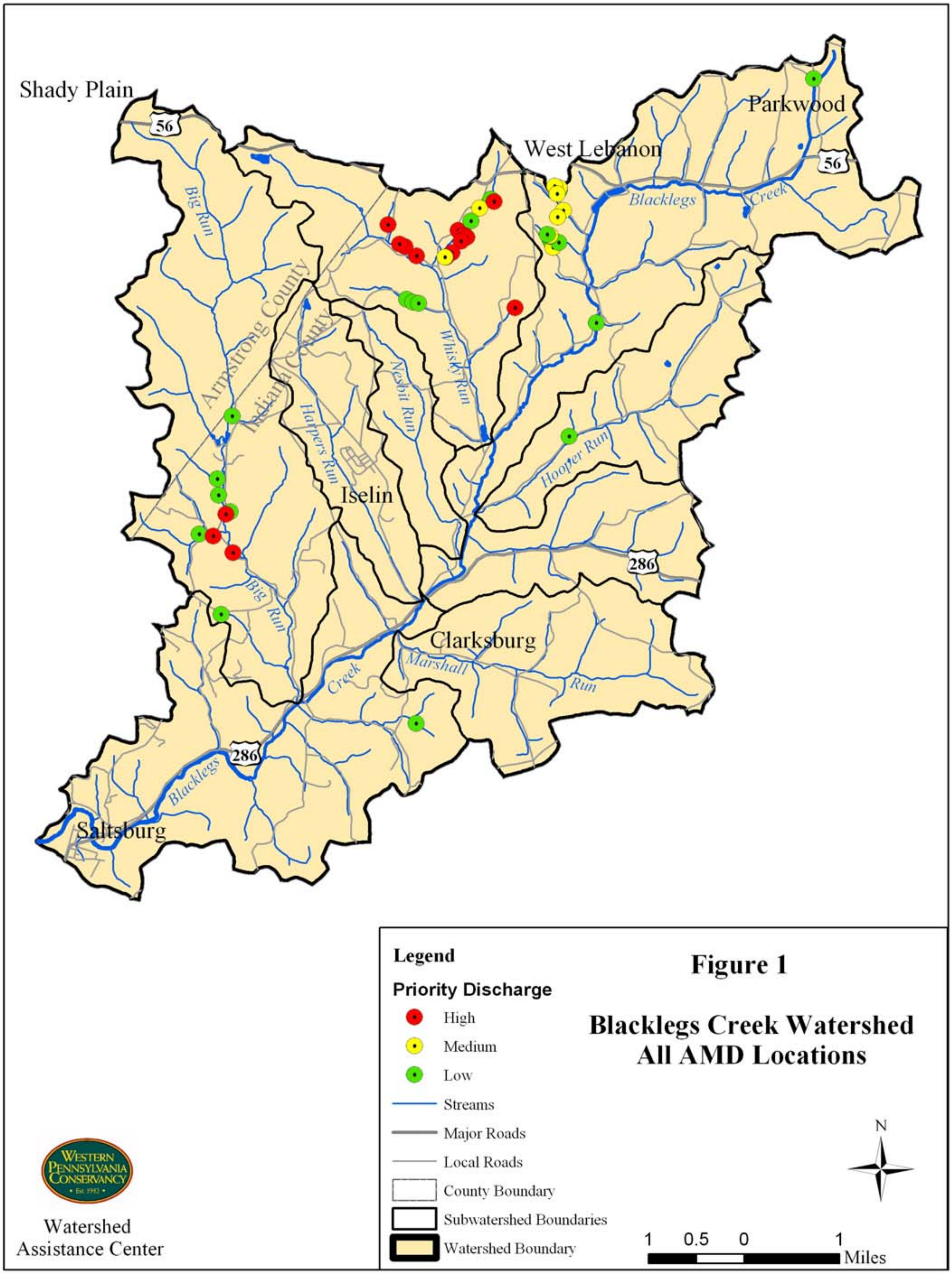
Following treatment of these discharges, it may be feasible to begin treatment of WR11 and WR12. An additional passive treatment system may be designed adjacent to the system used to treat WR9. However, further information is needed to determine the possibility of such a design, given that a vertical flow wetland is proposed for WR11 and that additional space may therefore be required. Next, it would be appropriate to concentrate on the treatment of WR13 and WR14, which could be treated jointly. However, treatment of these discharges may prove difficult due to limited space. It may be necessary to either mechanically pump these discharges uphill to the adjacent BAMR project location or to clear a portion of the forested area on the west side of these discharges in order to construct a passive treatment system.

Finally, the greatest effort may be needed to treat WR6. Due to the high levels of iron present, a vertical flow system is proposed. Unfortunately, there is little space available downhill of this discharge. Options include mechanically pumping the discharge uphill to a nearby field, which would provide sufficient space, or investigating the possibility of intercepting the receiving waters downstream from the discharge in an area where there is room for treatment. Further observation of this area is required to determine if these are feasible.

Table 4 shows the proposed order that mine drainages will be addressed in the watershed. This list may change based on additional chemical, geological, or other information. The completion of BR5 will depend on the ability to obtain permissions from a private landowner.

Table 4. Tentative Remediation Project Schedule

Discharge	System Type	Tentative Completion Date
Kolb	limestone pond/settling pond	(completed)
BR4	limestone pond/settling pond	2004 (completed)
BR7	limestone pond/settling pond	2006
BR8	limestone pond/settling pond	2007
WR9	limestone pond/settling pond	2008
BR5	Limestone pond/settling pond	2008
WR1, WR2, WR3	limestone pond/settling pond	2009
WR11	vertical flow wetland	2010
WR12	limestone pond/settling pond	2011
WR 13, WR14	limestone pond/settling pond	2012
WR6	vertical flow wetland	2013


Shady Plain
Parkwood
West Lebanon
56
Blacklegs
Creek
Big Run
Armstrong County
Indiana County
Harpers Run
Nesbit Run
Whisky Run
Hooper Run
Iselin
286
Big
Run
Clarksburg
Marshall
Run
Creek
Blacklegs
Saltsburg
Legend
Priority Discharge
High
Medium
Low
Streams
Major Roads
Local Roads
County Boundary
Subwatershed Boundaries
Watershed Boundary
Figure 1
Blacklegs Creek Watershed
All AMD Locations
N
1 0.5 0 1
Miles
Western Pennsylvania Conservancy
Est. 1932
Watershed
Assistance Center

Big Run Subwatershed Assessment

Big Run is a major tributary and a major contributor of AMD to Blacklegs Creek. Immediately downstream of its confluence with Big Run, Blacklegs Creek is devoid of life. Four major AMDs exist within the Big Run watershed (Figure 2). Funds have been allocated to address BR4 and BR7. The BR4 Treatment System (named Big Run # 2) has been completed, and the BR7 is currently under construction. The following section describes the discharges that have been identified within the Big Run subwatershed, including location maps and conceptual treatment considerations for the high-priority discharges.

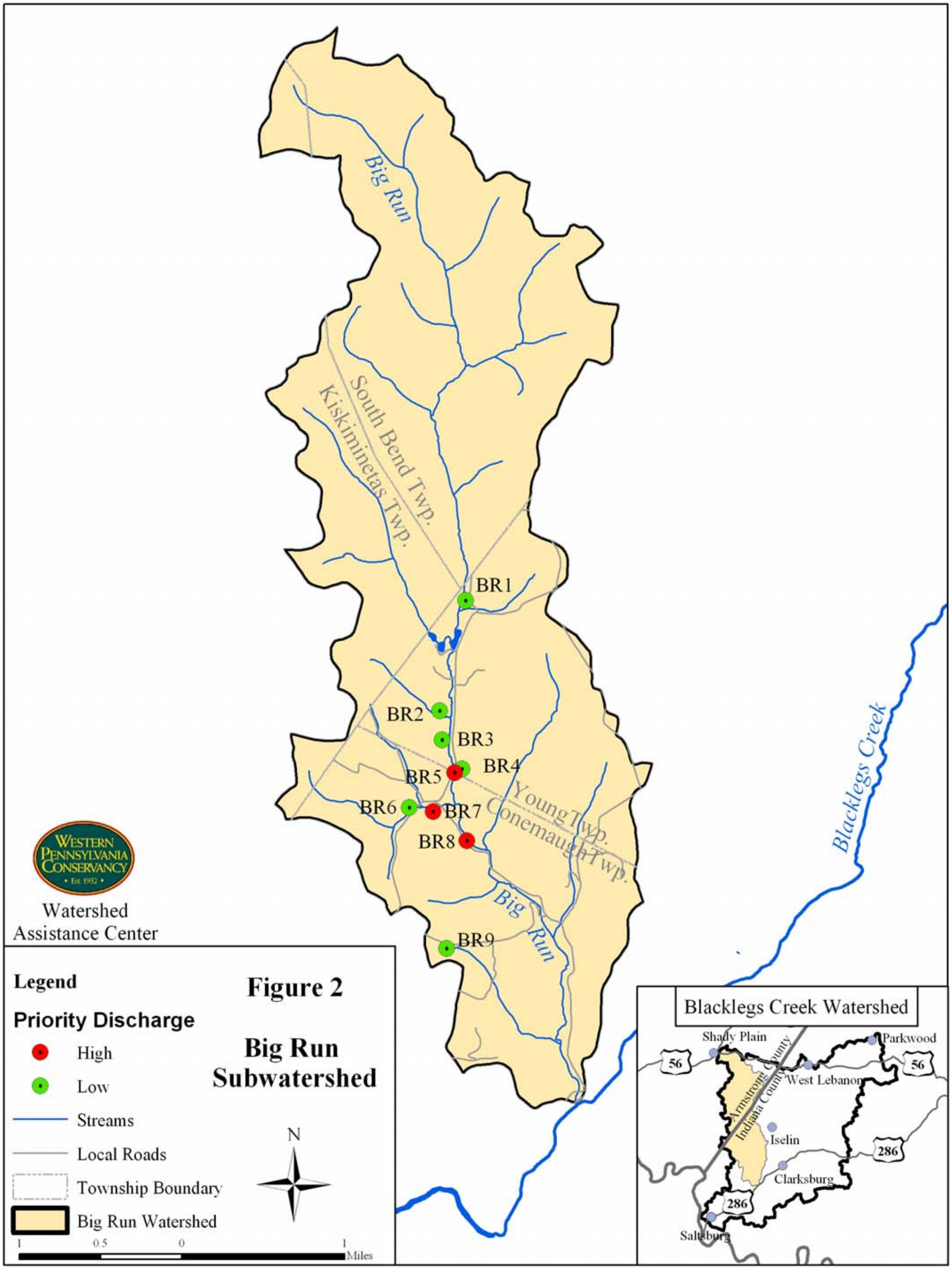
BR1

This discharge originates at the outflow of a constructed treatment system, which incorporates the use of soda ash and settling ponds for treatment, and then discharges through a pipe exiting to an existing wetland adjacent to Big Run. The discharge has a moderate flow of 4-10 gpm. The iron levels of the discharge are ~ 1 ppm. This discharge is already being treated and by a mining company, therefore, is considered a low priority at this time.

BR1 Prior to Treatment

BR1 Treatment Pond

BR1 Discharge after Treatment System



Big Run
South Bend Twp.
Kiskiminetas Twp.
BR1
BR2
BR3
BR4
BR5
BR6
BR7
BR8
BR9
Young Twp.
Conemaugh Twp.
Big Run
Blacklegs Creek
Western Pennsylvania Conservancy
Watershed Assistance Center
Legend
Priority Discharge
High
Low
Streams
Local Roads
Township Boundary
Big Run Watershed
1 0.5 0 1 Miles
N
Figure 2
Big Run Subwatershed
Blacklegs Creek Watershed
Shady Plain
Parkwood
56
West Lebanon
Armstrong County
Indiana County
Iselin
286
Clarksburg
Saltsburg

BR2

This discharge, located above the home of a private landowner, originates at a small abandoned mine opening. The flow is estimated to be ~3-5 gpm. Iron levels are estimated at ~4 ppm. Coal was found to be present in the streambed during investigations. The discharge is considered a low priority due to its low flow and minimal impact to Big Run.

BR3

The channel of the discharge is often dry, as well as most of the small intermittent tributary to Big Run. It appears that the discharge may have originated at an old mine opening. The pH above and below the discharge is ~5.9. There is minimal potential for treatment at the site, although some room may be available in a neighboring field. As a result of the minimum impact to Big Run, this discharge is considered a low priority.

BR4

This discharge emanates from a deep mine opening on Big Run. Though the chemistry of BR4 does not indicate a severe impact, the high average flow rate of 1,250 gpm, contributing 245 tons of acidity and 8.5 tons of aluminum per year, is a significant source of pollution to Big Run. A treatment system, Big Run #2 AMD Treatment Project, was constructed for this high-priority discharge in 2004. The design for the system was based on years of flow and chemistry and relies on contacting the acidic discharge with limestone to increase the pH of the water. The Department of Environmental Protection (DEP) Growing Greener Program and the Office of Surface Mining provided funding for the project. Because the treatment system eliminates a significant number of metals from this discharge, it has been downgraded to a low priority.

Conceptual Treatment Consideration

The BR4 discharge represented the first major impact to Big Run, even though a few smaller discharges are located upstream. The treatment system consists mainly of a large limestone treatment pond and a polishing wetland. Skelly and Loy, Inc. completed the engineering design for the project and Grguric Excavating constructed the system.

Big Run #2 Treatment System

Table 6. Big Run #2 Treatment System Average Performance		
Parameter	**Influent**	**Effluent**
Flow (gpm)	1,666	1,666
pH	5.0	6.1
Acidity (mg/L)	28.2	0.0
Alkalinity (mg/L CaCO3)	11.0	50.2
Aluminum (mg/L)	4.3	3.1
Manganese (mg/L)	1.8	1.9

Since its construction, the treatment system has received sustained flows greater than the design flow rate of 1,250 gpm. As a result, the effluent is a significant improvement over the influent water quality, but not to the level that was originally intended. The increased flow of the discharge can likely be attributed to the well-above average rainfalls experienced in the region in 2003 and 2004. During high flows, metals that have precipitated out during the treatment process are expelled from the system into the stream, rather than retained in the treatment pond. Filtered effluent has a significantly lower concentration of iron and aluminum than water coming into the system, but unfiltered effluent does not. Manganese does not differ between filtered and unfiltered samples because it is still dissolved at the pH measure exiting the treatment system.

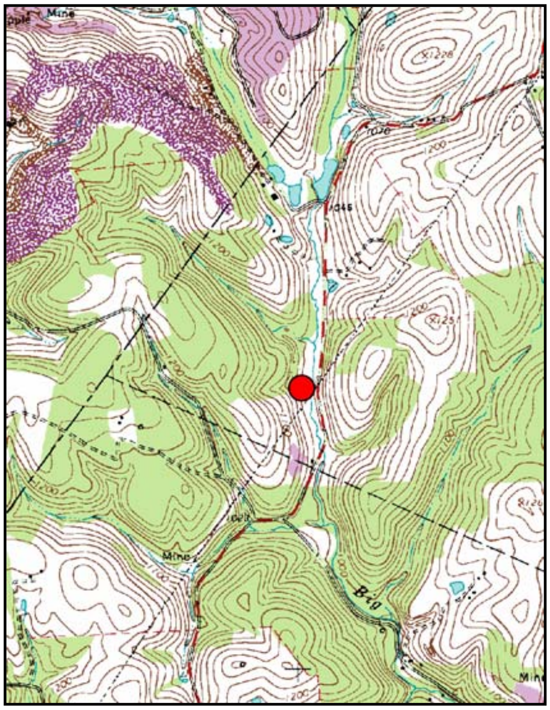
Table 7. Big Run # 2 Treatment System Comparison of Filtered and Unfiltered Samples			
Influent	Aluminum mg/L	Iron mg/L	Manganese mg/L
Unfiltered (10/24/04)	4.0	0.4	1.8
Filtered (10/28/04)	2.6	0.7	1.6
Effluent	Aluminum mg/L	Iron mg/L	Manganese mg/L
Unfiltered (10/24/04)	3.6	0.4	1.8
Filtered (10/28/04)	0.8	0.03	1.3

Conclusion

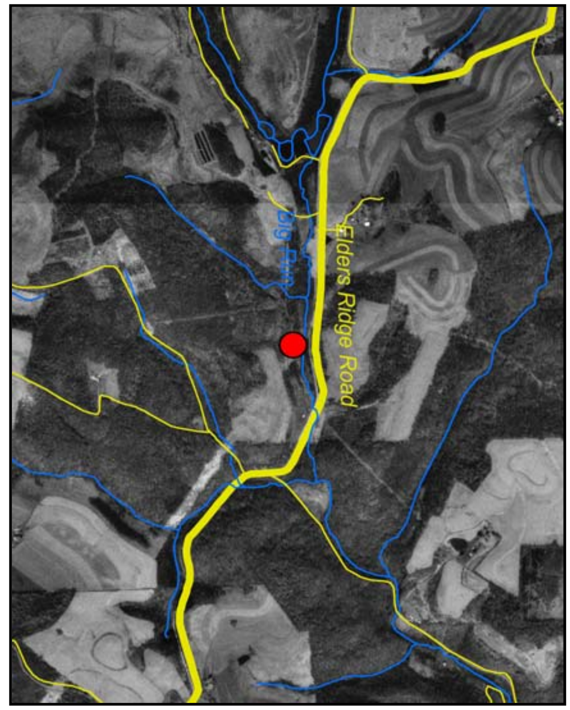
In spite of high flows, the system has continued to produce alkalinity at the rate of 144 tons/year. The BCWA has applied for a DEP Growing Greener Operation, Maintenance, and Replacement grant for additional limestone to raise the design flow rate from 1,250 gpm to 1,750 gpm. This would contribute an additional 230 tons of alkalinity per year.

BR5

This large AMD enters Big Run at stream level, directly across from a private residence. It confluences approximately 25 feet downstream of BR4, but on the opposite side of the stream. It appears to come from under a ground pipe that was routed below a small storage shed on the private residence. Acid-thriving bacteria is visible at the mouth of the AMD.



BR5 (Avonmore DRG)



BR5 (Avonmore NE and SE)

Table 8. Discharge BR5 Chemistry	
Parameter	**Average**
Flow	324.7 (n=6)
PH	3.2 (n=21)
Calculated Acidity	208.8 mg/L
Alkalinity	0 (n=19)
Iron	3.3 mg/L (n=18)
Aluminum	29.1 mg/L (n=11)
Manganese	4.5 mg/L (n=11)

Conceptual Treatment Consideration

A passive treatment, limestone pond-based approach is proposed to treat the BR5 discharge. One limestone pond will accept the BR5 discharge, contact the water with limestone, and direct the net-alkaline water to a settling pond.

A conceptual design was prepared for a limestone pond for treatment of the BR5 discharge. Only one sample showed iron concentrations greater than 5 mg/L. After weighing the risk of reduced system efficiency due to iron coating against the potential permeability problems associated with designing a vertical flow wetland for a discharge with flow rates above 300gpm, it was determined that simplified maintenance through easier access afforded by a limestone pond made it the preferable alternative.

A network of perforated pipes will be incorporated into the design to allow for the flushing of accumulated metals from the void space of the limestone pond. This flushing network will likely be separate from the primary flow outlet to minimize short-circuiting. If adequate space and hydraulic head are available, dosing siphons will be considered to passively flush the metals from the limestone pore spaces.

The limestone pond is proposed to discharge to a settling pond that will provide retention time for the oxidation, precipitation, and retention of metals. If site conditions permit, the settling pond will be sized to accommodate 2.5 times the volume of water released during a flushing operation plus 25 years of estimated sludge production.

BR6

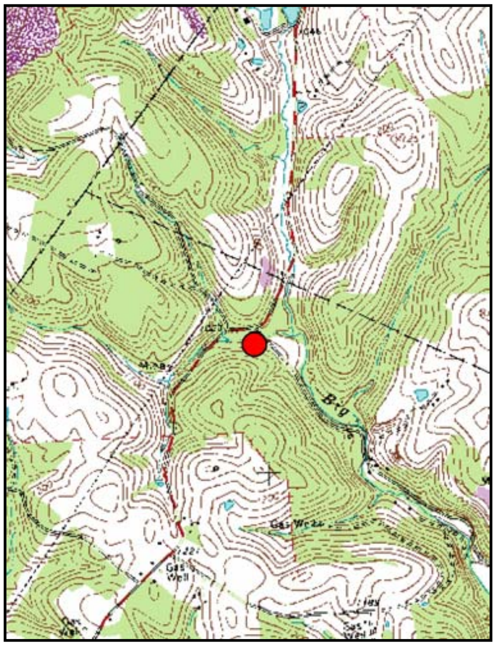
This discharge consists of two small AMD's that meet to form one discharge, which enters BR7 before being conveyed through a culvert under Sportsmen's Road. Originally, these two AMD's were considered separately by PASEC as BR5 and BR6. Because of their small size and close proximity, the discharges were combined into the BR6 discharge for the purposes of this assessment. Chemical information indicates that BR6 is not contributing a significant amount of pollution to Blacklegs Creek compared to the other discharges, and therefore it is considered a low priority.

BR7

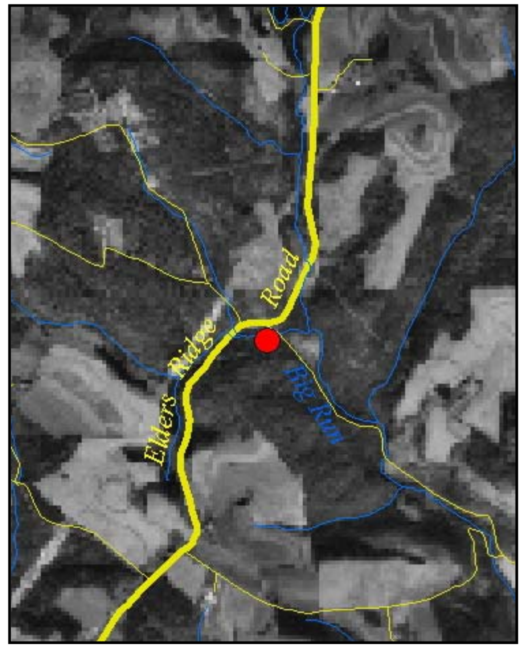
This discharge is considered a high priority due to high aluminum content, but it has low iron and low pH.

As of August 2005, a treatment system is being constructed for this discharge. The discharge initially was considered a moderate seep. After a year's worth of flow data, it was found that the flow fluctuated greatly and the average flow of this discharge is actually ~800 gpm. The flow of water capable of exiting the mine, were excavation done, was not known until tests were performed at the site prior to the building of a treatment system.

Photo of BR7



BR7 (Avonmore DRG)



Avonmore SE and NE

Conceptual Treatment Consideration

The conceptual design for treatment of this discharge includes a limestone pond. There is no specific data available to estimate the amount of alkalinity to be generated by this treatment system, although data collected for the BR4 discharge (Big Run #2 treatment system) suggests that, at average flow rates, approximately 350 tons of limestone would be dissolved. Using the design limestone volume of 5.738 tons, the contact time after 5 years would be 3 hours at the maximum flow of 1,826 gpm and 6hours at the average flow of 790 gpm.

Because only minor amounts of iron have been detected, there is a reduced threat of iron coating the limestone. Therefore, no compost is needed to lower oxygen levels prior to contact with the limestone (as in the treatment design for BR8, which includes a vertical flow wetland).

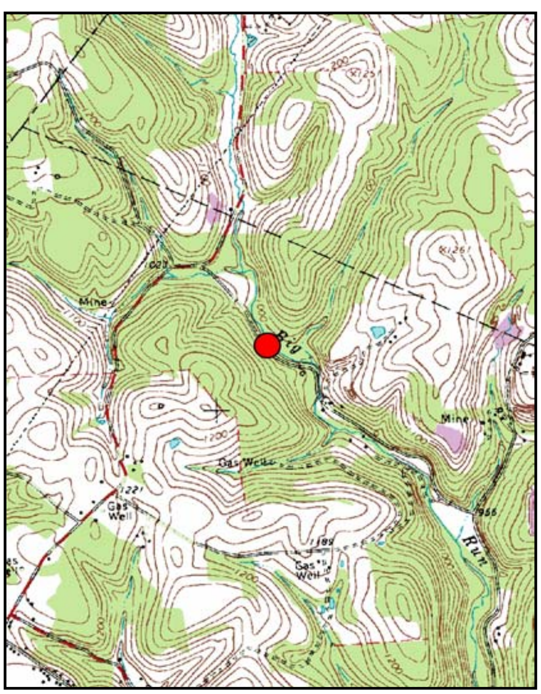
The limestone pond and initial settling pond is currently being installed near the BR7 location. A new road culvert will be installed to direct BR7 under the road, where it will be captured and transported approximately 1,000 feet to a polishing wetland using a limestone channel. Limestone in the pond will be installed to a depth of four feet. One in-line control structure will be placed in the limestone pond while another will be placed in the settling basin so that aluminum can be passively flushed through the voids in the limestone. Removing the boards in the limestone will flush the system. Prior to flushing, the settling basin will be drained and the boards replaced.

The polishing wetland on the other side of the road may also be used for parts of systems built in the future to treat BR5 and BR8.

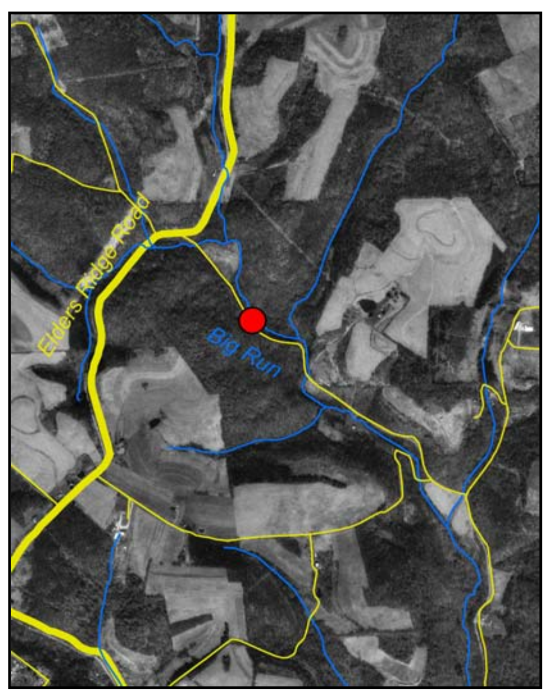
<u>BR8</u>

One of the three major AMD contributors to Big Run, this major discharge originates above the streambank on Sportsman's Road. This discharge contains a high level of both aluminum and iron. Because of the location of the discharge, which is extremely close to the stream, treatment options will involve transporting the discharge to an alternative treatment location.

Photo of BR8



B*R8 (Avonmore DRG)*



BR8 (Avonmore SE and NE)

Table 9. Discharge BR8 Chemistry	
Parameter	**Average**
Flow	898.1 (n=6)
pH	3.2 (n=27)
Calculated Acidity	231.8 mg/L
Alkalinity	0 (n=25)
Iron	20.4 mg/L (n=23)
Aluminum	26.9 mg/L (n=18)
Manganese	2.9 mg/L (n=2.9)

Conceptual Treatment Consideration

The most essential aspect of the design lies in delivering the discharge water to a suitable treatment location. Presently, the discharge emanates from a drainage heading constructed approximately 1,040 feet through bedrock from near the stream elevation to a low point in the underground mine. In order to direct the water to the proposed treatment area, a mine seal is proposed to raise the discharge elevation and allow the water to be directed to the available treatment location. To minimize the likelihood of a catastrophic blowout of the mine pool, the water elevation in all of the treatment system ponds will be lower than the coal outcrop elevation.

Geotechnical and exploratory drilling have been conducted on the proposed construction site. The drainage heading was located during the drilling and its location and orientation have been defined. In spite of the information obtained by the drilling program, the construction of a discharge capture structure in the existing drainage heading will be a significant challenge.

An upflow limestone pond-based approach is proposed for the passive treatment system to treat this discharge. One large limestone pond is proposed due to site restrictions. This limestone pond will be located adjacent to the limestone pond next to BR7. If adequate space existed, an additional pond would also be proposed. The proposed large limestone upflow pond will accept the discharge, contact the water with limestone, and direct the discharge water to a settling pond.

Coating of the limestone was considered and is a concern based on the measured concentrations of iron in BR8. By configuring the limestone pond so that the water enters from the bottom of the pond, it is believed that the limestone dissolution process may take place under anoxic or near anoxic conditions. In this anoxic state, the iron precipitation would be minimized. Furthermore, a subsurface capture of the discharge would result in minimizing ferric iron concentrations. After weighing the risk of reduced system efficiency due to iron coating against the potential permeability problems associated with designing a vertical flow wetland for a discharge with this magnitude of flow, it was determined that the easy maintenance access afforded by an upflow limestone pond made it the preferable alternative.

The upflow limestone pond will include a network of perforated pipes to flush accumulated metals from the void space of the limestone pond. This flushing network has a proposed separation from the primary flow outlet to minimize short-circuiting. The proposed limestone pond will discharge to a settling pond that will provide retention time for the oxidation, precipitation, and retention of metals. Because of this restriction, sludge removal activities will be required more frequently than the common design interval of 25 years. The settling pond will be sized based on space available at the site and may be a combined settling pond to include outflow from limestone ponds to treat BR5 and BR7. If additional treatment space can be made available, it would be advantageous to pass the discharge water through an additional limestone pond and a polishing wetland to ensure consistent system performance.

General Treatment Considerations for the Big Run subwatershed

This plan includes general conceptual treatment designs for the Big Run subwatershed. However, actual designs may change as a result of new geological and hydrological information. Due to the close proximity of BR5, BR7, and BR8 discharges and the general similarity of the treatment designs, there is the potential to direct these discharges into shared limestone ponds and/or settling ponds. This may also save money, time, and increase the ability of BCWA to maintain the systems. To date, the BCWA has met with representatives from Skelly and Loy, DEP, the Indiana Conservation District, and other vested parties to discuss these options but plans have not been finalized.

Whisky Run Subwatershed Assessment

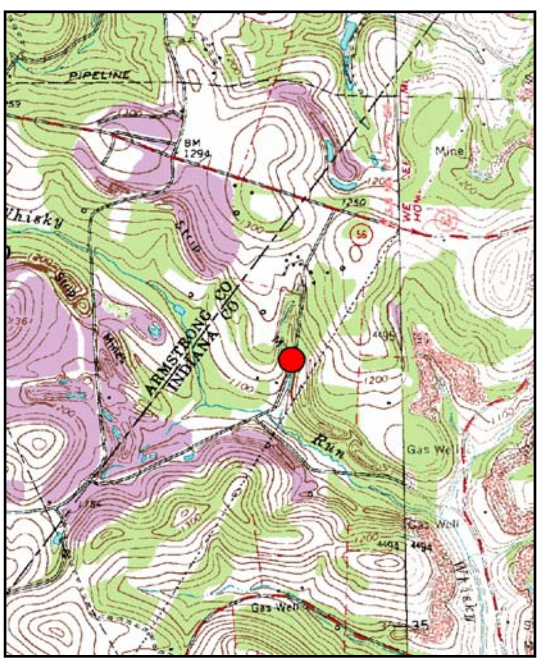
The discharges that impact Whisky Run have widely varying chemistries, ranging from highly acidic discharges with high concentrations of both iron and aluminum to discharges with circum-neutral pH and net-alkaline chemistry. However, most of the discharges are not unlike many of the other discharges in the Blacklegs Creek watershed in that they typically have low iron concentrations, moderate to high aluminum concentrations, and average pH in the range of 3 to 4.

Eleven discharges have been identified and sampled within the Whisky Run subwatershed. Sufficient data have been collected to formulate conceptual passive treatment design strategies for 10 of these 11 sites. WR10 has been sampled twice with radically different results. General design strategies were identified for WR10, and were individually based on each sample result. A description of discharges and conceptual treatment strategies follows.

WR1

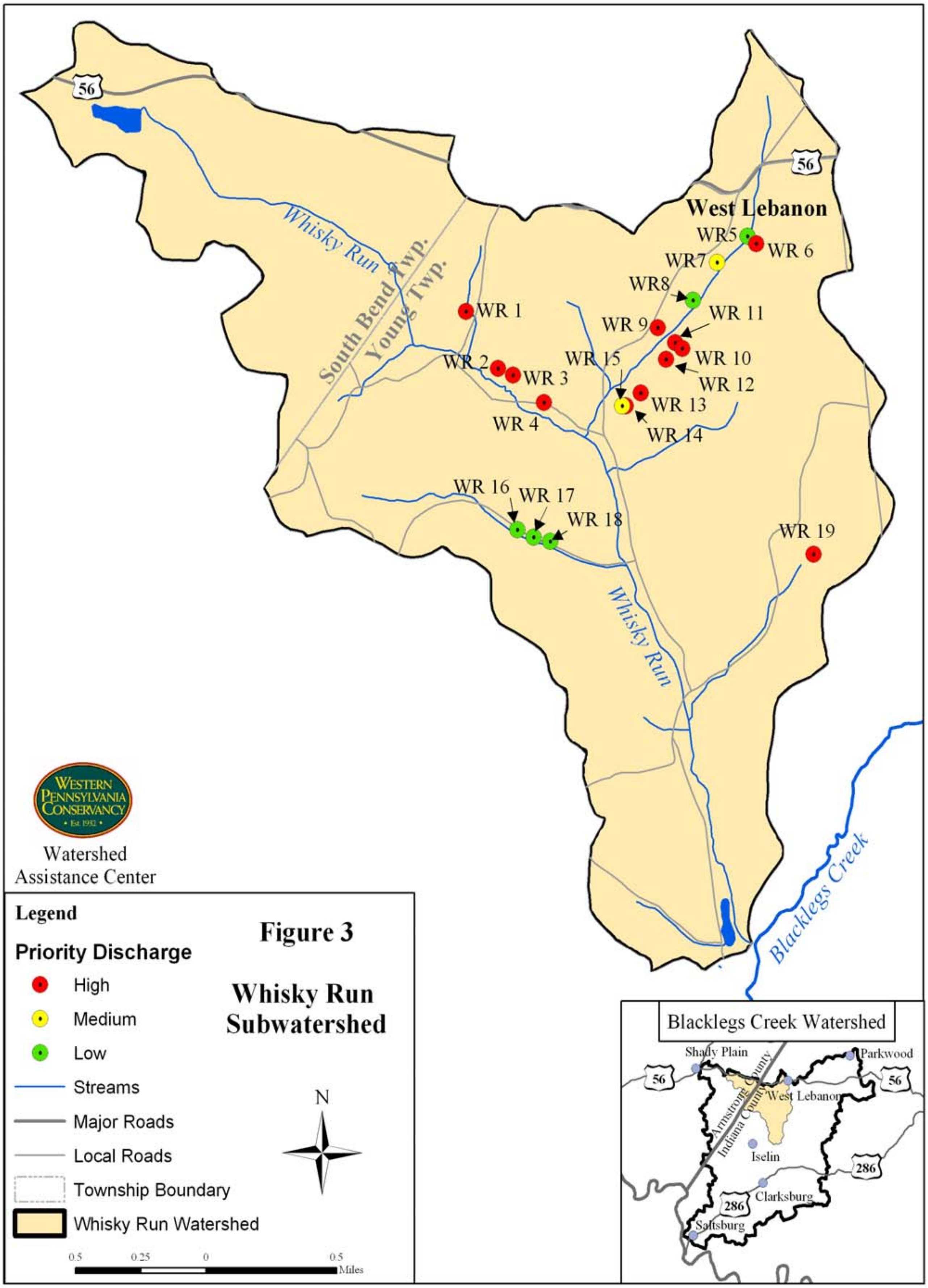
Two moderate flows join to form this discharge. Both flows appear to originate from the same mine complex, with an estimated flow of greater than 50 gpm. No iron staining is present at the site, but metals are uncertain due to low pH (3.1-3.5) tested at various points along the discharge. The discharge flows under the road and through a large wetland complex. These wetlands seem to do little to treat the discharge and will inhibit the construction of a treatment system.

Photo of WR1



WR 1 (Avonmore and McIntyre DRG)

WR1 (Avonmore NE and McIntyre)


56
56
West Lebanon
Whisky Run
South Bend Twp.
Young Twp.
WR 1
WR 2
WR 3
WR 4
WR5
WR 6
WR7
WR8
WR 9
WR 10
WR 11
WR 12
WR 13
WR 14
WR 15
WR 16
WR 17
WR 18
WR 19
Whisky Run
Blacklegs Creek
Watershed
Assistance Center
Legend
Priority Discharge
High
Medium
Low
Streams
Major Roads
Local Roads
Township Boundary
Whisky Run Watershed
Figure 3
Whisky Run
Subwatershed
N
0.5
0.25
0
0.5
Miles
Blacklegs Creek Watershed
Shady Plain
Parkwood
56
56
West Lebanon
Armstrong County
Indiana County
Iselin
286
Clarksburg
286
Saltsburg

The moderate iron concentrations in this discharge indicate the potential need to incorporate measures to prevent the armoring of the limestone with iron precipitates. For this reason, it is believed that a vertical flow wetland may be appropriate for this purpose. In addition, the high concentrations of aluminum dictate that a system for flushing aluminum precipitates from the limestone bed will be an integral part of the system. Based on the water chemistry, this discharge is a good candidate for passive treatment. However, before an appropriate system can be sized and designed for this system, it is recommended to collect flow data on a monthly basis for one year. If insufficient space exists for a vertical flow wetland, an upflow limestone may also be an option to treat this discharge.

Table 10. Discharge WR1 Chemistry

Parameter	**Average (n=8)**
Flow	Unknown
pH	3.4
Calculated Acidity	125.8 mg/L
Alkalinity	0
Iron	2.7 mg/L
Aluminum	15.2 mg/L
Manganese	8.5 mg/L

WR2

This discharge comes from a mine opening off of Pony Road and seeps down a hillside until it enters a long wetland complex. It is adjacent to discharge WR3. A sample station has been established where a weir is already present.

Photo of WR2

WR2 (Avonmore DRG)

WR2 (Avonmore SE and NE)

Conceptual Treatment Consideration

The low concentrations of iron in this discharge reduce the need for a vertical flow wetland type system. In this case, it is believed that a limestone pond is appropriate for passive treatment. In addition, the high concentrations of aluminum indicate that a system for flushing aluminum precipitates from the limestone bed will be required. Based on the water chemistry, this discharge is a good candidate for passive treatment. However, before an appropriate system can be sized and designed for this system, it is recommended that flow data should be collected on a monthly basis for one year. Due to its proximity to WR3, it may be possible to treat both of these discharges at a single location with a single treatment system. This approach would have several advantages, including a smaller footprint and simplified monitoring and maintenance requirements.

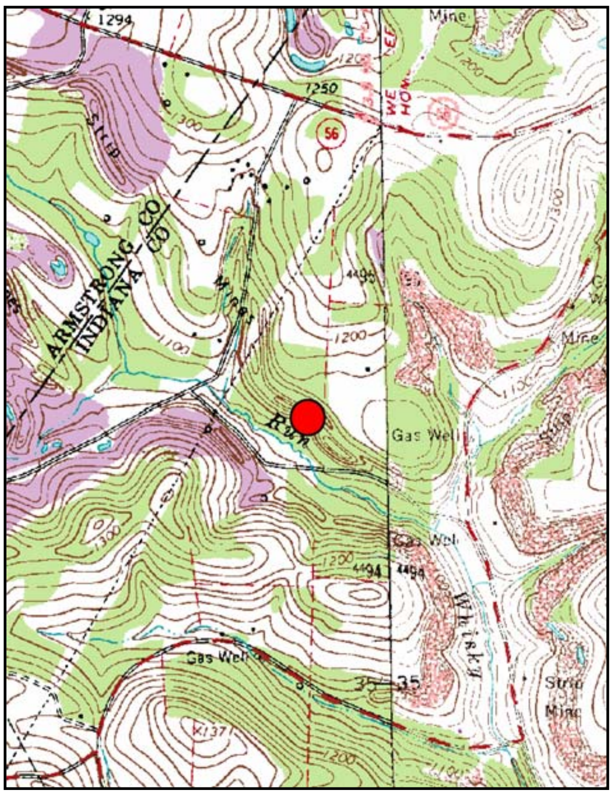
Table 11. Discharge WR2 Chemistry

Parameter	Average (n=9)
Flow	Unknown
pH	3.4
Calculated Acidity	117.2 mg/L
Alkalinity	0
Iron	1.0 mg/L
Aluminum	12.1 mg/L
Manganese	15.3 mg/L

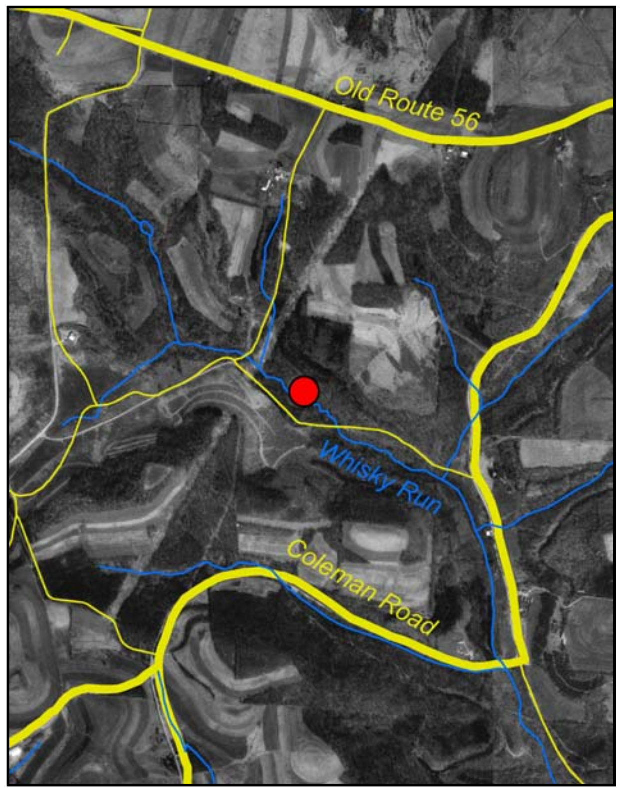
WR3

This major discharge emanates from an abandoned deep mine opening. Flow is estimated at 75-100 gpm. The discharge is adjacent to WR2. Treatment area is limited due to this AMD flowing into a very large wetland complex. There is a small AMD seep next to the discharge originating from the same mine pool.

Photo of WR3



WR 3 (Avonmore DRG)



WR 3 (Avonmore NE and McIntyre NW)

Conceptual Treatment Consideration

The type of passive treatment system recommended for this discharge is a limestone pond. Moderate concentrations of aluminum are present and must be flushed from the passive treatment system to ensure longevity. Based on the water chemistry, this discharge is a good candidate for passive treatment. However, before an appropriate system can be sized and designed for this system, it is recommended to collect flow data on a monthly basis for one year.

Due to its proximity to WR2, it may be possible to treat both of these discharges at a single location with a single treatment system. This approach would have several advantages, including a smaller footprint and simplified monitoring and maintenance requirements.

Table 12. Discharge WR3 Chemistry	
Parameter	**Average (n=9)**
Flow	18.6 gpm (n=7)
PH	3.5
Calculated Acidity	72.9 mg/L
Alkalinity	0
Iron	1.1 mg/L
Aluminum	4.7 mg/L
Manganese	15.7 mg/L

<u>WR4</u>

This AMD is located adjacent to a large wetland complex and enters a tributary of Whisky Run downstream of WR2 and WR3. The seep is located adjacent to and travels along Pony Road before entering the tributary. A weir is present on the site. This site is a low priority due to its low flow and minimal impact to Whisky Run.

Photo of WR 4

<u>WR5</u>

This discharge originates as a seep with a pH of 4.7. A mining company is currently treating this discharge with a limestone treatment system. There is some iron staining of the limestone. The pH of the effluent from the treatment system is ~6.6. The discharge is being released through an elbow pipe facing upwards, which provides aeration. This discharge is a low priority because it is already being treated successfully.

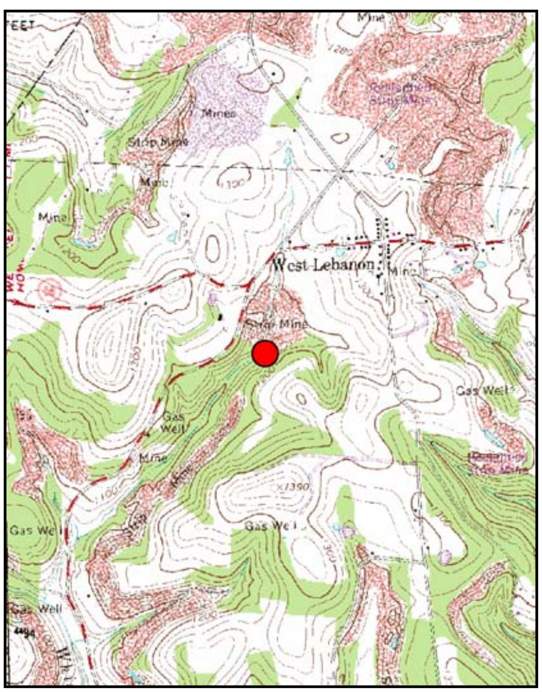
Photo of WR5 Discharge

Photo of WR5 Treatment System

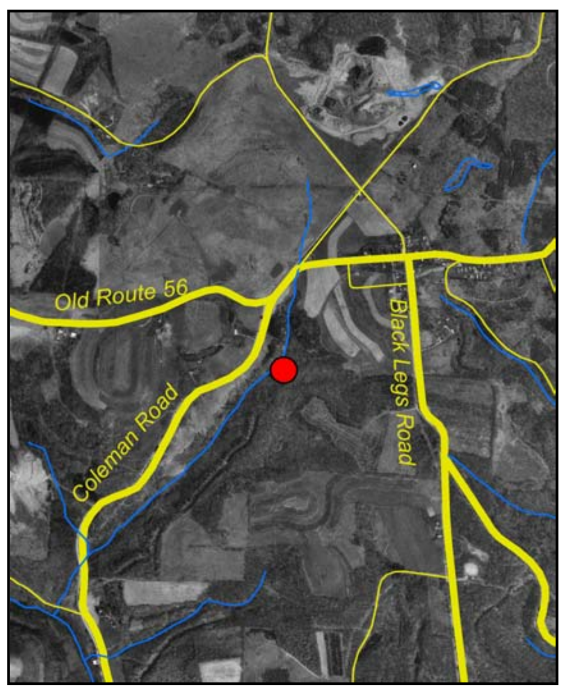
WR6

This discharge of moderate flow emanates from an abandoned mine opening. Estimated flow is less than 10 gpm. The pH of the discharge is approximately 3.3. The discharge flows 150 feet to the stream through what appears to be a constructed channel. The flow has caused a large wetland area to develop, limiting treatment options. The mainstem of the stream is showing significant metal deposits, mainly aluminum.

Photo of WR6



Avonmore and McIntyre DRG (1:24,000)



Avonmore and McIntyre NW DOQQ (1:24,000)

Table 13. Discharge WR6 Chemistry	
Parameter	**Average (n=4)**
Flow	Unknown
pH	3.5
Calculated Acidity	164.7 mg/L
Alkalinity*	0
Iron	31.7 mg/L
Aluminum	6.6 mg/L
Manganese	22.8 mg/L

Conceptual Treatment Consideration

The high iron concentrations in this discharge dictate the need to incorporate measures to prevent the armoring of the limestone with iron precipitates. In this case, it is believed that a vertical flow wetland is an appropriate choice for passive treatment. Complicating the treatment system design are moderate concentrations of aluminum. Therefore, a system for flushing aluminum precipitates from the limestone bed will also be required. Based on the water chemistry, this discharge is a good candidate for passive treatment. However, the space limitations in designing a system may prove challenging.

<u>WR 7</u>

This very small seep originates from the base of a reclaimed strip mine. The pH of the discharge is 3.1 and the flow is estimated at less than 5 gpm. The discharge flows over a small tram road approximately 200 feet until it reaches the stream. There is some area available for treatment, but the site is not considered a high priority due to its minimal impact on the receiving stream.

Photo of WR7

<u>WR8</u>

This small seep originates at the base of a reclaimed strip mine, with the discharge seeping out at various points along the hillside next to an adjacent gas well. The pH of the discharge is ~6.1, but there is a significant amount of iron present. Flow is less than 1 gpm. Due to the low flow, this is not a priority site.

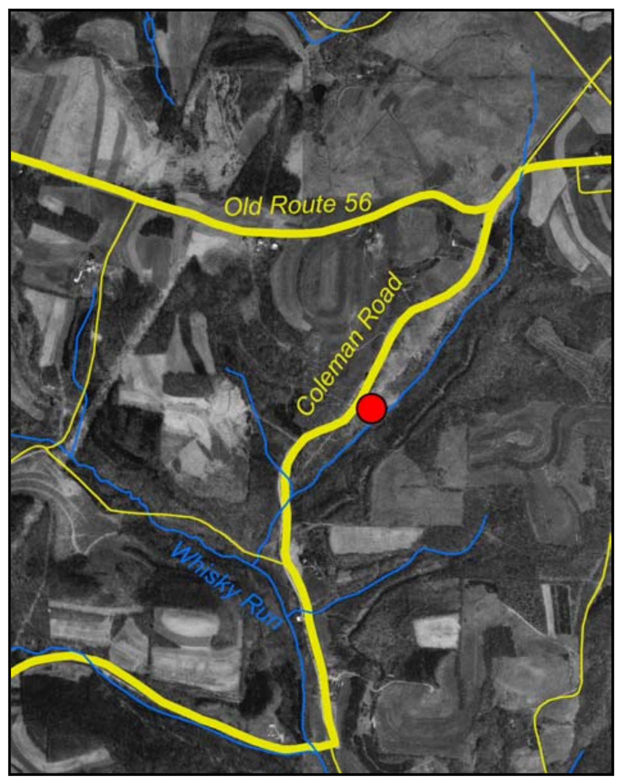
Photo of WR8

WR9

This major discharge exits an old mine opening located near a bony pile and travels approximately 50 yards before entering a tributary to Whisky Run. High levels of aluminum and iron are present.

Photo of WR9

WR9 (Avonmore and McIntyre DRG)



WR 9 (Avonmore NE and McIntyre NW)

Table 14. Discharge WR9 Chemistry	
Parameter	**Average (n=14)**
Flow	361.0 gpm (n=5)
pH	5.9
Calculated Acidity	40.9 mg/L
Alkalinity	67.3 mg/L
Iron	2.1 mg/L
Aluminum	3.4 mg/L
Manganese	9.5 mg/L

Conceptual Treatment Consideration

At the pH observed for this discharge, all that may be required for treatment is alkalinity addition combined with aeration to promote metals precipitation and ponds and/or wetlands for metals precipitation. A limestone-lined channel may serve to aerate the discharge water while adding additional alkalinity and directing the discharge water to a settling pond. In the settling pond, metals will oxidize, precipitate, and settle within the pond. If site conditions permit, additional channels and ponds may be constructed with an aerobic wetland for final metals polishing at the end of the system. The system would be designed to balance metals retention and the potential to create thermal conditions unsuitable for trout due to long residence times within the ponds. This condition could be enhanced by utilization of a buried limestone bed as the last system component to add excess alkalinity and serve to cool the water prior to discharge. Although some flow data are available for this site, it is recommended to collect additional data prior to proceeding with a detailed design or cost estimate.

Treatment Status

As of the time of this report, a grant proposal has been submitted to DEP's Growing Greener Program to fund the design, construction package, and pre-permitting tasks associated with Phase I of this treatment system. This specifically includes site characterization, map development, hydrological investigation, system design, specifications, pre-permitting tasks, and meetings. Based on February 2005 measurements of filtered and unfiltered water samples, it was found that the conceptual design including a settling pond, followed by an alkaline-amended aerobic wetland, will be appropriate for this discharge. If the grant proposal is approved, additional samples for total and dissolved metals will be taken to confirm the appropriateness of this design. Preliminary data indicates that Discharges WR1, WR2, WR3, and WR9 may be part of the same mine pool. Hydrological investigations will determine whether it is possible to get any of these other discharges to emerge at the WR9 location, which may beneficial given that there is little room for treatment at these other sites. Robindale Energy currently owns the property adjacent to WR9 and is planning on having the refuse at the site removed by 2008. Given this information and the further investigation that is needed, a treatment system is tentatively scheduled for construction in 2008.

WR10

This small seep is located adjacent to a tributary of Whisky Run. Located about 10 yards from site WR11, site WR10 is dry during much of the year and has a low flow. It is considered a low priority.

Photo of WR10

WR11

This discharge emanates from a mine opening on a reclaimed strip mine site. The discharge flows at least 100 yards before entering a tributary to Whisky Run. It travels through a wooded area behind a large coal refuse pile that has been turned into an illegal garbage dump. The discharge shows the presence of aluminum.

Table 15. Discharge WR11 Chemistry	
Parameter	**Average (n=5)**
Flow	Unknown
pH	4.4
Calculated Acidity	40.9 mg/L
Alkalinity	7.0 mg/L
Iron	1.2 mg/L
Aluminum	14.5 mg/L
Manganese	6.2 mg/L

Photo of WR11

Conceptual Treatment Consideration

The low average iron concentrations indicate that a vertical flow wetland-type system may not be required. However, one sample collected showed an anomalously high iron concentration, resulting in a somewhat misleading average iron concentration. Excluding this sample from the average produces an average iron concentration of 0.6 mg/L. It is believed that a limestone pond may be appropriate for treatment of this discharge. Elevated levels of aluminum indicate that a flushing system for aluminum precipitates is necessary. Based on the water chemistry, this discharge is a good candidate for passive treatment. However, before an appropriate system can be sized and designed for this discharge, it is recommended to collect flow data on a monthly basis for one year.

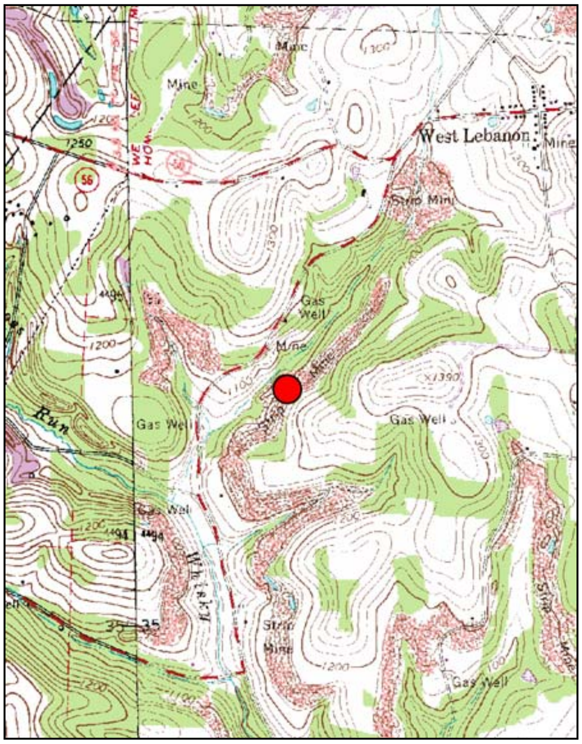
WR11 (Avonmore and McIntyre DRG)

WR11 (Avonmore NE and McIntyre NW)

WR12

This discharge consists of a large seep originating from behind a bony pile. The discharge has significant filamentous algal growth. This discharge comes out of the hillside at several locations. The treatment options are limited due to the presence of the bony pile. However, there is the possibility of removing the coal refuse, which may allow for suitable area to treat the water.

Photo of WR12



WR12 (Avonmore and McIntyre DRG)

WR12 (Avonmore NE and McIntyre NW)

Table 16. Discharge WR12 Chemistry	
Parameter	**Average (n=5)**
Flow	Unknown
pH	3.4
Calculated Acidity	139.1 mg/L
Alkalinity	0
Iron	0.9 mg/L
Aluminum	19.0 mg/L
Manganese	6.4 mg/L

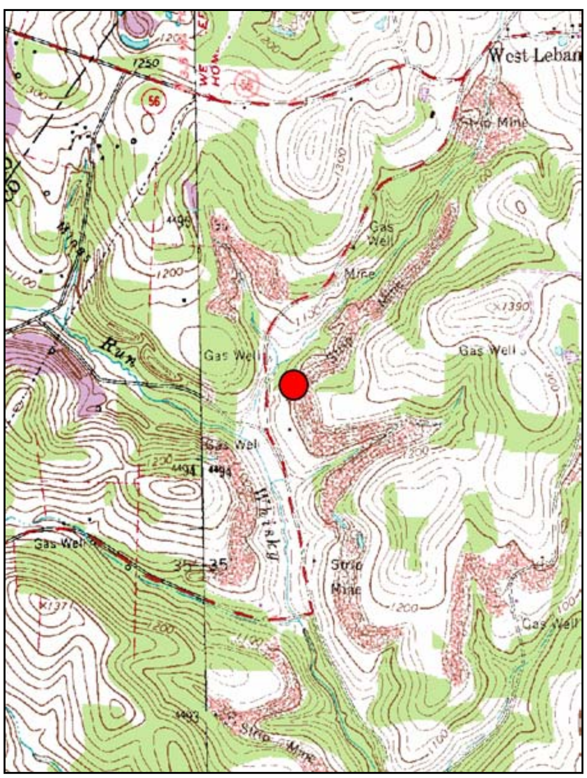
Conceptual Treatment Consideration

It is believed that a limestone pond is appropriate for the treatment of this discharge. Elevated concentrations of aluminum indicate that a system for flushing aluminum precipitates from the limestone bed will be required. Based on the water chemistry, this discharge is a good candidate for passive treatment. However, before an appropriate system can be sized and designed for this system, it is recommended to collect flow data on a monthly basis for one year.

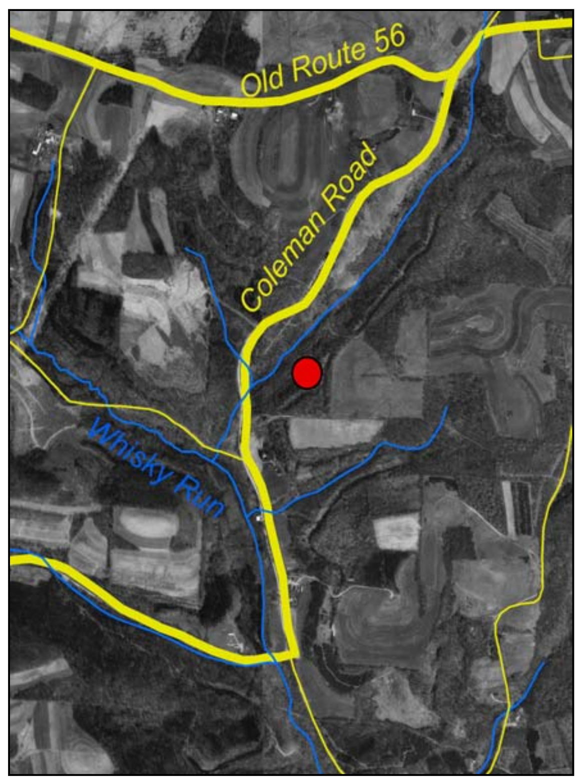
WR13

This discharge is located near a Bureau of Abandoned Mine Reclamation (BAMR) project and travels a approximately 300 yards to a tributary of Whisky Run. The flow of this highly acidic discharge (pH~3.5) is less than 5 gpm. A large wetland area, fed by the AMD, lies adjacent to this discharge.

Photo of WR13



WR13 (Avonmore and McIntyre DRG)



WR13 (Avonmore NE and McIntyre NW)

Table 17. Discharge WR13 Chemistry	
Parameter	**Average (n=5)**
Flow	Unknown
pH	3.3
Calculated Acidity	160.3 mg/L
Alkalinity	0
Iron	6.0 mg/L
Aluminum	20.0 mg/L
Manganese	5.9 mg/L

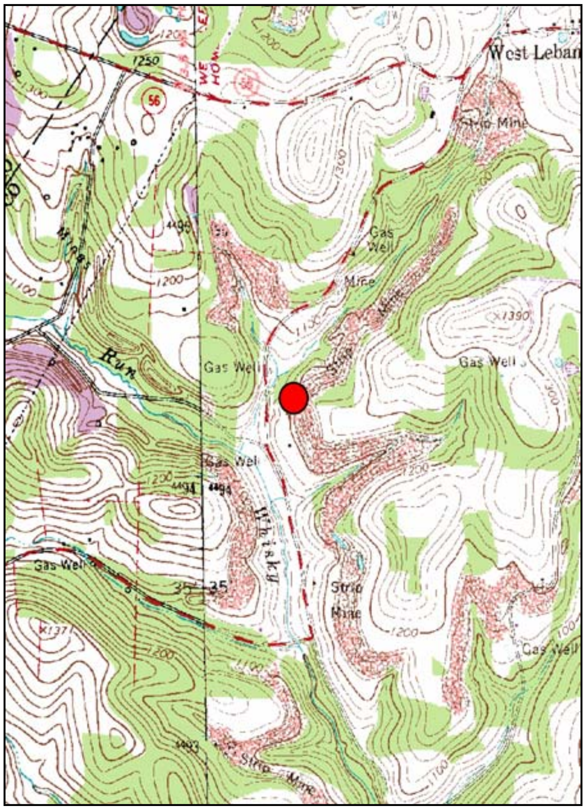
Conceptual Treatment Consideration

The elevated iron concentrations in this discharge dictate the need to incorporate measures to prevent the armoring of the limestone with iron precipitates. In this case, it is believed that a vertical flow wetland may be appropriate for this purpose. In addition, the high concentrations of aluminum require an aggressive system for flushing aluminum precipitates from the limestone bed. However, based on the water chemistry, this discharge is still a good candidate for passive treatment. Before an appropriate system can be sized and designed for this discharge, it is recommended to collect flow data on a monthly basis for one year.

<u>WR14</u>

This discharge is a seep that joins WR13 and flows more than 300 yards before entering a tributary of Whisky Run. The flow of this highly acidic pH is estimated to be around 5-10 gpm. Treatment options are limited, due to other discharges running alongside of WR14. There is the potential to treat both discharges at the same time. The discharge is located within a forested area with some wetlands present.

Photo of WR14



WR14 (Avonmore and McIntyre DRG) ***WR14 Avonmore NE and McIntyre NW***

Table 18. Discharge WR 14 Chemistry	
Parameter	**Average (n=4)**
Flow	Unknown
pH	3.4
Calculated Acidity	105.3 mg/L
Alkalinity	0
Iron	0.4 mg/L
Aluminum	13.8 mg/L
Manganese	4.3 mg/L

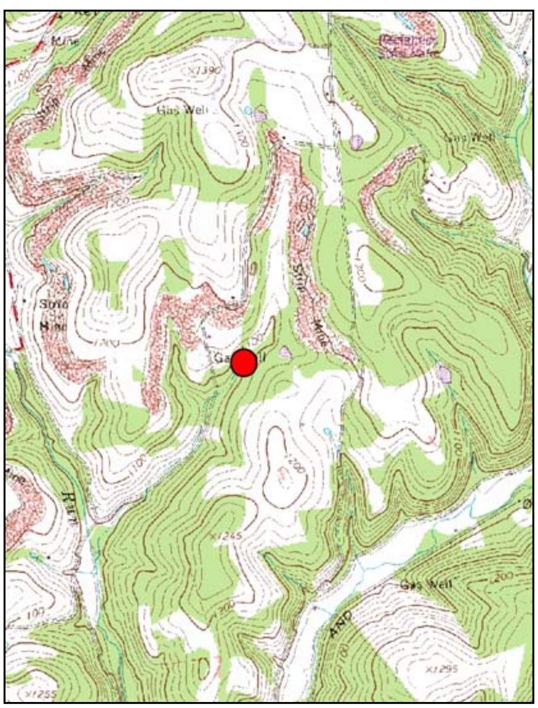
Conceptual Treatment Consideration

The combination of low iron and high aluminum in this discharge indicate that a limestone pond may be appropriate for treatment of this discharge. Aluminum flushing will be an integral part of this passive treatment system. Based on the water chemistry, this discharge is a good candidate for passive treatment. However, before an appropriate system can be sized and designed for this discharge, it is recommended to collect flow data on a monthly basis for one year.

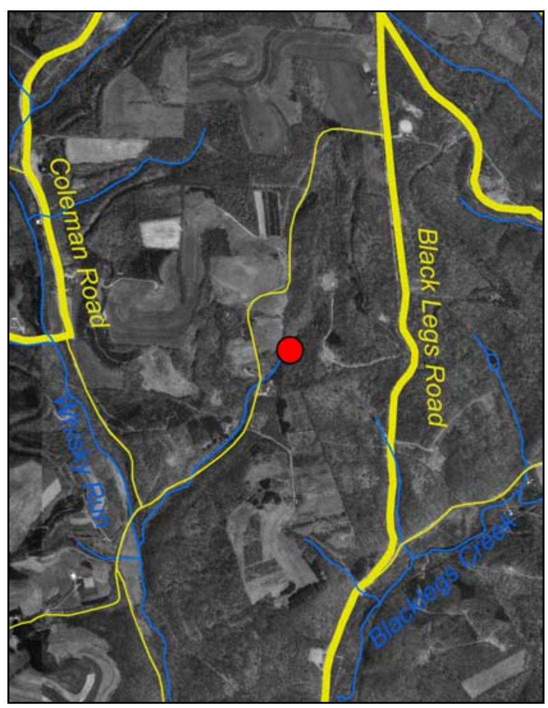
WR19

This discharge originates at an old "burn out" bony pile. The pH is ~4.14 and the estimated flow is estimated at 50-100 gpm. A significant amount of burnt coal refuse lies within the valley. Prior to mining, this was a freshwater stream, but this waterway is currently considered "dead." The area surrounding the discharge consists of a large wetland complex, leaving little opportunity for treatment near the discharge site. There is no defined discharge location, rather several small seeps coming together to produce the flow.

Photo of WR19



WR19 (McIntyre DRG)



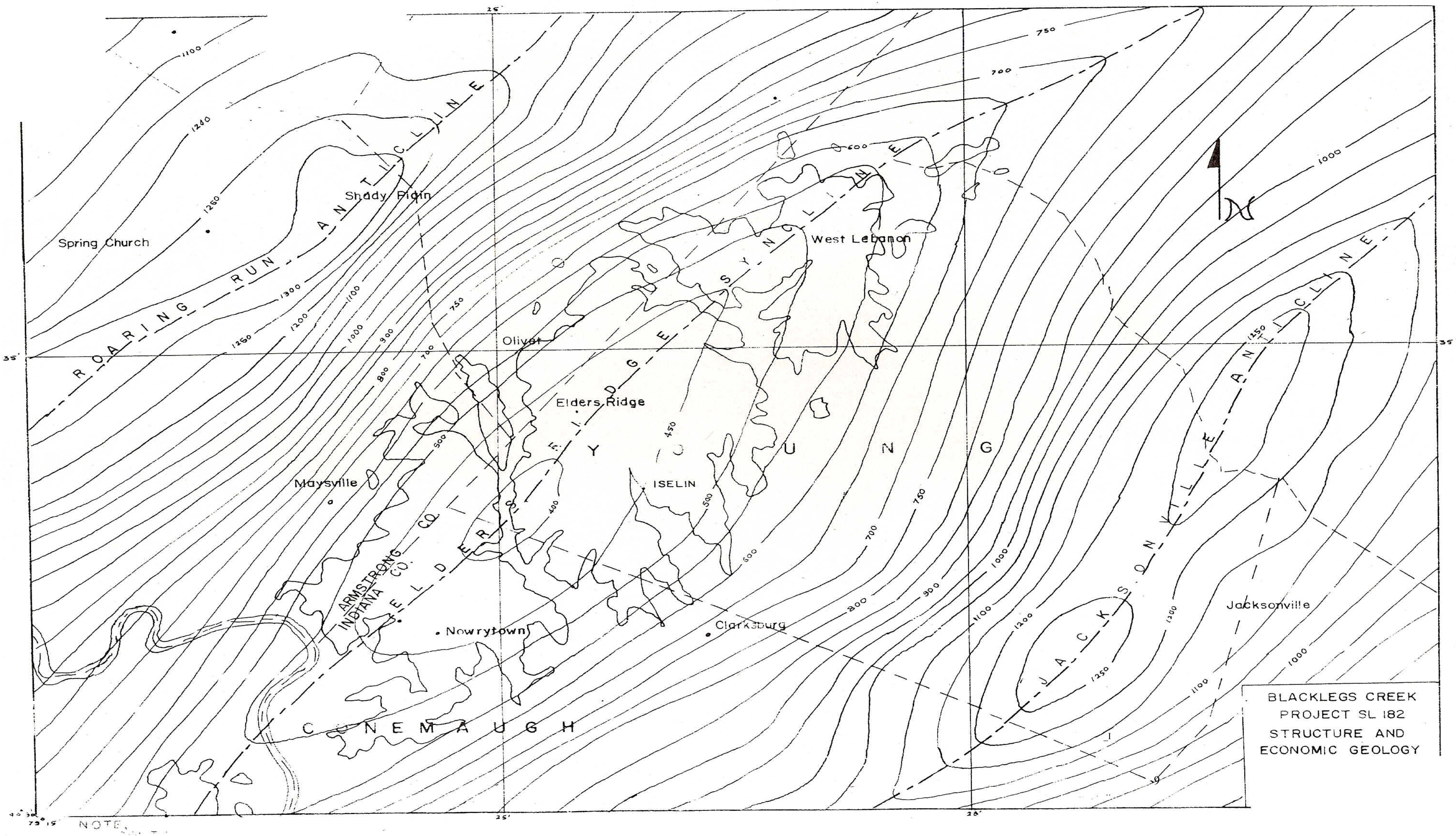
WR19 (McIntyre NW)

Table 19. Discharge WR19 Chemistry	
Parameter	**Average (n=4)**
Flow	Unknown
pH	6.3
Calculated Acidity	105.3 mg/L
Alkalinity	96.3 mg/L
Iron	2.9 mg/L
Aluminum	5.5 mg/L
Manganese	1.4 mg/L

Conceptual Treatment Consideration

The water quality data from the few samples taken thus far are highly variable for this discharge. Most of the samples indicated that the discharge is net alkaline. However, one of the samples shows strongly acidic chemistry. Based on the net alkaline results, a limestone-lined channel is suggested to aerate the discharge water while adding additional alkalinity and directing the discharge water to a settling pond. In the settling pond, metals will oxidize, precipitate, and settle within the pond. If site conditions permit, additional channels and ponds will be constructed with an aerobic wetland for final metals polishing on the tail end of the system. In addition, due to its variable chemistry, it is recommended that a limestone pond be incorporated at the downstream end of the system. This limestone pond could be buried to reduce impacts of thermal warming and would ensure consistent alkaline system effluent despite variation of the influent. The system will be designed to balance metals retention and the potential to create thermal conditions unsuitable for trout due to long residence times within the ponds. Although some flow data are available for this site, additional data are required prior to proceeding to advanced stages of design.

Appendix A. Structure and Economic Geology Map



Appendix B. Background Water Chemistry--Big Run Subwatershed

Big Run (old #1)--in Stream Sample
40 33' 1.2 N, 79 24' 53.5 W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L	mg/L	mg/L			mgL	mg/L	gpm
5/25/1999	6.7	1230		40	1.01			0	0.84	0.69	
6/28/1999	5.9		1790	48	0.4		0				
7/28/1999	6.6	>200	1972	21	0.8		55				
7/29/1999	7			94	1.1			0	1.45	1.91	
9/21/1999	7.7		1207	34.2	0.8		41				
10/28/1999	5.7		1562								
11/11/1999	6.4		1217	61.6	0.7		48				
3/22/2000	6.6	148		28	0.92			0	1.23	0.38	
4/19/2000	6.3		740	102.6	0.6		86				
7/6/2000	7.1	839		70	0.57			0	0.87	2.96	
10/13/2000	7		1054	51.3	0.9		34				
11/8/2001	7.1	>200	1402	102.6	0.85		41		1	0.4	
4/21/2002	6.2	410	995	74	0.52	0.05		0	0.44	1.2	normal

Big Run #4 (old #2)
40 32' 59.7" N, 79 24' 53.5"W

Date	pH	S04	Conduct.	Alkalinity	T. Fe	Fe+2	T. Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	gpm
5/25/1999	5.2	523		14	0.44			0	3.32	1.72	
6/18/1999	5.4		752	34.2	0		103				
6/28/1999	5.3		766	7	0.4		89				
7/15/1999	5.2		1020	12			57				897
7/28/1999	4.5	>200	757	14	0.06		89				1889
7/29/1999	5.2			11.2	0.33			3	2.89	1.5	
9/21/1999	5.5		973	21	0.4		89				830
10/28/1999	5.3		1010								1360
11/11/1999	5.4		1059	13.7	0.4		109				
3/22/2000	5.2	449		10.2	1.01			1	3.67	1.14	
4/11/2000	5.4										4741
4/19/2000	5.2			17.1	1.2		103				
7/6/2000	5.4	552		12.2	0.42			0	3.33	1.54	
8/8/2000											3410
10/13/2000	6.1		976	34.2	1.1		109				normal
7/12/2001	5.6	603	840	14.4	0.36	0.09		22	2.67	1.45	normal

Big Run #4 (Old #2) Continued

Date	pH	S04	Conduct.	Alkalinity	T. Fe	Fe+2	T. Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	gpm
10/30/2001	5.5	540	1020	34.2	1.2		90		2.64	1.7	normal
2/9/2002	4.8	460	996	2.6	0.5	0.1		49	2.83	0.9	normal
4/21/2002	5.5	490	1102	10	0.45	0.11		0	2.9	1.1	normal
7/14/2002	5.1	521	1020	9.2	1.49	0.36		39	3.69	1.79	normal
10/27/2002	4.8	500	1088	4	0.27	0.13		68	3	1.29	normal
11/24/2003											4688
1/13/2004	4.1	548	1270	2	6		115		17	2	v.high
2/18/2004	4.7	487	1230	8	1.16		32		7.76	2.4	high

Big Run #5 (Old #3)
40 32' 58.7N, 79 24' 54.5"W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	F3+2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	gpm
6/18/1999	3.1		1400	0	2.4		239				
6/28/1999	3.6		1388	0	3		226				
7/15/1999	3.1		1870	0			280				66.4
7/28/1999	3.3	>200	1550	0	3.4		257				379
7/29/1999	3.1			0	3.57			282	34.3	5.23	
9/21/1999	3.3		1999+	0	4.2		239				128
10/28/1999	3.2		1999+								
11/11/1999	3.2		1999+	0	5.4		342				
3/22/2000	3.1	823		0	2.52			173	20.4	4.47	
4/11/2000	3.2										334
4/19/2000	3.3		1501	0	2.5		205				691
7/6/2000	3.1			0	3.02			232	32	4.2	
8/8/2000											350
10/13/2000	3.2		1900	0	3.6		291				
7/12/2001	3.1	866	1426	0	3.2	0.15		262	29.3	4.27	normal
11/7/2001	3	880	1940	0	3.9		352		28.7	4.3	usual
2/9/2002	3.1	1109	1950	0	3.54	0.33	101	298	34.3	6.04	usual
4/21/2002	3.1	910	1920	0	3.62	0.2	100	262	29.2	5.51	usual
7/14/2002	3.2	813	1720	0	3.4	0.21		254	31	3.8	usual
5/27/2003	3	936	1770	0	2.99		264		30	3.52	usual
8/28/2003	3.3	850	1620	0	2.79		178		24.1	3.75	usual
10/7/2003	3.4	871	1680	0	2.71		188		26.4	3.89	usual

Big Run (Old #4)--in Stream
40 32' 54.8"N, 79 24' 54.2"W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe+3	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L	mg/L	Fe+2			mg/L	mg/L	gpm
7/28/1999	4.1	>200	1064	0	1.2		103				
7/29/1999	6.4			54	1.34			0	3.69	2.27	
9/21/1999	5.7		1612	0	0.8		75				
10/28/1999	5.6		1360				82				
11/11/1999	5.3		1310	0	0.8		342				
3/22/2000	6.3	164		24	1.04			0	1.8	0.54	
4/11/2000	5.6										17765
4/19/2000	5.3		899	0	0.7		68				
7/6/2000	4.7	564		2.8	0.99			36	8.1	2.34	
8/8/2000											12247
10/13/2000	5.7		1049	0	0.6		120				normal
11/7/2001		>200	1330	0	1.2		240		7	2.2	low
4/12/2002	5.6	>200	1003	5	1.35	0.12	60		2.32	3.1	normal
4/21/2002	5.8	503	996	22	1	0.12			4.16	1.71	normal
5/11/2002	6	>200	654	30	0.2	0.06	20		0.29	1.4	16965
6/8/2002	6.7	330	660	20	0.58	0.11	80		1	2.3	high
7/14/2002	4.5	>200	1280	5	1.13	0.34	100		7.49	3	low
7/14/2002	4.6	739	1280	2.8	1.09	0.3		69	7.43	2.47	low
10/14/2002	5.9	>200	1420	10	0.58	0.16	40		0.28	3	low
10/27/2002	6.1	640	1231	40	0.72	0.27		3	3.35	2	low
3/25/2003	5.9	>200	949	5	0.63	0.12	40		0.72	2.3	high

Big Run (Old #5)--in Stream
40 32' 50.3"N, 79 25' 8.9"W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe+2	T. Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	gpm
6/28/1999	4.4		897	0	2		188				
7/28/1999	3.5	>200	946	0	2		188				trickle
7/29/1999	4.4			0	1.28			110	17	3	
9/21/1999	4.6		972	0	1.2		171				v. low
10/28/1999	4.9		789								v. low
11/11/1999	5		796	0	0.8		82				v. low
3/22/2000	6.5	34		19	0.32			0	0.53	0.04	
4/11/2000	6.2										389
4/19/2000	6.5		218	17.1	0		34				high

Big Run (Old # 5)--in Stream Continued

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe+2	T. Acidity	Lab Acidity	Al	Mn	Water Flow
7/6/2000	3.9	384		0	1.46			146	25.4	2.72	gpm
8/8/2000											816
10/13/2000	5.3		436	34.2	0.4		34				normal
7/12/2001	4	419	694	0	1.27	0.54		149	18.3	2.53	low
2/9/2002	5.5	167	708	5	1.48	1.48		27	3.19	1.44	low
4/21/2002	5.5	>200	310	0	0.9		60		6.5	1.3	high

Big Run #6
40 32' 51.1"N, 79 25' 7.8"W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe	T. Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	gpm
6/28/1999	5.5		545	41	0.8		17				
7/28/1999	5.1	>200	510	55	1.4		41				v. slow
7/29/1999	6.7			36	4.29			0	6.22	0.27	
9/21/1999	6.4		638	21	0.6		41				v. low
10/28/1999	5.7		601								v.slow
11/11/1999	5.5		613	2	0.8		48				trickle
3/22/2000	6.6	39		28	0.53			0	0.54	0.03	high
4/11/2000	5.8										545
4/19/2000	6.1		245	51.3	0		34				
7/6/2000	6.9	65		56	0.09			0	0.41	0.1	
8/8/2000											1082
10/13/2000	6.7		340	17.1	1.2		68				normal
7/12/2001	6.8	126	404	50	1.75	0.05		0	<.2	0.21	low
2/9/2002	6.9	63	510	34	0.06	<.02		0	<.2	0.04	low
4/21/2002	6.1	54	317	48	0.34	0.32		0	0.34	0.08	high

Big Run #7
40 32' 50.7"N, 79 25' 3.5"W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe+2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
6/28/1999	3.6			0	1.2		137				
7/28/1999	3.6	>200	876	0	1.8		120				473
7/29/1999	3.4			0	1.79			132	14.6	2.4	
9/21/1999	2.7		1148	0	2.8		188				50
10/28/1999	3.5		1080								7

Big Run #7 Continued

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe+2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
11/11/1999	3.3		1317	0	1.8		222				2
3/22/2000	3.3	396		0	1.01			108	12.6	2.26	
4/11/2000	3.3										1240
4/19/2000	3.5		1045	0	0.8		171				1392
7/6/2000	3.4	441		0	1.63			124	16.5	2.34	
8/8/2000											1026
10/13/2000	3.4		1118	0	4		188				v. high
7/12/2001	3.4	426	918	0	2.39	0.17		132	14.5	2.53	low
10/30/2001	3.3	>200	1260	0	3		220		13	2.1	v low
2/9/2002	4.2	531	1190	0	2.12	1.93		99	8.22	3.68	low
4/21/2002	3.6	439	1019	0	0.59	0.53	31	147	16.3	2.48	1826
7/14/2002	3.4	484	890	0	1.01	0.6		165	16.2	2.43	
7/15/2002	-	-	-	-	-	-	-	-	-	-	1103
10/27/2002	3.2	539	1374	0	2.81	0.24		225	25.9	3.45	low
1/31/2003	3.3	488	1150	0	1.45	0.13		179	17.8	2.81	703
4/27/2003	3.3		1047	0	1.15	0.24		109	12	1.96	1595
5/27/2003	3.3	533	1060	0	1.42		138		15.1	2.23	
6/25/2003	3.4	531	1020	0	1.77		120		15.1	2.04	
8/3/2003	3.3	481	1088	0	2.84	0.31		134	15.5	2.53	1603
8/28/2003	3.3	507	1170	0	3.83		135		17.6	2.86	
10/1/2003	3.3	521	1220	0	4.71		152		20.2	3.02	940
10/25/2003	3.5	539	1130	0	4.61	0.46	169		17.4	2.71	1283
1/7/2004											5827
1/13/2004	3.6	474	965	0	0.67		98		9.91	1.94	3907
1/25/2004	3.8	629	1190	0	0.54	0.11		162	19	3.15	3482
2/18/2004	3.6	545	1430	0	2.28		178		25.3	3.38	2310

Big Run (Old #8) -- in Stream
40 32' 47.8"N, 79 24' 51.4"W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe+2	T.Acidity	Lab Acidit	Al	Mn	Water Flow
		mg/L	uS	mg/L	mg/L	mg/L			mg/L	mg/L	gpm
7/28/1999	4	>200	1012	0	0.9		85				mod
7/29/1999	6			17.8	3.76			1	5.89	3.54	
9/21/1999	5.2		1350	7	0.6		55				mod
10/28/1999	5.4		1340								med
11/11/1999	5.3		1258	20.6	0.8		62				
3/22/2000	6.3	224		22	1.09			0	1.92	0.53	
4/11/2000	5.4										20397
4/19/2000	5.4		875	34.2	0.6		51				

Big Run old #8 -- in Stream Continued

7/6/2000	4.7	614		2.2	0.8			42	7.85	2.16	
8/8/2000											13956
10/13/2000	5.6		985	17.1	1.2		120				normal
11/7/2001	5.4	>200	1278	21	0.9		90		6.7	3	low
4/12/2002	5.3	>200	920	5	1.19	0.14	60		2.93	2	normal
4/21/2002	5.6	483	979	9.6	0.92	0.81		21	5.22	1.79	normal
5/11/2002	5.9	>200	701	20	0.3	0.07	40		0.3	2.1	17887
6/8/2002	6.4	450	792	10	0.44	0.04	60		2.1	2.3	high
7/14/2002	4.2	>200	1220	<5	0.76	0.11	80		10.02	2.8	low
7/14/2002	4.5	669	1220	0	0.8	0.16		105	8.85	2.45	low
7/15/2002	-	-	-	-	-	-	-	-	-	-	3686
10/14/2002	5.6	>200	1342	15	0.66	0.12	40		0.4	3.3	normal
10/27/2002	5.1	642	1425	38	0.65	0.25		0	3.01	2.02	slow
3/25/2003	5.7	>200	929	10	0.34	0.07	40		0.88	1.9	high

Big Run # 8 (Old # 9)
40 32' 44.2"N, 79 24' 51.9"W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe+2	T.Acidity	Lab Acidit	Al	Mn	Water Flow
		mg/L	uS	mg/L	T. Fe	mg/L			mg/L	mg/L	gpm
5/25/1999	3.2	693		0	2.61			212	24.5	0.42	
6/28/1999	3.6		1017	0	7.4		274				
7/15/1999	3.1		1280	0			280				129.7
7/28/1999	3.4	>200	1025	0	9		257				1051
7/29/1999	3.2			0	20.1			228	22.1	2.37	
9/21/1999	3.1		1130	0	7		308				1131
10/28/1999	3.5		1256								842
11/11/1999	3.4		1230	0	>10		308				
3/22/2000	3	533		0	26.8			270	28.6	2.67	
4/11/2000	3.1										1439
4/19/2000	3		1575	0	8		376				
7/6/2000	3.1	521		0	27.3			268	30.7	2.89	
8/8/2000											796
10/13/2000	3.1		1423	0	7		513				
7/12/2001	3.4	606	1202	0	24.5	16.7		278	26.3	3.01	
10/30/2001	3.1	720	1520	0	23.8		310		24.16	3.2	
2/9/2002	3.4	563	1602	0	32	19.9	110	245	23.4	3.11	usual
4/21/2002	3	718	1520	0	26	18	114	260	26	2.91	usual
7/14/2002	3	682	1560	0	30.3	18.6		357	32.8	3.42	usual
10/27/2002	3.2	508	1440	0	29.4	25		399	25.6	2.97	usual
4/27/2003	3.2	653	1530	0	24.7	12.8		303	30.3	3.4	usual

Big Run # 8 (Old # 9) Continued

5/27/2003	3	745	1590	0	21.7		310		29.2	3.17	usual
6/25/2003	3.1	716	1470	0	20.8		267		29	2.89	usual
8/3/2003	3.1	618	1378	0	24.5	8.77		258	25.6	3.25	usual
8/28/2003	3.1	618	1410	0	27		254		27.5	3.5	usual
10/1/2003	3.1	620	1460	0	27.5		249		29.3	3.49	usual
10/25/2003	3.2	647	1410	0	25.8	21.3		264	24.6	3.04	usual
1/13/2004	3.2	534	1430	0	16.4		226		24.7	3.07	usual

Big Run # 10--in stream
40 32'34" N, 79 24' 39.8"W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe+2	T.Acidity	Lab Acidit	Al	Mn	Water Flow
		mg/L	uS	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	gpm
7/28/1999	3.7	>200	1038	0	3.7		116				
7/29/1999	4.5			0	11.4			48	7.95	3.86	
9/21/1999	3.2		1348	0	4.2		123				
10/28/1999	3.9		1260								2783
11/11/1999	4.1		1222	0	5.8		103				
3/22/2000	6.1	227		16	1.87			0	2.72	0.59	
4/11/2000	5										20568
4/19/2000	4.9		906	0	2.4		68				
7/6/2000	4	627		0	3.29			76	10.8	2.28	
8/8/2000											13875
10/13/2000	4.9		967	17.1	4		137				
11/7/2001	4.6	>200	1300	0	5.2		115		9.2	3.2	v low
4/21/2002	5.8	490	992	2.2	3.63	2.26		49	7.44	1.89	med
7/15/2002	-	-	-	-	-	-	-	-	-	-	5008
10/27/2002	4.8	618	1290	2.6	6.6	5.61		77	7.76	2.25	normal
1/31/2003	5.2	696	1140	2.2	4.56	2.17		69	8.7	2.27	normal
4/27/2003	4.6	564	1084	8.6	2.84	1.39		61	8.48	2.03	normal
5/27/2003	4.4	589	1060	6	3.12		66		9.59	2.08	normal
6/25/2003	4	603	1060	1	3.48		70		10.2	1.96	normal
8/3/2003	4.5	502	938	9.6	3.56	1.26		41	6.5	1.69	normal
8/28/2003	5	508	1090	7	4.56		21		7.72	1.94	normal
10/1/2003	4.8		1080	8	5.63		34		9.6	2.21	normal
10/25/2003	5.7	561	962	10.2	3.95	3.03		55	5.89	1.8	normal
1/13/2004	4.7	474	1130	9	3.5			70	11.5	2.05	high
1/25/2004	4.5	700	1173	9.4	3.36	1.28		98	14.7	2.93	high
2/18/2004	4.3	567	1250	8	5.08		178		14.8	2.73	high

Appendix C. Background Water Chemistry--Whisky Run Subwatershed

Whisky Run #1
40 35' 23.7" N, 79 22' 51.4" W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
1/31/2003	3.4	561	1130	0	2.92	0.32		150	16.7	9.17	usual
4/27/2003	3.3	417	1062	0	2.43	0.47		124	13.6	8.01	usual
5/27/2003	3.3	669	1160	0	2.86		156		18.5	9.25	usual
6/25/2003	3.5	555	1110	0	2.84		131		16.3	8.06	usual
8/3/2003	3.4	384	926	0	2.15	0.35		99	10.2	6.59	usual
8/28/2003	3.4	461	1070	0	3.04		62		14.8	9.04	usual
10/1/2003	3.5	457	1040	0			107		15.1	8.54	usual
10/26/2003	3.6	520	1135	0	2.67			154	16.3	9.5	usual

Whisky Run #2
40 35' 30.4" N, 79 22' 45.9" W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
1/31/2003	3.3	1220	1980	0	1.24	0.18		167	15.7	15.3	usual
4/27/2003	3.6	921	1763	0	0.8	0.21		115	10.5	14.7	usual
5/27/2003	3.2	1072	1920	0	0.87		140		12.3	14.2	usual
6/25/2003	3.4	1066	1830	0	0.99		110		11.2	13	usual
8/3/2003	3.4	970	1710	0	0.89	0.08		106	9.52	13.5	usual
8/28/2003	3.4	964	1880	0	1		113		11.9	15.6	usual
10/1/2003	3.4	1039	1930	0	1		125		13.7	16.7	usual
10/26/2003	3.4	1146	1810	0	0.96	0.12		151	11.1	17.2	usual
1/13/2004	3.5	939	1920	0	0.91		155		13.2	17.1	usual

Whisky Run #3
40 35' 29.1" N, 79 22' 41.6" W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
1/31/2003	3.5	1266	1925	0	0.93	0.17		105	5.11	16.5	19
4/27/2003	3.6	1007	1715	0	0.9	0.17		74	3.94	15.7	16.5
5/27/2003	3.4	1033	1850	0	0.8		86		4.85	14.6	26
6/25/2003	3.5	1084	1830	0	0.95		68		4.73	13.9	
8/3/2003	3.4	1049	1765	0	1.23	0.13		64	3.76	16.3	19.2
8/28/2003	3.5	1049	1880	0	1.81		66		4.97	17.4	19
10/1/2003	3.5	1004	1890	0	1.36		79		5.14	16.6	16.51
10/26/2003	3.5	1098	1790	0	1.2	0.14		96	4.54	17.1	14.1
1/13/2004	3.7	702	1620	0	0.55		75		5.15	12.9	

Whisky Run at beaver pond (Old #2)
40 32' 59.7" N, 79 24' 53.5" W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
6/22/2001	8	>200	1052	25	0.6		20				normal
7/12/2000	6	562	1563	11.4	0.74	0.33		36	3.68	12.4	normal
10/30/2001	6.8	>800	1360	15	0.81	0.29	20		*.98	11.1	normal
12/6/2001	5.9	>200	910						0.63	10.7	normal
2/8/2002	6.2	467	1002	15	0.54	0.24		30	2.75	5.55	normal
4/21/2002	5.9	496	995	9	0.61	0.498		29	3.28	6.35	normal
7/14/2002	4.7	981	1720	2.8	1.07	0.29		90	6.29	13.2	low
10/27/2002	5.7	860	1351	36	0.79	0.32		0	1.85	10.4	low
1/31/2003	5.4	836	1304	3	1.29	0.36		56	9.63	10.6	normal
8/3/2003	6.1	582	937	26.8	0.37	0.12		18	1.9	6.46	high

Whisky Run #6

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
5/27/2003	3.6	1046	1780	0	26.4		164		5.96	19.7	
6/25/2003	3.3	1211	1970	0	29.8		151		9.07	23.3	
8/28/2003	3.4	1036	1840	0	42.8		137		8.66	28.3	
10/1/2003	3.7	934	1770	0	27.8		142		2.78	19.9	

Whisky Run #9 (Old #1)
40 35' 36.84" N, 79 22' 2.22W

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
7/12/2001	6.3	905	1216	78	2.33	2.15		0	2.44	11.7	
10/30/2001	5.9	>800	1785	45	1.3		80		2.3	11.6	
2/8/2002	6.3	1359	1582	66	1.17	0.77		0	3.71	7.53	
4/21/2002	5.8	1198	>2000	60	2.61	2.53		0	3.62	9.65	
7/14/2002	6.1	1366	1850	82	2.81	2.46		0	2.76	10.5	
10/27/2002	6.1	1528	>2000	72	2.09	1.59		0	2.25	9.78	usual
1/31/2003	5.3	1481	>2000	62.2	1.52	0.86		0	2.46	9.04	332
4/27/2003	5.8	1353	1900	82.4	2.13	1.65	0		2.85	8.48	395.4
5/27/2003	5.9	1343	2150	82	2.39		58		3.5	9	
6/25/2003	6.2	1333	2120	79	2.28		0		3.98	8.99	302
8/3/2003	5.6	1331	1875	79.2	1.63	0.85		0	3.19	7.12	362.6
8/28/2003	6	1333	2240	57	2.14		0		4.16	9.27	413
10/1/2003	6	1440	2290	65	2.65		0		4.62	9.11	
1/13/2004	5.7	1141	2180	32	2.39		11		6.16	11	

Whisky Run #10

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
8/28/2003	5	487	1030	8	0.16		25		2.63	12	
10/1/2003	3.8	508	1080	0	34.2		56		4.57	12.8	
ving for part of year											

Whisky Run #11

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
5/27/2003	4.4	527	946	8	0.86		80		12.9	5.75	
6/25/2003	4.5	513	922	9	0.32		75		12.2	5.24	
8/28/2003	4.2	476	988	4	0.7		73		11.5	6.26	
10/1/2003	4.4	497	1020	6	3.84		81		17.8	6.38	
1/13/2004	4.5	457	1080	8	0.49		112		18.3	7.23	

Whisky Run #12

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
5/27/2003	3.4	564	1120	0	0.56		132		17.8	6.38	
6/25/2003	3.6	567	1120	0	0.56		111		17.2	5.79	
8/28/2003	3.4	504	1130	0	0.63		108		15.1	6.37	
10/1/2003	3.4	526	1180	0	0.61		117		15.6	6.46	
1/13/2004	3.3	613	1520	0	2.22		223		29.3	7.15	

Whisky Run #13

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
5/27/2003	3.2	649	1250	0	5.72		176		19.5	5.7	
6/25/2003	3.3	610	1250	0	6.07		166		22.1	6.31	
8/28/2003	3.3	448	1050	0	11.8		123		12.6	4.98	
10/1/2003	3.4	514	1150	0	3.74		129		16.7	5.78	
1/13/2004	3.3	611	1560	0	2.61		229		29.3	6.84	

Whisky Run #14

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
5/27/2003	3.3	545	1060	0	0.31		128		14.6	4.24	
6/25/2003	3.5	518	1050	0	0.5		109		12.3	3.68	
8/28/2003	3.4	475	1080	0	0.6		110		14	4.8	
10/1/2003	3.4	473	1080	0	0.31		110		14.2	4.52	

Whisky Run #19

Date	pH	SO4	Conduct.	Alkalinity	T. Fe	Fe +2	T.Acidity	Lab Acidity	Al	Mn	Water Flow
		mg/L	uS	mg/L					mg/L	mg/L	gpm
5/27/2003	3.7	402	824	0	0.1		122		15.8	4.69	
6/25/2003	6.7	241	596	77	0.22		0		0.11	0.15	
8/28/2003	7.8	303	874	157	10.4		0		5.53	0.6	
10/1/2003	6.9	286	849	151	0.86		0		0.42	0.11	
01/13/04											

Whisky Run Mouth (Old #3)
40 33 40"N, 79 21 42"W

		mg/L	uS	mg/L					mg/L	mg/L	gpm
Date	**pH**	**SO4**	**Conduct.**	**Alkalinity**	**T. Fe**	**Fe +2**	**T.Acidity**	**Lab Acidity**	**Al**	**Mn**	**Water Flow**
5/11/1999	4.9	487		2.6	0.45			13	3.1	4.79	
1/11/2000	6	547	864	5.8	0.54	0.24		7	2.92	4.12	medium
4/11/2000	5.1	426	706	2.8	0.49	0.19		17	4.21	4.22	medium
7/12/2000	5.9	955	1254	5	0.28	0.14		26	0.82	7.15	medium
10/12/2000	6.4	494	924	22	0.22	0.14		0	0.41	6.06	medium
2/7/2001	5.7	411	546	3.8	0.47			6	3.74	0.43	medium
7/12/2001	6.3	740	1216	11.8	0.45	0.16		30	1.55	6.99	med-low
10/30/2001	6	>800	1380	10	0.6		20		*0	7.2	med-low
4/21/2002	5.3	558	1126	3	1.06	0.83		38	5.03	6.09	med-low
7/14/2002	5.8	996	1640	5	0.55	0.11		45	2.23	9.14	med-low
10/27/2002	6.6	723	1315	24	0.13	0.09		0	<.2	6.22	med-low
1/31/2003	5.8	830	1302	2.6	0.83	0.41		46	6.2	8.04	med
5/19/2003	6.2	875	1057	10	0.46	0.22	20		0.6	6.6	3132
5/27/2003	5.9	656	1090	14	0.59		8		3.86	5.57	medium
6/25/2003	6.1	721	1240	14	0.67		4		4.17	5.57	medium
7/4/2003	6.3	1000	1313	10	0.42	0.16	20		2.2	8	1586
8/3/2003	6	560	1004	23	0.58	0.12		0	2.89	5.38	med-low
8/28/2003	6.4	567	1230	20	1.1			0	2.98	7.09	normal
10/1/2003	6.1	583	1230	23	0.95		0		4.15	6.72	normal
10/11/2003	6.4	1120	1211	20	0.49	0.12	20		0.5	7.5	2727

Whisky Run Mouth (Old #3) Continued

		mg/L	uS	mg/L					mg/L	mg/L	gpm
10/26/2003	6.3	621	1063	24.8	0.54	0.26		0	2.77	5.84	Med
1/13/2004	7.4	534	1250	8	1.16		72		10.7	7	
1/13/2004	4.7	1040	1090	0							8416
1/25/2004	4.9	831	1193	9.4	1.29	0.44		45	10	9.23	v.high

Appendix D. Active Mining Permits in the Blacklegs Creek Watershed

Permit	Mine Location	Mine	Mining Company	Contact	Address	City	State	Zip Code	Phone Number
32010103	Conemaugh Twp., Indiana Co.	Karp Mine	KMP Associates	William Pavlisick	RR2 Box 194	Avonmore	PA	15618	(724)639-8323
32950105	Young Twp., Indiana Co.	McCullough	KMP Associates	William Pavlisick	301 Salt Street	Saltsburg	PA	15681	(724) 639-8323
32940199	Young Twp., Indiana Co.	Ehenger Mine	KMP Associates	William Pavlisick	301 Salt Street	Saltsburg	PA	15681	(724)639-3446
32990108	Young and Conemaugh Twps, Indiana Co.	Clarksburg	KMP Associates	William Pavlisick	RD2 Box 194	Avonmore	PA	15618	(724) 639-8323
32970108	Young and Conemaugh Twps, Indiana Co.	Clarksburg	KMP Associates	William Pavlisick	RD 2 Box 194	Avonmore	PA	15618	(724) 639-8323
32010101	Conemaugh Twp., Indiana Co.	Norrytown # 2	Opal Industries	Harry Freed	PO Box 980	Latrobe	PA	15650	(724) 539-3264
32980110	Conemaugh Twp., Indiana Co.	Norrytown # 2	Opal Industries	Harry Freed	PO Box 980	Latrobe	PA	15650	(724) 539-3264
32920102	Young Twp., Indiana Co.	Marshall Run Mine	Kent Coal Mining Company	Thomas DeBerti	PO Box 729	Indiana	PA	15701	(724) 349-5800
3279103	Young Twp, Indiana Co.	Iselin # 11	Kent Coal Mining Company	JJ Shaeffer	655 Church St.	Indiana	PA	15701	(724) 349-5800
32970103	Young and Conemaugh Twps, Indiana Co.	Marshall Run # 2	Kent Coal Mining Company	Thomas DeBerti	PO Box 219	Shelocta	PA	15774	(724) 354-5800
32950104	Young Two, Indiana Co.	Iselin # 18	General Mining, Inc.	Cynthia Rupert	RD Box 194	Avonmore	PA	15618	(724) 639-3242
32920104	Conemaugh Twp., Indiana Co.	Skaptura Mine	M & S Mining Company	Andrew Smith	RD 4, Box 104	Blairsville	PA	15717	(724) 459-6844
32980114	Young Twp, Indiana Co.	Hosak Mine	Simpson Coal Company	Donald Simpson	RD 1, Box 104	Blairsville	PA	15717	(724) 639-9058
2869BMS13	South Bend Twp, Armstrong Co.	Iselin # 6	R & P Coal Company		Box 219	Shelocta	PA	15774	
3010103	Kiskimenetas Twp., Armstrong Co.; Conemaugh Twp, Indiana Co.	Kiski Mine	Marquise Mining Corporation						