Blacks Creek Restoration Plan

Revised December 2017

SLIPPERY ROCK WATERSHED COALITION

Prepared by

BIOMOST, INC. and **STREAM RESTORATION INCORPORATED** (non-profit)

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PREFACE

This report, “Blacks Creek Restoration Plan (December 2017)”, is a revision of the original restoration plan (i.e. Watershed Implementation Plan (WIP)) that was completed for the Blacks Creek watershed in April of 2007 through an EPA 319 Program funded grant. This revised report serves as a project deliverable for the EPA 319 funded ”Blacks Creek Priority Discharge Designs” project, which had proposed to conduct additional water monitoring of remaining priority discharges for the purpose of developing conceptual designs and cost estimates. The project also included monitoring of select stream sample points to document the progress of the watershed restoration and guide the direction of future efforts. While the report formatting as well as the general information and purpose has not changed, much of the report has been significantly altered to include updates that reflect the changes in the watershed due to the progress of restoration efforts, as well as changes based upon additional water monitoring conducted through this project. In addition, the report includes the conceptual designs and updated cost estimates for select priority discharges, as well as an updated timeline.

INTRODUCTION

Coal mining has been conducted in western Pennsylvania, as well as much of the Appalachian Coal Basin, for more than 150 years. With Pennsylvania’s coal reserves playing a major role in the Industrial Revolution, the United States became a modern developed nation and major world power. This historical utilization of coal to heat our homes and to fuel our industries, however, resulted in a legacy of severe environmental impacts and public safety issues. The majority of these impacts are associated with mines operational prior to the federal Surface Mining Control and Reclamation Act of 1977 and Pennsylvania’s legislative efforts including the Surface Mining Conservation and Reclamation Act of 1945.

Small towns and villages of western Pennsylvania and Appalachia, which were once bustling coal communities supporting the steel industry and electricity generation for such cities as Pittsburgh (PA), Wheeling (WV), and Johnstown (PA), are now often non-existent ghost towns left with only scarred landscapes characterized by dangerous highwalls, barren coal refuse piles, and, polluted mine drainage. According to the 2016 Pennsylvania Integrated Water Quality Monitoring and Assessment Report (PA DEP, 2016), these pollutive discharges, commonly referred to as abandoned mine drainage (AMD), are the largest source of stream degradation in the Commonwealth, with over 5,600 miles of streams impacted. Furthermore, 45 of Pennsylvania’s 67 counties are impacted with over 250,000 acres of unreclaimed mine lands, 2.6 billion cubic yards of abandoned coal refuse, and about 7,800 abandoned underground mines. In many cases, entire watersheds have been completely decimated by AMD.

Since 1994, the Slippery Rock Watershed Coalition (SRWC) has been actively working to restore the severely degraded headwaters of Slippery Rock Creek. This partnership effort has resulted in the installation of over 20 passive systems for more than 30 abandoned mine discharges. These passive systems are currently treating over a billion gallons of mine drainage per year, eliminating more than 700 tons of iron, 55 tons of aluminum, and 900 tons of acidity annually from Slippery Rock Creek and its tributaries. This reduction in pollution loading has significantly improved streams, with fish being observed in at least 6 miles of streams for the first time in over a century.

Much of the work completed by the SRWC to date has been based upon background data collected by the Pennsylvania Department of Environmental Protection (PA DEP) Knox District Mining Office (Knox DMO), as published in the 1998 Slippery Rock Creek Watershed Comprehensive Mining Reclamation Strategy (CMRS) Reclamation/Remediation Plan (for a 27-square mile area of the headwaters. While Blacks Creek, a major tributary in the headwaters of Slippery Rock Creek, was not included in the CMRS, a Total Maximum Daily Load (TMDL) was prepared by the Knox DMO (PA DEP, 10/20/04) and approved by the US Environmental Protection Agency (US EPA) on 01/19/05. In 2005, Stream Restoration Incorporated was awarded a US EPA 319 grant to address the BC16 abandoned mine discharge located along an unnamed tributary to Blacks Creek. Prior to utilizing these funds for construction, a watershed restoration plan was needed to provide an overview of Blacks Creek and tributaries thereto in relation to the applicable water quality criteria cited in the TMDL, as well as to identify sources of degraded mine drainage. The sources were also characterized and prioritized based on pollutant loading and impact to the overall watershed. Best Management Practices (BMP), such as land reclamation and passive treatment systems, with rough cost estimates, were also described.

BLACKS CREEK WATERSHED DESCRIPTION & CHARACTERISTICS

Blacks Creek (DEP Stream Code 34731, Basin 20-C) is a major headwater tributary and subwatershed of Slippery Rock Creek in the Ohio River Basin in western Pennsylvania. (The attached Stream Map identifies the Reach Codes from the National Hydrography Dataset developed by the USGS and EPA.) The Blacks Creek Watershed is primarily located in Marion and Venango Townships in northern Butler County with a small portion located in Irwin and Clinton Townships in southern Venango County. (See Topographic Map.) The watershed encompasses approximately 9-square miles (5,600 acres) with approximately 110,000 feet (20.8 miles) of 1st, 2nd, 3rd, and 4th order streams that flow in a generally southern direction. The Blacks Creek headwaters are characterized by spring/wetland- and abandoned mine discharge-fed tributaries. Blacks Creek enters Slippery Rock Creek about a mile west of Boyers, PA.

Surface elevations range from about 1200 to 1600 feet and contain relatively flat, rural and forested lands with gently rolling hills of low relief. A stream gradient analysis was completed on the major tributaries of Blacks Creek by utilizing streams digitized from aerial photography (1' resolution) and a digital terrain model generated from USGS contours (20' intervals). The analysis is presented in Table I as well as on the attached Stream Gradient Map. As shown, over 70% of Blacks Creek and the major tributary (Trib 6 on the Blacks Creek Watershed Map) are considered low or very low gradient.

Table I. Stream Gradient Analysis

Gradient (% slope)	Classification	Length		Percent
		Feet	Miles	
0-0.99	very low	25275.4	4.79	38.5
1-1.99	low	20997.5	3.98	32.0
2-3.99	moderate	11483.0	2.17	17.5
4-7.99	high	6561.9	1.24	10.0
8-20	very high	1312.3	0.25	2.0
	Total	**65630.1**	**12.43**	**100.0**

The Blacks Creek Watershed has been extensively mined through both surface and underground methods primarily on the Middle Kittanning, Lower Kittanning, and Brookville coalbeds. Numerous abandoned mine features such as spoil piles, coal refuse piles, water-filled surface mine pits, dangerous highwalls, subsidence, and abandoned mine drainage can be seen throughout the watershed as well as successfully-reclaimed surface mines. While there is one active quarry on the Vanport limestone that may encounter incidental coal, there are no coal mines currently in operation within the watershed. In addition to mining, the northern part of the watershed is part of the Bullion-Clintonville Oil Field, with average pay zones at a depth of about 1050 feet in the Venango Second and Third Sandstones. Petroleum exploration was reported to have begun around 1876. Numerous historic, as well as more recent, oil wells, pumping facilities, storage tanks, and piping systems are commonly observed in this portion of the watershed.

Major land uses in the Blacks Creek Watershed were documented in the Slippery Rock Creek Watershed Assessment and Restoration Plan (Beran et al, 2006) utilizing digital, orthophoto, quarter-quadrangle, aerial photographs (1993-1995) developed and published by the USGS. (See Table II.) The dominant land use is woodland. The combined land uses of woodland, scrub-shrub, unmanaged, and water bodies make up about 86% of the watershed. An evaluation of mine dump/disturbed land digitized form USGS quadrangles representing historical disturbance indicated that by the mid-1990's over 1,000 acres or 18% of the watershed has been surface mined. Much of these disturbed areas have since developed into woodland, scrub-shrub, or unmanaged land.

Table II. Land Uses in the Blacks Creek Watershed

Land Use	Watershed	
	(acres)	(%)
Woodland	3,179	57
Scrub-shrub Land	520	9
Agricultural Land	663	12
Unmanaged Land	1,097	20
Developed Land	58	1
Communities	-	0
Commercial	-	0
Water Bodies	23	0
Unvegetated Land	71	1
Total	**5,611**	**100**

WATER QUALITY

Sources of Data

Several sources of data were used to develop the restoration plan. A large portion of the older data was obtained from the PA DEP Knox DMO. Other sources of data included Non-Coal Surface Mining Permits 10960301 and 10960302 for limestone quarries operated by Quality Aggregates Inc. and Allegheny Mineral Corporation, respectively, and previous restoration activities, including Operation Scarlift (Gwin, 1970) and the Slippery Rock Creek Watershed Assessment and Restoration Plan (Beran et al, 2006). In addition, BioMost, Inc. collected samples as part of developing this restoration plan, as well as part of other remediation efforts.

The use of numerous sources created a significant data management challenge with many sampling locations having multiple sample names and nomenclature systems. For example, BC8, BC2, and 906-32 of the PA DEP, Beran Environmental, and BioMost, Inc., respectively, were the same sampling location. In addition, this point was approximately the same as Allegheny Mineral sampling point 40K. After all known available data were obtained and entered into the water quality database, there were nearly 150 named sampling points. For purposes of simplifying data management, sample point locations that were similar, but with different names, were combined and renamed when necessary to provide only one designation for any given sample point location. Table III provides a key to sample point locations with multiple names. Sample points with only one name were not included in the table. Sample point locations are identified on the Blacks Creek Watershed Map.

Table III. Key to Water Sampling Points with Multiple Names

Sample Point Used	BMI	PA DEP	Beran Environmental	Quality Aggregates	Allegheny Mineral	Operation Scarlift
BC6.1	906-1	BC6.1				
906-2	906-2		DSCH BC7.2			
906-6	906-6		STRM BC7.5			
906-10	906-10	BC6A	~STRM BC7.6			
906-12	906-12	BC7				
BC6	906-15	BC6	BC7			
BC12	906-18	BC12	BC3			
QAS4	906-30	QAS4	BC1	QAS4		T4
906-31	906-31				~40L	
BC8	906-32	BC8	BC2		~ 40K	
BC11	906-33	BC11			~ 40H	
BC9	906-34	BC9			64G	
BC10	906-35	BC10			64I	
BC3	906-37	BC3	BC8			
BC1	906-38	BC1	~ BC4		65B	
BC1A	906-39	BC1A				
BC3B	906-40	BC3B				
BC4	906-41	BC4				
BC4.1	906-43	BC4.1				
BC2	905 UP	BC2	BC6			
905 WL	905 WL	BC19D				
BC2B	905 DN	BC2B	BC5			

See Selected References.

Water Quality Criteria

In this area, PA Title 25, Chapter 93 (originally electronically retrieved 01/31/07 and reconfirmed 5/31/17), designates Slippery Rock Creek and the tributaries thereto as a Cold Water Fishery (CWF) with the following water quality criteria:

- Alkalinity - Min. 20 mg/L as $CaCO_3$, except where natural conditions are less
- Dissolved Oxygen - For flowing waters, min. daily average 6.0mg/l
- Iron - 30-day avg. 1.5 mg/L as total recoverable
- Osmotic Pressure - Max. 50 milliosmoles/kg
- pH - From 6.0 to 9.0 inclusive
- Total Dissolved Solids - 500 mg/L as a monthly avg. value; max. 750 mg/L

The TMDL documented that Blacks Creek was impaired with respect to metals from abandoned mine drainage, in agreement with the 2002 PA Section 303(d) list and the 2006 PA Integrated Water Quality Monitoring and Assessment Report.

Table III-a. Blacks Creek TMDL Stream Identification

Year	Miles	Seg. ID	DEP Stream Code	Stream Name	Designated Use	Data Source	Source	EPA 305(b) Cause Code
2002	4.6	4570	34731	Blacks Creek	CWF	SWMP	AMD	Metals

Portion of Table 1. 303(d) Sub-List; State Water Plan (SWP) Subbasin: 20-C Slippery Rock Creek Watershed in Final Blacks Creek Watershed TMDL Butler County (10/20/04), EPA approved 01/19/05; Cold Water Fishes (CWF); Surface Water Monitoring Program (SWMP)

Note that the applicable water quality criteria listed in the TMDL (See Table IV) does not correspond with that listed in Chapter 93. For instance, Subchapter 93.7 reserves the total manganese and dissolved iron criterion values for streams designated with the critical use as a Public Water Supply. For the purpose of this report, stream quality was not compared to Chapter 93 criteria. Instead, the water quality criteria listed in the TMDL (See Table IV) has been utilized as the metric.

Table IV. TMDL Applicable Water Quality Criteria

Parameter	Criterion Value
Aluminum - Total	0.75 mg/L
Iron - Total	1.50 mg/L
Iron - Dissolved	0.3 mg/L
Manganese - Total	1.00 mg/L
pH	6.0 – 9.0 standard units

Since the primary cause of impairment to Blacks Creek is metals associated with mine drainage, decreasing the iron, aluminum, and manganese concentrations within the streams to meet the applicable water quality criteria identified in the TMDL report is the ultimate goal of this restoration plan. The average values at sample point locations were used for comparison to TMDL criteria. In instances where only one sample was collected for a given point, the single set of analyses was assumed to represent the average water quality at that location. (Please note that continued monitoring may reflect a significantly different average water quality.)

Discussion of Stream Water Quality

Table V was compiled in 2007 for the original WIP to characterize the unnamed tributaries to Blacks Creek. (The attached Stream Map provides a key to both the Reach Codes and the "trib #".) "Trib #" is used within the narrative and shown on the Blacks Creek Watershed Map with sample point locations.

Data were compiled or collected for every unnamed tributary, except tributaries #3 and #4. Tributary #3 was not sampled due to accessibility, but is assumed to be of good quality based upon water quality characteristics of similar tributaries in the watershed, which have little or no mining in the contributory drainage area. Tributary #4 was also not sampled; however, a pH of 6.5 was measured on 10-03-06. As there was minimal flow at this location and mining was not indicated on the 7½' USGS topographic map in the contributory drainage area, a sample was not collected for laboratory analysis.

Table VI provides updated water quality data for select unnamed tributary sample points collected from 2012 through 2016. The majority of the "stream" sample points provided in Table VI are actually mine discharges and effluents of ponds that are essentially the primary source of water to that stream and were sampled as part of the Blacks Creek Priority Discharges project. For example, SB1 and 906-16 are the effluent of old sediment ponds that are now the source water for the associated stream.

Except for a few segments, most of Blacks Creek and its tributaries have an acceptable pH and are net-alkaline. This is assumed to be largely due to the influence of the persistent Vanport limestone (typically, 90% calcium carbonate content) which is <50 feet stratigraphically below the Lower Kittanning coalbed and crops out in the area. Of the 19 unnamed tributaries to Blacks Creek, in 2007, 14 met all of the water quality criteria identified in Table IV.

Tributaries Not Meeting Applicable Water Quality Criteria (TMDL)

Tributary #6 meets the criteria for most of its length, except for the iron content at 906-24, which is the effluent from an in-stream settling pond on a reclaimed surface mine within the headwaters. The pond discharge meets the surface mining permit effluent limit for total iron, which is 7 mg/L. Downstream the water becomes oxygenated, mixes with other sources, and the Table IV criteria are met at point 906-27.

Tributary #7 is formed by the confluence of two small abandoned mine discharges (906-22 and 906-23), which, as evident in both Table V and Table VI, are only slightly impacted. These discharges meet the typical surface mine permit effluent limits. Tributary #7 receives additional base flow and mixes with other water sources and, at downstream point 906-19, all criteria are met except for slightly exceeding the dissolved iron criterion of 0.3 mg/L. This may be due to a small abandoned mine discharge (906-21) that enters the tributary about 50 feet upstream of point 906-19.

Tributary #8 meets the criteria except for very slightly exceeding the dissolved iron content at point 906-25. With only one sample analysis, additional monitoring would be necessary to determine if the dissolved iron content is of concern. Further downstream at point 906-28, tributary #8 meets all criteria.

Tributary #15, also referred to as the "McIntire trib", was identified in the original restoration plan as the most degraded tributary and was responsible for the majority of the metal loading to Blacks Creek. As shown in Table V, there was not a single sampling point along the tributary that met the water quality criteria identified in Table IV. This tributary was primarily impacted by two sources of mine drainage. Since that time, two passive treatment systems were constructed (BC16 and McIntire) which treated the #1 and #2 priority discharges. In the original plan, the source water for Tributary #15 was identified as the effluent of an old treatment pond, TB1, but with the installation of the passive system, the majority of the source water now flows from the final pond of the treatment system, identified as SB1. The effluent of the BC16 system, which treats an upwelling of mine drainage from an abandoned oil well, enters tributary #15 between BC4.1 and the final downstream point BC4, located at the mouth of tributary #15 prior to the confluence with Blacks Creek. Additional information about these treatment systems is provided in the Restoration Plan section of this document.

As can be seen in Table V, the water quality at the mouth of Tributary #15 (BC4) was heavily impacted. The impact of the "McIntire trib" to Blacks Creek was severe, as observed by the change in water quality (Table VII) upstream (906-42) to downstream (BC2) of the confluence with tributary #15. However, a comparison of monitoring completed from 2012-2016 provided in Table VI demonstrates the success of the passive system. Water quality flowing from the passive system at SB1 is typically of good quality and meets typical mining water quality standards and at times even meets TMDL standards established for stream points. Possibly the most exciting aspect of this data is that while Tributary #15 used to be the biggest source of pollution to Blacks Creek, it now provides improvement in water quality as can be seen in Table VIII.

Tributary #16 is essentially formed by the effluent of a sediment pond (906-16) at an old reclaimed surface mine. The sediment pond receives both good quality surface runoff and degraded mine drainage (906-17 & 906-17b) that flows onto and across the reclaimed surface mine and is collected by diversion ditches. Water monitoring conducted in 2015 and 2016 provides a slightly revised characterization compared to the one sample collected in 2006. While on average the mine discharge point 906-16 still exceeds the total manganese and aluminum criteria as well as the dissolved iron criteria, the monitoring indicates that the water quality is quite variable ranging from slightly acidic to net-alkaline water and on a few sampling dates, the TMDL water quality standards were met. The drainage quickly mixes with good quality water downstream, significantly improves, and, based upon data previously collected by PA DEP, tributary #16 meets the water quality criteria at the mouth (BC5) prior to the confluence with Blacks Creek. An examination of water quality of Blacks Creek upstream (BC6) and downstream (BC14.1) of tributary #16 also does not indicate any major source of pollution to the stream in this area. One sampling event at sample point BC14.1 on 11/10/15 did have total iron concentrations of 2.85 mg/L, which skewed the average values presented in Table VIII. Sampling was conducted during the second day of a 2-day rain event and the stream was cloudy with sediment as indicated by the TSS of 38 mg/L. Dissolved iron on that date was 0.1 mg/L further indicating that the source of iron was likely sediment stirred up by the rain.

Tributary #18, formed by two abandoned mine discharges (906-4 & 906-5), was previously sampled at point B-BC7.2B. Monitoring conduced in 2015 and 2016 included sampling further downstream at sample point 908-Y, which includes influence of a less severely polluted mine discharge 906-2. Monitoring indicates that the stream does not meet TMDL criteria except for

total iron. With the successful improvement of tributary #15, tributaries #18 and #19 are now the most impacted tributaries to Blacks Creek. Downstream of 908-Y, the water flows into a large wetland complex where it mixes with other sources of water of varying quality.

Tributary #19 is partly formed by abandoned mine discharges (906-7, -8, -9) as well as various other sources of unknown quality water. During the 2015 and 2016 monitoring, a sampling point 906-7A was stablished, which consists of a water course to tributary #19 located downstream of the 906-7, -8, -9 discharges, which essentially consists of AMD. The water quality at 906-7A is now one of the worst quality sources of untreated mine water to the watershed. These discharges mix within a wetland created by a beaver dam. Sample point 906-6 has not been sampled since 2006, but is believed to likely be of similar quality as reported in Table V.

Table V. Unnamed Tributaries Water Quality Data (Average Values) (2007)

Trib #	Sample Point	pH	Alkalinity		Acidity	Iron		Manganese		Aluminum		SO_4
		field	field	lab		total	diss.	total	diss.	total	diss.	
1	QAS3	7.5	-	72	0	0.2	-	0.0	-	0.3	-	43
2	QAS2	7.2	-	101	-65	0.6	-	0.3	-	0.3	-	106
3		-	NO SAMPLE TAKEN									
4		6.5	NO SAMPLE TAKEN									
5	906-44	7.5	55	56	-49	0.5	0.1	0.0	0.0	0.2	0.0	60
6	906-24	7.5	130	128	-96	2.1	1.1	0.3	0.3	0.3	0.1	181
6	906-27	7.9	93	85	-76	0.4	0.2	0.1	0.1	0.2	0.2	114
6	906-29	7.9	95	92	-70	0.4	0.2	0.1	0.1	0.1	0.1	104
6	BC12A	7.3	-	96	0	0.2	-	0.0	-	0.3	-	-
6	906-20	7.7	84	72	-60	0.3	0.1	0.0	0.0	0.2	0.1	86
6	BC12	7.1	76	57	-33	0.5	0.2	0.8	0.2	0.2	0.1	157
7	906-22	7.0	28	14	-5	3.4	1.0	0.7	0.5	0.5	0.2	93
7	906-23	5.9	10	4	5	0.9	0.5	2.3	2.3	0.3	0.2	233
7	906-19	7.6	79	74	-60	0.8	0.5	0.5	0.5	0.1	0.1	313
8	906-25	7.7	74	70	-56	0.6	0.5	0.1	0.1	0.2	0.1	40
8	906-28	8.0	98	94	-72	0.5	0.1	0.1	0.1	0.1	0.1	89
9	906-26	7.7	128	129	-117	0.6	0.2	0.2	0.1	0.2	0.1	162
10	906-31	7.8	66	47	-16	0.7	0.1	0.1	0.2	0.3	0.1	122
11	BC11	7.4	198	126	-46	0.2	0.1	0.1	0.1	0.1	0.1	434
12	BC10	7.4	46	45	-6	0.4	0.2	0.3	0.1	0.1	0.1	82
13	BC9	7.1	52	48	-20	0.3	0.2	0.1	0.1	0.2	0.1	45
14	BC3	7.8	257	229	-160	0.3	0.2	0.4	0.3	0.1	0.1	306
14	BC3B	8.2	109	201	-83	0.1	0.1	0.1	0.1	0.2	0.1	234
15	SB1	3.0	-	0	374	33.0	31.9	47.6	42.5	22.5	20.0	1099
15	BC4.1	3.5	0	0	127	5.5	3.4	17.6	13.7	11.2	6.6	408
15	BC4	5.9	48	32	59	20.4	16.0	18.1	14.7	5.9	2.2	568
16	906-16	4.5	0	0	40	0.7	0.7	3.4	3.3	5.8	5.3	176
16	BC5	6.7	-	103	0	0.3	-	0.3	-	0.3	-	265
17	906-12	7.3	68	64	-26	0.3	0.2	0.3	0.4	0.2	0.1	103
18	B-BC7.2B	3.3	0	0	67	0.7	0.6	5.5	5.3	9.3	9.0	264
19	906-6	5.9	4	3	4	0.3	0.1	1.5	1.5	0.6	0.5	108

Trib # corresponds to the tributary number provided on the Stream Map; pH in standard units; Alkalinity, acidity, total and dissolved metals, and sulfates in mg/L; Metals and pH rounded to nearest tenth; Alkalinity, acidity, and sulfates rounded to nearest whole number; Highlighted entries indicate the unnamed tributary, sampling point, and parameter which do not meet the applicable water quality criteria (TMDL) listed in Table IV. Dissolved manganese and aluminum are also highlighted if the total concentrations exceed the applicable water quality criteria (TMDL). (See attached monitoring data.)

Table VI. Unnamed Tributaries Water Quality Data (Average Values) (2012-2016)

Trib #	Sample Point	pH	Alkalinity		Acidity	Iron		Manganese		Aluminum		SO_4
		field	field	lab		total	diss.	total	diss.	total	diss.	
7	906-22	6.6	22	13	-1	3.2	1.6	1.9	1.8	0.6	0.3	124
7	906-23	6.5	14	25	-17	2.1	1.5	1.8	1.8	0.3	0.2	121
15	SB1	7.1	92	99	-84	0.8	0.4	2.0	1.9	0.2	<0.1	450
15	BC4	7.6	97	95	-81	0.2	0.1	0.6	0.5	0.1	0.1	325
16	906-16	6.1	21	18	-3	1.3	0.4	1.8	1.2	2.4	1.0	93
18	908-Y	4.2	0	0	42	0.8	0.6	4.0	3.9	6.8	6.2	150
19	906-7A	3.3	0	0	109	3.7	3.1	5.6	4.8	15.7	12.8	244

Trib # corresponds to the tributary number provided on the Stream Map; pH in standard units; Alkalinity, acidity, total and dissolved metals, and sulfates in mg/L; Metals and pH rounded to nearest tenth; Alkalinity, acidity, and sulfates rounded to nearest whole number; Highlighted entries indicate the unnamed tributary, sampling point, and parameter which do not meet the applicable water quality criteria (TMDL) listed in Table IV. Dissolved manganese and aluminum are also highlighted if the total concentrations exceed the applicable water quality criteria (TMDL). (See attached monitoring data.)

Blacks Creek

While the majority of the unnamed tributaries to Blacks Creek met the water quality criteria listed in Table IV in 2007, most of the length of Blacks Creek, as identified in Table VII, did not. Water monitoring conducted in 2015 and 2016 provided in Table VIII, indicates that as a result of the watershed restoration efforts conducted so far, several of the Blacks Creek sampling points now meet all of the TMDL criteria and several other locations have been significantly improved. This monitoring also indicates where additional work is still needed.

Table VII. Blacks Creek Water Quality Data (Average Values) (2007)

← Downstream	Sample Point	pH field	Alkalinity		Acidity	Iron		Manganese		Aluminum		SO_4
			field	lab		total	diss.	total	diss.	total	diss.	
	906-10	4.8	2	3	21	0.4	0.3	2.3	1.9	2.2	1.1	118
	906-11	5.9	10	6	4	0.4	0.4	1.9	1.8	1.0	0.5	124
	BC6	5.7	25	16	8	1.1	0.3	2.5	1.5	1.0	1.0	155
	BC14.1	6.7	-	68	0	0.2	0.1	1.3	1.2	1.0	0.1	204
	906-42	7.2	67	68	-12	4.3	2.0	1.8	1.7	0.3	0.1	240
	BC2	6.7	74	69	-26	7.2	6.5	4.6	5.1	1.0	0.1	287
	BC2B	6.9	78	68	-29	6.6	4.0	5.2	3.5	1.1	0.2	316
	BC1A	7.7	87	85	-31	2.9	0.6	2.7	2.1	0.7	0.0	234
	BC1	7.2	94	81	-35	2.4	0.2	3.4	2.0	0.5	0.1	287
	BC8	7.1	83	69	-27	1.4	0.4	2.1	1.3	0.3	0.1	211
	QAS1	7.2	-	59	-34	0.5	-	0.4	-	0.2	-	179
	QAS4	7.1	84	60	-26	0.6	0.2	0.7	0.2	0.1	0.1	158

pH in standard units; Alkalinity, acidity, total & dissolved metals, and sulfates in mg/L; Highlighted or shaded entries indicate the Blacks Creek sampling point and the parameters which do not meet the applicable water quality criteria listed in Table IV. Dissolved Mn and Al are also highlighted if the total concentrations exceed the applicable water quality criteria (TMDL). The parameters analyzed and the sample sets for the individual points vary. (See attached monitoring data.)

Table VIII. Blacks Creek Water Quality Data (Average Values) (2012-2016)

← Downstream	Sample Point	pH field	Alkalinity		Acidity	Iron		Manganese		Aluminum		SO_4
			field	lab		total	diss.	total	diss.	total	diss.	
	906-10	6.3	13	9	3	0.4	0.2	1.9	1.9	2.2	0.9	113
	906-11	Not sampled during period of 2012-2016.										
	BC6	7.2	36	34	-17	0.2	0.1	1.5	1.4	1.1	0.1	112
	BC14.1	7.6	95	92	-73	0.9	0.1	0.9	0.7	0.7	0.2	140
	906-42	7.5	91	88	-72	2.5	0.8	1.5	1.2	0.3	0.1	178
	BC2	7.4	91	90	-75	1.9	0.7	1.3	1.2	0.2	<0.1	211
	BC2B	7.7	100	93	-75	2.4	1.1	1.7	1.6	0.2	<0.1	241
	BC1A	Not sampled during period of 2012-2016.										
	BC1	8.0	107	102	-83	0.5	<0.1	0.6	0.6	0.1	<0.1	204
	BC8	7.9	100	92	-73	0.7	0.1	0.4	0.4	0.1	<0.1	178
	QAS1	Not sampled during period of 2012-2016.										
	QAS4	8.1	105	90	-77	0.8	0.1	0.7	0.6	0.2	<0.1	175

pH in standard units; Alkalinity, acidity, total & dissolved metals, and sulfates in mg/L; Highlighted or shaded entries indicate the Blacks Creek sampling point and the parameters which do not meet the applicable water quality criteria listed in Table IV. Dissolved Mn and Al are also highlighted if the total concentrations exceed the applicable water quality criteria (TMDL). The parameters analyzed and the sample sets for the individual points vary. (See attached monitoring data.)

Tributaries #18 and #19, which are both significantly impacted by acid mine drainage (906-2, -4, -5, -7, -8, -9, etc.), confluence within a large wetland complex that also receives sources of alkaline water. A significant amount of treatment and dilution appears to occur within the wetland. The effluent of this wetland forms Blacks Creek and is represented by sample point 906-10, which on average, does not meet the water quality criteria for manganese and aluminum. In addition, pH values sometimes do not meet standards and the water is net-alkaline only about half the time. As part of a separate, unrelated project, an In-situ Aqua troll 600 multi-parameter data logger was installed near sampling point 906-10, which collected pH, DO, temperature, ORP, and conductivity data every 15 minutes from 3/24/16 to 12/13/16. Unfortunately, the data logger data set does not coincide with the stream sampling events associated with this project although the 3/22/16 sample was collected just 2 days before the sonde was deployed. Figure 1 provides a graph of the pH data. The data logger pH, as well as historical grab samples, indicates that pH is variable and tends to be lower in late winter and early spring. This may be due to a "flushing" of acids and metals that has been known to occur from abandoned mine lands during that time of year. In order for sample point 906-10 to meet the TMDL standards, at least a portion of the discharges will need to be addressed. It might be possible to treat only a couple of the discharges and it might not be necessary to treat them completely.

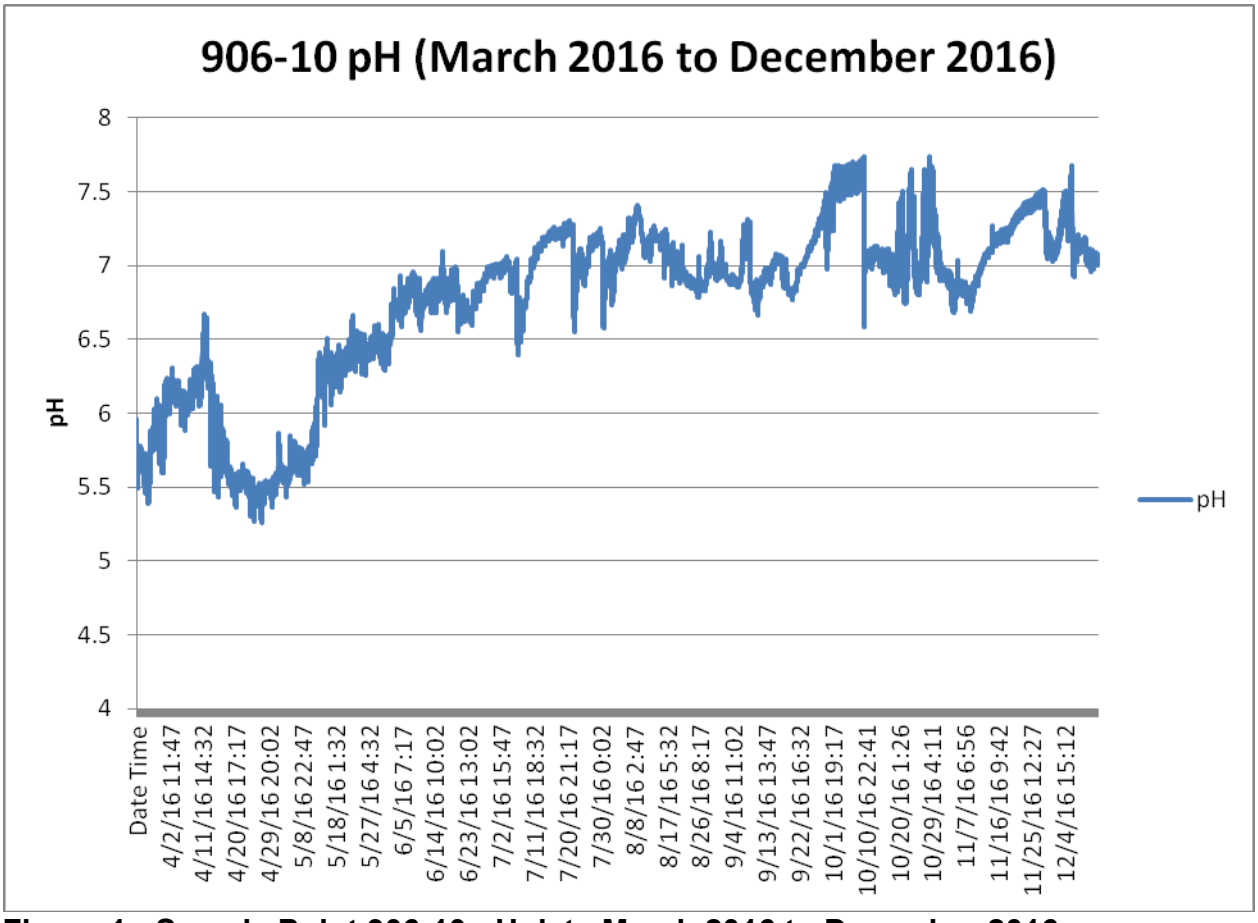


Figure 1: Sample Point 906-10 pH data March 2016 to December 2016

Sampling point 906-11 has not been sampled since the original restoration plan was created, but based upon past water monitoring data, Blacks Creek does improve due to the influence of good quality springs and seeps. Below the confluence of tributary #17, Blacks Creek is sampled at BC6 (aka 906-15). At BC6, on average, the manganese and aluminum criteria are exceeded; however, aluminum concentrations did meet the criteria in about half the samples collected. In addition, pH is good and the water is net-alkaline. Downstream of BC6, natural attenuation and enough good quality water enters and improves Blacks Creek as evidenced by point BC14.1, which now appears to meet TMDL criteria, although iron, manganese, and aluminum are still elevated.

The water quality of Blacks Creek then becomes degraded once again by two upwellings (BC14 & BC15) from abandoned oil wells conveying mine drainage. These discharges significantly impact Blacks Creek as illustrated by data at sample point 906-42. While aluminum content is still below the applicable water quality criterion, the iron and manganese content has increased due to the upwellings. About 50-75 feet downstream of 906-42, tributary #15 ("McIntire trib") enters Blacks Creek. The impact of this tributary can be seen 50-100 feet downstream at point BC2. Prior to the installation of the BC16 and McIntire treatment systems, this tributary severely polluted Blacks Creek, as can be seen in Table VII where iron, manganese, and aluminum concentrations significantly increased. Now the tributary is of such good quality water that it actually improves Blacks Creek (Table VIII). Because of the restoration work completed so far average metal concentrations at BC2 have decreased (Total Fe from 7.2 mg/L to 1.9 mg/L, Dissolved Fe from 6.5 mg/L to 0.7 mg/L, Total Mn from 4.6 mg/L to 1.3 mg/L, and Total Al from 1.0 mg/L to 0.2 mg/L).

Just downstream of BC2, the effluent of the BC19 & 19B passive treatment system (905-WL) enters Blacks Creek. Prior to installation of the passive system, these two discharges, which emanate from oil wells, directly entered Blacks Creek. Downstream of the passive treatment system, Blacks Creek is sampled at BC2B. Now that the McIntire tributary has been restored, the effluent of the BC19/19B system impacts the stream by increasing iron and manganese concentrations. While the criteria for iron and manganese are still exceeded, both BC2 and BC2B meet the aluminum criteria because of the McIntire treatment system. Due to its location, sample point BC1A was not sampled during the 2015-2016 project. At both BC1 and BC8, the stream has improved dramatically since 2007 to where all TMDL criteria are currently being met. There is a slight increase in average iron concentrations from BC1 to BC8, which may be due to the 906-36 and/or other smaller discharges. Sampling point QAS1 has not been sampled since 2006. The furthest downstream sampling point on Blacks Creek is QAS4, which is located about ½-mile above the confluence with Slippery Rock Creek. Water quality at this site remains good and meets all TMDL criteria. There is some indication that between BC8 and QAS4, that some minor discharges may be slightly affecting water quality.

Where flow rates were measured, loadings were calculated. Table IX provides a summary of average loading rates from the original 2007 restoration plan for each sampling point on Blacks Creek where flow rates were available. Table X provides a summary of the average loading rates from 2012-2016. As can be seen, the number of flow measurements for each sampling location varied in both tables. In general, data provided in Table IX is based upon more samples with flow measurements over a longer period of time (about 10 years) than the data in Table X where fewer samples were collected over four years. This variability, along with inherent inaccuracy associated with various flow measurement methods, makes comparing the data

between the tables and at times within the same table difficult. It may also help to explain some of the "unaccountable" differences in the data. For example, this may help to explain why there are significant increases in metal loadings from sample point BC1 to BC8 or from BC6 to BC14.1, considering the fact that there are not any known major discharges existing between the two points. This may also explain why QAS4 loadings appear to be much higher now than in the 2007 report even though water quality is about the same. The presence of beaver dams also made measuring flows difficult at times, especially at BC2.

Table X includes sample points BC14.1 and 906-42 whereas Table IX does not, due to a lack of flow data for these sample points prior to 2007. As the majority of the significant AMD discharges enter prior to BC2 and as the constituents of interest are not conservative, good quality water from tributaries and/or base flow to Blacks Creek are expected to not only dilute concentrations (no impact to loadings) but also encourage precipitation of metal solids resulting in decreased loadings. As can be seen by comparing the two tables, the installation of the BC16 and McIntire systems have significantly reduced metal loadings at BC2, BC2B, BC1, and BC8. The increase in metal loadings between BC14.1 and 906-42 demonstrates the impact of the BC14 and BC15 discharges while the difference between 906-42 and BC2B indicates the need to rehabilitate and possibly expand the BC19 & 19B passive system. As will be further discussed in later sections, addressing the discharges in this area of the watershed will be imperative to the restoration of Blacks Creek.

Table IX. Blacks Creek Average Loadings at Selected Sampling Points (2007)

Sample Point	# samples with Flow (n)	Alkalinity	Acidity	Total Fe	Total Mn	Total Al	Total Fe, Mn, Al
BC6 (906-15)	5	32.2	16.7	0.3	3.4	4.2	7.9
BC2	10	612.0	-241.6	53.0	31.3	7.8	92.1
BC2B	11	599.5	-243.6	42.8	29.2	5.2	77.2
BC1	21	841.9	-151.3	25.1	32.3	1.8	59.2
BC8	18	1394.8	-215.8	41.7	47.1	1.0	89.8
QAS1	11	364.6	-178.3	2.6	2.9	1.1	6.6
QAS4	11	537.3	-226.1	4.4	5.4	1.3	11.1

All loadings in lb/day based on available laboratory measurements to date. The number of sample sets (n) varies. (See attached monitoring data.)

Table X. Blacks Creek Average Loadings at Selected Sampling Points (2012-2016)

Sample Point	# samples with Flow (n)	Alkalinity	Acidity	Total Fe	Total Mn	Total Al	Total Fe, Mn, Al
BC6 (906-15)	6	71.9	-36.4	0.5	2.9	2.2	5.6
BC14.1	3	774.1	-639.7	2.1	7.4	3.9	13.4
906-42	5	417.8	-361.6	11.7	8.6	2.9	23.2
BC2	3	167.1	-135.9	1.7	1.8	0	3.5
BC2B	4	670.8	-582.0	18.4	12.9	1.6	32.9
BC1	5	673.5	-491.7	2.1	3.7	1.4	7.2
BC8	6	1125.5	-992.9	10.8	6.2	2.1	19.1
QAS1	0	Not sampled during period of 2012-2016.					
QAS4	2	2652.6	-2350.9	22.2	17.4	4.9	44.5

All loadings in lb/day based on available laboratory measurements to date. The number of sample sets (n) varies. (See attached monitoring data.)

Table XI provides a summary of information compiled from the Blacks Creek TMDL that was completed in 2002. The table provides the existing loading (in 2002) at certain stream sampling point locations and the loading reductions needed to meet the allowable loadings that will achieve the stated water quality criteria. The load reduction needed was calculated by subtracting the allowable load from the existing load. A comparison between Tables IX and XI made during the original restoration plan created in 2007 indicated that while there were minor discrepancies in calculated loadings, which were probably due to incorporation of additional monitoring data in Table IX, in general, the calculated loads were comparable and the trends were similar. Both tables indicate that while there were sources of pollutant loading above BC6, which need to be addressed, the majority of the loading enters the stream between BC6 and BC2. Both also illustrate that the water quality improves downstream and that no major additional sources enter the stream below BC2. According to the information in the TMDL, approximately 59 lb/day of iron, 29 lb/day of manganese and 3 lb/day of aluminum need to be eliminated from Blacks Creek in order to meet applicable water quality criteria. A comparison of Table X and XI demonstrates that a large portion of the loading removal needed at BC2 was obtained by the successful completion of the BC16 and McIntire treatment systems. The BMPs proposed in this restoration plan seek to meet the needed load reductions in order to restore the entire main stem of Blacks Creek. As will be further discussed, successful treatment of just a few of the remaining discharges such as BC14 would significantly reduce the remaining loadings. Even though prediction is tenuous, the treatment of the discharges coupled with the noted existing attenuation, may lead to the level of reduction indicated in the TMDL. In addition, proper maintenance of the existing systems will be imperative to continue meeting the water quality criteria.

Table XI. TMDL: Existing, Allowable, and Reduction Needed

Sample Point	Existing			Allowable			Reduction Needed			% Reduction		
	Fe	Mn	Al	Fe	Mn	Al	Fe	Mn	Al	Fe	Mn	Al
BC6 [906-15]	0.6	3.5	2.8	0.6	0.7	0.2	0.0	2.8	2.6	0	79	92
BC2	60.2	26.6	1.8	1.2	1.1	1.0	59.0	22.8	0.4	98	96	29
BC2B	33.6	25.8	5.2	4.7	2.6	2.3	0.0	0.0	0.0	0	0	0
BC1	20.1	35.9	6.2	5.6	7.2	6.2	0.0	3.2	0.0	0	31	0
BC8	10.2	25.1	0.0	10.2	8.0	0.0	0.0	0.0	0.0	0	0	0

Loadings in lb/day; all loading data reorganized from 2004 TMDL Table 3; based on data available during the period of study for the TMDL;

Sedimentation

The poor water quality, accumulation of sediment from upgradient erosion, and precipitation and settling of metal solids appear to greatly impact the aquatic ecosystem in Blacks Creek. In addition, as the majority of Blacks Creek has a low or very low gradient (less than 2%), even as the water quality improves, the pre-existing metal precipitates in the substrate may not be flushed as readily as in a stream with a higher gradient. According to the Slippery Rock Creek Watershed Assessment and Restoration Plan (Beran et al, 2006):

> "Marginal habitat conditions are reflected in the relatively low median scores (range of 8 – 10.5) for sediment deposition in all the assessed streams. This indicates that sediment is degrading habitat with major deposition of fines (sand, silt, clay) in pools and glides reducing pool depth. Coarse sand and gravel deposition on bars, transverse riffles, and formation of sand deposits occur at obstructions frequently limiting habitat quality."

Investigation of the sedimentation problem was not the focus of this report and requires further study for evaluation. Nonetheless, implementation of passive systems to collect metal sludge is expected to significantly assist in ameliorating further sediment accumulation in the stream.

Discussion of Mine Discharge Water Quality

The primary source of impairment to the watershed identified in the Blacks Creek TMDL was metals from abandoned mine drainage. Other sources may be on-lot septic systems; sedimentation from the erosion of stream banks, poorly-vegetated lands, and dirt/gravel roads; as well as nutrients and pesticides from agriculture. Investigation of these potential sources was beyond the scope of this report. Over 20 abandoned mine discharges exhibiting significant degradation and flow have been identified in the Blacks Creek Watershed. Numerous other small seeps exist. In addition, ephemeral, intermittent or other discharges of significance may exist within the watershed, but remain unidentified.

Several abandoned mine discharges have been monitored for many years while others were not identified until the original restoration plan was in development and therefore have limited data. Table XII provides a general characterization of these abandoned mine discharges. The water quality varies from alkaline water with relatively low metal concentrations to very acidic water with high metal concentrations. Unreclaimed surface mines on the Brookville coalbed, which characteristically encountered potentially alkalinity-generating material in the overburden, appear to have minimal impact to the water quality, other than possible sedimentation. The only exception may be discharges 906-4 and 906-5, which emanate at the toe of an unreclaimed surface mine; however, it is unclear as to whether the source of the degradation is from a surface or an underground mine or both. Surface mining of coalbeds which included disposal of

coal refuse and which did not encounter substantial alkalinity-generating material in the overburden prior to implementation of modern, environmentally-based mining methods appears to have been the major contributor to stream degradation. These discharges shall be further discussed in the Restoration Plan section.

Table XII. Mine Drainage Water Quality Characteristics

Sample Point		Flow	pH	Alkalinity		Acidity	Iron		Manganese		Aluminum		SO_4
			field	field	lab		total	diss.	total	diss.	total	diss.	
906-2		13	5.5	22	13	-0.2	1.0	0.2	2.7	2.6	5.2	1.1	146
906-4		18	3.4	0	0	143	0.9	0.8	6.6	6.3	22.2	19.7	320
906-5		51	3.6	0	0	61	0.4	0.3	5.1	4.8	7.0	6.7	170
906-7		9	4.1	0	0	38	1.5	1.1	3.5	3.3	5.3	5.0	113
906-8		5	3.0	0	0	379	35.0	31.1	11.7	11.1	49.8	47.4	786
906-9		28	3.2	0	0	118	1.4	1.2	8.8	8.3	14.9	14.1	333
906-14		7	5.9	30	14	1	14.1	9.5	4.6	4.1	0.2	0.1	138
906-16		20	6.1	21	18	-3	1.3	0.4	1.8	1.2	2.4	0.7	93
906-17		16	3.7	0	0	408	0.5	0.5	19.2	18.2	48.4	46.4	906
906-21		7	6.8	90	59	-40	28.5	25.7	1.0	1.0	0.1	0.1	95
906-22		14	6.6	22	13	-1	3.2	1.6	1.9	1.8	0.6	0.2	124
906-23		17	6.5	14	25	-17	2.1	1.5	1.8	1.8	0.2	0.1	121
906-36		48	6.6	128	112	-87	13.3	12.8	1.5	1.5	0.1	0.1	161
BC14		75	6.3	142	100	-1	48.7	49.9	10.6	9.8	0.2	0.1	442
BC15		21	6.3	-	85	23	22.3	35.0	16.7	10.0	0.2	0.0	417
BC16		74	6.0	168	170	2.4	55.3	47.8	15.6	11.5	023	0.2	604
BC19		22	6.5	151	129	-30	39.0	43.5	9.1	10.3	0.1	0.0	500
BC19B		41	6.3	205	189	-108	32.6	30.3	7.4	7.3	0.1	0.0	507
TB1	MC1	16	3.0	-	0	979	293.6	338.8	85.8	80.9	42.4	28.8	2053
	MC2	27	3.1	-	0	727	239.6	199.2	72.6	66.6	43.7	38.0	2039
	MC3	29	4.1	-	11	1239	348.8	-	90.3	-	37.0	-	2159

Flow in gallons/minute (gpm); pH in standard units; Alkalinity, acidity, total metals, dissolved metals, and sulfates in mg/L; Metals and pH rounded to nearest tenth; Alkalinity, acidity, and sulfates rounded to nearest whole number

Loadings were also calculated for each of the discharges and are presented in Table XIII. Since metals are the primary source of impairment to the watershed, the discharges were ranked based on total metal loadings. This ranking system was also used to help prioritize the restoration effort. Note that the top 3 discharges account for 70% of the metal loadings in the watershed, the top 5 account for 82%, and the top 10 account for 95% of the metal loadings. In contrast, the bottom 9 discharges account for a little less than 5% of the metal loadings to the watershed. In Table XIV, discharges that were likely to be treated together, were grouped together and then re-ranked. Once this was completed, the top 5 account for 87% and the top 7 account for 96% of the metal loading.

Table XIII. Individual Mine Discharges Ranked by Total Metals Loadings

Rank	Point	Alkalinity	Acidity	Total Fe	Total Mn	Total Al	Total Fe, Mn, Al	% of Total Contribution
1	TB1	0.0	216.9	56.0	18.9	12.8	87.7	30.2
2	BC16	157.2	-7.1	50.0	14.3	0.2	64.5	22.2
3	BC14	84.4	-4.2	42.9	9.0	0.1	52.0	17.9
4	BC19B	110.7	-50.7	17.2	3.7	0.1	21.0	7.2
5	BC19	33.8	-5.6	11.1	2.5	0.0	13.6	4.7
6	906-5	0.0	43.7	0.3	3.7	5.4	9.4	3.2
7	906-36	66.0	-52.6	7.7	0.9	0.1	8.7	3.0
8	906-9	0.0	40.2	0.6	2.7	4.9	8.2	2.8
9	906-8	0.0	22.7	2.5	0.7	2.8	6.0	2.1
10	906-4	0.0	29.9	0.2	1.4	4.2	5.8	2.0
11	BC15	13.7	7.8	0.2	5.3	0.0	5.5	1.9
12	906-21	4.8	-3.0	2.4	0.1	0.0	2.5	0.9
13	906-16	1.2	6.0	0.2	0.6	0.9	1.7	0.6
14	906-2	2.0	-0.1	0.1	0.4	0.8	1.3	0.4
15	906-14	0.9	0.2	1.0	0.3	0.0	1.3	0.4
16	906-7	0.0	2.9	0.1	0.2	0.4	0.7	0.2
17	906-22	0.8	1.3	0.2	0.2	0.1	0.5	0.2
18	906-23	2.6	-1.3	0.1	0.1	0.0	0.2	0.1
19	906-24	15.4	-11.5	0.2	0.0	0.0	0.2	0.1
	Totals			**193.0**	**65.0**	**32.8**	**290.8**	**100.0**

Loadings in lb/day calculated using available lab analyses; BC19/BC19B currently treated by passive system; thus, values do not represent current loadings; TB1 (combined MC1, MC2, and MC3 loadings) as some individual discharges appear spurious

Table XIV. Grouped Mine Discharges Ranked by Total Metals Loadings

Rank	Point	Alkalinity	Acidity	Total Fe	Total Mn	Total Al	Total Fe, Mn, Al	% of Total Contribution
1	TB1	0.0	216.9	56.0	18.9	12.8	87.7	30.1
2	BC16	157.2	-7.1	50.0	14.3	0.2	64.5	22.2
3	BC14	84.4	-4.2	42.9	9.0	0.1	52.0	17.9
4	BC19/19B	144.5	-56.3	28.3	6.2	0.1	34.6	11.9
5	906-4,5	0	73.6	0.5	5.1	9.6	15.2	5.2
6	906-7A (906-7,8,9)	0	69.4	2.0	3.7	9.3	15.0	5.2
7	906-36	66.0	-52.6	7.7	0.9	0.1	8.7	3.0
8	BC15	13.7	7.8	0.2	5.3	0.0	5.5	1.9
9	906-21	4.8	-3.0	2.4	0.1	0.0	2.5	0.9
10	906-16	1.2	6.0	0.2	0.6	0.9	1.7	0.6
11	906-2	2.0	-0.1	0.1	0.4	0.8	1.3	0.4
12	906-14	0.9	0.2	1.0	0.3	0.0	1.3	0.4
13	906-22,23	3.4	0	0.3	0.3	0.1	0.7	0.2
14	906-24	15.4	-11.5	0.2	0.0	0.0	0.2	0.1
	Totals			**191.8**	**65.1**	**34.0**	**290.9**	**100.0**

Loadings in lb/day calculated using available lab analyses; BC19/BC19B currently treated by passive system; thus, values do not represent current loadings; TB1 (combined MC1, MC2, and MC3 loadings) as some individual discharges appear spurious

RESTORATION PLAN

In order to meet the TMDL criteria provided for Blacks Creek as well as achieve the ultimate goal of returning the stream to a viable fishery, a restoration plan was developed and approved in 2007. This document provides a revised plan based upon additional data collection for select mine drainage discharges and streams. This plan proposes to passively treat the abandoned mine discharges that cause substantial degradation to Blacks Creek. The discharges have been grouped based on location and similar water quality. The final effluent from the passive systems, as proposed, is expected to be characterized as net-alkaline with low dissolved metals. Contingency plans will be developed at the appropriate scale for each project.

Passive systems have been proposed to treat the significant sources of AMD degradation to Blacks Creek. In addition to describing the conceptual BMP, an estimate of the cost and pollutant loading reduction have been provided. Costing generally follows guidelines used in the *AMDTreat* software program (US OSM et al, 2017). Component selection and sizing are generally based on information provided in the US Department of Energy, National Energy Technology Laboratory report, "The Passive Treatment of Coal Mine Drainage" (Watzlaf et al, 2004). Development of the conceptual design as well as the estimated costs and pollutant loading reductions are also based on the experience of the BioMost, Inc. and Stream Restoration Inc. team that have designed and built over 450 passive components for over 80 systems, which successfully treat ~3 billion gallons of mine drainage annually.

While sophisticated modeling programs could be developed to predict pollutant loading reductions, experience has shown that pre- and post- construction water monitoring data often illustrate that undetected mine drainage such as shallow subsurface flow is commonly encountered and treated by the system, typically resulting in higher pollutant loading removal than indicated by pre-construction monitoring. Nonetheless, a preliminary pollutant load reduction estimate is provided for each proposed passive system based only on existing pollutant loading of the discharge. Although passive systems have been online in the Slippery Rock Creek Watershed that have operated for more than a decade and have met or exceeded the design effluent criteria, typically passive systems are not expected to remove 100% of all pollutant loadings 100% of the time. Table XV briefly describes the functions of the components included in the passive treatment systems proposed for the Blacks Creek Watershed:

Table XV. Passive Treatment System Components: General Function and Description

Component	Function & Description
Oxidation & Precipitation Channel **(OPC)** aka Terrace Iron Formations **(TIF)**	Promote removal and recovery of iron minerals at low pH; substrate limestone aggregate with geotextile
Automatic Flushing Vertical Flow Pond **(AFVFP)**	Generate alkalinity; limestone aggregate; metal solids flushed automatically via either siphon or solar powered valves
Vertical Flow Pond – Jennings style **(JVFP)**	Generate alkalinity; mixed media consisting of organic material (compost and wood chips) with limestone aggregate; metal sulfides formed/retained; iron reduced (Fe^{+3} to Fe^{+2})
Settling Pond **(SP)**	Oxidize, precipitate, settle, retain metal solids
Aerobic Wetland **(WL)**	Oxidize, precipitate, settle, retain metal solids; provide wildlife habitat
Horizontal Flow Limestone Bed **(HFLB)**	Generate alkalinity; promote removal and recovery of manganese

Note: The descriptions and functions are applicable for this report only.

Unnamed "McIntire" Tributary #15 [includes discussion of TB1 (MC1, MC2, MC3) and BC16]
In the original restoration plan completed in 2007, the "McIntire" tributary #15 was identified as the single largest impact to Blacks Creek due to the severe impact caused by the two discharges (TB1 & BC16) with the highest metal loadings (~50%) in the Blacks Creek Watershed. As noted previously, TB1 is the effluent of an existing old chemical treatment pond, which receives, three discharges (MC1, MC2, MC3) from the H&D "McIntire" minesite in the headwaters of trib #15. At that time, the TB1 primary spillway had become plugged with iron minerals precipitating at low pH to the point that the water was discharging over the emergency spillway, forming trib #15. Trib #15 was then conveyed by a reconstructed stream channel to an in-stream settling pond (SB1). Trib #15 then flowed about a 1/3-mile before the confluence with the BC16 discharge just prior to entering Blacks Creek.

"McIntire" Site TB1 (MC1, MC2, and MC3): The "McIntire" bond forfeiture surface mine and coal refuse disposal site was the single largest impact to the Blacks Creek Watershed. A terrain conductivity study was completed by the PA DEP to identify "hot spots" at the minesite. This information was used to determine placement of alkaline material at the site. In 2006, local limestone quarry operator and active Slippery Rock Watershed Coalition participant, Quality Aggregates Inc., placed approximately 10,000 tons of waste lime to create a low- permeability barrier and to provide alkalinity to the subsurface flow. A comparison of data collected for sample point TB1 from the periods 1996-2004 and 2009-2015 indicates that there has been some improvement in water quality. Whether this is due to natural improvements or a direct result of the waste lime is difficult to state with certainty. Based on experience with similar efforts, loadings are expected to decrease, but degradation is expected to remain. In 2009, Stream Restoration Inc and the Slippery Rock Watershed Coalition received a grant for $720,246 to design, permit, and construct a passive system. System construction was completed in late 2011. A schematic (See McIntire Schematic) of the constructed system and Table XVI provides a list of the treatment components and related details.

Table XVII provides average post-construction water quality data of the McIntire system. As can be seen, the system is highly effective at neutralizing the acidity and removing the high metal concentrations. The effluent of HFLB2 meets all TMDL water quality standards. That water flows into the existing settling basin (SB1), which does receive other untreated ground water sources. The final effluent water of SB1 is generally of good quality water and does meet standard mining water quality effluent limits, but at times does not meet TMDL stream goals.

Table XVI McIntire Passive System Components

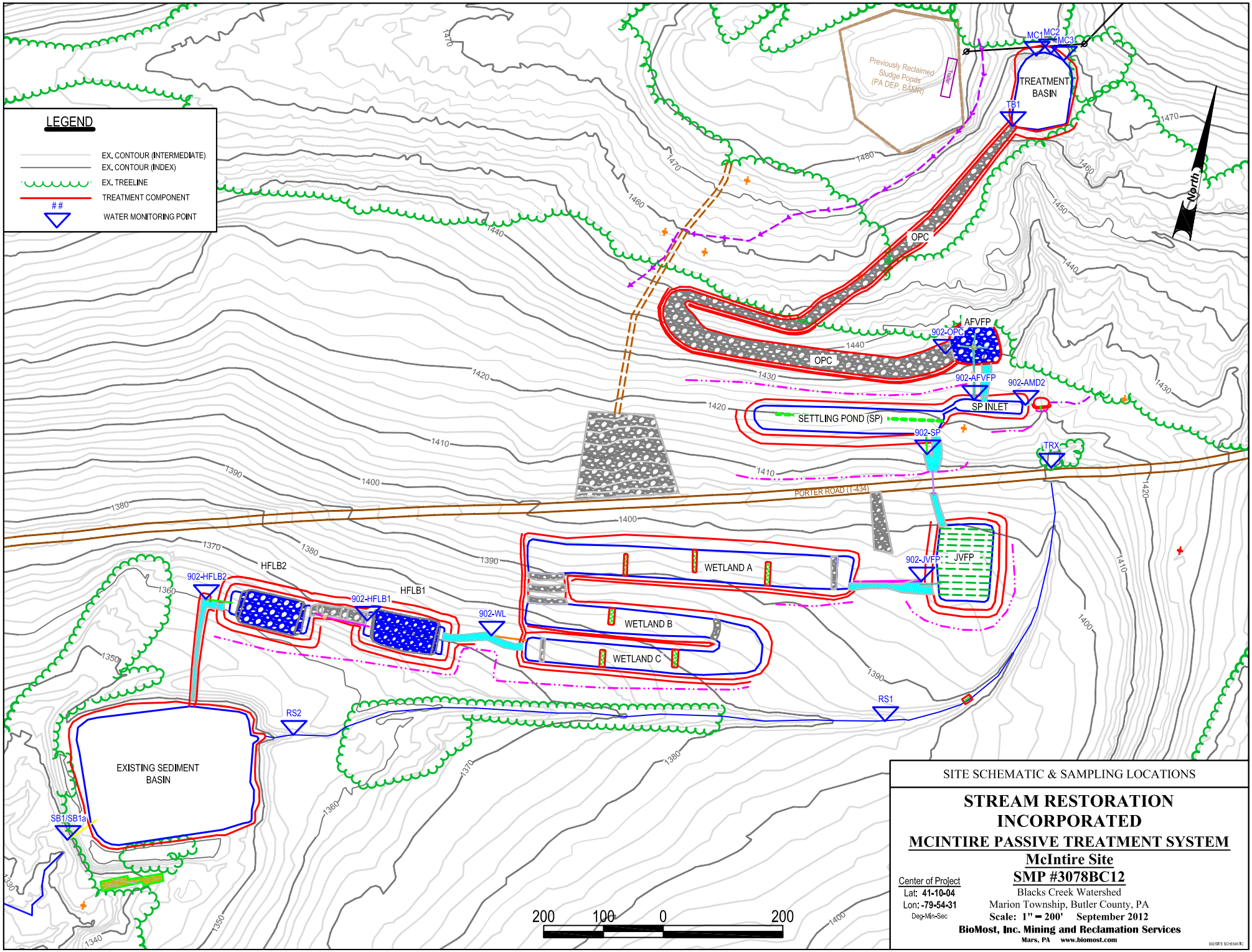
Component	Construction Details
Treatment Basin 1 **(TB1)** (existing)	Drained, removed sludge, rebuilt embankment of existing pond
Oxidation Precipitation Channel **(OPC)**	Approximately 3,000 feet long and ~20 feet wide, lined with limestone for low pH iron removal
Auto-Flushing Vertical Flow Pond **(AFVFP)**	1000T limestone; contains both a solar powered SmartDrain and a siphon to provide 2 different auto-flushing mechanisms to insure at least 1 flush of the treatment media every day.
Settling Pond **(SP)**	23,000 sq. ft. with baffle curtain
Jennings Vertical Flow Pond **(JVFP)**	1,500T limestone; with 556 CY each spent mushroom compost & wood chips)
Wetland **(WL)**	88,000 sq. ft.
Horizontal Flow Limestone Bed 1 **(HFLB1)**	1,500T limestone
Horizontal Flow Limestone Bed 2 **(HFLB2)**	1,500T limestone
Sediment Basin 1 **(SB1)** (existing)	Reconstructed primary & secondary spillways of existing pond

Table XVII. McIntire Treatment System – post construction (Average Values)

Sample Point	Flow	pH	Alkalinity		Acidity	Iron		Manganese		Aluminum		SO_4
		field	field	lab		total	diss.	total	diss.	Total	diss.	
TB1	30	2.9	0	0	667	150.8	146.3	61.5	67.0	52.2	48.5	1839
902-OPC	NA	2.9	0	0	439	39.0	42.1	55.4	56.4	45.7	44.3	1674
902-SP	40	4.0	0	0	291	16.7	22.8	41.3	38.7	39.5	38.7	1363
902-JVP	37	7.0	141	152	-80	3.0	3.4	40.8	40.5	0.1	<0.1	959
902-WL	58	7.4	55	70	-59	0.2	0.1	1.3	1.3	0.1	<0.1	858
902-HFLB2	29	7.0	133	130	-111	0.2	<0.1	0.5	0.5	0.3	<0.1	576
SB1	48	7.0	92	99	-84	0.8	0.4	1.9	1.9	0.2	<0.1	451

Flow in gpm; Alkalinity, acidity, total & dissolved metals, and sulfates in mg/L; Metals and pH rounded to nearest tenth; Alkalinity acidity, and sulfates rounded to nearest whole number; Number of sample sets (n) varies. (See attached monitoring data.)

Due to the automatic flushing mechanisms and other design features of the system, accurate flow measurements throughout the system are difficult. Based upon current available information, the system is believed to be neutralizing 212 lb/day of acidity and removing 50.9 lb/day of iron, 19.7 lb/day of manganese, and 15.6 lb/day of aluminum and discharging net-alkaline water with an average 0.3 lb/day of iron, 0.7 lb/day of manganese and 0.05 lb/day of aluminum. This means that the mine discharge with the highest pollutant loading in the watershed now has one of the lowest.



SITE SCHEMATIC & SAMPLING LOCATIONS

STREAM RESTORATION INCORPORATED

MCINTIRE PASSIVE TREATMENT SYSTEM

McIntire Site

SMP #3078BC12

Center of Project
Lat: 41-10-04
Lon: -79-54-31
Deg-Min-Sec

Blacks Creek Watershed
Marion Township, Butler County, PA
Scale: 1" = 200' September 2012

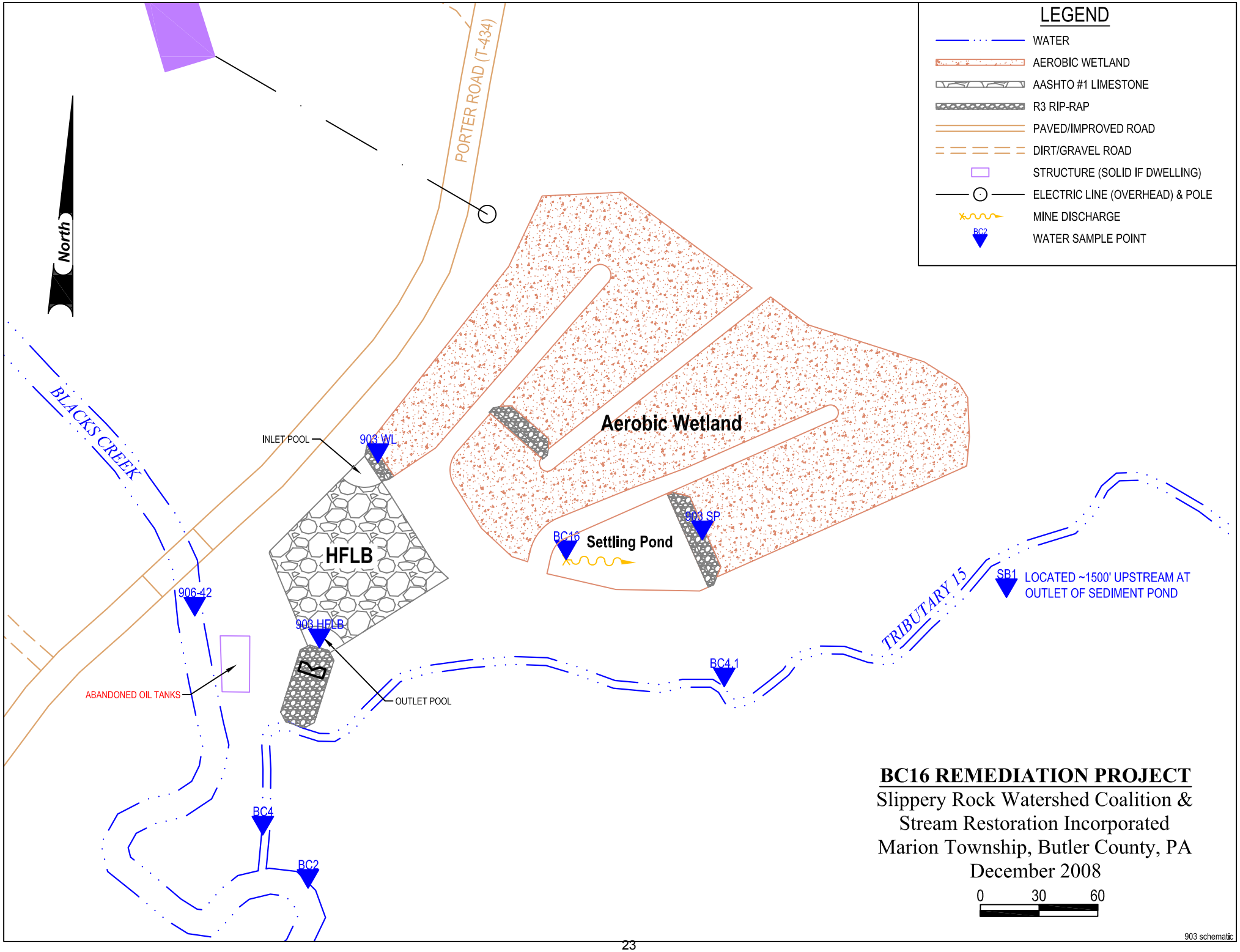
BioMost, Inc. Mining and Reclamation Services
Mars, PA www.biomost.com

BC16: The BC16 discharge, which emanates from an old oil well, was identified in the original restoration plan as having the second highest metal loading in the watershed. The Slippery Rock Watershed Coalition and Stream Restoration Incorporated received a $151,740 PADEP/EPA 319 grant to design, permit and construct a treatment system, which was completed in 2008. The passive system (See BC16 Schematic) consists of a 2,500 sq ft Settling Pond, a 30,000 sq ft Wetland and a 1,400-ton Horizontal Flow Limestone Bed. The way the system is currently configured prevents flow from being measured, which in turn prevents load removals from being accurately determined. To address this issue, a weir was installed in July of 2017, which will help with future evaluations. Pre-construction monitoring estimated that the system would neutralize 7 lb/day of acidity and remove 49 lb/day of iron and 15 lb/day of manganese. While flow data is not available, post-construction water sampling data provided in Table XVIII indicates the system is working very well. Monitoring data have indicated that the discharge has improved, which may be related to the application of waste lime at the McIntire mine site.

Table XVIII BC16 Treatment System – post construction (Average Values)

Sample Point	pH	Alkalinity		Acidity	Iron		Manganese		Aluminum		SO_4
	field	field	lab		total	diss.	total	diss.	Total	diss.	
BC16A	6.5	128	108	-35	36.5	-	7.9	-	<0.1	-	402
903SP	6.6	122	92	-50	35.2		7.5		<0.1		407
903WL	6.9	56	69	-57	4.2		5.1		<0.1		368
903HFLB	7.2	63	89	-74	0.3		1.3		<0.1		365

Alkalinity, acidity, total & dissolved metals, and sulfates in mg/L; Metals and pH rounded to nearest tenth; Alkalinity, acidity, and sulfates rounded to nearest whole number; Number of sample sets (n) varies. (See attached monitoring data.)


LEGEND
WATER
AEROBIC WETLAND
AASHTO #1 LIMESTONE
R3 RIP-RAP
PAVED/IMPROVED ROAD
DIRT/GRAVEL ROAD
STRUCTURE (SOLID IF DWELLING)
ELECTRIC LINE (OVERHEAD) & POLE
MINE DISCHARGE
BC2
WATER SAMPLE POINT
North
PORTER ROAD (T-434)
BLACKS CREEK
Aerobic Wetland
INLET POOL
903 WL
HFLB
903 SP
BC16
Settling Pond
906-42
903 HFLB
OUTLET POOL
ABANDONED OIL TANKS
BC4.1
TRIBUTARY 15
SB1
LOCATED ~1500' UPSTREAM AT
OUTLET OF SEDIMENT POND
BC4
BC2
BC16 REMEDIATION PROJECT
Slippery Rock Watershed Coalition &
Stream Restoration Incorporated
Marion Township, Butler County, PA
December 2008
0
30
60
903 schematic

Tributary #15 Restoration Results

Table XIX illustrates the water quality of trib #15 from the TB1 effluent to the confluence with Blacks Creek prior to any restoration activities. Samples are arranged from upstream to downstream. Table XIX also includes sample points on Blacks Creek upstream (906-42) and downstream (BC2) of the confluence with the trib #15. BC4.1 is the furthest downstream sample point below TB1 prior to BC16 entering the tributary. BC4 is near the mouth of trib #15 directly downstream of the untreated BC16 discharge and just upstream of the confluence with Blacks Creek. The impact of BC16 to trib #15 was remarkable. Based on the sample analyses, the iron concentrations in trib #15 significantly increased while the aluminum concentrations decreased. The alkaline BC16 discharge, with an average flow rate of 74 gpm, decreased the aluminum concentration in trib #15 both by dilution and by increasing the pH. As aluminum solubility is controlled primarily by pH, once the pH reaches ~4.0 aluminum solids begin to form and by pH of ~5, only ~1 mg/L dissolved aluminum is typically in solution. The impact of trib # 15 to Blacks Creek was devastating, as illustrated by comparing upstream (906-42) and downstream (BC2) points on Blacks Creek, with iron, manganese, and aluminum content doubling and in some cases tripling.

Table XIX. Unnamed Tributary #15 Water Quality Data (Average Values) (pre-2007)

Location		Sample Point	pH	Alkalinity		Acidity	Iron		Manganese		Aluminum		SO_4
			field	field	lab		total	diss.	total	diss.	Total	diss.	
↓ Downstream	Tributary #15	TB1	3.0	-	0	853	262.7	236.5	73.5	66.6	35.0	35.4	2028
		SB1	3.0	-	0	374	33.0	31.9	47.6	42.5	22.5	20.0	1099
		BC4.1	3.5	0	0	127	5.5	3.4	17.6	13.7	11.2	6.6	408
		BC16 AMD to trib15	6.0	167	171	13	53.0	45.0	15.7	11.9	0.3	0.2	610
		BC4	5.9	48	32	59	20.4	16.0	18.1	14.7	5.9	2.2	568
Blacks Creek		906-42 above trib15	7.2	67	68	-12	4.3	2.0	1.8	1.7	0.3	0.1	240
		BC2 below trib15	6.7	74	69	-26	7.2	6.5	4.6	5.1	1.0	0.1	287

Alkalinity, acidity, total & dissolved metals, and sulfates in mg/L; Metals and pH rounded to nearest tenth; Alkalinity acidity, and sulfates rounded to nearest whole number; Number of sample sets (n) varies. (See attached monitoring data.)

Table XX provides water quality of trib #15 from the TB1 effluent to the confluence with Blacks Creek after the installation of the BC16 and McIntire passive systems. TB1 and other sources of water are no longer the headwaters of the tributary as they are directed into the passive treatment system. The beginning of the tributary is now essentially the effluent of SB1. While no recent monitoring has been conducted at BC4.1, monitoring at BC4 indicates the once worst quality tributary to Blacks Creek now meets TMDL criteria. In addition, the tributary actually improves the water quality of Blacks Creek.

Table XX. Unnamed Tributary #15 Water Quality Data (Average Values) (2012-2016)

Location		Sample Point	pH field	Alkalinity field	Alkalinity lab	Acidity	Iron total	Iron diss.	Manganese total	Manganese diss.	Aluminum Total	Aluminum diss.	SO_4
↓ Downstream	Tributary #15	TB1	2.9	0	0	667	150.8	146.3	61.5	67.0	52.2	48.5	1839
		SB1	7.0	92	99	-84	0.8	0.4	1.9	1.9	0.2	<0.1	451
		BC4.1	Not sampled during period of 2012-2016.										
		BC16 effluent	7.2	63	89	-74	0.3		1.3		<0.1		365
		BC4	7.6	97	95	-81	0.2	0.1	0.6	0.5	0.1	0.1	325
Blacks Creek		906-42 above trib15	7.5	91	88	-72	2.5	0.8	1.5	1.2	0.3	0.1	178
		BC2 below trib15	7.4	91	90	-75	1.9	0.7	1.3	1.2	0.2	<0.1	211

Alkalinity, acidity, total & dissolved metals, and sulfates in mg/L; Metals and pH rounded to nearest tenth; Alkalinity acidity, and sulfates rounded to nearest whole number; Number of sample sets (n) varies. (See attached monitoring data.)

BC14

The BC14 discharge is ranked 3rd in terms of total metal loadings to Blacks Creek and therefore would be the next logical discharge to address to restore Blacks Creek. In the original restoration plan, it was suggested that due to their proximity to one another, that the BC14 and BC15 discharges could possibly be combined and treated together in one passive system. Based upon current information on the locations of the discharges, land use changes in the area, and landowner access issues, this does not appear to be likely at this point. It also appears that there may have been some confusion as to the locations and that the identities of the two discharges may have been accidentally switched for a period of time. It is also possible that, as they emanate from old abandoned oil wells, that something could have happened to the hydrology and caused the actual locations to have changed over time.

Like BC16, the discharge appears to emanate as an upwelling from an old abandoned oil well. BC14 can be characterized as an alkaline, iron- and manganese-bearing discharge with low aluminum content that is typically net-alkaline, but is sometimes net-acidic. The BC14 and BC15 discharges flow directly into Blacks Creek. The impact to the stream is quite evident as can be seen in Table VIII, by comparing the upstream sample point BC14.1, which meets the TMDL standards, and the next downstream sample point 906-42, which is significantly degraded. Unfortunately, the landowner who owns the property where BC15 is located would not give permission to enter the property for sampling. However, based upon available aerial photos and historical water monitoring, BC14 is believed to be the biggest impact.

A passive system consisting of a 1.1-acre wetland and 1,500-ton HFLB has been proposed. A conceptual design (See BC14 Conceptual Design #1) and a cost estimate have been developed and included in this report. Due to the location of the discharge, area needed for the passive system, elevations, stream, etc., the preferred conceptual design utilizes three different properties. The majority of the system would be constructed on one property, but a small portion would be constructed on an adjacent property and the access road would likely cross another property. The property owner where the access road would likely be constructed is a long-time supporter of the SRWC who allowed both the McIntire and BC16 systems to be built entirely on her property. It may be possible to shift the system further north, but surveying and a more thorough design analysis will be needed, which is beyond the scope of the current project. If needed, the HFLB could be built smaller or possibly eliminated all together. A second conceptual design (See BC14 Conceptual Design #2) consisting of the same size wetland, but a

smaller 700-ton HFLB has been developed. Even a partial system should provide significant treatment and improvement to Blacks Creek. Successful installation of the complete system is anticipated to remove over 40 lb/day of iron and about 9 lb/day of manganese.

Proposed Passive Treatment System Components

BC14

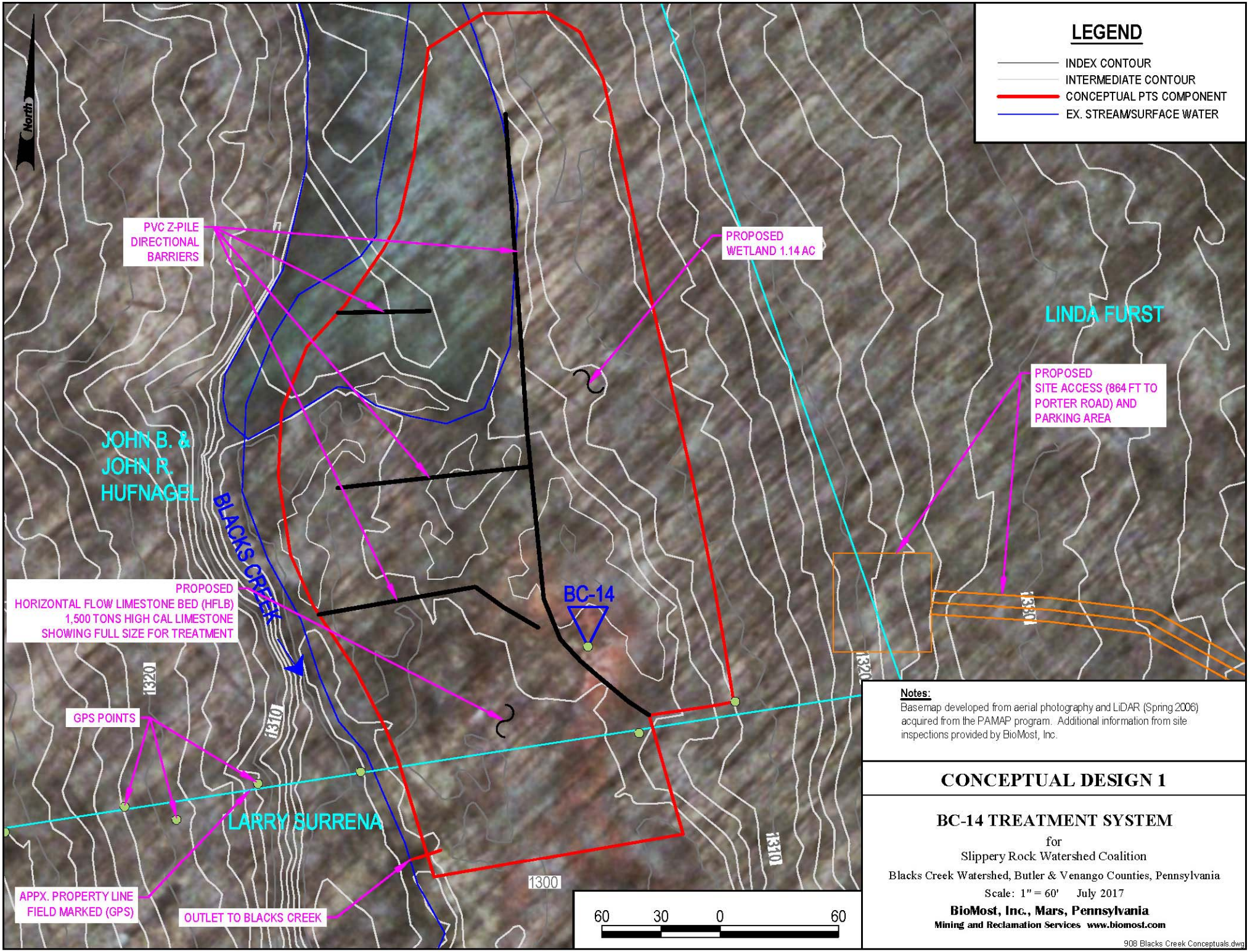
WL(1.1 ac) → **HFLB**

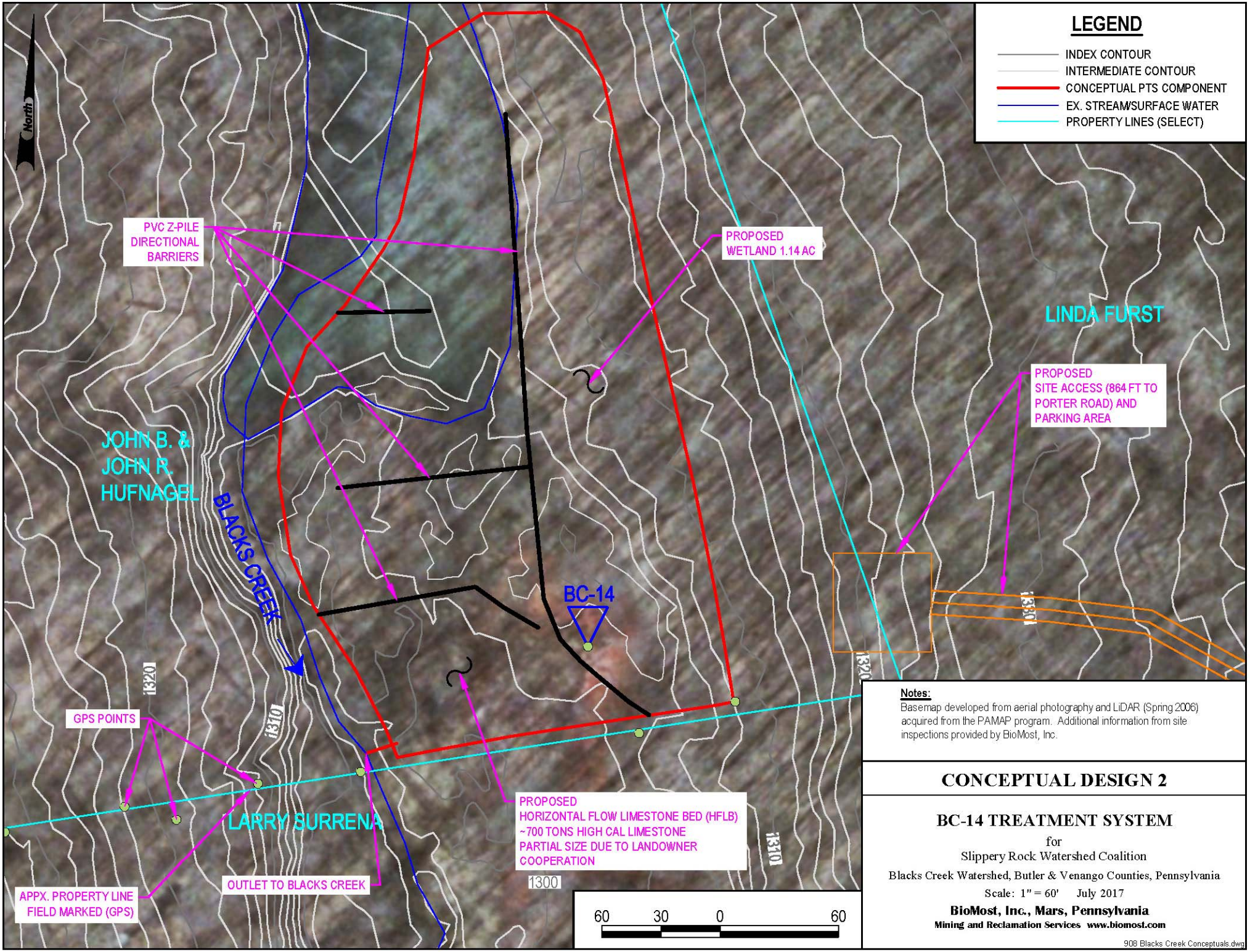
Treatment Media: HFLB-1,500 tons limestone

Projected Decrease in Pollutant Loadings:
(~19,000 lb/yr metals)

Parameter	Iron	Manganese	Aluminum
Lb/day	~43	~9	NA

Preliminary Cost Estimate: ~$300,000


LEGEND
INDEX CONTOUR
INTERMEDIATE CONTOUR
CONCEPTUAL PTS COMPONENT
EX. STREAM/SURFACE WATER
North
PVC Z-PILE DIRECTIONAL BARRIERS
PROPOSED WETLAND 1.14 AC
LINDA FURST
PROPOSED SITE ACCESS (864 FT TO PORTER ROAD) AND PARKING AREA
JOHN B. & JOHN R. HUFNAGEL
BLACKS CREEK
BC-14
PROPOSED HORIZONTAL FLOW LIMESTONE BED (HFLB) 1,500 TONS HIGH CAL LIMESTONE SHOWING FULL SIZE FOR TREATMENT
1320
1310
1300
GPS POINTS
LARRY SURRENA
APPX. PROPERTY LINE FIELD MARKED (GPS)
OUTLET TO BLACKS CREEK
60 30 0 60
Notes:
Basemap developed from aerial photography and LiDAR (Spring 2006) acquired from the PAMAP program. Additional information from site inspections provided by BioMost, Inc.
CONCEPTUAL DESIGN 1
BC-14 TREATMENT SYSTEM
for
Slippery Rock Watershed Coalition
Blacks Creek Watershed, Butler & Venango Counties, Pennsylvania
Scale: 1" = 60' July 2017
BioMost, Inc., Mars, Pennsylvania
Mining and Reclamation Services www.biomost.com
908 Blacks Creek Conceptuals.dwg


LEGEND
INDEX CONTOUR
INTERMEDIATE CONTOUR
CONCEPTUAL PTS COMPONENT
EX. STREAM/SURFACE WATER
PROPERTY LINES (SELECT)
North
PVC Z-PILE DIRECTIONAL BARRIERS
PROPOSED WETLAND 1.14 AC
LINDA FURST
PROPOSED SITE ACCESS (864 FT TO PORTER ROAD) AND PARKING AREA
JOHN B. & JOHN R. HUFNAGEL
BLACKS CREEK
BC-14
1320
1310
1300
GPS POINTS
LARRY SURRENA
PROPOSED HORIZONTAL FLOW LIMESTONE BED (HFLB) ~700 TONS HIGH CAL LIMESTONE PARTIAL SIZE DUE TO LANDOWNER COOPERATION
OUTLET TO BLACKS CREEK
APPX. PROPERTY LINE FIELD MARKED (GPS)
60 30 0 60
Notes:
Basemap developed from aerial photography and LiDAR (Spring 2006) acquired from the PAMAP program. Additional information from site inspections provided by BioMost, Inc.
CONCEPTUAL DESIGN 2
BC-14 TREATMENT SYSTEM
for
Slippery Rock Watershed Coalition
Blacks Creek Watershed, Butler & Venango Counties, Pennsylvania
Scale: 1" = 60' July 2017
BioMost, Inc., Mars, Pennsylvania
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BC15

As previously mentioned, the landowner at BC15 would not provide permission to sample the discharge; therefore, only limited historical data could be utilized in the evaluation. Based upon information from the PA DEP Knox District Mining Office and aerial photo interpretation, the discharge emanates from an old abandoned oil well and is located behind the property owner's garage. Based on the available data, BC15 is ranked 11th of individual discharges in terms of total metal loading and 8th after grouping. The discharge can be characterized as an alkaline, net-acidic discharge with significant iron and manganese concentrations, but low aluminum. Based on this limited information, a passive system conceptual design was developed (See BC15 Conceptual Design) consisting of a 0.6-acre wetland and 1000-ton Horizontal Flow Limestone Bed. While a passive system has been proposed and a rough cost estimate provided, additional water monitoring would be needed prior to developing a final design. As the landowner would not even allow water monitoring to be conducted, it is not likely that permission could be obtained in the foreseeable future to build a treatment system. Even if permission could be obtained, due to the close proximity of BC15 to the garage and stream, building the system could be difficult. It is possible that if some of the other discharges upstream are treated that the stream could potentially meet water quality goals without treating BC15.

Proposed Passive Treatment System Components

BC15

WL(0.6 ac) → **HFLB**

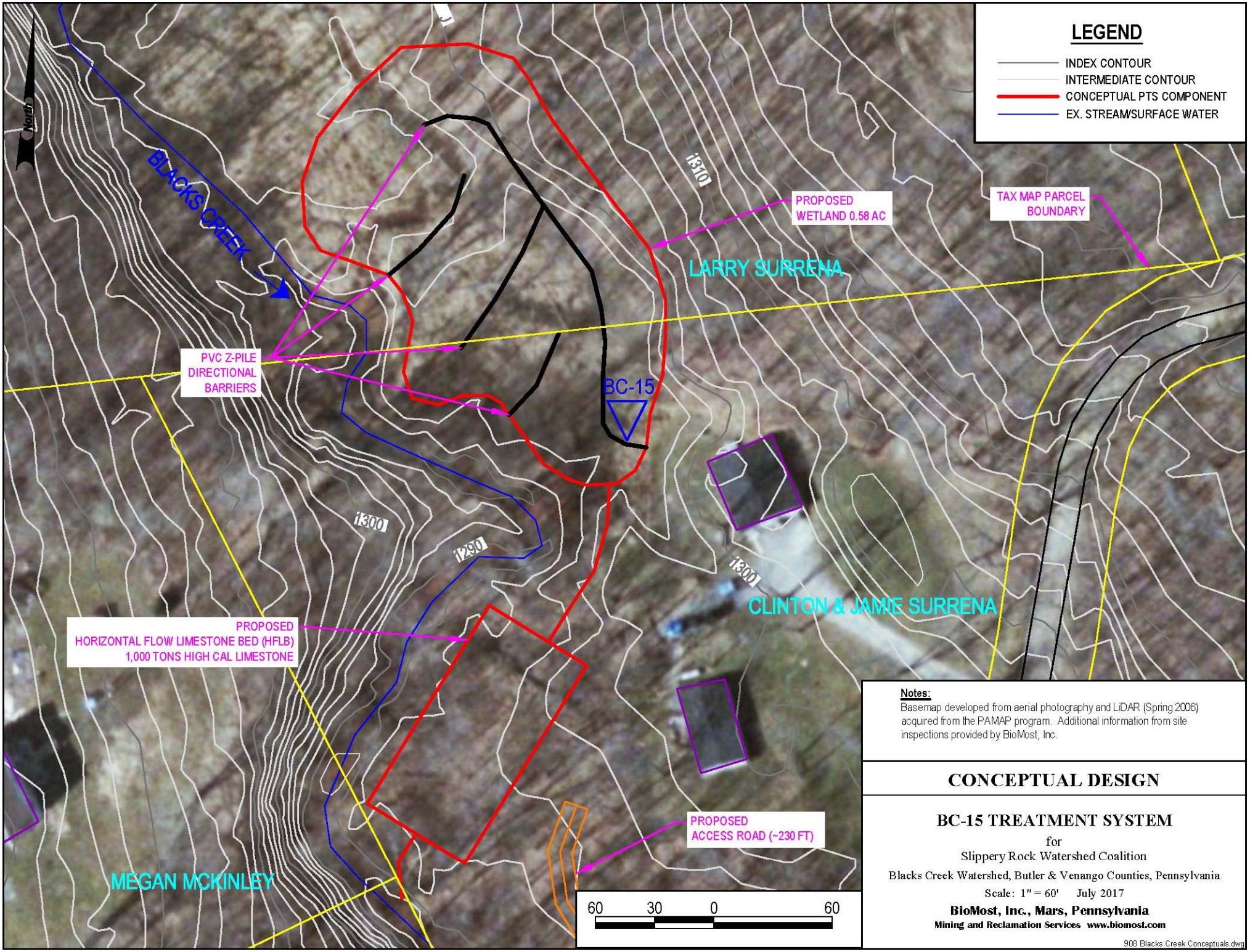
Treatment Media: HFLB-1,000 tons limestone

Projected Decrease in Pollutant Loadings:
(~2,800 lb/yr acidity; ~2,000 lb/yr metals)

Parameter	Acidity	Iron	Manganese	Aluminum
Lb/day	~8	~0.2	~5	NA

Estimates tenuous due to variable water quality reported.

Preliminary Cost Estimate: ~$190,000



Notes:
Basemap developed from aerial photography and LiDAR (Spring 2006) acquired from the PAMAP program. Additional information from site inspections provided by BioMost, Inc.

CONCEPTUAL DESIGN

BC-15 TREATMENT SYSTEM

for

Slippery Rock Watershed Coalition

Blacks Creek Watershed, Butler & Venango Counties, Pennsylvania

Scale: 1" = 60' July 2017

BioMost, Inc., Mars, Pennsylvania
Mining and Reclamation Services www.biomost.com

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BC19 & BC19B

In the original restoration plan, the BC19 & BC19B discharges were ranked 9th and 6th, respectively, in terms of metal loadings; however, based on current data they are ranked 5th and 4th. Once combined, the discharges rank 4th. These discharges, which formerly flowed directly into Blacks Creek, are currently being captured and partially treated by a ~½-acre aerobic (See BC19 & BC19B Schematic) wetland that was constructed in 2004 before the restoration plan was developed and with grant funding of about $110,000.

Water quality data of the BC19 & 19B passive system are provided in Table XXI below. On average, the treatment system is removing about 16 lb/day (~5,700 lb/yr) of iron. While the average total iron concentration from the wetland since it was built is 13.9 mg/L, there has been a major shift in treatment performance. From 2004-2012, the average effluent was 8.6 mg/L of total iron; however, the monitoring conducted from 2015-2016 indicates the average concentration leaving the system is 22.5 mg/L. Initially, this change in treatment was believed to be caused by a decrease in retention time due to either short-circuiting or to the accumulation of iron sludge and debris. While these are likely contributing factors to the problem, a further evaluation of the data indicates that the quality of the discharge may have gotten worse and flow rates seem to have increased, which is somewhat unusual.

Table XXII provides a comparison of average data of the BC19B discharge for the periods of 2000-2012 and 2015-2016. The recent water quality data is quite different with higher flow rates, less alkalinity, and higher concentrations of iron, manganese and sulfate. The reason for this change is uncertain and would require further investigation to determine; however, one potential cause is that following the construction of the McIntire system (late 2011), partially treated water was leaking through several of the pond bottoms and entering the groundwater. It is quite possible this water was affecting the water quality at the BC19 & BC19B discharges that are located less than a mile away. In August and September 2015, repairs were made to the suspected leaking ponds. If the leaking ponds were the cause of this problem, then previous water quality and flow rates would be expected to return in the near future.

Complicating the evaluation of the system is the fact that beaver had built a new dam just below the treatment system, which caused Blacks Creek to back up into the system for a portion of the monitoring period and washed away the effluent pipe used to measure flows. Eventually a slight breech occurred in the dam that lowered the water level in the stream some, but was at essentially the same elevation as the outlet of the system; therefore, a new pipe could not be installed. As water was flowing in a channelized section of the system, a cross-section flow measurement method was utilized; however, this is not the most accurate method to measure flow.

Table XXI BC19 Treatment System (Average Values)

Sample Point	Flow	pH	ORP	Alkalinity		Acidity	Iron		Manganese		Aluminum		SO_4
		field		field	lab		total	diss.	total	diss.	Total	diss.	
BC19	23	6.5	62	151	129	-30	39.0	43.5	9.1	10.3	0.1	<0.1	500
BC19B	41	6.5	54	205	189	-42	32.6	30.3	7.4	7.3	0.1	<0.1	507
905WL	69	6.8	76	133	122	-89	13.9	15.2	7.4	8.0	0.1	<0.1	472

Alkalinity, acidity, total & dissolved metals, and sulfates in mg/L; Metals and pH rounded to nearest tenth; Alkalinity, acidity, and sulfates rounded to nearest whole number; Number of sample sets (n) varies. (See attached monitoring data.)

Table XXII. BC19B data (Average Values)

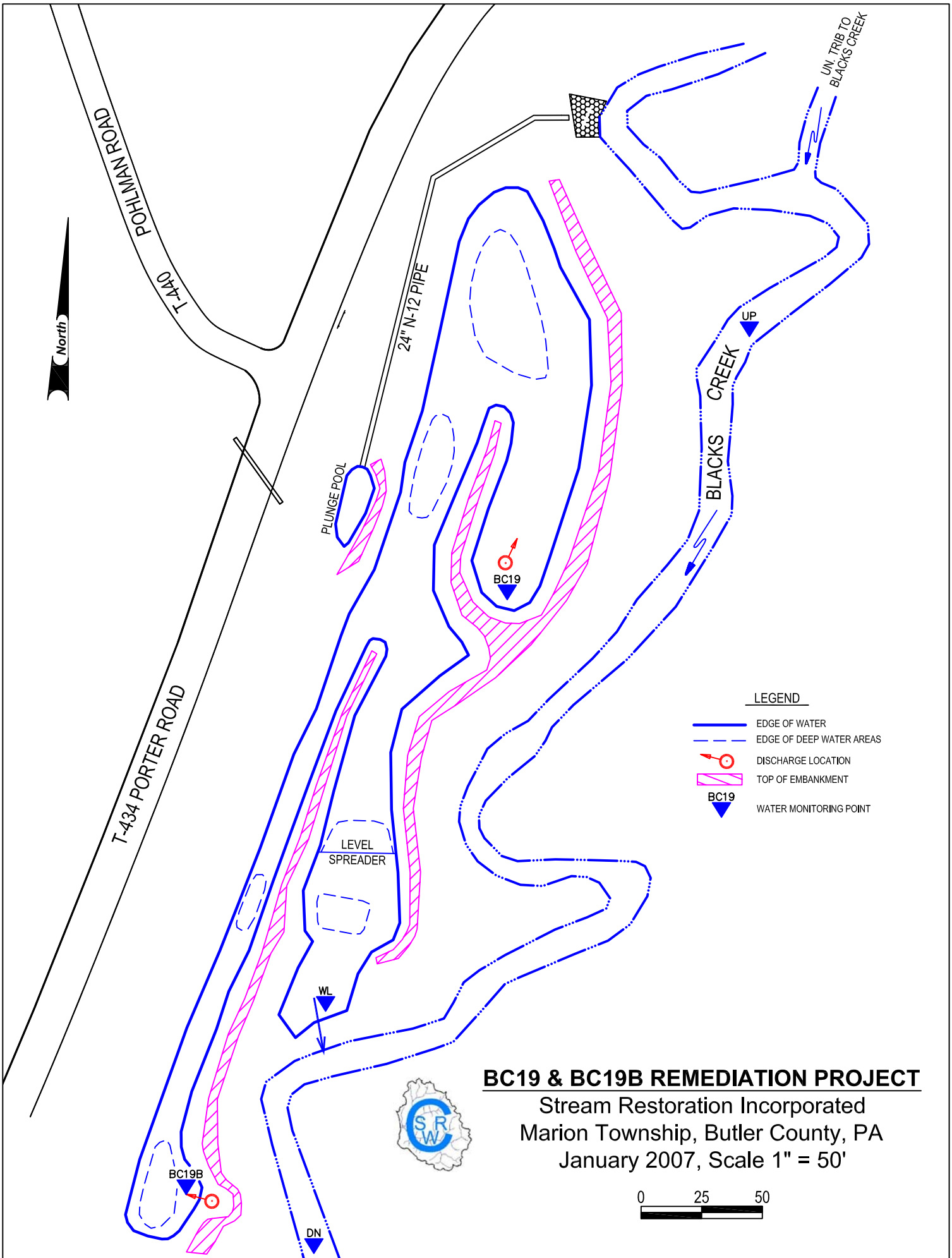
Dates	Flow	pH	ORP	Alkalinity		Acidity	Iron		Manganese		Aluminum		SO_4
		field		field	lab		total	diss.	total	diss.	Total	diss.	
2000-2012	36	6.4	47	226	211	-123	28.8	23.2	7.0	6.4	0.2	<0.1	489
2015-2016	51	6.5	59	178	127	-71	42.9	35.6	8.4	7.9	0.1	<0.1	557

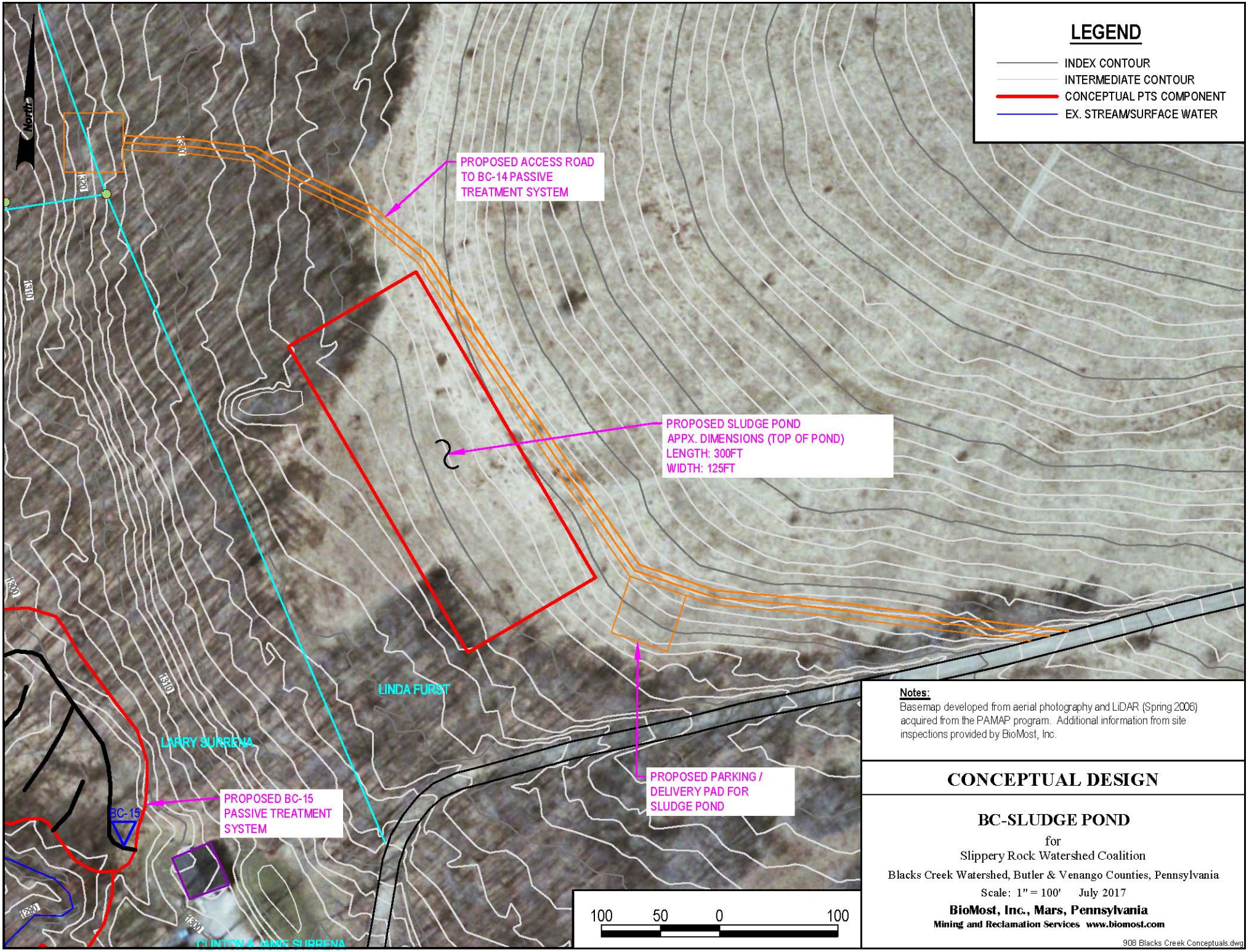
Alkalinity, acidity, total & dissolved metals, and sulfates in mg/L; Metals and pH rounded to nearest tenth; Alkalinity, acidity, and sulfates rounded to nearest whole number; Number of sample sets (n) varies. (See attached monitoring data.)

Regardless of whether the McIntire leaking ponds were impacting the functionality of the treatment system or not, the system has typically not been able to provide the level of treatment desired due to the fact it is undersized because of site conditions. The system had to be built along a steep hillside and in between a road and a stream. The performance of the BC19/19B treatment system could likely be improved through a variety of maintenance activities. As the system was undersized to begin with, the accumulation of iron sludge, sediment, and debris may be exasperating this issue. The system should be cleaned; however, there is not a good location on site to place/store the material. It will likely need to be trucked to an off-site location. As there are already 3 passive systems close together with the possibility of building additional systems nearby, it would be prudent to build a large sludge drying/storage pond nearby. One potential location would be on the property of the landowner who gave permission to build the McIntire and BC16 systems. While an agreement has not been signed, the landowner has given verbal permission to build a sludge pond. A conceptual design and cost estimate have been developed. A 38,000-square foot pond approximately 10 feet deep is proposed. The cost to build the sludge pond is estimated at $50,000 to $100,000 depending upon the exact location, site conditions, etc. Other maintenance activities and improvements such as addressing short-circuiting, adding aeration, using baffles, changing flow paths, etc. may also improve treatment.

While maintenance is certainly important and needed, treatment effectiveness would be greatly improved by expanding the system. Utilizing aerial photos and available surface elevation information, a small area of land on the other side of the stream has been initially identified as a potential location to construct additional treatment facilities. A conceptual design (See BC19 &19B Phase 2 Conceptual Design) with a cost estimate of $240,000 was developed, which would require closing the embankment at the outlet of the existing system and installing a pipe to convey the partially treated water from the existing system across Blacks Creek to Phase 2, where a ½-acre wetland and a 1,150-ton HFLB could be installed. In order to install Phase 2, the beaver dams would need to be removed at least temporarily, so that the construction area could be accessed. A large berm would likely need to be installed along this section of stream to help reduce impacts from future beaver activity.

If the water quality and flow rate of the discharges return to previous levels and some of the upstream discharges are treated, there may not be a need to expand the system. If that were the case, just rehabilitating the existing BC19/19B treatment system would be needed. It is therefore recommended that the system be rehabilitated and efforts made to address those upstream discharges and then reevaluate the situation before pursuing funds for expansion.


POHLMAN ROAD
T-440
T-434 PORTER ROAD
North
24" N-12 PIPE
PLUNGE POOL
UN. TRIB TO BLACKS CREEK
BLACKS CREEK
UP
BC19
LEVEL SPREADER
WL
BC19B
DN
LEGEND
EDGE OF WATER
EDGE OF DEEP WATER AREAS
DISCHARGE LOCATION
TOP OF EMBANKMENT
BC19
WATER MONITORING POINT
BC19 & BC19B REMEDIATION PROJECT
Stream Restoration Incorporated
Marion Township, Butler County, PA
January 2007, Scale 1" = 50'
0
25
50



Notes:
Basemap developed from aerial photography and LiDAR (Spring 2006) acquired from the PAMAP program. Additional information from site inspections provided by BioMost, Inc.

CONCEPTUAL DESIGN

BC-SLUDGE POND

for

Slippery Rock Watershed Coalition

Blacks Creek Watershed, Butler & Venango Counties, Pennsylvania

Scale: 1" = 100' July 2017

BioMost, Inc., Mars, Pennsylvania

Mining and Reclamation Services www.biomost.com

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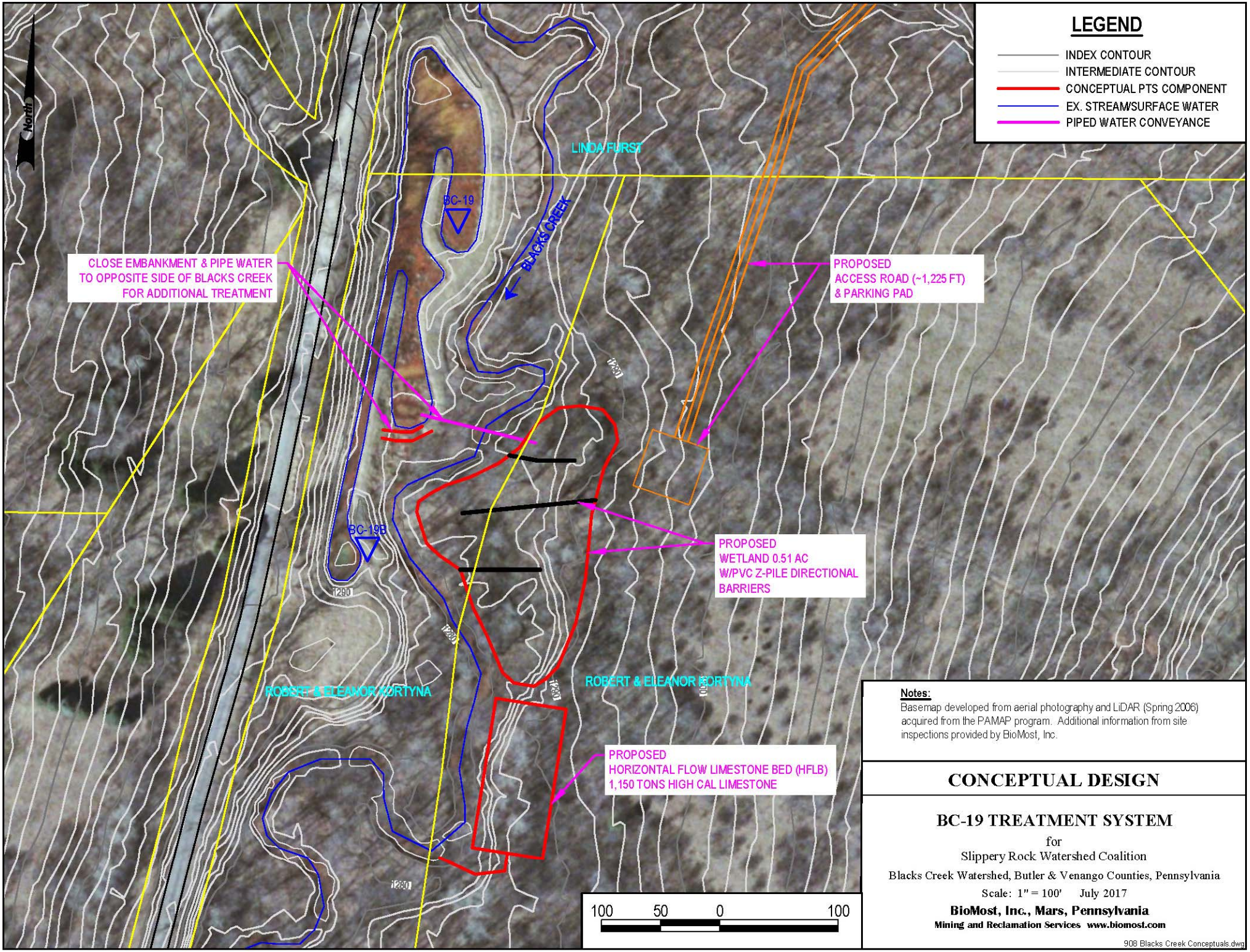

Notes:
Basemap developed from aerial photography and LiDAR (Spring 2006) acquired from the PAMAP program. Additional information from site inspections provided by BioMost, Inc.

CONCEPTUAL DESIGN

BC-19 TREATMENT SYSTEM

for

Slippery Rock Watershed Coalition

Blacks Creek Watershed, Butler & Venango Counties, Pennsylvania

Scale: 1" = 100' July 2017

BioMost, Inc., Mars, Pennsylvania

Mining and Reclamation Services www.biomost.com

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906-4 & 906-5 (includes discussion of 906-2)

The 906-4 and 906-5 abandoned mine discharges are ranked 10th and 6th, respectively, in terms of metal loadings, but when combined rank 5th. It is uncertain whether the source of these discharges is an abandoned underground mine, an unreclaimed surface mine, or both. The discharges emanate on opposite sides of a valley and essentially form tributary #18. Discharge 906-2, which is ranked 14th individually and 11th after grouping, emanates at the toe of spoil of a reclaimed surface mine and enters tributary #18 about ¼ mile downstream. It is suspected, and there was some visual evidence, that other sources of mine drainage may also enter the tributary downstream. While these minor discharges do not have the same level of impact as 906-4 and 906-5, it would make sense to try to treat all of the discharges if possible. Tributary #18 sample point 908-Y was collected just downstream of the 906-2 discharge prior to flowing into a large wetland complex where it mixes with other mine discharges, such as 906-7, -8, -9, other smaller seeps, and some sources of good quality water, and essentially forms the headwaters of Blacks Creek. 908-Y was added as a sample point to help evaluate the possibility of treating the entire stream closer to where it flows into the wetland. In hindsight, the 908-Y sample point should have probably been collected further upstream above the 906-2 discharge where the stream would likely be diverted into a treatment system.

Discharges 906-4, -5, -7, -8, and -9 are the primary sources of impairment within the upper portion of the watershed until the stream reaches the oil well upwellings of BC14 and BC15. Addressing at least one of these groups of discharges (906-4,-5 or 906-7,-8,-9), if not both, will likely be necessary for the entire Blacks Creek to meet water quality criteria. The two sets of discharges are very similarly ranked and therefore are in reality essentially tied for 5th. It may be beneficial to complete a land reclamation project in the general area of discharges 906-4 and 906-5 prior to installing a treatment system in order to improve or possibly even eliminate the two discharges all together. A land reclamation project might also be more appealing to the landowner. Further investigations/evaluations would likely be needed along with landowner interest/approval.

Due to fact that the discharges contribute most of the flow to tributary #18 and the presence of the 906-2 discharge further downstream, there are a variety of possible designs, configurations, and locations for the treatment system. Further complicating the issue of where the system would be constructed is where the access road could be installed, which will likely require crossing additional properties with different landowners. Therefore two passive treatment options have been developed. Option 1 with an estimated cost of $480,000 treats only the 906-4 and 906-5 discharges closer to their source and is referred to as 906-4,5-up. The system captures and partially treats each discharge individually and then combines them later in the system where they share additional components. Specific details are provided in the included conceptual design and table below. Option 2 with an estimated cost of $460,000 captures and treats tributary #18 further downstream and also includes treatment of discharge 906-2. The conceptual design for this system is referred to as 906-2,4,5-down. Specific details are provided in the included conceptual design and table below.

Proposed Passive Treatment System Components

906-4 & 906-5 "UP"

906-4 → AFVFP → SP (24 hour retention → Shared WL (0.4 ac) → Shared HFLB
906-5 → JVFP1 & JVFP2 in parallel → Shared components

Treatment Media:
AVFP- 450-tons limestone;
JVFP1- 1180 tons limestone, 437 CY compost, 437 CY wood chips;
JVFP2- 1180 tons limestone, 437 CY compost, 437 CY wood chips;
HFLB-850 tons limestone

Projected Decrease in Pollutant Loadings:
(~27,000 lb/yr acidity; ~5,500 lb/yr metals)

Parameter	Acidity	Iron	Manganese	Aluminum
Lb/day	74	0.5	5	9.6

Preliminary Cost Estimate: ~$475,000

Proposed Passive Treatment System Components

906-2, 906-4, 906-5 "Down"

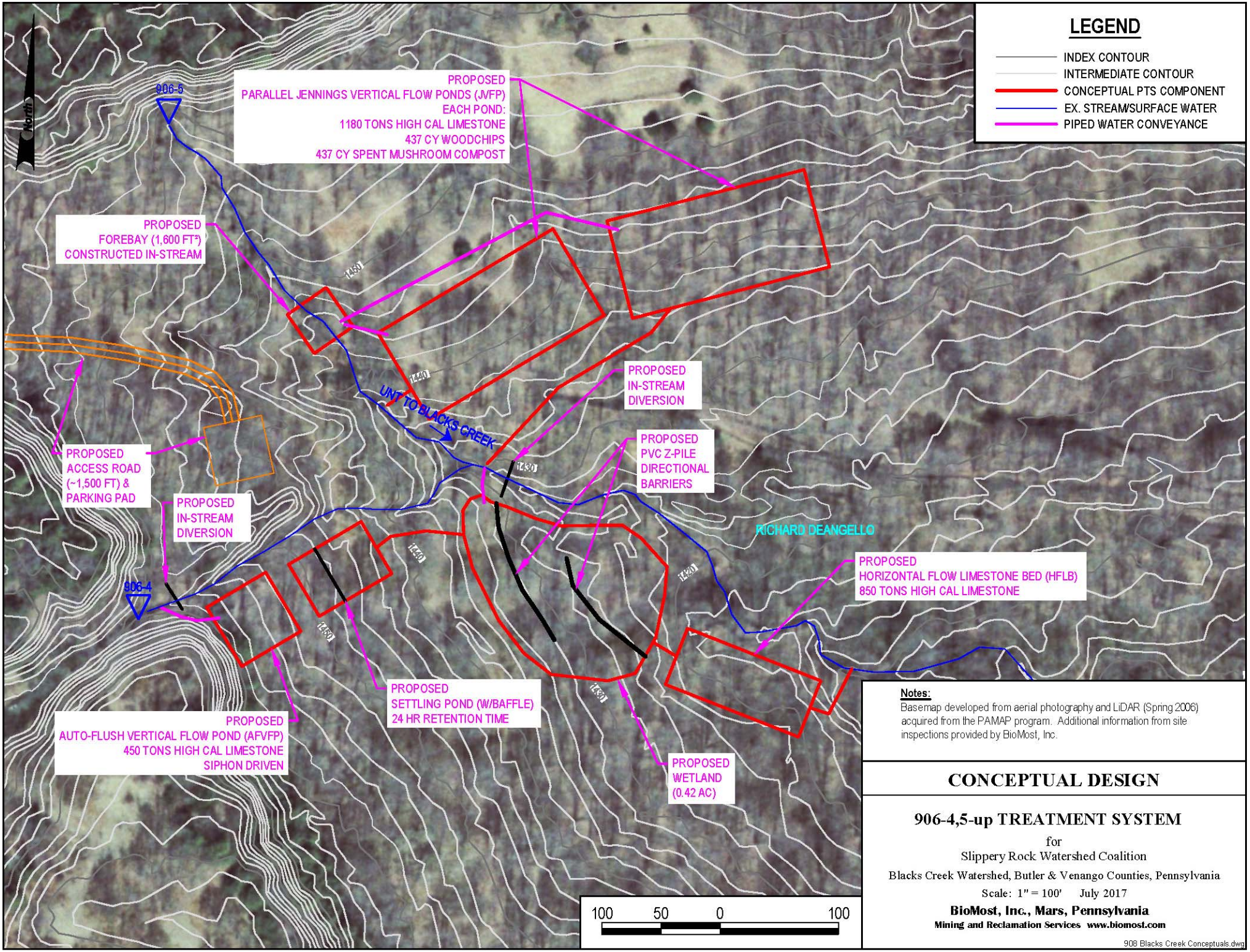
Forebay → JVFP (2 in parallel) → WL(0.4 ac) **→ HFLB**

Treatment Media:
JVFP1- 1340 tons limestone, 496 CY compost, 496 CY wood chips;
JVFP2- 1340 tons limestone, 496 CY compost, 496 CY wood chips;
HFLB- 780 tons limestone

Projected Decrease in Pollutant Loadings:
(~27,000 lb/yr acidity; ~5,500 lb/yr metals)

Parameter	Acidity	Iron	Manganese	Aluminum
Lb/day	74	0.6	5.5	10.7

Preliminary Cost Estimate: ~$460,000


LEGEND
INDEX CONTOUR
INTERMEDIATE CONTOUR
CONCEPTUAL PTS COMPONENT
EX. STREAM/SURFACE WATER
PIPED WATER CONVEYANCE
North
906-5
906-4
PROPOSED
PARALLEL JENNINGS VERTICAL FLOW PONDS (JVFP)
EACH POND:
1180 TONS HIGH CAL LIMESTONE
437 CY WOODCHIPS
437 CY SPENT MUSHROOM COMPOST
PROPOSED
FOREBAY (1,600 FT²)
CONSTRUCTED IN-STREAM
PROPOSED
ACCESS ROAD
(~1,500 FT) &
PARKING PAD
PROPOSED
IN-STREAM
DIVERSION
PROPOSED
IN-STREAM
DIVERSION
PROPOSED
PVC Z-PILE
DIRECTIONAL
BARRIERS
UNT TO BLACKS CREEK
RICHARD DEANGELLO
PROPOSED
HORIZONTAL FLOW LIMESTONE BED (HFLB)
850 TONS HIGH CAL LIMESTONE
PROPOSED
SETTLING POND (W/BAFFLE)
24 HR RETENTION TIME
PROPOSED
AUTO-FLUSH VERTICAL FLOW POND (AFVFP)
450 TONS HIGH CAL LIMESTONE
SIPHON DRIVEN
PROPOSED
WETLAND
(0.42 AC)
100 50 0 100
Notes:
Basemap developed from aerial photography and LiDAR (Spring 2006) acquired from the PAMAP program. Additional information from site inspections provided by BioMost, Inc.
CONCEPTUAL DESIGN
906-4,5-up TREATMENT SYSTEM
for
Slippery Rock Watershed Coalition
Blacks Creek Watershed, Butler & Venango Counties, Pennsylvania
Scale: 1" = 100' July 2017
BioMost, Inc., Mars, Pennsylvania
Mining and Reclamation Services www.biomost.com
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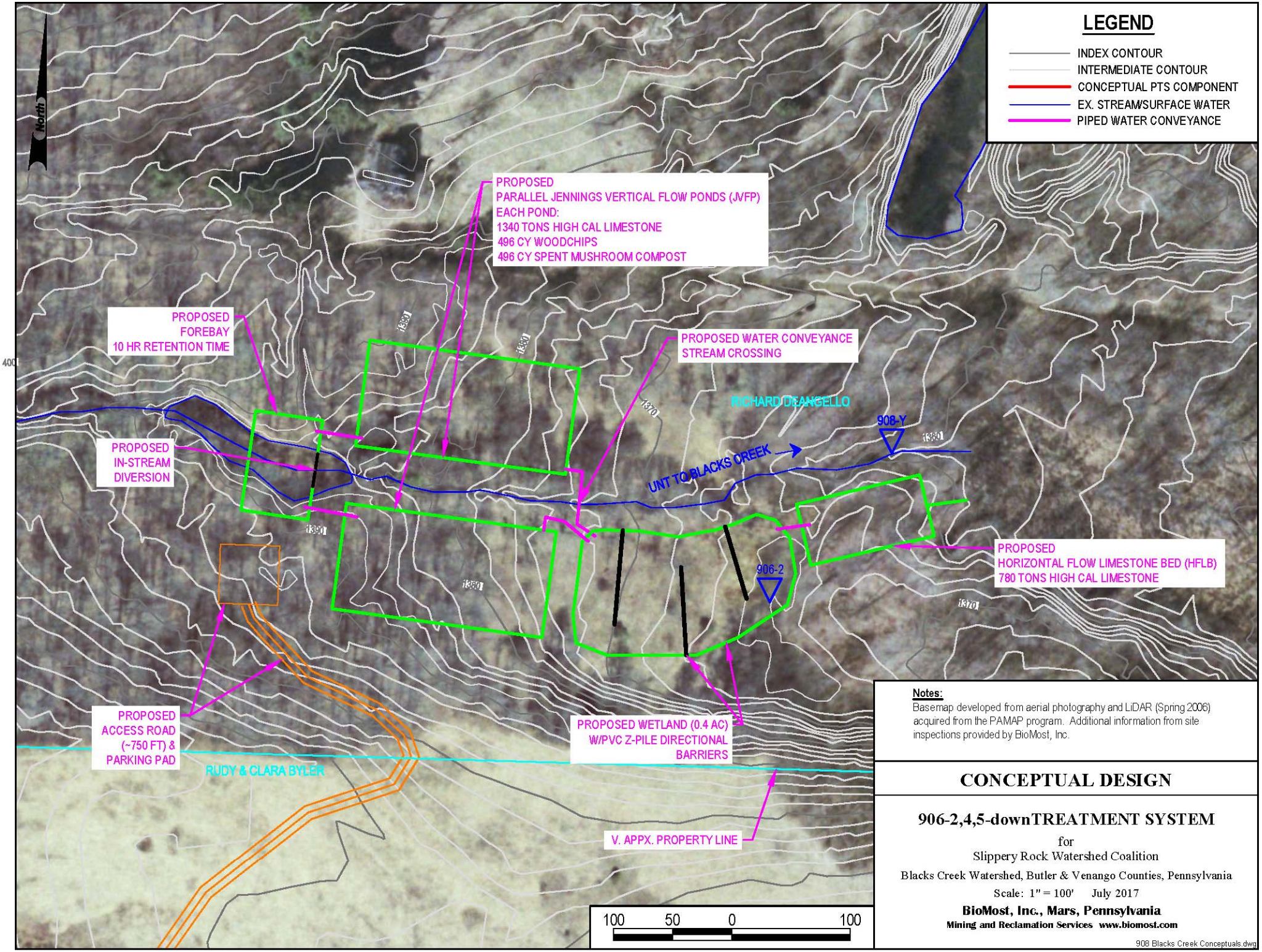

Notes:
Basemap developed from aerial photography and LiDAR (Spring 2006) acquired from the PAMAP program. Additional information from site inspections provided by BioMost, Inc.

CONCEPTUAL DESIGN

906-2,4,5-downTREATMENT SYSTEM

for

Slippery Rock Watershed Coalition

Blacks Creek Watershed, Butler & Venango Counties, Pennsylvania

Scale: 1" = 100' July 2017

BioMost, Inc., Mars, Pennsylvania
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906-7, -8, and -9 (906-7A)

Abandoned mine discharges 906-7, -8, and -9 are ranked individually 16th, 9th, and 8th, respectively, in terms of metal loadings to Blacks Creek, but, when all are combined with other unidentified discharges and sampled at point 906-7A, they rank 6th. These discharges emanate on top of a hill and are the primary source water of tributary #19 in the headwaters of Blacks Creek. Discharges 906-4, -5, -7, -8, and -9 are the primary sources of impairment within the upper portion of the watershed until the stream reaches the oil well upwellings of BC14 and BC15. Addressing at least one of these groups of discharges (906-4,-5 or 906-7,-8,-9) if not both, will likely be necessary for the entire Blacks Creek to meet water quality criteria. The two sets of discharges are very similarly ranked and therefore are in reality essentially tied for 5th.

Due to subsidence features in the general vicinity of the 906-8 and -9 discharges, the source of the drainage is believed to be from an abandoned underground mine. Discharge 906-7 may be an upwelling from an old oil well. Because of their proximity to one another, the discharges have been grouped into one passive treatment system design. Prior to development of the original restoration plan, the discharges did not appear to have been previously sampled at their source. The combined discharges may be reflected in PA DEP sampling point BC17. As there appeared to be a variety of other sources of water and intermittent watercourses of a variable water quality and flow, sample point 907-7A was established to try to capture and sample most sources of the mine drainage in the area. The water quality and flow data for sample point 907-7A was used to determine the grouped ranking as well design criteria for the passive system.

A conceptual design for a passive system has been developed and is estimated to cost approximately $300,000. An in-stream diversion/intake will be utilized downstream of the major sources of mine drainage and then piped to a forebay. From the forebay, the water will flow through a series of treatment ponds. Specific details are provided in the included conceptual design and table below. The landowner has been contacted and while an agreement has not been yet made, he is positive towards allowing a treatment system to be constructed on his property.

Proposed Passive Treatment System Components

906-7, 906-8, 906-9

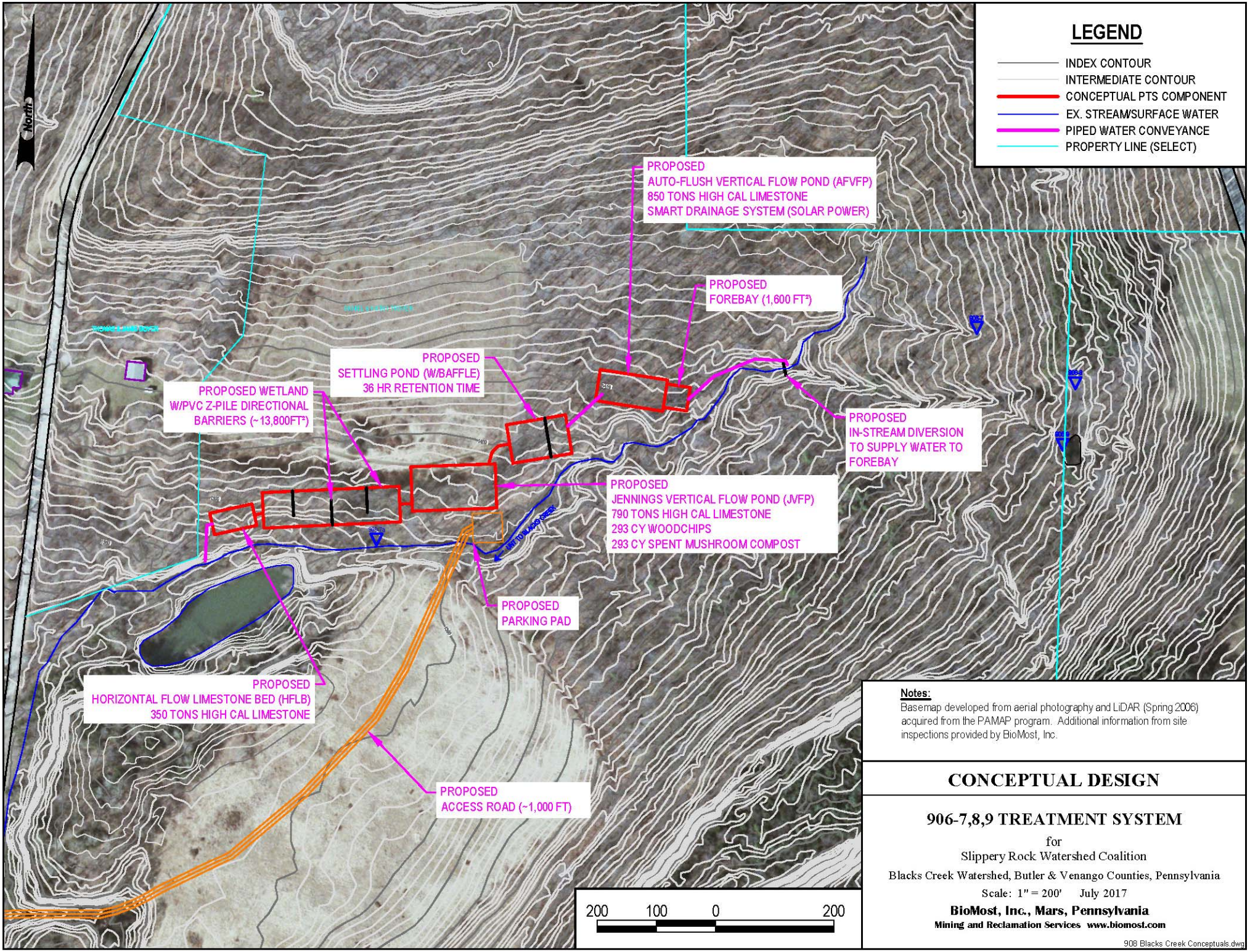
Intake → Forebay → AFVFP → SP → JVFP → WL (0.3 ac) **→ HFLB**

Treatment Media:
AFVFP-850 tons limestone;
JVFP-790 tons limestone, 293 CY compost, 293 CY wood chips;
HFLB-350 tons limestone

Projected Decrease in Pollutant Loadings:
(~25,000 lb/yr acidity; ~6,000 lb/yr metals)

Parameter	Acidity	Iron	Manganese	Aluminum
Lb/day	69	2	4	9

Preliminary Cost Estimate: ~$300,000


LEGEND
INDEX CONTOUR
INTERMEDIATE CONTOUR
CONCEPTUAL PTS COMPONENT
EX. STREAM/SURFACE WATER
PIPED WATER CONVEYANCE
PROPERTY LINE (SELECT)
North
PROPOSED
AUTO-FLUSH VERTICAL FLOW POND (AFVFP)
850 TONS HIGH CAL LIMESTONE
SMART DRAINAGE SYSTEM (SOLAR POWER)
PROPOSED
FOREBAY (1,600 FT²)
PROPOSED
SETTLING POND (W/BAFFLE)
36 HR RETENTION TIME
PROPOSED WETLAND
W/PVC Z-PILE DIRECTIONAL
BARRIERS (~13,800FT²)
PROPOSED
IN-STREAM DIVERSION
TO SUPPLY WATER TO
FOREBAY
PROPOSED
JENNINGS VERTICAL FLOW POND (JVFP)
790 TONS HIGH CAL LIMESTONE
293 CY WOODCHIPS
293 CY SPENT MUSHROOM COMPOST
PROPOSED
PARKING PAD
PROPOSED
HORIZONTAL FLOW LIMESTONE BED (HFLB)
350 TONS HIGH CAL LIMESTONE
PROPOSED
ACCESS ROAD (~1,000 FT)
200 100 0 200
Notes:
Basemap developed from aerial photography and LiDAR (Spring 2006) acquired from the PAMAP program. Additional information from site inspections provided by BioMost, Inc.
CONCEPTUAL DESIGN
906-7,8,9 TREATMENT SYSTEM
for
Slippery Rock Watershed Coalition
Blacks Creek Watershed, Butler & Venango Counties, Pennsylvania
Scale: 1" = 200' July 2017
BioMost, Inc., Mars, Pennsylvania
Mining and Reclamation Services www.biomost.com
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906-36

The 906-36 discharge, which appears to be an upwelling from an old oil well, ranks 7th in terms of metal loadings for both individual and grouped discharges. Historical data for this discharge does not appear to exist prior to 2006 as the discharge was "discovered" during the initial stream walks that were conducted while developing the original restoration plan. Based on the availability of only one sample at that time, in the original restoration plan, the discharge ranked low and therefore was considered a minor discharge. Because it was identified as a minor discharge, it was only sampled twice during the "Blacks Creek Priority Discharge Design" project. After including the additional data, the discharge now ranks higher with a loading of 7.7 lb/day of iron and 0.9 lb/day of manganese. The discharge is located about 800-1000 feet downstream of sample point BC1 and currently flows in a channelized path where iron precipitation occurs before entering Blacks Creek. A comparison of sample points BC1 (upstream) and BC8 (downstream) does indicate a slight increase in iron concentrations and iron loading, but still does not have a significant impact to Blacks Creek as it is still meeting TMDL goals. Based on the loading, location and impact to the watershed this discharge is a medium priority. A conceptual design, consisting of 0.6-acre aerobic wetland and 100-ton HFLB, and cost estimate have been developed. Based upon available Tax map information, which is not typically very accurate, most of the system would be built on property owned by Allegheny Mineral Corporation. As the SRWC and project partners have a good relationship with Allegheny Mineral, we could likely obtain permission to build a system, unless this area is to be mined. Additional water monitoring may be necessary prior to finalizing the design and a survey would likely need to be completed to establish property lines. Specific details are provided in the included conceptual design and table below. The project has been estimated to cost approximately $160,000.

Proposed Passive Treatment System Components

906-36

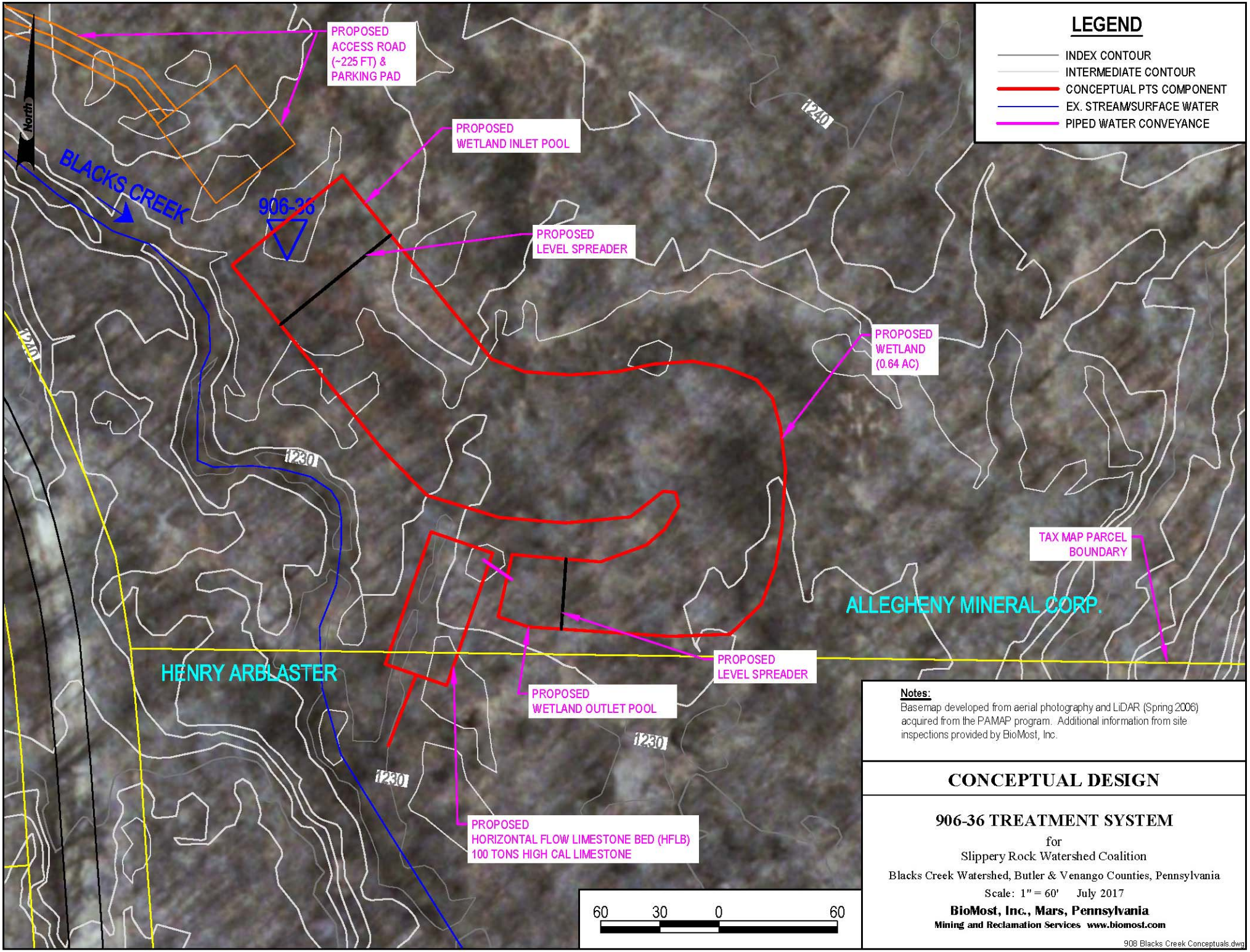
WL(0.64 ac) → **HFLB**

Treatment Media:
HFLB-100 tons limestone

Projected Decrease in Pollutant Loadings:
(~3,000 lb/yr metals)

Parameter	Acidity	Iron	Manganese	Aluminum
Lb/day	0	7.7	~1	~0

Preliminary Cost Estimate: ~$160,000



Notes:
Basemap developed from aerial photography and LiDAR (Spring 2006) acquired from the PAMAP program. Additional information from site inspections provided by BioMost, Inc.

CONCEPTUAL DESIGN

906-36 TREATMENT SYSTEM

for

Slippery Rock Watershed Coalition

Blacks Creek Watershed, Butler & Venango Counties, Pennsylvania

Scale: 1" = 60' July 2017

BioMost, Inc., Mars, Pennsylvania
Mining and Reclamation Services www.biomost.com

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906-16 (includes discussion of 906-17 and 906-17B)

Mine discharge 906-16 is the effluent of an old surface mine sediment pond located on the other side of the hill north of the McIntire system and is essentially the headwaters of tributary #16. The pond receives water from seeps formerly identified as 906-17 and 906-17b, as well as other seeps and surface runoff that are all collected by a surface diversion channel that feeds the pond. In the original restoration plan, recommendations were made based upon only one high flow sample event resulting in 906-16 being ranked 5th in terms of loadings, identifying it as a priority discharge. Water monitoring conducted during the "Blacks Creek Priority Discharge Design" project indicated that the water quality is quite variable both in terms of flow and quality. In general, the discharge has much better quality and less flow than identified in the original plan. As the water quality of 906-16 appeared to be much improved during the first sampling event, 906-17 and 907-17b were not individually sampled as ultimately their contributions were being captured at 906-16. It is uncertain if the water quality improvements are related to the land reclamation work completed by Quality Aggregates in 2006 or other factors. Based on the updated data, 906-16 is ranked 13th in terms of metal loadings for individual and 10th for grouped discharges.

While on average the effluent of the pond does not meet TMDL standards, the average data is being skewed by 2 or 3 sampling events, which may make the discharge appear to be worse than typical conditions. Unfortunately, those sampling events that skew the results did not correspond with stream sampling events; therefore, the impact to Blacks Creek during those poor water quality dates is unknown. As the water flows downstream, additional good quality sources of water enter tributary #16. Based upon comparison of the available data for upstream (BC6) and downstream (BC14.1), tributary #16 does not appear to degrade Blacks Creek and likely improves water quality. It is possible that at times, the discharge may impact Blacks Creek. Therefore, the discharge is ranked as a low to medium priority and should probably be reconsidered once higher priority discharges are addressed and additional stream monitoring conducted. A conceptual design and cost estimate has been developed that consists of installing a vertical flow pond and then using the existing sediment pond as a settling pond. Specific details are provided in the conceptual design and table below.

Proposed Passive Treatment System Components

906-16

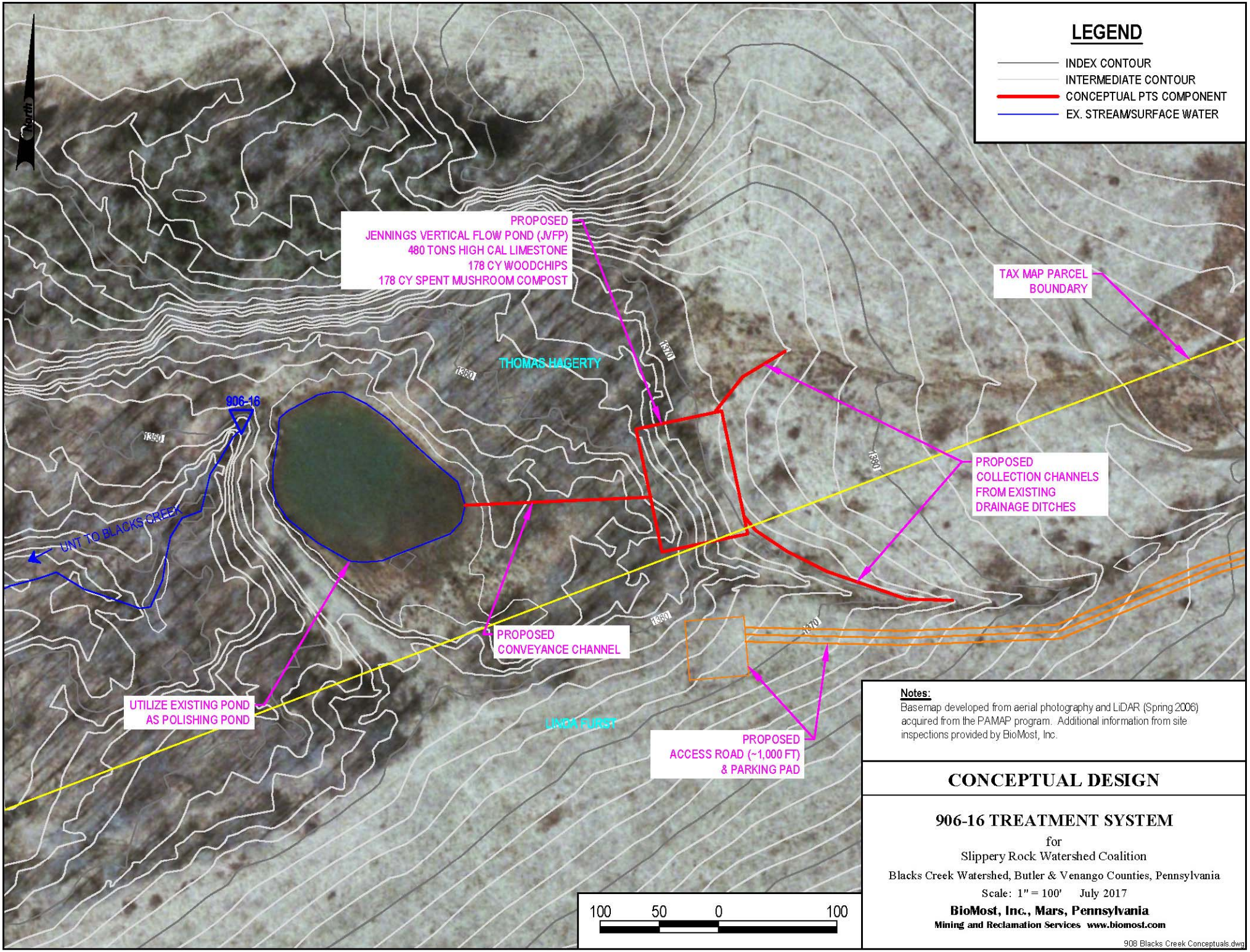
JVFP → existing SP

Treatment Media: JVFP- 4800 tons limestone, 178 CY compost, 178 CY wood chips

Projected Decrease in Pollutant Loadings:
(~2,000 lb/yr acidity; ~600 lb/yr metals)

Parameter	Acidity	Iron	Manganese	Aluminum
Lb/day	6	<1	<1	~1

Preliminary Cost Estimate: ~$160,000


LEGEND
INDEX CONTOUR
INTERMEDIATE CONTOUR
CONCEPTUAL PTS COMPONENT
EX. STREAM/SURFACE WATER
North
PROPOSED
JENNINGS VERTICAL FLOW POND (JVFP)
480 TONS HIGH CAL LIMESTONE
178 CY WOODCHIPS
178 CY SPENT MUSHROOM COMPOST
TAX MAP PARCEL
BOUNDARY
THOMAS HAGERTY
906-16
PROPOSED
COLLECTION CHANNELS
FROM EXISTING
DRAINAGE DITCHES
UNT TO BLACKS CREEK
PROPOSED
CONVEYANCE CHANNEL
UTILIZE EXISTING POND
AS POLISHING POND
LINDA FURST
PROPOSED
ACCESS ROAD (~1,000 FT)
& PARKING PAD
100 50 0 100
Notes:
Basemap developed from aerial photography and LiDAR (Spring 2006) acquired from the PAMAP program. Additional information from site inspections provided by BioMost, Inc.
CONCEPTUAL DESIGN
906-16 TREATMENT SYSTEM
for
Slippery Rock Watershed Coalition
Blacks Creek Watershed, Butler & Venango Counties, Pennsylvania
Scale: 1" = 100' July 2017
BioMost, Inc., Mars, Pennsylvania
Mining and Reclamation Services www.biomost.com
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906-21

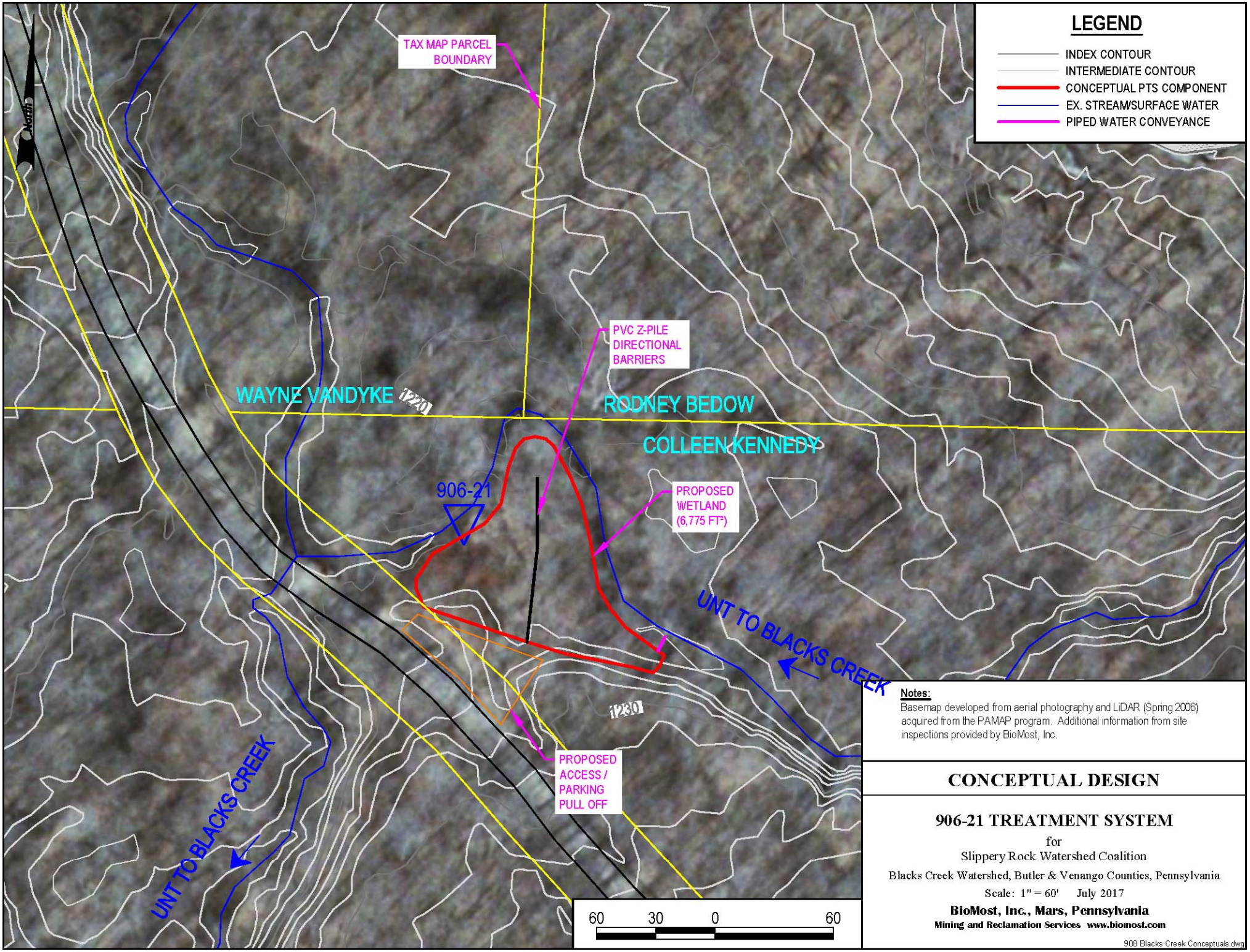
The 906-21 discharge is ranked 12th in terms of individual metal loadings and 9th after grouping. The exact source of the discharge is not known, but is likely an upwelling from an old oil well. Historical data for this discharge does not appear to exist prior to 2006 as the discharge was "discovered" during the initial stream walks that were conducted while developing the original restoration plan. The discharge emanates along tributary #7 just prior to the confluence with tributary #6. The discharge has limited impact to the tributaries and is therefore a low to medium priority, but may need to be addressed in order for the tributaries to meet TMDL standards. If a system were to be built, additional water monitoring should probably be conducted prior to finalizing a design. A ~0.2-acre aerobic wetland is proposed which would remove ~4 lb/day of iron. The project has been estimated to cost about $100,000. While not considered a priority discharge, a conceptual design was developed.

906-2

The 906-2 discharge is ranked 14th in terms of individual metal loadings and 11th after grouping. The discharge emanates near the toe of spoil of an old reclaimed surface mine as a diffuse seep zone within a wetland and then discharges into tributary #18. Sample point 906-2 is actually sampled at the end of the wetland just prior to entering the stream. The water quality is variable ranging from acidic to net-alkaline. Probably the most cost effective option to treat 906-2 would be to treat it along with 906-4, -5 as previously described as Option #2 (See 906-2,4,5-dn). An individual passive system would not likely be built for just this discharge unless the water quality was to worsen. A conceptual design and cost estimate to treat the discharge individually was not developed.

906-14

The 906-14 discharge is ranked 15th in terms of individual metal loadings and 12th after grouping. The discharge emanates along County Line Road where it is conveyed in a ditch through a road culvert and into a natural wetland prior to entering tributary #17. The discharge has limited, if any, impact to the stream as most of the iron precipitates within the road ditch and natural wetland. The discharge has a loading of about 1.0 lb/day of iron and 0.3 lb/day of manganese. While a conceptual design was not developed, a 0.1-acre wetland would probably be sufficient to remove the remaining iron. To remove the manganese, a 100-ton HFLB would be needed. The cost has been estimated at $50,000 to $100,000. As there is little or no impact from discharge 906-14, implementation of treatment is not proposed at this time.


LEGEND
INDEX CONTOUR
INTERMEDIATE CONTOUR
CONCEPTUAL PTS COMPONENT
EX. STREAM/SURFACE WATER
PIPED WATER CONVEYANCE
TAX MAP PARCEL BOUNDARY
PVC Z-PILE DIRECTIONAL BARRIERS
WAYNE VANDYKE
RODNEY BEDOW
COLLEEN KENNEDY
906-21
PROPOSED WETLAND (6,775 FT²)
UNT TO BLACKS CREEK
PROPOSED ACCESS / PARKING PULL OFF
UNT TO BLACKS CREEK
60 30 0 60
Notes:
Basemap developed from aerial photography and LiDAR (Spring 2006) acquired from the PAMAP program. Additional information from site inspections provided by BioMost, Inc.
CONCEPTUAL DESIGN
906-21 TREATMENT SYSTEM
for
Slippery Rock Watershed Coalition
Blacks Creek Watershed, Butler & Venango Counties, Pennsylvania
Scale: 1" = 60' July 2017
BioMost, Inc., Mars, Pennsylvania
Mining and Reclamation Services www.biomost.com
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906-22 & 906-23

Abandoned mine discharges 906-22 and 906-23 are ranked 17th and 18th respectively in terms of individual metal loadings and 13th when grouped, contributing less than 1 lb/day of metals. As these two discharges form tributary #7, installation of a small passive system consisting of a ~0.1-acre wetland would improve at least a short segment of the tributary; however, because of other sources of good quality water, tributary #7 improves rapidly. These discharges, therefore, are placed very low on the priority list. A conceptual design was not developed. The cost has been estimated at $50,000 to $100,000.

906-24

Sampling point 906-24 is the effluent of a settling pond on a reclaimed surface mine receiving primarily surface run-off. The discharge of this settling pond forms tributary #6. There does not appear to be any historic data available for this site. At this sampling point, while the effluent does meet surface mining water quality standards, it does not meet the TMDL water quality criteria. As better quality waters are encountered, 906-24 improves substantially, as evidenced by sampling point 906-27. Due to difficulty of access and lack of impact, this discharge was not sampled during the Blacks Creek Priority Discharge Project in order to utilize funds to collect samples at other locations. Like many of these smaller discharges, a small 0.1-acre wetland could be installed; however, due to the lack of known impact, a passive system is not currently recommended and a conceptual design and cost estimate were not developed

PRIORITIZATION, SCHEDULING, EVALUATION, and COST ESTIMATE SUMMARY

Since this report is a revised version of the restoration plan, Table XXIII below provides a prioritized list of projects, cost estimates, and identifies if the project has been completed. In general, the projects were first prioritized based upon pollutant loading and estimated impacts to the streams. Additional considerations included "cost/benefit" and landowner interest if known. In addition to new and existing passive systems, the list also includes the proposed construction of a centrally located sludge pond as well as a possible expansion of the BC19/19B system (Phase 2). Implementation of all proposed passive systems is estimated to cost about $3.1 million dollars. Three projects costing $982,000 have already been completed. It is likely that the water quality criteria of Blacks Creek can be met without completing all 15 of the identified projects. Potential sources of available funding to implement these projects are provided in Table XXVI.

One long-term cost not addressed in the table is for Operation, Maintenance, and Rehabilitation (OM&R). The cost of OM&R is quite variable over the life of a system and varies between different types of technologies utilized, the quality of the design, etc. For example, while discharges 906-4,5 technically have a slightly higher pollutant load, the estimated cost for the 906-7,8,9 is lower and the landowner has already expressed an interest in allowing a passive system to be constructed; therefore, the project was ranked higher. In general, passive systems will typically operate without any maintenance needed for the first five years and perhaps even longer. The SRWC has constructed passive systems that did not require any kind of major maintenance for 10 years. Major maintenance that can be expected every 5-10 years includes tasks such as stirring/washing treatment media, removing vegetation from channels, and removing sludge from ponds. Most passive systems have a design life of 15-25 years. At that point in time, major rehabilitation is usually needed, which will include tasks such as replacing treatment media and removing sludge from the ponds. In 2003, the Pennsylvania OM&R Workgroup, which was initiated and organized by the PA DEP, developed a recommendation that for each new passive system constructed, 4% of the capital cost should be placed into a trust fund, which would then be managed and invested to provide for OM&R needs of the system. Unfortunately, this is not a recommendation that is typically followed for a variety of reasons, but is mostly related to availability of funding. The Slippery Rock Watershed Coalition currently does have a small fund for O&M, but it is not fully funded. The SRWC should make more of an effort to obtain a fully funded trust. Even though a trust fund is not available, there are other options. Currently Stream Restoration Incorporated has an O&M Technical Assistance Program funded by the PA DEP Growing Greener program to provide assistance with O&M needs. This program can usually take care of typical maintenance issues, but does not have the amount of funding needed for large scale rehabilitation. In addition, the Western Pennsylvania Coalition for Abandoned Mine Reclamation (WPCAMR) has the Quick Response program, which is also funded by the PA DEP to provide funds for O&M. Currently, funding for large-scale rehabilitation projects will need to be sought from sources that are identified in Table XXVI.

Table XXIII. Summary of Priority List and Cost Estimates

Priority Ranking	Project	Cost Estimate	Status
1	TB1 ("McIntire" Site)	$720,000	Completed
2	BC16	$152,000	Completed
3	BC14	$300,000	
4	BC19 & BC19B Phase 1	$110,000	Completed
5	906-7, -8, -9	$300,000	Applied
6	906-4, -5	$475,000	
7	Blacks Creek Sludge Pond	$80,000	
8	BC19 & BC19B Phase 2	$240,000	
9	906-36	$160,000	
10	BC15	$190,000	
11	906-21	$100,000	
12	906-16	$160,000	
13	906-14	$75,000	
14	906-22, -23	$75,000	
15	906-24	NA	
	Total	**$3,137,000**	

Cost estimate provided for the completed passive systems do not include in-kind/matching contributions.

Tables XXIV and XXV provide estimated TMDL reductions for Blacks Creek at sample points BC6 and BC2 for eight out of the proposed twelve passive systems. In order to estimate the impact of the proposed systems, certain assumptions were made. The first assumption is that the entire pollutant load of the mine discharge will be treated by the passive system. Second, while the decrease of loading due to apparent natural attenuation is provided in the tables, apparent natural attenuation was not considered in estimating the pollutant loading contributions of each discharge. (In this case, apparent natural attenuation is attributed to unaccounted surface and subsurface flow and to the chemical, physical, and biological processes that occur within the streams resulting in the precipitation and settling of metals from the water column.) A third assumption is that the available data are accurate and representative of typical water quality and flow conditions. The fourth assumption is that the values in the TMDL are accurate and representative.

According to the Blacks Creek TMDL only 2.8 lb/day of manganese and 2.6 lb/day of aluminum needs to be removed at sample point BC6 in order for that part of the stream to meet the water quality standards. It may be possible to obtain this goal by only treating one of the two sets of discharges (906-4,5 or 906-7,8,9). The TMDL states that at sample point BC2, 59.0 lb/day of iron, 22.8 lb/day of manganese and 0.4 lb/day of aluminum needs to be removed. The McIntire and BC16 systems already remove more than this amount, but BC2 remains impacted, which illustrates the difficulties of accounting for the effects of natural attenuation. The largest contributor of pollutant loading to this sample point that remains untreated is BC14. It may be possible that by treating BC14 along with at least one of the other sets of discharges

contributing to BC6 that water quality goals could be met. Additional monitoring would of course need to be completed following these restoration efforts to document the actual improvements.

The remaining four proposed passive systems (addressing discharges 906-21, -22, -23, -24, and -36) were not included in Tables XXIV and XXV as implementation is downstream of BC6 and BC2 and would, therefore, have no impact to the segments of Blacks Creek identified for TMDL pollutant loading reductions. Note that TMDL reductions are improvements needed to the main branch of Blacks Creek at specific sampling point locations and not improvements to the individual tributaries for restoration of the entire watershed.

Table XXIV. Blacks Creek Point BC6 TMDL:
Discharge Contribution and Corresponding Passive System Reduction (prelim. est.)

Sample Point	Pollutant Loading by Source (lb/day)				Percentage of Total Source Load by Discharge (%)				Estimated Load Contribution (Reduction) to point BC6 (lb/day)			
	Fe	Mn	Al	Acidity	Fe	Mn	Al	Acidity	Fe	Mn	Al	Acidity
906-4,5	0.5	5.1	9.6	73.6	8%	58%	51%	51%	0.1	2.0	1.4	7.4
906-7A (906-7,8,9)	2.0	3.7	9.3	69.4	92%	42%	49%	49%	0.5	1.5	1.4	7.2
Apparent Natural Attenuation	-1.9	-5.3	-16.1	-128.4								
BC6	0.6	3.5	2.8	14.6	100%	100%	100%	100%	0.6	3.5	2.8	14.6

Pollutant discharge loadings (n varies) from existing data provided in appendix; BC6 loading from Final Blacks Creek TMDL Table 3 - Summary…; assumes 100% discharge load reduction with installation of passive system; apparent natural attenuation attempts to quantify pollutant loading reduction from chemical, physical, and biological processes; BC6 loading attributed to discharges (percentage and quantity) does not consider natural attenuation in Blacks Creek; Estimated Load Contribution (Reduction) to point BC6 is calculated by multiplying BC6 loading (bottom row first column set) by the Percentage of Total Source Load by Discharge for each pollutant.

Table XXV. Blacks Creek Point BC2 TMDL:
Discharge Contribution and Corresponding Passive System Reduction (prelim. est.)

Sample Point	Pollutant Loading by Source (lb/day)				Percentage of Total Source Load by Discharge (%)				Estimated Load Contribution (Reduction) to point BC2 (lb/day)			
	Fe	Mn	Al	Acidity	Fe	Mn	Al	Acidity	Fe	Mn	Al	Acidity
BC6	0.6	3.5	2.8	14.6	0.3	6.7	16.7	6.2	0.2	1.8	0.7	0.0
906-14	1.0	0.3	0.0	0.2	0.6	0.5	0	0.1	0.4	0.1	0.0	0.0
906-16	0.2	0.6	0.9	6.0	0.1	1.2	5.3	2.6	0.1	0.3	0.2	0.0
BC14	42.9	9.0	0.1	-4.2	28.4	17.3	0.6	0	17.1	4.6	0.0	0.0
BC15	0.2	5.3	0.0	7.8	0.1	10.2	0	3.3	0.1	2.7	0.0	0.0
BC16 (complete)	50.0	14.3	0.2	-7.1	33.1	27.5	1.2	0	19.9	8.8	0.0	0.0
TB1 (complete)	56.0	18.9	12.8	216.9	37.1	36.4	76.2	92.6	22.3	9.9	3.0	0.0
Apparent Natural Attenuation	-90.7	-25.3	-12.8	-234.2								
BC2	60.2	26.6	4.0	0.0	100	100	100	100	60.2	26.6	4.0	0.0

(See notes for Table XIV.) BC6 and BC2 loadings from Final Blacks Creek TMDL Table 3 - Summary…; BC2 loadings attributed to discharges (percentage and quantity) does not consider apparent natural attenuation in Blacks Creek; implementation of proposed passive systems at 906-7,8,9 and 906-4,5 upstream of BC6 expected to result in loading reductions at BC2 of 0.2 lb/day, 1.7 lb/day, 0.6 lb/day, 0.0 lb/day of Fe, Mn, Al, acidity, respectively; Estimated Load Contribution (Reduction) to point BC2 is calculated by multiplying BC2 loading (bottom row first column set) by the Percentage of Total Source Load by Discharge for each pollutant.

Table XXVI. Potential Funding Sources for Implementing Blacks Creek Restoration Plan

Funding Source	Contact Information	Eligible Uses	Amount
US EPA Section 319 Nonpoint Source Program	PA DEP Grants Center RCSOB, 15th Floor 400 Market Street P.O. Box 8776 Harrisburg, PA 17105 717-705-5400 www.depweb.state.pa.us	Projects addressing nonpoint sources including AMD restoration (construction projects); watersheds with approved TMDLs and restoration plans considered a priority	No known maximum or minimum
PA DEP Growing Greener Program	PA DEP Grants Center RCSOB, 15th Floor 400 Market Street P.O. Box 8776 Harrisburg, PA 17105 717-705-5400 www.depweb.state.pa.us	Watershed restoration implementation (construction) projects, O&M, education/outreach projects, watershed organization, and watershed assessment	No known maximum or minimum
US OSM Appalachian Clean Streams Initiative	US OSM Harrisburg Field Office 415 Market Street, Suite 3 Harrisburg, PA 17101 717-782-2285	AMD restoration (construction projects) in the Appalachian Region	Up to around $100,000 with no defined maximum
Foundation for Pennsylvania Watersheds	John Dawes 9697 Loop Road Alexandria, PA 16611 814-669-4244 www.pennsylvaniawatersheds.org	Watershed restoration and preservation projects including AMD	No known min/max; funding typically $\leq$$20,000/ project
Common Grant Application	Grant Makers of Western Pennsylvania 650 Smithfield St., Suite 210 Pittsburgh, PA 15222 412-471-6488	Variety of uses; application may be used for many different foundations, although each foundation should be contacted individually	Varies
The Heinz Endowment	The Heinz Endowments 30 EQT Plaza 625 Liberty Avenue Pittsburgh PA 15222-3115 412-281-5777 http://www.heinz.org	Restore and protect watersheds, ecosystems and landscapes; decrease human impact (point and non-point) sources; encourage public awareness, empower grassroots organizations, and build partnerships to address environmental preservation and remediation	No known minimum or maximum
Richard King Mellon Foundation	Richard King Mellon Foundation BNY Mellon Center 500 Grant Street, Suite 4106 Pittsburgh, PA 15219-2502 fdnweb.org/rkmf	Watershed Restoration, Protection and preservation of natural resources	No known minimum or maximum

Table XXVII provides a proposed timetable for implementing the restoration plan. As of August 2017, three passive treatment systems (McIntire, BC16, and BC19/19B) have been constructed that address over 55% of the pollutant loading. As the BC14 discharge is the next highest loading discharge remaining and it directly flows into Blacks Creek, completing that project would be the logical best choice, assuming that landowner permissions can be obtained. In addition, the 906-7,8,9 or the 906-4,5 system should be completed. In addition, the Blacks Creek Sludge pond should be built for future maintenance needs and could easily be constructed as part of the BC14 project. Following completion of these two passive systems, an evaluation of the impact to Blacks Creek should be conducted. Priorities may be rearranged following this evaluation. It is possible that after these two systems are completed, Blacks Creek might meet TMDL water criteria. As part of each project, funding should be included to evaluate the impact in order to restore Blacks Creek in the most efficient and economical manner possible. Load reductions and the water quality criteria are to be used, primarily, for evaluating the progress of the restoration plan. This priority list and proposed timetable are to serve as a guide to developing implementation projects within the Blacks Creek Watershed and should be revised as needed.

Table XXVII. Proposed Time Table for Implementing Restoration Plan

Passive System	Obtain Funding		Design & Construct	
	Start	End	Start	End
BC19 & BC19B	Completed		Completed	
BC16	Completed		Completed	
"McIntire"	Completed		Completed	
906-7, -8, -9	2017	2018	2018	2020
BC14	2018	2019	2019	2021
906-4, -5	2020 If Needed		2021	2023
BC19 & BC19B Expansion	2020 If needed		2021	2023
906-36	2023 If needed		2024	2024

WATER QUALITY MILESTONES AND PROGRESS EVALUATION

Water quality standards will be used to evaluate the progress and degree of success in the implementation of the restoration plan. The primary purpose of this plan is to improve the water quality of Blacks Creek and its tributaries with the ultimate goal of meeting water quality standards to attain the designated use and hopefully return the stream to a viable fishery. Water monitoring shall be conducted by the SRWC with support of SRI. When funding is available, water samples will be collected and analyzed by a laboratory for standard mining parameters including pH, alkalinity, acidity, iron, manganese, aluminum, sulfates, and suspended solids. When funding is not available for laboratory analyses, field kits may be used to measure pH, alkalinity, and iron. Ideally, flow rate should also be measured. At a minimum, water monitoring should be conducted once per year, although quarterly is preferred, at stream sampling points BC6, BC2, BC2B, BC1, and BC8. Monitoring locations are also proposed at the influent and effluent for each passive treatment system as well as on the receiving stream above and below the confluence with the final system effluent. Monitoring is to follow the EPA-approved QAPP (BioMost et al, 2014). Once water quality goals have been met, SRI or the SRWC will contact the PA DEP to reassess the watershed utilizing the Instream Comprehensive Evaluation (ICE) protocols. Interim macroinvertebrate sampling may be conducted as feasible.

Once per year, the SRWC will review available water quality data and discuss the progress of the implementation plan. This will most likely be conducted during a public meeting during the 1st quarter of the year. With each new passive treatment system installed, the degree of improvement to the impacted tributary and/or main branch of Blacks Creek will be reported. In general, these improvements are expected to be reflected by increases in pH and alkalinity values and decreases in acidity, iron, manganese, and aluminum values. Implementation of the restoration plan, as feasible, shall continue until applicable water quality criteria have been met.

PUBLIC PARTICIPATION

Public participation has always been encouraged by the SRWC and Stream Restoration Inc. Progress relating to plan development has been discussed at the SRWC monthly meetings (open to the public) as well as outreach events. As this plan outlines the restoration of an entire watershed, the major stakeholders includes everyone who lives within the watershed, especially the landowners who have property directly impacted by abandoned mine lands, people who use the watershed recreationally, those who work in the watershed, the SRWC, and the PADEP. A public meeting was held at the Jennings Environmental Education Center on September 14, 2017 to present the draft plan. Landowners who have discharges on their property were invited to attend. A PDF of the draft was emailed to SRWC participants, select DEP personnel, and other interested persons prior to the public meeting. The SRWC, Stream Restoration Inc., and PA DEP will be leading the effort to implement the plan. In order to inform the public about the progress of implementing the plan, various education/outreach activities will be utilized including the internet, our monthly newsletter *The Catalyst,* newspaper articles, monthly SRWC meetings and public outreach events such as the Bloom festival that is held annually at the Jennings Environmental Education Center. The plan, along with water monitoring data, will be uploaded to the on-line GIS and database management website Datashed www.datashed.org.

CONCLUSIONS

The watershed of Blacks Creek, a major headwaters tributary to Slippery Rock Creek, has been extensively mined through both surface and underground methods. In addition, the northern portion of the watershed was developed for oil production. These extensive resource extraction activities have severely degraded portions of the watershed. In addition to the TMDL developed by the PADEP Knox District Mining Office in 2002, a restoration plan was originally completed in 2006 by BioMost, Inc., Stream Restoration Inc., and the SRWC based upon available data compiled from a variety of sources as well as newly acquired water quality data obtained while conducting stream walks of the watershed. The plan has been revised in 2017 based upon progress made to date and additional water monitoring. This restoration plan has described all observed major sources of mine drainage that impact the Blacks Creek Watershed. Conceptual passive treatment Best Management Practices (BMPs) have been developed and cost estimates provided for these major sources of mine drainage. The restoration projects were then prioritized and a proposed timetable for implementation was developed. In some cases, due to limited available data, additional water monitoring of mine discharges and more thorough site investigations may be required prior to finalizing the proposed passive treatment system designs. Occasional re-evaluations of the watershed to determine the progress of the restoration effort and possible reprioritization of the mine drainage abatement projects will be necessary to ensure a wise use of available funding and resources in order to restore the watershed in the most efficient, economical, and environmentally-friendly manner feasible.

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Watzlaf, George R. et al, 2004, The Passive Treatment of Coal Mine Drainage, US Dept. of Energy, National Energy Technology Laboratory, DOE/NETL-2004/1202, 72pp.



AMD discharges 906-4 (Left) and 906-5 (Center) as well as other seeps such as 906-2 (Right) are the primary sources of water for unnamed tributary #18, which feeds into a large AMD impacted wetland complex.



Illegal dumps (Left), highwalls (Left), and water-filled pits (Center and Right) are located throughout the watershed.



AMD discharges 906-7 (not shown), 906-8 (Left) and 906-9 (Right) emanate from an abandoned underground mine evidenced by numerous subsidence features (Center) present in the vicinity and form tributary #19.



AMD discharges 906-7,-8,-9 mix with good quality water in a beaver dam wetland (Left) before entering the larger AMD impacted wetland complex (Center) with the outlet forming Blacks Creek (Right).



Wetlands/springs like 906-1 (Left) are sources of good quality water to the watershed. 906-1 mixes with unnamed tributary #19 (Center), which raises the pH to precipitate aluminum (Center and Right) within the stream.



AMD discharge 906-14 (Left), along County Line Road, has minimal impact to good quality tributary #17 which confluences with Blacks Creek at 906-15 (Center). Sediment Pond 906-16 (Right), at the headwaters of tributary #16 receives surface runoff from a reclaimed strip mine and AMD discharges 906-17, -17B.



Historic oil wells (Left), piping systems, and storage tanks (Center) can be seen throughout the northern portion of the watershed. These old oil wells can provide a conduit for mine drainage to reach the surface. Discharges BC14 and BC15 impact Blacks Creek as can be seen downstream at sampling point 906-42 (Right).


Existing treatment pond TB1 (Left) receives mine discharges MC1, MC2, and MC3 which emanate from the "McIntire" site. The effluent of TB1 (Right) used to be the headwaters of tributary #15. The natural formation of iron minerals at low pH, plugging old piping (Center), has been incorporated into the passive system design.


The BC16 discharge upwelling (Left) from an old oil well is the 2nd largest source of metal loadings in the watershed and used to flow untreated into tributary #15 (Center & Right) before the passive system was constructed in 2008.

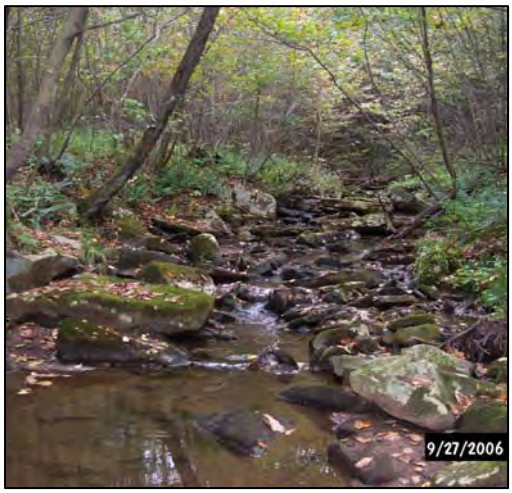

Discharges BC19 & 19B (Left) are upwellings from old oil wells, which use to flow directly into Blacks Creek, but are now captured and treated in a passive treatment wetland (Right). Blacks Creek sampling point BC2B (Center) is downstream of all known major AMD discharges. Note the historic oil pipeline crossing Blacks Creek.



Several working farms, such as this one (Left) located downstream of BC2B, use the water resources within the watershed. With the installation of passive treatment systems and good quality streams such as tributary #14 (Center) Blacks Creek has significantly improved and sampling point BC1 (right) now meets TMDL goals.



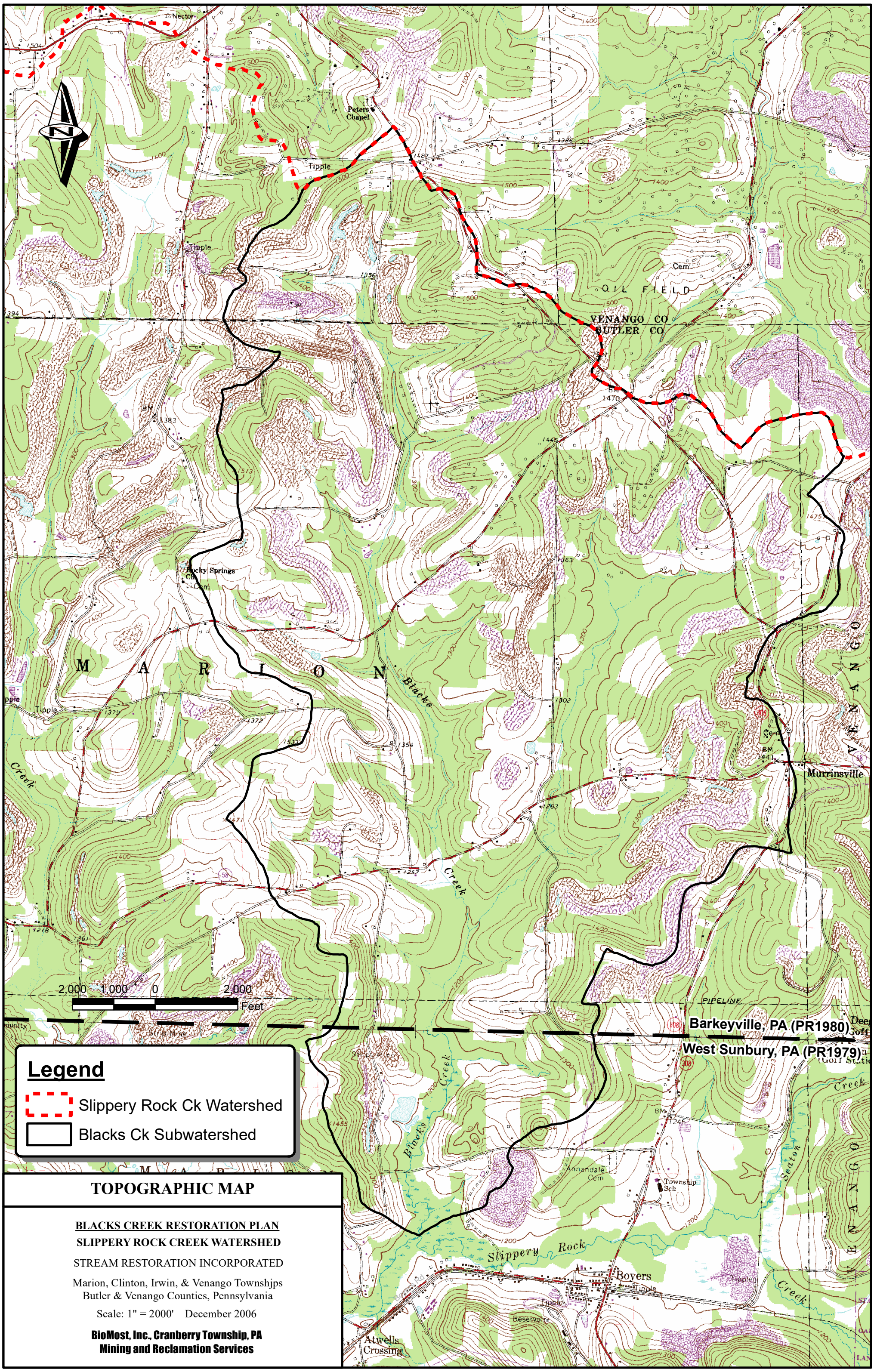
The oil well upwelling 906-36 (Left) has a minimal impact to Blacks Creek. An Allegheny Mineral limestone quarry (Center) has “eliminated” pre-existing AMD discharges. Blacks Creek now meets TMDL goals at BC8 (Right).



Unnamed tributary #7 is formed by two small AMD discharges 906-22 and 906-23 (Left); however, the tributary quickly assimilates the drainage and becomes a stream with excellent water quality and habitat (Center). Another small AMD discharge 906-21 enters the stream just before the confluence with tributary #6. Other small seeps with little impact exist in the watershed like this on unnamed tributary #8 (Right).


Tributary #6 is essentially formed by the effluent of several old settling ponds (Left) that receive runoff from a large successfully reclaimed surface mine. The water quality meets mining effluent limits, but is slightly higher than the stream water quality criteria identified in the TMDL. The tributary quickly assimilates the drainage and is of excellent quality at sampling point BC12 (Center). Tributary #6 then confluences with and improves the water quality of Blacks Creek. The final downstream sampling point QAS4 (Right) on Blacks Creek is located below a Quality Aggregates limestone quarry.

With the installation of the McIntire (Top Left) and BC16 (Top Right) passive systems that are treating the #1 and #2 priority discharges, tributary #15 (aka McInitre trib) (Center Left) is now of good quality and improves Blacks Creek. The BC14 discharge (Center Right) ranked as the #3 priority, heavily impacts Blacks Creek, which can be seen visually by comparing the upstream sample point BC14.1 (Bottom Left) with the downstream sample point 906-42 (Bottom Right).



TOPOGRAPHIC MAP

BLACKS CREEK RESTORATION PLAN

SLIPPERY ROCK CREEK WATERSHED

STREAM RESTORATION INCORPORATED

Marion, Clinton, Irwin, & Venango Townshjps
Butler & Venango Counties, Pennsylvania

Scale: 1" = 2000' December 2006

BioMost, Inc., Cranberry Township, PA
Mining and Reclamation Services

Notes: Stream gradient created with AutoCAD Civil 3D utilizing streams digitizied from aerial photography (1' resolution) and a digital terrain model (DTM) generated from USGS contours (20' interval). Grade breaks within the resulting profile were transferred to the plan view of the stream layer and imported to ArcGIS.

Digital elevation model based on National Elevation Dataset (NED) 1/3 Arc Second. Digital elevation model overlayed onto hillshade generated using ArcGIS 9.2 Spatial Analyst Extension.

Legend

Slippery Rock Ck Watershed

Blacks Ck Subwatershed

Stream Gradient

- 0-0.99 very low
- 1-1.99 low
- 2-3.99 moderate
- 4-7.99 high
- 8-20 very high

Elevation

Value

High : 1600'

Low :1160'

2,000 1,000 0 2,000

Feet

STREAM GRADIENT

BLACKS CREEK RESTORATION PLAN

SLIPPERY ROCK CREEK WATERSHED

STREAM RESTORATION INCORPORATED

Marion, Clinton, Irwin, & Venango Townshjps
Butler & Venango Counties, Pennsylvania

Scale: 1" = 2000' December 2006

BioMost, Inc., Cranberry Township, PA
Mining and Reclamation Services

STREAM MAP

BLACKS CREEK RESTORATION PLAN

SLIPPERY ROCK CREEK WATERSHED

STREAM RESTORATION INCORPORATED

Marion, Clinton, Irwin, & Venango Townshjps
Butler & Venango Counties, Pennsylvania

Scale: 1" = 2000' December 2006

BioMost, Inc., Cranberry Township, PA
Mining and Reclamation Services

Notes: The highlighted labels located below the streams are the cooresponding Reach Code to the unique stream names created for this report. The Reach Codes are based on the National Hydrography Dataset developed by the USGS and EPA.

IRWIN TWP

CLINTON TWP

MARION TWP

VENANGO TWP

SEATON CREEK

NORTH BRANCH SLIPPERY ROCK CREEK

SLIPPERY ROCK CREEK

SLIPPERY ROCK CREEK

Trib 18

Trib 19

05030105005298

Trib 17

05030105005300

Trib 16

05030105005303

Trib 15

05030105005305

Trib 14

05030105005312

Trib 6

Trib 9

05030105005311

Trib 8

05030105005310

Trib 8

05030105005313

Trib 12

05030105005315

Trib 13

05030105005314

05030105000128

05030105000382

Trib 11

05030105005318

Trib 6

Trib 7

05030105005319

Trib 10

05030105005322

Trib 4

05030105005326

Blacks Creek

Trib 5

05030105005325

Trib 3

05030105006075

05030105006077

Trib 2

05030105000127

Trib 1

05030105006082

Slippery Rock Creek

Murrinsville

Boyers

Atwells Crossing

Keenan

County Line Rd

Byers Rd

Pohlman Rd

Porter Rd

Creek Bottom Rd

Windy Point Rd

Midberry Rd

Van Dyke Rd

Patton Rd

Murrin Rd

Herman Rd

Deer Rd

Boyers Rd

58

308

2,000 1,000 0 2,000

Feet

Legend

- Town

Streams

- 1st Order
- 2nd Order
- 3rd Order
- 4th Order
- State Routes
- Major Roads
- Local Roads
- Waterbodies
- County
- Municipalities
- Slippery Rock Ck Watershed
- Blacks Ck Subwatershed
- Slippery Rock Ck Subwatersheds

Passive Treatment System Priority List	
Priority Rank	**Project**
1	TB1 (“McIntire” Site)
2	BC16
3	BC14
4	BC19 & BC19B Phase 1
5	906-7, -8, -9
6	906-4, -5
7	Blacks Creek Sludge Pond
8	BC19 & BC19B Phase 2
9	906-36
10	BC15
11	906-21
12	906-16
13	906-14
14	906-22, -23
15	906-24
See Table XXIII of Narrative for more information.	

Nectarine

208

Clintonville

CLINTONVILLE BORO

IRWIN TWP

CLINTON TWP

MARION TWP

VENANGO TWP

SEATON CREEK

NORTH BRANCH SLIPPERY ROCK CREEK

SLIPPERY ROCK CREEK

SLIPPERY ROCK CREEK

Inset 1

Inset 2

Inset 3

Bullion-Clintonville Oil Field

McIntire Restoration Area

Old Surface Mines

Allegheny Mineral Corp (active limestone quarry)

Allegheny Mineral Corp (active limestone quarry)

Trib 19

Trib 18

Trib 17

Trib 16

Trib 15

Trib 14

Trib 13

Trib 12

Trib 11

Trib 10

Trib 9

Trib 8

Trib 7

Trib 6

Trib 5

Trib 4

Trib 3

Trib 2

Trib 1

Blacks Creek

Slippery Rock Creek

Byers Rd

Pohlman Rd

Porter Rd

County Line Rd

Windy Point Rd

Creek Bottom Rd

Midberry Rd

Van Dyke Rd

Murrin Rd

Herman Rd

Patton Rd

Deer Rd

Boyers Rd

Murrinsville

Boyers

58

308

906-1 906-2 906-4 906-5 906-6 906-7 906-8 906-9 906-10 906-11 906-12 906-13 906-14 906-16 906-17 906-17B 906-20 906-22 906-23 906-24 906-25 906-26 906-27 906-28 906-29 906-31 906-36 906-42 906-44 908-Y B-BC7-2B 40H 40L BC1 BC1A BC2 BC2B BC3 BC3B BC4 BC4.1 BC5 BC6 BC6.1 BC8 BC9 BC10 BC11 BC12 BC12A BC13 BC14 BC14.1 BC15 BC16 BC17 BC19 BC19B MC1 MC2 MC3 TB1 TRX RS1 RS2 SB1 905-WL QAS1 QAS2 QAS3 QAS4

1,000 500 0 1,000 Feet

300 150 0 300 Feet

500 250 0 500 Feet

60 30 0 60 Feet

Legend

- Town
- Sample Points
- Oil Wells
- State Routes
- Major Roads
- Local Roads
- Waterbodies
- County
- Municipalities
- Slippery Rock Ck Watershed
- Surface Mines
- Blacks Ck Subwatershed
- Slippery Rock Ck Subwatersheds

Passive Treatment System

- Proposed
- Completed

Streams

- 1st Order
- 2nd Order
- 3rd Order
- 4th Order

Notes: Surface mines based on USGS Topographic Maps [Barkeyville, PA (PR1980) & West Sunbury, PA (PR1979)]. Additional mining after photorevision dates are not shown. Oil wells based on locations provided by DEP (published 10/25/06). Passive Treatment System label corresponds to Priority Ranking on Table XIII. of narrative.

LOCATION MAP

MERCER

VENANGO

LAWRENCE

BUTLER

BEAVER

Blacks Creek

Slippery Rock Creek Watershed

6 3 0 6 Miles

BLACKS CREEK WATERSHED MAP

BLACKS CREEK RESTORATION PLAN

SLIPPERY ROCK CREEK WATERSHED

STREAM RESTORATION INCORPORATED

Marion, Clinton, Irwin, & Venango Townships
Butler & Venango Counties, Pennsylvania

Scale: 1" = 1000' September 2017

BioMost, Inc., Cranberry Township, PA
Mining and Reclamation Services

Blacks Creek Restoration Plan Water Quality Data

AMD Discharge Data

Stream Data

BC16 Passive System Data

BC19 & BC19B Passive System Data

McIntire Passive System Data

AMD Discharge Data

Blacks Creek Discharges Water Quality Report - 906-2

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2005-03-30	--	--	5.87	6.23	--	--	--	387	38	35.92	-27.3	0.07	0.04	1.39	1.34	0.9	0.02	264	1
2006-05-10	--	--	6.51	--	167	--	14	--	58	--	--	0.5	--	--	--	--	--	--	--
2015-06-17	--	10	4.57	4.27	371	7.75	14.8	343	0	0.00	27.54	2.45	0.34	3.42	3.39	3.47	2.64	122.9	21
2015-08-11	--	10	4.91	4.64	284	5.85	19.7	336	1	1.85	14.13	1.82	0.42	3.52	3.39	3.49	1.18	126.5	5
2015-09-15	--	5	4.52	4.68	311	6.93	22.4	341	0	1.58	14.73	3.02	0.55	3.75	3.65	7.73	1.49	120.8	0
2015-10-21	--	5	5.23	6.04	267	7.12	10.1	346	--	8.78	1.59	1.02	0.14	2.51	2.31	8.27	0.74	133.9	14
2015-11-11	--	15	5.97	6.47	264	8.88	9.7	360	38	32.73	-19.50	0.22	0	2.11	1.86	3.33	0.22	128.3	0
2016-01-28	--	10	5.33	6.00	250	11.75	0.8	370	13	10.70	0.20	1.23	0.11	2.84	2.82	11.55	2.67	143.3	25
2016-02-23	--	20	5.70	6.38	--	--	--	352	16	12.91	-3.96	0.22	0	2.67	2.65	6.39	1.77	136.7	0
2016-03-24	--	25	5.94	6.15	210	8.81	12.5	374	34	14.17	-5.94	0.25	0.15	2.41	2.40	3.74	0.45	146.2	7
2016-04-27	--	15	5.91	6.21	240	7.78	15.2	368	19	13.69	-2.99	0.23	0.14	2.45	2.36	2.96	0.16	134.5	0
Minimum:		5	4.52	4.27	167	5.85	0.8	336	0	0.00	-27.3	0.07	0	1.39	1.34	0.9	0.02	120.8	0
Maximum:		25	6.51	6.47	371	11.75	22.4	387	58	35.92	27.54	3.02	0.55	3.75	3.65	11.55	2.67	264	25
Average:		12.8	5.1	--	262.7	8.11	13.2	358	21.7	13.23	-0.15	1	0.19	2.71	2.62	5.18	1.13	145.7	7.3
Range:		20	1.99	2.2	204	5.9	21.6	51	58	35.92	54.84	2.95	0.55	2.36	2.31	10.65	2.65	143.2	25
Median:		10	5.70	6.1	264	7.77	14	356	17.5	11.81	-1.4	0.5	0.14	2.59	2.53	3.62	0.96	134.2	3
Loading (lb/day):									3.25	1.98	-0.09	0.12	0.02	0.41	0.4	0.77	0.17		

Sample Point Description: AMD; Seep zone forming an AMD impacted wetland located below previous surface mine activities; Discharges to unnamed Tributary #18 near an old tree stand; BMI sampling point; Includes Beran Environmental sampling point DSCH BC7.2 which is assumed to be similar.

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-4

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-05-10	--	20	3.08	3.05	415	--	20	1158	--	0	316.98	2.11	1.81	8.01	7.72	37.83	35.83	420.8	4
2015-05-20	--	9	3.65	3.42	430	8.20	10.1	669	0	0.00	125.66	0.69	0.62	6.46	6.39	13.09	13.01	268.6	9
2015-06-17	--	85	--	3.41	--	--	--	677	--	0.00	125.26	0.59	0.51	6.50	6.09	16.59	15.77	274.3	10
2015-08-11	--	7	3.34	3.47	470	6.17	16.2	665	0	0.00	123.38	1.46	1.37	6.36	6.34	15.70	14.16	315.6	0
2015-09-15	--	3	3.25	3.34	505	5.86	14.7	800	0	0.00	138.70	2.16	1.91	6.68	6.42	24.18	23.40	310.8	0
2015-10-21	--	3	3.30	3.31	470	6.17	9.5	786	0	0.00	170.74	1.20	1.06	5.88	5.46	27.63	25.75	392.4	0
2015-11-11	--	9	3.49	3.27	400	7.27	9.4	687	0	0.00	138.11	0.51	0.46	6.86	6.15	24.94	22.65	475.7	7
2015-12-15	--	3	3.43	3.34	425	6.22	8.5	724	0	0.00	130.74	0.43	0.41	6.85	6.06	40.55	25.54	312.0	7
2016-01-28	--	12	3.50	3.46	352	10.90	3.9	670	0	0.00	111.47	0.41	0.27	6.51	6.48	17.25	14.08	295.5	0
2016-02-23	--	21	--	3.41	--	--	--	687	0	0.00	117.61	0.34	0.27	6.56	6.33	19.07	18.68	258.6	0
2016-03-24	--	23	3.60	3.46	380	9.02	10.5	634	0	0.00	102.37	0.48	0.36	5.86	5.85	15.47	13.78	260.0	6
2016-04-27	--	20	3.63	3.45	350	8.04	11.2	632	0	0.00	109.65	0.29	0.19	6.35	6.27	14.25	14.23	260.5	6
Minimum:		3	3.08	3.05	350	5.86	3.9	632	--	0	102.37	0.29	0.19	5.86	5.46	13.09	13.01	258.6	0
Maximum:		85	3.65	3.47	505	10.90	20	1158	--	0	316.98	2.16	1.91	8.01	7.72	40.55	35.83	475.7	10
Average:		17.9	--	3.35	419.7	7.54	11.4	732	--	0	142.56	0.89	0.77	6.57	6.3	22.21	19.74	320.4	4.1
Range:		82	0.57	0.42	155	5.04	16.1	526	--	0	214.61	1.87	1.72	2.15	2.26	27.46	22.82	217.1	10
Median:		10.5	3.46	3.41	420	7.27	10.3	682	--	0	125.46	0.55	0.49	6.51	6.3	18.16	17.23	303.2	5
Loading (lb/day):									--	0	29.9	0.15	0.13	1.41	1.35	4.14	3.86		

Sample Point Description: Abandoned Mine Discharge; Emenates from an abandoned surface mine pit; Confluences with Abandoned Mine Discharge 906-5to form unnamed headwaters tributary #18 to Blacks Creek; Upstream of 906-2 which feeds into the AMD impacted wetland; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-5

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-05-10	--	20	3.59	3.56	0	--	20	461	--	0	77.18	0.3	0.27	5.35	5.29	6.42	6.36	167.3	13
2015-05-20	--	40	3.49	3.48	436	4.10	9.5	450	0	0.00	57.32	0.21	0.20	4.65	4.54	6.10	5.98	159.4	16
2015-06-17	--	53	--	3.49	--	--	--	492	--	0.00	70.79	0.29	0.22	5.97	5.85	7.97	7.59	183.4	5
2015-08-11	--	40	3.33	3.52	429	3.46	11.9	422	0	0.00	48.95	0.52	0.26	5.04	4.74	5.48	5.40	217.2	0
2015-09-15	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2015-10-21	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2015-11-11	--	1	3.59	3.42	415	4.20	11.6	404	0	0.00	59.30	0.46	0.17	4.94	4.29	6.96	6.45	194.9	0
2015-12-15	--	15	3.60	3.48	491	9.20	10.5	444	0	0.00	62.29	0.38	0.38	5.60	4.36	6.12	5.98	140.4	0
2016-01-28	--	100	3.91	3.53	330	9.66	4.0	463	0	0.00	59.40	0.26	0.19	5.19	5.04	8.20	7.90	179.0	0
2016-02-23	--	100	--	3.49	--	--	--	444	--	0.00	60.59	0.19	0	5.06	4.99	7.87	7.74	147.5	0
2016-03-24	--	125	3.56	3.57	440	9.26	10.1	445	0	0.00	52.73	0.80	0.65	4.71	4.62	7.88	7.06	172.2	0
2016-04-27	--	120	3.69	3.53	390	8.84	10.0	427	0	0.00	60.10	0.21	0	4.72	4.67	6.83	6.71	139.5	0
Minimum:		0	3.33	3.42	0	3.46	4.0	404	--	0	48.95	0.19	0	4.65	4.29	5.48	5.40	139.5	0
Maximum:		125	3.91	3.57	491	9.66	20	492	--	0	77.18	0.80	0.65	5.97	5.85	8.20	7.90	217.2	16
Average:		51.2	--	--	366.4	6.96	11	445	--	0	60.87	0.36	0.23	5.12	4.84	6.98	6.72	170.1	3.4
Range:		125	0.58	0.15	491	6.2	16	88	--	0	28.23	0.61	0.65	1.32	1.56	2.72	2.5	77.7	16
Median:		40	3.59	3.51	422	8.84	10.3	445	--	0	59.75	0.3	0.21	5.05	4.71	6.9	6.58	169.8	0
Loading (lb/day):									--	0	43.61	0.27	0.17	3.7	3.6	5.43	5.2		

Sample Point Description: Abandoned Mine Discharge; Initially emanates at toe of spoil at base of large rock (Latitude 41.176048928 Longitude 79.931784324); Uncertain if source is underground or surface mine; Discharge seems to emanate from a more diffuse area than it appears and picks up additional mine water as it flows in channel; Starting on 12/15/15, the monitoring point location was changed to a culvert where the water discharges to and forms the stream channel. Therefore flow data before 12/15/15 may not be truly accurate especially during low flow doncidtions; Confluences with Mine Discharge 906-4 to form unnamed headwaters tributary #18 to Blacks Creek; Upstream of 906-2 which feeds portion of the AMD impacted wetland; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-7

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-05-10	--	15	4.18	4.1	373	--	8	567	--	0	48.04	0.17	0.13	3.4	3.48	5.31	5.05	141	5
2015-05-20	--	3	4.08	4.04	358	7.24	9.6	437	0	0.00	29.99	1.47	0.65	2.05	1.96	2.99	2.93	67.1	15
2015-08-11	--	2	4.09	3.91	325	5.16	15.4	518	0	0.00	32.44	2.35	2.06	3.67	3.14	3.92	3.74	116.3	10
2015-09-15	--	1	3.77	3.63	286	3.16	17.4	719	0	0.00	63.28	5.21	4.61	7.69	7.22	10.41	10.37	195.6	0
2015-10-21	--	1	3.72	3.60	350	4.49	14.3	717	0	0.00	81.19	1.98	1.96	7.23	7.13	13.37	11.83	240.9	0
2015-11-11	--	5	4.11	3.84	411	5.96	12.5	474	0	0.00	35.62	0.60	0.15	3.53	3.21	6.09	5.92	114.9	0
2016-02-23	--	21	4.00	4.17	--	--	--	312	0	0.00	18.22	0.20	0	1.32	1.31	2.56	2.56	47.9	0
2016-03-22	--	25	4.33	4.12	340	10.11	9.8	301	0	0.00	17.42	1.60	0.13	1.09	1.02	1.81	1.70	45.7	14
2016-04-27	--	10	4.29	4.02	338	7.67	17.9	314	0	0.00	18.91	0.36	0	1.24	1.21	1.37	1.24	43.7	0
Minimum:		1	3.72	3.60	286	3.16	8	301	--	0	17.42	0.17	0	1.09	1.02	1.37	1.24	43.7	0
Maximum:		25	4.33	4.17	411	10.11	17.9	719	--	0	81.19	5.21	4.61	7.69	7.22	13.37	11.83	240.9	15
Average:		9.2	4.02	3.89	347.6	6.26	13.1	484	--	0	38.35	1.55	1.08	3.47	3.3	5.31	5.04	112.6	4.9
Range:		24	0.61	0.57	125	6.95	9.9	418	--	0	63.77	5.04	4.61	6.6	6.2	12	10.59	197.2	15
Median:		5	4.09	4.02	345	5.96	13.4	474	--	0.00	32.44	1.47	0.15	3.4	3.14	3.92	3.74	114.9	0
Loading (lb/day):									--	0	2.94	0.09	0.02	0.22	0.21	0.35	0.34		

Sample Point Description: Abandoned Mine Discharge; Possibly emanating from old deep mine or oil well; Mixes with other seeps, discharges and other sources of water which is then sampled at 906-7A and then further downstream at 906-6; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-7A

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2015-05-20	--	21	3.18	3.19	548	9.99	12.6	838	0	0.00	134.03	4.34	4.32	6.29	6.11	14.60	14.38	251.8	11
2015-06-17	--	250	3.42	3.42	--	9.51	14.0	571	0	0.00	88.13	2.48	2.24	4.84	4.72	9.81	9.40	158.7	9
2015-08-11	--	20	3.27	3.27	530	7.73	20.6	857	0	0.00	105.47	5.95	5.43	7.14	6.48	15.19	15.18	421.4	0
2015-09-15	--	10	3.12	3.16	581	7.99	18.4	996	0	0.00	161.99	7.13	6.81	7.62	7.24	24.07	23.55	284.7	0
2015-10-21	--	13	3.27	3.20	550	8.93	14.0	844	0	0.00	135.92	4.51	0.37	6.24	0.35	20.85	0.15	320.3	6
2015-11-11	--	80	3.53	3.43	520	9.79	10.8	452	0	0.00	63.68	2.25	1.91	3.33	2.96	9.53	8.99	203.9	0
2015-12-15	--	30	3.34	3.26	546	10.42	8.3	749	0	0.00	142.29	4.57	4.04	6.40	5.63	27.22	19.85	240.5	5
2016-01-28	--	45	3.21	3.36	530	12.31	2.7	676	0	0.00	106.13	2.85	2.71	5.44	5.34	15.27	14.90	232.8	0
2016-02-23	--	100	--	3.45	--	--	--	509	0	0.00	71.28	1.98	1.90	3.96	3.90	10.50	10.33	156.8	0
2016-03-22	--	75	3.44	3.37	490	10.93	10.6	650	0	0.00	88.11	2.17	2.05	4.76	4.75	13.63	12.88	208.6	0
2016-04-27	--	50	3.45	3.27	473	8.74	17.9	695	0	0.00	105.27	2.30	2.09	5.42	5.40	12.29	11.80	207.6	8
Minimum:		10	3.12	3.16	473	7.73	2.7	452	--	0.00	63.68	1.98	0.37	3.33	0.35	9.53	0.15	156.8	0
Maximum:		250	3.53	3.45	581	12.31	20.6	996	--	0.00	161.99	7.13	6.81	7.62	7.24	27.22	23.55	421.4	11
Average:		63.1	--	3.3	529.8	9.63	13	712	--	0	109.3	3.68	3.08	5.59	4.81	15.72	12.86	244.3	3.5
Range:		240	0.41	0.29	108	4.58	17.9	544	--	0	98.31	5.15	6.44	4.29	6.89	17.69	23.4	264.6	11
Median:		45	3.31	3.27	530	9.65	13.3	695	--	0.00	105.47	2.85	2.24	5.44	5.34	14.60	12.88	232.8	0
Loading (lb/day):									--	0	69.25	2.05	1.83	3.68	3.47	9.3	8.47		

Sample Point Description: "Stream" consisting of water from various mine discharges, seeps, springs, etc. Sampled downstream of 906-7, 906-8, and 906-9 and upstream of 906-6; This point was established as an alternative to sampling every source of water on the hillside; located not far from the nearby reclaimed surface mine and old strip pit pond

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-8

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-05-10	--	10	3.15	3.04	512	--	12	1829	--	0	639.78	104.8	95.65	16.78	16.71	59.42	55.21	950.4	6
2015-06-17	--	5	2.97	3.03	511	8.61	13.9	1311	0	0.00	341.29	25.98	21.89	10.53	10.20	40.54	39.52	587.4	0
2015-08-11	--	4	2.81	2.99	548	8.21	18.4	1419	0	0.00	308.25	23.28	22.53	11.44	10.02	38.63	35.53	1034.7	0
2015-09-15	--	3	2.82	2.96	533	8.80	14.1	1508	0	0.00	332.33	29.67	16.98	10.98	10.76	51.44	51.34	579.0	0
2015-10-21	--	1	3.16	2.95	605	6.91	13.0	1508	0	0.00	373.92	26.35	26.04	10.45	10.31	52.72	49.57	735.4	0
2015-11-11	--	4	2.98	2.87	611	6.35	11.3	1552	0	0.00	383.87	33.38	29.66	14.92	12.85	65.22	61.69	1211.0	0
2016-02-23	--	5	--	2.95	--	--	--	1467	--	0.00	355.81	28.18	27.30	11.21	10.97	52.96	51.64	691.7	0
2016-03-22	--	6	2.99	2.96	--	8.05	10.7	1413	0	0.00	324.32	26.51	23.56	9.70	9.42	48.13	45.68	742.6	6
2016-04-27	--	3	2.97	2.90	560	6.77	19.0	1384	0	0.00	350.44	17.38	16.39	9.58	9.04	39.04	36.45	546.1	0
Minimum:		1	2.81	2.87	511	6.35	10.7	1311	--	0	308.25	17.38	16.39	9.58	9.04	38.63	35.53	546.1	0
Maximum:		10	3.16	3.04	611	8.80	19.0	1829	--	0	639.78	104.8	95.65	16.78	16.71	65.22	61.69	1211.0	6
Average:		4.6	--	2.96	554.3	7.67	14.1	1488	--	0	378.89	35.06	31.11	11.73	11.14	49.79	47.4	786.5	1.3
Range:		9	0.35	0.17	100	2.45	8.3	518	--	0	331.53	87.42	79.26	7.2	7.67	26.59	26.16	664.9	6
Median:		4	2.98	2.96	548	8.05	13.5	1467	--	0.00	350.44	26.51	23.56	10.98	10.31	51.44	49.57	735.4	0
Loading (lb/day):									--	0	22.69	2.5	2.24	0.68	0.65	2.79	2.65		

Sample Point Description: Abandoned Mine Discharge; Probably emanates from an abandoned deep mine; Numerous subsidence features in vicinity; Mixes with other seeps, discharges and other sources of water which is then sampled at 906-6; BMI point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-9

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-05-10	--	5	3.35	3.27	538	--	12	998	--	0	160.2	0.86	0.86	11.73	11.65	15.3	14.46	327.5	6
2015-05-20	--	5	3.34	3.23	525	8.21	11.5	877	0	0.00	116.08	1.31	0.80	8.92	8.55	13.59	13.29	293.8	20
2015-06-17	--	120	3.14	3.24	517	7.28	11.0	810	0	0.00	124.44	2.31	2.30	7.63	7.46	13.44	12.73	249.5	8
2015-08-11	--	16	2.98	3.23	403	6.58	13.8	825	0	0.00	125.37	1.72	1.49	9.65	6.58	11.93	11.43	477.2	0
2015-09-15	--	4	3.12	3.30	485	7.31	15.0	882	0	0.00	103.48	2.45	2.28	8.63	8.50	16.11	15.59	301.9	0
2015-10-21	--	3	3.22	3.31	449	7.68	12.7	836	0	0.00	105.67	1.96	1.83	7.81	7.73	15.44	14.34	320.3	11
2015-11-11	--	10	3.40	3.27	490	7.34	10.9	809	0	0.00	111.64	0.80	0.60	9.35	9.23	17.27	16.23	485.1	0
2016-02-23	--	30	--	3.26	--	--	--	846	0	0.00	104.54	0.67	0.54	8.52	8.50	16.25	15.59	267.8	0
2016-03-22	--	65	3.29	3.27	470	10.24	10.5	819	0	0.00	114.84	1.44	0.97	7.78	7.31	16.29	15.57	337.3	5
2016-04-27	--	25	3.32	3.24	475	8.89	12.8	803	0	0.00	108.85	0.53	0.48	8.02	7.86	13.03	12.19	268.1	0
Minimum:		3	2.98	3.23	403	6.58	10.5	803	--	0	103.48	0.53	0.48	7.63	6.58	11.93	11.43	249.5	0
Maximum:		120	3.40	3.31	538	10.24	15.0	998	--	0	160.2	2.45	2.30	11.73	11.65	17.27	16.23	485.1	20
Average:		28.3	--	3.26	483.6	7.94	12.2	851	--	0	117.51	1.41	1.22	8.8	8.34	14.87	14.14	332.9	5
Range:		117	0.42	0.08	135	3.66	4.5	195	--	0	56.72	1.92	1.82	4.1	5.07	5.34	4.8	235.6	20
Median:		13	3.29	3.27	485	7.51	12	831	--	0	113.24	1.38	0.92	8.58	8.18	15.37	14.4	311.1	2.5
Loading (lb/day):									--	0	40.19	0.56	0.5	2.74	2.61	4.92	4.68		

Sample Point Description: Abandoned Mine Discharge; Close proximity to 906-8; Emanates from small pond like depression; May be hydrologically connected to deep mine; Mixes with other seeps, discharges and other sources of water which is then sampled at 906-7A and then 906-6; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-13

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-05-17	--	1	6.81	--	238	--	12	--	--	--	--	--	6	--	--	--	--	--	--
Minimum:		1	6.81	--	238	--	12	--	--	--	--	--	6	--	--	--	--	--	--
Maximum:		1	6.81	--	238	--	12	--	--	--	--	--	6	--	--	--	--	--	--
Average:		1	6.81	--	238	--	12	--	--	--	--	--	6	--	--	--	--	--	--
Range:		0	0	--	0	--	0	--	--	--	--	--	0	--	--	--	--	--	--
Median:		1	6.81	--	238	--	12	--	--	--	--	--	6	--	--	--	--	--	--
Loading (lb/day):									--	--	--	--	0.07	--	--	--	--		

Sample Point Description: Seep; Small alkaline iron seep near old strip mine located north of County Line road along side of unnamed tributary #17 to Blacks Creek; Seep appears to have minimal impact to unnamed tributary #17; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-14

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-05-17	--	6.5	5.72	5.71	229	--	9	368	34	9.29	10.91	20.14	11.13	5.99	4.77	0.18	0.14	148.3	1
2015-09-16	--	3	6.90	6.14	--	6.14	14.0	366	36	21.82	-7.16	13.42	11.98	5.21	4.91	0.11	0	127.6	20
2016-03-24	--	10	5.90	5.84	170	8.17	11.4	323	21	9.44	0.00	8.66	5.33	2.71	2.67	0.18	0.13	139.1	15
Minimum:		3	5.72	5.71	170	6.14	9	323	21	9.29	-7.16	8.66	5.33	2.71	2.67	0.11	0	127.6	1
Maximum:		10	6.90	6.14	229	8.17	14.0	368	36	21.82	10.91	20.14	11.98	5.99	4.91	0.18	0.14	148.3	20
Average:		6.5	5.96	5.86	199.5	7.16	11.5	352	30.33	13.52	1.25	14.07	9.48	4.64	4.12	0.16	0.09	138.3	12
Range:		7	1.18	0.43	59	2.03	5	45	15	12.53	18.07	11.48	6.65	3.28	2.24	0.07	0.14	20.7	19
Median:		6.5	5.90	5.84	199.5	7.16	11.4	366	34	9.44	0.00	13.42	11.13	5.21	4.77	0.18	0.13	139.1	15
Loading (lb/day):									2.16	0.88	0.2	1.03	0.65	0.33	0.29	0.01	0.01		

Sample Point Description: Abandoned Mine Discharge; Emanates along County Line Road, flows along ditch, through wetlands and enters unnamed tributary #17 to Blacks Creek; Source may be strip mine, but uncertain; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-16

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-05-17	--	150	4.5	4.35	292	--	15	411	--	0	40.4	0.68	0.66	3.4	3.34	5.76	5.33	176.2	1
2015-05-20	--	1	6.20	6.46	296	6.64	18.3	309	22	8.19	3.67	1.14	1.02	1.14	1.11	0.14	0	107.4	12
2015-06-17	--	35	5.77	6.22	296	6.64	20.3	191	12	12.64	2.45	0.62	0.22	0.69	0.68	0.54	0.20	56.8	8
2015-08-11	--	0.1	6.14	7.22	--	--	--	236	--	62.00	-45.77	3.57	--	2.35	--	0.74	--	38.3	24
2015-09-15	--	0.3	8.34	7.36	205	8.71	--	255	47	33.82	-18.51	0.90	0.71	0.91	0.77	0.42	0.18	63.9	18
2015-10-21	--	1	5.89	6.88	174	9.86	15.9	214	--	28.18	-16.72	4.61	0.39	6.38	0.38	18.61	0.22	62.6	11
2015-11-11	--	15	6.64	6.88	250	11.00	9.7	209	21	20.91	-10.95	0.45	0.14	0.48	0.37	0.27	0	65.2	14
2015-12-15	--	2	6.72	7.00	280	10.58	8.3	217	17	16.97	-2.39	0.96	0.12	0.36	0.34	0.19	0	69.6	11
2016-01-28	--	5	5.87	6.12	240	9.52	1.9	313	15	10.59	-1.39	0.76	0.35	1.46	1.43	0.55	0.19	121.8	0
2016-02-23	--	25	6.00	6.37	--	--	--	274	--	10.15	-0.79	0.39	0.15	1.21	1.19	0.65	0.36	96.0	0
2016-03-22	--	5	5.47	6.16	281	10.29	10.8	343	19	4.88	5.35	0.88	0.38	1.97	1.66	0.57	0.40	131.4	0
2016-04-27	--	5	6.29	6.20	156	8.32	20.1	331	12	2.86	5.57	0.33	0	1.79	1.76	0.16	0	128.4	0
Minimum:		0.1	4.5	4.35	156	6.64	1.9	191	12	0	-45.77	0.33	0	0.36	0.34	0.14	0	38.3	0
Maximum:		150	8.34	7.36	296	11.00	20.3	411	47	62.00	40.4	4.61	1.02	6.38	3.34	18.61	5.33	176.2	24
Average:		20.4	5.45	5.39	247	9.06	13.4	275	20.63	17.6	-3.26	1.27	0.38	1.85	1.18	2.38	0.63	93.1	8.3
Range:		149.9	3.84	3.01	140	4.36	18.4	220	35	62	86.17	4.28	1.02	6.02	3	18.47	5.33	137.9	24
Median:		5	6.07	6.42	265	9.52	15	265	18	11.62	-1.09	0.82	0.35	1.34	1.11	0.55	0.19	82.8	9.5
Loading (lb/day):									1.55	1.19	5.98	0.16	0.13	0.61	0.64	0.93	0.89		

Sample Point Description: Effluent of sediment pond on reclaimed surface mine; Forms unnamed tributary #16 to Blacks Creek; Source of water includes surface runnoff as well as mine discharges 906-17 & 17b; Flow and quality quite variable; Brief heavy rain while collecting 5-17-06 sample; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-17

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-05-17	--	11.5	3.65	3.59	419	--	10	1399	--	0	408.24	0.5	0.47	19.15	18.18	48.38	46.38	905.7	2
Minimum:		11.5	3.65	3.59	419	--	10	1399	--	--	408.24	0.5	0.47	19.15	18.18	48.38	46.38	905.7	2
Maximum:		11.5	3.65	3.59	419	--	10	1399	--	--	408.24	0.5	0.47	19.15	18.18	48.38	46.38	905.7	2
Average:		11.5	3.65	3.59	419	--	10	1399	--	--	408.24	0.5	0.47	19.15	18.18	48.38	46.38	905.7	2
Range:		0	0	0	0	--	0	0	--	--	0	0	0	0	0	0	0	0	0
Median:		11.5	3.65	3.59	419	--	10	1399	--	--	408.24	0.5	0.47	19.15	18.18	48.38	46.38	905.7	2
Loading (lb/day):									--	--	56.34	0.07	0.06	2.64	2.51	6.68	6.4		

Sample Point Description: Abandoned Mine Discharge; Possibly from a deep mine; Flows down into and across reclaimed strip mine and mixes with surface flow before entering sediment pond (906-16); BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-17b

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-05-17	--	3.5	3.81	--	357	--	10	--	--	--	--	--	--	--	--	--	--	--	--
Minimum:		3.5	3.81	--	357	--	10	--	--	--	--	--	--	--	--	--	--	--	--
Maximum:		3.5	3.81	--	357	--	10	--	--	--	--	--	--	--	--	--	--	--	--
Average:		3.5	3.81	--	357	--	10	--	--	--	--	--	--	--	--	--	--	--	--
Range:		0	0	--	0	--	0	--	--	--	--	--	--	--	--	--	--	--	--
Median:		3.5	3.81	--	357	--	10	--	--	--	--	--	--	--	--	--	--	--	--
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Abandoned Mine Discharge; Located in close proximity to (~20 feet away) and probably related to 906-17; Assumed to be of similar quality as 906-17; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-21

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-09-27	--	10	6.61	6.14	180	--	12	400	80	48.48	-15.76	30.14	27.89	1.01	0.97	0.22	0.17	95	11
2015-09-16	--	5	7.32	6.32	120	0.11	11.2	376	93	39.86	-29.45	23.58	22.36	1.08	1.05	0	0	71.9	41
2016-03-24	--	6	6.57	7.20	50	0.25	12.2	472	98	87.96	-73.85	31.75	26.80	0.98	0.97	0	0	119.5	184
Minimum:		5	6.57	6.14	50	0.11	11.2	376	80	39.86	-73.85	23.58	22.36	0.98	0.97	0	0	71.9	11
Maximum:		10	7.32	7.20	180	0.25	12.2	472	98	87.96	-15.76	31.75	27.89	1.08	1.05	0.22	0.17	119.5	184
Average:		7	6.73	6.37	116.7	0.18	11.8	416	90.33	58.77	-39.69	28.49	25.68	1.02	1	0.07	0.06	95.5	78.7
Range:		5	0.75	1.06	130	0.14	1	96	18	48.1	58.09	8.17	5.53	0.1	0.08	0.22	0.17	47.6	173
Median:		6	6.61	6.32	120	0.18	12	400	93	48.48	-29.45	30.14	26.80	1.01	0.97	0	0	95	41
Loading (lb/day):									7.41	4.85	-2.99	2.44	2.21	0.09	0.08	0.01	0.01		

Sample Point Description: Abandoned Mine Discharge; Located just upstream of 906-19 along unnamed tributary #7 to Blacks Creek; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-22

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-09-27	--	12	6.97	6.26	179	--	14	256	28	13.67	-5.45	3.43	1.01	0.65	0.53	0.54	0.17	92.7	1
2015-09-16	--	1	6.89	6.51	177	3.01	15.3	325	--	24.39	-11.74	5.95	3.73	4.07	3.77	0.87	0	97.9	68
2016-03-24	--	30	5.82	3.75	195	9.67	13.7	520	17	0.00	13.66	0.32	0.23	1.09	1.07	0.38	0.35	180.9	0
Minimum:		1	5.82	3.75	177	3.01	13.7	256	17	0.00	-11.74	0.32	0.23	0.65	0.53	0.38	0	92.7	0
Maximum:		30	6.97	6.51	195	9.67	15.3	520	28	24.39	13.66	5.95	3.73	4.07	3.77	0.87	0.35	180.9	68
Average:		14.3	6.23	4.23	183.7	6.34	14.3	367	22.5	12.69	-1.18	3.23	1.66	1.94	1.79	0.6	0.17	123.8	23
Range:		29	1.15	2.76	18	6.66	1.6	264	11	24.39	25.4	5.63	3.5	3.42	3.24	0.49	0.35	88.2	68
Median:		12	6.89	6.26	179	6.34	14	325	22.5	13.67	-5.45	3.43	1.01	1.09	1.07	0.54	0.17	97.9	1
Loading (lb/day):									5.08	0.75	1.33	0.23	0.09	0.18	0.17	0.08	0.05		

Sample Point Description: Abandoned Mine Discharge; Sampled near RT58; Confluences with Abandoned Mine Discharge 906-23 to form unnamed tributary #7 to Blacks Creek; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-23

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-09-27	--	4	5.87	5.67	271	--	14	499	10	3.56	4.85	0.92	0.54	2.3	2.28	0.33	0.15	222.6	2
2015-09-16	--	1	6.96	6.99	134	6.66	16.0	337	--	58.38	-48.56	4.79	3.67	3.00	2.86	0	0	79.4	13
2016-03-24	--	45	6.79	6.84	169	9.66	14.9	196	17	12.93	-6.53	0.48	0.25	0.20	0.19	0	0	61.8	0
Minimum:		1	5.87	5.67	134	6.66	14	196	10	3.56	-48.56	0.48	0.25	0.20	0.19	0	0	61.8	0
Maximum:		45	6.96	6.99	271	9.66	16.0	499	17	58.38	4.85	4.79	3.67	3.00	2.86	0.33	0.15	222.6	13
Average:		16.7	6.27	6.1	191.3	8.16	15	344	13.5	24.96	-16.75	2.06	1.49	1.83	1.78	0.11	0.05	121.3	5
Range:		44	1.09	1.32	137	3	2	303	7	54.82	53.41	4.31	3.42	2.8	2.67	0.33	0.15	160.8	13
Median:		4	6.79	6.84	169	8.16	14.9	337	13.5	12.93	-6.53	0.92	0.54	2.3	2.28	0	0	79.4	2
Loading (lb/day):									4.83	2.62	-1.29	0.12	0.07	0.08	0.08	0.01	0		

Sample Point Description: Abandoned Mine Discharge; Sampled near Rt 58; Confluences with Abandoned Mine Discharge 906-22 to form unnamed tributary #7 to Blacks Creek; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-24

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-09-27	--	10	7.49	7.06	184	--	18	652	130	127.75	-95.55	2.05	1.11	0.31	0.3	0.25	0.07	181.4	4
Minimum:		10	7.49	7.06	184	--	18	652	130	127.75	-95.55	2.05	1.11	0.31	0.3	0.25	0.07	181.4	4
Maximum:		10	7.49	7.06	184	--	18	652	130	127.75	-95.55	2.05	1.11	0.31	0.3	0.25	0.07	181.4	4
Average:		10	7.49	7.06	184	--	18	652	130	127.75	-95.55	2.05	1.11	0.31	0.3	0.25	0.07	181.4	4
Range:		0	0	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0
Median:		10	7.49	7.06	184	--	18	652	130	127.75	-95.55	2.05	1.11	0.31	0.3	0.25	0.07	181.4	4
Loading (lb/day):									15.6	15.33	-11.47	0.25	0.13	0.04	0.04	0.03	0.01		

Sample Point Description: Settling Pond located on a reclaimed surface mine; Discharge of the pond forms headwaters of unnamed tirbutary #6 to Blacks Creek; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 906-36

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-10-03	--	25	6.5	6.43	69	--	10.9	891	133	107.25	-69.69	13.46	12.85	1.52	1.52	0.07	0.06	156.8	8
2015-09-16	--	60	6.89	6.58	70	0.42	10.7	835	132	111.80	-93.53	13.01	12.84	1.54	1.49	0	0	161.3	11
2016-03-22	--	60	6.35	6.54	50	0.13	10.4	859	120	118.16	-96.43	13.49	12.81	1.48	1.46	0	0	165.6	8
Minimum:		25	6.35	6.43	50	0.13	10.4	835	120	107.25	-96.43	13.01	12.81	1.48	1.46	0	0	156.8	8
Maximum:		60	6.89	6.58	70	0.42	10.9	891	133	118.16	-69.69	13.49	12.85	1.54	1.52	0.07	0.06	165.6	11
Average:		48.3	6.53	6.51	63	0.28	10.7	862	128.33	112.4	-86.55	13.32	12.83	1.51	1.49	0.02	0.02	161.2	9
Range:		35	0.54	0.15	20	0.29	0.5	56	13	10.91	26.74	0.48	0.04	0.06	0.06	0.07	0.06	8.8	3
Median:		60	6.5	6.54	69	0.28	10.7	859	132	111.80	-93.53	13.46	12.84	1.52	1.49	0	0	161.3	8
Loading (lb/day):									73.78	65.92	-52.56	7.71	7.44	0.88	0.86	0.01	0.01		

Sample Point Description: Abandoned Mine Discharge; Appears to be bubbling up from an old oil well; Flows into Blacks Creek; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - BC14

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-28	--	100	--	6.3	--	--	--	--	--	116	12.4	40.6	--	12.6	--	0.14	--	527	52
1996-11-07	--	100	--	6.3	--	--	--	--	--	134	3.8	38.4	--	9.31	--	0.14	--	265	64
1997-03-11	--	--	--	6.4	--	--	--	--	--	134	16	40.7	--	15.2	--	0.4	--	397	42
2000-02-02	--	60	6.1	6.48	--	--	10	1125	--	114.79	1.62	34.4	33.4	10.55	10.4	0.08	0.04	435.1	20
2000-03-30	--	80	--	6.3	--	--	--	--	--	118	0	32.8	--	9.26	--	0.25	--	401.2	6
2000-06-28	--	60	--	6.4	--	--	--	--	--	114	0	29.9	--	8.76	--	0.25	--	370.8	10
2001-02-05	--	--	6.2	6.45	--	--	9	1073	--	136.75	0	38.5	34.6	10.5	10.05	0.09	0	565.9	9
2015-05-19	--	75	7.08	6.06	29	2.0	12.3	1139	152	91.40	-11.63	38.05	38.02	9.71	8.89	0.11	0	428.6	42
2015-06-17	--	65	5.99	5.97	90	1.58	10.9	1156	154	109.51	54.47	59.51	53.62	9.66	9.42	0.18	0	433.0	20
2015-08-11	--	60	5.79	6.10	113	0.28	10.8	1150	139	80.52	-4.38	51.79	50.68	11.21	10.58	0.17	0.11	507.0	28
2015-09-14	--	70	7.30	6.14	--	0.28	10.6	1158	139	73.79	-9.75	60.27	59.96	11.97	9.75	0.11	0	443.8	34
2015-10-21	--	50	5.72	5.89	80	0.32	10.7	1075	135	51.27	4.98	52.05	49.85	9.61	9.28	0	0	481.8	16
2015-11-10	--	35	6.58	5.96	66	0.29	10.4	1088	142	100.23	-1.99	56.89	49.85	9.46	8.95	0.16	0.13	467.4	8
2015-12-15	--	55	6.27	6.08	70	0.34	10.4	1157	141	80.49	43.18	87.25	69.98	11.96	10.48	0	0	481.0	7
2016-01-28	--	60	5.79	6.19	70	0.52	10.1	1135	138	93.37	-35.64	46.43	45.58	9.89	9.83	0.14	0	429.9	9
2016-02-23	--	95	6.20	6.26	--	--	--	1122	142	68.70	-24.55	53.32	52.17	10.04	10.00	0.22	0.12	424.7	16
2016-03-21	--	100	6.41	6.11	--	0.19	10.0	1118	135	73.63	-37.62	65.22	62.73	10.96	9.98	0.18	0	408.5	7
2016-04-27	--	95	6.17	6.19	60	0.34	11.5	1145	146	107.71	-28.26	51.15	48.82	9.96	9.71	0.17	0	490.8	14
Minimum:		35	5.72	5.89	29	0.19	9	1073	135	51.27	-37.62	29.9	33.4	8.76	8.89	0	0	265	6
Maximum:		100	7.30	6.48	113	2.0	12.3	1158	154	136.75	54.47	87.25	69.98	15.2	10.58	0.4	0.13	565.9	64
Average:		72.5	--	6.17	72.3	0.61	10.6	1126	142.09	99.9	-0.96	48.74	49.94	10.59	9.79	0.15	0.03	442.1	22.4
Range:		65	1.58	0.59	84	1.81	3.3	85	19	85.48	92.09	57.35	36.58	6.44	1.69	0.4	0.13	300.9	58
Median:		67.5	6.2	6.19	70	0.33	10.5	1135	141	103.97	0	48.79	49.85	10	9.83	0.15	0	434.1	16
Loading (lb/day):									117.92	84.27	-3.69	42.79	42.27	9.01	8.03	0.13	0.02		

Sample Point Description: Abandoned mine discharge; Emanates from an abandoned oil well; Located along Blacks Creek, downstream of stream point BC14.1; upstream of Porter Road and BC15 discharge. There appears to be some confusion/discrepency between sample point location maps and water quality data of discharge BC14 and BC15. There is a possibility that the water quality and flow rates have changed, but the data listed in the TMDL for BC14 and BC15 seem to be switched based upon existing monitoring. Therefore, the data listed for BC14 includes PA DEP BC15.

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - BC15

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-28	--	20	--	6.2	--	--	--	--	--	56	78	0.99	--	42.4	--	0.14	--	614	22
1996-11-07	--	35	--	6.3	--	--	--	--	--	46	30	0.4	--	21.1	--	0.14	--	285	0
1997-03-11	--	--	--	6.3	--	--	--	--	--	156	62	67	--	28.4	--	0.17	--	529	40
2000-02-02	--	--	6.3	6.45	--	--	10	1047	--	119.25	12.73	37.15	37.1	11.75	11.2	0	0	57.4	19
2000-03-30	--	10	--	6.1	--	--	--	--	--	42	0	0.15	--	1.85	--	0.25	--	414.8	0
2000-06-28	--	20	--	6.3	--	--	--	--	--	70	0	1.92	--	8.57	--	0.25	--	487.9	12
2001-01-15	--	--	6	6.42	--	--	9	1022	--	67	0	34.5	34.5	10	9.5	0.06	0	464.6	17
2001-02-05	--	--	6.5	6.49	--	--	9	1113	--	124.78	0	36.25	33.45	9.7	9.15	0.13	0.04	484.6	10
Minimum:		10	6	6.1	--	--	9	1022	--	42	0	0.15	33.45	1.85	9.15	0	0	57.4	0
Maximum:		35	6.5	6.49	--	--	10	1113	--	156	78	67	37.1	42.4	11.2	0.25	0.04	614	40
Average:		21.3	--	6.3	--	--	9.3	1061	--	85.13	22.84	22.29	35.02	16.72	9.95	0.14	0.01	417.2	15
Range:		25	0.5	0.39	--	--	1	91	--	114	78	66.85	3.65	40.55	2.05	0.25	0.04	556.6	40
Median:		20	6.3	6.3	--	--	9	1047	--	68.5	6.37	18.21	34.5	10.88	9.5	0.14	0	474.6	14.5
Loading (lb/day):									--	13.65	7.83	0.22	--	5.33	--	0.04	--		

Sample Point Description: Abandoned Mine Discharge; located upstream of Porter Road close to road and behind the house that is located across the street from BC16 treatment system. There appears to be some confusion/discrepency between sample point location maps and water quality data of discharge BC14 and BC15. There is a possibility that the water quality and flow rates have changed, but the data listed in the TMDL for BC14 and BC15 seem to be switched based upon existing monitoring. Therefore, the data listed for BC15 includes PA DEP BC14.

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Stream Data

Blacks Creek Water Quality Report - 906-6

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2005-04-05	--	--	5.5	6.04	--	--	--	456	--	4.26	3.32	0.38	0.13	1.16	1.12	0.72	0.7	91.6	2
2006-05-10	--	--	6.2	5.7	274	--	20	369	4	2.65	5.63	0.28	0.12	1.93	1.9	0.41	0.2	124.4	10
Minimum:		--	5.5	5.7	274	--	20	369	4	2.65	3.32	0.28	0.12	1.16	1.12	0.41	0.2	91.6	2
Maximum:		--	6.2	6.04	274	--	20	456	4	4.26	5.63	0.38	0.13	1.93	1.9	0.72	0.7	124.4	10
Average:		--	5.72	5.84	274	--	20	413	4	3.46	4.48	0.33	0.13	1.55	1.51	0.57	0.45	108	6
Range:		--	0.7	0.34	0	--	0	87	0	1.61	2.31	0.1	0.01	0.77	0.78	0.31	0.5	32.8	8
Median:		--	5.85	5.87	274	--	20	413	4	3.46	4.48	0.33	0.13	1.55	1.51	0.57	0.45	108	6
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Unnamed headwaters tributary #19 to Blacks Creek; Sample taken in middle of large beaver dam; Upstream of confluence with unnamed tributary #18; BMI sampling point; Approximately the same as Beran Environmental sampling point STRM BC7.5

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-10

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2000-03-30	--	100	--	4.5	--	--	--	--	--	7.8	50	0.15	--	3.29	--	4.63	--	134.9	--
2005-04-05	--	--	4.68	4.65	--	--	16.7	272	--	0.64	13.46	0.41	0.21	1.87	1.87	1.54	1.25	128.8	1
2006-05-17	--	--	4.48	4.78	317	--	12	311	--	1.07	13.13	0.31	0.28	1.81	1.77	1.61	1.44	121	5
2006-10-04	--	--	5.16	5.1	333	--	17	295	2	1.89	8.69	0.54	0.52	2.17	2.17	0.86	0.72	85.8	1
2012-03-29	--	50	5.2	4.85	180	10.2	9.5	266	2	1.74	13.33	0.22	0	2.18	2.09	2.39	1.6	113.3	--
2012-04-27	--	60	5.1	5.06	--	--	--	299	3	1.74	8.76	0.2	0.15	1.89	1.85	1.44	1.22	118.3	--
2012-05-24	--	50	6.48	5.8	--	7.4	21.4	2561	16	10.47	3.58	0.25	0.14	2.15	2.04	1.06	0.15	1769.9	--
2015-05-20	--	110	7.43	5.61	304	8.93	15.5	321	9	3.05	8.77	0.50	0.36	2.43	2.36	1.62	0.36	114.1	12
2015-09-15	--	120	7.51	7.18	105	8.42	16.0	292	33	27.70	-15.32	0.69	0.57	1.94	1.92	0.49	0	69.2	0
2015-11-11	--	--	6.92	6.64	213	10.19	10.0	258	27	13.92	-5.97	0	0	0.91	0.90	0.25	0	87.6	0
2016-03-22	--	400	5.55	4.87	200	11.15	9.6	315	3	2.50	7.33	0.44	0.16	1.98	1.96	2.88	1.30	124.6	5
Minimum:		50	4.48	4.5	105	7.4	9.5	258	2	0.64	-15.32	0	0	0.91	0.90	0.25	0	69.2	0
Maximum:		400	7.51	7.18	333	11.15	21.4	2561	33	27.70	50	0.69	0.57	3.29	2.36	4.63	1.6	1769.9	12
Average:		127.1	--	4.97	236	9.38	14.2	519	11.88	6.59	9.61	0.34	0.24	2.06	1.89	1.71	0.8	260.7	3.4
Range:		350	3.03	2.68	228	3.75	11.9	2303	31	27.06	65.32	0.69	0.57	2.38	1.46	4.38	1.6	1700.7	12
Median:		100	5.38	5.06	213	9.56	15.5	297	6	2.50	8.76	0.31	0.19	1.98	1.94	1.54	0.97	118.3	1
Loading (lb/day):									14.46	10.55	14.45	0.62	0.38	3.34	3.18	3.62	1.44		

Sample Point Description: Blacks Creek; Downstream of large AMD impacted wetlands that forms the stream; Upstream of BC6.1 spring and stream point BC6; BMI sampling point; Essentially the same as PA DEP point BC6A; Assumed to be the same as Beran Environmental point STRM BC7.6

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-11

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-05-17	--	--	5.21	5.08	308	--	12	324	7	1.73	8.69	0.35	0.28	1.72	1.69	1.46	0.94	123.7	2
2006-10-04	--	--	6.55	6.09	255	--	13	337	13	9.63	-0.4	0.52	0.42	2.07	2	0.45	0.04	123.4	2
Minimum:		--	5.21	5.08	255	--	12	324	7	1.73	-0.4	0.35	0.28	1.72	1.69	0.45	0.04	123.4	2
Maximum:		--	6.55	6.09	308	--	13	337	13	9.63	8.69	0.52	0.42	2.07	2	1.46	0.94	123.7	2
Average:		--	5.49	5.34	281.5	--	12.5	331	10	5.68	4.15	0.44	0.35	1.9	1.85	0.96	0.49	123.6	2
Range:		--	1.34	1.01	53	--	1	13	6	7.9	9.09	0.17	0.14	0.35	0.31	1.01	0.9	0.3	0
Median:		--	5.88	5.59	281.5	--	12.5	331	10	5.68	4.15	0.44	0.35	1.9	1.85	0.96	0.49	123.6	2
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Blacks Creek; Sample point located downstream of 906-10 and downstream of the confluence with BC6.1 spring and upstream of confluence with unnamed tributary #17 (906-12); BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-12

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-23	--	--	--	6.6	--	--	--	--	--	48	0	0.5	--	0.06	--	0.25	--	26.1	8
2000-03-30	--	25	--	6.7	--	--	--	--	--	78	0	0.15	--	0.25	--	0.25	--	177.8	--
2006-05-17	--	--	6.85	6.97	285	--	10	324	40	38.53	-26.66	0.49	0.22	0.35	0.35	0.23	0.12	89.7	5
2006-10-04	--	25	7.72	6.97	229	--	15	482	95	92.25	-75.95	0.21	0.1	0.36	0.35	0.02	0.02	119.4	2
Minimum:		25	6.85	6.6	229	--	10	324	40	38.53	-75.95	0.15	0.1	0.06	0.35	0.02	0.02	26.1	2
Maximum:		25	7.72	6.97	285	--	15	482	95	92.25	0	0.5	0.22	0.36	0.35	0.25	0.12	177.8	8
Average:		25	--	6.78	257	--	12.5	403	67.5	64.2	-25.65	0.34	0.16	0.25	0.35	0.19	0.07	103.3	5
Range:		0	0.87	0.37	56	--	5	158	55	53.72	75.95	0.35	0.12	0.3	0	0.23	0.1	151.7	6
Median:		25	7.29	6.84	257	--	12.5	403	67.5	63	-13.33	0.35	0.16	0.3	0.35	0.24	0.07	104.6	5
Loading (lb/day):									28.5	25.54	-11.39	0.05	0.03	0.09	0.11	0.04	0.01		

Sample Point Description: Unnamed headwaters tributary #17 to Blacks Creek; Sampled near mouth before confluencing with unnamed tributary #19 (906-11) to form Blacks Creek; BMI sampling point; Assumed to be same as PA DEP sampling point BC7

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-19

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-09-27	--	--	7.64	7	207	--	13	750	79	74.41	-59.99	0.82	0.5	0.46	0.45	0.14	0.12	312.8	2
Minimum:		--	7.64	7	207	--	13	750	79	74.41	-59.99	0.82	0.5	0.46	0.45	0.14	0.12	312.8	2
Maximum:		--	7.64	7	207	--	13	750	79	74.41	-59.99	0.82	0.5	0.46	0.45	0.14	0.12	312.8	2
Average:		--	7.64	7	207	--	13	750	79	74.41	-59.99	0.82	0.5	0.46	0.45	0.14	0.12	312.8	2
Range:		--	0	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0
Median:		--	7.64	7	207	--	13	750	79	74.41	-59.99	0.82	0.5	0.46	0.45	0.14	0.12	312.8	2
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Unnamed tributary #7 to Blacks Creek; Sample point located upstream of BC12 and ~50 ft above confluence with unnamed tributary #6 (906-20) at Murrin Road and just downstream of alkaline AMD discharge 906-21; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-20

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-09-27	--	--	7.7	6.95	185	--	15	375	84	71.65	-59.59	0.3	0.11	0.04	0.04	0.24	0.07	85.9	5
Minimum:		--	7.7	6.95	185	--	15	375	84	71.65	-59.59	0.3	0.11	0.04	0.04	0.24	0.07	85.9	5
Maximum:		--	7.7	6.95	185	--	15	375	84	71.65	-59.59	0.3	0.11	0.04	0.04	0.24	0.07	85.9	5
Average:		--	7.7	6.95	185	--	15	375	84	71.65	-59.59	0.3	0.11	0.04	0.04	0.24	0.07	85.9	5
Range:		--	0	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0
Median:		--	7.7	6.95	185	--	15	375	84	71.65	-59.59	0.3	0.11	0.04	0.04	0.24	0.07	85.9	5
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Unnamed tributary #6 to Blacks Creek; Sample point located upstream of BC12 and ~50 feet upstream of confluence with unnamed tributary #7 (906-19) at Murrin Road; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-25

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-09-27	--	50	7.7	6.8	172	--	16	260	74	70	-55.95	0.58	0.46	0.13	0.13	0.17	0.12	40.1	5
Minimum:		50	7.7	6.8	172	--	16	260	74	70	-55.95	0.58	0.46	0.13	0.13	0.17	0.12	40.1	5
Maximum:		50	7.7	6.8	172	--	16	260	74	70	-55.95	0.58	0.46	0.13	0.13	0.17	0.12	40.1	5
Average:		50	7.7	6.8	172	--	16	260	74	70	-55.95	0.58	0.46	0.13	0.13	0.17	0.12	40.1	5
Range:		0	0	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0
Median:		50	7.7	6.8	172	--	16	260	74	70	-55.95	0.58	0.46	0.13	0.13	0.17	0.12	40.1	5
Loading (lb/day):									44.4	42	-33.57	0.35	0.28	0.08	0.08	0.1	0.07		

Sample Point Description: Unnamed tributary #8 to Blacks Creek; Sampled at Windy Point Road culvert; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-26

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-09-27	--	--	7.66	7.22	180	--	20	633	128	129.47	-116.96	0.58	0.16	0.16	0.14	0.24	0.11	162	2
Minimum:		--	7.66	7.22	180	--	20	633	128	129.47	-116.96	0.58	0.16	0.16	0.14	0.24	0.11	162	2
Maximum:		--	7.66	7.22	180	--	20	633	128	129.47	-116.96	0.58	0.16	0.16	0.14	0.24	0.11	162	2
Average:		--	7.66	7.22	180	--	20	633	128	129.47	-116.96	0.58	0.16	0.16	0.14	0.24	0.11	162	2
Range:		--	0	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0
Median:		--	7.66	7.22	180	--	20	633	128	129.47	-116.96	0.58	0.16	0.16	0.14	0.24	0.11	162	2
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Unnamed tributary #9 to Blacks Creek; Sampled near mouth; Confluences with unnamed tributary #8 downstream of 906-25; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-27

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-09-27	--	--	7.85	7.1	195	--	15	484	93	85.43	-75.55	0.43	0.18	0.12	0.12	0.23	0.21	114.3	5
Minimum:		--	7.85	7.1	195	--	15	484	93	85.43	-75.55	0.43	0.18	0.12	0.12	0.23	0.21	114.3	5
Maximum:		--	7.85	7.1	195	--	15	484	93	85.43	-75.55	0.43	0.18	0.12	0.12	0.23	0.21	114.3	5
Average:		--	7.85	7.1	195	--	15	484	93	85.43	-75.55	0.43	0.18	0.12	0.12	0.23	0.21	114.3	5
Range:		--	0	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0
Median:		--	7.85	7.1	195	--	15	484	93	85.43	-75.55	0.43	0.18	0.12	0.12	0.23	0.21	114.3	5
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Unnamed tributary #6 to Blacks Creek; Sample point located downstream of 906-24 prior to confluencing with unnamed tributary #8 (906-28); BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-28

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-09-27	--	--	7.98	7	199	--	15	433	98	93.73	-72.32	0.49	0.11	0.09	0.09	0.11	0.09	88.6	8
Minimum:		--	7.98	7	199	--	15	433	98	93.73	-72.32	0.49	0.11	0.09	0.09	0.11	0.09	88.6	8
Maximum:		--	7.98	7	199	--	15	433	98	93.73	-72.32	0.49	0.11	0.09	0.09	0.11	0.09	88.6	8
Average:		--	7.98	7	199	--	15	433	98	93.73	-72.32	0.49	0.11	0.09	0.09	0.11	0.09	88.6	8
Range:		--	0	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0
Median:		--	7.98	7	199	--	15	433	98	93.73	-72.32	0.49	0.11	0.09	0.09	0.11	0.09	88.6	8
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Unnamed tributary #8 to Blacks Creek; Sample point located downstream of confluence with unnamed tributary #9 (906-26) prior to confluence with unnamed tributary #6 (906-27); BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-29

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-09-27	--	--	7.9	7.22	200	--	15	448	95	92.3	-69.69	0.43	0.17	0.13	0.11	0.06	0.05	104	1
Minimum:		--	7.9	7.22	200	--	15	448	95	92.3	-69.69	0.43	0.17	0.13	0.11	0.06	0.05	104	1
Maximum:		--	7.9	7.22	200	--	15	448	95	92.3	-69.69	0.43	0.17	0.13	0.11	0.06	0.05	104	1
Average:		--	7.9	7.22	200	--	15	448	95	92.3	-69.69	0.43	0.17	0.13	0.11	0.06	0.05	104	1
Range:		--	0	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0
Median:		--	7.9	7.22	200	--	15	448	95	92.3	-69.69	0.43	0.17	0.13	0.11	0.06	0.05	104	1
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Unnamed tributary #6 to Blacks Creek; Sampled below confluence with unnamed tributary #8 (906-28); Upstream of BC12A and 906-20 and downstream of 906-27; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-31

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1997-12-03	--	157	--	7.4	--	--	6	305	--	42.61	0	0.18	--	0.1	--	0.1	--	34.4	7
1998-11-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1999-11-23	--	13.4	7.2	7.64	--	--	10	548	--	76.66	0	0.14	--	0.07	--	--	--	149.8	8
2000-10-16	--	2.7	7.3	7.63	--	--	10	569	--	95.53	0	0.08	--	0.06	--	--	--	160.9	1
2001-12-11	--	54	7.2	7.51	--	--	4	452	--	47.43	0	0.07	--	0.05	--	--	--	166.5	2
2002-10-31	--	6.7	7.2	7.49	--	--	4	573	--	63.81	0	0.27	--	0.08	--	--	--	279.5	4
2003-12-11	--	224	7.5	6.78	--	--	4	213	--	27.26	0	0.62	--	0.1	--	--	--	66.5	4
2004-03-29	--	478	7.3	7.34	--	--	13	271	--	31.49	0	1.18	--	0.08	--	--	--	89.4	3
2004-05-17	--	94	7.3	7.13	--	--	13	405	--	45.78	0	0.32	--	0.12	--	--	--	137	3
2004-08-04	--	108	7.1	7.38	--	--	17	274	--	36.64	0	0.33	--	0.07	--	--	--	87.3	3
2004-12-22	--	--	7.2	6.69	--	--	0	331	--	40.84	-25.87	0.42	--	0.11	--	--	--	124.2	1
2005-01-27	--	--	7.2	6.97	--	--	1	410	--	36.57	-23.79	1.39	--	0.22	--	--	--	122.5	30
2005-06-23	--	21.5	7.1	7.23	--	--	14	275	--	25.64	-15.83	0.32	--	0.09	--	--	--	97.1	1
2005-09-12	--	14.3	7	7.14	--	--	17	568	--	46.93	-29.55	0.22	--	0.17	--	--	--	205.9	2
2005-12-14	--	--	--	7.08	--	--	--	420	--	41.45	-28.71	1.08	--	0.27	--	--	--	131.6	4
2006-03-09	--	538	6.8	7	--	--	4	563	--	39.98	-34.43	2.89	--	0.2	--	--	--	56.2	34
2006-06-20	--	54	7	7.22	--	--	16	301	--	32.27	-23.55	0.78	--	0.21	--	--	--	82.5	11
2006-09-05	--	404	7.3	7.61	--	--	13	490	--	67.11	-57.69	0.93	--	0.13	--	--	--	112	7
2006-10-03	--	--	7.78	7.18	192	--	13.6	388	66	53.42	-41.61	1.1	0.1	0.16	0.16	0.53	0.09	94.6	13
Minimum:		2.7	6.8	6.69	192	--	0	213	66	25.64	-57.69	0.07	0.1	0.05	0.16	0.1	0.09	34.4	1
Maximum:		538	7.78	7.64	192	--	17	573	66	95.53	0	2.89	0.1	0.27	0.16	0.53	0.09	279.5	34
Average:		155	--	--	192	--	9.4	409	66	47.3	-15.61	0.68	0.1	0.13	0.16	0.32	0.09	122.1	7.7
Range:		535.3	0.98	0.95	0	--	17	360	0	69.89	57.69	2.82	0	0.22	0	0.43	0	245.1	33
Median:		74	7.2	7.23	192	--	10	408	66	42.03	-7.92	0.38	0.1	0.11	0.16	0.32	0.09	117.3	4
Loading (lb/day):									--	78.83	-37.6	2.39	--	0.24	--	0.19	--		

Sample Point Description: Unnamed tributary to Blacks Creek; Sampled below bridge on Patton Road below Allegheny Mineral limestone quarry; BMI sampling point; Also includes Allegheny Mineral (permit #10960302) sampling point 40L located approximately 1000' downstream near mouth

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-42

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2000-02-02	--	--	--	7.31	--	--	--	707	--	80.84	0	3.57	1.9	2.38	2.26	0.7	0.05	315.7	9
2001-01-15	--	--	7.1	7.17	--	--	2	625	--	78.86	0	9.45	2.61	1.87	1.75	0.21	0.16	256.2	5
2001-02-05	--	--	7.1	6.92	--	--	2	533	--	48.98	0	2.93	2.82	1.78	1.7	0.15	0.08	218.2	8
2006-10-03	--	--	7.39	7.11	92	--	14.6	541	67	63.69	-48.88	1.3	0.59	1.31	1.27	0.06	0.04	171	7
2007-04-26	--	--	7.22	6.92	143	--	14	604	--	56.05	-48.22	0.75	0.42	1.23	1.13	0.41	0.11	198.6	2
2007-09-24	--	80	7.52	7.76	116	8.84	15	768	113	107.6	-98.51	1.52	0.02	2.1	2.09	0.19	0.13	224.5	3
2007-11-14	--	115	7.23	6.33	128	9.5	9.1	521	79	75.05	-58.28	1.48	0.69	1.57	1.48	0.44	0.31	155.5	7
2009-04-29	--	100	7.57	7.26	215	9.28	15.2	559	72	73.57	-55.75	0.85	0.28	0.80	0.78	0.10	0.02	207.2	1
2009-09-23	--	85	7.51	7.42	93	8.14	16.4	785	128	120.06	-99.49	2.51	0.02	1.71	1.41	0.12	0.02	259.3	1
2009-12-16	--	--	7.32	6.59	89	12.20	1.0	487	65	60.90	-52.14	1.33	0.65	1.93	1.74	0.26	0.04	143.2	8
2010-05-04	--	--	7.29	7.09	142	8.40	16.8	521	67	61.93	-54.70	1.06	0.35	0.78	0.75	0.14	0	166.1	5
2012-03-29	--	100	7.7	7.39	10	10.3	9.3	548	84	81.08	-55.72	0.89	0.38	0.94	0.89	0.09	0	170.6	--
2012-04-27	--	100	7.5	7.39	--	--	--	561	75	74.41	-62.88	1.13	0.6	1.05	1.04	0.09	0.05	174.2	--
2012-05-24	--	100	7.66	7.81	20	8.2	19.1	614	97	97.77	-79.4	1.55	1.02	1.24	1.13	0.12	0	182.7	--
2015-05-19	--	--	7.45	7.50	139	8.34	19.2	659	92	84.98	-72.22	1.09	0	1.10	0.91	0.14	0	188.6	0
2015-09-14	--	430	7.05	7.57	101	9.09	15.3	721	106	107.08	-91.54	3.81	1.13	3.36	2.46	0	0	204.4	10
2015-11-10	--	--	7.46	7.52	145	10.22	10.0	533	93	85.65	-66.67	6.57	0.37	1.20	1.02	0.64	0	147.1	30
2016-03-21	--	1200	7.75	7.61	--	11.68	7.4	601	88	85.35	-76.03	2.41	1.11	1.52	1.31	0.78	0.19	178.7	8
Minimum:		80	7.05	6.33	10	8.14	1.0	487	65	48.98	-99.49	0.75	0	0.78	0.75	0	0	143.2	0
Maximum:		1200	7.75	7.81	215	12.20	19.2	785	128	120.06	0	9.45	2.82	3.36	2.46	0.78	0.31	315.7	30
Average:		256.7	7.35	7.06	110.2	9.52	11.7	605	87.57	80.21	-56.69	2.46	0.83	1.55	1.4	0.26	0.07	197.9	6.9
Range:		1120	0.7	1.48	205	4.06	18.2	298	63	71.08	99.49	8.7	2.82	2.58	1.71	0.78	0.31	172.5	30
Median:		100	7.45	7.35	116	9.19	14.3	581	86	79.85	-57.02	1.5	0.6	1.42	1.29	0.15	0.04	185.7	7
Loading (lb/day):									283.98	278.12	-238.68	7.3	2.84	5.55	4.63	1.4	0.38		

Sample Point Description: Blacks Creek; Sampled at T-434 (Porter Road) crossing located upstream of confluence with tributary #15 ("McIntire trib") and below BC14 and BC15 discharges

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - 906-44

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2006-10-04	--	--	7.5	6.58	265	--	15	263	55	55.6	-49.49	0.52	0.06	0.03	0.02	0.23	0.02	59.8	3
Minimum:		--	7.5	6.58	265	--	15	263	55	55.6	-49.49	0.52	0.06	0.03	0.02	0.23	0.02	59.8	3
Maximum:		--	7.5	6.58	265	--	15	263	55	55.6	-49.49	0.52	0.06	0.03	0.02	0.23	0.02	59.8	3
Average:		--	7.5	6.58	265	--	15	263	55	55.6	-49.49	0.52	0.06	0.03	0.02	0.23	0.02	59.8	3
Range:		--	0	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0
Median:		--	7.5	6.58	265	--	15	263	55	55.6	-49.49	0.52	0.06	0.03	0.02	0.23	0.02	59.8	3
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Unnamed tributary #5 to Blacks Creek; Sampled near mouth; Stream forms below reclaimed surface mine near the "Lucas" site; BMI sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Discharges Water Quality Report - 908-Y

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2015-10-21	--	20	3.97	3.81	500	8.39	10.1	366	0	0.00	38.61	1.11	1.07	3.68	3.53	6.44	5.91	151.2	0
2015-11-11	--	75	4.68	4.16	360	9.80	9.5	295	0	0.00	26.67	1.31	0.52	3.19	3.10	5.65	4.74	119.2	0
2015-12-15	--	50	4.34	4.05	454	9.32	8.3	355	0	0.00	43.98	0.99	0.86	4.70	4.29	5.48	5.35	141.9	6
2016-01-28	--	120	4.11	4.09	415	12.03	2.5	388	0	0.00	44.75	0.67	0.59	4.49	4.34	7.36	7.30	179.1	0
2016-02-23	--	130	4.50	4.25	--	--	--	337	0	0.00	35.64	0.67	0.46	3.64	3.63	7.39	6.24	144.1	6
2016-03-24	--	150	4.04	3.85	315	10.29	11.9	404	0	0.00	50.09	0.64	0.58	4.14	4.02	8.00	7.25	154.6	0
2016-04-27	--	150	3.91	3.79	405	9.66	13.4	379	0	0.00	53.13	0.62	0.48	4.48	4.35	6.96	6.61	158.7	8
Minimum:		20	3.91	3.79	315	8.39	2.5	295	--	0.00	26.67	0.62	0.46	3.19	3.10	5.48	4.74	119.2	0
Maximum:		150	4.68	4.25	500	12.03	13.4	404	--	0.00	53.13	1.31	1.07	4.70	4.35	8.00	7.30	179.1	8
Average:		99.3	4.15	3.97	408.2	9.92	9.3	361	--	0	41.84	0.86	0.65	4.05	3.89	6.75	6.2	149.8	2.9
Range:		130	0.77	0.46	185	3.64	10.9	109	--	0	26.46	0.69	0.61	1.51	1.25	2.52	2.56	59.9	8
Median:		120	4.11	4.05	410	9.73	9.8	366	--	0.00	43.98	0.67	0.58	4.14	4.02	6.96	6.24	151.2	0
Loading (lb/day):									--	0	52.21	0.9	0.67	4.89	4.74	8.42	7.73		

Sample Point Description: Unnamed tributary #18; sampled just below confluence of 906-2 and upstream of giant wetland complex; Downstream of discharges 906-4 and 906-5; Sampled as potential source water of passive system

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC1

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-23	--	--	--	7	--	--	--	--	--	88	0	0.81	--	4.07	--	--	--	219.7	--
1997-12-03	--	4039	--	7.37	--	--	6	638	--	65.77	0	1.55	--	2.63	--	0.23	--	191.3	21
1998-11-09	--	553	7.4	7.74	--	--	8	979	--	103.77	0	0.22	--	3.07	--	--	--	360.9	1
1999-11-23	--	269	7.3	7.64	--	--	10	790	--	87.63	0	0.27	--	2.78	--	--	--	294.6	10
2000-03-30	--	--	--	6.8	--	--	--	--	--	92	0	2.8	--	3.05	--	0.56	--	263.8	--
2000-04-25	--	1625	--	7.4	--	--	--	--	--	102	0	2.41	--	2.29	--	0.64	--	310	8
2000-10-16	--	269	7.2	7.64	--	--	9	878	--	94.69	0	0.26	--	2.95	--	--	--	390.5	9
2001-04-19	--	--	--	7.2	--	--	--	--	--	78	0	2.67	--	2.7	--	0.59	--	234.7	14
2001-05-08	--	915	--	7.3	--	--	--	--	--	108	0	1.69	--	3.8	--	0.25	--	306	4
2001-09-28	--	278	--	7.1	--	--	--	--	--	106	0	0.15	--	3.17	--	0.25	--	300	--
2001-12-11	--	403	7.2	7.5	--	--	5	748	--	78.84	0	0.88	--	2.95	--	--	--	315.6	5
2002-10-31	--	430	7.2	7.51	--	--	2	794	--	82.6	0	0.56	--	3.23	--	--	--	231.9	1
2003-05-15	--	--	7	7.3	--	--	12	576	--	59	--	3.67	--	3.72	--	0.6	--	230	--
2003-06-17	--	--	7.5	7.5	--	--	16	653	96	72	--	2.41	--	2.81	--	0.4	--	280	--
2003-07-16	--	--	7.5	7.68	--	--	17	299	92	91	-72	1.3	--	9.6	--	0.01	0.01	345	--
2003-08-13	--	--	7	7.65	--	--	17.5	267	98	89	-81.5	0.26	--	3.85	--	0.07	--	345	--
2003-09-13	--	--	7	7.81	--	--	15	220	104	87	-70	3.14	--	3.77	--	0.59	0.01	280	--
2003-10-18	--	--	7	7.81	--	--	9	220	90	69	-53.5	3.01	--	4.21	--	0.81	0.09	200	--
2003-12-11	--	1795	7.7	7.11	--	--	3	339	--	11.65	0	2.26	--	2.36	--	--	--	174.1	5
2003-12-16	--	--	--	7.87	--	--	--	589	--	73	-56.5	2.03	--	2.6	--	0.78	0.01	210	--
2004-01-18	--	--	--	7.83	--	--	--	671	--	89	-62.5	3.18	--	4.29	--	0.48	0.17	305	--
2004-02-14	--	--	--	7.63	--	--	--	425	--	74	-60.5	3.49	--	4.71	--	1.18	0.44	400	--
2004-03-11	--	--	--	7.73	--	--	--	356	--	79	-35	2.18	--	3.18	--	0.92	0.07	375	--
2004-03-29	--	2639	7.2	7.54	--	--	10	595	--	64.19	0	2.91	--	2.17	--	--	--	247.4	6
2004-04-16	--	--	--	7.8	--	--	--	487	--	76	-51.5	2.42	--	3.27	--	0.45	0.15	210	--
2004-05-12	--	--	--	7.75	--	--	--	400	--	72	-44.5	3.03	--	4.55	--	0.26	0.29	290	--
2004-05-17	--	647	6.2	5.34	--	--	13	936	--	3.15	23.4	10.99	--	10	--	--	--	453.5	25
2004-08-04	--	754	7.3	7.7	--	--	18	730	--	86.3	0	1.58	--	2.5	--	--	--	295	2
2004-12-22	--	1005	7.3	6.97	--	--	0	680	--	80.47	-49.59	3.23	--	2.22	--	--	--	367.5	2
2005-01-27	--	--	7.2	7.39	--	--	2	733	--	96.89	-73.91	3.23	--	2.68	--	--	--	306.1	4
2005-06-23	--	359	7.3	7.78	--	--	13	783	--	103.39	-91.15	1.5	--	3.45	--	--	--	341.1	2
2005-09-12	--	336	7.2	7.59	--	--	16	867	--	107.09	-86.83	0.29	--	1.95	--	--	--	314.7	4
2005-12-14	--	--	--	7.41	--	--	--	739	--	104.99	-84.35	1.79	--	2.46	--	--	--	278.6	2
2006-03-09	--	--	7	7.14	--	--	5	620	--	74.17	-71.24	12.28	--	2.2	--	--	--	220.7	3
2006-06-20	--	539	7.3	7.75	--	--	16	820	--	106.6	-80.99	1.03	--	2.24	--	--	--	397.1	5
2006-09-05	--	1436	7.2	7.61	--	--	17	580	--	79.03	-60.7	1.59	--	1.76	--	0.32	--	174.4	3
2006-10-03	--	195	7.69	7.33	165	--	14	595	82	77.39	-60.6	1.81	0.21	2.07	1.95	0.4	0.1	169.9	2

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2009-04-29	--	200	7.89	7.42	229	10.05	11.8	669	89	83.04	-68.36	0.80	0.06	1.68	1.60	0.37	0.02	225.3	1
2009-09-23	--	120	7.74	7.59	215	8.49	15.2	827	118	127.23	-107.33	0.36	0.02	0.30	0.15	0.02	0.02	274.8	2
2009-12-16	--	--	7.90	6.70	140	13.00	0.2	542	67	80.51	-66.67	0.41	0.27	2.10	1.76	0.26	0.23	159.9	9
2012-03-29	--	250	7.99	7.9	95	10.9	8.4	616	115	107.38	-92.34	0.33	0	0.49	0.46	0.06	0	176.8	--
2012-04-27	--	240	7.7	7.77	--	--	--	586	97	90.86	-75.62	0.33	0	0.54	0.5	0	0	184.2	--
2012-05-24	--	230	8	7.49	114	8.9	16.8	686	119	111.69	-86.57	0.29	0	0.14	0.08	0.04	0	243	--
2015-05-19	--	1300	7.97	7.75	146	8.21	17.8	733	103	93.43	-61.20	0.40	0	0.37	0.11	0.29	0.20	214.3	14
2015-09-14	--	800	8.12	7.66	166	9.87	13.1	7	113	105.43	-79.80	0.16	0	0.98	0.97	0	0	213.1	0
2015-11-10	--	--	7.97	7.69	201	10.52	9.0	634	100	98.52	-85.17	0.71	0.11	0.86	0.76	0.20	0	190.4	0
2016-03-21	--	--	8.10	7.85	100	11.99	6.5	663	103	108.52	-101.77	1.19	0	1.05	0.97	0	0	204.3	5
Minimum:		120	6.2	5.34	95	8.21	0	7	67	3.15	-107.33	0.15	0	0.14	0.08	0	0	159.9	0
Maximum:		4039	8.12	7.9	229	13.00	18	979	119	127.23	23.4	12.28	0.27	10	1.95	1.18	0.44	453.5	25
Average:		831.8	7.2	6.87	157.1	10.21	10.7	609	99.13	85.52	-45.52	2	0.06	2.85	0.85	0.37	0.09	270.5	5.8
Range:		3919	1.92	2.56	134	4.79	18	972	52	124.08	130.73	12.13	0.27	9.86	1.87	1.18	0.44	293.6	25
Median:		484.5	7.3	7.59	155.5	10.05	11.8	638	99	87.63	-60.5	1.58	0	2.68	0.76	0.31	0.02	274.8	4
Loading (lb/day):									527.48	758.24	-217.07	18.84	0.08	24.47	2.84	3.04	0.43		

Sample Point Description: Blacks Creek; Sampled upstream of bridge on Creek Bottom Road (SR 4013); PA DEP sampling point; Same as BMI point 906- 38; Essentially same as Beran Environmental point BC4;

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC1A

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2000-03-30	--	--	--	6.9	--	--	--	--	--	94	0	3.65	--	3.12	--	0.91	--	278.4	6
2006-10-03	--	--	7.71	7.39	75	8	14	625	87	75.28	-61	2.17	0.63	2.25	2.06	0.51	0.04	188.9	2
Minimum:		--	7.71	6.9	75	8	14	625	87	75.28	-61	2.17	0.63	2.25	2.06	0.51	0.04	188.9	2
Maximum:		--	7.71	7.39	75	8	14	625	87	94	0	3.65	0.63	3.12	2.06	0.91	0.04	278.4	6
Average:		--	--	7.08	75	8	14	625	87	84.64	-30.5	2.91	0.63	2.69	2.06	0.71	0.04	233.7	4
Range:		--	0	0.49	0	0	0	0	0	18.72	61	1.48	0	0.87	0	0.4	0	89.5	4
Median:		--	7.71	7.15	75	8	14	625	87	84.64	-30.5	2.91	0.63	2.69	2.06	0.71	0.04	233.7	4
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Blacks Creek; Sampled below confluence with unnamed tributary #14; PA DEP sampling point; Same as BMI point 906-39

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC2

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-23	--	--	--	6.8	--	--	--	--	--	86	0	4	--	2.94	--	0.25	--	229.7	12
1996-11-07	--	--	--	6.4	--	--	--	--	--	80	0	9.25	--	6.52	--	1	--	189	0
1997-03-11	--	--	--	6.7	--	--	--	--	--	70	0	5.46	--	4.09	--	1.83	--	211	14
2000-02-02	--	--	6.84	6.67	--	--	3.8	1015	--	58.17	0	17.3	13	12.7	10.45	2.52	0	457.4	30
2000-03-30	--	--	--	6.3	--	--	--	--	--	182	0	49	--	15	--	0.25	--	841.6	70
2000-06-28	--	--	--	6.4	--	--	--	--	--	68	0	10.1	--	5.82	--	1.39	--	280.6	8
2001-01-15	--	--	5.8	6.62	--	--	3	775	--	47.16	0	10.25	6.43	8.46	5.89	2.28	0.43	400.8	20
2001-02-05	--	--	6.6	6.48	--	--	4	799	--	37.31	0	10.85	10.55	7.27	6.75	2.34	0.22	406.4	18
2003-05-15	--	--	7	6.8	--	--	12	476	--	46	--	2.08	--	1.91	--	0.1	--	300	--
2003-06-17	--	--	7	7.1	--	--	17.5	560	94	60	--	2.12	--	1.82	--	0.1	--	190	--
2003-07-16	--	--	6.5	7.42	--	--	18	255	88	80	-39.5	4.84	--	4.05	--	0.01	0.01	290	--
2003-09-13	--	--	6.5	7.43	--	--	16.5	202	104	83	-27	2.42	--	2.9	--	0.94	--	235	--
2003-10-18	--	--	7	7.35	--	--	8.5	482	64	51	--	2.05	--	2.87	--	1.35	0.08	185	--
2003-12-16	--	--	--	7.67	--	--	--	205	--	58	-35.5	1.68	--	2.15	--	0.81	0.12	205	--
2004-01-18	--	--	--	7.37	--	--	--	606	--	68	-48	2.27	--	3.06	--	0.38	0.23	270	--
2004-02-14	--	--	--	7.51	--	--	--	385	--	62	-48	2.25	--	3.04	--	0.82	0.36	300	--
2004-03-11	--	--	--	7.4	--	--	--	331	--	65	-52.5	1.53	--	2.23	--	1.01	0.18	275	--
2004-04-16	--	--	--	7.18	--	--	--	446	--	63	-22.5	1.54	--	2.08	--	0.11	0.01	225	--
2004-05-06	--	--	7	6.86	--	--	15	778	69	55.23	-41.73	6.87	5.13	3.84	3.62	1.41	0.05	380.8	7
2004-05-12	--	--	--	7.75	--	--	--	357	--	67	-55.5	1.88	--	2.82	--	0.02	0.14	225	--
2004-10-18	--	--	--	6.7	--	--	--	--	--	68.8	-18.6	11.6	--	7.71	--	2.45	--	293.8	24
		--	--	6.7	--	--	--	--	--	68.8	-18.6	11.6	--	7.71	--	2.45	--	293.8	24
2004-10-21	--	--	6.6	6.77	--	--	11	823	62	54.87	-35.13	9.74	7.43	5.49	5.26	1.45	0.18	396.6	14
2005-01-12	--	--	6.1	5.96	--	--	6	383	15	8.89	4.12	2.51	1.48	2.73	2.7	1.77	0.16	184.6	8
2005-02-01	--	927	--	7	--	--	--	--	--	76	-25.8	7.87	--	4.86	--	2.01	--	252.5	24
		927	--	7	--	--	--	--	--	76	-25.8	7.87	--	4.86	--	2.01	--	252.5	24
2005-04-06	--	--	7.1	7.04	--	--	13	558	--	49.81	-40.37	4.12	3.13	2.83	2.75	0.66	0.02	275.4	4
2005-05-09	--	931	--	6.9	--	--	--	--	--	75.2	-31.4	5.79	--	3.5	--	0.66	--	247.2	16
		931	--	6.9	--	--	--	--	--	75.2	-31.4	5.79	--	3.5	--	0.66	--	247.2	16
2005-08-02	--	197	--	7	--	--	--	--	--	102.8	-56.6	12.7	--	6.14	--	0.25	--	271.3	24
2005-11-09	--	240	--	6.8	--	--	--	--	--	71.2	-18	--	--	--	--	--	--	--	--
2006-02-08	--	820	--	6.6	--	--	--	--	--	56.2	5	6.6	--	3.88	--	0.69	--	233.2	6
2006-05-09	--	465	--	6.9	--	--	--	--	--	82.8	-42.2	7.72	--	3.23	--	0.25	--	259.4	20
2006-08-03	--	692	--	6.8	--	--	--	--	--	80	-63	4.02	--	2.92	--	0.25	--	215.3	4
2006-08-13	--	--	7	7.58	--	--	--	231	106	83	-54.5	2.33	--	2.46	--	0.62	0.08	275	--
2006-10-03	--	--	7.12	6.7	89	--	15	656	64	54.2	-37.77	5.64	4.58	3.37	3.25	0.92	0.13	236.5	1
2007-04-26	--	--	7.04	6.51	148	--	14.3	543	41	38.1	-29.01	3.35	2.52	2.85	2.85	1.27	0.14	304.6	6

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2007-09-24	--	120	7.25	7.26	45	8.76	14	947	116	95.95	-83.39	12.63	10.18	5.4	5.37	0.2	0.15	317.8	12
2007-11-14	--	175	6.8	5.99	140	9.22	8.4	705	92	47.63	-28.36	5.25	3.08	6.01	5.84	1.82	0.28	269.5	6
2008-09-26	--	--	7.19	7.28	--	8.69	13.1	737	113	90.14	-65.99	13.85	--	3.77	--	0.32	--	286.5	4
2009-04-29	--	300	7.3	7.04	168	9.43	14.3	649	65	63.25	-47.08	1.27	0.44	2.66	2.53	0.86	0.02	230.9	1
2010-05-04	--	--	7.15	6.70	158	8.29	17.0	620	40	38.31	-23.50	1.68	0.44	2.94	2.82	1.89	0.26	204.0	14
2012-03-29	--	200	7.8	7.53	35	10.4	9.1	607	88	83.93	-67.26	0.75	0.26	0.98	0.87	0	0	179.3	--
2012-04-27	--	130	7.7	7.46	--	--	--	611	78	80.47	-65.67	0.95	0.47	0.95	0.93	0	0	215.5	--
2012-05-24	--	150	7.47	7.06	40	8.3	19	701	97	96.38	-79.6	1	0.18	0.89	0.85	0	0	232.4	--
2015-05-19	--	--	7.04	7.44	158	6.63	18.4	679	93	88.86	-69.77	0.90	0	1.11	0.92	0.51	0.13	188.6	7
2015-09-14	--	--	7.38	7.63	--	9.31	15.9	776	105	107.52	-89.95	3.36	0.82	2.50	2.14	0	0	256.9	11
2015-11-10	--	--	7.07	7.34	110	9.98	10.0	578	88	82.97	-69.05	4.74	0.76	1.36	1.23	0.37	0	175.9	21
2016-03-21	--	--	7.64	7.55	--	11.61	7.3	678	88	90.66	-84.35	1.72	1.53	1.38	1.16	0.44	0	229.8	5
Minimum:		120	5.8	5.96	35	6.63	3	202	15	8.89	-89.95	0.75	0	0.89	0.85	0	0	175.9	0
Maximum:		931	7.8	7.75	168	11.61	19	1015	116	182	5	49	13	15	10.45	2.52	0.43	841.6	70
Average:		480.3	--	6.77	109.1	9.15	12.2	580	80.45	70.91	-36.16	6.36	3.62	4.03	3.41	0.91	0.12	273.4	14.4
Range:		811	2	1.79	133	4.98	16	813	101	173.11	94.95	48.25	13	14.11	9.6	2.52	0.43	665.7	70
Median:		300	7.04	7	125	9.22	13.1	607	88	68.8	-35.32	4.43	2.03	3.05	2.79	0.68	0.12	252.5	12
Loading (lb/day):									183.62	367.64	-176.09	30.21	4.07	18.63	5.7	3.99	0.15		

Sample Point Description: Blacks Creek; Downstream of 906-42 and the confluence with tributary #15 ("McIntire trib"); Upstream of BC19 and 19B passive treatment system effluent discharge and BC2B

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC2B

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2000-03-30	--	--	--	6.6	--	--	--	--	--	74	0	7.67	--	4.56	--	1.11	--	295.6	10
2000-06-28	--	--	--	6.5	--	--	--	--	--	74	0	9.48	--	6.07	--	1.29	--	314.6	10
2001-09-28	--	157	--	6.7	--	--	--	--	--	98	0	7.35	--	6.71	--	1.13	--	300	16
2001-11-07	--	157	--	6.9	--	--	--	--	--	78	0	7.95	--	7.58	--	1.46	--	393.6	16
2003-05-15	--	--	7.5	6.4	--	--	12.5	641	--	39	--	10.6	--	6.34	--	1.6	--	280	--
2003-06-17	--	--	7	7.3	--	--	16.5	462	94	54	--	9.04	--	5.5	--	1.2	--	280	--
2003-07-16	--	--	6.5	7	--	--	16	327	105	76	-39	18.74	--	3.28	--	0.79	0.01	475	--
2003-08-13	--	--	7	6.8	--	--	17.2	298	108	73	-45.5	0.32	--	7.09	--	0.01	--	500	--
2003-09-13	--	--	6.5	7.02	--	--	15.5	239	94	94	-33.5	5.17	--	6.2	--	0.95	0.01	375	--
2003-10-18	--	--	7	6.91	--	--	9	614	70	47	-23.5	5.31	--	7.43	--	1.58	0.24	290	--
2004-01-18	--	--	--	7.18	--	--	--	689	--	65	-41.5	4.68	--	6.32	--	0.87	--	400	--
2004-02-14	--	--	--	7.04	--	--	--	461	--	52	-32.5	5.67	--	7.65	--	1.01	0.39	375	--
2004-03-11	--	--	--	7	--	--	--	384	--	62	-44	3.43	--	5.01	--	2.33	0.21	375	--
2004-03-25	--	--	7	6.66	--	--	16	674	--	47.74	-34.65	8.25	4.58	3.44	3.25	1.64	0.02	283	17
2004-04-16	--	--	--	7.02	--	--	--	515	--	57	-35	4.19	--	5.66	--	0.97	0.57	275	--
2004-05-06	--	--	7	6.91	--	--	16	794	74	62.44	-47.39	7.58	5.08	3.91	3.72	1.28	0	414.4	8
2004-05-12	--	--	--	7.2	--	--	--	422	--	60	-41	6.55	--	9.83	--	1.64	1.12	340	--
2004-10-18	--	--	--	6.9	--	--	--	--	--	77.6	-29	10.8	--	7.35	--	2.03	--	276.9	28
		--	--	6.9	--	--	--	--	--	77.6	-29	10.8	--	7.35	--	2.03	--	276.9	28
2004-10-21	--	--	6.9	6.85	--	--	11	844	79	62.26	-36.09	9.26	6.62	5.9	5.59	1.58	0.11	421.4	17
2004-12-16	--	--	--	7.64	--	--	--	626	--	56	-31	3.47	--	4.44	--	1.66	--	325	--
2005-01-12	--	--	6.2	6.24	--	--	6	366	15	11.21	2.94	3.1	1.42	2.82	2.64	1.75	0.15	189.8	14
2005-02-01	--	1026	--	7.1	--	--	--	--	--	82.6	-42.4	7.42	--	4.42	--	1.63	--	262.3	16
2005-04-06	--	--	7.1	7.12	--	--	13	583	--	50.96	-41.15	3.9	2.55	2.82	2.66	0.64	0.02	308.9	5
2005-05-09	--	1021	--	7	--	--	--	--	--	79	-34.2	5.38	--	3.68	--	0.6	--	250.4	18
		1021	--	7	--	--	--	--	--	79	-34.2	5.38	--	3.68	--	0.6	--	250.4	18
2005-08-02	--	271	--	7.2	--	--	--	--	--	115.4	-7	8.5	--	5.92	--	0.25	--	288.9	20
2005-11-09	--	315	--	6.8	--	--	--	--	--	79.6	-34.8	0.15	--	0.25	--	0.25	--	275.9	1.5
2006-02-08	--	891	--	6.6	--	--	--	--	--	59.2	6.4	6.47	--	4.11	--	0.64	--	245.5	8
2006-05-09	--	546	--	6.8	--	--	--	--	--	91	-56.4	5.31	--	3.62	--	0.25	--	276.1	18
2006-08-03	--	793	--	6.6	--	--	--	--	--	83.6	-64.8	4.48	--	3.34	--	0.25	--	245.3	4
2006-10-03	--	--	7.42	6.75	80	--	15	697	66	54.9	-35.96	5.11	3.71	3.38	3.3	0.86	0.02	242.4	6
2007-09-24	--	125	7.07	7.39	97	8.57	14.8	1006	95	106.26	-94.07	3.93	1.79	5.65	5.55	0.13	0.1	329	7
2008-09-26	--	--	7.02	7.35	--	8.49	13.4	830	116	101.23	-68.16	5.09	--	4.44	--	0.16	--	304.2	4
2009-04-29	--	300	7.55	6.62	1968	9.73	12.6	711	66	62.74	-47.95	2.03	1.17	2.96	2.88	0.74	0.08	267	8
2012-03-29	--	240	7.8	7.6	95	10.9	8.4	647	96	86.51	-51.34	0.8	0.27	1.15	1.11	0	0	213.9	--
2012-04-27	--	170	7.7	7.5	--	--	--	661	89	82.18	-63.08	1.06	0.68	1.3	1.16	0.05	0	231.8	--

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2012-05-24	--	--	7.47	7.91	57	8.9	16.9	715	101	97.35	-85.97	1.01	0.29	1.36	1.32	0	0	239.6	--
2015-05-19	--	--	7.98	7.43	28	7.42	19.5	750	105	97.41	-76.09	1.00	0	1.05	0.37	0.20	0	239.9	10
2015-09-14	--	400	7.86	7.21	-9	9.80	15.5	835	107	104.46	-87.96	4.74	1.67	3.22	3.20	0	0	265.7	0
2015-11-10	--	--	7.66	6.85	120	9.94	9.2	719	106	82.76	-69.85	5.91	2.56	2.37	2.21	0.43	0	240.9	10
2016-03-21	--	1500	7.71	7.58	-23	11.95	6.4	722	99	97.81	-90.29	2.58	1.26	1.67	1.54	0.26	0	255.3	7
Minimum:		125	6.2	6.24	-23	7.42	6	239	15	11.21	-94.07	0.15	0	0.25	0.37	0	0	189.8	0
Maximum:		1500	7.98	7.91	1968	11.95	19.5	1006	116	115.4	6.4	18.74	6.62	9.83	5.59	2.33	1.12	500	28
Average:		558.3	--	6.87	268.1	9.52	13.4	615	88.68	73.61	-40.47	5.71	2.24	4.54	2.7	0.9	0.14	302.1	12
Range:		1375	1.78	1.67	1991	4.53	13.5	767	101	104.19	100.47	18.59	6.62	9.58	5.22	2.33	1.12	310.2	28
Median:		357.5	7.09	7	80	9.73	14.8	654	95	76.8	-37.55	5.31	1.67	4.43	2.66	0.87	0.02	280	10
Loading (lb/day):									522.29	538.76	-310.05	29.85	6.63	21.11	11.22	3.5	0.07		

Sample Point Description: Blacks Creek; Located downstream of BC2 and the BC19 & 19B passive system effluent discharge

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC3

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-23	--	--	--	6.8	--	--	--	--	--	198	0	0.35	--	0.11	--	0.25	--	221.2	16
2002-02-07	--	--	--	8	--	--	--	--	--	246	0	0.39	--	0.43	--	0.25	--	459	--
2003-05-15	--	--	--	8	--	--	--	807	--	243	--	0.17	--	0.12	--	0.1	--	240	--
2003-06-17	--	--	8	7.2	--	--	16	883	276	226	--	0.52	--	0.15	--	0.5	--	240	--
2003-07-16	--	--	8	7.68	--	--	17	336	268	239	-220.5	0.15	--	1.24	--	0.01	0.01	375	--
2003-08-13	--	--	7.5	7.88	--	--	17.5	293	280	232	-207	0.05	--	0.04	--	0.01	0.12	300	--
2003-09-13	--	--	7.5	8.09	--	--	15.5	258	230	227	-104.25	0.11	--	0.13	--	0.24	--	325	--
2003-10-18	--	--	7.5	8.15	--	--	9.5	765	252	230	-220	0.09	--	0.13	--	0.1	0.14	245	--
2003-12-16	--	--	--	8.19	--	--	--	835	--	213	-205	0.46	--	0.59	--	0.01	0.01	300	--
2004-01-18	--	--	--	8.11	--	--	--	905	--	262	-208.5	0.96	--	1.3	--	0.05	0.14	425	--
2004-02-14	--	--	--	8.11	--	--	--	542	--	218	-202	0.42	--	0.57	--	0.17	0.4	315	--
2004-03-11	--	--	--	8.04	--	--	--	498	--	233	-109	0.39	--	0.57	--	0.08	--	275	--
2004-04-16	--	--	--	8.15	--	--	--	653	--	214	-206.5	0.27	--	0.36	--	0.03	0.04	330	--
2004-05-12	--	--	--	7.83	--	--	--	519	--	228	-214	0.06	--	0.09	--	0.03	0.22	325	--
2006-10-03	--	--	8.09	7.97	160	--	14.8	883	237	233.22	-187.05	0.34	0.17	0.34	0.3	0.15	0.12	219.8	2
Minimum:		--	7.5	6.8	160	--	9.5	258	230	198	-220.5	0.05	0.17	0.04	0.3	0.01	0.01	219.8	2
Maximum:		--	8.09	8.19	160	--	17.5	905	280	262	0	0.96	0.17	1.3	0.3	0.5	0.4	459	16
Average:		--	--	7.63	160	--	15.1	629	257.17	229.48	-160.29	0.32	0.17	0.41	0.3	0.13	0.13	306.3	9
Range:		--	0.59	1.39	0	--	8	647	50	64	220.5	0.91	0	1.26	0	0.49	0.39	239.2	14
Median:		--	7.75	8	160	--	15.8	653	260	230	-205	0.34	0.17	0.34	0.3	0.1	0.12	300	9
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Unnamed tributary #14 to Blacks Creek; Sampled along Porter Road (T434); PA DEP sampling point; Same as BMI point 906-37 and Beran Environmental BC8

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC3B

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2000-03-30	--	--	--	7.9	--	--	--	--	--	216	0	0.15	--	0.03	--	0.25	--	302.3	--
2006-10-03	--	--	8.23	8.01	109	--	14.5	702	109	185.8	-165.24	0.14	0.1	0.11	0.1	0.2	0.06	165.1	2
Minimum:		--	8.23	7.9	109	--	14.5	702	109	185.8	-165.24	0.14	0.1	0.03	0.1	0.2	0.06	165.1	2
Maximum:		--	8.23	8.01	109	--	14.5	702	109	216	0	0.15	0.1	0.11	0.1	0.25	0.06	302.3	2
Average:		--	--	7.95	109	--	14.5	702	109	200.9	-82.62	0.15	0.1	0.07	0.1	0.23	0.06	233.7	2
Range:		--	0	0.11	0	--	0	0	0	30.2	165.24	0.01	0	0.09	0	0.05	0	137.2	0
Median:		--	8.23	7.96	109	--	14.5	702	109	200.9	-82.62	0.15	0.1	0.07	0.1	0.23	0.06	233.7	2
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Unnamed tributary #14 to Blacks Creek; Sampled near mouth before confluence with Blacks Creek; PA DEP sampling point; Same as BMI sampling point 906-40

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC4

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-23	--	175	--	5.9	--	--	--	--	--	42	48	30	--	19.5	--	2.61	--	620.2	60
1996-11-07	--	145	--	3.4	--	--	--	--	--	0	154	3.57	--	22.2	--	9.6	--	403	0
2000-06-28	--	130	--	6.1	--	--	--	--	--	72	32	31.5	--	19.4	--	6.07	--	652.4	20
2001-01-15	--	--	5.2	4.71	--	--	5	1181	--	2.34	81	19.1	13.45	21.9	19.8	9.35	6.12	783.7	33
2001-02-05	--	47	6	6.32	--	--	6	1021	--	36	26.52	18.05	16.25	13.7	12.85	3.9	0.44	496.7	18
2006-10-03	--	--	6.41	6.36	113	--	13	1068	48	40.04	9.49	20.34	18.4	12.11	11.39	3.84	0.1	453.9	22
2007-04-26	--	205	6.56	6.26	167	--	13	989	43	30.9	-4.7	13.62	10.84	10.27	10.1	4.7	0.17	467.1	29
2007-09-24	--	50	7.02	6.82	17	8.79	12.4	1259	129	77.96	-53.1	33.22	30.17	11.1	10.81	0.24	0.17	494.5	41
2007-11-14	--	60	5.09	4.77	250	9.09	9.5	1235	10	2.14	85.71	17.44	14	21.53	21.06	6.02	3.62	584.7	24
2009-04-29	--	140	6.77	6.42	210	9.27	13.2	983	33	30.46	-10.64	2.30	1.20	9.93	9.28	3.49	0.02	434.8	4
2009-09-23	--	24	7.59	7.06	75	7.77	18.9	932	77	67.76	-53.46	0.21	0.13	1.08	1.07	0.12	0.08	343.3	1
2009-12-16	--	--	4.44	4.19	--	--	0.1	792	0	0.00	49.47	2.32	1.26	10.96	9.08	5.84	5.82	380.1	8
2010-05-04	--	--	4.80	4.33	300	8.23	15.7	943	0	0.00	42.85	4.51	1.24	11.45	10.76	7.51	5.58	482.6	10
2012-03-29	--	100	7.8	7.68	39	10.4	9.1	882	112	106.36	-87.36	0.2	0	0.97	0.93	0.05	0	316.7	--
2012-04-27	--	110	7.8	7.43	--	--	--	806	83	85.68	-59.1	0.22	0.08	0.61	0.53	0.09	0	325.7	--
2012-05-24	--	75	7.7	7.88	166	8.6	16.8	892	87	95.56	-85.17	0.16	0.06	0.07	0.04	0.11	0	319.1	--
2015-05-19	--	180	7.52	7.46	198	8.00	18.3	1053	110	95.74	-81.40	0.21	0	0.32	0.28	0.12	0	308.6	0
2015-09-14	--	110	7.54	7.66	133	8.80	15.1	994	101	97.98	-85.57	0.19	0.10	0.69	0.53	0	0	391.2	0
2015-11-10	--	--	7.29	7.47	174	9.84	9.4	668	80	74.39	-63.08	0.43	0.16	0.64	0.53	0.20	0	219.2	0
2016-03-21	--	500	7.75	7.62	--	11.45	6.7	999	103	108.69	-103.16	0.30	0.12	1.01	0.86	0.14	0	391.5	0
Minimum:		24	4.44	3.4	17	7.77	0.1	668	0	0	-103.16	0.16	0	0.07	0.04	0	0	219.2	0
Maximum:		500	7.8	7.88	300	11.45	18.9	1259	129	108.69	154	33.22	30.17	22.2	21.06	9.6	6.12	783.7	60
Average:		136.7	5.39	4.56	153.5	9.11	11.4	982	67.73	53.3	-7.89	9.89	6.32	9.47	7.05	3.2	1.3	443.5	15.9
Range:		476	3.36	4.48	283	3.68	18.8	591	129	108.69	257.16	33.06	30.17	22.13	21.02	9.6	6.12	564.5	60
Median:		110	7.02	6.39	166.5	8.80	12.7	989	80	54.88	-7.67	2.95	1.20	10.62	9.08	3.05	0.08	418.9	10
Loading (lb/day):									143.56	115.39	-49.91	13.44	5.59	12.78	6.5	3.81	0.29		

Sample Point Description: Tributary #15 (aka "McIntire trib") to Blacks Creek; Sampled near mouth prior to confluence with Blacks Creek; Downstream of BC16 discharge

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC4.1

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2000-06-28	--	120	--	3.3	--	--	--	--	--	0	162	7.52	--	20.9	--	12.4	--	467.8	14
2006-10-04	--	78	3.51	3.5	612	--	12	930	--	0	92.92	3.46	3.35	14.22	13.69	9.93	6.63	347.8	1
2007-04-26	--	115	5.04	4.54	252	--	13	793	--	0.38	34.1	8.55	0.79	10.58	10.19	7.3	4.33	376.4	14
2007-09-24	--	10	4.57	4.63	413	6.64	15.4	650	0	0.55	22.31	0.93	0.5	6.34	6.29	2.39	2.08	226.4	2
2007-11-14	--	40	3.29	3.27	578	9.35	9.6	1335	0	0	176.27	10.41	10.05	26.96	26.79	16.51	13.72	515.4	8
2009-04-29	--	60	4.96	4.77	314	9.34	14.2	911	4	2.11	43.73	2.76	1.23	12.05	11.88	9.90	5.46	432.5	2
2009-09-23	--	5	5.95	5.06	285	7.68	17.7	671	2	1.99	13.27	0.84	0.71	6.31	6.19	0.92	0.86	294.8	1
2009-12-16	--	--	3.68	3.55	--	--	0.1	875	0	0.00	86.76	2.54	2.07	15.09	13.50	8.34	7.02	213.6	13
2010-05-04	--	--	3.76	3.39	346	8.05	16.9	1081	0	0.00	100.05	6.25	5.63	17.45	17.27	12.42	12.03	531.9	5
Minimum:		5	3.29	3.27	252	6.64	0.1	650	0	0	13.27	0.84	0.5	6.31	6.19	0.92	0.86	213.6	1
Maximum:		120	5.95	5.06	612	9.35	17.7	1335	4	2.11	176.27	10.41	10.05	26.96	26.79	16.51	13.72	531.9	14
Average:		61.1	3.81	3.63	400	8.21	12.4	906	1	0.56	81.27	4.81	3.04	14.43	13.23	8.9	6.52	378.5	6.7
Range:		115	2.66	1.79	360	2.71	17.6	685	4	2.11	163	9.57	9.55	20.65	20.6	15.59	12.86	318.3	13
Median:		60	4.17	3.55	346	8.05	13.6	893	0	0	86.76	3.46	1.65	14.22	12.69	9.90	6.05	376.4	5
Loading (lb/day):									0.75	0.32	69.55	4.72	1.67	11.54	8.24	7.52	3.83		

Sample Point Description: Tributary #15 (aka "McIntire trib") to Blacks Creek; Sampled upstream of BC16 discharge

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC5

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-23	--	--	--	7.6	--	--	--	--	--	298	0	0.15	--	0.17	--	0.25	--	430	16
1996-08-28	--	--	--	6.2	--	--	--	--	--	34	0.8	0.78	--	0.47	--	0.52	--	223	22
2000-03-30	--	15	--	6.4	--	--	--	--	--	46	0	0.15	--	0.14	--	0.25	--	234.8	--
2002-02-07	--	--	--	6.6	--	--	--	--	--	32	0	0.15	--	0.23	--	0.25	--	172	--
Minimum:		15	--	6.2	--	--	--	--	--	32	0	0.15	--	0.14	--	0.25	--	172	16
Maximum:		15	--	7.6	--	--	--	--	--	298	0.8	0.78	--	0.47	--	0.52	--	430	22
Average:		15	--	6.49	--	--	--	--	--	102.5	0.2	0.31	--	0.25	--	0.32	--	265	19
Range:		0	--	1.4	--	--	--	--	--	266	0.8	0.63	--	0.33	--	0.27	--	258	6
Median:		15	--	6.5	--	--	--	--	--	40	0	0.15	--	0.2	--	0.25	--	228.9	19
Loading (lb/day):									--	8.28	0	0.03	--	0.02	--	0.05	--		

Sample Point Description: Unnamed tributary #16 to Blacks Creek; Sample point located near mouth prior to confluence with Blacks Creek; Downstream of 906-16; PA DEP sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC6

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-23	--	--	--	6.2	--	--	--	--	--	20	0	0.64	--	2.8	--	0.25	--	164.3	18
2000-03-30	--	100	--	4.7	--	--	--	--	--	9	40	0.15	--	3.14	--	4.23	--	146.3	0
2000-04-25	--	334	--	5	--	--	--	--	--	10.2	13	0.15	--	2.31	--	3.64	--	158.6	10
2000-06-28	--	--	--	6.3	--	--	--	--	--	24	0	0.34	--	2.21	--	0.85	--	132.5	16
2001-09-28	--	60	--	6.8	--	--	--	--	--	64	0	0.15	--	1.21	--	0.25	--	187	4
2001-11-07	--	57	--	6.9	--	--	--	--	--	48	0	0.15	--	0.98	--	0.25	--	172	--
2003-05-15	--	--	5	6	--	--	12.5	362	--	4	--	0.18	--	2.54	--	2.3	--	190	--
2003-06-17	--	--	5.5	7.3	--	--	18	387	28	6	--	0.22	--	2.47	--	1.9	--	170	--
2003-07-16	--	--	6.5	6.72	--	--	18	171	40	30	-10	0.47	--	0.07	--	0.73	0.22	175	--
2003-08-13	--	--	5.5	6.98	--	--	19.5	147	28	19	2.5	0.3	--	3.73	--	0.03	0.2	185	--
2003-09-13	--	--	5	6.12	--	--	--	127	24	7	30	2.97	--	3.56	--	0.19	0.85	180	--
2003-10-18	--	--	5	6.46	--	--	8	348	20	9	9	2.1	--	2.94	--	0.21	1.08	140	--
2003-12-16	--	--	--	5.44	--	--	--	363	--	2	26.5	2.25	--	2.88	--	0.1	1.65	145	--
2004-01-18	--	--	--	5.24	--	--	--	390	--	2	21	2.9	--	3.92	--	0.19	1.83	165	--
2004-02-14	--	--	--	6.72	--	--	--	246	--	12	1.5	2.2	--	2.97	--	0.2	1.03	135	--
2004-03-11	--	--	--	6.12	--	--	--	224	--	5	13.5	1.92	--	2.8	--	0.1	1.6	145	--
2004-04-16	--	--	--	5.88	--	--	--	291	--	4	14	2.01	--	2.71	--	1.82	1.63	125	--
2004-05-12	--	--	--	6.64	--	--	--	239	--	10	3.5	2.14	--	3.21	--	0.12	1.68	140	--
2006-05-17	--	--	6.23	6.21	223	--	12	312	12	7.4	1.21	0.45	0.21	1.46	1.33	1.25	0.15	120.3	1
2006-10-04	--	110	6.94	6.33	262	--	16	373	24	23.3	-12.73	0.46	0.36	1.72	1.71	0.9	0.05	128.9	1
2012-03-29	--	75	6.7	6.61	60	10.6	9	337	20	31.37	-3.18	0.21	0	1.87	1.73	1.62	0	121.2	--
2012-04-27	--	80	7.2	6.74	--	--	--	361	27	21.94	-11.14	0.28	0.1	1.42	1.33	1.07	0.11	124.8	--
2012-05-24	--	60	7.55	6.72	22	8.6	18.1	282	40	43.92	-28.66	0.19	0	1.5	1.36	0.45	0.07	100.9	--
2015-05-20	--	140	7.65	7.19	251	9.73	13.4	409	44	28.87	-15.50	0.37	0.21	1.84	1.80	0.75	0	125.8	9
2015-09-15	--	300	8.01	7.74	188	9.41	14.8	428	71	69.12	-36.62	0.21	0	1.38	1.34	0	0	98.1	0
2015-11-11	--	--	6.76	6.93	194	10.47	9.8	300	32	29.58	-18.51	0.18	0	0.78	0.75	0.18	0.10	91.3	0
2016-03-22	--	260	6.57	6.75	103	11.68	8.0	367	21	16.84	-8.32	0.34	0.13	1.68	1.68	2.30	0	121.2	8
Minimum:		57	5	4.7	22	8.6	8	127	12	2	-36.62	0.15	0	0.07	0.75	0	0	91.3	0
Maximum:		334	8.01	7.74	262	11.68	19.5	428	71	69.12	40	2.97	0.36	3.92	1.80	4.23	1.83	190	18
Average:		143.3	--	5.75	162.9	10.08	13.6	308	30.79	20.65	1.24	0.89	0.11	2.23	1.45	0.96	0.64	144	6.1
Range:		277	3.01	3.04	240	3.08	11.5	301	59	67.12	76.62	2.82	0.36	3.85	1.05	4.23	1.83	98.7	18
Median:		100	6.57	6.61	191	10.1	13.4	337	27.5	16.84	0	0.34	0.1	2.31	1.36	0.45	0.2	140	4
Loading (lb/day):									71.35	53.83	-12.25	0.42	0.19	3.11	2.74	2.95	0.03		

Sample Point Description: Blacks Creek; Sampled below confluence with unnamed tributary #17, upstream of County Line Road; Upstream of stream point BC14.1 and discharges BC14 and BC15; also known as BMI sampling point 906-15; Same as Beran Environmental point BC7

1. Records with no value are not included in statistical calculations.

Blacks Creek Water Quality Report - BC8

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-23	--	--	--	6.9	--	--	--	--	--	74	0	0.53	--	1.78	--	0.25	--	160.3	6
1997-12-03	--	6283	--	7.24	--	--	7	519	--	55.77	0	0.59	--	1.39	--	0.13	--	122.7	11
1998-11-09	--	1312	7.4	7.45	--	--	7	793	--	85.84	0	0.39	--	1.37	--	--	--	230.9	3
1999-11-23	--	282	7.1	7.35	--	--	10	650	--	81.28	0	0.31	--	1.39	--	--	--	209.5	5
2000-03-30	--	--	--	6.7	--	--	--	--	--	76	0	0.74	--	1.79	--	0.25	--	215.4	--
2000-04-25	--	--	--	7.2	--	--	--	--	--	82	0	0.63	--	1.42	--	0.25	--	215.4	8
2000-06-28	--	--	--	6.6	--	--	--	--	--	60	0	1.01	--	2.57	--	0.25	--	191.9	6
2000-10-16	--	358	7.2	7.51	--	--	9	726	--	78.86	0	0.47	--	1.27	--	--	--	265.1	10
2001-09-28	--	553	--	7	--	--	--	--	--	94	0	0.78	--	1.57	--	0.25	--	232	--
2001-12-11	--	470	7.1	7.44	--	--	5	620	--	67.58	0	0.69	--	1.59	--	--	--	242.5	4
2002-02-07	--	1600	--	7	--	--	--	--	--	62	0	1.3	--	1.6	--	0.25	--	180	--
2002-10-31	--	1075	7.1	7.42	--	--	4	680	--	70.73	0	0.69	--	1.92	--	--	--	301.1	3
2003-05-15	--	--	7	7.2	--	--	12.5	449	--	52	--	0.99	--	2.35	--	0.2	--	167	--
2003-06-17	--	--	7	7	--	--	16	504	82	61	--	1.41	--	1.62	--	0.3	--	160	--
2003-07-16	--	--	7	7.49	--	--	18	267	96	81	-63.5	1.19	--	0.07	--	0.01	0.01	255	--
2003-08-13	--	--	7	6.82	--	--	17	218	88	80	-40	0.35	--	2.18	--	0.11	0.08	215	--
2003-09-13	--	--	7	7.81	--	--	16	189	90	78	-45	1.96	--	2.35	--	0.32	0.01	215	--
2003-10-18	--	--	7	7.6	--	--	9	470	70	59	-45	1.98	--	2.77	--	0.63	0.06	145	--
2003-12-11	--	10098	7.6	6.42	--	--	4	302	--	24.28	0	1.91	--	1.54	--	--	--	135.8	5
2003-12-16	--	--	--	7.58	--	--	--	464	--	61	-42.5	1.6	--	2.05	--	0.3	0.01	175	--
2004-01-18	--	--	--	7.39	--	--	--	594	--	77	-47.5	2.38	--	3.21	--	0.4	0.08	--	--
2004-02-14	--	--	--	7.84	--	--	--	353	--	64	-46	2.42	--	3.27	--	1.09	0.32	185	--
2004-03-11	--	--	--	7.52	--	--	--	330	--	68	--	1.59	--	2.32	--	0.55	0.05	185	--
2004-03-29	--	6059	7.1	7.45	--	--	9	511	--	54.71	0	2.25	--	1.57	--	--	--	168.8	3
2004-04-16	--	--	--	7.66	--	--	--	418	--	65	-52	1.63	--	2.2	--	0.31	0.09	160	--
2004-05-12	--	--	--	7.64	--	--	--	370	--	71	-62	2.05	--	3.08	--	0.06	0.16	200	--
2004-05-17	--	898	6	4.56	--	--	13	967	--	0.33	54.02	9.48	--	12.72	--	--	--	561.3	16
2004-08-04	--	1437	7.2	7.59	--	--	19	620	--	71.22	0	0.75	--	1.46	--	--	--	215	1
2004-12-22	--	--	7.2	6.96	--	--	0	575	--	70.18	-55.47	1.42	--	1.4	--	--	--	267.8	5
2005-01-27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2005-06-23	--	431	7.3	7.64	--	--	15	690	--	90.77	-75.52	0.88	--	2.2	--	--	--	245.4	3
2005-09-12	--	449	7.2	7.53	--	--	16	776	--	93.46	-75.78	0.72	--	1.43	--	--	--	252	2
2005-12-14	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2006-03-09	--	--	6	7.17	--	--	4	613	--	80.74	-71.84	2.77	--	1.49	--	--	--	187.2	20
2006-06-20	--	880	7.2	7.65	--	--	17	751	--	96.09	-82.22	0.79	--	1.4	--	--	--	240.8	7
2006-09-05	--	3232	7.2	7.55	--	--	15	531	--	73.82	-60.9	1.09	--	1.13	--	--	--	148.7	5
2006-10-03	--	--	7.65	7.27	195	--	13	529	69	63.01	-46.66	0.92	0.4	1.3	1.3	0.1	0.1	131.8	2

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2009-04-29	--	300	7.69	7.02	222	9.88	12.1	607	73	77.51	-64.03	0.80	0.13	0.89	0.84	0.17	0.02	200.5	1
2009-09-23	--	200	7.62	7.34	193	8.37	14.9	716	119	98.94	-61.10	0.88	0.08	0.40	0.37	0.06	0.02	203.8	3
2009-12-16	--	--	8.30	6.61	166	12.32	0.2	502	67	62.05	-50.94	0.50	0.45	1.31	1.23	0.11	0.04	163.5	8
2012-03-29	--	300	8.02	7.71	81	10.7	8.3	577	94	93.15	-72.04	0.64	0.06	0.3	0.26	0.13	0	181.7	--
2012-04-27	--	300	7.4	7.61	--	--	--	523	86	79.66	-65.67	0.71	0.17	0.39	0.37	0	0	147.9	--
2012-05-24	--	300	7.74	7.15	65	9.1	15.9	603	113	96.51	-80.79	0.66	0.07	0.14	0.12	0.05	0	163.8	--
2015-05-19	--	1100	8.18	7.73	108	8.90	16.8	698	98	92.69	-77.11	0.39	0	0.24	0.12	0.34	0.14	197.1	8
2015-09-14	--	1200	8.07	7.76	86	9.49	14.2	729	106	98.12	-81.19	0.71	0	0.56	0.44	0	0	195.6	0
2015-11-10	--	--	7.95	7.60	203	10.41	9.4	670	102	90.14	-45.97	0.72	0.21	0.56	0.56	0	0	197.6	0
2016-03-21	--	2800	7.97	7.75	60	12.20	6.1	612	100	93.33	-88.51	1.25	0.14	0.68	0.58	0.16	0	161.7	6
Minimum:		0	6	4.56	60	8.37	0	189	67	0.33	-88.51	0.31	0	0.07	0.12	0	0	122.7	0
Maximum:		10098	8.30	7.84	222	12.32	19	967	119	98.94	54.02	9.48	0.45	12.72	1.3	1.09	0.32	561.3	20
Average:		1676.7	6.95	6.17	137.9	10.15	11	557	90.81	73.46	-36.79	1.29	0.16	1.78	0.56	0.23	0.06	204.5	5.6
Range:		10098	2.3	3.28	162	3.95	19	778	52	98.61	142.53	9.17	0.45	12.65	1.18	1.09	0.32	438.6	20
Median:		880	7.2	7.44	137	9.88	12.3	577	92	76	-45.99	0.88	0.13	1.49	0.44	0.23	0.02	196.4	5
Loading (lb/day):									972.9	1230.78	-407.15	30.64	0.81	33.06	4.25	2.5	0.25		

Sample Point Description: Blacks Creek; Sampled upstream of RT 58 bridge; PA DEP sampling point; Same as BMI sampling point 906-32 and Beran Environmental sampling point BC3;

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC9

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-23	--	--	--	6.9	--	--	--	--	--	86	0	0.15	--	0.64	--	0.25	--	155.5	8
1997-12-03	--	89.4	--	7.18	--	--	5	174	--	34.5	0	0.16	--	0.04	--	0.17	--	31.4	16
1998-11-09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1999-11-23	--	7.2	6.9	7.05	--	--	9	191	--	32.22	0	0.14	--	0.05	--	--	--	36.8	4
2000-10-16	--	1	6.8	7.17	--	--	9	213	--	53.98	0	1.41	--	0.42	--	--	--	37.6	7
2001-12-11	--	21.5	6.8	6.9	--	--	6	210	--	23.47	0	0.07	--	0.02	--	--	--	59.6	3
2002-02-07	--	--	--	6.8	--	--	--	--	--	34	0	0.15	--	0.05	--	0.25	--	46	--
2002-10-31	--	2.5	6.9	7.14	--	--	6	209	--	33.3	0	0.1	--	0.03	--	--	--	30.2	4
2003-12-11	--	359	7.6	5.69	--	--	4	121	--	5.34	4.8	0.45	--	0.08	--	--	--	44.2	4
2004-03-29	--	273	7.4	7.27	--	--	10	192	--	30.99	0	0.23	--	0.04	--	--	--	46.8	4
2004-05-17	--	54	7.2	7.06	--	--	14	227	--	57.98	0	0.27	--	0.08	--	--	--	55.1	1
2004-08-04	--	121	7.1	7.48	--	--	18	204	--	50.65	0	0.31	--	0.07	--	--	--	34.7	2
2004-12-22	--	67	7.2	6.72	--	--	3	214	--	50.09	-32.54	0.15	--	0.02	--	--	--	54.5	2
2005-01-27	--	--	7	7.24	--	--	1	229	--	54.85	-44.85	0.2	--	0.01	--	--	--	47	3
2005-06-23	--	1.5	7.2	7.45	--	--	13	193	--	60.92	-52.37	0.51	--	0.29	--	--	--	23.2	3
2005-09-12	--	0.5	7.2	7.5	--	--	16	315	--	117.63	-92.66	0.36	--	0.37	--	--	--	23.7	2
2005-12-14	--	--	--	7.18	--	--	--	205	--	46.26	-36.04	0.24	--	0.05	--	--	--	34.6	4
2006-03-09	--	287	7	6.97	--	--	4	205	--	44.71	-40.6	0.46	--	0.08	--	--	--	36.1	6
2006-06-20	--	54	7.2	7.43	--	--	16	262	--	63.17	-53.8	0.45	--	0.13	--	--	--	44.6	9
2006-09-05	--	350	6.7	7.24	--	--	17	201	--	41.96	-27.74	0.36	--	0.08	--	--	--	28	4
2006-10-03	--	--	7.66	6.96	183	--	14	221	52	44.93	-30.3	0.35	0.22	0.1	0.1	0.15	0.14	35.4	3
Minimum:		0.5	6.7	5.69	183	--	1	121	52	5.34	-92.66	0.07	0.22	0.01	0.1	0.15	0.14	23.2	1
Maximum:		359	7.66	7.5	183	--	18	315	52	117.63	4.8	1.41	0.22	0.64	0.1	0.25	0.14	155.5	16
Average:		112.6	--	--	183	--	9.7	210	52	48.35	-20.31	0.33	0.22	0.13	0.1	0.21	0.14	45.3	4.7
Range:		358.5	0.96	1.81	0	--	17	194	0	112.29	97.46	1.34	0	0.63	0	0.1	0	132.3	15
Median:		54	7.15	7.16	183	--	9	207	52	45.6	0	0.26	0.22	0.08	0.1	0.21	0.14	37.2	4
Loading (lb/day):									--	46.42	-19.88	0.47	--	0.09	--	0.18	--		

Sample Point Description: Unnamed tributary #13 to Blacks Creek; PA DEP sampling point; Same as BMI point 906-34; Same as Allegheny Mineral (permit #1096030) downstream sampling point 64G

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC10

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1995-04-26	--	154.6	8.3	7	--	--	10	210	--	42	0	0.15	--	0	--	0	--	77.6	0.8
1995-05-25	--	516	6.9	7.1	--	--	13	180	--	34	0	0.11	--	0.96	--	0	--	71.8	5.7
1995-07-17	--	101	6.8	6	--	--	20	200	--	48	0	0.38	--	0.38	--	0	--	67.4	9
1996-08-23	--	--	--	6.5	--	--	--	--	--	34	0	0.38	--	0.15	--	0.25	--	72.1	8
2002-02-07	--	--	--	6.8	--	--	--	--	--	38	0	0.86	--	0.11	--	0.25	--	141	--
2006-10-03	--	--	7.61	7.02	172	--	14.5	295	46	73.75	-33.33	0.3	0.16	0.09	0.08	0.12	0.08	62.8	2
Minimum:		101	6.8	6	172	--	10	180	46	34	-33.33	0.11	0.16	0	0.08	0	0.08	62.8	0.8
Maximum:		516	8.3	7.1	172	--	20	295	46	73.75	0	0.86	0.16	0.96	0.08	0.25	0.08	141	9
Average:		257.2	--	6.54	172	--	14.4	221	46	44.96	-5.56	0.36	0.16	0.28	0.08	0.1	0.08	82.1	5.1
Range:		415	1.5	1.1	0	--	10	115	0	39.75	33.33	0.75	0	0.96	0	0.25	0	78.2	8.2
Median:		154.6	7.26	6.9	172	--	13.8	205	46	40	0	0.34	0.16	0.13	0.08	0.06	0.08	72	5.7
Loading (lb/day):									--	115.54	0	0.47	--	2.13	--	0	--		

Sample Point Description: Unnamed tributary #12 to Blacks Creek; PA DEP sampling point; Same as BMI point 906-35; Same as Allegheny Mineral (permit #10960302) sampling point 64i

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC11

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1995-03-23	--	114	--	7.8	--	--	5	420	--	102	0	0	--	0	--	0	--	161	10.2
1995-04-24	--	136	--	7.2	--	--	8	360	--	24	0	0	--	0	--	0	--	148	3.6
1995-09-22	--	--	--	7.7	--	--	--	640	--	164	0	0.18	--	0	--	--	--	290.4	2.7
1995-10-30	--	14	7.3	7.6	--	--	6	620	--	180	0	0.07	--	0	--	0	--	306	3.7
1996-08-23	--	--	--	7.3	--	--	--	--	--	126	0	0.15	--	0.06	--	0.25	--	155.8	8
1997-12-03	--	--	--	7.33	--	--	6	526	--	62.12	0	0.67	--	1.35	--	0.1	--	129.7	21
1998-11-09	--	11.2	7.4	7.94	--	--	7	923	--	146.58	0	0.2	--	0.16	--	--	--	353.4	2
1999-11-23	--	13.4	7.5	8	--	--	11	720	--	130.27	0	0.07	--	0.03	--	--	--	272.4	5
2000-10-16	--	13.4	7.4	7.91	--	--	9	836	--	164.29	0	0.04	--	0.04	--	--	--	366.4	3
2001-12-11	--	54	7.3	7.9	--	--	5	690	--	103.8	0	0.07	--	0.04	--	--	--	328.7	4
2002-02-07	--	--	--	7.6	--	--	--	--	--	112	0	0.15	--	0.03	--	0.25	--	218	--
2002-10-31	--	9	7.4	7.91	--	--	6	828	--	147.78	0	0.08	--	0.06	--	--	--	230.5	1
2003-12-11	--	323	7.9	6.86	--	--	5	267	--	47.54	0	0.21	--	0.04	--	--	--	110.3	4
2004-03-29	--	283	7.4	7.95	--	--	8	474	--	97.74	0	0.13	--	0.03	--	--	--	159	4
2004-05-17	--	27	7.3	7.41	--	--	12	550	--	105.11	0	0.17	--	0.04	--	--	--	208.8	2
2004-08-04	--	--	7.4	7.88	--	--	19	460	--	100.35	0	0.25	--	0.07	--	--	--	153.4	6
2004-12-22	--	89	7.3	7.83	--	--	5	718	--	132.07	-96.82	0.06	--	0.04	--	--	--	334.3	6
2005-01-27	--	108	7.2	8.03	--	--	2	900	--	160.89	-131.63	0.09	--	0.03	--	--	--	302.7	4
2005-06-23	--	18	7.4	7.85	--	--	12	460	--	100.22	-79.98	0.12	--	0.01	--	--	--	128.8	6
2005-09-12	--	9	7.1	7.86	--	--	16	535	--	105.44	-90.85	0.13	--	0.04	--	--	--	136.1	4
		9	7.1	7.86	--	--	16	535	--	105.44	-90.85	0.13	--	0.02	--	--	--	136.1	4
2005-12-14	--	--	--	7.9	--	--	--	1034	--	172.97	-151.27	0.17	--	0.03	--	--	--	448.1	1
2006-03-09	--	54	7.3	7.77	--	--	6	694	--	116.63	-106.27	0.48	--	0.04	--	--	--	261.9	13
2006-06-20	--	54	7.5	8.01	--	--	17	1185	--	174.19	-146.36	0.16	--	0.06	--	--	--	461.1	10
2006-09-05	--	229	7.6	8.01	--	--	15	1444	--	215.67	-148.54	0.17	--	0.03	--	--	--	584.6	6
2006-10-03	--	80	7.98	7.9	182	--	13	1392	198	189.69	-160.19	1.02	0.12	0.06	0.06	0.16	0.1	498.3	2
Minimum:		9	7.1	6.86	182	--	2	267	198	24	-160.19	0	0.12	0	0.06	0	0.1	110.3	1
Maximum:		323	7.98	8.03	182	--	19	1444	198	215.67	0	1.02	0.12	1.35	0.06	0.25	0.1	584.6	21
Average:		82.4	--	7.61	182	--	9.5	717	198	126.42	-46.26	0.19	0.12	0.09	0.06	0.11	0.1	264.8	5.4
Range:		314	0.88	1.17	0	--	17	1177	0	191.67	160.19	1.02	0	1.35	0	0.25	0	474.3	20
Median:		54	7.4	7.86	182	--	8	665	198	121.32	0	0.14	0.12	0.04	0.06	0.1	0.1	246.2	4
Loading (lb/day):									190.08	118.7	-54.04	0.18	0.12	0.03	0.06	0.04	0.1		

Sample Point Description: Unnamed tributary #11 to Blacks Creek; Sampled below Allegheny Mineral quarry; PA DEP sampling point; Same as BMI sampling point 906-33; Assumed to be similar to Allegheny Mineral (Permit #10960302) sampling point 40H located ~750 feet downstream

1. Records with no value are not included in statistical calculations.

Blacks Creek Water Quality Report - BC12

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-08-23	--	--	--	6.9	--	--	--	--	--	62	0	0.33	--	0.16	--	0.25	--	151.7	--
2002-02-07	--	--	--	7.1	--	--	--	--	--	50	0	0.15	--	0.22	--	0.25	--	152	--
2003-05-15	--	--	7	7.4	--	--	11.5	343	--	41	--	0.56	--	0.5	--	0.2	--	137	--
2003-06-17	--	--	7	7.2	--	--	15.7	--	66	52	--	0.71	--	0.32	--	0.2	--	140	--
2003-07-16	--	--	7	7.78	--	--	17	226	104	82	-57.5	0.65	--	4.85	--	0.01	0.01	225	--
2003-08-13	--	--	7	7.26	--	--	17	165	58	55	-32.5	0.31	--	0.38	--	0.21	0.09	165	--
2003-09-13	--	--	7	7.85	--	--	16	167	102	71	-47	0.32	--	0.38	--	0.3	0.01	195	--
2003-10-18	--	--	7	7.52	--	--	9	375	56	48	-33	0.34	--	0.48	--	0.21	0.03	125	--
2003-12-16	--	--	--	7.83	--	--	--	415	--	45	-29.5	0.61	--	0.78	--	0.19	0.01	135	--
2004-01-18	--	--	--	7.65	--	--	--	527	--	63	-35	0.7	--	0.95	--	0.2	0.11	195	--
2004-02-14	--	--	--	7.65	--	--	--	303	--	50	-24	0.58	--	0.78	--	0.3	0.24	145	--
2004-03-11	--	--	--	7.71	--	--	--	263	--	48	-39	0.57	--	0.83	--	0.18	0.07	150	--
2004-04-16	--	--	--	7.92	--	--	--	359	--	51	-35.5	0.53	--	0.72	--	0.15	0.08	130	--
2004-05-12	--	--	--	7.83	--	--	--	301	--	62	-38.5	0.2	--	0.3	--	0.01	0.01	170	--
2006-09-27	--	125	7.64	6.83	203	--	12	501	71	77.68	-58.58	0.34	0.24	0.24	0.19	0.13	0.05	133.7	1
Minimum:		125	7	6.83	203	--	9	165	56	41	-58.58	0.15	0.24	0.16	0.19	0.01	0.01	125	1
Maximum:		125	7.64	7.92	203	--	17	527	104	82	0	0.71	0.24	4.85	0.19	0.3	0.24	225	1
Average:		125	--	7.34	203	--	14	329	76.17	57.18	-33.08	0.46	0.24	0.79	0.19	0.19	0.06	156.6	1
Range:		0	0.64	1.09	0	--	8	362	48	41	58.58	0.56	0	4.69	0	0.29	0.23	100	0
Median:		125	7	7.65	203	--	15.7	323	68.5	52	-35	0.53	0.24	0.48	0.19	0.2	0.05	150	1
Loading (lb/day):									106.5	116.52	-87.87	0.51	0.36	0.36	0.29	0.2	0.08		

Sample Point Description: Unnamed tributary #6 to Blacks Creek; Sampled below culvert on Murrin Road after confluence with unnamed tributary #7 (906-19); Downstream of 906-20; PA DEP sampling point; Same as BMI sampling poin 906-18 and Beran Environmental BC3

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC12A

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2001-09-28	--	90	--	7.3	--	--	--	--	--	96	0	0.15	--	0.03	--	0.25	--	--	--
Minimum:		90	--	7.3	--	--	--	--	--	96	--	0.15	--	0.03	--	0.25	--	--	--
Maximum:		90	--	7.3	--	--	--	--	--	96	--	0.15	--	0.03	--	0.25	--	--	--
Average:		90	--	7.3	--	--	--	--	--	96	--	0.15	--	0.03	--	0.25	--	--	--
Range:		0	--	0	--	--	--	--	--	0	--	0	--	0	--	0	--	--	--
Median:		90	--	7.3	--	--	--	--	--	96	--	0.15	--	0.03	--	0.25	--	--	--
Loading (lb/day):									--	103.68	--	0.16	--	0.03	--	0.27	--		

Sample Point Description: Unnamed tributary #6 to Blacks Creek; Sample point located at Rt 58 Bridge upstream of 906-20 and BC12 and downstream of 906-29; PA DEP sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - BC14.1

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1997-03-11	--	--	--	6.9	--	--	--	--	--	68	0	0.21	--	1.45	--	1.74	--	179	0
2000-02-02	--	--	6.6	7.6	--	--	0	688	--	91.22	0	0.24	0.13	1.22	1.16	0.97	0.04	264.7	4
2000-03-30	--	--	--	6.7	--	--	--	--	--	70	0	0.15	--	1.54	--	1.57	--	211.3	0
2001-01-15	--	--	6.3	7.43	--	--	1	545	--	59.56	0	0.32	0.08	1.34	1.31	0.34	0.12	184.6	3
2001-02-05	--	--	7.2	7.29	--	--	2	468	--	48.87	0	0.31	0.19	1.08	1.03	0.51	0	180.6	5
2015-05-19	--	460	7.18	7.75	216	8.47	2.2	589	--	89.69	-75.07	0.20	0	0.74	0.59	0.22	0	145.7	0
2015-09-14	--	500	7.82	7.93	120	8.98	17.5	607	117	118.44	-79.40	0.32	0.13	0.92	0.81	0.11	0	143.1	0
2015-11-10	--	--	7.50	7.53	170	10.26	10.2	419	77	74.74	-58.11	2.85	0.15	0.84	0.53	1.65	0	111.0	38
2016-03-21	--	1060	7.98	7.73	--	11.75	7.2	566	90	87.47	-80.59	0.25	0.15	0.99	0.88	0.77	0.19	161.7	6
Minimum:		460	6.3	6.7	120	8.47	0	419	77	48.87	-80.59	0.15	0	0.74	0.53	0.11	0	111.0	0
Maximum:		1060	7.98	7.93	216	11.75	17.5	688	117	118.44	0	2.85	0.19	1.54	1.31	1.74	0.19	264.7	38
Average:		673.3	--	7.24	168.7	9.87	5.7	555	94.67	78.67	-32.57	0.54	0.12	1.12	0.9	0.88	0.05	175.7	6.2
Range:		600	1.68	1.23	96	3.28	17.5	269	40	69.57	80.59	2.7	0.19	0.8	0.78	1.63	0.19	153.7	38
Median:		500	7.2	7.53	170	9.62	2.2	566	90	74.74	0	0.25	0.13	1.08	0.88	0.77	0	179	3
Loading (lb/day):									923.4	772.78	-638.63	2.07	0.9	7.4	6.44	3.89	0.81		

Sample Point Description: Blacks Creek; Downstream of County Line Road and Trib 16; Upstream of discharges BC14 and BC15 and Porter Road

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - QAS1

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2004-03-17	--	752	7	6.89	--	--	3	513	--	57.05	0	0.37	--	0.63	--	0.19	--	195	3
2004-05-13	--	754	7.5	7.54	--	--	19	563	--	72.85	0	0.54	--	0.55	--	0.11	--	244.4	6
2004-09-10	--	1000	6.4	6.36	--	--	14	253	--	33.11	0	0.36	--	0.4	--	0.24	--	111.3	4
2004-12-15	--	302	6.9	6.76	--	--	1	357	--	42.51	-30.9	0.35	--	0.42	--	0.09	--	116.2	2
2005-02-02	--	562	7.4	7.61	--	--	0	630	--	71.19	-49.2	0.33	--	0.75	--	0.23	--	304.8	2
2005-06-23	--	123	7.8	7.64	--	--	19	582	--	79.29	-55.4	0.73	--	0.17	--	0.04	--	186.1	1
2005-08-24	--	101	7.4	7.36	--	--	19	703	--	90.21	-68.9	0.91	--	0.41	--	0.12	--	232.3	3
2005-12-29	--	1000	7.1	7.14	--	--	4	308	--	26.04	-21.7	0.28	--	0.35	--	0.14	--	99.9	9
2006-03-27	--	1000	7.6	7.53	--	--	9	496	--	62.6	-55.6	0.24	--	0.22	--	0.05	--	237.5	2
2006-05-31	--	434	7	7.04	--	--	20	519	--	64.93	-60	0.47	--	0.17	--	0.24	--	154.8	4
2006-09-19	--	302	7.4	7.39	--	--	16	325	--	47.02	-30.15	0.53	--	0.29	--	0.32	--	81.6	4
Minimum:		101	6.4	6.36	--	--	0	253	--	26.04	-68.9	0.24	--	0.17	--	0.04	--	81.6	1
Maximum:		1000	7.8	7.64	--	--	20	703	--	90.21	0	0.91	--	0.75	--	0.32	--	304.8	9
Average:		575.5	7.04	7	--	--	11.3	477	--	58.8	-33.8	0.46	--	0.4	--	0.16	--	178.5	3.6
Range:		899	1.4	1.28	--	--	20	450	--	64.17	68.9	0.67	--	0.58	--	0.28	--	223.2	8
Median:		562	7.4	7.36	--	--	14	513	--	62.6	-30.9	0.37	--	0.4	--	0.14	--	186.1	3
Loading (lb/day):									--	364	-178.04	2.62	--	2.87	--	1.12	--		

Sample Point Description: Blacks Creek; Located downstream of BC8 and upstream of QAS4; Quality Aggregates (permit #1096031) sampling point;

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - QAS2

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1995-10-23	--	50	7.7	7.57	--	--	12	583	--	77.52	0	0.63	--	0.72	--	0.14	--	136.8	3
1996-01-24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1996-02-08	--	5.5	7.2	7.14	--	--	9	611	--	71.47	0	0.74	--	1.7	--	0.19	--	184.6	5
1996-03-20	--	10	6.99	6.82	--	--	10	89	--	22.61	0	0.29	--	0.01	--	0.53	--	13.9	8
1996-04-18	--	5	6.8	6.94	--	--	10	113	--	28.96	0	0.22	--	0.03	--	0.22	--	17.1	1
1996-05-15	--	3.5	6.9	6.88	--	--	10	115	--	34.22	0	0.26	--	0.03	--	0.3	--	15.3	1
1996-06-17	--	1.5	6.64	7.01	--	--	12	187	--	87.44	0	2.78	--	0.41	--	0	--	6.2	12
2004-03-17	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2004-05-13	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2004-09-10	--	27	6.4	6.39	--	--	17	250	--	34.1	0	0.5	--	0.43	--	0.23	--	104.9	1
2004-12-15	--	3	7.5	7.44	--	--	1	557	--	95.89	-80.3	0.21	--	0.07	--	0.18	--	180.4	10
2005-02-02	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2005-06-23	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2005-08-24	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2005-12-29	--	2	7.8	8.03	--	--	2	598	--	142.62	-117	0.27	--	0.04	--	0.29	--	188.2	18
2006-03-27	--	3	7.9	7.99	--	--	7	527	--	100.95	-83.2	0.15	--	0.01	--	0.13	--	173.1	1
2006-05-31	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2006-09-19	--	3	7.6	7.74	--	--	18	514	--	101.37	-64.52	0.51	--	0.12	--	0.66	--	147.2	8
Minimum:		0	6.4	6.39	--	--	1	89	--	22.61	-117	0.15	--	0.01	--	0	--	6.2	1
Maximum:		50	7.9	8.03	--	--	18	611	--	142.62	0	2.78	--	1.7	--	0.66	--	188.2	18
Average:		6.7	--	--	--	--	9.8	377	--	72.47	-31.37	0.6	--	0.32	--	0.26	--	106.2	6.2
Range:		50	1.5	1.64	--	--	17	522	--	120.01	117	2.63	--	1.69	--	0.66	--	182	17
Median:		3	7.2	7.14	--	--	10	514	--	77.52	0	0.29	--	0.07	--	0.22	--	136.8	5
Loading (lb/day):									--	7.63	-1	0.07	--	0.06	--	0.03	--		

Sample Point Description: Unnamed tributary #2 to Blacks Creek; Quality Aggregates (permit #1096031) sampling point;

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - QAS3

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1995-10-23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1996-01-24	--	20	7.52	7.65	--	--	10	390	--	71.9	0	0.23	--	0.04	--	0.32	--	43	--
Minimum:		20	7.52	7.65	--	--	10	390	--	71.9	--	0.23	--	0.04	--	0.32	--	43	--
Maximum:		20	7.52	7.65	--	--	10	390	--	71.9	--	0.23	--	0.04	--	0.32	--	43	--
Average:		20	--	--	--	--	10	390	--	71.9	--	0.23	--	0.04	--	0.32	--	43	--
Range:		0	0	0	--	--	0	0	--	0	--	0	--	0	--	0	--	0	--
Median:		20	7.52	7.65	--	--	10	390	--	71.9	--	0.23	--	0.04	--	0.32	--	43	--
Loading (lb/day):									--	17.26	--	0.06	--	0.01	--	0.08	--		

Sample Point Description: Unnamed tributary #1 to Blacks Creek; Quality Aggregates (permit #1096031) sampling point;

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

Blacks Creek Water Quality Report - QAS4

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2000-11-03	--	500	--	7.6	--	--	--	--	--	88	0	1.03	--	0.75	--	0.12	--	181	5
2001-01-17	--	--	--	7.34	--	--	--	--	--	70	0	0.32	--	0.56	--	0.12	--	161	6
2001-04-03	--	--	--	7.55	--	--	--	--	--	67	0	0.32	--	0.8	--	0.07	--	165	2
2001-07-11	--	--	--	7.44	--	--	--	--	--	90	0	0.33	--	0.53	--	0.04	--	219	5
2003-05-15	--	--	6.5	7.2	--	--	15.5	361	--	50	0	0.41	--	0.45	--	0.05	--	175	--
2003-06-19	--	--	7	7.6	--	--	18	423	80	60	--	0.85	--	0.49	--	0.05	--	120	--
2003-07-17	--	--	7.5	7.54	--	--	22	226	102	87	-72	0.27	--	2.6	--	0.01	--	185	--
2003-08-14	--	--	7	6.91	--	--	23	165	92	71	-43.5	0.16	--	0.16	--	0.07	0.06	140	--
2003-09-13	--	--	7	7.8	--	--	20.5	166	108	77	-44	0.25	--	0.3	--	0.19	0.01	170	--
2003-10-19	--	--	7	7.39	--	--	9.5	381	52	60	-48	0.23	--	0.32	--	0.27	0.07	110	--
2003-12-17	--	--	--	7.62	--	--	--	373	--	48	-29	0.59	--	0.76	--	0.16	0.01	125	--
2004-02-15	--	--	--	7.82	--	--	--	306	--	60	-42.5	1.06	--	1.43	--	0.24	0.18	155	--
2004-03-10	--	--	--	7.52	--	--	--	246	--	50	--	0.63	--	0.92	--	0.22	0.05	130	--
2004-03-17	--	1000	7	6.87	--	--	2	510	--	63.22	0	0.38	--	1.03	--	0.11	--	183.5	1
2004-04-16	--	--	--	7.69	--	--	--	347	--	54	-44.5	0.49	--	0.66	--	0.01	0.01	130	--
2004-05-13	--	1000	7.5	7.46	--	--	20	582	--	76.97	0	0.62	--	0.82	--	0.17	--	236.8	6
		--	--	7.62	--	--	--	323	--	77	-43	0.85	--	1.28	--	0.01	0.01	165	--
2004-09-10	--	1000	6.5	6.43	--	--	16	248	--	36.36	0	0.61	--	0.46	--	0.25	--	100.4	--
2004-12-15	--	1000	7	6.87	--	--	1	398	--	52.06	-38.6	0.35	--	0.6	--	0.02	--	322.1	3
2005-02-02	--	671	7.4	7.48	--	--	0	630	--	79.42	-46.1	0.38	--	1.38	--	0.16	--	271.5	7
2005-06-23	--	234	7.7	7.63	--	--	24	600	--	81.27	-54.8	0.6	--	0.65	--	0.09	--	179.1	12
2005-08-24	--	129	7.6	7.49	--	--	19	673	--	98.07	-72.1	0.5	--	0.52	--	0.19	--	217.6	1
2005-12-29	--	1000	6.7	6.77	--	--	2	77	--	9.85	-2.77	0.1	--	0.01	--	0.02	--	15.6	1
2006-03-27	--	1000	7.2	7.39	--	--	9	518	--	69.61	-62.6	0.48	--	0.49	--	0.08	--	175.4	4
2006-05-31	--	609	7	7.03	--	--	20	548	--	80.8	-72.92	0.51	--	0.53	--	0.22	--	153.2	4
2006-09-19	--	799	7.4	7.33	--	--	16	397	--	62.84	-30.35	0.69	--	0.18	--	0.36	--	104.8	2
2006-10-03	--	--	7.67	6.9	220	--	12.6	400	67	57.92	-42.62	0.43	0.17	0.22	0.21	0.11	0.08	89	2
2015-09-14	--	1400	8.07	7.68	72	8.53	13.4	704	135	105.13	-86.96	1.22	0.11	1.20	0.92	0.33	0	195.6	12
2015-11-10	--	--	8.30	7.44	195	9.89	8.6	589	106	82.90	-68.46	0.54	0.14	0.48	0.46	0.16	0	168.7	0
2016-03-21	--	3600	7.98	7.71	105	12.58	4.7	582	75	81.72	-74.84	0.55	0	0.34	0.30	0	0	161.7	0
Minimum:		129	6.5	6.43	72	8.53	0	77	52	9.85	-86.96	0.1	0	0.01	0.21	0	0	15.6	0
Maximum:		3600	8.30	7.82	220	12.58	24	704	135	105.13	0	1.22	0.17	2.6	0.92	0.36	0.18	322.1	12
Average:		995.9	--	7.21	148	10.33	13.2	414	90.78	68.24	-36.42	0.53	0.11	0.7	0.47	0.13	0.04	163.5	4.1
Range:		3471	1.8	1.39	148	4.05	24	627	83	95.28	86.96	1.12	0.17	2.59	0.71	0.36	0.18	306.5	12
Median:		1000	7.2	7.47	150	9.89	15.5	398	92	69.81	-42.81	0.5	0.13	0.55	0.38	0.12	0.01	165	3.5
Loading (lb/day):									2754	838.13	-528.73	6.91	0.92	7.11	14.21	1.5	0		

BC16 Passive System Data

BC16 Water Quality Report - BC16A

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2009-04-29	--	70	6.43	6.34	31	0.09	10.5	1086	138	113.01	-28.17	43.90	--	8.54	--	0.04	--	421.2	22
2009-09-23	--	20	6.49	6.36	15	0.12	11.1	1030	133	110.23	-30.95	34.61	--	7.23	--	0.04	--	392.1	14
2009-12-16	--	--	6.43	6.29	--	--	4.5	1045	128	97.26	-42.21	22.88	--	6.65	--	0.04	--	359.2	14
2010-05-04	--	40	6.73	6.59	39	0.08	10.9	1142	147	122.20	-45.34	43.42	--	8.19	--	0	--	434.7	3
2012-05-24	--	--	--	6.1	--	--	--	1021	--	102.49	-48.36	40.88	--	9.24	--	0	--	393.6	26
2013-11-28	--	--	6.5	--	--	--	45	--	90	--	--	--	--	--	--	--	--	--	--
2014-02-24	--	--	6.5	--	--	--	48	--	108	--	--	--	--	--	--	--	--	--	--
2014-03-27	--	--	6.5	--	--	--	50	--	144	--	--	--	--	--	--	--	--	--	--
2014-04-28	--	--	6.5	--	--	--	50	--	136	--	--	--	--	--	--	--	--	--	--
2015-05-19	--	--	6.79	6.12	50	0.31	11	1188	132	103.01	-13.26	33.36	--	7.61	--	0.1	--	411.4	26
Minimum:		20	6.43	6.1	15	0.08	4.5	1021	90	97.26	-48.36	22.88	--	6.65	--	0	--	359.2	3
Maximum:		70	6.79	6.59	50	0.31	50	1188	147	122.20	-13.26	43.90	--	9.24	--	0.1	--	434.7	26
Average:		43.3	6.53	6.27	33.8	0.15	26.8	1085	128.44	108.03	-34.72	36.51	--	7.91	--	0.04	--	402	17.5
Range:		50	0.36	0.49	35	0.23	45.5	167	57	24.94	35.1	21.02	--	2.59	--	0.1	--	75.5	23
Median:		40	6.5	6.32	35	0.11	11.1	1066	133	106.62	-36.58	37.75	--	7.9	--	0.04	--	402.5	18
Loading (lb/day):									72.8	60.01	-17.62	22.01	--	4.28	--	0.01	--		

Sample Point Description: Influent to BC16 passive system

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

BC16 Water Quality Report - 903SP

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2009-04-29	--	70	6.45	6.28	85	2.30	12.1	1114	134	95.03	-36.25	40.48	--	8.47	--	0.04	--	416.7	9
2009-09-23	--	20	6.38	6.29	54	1.83	11.6	1024	130	95.83	-44.62	30.32	--	7.44	--	0.04	--	398.8	22
2009-12-16	--	--	7.08	6.45	--	--	1.4	1003	119	76.13	-63.24	29.29	--	5.96	--	0.04	--	369.5	55
2010-05-04	--	--	6.70	6.63	48	3.18	16.4	1082	139	99.82	-56.99	40.89	--	8.24	--	0	--	443.1	37
2013-11-28	--	--	6.6	--	--	--	46	--	120	--	--	--	--	--	--	--	--	--	--
2014-02-24	--	--	6.6	--	--	--	44	--	72	--	--	--	--	--	--	--	--	--	--
2014-03-27	--	--	6.6	--	--	--	52	--	116	--	--	--	--	--	--	--	--	--	--
2014-04-28	--	--	144	--	--	--	53	--	144	--	--	--	--	--	--	--	--	--	--
Minimum:		20	6.38	6.28	48	1.83	1.4	1003	72	76.13	-63.24	29.29	--	5.96	--	0	--	369.5	9
Maximum:		70	144	6.63	85	3.18	53	1114	144	99.82	-36.25	40.89	--	8.47	--	0.04	--	443.1	55
Average:		45	6.65	6.39	62.3	2.44	29.6	1056	121.75	91.7	-50.28	35.25	--	7.53	--	0.03	--	407	30.8
Range:		50	137.62	0.35	37	1.35	51.6	111	72	23.69	26.99	11.6	--	2.51	--	0.04	--	73.6	46
Median:		45	6.6	6.37	54	2.30	30.2	1053	125	95.43	-50.81	35.4	--	7.84	--	0.04	--	407.8	29.5
Loading (lb/day):									71.88	51.41	-20.58	20.64	--	4.45	--	0.02	--		

Sample Point Description: Effluent of Settling Pond that captures the BC16 mine discharge.

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

BC16 Water Quality Report - 903WL

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2009-04-29	--	70	7.11	6.56	139	8.61	16.9	1068	81	67.90	-48.66	22.72	--	8.19	--	0.04	--	396.4	10
2009-09-23	--	20	7.59	7.10	148	8.23	23.0	994	78	73.86	-63.32	0.49	--	3.30	--	0.04	--	354.4	3
2009-12-16	--	--	6.88	6.61	--	--	0.1	810	73	71.07	-54.90	0.33	--	2.80	--	0.04	--	252.6	7
2010-05-04	--	--	7.24	7.04	148	7.88	21.0	1056	78	72.40	-65.52	0.88	--	5.68	--	0	--	417.8	9
2012-05-24	--	60	--	6.45	--	--	--	984	--	77.94	-64.87	0.12	--	3.89	--	0.04	--	392.2	0
2013-11-28	--	--	6.7	--	--	--	32	--	14	--	--	--	--	--	--	--	--	--	--
2014-02-24	--	--	6.6	--	--	--	32	--	40	--	--	--	--	--	--	--	--	--	--
2014-03-27	--	--	64	--	--	--	40	--	6.7	--	--	--	--	--	--	--	--	--	--
2014-04-28	--	--	6.6	--	--	--	55	--	64	--	--	--	--	--	--	--	--	--	--
2015-05-19	--	--	6.98	6.59	190	7.94	25.6	1130	68	53.67	-42.23	0.6	--	6.54	--	0	--	394.3	0
Minimum:		20	6.6	6.45	139	7.88	0.1	810	6.7	53.67	-65.52	0.12	--	2.80	--	0	--	252.6	0
Maximum:		70	64	7.10	190	8.61	55	1130	81	77.94	-42.23	22.72	--	8.19	--	0.04	--	417.8	10
Average:		50	6.91	6.66	156.3	8.17	27.3	1007	55.86	69.47	-56.58	4.19	--	5.07	--	0.03	--	368	4.8
Range:		50	57.4	0.65	51	0.73	54.9	320	74.3	24.27	23.29	22.6	--	5.39	--	0.04	--	165.2	10
Median:		60	6.98	6.6	148	8.09	25.6	1025	68	71.74	-59.11	0.55	--	4.79	--	0.04	--	393.3	5
Loading (lb/day):									43.38	43.63	-34.26	6.43	--	3.49	--	0.02	--		

Sample Point Description: Effluent of aerobic wetland treating BC16 discharge

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

BC16 Water Quality Report - 903HFLB

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2009-04-29	--	70	7.15	7.07	238	8.30	13	1102	83	89.52	-73.88	1.63	--	7.01	--	0.04	--	407.7	3
2009-09-23	--	20	7.60	7.20	176	6.36	22.4	1047	90	83.97	-69.55	0.04	--	0.02	--	0.04	--	356.4	1
2009-12-16	--	--	7.40	6.95	--	--	1.1	806	76	85.22	-71.76	0.07	--	0.10	--	0.04	--	249.5	9
2010-05-04	--	40	7.41	7.40	179	6.82	16.6	1012	89	83.90	-75.09	0.08	--	0.39	--	0	--	388.3	0
2012-05-24	--	25	--	6.79	--	--	--	1051	--	100.96	-85.77	0.14	--	0.03	--	0	--	367.2	0
2013-11-28	--	--	6.9	--	--	--	33	--	20	--	--	--	--	--	--	--	--	--	--
2014-02-24	--	--	6.8	--	--	--	34	--	20	--	--	--	--	--	--	--	--	--	--
2014-03-27	--	--	76	--	--	--	35	--	6.9	--	--	--	--	--	--	--	--	--	--
2014-04-28	--	--	6.7	--	--	--	50	--	72	--	--	--	--	--	--	--	--	--	--
2015-05-19	--	--	7.63	7.22	215	6.54	19.5	1171	89	86.94	-65.48	0.18	--	0.55	--	0.12	--	394.3	6
2015-09-14	--	--	7.65	7.39	147	7	15	1141	88	90.69	-78.01	0	0	1.15	0.96	0.13	0	391.2	6
Minimum:		20	6.7	6.79	147	6.36	1.1	806	6.9	83.90	-85.77	0	--	0.02	0.96	0	--	249.5	0
Maximum:		70	76	7.40	238	8.30	50	1171	90	100.96	-65.48	1.63	--	7.01	0.96	0.13	--	407.7	9
Average:		38.8	7.15	7.09	191	7	24	1047	63.39	88.74	-74.22	0.31	--	1.32	0.96	0.05	--	364.9	3.6
Range:		50	69.3	0.61	91	1.94	48.9	365	83.1	17.06	20.29	1.63	--	6.99	0	0.13	--	158.2	9
Median:		32.5	7.41	7.20	179	6.82	21	1051	79.5	86.94	-73.88	0.08	--	0.39	0.96	0.04	--	388.3	3
Loading (lb/day):									44.68	41.48	-35.13	0.36	--	1.52	--	0.01	--		

Sample Point Description: Final Effluent of BC16 passive treatment system which flows from the Horizontal Flow Limestone Bed

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

BC19 & BC19B Passive System Data

BC19 & 19B Water Quality Report - BC19

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1997-01-28	Estimated	30	--	6.7	--	--	--	--	--	168	0	14.5	--	7.1	--	0.14	--	425	24
1997-03-11	--	--	--	6.6	--	--	--	--	--	190	0	25.7	--	7.33	--	0.16	--	364	36
2000-03-30	Estimated	40	--	6.4	--	--	--	--	--	170	0	26.2	--	6.88	--	0.25	--	659.4	36
2000-06-28	--	--	--	6.4	--	--	--	--	--	198	0	27	--	7.59	--	0.25	--	467.2	14
2001-09-28	Measured	30	--	6.5	--	--	--	--	--	256	0	25.4	--	7.57	--	0.25	--	--	--
2001-11-07	Measured	20	--	6.5	--	--	--	--	--	230	0	28.8	--	8.47	--	0.25	--	659.8	12
2004-05-06	--	--	6.3	6.48	--	--	11	1200	180	146.34	-92.63	32.22	31.73	7.07	6.7	0.04	0	402.2	16
2009-04-29	--	5	6.47	6.42	109	2.47	12.5	1217	169	122.06	-60.68	36.99	--	8.54	--	0.04	--	523.4	8
2009-09-23	--	25	6.45	6.29	36	1.06	13.4	1086	160	109.31	-74.17	37.06	--	8.18	--	0.04	--	403.2	34
2009-12-16	--	12	6.71	6.17	50	2.00	--	1053	156	91.96	-64.61	35.34	--	6.92	--	0.04	--	400.4	23
2010-05-04	--	13	6.74	6.50	65	2.16	13.0	1240	167	131.71	-75.09	46.00	--	8.72	--	0	--	470.2	25
2012-05-24	--	--	--	6.16	--	--	--	1108	--	105.5	-74.43	25.12	--	8.99	--	0	--	459.6	33
2015-05-19	--	--	6.59	6.01	48	1.77	15.3	1327	150	81.28	-16.32	38.97	4.59	10.71	10.44	0.11	0	514.4	54
2015-06-17	--	20	6.46	5.87	63	0.25	12.9	1316	154	88.06	-12.24	57.09	52.27	11.20	10.79	0	0	504.8	34
2015-09-14	--	25	6.67	6.12	45	2.34	14.6	1297	134	78.20	-11.74	57.36	56.62	12.42	11.40	0	0	540.1	47
2015-10-21	--	20	6.34	5.85	92	2.25	12.4	1177	131	47.17	-33.23	48.63	45.18	9.93	9.61	0	0	481.8	48
2015-11-10	--	25	6.38	6.02	97	3.72	10.7	1166	133	102.97	-5.57	44.27	39.21	9.40	8.56	0.15	0.11	496.2	11
2015-12-15	--	20	6.45	6.13	72	3.42	9.8	1257	141	81.38	1.59	63.76	56.82	12.64	11.80	0	0	594.8	36
2016-03-21	--	30	6.52	5.99	6	5.74	10.1	1299	137	52.34	-45.14	70.23	61.75	13.46	13.41	0	0	638.4	14
Minimum:		5	6.3	5.85	6	0.25	9.8	1053	131	47.17	-92.63	14.5	4.59	6.88	6.7	0	0	364	8
Maximum:		40	6.74	6.7	109	5.74	15.3	1327	180	256	1.59	70.23	61.75	13.46	13.41	0.25	0.11	659.8	54
Average:		22.5	6.49	6.2	62.1	2.47	12.3	1211	151	128.96	-29.7	38.98	43.52	9.11	10.34	0.09	0.01	500.3	28.1
Range:		35	0.44	0.85	103	5.49	5.5	274	49	208.83	94.22	55.73	57.16	6.58	6.71	0.25	0.11	295.8	46
Median:		22.5	6.47	6.29	63	2.25	12.5	1217	152	109.31	-12.24	36.99	48.73	8.54	10.62	0.04	0	489	29
Loading (lb/day):									33.83	34.89	-5.63	11.14	14.67	2.53	3.09	0.03	0.01		

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

BC19 & 19B Water Quality Report - BC19B

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2000-03-30	--	20	--	6.5	--	--	--	--	--	248	--	26.2	--	7.78	--	0.25	--	544.9	20
2000-06-28	--	24	--	6.4	--	--	--	--	--	280	--	30.7	--	9.34	--	0.25	--	573.7	8
2004-03-25	--	25.5	6.3	6.38	--	--	--	1412	--	217.14	-169.49	32.74	31.33	6.98	6.86	0.02	0.02	496.1	19
2004-05-06	--	35	6.3	6.59	--	--	10	1350	258	221.09	-182.13	27.36	26.82	6.03	6	--	--	578.4	21
2004-10-18	--	--	--	6.7	--	--	--	--	--	241.6	-84	28.6	--	7.71	--	--	--	425.5	12
2004-10-21	--	--	6	6.6	--	--	10	1350	252	220.02	-147.84	28.82	28.23	6.13	6.05	0.12	0.09	585	13
2005-01-12	--	--	6.1	6.53	--	--	10	1365	255	246.54	-129.75	28.34	9.03	6.82	6.48	0.04	--	653.3	7
2005-02-01	--	27	--	6.5	--	--	--	--	--	260.2	-82.6	25.6	--	6.67	--	--	--	448.3	8
2005-04-06	--	--	6	6.68	--	--	10	1246	--	215.68	-166.53	27.38	26.26	7.07	6.81	0.02	0.02	553.8	3
2005-05-09	--	27	--	6.5	--	--	--	--	--	260.2	-82.6	25.6	--	6.67	--	--	--	451.6	10
2005-08-02	--	37.5	--	6.7	--	--	--	--	--	237.6	-126.4	24.7	--	6.47	--	0.25	--	419.7	14
2005-11-09	--	37.5	--	6.5	--	--	--	--	--	203.2	-89.8	26.1	--	6.1	--	0.25	--	483.9	8
2006-02-08	--	37.5	--	6.64	--	--	--	--	--	228.2	-115.4	30.5	--	7.79	--	0.25	--	505.1	1.5
2006-05-09	--	37.5	--	6.5	--	--	--	--	--	229.4	-147	26.2	--	6.21	--	0.25	--	451.1	16
2006-10-03	--	30	6.56	6.54	81	--	12.6	1374	240	196.17	-152.51	31.58	17.48	6.62	6.26	0.08	0.04	409.1	4
2008-09-26	--	30	6.53	6.62	--	0.25	10.2	1117	213	152.26	-114.85	9.46	--	6.55	--	0.11	--	382.2	2
2008-12-18	--	40	6.53	6.38	--	0.34	10.2	1432	198	149.09	-86.68	43.09	--	8.70	--	0.86	--	523.5	16
2009-04-29	--	50	6.48	6.49	6	0.25	10.3	1304	217	164.10	-99.29	29.80	--	6.98	--	0.04	--	478.3	14
2009-09-23	--	45	6.52	6.38	38	0.09	10.7	1181	209	173.85	-108.94	29.76	--	6.61	--	0.04	--	427.6	10
2009-12-16	--	60	6.59	6.40	40	0.23	9.9	1219	199	138.56	-111.35	33.86	--	6.70	--	0.04	--	471.3	27
2010-05-04	--	55	6.66	6.58	70	0.21	11.7	1319	222	191.64	-126.88	37.14	--	7.15	--	0	--	454.4	8
2012-05-24	--	30	--	6.27	--	--	--	1118	--	169.1	-140.89	31.19	--	7.29	--	0	--	436.1	25
2015-05-19	--	40	7.01	6.20	43	1.00	10.4	1318	190	132.74	-42.64	29.53	6.87	7.85	7.32	0.16	0	514.4	40
2015-06-17	--	48	6.25	6.02	52	0.26	10.7	1303	186	132.84	-69.56	39.31	37.93	7.89	7.55	0.10	0	546.1	47
2015-08-11	--	48	5.85	6.36	60	0.32	10.7	1274	177	126.93	-91.94	37.05	35.87	8.19	8.00	0.15	0.08	542.5	16
2015-09-14	--	52	7.08	6.30	--	0.88	11.6	1262	173	134.49	-92.54	45.54	38.82	8.63	8.11	0	0	540.1	26
2015-10-21	--	50	5.99	6.17	68	0.39	10.7	1194	174	108.23	-82.59	37.24	36.66	7.50	7.40	0.12	0	496.2	22
2015-11-10	--	50	6.74	6.12	60	0.38	10.5	1245	174	131.43	-55.92	37.42	36.11	7.72	7.37	0	0	591.1	11
2015-12-15	--	60	6.44	6.34	70	0.25	10.5	1294	170	128.61	-41.79	62.61	45.93	10.00	8.32	0	0	630.6	14
2016-03-21	--	60	6.45	6.21	--	0.20	10.3	1295	183	124.01	-88.31	53.56	46.90	9.48	9.07	0	0	595.9	20
Minimum:		20	5.85	6.02	6	0.09	9.9	1117	170	108.23	-182.13	9.46	6.87	6.03	6	0	0	382.2	1.5
Maximum:		60	7.08	6.7	81	1.00	12.6	1432	258	280	-41.79	62.61	46.90	10.00	9.07	0.86	0.09	653.3	47
Average:		40.6	6.31	6.4	53.5	0.36	10.6	1284	205	188.76	-108.22	32.57	30.3	7.39	7.26	0.13	0.02	507	15.4
Range:		40	1.23	0.68	75	0.91	2.7	315	88	171.77	140.34	53.15	40.03	3.97	3.07	0.86	0.09	271.1	45.5
Median:		38.8	6.47	6.5	60	0.26	10.4	1295	198.5	193.91	-104.12	30.15	33.6	7.11	7.35	0.09	0	500.7	14
Loading (lb/day):									110.66	83.53	-50.67	17.16	18.88	3.69	4.16	0.06	0.01		

BC19 & 19B Water Quality Report - 905 WL

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2004-10-18	--	--	--	7.2	--	--	--	--	--	173.8	-107.8	13	--	7.61	--	0.25	--	442.6	18
2005-01-12	Bucket	56	7.2	6.93	--	--	9	1060	143	139.66	-110.54	12.56	9.92	5.45	5.45	0.17	0	473.2	4
2005-02-01	Measured	48	--	7.2	--	--	--	--	--	172.6	-113.8	15.1	--	7	--	0.25	--	363.8	36
2005-04-06	Bucket	64	7.3	7.59	--	--	19.5	12	--	164.39	-147.62	3.99	1.29	6.47	6.41	0.02	0.02	751.4	4
2005-05-09	Measured	66	--	7.4	--	--	--	--	--	172.8	-130.6	1.44	--	4.42	--	0	--	422.8	12
2005-08-02	Measured	67	--	7.2	--	--	--	--	--	162.8	-81.8	5.73	--	6.57	--	0.25	--	371.1	14
2005-11-09	Measured	75	--	6.9	--	--	--	--	--	133.2	-36.4	26.7	--	6.18	--	0.25	--	438.9	68
2006-02-08	Measured	67	--	7	--	--	--	--	--	140	-42.4	4.84	--	6.95	--	0.25	--	418.1	12
2006-05-09	--	--	--	7	--	--	--	--	--	156	-86	2.69	--	5.43	--	0.25	--	418.1	12
2006-08-03	Measured	52	--	6.8	--	--	--	--	--	161.2	-136.8	3.57	--	6.13	--	0.25	--	403.8	4
2006-10-03	Bucket	66	6.89	6.89	--	--	15	1240	157	148.26	-120.8	3.52	2.88	3.88	3.79	0.11	0.07	403.2	2
2008-09-26	--	45	6.86	7.07	--	6.19	14.7	1015	142	129.47	-96.33	5.87	--	6.21	--	0.11	--	353.4	1
2008-12-18	--	50	7.13	6.71	--	9.99	6.0	1200	127	105.57	-79.59	11.78	--	6.88	--	0.81	--	381.2	1
2009-04-29	--	55	7.04	6.86	131	8.63	12.3	1268	160	129.35	-111.90	13.18	--	7.04	--	0.04	--	512.1	7
2009-09-23	--	70	6.79	6.68	47	7.14	15.7	1147	151	129.89	-90.65	9.01	--	6.49	--	0.04	--	392.1	16
2009-12-16	--	72	7.09	6.90	48	11.53	1.3	1154	130	109.86	-91.05	10.73	--	5.24	--	0.04	--	435.3	18
2010-05-04	--	68	7.11	7.22	108	7.54	15.7	1207	148	130.53	-122.51	8.44	--	6.01	--	0	--	428.0	10
2012-05-24	--	--	--	6.84	--	--	--	1112	--	143.56	-127.96	3.18	--	5.55	--	0.06	--	436.1	0
2015-05-19	--	--	6.90	6.47	49	6.22	21.6	1293	132	94.30	-65.08	20.94	3.80	10.31	8.85	0	0	514.4	46
2015-06-17	--	70	6.50	6.12	100	6.05	17.5	1249	--	88.71	-68.34	19.06	15.83	9.07	8.57	0	0	504.8	27
2015-08-11	--	70	6.41	6.59	100	5.88	19.5	1252	120	93.63	-77.61	16.58	15.52	9.46	8.87	0	0	542.5	22
2015-09-14	--	70	6.94	6.32	33	5.80	20.5	1236	129	88.65	-73.65	24.86	24.50	11.26	8.22	0	0	496.3	33
2015-10-21	--	70	6.46	6.62	--	8.30	15.7	1190	118	80.57	-56.91	16.90	15.30	8.23	8.04	0.14	0	510.6	26
2015-11-10	--	75	6.76	6.31	106	7.31	10.9	1065	119	72.29	-53.13	19.93	19.37	7.10	7.08	0	0	438.5	24
2015-12-15	--	80	6.96	6.62	74	8.69	8.4	1252	126	79.28	-36.82	29.95	29.42	10.17	9.51	0	0	559.1	42
2016-01-28	--	80	6.35	6.67	48	9.77	6.5	1279	122	83.63	-74.84	24.05	10.11	9.50	9.33	0	0	671.5	30
2016-02-23	--	90	--	6.78	--	--	--	1272	123	81.09	-70.29	24.60	22.92	9.60	9.50	0.18	0.11	498.7	34
2016-03-21	--	90	7.15	6.75	--	9.81	11.3	1291	126	90.56	-81.58	33.19	26.15	10.58	9.77	0	0	595.9	45
2016-04-27	--	100	6.69	6.75	62	7.73	16.8	1266	116	94.92	-80.20	17.74	15.53	8.97	8.72	0.13	0	508.3	32
Minimum:		45	6.35	6.12	33	5.80	1.3	12	116	72.29	-147.62	1.44	1.29	3.88	3.79	0	0	353.4	0
Maximum:		100	7.3	7.59	131	11.53	21.6	1293	160	173.8	-36.4	33.19	29.42	11.26	9.77	0.81	0.11	751.4	68
Average:		68.6	--	6.72	75.5	7.91	13.6	1146	132.72	122.43	-88.72	13.9	15.18	7.37	8.01	0.12	0.01	471.9	20.7
Range:		55	0.95	1.47	98	5.73	20.3	1281	44	101.51	111.22	31.75	28.13	7.38	5.98	0.81	0.11	398	68
Median:		70	6.90	6.84	68	7.64	15	1236	128	129.47	-81.8	13	15.53	6.95	8.65	0.06	0	438.9	18
Loading (lb/day):									111.79	95.32	-69.85	12.8	15.13	6.25	7.36	0.09	0.01		

McIntire Passive System Data

McIntire Water Quality Report - MC1

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1997-01-27	--	--	--	3.9	--	--	--	2960	--	--	919	372	--	96.1	--	36.8	--	2200	0
2000-02-02	--	--	4.1	4.42	--	--	11	2571	--	0	827.19	372.5	368.75	90	88.75	25.15	24.35	2411.4	1
2001-01-15	--	--	4.3	3.88	--	--	7	2804	--	0	901.32	348.75	308.75	95	87.25	21.4	20.6	2606.4	8
2001-02-05	--	--	3.9	3.99	--	--	4	2812	--	0	776.83	336.25	--	69	--	24.4	--	2227.4	13
2001-04-19	--	20	--	3.8	--	--	--	--	--	0	1042	300	--	83.6	--	61.7	--	2951.9	--
2001-05-08	--	15	--	3.9	--	--	--	--	--	0	998	300	--	87.9	--	67	--	1688.9	26
2001-09-28	--	2	--	4.5	--	--	--	--	--	16.4	1057.2	319	--	77.3	--	20.6	--	--	10
2001-11-07	--	0.8	--	4.5	--	--	--	--	--	13.6	1190.4	300	--	89.4	--	22.5	--	2092.8	14
2002-02-07	--	12	--	4.2	--	--	--	--	--	10.6	1118.8	300	--	85.4	--	33.5	--	1843	--
2002-05-02	--	--	--	3	--	--	--	--	--	0	1184.8	268	--	82.6	--	79	--	2154	60
2002-10-15	--	12	--	2.8	--	--	--	--	--	0	1064.8	316	--	99.5	--	37.3	--	2127.6	--
2002-11-21	--	--	--	2.8	--	--	--	--	--	0	945.4	316	--	96.3	--	29.5	--	1908	--
2002-12-20	--	40	--	3.1	--	--	--	--	--	0	608.6	208	--	59.1	--	17.5	--	1179.2	--
2003-01-14	--	--	--	2.9	--	--	--	--	--	0	1028.4	331	--	88.6	--	41.2	--	2570	--
2003-02-12	--	--	--	3	--	--	--	--	--	0	987.2	298	--	91.9	--	43.2	--	2032.4	--
2003-03-12	--	40	--	3	--	--	--	--	--	0	962.4	296	--	81.1	--	49.5	--	1863.1	--
2003-05-01	--	35	--	2.8	--	--	--	--	--	0	1062.2	275	--	105	--	68.3	--	1834.8	--
2003-06-25	--	--	--	2.8	--	--	--	--	--	0	1135.4	271	--	95.3	--	58.09	--	2094	--
2003-07-23	--	--	--	2.8	--	--	--	2930	--	0	1012.2	248	--	84.4	--	50	--	1976	--
2003-12-10	--	--	--	3.8	--	--	--	2910	--	0	1068.6	361	--	75.2	--	54.1	--	2215.5	--
2006-07-18	--	5	--	2.6	--	--	--	--	--	0	803.8	139.2	--	--	66.69	--	41.58	1738.1	8
2006-09-12	--	5	--	2.8	--	--	--	--	--	0	839.8	183	--	68.9	--	49	--	1389.5	12
2009-04-29	--	dripping	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2009-09-23	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum:		0	3.9	2.6	--	--	4	2571	--	0	608.6	139.2	308.75	59.1	66.69	17.5	20.6	1179.2	0
Maximum:		dripping	4.3	4.5	--	--	11	2960	--	16.4	1190.4	372.5	368.75	105	88.75	79	41.58	2951.9	60
Average:		15.6	--	--	--	--	7.3	2831	--	1.93	978.83	293.58	338.75	85.79	80.9	42.37	28.84	2052.6	15.2
Range:		40	0.4	1.9	--	--	7	389	--	16.4	581.8	233.3	60	45.9	22.06	61.5	20.98	1772.7	60
Median:		12	4.1	3.05	--	--	7	2861	--	0	1005.1	300	338.75	87.9	87.25	41.2	24.35	2092.8	11
Loading (lb/day):									--	0.19	189.01	54.71	--	18.07	4	10.15	2.49		

Sample Point Description: Abandoned Mine Discharge; Located on the H&D Coal Company bond forfeiture "McIntire" mine site; Sampled at 6" pipe into a blue barrel flowing into existing treatment pond (TB1); Typically does not flow any more; PA DEP sampling point

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

McIntire Water Quality Report - MC2

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1997-01-27	--	--	--	3.2	--	--	--	2940	--	--	785	272	--	90.4	--	32	--	2000	8
2000-01-15	--	8.5	3.2	3.27	--	--	7	2854	--	0	828.24	320	308.75	93.25	89	21.3	19.1	2397.6	21
2000-02-02	--	--	--	3.18	--	--	4	2768	--	0	719.73	297	269.5	93.25	91.5	25.15	22.6	2187.7	40
2001-02-05	--	15.5	3.1	3.26	--	--	5	2820	--	0	799.68	288.75	232.5	83	79.25	23.95	23.2	2242.5	9
2002-07-22	--	22	3.32	--	--	--	--	3450	--	0	1166	377.98	--	90.44	--	55.74	--	2279.9	--
2004-04-02	--	--	3.13	--	--	--	--	--	--	0	942	296	272	76.5	70.4	73.6	67.3	2262	--
2006-10-04	--	30	2.75	2.94	699	--	14	2926	--	0	754.27	349	121	90.87	73.18	51.96	36.9	1634.5	10
2009-04-29	--	45	3.00	2.88	450	6.58	14.4	2864	0	0	672.22	158.00	152.00	59.34	59.17	51.33	50.96	1779.3	43
2009-09-23	--	18	2.71	2.81	492	4.68	19.7	2776	0	0	743.90	225.00	206.00	66.48	66.30	35.18	34.68	2082.6	10
2009-12-16	--	13	3.15	2.91	460	5.82	3.4	2736	0	0	618.69	208.00	189.00	83.75	65.98	29.86	7.60	2290.5	4
2010-01-20	--	16	3.14	3.07	460	5.64	3.7	2541	0	0	578.77	230.00	225.00	58.96	57.60	26.80	26.23	1925.4	8
		16	3.14	3.07	460	5.64	3.7	2541	0	0	578.77	230.00	225.00	58.96	57.60	26.80	26.23	1925.4	8
2010-05-05	--	28	3.24	2.89	484	4.75	19.3	2755	0	0.00	716.56	289.00	191.00	76.61	63.62	60.32	56.03	2030.1	1
2012-03-29	--	43	3	3.05	431	--	--	2337	--	0	631.63	160	152	66.98	63.94	54.21	45.42	2114.9	0
2012-04-27	--	30	3	3.02	450	--	--	2398	--	0	616.5	172	172	66.09	59.24	46.71	44.65	2180.2	5
2014-03-22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2015-05-19	--	--	2.81	2.88	510	6.46	19.4	2710	0	0	684.42	127	--	44.91	--	56.94	--	1457.3	7
2015-11-11	--	50	2.93	2.87	490	4.75	10.1	2607	0	0	610.93	168	131	54.56	51.92	50.25	46.5	2334.1	0
2016-03-22	--	40	3.04	2.88	430	6.66	10.6	2689	0	0	630.63	146	141	52.76	50.2	64.46	63.32	1570.9	0
2017-05-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum:		8.5	2.71	2.81	430	4.68	3.4	2337	--	0	578.77	127	121	44.91	50.2	21.3	7.60	1457.3	0
Maximum:		50	3.32	3.27	699	6.66	19.7	3450	--	0	1166	377.98	308.75	93.25	91.5	73.6	67.3	2397.6	43
Average:		26.8	--	--	484.7	5.66	10.3	2748	--	0	726.55	239.65	199.18	72.62	66.59	43.7	38.05	2038.6	10.9
Range:		41.5	0.61	0.46	269	1.98	16.3	1113	--	0	587.23	250.98	187.75	48.34	41.3	52.3	59.7	940.3	43
Median:		25	3.07	2.98	460	5.64	10.1	2755	--	0	700.49	230	191.00	71.74	63.94	48.48	36.9	2098.8	8
Loading (lb/day):									--	0	230.85	71.89	55.68	22.65	20.72	16.25	14.78		

Sample Point Description: Abandoned Mine Discharge; Located on the H&D Coal Company bond forfeiture "McIntire" mine site; Sampled at 12" pipe flowing into existing treatment pond (TB1)

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

McIntire Water Quality Report - TB1

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
1996-11-15	--	47	--	3.3	--	--	--	--	--	0	898	244	--	71.2	--	28.5	--	1731.6	0
1997-01-27	--	--	--	3.3	--	--	--	2990	--	--	879	330	290	91.7	--	35.9	--	2100	0
2000-02-02	--	13.4	3.3	3.19	--	--	2.6	2670	--	0	774.87	288.5	284	89	86.5	23.25	21.2	2249.8	34
2001-01-15	--	9.5	2.9	3.02	--	--	2	2902	--	0	795.76	273.75	246.25	95.5	81.25	20.35	19.55	2516.9	5
2001-02-05	--	12.4	3	3.14	--	--	3	2572	--	0	671.16	257.5	218.25	71.25	69.5	20.6	16.9	1971.6	6
2002-07-22	--	22	2.86	--	--	--	--	3800	--	0	1151	250.25	252.16	28.23	28.93	57.63	58.48	2207.1	--
2004-04-02	--	--	2.85	--	--	--	--	--	--	0	840	195	182	67.6	63.4	58.7	54.5	1938	--
2004-05-28	--	--	2.88	--	--	--	--	--	--	0	817	--	183	--	70.1	--	41.6	1506	--
2009-04-29	--	45	2.84	2.78	491	8.69	16.7	2767	0	0	658.29	129.00	122.00	58.69	57.21	52.22	51.79	1734.2	33
2009-09-23	--	18	2.52	2.57	506	4.10	19.9	3065	0	0	764.20	165.00	165.00	75.01	66.71	35.94	25.58	1827.5	5
2009-12-16	--	13	2.91	2.89	474	1.69	2.6	2813	0	0	633.62	189.00	94.15	64.91	60.83	30.16	10.04	2111.6	13
2010-01-20	--	16	3.20	3.10	463	6.27	1.3	2485	0	0	572.25	225.00	206.00	60.54	55.28	54.39	27.86	1867.1	4
		16	3.20	3.10	463	6.27	1.3	2485	0	0	572.25	225.00	206.00	60.54	55.28	54.39	27.86	1867.1	4
2010-05-05	--	28	3.08	2.69	507	4.40	19.2	2801	0	0.00	662.48	204.00	165.00	62.49	61.49	56.60	54.55	1882.5	15
2012-03-29	--	43	3	2.93	453	--	--	2299	--	0	738.89	133	127	65.76	64.6	53.51	48.5	1707.2	0
2012-04-27	--	30	3	2.93	460	--	--	2518	--	0	632.02	164	163	65.59	65.41	48.12	46.5	2205.2	7
2012-05-24	--	17	2.73	2.89	461	5.82	26.3	2514	--	ND	651.53	167.00	149.00	71.64	71.04	51.38	50.63	1730.4	0
2014-03-22	--	--	--	--	--	--	48	--	4	--	--	--	--	--	--	--	--	--	--
2015-05-19	--	--	2.74	2.8	514	7	23.5	2774	0	0	643.62	139	--	42.96	--	55.75	--	1714.4	16
2017-05-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum:		9.5	2.52	2.57	453	1.69	1.3	2299	0	0	572.25	129.00	94.15	28.23	28.93	20.35	10.04	1506	0
Maximum:		47	3.3	3.3	514	8.69	48	3800	4	ND	1151	330	290	95.5	86.5	58.7	58.48	2516.9	34
Average:		23.6	--	--	479.2	5.53	13.9	2764	0.5	0	742	210.53	190.8	67.21	63.84	43.38	37.04	1937.1	9.5
Range:		37.5	0.78	0.73	61	7	46.7	1501	4	0	578.75	201	195.85	67.27	57.57	38.35	48.44	1010.9	34
Median:		17.5	2.91	2.93	468.5	6.05	9.9	2767	0	0	705.03	204.00	182.5	65.76	64.6	51.38	41.6	1874.8	5
Loading (lb/day):									0	0	216.88	56	44.89	18.94	16.55	12.77	11.2		

Sample Point Description: An existing treatment pond at the H&D (Adobe) "McIntire" minesite, which has since been incorporated into part of the passive treatment system; Prior to installation of the passive system, samples were generally sampled at the spillway as the effluent pipe had become plugged with low pH iron; TB1 receives the MC1, MC2, and MC3 mine discharges; Currently TB1 is sampled at the spillway of the pond as it enters the Oxidation Precipitation Channel. Prior to the passive system, TB1 flowed into an existing channel and was located upstream of sampling point TRX;

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

McIntire Water Quality Report - 902-OPC

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2012-01-27	--	--	3.86	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-29	--	43	3	3.02	527	--	--	2224	--	0	516.41	57.75	54.53	60.91	57.34	50.4	46.82	1458.6	5
2012-04-27	--	30	3	2.92	531	--	--	2404	--	0	426.26	42.92	38.79	63.46	56.28	38.1	37.85	1704.2	0
2012-05-24	--	17	2.85	2.96	524	7.19	31.1	2612	--	ND	412.33	20.32	19.38	66.18	65.31	45.82	40.25	2007.6	0
2014-03-22	--	--	--	--	--	--	34	--	--	--	--	--	--	--	--	--	--	--	--
2015-05-19	--	--	2.9	2.93	530	8.07	28.3	2876	0	0	379.64	9.11	--	39.78	--	41.69	--	1714.4	7
2016-03-22	--	--	3.11	2.83	510	12.9	6	2619	0	0	459.95	64.69	59.8	46.67	46.45	52.29	52.19	1485.2	6
2017-05-08	--	--	4.6	--	--	--	70	--	--	--	--	--	--	--	--	--	--	--	--
Minimum:		17	2.85	2.83	510	7.19	6	2224	--	0	379.64	9.11	19.38	39.78	46.45	38.1	37.85	1458.6	0
Maximum:		43	4.6	3.02	531	12.9	70	2876	--	ND	516.41	64.69	59.8	66.18	65.31	52.29	52.19	2007.6	7
Average:		30	--	--	524.4	9.39	33.9	2547	--	0	438.92	38.96	43.13	55.4	56.35	45.66	44.28	1674	3.6
Range:		26	1.75	0.19	21	5.71	64	652	--	0	136.77	55.58	40.42	26.4	18.86	14.19	14.34	549	7
Median:		30	3	2.93	527	8.07	31.1	2612	--	0	426.26	42.92	46.66	60.91	56.81	45.82	43.54	1704.2	5
Loading (lb/day):									--	0	168.01	16.47	15.35	22.59	21.06	16.36	15.33		

Sample Point Description: Effluent of the Oxidation and Precipitation Channel; Sampled at end of channel before entering the Auto-Flushing Vertical Flow Pond

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

McIntire Water Quality Report - 902-AFVFP

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2012-01-06	--	21.3	4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-13	--	31.7	4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-20	--	43.4	4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-27	--	--	4.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-03	--	23	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-04-24	--	26.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-05-24	--	17.6	4.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2014-03-22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2017-05-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum:		17.6	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Maximum:		43.4	4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Average:		27.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Range:		25.8	0.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Median:		24.9	4.35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Auto-Flushing Limestone Only Vertical Flow Pond; Receives water from the OPC and discharges into a settling pond; 902-AFVFP has both a siphon as well as an Agri-Drain SmartDrain to allow flushing of the limestone only treatment media

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

McIntire Water Quality Report - 902-AMD2

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2012-01-06	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-13	--	7.7	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-20	--	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-27	--	67	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-03	--	2.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-04-24	--	2.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-04-27	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-05-24	--	1.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2014-03-22	--	6	>4.5	--	--	--	52	--	4	--	--	--	--	--	--	--	--	--	--
2017-05-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum:		1	4	--	--	--	52	--	4	--	--	--	--	--	--	--	--	--	--
Maximum:		67	>4.5	--	--	--	52	--	4	--	--	--	--	--	--	--	--	--	--
Average:		10.8	--	--	--	--	52	--	4	--	--	--	--	--	--	--	--	--	--
Range:		66	0	--	--	--	0	--	0	--	--	--	--	--	--	--	--	--	--
Median:		3	4	--	--	--	52	--	4	--	--	--	--	--	--	--	--	--	--
Loading (lb/day):									0.29	--	--	--	--	--	--	--	--		

Sample Point Description: Additional mine drainage seep that does not enter TB1 but is collected in the pre-existing stream channel and directed into 902-SP via a check dam and 6" pipe.

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

McIntire Water Quality Report - 902-SP

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2012-01-06	--	29.5	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-13	--	31.6	4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-20	--	42	4.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-27	--	117	4.82	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-03	--	26	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-22	--	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-07	--	49	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-16	--	46	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-22	--	40	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-29	--	43	4.5	--	490	--	--	--	0	--	--	--	--	--	--	--	--	--	--
2012-04-24	--	32.5	4.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-04-27	--	30	4	3.1	509	--	--	2113	0	0	358.6	32.71	32.07	56.73	51.68	46.19	41.82	1716.7	10
2012-05-24	--	18	4.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2014-03-22	--	56.4	>4.5	--	--	--	40	--	4	--	--	--	--	--	--	--	--	--	--
2015-05-19	--	9	3.62	3.51	361	8.2	24.4	2284	0	0	270.91	2.22	--	33.64	--	36.59	--	1371.6	16
2016-03-22	--	35	3.35	3.22	460	11.9	6.5	1873	0	0	244.93	15.29	13.42	33.59	31.63	35.76	35.65	1000	0
2017-05-08	--	75	4.8	--	--	--	58	--	*	--	--	--	--	--	--	--	--	--	--
Minimum:		9	3.35	3.1	361	8.2	6.5	1873	*	--	244.93	2.22	13.42	33.59	31.63	35.76	35.65	1000	0
Maximum:		117	>4.5	3.51	509	11.9	58	2284	4	--	358.6	32.71	32.07	56.73	51.68	46.19	41.82	1716.7	16
Average:		42.2	--	--	455	10.05	32.2	2090	0.8	--	291.48	16.74	22.75	41.32	41.66	39.51	38.74	1362.8	8.7
Range:		108	1.47	0.41	148	3.7	51.5	411	4	--	113.67	30.49	18.65	23.14	20.05	10.43	6.17	716.7	16
Median:		38	4.1	3.22	475	10.05	32.2	2113	0	--	270.91	15.29	22.75	33.64	41.66	36.59	38.74	1371.6	10
Loading (lb/day):									0.54	--	87.07	6.15	8.59	12.72	15.94	11.87	15.01		

Sample Point Description: Settling Pond; Receives flow from the Auto-flushing Vertical Flow Pond; Sampled at effluent pipe; The discharge from this pond flows down a channel, through a culvert and into the Jennings Vertical Flow Pond.

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

McIntire Water Quality Report - 902-JVFP

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2012-01-06	--	11.5	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-13	--	15.6	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-20	--	22.4	7.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-27	--	239	7.91	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-03	--	26	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-22	--	38	5.74	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-07	--	44.5	5.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-16	--	46	6.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-22	--	31	6.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-29	--	24	7.2	7.26	-92	--	--	1916	168	153.32	-67.06	3.82	3.81	44.84	42.58	0	0	1224.6	14
2012-04-24	--	22.4	6.9	--	--	--	--	--	150	--	--	--	--	--	--	--	--	--	--
2012-04-27	--	18	7	6.98	-80	--	--	2275	190	173.04	-73.43	6.6	6.54	69.02	61.14	0.23	0	1466.2	23
2012-05-24	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2014-03-22	--	1.7	6.8	--	--	--	34	--	22.4	--	--	--	--	--	--	--	--	--	--
2015-05-19	--	2	7.3	6.91	-101	1.92	20	2322	210	194.94	-118.73	1.23	--	29.01	--	0.12	--	114.5	7
2015-11-11	--	45	7.16	6.99	-85	2.32	12.3	2009	129	123.78	-60.5	0.54	0.48	33.84	32.78	0.1	0.1	1120.6	0
2016-03-22	--	35	7.18	7.19	-56	2.46	8.9	1724	117	113.11	-78.21	2.91	2.62	27.54	25.63	0.1	0.1	871.3	0
2017-05-08	--	--	6.6	--	--	--	58	--	140	--	--	--	--	--	--	--	--	--	--
Minimum:		0	5.5	6.91	-101	1.92	8.9	1724	22.4	113.11	-118.73	0.54	0.48	27.54	25.63	0	0	114.5	0
Maximum:		239	7.91	7.26	-56	2.46	58	2322	210	194.94	-60.5	6.6	6.54	69.02	61.14	0.23	0.1	1466.2	23
Average:		36.6	--	--	-82.8	2.23	26.6	2049	140.8	151.64	-79.59	3.02	3.36	40.85	40.53	0.11	0.05	959.4	8.8
Range:		239	2.41	0.35	45	0.54	49.1	598	187.6	81.83	58.23	6.06	6.06	41.48	35.51	0.23	0.1	1351.7	23
Median:		24	7	6.99	-85	2.32	20	2009	145	153.32	-73.43	2.91	3.22	33.84	37.68	0.1	0.05	1120.6	7
Loading (lb/day):									36.29	40.11	-20.71	0.81	0.97	11.67	13.48	0.03	0.02		

Sample Point Description: Vertical Flow Pond; Receives the flow from 902-SP via a culvert and channel. The Vertical Flow Pond is a mixed treatment media based on the Vertical Flow Pond at the Jennings Environmental Education Center. The media consists of limestone, compost, and wood chips mixed together. Sampled at the effluent pipes; The effluent flows into the wetland

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

McIntire Water Quality Report - 902-WL

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2012-01-13	--	--	7.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-27	--	180	7.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-07	--	6.6	7	--	--	--	--	--	18	--	--	--	--	--	--	--	--	--	--
2012-03-16	--	15	7.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2014-03-22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2015-11-11	--	50	7.4	7.66	212	10.51	10.6	1661	84	77.84	-65.47	0.29	0	2.33	2.32	0.16	0	844.3	8
2016-03-22	--	40	8	7.79	71	11.87	3.7	1642	63	62.04	-52.87	0.16	0.11	0.26	0.23	0	0	871.3	0
2017-05-08	--	60	7	--	--	--	64	--	76	--	--	--	--	--	--	--	--	--	--
Minimum:		6.6	7	7.66	71	10.51	3.7	1642	18	62.04	-65.47	0.16	0	0.26	0.23	0	--	844.3	0
Maximum:		180	8	7.79	212	11.87	64	1661	84	77.84	-52.87	0.29	0.11	2.33	2.32	0.16	--	871.3	8
Average:		58.6	--	--	141.5	11.19	26.1	1652	60.25	69.94	-59.17	0.23	0.06	1.3	1.28	0.08	--	857.8	4
Range:		173.4	1	0.13	141	1.36	60.3	19	66	15.8	12.6	0.13	0.11	2.07	2.09	0.16	--	27	8
Median:		45	7.4	7.73	141.5	11.19	10.6	1652	69.5	69.94	-59.17	0.23	0.06	1.3	1.28	0.08	--	857.8	4
Loading (lb/day):									34.2	38.24	-32.33	0.13	0.03	0.76	0.75	0.05	--		

Sample Point Description: Effluent of the wetland; Receives the water from the Jennings Vertical Flow Pond (902-JVFP); Sampled at effluent pipe; Effluent flows into the Horizontal Flow Limestone Pond.

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

McIntire Water Quality Report - 902-HFLB1

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2014-03-22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2017-05-08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum:		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Maximum:		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Average:		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Range:		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Median:		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Loading (lb/day):									--	--	--	--	--	--	--	--	--		

Sample Point Description: Effluent of Horizontal Flow Limestone Bed 1; Receives influent from the wetland (902-WL). Flows into HFLB2.

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

McIntire Water Quality Report - 902-HFLB2

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2012-01-06	--	8.1	6.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-13	--	6.8	7.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-20	--	44	6.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-27	--	--	7.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-03	--	--	7.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-10	--	3	7.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-22	--	20	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-07	--	60	7	--	--	--	--	--	189	--	--	--	--	--	--	--	--	--	--
2012-03-16	--	65	6.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-22	--	28	6.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-29	--	30	7.2	7.4	100	--	--	1400	224	223.85	-184.87	0.1	0	2.14	2.08	0.05	0	611.7	0
2012-04-24	--	1	7.7	--	--	--	--	--	154	--	--	--	--	--	--	--	--	--	--
2012-04-27	--	0.5	8	7.64	--	--	--	536	77	71.75	-57.51	0.59	0	0	0	0.87	0	166.7	10
2014-03-22	--	--	6.8	--	--	--	43	--	46.4	--	--	--	--	--	--	--	--	--	--
2015-11-11	--	50	7.12	7.73	221	10.44	9.8	1579	81	72.98	-59.5	0	0	0	0	0.1	0.1	783.4	5
2016-03-22	--	60	7.25	7.43	--	9.43	6.6	1485	160	151.5	-142.16	0	0	0	0	0	0	742.6	0
2017-05-08	--	--	6.8	--	--	--	52	--	136	--	--	--	--	--	--	--	--	--	--
Minimum:		0.5	6.7	7.4	100	9.43	6.6	536	46.4	71.75	-184.87	0	--	0	0	0	0	166.7	0
Maximum:		65	8	7.73	221	10.44	52	1579	224	223.85	-57.51	0.59	--	2.14	2.08	0.87	0.1	783.4	10
Average:		29	7.02	--	160.5	9.94	27.9	1250	133.43	130.02	-111.01	0.17	--	0.54	0.52	0.26	0.03	576.1	3.8
Range:		64.5	1.3	0.33	121	1.01	45.4	1043	177.6	152.1	127.36	0.59	--	2.14	2.08	0.87	0.1	616.7	10
Median:		28	7.12	7.54	160.5	9.94	26.4	1443	145	112.24	-100.83	0.05	--	0	0	0.08	0	677.2	2.5
Loading (lb/day):									63.81	58.47	-51.24	0.01	--	0.19	0.19	0.02	0.02		

Sample Point Description: Effluent of Horizontal Flow Limestone Bed 2; Receives influent from 902-HFLB1; Sampled at effluent pipe. Flows via a channel into Settling Basin 1.

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.

McIntire Water Quality Report - SB1

Date	Method of Flow	Flow - Field (gal/min)	pH - Field (S.U.)	pH - Lab (S.U.)	ORP - Field (mvolts)	DO - Field (mg/L)	Temp - Field (C)	Cond - Lab (umhos/cm)	Alkalinity - Field (mg/L)	Alkalinity - Lab (mg/L)	Acidity - Lab (mg/L)	T. Fe - Lab (mg/L)	D. Fe - Lab (mg/L)	T. Mn - Lab (mg/L)	D. Mn - Lab (mg/L)	T. Al - Lab (mg/L)	D. Al - Lab (mg/L)	SO4 - Lab (mg/L)	TSS - Lab (mg/L)
2012-01-06	--	36	6.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-13	--	91	6.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-20	--	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-01-27	--	--	6.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-03	--	73	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-10	--	33	6.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-02-22	--	67	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-07	--	115	7.5	--	--	--	--	--	69	--	--	--	--	--	--	--	--	--	--
2012-03-16	--	132	7.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-22	--	45.2	7.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2012-03-29	--	38	7.5	7.6	160	--	--	987	96	86.66	-68.85	0.35	0	3.99	3.82	0.13	0	432.9	7
2012-04-24	--	35.3	7.4	--	--	--	--	--	78	--	--	--	--	--	--	--	--	--	--
2012-04-27	--	31	7.5	7.45	50	--	--	1072	93	77	-64.68	0.44	0.08	3.17	3	0.25	0	536.2	5
2012-05-24	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2014-03-22	--	15.8	6.8	--	--	--	40	--	5	--	--	--	--	--	--	--	--	--	--
2015-05-19	--	2	7.2	7.89	178	8.5	22.9	1150	127	129.03	-112.2	0.1	0	0.07	0	0	0	394.3	8
2015-09-16	--	0.5	6.83	7.66	100	8.24	21.9	971	147	126.29	-110.25	1.5	0.9	2.53	2.48	0	0	337.5	10
2015-11-11	--	50	6.7	6.79	237	9.81	11.5	964	93	70.51	-54.13	1.29	1.16	1.61	1.61	0.1	0	434.8	6
2016-03-22	--	60	7.93	7.94	--	11.3	7	1221	118	104.59	-93.06	0.91	0.38	0.33	0.29	0.12	0	570.9	0
2017-05-08	--	--	7	--	--	--	58	--	116	--	--	--	--	--	--	--	--	--	--
Minimum:		0	6.2	6.79	50	8.24	7	964	5	70.51	-112.2	0.1	0	0.07	0	0	--	337.5	0
Maximum:		132	7.93	7.94	237	11.3	58	1221	147	129.03	-54.13	1.5	1.16	3.99	3.82	0.25	--	570.9	10
Average:		48	--	--	145	9.46	26.9	1061	94.2	99.01	-83.86	0.77	0.42	1.95	1.87	0.1	--	451.1	6
Range:		132	1.73	1.15	187	3.06	51	257	142	58.52	58.07	1.4	1.16	3.92	3.82	0.25	--	233.4	10
Median:		39	7	7.63	160	9.16	22.4	1030	94.5	95.63	-80.96	0.68	0.23	2.07	2.05	0.11	--	433.9	6.5
Loading (lb/day):									39.14	31.6	-26.38	0.29	0.17	0.7	0.67	0.05	--		

Sample Point Description: Final Effluent of the McIntire passive treatment system; Existing Sediment Basin constructed during mining and built within the unnamed reconstructed "McIntire" tributary #15 to Blacks Creek; Receives flow from both the Horizontal Flow Bed 2 (HFLB2) as well as from the reconstructed stream channel sampled at RS2; This data represents all sampling conducted after the passive treatment system was constructed; Effluent represents the beginning of trib #15; Located upstream of BC4.1;

1. Records with no value are not included in statistical calculations.

2. Values lower than the minimum detection limit are assumed to be 0.

3. Average pH is not calculated as a mean of pH values, but rather a mean of hydronium ion concentration.

4. Dissolved metals used for calculated acidity values when available. Acidities calculated from total metals may be exaggerated.