FINAL

CUCUMBER RUN WATERSHED TMDL

Somerset County

For Acid Mine Drainage Affected Segments

Prepared by:

Pennsylvania Department of Environmental Protection

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Introduction

This report presents the Total Maximum Daily Loads (TMDLs) developed for segments in the Cucumber Run Watershed (Attachment 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 one segment on this list (shown in Table 1). High levels of metals and depressed pH caused these impairments. 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: 19-F Casselman River								
Year	**Miles**	**Segment ID**	**DEP Stream Code**	**Stream Name**	**Designated Use**	**Data Source**	**Source**	**EPA 305(b) Cause Code**
1996	1.5	4838	38817	Cucumber Run	WWF	305(b) Report	RE	Metals
1998	1.7	4838	38817	Cucumber Run	WWF	305(b) Report	AMD	Metals
2002	New survey; new segment id. (990102-1035-TVP)							
1996	Not on 303(d) list.							
1998	Not on 303(d) list.							
2002	1.7	990102-1035-TVP	38817	Cucumber Run	WWF	SWMP	AMD	Metals & pH

Resource Extraction=RE
Warm Water Fishes = WWF
Abandoned Mine Drainage = AMD
Surface Water Monitoring Program = SWMP

See Attachment D, *Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists.*

The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.

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

Directions to the Cucumber Run Watershed

The Cucumber Run Watershed is located in the extreme southwestern portion of Somerset County in southwestern Pennsylvania. The watershed lies within two USGS topographic map quadrangles; the southeastern corner of the Confluence 7 ½ minute quadrangle and the southwestern corner of the Markleton 7 ½ minute quadrangle. Most of the watershed is privately held and is predominately forested. Land uses within the 6.19 square mile watershed include agriculture, abandoned mine lands, and rural residential properties.

The villages of Harnedsville, Dumas, Beachley, and Listonburg lie along State Route 523 approximately one to two miles southwest of the southwestern boundary of the watershed. Access to the watershed is gained by taking Route 523 south from Confluence for a distance of approximately 3.7 miles. At 3.7 miles (which is also approximately 0.2 miles south of Dumas), turn left onto a township road (locally known as Silbaugh Church Road). At approximately 3.5 miles a road intersects from the left. Continue straight ahead for another 0.1 mile to an intersection with a road on the right. Continue straight ahead. Just after that intersection, the entrance road to the Silbaugh Church is on the left. After an additional 0.5 miles the road crosses over the main stem of Cucumber Run.

Hydrology and Geology

Cucumber Run drains into the Casselman River approximately 5.5 miles upstream of its confluence with the Youghiogheny River. This latter watershed is well known for it multi-recreational uses, including, swimming, boating, white-water rafting, sightseeing, and hiking. A portion of the Rails-to-Trails system crosses the mouth of Cucumber Run just before it empties into the Casselman River. Cucumber Run above its confluence with Unnamed Tributary 38822, as well as Unnamed Tributary 38822, is buried under approximately 10 feet of colluvium.

The watershed area is located in the Allegheny Mountain Section of the Appalachian Plateaus Physiographic Province. The plateau is strongly dissected by stream valleys—of which Cucumber Run is a good example. The position of the Casselman River has helped determine base level for local groundwater systems. The mouth of Cucumber Run lies at an elevation of approximately 1407’ MSL. The areas of highest elevation within the watershed lie in the extreme southeastern portion of the watershed--at an elevation of approximately 3000’ MSL.

Segments addressed in this TMDL

There are no active mining operations in the watershed. All of the 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. Where there is no responsible party the discharge is considered to be a non-point source. Each segment on the Section 303(d) list will be addressed as a separate TMDL. 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 Attachment C 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);

- 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 country.

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.

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;

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

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

Field reconnaissance provides evidence of ongoing logging and small-scale agricultural practices from as early as the mid-1800's. Deep mining on the Upper Freeport coal seam took place approximately one mile northeast of the Silbaugh Church in the late 1960's and 1970's by The North American Coal Corporation and Crichton Coal and Coke Companies. Surface mining took place in several areas: 1) just east of the Silbaugh church, Finzel and Yammer Coal Company and Finzel Coal Companies removed the Upper Freeport coal seam; 2) Will's construction mined the Upper Freeport and overlying Harlem coal seams just west of the Silbaugh Church; 3) Svonavec Inc. mined the Upper Freeport coal seam approximately 1.75 miles north-northeast of the church. The surface mined areas have been reclaimed and revegetated to present-day reclamation standards. No active surface or deep mining has occurred in the watershed for at least the last decade. Only the Finzel site(s) appear to have any visible surface discharges. The watershed has remained largely rural with widely scattered residences and small farms. Industrial expansion is basically non-existent in the watershed.

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.

Allowable loads are determined for each point of interest using Monte Carlo simulation. Monte Carlo simulation is an analytical method meant to imitate real-life systems, especially when other analyses are too mathematically complex or too difficult to reproduce. Monte Carlo simulation calculates multiple scenarios of a model by repeatedly sampling values from the probability distribution of the uncertain variables and using those values to populate a larger data set.

Allocations were applied uniformly for the watershed area specified for each allocation point. For each source and pollutant, it was assumed that the observed data were log-normally distributed. Each pollutant source was evaluated separately using @Risk[3] by performing 5,000 iterations to determine the required percent reduction so that the water quality criteria, as defined in the *Pennsylvania Code. Title 25 Environmental Protection, Department of Environmental Protection, Chapter 93, Water Quality Standards*, will be met instream at least 99 percent of the time. For each iteration, the required percent reduction is:

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

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

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

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

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

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

LTA = Mean * (1 – PR99) where (2)

LTA = allowable LTA source concentration in mg/l

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

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

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

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

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

TMDL Endpoints

One of the major components of a TMDL is the establishment of an instream numeric endpoint, which is used to evaluate the attainment of applicable water quality. An instream numeric endpoint, therefore, represents the water quality goal that is to be achieved by implementing the load reductions specified in the TMDL. The endpoint allows for 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.

Because most of the pollution sources in the watershed are nonpoint sources, the TMDLs' component makeup will be Load Allocations (LAs). 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 2. 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)

$$TMDL = WLA + LA + MOS$$

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 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. There are currently no permitted discharges in the watershed and therefore all waste load allocations are equal to zero. 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 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 3. TMDL Component Summary for the Cucumber Run Watershed

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
CUKE05	*Cucumber Run, downstream of Unnamed Tributary 38822*						
	Fe	ND	NA	NA	NA	0.0	0
	Mn	1.0	1.0	NA	NA	0.0	0
	Al	ND	NA	NA	NA	0.0	0
	Acidity	68.3	17.1	0.0	17.1	51.2	75
CUKE04	*Mouth of Unnamed Tributary 38821*						
	Fe	0.35	0.23	0.0	0.23	0.12	34
	Mn	0.1	0.1	NA	NA	0.0	0
	Al	0.13	0.08	0.0	0.08	0.05	40
	Acidity	9.7	7.2	0.0	7.2	2.5	26
CUKE03	*Cucumber Run, downstream of Unnamed Tributary 38821*						
	Fe	ND	NA	NA	NA	0.0	0
	Mn	3.4	3.4	NA	NA	0.0	0
	Al	ND	NA	NA	NA	0.0	0
	Acidity	277.9	72.3	0.0	72.3	151.9	68
CUKE02	*Mouth of Unnamed Tributary 38818*						
	Fe	4.0	1.1	0.0	1.1	2.9	72
	Mn	0.5	0.5	NA	NA	0.0	0
	Al	NA	NA	NA	NA	0.0	0
	Acidity	14.1	11.9	0.0	11.9	2.2	16
CUKE01	*Mouth of Cucumber Run*						
	Fe	ND	NA	NA	NA	0.0	0
	Mn	5.4	5.4	NA	NA	0.0	0
	Al	NA	NA	NA	NA	0.0	0
	Acidity	194.8	93.5	0.0	93.5	0.0	0

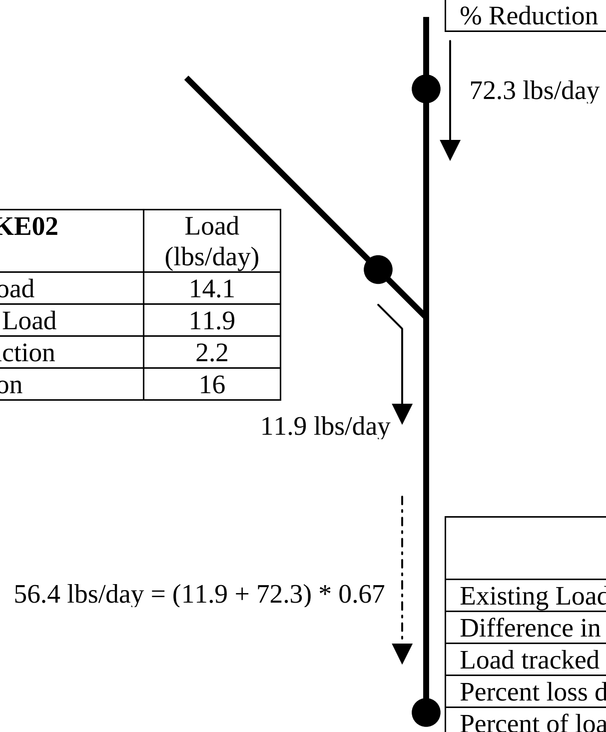
ND, values below the detection limit
NA, meets WQS. No TMDL necessary.

In the instance that the allowable load is equal to the existing load (e.g. manganese point CUKE05, Table 3), 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. In addition, when all measured values are below the method detection limit, denoted by ND (e.g. iron point CUKE05, Table 3), no TMDL is necessary. In this case the accounting for upstream loads is not carried through to the next downstream point. Rather, there is a disconnect noted and the allowable load is considered to start over because the water quality standard is satisfied.

Following is an example of how the allocations, presented in Table 3 are calculated. For this example, acidity allocations for points CUKE01, CUKE02, and CUKE03 are shown. As demonstrated in the example, all upstream contributing loads are accounted for at each point. Attachment C contains the TMDLs by segment analysis for each allocation point in a detailed discussion. These analyses follow the example. Attachment A contains a map of the sampling point locations for reference.

CUKE03	Load (lbs/day)
Existing Load	277.9
Difference in Existing Load	199.9
Load tracked from upstream	24.3
Total Load tracked between points	224.2
Allowable Load	72.3
Load Reduction	151.9
% Reduction	68

CUKE02	Load (lbs/day)
Existing Load	14.1
Allowable Load	11.9
Load Reduction	2.2
% Reduction	16



CUKE01	Load (lbs/day)
Existing Load	194.8
Difference in Existing Load	-97.2
Load tracked from upstream	84.2
Percent loss due to instream process	33
Percent of loads tracked through segment	67
Total Load tracked between points	56.4
Allowable Load	93.5
Load Reduction	0.0
% Reduction	0

Recommendations

The overall impacts to this watershed from past surface and deep mining appear to be minor. Small variations in metals, particularly in manganese and iron, are the main sources of pollutants. The stream appears to possess a low buffering capacity and hence, is easily affected by mine drainage. Remediation or mitigation of the sources of mine drainage pollution should be addressed relatively easily through a variety of methods. For example, additional passive treatment systems would help reduce the pollution loading from the Finzel sites. Daylighting of the existing small-scale deep mine(s) would remove the source of non-point pollution from these mines.

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.

Additional opportunities for water quality improvement are both ongoing and anticipated. Historically, a great deal of research into mine drainage has been conducted by DEP's Bureau of Abandoned Mine Reclamation, 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 CWA Section 319(a) Grant program and Pennsylvania's Growing Greener program has 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 form 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; 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.

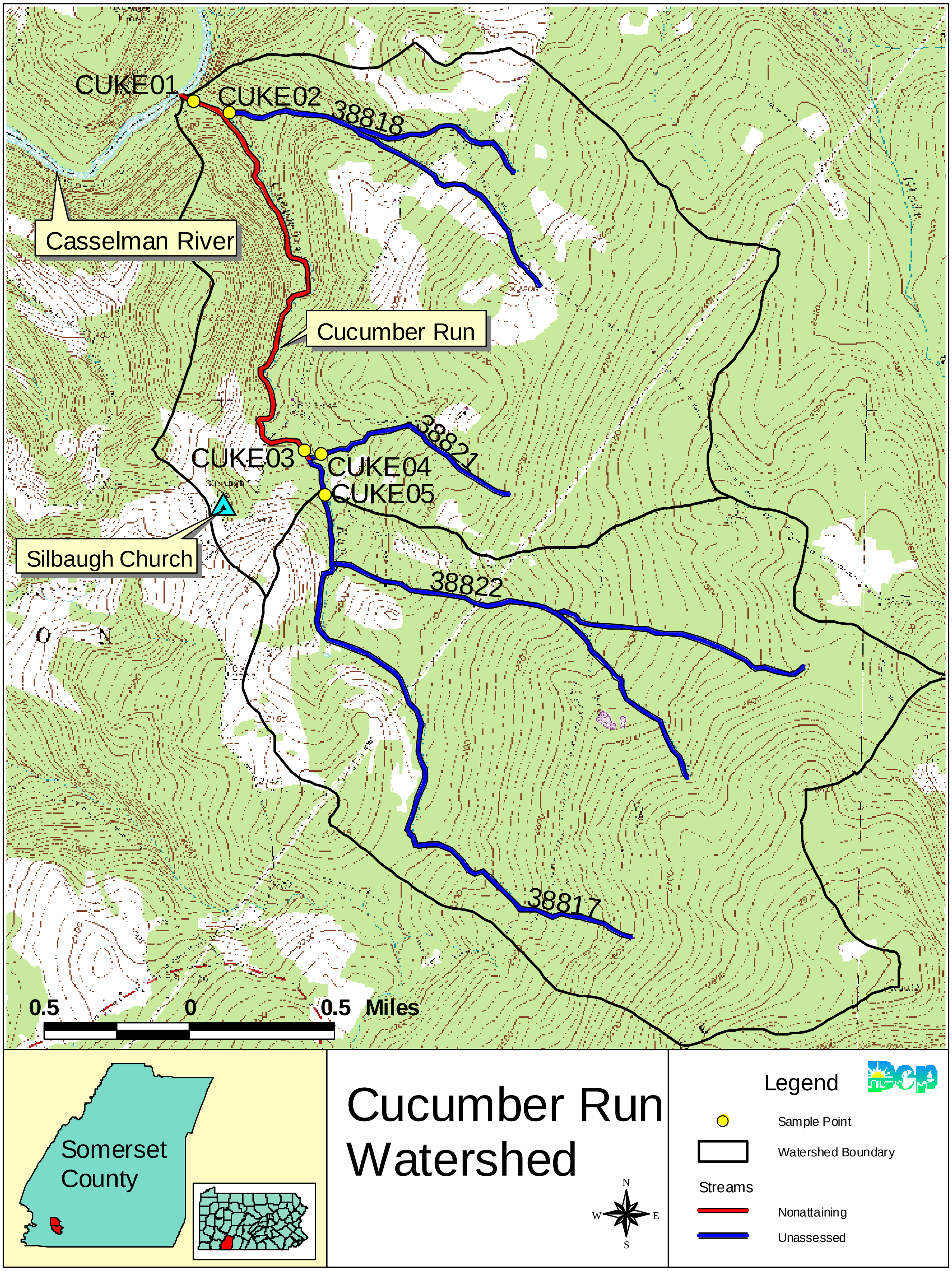
Reclaim PA is DEP's initiative designed to maximize reclamation of the state's quarter million acres of abandoned mineral extraction lands. Abandoned mineral extraction lands in Pennsylvania constituted a significant public liability – more than 250,000 acres of abandoned surface mines, 2,400 miles of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

Public Participation

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on February 07, 2004 and the *Somerset Daily American* on February 04, 2004 to foster public comment on the allowable loads calculated. The public comment period on this TMDL was open from February 07, 2004 to April 07, 2004. A public meeting was held on March 04, 2004 at the Confluence Community Center in Confluence, PA to discuss the proposed TMDL.

Attachment A

Cucumber Run Watershed Maps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CUKE02
38818
Casselman River
Cucumber Run
38821
CUKE03
CUKE04
CUKE05
Silbaugh Church
38822
38817
0.5
0
0.5 Miles
Somerset
County
Cucumber Run
Watershed
Legend
Sample Point
Watershed Boundary
Streams
Nonattaining
Unassessed
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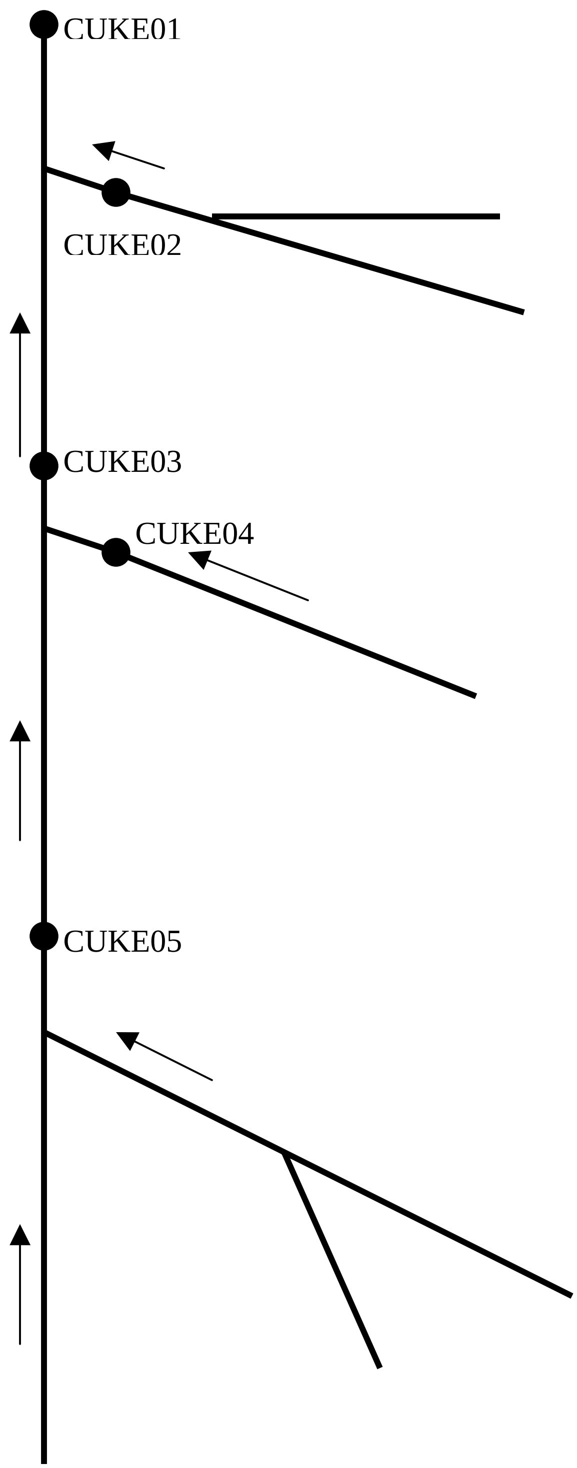
Sampling Station Diagram
Arrows represent Direction of Flow
(Diagram not to scale)



Attachment B

Method for Addressing Section 303(d) Listings for pH and Surface Mining Control and Reclamation Act

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 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 EPA'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 Section 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. Therefore, net alkalinity will be used to evaluate pH in these TMDL calculations. This methodology assures that the standard for pH will be met because net alkalinity is a measure of the reduction of acidity. When acidity in a stream is neutralized or is restored to natural levels, pH will be acceptable. Therefore, the measured instream alkalinity at the point of evaluation in the stream will serve as the goal for reducing total acidity at that point. The methodology that is applied for alkalinity (and therefore pH) is the same as that used for other parameters such as iron, aluminum, and manganese that have numeric water quality criteria.

Each sample point used in the analysis of pH by this method must have measurements for total alkalinity and total acidity. Net alkalinity is alkalinity minus acidity, both being in units of milligrams per liter (mg/l) $CaCO_3$. The same statistical procedures that have been described for use in the evaluation of the metals is applied, using the average value for total alkalinity at that point as the target to specify a reduction in the acid concentration. By maintaining a net alkaline stream, the pH value will be in the range 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.

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

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

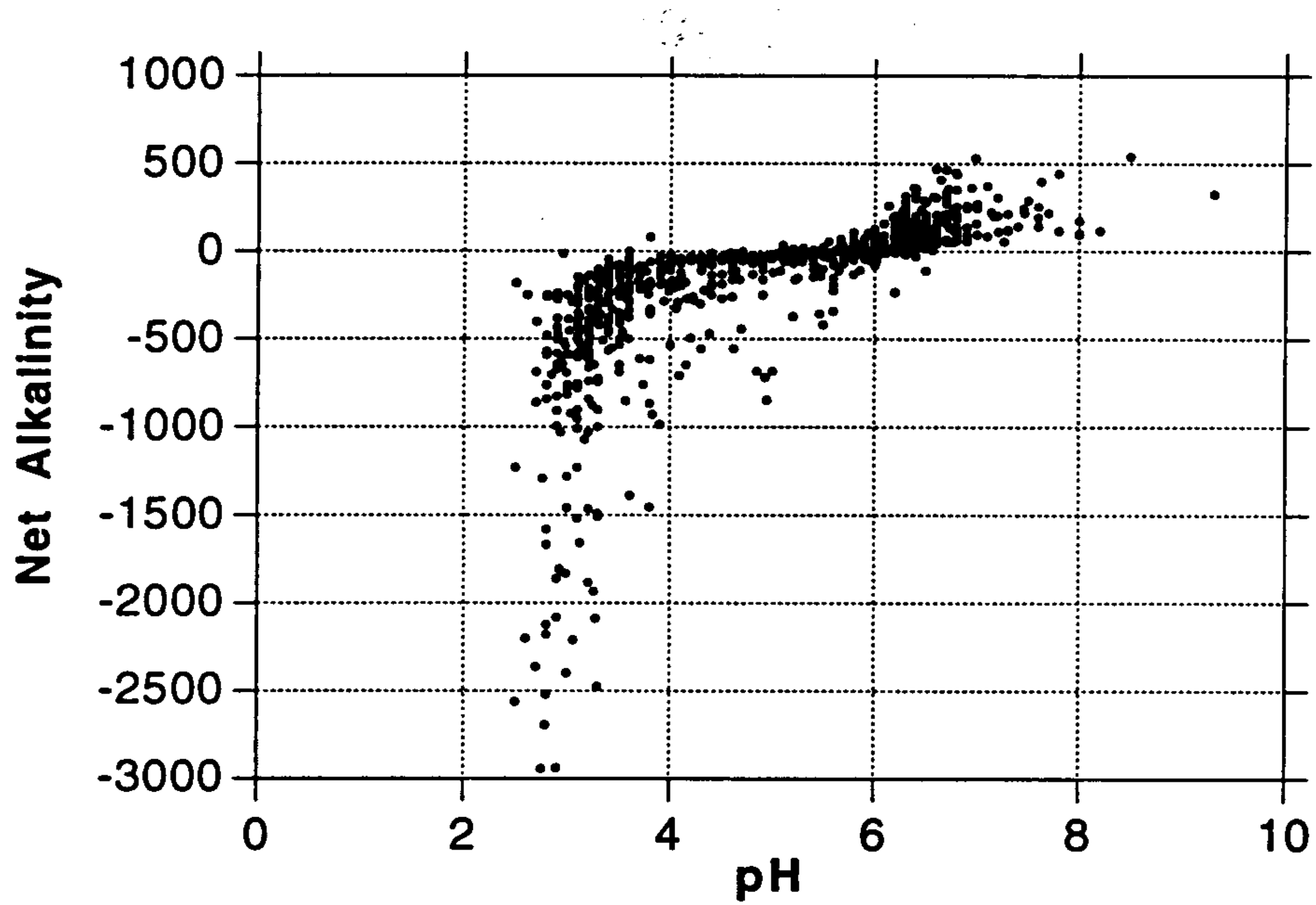


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Surface Mining Control and Reclamation Act

The Surface Mining Control and Reclamation Act of 1977 (SMCRA, Public Law 95-87) and its subsequent revisions were enacted to established a nationwide program to, among other things, protect the beneficial uses of land or water resources, and pubic health and safety from the adverse effects of current surface coal mining operations, as well as promote the reclamation of mined areas left without adequate reclamation prior to August 3, 1977. SMCRA requires a permit for the development of new, previously mined, or abandoned sites for the purpose of surface mining. Permittees are required to post a performance bond that will be sufficient to ensure the completion of reclamation requirements by the regulatory authority in the event that the applicant forfeits. Mines that ceased operating by the effective date of SMCRA, (often called "pre-law" mines) are not subject to the requirements of SMCRA.

Title IV of the Act is designed to provide assistance for reclamation and restoration of abandoned mines, while Title V states that any surface coal mining operations shall be required to meet all applicable performance standards. Some general performance standards include:

- Restoring the affected land to a condition capable of supporting the uses which it was capable of supporting prior to any mining,

- Backfilling and compacting (to insure stability or to prevent leaching of toxic materials) in order to restore the approximate original contour of the land with all highwalls being eliminated, and topsoil replaced to allow revegetation, and

- Minimizing the disturbances to the hydrologic balance and to the quality and quantity of water in surface and ground water systems both during and after surface coal mining operations and during reclamation by avoiding acid or other toxic mine drainage.

For purposes of these TMDLs, point sources are identified as NPDES-permitted discharge points, and nonpoint sources include discharges from abandoned mine lands, including but not limited to, tunnel discharges, seeps, and surface runoff. Abandoned and reclaimed mine lands were treated in the allocations as nonpoint sources because there are no NPDES permits associated with these areas. In the absence of an NPDES permit, the discharges associated with these land uses were assigned load allocations.

The decision to assign load allocations to abandoned and reclaimed mine lands does not reflect any determination by EPA as to whether there are, in fact, unpermitted point source discharges within these land uses. In addition, by establishing these TMDLs with mine drainage discharges treated as load allocations, EPA is not determining that these discharges are exempt from NPDES permitting requirements.

Related Definitions

Pre-Act (Pre-Law) - Mines that ceased operating by the effective date of SMCRA and are not subject to the requirements of SMCRA.

Bond – A instrument by which a permittee assures faithful performance of the requirements of the acts, this chapter, Chapters 87-90 and the requirements of the permit and reclamation plan.

Postmining pollution discharge – A discharge of mine drainage emanating from or hydrologically connected to the permit area, which may remain after coal mining activities have been completed, and which does not comply with the applicable effluent requirements described in Chapters 87.102, 88.92, 88.187, 88.292, 89.52 or 90.102. The term includes minimal-impact postmining discharges, as defined in Section of the Surface Mining Conservation and Reclamation Act.

Forfeited Bond – Bond money collected by the regulatory authority to complete the reclamation of a mine site when a permittee defaults on his reclamation requirements.

Attachment C
TMDLs By Segment

Cucumber Run

The TMDL for Cucumber Run consists of load allocations of two tributaries and three sampling sites along the stream. No waste load allocations are assigned because there are currently no permitted discharges in the watershed. Following is an explanation of the TMDL for each allocation point.

Cucumber Run is listed as impaired on the PA Section 303(d) list by high metals and depressed pH from AMD. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the acceptable range. 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 iron, manganese, aluminum, 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 lognormally 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. The following table shows the load allocations for this stream segment.

TMDL Calculations - Sample Point CUKE05, Cucumber Run downstream of Unnamed Tributary 38822

The TMDL for Cucumber Run consists of a load allocation to all of the area above sampling point CUKE05 (Attachment A). The load allocation for this stream segment was computed using water-quality sample data collected at point CUKE05. The average flow of 0.91 MGD, measured at the sampling point, is used for these computations.

There is currently no entry for this segment on the PA Section 303(d) list for metals and pH impairment from AMD. Sample data at point CUKE05 shows pH ranging between 4.7 and 6.5; pH will be addressed as part of this TMDL.

All values for iron and aluminum are below the method detection limits, denoted by ND. The existing manganese load is equal to the allowable manganese load because water quality analysis performed at CUKE05 for manganese determined the applicable water quality standard is met. Because WQS are met, TMDLs for iron, aluminum, and manganese are not necessary.

Table C1. TMDL Calculations at Point CUKE05				
Flow = 0.91 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	ND	ND	NA	NA
Mn	0.14	1.0	0.14	1.0
Al	ND	ND	NA	NA
Acidity	9.03	68.3	2.26	17.1
Alkalinity	9.27	70.1		

Table C2. Calculation of Load Reduction Necessary at Point CUKE05				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	ND	1.0	ND	68.3
Allowable Load	NA	1.0	NA	17.1
Load Reduction	0.0	0.0	0.0	51.2
% Reduction Segment	0	0	0	75

TMDL Calculations - Sampling Points CUKE04, mouth of Unnamed Tributary 38821

The TMDL for sampling point CUKE04 consists of a load allocation to all of the area above the sampling point shown in Attachment A. The load allocation for this tributary was computed using water-quality sample data collected at point CUKE04. The average flow of 0.12 MGD, measured at the sampling point CUKE04, is used for these computations

There is currently no entry for this segment on the PA Section 303(d) list for AMD impairment. Sample data at point CUKE04 shows pH ranging between 5.0 and 7.7; pH will be addressed as part of this TMDL.

All values for iron are below the criterion; however, the simulation determined that standards are not met 99% of the time resulting in a necessary reduction. Water quality analysis determined that the existing and allowable manganese loads are equal. Because the WQS is met, a TMDL for manganese is not necessary.

Table C3. TMDL Calculations at Point CUKE04				
Flow = 0.12 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	0.36	0.3	0.24	0.2
Mn	0.08	0.1	0.08	0.1
Al	0.13	0.13	0.08	0.08
Acidity	10.12	9.7	7.49	7.2
Alkalinity	37.47	36.0		

Table C4. Calculation of Load Reduction Necessary at Point CUKE04				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	0.35	0.1	0.13	9.7
Allowable Load	0.23	0.1	0.08	7.2
Load Reduction	0.12	0.0	0.05	2.5
% Reduction Segment	34	0	40	26

TMDL Calculations - Sampling Point CUKE03, Cucumber Run downstream of Unnamed Tributary 38821

The TMDL for sampling point CUKE03 consists of a load allocation to all of the area between sample points CUKE03, CUKE04, and CUKE05 shown on the map in Attachment A. The load allocation for this segment was computed using water-quality sample data collected at point CUKE03. The average flow of 2.55 MGD, measured at the sampling point CUKE03, is used for these computations.

This segment is on the 1996 and 1998 PA Section 303(d) lists for metals impairments. A reassessment of the segment in 1999 resulted in the addition of depressed pH as a cause of impairment to the PA 2002 Section 303(d) list. Sample data at point CUKE03 shows pH ranging between 4.7 and 6.2; pH will be addressed as part of this TMDL because of the mining impacts.

All values for iron and aluminum are below the method detection limits, denoted by ND. Water quality analysis determined that the existing and allowable manganese loads are equal. Because WQS are met, TMDLs for iron, aluminum, and manganese are not necessary.

Table C5. TMDL Calculations at Point CUKE03				
Flow = 2.55 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	ND	ND	NA	NA
Mn	0.16	3.4	0.16	3.4
Al	ND	ND	NA	NA
Acidity	13.09	277.9	3.40	72.3
Alkalinity	8.23	174.8		

The calculated load reductions for all the loads that enter point CUKE03 must be accounted for in the calculated reductions at the sample point shown is Table C6. Because iron and aluminum are not detected at CUKE03 under current conditions, it is not necessary to account for upstream loads for these parameters. A comparison of measured manganese and acidity loads between points CUKE03, CUKE04 and CUKE05 shows that there is additional loading entering the segment for both parameters. The total segment load is the sum of the upstream loads and the load directly entering the segment.

Table C6. Calculation of Load Reduction Necessary at Point CUKE03				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	ND	3.4	ND	277.9
Difference in Existing Load between CUKE03, CUKE04 & CUKE05	-	2.3	-	199.9
Load tracked from CUKE04 & CUKE0 5	-	1.1	-	24.3
Total Load tracked between CUKE03, CUKE04 & CUKE05	-	3.4	-	224.2
Allowable Load at CUKE03	NA	3.4	NA	72.3
Load Reduction at CUKE03	0.0	0.0	0.0	151.9
% Reduction required at CUKE03	0	0	0	68

TMDL Calculation - Sample Point CUKE02, mouth of Unnamed Tributary 38818

The TMDL for sample point CUKE02 consists of a load allocation to all of the area above the sampling point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point CUKE02. The average flow of 0.57 MGD, measured at the sampling point, is used for these computations.

There is currently no entry for this segment on the PA Section 303(d) list for AMD impairment. Sample data at point CUKE02 shows pH ranging between 4.7 and 7.0; pH will be addressed as part of this TMDL.

All values for aluminum are below or near the detectable limits. Water quality analysis determined that the existing and allowable manganese loads are equal. Because WQS are met, TMDLs for aluminum and manganese are not necessary.

Table C7. TMDL Calculations at Point CUKE02				
Flow = 0.57 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	0.84	4.0	0.24	1.1
Mn	0.10	0.5	0.10	0.5
Al	NA	NA	NA	NA
Acidity	2.97	14.1	2.49	11.9
Alkalinity	24.17	115.1		

Table C8. Calculation of Load Reduction Necessary at Point CUKE02				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	4.0	0.5	NA	14.1
Allowable Load	1.1	0.5	NA	11.9
Load Reduction	2.9	0.0	0.0	2.2
% Reduction Segment	72	0	0	16

TMDL Calculation - Sample Point CUKE01, mouth of Cucumber Run

The TMDL for sample point CUKE01 consists of a load allocation to all of the area between sample points CUKE01, CUKE02, and CUKE03 shown in Attachment A. The load allocation for this stream segment was computed using water-quality sample data collected at point CUKE01. The average flow of 3.58 MGD, measured at the sampling point, is used for these computations.

This segment is on the 1996 and 1998 PA Section 303(d) lists for metals impairments. A reassessment of the segment in 1999 resulted in the addition of depressed pH as a cause of impairment to the PA 2002 Section 303(d) list. Sample data at point CUKE01 shows pH ranging between 4.7 and 6.5; pH will be addressed as part of this TMDL because of the mining impacts.

All values for iron and aluminum are below the method detection limits, with the exception of one for aluminum that is just above detection. Water quality analysis determined that the existing and allowable manganese loads are equal. Because WQS are met, TMDLs for iron, aluminum, and manganese are not necessary.

Table C9. TMDL Calculations at Point CUKE01				
Flow = 3.58 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	ND	ND	NA	NA
Mn	0.18	5.4	0.18	5.4
Al	NA	NA	NA	NA
Acidity	6.52	194.8	3.13	93.5
Alkalinity	10.04	300.0		

The calculated load reductions for all the loads that enter point CUKE01 must be accounted for in the calculated reductions at the sample point shown is Table C10. Because iron and aluminum are not detected at CUKE01 under current conditions, it is not necessary to account for upstream loads for these parameters. A comparison of measured manganese and acidity loads between points CUKE01, CUKE02 and CUKE03 shows that there is additional load entering the segment for manganese and a loss of load for acidity. The total segment manganese load is the sum of the upstream loads and the load directly entering the segment. For loss of acidity load, the percent of load lost within the segment is calculated and applied to the upstream allocated loads to determine the amount of the upstream load that is tracked through the segment.

Table C10. Calculation of Load Reduction Necessary at Point CUKE01				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	ND	5.4	NA	194.8
Difference in Existing Load between CUKE01, CUKE02 & CUKE03	-	1.5	-	-97.2
Load tracked from CUKE02 & CUKE03	-	3.9	-	84.2
Percent loss due to instream process	-	NA	-	33
Percent of loads tracked through segment	-	NA	-	67
Total Load tracked between points CUKE01, CUKE02 & CUKE03	-	5.4	-	56.4
Allowable Load at CUKE01	NA	5.4	NA	93.5
Load Reduction at CUKE01	0.0	0.0	0.0	0.0
% Reduction required at CUKE01	0	0	0	0

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:

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

Attachment D

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

The following are excerpts from the Pennsylvania DEP Section 303(d) narratives that justify changes in listings between the 1996, 1998, and 2002 list. 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).

Attachment E
Water Quality Data Used In TMDL Calculations

Monitoring point	Sampling date	Flow (gpm)	Lab pH	Alk (mg/L)	Acidity (mg/L)	Iron (mg/L)	Manganese (mg/L)	Aluminum (mg/L)
CUKE01	6/26/2002	2027	4.7	8.6	6.2	ND	0.166	ND
Latitude:	7/25/2002	640	6.5	17.2	0.0	ND	0.000	ND
39 48' 25"	4/29/2003	2575	6.0	7.0	8.0	ND	0.273	0.579
Longitude:	7/9/2003	5968	6.2	8.6	10.8	ND	0.215	ND
79 17' 37"	8/11/2003	1232	6.1	8.8	7.6	ND	0.244	ND
Mouth of Cucumber Run	Average	2488.40000	5.90000	10.04000	6.52000	NA	0.17960	NA
	St Dev	2081.05317	0.69642	4.06792	4.00899	NA	0.10789	NA
CUKE02	6/11/2002	55	4.7	8.8	17.8	0	0.168	ND
Latitude:	7/15/2002	20	6.8	12.8	0.0	0.342	0.000	ND
39 48' 22"	7/25/2002	10	7.0	84.0	0.0	3.15	0.410	ND
Longitude:	4/29/2003	690	6.6	11.6	0.0	0.392	0.000	ND
79 17' 28"	7/9/2003	1183	6.6	13.0	0.0	0.61	0.000	0.532
Mouth of	8/11/2003	421	6.5	14.8	0.0	0.569	0.000	ND
Unnamed Trib 38818	Average	396.50000	6.36667	24.16667	2.96667	0.84383	0.09633	NA
	St Dev	471.82232	0.83586	29.37929	7.26682	1.15036	0.16772	NA
CUKE03	6/11/2002	2472	4.7	8.6	7.6	ND	0.173	ND
Latitude:	6/24/2002	3800	6.2	11.6	10.2	ND	0.000	ND
39 47' 22"	7/15/2002	188.5	4.7	5.4	16.2	ND	0.195	ND
Longitude:	7/25/2002	550	6.2	11.2	5.8	ND	0.275	ND
79 17' 08"	4/29/2003	1155	4.8	6.8	12.4	ND	0.125	ND
Downstream of	7/9/2003	3313	5.2	7.2	18.8	ND	0.146	ND
Unnamed Trib 38821	8/11/2003	901	5.1	6.8	20.6	ND	0.220	ND
	Average	1768.50000	5.27143	8.22857	13.08571	NA	0.16200	NA
	St Dev	1421.11843	0.66261	2.36200	5.63898	NA	0.08681	NA
CUKE04	6/11/2002	35	7.7	86.0	0.0	0	0.000	0.000
Latitude:	7/15/2002	15	8.0	106.0	0.0	0	0.000	0.000
39 47' 20"	7/25/2002	300	5.0	7.8		0.438	0.374	0.000
Longitude:	4/29/2003	15	5.6	8.2	9.8	0	0.000	0.000
79 17' 06"	7/9/2003	102	6.0	8.4	23.0	0.527	0.000	0.000
Mouth of	8/11/2003	13	5.8	8.4	17.8	1.22	0.085	0.783
Unnamed Trib 38821	Average	80.00000	6.35000	37.46667	10.12000	0.36417	0.07650	0.13050
	St Dev	113.0027	1.21285	45.77924	10.36591	0.48213	0.14966	0.31966
CUKE05	6/11/2002	325	6.5	12.6	0.0	ND	0.000	ND
Latitude:	7/15/2002	292.3	4.7	5.2	16.0	ND	0.198	ND
39 47' 14"	7/25/2002	250	6.4	16.8	0.0	ND	0.149	ND
Longitude:	4/29/2003	1100	4.7	7.2	8.6	ND	0.127	ND
79 17' 04"	7/9/2003	1356	5.0	7.2	16.2	ND	0.152	ND
Upstream of	8/11/2003	454	4.9	6.6	13.4	ND	0.206	ND
Unnamed Trib 38821	Average	629.55000	5.36667	9.26667	9.03333	NA	0.13867	NA
	St Dev	475.4823	0.84774	4.47333	7.51470	NA	0.07444	NA

ND = Nondetect

Attachment F
Comment and Response

A 60-day public comment period was open from February 7, 2004 to April 7, 2004. During this time, no comments on the draft TMDL for the Cucumber Run Watershed were received.