CLEARFIELD CREEK WATERSHED TMDL

Clearfield and Cambria Counties

Prepared for:

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TABLE OF CONTENTS

FIGURES

TABLES

ATTACHMENTS

INTRODUCTION

Location

The Clearfield Creek Watershed is approximately 398 square miles in area. The headwaters of Clearfield Creek are located inside the northern border of Cambria County, a few miles south-west of Loretto, Pa. The watershed is located on the U.S. Geological Survey 7.5 minute quadrangles of Ebensburg, Cresson, Carrolltown, Ashville, Altoona, Hastings, Coalport, Blandburg, Tipton, Westover, Irvona, Ramey, Houtzdale, Mahaffey, Curwensville, Glen Richey, Wallaceton, Clearfield and Lecontes Mills, Pa. The stream flows north-northeast from northern Cambria County into central Clearfield County, where it joins the West Branch Susquehanna River. The major tributaries to Clearfield Creek include: Roaring Run, Morgan Run, Upper Morgan Run, Muddy Run, Beaverdam Run, Powell Run, Potts Run, North Witmer Run, Brubaker Run, Little Laurel Run, Burgoon Run, Laurel Run, Bradley Run and Little Clearfield Creek. The largest municipalities include Cresson, Gallitzin, Ashville, Coalport, Irvona, Glen Hope, Madera and Clearfield. State Highway 53 travels parallel to the creek through the entire watershed, and State Highways 36, 253, 865, and 729 bisect portions of the mainstem of Clearfield Creek. Numerous township roads provide access to Clearfield Creek and its tributaries (Attachment A).

Segments Addressed in this TMDL

The Clearfield Creek Watershed is affected by pollution from abandoned mine drainage (AMD). The AMD has caused high levels of metals and low pH in the mainstem of Clearfield Creek upstream of Clearfield, Pa. Strip mining and deep mining of bituminous coal in the watershed account for most of the AMD inputs. Muddy Run, Morgan Run, Bradley Run, Roaring Run, Brubaker Run, Little Laurel Run, Powell Run, and Upper Morgan Run are some of the larger tributaries that contribute AMD pollution to Clearfield Creek. Sanbourn Run, Blue Run and Brubaker Run have TMDLs completed for their watersheds. In 1958, the Pennsylvania Fish and Boat Commission (PFBC) surveyed Clearfield Creek and determined that the creek was highly degraded; for this reason, PFBC no longer recommended trout stocking (Trembley, 1962). In 1975, both PFBC and the Pennsylvania Department of Environmental Resources (PADER) performed investigations of the aquatic life in Clearfield Creek. The PFBC surveyed the stream from Ashville to Frugality and found that macroinvertebrate populations were depressed and noted that fish were very scarce due to AMD (Hollender, 1975). The PADER surveyed the stream in the Glen Hope area and found satisfactory water quality, but very low numbers of aquatic organisms (Hasse, 1975). An additional study was completed by Pennsylvania Department of Environmental Protection (PADEP) from 1998 to 2004 in Clearfield Creek. The study identified the larger sources of AMD and determined that water quality and macroinvertebrate populations could not recover while AMD was being produced by those sources (Spyker, 2002). Other examples of studies completed within the Clearfield Creek watershed include: The Clearfield Creek Scarlift Report completed in 1972, Muddy Run Scarlift Report complete in 1972, and Clearfield Creek Assessment Report completed in 2004. Table 1 provides a list of the impaired waters addressed by this TMDL. The stream designations for Clearfield Creek, defined by Pa. Title 25 Chapter 96, can be found in Table 2.

Table 1. 303(d) Listed Streams Addressed by the TMDL

Segment ID	Year Listed	Stream Name	Stream Code	Source	Cause	Miles
990819-1030-LMS	1996	Clearfield Creek	26107	AMD	Metals	24.3
990819-1020-LMS	1996	Clearfield Creek	26107	AMD	Metals	3.4
990824-1445-LMS	1996	Clearfield Creek	26107	AMD	Metals	7.5

See Attachment B, Excerpts Justifying Changes Between the 1996, 1998, 2002, and 2004 Section 303(d) lists.

Table 2. Stream Designation

Stream Name/Number of Segments	Zone	County	Water Uses Protected	Exceptions To Specific Criteria
Clearfield Creek	Main stem	Clearfield	WWF	none

Active mining operations with discharges are found in the watershed. Some permits are for remining operations that are not contributing to point source pollution because they have not created any new discharges and have not caused degradation of pre-existing discharges. The discharges in the watershed are from a combination of active and abandoned mines. Active discharges are treated as point sources and abandoned discharges are treated as nonpoint sources. The distinction between point and nonpoint sources in this case is determined on the basis of whether or not there is a responsible party for the discharge. Where there is no responsible party the discharge is considered to be a nonpoint source. Each pollutant on the 303(d) list will be addressed as a separate TMDL. These TMDLs are expressed as long-term average loadings. Due to the nature and complexity of mining effects on the watershed, expressing the TMDL as a long-term average gives better representation of the data used for calculations. A map showing the impaired waters of the Clearfield Creek Watershed is shown in Figure 1.

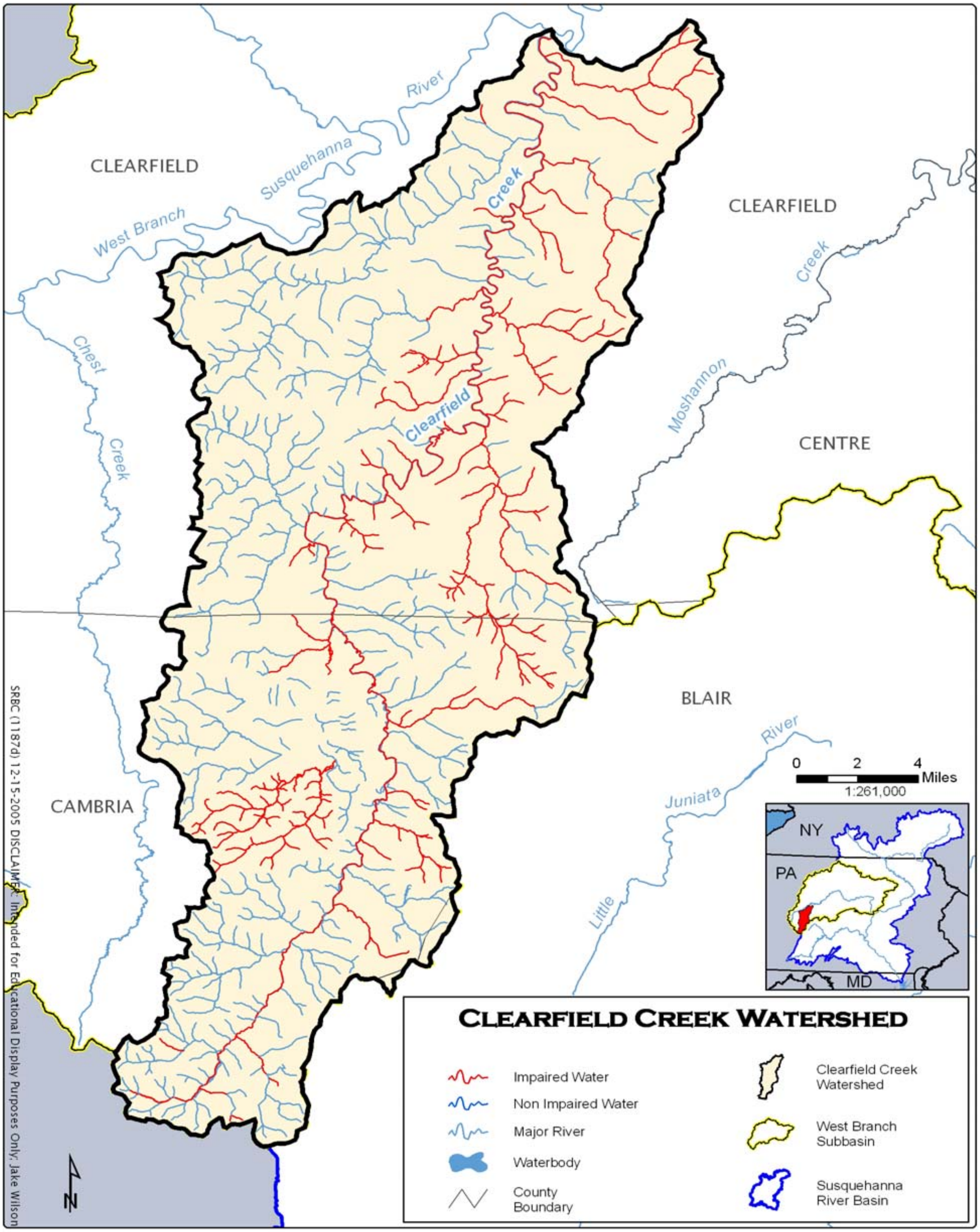

Figure 1. Impaired Waters in the Clearfield Creek Watershed

CLEAN WATER ACT REQUIREMENTS

Section 303(d) of the 1972 Clean Water Act requires states, territories, and authorized tribes to establish water quality standards. The water quality standards identify the uses for each waterbody and the scientific criteria needed to support that use. Uses can include designations for drinking water supply, contact recreation (swimming), and aquatic life support. Minimum goals set by the Clean Water Act require that all waters be "fishable" and "swimmable."

Additionally, the federal Clean Water Act and the U.S. Environmental Protection Agency's (USEPA) implementing regulations (40 CFR 130) require:

- States to develop lists (Section 303(d) lists) of impaired waters for which current pollution controls are not stringent enough to meet water quality standards (the list is used to determine which streams need TMDLs);

- States to establish priority rankings for waters on the lists based on severity of pollution and the designated use of the waterbody; states must also identify those waters for which TMDLs will be developed and a schedule for development;

- States to submit the list of waters to USEPA every two years (April 1 of the even numbered years);

- States to develop TMDLs, specifying a pollutant budget that meets state water quality standards and allocate pollutant loads among pollution sources in a watershed, e.g., point and nonpoint sources; and

- USEPA to approve or disapprove state lists and TMDLs within 30 days of final submission.

Despite these requirements, states, territories, authorized tribes, and USEPA have not developed many TMDLs since 1972. Beginning in 1986, organizations in many states filed lawsuits against the USEPA for failing to meet the TMDL requirements contained in the federal Clean Water Act and its implementing regulations. USEPA has entered into consent agreements with the plaintiffs in several states.

In the cases that have been settled to date, the consent agreements require USEPA to backstop TMDL development, track TMDL development, review state monitoring programs, and fund studies on issues of concern (e.g., AMD, implementation of nonpoint source Best Management Practices (BMPs), etc.). These TMDLs were developed in partial fulfillment of the 1996 lawsuit settlement of *American Littoral Society and Public Interest Group of Pennsylvania v. EPA.*

SECTION 303(D) LISTING PROCESS

Prior to developing TMDLs for specific waterbodies, sufficient data must be available to assess which streams are impaired and should be on the Section 303(d) list. With guidance from the

USEPA, the states have developed methods for assessing the waters within their respective jurisdictions.

The primary method adopted by PADEP for evaluating waters changed between the publication of the 1996 and 1998 303(d) lists. Prior to 1998, data used to list streams were in a variety of formats, collected under differing protocols. Information also was gathered through the Section 305(b)[1] reporting process. Since that time, PADEP is now using the Unassessed Waters Protocol (UWP), a modification of the USEPA Rapid Bioassessment Protocol II (RPB-II), as the primary mechanism to assess Pennsylvania's waters. The UWP provides a more consistent approach to assessing Pennsylvania's streams.

The assessment method requires selecting representative stream segments based on factors such as surrounding land uses, stream characteristics, surface geology, and point source discharge locations. A biologist selects as many sites as necessary to establish an accurate assessment for a stream segment; the length of the stream segment can vary between sites. All the biological surveys include kick-screen sampling of benthic macroinvertebrates, habitat surveys, and measurements of pH, temperature, conductivity, dissolved oxygen, and alkalinity. Benthic macroinvertebrates are identified to the family level in the field.

After the survey is completed, the biologist determines the status of the stream segment. The decision is based on the performance of the segment using a series of biological metrics. If the stream is determined to be impaired, the source and cause of the impairment are documented. An impaired stream must be placed on the state's 303(d) list with the documented source and cause. A TMDL must be developed for the stream segment. Each TMDL is for only one pollutant. If a stream segment is impaired by two pollutants, two TMDLs must be developed for that stream segment. In order for the process to be more effective, adjoining stream segments with the same source and cause listing are addressed collectively, and on a watershed basis.

BASIC STEPS FOR DETERMINING A TMDL

Although all watersheds must be handled on a case-by-case basis when developing TMDLs, basic processes or steps apply to all cases. They include:

1. Collect and summarize pre-existing data (watershed characterization, inventory contaminant sources, determination of pollutant loads, etc.);
2. Calculate TMDL for the waterbody using USEPA approved methods and computer models;
3. Allocate pollutant loads to various sources;
4. Determine critical and seasonal conditions;
5. Submit draft report for public review and comments; and
6. Obtain USEPA approval of the TMDL.

[1] Section 305(b) of the Clean Water Act requires a biannual description of the water quality of the waters of the state.

This document will present the information used to develop the Clearfield Creek Watershed TMDL.

WATERSHED BACKGROUND

The headwaters of Clearfield Creek begin in Cambria County, Pa. Clearfield Creek flows north into Clearfield County and adjacent to Prince Gallitzin State Park. The Clearfield Creek Watershed contains approximately 398 square miles and 700 stream miles. Clearfield Creek flows through the boroughs and towns of Ashville, Coalport, Irvona, Glen Hope, Wildwood Springs, Amsbry, Syberton, Dysart, Tippletown, Dean, Frugality, Fallen Timber, Flinton, Blain City, Faunce, Dimeling and Mount Hope. The mainstem of Clearfield Creek continues to flow north until its confluence with the West Branch Susquehanna River near the town of Clearfield, Clearfield County, Pa.

The Clearfield Creek Watershed lies within the Allegheny Mountain Section of the Appalachian Plateau Province. There is a vertical drop in the watershed of about 1,400 feet from its headwaters to the mouth. The average annual precipitation is 42 inches. The region is characterized by warm summers and long, cold winters. Temperatures change frequently and sometimes rapidly.

The watershed is dominated primarily by agriculture and forested land uses. Agriculture consists of 24 percent of the land use and is predominantly found in the western portion of the Clearfield Creek Watershed. Forests make up the majority of the land use at 66 percent. The remaining 10 percent consists of two percent disturbed and eight percent developed lands.

Clearfield Creek Watershed is primarily sandstone geology, which accounts for approximately 75 percent of the area. Shale comprises the remaining 25 percent of the area. The predominant soil associations in the watershed are the Hazelton-Dekalb-Buchanan and the Gilpin-Ernest-Cavode. These two soils account for 50 percent of the Clearfield Creek Watershed. The remaining portion of the watershed is comprised of Hazelton-Cookport-Ernest, Monongahela-Philo-Atkins, Gilpin-Wharton-Ernest, Gilpin-Binkerton-Cavode and Tilsit-Binkerton-Buchanan soil associations.

Historical data show that mining began in this area in the early twentieth century. A large portion of the watershed has been mined for coal, and some unreclaimed abandoned mine lands, as well as active mining operations, line the hillsides. Both strip and deep mining have been conducted in the watershed. Coal mining has historically been the major economic force in the Clearfield Creek Watershed. The Allegheny Group contains mineable coal including the Upper and Lower Freeport; Upper, Middle, and Lower Kittanning; Clarion; and Brookville coal seams. The Mercer coal seam and its underclay of the Pottsville Group also have been mined in Clearfield County. In the headwaters of Clearfield Creek, the shales of the Conemaugh Group overlie the coal seams, which have been deep mined extensively. The headwaters region around Cresson, Gallitzin, and Ashville contains 13 deep mine complexes on the Upper Freeport coal seam. The mines were established in the early 1900s, and most were abandoned by 1945. The last deep mine in the watershed closed in 1965. Cumulatively, the abandoned deep mine complexes encompass over 10,000 acres (U.S. Environmental Research Inc., 2004). As Clearfield Creek flows north, the Allegheny Group and its coal seams are exposed on the surface, and strip mining is the dominant method of extraction. Table 3 provides a list of mining permits in the Clearfield Creek Watershed (Dillon, 2004).

Table 3. Mining Permits in the Clearfield Creek Watershed

Permit No.	Company Name	Permit Acronym	Operation	Status
07000101	Cooney Brothers	HORS	Horseshoe IV Mine	Active
11010101	EP Bender	JCGY	77 Job Cash Gray	Stage 1/Regraded
11010102	EP Bender	JBFN	73 Job Fulkerson II	Active
11020101	EP Bender	JBHN	78 Job Hollentown II	Active
11040102	EP Bender	JB83	83 Job – SGL 120	Active
11841601	EP Bender	EPBC	Fallen Timber Prep	Active
11960105	EP Bender	JOBF	63 Job Flinton	Active
11980102	EP Bender	JBMS	75 Job Mathews	Stage 1/Regraded
17000111	Gregg Barr	WATO	Watts Operation	Active
17000904	RB Contracting	PKEO	Pike 2 Operation	Stage 1/ Regraded
17020108	RB Contracting	JNME	Jordan 1 Mine	Stage 1/Regraded
17020115	Hepburnia Coal Co.	PGME	Prisk Grandview Mine	Active
17030104	EP Bender	JLYM	79 Job Lyleville II Mine	Active
17030105	Hepburnia Coal Co.	WATS	Watts Mine	Not Started
17030117	Forcey Coal	BBNM	Buterbaugh No 3 Mine	Active
17-03-05	McDowell	WOOT	Wootton GFCC	Not Started
17040103	Hepburnia Coal Co.	HEND	Henderson 2	Not Started
17-04-04	RB Contracting	LUTZ	Lutz Operation	Active
17040901	Blue Mountain	WROR	Wohler Operation	Active
17743165	Sky Haven Coal Co.	RCCR	Roy 3	Active
17820104	Sky Haven Coal Co.	SHCC	Penn State 1	Stage 1/Regraded
17840126	TDK Coal	DOTS	Dotts Johnston	Not Started
17851501	Sky Haven Coal Co.	CLFD	CLFD Siding	Active
17860122	Amfire Mining	BRWC	Browncrest 6	Active
17860123	Hepburnia Coal Co.	HCCH	Henderson	Active
17910101	Waroquier	WRCC	Witherow	Stage 1/Regraded
17910125	Amfife Mining	BRWR	Browncrest 7	Active
17910131	Ecklund Co.	BAME	Bakaysa Mine	Stage 1/Regraded
17930120	Energy Resources	BTME	Burnett Mine	Active
17940122	Waroquier	BARM	Barrett 2 Mine	Active
17950104	Sky Haven Coal Co.	SMTH	Smith No 5	Active
17950106	Waroquier	BRME	Barrett 3 Mine	Active
17950111	Sky Haven Coal Co.	BLOM	Bloom 1 Mine	Stage 1/Regraded
17950113	Waroquier	BARR	Barrett 1	Active
17970105	EP Bender	LYME	Lyleville Mine 60 Job	Active
17980105	Johnson	CEME	Chase Mine	Stage 1/Regraded
17980123	Amfire Mining	SJME	Skebo Job Mine	Stage 1/Regraded
17773038	Al Hamilton	ALHM	17773038	Post mining discharge

AMD METHODOLOGY

A two-step approach was used for the TMDL analysis of AMD impaired stream segments. The first step uses a statistical method for determining the allowable instream concentration at the point of interest necessary to meet water quality standards. This is done at each point of interest (sample point) in the watershed. The second step is a mass balance of the loads as they pass through the watershed. Loads at these points are computed based on average annual flow.

The statistical analysis described below can be applied to situations where all of the pollutant loading is from nonpoint sources, as well as those where there are both point and nonpoint sources. The following defines point sources and nonpoint sources for the purposes of our evaluation. Point sources are defined as permitted discharges or a discharge that has a responsible party; nonpoint sources are any pollution sources that are not point sources. For situations where all of the impact is due to nonpoint sources, the equations shown below are applied using data for a point in the stream. The load allocation made at that point is for all of the watershed area that is above that point. For situations where there are point source impacts alone, or in combination with nonpoint sources, the evaluation uses the point source data and a mass balance is performed with the receiving water to determine the impact of the point source.

Allowable loads are determined for each point of interest using Monte Carlo simulation. Monte Carlo simulation is an analytical method meant to imitate real-life systems, especially when other analyses are too mathematically complex or too difficult to reproduce. Monte Carlo simulation calculates multiple scenarios of a model by repeatedly sampling values from the probability distribution of the uncertain variables and using those values to populate a larger data set. Allocations were applied uniformly for the watershed area specified for each allocation point. For each source and pollutant, it was assumed that the observed data were log-normally distributed. Each pollutant source was evaluated separately using @Risk[2] by performing 5,000 iterations to determine the required percent reduction so that the water quality criteria, as defined in the *Pennsylvania Code, Title 25 Environmental Protection, Department of Environmental Protection, Chapter 93, Water Quality Standards,* will be met instream at least 99 percent of the time. For each iteration, the required percent reduction is:

PR = maximum {0, (1-Cc/Cd)} where (1)

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

Cd = randomly generated pollutant source concentration in mg/l based on the observed data

Cd = RiskLognorm(Mean, Standard Deviation) where (1a)
Mean = average observed concentration

[2] @Risk – Risk Analysis and Simulation Add-in for Microsoft Excel, Palisade Corporation, Newfield, NY, 1990-1997.

Standard Deviation = standard deviation of observed data

The overall percent reduction required is the 99th percentile value of the probability distribution generated by the 5,000 iterations, so that the allowable long-term average (LTA) concentration is:

LTA = Mean * (1 – PR99) where (2)

LTA = allowable LTA source concentration in mg/l

Once the allowable concentration and load for each pollutant is determined, mass-balance accounting is performed starting at the top of the watershed and working down in sequence. This mass-balance or load tracking is explained below.

For pH TMDLs, acidity is compared to alkalinity. Each sample point used in the analysis of pH by this method must have measurements for total alkalinity and total acidity. Net alkalinity is alkalinity minus acidity, both in units of milligrams per liter (mg/l) $CaCO_3$. Statistical procedures are applied, using the average value for total alkalinity at that point as the target to specify a reduction in the acid concentration. By maintaining a net alkaline stream, the pH value will be in the range between six and eight. This method negates the need to specifically compute the pH value, which for streams affected by low pH from AMD may not a true reflection of acidity. This method assures that Pennsylvania's standard for pH is met when the acid concentration reduction is met.

Information for the TMDL analysis performed using the methodology described above is contained in the TMDLs by Segment section of this report.

TMDL ENDPOINTS

One of the major components of a TMDL is the establishment of an instream numeric endpoint, which is used to evaluate the attainment of applicable water quality. An instream numeric endpoint, therefore, represents the water quality goal that is to be achieved by implementing the load reductions specified in the TMDL. The endpoint allows for comparison between observed instream conditions and conditions that are expected to restore designated uses. The endpoint is based on either the narrative or numeric criteria available in water quality standards.

Because of the nature of the pollution sources in the watershed, the TMDL's components makeup will be load allocations that are specified above a point in the stream segment. All allocations will be specified as long-term average daily concentrations. These long-term average daily concentrations are expected to meet water quality criteria 99 percent of the time. Pa. Title 25 Chapter 96.3(c) specifies that the water quality standards must be met 99 percent of the time. The iron TMDLs are expressed as total recoverable as the iron data used for this analysis was reported as total recoverable. Table 4 shows the water quality criteria for the selected parameters.

Table 4. Applicable Water Quality Criteria

Parameter	*Criterion Value (mg/l)*	*Total Recoverable/Dissolved*
Aluminum (Al)	0.75	Total Recoverable
Iron (Fe)	1.50 0.3	30-Day Average Total Recoverable Dissolved
Manganese (Mn)	1.00	Total Recoverable
pH *	6.0-9.0	N/A

*The pH values shown will be used when applicable. In the case of freestone streams with little or no buffering capacity, the TMDL endpoint for pH will be the natural background water quality. These values are typically as low as 5.4 (Pennsylvania Fish and Boat Commission).

TMDL ELEMENTS (WLA, LA, MOS)

A TMDL equation consists of a wasteload allocation (WLA), load allocation (LA), and a margin of safety (MOS). The WLA is the portion of the load assigned to point sources. The LA is the portion of the load assigned to nonpoint sources. The MOS is applied to account for uncertainties in the computational process. The MOS may be expressed implicitly (documenting conservative processes in the computations) or explicitly (setting aside a portion of the allowable load).

TMDL ALLOCATIONS SUMMARY

Methodology for dealing with pH impairments is discussed in Attachment C. Information for the TMDL analysis using the methodology described above is contained in the TMDLs by Segment section in Attachment D.

This TMDL will identify numerical reduction targets for each monitoring point. As changes occur in the watershed, the TMDL may be reevaluated to reflect current conditions. Table 5 presents the estimated reductions identified for all points in the watershed. Attachment D gives detailed TMDLs by Segment analysis for each allocation point.

Table 5. Summary Table–Clearfield Creek Watershed

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
CLCR 15.0	*Clearfield Creek near headwaters*						
	Fe	15.1	1.2	-	-	13.9	92
	Mn	1.0	1.0	-	-	0.0	0
	Al	10.1	0.5	-	-	9.6	95
	Acidity	ND	NA	-	-	-	-
	Alkalinity	308.3					
CLCR 14.0	*Clearfield Creek upstream of Amsbry, PA*						
	Fe	486.3	39.6	-	-	432.8	92
	Mn	46.2	46.2	-	-	0.0	0
	Al	763.6	22.0	-	-	732.0	97
	Acidity	2,150.0	1,311.5	-	-	838.5	39
	Alkalinity	7,167.3					
CLCR 13.0	*Clearfield Creek downstream of Amsbry, PA*						
	Fe	325.4	48.0	-	-	0.0	0
	Mn	45.9	45.9	-	-	0.0	0
	Al	292.6	28.4	-	-	0.0	0
	Acidity	3,533.5	1,201.1	-	-	1,493.9	55
	Alkalinity	4,439.8					
CLCR 12.0	*Clearfield Creek downstream of Little Laurel Run*						
	Fe	490.4	94.3	1.1	93.2	119.8	56
	Mn	158.4	158.4	0.7	157.7	0.7	0
	Al	686.5	67.9	0.7	67.2	355.1	84
	Acidity	3,802.1	1,938.8	-	-	0.0	0
	Alkalinity	10,851.9					
CLCR 11.0	*Clearfield Creek upstream of Brubaker Run*						
	Fe	624.6	136.8	-	-	91.7	40
	Mn	196.0	196.0	-	-	0.0	0
	Al	784.1	118.5	-	-	47.0	28
	Acidity	6,095.2	2,498.3	-	-	1,733.6	41
	Alkalinity	9,423.2					
BRBK01	*Brubaker Run at its mouth*						
	Fe	1,636.3	16.4	-	-	0.0	0
	Mn	909.7	13.6	-	-	80.0	85
	Al	640.4	12.8	-	-	61.3	83
	Acidity	12,140.8	0.0	-	-	1,641.6	100
	Alkalinity	0.0					
CLCR 10.0	*Clearfield Creek downstream of Brubaker Run*						
	Fe	1,579.7	237.3	-	-	0.0	0
	Mn	1,255.0	299.7	-	-	59.2	16
	Al	830.4	143.6	-	-	0.0	0
	Acidity	19,418.0	6,599.3	-	-	0.0	0
	Alkalinity	11,507.2					
CLCR 9.0	*Clearfield Creek above Glendale,PA*						
	Fe	949.5	245.7	2.2	243.5	0.0	0
	Mn	1,142.1	318.7	1.4	317.3	0.0	0
	Al	670.7	159.4	1.4	158.0	0.0	0
	Acidity	13,877.8	3,718.5	-	-	967.0	21
	Alkalinity	13,625.5					
CLCR 8.0	*Clearfield Creek downstream of Beaverdam Run*						
	Fe	1,254.4	648.1	2.0	646.1	0.0	0
	Mn	1,212.5	574.9	1.3	573.6	0.0	0
	Al	919.9	501.7	1.3	500.4	0.0	0
	Acidity	15,993.0	6,397.2	-	-	2,436.5	28
	Alkalinity	28,411.1					

Table 5. Summary Table–Clearfield Creek Watershed Cont.

CLCR 7.0	*Clearfield Creek at Irvona, PA*						
	Fe	1,038.8	985.5	12.5	973.2	0.0	0
	Mn	1,105.4	705.8	8.1	697.7	0.0	0
	Al	ND	NA	-	-	-	-
	Acidity	17,512.9	8,936.2	-	-	0.0	0
	Alkalinity	38,155.5					
CLCR 6.0	*Clearfield Creek upstream of Shoft Mine Discharge*						
	Fe	1,246.7	706.4	0.4	706.0	487.4	41
	Mn	1,260.5	678.7	0.2	678.5	182.4	21
	Al	1,177.4	748.0	0.2	747.8	429.6	36
	Acidity	15,057.0	9,640.9	-	-	0.0	0
	Alkalinity	43,356.3					
BR01	*Blue Run at its mouth*						
	Fe	ND	-	-	-	NA	-
	Mn	3.9	1.3	-	-	0.0	0
	Al	ND	-	-	-	NA	-
	Acidity	ND	-	-	-	NA	-
	Alkalinity	121.4					
CLCR 5.0	*Clearfield Creek upstream of Muddy Run*						
	Fe	2,189.9	1,182.6	2.2	1,180.4	469.2	28
	Mn	1,314.0	759.2	1.4	757.8	0.0	0
	Al	1,226.4	1,080.4	1.4	1,079.0	0.0	0
	Acidity	18,103.5	8,146.6	-	-	4,540.8	36
	Alkalinity	38,878.7					
CLCR 4.0	*Clearfield Creek downstream of Muddy Run*						
	Fe	3,148.7	1,704.8	-	-	436.6	20
	Mn	2,696.4	1,043.8	-	-	1,097.8	51
	Al	1,200.3	1,058.8	-	-	363.0	34
	Acidity	18,909.4	11,724.9	-	-	0.0	0
	Alkalinity	57,354.6					
CLCR 3.0	*Clearfield Creek at Faunce, PA*						
	Fe	4,005.7	1,473.8	2.2	1,471.6	1,090.2	43
	Mn	3,722.3	1,265.9	1.4	1,264.5	805.2	39
	Al	1,624.9	812.5	1.4	811.1	309.3	28
	Acidity	27,435.2	12,735.1	-	-	7,515.6	37
	Alkalinity	37,166					
SBRN01	*Sanbourn Run at its mouth*						
	Fe	16.4	16.4	-	-	0.0	0
	Mn	267.8	10.7	-	-	7.0	40
	Al	134.6	9.4	-	-	4.7	33
	Acidity	3,449.2	34.5	-	-	202.4	85
	Alkalinity	115.0					
CLCR 2.0	*Clearfield Creek downstream of Morgan Run*						
	Fe	4,146.5	1,364.3	14.6	1,349.7	264.9	16
	Mn	5,243.3	1,524.8	9.4	1,515.4	1,014.4	40
	Al	2,592.2	1,444.6	9.4	365.1	219.4	13
	Acidity	31,647.1	15,515.9	-	-	0.0	0
	Alkalinity	76,429.2					
CLCR 1.0	*Clearfield Creek at its mouth*						
	Fe	4,024.0	1,530.2	3.3	1,526.9	0.0	0
	Mn	5,242.5	1,728.6	2.1	1,726.5	0.0	0
	Al	2,267.0	793.5	2.1	791.4	46.5	6
	Acidity	42,790.3	26,658.8	-	-	15,096.9	57
	Alkalinity	77,646.0					

ND = Non Detect; NA = Not Applicable

WLAs are assigned to the permitted operations for iron, manganese, and aluminum. Permits were recorded from unimpaired areas of the watershed. Permits on nonimpaired will be given WLAs in future TMDLs. Acidity is narratively addressed to be exceeded by the alkalinity at all times; because a numeric standard was not included in the permits, no WLAs are assigned for this parameter. The WLAs were calculated using the methodology explained in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. No required reduction of these permits is necessary at this time because there are nonpoint contributions upstream and downstream of discharges that when reduced will satisfy the TMDL. Consequently, all necessary reductions are assigned to the nonpoint sources. Table 6 contains the WLAs for the permitted operations.

Table 6. Waste Load Allocation of Permitted Operations

Parameter	Allowable Average Monthly Conc. (mg/l)	Average Flow (MGD)	Allowable Load (lbs/day)
HORS*			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
JCGY			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
JBFN			
Fe	3.0	0.0017	0.0
Mn	2.0	0.0017	0.0
Al	2.0	0.0017	0.0
JBHN			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
EPBC			
Fe	3.0	0.0360	0.9
Mn	2.0	0.0360	0.6
Al	2.0	0.0360	0.6
JBMS			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
SMTH			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
LYME			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
JLYM			
Fe	3.0	0.0638	2.4
Mn	2.0	0.0638	1.6
Al	2.0	0.0638	1.6
WROR			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

*These are acronyms for WLA that are further explained in Attachment D.

Table 6. Waste Load Allocation of Permitted Operations Cont.

JNME			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
DOTS			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
JOBF			
Fe	3.0	0.0071	0.1
Mn	2.0	0.0071	0.0
Al	2.0	0.0071	0.0
BAME			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
BLOM			
Fe	3.0	0.0010	0.0
Mn	2.0	0.0010	0.0
Al	2.0	0.0010	0.0
BBNM			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
WRCC			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
CEME			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
SJME			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
RCCR			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
BTME			
Fe	3.0	0.1089	2.7
Mn	2.0	0.1089	1.8
Al	2.0	0.1089	1.8
BRWC			
Fe	3.0	0.0119	0.3
Mn	2.0	0.0119	0.2
Al	2.0	0.0119	0.2
BRWR			
Fe	3.0	0.0119	0.3
Mn	2.0	0.0119	0.2
Al	2.0	0.0119	0.2
LUTZ			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

Table 6. Waste Load Allocation of Permitted Operations Cont.

PKEO			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
HCCH			
Fe	3.0	0.0381	1.0
Mn	2.0	0.0381	0.6
Al	2.0	0.0381	0.6
HEND			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
PGME			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
WATS			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
WATO			
Fe	3.0	0.0089	0.2
Mn	2.0	0.0089	0.1
Al	2.0	0.0089	0.1
BARR			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
BRME			
Fe	3.0	0.0094	0.2
Mn	2.0	0.0094	0.2
Al	2.0	0.0094	0.2
BARM			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
WOOT			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
SHCC			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
CLFD			
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7
JB83			
Fe	3.0	0.1755	4.4
Mn	2.0	0.1755	2.9
Al	2.0	0.1755	2.9
ALHM			
Fe	3.0	0.0144	0.4
Mn	2.0	0.0144	0.2
Al	2.0	0.0144	0.2

RECOMMENDATIONS

Two primary programs in Pennsylvania that provide reasonable assurance for maintenance and improvements of water quality in the watershed are in effect. The PADEP's efforts to reclaim abandoned mine lands, coupled with its duties and responsibilities for issuing NPDES permits, will be the focal points in water quality improvement.

The Clearfield Creek Watershed Association (CCWA) is an active group in the watershed. CCWA has actively pursued grant funding to assess the watershed and to construct treatment systems. Passive treatment systems have been implemented on two discharges in the Little Laurel Run Watershed. A Growing Greener Grant in 2003 allowed for the design and permitting of these systems. In 2004, USEPA provided funding under Section 319 of the Clean Water Act for construction of the passive treatment systems. These treatment systems will aid in restoring the upper portion of the stream (CCWA website, 2003). Other focus areas of the CCWA include: Harborson Walker Clay Mine Sealing Feasibility Study in Brubaker Run, Amsbry Refuse Pile Removal Project, Clearfield Creek monitoring, and assessment of Muddy Run.

An extensive assessment of the watershed has been conducted by the Clearfield County and Cambria County Conservation Districts, CCWA and other groups. This assessment included sampling AMD discharges and instream points throughout the watershed to summarize impairments in the watershed. The assessment shows that of the sites sampled, 66 percent exceeded the iron limit, 82 percent exceeded the manganese limit, 51 percent exceeded the aluminum limit, and 46 percent exceeded the sulfate limit (Clearfield Creek Watershed Assessment, 2004).

In addition to CCWA, the Clearfield Creek Assessment recommends a priority list for "…clean water and restoration of ecological communities, recreational and economic opportunities, and improvement to the quality of life to the residents living in these watershed communities"(Clearfield Creek Watershed Assessment page I-ii). This assessment for the watershed has been divided into two phases. Phase I recommends Brubaker Run, Powell Run, Cresson Borehole, and the Shoff Mine Discharge for remediation. Phase II involves: Morgan Run, Long Run, Upper Morgan, Sanbourn Run, and 104A discharge as priority remediation areas. The assessment outlines restoration strategies for each of these watersheds or discharges, taking into account issues that could hinder remediation efforts (access to the watershed, land owner permission, existing wetlands, etc). These potential issues have been addressed for each of the priority watersheds (Clearfield Creek Watershed Assessment, 2004). Applying the recommendations from the watershed assessment will help to restore Clearfield Creek and its tributaries.

CCWA has regarded Brubaker Run as a priority watershed for remediation. Upstream of the confluence of Brubaker Run, Clearfield Creek supports a few fish and macroinvertabrates. However, the metal loadings from Brubaker Run eliminate almost all life in Clearfield Creek for 12 miles downstream of the confluence. The Brubaker Run Watershed is disturbed from underground and surface mines, and a large abandoned discharge from a clay mine. CCWA is proposing sealing the discharge and is currently applying for funds (CCWA website, 2003).

Future threats to the watershed should decline as mines are closed and properly reclaimed. Remining has helped to lower the pollutant loadings reaching the stream.

The PADEP Bureau of Abandoned Mine Reclamation (BAMR) administers an environmental regulatory program for all mining activities, including mine subsidence regulation, mine subsidence insurance, and coal refuse disposal. PADEP BAMR also manages a program to ensure safe underground bituminous mining and protect certain structures from subsidence; administers a mining license and permit program; administers a regulatory program for the use, storage, and handling of explosives; and provides for training, examination, and certification of applicant's blaster's licenses. In addition, PADEP BAMR administers a loan program for bonding anthracite underground mines and for mine subsidence, administers the USEPA Watershed Assessment Grant Program, the Small Operator's Assistance Program (SOAP), and the Remining Operator's Assistance Program (ROAP).

Reclaim PA is PADEP's initiative designed to maximize reclamation of the state's quarter million acres of abandoned mineral extraction lands. Abandoned mineral extraction lands in Pennsylvania constitute a significant public liability - more than 250,000 acres of abandoned surface mines, 2,400 miles of stream polluted with AMD, over 7,000 orphaned and abandoned oil and gas wells, widespread subsidence problems, numerous hazardous mine openings, mine fires, abandoned structures, and affected water supplies – representing as much as one third of the total abandoned mine land problem nationally.

Since the 1960s, Pennsylvania has been a national leader in establishing laws and regulations to ensure mine reclamation and well plugging occur after active mining is completed. Mine reclamation and well plugging refers to the process of cleaning up environmental pollutants and safety hazards associated with a site and returning the land to a productive condition, similar to PADEP's Brownfields Program. Pennsylvania is striving for complete reclamation of its abandoned mines and plugging of its orphan wells. Realizing this task is no small order, PADEP has developed Reclaim PA, a collection of concepts to make abandoned mine reclamation easier. These concepts include legislative, policy, and land management initiatives designed to enhance mine operator/volunteer/PADEP reclamation efforts. Reclaim PA has the following four objectives:

- To encourage private and public participation in abandoned mine reclamation efforts.
- To improve reclamation efficiency through better communication between reclamation partners.
- To increase reclamation by reducing remining risks.
- To maximize reclamation funding by expanding existing sources and exploring new sources.

PUBLIC PARTICIPATION

In the beginning stages of the Clearfield Creek Watershed TMDL, an early notification letter was sent to inform stakeholders and interested parties that a TMDL would be completed in their watershed and offer them the opportunity to submit information for TMDL development. The

PADEP considered all the information submitted and all pertinent information was included in the report.

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on February 3, 2007, and The Progress February 17, 2007, to foster public comment on the allowable loads calculated. A public meeting was held on February 20, 2007, at Prince Gallitzin State Park in Patton, Pa., to discuss the proposed TMDL.

REFERENCES

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U.S. Environmental Research Services, Inc. and Foreman, Inc. 2004. Clearfield Creek Headwaters Upper Freeport Coal Seam Mine Drainage Assessment Abatement Recommendations.

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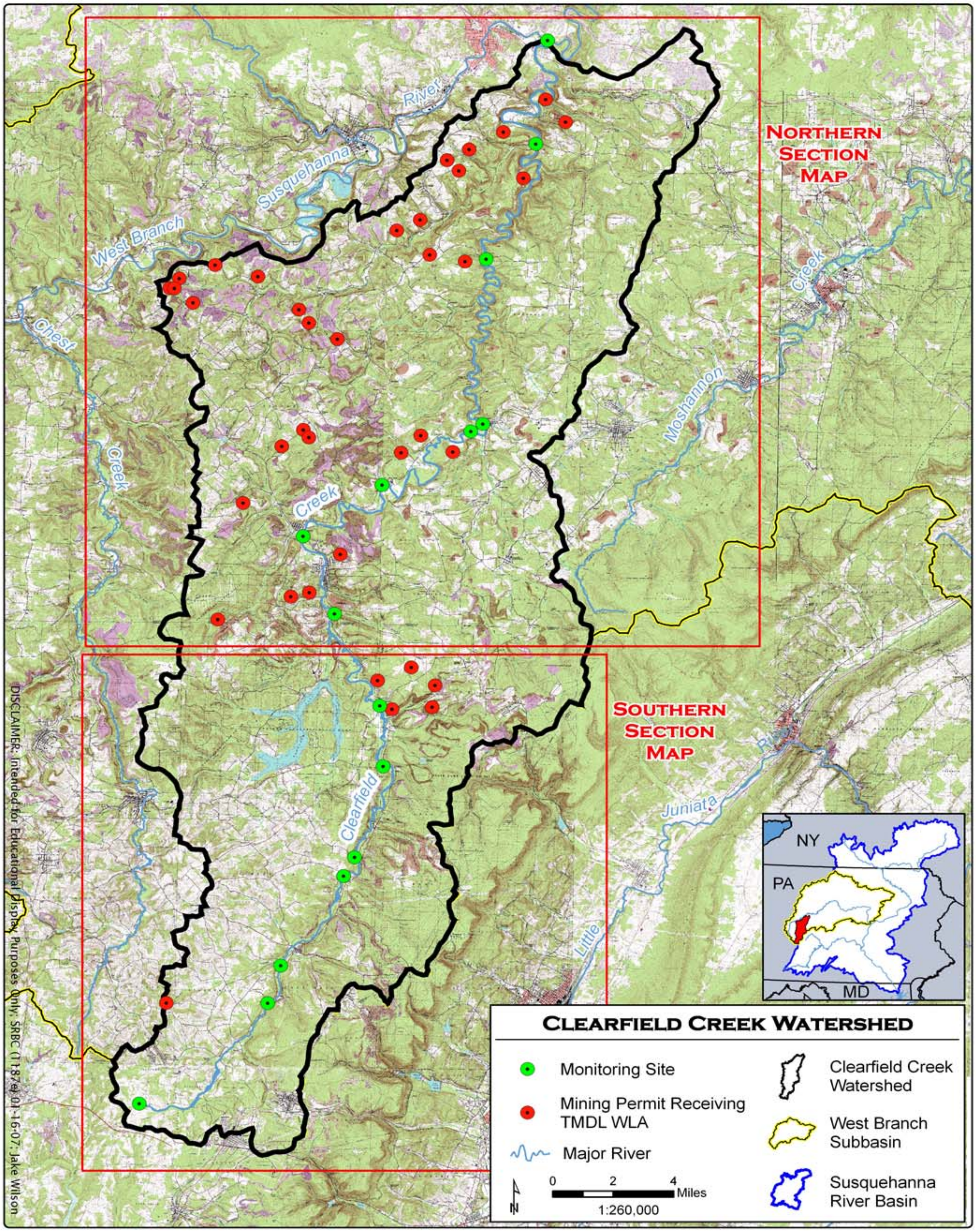
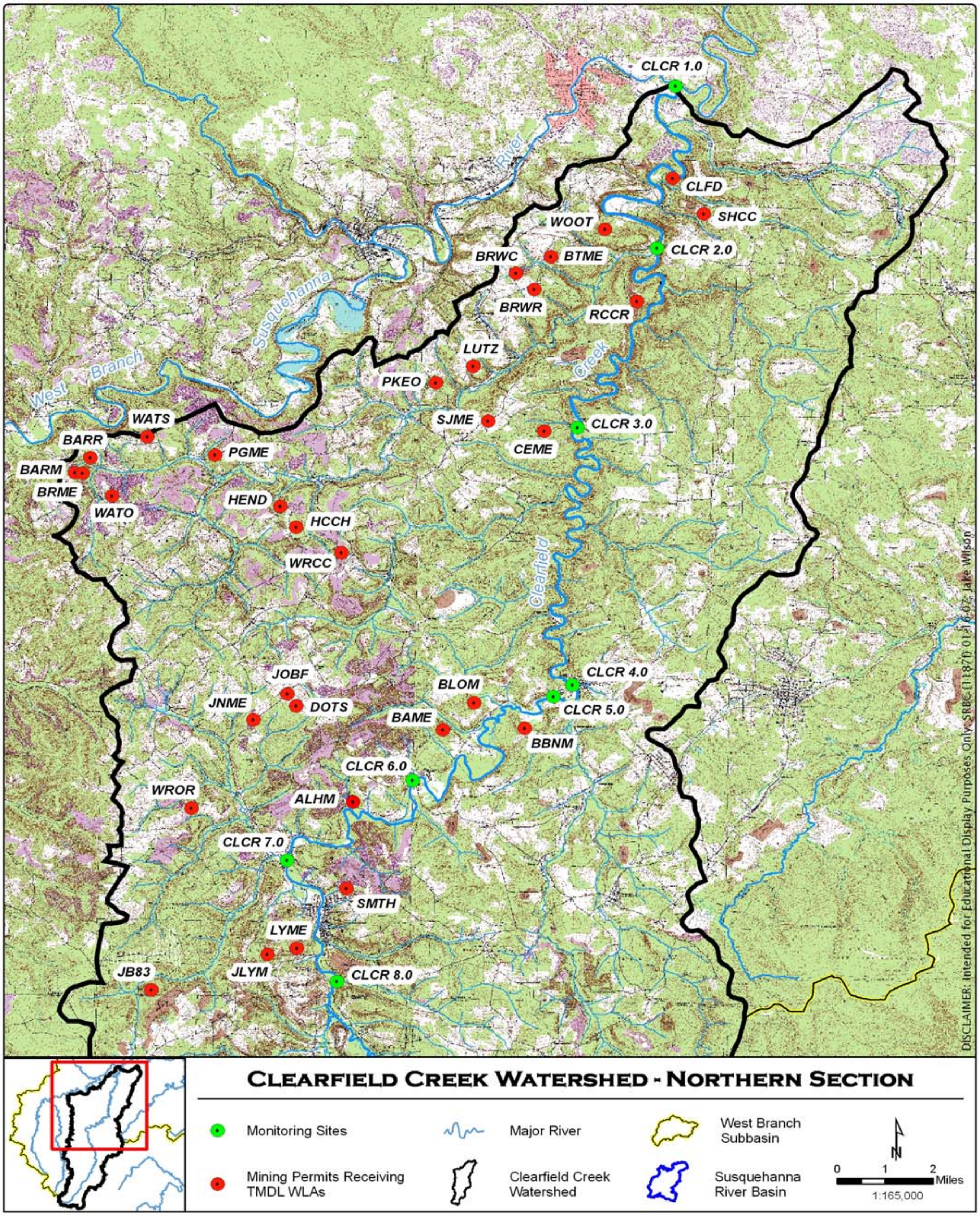
Attachment A

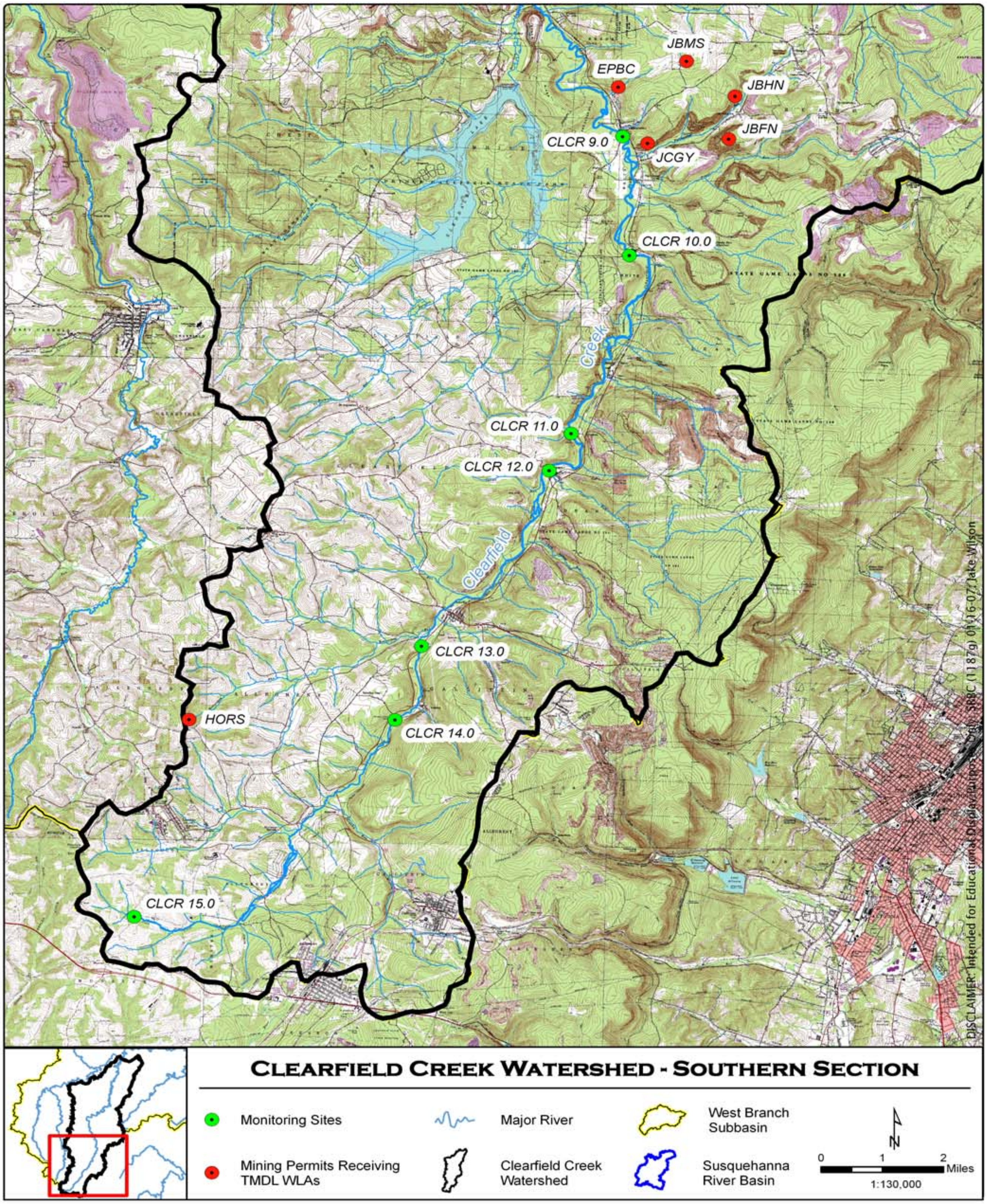
Clearfield Creek Watershed Maps



NORTHERN SECTION MAP
SOUTHERN SECTION MAP
West Branch
Susquehanna
River
Chest
Creek
Creek
Moshannon
Creek
Clearfield
Juniata
River
Little
NY
PA
MD
CLEARFIELD CREEK WATERSHED
Monitoring Site
Mining Permit Receiving TMDL WLA
Major River
Clearfield Creek Watershed
West Branch Subbasin
Susquehanna River Basin
0
2
4
Miles
1:260,000
DISCLAIMER: Intended for Educational Display Purposes Only. SRBC (11/27/e) 01-16-07; Jake Wilson



Clearfield Creek Watershed - Northern Section
CLCR 1.0
CLCR 2.0
CLCR 3.0
CLCR 4.0
CLCR 5.0
CLCR 6.0
CLCR 7.0
CLCR 8.0
CLFD
SHCC
WOOT
BTME
BRWC
BRWR
RCCR
LUTZ
PKEO
SJME
CEME
WATS
BARR
BARM
BRME
WATO
PGME
HEND
HCCH
WRCC
JOBF
JNME
DOTS
BLOM
BAME
BBNM
WROR
ALHM
SMTH
LYME
JLYM
JB83
West Branch
Susquehanna
River
Clearfield
Creek
Monitoring Sites
Mining Permits Receiving TMDL WLAs
Major River
Clearfield Creek Watershed
West Branch Subbasin
Susquehanna River Basin
0
1
2
Miles
1:165,000
N
DISCLAIMER: Intended for Educational Display Purposes Only



JBMS
EPBC
JBHN
JBFN
CLCR 9.0
JCGY
CLCR 10.0
Creek
CLCR 11.0
CLCR 12.0
Clearfield
CLCR 13.0
HORS
CLCR 14.0
CLCR 15.0
CLEARFIELD CREEK WATERSHED - SOUTHERN SECTION
Monitoring Sites
Mining Permits Receiving TMDL WLAs
Major River
Clearfield Creek Watershed
West Branch Subbasin
Susquehanna River Basin
0 1 2 Miles
1:130,000

Attachment B

Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists and 2004 Integrated List

The following are excerpts from the Pennsylvania DEP 303(d) narratives that justify changes in listings between the 1996, 1998, 2002, and 2004 lists. The 303(d) listing process has undergone an evolution in Pennsylvania since the development of the 1996 list.

In the 1996 Section 303(d) narrative, strategies were outlined for changes to the listing process. Suggestions included, but were not limited to, a migration to a Global Information System (GIS), improved monitoring and assessment, and greater public input.

The migration to a GIS was implemented prior to the development of the 1998 Section 303(d) list. As a result of additional sampling and the migration to the GIS some of the information appearing on the 1996 list differed from the 1998 list. Most common changes included:

1. mileage differences due to recalculation of segment length by the GIS;
2. slight changes in source(s)/cause(s) due to new USEPA codes;
3. changes to source(s)/cause(s), and/or miles due to revised assessments;
4. corrections of misnamed streams or streams placed in inappropriate SWP subbasins; and
5. unnamed tributaries no longer identified as such and placed under the named watershed listing.

Prior to 1998, segment lengths were computed using a map wheel and calculator. The segment lengths listed on the 1998 Section 303(d) list were calculated automatically by the GIS (ArcInfo) using a constant projection and map units (meters) for each watershed. Segment lengths originally calculated by using a map wheel and those calculated by the GIS did not always match closely. This was the case even when physical identifiers (e.g., tributary confluence and road crossings) matching the original segment descriptions were used to define segments on digital quad maps. This occurred to some extent with all segments, but was most noticeable in segments with the greatest potential for human errors using a map wheel for calculating the original segment lengths (e.g., long stream segments or entire basins). The 2002 Pa. Section 303(d) list was written in a manner similar to the 1998 Section 303(d) list.

In 2004, Pennsylvania developed the Integrated List of All Waters. The water quality status of Pennsylvania's waters is summarized using a five-part categorization of waters according to their water quality standard (WQS) attainment status. The categories represent varying levels of WQS attainment, ranging from Category 1, where all designated water uses are met, to Category 5, where impairment by pollutants requires a TMDL to correct. These category determinations are based on consideration of data and information consistent with the methods outlined by the Statewide Surface Water Assessment Program. Each PADEP five-digit waterbody segment is placed in one of the WQS attainment categories. Different segments of the same stream may appear on more than one list if the attainment status changes as the water flows downstream. The listing categories are as follows:

Category 1: Waters attaining all designated uses.

Category 2: Waters where some, but not all, designated uses are met. Attainment status of the remaining designated uses is unknown because data are insufficient to categorize a water consistent with the state's listing methodology.

Category 3: Waters for which there are insufficient or no data and information to determine, consistent with the state's listing methodology, if designated uses are met.

Category 4: Waters impaired for one or more designated use but not needing a TMDL. States may place these waters in one of the following three subcategories:

- TMDL has been completed.
- Expected to meet all designated uses within a reasonable timeframe.
- Not impaired by a pollutant.

Category 5: Waters impaired for one or more designated uses by any pollutant. Category 5 includes waters shown to be impaired as the result of biological assessments used to evaluate aquatic life use even if the specific pollutant is not known unless the state can demonstrate that nonpollutant stressors cause the impairment or that no pollutant(s) causes or contribute to the impairment. Category 5 constitutes the Section 303(d) list that USEPA will approve or disapprove under the Clean Water Act. Where more than one pollutant is causing the impairment, the water remains in Category 5 until all pollutants are addressed in a completed USEPA-approved TMDL or one of the delisting factors is satisfied.

Attachment C

Method for Addressing 303(d) Listings for pH

A great deal of research has been conducted on the relationship between alkalinity, acidity, and pH. Research published by the PADEP demonstrates that by plotting net alkalinity (alkalinity-acidity) vs. pH for 794 mine sample points, the resulting pH value from a sample possessing a net alkalinity of zero is approximately equal to six (Figure 1). Where net alkalinity is positive (greater than or equal to zero), the pH range is most commonly six to eight, which is within the USEPA's acceptable range of six to nine and meets Pennsylvania water quality criteria in Pa. Code, Chapter 93.

The pH, a measurement of hydrogen ion acidity presented as a negative logarithm, is not conducive to standard statistical analysis. Additionally, pH does not measure latent acidity. For this reason, and based on the above information, Pennsylvania is using the following approach to address the stream impairments noted on the 303(d) list due to pH. The concentration of acidity in a stream is at least partially chemically dependent upon metals. For this reason, it is extremely difficult to predict the exact pH values, that would result from treatment of abandoned mine drainage. Therefore, net alkalinity will be used to evaluate pH in these TMDL calculations. This methodology assures that the standard for pH will be met because net alkalinity is a measure of the reduction of acidity. When acidity in a stream is neutralized or is restored to natural levels, pH will be acceptable. Therefore, the measured instream alkalinity at the point of evaluation in the stream will serve as the goal for reducing total acidity at that point. The methodology that is applied for alkalinity (and therefore pH) is the same as that used for other parameters such as iron, aluminum, and manganese that have numeric water quality criteria.

Each sample point used in the analysis of pH by this method must have measurements for total alkalinity and total acidity. Net alkalinity is alkalinity minus acidity, both being in units of milligrams per liter (mg/l) $CaCO_3$. The same statistical procedures that have been described for use in the evaluation of the metals is applied, using the average value for total alkalinity at that point as the target to specify a reduction in the acid concentration. By maintaining a net alkaline stream, the pH value will be in the range from six to eight. This method negates the need to specifically compute the pH value, which for mine waters is not a true reflection of acidity. This method assures that Pennsylvania's standard for pH is met when the acid concentration reduction is met.

There are several documented cases of streams in Pennsylvania having a natural background pH below six. If the natural pH of a stream on the 303(d) list can be established from its upper unaffected regions, then the pH standard will be expanded to include this natural range. The acceptable net alkalinity of the stream after treatment/abatement in its polluted segment will be the average net alkalinity established from the stream's upper, pristine reaches. Summarized, if the pH in an unaffected portion of a stream is found to be naturally occurring below six, then the average net alkalinity for that portion of the stream will become the criterion for the polluted portion. This "natural net alkalinity level" will be the criterion to which a 99 percent confidence level will be applied. The pH range will be varied only for streams in which a natural unaffected net alkalinity level can be established. This can only be done for streams that have upper segments that are not impacted by mining activity. All other streams will be required to meet a minimum net alkalinity of zero.

Reference: *Rose, Arthur W. and Charles A. Cravotta, III. 1998. Geochemistry of Coal Mine Drainage. Chapter 1 in Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania. Pa. Dept. of Environmental Protection, Harrisburg, Pa.*

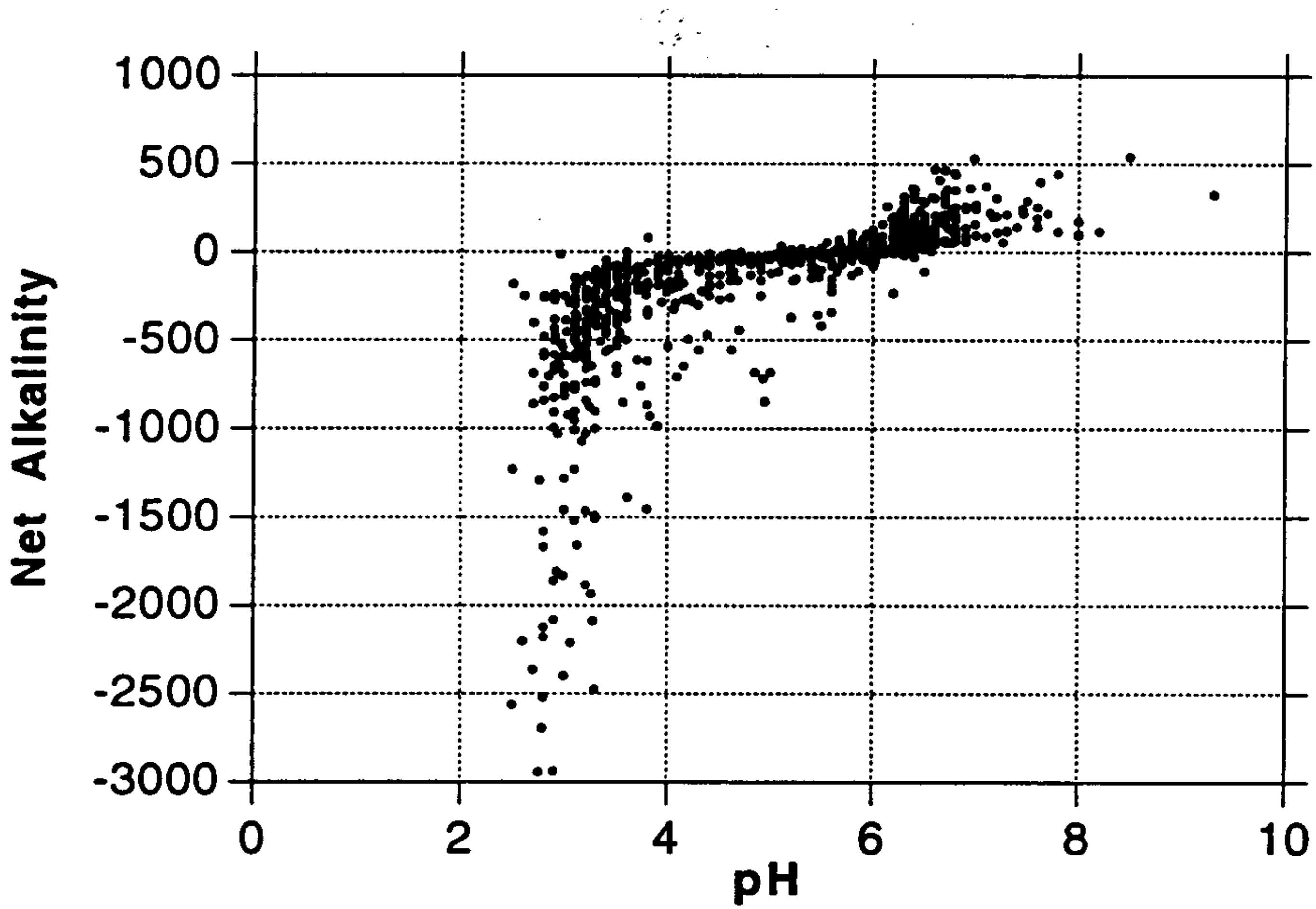


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania.

Attachment D
TMDLs By Segment

Clearfield Creek

The TMDL for the Clearfield Creek Watershed consists of load allocations to three tributaries: Blue Run, Brubaker Run and Sanbourn Run. Blue Run is a tributary to Clearfield Creek that enters the creek north of Chesterfield, Pa. Sanbourn Run is a tributary to Clearfield Creek that enters the creek northwest of Jeffries, Pa. Brubaker Run is a larger tributary to Clearfield Creek that enters the creek near Dean, Pa. The TMDLs completed for Blue Run, Sanbourn Run and Brubaker Run at their mouths are included in this document and are used to account for the upstream reductions at the AMD portion of the 303(d) listed segments of Clearfield Creek. The data and calculations for Sanbourn Run, Blue Run and Brubaker Run are found in their respective TMDL documents and are not included in this report.

The Clearfield Creek Watershed is listed as impaired on the Section 303(d) list for high metal levels from AMD as the cause of the degradation to the stream. For pH, the objective is to reduce acid loading to the stream that will in turn raise the pH to the acceptable range. The result of these analyses is an acid loading reduction that equates to meeting standards for pH (TMDL Endpoint section in the report, Table 4). The method and rationale for addressing pH is contained in Attachment C.

An allowable long-term average instream concentration for iron, manganese, aluminum, and acidity is determined at each sample point. These analyses are designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent of the time. An analysis was performed using Monte Carlo simulation to determine the necessary long-term average concentration needed to attain water quality criteria 99 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 iterations of sampling were completed and compared against the water quality criterion for that parameter. For each sampling event a percent reduction was calculated, if necessary, to meet water quality criteria. A second simulation that multiplied the percent reduction times the sampled value was run to insure that criteria were met 99 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards.

CLCR 15.0: Clearfield Creek Headwaters

The headwaters of Clearfield Creek begin outside of Munster, Pa. Bituminous coal mining in the watershed severely disturbed the land surface and underground structure. This portion of the stream is visibly impaired by abandoned mine drainage with the presence of orange iron precipitate. The point CLCR 15.0 is located at the upstream side of the bridge on State Route 1004.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area above CLCR 15.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 15.0 (0.82 MGD). The load allocations made at point CLCR 15.0 for this stream segment are presented in Table D1.

Table D1. TMDL Calculations at Point CLCR 15.0				
Flow = 0.82 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	2.21	15.1	0.18	1.2
Mn	0.15	1.0	0.15	1.0
Al	1.48	10.1	0.07	0.5
Acidity	ND	NA	NA	NA
Alkalinity	45.05	308.3		

ND- Not Detected, NA - Not Applicable

Reductions at point CLCR 15.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 15.0 are shown in Table D2.

Table D2. Calculation of Load Reduction Necessary at Point CLCR 15.0				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	15.1	1.0	10.1	NA
Existing load from upstream points (none)	-	-	-	-
Difference of existing load and upstream existing load	15.1	1.0	10.1	-
Allowable loads from upstream points (none)	-	-	-	-
Total load at CLCR 15.0	15.1	1.0	10.1	-
Allowable load at CLCR 15.0	1.2	1.0	0.5	-
Load Reduction at CLCR 15.0 (Total load at CLCR 15.0 - Allowable load at CLCR 15.0)	13.9	0.0	9.6	-
Percent reduction required at CLCR 15.0	92	0	95	-

The TMDL for point CLCR 15.0 does require a load allocation for total iron and total aluminum.

CLCR 14.0: Clearfield Creek upstream of Amsbry, Pa.

CLCR 14.0 is located next to Amsbry Union Cemetery just south of Amsbry, Pa. All measurements were recorded next to a group of hemlocks that were down an old logging road, and next to the cemetery. This monitoring point is located downstream of Bradley Run. Bradley Run is a large tributary to Clearfield Creek and is listed for metals impairment from AMD. The Bradley Run Watershed is degraded by the presence of the Gallitzin Borehole AMD discharge. This monitoring point also accounts for several non impaired UNTs to Clearfield Creek and one additional tributary (UNT 26591) which is AMD impaired. Loadings for Bradley Run and UNT 26591 will be allocated in future TMDLs.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 14.0 and CLCR 15.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 14.0 (26.37 MGD). The load allocations made at point CLCR 14.0 for this stream segment are presented in Table D3.

Table D3. TMDL Calculations at Point CLCR 14.0				
Flow 26.37 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	2.21	486.3	0.18	39.6
Mn	0.21	46.2	0.21	46.2
Al	3.47	763.6	0.10	22.0
Acidity	9.77	2,150.0	5.96	1,311.5
Alkalinity	32.57	7,167.3		

The loading reduction for point CLCR 15.0 was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 14.0. This value was compared to the allowable load at point CLCR 14.0. Reductions at point CLCR 14.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 14.0 are shown in Table D4.

Table D4. Calculation of Load Reduction Necessary at Point CLCR 14.0				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	486.3	46.2	763.6	2,150.0
Existing load from upstream points (CLCR 15.0)	15.1	1.0	10.1	-
Difference of existing load and upstream existing load	471.2	45.2	753.5	2,150.0
Allowable loads from upstream points (CLCR 15.0)	1.2	1.0	0.5	-
Total load at CLCR 14.0	472.4	46.2	754.0	2,150.0
Allowable load at CLCR 14.0	39.6	46.2	22.0	1,311.5
Load Reduction at CLCR 14.0 (Total load at CLCR 14.0- Allowable load at CLCR 14.0)	432.8	0.0	732.0	838.5
Percent reduction required at CLCR 14.0	92	0	97	39

The TMDL for point CLCR 14.0 requires a load allocation for total iron, total aluminum and acidity.

CLCR 13.0: Clearfield Creek downstream of Amsbry, Pa.

CLCR 13.0 is located at the State Highway 53 bridge just south of Ashville, Pa. All measurements were recorded on the upstream side of the bridge. This monitoring point accounts for several nonimpaired UNTs that enter Clearfield Creek below monitoring point CLCR 14.0.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 13.0 and CLCR 14.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 13.0 (26.17 MGD). The load allocations made at point CLCR 13.0 for this stream segment are presented in Table D5.

Table D5. TMDL Calculations at Point CLCR 13.0				
Flow = 26.17 MGD	*Measured Sample Data*		*Allowable*	
Parameter	*Conc. (mg/l)*	*Load (lbs/day)*	*LTA Conc. (mg/l)*	*Load (lbs/day)*
Fe	1.49	325.4	0.22	48.0
Mn	0.21	45.9	0.21	45.9
Al	1.34	292.6	0.13	28.4
Acidity	16.18	3,533.5	5.50	1,201.1
Alkalinity	25.55	5,579.8		

The loading reduction for point CLCR 14.0 was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 13.0. This value was compared to the allowable load at point CLCR 13.0. Reductions at point CLCR 13.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 13.0 are shown in Table D6.

Table D6. Calculation of Load Reduction Necessary at Point CLCR 13.0				
	Fe (lbs/day)	*Mn (lbs/day)*	*Al (lbs/day)*	*Acidity (lbs/day)*
Existing load	325.4	45.9	292.6	3,533.5
Existing load from upstream points (CLCR 14.0)	486.3	46.2	763.6	2,150.0
Difference of existing load and upstream existing load	-160.9	-0.3	-471.0	1,383.5
Allowable loads from upstream points (CLCR 14.0)	39.6	46.2	22.0	1,311.5
Percent load loss due to instream process	33	1	62	0
Percent load remaining at CLCR 13.0	67	99	38	100
Total load at CLCR 13.0	26.5	45.7	8.36	2,695.0
Allowable load at CLCR 13.0	48.0	45.9	28.4	1,201.1
Load Reduction at CLCR 13.0 (Total load at CLCR 13.0 - Allowable load at CLCR 13.0)	0.0	0.0	0.0	1,493.9
Percent reduction required at CLCR 13.0	0	0	0	55

The TMDL for point CLCR 14.0 requires a load allocation for acidity.

HORS: Cooney Bros., Horseshoe IV Mine

Cooney Bros., SMP#07000101, operates a surface mine in the adjacent Beaverdam Run Watershed in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the Best Available Technology (BAT) limits, assigned to the permit before it enters the stream.

HORS is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a waste load allocation (WLA). The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The standard 1500' x 300' open pit size was used for this operation. Table D7 shows the waste load allocations for the discharge.

Table D7. Waste Load Allocations at HORS			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

CLCR 12.0: Clearfield Creek downstream of Little Laurel Run

CLCR 12.0 is located at the State Route 1012 bridge just south of Dysart, Pa. All measurements were recorded on the upstream side of the bridge. This monitoring point accounts for several large tributaries entering Clearfield Creek. Indian Run, Swartz Run, and Little Laurel Run enter Clearfield Creek upstream of monitoring point CLCR 12.0.

One major contributing factor to the degraded water quality is the presence of Little Laurel Run. Little Laurel Run is an AMD tributary, listed for metals and pH impairments, and severely impacts the watershed downstream of its confluence. Little Laurel Run is impaired by the following AMD discharges: Belden Deep Mine, Old Klondike Mine, and the Ferris Wheel surface mines #1 and #2. The loadings for Little Laurel Run will be allocated in future TMDLs.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 12.0 and CLCR 13.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 12.0 (45.2 MGD). The load allocations made at point CLCR 12.0 for this stream segment are presented in Table D8.

Table D8. TMDL Calculations at Point CLCR 12.0				
Flow = 45.2 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	1.30	490.4	0.25	94.3
Mn	0.42	158.4	0.42	158.4
Al	1.82	686.5	0.18	67.9
Acidity	10.08	3,802.1	5.14	1,938.8
Alkalinity	28.77	10,851.9		

The loading reduction for point CLCR 13.0 was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 12.0. This value was compared to the allowable load at point CLCR 12.0. Reductions at point CLCR 12.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 12.0 are shown in Table D9.

Table D9. Calculation of Load Reduction Necessary at Point CLCR 12.0				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	490.4	158.4	686.5	3,802.1
Existing load from upstream points (CLCR 13.0)	325.4	45.9	292.6	3,533.5
Difference of existing load and upstream existing load	165.0	112.5	393.9	268.6
Allowable loads from upstream points (CLCR 13.0)	48.0	45.9	28.4	1,201.1
Total load at CLCR 12.0	213.0	158.4	422.3	1,469.7
Allowable load at CLCR 12.0	94.3	158.4	67.9	1,938.8
Waste load allocation (HORS)	1.1	0.7	0.7	-
Remaining load at CLCR 12.0	93.2	157.7	67.2	1,938.8
Load Reduction at CLCR 12.0 (Total load at CLCR 12.0- Remaining load at CLCR 12.0)	119.8	0.7	355.1	0.0
Percent reduction required at CLCR 12.0	56	0	84	0

The TMDL for point CLCR 12.0 requires a load allocation for total iron and total aluminum.

CLCR 11.0: Clearfield Creek upstream of Brubaker Run

CLCR 11.0 is located at the bridge on Condron Road (gravel road), west of State Highway 53, near the town of Dean, Pa. All measurements were recorded on the upstream side of the bridge. This monitoring point accounts for several tributaries entering Clearfield Creek. Laurel Run is a large, non impaired tributary that enters Clearfield Creek upstream of monitoring point CLCR 11.0.

This TMDL section for Clearfield Creek consists of a load allocation to the watershed area between CLCR 11.0 and CLCR 12.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 11.0 (54.63 MGD). The load allocations made at point CLCR 11.0 for this stream segment are presented in Table D10.

Table D10. TMDL Calculations at Point CLCR 11.0				
Flow = 54.63 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	1.37	624.6	0.30	136.8
Mn	0.43	196.0	0.43	196.0
Al	1.72	784.1	0.26	118.5
Acidity	13.37	6,095.2	5.48	2,498.3
Alkalinity	24.80	11,306.0		

The loading reduction for point CLCR 12.0 was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 11.0. This value was compared to the allowable load at point CLCR 11.0. Reductions at point CLCR 11.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 11.0 are shown in Table D11.

Table D11. Calculation of Load Reduction Necessary at Point CLCR 11.0				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	624.6	196.0	784.1	6,095.2
Existing load from upstream points (CLCR 12.0)	490.4	158.4	686.5	3,802.1
Difference of existing load and upstream existing load	134.2	37.6	97.6	2,293.1
Allowable loads from upstream points (CLCR 12.0)	94.3	158.4	67.9	1,938.8
Total load at CLCR 11.0	228.5	196.0	165.5	4,231.9
Allowable load at CLCR 11.0	136.8	196.0	118.5	2,498.3
Load Reduction at CLCR 11.0 (Total load at CLCR 11.0- Allowable load at CLCR 11.0)	91.7	0.0	47.0	1,733.6
Percent reduction required at CLCR 11.0	40	0	28	41

The TMDL for point CLCR 11.0 requires a load allocation for total iron, total aluminum, and acidity.

BRBK01: Brubaker Run at its mouth

Brubaker Run enters Clearfield Creek between monitoring points CLCR 11.0 and 10.0, near Dean, Pa. Brubaker Run is highly polluted at its mouth and has a TMDL completed for its watershed. The TMDLs assigned in Tables D12 and D13 are based on the data and calculations found in the Brubaker Run Watershed TMDL completed by PADEP and approved by USEPA on August 30, 2004.

The TMDL for this section of Brubaker Run consists of a load allocation recorded from the established Brubaker Run TMDL. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point BRBK01 (3.66 MGD). The load allocations made at point BRBK01 for this stream segment are calculated after upstream reductions have been made and are presented in Table D12.

Table D12. TMDL Calculations at Point BRBK01				
Flow = 3.66 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	53.66	1,636.3	0.54	16.4
Mn	29.83	909.7	0.45	13.6
Al	21.00	640.4	0.42	12.8
Acidity	398.13	12,140.8	0.00	0.0
Alkalinity	0.00	0.0		

Reductions at point BRBK01 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point BRBK01 are shown in Table D13.

Table D13. Calculation of Load Reduction Necessary at Point BRBK01				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	1,636.3	909.7	640.4	12,140.8
Allowable load at BRBK01	16.4	13.6	12.8	0.0
Percent reduction required at BRBK01	0	85	83	100

The TMDL for point BRBK01 requires a load allocation for total manganese, total aluminum and acidity.

CLCR 10.0: Clearfield Creek downstream of Brubaker Run

CLCR 10.0 is located at the State Route 1026 bridge near Frugality, Pa. All measurements were recorded on the upstream side of the bridge. This monitoring point accounts for several tributaries entering Clearfield Creek including Brubaker Run.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 10.0 and CLCR 11.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 10.0 (74.82 MGD). The load allocations made at point CLCR 10.0 for this stream segment are presented in Table D14.

Table D14. TMDL Calculations at Point CLCR 10.0				
Flow = 74.82 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	2.53	1,579.7	0.38	237.3
Mn	2.01	1,255.0	0.48	299.7
Al	1.33	830.4	0.23	143.6
Acidity	31.10	19,418.0	10.57	6,599.3
Alkalinity	18.43	11,507.2		

The loading reduction for points CLCR 11.0 and BRBK01 were used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 10.0. This value was compared to the allowable load at point CLCR 10.0. Reductions at point CLCR 10.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 10.0 are shown in Table D15.

Table D15. Calculation of Load Reduction Necessary at Point CLCR 10.0				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	1,579.7	1,255.0	830.4	19,418.0
Existing load from upstream points (CLCR 11.0 & BRBK01)	2,260.9	1,105.7	1,424.5	18,236.0
Difference of existing load and upstream existing load	-681.2	149.3	-594.1	1,182.0
Allowable loads from upstream points (CLCR 11.0 & BRBK01)	153.2	209.6	131.3	2,498.3
Percent load loss due to instream process	30	0	42	0
Percent load remaining at CLCR 10.0	70	100	58	100
Total load at CLCR 10.0	107.2	358.9	76.2	3,680.3
Allowable load at CLCR 10.0	237.3	299.7	143.6	6,599.3
Load Reduction at CLCR 10.0 (Total load at CLCR 10.0- Allowable load at CLCR 10.0)	0.0	59.2	0.0	0.0
Percent reduction required at CLCR 10.0	0	16	0	0

The TMDL for point CLCR 10.0 requires a load allocation for total manganese.

JCGY: EP Bender, 77 Job Cash Gray

EP Bender, SMP#11010101, operates a surface mine near UNT 26464 in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

JCGY is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The standard 1500' x 300' open pit size was used for this operation. Table D16 shows the waste load allocations for the discharge.

Table D16. Waste Load Allocations at JCGY			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

JBFN: EP Bender, 73 Job Fulkerson II

EP Bender, SMP#11010102, operates a surface mine near UNT 26464 in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

JBFN is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is 175' x 100', smaller than the standard 1500' x 300'. Table D17 shows the waste load allocations for the discharge.

Table D17. Waste Load Allocations at JBFN			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0017	0.0
Mn	2.0	0.0017	0.0
Al	2.0	0.0017	0.0

JBHN: EP Bender, 78 Job Hollentown II

EP Bender, SMP#11020101, operates a surface mine near UNT 26464 in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

JBHN is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500' x 300'. Table D18 shows the waste load allocations for the discharge.

Table D18. Waste Load Allocations at JBHN			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

CLCR 9.0: Clearfield Creek above Glendale, Pa.

CLCR 9.0 is located at the State Route 1023 bridge near Fallen Timber, Pa. All measurements were recorded on the upstream side of the bridge. This monitoring point accounts for Sandy Run, a nonimpaired tributary, and Powell Run, an AMD impaired tributary, entering Clearfield Creek. Powell Run is listed for metals and pH impairments from AMD and loadings will be allocated in future TMDLs. Powell Run is a large source of metals to Clearfield Creek and was listed as a reclamation priority area.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 9.0 and CLCR 10.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 9.0 (79.57 MGD). The load allocations made at point CLCR 9.0 for this stream segment are presented in Table D19.

Table D19. TMDL Calculations at Point CLCR 9.0				
Flow = 79.57 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	1.43	949.5	0.37	245.7
Mn	1.72	1,142.1	0.48	318.7
Al	1.01	670.7	0.24	159.4
Acidity	20.90	13,877.8	5.60	3,718.5
Alkalinity	20.52	13,625.5		

The loading reduction for point CLCR 10.0 was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 9.0. This value was compared to the allowable load at point CLCR 9.0. Reductions at point CLCR 9.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 9.0 are shown in Table D20.

Table D20. Calculation of Load Reduction Necessary at Point CLCR 9.0				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	949.5	1,142.1	670.7	13,877.8
Existing load from upstream points (CLCR 10.0)	1,579.7	1,255.0	830.4	19,418.0
Difference of existing load and upstream existing load	-630.2	-112.9	-159.7	-5,541.0
Allowable loads from upstream points (CLCR 10.0)	237.3	299.7	143.6	6,599.3
Percent load loss due to instream process	40	9	19	29
Percent load remaining at CLCR 9.0	60	91	81	71
Total load at CLCR 9.0	142.4	272.7	116.3	4,685.5
Allowable load at CLCR 9.0	245.7	318.7	159.4	3,718.5
Waste load allocation (JCGY + JBFN + JBHN)	2.2	1.4	1.4	-
Remaining load at CLCR 9.0	243.5	317.3	158.0	3718.5
Load Reduction at CLCR 9.0 (Total load at CLCR 9.0-Remaining load at CLCR 9.0)	0.0	0.0	0.0	967.0
Percent reduction required at CLCR 9.0	0	0	0	21

The TMDL for point CLCR 9.0 requires a load allocation for acidity.

EPBC: EP Bender, Fallentimber Prep

EP Bender, SMP# 11841601, operates a surface mine near UNT 26460 in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

EPBC is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. Flow measurements were recorded for EPBC. Table D21 shows the waste load allocations for the discharge.

Table D21. Waste Load Allocations at EPBC			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0360	0.9
Mn	2.0	0.0360	0.6
Al	2.0	0.0360	0.6

JBMS: EP Bender, 75 JOB MATTHEWS

EP Bender, SMP#11980102, operates a surface mine near UNT 26458 in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

JBMS is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load*

section in Attachment F. The open pit size for this operation is the standard 1500’ x 300’. Table D22 shows the waste load allocations for the discharge.

Table D22. Waste Load Allocations at JBMS			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

CLCR 8.0: Clearfield Creek downstream of Beaverdam Run

CLCR 8.0 is located at the State Highway 53 pull-off just upstream of Turner Run. All measurements were recorded in a riffle area approximately 50 feet upstream of Turner Run. This monitoring point accounts for two large tributaries entering Clearfield Creek near Flinton, Pa: Dutch Run and Beaverdam Run.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 8.0 and CLCR 9.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 8.0 (125.26 MGD). The load allocations made at point CLCR 8.0 for this stream segment are presented in Table D23.

Table D23. TMDL Calculations at Point CLCR 8.0				
Flow = 125.26 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	1.20	1,254.4	0.62	648.1
Mn	1.16	1,212.5	0.55	574.9
Al	0.88	919.9	0.48	501.7
Acidity	15.30	15,993.0	6.12	6,397.2
Alkalinity	27.18	28,411.1		

The loading reduction for point CLCR 9.0 was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 8.0. This value was compared to the allowable load at point CLCR 8.0. Reductions at point CLCR 8.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 8.0 are shown in Table D24.

Table D24. Calculation of Load Reduction Necessary at Point CLCR 8.0				
	***Fe* (lbs/day)**	***Mn* (lbs/day)**	***Al* (lbs/day)**	***Acidity* (lbs/day)**
Existing load	1,254.4	1,212.5	919.9	15,993.0
Existing load from upstream points (CLCR 9.0)	949.5	1,142.1	670.7	13,877.8
Difference of existing load and upstream existing load	304.9	70.4	249.2	2,115.2
Allowable loads from upstream points (CLCR 9.0)	245.7	318.7	159.4	3,718.5
Percent load loss due to instream process	0	0	0	0
Percent load remaining at CLCR 8.0	100	100	100	100
Total load at CLCR 8.0	550.6	389.1	408.6	8,833.7
Allowable load at CLCR 8.0	648.1	574.9	501.7	6,397.2
Waste load allocation (EPBC + JBMS)	2.0	1.3	1.3	-
Remaining load at CLCR 8.0	646.1	573.6	500.4	6,397.2
Load Reduction at CLCR 8.0 (Total load at CLCR 8.0 - Remaining load at CLCR 8.0)	0.0	0.0	0.0	2,436.5
Percent reduction required at CLCR 8.0	0	0	0	28

The TMDL for point CLCR 8.0 requires a load allocation for acidity.

SMTH: Sky Haven Coal Co., Smith No. 5

Sky Haven Coal Co., SMP#17950104, operates a surface mine near UNT 26352 in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

SMTH is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500' x 300'. Table D25 shows the waste load allocations for the discharge.

Table D25. Waste Load Allocations at SMTH			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

LYME: EP Bender, Lyleville Mine 60 Job

EP Bender, SMP#17970105, operates a surface mine in the Clearfield Creek Watershed along the stream channel. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

LYME is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load*

section in Attachment F. The open pit size for this operation is the standard 1500’ x 300’. Table D26 shows the waste load allocations for the discharge.

Table D26. Waste Load Allocations at LYME			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

JLYM: EP Bender, 79 Job Lyleville II Mine

EP Bender, SMP#17030104, operates a surface mine in the Clearfield Creek Watershed along the stream channel. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

JLYM is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit sizes (no more than 3 pits) for this operation is 1900’ x 500’, larger than the standard 1500’ x 300’. Table D27 shows the waste load allocations for the discharge.

Table D27. Waste Load Allocations at JLYM			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0638	2.4
Mn	2.0	0.0638	1.6
Al	2.0	0.0638	1.6

WROR: Blue Mnt Co., Wohler Opreration

Blue Mnt. Co., SMP#17040901, operates a surface mine near UNT 26324 in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

WROR is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500’ x 300’. Table D28 shows the waste load allocations for the discharge.

Table D28. Waste Load Allocations at WROR			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

JNME: RB Contracting., Jordan 1 Mine

RB Contracting, SMP#17020108, operates a surface mine near Hunter Run in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

JNME is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500' x 300'. Table D29 shows the waste load allocations for the discharge.

Table D29. Waste Load Allocations at JNME			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

DOTS: TDK Coal Services, Dotts Johnston

TDK Coal Services, SMP#17840126, has not started, but a WLA will be assigned for future loadings. Any discharge from the operations treatment pond will be treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

DOTS is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The standard 1500' x 300' open pit size was used for this operation. Table D30 shows the waste load allocations for the discharge.

Table D30. Waste Load Allocations at DOTS			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

JOBF: EP Bender, 63 Job Flinton

EP Bender, SMP#11960105, operates a surface mine near Comfort Run in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

JOBF is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The combined open pit size for this operation is 300' x 240', smaller than the standard 1500' x 300'. Table D31 shows the waste load allocations for the discharge.

Table D31. Waste Load Allocations at JOBF			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0071	0.2
Mn	2.0	0.0071	0.1
Al	2.0	0.0071	0.1

JB83: EP Bender, 83 JOB - SGL 120

EP Bender, SMP#11040102, operates a surface mine near South Witmer Run in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

JB83 is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. Flow measurements were recorded for JB83. Table D32 shows the waste load allocations for the discharge.

Table D32. Waste Load Allocations at JB83			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.1755	4.4
Mn	2.0	0.1755	2.9
Al	2.0	0.1755	2.9

CLCR 7.0: Clearfield Creek at Irvona, Pa.

CLCR 7.0 is located at the State Highway 53 bridge in Irvona, Pa. All measurements were recorded in at the head of the riffle area, downstream of an old bridge abutment. This monitoring point accounts for two large tributaries and several small UNTs entering Clearfield Creek. Whitmer Run and Blain Run are two nonimpaired streams that contribute significant flow to Clearfield Creek. UNT 26348 enters Clearfield Creek and is severely impaired by metals and pH from AMD. Loadings for UNT 26348 will be allocated in future TMDLs.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 7.0 and CLCR 8.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 7.0 (159.59 MGD). The load allocations made at point CLCR 7.0 for this stream segment are presented in Table D33.

Table D33. TMDL Calculations at Point CLCR 7.0				
Flow = 159.59 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	0.78	1,038.8	0.74	985.5
Mn	0.83	1,105.4	0.53	705.8
Al	ND	NA	NA	NA
Acidity	13.15	17,512.9	6.71	8,936.2
Alkalinity	28.65	38,155.5		

The loading reduction for point CLCR 8.0 was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 7.0. This value was compared to the allowable load at point CLCR 7.0. Reductions at point CLCR 7.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 7.0 are shown in Table D34.

Table D34. Calculation of Load Reduction Necessary at Point CLCR 7.0				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	1,038.8	1,105.4	NA	17,512.9
Existing load from upstream points (CLCR 8.0)	1,254.4	1,212.5	-	15,993.0
Difference of existing load and upstream existing load	-215.6	-107.1	-	1,519.9
Allowable loads from upstream points (CLCR 8.0)	648.1	574.9	-	6,397.2
Percent load loss due to instream process	17	9	-	0
Percent load remaining at CLCR 6.0	83	91	-	100
Total load at CLCR 7.0	537.9	523.2	-	8,161.7
Allowable load at CLCR 7.0	985.5	705.8	-	8,936.2
Waste load allocation (SMTH +LYME + JLYM + WROR + JNME + DOTS + JOBF)	12.5	8.1	-	-
Remaining load at CLCR 7.0	973.2	697.7	-	8,936.2
Load Reduction at CLCR 7.0 (Total load at CLCR 7.0-Remaining load at CLCR 7.0)	0.0	0.0	-	0.0
Percent reduction required at CLCR 7.0	0	0	-	0

The TMDL for point CLCR 7.0 does not require a load allocation.

ALHM: Al Hamilton, 17773038 Post Mining Discharge

Al Hamilton, SMP#17773038, is a former active mining permit with post mining discharges that drain into Dotts Hollow in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

ALHM is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. Flow measurements were recorded for WLA ALHM. Table D35 shows the waste load allocations for the discharge.

Table D35. Waste Load Allocations at ALHM			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0144	0.4
Mn	2.0	0.0144	0.2
Al	2.0	0.0144	0.2

CLCR 6.0: Clearfield Creek upstream of Shoft Mine Discharge

CLCR 6.0 is located upstream of State Highway 729 in the town of Glen Hope, Pa. All measurements were recorded by the emergency fire hydrant upstream of the State Highway 729 bridge. Two large impaired tributaries enter Clearfield Creek just upstream of monitoring point CLCR 6.0. Pine Run and Cofinan Run are listed for metal impairments from AMD; Pine Run is also listed for pH impairments. Loadings for Pine Run and Cofinan Run will be allocated in future TMDLs.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 6.0 and CLCR 7.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 6.0 (165.99 MGD). The load allocations made at point CLCR 6.0 for this stream segment are presented in Table D36.

Table D36. TMDL Calculations at Point CLCR 6.0				
Flow 165.99 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	0.90	1,246.7	0.51	706.4
Mn	0.91	1,260.5	0.49	678.7
Al	0.85	1,177.4	0.54	748.0
Acidity	10.87	15,057.0	6.96	9,640.9
Alkalinity	31.30	43,356.3		

The loading reduction for point CLCR 7.0 was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 6.0. This value was compared to the allowable load at point CLCR 6.0. Reductions at point CLCR 6.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 6.0 are shown in Table D37.

Table D37. Calculation of Load Reduction Necessary at Point CLCR 6.0

	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	1,246.7	1,260.5	1,177.4	15,057.0
Existing load from upstream points (CLCR 7.0)	1,038.8	1,105.4	-	17,512.9
Difference of existing load and upstream existing load	207.9	155.1	1,177.4	-2,455.9
Allowable loads from upstream points (CLCR 7.0)	985.5	705.8	-	8,936.2
Percent load loss due to instream process	0	0	0	14
Percent load remaining at CLCR 6.0	100	100	100	86
Total load at CLCR 6.0	1,193.4	860.9	1,177.4	7,685.1
Allowable load at CLCR 6.0	706.4	678.7	748.0	9,640.9
Waste load allocation (ALHM)	0.4	0.2	0.2	-
Remaining load at CLCR 7.0	706.0	678.5	747.8	-
Load Reduction at CLCR 6.0 (Total load at CLCR 6.0 - Allowable load at CLCR 6.0)	487.4	182.4	429.6	0.0
Percent reduction required at CLCR 6.0	41	21	36	0

The TMDL for point CLCR 6.0 requires a load allocation for total iron, total manganese, and total aluminum.

BR01: Blue Run at its mouth

Blue Run enters Clearfield Creek between monitoring points CLCR 6.0 and 5.0, near Glen Hope, Pa. Blue Run is highly polluted at its mouth and has a TMDL completed for its watershed. The TMDLs assigned in Tables D38 and D39 are based on the data and calculations found in the Blue Run Watershed TMDL completed by PADEP and approved by USEPA on July, 17 2006.

The TMDL for this section of Blue Run consists of a load allocation from the established Blue Run TMDL. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point BR01 (0.70 MGD). The load allocations made at point BR01 for this stream segment are calculated after upstream reductions have been made and are presented in Table D37.

Table D38. TMDL Calculations at Point BR01				
Flow 0.70 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	ND	NA	NA	NA
Mn	0.67	3.9	0.21	1.3
Al	ND	NA	NA	NA
Acidity	ND	NA	NA	NA
Alkalinity	20.78	121.4		

Reductions at point BR01 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point BR01 are shown in Table D39.

Table D39. Calculation of Load Reduction Necessary at Point BR01				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	-	3.9	-	-
Allowable load at BR01	-	1.3	-	-
Percent reduction required at BR01	-	0	-	-

The TMDL for point BR01 does not require a load allocation.

BAME: Ecklund Co., Bakaysa Mine

Ecklund Co., SMP#17910131, operates a surface mine near Porter Run in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

BAME is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500’ x 300’. Table D40 shows the waste load allocations for the discharge.

Table D40. Waste Load Allocations at BAME			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

BLOM: Sky Haven Coal Co., Bloom 1 Mine

Sky Haven Coal Co., SMP#17950111, operates a surface mine near Maplepole Run in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

BLOM is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is 125' x 80', smaller than the standard 1500' x 300'. Table D41 shows the waste load allocations for the discharge.

Table D41. Waste Load Allocations at BLOM			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0010	0.0
Mn	2.0	0.0010	0.0
Al	2.0	0.0010	0.0

BBNM: Forcey Coal, Butterbaugh No 3 Mine

Forcey Coal, SMP#17030117, operates a surface mine in the Clearfield Creek Watershed along the stream channel. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

BBNM is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The standard 1500' x 300' open pit size was used for this operation. Table D42 shows the waste load allocations for the discharge.

Table D42. Waste Load Allocations at BBNM			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

CLCR 5.0: Clearfield Creek upstream of Muddy Run

CLCR 5.0 is located at the upstream of Muddy Run near Madera, Pa. All measurements were recorded upstream of the baseball field just upstream of State Highway 53 bridge south of Madera, Pa. This monitoring point accounts for three AMD impaired UNTs and Blue Run. Blue Run contributes significant flow to Clearfield Creek and is impaired by metals and pH from AMD. UNTs 26285, 26291, and 64243 are listed as being impaired by metals from AMD.

Loadings for UNTs 26285, 26291, and 64243 will be allocated in future TMDLs. Also, this monitoring point takes into account the presence of the Shoft Mine Discharge. The abandoned Shoft Mine Discharge is the result of extensive deep and surface mining around the 1930s and flows directly into Clearfield Creek.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 5.0 and CLCR 6.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 5.0 (174.95 MGD). The load allocations made at point CLCR 5.0 for this stream segment are presented in Table D43.

Table D43. TMDL Calculations at Point CLCR 5.0				
Flow = 174.95 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	1.50	2,189.9	0.81	1,182.6
Mn	0.90	1,314.0	0.52	759.2
Al	0.84	1,226.4	0.74	1,080.4
Acidity	12.40	18,103.5	5.58	8,146.6
Alkalinity	26.63	38,878.7		

The loading reduction for points CLCR 6.0 and BR01 were used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 5.0. This value was compared to the allowable load at point CLCR 5.0. Reductions at point CLCR 5.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 5.0 are shown in Table D44.

Table D44. Calculation of Load Reduction Necessary at Point CLCR 5.0				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	2,189.9	1,314.0	1,226.4	18,103.5
Existing load from upstream points (CLCR 6.0 + BR 01)	1,246.7	1,264.4	1,177.4	15,057.0
Difference of existing load and upstream existing load	943.2	49.6	49.0	3,046.5
Allowable loads from upstream points (CLCR + BR 01)	706.4	680.0	748.0	9,640.9
Total load at CLCR 5.0	1,649.6	729.6	797.0	12,687.4
Allowable load at CLCR 5.0	1,182.6	759.2	1,080.4	8,146.6
Waste load allocation (BAME + BLOM + BBNM)	2.2	1.4	1.4	-
Remaining load at CLCR 5.0	1,180.4	757.8	1,079.0	8,146.6
Load Reduction at CLCR 5.0 (Total load at CLCR 5.0-Allowable load at CLCR 5.0)	469.2	0.0	0.0	4,540.8
Percent reduction required at CLCR 5.0	28	0	0	36

The TMDL for point CLCR 5.0 requires a load allocation for total iron and acidity.

CLCR 4.0: Clearfield Creek downstream of Muddy Run

CLCR 4.0 is located just downstream of Muddy Run near Madera, Pa. All measurements were recorded on the downstream side of the State Highway 53 bridge. This monitoring point accounts for the water quality contributions from Muddy Run, one of the largest tributaries to enter Clearfield Creek. Muddy Run is listed as being impaired by metals and pH from AMD. Loadings for Muddy Run will be allocated in future TMDLs.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 4.0 and CLCR 5.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 4.0 (208.46 MGD). The load allocations made at point CLCR 4.0 for this stream segment are presented in Table D45.

Table D45. TMDL Calculations at Point CLCR 4.0

Flow = 208.46 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	1.81	3,148.7	0.98	1,704.8
Mn	1.55	2,696.4	0.60	1,043.8
Al	0.69	1,200.3	0.40	695.8
Acidity	10.87	18,909.4	6.74	11,724.9
Alkalinity	32.97	57,354.6		

The loading reduction for point CLCR 5.0 was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 4.0. This value was compared to the allowable load at point CLCR 4.0. Reductions at point CLCR 4.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 4.0 are shown in Table D46.

Table D46. Calculation of Load Reduction Necessary at Point CLCR 4.0				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	3,148.7	2,696.4	1,200.3	18,909.4
Existing load from upstream points (CLCR 5.0)	2,189.9	1,314.0	1,226.4	18,103.5
Difference of existing load and upstream existing load	958.8	1,382.4	-26.1	805.9
Allowable loads from upstream points (CLCR 5.0)	1,182.6	759.2	1,080.4	8,146.6
Percent load loss due to instream process	0	0	2	0
Percent load remaining at CLCR 4.0	100	100	98	100
Total load at CLCR 4.0	2,141.4	2,141.6	1,058.8	8,952.5
Allowable load at CLCR 4.0	1,704.8	1,043.8	695.8	11,724.9
Load Reduction at CLCR 4.0 (Total load at CLCR 4.0-Allowable load at CLCR 4.0)	436.6	1,097.8	363.0	0.0
Percent reduction required at CLCR 4.0	20	51	34	0

The TMDL for point CLCR 4.0 requires a load allocation for total iron, total manganese and total aluminum.

WRCC: Waroquier Coal Co., Waroquier Witherow

Waroquier Coal Co., SMP#17910101, operates a surface mine near Carson Run in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

WRCC is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500’ x 300’. Table D47 shows the waste load allocations for the discharge.

Table D47. Waste Load Allocations at WRCC			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

CEME: Johnson Br., Chase Mine

Johnson Br., SMP#17980105, operates a surface mine near Cherry Run in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

CEME is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load*

section in Attachment F. The open pit size for this operation is the standard 1500’ x 300’. Table D48 shows the waste load allocations for the discharge.

Table D48. Waste Load Allocations at CEME			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

CLCR 3.0: Clearfield Creek at Faunce, Pa.

CLCR 3.0 is located at the State Route 2012 bridge near Faunce, Pa. All measurements were recorded on the upstream side of the bridge. This monitoring point accounts for the water quality contributions from Pine Run, Potts Run, Japling Run, Upper Morgan Run and Lost Run. All five of the tributaries listed above, with the exception of Pine Run, are harshly impaired for metals and pH from AMD. Loadings for Japling Run, Potts Run, Upper Morgan Run and Lost Run will be allocated for in future TMDLs.

This TMDL section for Clearfield Creek consists of a load allocation to the watershed area between CLCR 3.0 and CLCR 4.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 3.0 (226.42 MGD). The load allocations made at point CLCR 3.0 for this stream segment are presented in Table D49.

Table D49. TMDL Calculations at Point CLCR 3.0				
Flow = 226.42 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	2.12	4,005.7	0.78	1,473.8
Mn	1.97	3,722.3	0.67	1,265.9
Al	0.86	1,624.9	0.43	812.5
Acidity	14.52	27,435.2	6.74	12,735.1
Alkalinity	25.42	48,030.5		

The loading reduction for point CLCR 4.0 was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 3.0. This value was compared to the allowable load at point CLCR 3.0. Reductions at point CLCR 3.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 3.0 are shown in Table D50.

Table D50. Calculation of Load Reduction Necessary at Point CLCR 3.0				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	4,005.7	3,722.3	1,624.9	27,435.2
Existing load from upstream points (CLCR 4.0)	3,148.7	2,696.4	1,200.3	18,909.4
Difference of existing load and upstream existing load	857.0	1,025.9	424.6	8,525.8
Allowable loads from upstream points	1,704.8	1,043.8	695.8	11,724.9
Total load at CLCR 3.0	2,561.8	2,069.7	1,120.4	20,250.7
Allowable load at CLCR 3.0	1,473.8	1,265.9	812.5	12,735.1
Waste load allocation (WRCC + CEME)	2.2	1.4	1.4	-
Remaining load at CLCR 7.0	1,471.6	1,264.5	811.1	12,735.1
Load Reduction at CLCR 3.0 (Total load at CLCR 3.0-Remaining load at CLCR 3.0)	1,090.2	805.2	309.3	7,515.6
Percent reduction required at CLCR 3.0	43	39	28	37

The TMDL for point CLCR 3.0 requires a load allocation for total iron, total manganese, total aluminum and acidity.

SJME: Amfire Mining, Skebo Job Mine

Amfire Mining, SMP#17980123, operates a surface mine near Little Clearfield Creek in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

SJME is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500' x 300'. Table D51 shows the waste load allocations for the discharge.

Table D51. Waste Load Allocations at SJME			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

SBRN01: Sanbourn Run at its mouth

Sanbourn Run enters Clearfield Creek between monitoring points CLCR 3.0 and CLCR2.0, north of Sanbourn, Pa. Sanbourn Run is highly polluted at its mouth and has a TMDL completed for its watershed. The TMDLs assigned in Tables D52 and D53 are based on the data and calculations found in the Sanbourn Run Watershed TMDL completed by PADEP and approved by USEPA on March 17, 2005.

The TMDL for this section of Sanbourn Run consists of a load allocation from the established Sanbourn Run TMDL. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point SBRN01 (4.67 MGD). The load allocations made at point SBRN01 for this stream segment are calculated after upstream reductions have been made and are presented in Table D52.

Table D52. TMDL Calculations at Point SBRN01				
Flow 4.67 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	0.42	16.4	0.42	16.4
Mn	6.87	267.8	0.27	10.7
Al	3.45	134.6	0.24	9.4
Acidity	88.50	3,449.2	0.89	34.5
Alkalinity	2.95	115.0		

Reductions at point SBRN01 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point SBRN01 are shown in Table D53.

Table D53. Calculation of Load Reduction Necessary at Point SBRN01				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	16.4	267.8	134.6	3,449.2
Allowable load at SBNR01	16.4	10.7	9.4	34.5
Percent reduction required at SBRN01	0	40	33	85

The TMDL for point SBRN01 requires a load allocation for total manganese, total aluminum and acidity.

RCCR: Sky Haven Coal Co., Roy #3

Sky Haven Coal Co., SMP#17743165, operates a surface mine in the Clearfield Creek Watershed along the stream channel. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

RCCR is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500’ x 300’. Table D54 shows the waste load allocations for the discharge.

Table D54. Waste Load Allocations at RCCR			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

BTME: Energy Res., Burnett Mine

Energy Res., SMP#17930120, operates a surface mine near Little Clearfield Creek in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

BTME is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is 2200' x 500', larger than the standard 1500' x 300'. Table D55 shows the waste load allocations for the discharge.

Table D55. Waste Load Allocations at BTME			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.1089	2.7
Mn	2.0	0.1089	1.8
Al	2.0	0.1089	1.8

BRWC: Amfire Mining, Browncrest 6

Amfire Mining, SMP#17860122, operates a surface mine near Little Clearfield Creek in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

BRWC is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is 800' x 150', smaller than the standard 1500' x 300'. Table D56 shows the waste load allocations for the discharge.

Table D56. Waste Load Allocations at BRWC			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0119	0.3
Mn	2.0	0.0119	0.2
Al	2.0	0.0119	0.2

BRWR: Amfire Mining, Browncrest 7

Amfire Mining, SMP#17910125, operates a surface mine near Little Clearfield Creek in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

BRWR is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is 800' x 150', smaller than the standard 1500' x 300'. Table D57 shows the waste load allocations for the discharge.

Table D57. Waste Load Allocations at BRWR

Parameter	*Monthly Avg. Allowable Conc. (mg/l)*	*Average Flow (MGD)*	*Allowable Load (lbs/day)*
Fe	3.0	0.0119	0.3
Mn	2.0	0.0119	0.2
Al	2.0	0.0119	0.2

LUTZ: RB Contracting, Lutz Opreration

RB Contracting, SMP#17-04-04, operates a surface mine in the Clearfield Creek Watershed along the stream channel. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

LUTZ is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is 1500' x 300'. Table D58 shows the waste load allocations for the discharge.

Table D58. Waste Load Allocations at LUTZ

Parameter	*Monthly Avg. Allowable Conc. (mg/l)*	*Average Flow (MGD)*	*Allowable Load (lbs/day)*
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

PKEO: RB Contracting, Pike 2 Opreration

RB Contracting, SMP#17000904, operates a surface mine near Little Clearfield Creek in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

PKEO is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500' x 300'. Table D59 shows the waste load allocations for the discharge.

Table D59. Waste Load Allocations at PKEO			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

HCCH: Hepburnia Coal Co, Henderson

Hepburnia Coal Co., SMP#17860123, operates a surface mine near Little Clearfield Creek in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

HCCH is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The combined open pit sizes of the two pits for this operation is 2200' x 175', smaller than the standard 1500' x 300'. Table D60 shows the waste load allocations for the discharge.

Table D60. Waste Load Allocations at HCCH			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0381	1.0
Mn	2.0	0.0381	0.6
Al	2.0	0.0381	0.6

HEND: Hepburnia Coal Co., Henderson 2

Hepburnia Coal Co., SMP#17040103, has not started, and a WLA is being assigned for future loadings. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

HEND is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500' x 300'. Table D61 shows the waste load allocations for the discharge.

Table D61. Waste Load Allocations at HEND			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

PGME: Hepburnia Coal Co., Prisk Grandview Mine

Hepburnia Coal Co., SMP#17020115, operates a surface mine near Little Clearfield Creek in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

PGME is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The standard 1500' x 300' open pit size was used for this operation. Table D62 shows the waste load allocations for the discharge.

Table D62. Waste Load Allocations at PGME			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

WATS: Hepburnia Coal Co., Watts Mine

Hepburnia Coal Co., SMP#17030105, has not started, but a WLA is being assigned for future loadings. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

WATS is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500' x 300'. Table D63 shows the waste load allocations for the discharge.

Table D63. Waste Load Allocations at WATS			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

WATO: Gregg Barr, Watts Operation

Gregg Barr, SMP#17000111, operates a surface mine near Little Clearfield Creek in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

WATO is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is 900’ x 100’, smaller than the standard 1500’ x 300’. Table D64 shows the waste load allocations for the discharge.

Table D64. Waste Load Allocations at WATO			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0089	0.2
Mn	2.0	0.0089	0.1
Al	2.0	0.0089	0.1

BARR: Waroquier Coal Co., Barrett 1

Waroquier Coal Co., SMP#17950113, operates a surface near Little Clearfield Creek in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

BARR is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500’ x 300’. Table D65 shows the waste load allocations for the discharge.

Table D65. Waste Load Allocations at BARR			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

BRME: Waroquier Coal Co., Barrett 3 Mine

Waroquier Coal Co., SMP#17950106, operates a surface mine in the Clearfield Creek watershed along the stream channel. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

BRME is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. Flow and metal concentrations were recorded for BRME. Table D66 shows the waste load allocations for the discharge.

Table D66. Waste Load Allocations at BRME

Parameter	*Monthly Avg. Allowable Conc. (mg/l)*	*Average Flow (MGD)*	*Allowable Load (lbs/day)*
Fe	3.0	0.0094	0.2
Mn	2.0	0.0094	0.2
Al	2.0	0.0094	0.2

BARM: Waroquier Coal Co., Barrett 2 Mine

Waroquier Coal Co., SMP#17940122, operates a surface mine near Little Clearfield Creek in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

BARM is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500’ x 300’. Table D67 shows the waste load allocations for the discharge.

Table D67. Waste Load Allocations at BARM

Parameter	*Monthly Avg. Allowable Conc. (mg/l)*	*Average Flow (MGD)*	*Allowable Load (lbs/day)*
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

CLCR 2.0: Clearfield Creek downstream of Morgan Run

CLCR 2.0 is located at the State Route 2024 bridge in the town of Dimeling, Pa. All measurements were recorded on the upstream side of the bridge. This monitoring point accounts for Sanbourn Run, Camp Hope Run and Morgan Run entering Clearfield Creek. These three AMD impaired tributaries contribute significant flow and increase the metals and pH impairments to Clearfield Creek. Loadings for Morgan Run and Camp Hope Run will be allocated in future TMDLs.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 2.0 and CLCR 3.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 2.0 (320.57 MGD). The load allocations made at point CLCR 2.0 for this stream segment are presented in Table D68.

Table D68. TMDL Calculations at Point CLCR 2.0				
Flow = 320.57 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	1.55	4,146.5	0.51	1,364.3
Mn	1.96	5,243.3	0.57	1,524.8
Al	0.97	2,592.2	0.54	1,444.6
Acidity	11.83	31,647.1	5.80	15,515.9
Alkalinity	28.57	76,429.2		

The loading reduction for points CLCR 3.0 and SBRN01 were used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 2.0. This value was compared to the allowable load at point CLCR 2.0. Reductions at point CLCR 2.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 2.0 are shown in Table D69.

Table D69. Calculation of Load Reduction Necessary at Point CLCR 2.0				
	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	4,146.5	5,243.3	2,592.2	31,647.1
Existing load from upstream points (CLCR 3.0 + SBRN01)	4,022.1	3,990.1	1,759.5	30,884.4
Difference of existing load and upstream existing load	124.4	1,253.2	832.7	762.7
Allowable loads from upstream points (CLCR 3.0 + SBRN01)	1,490.2	1,276.6	821.9	12,769.6
Total load at CLCR 2.0	1,614.6	2,529.8	1,654.6	13,532.3
Allowable load at CLCR 2.0	1,364.3	1,524.8	1,444.6	15,515.9
Waste load allocation (RCCR + BTME + BRWC + BRWR + LUTZ + PKEO + HCCH + HEND + PGME + WATS + WATO + BARR + BRME + BARM + SJME)	14.6	9.4	9.4	-
Remaining load at CLCR 2.0	1,349.7	1,515.4	1,435.2	15,515.9
Load Reduction at CLCR 2.0 (Total load at CLCR 2.0 – Remaining load at CLCR 2.0)	264.9	1,014.4	219.4	0.0
Percent reduction required at CLCR 2.0	16	40	13	0

The TMDL for point CLCR 2.0 requires a load allocation for total iron, total manganese, and total aluminum.

WOOT: McDowelle, Wootton GFCC

McDowelle, SMP#17-03-05, has not started, but a WLA is being assigned for future loadings. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

WOOT is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500' x 300'. Table D70 shows the waste load allocations for the discharge.

Table D70. Waste Load Allocations at WOOT			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

SHCC: Sky Haven Coal Co., Penn State #1

Sky Haven Coal Co., SMP#17-03-05, operates a surface mine near UNT 26117 in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

SHCC is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500' x 300'. Table D71 shows the waste load allocations for the discharge.

Table D71. Waste Load Allocations at SHCC			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

CLFD: Sky Haven Coal Co., CLFD Siding

Sky Haven Coal Co., SMP#17851501, operates a surface mine near Long Run in the Clearfield Creek Watershed. Any discharge from the operations treatment pond is treated to the BAT limits, assigned to the permit before it enters Clearfield Creek.

CLFD is considered to be a point source discharge in the watershed; therefore, the allocation made at this point is a WLA. The WLAs for iron, manganese, and aluminum were calculated using the methodology described in the *Method to Quantify Treatment Pond Pollutant Load* section in Attachment F. The open pit size for this operation is the standard 1500' x 300'. Table D72 shows the waste load allocations for the discharge.

Table D72. Waste Load Allocations at CLFD			
Parameter	***Monthly Avg. Allowable Conc. (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.0446	1.1
Mn	2.0	0.0446	0.7
Al	2.0	0.0446	0.7

CLCR 1.0: Clearfield Creek at Mouth

CLCR 1.0 is located just upstream of Clearfield Creek's confluence with the West Branch Susquehanna River. All measurements were recorded on the upstream side of a US 322 bridge in this portion of the stream. This monitoring point accounts for Roaring Run and Long Run entering Clearfield Creek. Both tributaries are significantly impaired by metals and pH from AMD. Loadings for Long Run and Roaring Run will be allocated in future TMDLs.

The TMDL for this section of Clearfield Creek consists of a load allocation to the watershed area between CLCR 1.0 and CLCR 2.0. Addressing the mining impacts above this point addresses the impairment for the stream segment. An average instream flow measurement was available for point CLCR 1.0 (339.58 MGD). The load allocations made at point CLCR 1.0 for this stream segment are presented in Table D73.

Table D73. TMDL Calculations at Point CLCR 1.0				
Flow = 339.58 MGD	***Measured Sample Data***		***Allowable***	
Parameter	***Conc. (mg/l)***	***Load (lbs/day)***	***LTA Conc. (mg/l)***	***Load (lbs/day)***
Fe	1.42	4,024.0	0.54	1,530.2
Mn	1.85	5,242.5	0.61	1,728.6
Al	0.80	2,267.0	0.28	793.5
Acidity	15.10	42,790.3	4.08	11,561.9
Alkalinity	27.40	77,646.0		

The loading reduction for point CLCR 2.0 was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point CLCR 1.0. This value was compared to the allowable load at point CLCR 1.0. Reductions at point CLCR 1.0 are necessary for any parameter that exceeds the allowable load at this point. Necessary reductions at point CLCR 1.0 are shown in Table D74.

Table D74. Calculation of Load Reduction Necessary at Point CLCR 1.0

	Fe (lbs/day)	***Mn (lbs/day)***	***Al (lbs/day)***	***Acidity (lbs/day)***
Existing load	4,024.0	5,242.5	1,501.9	42,790.3
Existing load from upstream points (CLCR 2.0)	4,146.5	5,243.3	2,592.2	31,647.1
Difference of existing load and upstream existing load	-122.5	-0.8	-1,090.3	11,142.9
Allowable loads from upstream points	1,364.3	1,524.8	1,444.6	15,515.9
Percent load loss due to instream process	3	0	42	0
Percent load remaining at CLCR 1.0	97	100	58	100
Total load at CLCR 1.0	1,323.4	1,524.8	837.9	26,658.8
Allowable load at CLCR 1.0	1,530.2	1,728.6	793.5	11,561.9
Waste load allocation (WOOT + SHCC + CLFD)	3.3	2.1	2.1	-
Remaining load at CLCR 1.0	1,526.9	1,726.5	791.4	-
Load Reduction at CLCR 1.0 (Total load at CLCR 1.0 - Allowable load at CLCR 1.0)	0.0	0.0	46.5	15,096.9
Percent reduction required at CLCR 1.0	0	0	6	57

The TMDL for point CLCR 1.0 requires a load allocation for total aluminum and acidity.

Margin of Safety (MOS)

An implicit MOS was used in these TMDLs derived from the Monte Carlo statistical analysis employing the @Risk software. Pa. Title 25 Chapter 96.3(c) states that water quality criteria must be met at least 99 percent of the time. All of the @Risk analyses results surpass the minimum 99 percent level of protection. Other MOS used for this TMDL analyses are:

- Effluent variability plays a major role in determining the average value that will meet water-quality criteria over the long term. The value that provides this variability in our analysis is the standard deviation of the dataset. The simulation results are based on this variability and the existing stream conditions (an uncontrolled system). The general assumption can be made that a controlled system (one that is controlling and stabilizing the pollution load) would be less variable than an uncontrolled system. This implicitly builds in a MOS.

- An additional MOS is that the calculations were performed using a daily iron average, instead of the 30-day average.

- The method used to calculate a flow for a WLA using the area of the pit and ungraded portions of an active mine is conservative and an implicit MOS.

Seasonal Variation

Seasonal variation is implicitly accounted for in these TMDLs because the data used represents all seasons.

Critical Conditions

The reductions specified in this TMDL apply at all flow conditions. A critical flow condition could not be identified from the data used for this analysis.

Attachment E

Water Quality Data Used In TMDL Calculations

TMDL Point	Company	Date	Flow (gpm)	pH (lab)	Aluminum (mg/L)	Iron (mg/L)	Manganese (mg/L)	Acidity (mg/L)	Alkalinity (mg/L)	Sulfate (mg/L)
CLCR1.0	SRBC	11-13-03	283,347.1	7.2	0.766	1.720	1.440	0	25.6	162.6
	SRBC	11-13-03	-	7.2	1.020	1.830	1.570	0	26.0	155.8
	SRBC	01-21-04	230,609.5	6.7	0.867	2.500	2.510	0	26.8	232.7
	SRBC	03-30-04	381,775.8	7.2	0.515	1.620	1.460	12.6	23.8	158.6
	SRBC	05-18-04	178,293.7	7.3	<0.500	1.120	2.070	41.4	25.2	272.0
	SRBC	06-29-04	157,853.9	7.0	<0.500	0.375	1.860	16.8	30.4	239.9
	SRBC	08-10-04	183,033.4	7.4	<0.500	1.120	1.670	19.8	32.4	1,987.7
		Average=	235,818.9	7.13	0.80	1.42	1.85	15.10	27.4	458.37
		StDev=	84,573.62	0.25	0.40	0.72	0.40	15.36	3.31	675.91
CLCR 2.0	SRBC	11-13-03	267,503.4	7.1	0.937	2.020	1.760	0	24.6	161.2
	SRBC	01-21-04	217,683.1	6.6	1.100	2.910	2.810	0	22.8	242.6
	SRBC	03-30-04	360,411.4	7.2	0.831	1.570	1.420	12.6	25.8	166.9
	SRBC	05-17-04	168,311.7	7.4	<0.500	1.040	2.190	31.6	28.6	250.7
	SRBC	06-29-04	149,011.9	7.1	<0.500	0.507	1.870	10.0	34.0	220.2
	SRBC	08-10-04	172,800.0	7.4	<0.500	1.240	1.690	16.8	35.6	223.1
		Average=	222,620.25	7.13	0.96	1.55	1.96	11.83	28.57	210.78
		StDev=	79,843.52	0.29	0.14	0.84	0.49	11.83	5.21	38.03
CLCR 3.0	SRBC	11-13-03	216,157.1	7.0	0.976	2.600	1.650	0	24.0	157.4
	SRBC	01-21-04	175,896.9	6.6	0.975	3.080	2.460	0	24.8	230.7
	SRBC	03-30-04	291,201.7	7.0	0.972	2.160	1.570	16.2	21.6	182.4
	SRBC	05-17-04	106,256.3	6.9	<0.500	1.680	2.280	36.4	22.6	262.6
	SRBC	06-29-04	95,224.02	7.3	<0.500	1.400	1.970	12.6	29.8	254.4
	SRBC	06-29-04	-	7.3	<0.500	1.440	1.990	14.0	29.2	265.9
	SRBC	08-10-04	58,697.69	7.1	0.528	1.800	1.850	21.2	30.0	204.5
		Average=	157,238.95	6.98	0.86	2.12	1.97	14.52	25.42	222.56
		StDev=	87,087.25	0.23	0.22	0.62	0.35	13.78	3.54	42.38
CLCR 4.0	SRBC	11-12-03	162,162.7	6.7	0.517	1.660	1.290	0	30.2	151.8
	SRBC	01-19-04	181,238.0	6.8	0.640	2.460	2.060	0	29.2	223.7
	SRBC	03-31-04	258,392.1	7.0	0.912	1.780	1.250	13.4	28.8	170.0
	SRBC	03-31-04	-	7.0	0.909	1.790	1.280	12.2	28.8	169.0
	SRBC	05-1704	94,241.08	6.9	<0.500	1.880	1.920	26.8	32.8	267.1
	SRBC	06-28-04	71,382.11	6.9	<0.500	1.630	1.470	19.2	37.0	250.6
	SRBC	08-12-04	101,171.0	6.8	<0.500	1.470	1.280	6.4	39.8	208.2
		Average=	144,764.50	6.85	0.69	1.81	1.55	10.87	32.97	205.77
		StDev=	69,831.55	0.10	0.20	0.35	0.35	10.80	4.52	44.05
CLCR 5.0	SRBC	11-12-03	139,003.0	6.7	0.837	2.200	0.874	0	25.6	120.2

TMDL Point	Company	Date	Flow (gpm)	pH (lab)	Aluminum (mg/L)	Iron (mg/L)	Manganese (mg/L)	Acidity (mg/L)	Alkalinity (mg/L)	Sulfate (mg/L)
	SRBC	01-19-04	155,340.5	6.8	<0.500	1.660	1.360	0	22.4	164.0
	SRBC	03-31-04	221,498.2	6.9	0.833	1.660	0.747	12.6	23.0	125.2
	SRBC	05-17-04	71,386.6	6.9	<0.500	1.240	1.050	31.6	26.6	181.3
	SRBC	06-28-04	56,287.92	7.0	<0.500	1.040	0.644	15.0	31.4	171.0
	SRBC	08-12-04	85,435.01	6.7	<0.500	1.220	0.683	15.2	30.8	137.5
		Average=	121,268.84	6.83	0.28	1.50	0.90	12.40	26.63	149.87
		StDev=	62,475.32	0.12	0.43	0.42	0.27	11.75	3.80	25.60
CLCR 6.0	SRBC	11-12-03	133,033.6	6.8	<0.500	1.030	0.796	0	29.8	106.4
	SRBC	01-19-04	148,697.8	7.0	0.765	1.590	1.250	0	28.2	157.5
	SRBC	03-31-04	211,983.0	7.2	0.935	1.330	0.751	18.8	27.2	122.1
	SRBC	05-17-04	74,550.86	7.0	<0.500	0.404	1.290	24.2	31.8	188.6
	SRBC	06-28-04	55,318.44	7.2	<0.500	0.431	0.802	12.0	33.2	175.4
	SRBC	08-12-04	68,029.34	6.9	<0.500	0.587	0.543	10.2	37.6	127.4
		Average=	115,268.84	6.70	0.85	0.90	0.91	10.87	31.30	146.23
		StDev=	60,448.80	0.30	0.12	0.50	0.30	9.78	3.80	32.55
CLCR 7.0	SRBC	11-12-03	149,070.3	6.7	<0.500	0.815	0.610	0	27.0	93.2
	SRBC	01-19-04	140,214.9	7.0	<0.500	0.755	0.697	0	25.6	124.3
	SRBC	03-31-04	199,909.4	7.1	0.848	1.180	0.778	20.4	23.2	102.3
	SRBC	05-17-04	65,071.54	6.9	<0.500	0.517	1.160	29.0	29.0	156.0
	SRBC	05-17-04	-	6.9	<0.500	0.527	1.200	26.0	29.2	162.2
	SRBC	06-28-04	47,167.67	7.0	<0.500	0.474	1.090	18.2	31.0	172.1
	SRBC	08-12-04	63,527.56	6.8	<0.500	0.907	0.629	12.8	36.0	119.3
		Average=	110,826.80	6.92	0.85	0.78	0.83	13.15	28.65	132.77
		StDev=	61,065.84	0.15	-	0.26	0.24	11.22	4.50	30.82
CLCR 8.0	SRBC	11-11-03	88,787.78	6.7	0.611	1.210	1.020	0	26.8	101.4
	SRBC	01-19-04	107,450.2	7.0	0.958	1.810	1.530	0	25.6	132.0
	SRBC	03-31-04	153,231.0	7.1	0.959	1.180	0.812	23.0	22.4	100.1
	SRBC	05-13-04	67,966.5	7.3	PBQ	1.020	0.997	35.4	26.2	120.6
	SRBC	06-28-04	40,058.18	6.8	<0.500	0.360	1.610	15.6	29.6	180.6
	SRBC	08-11-04	64,407.27	7.4	0.969	1.560	1.010	17.4	32.2	141.7
	SRBC	08-11-04	-	7.4	1.030	1.670	1.030	18.2	32.8	126.5
		Average=	86,983.45	7.05	0.88	1.20	1.16	15.30	27.18	128.99
		StDev=	39,709.42	0.27	0.18	0.51	0.32	13.70	3.48	27.41
CLCR 9.0	SRBC	11-11-03	52,818.45	6.5	1.100	1.430	1.630	0	19.0	155.7
	SRBC	11-11-03	-	6.6	0.979	1.390	1.580	0	18.4	152.4
	SRBC	01-19-04	66,427.01	6.7	2.120	3.660	2.590	0	18.6	186.4

TMDL Point	Company	Date	Flow (gpm)	pH (lab)	Aluminum (mg/L)	Iron (mg/L)	Manganese (mg/L)	Acidity (mg/L)	Alkalinity (mg/L)	Sulfate (mg/L)
	SRBC	03-31-04	94,703.38	7.0	1.010	1.050	1.040	24.8	18.4	109.1
	SRBC	05-13-04	52,697.27	7.0	0.938	1.300	1.400	46.2	20.0	157.4
	SRBC	06-28-04	29,039.38	6.8	0.524	0.541	2.260	30.2	20.2	184.0
	SRBC	06-28-04	-	6.8	0.510	0.552	2.350	27.8	21.4	215.0
	SRBC	08-12-04	35848.15	6.7	0.508	0.620	1.390	24.4	26.6	144.1
		Average=	55,255.61	6.79	1.01	1.43	1.72	20.9	20.52	163.01
		StDev=	23,483.41	0.18	0.59	1.15	0.60	18.02	3.12	31.96
CLCR 10.0	SRBC	11-05-03	50,910.92	6.4	0.979	1.640	1.590	32.2	15.4	109.5
	SRBC	01-22-04	42,324.78	6.4	2.640	5.860	3.200	37.2	17.4	183.2
	SRBC	04-01-04	113,599.2	6.7	2.070	3.750	1.460	27.0	18.0	92.2
	SRBC	05-13-04	31,750.32	6.9	0.830	1.480	1.570	42.4	15.8	129.7
	SRBC	06-24-04	33,918.17	6.8	0.864	1.410	2.320	21.8	19.2	140.5
	SRBC	08-12-04	39,227.84	6.6	0.605	1.060	1.940	26.0	24.8	135.2
		Average=	51,955.21	6.63	1.33	2.53	2.01	31.10	18.43	131.72
		StDev=	30,949.56	0.24	0.82	1.89	0.66	7.69	3.42	30.98
CLCR 11.0	SRBC	11-05-03	26,823.95	6.6	<0.500	<0.300	0.407	0	25.0	74.4
	SRBC	01-22-04	24,446.94	6.7	1.050	0.795	0.585	0	20.6	95.7
	SRBC	04-01-04	97,037.3	6.9	2.390	2.910	0.555	29.4	20.8	67.3
	SRBC	05-13-04	26,184.81	7.4	<0.500	<0.300	0.331	24.0	23.0	81.7
	SRBC	06-24-04	27,455.0	7.3	<0.500	<0.300	0.375	11.8	28.8	93.7
	SRBC	08-12-04	25,677.63	6.9	<0.500	0.405	0.315	15.0	30.6	78.5
		Average=	37,937.61	6.97	1.72	1.37	0.43	13.37	24.80	81.88
		StDev=	28,971.04	0.32	0.95	1.35	0.12	12.10	4.16	11.05
CLCR 12.0	SRBC	11-05-03	22055.56	6.7	<0.500	0.398	0.320	0	29.8	74.0
	SRBC	11-05-03	-	6.8	<0.500	0.389	0.362	0	30.0	73.0
	SRBC	01-20-04	22596.41	6.7	0.798	0.685	0.596	0	22.2	98.4
	SRBC	04-01-04	85053.51	7.0	2.840	3.710	0.650	29.8	24.4	57.9
	SRBC	05-13-04	18464.91	7.4	<0.500	<0.300	0.311	16.8	26.6	92.8
	SRBC	06-24-04	18119.31	7.4	<0.500	<0.300	0.352	3.4	34.0	85.4
	SRBC	08-12-04	22046.59	6.9	<0.500	0.399	0.275	10.2	35.2	83.2
	SRBC	08-12-04	-	6.9	<0.500	0.438	0.271	10.8	35.8	82.8
		Average=	31,389.38	7.03	1.82	1.30	0.42	10.08	28.77	80.94
		StDev=	26,361.71	0.31	1.44	1.61	0.16	11.68	5.31	12.63
CLCR 13.0	SRBC	11-04-03	12,689.8	6.5	0.515	0.437	0.697	0	25.2	92.9
	SRBC	01-20-04	17,093.29	6.6	0.995	0.948	0.252	0	17.2	99.8
	SRBC	04-01-04	41,382.23	7.0	3.990	5.550	0.387	27.8	27.4	43.5
	SRBC	05-13-04	13,720.77	7.1	0.522	0.354	0.181	36.0	20.8	102.8

TMDL Point	Company	Date	Flow (gpm)	pH (lab)	Aluminum (mg/L)	Iron (mg/L)	Manganese (mg/L)	Acidity (mg/L)	Alkalinity (mg/L)	Sulfate (mg/L)
	SRBC	05-13-04	-	7.1	0.501	0.330	0.179	38.8	21.2	107.2
	SRBC	06-24-04	12,087.02	7.2	<0.500	0.527	0.143	17.0	29.6	92.3
	SRBC	06-24-04	-	7.2	<0.500	0.547	0.148	14.0	29.8	93.0
	SRBC	08-11-04	12,689.8	7.5	0.670	1.100	0.120	16.4	32.8	104.7
		Average=	18,176.69	6.98	1.34	1.49	0.21	16.18	25.55	92.03
		StDev=	11,522.15	0.38	1.50	2.01	0.10	14.90	5.72	20.44
CLCR 14.0	SRBC	11-04-03	15,030.46	6.6	<0.500	0.448	0.151	0	33.6	73.7
	SRBC	01-20-04	16,047.96	6.5	0.515	0.948	0.231	0	25.2	85.2
	SRBC	04-01-04	37,567.17	7.1	0.624	9.760	0.427	17.0	30.4	33.6
	SRBC	05-13-04	11,023.29	6.9	6.320	0.402	0.189	28.0	30.2	91.9
	SRBC	06-24-04	15,124.26	7.1	<0.500	0.693	0.140	4.8	37.2	74.7
	SRBC	08-11-04	15,077.14	7.2	<0.500	1.020	0.116	8.8	38.8	80.0
		Average=	18,311.71	6.90	3.47	2.21	0.21	9.77	32.57	77.30
		StDev=	9,595.91	0.29	4.03	3.71	0.11	10.96	5.02	24.31
CLCR 15.0	SRBC	11-04-03	297.58	6.7	<0.500	<0.300	<0.005	0	46.4	23.0
	SRBC	11-04-03	-	6.6	<0.500	<0.300	<0.005	0	46.2	25.3
	SRBC	01-20-04	-	7.0	<0.500	0.394	0.068	0	38.8	37.4
	SRBC	04-01-04	1,275.13	7.0	8.490	9.190	0.340	17.2	26.6	22.6
	SRBC	04-01-04	-	7.0	9.260	8.590	0.317	15.8	26.6	20.2
	SRBC	05-18-04	498.20	7.3	-	0.916	0.106	-19.4	62.6	37.2
	SRBC	06-24-04	417.41	7.4	<0.500	0.534	0.057	-13.8	44.0	37.3
	SRBC	08-11-04	363.55	7.6	<0.500	0.339	<0.005	-15.2	52.0	45.6
		Average=	570.37	7.16	8.88	2.21	0.15	-5.32	45.05	31.08
		StDev=	400.77	0.34	-	3.74	0.15	-	12.15	9.38

Attachment F

Method to Quantify Treatment Pond Pollutant Load

The following is an explanation of the quantification of the potential pollution load reporting to the stream from permitted pit water treatment ponds that discharge water at established effluent limits.

Surface coal mines remove soil and overburden materials to expose the underground coal seams for removal. After removal of the coal the overburden is replaced as mine spoil and the soil is replaced for revegetation. In a typical surface mining operation the overburden materials are removed and placed in the previous cut where the coal has been removed. In this fashion, an active mining operation has a pit that progresses through the mining site during the life of the mine. The pit may have water reporting to it, as it is a low spot in the local area. Pit water can be the result of limited shallow groundwater seepage, direct precipitation into the pit, and surface runoff from partially regraded areas that have been backfilled but not yet revegetated. Pit water is pumped to nearby treatment ponds where it is treated to the required treatment pond effluent limits. The standard effluent limits are as follows, although stricter effluent limits may be applied to a mining permit's effluent limits to insure that the discharge of treated water does not cause in-stream limits to be exceeded.

Standard Treatment Pond Effluent Limits:
Alkalinity > Acidity
6.0 <= pH <= 9.0
Fe <= 3.0 mg/l
Mn <= 2.0 mg/l
Al <= 2.0 mg/l

Discharge from treatment ponds on a mine site is intermittent and often varies as a result of precipitation events. Measured flow rates are almost never available. If accurate flow data are available, it is used along with the Best Available Technology (BAT) limits to quantify the WLA for one or more of the following: aluminum, iron, and manganese. The following formula is used:

Flow (MGD) X BAT limit (mg/l) X 8.34 = lbs/day

The following is an approach that can be used to determine a waste load allocation for an active mining operation when treatment pond flow rates are not available. The methodology involves quantifying the hydrology of the portion of a surface mine site that contributes flow to the pit and then calculating waste load allocation using NPDES treatment pond effluent limits.

The total water volume reporting to ponds for treatment can come from two primary sources: direct precipitation to the pit and runoff from the unregraded area following the pit's progression through the site. Groundwater seepage reporting to the pit is considered negligible compared to the flow rates resulting from precipitation.

In an active mining scenario, a mine operator pumps pit water to the ponds for chemical treatment. Pit water is often acidic with dissolved metals in nature. At the treatment ponds, alkaline chemicals are added to increase the pH and encourage dissolved metals to precipitate and settle. Pennsylvania averages 41.4 inches of precipitation per year (Mid-Atlantic River Forecast Center, National Weather Service, State College, PA, 1961-1990, http://www.dep.state.pa.us/dep/subject/hotopics/ drought/PrecipNorm.htm). A maximum pit dimension without special permit approval is 1500 feet long by 300 feet wide. Assuming that 5 percent of the precipitation evaporates and the remaining 95 percent flows to the low spot in the active pit to be pumped to the treatment ponds, results in the following equation and average flow rates for the pit area.

41.4 in. precip./yr x 0.95 x 1 ft./12/in. x 1500'x300'/pit x 7.48 gal/ft^3 x 1yr/365days x 1day/24hr. x 1hr./60 min. =

= 21.0 gal/min average discharge from direct precipitation into the open mining pit area.

Pit water also can result from runoff from the unregraded and revegetated area following the pit. In the case of roughly backfilled and highly porous spoil, there is very little surface runoff. It is estimated that 80 percent of precipitation on the roughly regraded mine spoil infiltrates, 5 percent evaporates, and 15 percent may run off to the pit for pumping and potential treatment (Jay Hawkins, Office of Surface Mining, Department of the Interior, Personal Communications, 2003). Regrading and revegetation of the mine spoil is conducted as the mining progresses. The PADEP encourages concurrent backfilling and revegetation through its compliance efforts and it is in the interest of the mining operator to minimize the company's reclamation bond liability by keeping the site reclaimed and revegetated. Experience has shown that reclamation and revegetation is accomplished two to three pit widths behind the active mining pit area. PADEP uses three pit widths as an area representing potential flow to the pit when reviewing the NPDES permit application and calculating effluent limits based on best available treatment technology and insuring that in-stream limits are met. The same approach is used in the following equation, which represents the average flow reporting to the pit from the unregraded and unrevegetated spoil area.

41.4 in. precip./yr x 3 pit areas x 1 ft./12/in. x 1500'x300'/pit x 7.48 gal/ft^3 x 1yr/365days x 1day/24hr. x 1hr./60 min. x 15 in. runoff/100 in. precipitation =

= 9.9 gal./min. average discharge from spoil runoff into the pit area.

The total average flow to the pit is represented by the sum of the direct pit precipitation and the water flowing to the pit from the spoil area as follows:

Total Average Flow = Direct Pit Precipitation + Spoil Runoff

Total Average Flow = 21.0 gal./min + 9.9 gal./min. = 30.9 gal./min.

The resulting average waste load from a permitted treatment pond area is as follows:

Allowable Iron Waste Load Allocation:
30.9 gal./min. x 3 mg/l x 0.01202 = 1.1 lbs./day

Allowable Manganese Waste Load Allocation:
30.9 gal./min. x 2 mg/l x 0.01202 = 0.7 lbs./day

Allowable Aluminum Waste Load Allocation:
30.9 gal./min. x 2 mg/l x 0.01202 = 0.7 lbs./day

(Note: 0.01202 is a conversion factor to convert from a flow rate in gal/min. and a concentration in mg/l to a load in units of lbs./day.)

There is little or no documentation available to quantify the actual amount of water that is typically pumped from active pits to treatment ponds. Experience and observations suggest that the above approach is very conservative and overestimates the quantity of water, creating a large margin of safety in the methodology. County specific precipitation rates can be used in place of the long-term state average rate, although the margin of safety is greater than differences from individual counties. It is common for many mining sites to have very “dry” pits that rarely accumulate water that would require pumping and treatment.

Also, it is the goal of PADEP’s permit review process to not issue mining permits that would cause negative impacts to the environment. As a step to insure that a mine site does not produce acid mine drainage, it is common to require the addition of alkaline materials (waste lime, baghouse lime, limestone, etc.) to the backfill spoil materials to neutralize any acid-forming materials that may be present. This practice of ‘alkaline addition’ or the incorporation of naturally occurring alkaline spoil materials (limestone, alkaline shale or other rocks) may produce alkaline pit water with very low metals concentrations that does not require treatment. A comprehensive study in 1999 evaluated mining permits issued since 1987 and found that only 2.2 percent resulted in a post-mining pollution discharge (Evaluation of Mining Permits Resulting in Acid Mine Drainage 1987-1996: A Post Mortem Study, March 1999). As a result of efforts to insure that acid mine drainage is prevented, most mining operations have alkaline pit water that often meets effluent limits and requires little or no treatment.

While most mining operations are permitted and allowed to have a standard, 1500’ x 300’ pit, most are well below that size and have a corresponding decreased flow and load. Where pit dimensions are greater than the standard size or multiple pits are present, the calculations to define the potential pollution load can be adjusted accordingly. Hence, the above calculated waste load allocation is very generous and likely high compared to actual conditions that are generally encountered. A large margin of safety is included in the waste load allocation calculations.

This is an explanation of the quantification of the potential pollution load reporting to the stream from permitted pit water treatment ponds that discharge water at established effluent limits. This allows for including active mining activities and their associated waste load in the TMDL calculations to more accurately represent the watershed pollution sources and the reductions necessary to achieve in-stream limits. When a mining operation is concluded its waste load allocation is available for a different operation. Where there are indications that future mining in a watershed is greater than the current level of mining activity, an additional waste load allocation amount may be included to allow for future mining.

Attachment G

Comment and Response

COMMENTER: United States Environmental Protection Agency

Comment:
Page 37, Table 13: The identified percent reductions do not match the numbers shown. Explanation should be added to the text above that the reductions shown are after any upstream reductions have been made. Same for Tables 38 and 52.

Response:
The required changes have been made to Table 13 and text added to the tables listed above.

Comment:
Attachment E, Data Used, should have a footnote identifying “PBQ”.

Response:
In Attachment E, the data labeled as PBQ were changed to less than detection limits.

Comment:
The calculations were done ignoring <DL instead of setting them equal to zero.

Response:
For some TMDLs, the Department recognizes that "non-detects" were ignored, and not set to zero values, when calculating the average concentration for a particular pollutant at a specific point. Methods for treating "non-detects" will be standardized for future TMDLs. Regardless, not setting these values to zero is more protective of the waterbody since the calculated average uses only known values, which are obviously higher than both zero and the stated detection limit. In addition, the value may not necessarily be zero, and just reflect limits on the lab's analytical method.

Points CLCR 7.0 (aluminum) and CLCR 15.0 (aluminum) have one point of detection and the remainder of the measurements are “no detections.” For these points, the “no detections” were set to zero and new averages were calculated. The average aluminum concentrations for CLCR 7.0 and CLCR 15.0 are 0.14 mg/L and 1.48 mg/L respectively. Reduction for CLCR 7.0 remained the same since the average was still below the 0.75 mg/L water quality standard. Reductions for CLCR 15.0 were updated in Attachment D.

COMMENTER: PennFUTURE

Comment:
The Draft TMDL fails to identify the post-mining discharges from regulated mines in the Clearfield Creek watershed, which are point source discharges that must receive WLAs in the TMDL.

The draft lists 37 mining operations in the Clearfield Creek watershed that are authorized by a surface mining permit or government-financed construction or reclamation contract. In calculating the wasteload allocations (WLAs) for each of those operations, the Draft TMDL applies the “Method to Quantify Treatment Pond Pollutant Load” set forth in its Appendix F.

The problem with this approach is that not all of the discharges of treated mine drainage from regulated mining operations in the Clearfield Creek watershed are discharges of water pumped from active mining pits. The Draft TMDL does not mention any treated, post mining discharge in the watershed. Elsewhere, however, PADEP has identified at least one of the mines listed in the Draft TMDL's Table 3 – site identified as "Roy 3" SMP No. 17743165 – as having post mining discharges. PADEP also has elsewhere identified several additional mining operations with post-mining discharges that appear to be in the Clearfield Creek watershed. The TMDL must account for those discharges by assigning each of them a WLA. See 40 C.F.R. 130.2(h).

PADEP's list of mines with post mining discharges entitled "Discharge Liability by Permit Number" includes Roy Coal Company mine permitted under SMP no. 17743165. PADEP's May 5, 1999 mine drainage inventory listed two post mining discharges form that Roy Coal Company Site. The Draft TMDL's discussion of the site, however, does not mention any post mining discharges, and explains that "the WLAs for iron, manganese and aluminum were calculated using the methodology described in the Method to Quantify Treatment Pond Pollutant Load in Attachment F." That quantification method, however, accounts for only mine drainage collected in the active mining pit as a result of precipitation, and does not include post mining discharges from backfilled portions of the site. The final TMDL should properly account for all of the mine drainage at the Roy Coal Company site.

There appear to be several more post-mining discharges from sites in the Clearfield Creek watershed that are not accounted for, or even mentioned, in the Draft TMDL. Three of those discharges are from another Roy Coal Company, SMP No. 4474SM21 which PADEP's May 5, 1999 mine drainage inventory identifies as the Roy 3 site. The same inventory lists three post mining discharges from Sky Haven Coal Company's Mitchell #1 site, SMP no. 17800124, where mine drainage treatment operations continue. See 37 Pa. Bull. 993 (February 24, 2007) (permit renewal). Three primacy sites that were formerly operated by Al Hamilton Contracting Co. (SMP Nos. 17733038, 17803176, and 17850109) also appear to have post mining discharges that add mine drainage pollutants directly or indirectly to Clearfield Creek. The failure to allocate allowable load to these discharges through WLAs is the equivalent of establishing a WLA of zero pounds per day for each relevant pollutant, which in turn would require that the NPDES permits for the discharges contain "no-detect" effluent limitations prohibiting the release of any of the pollutants for which the relevant segment is impaired. See 40 C.F.R. 122.44(d)(1)(vii)(B) (incorporated into Pennsylvania law by 25 Pa. Code 92.2(b)(14); Mountain Watershed Association and PennFUTURE v. Department of Environmental Protection and Kaiser Refractories. EHB Docket No. 2004-102-R (Opinion and Order on Motion for Partial Summary Judgment dated June 23, 2005), p.3. The TMDL should properly account for these discharges by assigning them WLAs.

Response:
Permit 4474SM21 was formerly owned by Roy Coal Company and pre-dates the Surface Mining Control Reclamation Act of 1977, but is now permit 17743165 which is owned and operated by Sky Haven Coal Company. According to PADEP's *Post Mining Treatment Trust Consent Order and Agreement,* dated January 19th 2007, neither the original Roy Coal Company permit 4474SM121, nor permit 17743165 is listed. Ownership of permit has been edited in the TMDL.

As for the other permits mentioned, permit 17800124 drains into Wolf Run and will be allocated for in future TMDLs. Permit 17850109 drains into Sanbourn Run and will be allocated for in future TMDLs. Permit 17733038 is not in PADEP's database, but we assumed the commenter meant to refer to permit number 17773038. Permit 17773038 was added to the *TMDL by Segments* attachment. Permit 17803176 drains into Morgan Run and will be allocated in future TMDLs.

Comment:
Discharges from mine drainage treatment systems being operated with funds provided by the former permittee and operator of the mine are point source discharges that must be authorized by NPDES permits, and must receive WLAs in the TMDL.

PennFUTURE is aware that Al Hamilton Contracting Co. has wound up its affairs, and that treatment of the discharges at the Al Hamilton Contracting sites mentioned in comment 1 is now the responsibility of Clean Streams Foundation, Inc. (CSF). CSF holds funds provided by Al Hamilton Contracting in trust to continue the treatment of post mining discharges that formerly was performed by the mining company. If those discharges are not presently authorized by a NPDES permit (as the Draft TMDLs failure to mention them appears to confirm), they should be. As PennFUTURE explained in the attached letter dated December 21, 2005, a NPDES permitted, point source discharge from a permitted mining operation is not magically transformed into a nonpoint source discharge or otherwise exempted from the Clean Water Act's NPDES permit requirement because the mining company switches from operating the treatment system itself to providing for the operation of the treatment system though establishing a trust. In short, the manner in which the mining company fulfills its responsibility to treat a post mining discharge – whether directly or through a contractual agreement with a trustee – does not affect whether the discharge is properly classified as a point source discharge within the meaning of the federal Clean Water Act and its implementing regulations. See 33 U.S.C. 1362 (6), (12), (14), (16); 40 C.F.R. 122.2; see also 25 Pa. Code 92.2 (b)(1) (incorporating by reference 40 C.F.R. 122.2). The post mining discharges from the Al Hamilton Contracting sites were properly classified as point source discharges when Al Hamilton Contracting operated the treatment systems, and they remain point source discharges today, when the money paid into a trust by Al Hamilton Contracting provides for the continued operation of the same treatment systems. As a result the discharges must be authorized by NPDES permits, see 33 U.S.C. 1311(a), 1342(a), and the TMDL must assign WLAs to them. See 40 C.F.R. 130.2(h).

Response:
The Department disagrees with Commenter's assertion that the Clean Streams Foundation (CSF) is "responsible" for treating the Al Hamilton discharges identified in Comment 1. CSF merely acts as the trustee for a trust fund established by the mine operator liable for treating discharges caused by the operator's mining operations—which trust fund is used to pay ongoing treatment costs after the liable operator ceased to exist. The Department also disagrees with Commenter's contention that these Al Hamilton discharges should be classified as "point source discharges" pursuant to applicable law. Where the mine operator liable for completing reclamation of a permitted mine site—including treatment of any post-mining discharges—is liquidated, dissolved or otherwise ceases to exist prior to completing the reclamation, the unreclaimed site is considered an abandoned mine site. A post-mining discharge emanating from an abandoned

mine site is properly classified as a non-point source discharge, because no person liable for causing the discharge exists or can be found. EPA has articulated this interpretation in the past, see 55 FR 35248 (Aug. 28, 1990) (describing "acid mine drainage from abandoned mines" as "non-point sources" because no owner can be found); and, more recently, EPA has approved Department TMDLs classifying discharges from abandoned mine sites as non-point sources. *See, e.g.*, EPA Decision Rationale, TMDL, Elk Creek Watershed for Acid Mine Drainage Affected Segments (April 1, 2005). Because the Al Hamilton discharges identified in Comment 1 are appropriately classified as non-point sources, the Department disagrees with Commenter's assertion that these discharges should be assigned WLAs in the TMDL. These discharges will be assigned LAs along with the other non-point sources identified in the TMDL.

COMMENTER: Arthur W. Rose

The following are comments and objections to the TMDL for Clearfield Creek as available on the DEP Website and as presented on Feb. 20, 2007. I consider items 3, 5 and 14 as the most serious problems with the TMDL, that invalidate some conclusions. I am the Technical Chair for the Clearfield Creek Watershed Association and have studied the watershed considerably over the past 5 years. I believe a much better TMDL should be prepared.

Comment:
Figure 1, showing impaired waters. Blain Run near Coalport is badly degraded by AMD for about a mile. Also, a major Fe-rich discharge enters Turner Run about ½ mile above junction with Clearfield Creek. Bradley Run near Gallitzin is degraded. These sites are identified in the Clearfield Creek Assessment Report. This report is not mentioned in the previous section on past studies, though it is mentioned later. Also, the Scarlift reports on Clearfield Creek and Muddy Run are not mentioned.

Response:
According to the PADEP 2006 Integrated List of impaired waters, Blain Run, and Turner Run are not listed as being impaired. Bradley Run was added to the list of larger AMD tributaries to Clearfield Creek in the *Segments Addressed in this TMDL* section.

Regarding the Clearfield Creek Assessment Report and Scarlift Report comments, the intent was to list examples of past work in the *Segments Addressed in this TMDL* section. However, this section was edited by adding the requested reports.

Comment:
Table 3, Permits. This appears to be incomplete. For example, Cooney Bros has active permits near Buckhorn and on Brubaker Run. Bender has an active permit on Brubaker Run.

Response:
Only permits that were located on non-impaired tributaries to Clearfield Creek, and on the mainstem of Clearfield Creek were assigned WLAs. Permits on impaired streams have been accounted for in past TMDLs or will be accounted for in future TMDLs. Also, after researching the Brubaker Run TMDL, these permits had already been allocated for in the document.

Comment:
There is no discussion of the sampling methods and interpretation used in the study samples reported in Appendix. Beth Dillon mentioned that she was told to sample at extreme events (and did so on Little Laurel Run), but I think this gives a very erroneous frequency distribution that distorts the TMDL. What lab did the analyses reported in Attachment E? I infer it was the DEP lab.

Response:
For questions regarding sampling methods at extreme events on Little Laurel Run, please refer to the PADEP Assessment and Standards Data Report *Section 205(j)(1)/604(b)* (Task 2: Collection of Water Quality Samples for TMDL Development 2004). The PADEP lab was used for the analyses reported in Attachment E.

Comment:
p. 8-9. The statistics equations and statements are not intelligible to me. Among other things, what are (1), (1a) and (2)?

Response:
Format changes have been made to make the statistical calculation steps more easily understood.

Comment:
p 9. The treatment of acidity is incorrect, though it does follow the past incorrect usage by DEP. A hot peroxide acidity using Standard Methods (1998) and EPA method is actually a net acidity, that already has had the alkalinity subtracted. This is discussed in Cravotta and Kirby, Amer. Soc. of Mining and Reclamation Proceedings, Meeting in Morgantown, WV. The subtraction of alkalinity from acidity to get net acidity (or the inverse to get net alkalinity) is incorrect. People should start doing this correctly. As a result of this, your claim of using net alkalinity, net acidity to understand pH is not correct.

Response:
The Department is aware of the issues and confusion surrounding acidity and alkalinity methods of analysis and reporting as described in Kirby 2002[3] and Watzlaf et al.2004[4] and impacts of acidity/alkalinity balance processes, especially in areas of the Commonwealth with alkaline mine drainage containing large concentrations of metals. TMDL program staff is investigating the programmatic implications of these issues, in addition to doing a comparison of acidity/alkalinity balances versus calculated acidity (Watzlaf et al 2004, Equation 2, p.12) methods for use in TMDLs throughout the Commonwealth. Method changes will be considered as appropriate pending the results of these investigations and further review of relevant literature.

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[3] Source: Kirby, C.S. 2002. Problems in acidity and alkalinity measurements in mine drainage. *Proceedings of the 2002 National Meeting of the American Society of Mining and Reclamation*. (Lexington, KY), pp. 1068-1071.
[4] Source: Watzlaf, George R., Karl T. Schroeder, Robert L.P.Kleinmann, Candace L. Kairies, and Robert W. Nairn. 2004. The Passive Treatment of Coal Mine Drainage. U.S. Department of Energy, National Energy Technology Laboratory, Pittsburgh, PA. DOE/NETL-2004/1202.

Comment:
p.16. The Priority listing attributed to Clearfield Creek Watershed Assoc. is misleading. You appear to have listed the priorities from the Clearfield Creek Assessment report by Melius and Hockenberry and Cambria-Clearfield County Conservation Districts. This report is awful in the way it handles priorities. The Watershed Association has distinctly different priorities.

Response:
The statement regarding the priorities of the Clearfield Creek Watershed Association has been inserted in the Recommendations section along with priorities identified in the Clearfield Creek Watershed Assessment Report of 2004.

Comment:
In the presentation on Feb. 20, a slide showed a report on Little Muddy Run that was used in the evaluation. I can't find this listed in this report. We would be very interested in obtaining a copy of this report, as we are proposing an assessment in this area. Please provide the reference.

Response:
A copy of the Little Muddy Run TMDL can be found on PADEP website: http://www.dep.state.pa.us/watermanagement_apps/tmdl/

Comment:
Map 1. The Cooney permit (11850102) near Buckhorn is not shown on the map, but has a Subchapter F point that is a significant source of acid. See my Restoration Plan for Little Laurel Run.

Response:
This permit is not located on a non-impaired stream and will be allocated for in future TMDLs.

Comment:
GAI and US Environmental Research Service are currently collecting extensive samples for an SRBC Low-flow study. These would provide considerable data for the TMDL.

Response:
Due to time constraints driven by the TMDL lawsuit and PADEP's Memorandum of Understanding with USEPA, the development of the TMDL needed to be developed using data that was ready for analysis by the end of fall 2006.

Comment:
p. 30, 36. Brubaker Run enters Clearfield Creek at the village of Dean, not at Tippletown as stated in the report.

Response:

The requested edit was made to the report.

Comment:
Site CLCR 15.0. See data from the Low-flow project at the same location. (CR101 site).

Response:
Due to time constraints driven by the TMDL lawsuit and PADEP's Memorandum of Understanding with USEPA, the development of the TMDL needed to be developed using data that was ready for analysis by the end of fall 2006.

Comment:
Site CLCR 12.0. I am not aware of active permits for the Beldin mine, Klondike Mine, Ferris Wheel area. These are all very old abandoned mines. However, Cooney 11850101 is definitely active.

Response:
This section was edited by listing the mines as abandoned. A WLA for Cooney 11850101 will be established in the Little Laurel Run TMDL.

Comment:
You give the required % decrease at the mouth of Brubaker Run, but this is very misleading, because most of the Brubaker decrease is required at several of the upstream points.

Response:
Please refer to the Brubaker Run TMDL for further explanation of the reduction assigned for Brubaker Run.

Comment:
I have considerable problems with the statistical handling of the data in Attachment E. In particular, for site CLCR 15.0 I am unable to see any way that the acidity can average to a positive number; the average is clearly negative. Our 17 values in the Low-Flow Project clearly show negative acidity. Also, how have you handled "less than" values? For Al you seem to have ignored them, though they clearly indicate a much lower mean Al than you report. And I think the "<" values for Fe are averaged in as zeros, in contrast to Al? I question whether any decrease in Fe is needed here if the data are handled reasonably.

Another problem is that the DEP lab changed its reporting procedure for acidity in the middle of your project, and started reporting negative values. Therefore, the zeros for acidity in your table are inconsistent with the other values. You should at least record this problem – it is probably too late to do anything about it. Or you could calculate an acidity – See Cravotta and Kirby paper.

Response:
The average acidity at CLCR 15.0 was corrected from 5.32 to -5.32 in Attachment E. Averages were calculated by ignoring less than values since there is no real value that can be determined. Less than values were treated as blank values in the Monte Carlo simulation.

The Department recognizes that the PADEP lab changed their acidity analyses about half way though the period of sampling for this TMDL. In the case where negative values aren't present, zero concentrations levels were used and are more protective by establishing a higher average concentration at the given point. The switch in methods was beyond the control of the data collection efforts (PADEP Assessment and Standards Data Report *Section 205(j)(1)/604(b)* (Task 2: Collection of Water Quality Samples for TMDL Development 2004).