

DRAFT

**SHADE CREEK, DARK SHADE CREEK &
UNNAMED TRIBUTARY TO DARK
SHADE CREEK WATERSHED TMDL
Somerset County**

For Acid Mine Drainage Affected Segments



Prepared by:

Pennsylvania Department of Environmental Protection

August 5, 2008

DRAFT

TABLE OF CONTENTS

Introduction.....	4
Directions to the Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek Watershed.....	6
Hydrology and Geology.....	6
Segments addressed in this TMDL.....	7
Clean Water Act Requirements	8
Section 303(d) Listing Process	9
Basic Steps for Determining a TMDL.....	10
Watershed History	10
AMD Methodology.....	12
TMDL Endpoints.....	14
TMDL Elements (WLA, LA, MOS)	15
Allocation Summary	15
Recommendations.....	25
Public Participation.....	27
Future TMDL Modifications	27

TABLES

Table 1. 303(d) Sub-List.....	4
Table 2. NPDES permits associated with mining permits in the Shade Creek Watershed requiring a waste load allocation.....	10
Table 3. NPDES permits not associated with mining permits requiring waste load allocations (WLAs) in the Shade Creek Watershed.....	12
Table 4. Applicable Water Quality Criteria.....	15
Table 5. Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek Watershed Summary Table.....	16

ATTACHMENTS

ATTACHMENT A	29
Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek Watershed Maps.....	29
ATTACHMENT B	33
Method for Addressing Section 303(d) Listings for pH.....	33
ATTACHMENT C	36
Method for Calculating Loads from Mine Drainage Treatment Facilities from Surface Mines	36
ATTACHMENT D	41
TMDLs By Segment.....	41
ATTACHMENT E	66
Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists and Integrated Report/List (2004, 2006)	66
ATTACHMENT F	69

DRAFT

Water Quality Data Used In TMDL Calculations	69
ATTACHMENT G	75
TMDLs and NPDES Permitting Coordination	75
ATTACHMENT H	78
Comment and Response.....	78

DRAFT

TMDL¹

Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek Watershed Somerset County, Pennsylvania

Introduction

This report presents the Total Maximum Daily Loads (TMDLs) developed for segments in the Shade Creek, Dark Shade Creek and unnamed tributary to Dark Shade Creek Watershed (Attachments A). These were done to address the impairments noted on the 1996 Pennsylvania Section 303(d) list of impaired waters, required under the Clean Water Act, and covers three segments on this list. Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek were listed as impaired for metals. All impairments resulted from acid drainage from abandoned coalmines. The TMDL addresses the three primary metals associated with acid mine drainage (iron, manganese, aluminum) and pH.

Table 1. 303(d) Sub-List										
State Water Plan (SWP) Subbasin: 18-E Shade Creek, Dark Shade Creek and Unnamed tributary to Dark Shade Creek										
Year	Miles	Use Designation	Assessment ID	Segment ID	DEP Stream Code	Stream Name	Designated Use	Data Source	Source	EPA 305(b) Cause Code
1996	2.7 7.7	*	*	5137 5138	45270	Shade Creek	CWF	305(b) Report	RE	metals metals
1996	2.7	*	*	5153	45330	Dark Shade Creek	CWF	305(b) Report	RE	metals
1996	0.6	*	*	5155	45354	Unt Dark Shade Creek	CWF	305(b) Report	RE	metals
1998	7.97 4.31	*	*	5137 5138	45270	Shade Creek	CWF	SWMP	AMD	metals metals
1998	4.14 0.54	*	*	5153 5155	45330	Dark Shade Creek	CWF	SWMP	AMD	metals metals
2002	9.6	*	*	2001061 9-1000-ALF	45270	Shade Creek	CWF	SWAP	AMD	pH metals
2002	3.4	*	*	2001062 1-1330-ALF	45330	Dark Shade Creek	CWF	SWAP	AMD	pH metals
2002	3.0	*	*	2001062 6-1100-ALF	45330	Dark Shade Creek	CWF	SWAP	AMD	pH
2002	0.6	*	*	2001062 6-1200-ALF	45330	Dark Shade Creek	CWF	SWAP	AMD	pH metals

¹ Pennsylvania's 1996, 1998, and 2002 Section 303(d) lists were approved by the Environmental Protection Agency (EPA). The 1996 Section 303(d) list provides the basis for measuring progress under the 1997 lawsuit settlement of *American Littoral Society and Public Interest Group of Pennsylvania v. EPA*.

DRAFT

Table 1. 303(d) Sub-List										
State Water Plan (SWP) Subbasin: 18-E Shade Creek, Dark Shade Creek and Unnamed tributary to Dark Shade Creek										
Year	Miles	Use Designation	Assessment ID	Segment ID	DEP Stream Code	Stream Name	Designated Use	Data Source	Source	EPA 305(b) Cause Code
2004	9.6	*	*	20010629-1300-ALF	45270	Shade Creek	CWF	SWAP	AMD	pH metals
2004	3.4	*	*	20010621-1330-ALF	45330	Dark Shade Creek	CWF	SWAP	AMD	metals pH
2004	3.0	*	*	20010626-1100-ALF	45330	Dark Shade Creek	CWF	SWAP	AMD	pH
2004	2.5	*	*	990102-0916-TVP	45330	Dark Shade Creek	CWF	SWAP	AMD	pH metals
2004	0.4	*	*	20010626-1200-ALF	45354	Unt 45354 Dark Shade Creek	CWF	SWAP	AMD	pH metals
2004	0.1	*	*	20010626-1201-ALF	45355	Unt 45355 Dark Shade Creek	CWF	SWAP	AMD	pH metals
2006	9.62	Aquatic Life	2152	*	45270	Shade Creek	CWF	SWAP	AMD	pH metals
2006	3.4	Aquatic Life	2201	*	45330	Dark Shade Creek	CWF	SWAP	AMD	pH; metals
	0.49		2233							pH
	2.52		10043							pH; metals
2006	0.47	Aquatic Life	2239	*	45354	Unt 45354 Dark Shade Creek	CWF	SWAP	AMD	pH metals
2006	0.13	Aquatic Life	2240	*	45355	Unt 45355 Dark Shade Creek	CWF	SWAP	AMD	pH metals
2006	2.11	Aquatic Life	2243	*		Coal Run	CWF	SWAP	AMD	pH
	3.74	Aquatic Life	12490							Metals
2006	1.08	Aquatic Life	12490	*	43942	Coal Run, Unt	CWF	SWAP	AMD	Metals
2006	0.69	Aquatic Life	12490	*	43943	Coal Run, Unt	CWF	SWAP	AMD	Metals

DRAFT

Table 1. 303(d) Sub-List										
State Water Plan (SWP) Subbasin: 18-E Shade Creek, Dark Shade Creek and Unnamed tributary to Dark Shade Creek										
Year	Miles	Use Designation	Assessment ID	Segment ID	DEP Stream Code	Stream Name	Designated Use	Data Source	Source	EPA 305(b) Cause Code
2006	1.64	Aquatic Life	12490	*	43944	Coal Run, Unt	CWF	SWAP	AMD	Metals
2006	0.57	Aquatic Life	2243	*	45360	Coal Run, Unt	CWF	SWAP	AMD	pH
2006	2.43	Aquatic Life	2163	*		Spruce Run	CWF	SWAP	AMD	Metals
2006	0.78	Aquatic Life	2163	*	45274	Spruce Run, Unt	CWF	SWAP	AMD	Metals
2006	0.61	Aquatic Life	2163	*	45275	Spruce Run, Unt	CWF	SWAP	AMD	Metals

Resource Extraction=RE

Cold Water Fishes = CWF

Surface Water Monitoring Program = SWMP

Surface Water Assessment Program = SWAP

Abandoned Mine Drainage = AMD

See Attachment D, *Excerpts Justifying Changes Between the 1996, 1998, 2002 and 2004 Section 303(d) Lists*. The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.

Directions to the Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek Watershed

The Shade Creek Watershed is located in Southwest Pennsylvania, in the northern portion of Somerset County. The watershed area is found on United States Geological Survey maps covering portions of the Windber, Hooversville, and Central City 7.5 Minute Quadrangles.

Hydrology and Geology

The area within the Shade Creek Watershed consists of 133.1 square miles. Land uses within the watershed include forestland, open land (composed of reclaimed surface mines and agriculture), and rural residential. The unnamed tributary to Dark Shade Creek has an estimated total length of 2,000 feet. The area within the watershed consists of approximately 1.0 square mile. Land uses within the unnamed tributary to Dark Shade Creek Watershed include forestland, open land (composed of surface mines and agriculture), and rural residential. Two villages are located in the Shade Creek Watershed. The village of Seanor is situated at the mouth of Shade Creek. Shade Creek at this point flows into the Stony Creek River at the intersection of SR601 (Seanor Road) and SR4039 (Miller Picking Road). The next village upstream in the watershed is Hillsboro, which lies where Roaring Fork enters into Shade Creek. The Shade Creek headwaters are formed at the confluence of Dark Shade Creek and Clear Shade Creek. The villages in the Shade Creek Watershed were established primarily during the early 1800s. Three communities are located in the Dark Shade Creek Watershed. The village of Reitz is situated approximately

DRAFT

4,500 feet upstream from the mouth of Dark Shade Creek. The mouth of Dark Shade Creek begins at the confluence with Clear Shade Creek and Shade Creek. The next community upstream in the watershed is Central City. This community has the largest population within the Dark Shade Creek Watershed. The final community in the watershed is Gahagen. This particular village lies near the headwaters of Dark Shade Creek.

The watershed is situated in the upland plateau of the Appalachian Physiographic Province. The upland region contains streams, which drain to the south and west toward the Ohio River. The headwaters of Shade Creek have an elevation of approximately 2030 feet above sea level. The confluence of Shade Creek with the Stony Creek River has an elevation of 1475 feet above sea level. The watershed is situated in the upland plateau of the Appalachian Physiographic Province. The upland region contains streams, which drain to the south and west toward the Ohio River. The headwaters of Dark Shade Creek have an elevation of approximately 2740 feet above sea level. The mouth of Dark Shade Creek with the Stony Creek River is at an elevation of 2030 feet above sea level.

Within the Shade Creek Watershed are three geologic groups: the Conemaugh, Allegheny, and the Pottsville. The Conemaugh Group contains the Glenshaw and Casselman Formations. These formations have sequences of shale, sandstone, thin limestone, claystone, and thin coal units. The Allegheny Group has a sequence of shale, sandstone, limestone, claystone, and coal units. The Upper Freeport, Lower Freeport, Upper Kittanning, Lower Kittanning, and Brookville-Clarion coal seams are present in the Allegheny Group. The Pottsville Group, the oldest rock unit, contains the Homewood sandstone and Mercer coal seam. Generally, the group has shale, sandstone, and clay units. Within the Dark Shade Creek Watershed are three geologic groups, the Conemaugh, Allegheny, and the Pottsville. The Conemaugh Group contains the Glenshaw and Casselman Formations. These formations have sequences of shale, sandstone, thin limestone, claystone, and thin coal units. The Allegheny Group has a sequence of shale, sandstone, limestone, claystone, and coal units. The Upper Freeport, Lower Freeport, Upper Kittanning, Lower Kittanning, and Brookville-Clarion coal seams are present in the Allegheny Group. The Pottsville Group, the oldest rock unit, contains the Homewood sandstone and Mercer coal seam. Generally, the group has shale, sandstone, and clay units.

Segments addressed in this TMDL

Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek are affected by pollution from AMD. This pollution has caused high levels of metals in the watershed. There are numerous active mining operations in the watershed. These TMDLs will be 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 a better representation of the data used for the calculations. See Table 3 for TMDL calculations and see Attachment C for TMDL explanations.

This AMD TMDL document contains one or more future mining Waste Load Allocations (WLA). This (these) WLA(s) were requested by the (Knox, Moshannon, Greensburg, Cambria or Pottsville) District Mining Office (DMO) to accommodate one or more future mining operations. The District Mining Office determined the number of and location of the future

DRAFT

mining WLAs. This will allow speedier approval of future mining permits without the time-consuming process of amending this TMDL document. All comments and questions concerning the future mining WLAs in this TMDL are to be directed to the appropriate DMO. Future wasteload allocations are calculated using the method described for quantifying pollutant load in Attachment C.

The following are examples of what is or is not intended by the inclusion of future mining WLAs. This list is by way of example and is not intended to be exhaustive or exclusive:

1. The inclusion of one or more future mining WLAs is not intended to exclude the issuance of future non-mining NPDES permits in this watershed or any waters of the Commonwealth.
2. The inclusion of one or more future mining WLAs in specific segments of this watershed is not intended to exclude future mining in any segments of this watershed that does not have a future mining WLA.
3. The inclusion of future mining WLAs does not preclude the amending of this AMD TMDL to accommodate additional NPDES permits.

All of the remaining discharges in the watershed are from abandoned mines and will be treated as non-point sources. The distinction between non-point and point sources in this case is determined on the basis of whether or not there is a responsible party for the discharge. TMDLs will be 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 a better representation of the data used for the calculations. See Attachment D for TMDL calculations.

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 Environmental Protection Agency’s (EPA) implementing regulations (40 CFR Part 130) require:

- States to develop 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 EPA every two years (April 1 of the even numbered years);

DRAFT

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

Despite these requirements, states, territories, authorized tribes, and EPA had not developed many TMDLs. Beginning in 1986, organizations in many states filed lawsuits against the EPA for failing to meet the TMDL requirements contained in the federal Clean Water Act and its implementing regulations. While EPA has entered into consent agreements with the plaintiffs in several states, other lawsuits still are pending across the county.

In the cases that have been settled to date, the consent agreements require EPA 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 1997 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, there must be sufficient data available to assess which streams are impaired and should be on the Section 303(d) list. With guidance from the EPA, the states have developed methods for assessing the waters within their respective jurisdictions.

The primary method adopted by the Pennsylvania Department of Environmental Protection (DEP) for evaluating waters changed between the publication of the 1996 and 1998 Section 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)² reporting process. DEP is now using the Statewide Surface Waters Assessment Protocol (SSWAP), a modification of the EPA's 1989 Rapid Bioassessment Protocol II (RBP-II), as the primary mechanism to assess Pennsylvania's waters. The SSWAP 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. The biologist selects as many sites as necessary to establish an accurate assessment for a stream segment; the length of the assessed stream segment can vary between sites. All the biological surveys included kick-screen sampling of benthic macroinvertebrates and habitat evaluations. Benthic macroinvertebrates are identified to the family level in the field.

² Section 305(b) of the Clean Water Act requires a biannual description of the water quality of the waters of the state.

DRAFT

After the survey is completed, the biologist determines the status of the stream segment. The decision is based on habitat scores and a series of narrative biological statements used to evaluate the benthic macroinvertebrate community. If the stream is determined to be impaired, the source and cause of the impairment is documented. An impaired stream must be listed on the state's Section 303(d) list with the source and cause. A TMDL must be developed for the stream segment and each pollutant. 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, there are basic processes or steps that apply to all cases. They include:

1. Collection and summarization of pre-existing data (watershed characterization, inventory contaminant sources, determination of pollutant loads, etc.);
2. Calculating the TMDL for the waterbody using EPA approved methods and computer models;
3. Allocating pollutant loads to various sources;
4. Determining critical and seasonal conditions;
5. Public review and comment and comment period on draft TMDL;
6. Submittal of final TMDL; and
7. EPA approval of the TMDL.

Watershed History

Somerset County has been an important coal-producing region in Pennsylvania. The coal seams most mined in the county would include the following: Redstone, Blue Lick, Pittsburgh, Upper Freeport, Lower Freeport, Upper Kittanning, and Lower Kittanning.

Numerous deep and surface coal mining operations have occurred in the Shade, Dark Shade, and unnamed tributary to Dark Shade Creek Watersheds since the late 1800's. Recent coal mining operations in the watershed are listed in Table 2.

Table 2. NPDES permits associated with mining permits in the Shade Creek Watershed requiring a waste load allocation

Company Name	Operation Name	Mining Permit	NPDES Permit	Seams Mined	Operation Status	Post Mining Discharge
Hoffman Mining, Inc.	"Faas Mine"	#56050108	PA0249874	LK, LKR, MK, UK		No
Cooney Brothers Coal Co.	"Ridge Mine"	#56000101	PA0235229	UK, LF, UF		No
Hoffman Mining, Inc.	"Shaffer Mine"	#56050104	PA0249777	LK, UK, LF		No
Hoffman	"St. Thomas	#56040105	PA0249602	LK, MKUB,		No

DRAFT

Mining, Inc.	Mine”			MKLB, UK, LF		
Cooney Brothers Coal Co.	“Burgess Mine”	#56930102	PA0212407	LK, UK, LF	Reclaimed	Yes
Cooney Brothers Coal Co.	“Burgess II Mine”	#56950111	PA0213225	LK, UK, LF		No
Cooney Brothers Coal Co.	“Brubaker Mine”	#56920106	PA0599557	UK, LF, UF		No
Heritage Mining Co.	“Shaffer Strip”	#56980101	PA02354664	UK, LF, UF		No
Shade Mining Company	“Shaulis Strip”	#4173SM6	PA0249980		Reclaimed	Yes
Hoffman Mining Inc.	“Arrow Mine”	#56080105	PA0262633			No
Sherpa Mining Contractors, Inc.	“Cook Mine”	#56080102	PA0262909			No
Fieg Brothers	“Will Mine”	#56060104	PA0249963			No
New Enterprise Stone & Lime Co., Inc.	"Ishman Quarry"	#56920302	PA0212326	Non-coal		No
New Enterprise Stone & Lime Co., Inc.	"Central City Quarry"	#4174SM2	PA0009814	Non-coal		Yes
PBS Coals, Inc.	"Job 12 Expansion"	#56900701	PA0214078	Refuse disposal		No
PBS Coals, Inc.	"Shade Creek Preparation Plant"	#56841603	PA0588504	Coal preparation plant		No
PBS Coals, Inc.	"Jolin Strip - Job 12"	#56663098	PA0607932	Refuse reprocessing		Yes
PBS Coals, Inc.	"Huskin Run Mine"	#56050103	PA 0214850			No
Shade Landfill, Inc.	"Will No.2 Strip"	#56763036	PA0125015	LK, UK, LF, UF		Yes
Robindale Energy Services, Inc.	“Custom Coals Laurel”	#56743701	PA0249343	Post-mining water treatment		Yes
Reitz Coal Company	“Reitz No.4 Plant”	#56831602	PA0214469	Coal preparation plant		Yes

LK = Lower Kittaning
 MK = Middle Kittaning (UB = Upper Bench; LB = Lower Bench)
 UK = Upper Kittaning
 LKR = Lower Kittaning Rider
 LF = Lower Freeport
 UF = Upper Freeport

DRAFT

In addition to NPDES permits issued as part of mining permits for mine drainage treatment, there are additional facilities that discharge metals in the Shade Creek Watershed that require waste load allocations. These permits are issued as industrial waste permits under the Department's Water Pollution Control Program and are generally for backwashing of filters from water treatment facilities or from landfill leachate treatment and discharge (Table 3).

Table 3. NPDES permits not associated with mining permits requiring waste load allocations (WLAs) in the Shade Creek Watershed

<i>NPDES Permit</i>	<i>Facility</i>
PA0097110	Waste Management Shade Creek Landfill
PA0110990	Central City Water Treatment Plant
PA0025810	Shade Township & Central City Wastewater Treatment Plant

A large abandoned Lower Kittanning deep mine discharge enters Dark Shade Creek, located adjacent to the Reitz preparation plant. The Lower Kittanning discharge is made up from primarily the abandoned Reitz #4 deep mine, PBS Coals, Inc.'s Job 12 Expansion site, which pumps treated coal refuse disposal water into the deep mine complex, and PBS Coals, Inc.'s Huskin Run mine, that the operator redirected the abandoned deep mine water that reached the surface back in the deep mine. Other abandoned Lower Kittanning deep mine discharges enter into Dark Shade Creek. These discharges are located downstream from the Reitz #4 deep mine discharge located in Central City.

An Unsuitable for Mining (UFM) petition area exists near the headwaters of Dark Shade Creek. The petition area is identified as Indian Lake #56959901. The UFM area lies between the village of Gahagen and RT 160.

AMD Methodology

A two-step approach is 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 will be computed based on average annual flow.

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

DRAFT

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 @Risk³ 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:

$$PR = \text{maximum } \{0, (1 - Cc/Cd)\} \text{ where} \quad (1)$$

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

$$Cd = \text{RiskLognorm (Mean, Standard Deviation) where} \quad (1a)$$

Mean = average observed concentration

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:

$$LTA = \text{Mean} * (1 - PR99) \text{ where} \quad (2)$$

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.

³@Risk – Risk Analysis and Simulation Add-in for Microsoft Excel, Palisade Corporation, Newfield, NY, 1990-1997.

DRAFT

Load tracking through the watershed utilizes the change in measured loads from sample location to sample location, as well as the allowable load that was determined at each point using the @Risk program.

There are two basic rules that are applied in load tracking; rule one is that if the sum of the measured loads that directly affect the downstream sample point is less than the measured load at the downstream sample point it is indicative that there is an increase in load between the points being evaluated, and this amount (the difference between the sum of the upstream and downstream loads) shall be added to the allowable load(s) coming from the upstream points to give a total load that is coming into the downstream point from all sources. The second rule is that if the sum of the measured loads from the upstream points is greater than the measured load at the downstream point this is indicative that there is a loss of instream load between the evaluation points, and the ratio of the decrease shall be applied to the load that is being tracked (allowable load(s)) from the upstream point.

Tracking loads through the watershed gives the best picture of how the pollutants are affecting the watershed based on the information that is available. The analysis is done to insure that water quality standards will be met at all points in the stream. The TMDL must be designed to meet standards at all points in the stream, and in completing the analysis, reductions that must be made to upstream points are considered to be accomplished when evaluating points that are lower in the watershed. Another key point is that the loads are being computed based on average annual flow and should not be taken out of the context for which they are intended, which is to depict how the pollutants affect the watershed and where the sources and sinks are located spatially in the watershed.

For pH TMDLs, acidity is compared to alkalinity as described in Attachment B. Each sample point used in the analysis of pH by this method must have measurements for total alkalinity and total acidity. 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 be 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 a 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.

DRAFT

Because the sources of the pollution in the watershed are due to both point and non-point sources, the TMDLs' component makeup will be load allocations (LAs) and waste load allocations (WLAs). All allocations will be specified as long-term average daily concentrations. These long-term average concentrations are expected to meet water-quality criteria 99% of the time as required in PA Title 25 Chapter 96.3(c). The following table shows the applicable 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	30 day average; Total Recoverable
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.

TMDL Elements (WLA, LA, MOS)

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS}$$

A TMDL equation consists of a waste load allocation (WLA), load allocation (LA), and a margin of safety (MOS). The waste load allocation is the portion of the load assigned to point sources. The load allocation is the portion of the load assigned to non-point sources. The margin of safety is applied to account for uncertainties in the computational process. The margin of safety may be expressed implicitly (documenting conservative processes in the computations) or explicitly (setting aside a portion of the allowable load). The TMDL allocations in this report are based on available data. Other allocation schemes could also meet the TMDL.

Allocation Summary

These TMDLs will focus remediation efforts on the identified numerical reduction targets for each watershed. The reduction schemes in Table 3 for each segment are based on the assumption that all upstream allocations are achieved and take into account for all upstream reductions. Attachment C contains the TMDLs by segment analysis for each allocation point in a detailed discussion. As changes occur in the watershed, the TMDLs may be re-evaluated to reflect current conditions. An implicit MOS based on conservative assumptions in the analysis is included in the TMDL calculations.

The allowable LTA concentration in each segment is calculated using Monte Carlo Simulation as described previously. The allowable load is then determined by multiplying the allowable concentration by the flow and a conversion factor at each sample point. The allowable load is the TMDL.

Each permitted discharge in a segment is assigned a waste load allocation and the total waste load allocation for each segment is included in this table. The difference between the TMDL and the WLA at each point is the load allocation (LA) at the point. The LA at each point includes all loads entering the segment, including those from upstream allocation points. The percent

DRAFT

reduction is calculated to show the amount of load that needs to be reduced within a segment in order for water quality standards to be met at the point.

In some instances, instream processes, such as settling, are taking place within a stream segment. These processes are evidenced by a decrease in measured loading between consecutive sample points. It is appropriate to account for these losses when tracking upstream loading through a segment. The calculated upstream load lost within a segment is proportional to the difference in the measured loading between the sampling points.

Table 5. Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek Watershed Summary Table

Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	% Reduction
SC27 - Coal Run in Gahagen						
Aluminum (lbs/day)	67.91	2.15	0	2.15	65.76	97%
Iron (lbs/day)	15.86	1.92	0	1.92	13.94	88%
Manganese(lbs/day)	13.18	3.00	0	3.00	10.18	77%
Acidity (lbs/day)	554.92	0.00	0	0.00	554.92	100%
SC26 - Coal Run near railroad tracks						
Aluminum (lbs/day)	113.87	12.88	0.32	12.56	35.23	74%*
Iron (lbs/day)	53.36	31.45	1.28	30.17	7.97	20%*
Manganese(lbs/day)	20.77	17.37	0.85	16.52	0.00	0%*
Acidity (lbs/day)	1335.56	0.00	-	0.00	780.64	100%*
SC25 – Unnamed tributary to Dark Shade Creek near ponds with cherry red water						
Aluminum (lbs/day)	9.37	0.01	0	0.01	9.36	99.9%
Iron (lbs/day)	83.12	0.001	0	0.001	83.119	99.999%
Manganese(lbs/day)	0.66	0.02	0	0.02	0.64	97%
Acidity (lbs/day)	168.26	0.00	0	0.00	168.26	100%
SC24 - Dark Shade before Coal Run						
Aluminum (lbs/day)	153.68	42.50	0.56	41.94	0.73	2%*
Iron (lbs/day)	127.61	56.85	2.25	54.60	0.00	0%*
Manganese(lbs/day)	30.60	30.60	NA	NA	NA	NA
Acidity (lbs/day)	1681.55	0.00	-	0.00	345.99	100%*
SC23 - Little Dark Shade Creek near snack shop						
Aluminum (lbs/day)	3.67	3.67	NA	NA	NA	NA
Iron (lbs/day)	10.90	10.90	NA	NA	NA	NA
Manganese(lbs/day)	1.16	1.16	NA	NA	NA	NA
Acidity (lbs/day)	-35.04	-1286.88	NA	NA	NA	NA
SC22 - Tributary to Little Dark Shade Creek						
Aluminum (lbs/day)	6.02	1.14	0.28	0.86	4.88	82%
Iron (lbs/day)	111.99	4.03	1.13	2.90	107.96	97%
Manganese(lbs/day)	10.87	3.66	0.75	2.91	7.21	67%

DRAFT

Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	% Reduction
Acidity (lbs/day)	17.47	17.47	-	NA	NA	NA
SC21 - Dark Shade Creek near Cairnbrook						
Aluminum (lbs/day)	671.51	82.93	4.92	78.01	472.52	85%
Iron (lbs/day)	3379.45	145.88	12.15	133.73	3054.85	96%
Manganese(lbs/day)	579.54	81.55	8.43	73.12	490.78	86%
Acidity (lbs/day)	12421.14	5.24	-	5.24	10734.35	99.95%
SC20 - Mouth of Dark Shade Creek						
Aluminum (lbs/day)	815.34	103.10	0.14	102.96	123.66	55%
Iron (lbs/day)	2971.71	204.95	0.55	204.40	0.00	0%*
Manganese(lbs/day)	726.47	107.17	0.37	106.80	121.31	53%
Acidity (lbs/day)	13947.78	30.91	-	30.91	1500.97	98%
SC19 - Clear Shade Creek						
Aluminum (lbs/day)	41.52	41.52	NA	NA	NA	NA
Iron (lbs/day)	57.39	57.39	NA	NA	NA	NA
Manganese(lbs/day)	7.33	7.33	NA	NA	NA	NA
Acidity (lbs/day)	359.83	201.28	-	201.28	158.55	44%
SC17 - Shade Creek near Hillsboro						
Aluminum (lbs/day)	865.21	234.60	0.70	233.90	0.00	0%*
Iron (lbs/day)	1728.48	364.31	2.77	361.54	0.00	0%*
Manganese(lbs/day)	780.73	217.03	1.70	215.33	0.00	0%*
Acidity (lbs/day)	14369.72	79.81	-	79.81	214.49	73%*
SC18 - Mouth of Roaring Fork						
Aluminum (lbs/day)	78.01	52.17	0.56	51.61	25.84	34%
Iron (lbs/day)	99.73	68.71	2.25	66.46	31.02	32%
Manganese(lbs/day)	150.40	41.72	1.50	40.22	108.68	73%
Acidity (lbs/day)	1564.76	17.79	-	17.79	1546.97	99%
SC16 - Shade Creek upstream of Spruce Run						
Aluminum (lbs/day)	940.35	280.47	0.48	279.99	3.43	2%*
Iron (lbs/day)	1192.21	317.84	1.80	316.04	0.00	0%*
Manganese(lbs/day)	909.75	279.66	1.20	278.46	0.00	0%*
Acidity (lbs/day)	14165.24	126.86	-	126.86	0.00	0%*
SC15 - Mouth of Spruce Run						
Aluminum (lbs/day)	1.15	1.15	NA	NA	NA	NA
Iron (lbs/day)	6.74	6.74	NA	NA	NA	NA
Manganese(lbs/day)	1.26	1.26	NA	NA	NA	NA
Acidity (lbs/day)	-21.25	-365.82	NA	NA	NA	NA
SC14 - Mouth of Shade Creek						
Aluminum (lbs/day)	1021.48	284.54	1.22	283.32	77.06	22%*
Iron (lbs/day)	840.05	254.61	4.54	250.07	0.00	0%*
Manganese(lbs/day)	971.78	293.41	3.26	290.15	48.28	15%*
Acidity (lbs/day)	14620.13	157.68	-	157.68	424.07	73%*

* Total of loads affecting this segment is less than the allowable load calculated at this point, therefore no reduction is necessary.

*ND = not determined NA = not applicable

DRAFT

In the instance that the allowable load is equal to the existing load (e.g. manganese, point SC15, Table 5), the simulation determined that water quality standards are being met instream 99% of the time and no TMDL is necessary for the parameter at that point. Although no TMDL is necessary, the loading at the point is considered at the next downstream point. This is denoted as “NA” in the above table.

Waste Load Allocation –PBS Coals, Inc. Huskin Run Mine

PBS Coals, Inc. (SMP56050103; NPDES PA0214850) Huskin Run Mine has one mine drainage treatment facility requiring treatment. Outfall 002 is a discharge from a treatment facility that discharges into the underlying deep mine pool. This discharge does not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for this discharge.

Table C4. Waste Load Allocations at Huskin Run Mine			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
002			
Al	0.75	0.045	0.28
Fe	3.0	0.045	1.13
Mn	2.0	0.045	0.75

Waste Load Allocation –PBS Coals, Inc. Jolin Strip – Job 12

PBS Coals, Inc. (SMP56663098; does not have NPDES permit) Jolin Strip has one post-mining discharge requiring treatment. Outfall 002 is a discharge from a treatment facility that discharges into Dark Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The average raw chemical characteristics of the discharge are as follows: 3.12 pH, 772.8 mg/L acidity, 0 mg/L alkalinity, 62.67 mg/L total iron, 20.66 mg/L total manganese, and 84.66 mg/L total aluminum. The following table shows the waste load allocation for this discharge.

Table C5. Waste Load Allocations at Jolin Strip – Job 12			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
002			
Al	0.75	0.006	0.04
Fe	3.0	0.006	0.15
Mn	2.0	0.006	0.10

Waste Load Allocation –Reitz Coal Company Reitz No. 4 Plant

DRAFT

Reitz Coal Company (SMP56831602; NPDES PA0214469) Number 4 Plant has one post-mining discharge requiring treatment. Pond 001 is a discharge from a treatment facility that discharges into Dark Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for this discharge.

Table C15. Waste Load Allocations at Reitz No. 4 Plant			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.00721	0.05
Fe	3.0	0.00721	0.18
Mn	2.0	0.00721	0.12

Waste Load Allocation –New Enterprise Stone & Lime Co., Inc. Ishman Quarry

New Enterprise Stone & Lime Co., Inc. (SMP56920302; NPDES PA0212326) Ishman Quarry has one mine drainage treatment facility requiring treatment. Treatment Pond 003 is a discharge from a treatment facility that discharges into Laurel Run, then into Dark Shade Creek. The following table shows the waste load allocation for this discharge.

Table C16. Waste Load Allocations at Ishman Quarry			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
003			
Al	1.9	0.166	2.64
Fe	2.2	0.166	3.05
Mn	1.7	0.166	2.36

Waste Load Allocation –New Enterprise Stone & Lime Co., Inc. Central City Quarry

New Enterprise Stone & Lime Co., Inc. (SMP4174SM2; NPDES PA0009814) Central City Quarry has one mine drainage treatment facility requiring treatment. Treatment Pond 001 is a discharge from a treatment facility that discharges into Dark Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for this discharge.

Table C17. Waste Load Allocations at Central City Quarry			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.356	2.23
Fe	3.0	0.356	8.92

DRAFT

Mn	2.0	0.356	5.95
----	-----	-------	------

Waste Load Allocation –Robindale Energy Custom Coals Laurel

Robindale Energy (SMP56743701; NPDES PA0249343) Custom Coals Laurel has one post-mining discharge requiring treatment. Treatment Pond 002 is a discharge from a treatment facility that discharges into Dark Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for this discharge.

Table C20. Waste Load Allocations at Custom Coals Laurel			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
002			
Al	0.75	0.022	0.14
Fe	3.0	0.022	0.55
Mn	2.0	0.022	0.37

Waste Load Allocation –Cooney Brothers Coal Co. Burgess II Mine

Cooney Brothers Coal Co. (SMP56950111; NPDES PA0213225) Burgess II Mine has six mine drainage treatment facilities. Treatment Pond 001-004, 009, and 011 are discharges from treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

Table C25. Waste Load Allocations at Burgess II Mine			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.015	0.09
Fe	2.7	0.015	0.34
Mn	1.3	0.015	0.16
002			
Al	0.75	0.015	0.09
Fe	2.7	0.015	0.34
Mn	1.3	0.015	0.16
003			
Al	0.75	0.015	0.09
Fe	3.0	0.015	0.38
Mn	2.0	0.015	0.25
004			
Al	0.75	0.015	0.09
Fe	3.0	0.015	0.38
Mn	2.0	0.015	0.25

DRAFT

009			
Al	0.75	0.015	0.09
Fe	3.0	0.015	0.38
Mn	2.0	0.015	0.25
011			
Al	0.75	0.015	0.09
Fe	2.8	0.015	0.35
Mn	1.8	0.015	0.23

Waste Load Allocation –Heritage Mining Co. Shaffer Strip

Heritage Mining Co. (SMP56980101; NPDES PA02354664) Shaffer Strip has two mine drainage treatment facilities. Treatment Ponds 001 and 002 are discharges from treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

Table C26. Waste Load Allocations at Shaffer Strip			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.009	0.06
Fe	3.0	0.009	0.21
Mn	2.0	0.009	0.14
002			
Al	0.75	0.009	0.06
Fe	3.0	0.009	0.21
Mn	2.0	0.009	0.14

Waste Load Allocation –Shade Mining Company Shaulis Strip

Shade Mining Co. (SMP4173SM6; NPDES PA0249980) Shaulis Strip has one post-mining discharge that requires treatment. Treatment Pond 001 is a discharge from a passive treatment system that discharges into Shade Creek. This discharge does not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for this discharge.

Table C27. Waste Load Allocations at Shaulis Strip			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.007	0.04
Fe	3.0	0.007	0.18
Mn	2.0	0.007	0.12

DRAFT

Waste Load Allocation –Hoffman Mining, Inc. St. Thomas Mine

Hoffman Mining Inc. (SMP56040105; NPDES PA0249602) St. Thomas Mine has three mine drainage treatment facilities. Treatment Ponds 001-003 are discharges from mine drainage treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharges for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

Table C32. Waste Load Allocations at St. Thomas Mine			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20
002			
Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20
003			
Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20

Waste Load Allocation –Hoffman Mining, Inc. Shaffer Mine

Hoffman Mining Inc. (SMP56050104; NPDES PA0249777) Shaffer Mine has three mine drainage treatment facilities. Treatment Ponds 001-003 are discharges from mine drainage treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharges for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

Table C33. Waste Load Allocations at Shaffer Mine			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20
002			
Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20
003			

DRAFT

Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20

Waste Load Allocation –Hoffman Mining, Inc. Faas Mine

Hoffman Mining Inc. (SMP56050108; NPDES PA0249874) Faas Mine has three mine drainage treatment facilities. Treatment Ponds 001-003 are discharges from mine drainage treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharges for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

Table C37. Waste Load Allocations at Faas Mine			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.031	0.20
Fe	2.3	0.031	0.60
Mn	2.0	0.031	0.52
002			
Al	0.75	0.031	0.20
Fe	2.3	0.031	0.60
Mn	2.0	0.031	0.52
003			
Al	0.75	0.031	0.20
Fe	3.0	0.031	0.78
Mn	2.0	0.031	0.52

Waste Load Allocation –Cooney Brothers Coal Co. Ridge Mine

Cooney Brothers Coal Co. (SMP56000101; NPDES PA0235229) Ridge Mine has two mine drainage treatment facilities. Treatment Ponds 001 and 002 are discharges from mine drainage treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharges for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

Table C38. Waste Load Allocations at Faas Mine			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.051	0.32
Fe	2.3	0.051	1.28
Mn	2.0	0.051	0.85
002			
Al	0.75	0.051	0.32

DRAFT

Fe	2.3	0.051	1.28
Mn	2.0	0.051	0.85

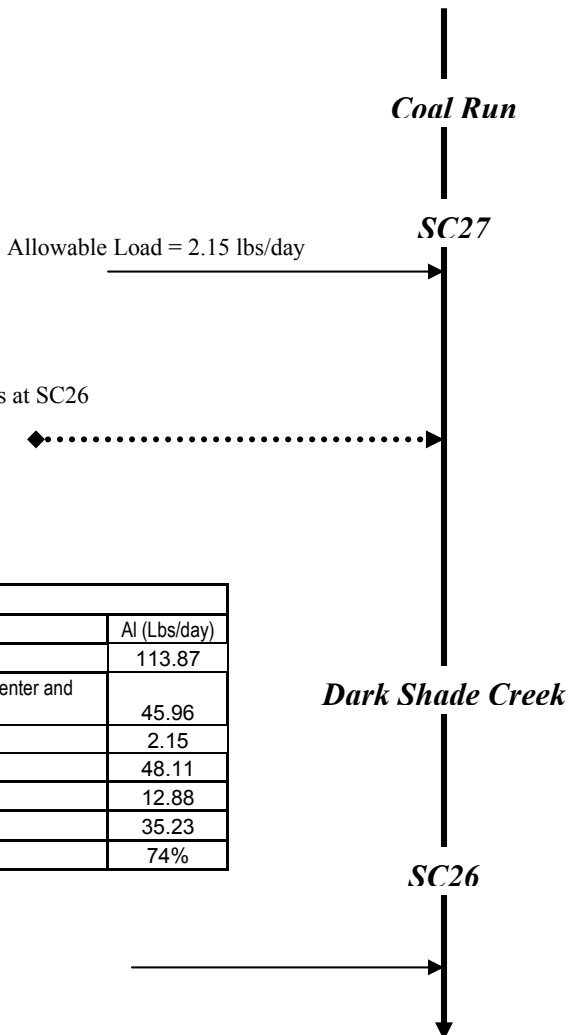
Following is an example of how the allocations, presented in Table 5, for a stream segment are calculated. For this example, aluminum allocations for SC15 of Shade Creek are shown. As demonstrated in the example, all upstream contributing loads are accounted for at each point. Attachment D contains the TMDLs by segment analysis for each allocation point in a detailed discussion. These analyses follow the example. Attachment A contains maps of the sampling point locations for reference.

Allocations SC27	
SC27	Al (Lbs/day)
Existing Load @ SC27	67.91
Allowable Load @ SC27	2.15
Load Reduction @ SC27	65.76
% Reduction required @ SC27	97%

Load input = 45.96 lbs/day
(Difference between existing loads at SC26
And SC27)

ALLOCATIONS SC26	
SC26	Al (Lbs/day)
Existing Load @ SC26	113.87
Difference in measured Loads between the loads that enter and existing SC26 (SC26-(SC27))	45.96
Additional load tracked from above samples	2.15
Total load tracked between SC26 and SC27	48.11
Allowable Load @ SC26	12.88
Load Reduction @ SC26	35.23
% Reduction required at SC26	74%

Allowable Load = 12.88 lbs/day



The allowable aluminum load tracked from SC27 was 2.15 lbs/day. The existing load at SC27 was subtracted from the existing load at SC26 to show the actual measured increase of aluminum load that has entered the stream between these two sample points (45.96 lbs/day). This increased value was then added to the calculated allowable load from SC27 to calculate the total load that was tracked between SC27 and SC26 (allowable loads @ SC27 + the difference in existing load between SC27 and SC26). This total load tracked was then subtracted from the calculated allowable load at SC26 to determine the amount of load to be reduced at SC26. This total load

DRAFT

value was found to be 48.11 lbs/day; it was 35.23 lbs/day greater than the SC26 allowable load of 12.88 lbs/day. Therefore, a 74% aluminum reduction at SC26 is necessary.

Recommendations

Local Reclamation Efforts

Shade Creek has been severely impacted from acid mine drainage. The Shade Creek Watershed Association (SCWA) was formed in 2000 by local residents and Americorps members involved with the Dark Shade Creek Brownfield Projects. The Brownfield Projects on Dark Shade Creek was started through the EPA from stream pollution caused by previous coal mining activities. Dark Shade Creek and Clear Shade Creek converge to form Shade Creek. The Shade Creek Watershed Association (SCWA) has been involved with several projects to improve water quality which include:

- 1.) “Cottage Town Wetlands” – the treatment system, near the village of Cairnbrook, was constructed in the late 1980’s.
- 2.) “Shingle Run” (Project #351253) – an anoxic limestone drain (ALD) which was constructed in 2002.
- 3.) “Swallow Farm/Coal Run Site” – a treatment system reconstructed by the Bureau of Abandoned Mine Reclamation (BAMR) in 2006.
- 4.) “Reitz #1” (Project #4100020607) – a treatment system uses two (2) procedures to improve water quality a vertical flow pond and a bioreactor. The system increases the pH levels from 3.4 to 6.6 before discharging the water into Laurel Run. This particular discharge represents the fourth largest pollution source in the Shade Creek Watershed.
- 5.) “Limestone Sand Dosing” (Project # 712772) – the tentative plan is to reduce the impact acid rain has on the watershed. SCWA obtained a grant for \$15,000 from the Department of Environmental Protection’s Growing Greener Program to place limestone sand dosing in the tributaries to Shade Creek.

Shade Creek Watershed Association is continuing the efforts to improve water quality in the watershed. The association has made significant progress in the Shade Creek Watershed. However, large discharges such as the one from the abandoned Reitz #4 deep mine represent major challenges in further reductions of mine drainage pollution to the watershed. In the future, additional water improvements probably can be made to the watershed through advancements in mine drainage treatment facilities and increased funding.

Commonwealth Reclamation Efforts

Two primary programs provide maintenance and improvement of water quality in the watershed. DEP’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.

DRAFT

Additional opportunities for water quality improvement are both ongoing and anticipated. Historically, a great deal of research into mine drainage has been conducted by BAMR, which administers and oversees the Abandoned Mine Reclamation Program in Pennsylvania, the United States Office of Surface Mining, the National Mine Land Reclamation Center, the National Environmental Training Laboratory, and many other agencies and individuals. Funding from EPA's 319 Grant program and Pennsylvania's Growing Greener program have been used extensively to remedy mine drainage impacts. These many activities are expected to continue and result in water quality improvement.

The DEP Bureau of Mining and Reclamation administers an environmental regulatory program for all mining activities, mine subsidence regulation, mine subsidence insurance, and coal refuse disposal; conducts 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; provides for training, examination, and certification of applicants for blaster's licenses; and administers a loan program for bonding anthracite underground mines and for mine subsidence and administers the EPA Watershed Assessment Grant Program, the Small Operator's Assistance Program (SOAP), and the Remining Operators Assistance Program (ROAP).

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 DEP's Brownfields program. Since the 1960's, Pennsylvania has been a national leader in establishing laws and regulations to ensure reclamation and plugging occur after active operation is completed.

Pennsylvania is striving for complete reclamation of its abandoned mines and plugging of its orphaned wells. Realizing this task is no small order, DEP has developed concepts to make abandoned mine reclamation easier. These concepts, collectively called Reclaim PA, include legislative, policy land management initiatives designed to enhance mine operator, volunteer land DEP 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

Reclaim PA is DEPs initiative designed to maximize reclamation of the state's quarter million acres of abandoned mineral extraction lands. Abandoned mineral extraction lands in Pennsylvania constituted a significant public liability – more than 250,000 acres of abandoned surface mines, 2,400 miles of streams polluted with mine drainage, 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 problem nationally.

DRAFT

The coal industry, through DEP-promoted re-mining efforts, can help to eliminate some sources of AMD and conduct some of the remediation identified in the above recommendations through the permitting, mining, and reclamation of abandoned and disturbed mine lands. Special consideration should be given to potential re-mining projects within these areas, as the environmental benefit versus cost ratio is generally very high.

Candidate or federally-listed threatened and endangered species may occur in or near the watershed. While implementation of the TMDL should result in improvements to water quality, they could inadvertently destroy habitat for candidate or federally-listed species. TMDL implementation projects should be screened through the Pennsylvania Natural Diversity Inventory (PNDI) early in their planning process, in accordance with the Department's policy titled Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation (Document ID# 400-0200-001).

Public Participation

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* and the *local newspaper* on date to foster public comment on the allowable loads calculated. The public comment period on this TMDL was open from date to date. A public meeting was held on date at the location, to discuss the proposed TMDL.

Future TMDL Modifications

In the future, the Department may adjust the load and/or wasteload allocations in this TMDL to account for new information or circumstances that are developed or discovered during the implementation of the TMDL when a review of the new information or circumstances indicate that such adjustments are appropriate. Adjustment between the load and wasteload allocation will only be made following an opportunity for public participation. A wasteload allocation adjustment will be made consistent and simultaneous with associated permit(s) revision(s)/reissuances (i.e., permits for revision/reissuance in association with a TMDL revision will be made available for public comment concurrent with the related TMDLs availability for public comment). New information generated during TMDL implementation may include, among other things, monitoring data, BMP effectiveness information, and land use information. All changes in the TMDL will be tallied and once the total changes exceed 1% of the total original TMDL allowable load, the TMDL will be revised. The adjusted TMDL, including its LAs and WLAs, will be set at a level necessary to implement the applicable WQS and any adjustment increasing a WLA will be supported by reasonable assurance demonstration that load allocations will be met. The Department will notify EPA of any adjustments to the TMDL within 30 days of its adoption and will maintain current tracking mechanisms that contain accurate loading information for TMDL waters.

Changes in TMDLs That May Require EPA Approval

- Increase in total load capacity.
- Transfer of load between point (WLA) and nonpoint (LA) sources.

DRAFT

- Modification of the margin of safety (MOS).
- Change in water quality standards (WQS).
- Non-attainment of WQS with implementation of the TMDL.
- Allocations in trading programs.

Changes in TMDLs That May Not Require EPA Approval

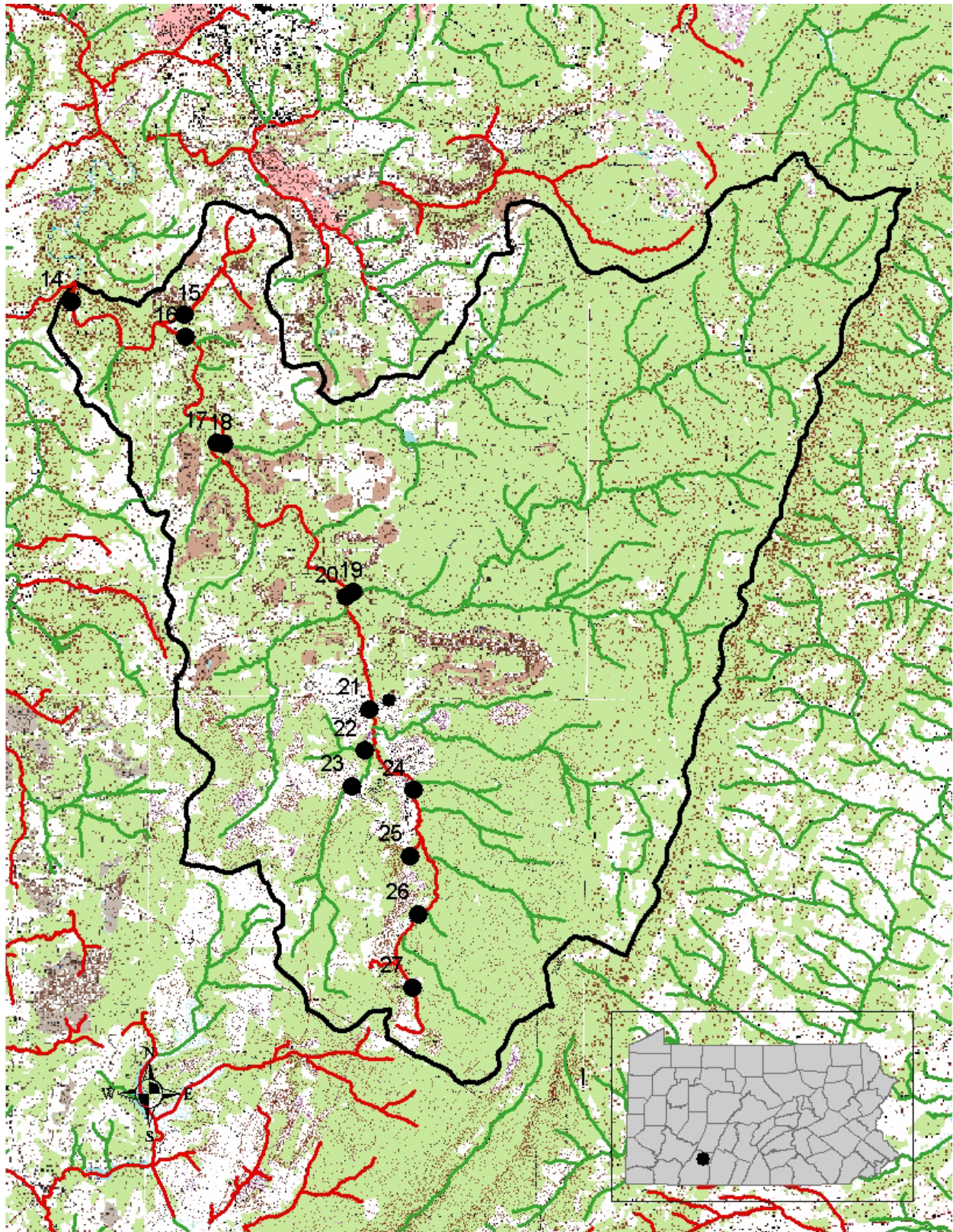
- Total loading shift less than or equal to 1% of the total load.
- Increase of WLA results in greater LA reductions provided reasonable assurance of implementation is demonstrated (a compliance/implementation plan and schedule).
- Changes among WLAs with no other changes; TMDL public notice concurrent with permit public notice.
- Removal of a pollutant source that will not be reallocated.
- Reallocation between LAs.
- Changes in land use.

DRAFT

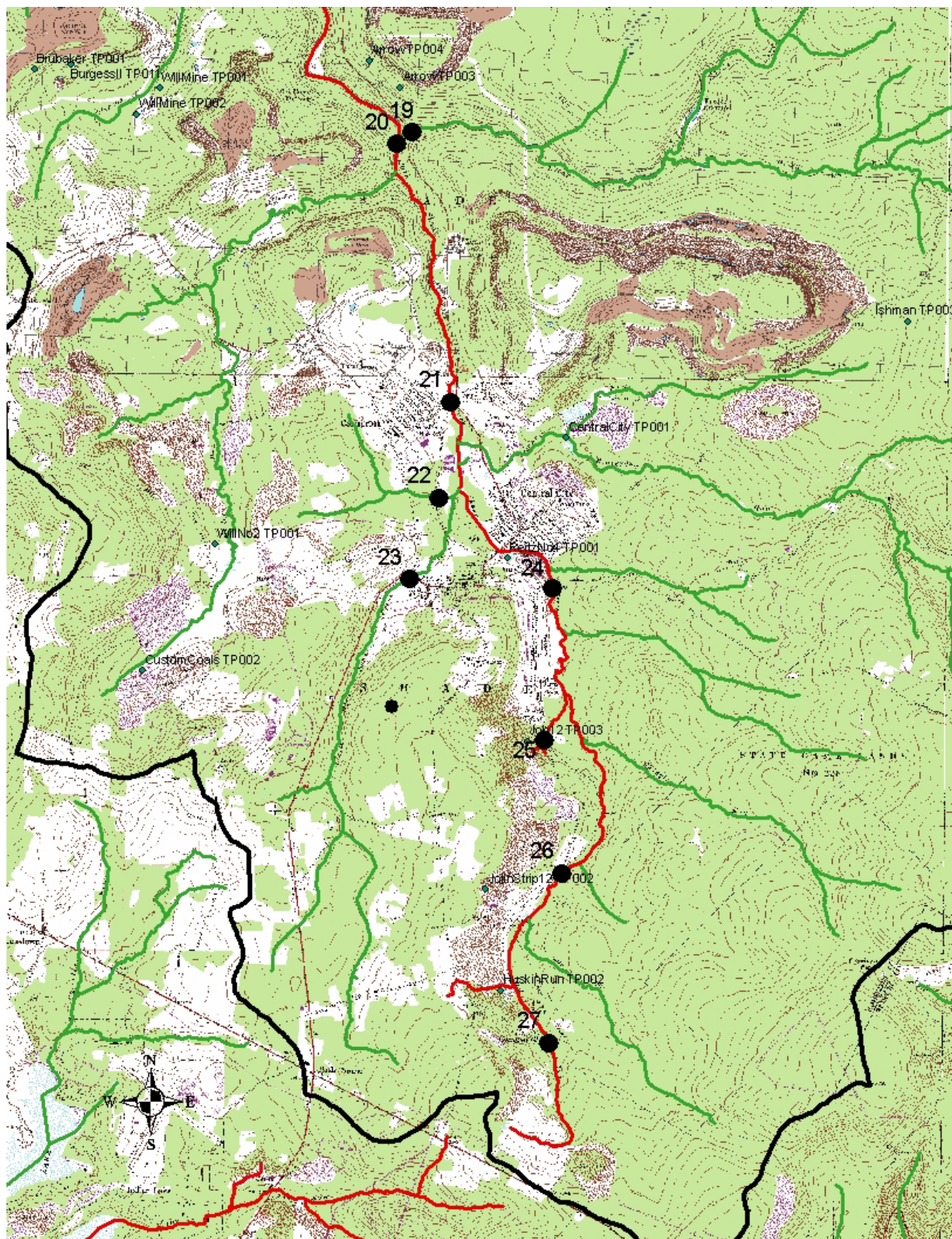
Attachment A

**Shade Creek, Dark Shade Creek and the unnamed tributary to
Dark Shade Creek Watershed Maps**

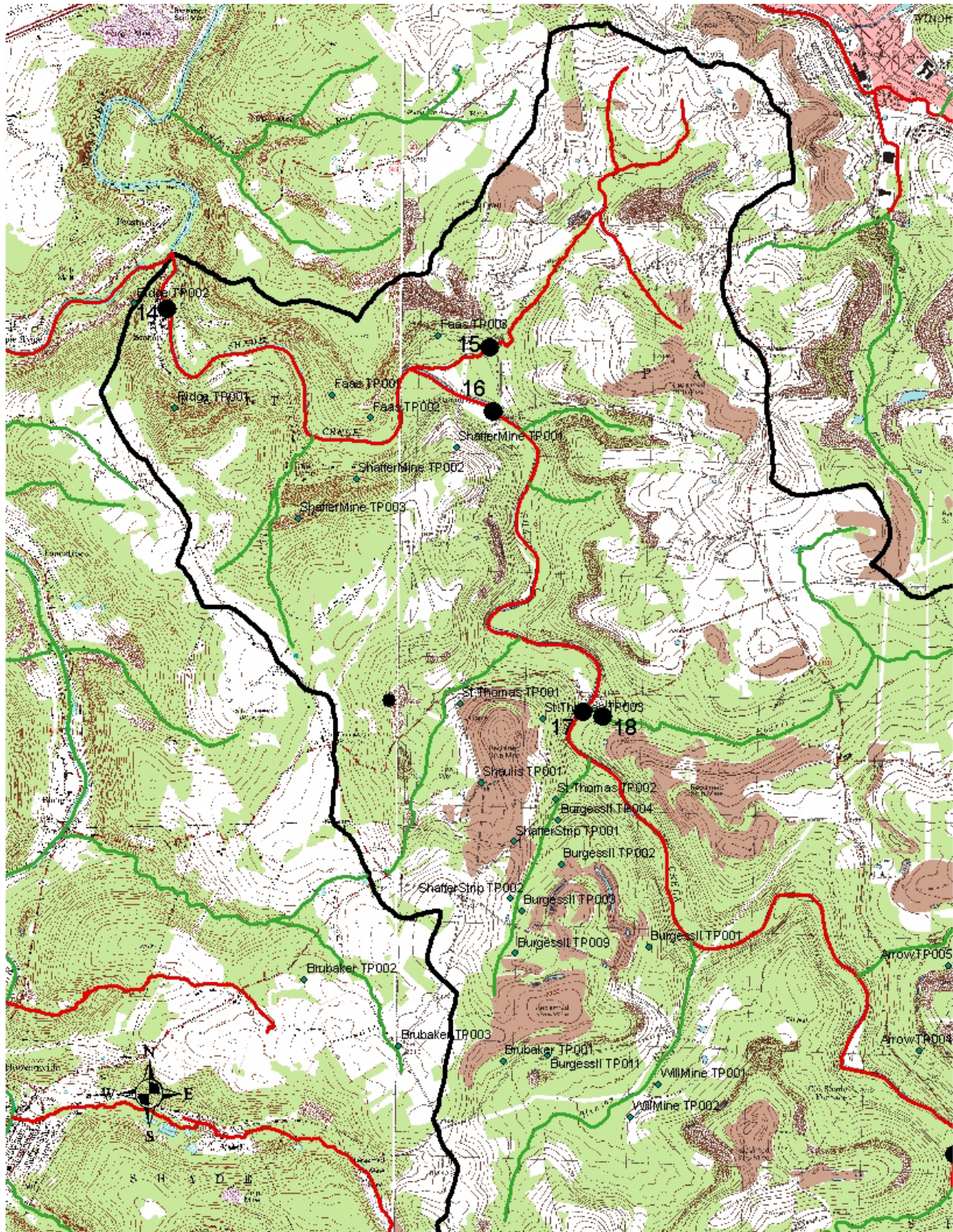
DRAFT



DRAFT



DRAFT



DRAFT

Attachment B

Method for Addressing Section 303(d) Listings for pH

DRAFT

Method for Addressing Section 303(d) Listings for pH

There has been a great deal of research conducted on the relationship between alkalinity, acidity, and pH. Research published by the Pa. Department of Environmental Protection 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 Chapter 93.

The pH, a measurement of hydrogen ion acidity presented as a negative logarithm, is not conducive to standard statistics. 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, which would result from treatment of abandoned mine drainage. 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. 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 between six and 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.

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.*

DRAFT

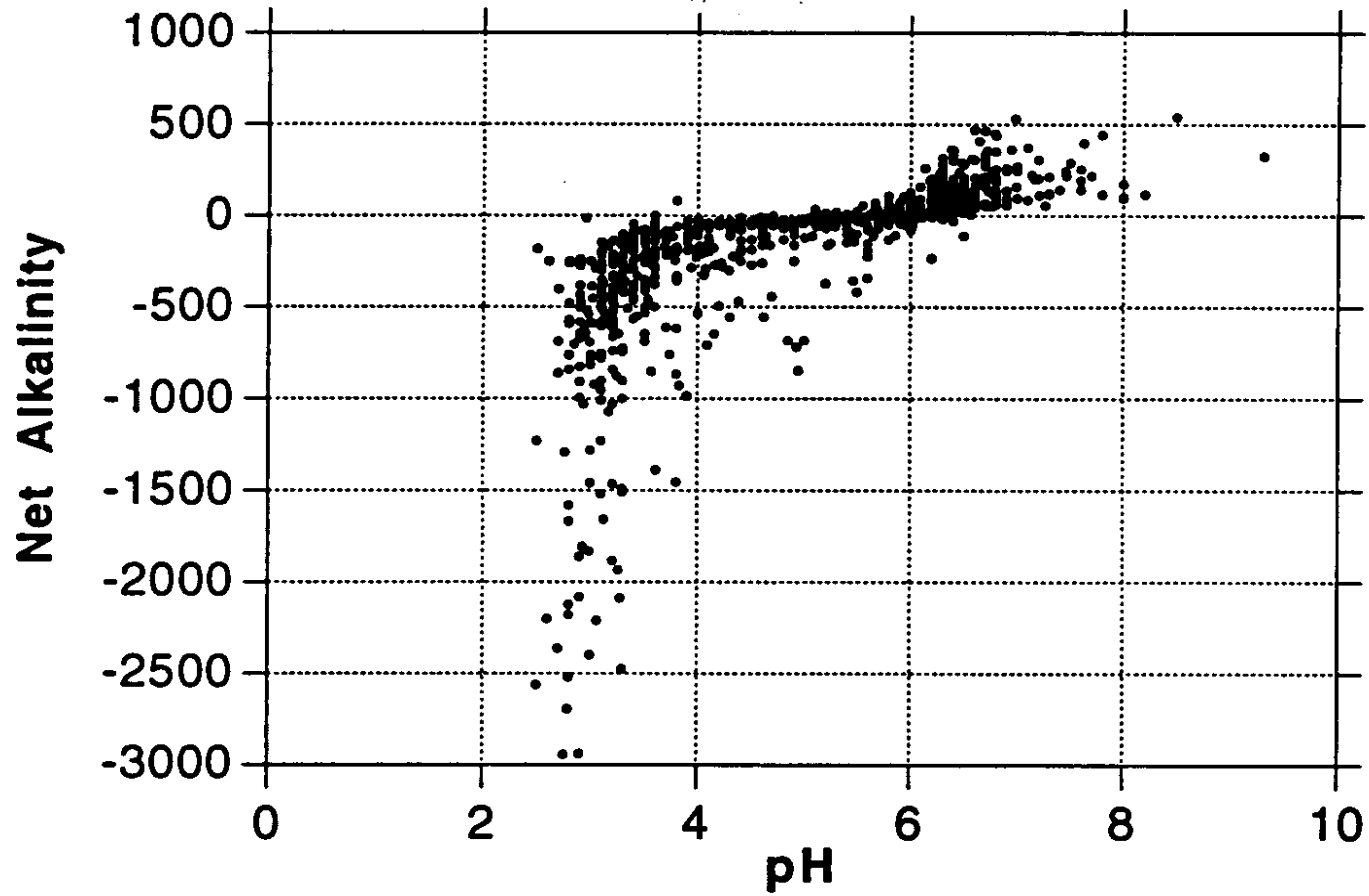


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

DRAFT

Attachment C

**Method for Calculating Loads from Mine Drainage Treatment
Facilities from Surface Mines**

DRAFT

Method to Quantify Treatment Pond Pollutant Load

Calculating Waste Load Allocations for Active Mining in the TMDL Stream Segment.

The end product of the TMDL report is to develop Waste Load Allocations (WLA) and Load Allocations (LA) that represent the amount of pollution the stream can assimilate while still achieving in-stream limits. The LA is the load from abandoned mine lands where there is no NPDES permit or responsible party. The WLA is the pollution load from active mining that is permitted through NPDES.

In preparing the TMDL, calculations are done to determine the allowable load. The actual load measured in the stream is equal to the allowable load plus the reduced load.

$$\text{Total Measured Load} = \text{Allowed Load} + \text{Reduced Load}$$

If there is active mining or anticipated mining in the near future in the watershed, the allowed load must include both a WLA and a LA component.

$$\text{Allowed Load (lbs/day)} = \text{WLA (lbs/day)} + \text{LA (lbs/day)}$$

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 coalmines 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 is 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 regarded 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

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

DRAFT

available, they can be used to quantify the WLA. 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 ungraded 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.

$$41.4 \text{ in. precip./yr} \times 0.95 \times 1 \text{ ft./12/in.} \times 1500' \times 300' / \text{pit} \times 7.48 \text{ gal/ft}^3 \times 1 \text{ yr}/365 \text{ days} \times 1 \text{ day}/24 \text{ hr.} \times 1 \text{ hr.}/60 \text{ min.} =$$
$$= 21.0 \text{ gal/min average discharge from direct precipitation into the open mining pit area.}$$

Pit water can also result from runoff from the ungraded 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 regarded 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. DEP 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. DEP 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 ungraded and unvegetated spoil area.

$$41.4 \text{ in. precip./yr} \times 3 \text{ pit areas} \times 1 \text{ ft./12/in.} \times 1500' \times 300' / \text{pit} \times 7.48 \text{ gal/ft}^3 \times 1 \text{ yr}/365 \text{ days} \times 1 \text{ day}/24 \text{ hr.} \times 1 \text{ hr.}/60 \text{ min.} \times 15 \text{ in. runoff}/100 \text{ in. precipitation} =$$
$$= 9.9 \text{ gal./min. average discharge from spoil runoff into the pit area.}$$

DRAFT

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:

$$\text{Total Average Flow} = \text{Direct Pit Precipitation} + \text{Spoil Runoff}$$

$$\text{Total Average Flow} = 21.0 \text{ gal./min} + 9.9 \text{ gal./min.} = 30.9 \text{ gal./min.}$$

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

Allowable Iron Waste Load Allocation:

$$30.9 \text{ gal./min.} \times 3 \text{ mg/l} \times 0.01202 = 1.1 \text{ lbs./day}$$

Allowable Manganese Waste Load Allocation:

$$30.9 \text{ gal./min.} \times 2 \text{ mg/l} \times 0.01202 = 0.7 \text{ lbs./day}$$

Allowable Aluminum Waste Load Allocation:

$$30.9 \text{ gal./min.} \times 0.75 \text{ mg/l} \times 0.01202 = 0.3 \text{ lbs./day}$$

(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 DEP’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

DRAFT

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 WLA calculations.

The allowable load for the stream segment is determined by modeling of flow and water quality data. The allowable load has a potential Waste Load Allocation (WLA) component if there is active mining or anticipated future mining and a Load Allocation (LA). So, the sum of the Load Allocation and the Waste Load Allocation is equal to the allowed load. The WLA is determined by the above calculations and the LA is determined by the difference between the allowed load and the WLA.

Allowed Load = Waste Load Allocation + Load Allocation

Or

Load Allocation = Allowed Load – Waste Load Allocation

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 WLA is available for a different operation. Where there are indications that future mining in a watershed are greater than the current level of mining activity, an additional WLA amount may be included in the allowed load to allow for future mining.

DRAFT

Attachment D

TMDLs By Segment

DRAFT

Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek

The TMDL for Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek consists of load allocations to three sampling sites on Shade Creek (SC17, SC16 and SC14), four sites on Dark Shade Creek (SC26, SC24, SC21 and SC20), one site on the unnamed tributary to Dark Shade Creek (SC25), one site on Spruce Run (SC15), one site on Roaring Run (SC18), one site on Clear Shade Creek (SC19), two sites on Little Dark Shade Creek (SC22 & SC23) and one site on Coal Run (SC27). Sample data sets were collected throughout 2004. All sample points are shown on the maps included in Attachment A as well as on the loading (allowable) schematic presented on the following page. Eight of the fourteen sample sites did not have flow values associated with the chemistry samples. Because a true representation of stream flow was not provided in the data set, a unit area method was used to calculate flow values at each sample site. The measured stream flow at sample site SC24 was used as the reference sample site to calculate the rest of the flow values based on their drainage areas.

Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek are listed on the 1996 PA Section 303(d) list for metals from AMD as being the cause of the degradation to this stream. Although this TMDL will focus primarily on metal loading to the Shade Creek, Dark Shade Creek and the unnamed tributary to Dark Shade Creek Watershed, reduced acid loading analysis will be performed. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

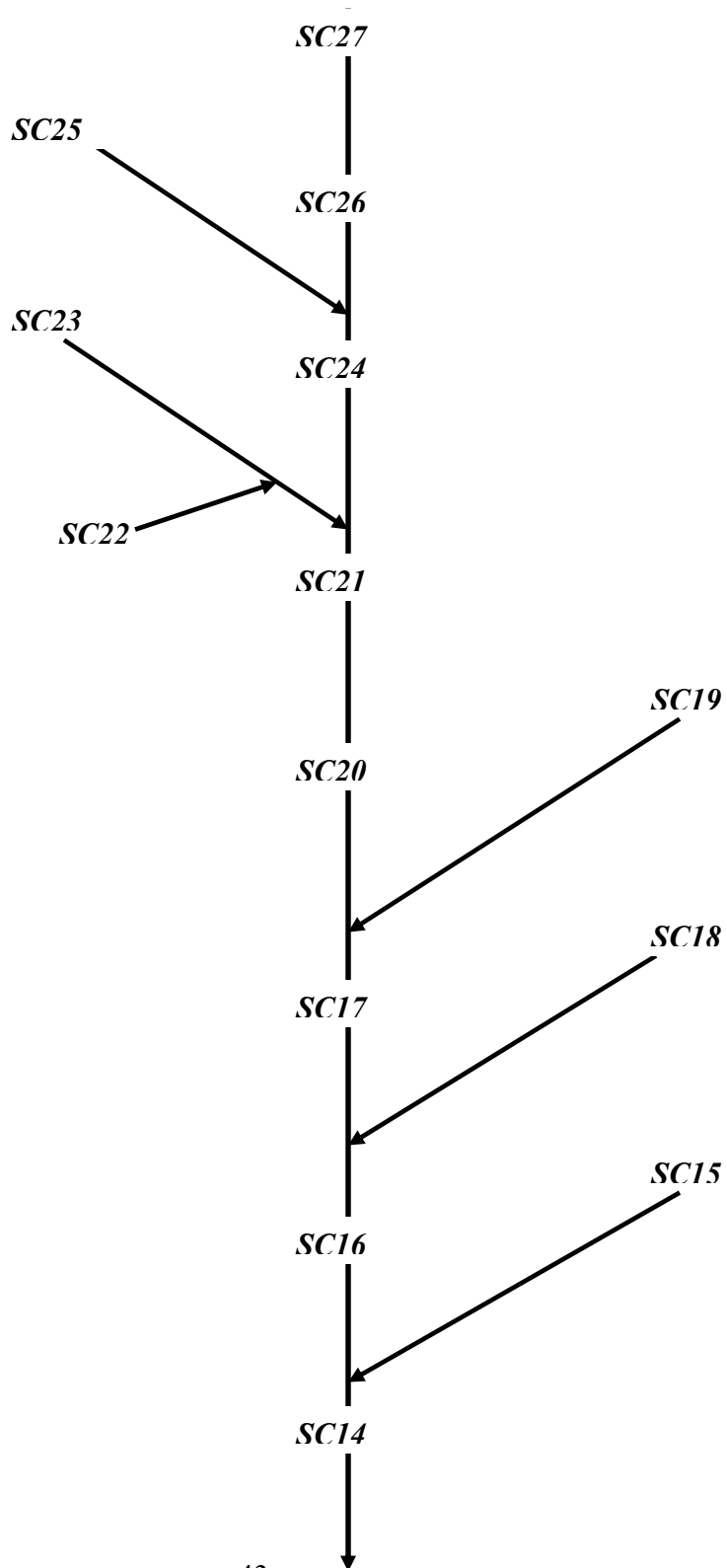
An allowable long-term average in-stream concentration was determined at each sample point for metals and acidity. The analysis is designed to produce an average value that, when met, will be protective of the water-quality criterion for that parameter 99% of the time. An analysis was performed using Monte Carlo simulation to determine the necessary long-term average concentration needed to attain water-quality criteria 99% of the time. The simulation was run assuming the data set was log normally distributed. Using the mean and standard deviation of the data set, 5000 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% of the time. The mean value from this data set represents the long-term average concentration that needs to be met to achieve water-quality standards. Following is an explanation of the TMDL for each allocation point.

DRAFT

Shade Creek, Dark Shade Creek and unnamed tributary to Dark Shade Creek Sampling Station Diagram

Arrows represent direction of flow

Diagram not to scale



DRAFT

TMDL calculations- SC27- Coal Run in Gahagen

The TMDL for sample point SC27 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for the headwaters of Coal Run was computed using water-quality sample data collected at point SC27. The unit area method was used to calculate the flow at the sampling point SC27 (0.604 MGD) that is used for these computations. The allowable load allocations calculated at SC27 will directly affect the downstream point SC26.

Sample data at point SC27 shows that Coal Run headwaters segment has a pH ranging between 3.13 and 3.30. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH.

A TMDL for aluminum, iron, manganese and acidity has been calculated at this site.

Table D1 shows the measured and allowable concentrations and loads at SC27. Table D2 shows the percent reductions for aluminum, iron, manganese and acidity.

Table D1		Measured		Allowable	
Flow (gpm)=	419.35	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	13.48	67.91	0.43	2.15
	Iron	3.15	15.86	0.38	1.92
	Manganese	2.62	13.18	0.60	3.00
	Acidity	110.19	554.92	0.00	0.00
	Alkalinity	3.24	16.33		

Table D2. Allocations SC27				
SC27	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SC27	67.91	15.86	13.18	554.92
Allowable Load @ SC27	2.15	1.92	3.00	0.0
Load Reduction @ SC27	65.76	13.94	10.18	554.92
% Reduction required @ SC27	97%	88%	77%	100%

Waste Load Allocation –PBS Coals, Inc. Huskin Run Mine

PBS Coals, Inc. (SMP56050103; NPDES PA0214850) Huskin Run Mine has one mine drainage treatment facility requiring treatment. Outfall 002 is a discharge from a treatment facility that discharges into the underlying deep mine pool. This discharge does not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for this discharge.

DRAFT

Table D3. Waste Load Allocations at Huskin Run Mine			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
002			
Al	0.75	0.045	0.28
Fe	3.0	0.045	1.13
Mn	2.0	0.045	0.75

Waste Load Allocation –PBS Coals, Inc. Jolin Strip – Job 12

PBS Coals, Inc. (SMP56663098; does not have NPDES permit) Jolin Strip has one post-mining discharge requiring treatment. Outfall 002 is a discharge from a treatment facility that discharges into Dark Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The average raw chemical characteristics of the discharge are as follows: 3.12 pH, 772.8 mg/L acidity, 0 mg/L alkalinity, 62.67 mg/L total iron, 20.66 mg/L total manganese, and 84.66 mg/L total aluminum. The following table shows the waste load allocation for this discharge.

Table D4. Waste Load Allocations at Jolin Strip – Job 12			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
002			
Al	0.75	0.006	0.04
Fe	3.0	0.006	0.15
Mn	2.0	0.006	0.10

TMDL calculations- SC26- Headwaters segment of Dark Shade Creek

The TMDL for sampling point SC26 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this segment of Dark Shade Creek was computed using water-quality sample data collected at point SC26. The unit area method was used to calculate the flow at the sampling point SC26 (3.43 MGD) for these computations. The allowable load allocations calculated at SC26 will directly affect the downstream point SC24.

Sample data at point SC26 shows pH ranging between 3.31 and 3.78; pH will be addressed as part of this TMDL. There currently is not an entry for this segment on the Section Pa 303(d) list for impairment due to pH.

A TMDL for aluminum, iron, manganese and acidity at SC26 has been calculated.

Table D5 shows the measured and allowable concentrations and loads at SC26. Table D6 shows the percent reduction for aluminum, iron, manganese and acidity needed at SC26.

DRAFT

Table D5		Measured		Allowable	
Flow (gpm)=	2380.30	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	3.98	113.87	0.45	12.88
	Iron	1.87	53.36	1.10	31.45
	Manganese	0.73	20.77	0.61	17.37
	Acidity	46.72	1335.56	0.00	0.0
	Alkalinity	3.57	101.96		

The measured and allowable loading for point SC26 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points SC27 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points SC27 and SC26 to determine a total load tracked for the segment of stream between SC26 and SC27. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at SC26.

Table D6. Allocations SC26				
SC26	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SC26	113.87	53.36	20.77	1335.56
Difference in measured Loads between the loads that enter and existing SC26	45.96	37.50	7.59	780.64
Additional load tracked from above samples	2.15	1.92	3.00	0.0
Total load tracked between SC27 and SC26	48.11	39.42	10.59	780.64
Allowable Load @ SC26	12.88	31.45	17.37	0.0
Load Reduction @ SC26	35.23	7.97	0	780.64
% Reduction required @ SC26	74%	21%	0%	100%

TMDL calculations- SC25- Unnamed tributary to Dark Shade Creek near ponds with cherry red water

The TMDL for sample point SC25 consists of a load allocation to the abandoned mine discharge at this point shown in Attachment A. The load allocation for the abandoned mine discharge into an unnamed tributary to Coal Run was computed using water-quality sample data collected at point SC25. Flow data collected at the sampling point SC25 (0.003863 MGD) are used for these computations. The allowable load allocations calculated at SC25 will directly affect the downstream point SC24.

Sample data at point SC25 shows that abandoned mine discharge to the unnamed tributary to Coal Run has a pH ranging between 0.8 and 2.1. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH.

A TMDL for aluminum, iron, manganese and acidity has been calculated at this site.

DRAFT

Table D7 shows the measured and allowable concentrations and loads at SC25. Table D8 shows the percent reductions for aluminum, iron, manganese and acidity.

Table D7		Measured		Allowable	
Flow (gpm)=	2.68	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	290.77	9.37	0.29	0.01
	Iron	2580.00	83.12	0.03	0.001
	Manganese	20.46	0.66	0.61	0.02
	Acidity	5222.67	168.26	0.00	0.00
	Alkalinity	0.00	0.00		

Table D8. Allocations SC25				
SC25	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SC25	9.37	83.12	0.66	168.26
Allowable Load @ SC25	0.01	0.001	0.02	0.00
Load Reduction @ SC25	9.36	83.119	0.64	168.26
% Reduction required @ SC25	99.9%	99.999%	97%	100%

A waste load allocation for future mining was included for this segment of Dark Shade Creek (SC24) allowing for one operation with two active pits (1500' x 300') to be permitted in the future on this segment.

Table D9. Waste load allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

TMDL calculations- SC24- Dark Shade Creek upstream of Central City

The TMDL for sampling point SC24 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this segment of Dark Shade Creek was computed using water-quality sample data collected at point SC24. The average flow, measured at the sampling point SC24 (9.87 MGD), is used for these computations. The allowable load allocations calculated at SC24 will directly affect the downstream point SC21.

DRAFT

Sample data at point SC24 shows pH ranging between 3.97 and 4.39; pH will be addressed as part of this TMDL. There currently is not an entry for this segment on the Section Pa 303(d) list for impairment due to pH.

A TMDL for aluminum, iron and acidity at SC24 has been calculated. Sample data for manganese was above detection limits but still under water quality standards. Because water quality standards are met, a TMDL for this parameter isn't necessary and is not calculated.

Table D10 shows the measured and allowable concentrations and loads at SC24. Table D11 shows the percent reduction for aluminum, iron and acidity needed at SC24.

Table D10		Measured		Allowable	
Flow (gpm)=	6855.17	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.87	153.68	0.52	42.50
	Iron	1.55	127.61	0.69	56.85
	Manganese	0.37	30.60	0.37	30.60
	Acidity	20.43	1681.55	0.00	0.0
	Alkalinity	4.16	342.48		

The measured and allowable loading for point SC24 for aluminum, iron and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points SC26/SC25 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points SC26/SC25 and SC24 to determine a total load tracked for the segment of stream between SC24 and SC26/SC25. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at SC24.

Table D11. Allocations SC24			
SC24	Al (Lbs/day)	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SC24	153.68	127.67	1681.55
Difference in measured Loads between the loads that enter and existing SC24	30.34	-8.81	177.73
Percent loss due calculated at SC24	0%	7%	0%
Additional load tracked from above samples	12.89	31.451	0
Percentage of upstream loads that reach the SC24	100%	93%	100%
Total load tracked between SC26/SC25 and SC24	43.33	29.25	177.73
Allowable Load @ SC24	42.50	56.85	0
Load Reduction @ SC24	0.73	0	177.73
% Reduction required @ SC24	2%	0%	100%

DRAFT

A waste load allocation for future mining was included for this segment of Little Dark Shade Creek (SC23) allowing for one operation with one active pits (1500' x 300') to be permitted in the future on this segment.

Table D12. Waste load allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.045	0.28
Fe	3.0	0.045	1.13
Mn	2.0	0.045	0.75

TMDL calculations- SC23- Little Dark Shade Creek

The TMDL for sample point SC23 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Little Dark Shade Creek was computed using water-quality sample data collected at point SC23. The unit area method was used to calculate the flow at the sampling point SC23 (4.404 MGD) for these computations. The allowable load allocations calculated at SC23 will directly affect the downstream point SC21.

Sample data at point SC23 shows that this Little Dark Shade Creek segment has a pH ranging between 6.35 and 7.75. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH.

No TMDLs have been calculated at this site. Sample data for aluminum, iron and manganese were measured above detection limits but less than water quality criteria. Because water quality standards are met, a TMDL for these parameters isn't necessary and is not calculated.

Table D13 shows the measured and allowable concentrations and loads at SC23.

Table D13		Measured		Allowable	
Flow (gpm)=	3058.34	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.10	3.67	0.10	3.67
	Iron	0.30	10.90	0.30	10.90
	Manganese	0.03	1.16	0.03	1.16
	Acidity	-35.04	-1286.88	-35.04	-1286.88
	Alkalinity	7.34	269.41		

A waste load allocation for future mining was included for this segment of the unnamed tributary to Little Dark Shade Creek (SC22) allowing for one operation with one active pits (1500' x 300') to be permitted in the future on this segment.

DRAFT

Table D14. Waste load allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.045	0.28
Fe	3.0	0.045	1.13
Mn	2.0	0.045	0.75

TMDL calculations- SC22- Unnamed Tributary 45345 to Little Dark Shade Creek

The TMDL for sample point SC22 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for the unnamed tributary 45345 to Little Dark Shade Creek was computed using water-quality sample data collected at point SC22. The unit area method was used to calculate the flow at the sampling point SC22 (1.14 MGD) for these computations. The allowable load allocations calculated at SC22 will directly affect the downstream point SC21.

Sample data at point SC22 shows that this unnamed tributary 45345 to Little Dark Shade Creek segment has a pH ranging between 4.97 and 6.18. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH.

A TMDL for aluminum, iron and manganese has been calculated at this site. Sample data calculations shows that no reductions for acidity are necessary. Because water quality standards are met, a TMDL for this parameter isn't necessary and is not calculated.

Table D15 shows the measured and allowable concentrations and loads at SC22. Table D16 shows the percent reductions for aluminum, iron and manganese.

Table D15		Measured		Allowable	
Flow (gpm)=	795.11	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.63	6.02	0.12	1.14
	Iron	11.73	111.99	0.42	4.03
	Manganese	1.14	10.87	0.38	3.66
	Acidity	1.83	17.47	1.83	17.47
	Alkalinity	5.77	55.05		

DRAFT

Table D16. Allocations SC22			
SC22	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)
Existing Load @ SC22	6.02	111.99	10.87
Allowable Load @ SC22	1.14	4.03	3.66
Load Reduction @ SC22	4.88	107.96	7.21
% Reduction required @ SC22	82%	97%	67%

Waste Load Allocation –Reitz Coal Company Reitz No. 4 Plant

Reitz Coal Company (SMP56831602; NPDES PA0214469) Number 4 Plant has one post-mining discharge requiring treatment. Pond 001 is a discharge from a treatment facility that discharges into Dark Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for this discharge.

Table D17. Waste Load Allocations at Reitz No. 4 Plant			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.00721	0.05
Fe	3.0	0.00721	0.18
Mn	2.0	0.00721	0.12

Waste Load Allocation –New Enterprise Stone & Lime Co., Inc. Ishman Quarry

New Enterprise Stone & Lime Co., Inc. (SMP56920302; NPDES PA0212326) Ishman Quarry has one mine drainage treatment facility requiring treatment. Treatment Pond 003 is a discharge from a treatment facility that discharges into Laurel Run, then into Dark Shade Creek. The following table shows the waste load allocation for this discharge.

Table D18. Waste Load Allocations at Ishman Quarry			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
003			
Al	1.9	0.166	2.64
Fe	2.2	0.166	3.05
Mn	1.7	0.166	2.36

Waste Load Allocation –New Enterprise Stone & Lime Co., Inc. Central City Quarry

New Enterprise Stone & Lime Co., Inc. (SMP4174SM2; NPDES PA0009814) Central City Quarry has one mine drainage treatment facility requiring treatment. Treatment Pond 001 is a discharge from a treatment facility that discharges into Dark Shade Creek. These discharges do

DRAFT

not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for this discharge.

Table D19. Waste Load Allocations at Central City Quarry			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.356	2.23
Fe	3.0	0.356	8.92
Mn	2.0	0.356	5.95

TMDL calculations- SC21- Dark Shade Creek near Cairnbrook

The TMDL for sampling point SC21 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this segment of Dark Shade Creek was computed using water-quality sample data collected at point SC21. The unit area method was used to calculate the flow at the sampling point SC21 (26.26 MGD) for these computations. The allowable load allocations calculated at SC21 will directly affect the downstream point SC20.

Sample data at point SC21 shows pH ranging between 3.53 and 4.53; pH will be addressed as part of this TMDL. There currently is not an entry for this segment on the Section Pa 303(d) list for impairment due to pH.

A TMDL for aluminum, iron, manganese and acidity at SC21 has been calculated.

Table D20 shows the measured and allowable concentrations and loads at SC21. Table D21 shows the percent reduction for aluminum, iron, manganese and acidity needed at SC21.

Table D20		Measured		Allowable	
Flow (gpm)=	18233.01	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	3.07	671.51	0.38	82.93
	Iron	15.43	3379.45	0.67	145.88
	Manganese	2.65	579.54	0.37	81.55
	Acidity	56.73	12421.14	0.02	5.24
	Alkalinity	3.82	837.20		

The measured and allowable loading for point SC21 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points SC24/SC23/SC22 shows the total load that was

DRAFT

permitted from upstream sources. This value was added to the difference in existing loads between points SC24/SC23/SC22 and SC21 to determine a total load tracked for the segment of stream between SC21 and SC24/SC23/SC22. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at SC21.

Table D21. Allocations SC21				
SC21	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SC21	671.51	3379.45	579.54	12421.14
Difference in measured Loads between the loads that enter and existing SC21	508.14	3128.95	536.91	10722.12
Additional load tracked from above samples	47.31	71.78	35.42	17.47
Total load tracked between SC24/SC23/SC22 and SC21	555.45	3200.73	572.33	10739.59
Allowable Load @ SC21	82.93	145.88	81.55	5.24
Load Reduction @ SC21	472.52	3054.85	490.78	10734.35
% Reduction required at SC21	85%	96%	86%	99.95%

Waste Load Allocation –Robindale Energy Custom Coals Laurel

Robindale Energy (SMP56743701; NPDES PA0249343) Custom Coals Laurel has one post-mining discharge requiring treatment. Treatment Pond 002 is a discharge from a treatment facility that discharges into Dark Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for this discharge.

Table D22. Waste Load Allocations at Custom Coals Laurel			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
002			
Al	0.75	0.022	0.14
Fe	3.0	0.022	0.55
Mn	2.0	0.022	0.37

TMDL calculations- SC20- Mouth of Dark Shade Creek

The TMDL for sampling point SC20 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this segment of Dark Shade Creek was computed using water-quality sample data collected at point SC20. The unit area method was used to calculate the flow at the sampling point SC20 (33.83 MGD) for these computations. The allowable load allocations calculated at SC20 will directly affect the downstream point SC17.

Sample data at point SC20 shows pH ranging between 3.41 and 4.81; pH will be addressed as part of this TMDL. There currently is not an entry for this segment on the Section Pa 303(d) list for impairment due to pH.

DRAFT

A TMDL for aluminum, iron, manganese and acidity at SC20 has been calculated.

Table D23 shows the measured and allowable concentrations and loads at SC20. Table D24 shows the percent reduction for aluminum, iron, manganese and acidity needed at SC20.

Table D23		Measured		Allowable	
Flow (gpm)=	23491.6	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	2.89	815.34	0.37	103.10
	Iron	10.53	2971.71	0.73	204.95
	Manganese	2.58	726.47	0.38	107.17
	Acidity	49.44	13947.78	0.11	30.91
	Alkalinity	3.78	1065.02		

The measured and allowable loading for point SC20 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points SC21 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points SC21 and SC20 to determine a total load tracked for the segment of stream between SC20 and SC21. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at SC20.

Table D24. Allocations SC20				
SC20	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SC20	815.34	2971.71	726.47	13947.78
Difference in measured Loads between the loads that enter and existing SC20	143.83	-407.74	146.93	1526.64
Percent loss due calculated at SC20	0%	12%	0%	0%
Additional load tracked from above samples	82.93	145.88	81.55	5.24
Percentage of upstream loads that reach the SC20	100%	88%	100%	100%
Total load tracked between SC21 and SC20	226.76	128.38	228.48	1531.88
Allowable Load @ SC20	103.10	204.95	107.17	30.91
Load Reduction @ SC20	123.66	0	121.31	1500.97
% Reduction required @ SC20	55%	0%	53%	98%

A waste load allocation for future mining was included for this segment of Clear Shade Creek (SC19) allowing for one operation with two active pits (1500' x 300') to be permitted in the future on this segment.

DRAFT

Table D25. Waste load allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

TMDL calculations- SC19- Mouth of Clear Shade Creek

The TMDL for sample point SC19 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Clear Shade Creek was computed using water-quality sample data collected at point SC19. The unit area method was used to calculate the flow at the sampling point SC19 (29.284 MGD) for these computations. The allowable load allocations calculated at SC19 will directly affect the downstream point SC17.

Sample data at point SC19 shows that the Clear Shade Creek segment has a pH ranging between 5.84 and 7.13. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH.

A TMDL for acidity has been calculated at this site. Sample data calculations shows that no reductions for aluminum, iron and manganese are necessary. Because water quality standards are met, a TMDL for these parameters isn't necessary and is not calculated.

Table D26 shows the measured and allowable concentrations and loads at SC19. Table D27 shows the percent reduction for acidity.

Table D26		Measured		Allowable	
Flow (gpm)=	20336.3	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.17	41.52	0.17	41.52
	Iron	0.24	57.39	0.24	57.39
	Manganese	0.03	7.33	0.03	7.33
	Acidity	1.47	359.83	0.82	201.28
	Alkalinity	6.69	1633.09		

DRAFT

Table D27. Allocations SC19	
SC19	Acidity (Lbs/day)
Existing Load @ SC19	359.83
Allowable Load @ SC19	201.28
Load Reduction @ SC19	158.55
% Reduction required @ SC19	44%

Waste Load Allocation –Cooney Brothers Coal Co. Burgess II Mine

Cooney Brothers Coal Co. (SMP56950111; NPDES PA0213225) Burgess II Mine has six mine drainage treatment facilities. Treatment Pond 001-004, 009, and 011 are discharges from treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

Table D28. Waste Load Allocations at Burgess II Mine			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.015	0.09
Fe	2.7	0.015	0.34
Mn	1.3	0.015	0.16
002			
Al	0.75	0.015	0.09
Fe	2.7	0.015	0.34
Mn	1.3	0.015	0.16
003			
Al	0.75	0.015	0.09
Fe	3.0	0.015	0.38
Mn	2.0	0.015	0.25
004			
Al	0.75	0.015	0.09
Fe	3.0	0.015	0.38
Mn	2.0	0.015	0.25
009			
Al	0.75	0.015	0.09
Fe	3.0	0.015	0.38
Mn	2.0	0.015	0.25
011			
Al	0.75	0.015	0.09
Fe	2.8	0.015	0.35
Mn	1.8	0.015	0.23

DRAFT

Waste Load Allocation –Heritage Mining Co. Shaffer Strip

Heritage Mining Co. (SMP56980101; NPDES PA0235464) Shaffer Strip has two mine drainage treatment facilities. Treatment Ponds 001 and 002 are discharges from treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

Table D29. Waste Load Allocations at Shaffer Strip			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.009	0.06
Fe	3.0	0.009	0.21
Mn	2.0	0.009	0.14
002			
Al	0.75	0.009	0.06
Fe	3.0	0.009	0.21
Mn	2.0	0.009	0.14

Waste Load Allocation –Shade Mining Company Shaulis Strip

Shade Mining Co. (SMP4173SM6; NPDES PA0249980) Shaulis Strip has one post-mining discharge that requires treatment. Treatment Pond 001 is a discharge from a passive treatment system that discharges into Shade Creek. This discharge does not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharge for aluminum in the effluent. The following table shows the waste load allocation for this discharge.

Table D30. Waste Load Allocations at Shaulis Strip			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.007	0.04
Fe	3.0	0.007	0.18
Mn	2.0	0.007	0.12

TMDL calculations- SC17- Shade Creek near Hillsboro

The TMDL for sampling point SC17 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this segment of Shade Creek was computed using water-quality sample data collected at point SC17. The unit area method was

DRAFT

used to calculate the flow at the sampling point SC17 (69.86 MGD) for these computations. The allowable load allocations calculated at SC17 will directly affect the downstream point SC16.

Sample data at point SC17 shows pH ranging between 3.77 and 5.31; pH will be addressed as part of this TMDL. There currently is not an entry for this segment on the Section Pa 303(d) list for impairment due to pH.

A TMDL for aluminum, iron, manganese and acidity at SC17 has been calculated.

Table D31 shows the measured and allowable concentrations and loads at SC17. Table D31 shows the percent reduction for aluminum, iron, manganese and acidity needed at SC17.

Table D31		Measured		Allowable	
Flow (gpm)=	48514.09	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.49	865.21	0.40	234.60
	Iron	2.97	1728.48	0.63	364.31
	Manganese	1.34	780.73	0.37	217.03
	Acidity	24.66	14369.72	0.14	79.81
	Alkalinity	4.22	2456.78		

The measured and allowable loading for point SC17 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points SC20/SC19 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points SC20/SC19 and SC17 to determine a total load tracked for the segment of stream between SC17 and SC20/SC19. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at SC17.

Table D32. Allocations SC17				
SC17	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SC17	865.21	1728.48	780.73	14369.72
Difference in measured Loads between the loads that enter and existing SC17	8.35	-1246.62	46.93	62.11
Percent loss due calculated at SC17	0%	42%	0%	0%
Additional load tracked from above samples	144.62	262.34	114.50	232.19
Percentage of upstream loads that reach the SC17	100%	58%	100%	100%
Total load tracked between SC20/SC19 and SC17	152.97	152.16	161.43	294.30
Allowable Load @ SC17	234.60	364.31	217.03	79.81
Load Reduction @ SC17	0	0	0	214.49
% Reduction required @ SC17	0%	0%	0%	73%

DRAFT

A waste load allocation for future mining was included for this segment of Roaring Fork (SC18) allowing for one operation with two active pits (1500' x 300') to be permitted in the future on this segment.

Table D33. Waste load allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

TMDL calculations- SC18- Mouth of Roaring Fork

The TMDL for sample point SC18 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Roaring Fork was computed using water-quality sample data collected at point SC18. The unit area method was used to calculate the flow at the sampling point SC18 (11.57 MGD) for these computations. The allowable load allocations calculated at SC18 will directly affect the downstream point SC16.

Sample data at point SC18 shows that the Roaring Fork segment has a pH ranging between 4.05 and 4.73. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH.

A TMDL for aluminum, iron, manganese and acidity has been calculated at this site.

Table D34 shows the measured and allowable concentrations and loads at SC18. Table D35 shows the percent reduction for aluminum, iron, manganese and acidity.

Table D34		Measured		Allowable	
Flow (gpm)=	8036.13	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.81	78.01	0.54	52.17
	Iron	1.03	99.73	0.71	68.71
	Manganese	1.56	150.40	0.43	41.72
	Acidity	16.21	1564.76	0.18	17.79
	Alkalinity	4.31	416.12		

DRAFT

Table D35. Allocations SC18				
SC18	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SC18	78.01	99.73	150.40	1564.76
Allowable Load @ SC18	52.17	68.71	41.72	17.79
Load Reduction @ SC18	25.84	31.02	108.68	1546.97
% Reduction required @ SC18	34%	32%	73%	99%

Waste Load Allocation –Hoffman Mining, Inc. St. Thomas Mine

Hoffman Mining Inc. (SMP56040105; NPDES PA0249602) St. Thomas Mine has three mine drainage treatment facilities. Treatment Ponds 001-003 are discharges from mine drainage treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharges for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

Table D36. Waste load allocations at St. Thomas Mine			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20
002			
Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20
003			
Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20

Waste Load Allocation –Hoffman Mining, Inc. Shaffer Mine

Hoffman Mining Inc. (SMP56050104; NPDES PA0249777) Shaffer Mine has three mine drainage treatment facilities. Treatment Ponds 001-003 are discharges from mine drainage treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharges for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

DRAFT

Table D37. Waste Load Allocations at Shaffer Mine

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20
002			
Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20
003			
Al	0.75	0.012	0.08
Fe	3.0	0.012	0.30
Mn	2.0	0.012	0.20

TMDL calculations- SC16- Shade Creek upstream of Spruce Run

The TMDL for sampling point SC16 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this segment of Shade Creek was computed using water-quality sample data collected at point SC16. The unit area method was used to calculate the flow at the sampling point SC16 (84.67 MGD) for these computations. The allowable load allocations calculated at SC16 will directly affect the downstream point SC14.

Sample data at point SC16 shows pH ranging between 3.68 and 5.63; pH will be addressed as part of this TMDL. There currently is not an entry for this segment on the Section Pa 303(d) list for impairment due to pH.

A TMDL for aluminum, iron, manganese and acidity at SC16 has been calculated.

Table D38 shows the measured and allowable concentrations and loads at SC16. Table D39 shows the percent reduction for aluminum, iron, manganese and acidity needed at SC16.

Table D38		Measured		Allowable	
Flow (gpm)=	58798.27	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.33	940.35	0.40	280.47
	Iron	1.69	1192.21	0.45	317.84
	Manganese	1.29	909.75	0.40	279.66
	Acidity	20.06	14165.24	0.18	126.86
	Alkalinity	4.20	2968.16		

DRAFT

The measured and allowable loading for point SC16 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points SC17/SC18 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points SC17/SC18 and SC16 to determine a total load tracked for the segment of stream between SC16 and SC17/SC18. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at SC16.

Table D39. Allocations SC16				
SC16	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SC16	940.35	1192.21	909.75	14165.24
Difference in measured Loads between the loads that enter and existing SC16	-2.87	-636.00	-21.38	-1769.24
Percent loss due calculated at SC16	1%	35%	3%	12%
Additional load tracked from above samples	286.78	433.02	258.75	97.60
Percentage of upstream loads that reach the SC16	99%	65%	97%	88%
Total load tracked between SC17/SC18 and SC16	283.91	281.46	250.99	85.89
Allowable Load @ SC16	280.47	317.84	279.66	126.86
Load Reduction @ SC16	3.44	0	0	0
% Reduction required @ SC16	2%	0%	0%	0%

TMDL calculations- SC15- Mouth of Spruce Run

The TMDL for sample point SC15 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Spruce Run was computed using water-quality sample data collected at point SC15. The unit area method was used to calculate the flow at the sampling point SC15 (2.064 MGD) for these computations. The allowable load allocations calculated at SC15 will directly affect the downstream point SC14.

Sample data at point SC15 shows that the Spruce Run segment has a pH ranging between 6.98 and 7.31. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH.

No TMDLs have been calculated at this site. Sample data for aluminum, iron and manganese were measured above detection limits but less than water quality criteria. Sample data calculations shows that no reductions for acidity are necessary. Because water quality standards are met, a TMDL for these parameters isn't necessary and is not calculated.

Table D40 shows the measured and allowable concentrations and loads at SC15.

DRAFT

Table D40		Measured		Allowable	
Flow (gpm)=	1433.67	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.07	1.15	0.07	1.15
	Iron	0.39	6.74	0.39	6.74
	Manganese	0.07	1.26	0.07	1.26
	Acidity	-21.25	-365.82	-21.25	-365.82
	Alkalinity	7.17	123.51		

Waste Load Allocation –Hoffman Mining, Inc. Faas Mine

Hoffman Mining Inc. (SMP56050108; NPDES PA0249874) Faas Mine has three mine drainage treatment facilities. Treatment Ponds 001-003 are discharges from mine drainage treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharges for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

Table D41. Waste load allocations at Faas Mine			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.031	0.20
Fe	2.3	0.031	0.60
Mn	2.0	0.031	0.52
002			
Al	0.75	0.031	0.20
Fe	2.3	0.031	0.60
Mn	2.0	0.031	0.52
003			
Al	0.75	0.031	0.20
Fe	3.0	0.031	0.78
Mn	2.0	0.031	0.52

Waste Load Allocation –Cooney Brothers Coal Co. Ridge Mine

Cooney Brothers Coal Co. (SMP56000101; NPDES PA0235229) Ridge Mine has two mine drainage treatment facilities. Treatment Ponds 001 and 002 are discharges from mine drainage treatment facilities that discharge into Shade Creek. These discharges do not have effluent limits for aluminum currently; a concentration of 0.75 mg/L was assigned to the discharges for aluminum in the effluent. The following table shows the waste load allocation for these discharges.

DRAFT

Table D42. Waste load allocations at Faas Mine			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
001			
Al	0.75	0.051	0.32
Fe	2.3	0.051	1.28
Mn	2.0	0.051	0.85
002			
Al	0.75	0.051	0.32
Fe	2.3	0.051	1.28
Mn	2.0	0.051	0.85

TMDL calculations- SC14- Mouth of Shade Creek

The TMDL for sampling point SC14 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this segment of Shade Creek was computed using water-quality sample data collected at point SC16. A unit area method was used to calculate the flow at the sampling point SC14 (89.40 MGD), is used for these computations.

Sample data at point SC14 shows pH ranging between 3.74 and 5.63; pH will be addressed as part of this TMDL. There currently is not an entry for this segment on the Section Pa 303(d) list for impairment due to pH.

A TMDL for aluminum, iron, manganese and acidity at SC14 has been calculated.

Table D43 shows the measured and allowable concentrations and loads at SC14. Table D44 shows the percent reduction for aluminum, iron, manganese and acidity needed at SC14.

Table D43		Measured		Allowable	
Flow (gpm)=	62084.35	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.37	1021.48	0.38	284.54
	Iron	1.13	840.05	0.34	254.61
	Manganese	1.30	971.78	0.39	293.41
	Acidity	19.61	14620.13	0.21	157.68
	Alkalinity	4.24	3158.89		

The measured and allowable loading for point SC14 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points SC15/SC16 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points

DRAFT

SC15/SC16 and SC14 to determine a total load tracked for the segment of stream between SC14 and SC15/SC16. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at SC14.

Table D44. Allocations SC14				
SC14	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SC14	1021.48	840.05	971.78	14620.13
Difference in measured Loads between the loads that enter and existing SC14	79.98	-358.90	60.77	454.89
Percent loss due calculated at SC14	0%	30%	0%	0%
Additional load tracked from above samples	281.62	324.58	280.92	126.86
Percentage of upstream loads that reach the SC14	100%	70%	100%	100%
Total load tracked between SC16/SC15 and SC14	361.60	227.21	341.69	581.75
Allowable Load @ SC14	284.54	254.61	293.41	157.68
Load Reduction @ SC14	77.06	0	48.28	424.07
% Reduction required @ SC14	22%	0%	15%	73%

Margin of Safety

For this study the margin of safety is applied implicitly. A MOS is implicit because the allowable concentrations and loadings were simulated using Monte Carlo techniques and employing the @Risk software. Other margins of safety used for this TMDL analysis include the following:

- An additional MOS is provided because that the calculations were done with a daily Fe average instead of the 30-day average.

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.

DRAFT

Attachment E

**Excerpts Justifying Changes Between the 1996, 1998, and 2002
Section 303(d) Lists and Integrated Report/List (2004, 2006)**

DRAFT

The following are excerpts from the Pennsylvania DEP Section 303(d) narratives that justify changes in listings between the 1996, 1998, 2002, 2004 and 2006 303(d) Lists and Integrated Report/List (2006). The Section 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 EPA 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).

Migration to National Hydrography Data (NHD)

New to the 2006 report is use of the 1/24,000 National Hydrography Data (NHD) streams GIS layer. Up unnamed tributary to 2006 the Department relied upon its own internally developed stream layer. Subsequently, the United States Geologic Survey (USGS) developed 1/24,000 NHD streams layer for the Commonwealth based upon national geodatabase standards. In 2005, DEP contracted with USGS to add missing streams and correct any errors in the NHD. A GIS contractor transferred the old DEP stream assessment information to the improved NHD and the old DEP streams layer was archived. Overall, this marked an improvement in the quality of the streams layer and made the stream assessment data compatible with national standards but it necessitated a change in the Integrated Listing format. The NHD is not attributed with the old DEP five digit stream codes so segments can no longer be listed by stream code but rather only by stream name or a fixed combination of NHD fields known as reachcode and ComID. The NHD is aggregated by Hydrologic Unit Code (HUC) watersheds so HUCs rather than the old State Water Plan (SWP) watersheds are now used to group streams together. The map in

DRAFT

Appendix E illustrates the relationship between the old SWP and new HUC watershed delineations. A more basic change was the shift in data management philosophy from one of “dynamic segmentation” to “fixed segments”. The dynamic segmentation records were proving too difficult to manage from an historical tracking perspective. The fixed segment methods will remedy that problem. The stream assessment data management has gone through many changes over the years as system requirements and software changed. It is hoped that with the shift to the NHD and OIT’s (Office of Information Technology) fulltime staff to manage and maintain SLIMS the systems and formats will now remain stable over many Integrated Listing cycles.

DRAFT

Attachment F

Water Quality Data Used In TMDL Calculations

DRAFT

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
27	Coal Run	040628-1010		3.25	127.1	0.0	0.4	16	2.0	3.1
27		040706-0955		3.13	121.3	0.0	1.5	14	1.9	3.0
27		040713-1005		3.26	115.6	0.0	39.2	14	8.1	2.7
27		040722-0955		3.24	86.1	0.0	68.0	10.5	2.6	2.6
27		040919-0930		3.30	70.9	0.0	0.5	8.4	1.4	1.4
27		041003-1020		3.28	140.2	0.0	0.0	18	2.9	2.9
AVERAGE			419.35	3.24	110.19	0.00	18.27	13.48	3.15	2.62
ST DEV				0.06	26.33	0.00	28.85	3.52	2.48	0.62

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
26	Coal Run	040628-1040		3.49	59.7	0.0	0.8	4.6	2.2	0.83
26		040706-1010		3.31	52.1	0.0	1.3	3.9	1.8	0.76
26		040713-1020		3.78	41.7	0.0	1.3	3.7	1.5	0.64
26		040722-1010		3.44	47.2	0.0	1.1	4.6	2.1	0.91
26		040919-0955		3.71	31.2	0.0	5.5	2.3	1.7	0.44
26		041003-1040		3.67	48.5	0.0	6.8	4.8	1.9	0.78
AVERAGE			2380.30	3.57	46.72	0.00	2.80	3.98	1.87	0.73
ST DEV				0.18	9.65	0.00	2.63	0.93	0.26	0.17

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
25	Unname trib	1/11/2007	3.9	1.01	5640	0	7	300.6	1590	19.5
25	Dark Shade	2/2/2007	3.01	0.8	6620	0	6	480	2050	21.3
		3/13/2007	3.3	1.2	4000	0	7	240	1130	15.3
		4/20/2007	4.01	1.5	4200	0	4	270	1270	15.2
		5/2/2007	2.3	2.01	5680	0	3	430	2380	19.3
		6/5/2007	4.2	0.9	5000	0	7	229	1600	21.6
		7/23/2007	0.7	1.9	6850	0	17	349	2370	30
		8/15/2007	2.01	1.01	6250	0	14	268	1960	23.1
		9/7/2007	2	2.01	5650	0	3	256	1688	19.8
		10/11/2007	1.3	1.9	6000	0	16	294	1980	26
		11/6/2007	1.7	2.1	5410	0	7	253	1648	25
		12/4/2007	2.2	2.01	3870	0	6	178	750	17.5
		1/10/2008	3.3	1.9	4550	0	3	261	15550	17.7
		2/4/2008	3.3	2.1	4550	0	5	287	1468	18.2
		3/7/2008	3.01	1.9	4070	0	7	266	1266	17.4
AVERAGE			2.68	1.62	5222.67	0.00	7.47	290.77	2580.00	20.46
ST DEV			1.04	0.49	982.53	0.00	4.55	76.95	3616.09	4.13

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
24	Coal Run	040628-1130	1766	4.11	22.8	0.0	2.8	1.9	0.95	0.40
24		040706-1050	1394	4.16	18.9	0.0	3.0	1.5	0.95	0.40
24		040713-1100	1377	4.39	23.7	0.0	6.0	2.2	1.6	0.44

DRAFT

24	040722-1050	689	4.27	11.1	0.0	5.0	1.9	1.5	0.44
24	040919-1050	29066	3.97	21.0	0.0	7.0	1.5	1.8	0.20
24	041003-1115	6839	4.06	25.1	0.0	2.6	2.2	2.5	0.35
AVERAGE		6855.17	4.16	20.43	0.00	4.40	1.87	1.55	0.37
ST DEV		11109.25	0.15	5.06	0.00	1.87	0.31	0.58	0.09

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
23	Little Dark Shade	040628-1150		7.17	-26.3	33.2	6.4	0.09	0.8	0.03
23		040706-1230		7.66	-76.3	85.0	4.0	0.05	0.11	0.03
23		040713-1225		7.71	-17.5	45.6	17.6	0.10	0.27	0.05
23		040722-1110		7.75	-64.9	69.1	16.0	0.05	0.18	0.04
23		040919-1150		6.35	-2.4	10.8	5.0	0.27	0.23	0.02
23		041003-1210		7.37	-22.9	33.0	1.4	0.04	0.19	0.02
AVERAGE			3058.34	7.34	-35.04	46.12	8.40	0.10	0.30	0.03
ST DEV				0.53	28.95	26.95	6.73	0.09	0.25	0.01

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
22	Trib to Little	040628-1230		5.99	-7.6	24.5	25.0	0.15	14	1.4
22	Dark Shade	040706-1110		6.18	-12.5	39.0	80.0	0.11	21	1.8
22		040713-1145		5.94	-14.1	48.5	226.7	0.64	18	1.5
22		040722-1120		5.75	1.3	16.7	197.3	2.3	14	1.1
22		040919-1240		4.97	8.0	2.8	3.0	0.37	0.47	0.29
22		041003-1250		5.76	1.8	9.7	6.6	0.21	2.9	0.74
AVERAGE			795.11	5.77	-3.87	23.52	89.77	0.63	11.73	1.14
ST DEV				0.42	8.84	17.51	99.04	0.84	8.25	0.55

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
21	Dark Shade Cr.	040628-1240		3.65	71.3	0.0	15.2	3.6	19	3.4
21		040706-1115		3.53	53.4	0.0	25.5	3.2	17	3.4
21		040713-1120		3.72	84.2	0.0	20.8	4.0	18.6	3.4
21		040722-1130		3.61	69.9	0.0	32.0	3.7	20.2	3.7
21		040919-1250		4.53	16.7	0.3	16.0	1.3	3.8	0.48
21		041003-1300		3.90	44.9	0.0	55.7	2.6	14	1.5
AVERAGE			18233.01	3.82	56.73	0.06	27.53	3.07	15.43	2.65
ST DEV				0.37	24.04	0.14	15.15	0.99	6.09	1.33

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
------	-----------	-----------	------------	----	----------------	-------------------	------------	----------	----------	----------

DRAFT

20	Dark Shade Cr.	040628-1310	3.66	59.3	0.0	10.8	3.5	13	3.3	
20		040706-1245	3.41	59.2	0.0	10.4	3.2	12	3.3	
20		040713-1240	3.46	59.1	0.0	11.3	3.8	11	3.3	
20		040722-1235	3.50	59.8	0.0	16.8	3.2	12	3.5	
20		040919-1310	4.81	16.0	1.4	20.0	1.0	3.2	0.45	
20		041003-1325	3.81	43.3	0.0	16.8	2.6	12	1.6	
AVERAGE			23491.60	3.78	49.44	0.23	14.36	2.89	10.53	2.58
ST DEV				0.53	17.60	0.56	4.03	0.99	3.65	1.26

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
19	Clear Shade Cr.	040628-1315		6.96	-1.2	6.7	1.6	0.14	0.32	0.02
19		040706-1245		6.56	0.3	6.7	1.7	0.07	0.25	0.02
19		040713-1240		7.13	-3.8	8.5	2.8	0.18	0.30	0.03
19		040722-1235		6.97	-2.1	8.1	2.6	0.06	0.29	0.03
19		040919-1320		5.84	6.3	3.3	3.0	0.38	0.1	0.04
19		041003-1325		6.66	2.3	4.8	1.4	0.19	0.15	0.04
AVERAGE			20336.30	6.69	0.31	6.34	2.18	0.17	0.24	0.03
ST DEV				0.47	3.58	1.99	0.69	0.12	0.09	0.01

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
17	Shade Cr.	040628-1340		3.94	26.4	0.0	4.2	1.6	3.7	1.6
17		040706-1300		3.77	25.6	0.0	16.0	1.56	2.2	1.9
17		040713-1300		4.00	37.4	0.0	4.3	1.9	3.5	1.7
17		040722-1245		3.84	26.7	0.0	6.0	1.7	2.4	1.8
17		040919-1335		5.31	7.9	1.8	5.0	0.65	1.2	0.21
17		041003-1345		4.44	24.1	0.0	5.4	1.5	4.8	0.83
AVERAGE			48514.09	4.22	24.66	0.30	6.82	1.49	2.97	1.34
ST DEV				0.58	9.49	0.74	4.55	0.43	1.28	0.67

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
18	Roaring Fork	040628-1335		4.36	17.1	0.0	5.6	0.79	1.1	1.6
18		040706-1300		4.16	16.7	0.0	4.7	0.85	1.1	2.0
18		040713-1300		4.05	19.6	0.0	6.4	0.99	1.4	2.1
18		040722-1245		4.11	17.6	0.0	7.0	0.76	1.4	2.0
18		040919-1330		4.73	11.8	1.6	8.0	0.63	0.48	0.45
18		041003-1330		4.46	14.6	0.0	3.4	0.83	0.72	1.2

DRAFT

AVERAGE	8036.13	4.31	16.21	0.27	5.85	0.81	1.03	1.56
ST DEV		0.26	2.69	0.65	1.66	0.12	0.37	0.64

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
16	Shade Cr.	040628-1425		3.91	25.4	0.0	2.8	1.5	1.8	1.6
16		040706-1325		3.68	20.8	0.0	1.7	1.3	0.73	1.6
16		040713-1320		3.83	22.6	0.0	20.8	1.7	1.5	1.7
16		040722-1310		3.89	22.0	0.0	4.3	1.6	1.1	1.7
16		040919-1400		5.63	7.7	2.1	7.5	0.59	1.2	0.25
16		041003-1355		4.28	22.0	0.0	6.4	1.3	3.8	0.88
AVERAGE			58798.27	4.20	20.06	0.35	7.24	1.33	1.69	1.29
ST DEV				0.73	6.27	0.85	6.99	0.40	1.10	0.60

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
15	Spruce Run	040628-1510		6.98	-21.3	30.3	10.4	0.05	0.38	0.07
15		040706-1600		7.20	-21.6	30.6	16.0	0.05	0.45	0.08
15		040713-1355		7.27	-22.9	30.1	9.0	0.05	0.49	0.07
15		040722-1335		7.31	-23.1	29.6	11.7	0.05	0.60	0.08
15		040919-1420		7.04	-18.0	25.7	4.0	0.16	0.30	0.09
15		041003-1420		7.24	-20.7	29.1	2.4	0.04	0.13	0.05
AVERAGE			1433.67	7.17	-21.25	29.24	8.91	0.07	0.39	0.07
ST DEV				0.13	1.85	1.82	5.03	0.05	0.16	0.01

Site	Site Name	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	TSS (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
14	Shade Cr.	040628-1530		3.99	21.9	0.0	0.4	1.6	0.96	1.6
14		040706-1425		3.74	24.0	0.0	0.8	1.6	0.43	1.7
14		040713-1415		3.85	23.3	0.0	0.9	1.7	0.54	1.7
14		040722-1400		4.00	20.6	0.0	3.5	1.5	0.63	1.7
14		040919-1435		5.63	8.7	2.3	7.0	0.52	1.1	0.26
14		041003-1440		4.21	19.2	0.0	5.4	1.3	3.1	0.86
AVERAGE			62084.35	4.24	19.61	0.39	2.99	1.37	1.13	1.30
ST DEV				0.70	5.61	0.96	2.77	0.44	1.00	0.61

DRAFT

Flow Calculation

sample point 24 used as reference for flow calculations

SC24	Flow = 6855.17	Area = 27942039.3344
SC14	Flow = 62084.35	Area = 253059123.714
SC15	Flow = 1433.67	Area = 5843697.18297
SC16	Flow = 58798.27	Area = 239664908.988
SC17	Flow = 48514.09	Area = 197746027.817
SC18	Flow = 8036.13	Area = 32755702.5229
SC19	Flow = 20336.30	Area = 82891841.4172
SC20	Flow = 23491.60	Area = 95753036.8275
SC21	Flow = 18233.01	Area = 74318716.6661
SC22	Flow = 795.11	Area = 3240898.16205
SC23	Flow = 3058.34	Area = 12465963.1697
SC24	Flow = 6855.17	
SC25	Flow = 73.6333	
SC26	Flow = 2380.30	Area = 9702226.10119
SC27	Flow = 419.35	Area = 1709290.27477

DRAFT

Attachment G

TMDLs and NPDES Permitting Coordination

DRAFT

NPDES permitting is unavoidably linked to TMDLs through waste load allocations and their translation, through the permitting program, to effluent limits. Primary responsibility for NPDES permitting rests with the District Mining Offices (for mining NPDES permits) and the Regional Offices (for industrial NPDES permits). Therefore, the DMOs and Regions will maintain tracking mechanisms of available waste load allocations, etc. in their respective offices. The TMDL program will assist in this effort. However, the primary role of the TMDL program is TMDL development and revision/amendment (the necessity for which is as defined in the Future Modifications section) at the request of the respective office. All efforts will be made to coordinate public notice periods for TMDL revisions and permit renewals/reissuances.

Load Tracking Mechanisms

The Department has developed tracking mechanisms that will allow for accounting of pollution loads in TMDL watersheds. This will allow permit writers to have information on how allocations have been distributed throughout the watershed in the watershed of interest while making permitting decisions. These tracking mechanisms will allow the Department to make minor changes in WLAs without the need for EPA to review and approve a revised TMDL. Tracking will also allow for the evaluation of loads at downstream points throughout a watershed to ensure no downstream impairments will result from the addition, modification or movement of a permit.

Options for Permittees in TMDL Watersheds

The Department is working to develop options for mining permits in watersheds with approved TMDLs.

Options identified

- Build excess WLA into the TMDL for anticipated future mining. This could then be used for a new permit. The permittee must show that there has been actual load reduction in the amount of the proposed permit or must include a schedule to guarantee the reductions using current data referenced to the TMDL prior to permit issuance.
- Use WLA that is freed up from another permit in the watershed when that site is reclaimed. If no permits have been recently reclaimed, it may be necessary to delay permit issuance until additional WLA becomes available.
- Re-allocate the WLA(s) of existing permits. WLAs could be reallocated based on actual flows (as opposed to design flows) or smaller than approved pit/spoil areas (as opposed to default areas). The "freed-up" WLA could be applied to the new permit. This option would require the simultaneous amendment of the permits involved in the reallocation.
- Non-discharge alternative.

Other possible options

The following two options have also been identified for use in TMDL watersheds. However, before recommendation for use as viable implementation options, a thorough regulatory (both state and federal) review must be completed. These options should not be implemented

DRAFT

unnamed tributary to the completion of the regulatory review and development of any applicable administrative mechanisms.

- Issue the permit with in-stream water quality criteria values as the effluent limits. The in-stream criteria value would represent the monthly average, with the other limits adjusted accordingly (e.g., for Fe, the limits would be 1.5 mg/L monthly average, 3.0 mg/L daily average and 4.0 instantaneous max mg/L).
- The applicant would agree to treat an existing source (point or non-point) where there is no responsible party and receive a WLA based on a portion of the load reduction to be achieved. The result of using these types of offsets in permitting is a net improvement in long-term water quality through the reclamation or treatment of an abandoned source.

DRAFT

Attachment H
Comment and Response