FINAL

ELK CREEK WATERSHED TMDL

Elk County

For Acid Mine Drainage Affected Segments

Prepared by:

Pennsylvania Department of Environmental Protection

March 28, 2005

TABLE OF CONTENTS

Introduction ... 3
Directions to the Elk Creek Watershed ... 4
Segments addressed in this TMDL ... 4
Clean Water Act Requirements ... 4
Section 303(d) Listing Process ... 5
Basic Steps for Determining a TMDL ... 6
Watershed History ... 6
AMD Methodology ... 7
TMDL Endpoints ... 10
TMDL Elements (WLA, LA, MOS) ... 10
Allocation Summary ... 10
Recommendations ... 17
Public Participation ... 18

TABLES

Table 1. 303(d) Sub-List ... 3
Table 2. Applicable Water Quality Criteria ... 10
Table 3. TMDL Component Summary for the Elk Creek Watershed ... 11

ATTACHMENTS

ATTACHMENT A ... 19
Elk Creek Watershed Maps ... 19
ATTACHMENT B ... 25
Method for Addressing Section 303(d) Listings for pH ... 25
ATTACHMENT C ... 28
TMDLs By Segment ... 28
ATTACHMENT D ... 67
Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists ... 67
ATTACHMENT E ... 69
Water Quality Data Used In TMDL Calculations ... 69
ATTACHMENT F ... 92
Comment and Response ... 92

FINAL TMDL[1]
Elk Creek Watershed
Elk County, Pennsylvania

Introduction

This report presents the Total Maximum Daily Loads (TMDLs) developed for segments in the Elk 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. All impairments resulted from acid drainage from abandoned coal mines. 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: 17-A Toby Creek

Year	Miles	Segment ID	DEP Stream Code	Stream Name	Designated Use	Data Source	Source	EPA 305(b) Cause Code
1996	0.8	5442	50459	Elk Creek (North Branch)	CWF	305(b) Report	RE	Metals
1998	0.63	5442	50459	Elk Creek	CWF	SWMP	AMD	Metals
2002	0.6	5442	50459	Elk Creek	CWF	SWMP	AMD	Metals
1996	16.3	5447	50459	Elk Creek	CWF	305(b) Report	RE	Metals
1998	2.84	5447	50459	Elk Creek	CWF	SWMP	AMD	Metals
2002	2.8	5447	50459	Elk Creek	CWF	SWMP	AMD	Metals
1996	3.6	NA	50518	Elk Creek-South Br (Unt)	CWF	305(b) Report	RE	Metals
1998	3.6	Part C of List	50518	Elk Creek-South Br (Unt)	CWF	305(b) Report	RE	Metals
2002	Incorrectly included as part of segment 5447 (Addendum A)			Elk Creek-South Branch (Unt)	CWF	305(b) Report	AMD	Metals

Resource Extraction=RE
Cold Water Fishes = CWF
Surface Water Assessment Program = SWAP
Abandoned Mine Drainage = AMD

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 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.*

Directions to the Elk Creek Watershed

The Elk Creek Watershed is approximately 63.4 square miles in area. It is located in central Elk County and can be found on the Ridgway and St. Mary's United States Geological Survey 7-1/2 Minute quadrangles. Elk Creek flows 16 miles east from its headwaters in the town of St. Mary's to its confluence with the Clarion River in the town of Ridgway, Pennsylvania.

Elk Creek can be reached from exit 97 North (Route 219) of Interstate 80. To reach the mouth of Elk Creek, take Rt. 219 North for approximately 24 miles into the town of Ridgway. Rt. 219 crosses over Elk Creek just upstream from the mouth of Elk Creek in Ridgway. The North Branch of Elk Creek can be reached by traveling approximately 24 miles North on Rt. 219 from exit 97 of Interstate 80 to the town of Ridgway. In Ridgway follow route 120 East (towards St. Mary's) for approximately 10 miles to the traffic signal in the town of St. Mary's. Turn left at the traffic light and continue on Rt.120 East for 0.7 miles to John Street. Take a left on John Street and travel for approximately 0.25 miles and the main stem of Elk Creek (EC10) flows under John Street. The headwaters of Elk Creek merge approximately 400 feet upstream from this point in the City of St. Mary's.

Segments addressed in this TMDL

The Elk Creek Watershed is affected by pollution from AMD. This pollution has caused high levels of metals and low pH in the North and South Branches of Elk Creek and below the confluence of an unnamed tributary in the City of St. Mary's.

There are two active mining operations in the watershed. Tamburlin Brothers Coal Co., Inc. (permit #24010903) currently has a 4.0-acre incidental coal extraction permit associated with a surface mine construction project and Park Excavating & Welding, Inc (permit#24030804) has a 3.0-acre small noncoal (Industrial Minerals) surface mine. Neither of these operations have an NPDES permit, and no discharges. All of the discharges in the watershed are from abandoned mines and will be treated as non-point sources. Each segment on the 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.

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;
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

Elk Creek originates near the northern boundary of the bituminous coal region and historical data shows the major sources of AMD in the Elk Creek Watershed come from abandoned deep clay mine portals and ground water seeps.

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

After being identified as a Priority Water Body by the Bureau of Water Quality in 1986, a study was conducted in order to determine the physical and chemical quality of Elk Creek and its tributaries (Pennsylvania Department of Environmental Resources Bureau of Water Quality Management (Pa. DER BWQM) 1986). Results from this study indicated that AMD exerts a significant impact in the Elk Creek Watershed. High metal concentrations were found throughout most of the watershed due to a combination of AMD and treated industrial waste discharges, resulting in severely depressed biological communities. Results from this study indicated that AMD has a considerable impact in the Elk Creek Watershed and that of the approximately 31 miles of Elk Creek (and its tributaries) assessed during this study, around 24 miles were degraded by AMD. Water quality from this report has been incorporated into the TMDL.

Several mine drainage seeps have been identified along the North and South Branches of Elk Creek, in the City of St. Mary's and are a result of abandoned deep clay mining activities (NBECD1, NBECD2, NBECD3, NBEC6, NBEC8, SBECD3, SBEC8A). An AMD seep was also documented on the headwaters of an unnamed tributary to Elk Creek in the City of St. Mary's (UNT06D). Several AMD seeps were identified on the headwaters of Iron Run, a tributary to Elk Creek, as originating from an old strip mine and landfill in the City of St. Mary's (IR16, IR17). Daguscahonda Run is also impaired by AMD. A deep mine discharge (DMD) along the mainstem was identified along with several low flow seeps (SEEP 1-4, UNT01D). On the headwaters of Beaver Run, a tributary to Daguscahonda Run, two AMD seeps were identified that originate in the Fox Township Industrial Park (BR01C, BR01D).

Baker Environmental, Inc. performed a Focused Feasibility Study (FFS) for the Department of Environmental Protection, Northwest Regional Office Environmental Cleanup Program (PADEP Contract No.: ME-359184, Work Requisition No.: 36-046), in order to address environmental concerns at the 89.5-acre St. Mary's Landfill Site and develop response action alternatives (RAAs) to control off-site mitigation of the contaminants and to protect human health and the environment. This site had been extensively deep-mined and strip-mined and then used as a landfill from the 1950's to 1978. Several leachate flows were identified and sampled during the course of the study consisting of a mixture of AMD and landfill leachate, which drain to headwater tributaries of Iron Run, which flows into Elk Creek. RAA's developed by this study included capping the landfill, treatment of leachate and collection and control of landfill gases.

The Department of Environmental Protections (DEP) Northwest Regional Office Environmental Cleanup Division is currently working with EM Source St. Mary's LLC, former Stackpole Carbon, to remediate Tri-Chloro-Ethylene (TCE) contamination on Elk Creek in the City of St. Marys.

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, 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:

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

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

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

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

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

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 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 NPDES 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, assuming upstream reductions are achieved, 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.

In the instance that the allowable load is equal to the existing load (e.g. iron point SBEC9, 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. aluminum point SBEC9, 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.

Table 3. TMDL Component Summary for the Elk Creek Watershed

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
SBEC8	*South Branch Elk Creek above Trout Run Rd.*						
	Al	0.9	0.2	0.0	0.2	0.7	76
	Fe	3.7	1.1	0.0	1.1	2.5	69
	Mn	2.8	1.6	0.0	1.6	1.2	43
	Acidity	56.5	15.8	0.0	15.8	40.7	72
SBEC9	*South Branch Elk Creek above Trout Run Rd.*						
	Al	ND	NA	-	-	0	0.0

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Fe	0.6	0.6	NA	NA	0	0
	Mn	4.2	2.9	0.0	2.9	0.1	4
	Acidity	111.4	14.5	0.0	14.5	56.2	80
SBEC5	*South Branch of Elk Creek*						
	Al	ND	NA	-	-0	0.0	0
	Fe	7.7	4.2	0.0	4.2	3.5	45
	Mn	8.1	6.6	0.0	6.6	0.2	4
	Acidity	184.7	48.0	0.0	48.0	39.8	45
SBEC4	*South Branch of Elk Creek*						
	Al	15.1	4.2	0.0	4.2	11.9	74
	Fe	72.3	11.6	0.0	11.6	57.2	83
	Mn	25.3	11.9	0.0	11.9	11.8	50
	Acidity	321.0	86.7	0.0	86.7	97.6	53
SBEC	*Mouth of South Branch Elk Creek*						
	Al	47.4	1.9	0.0	1.9	34.6	95
	Fe	167.0	3.3	0.0	3.3	103.0	97
	Mn	33.5	9.0	0.0	9.0	11.1	55
	Acidity	619.6	130.1	0.0	130.1	255.2	66
NBEC8	*Unnamed Trib to North Branch Elk Creek*						
	Al	10.0	0.7	0.0	0.7	9.3	93
	Fe	3.8	0.9	0.0	0.9	2.9	76
	Mn	3.1	1.0	0.0	1.0	2.1	69
	Acidity	123.2	0.5	0.0	0.5	122.7	99.6
NBEC6	*Unnamed Trib to North Branch Elk Creek*						
	Al	36.8	1.5	0.0	1.5	35.3	96
	Fe	25.1	3.0	0.0	3.0	22.1	88
	Mn	9.5	2.6	0.0	2.6	6.9	73
	Acidity	502.9	0.0	0.0	0.0	502.9	100
NBEC5	*North Branch Elk Creek*						
	Al	ND	NA	-	-	0.0	0
	Fe	28.4	20.7	0.0	20.7	0.0	0
	Mn	15.6	15.0	0.0	15.0	0.0	0
	Acidity	801.0	104.1	0.0	104.1	71.2	41
NBEC	*North Branch of Elk Creek*						
	Al	ND	NA	-	-	0.0	0
	Fe	53.3	3.7	0.0	3.7	41.9	92
	Mn	9.2	1.3	0.0	1.3	7.6	95
	Acidity	301.1	69.3	0.0	69.3	0.0	0
NBEC1	*North Branch Elk Creek before conf. with SBEC*						
	Al	25.9	4.9	0.0	4.9	21.0	81

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Fe	37.0	37.0	NA	NA	0.0	0
	Mn	24.6	24.6	NA	NA	0.0	0
	Acidity	1,456.1	160.2	0.0	160.2	1064.1	87
EC10	*Elk Creek where North and South Branches Merge*						
	Al	20.8	7.7	0.0	7.7	0.0	0
	Fe	117.1	21.1	0.0	21.1	2.1	9
	Mn	67.5	27.0	0.0	27.0	16.0	37
	Acidity	1,434.1	344.2	0.0	344.2	0.0	0
UNT06D	*Headwaters of UNT06 @ Lynch Rd where several culverts join*						
	Al	3.9	0.5	0.0	0.5	3.4	87
	Fe	5.5	1.0	0.0	1.0	4.5	81
	Mn	1.50	0.7	0.0	0.7	0.8	55
	Acidity	77.5	2.3	0.0	2.3	75.2	97
UNT06	*Unnamed Tributary to Elk Creek above EC07*						
	Al	0.7	0.28	0.0	0.28	0.0	0
	Fe	1.4	0.72	0.0	0.72	0.0	0
	Mn	0.5	0.54	0.0	0.54	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
EC07	*Elk Creek below UNT06*						
	Al	12.5	3.9	0.0	3.9	0.8	17
	Fe	85.9	15.5	0.0	15.5	0.3	2
	Mn	40.5	22.3	0.0	22.3	0.0	0
	Acidity	ND	NA	-	-	0.0	0
IR1	*Mouth of Iron Run*						
	Al	ND	NA	-	-	0.0	0
	Fe	27.1	13.8	0.0	13.8	13.3	49
	Mn	5.2	5.2	0.0	0.0	0.0	0
	Acidity	419.4	230.7	0.0	230.7	0.0	0
EC07A	*Elk Creek below Iron Run*						
	Al	ND	NA	-	-	0.0	0
	Fe	143.1	22.9	0.0	22.9	36.5	61
	Mn	52.5	31.0	0.0	31.0	3.3	10
	Acidity	ND	NA	-	-A	0.0	0
EC06	*Elk Creek above Silver Run*						
	Al	ND	NA	-	-	0.0	0
	Fe	76.2	8.4	0.0	8.4	3.8	31
	Mn	1,020.9	10.2	0.0	10.2	989.2	99
	Acidity	ND	NA	-	-	0.0	0
SR	*Mouth of Silver Run*						
	Al	ND	NA	-	-	0.0	0

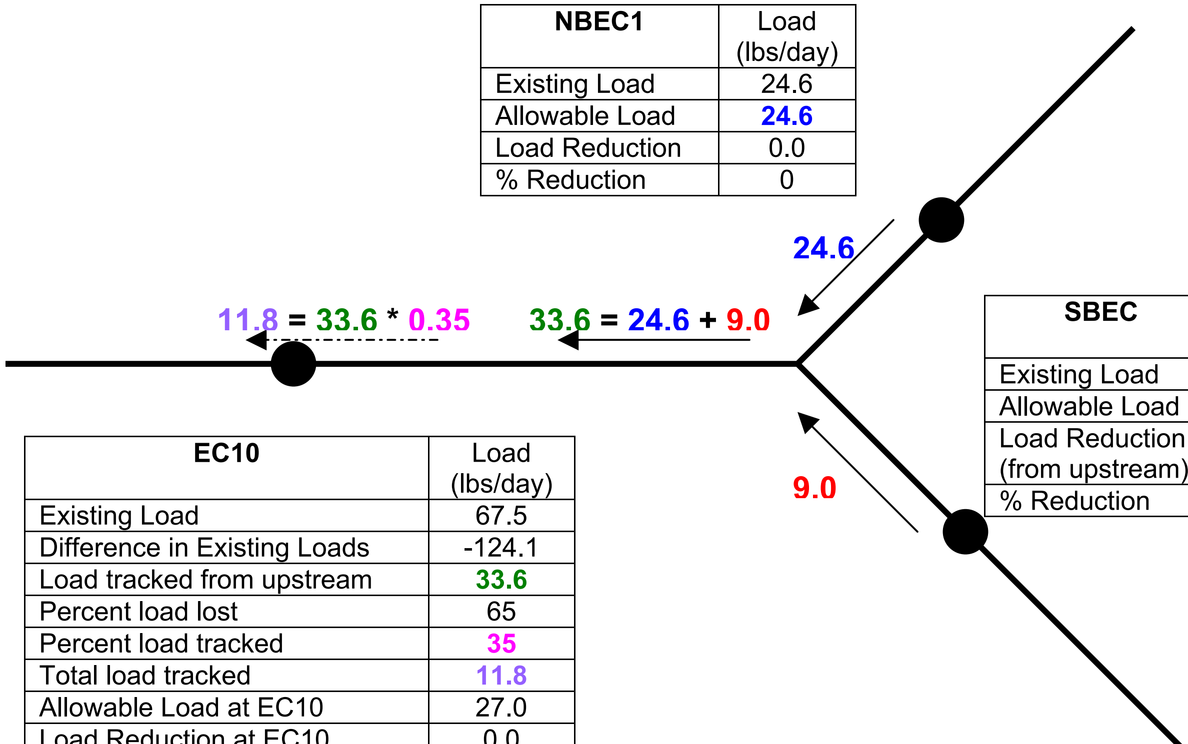
Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Fe	12.2	12.2	NA	NA	0.0	0
	Mn	2.5	2.5	NA	NA	0.0	0
	Acidity	ND	ND	NA	NA	0.0	0
EC05	*Elk Creek above Dusty Hollow*						
	Al	ND	NA	-	-	0.0	0
	Fe	106.3	94.6	0.0	94.6	0.0	0
	Mn	50.6	49.1	0.0	49.1	0.0	0
	Acidity	ND	NA	-	-	0.0	0
DH	*Mouth of Dusty Hollow*						
	Al	ND	NA	-	-	0.0	0
	Fe	0.2	0.2	NA	NA	0.0	0
	Mn	0.1	0.1	NA	NA	0.0	0
	Acidity	5.6	5.6	NA	NA	0.0	0
LR	*Mouth of Laurel Run*						
	Al	ND	NA	-	-	0.0	0
	Fe	0.001	0.001	NA	NA	0.0	0
	Mn	0.029	0.019	0.0	0.019	0.010	35
	Acidity	ND	NA	-	-	0.0	0
WTR	*Mouth of Water Tank Run*						
	Al	ND	NA	-	-	0.0	0
	Fe	ND	NA	-	-	0.0	0
	Mn	0.3	0.3	NA	NA	0.0	0
	Acidity	56.8	27.8	0.0	27.8	29.0	51
SO	*Mouth of Seventy One*						
	Al	ND	NA	-	-	0.0	0
	Fe	ND	NA	-	-	0.0	0
	Mn	0.1	0.1	NA	NA	0.0	0
	Acidity	130.1	42.9	0.0	42.9	87.2	67
EC04	*Elk Creek Below Seventy One*						
	Al	ND	NA	-	-	0.0	0
	Fe	127.6	117.4	0.0	117.4	0.0	0
	Mn	119.1	28.6	0.0	28.6	89.0	76
	Acidity	ND	NA	-	-	0.0	0
DAG09	*Daguscahonda Run above confluence with Elk Creek*						
	Al	165.3	11.6	0.0	11.6	153.7	93
	Fe	90.6	87.9	0.0	87.9	2.7	3
	Mn	586.2	11.7	0.0	11.7	574.5	98
	Acidity	5,888.2	294.4	0.0	294.4	5593.8	95
EC04A	*Elk Creek Below Confluence with Daguscahonda Run*						
	Al	ND	NA	-	-	0.0	0
	Fe	136.1	93.9	0.0	93.9	34.1	27

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Mn	181.9	94.6	0.0	94.6	0.0	0
	Acidity	ND	NA	-	-	0.0	0
UNT04	***Unnamed Tributary to Elk Creek at Town of Daguscahonda***						
	Al	ND	NA	-	-	0.0	0
	Fe	ND	NA	-	-	0.0	0
	Mn	0.1	0.1	NA	NA	0.0	0
	Acidity	40.3	23.8	0.0	23.8	16.5	41
RR	***Rocky Run***						
	Al	ND	NA	-	-	0.0	0
	Fe	2.4	0.1	0.0	0.1	2.3	96
	Mn	2.6	0.1	0.0	0.1	2.5	97
	Acidity	22.6	2.5	0.0	2.5	20.1	89
RR1	*Mouth of Rocky Run*						
	Al	ND	NA	-	-A	0.0	0
	Fe	ND	NA	-	-	0.0	0
	Mn	2.3	2.3	NA	NA	0.0	0
	Acidity	232.2	78.9	0.0	78.9	133.2	63
UNT03	*Unnamed Tributary to Elk Creek (above UNT02)*						
	Al	ND	NA	-	-	0.0	0
	Fe	ND	NA	-	-	0.0	0
	Mn	ND	NA	-	-	0.0	0
	Acidity	12.2	8.6	0.0	8.6	3.7	30
UNT02	*Unnamed Tributary to Elk Creek (above EC03)*						
	Al	ND	NA	-	-	0.0	0
	Fe	ND	NA	-	-	0.0	0
	Mn	0.3	0.3	NA	NA	0.0	0
	Acidity	27.9	9.2	0.0	9.2	18.7	67
EC03	*Elk Creek above Mohan Run*						
	Al	ND	NA	-	-	0.0	0
	Fe	64.8	64.8	0.0	64.8	0.0	0
	Mn	80.2	62.5	0.0	62.5	0.0	0
	Acidity	1,442.3	389.4	0.0	389.4	860.7	69
UNT01	*Unnamed Tributary to Elk Creek*						
	Al	ND	NA	-	-A	0.0	0
	Fe	ND	NA	-	-	0.0	0
	Mn	0.2	0.2	NA	NA	0.0	0
	Acidity	ND	NA	-	-	0.0	0
ECO1	*Mouth of Elk Creek*						
	Al	ND	NA	-	-	0.0	0
	Fe	145.8	132.6	0.0	132.6	13.1	9

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Mn	132.6	131.3	0.0	131.3	0.0	0
	Acidity	ND	NA	-	-	0.0	0

ND, Not Detected.
NA meets WQS. No TMDL necessary.

Following is an example of how the allocations, presented in Table 3 are calculated. For this example, manganese allocations for points NBEC1, SBEC and EC10 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.



NBEC1	Load (lbs/day)
Existing Load	24.6
Allowable Load	**24.6**
Load Reduction	0.0
% Reduction	0

SBEC	Load (lbs/day)
Existing Load	167.0
Allowable Load	**9.0**
Load Reduction (from upstream)	158.0
% Reduction	95

EC10	Load (lbs/day)
Existing Load	67.5
Difference in Existing Loads	-124.1
Load tracked from upstream	**33.6**
Percent load lost	65
Percent load tracked	**35**
Total load tracked	**11.8**
Allowable Load at EC10	27.0
Load Reduction at EC10	0.0
% Reduction required at EC10	0

Recommendations

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.

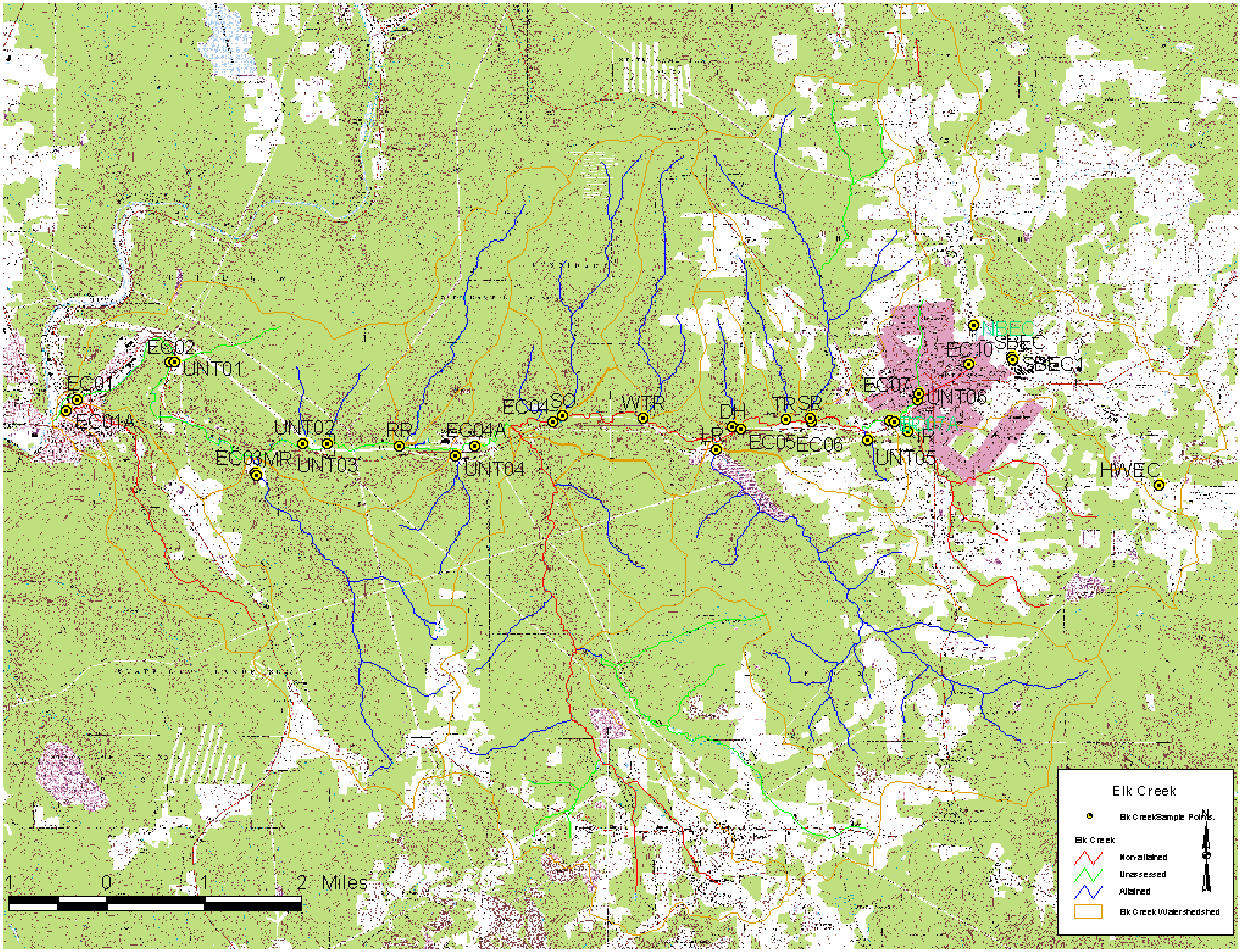
Public Participation

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* and the Ridgway Record on December 7 & 8, 2004 to foster public comment on the allowable loads calculated. The public comment period on this TMDL was open from November 20, 2004 to January 19, 2004. A public meeting was held on December 15, 2004 at the Elk County Courthouse Annex in Ridgway , PA, to discuss the proposed TMDL.

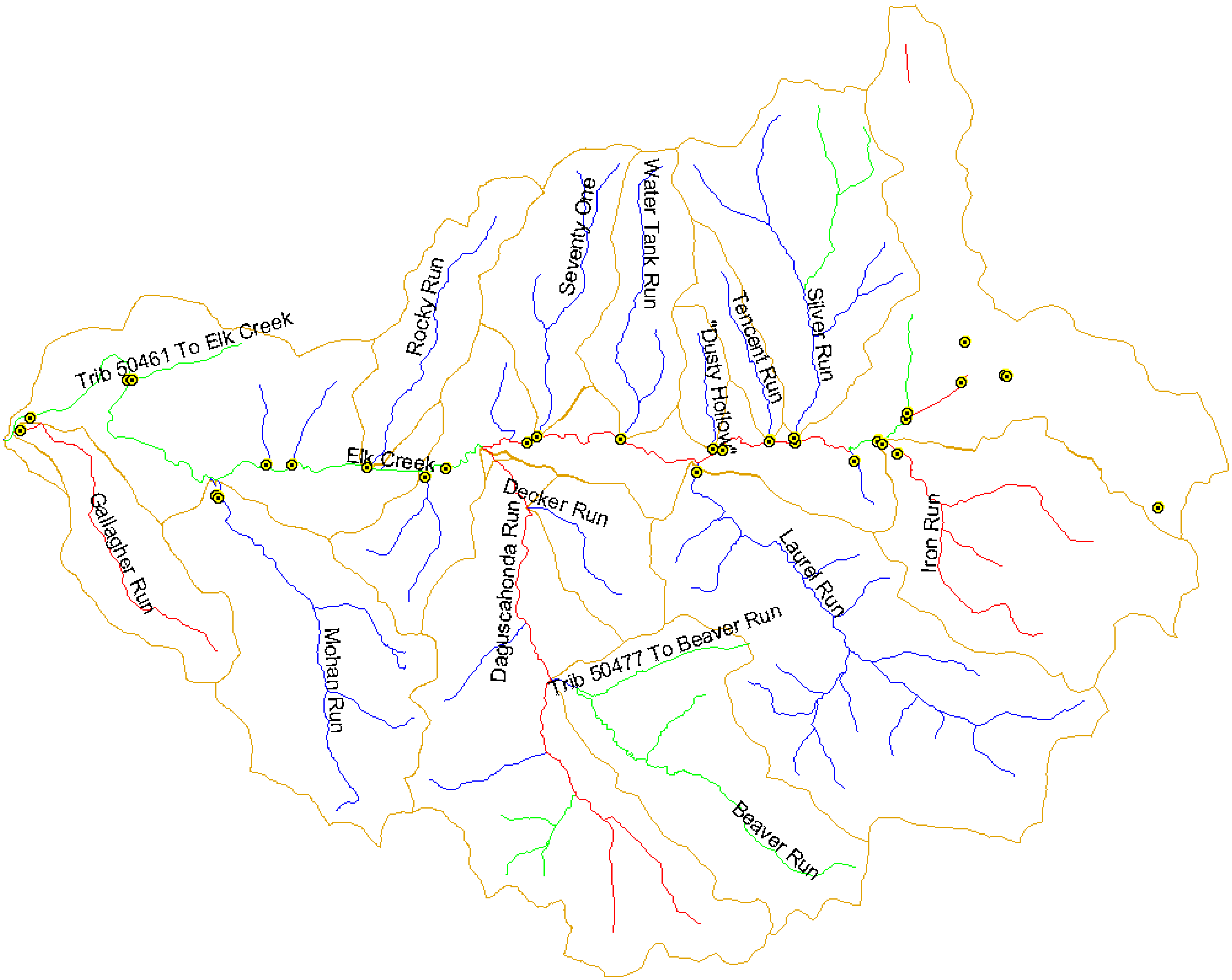
Attachment A

Elk Creek Watershed Maps

DRAFT

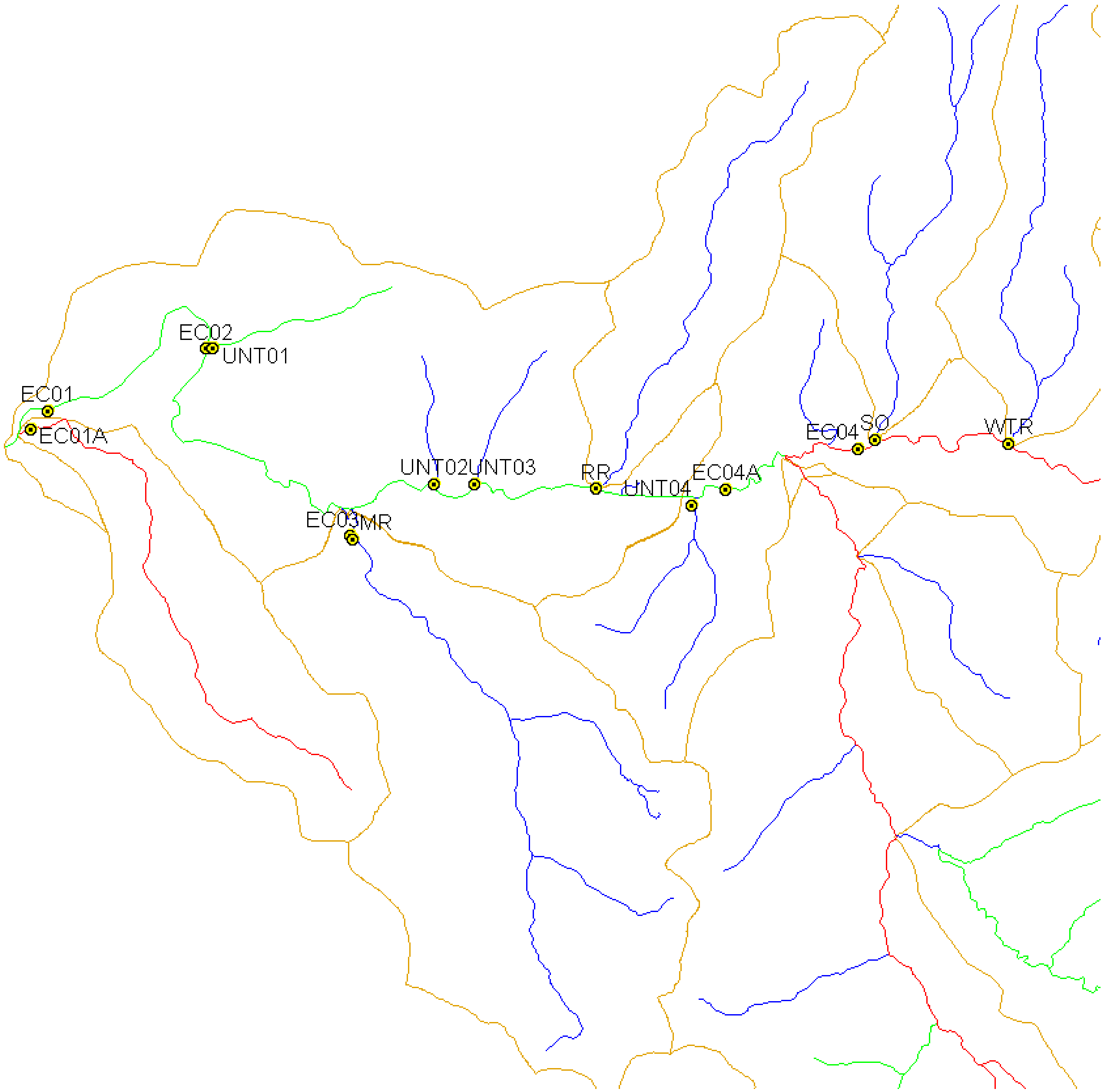

EC02
UNT01
EC01
EC01A
UNT02
RR
EC04A
EC03MP
UNT03
UNT04
EC04
SQ
WTR
DH
TR
SR
LP
EC05
EC06
EC07
UNT06
UNT05
EC10
SBEC
SBEC1
HWEC
1 0 1 2 Miles
Elk Creek
Elk Creek Sample Points.
Elk Creek
Non-attained
Unassessed
Attained
Elk Creek Watershedshed
N

DRAFT



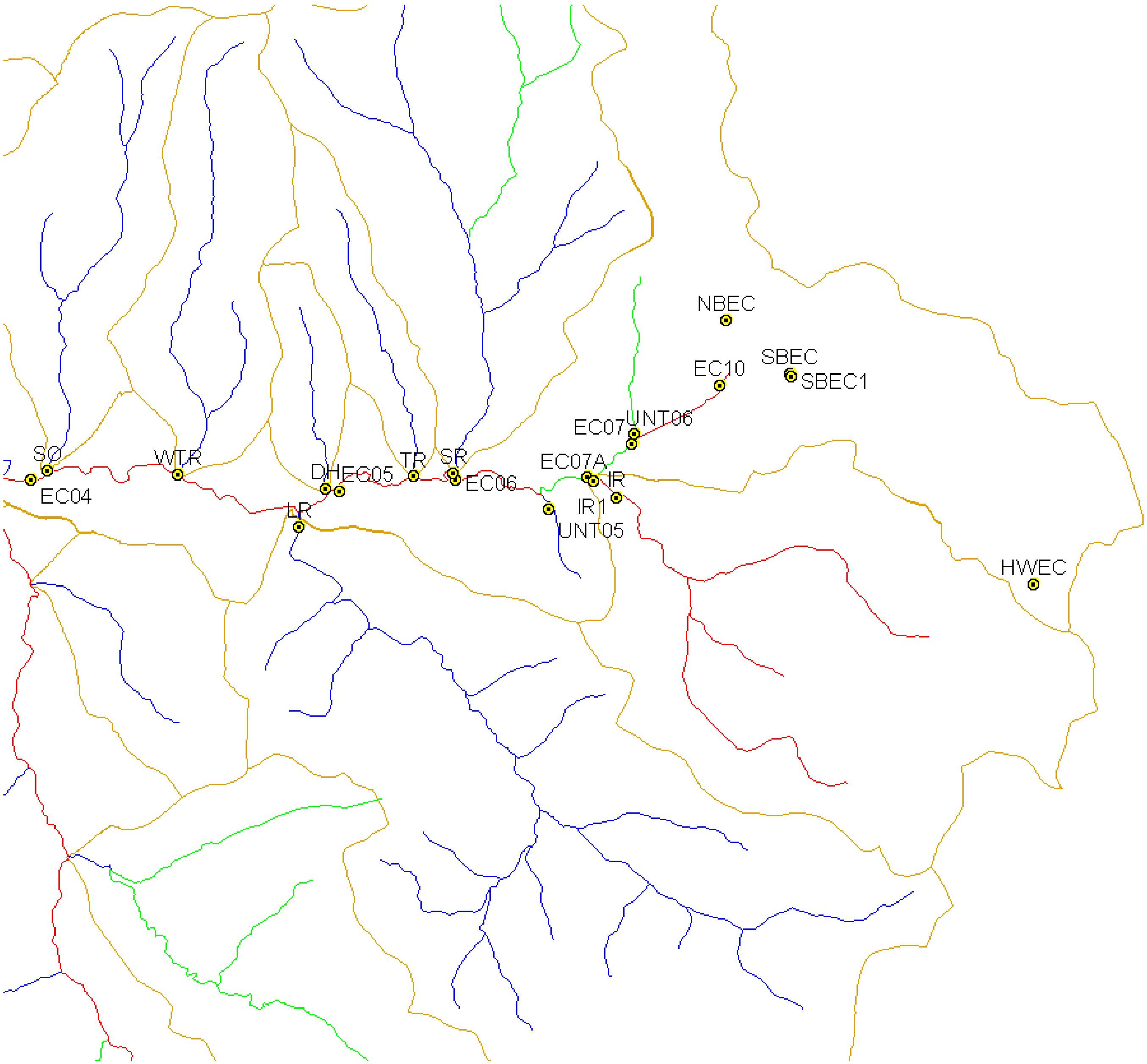
Trib 50461 To Elk Creek
Rocky Run
Seventy One
Water Tank Run
"Dusty Hollow"
Tencent Run
Silver Run
Elk Creek
Decker Run
Daguscahonda Run
Gallagher Run
Mohan Run
Laurel Run
Iron Run
Trib 50477 To Beaver Run
Beaver Run

DRAFT



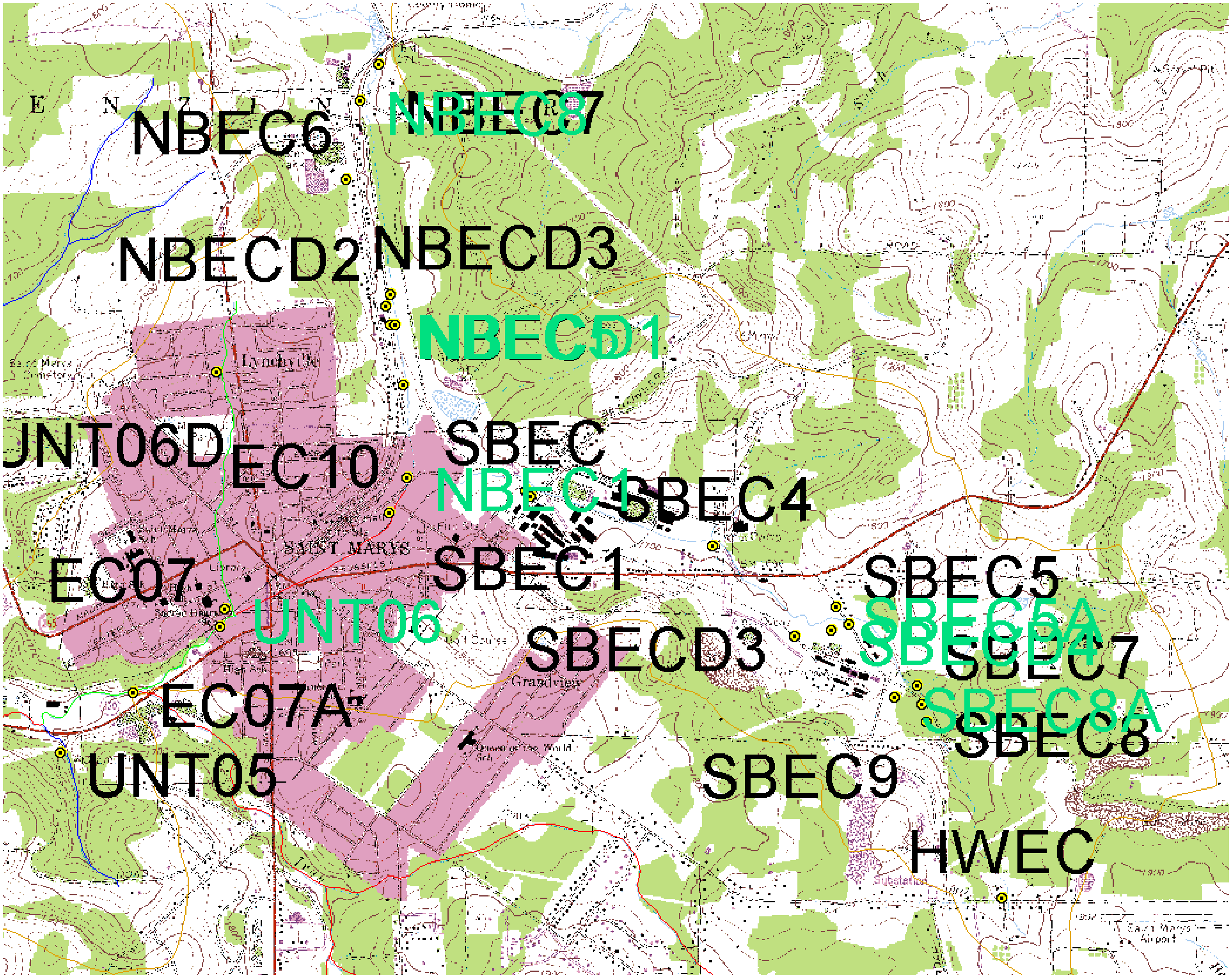
EC02
UNT01
EC01
EC01A
UNT02
UNT03
RR
UNT04
EC04A
EC03
MR
EC04
SO
WTR

DRAFT



NBEC
EC10
SBEC
SBEC1
EC07
UNT06
SO
WTR
TR
SR
EC07A
IR
DHEC05
EC06
EC04
LR
IR1
UNT05
HWEC

DRAFT



NBEC6
NBEC7
NBEC8
NBECD2
NBECD3
SBEC
NBEC1
SBEC4
EC10
EC07
SBEC1
SBEC5
SBEC5A
SBEC7
UNT06
SBECD3
EC07A
SBEC8A
SBEC8
UNT05
SBEC9
HWEC

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 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.*

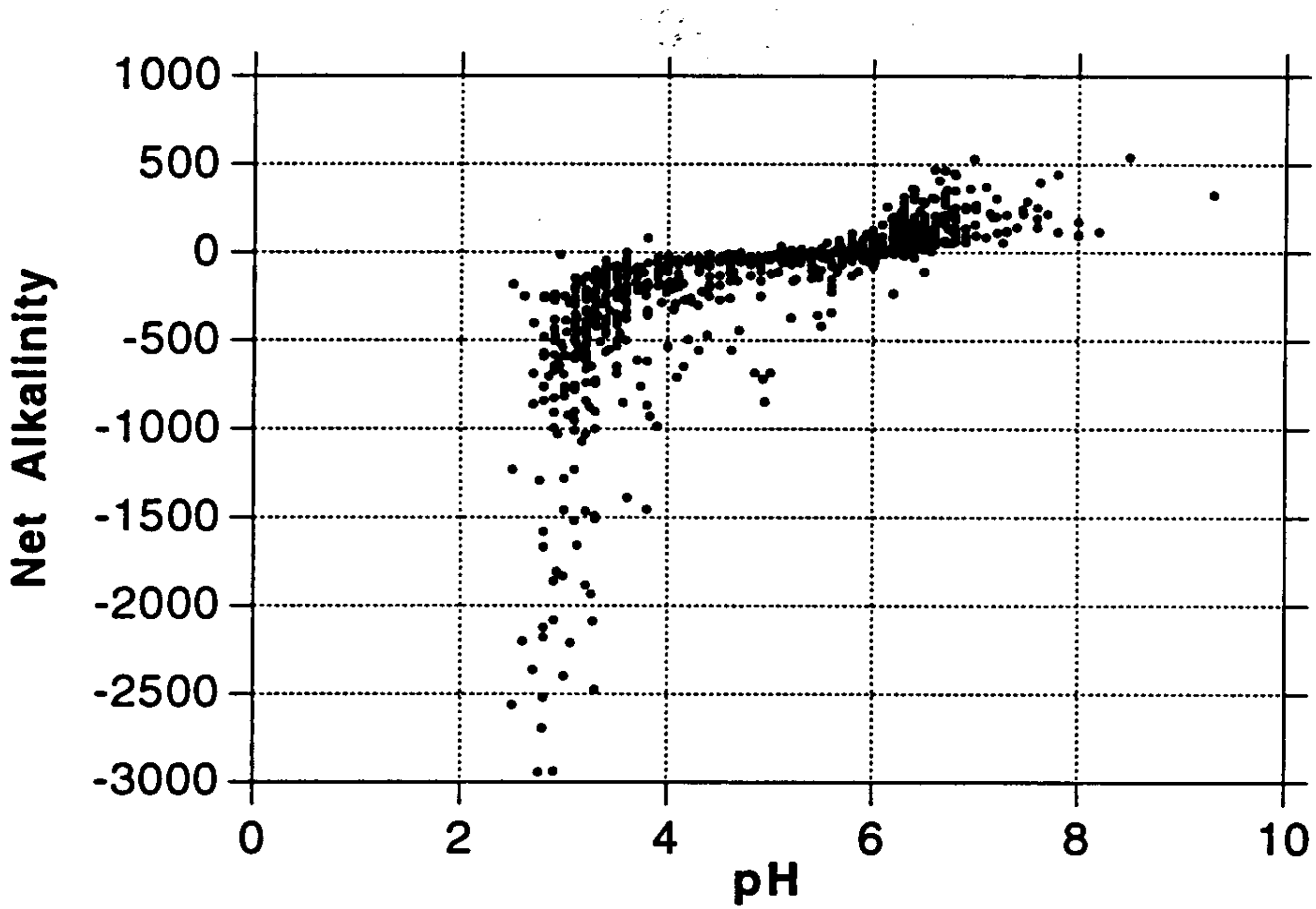


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C
TMDLs By Segment

Elk Creek

The TMDL for Elk Creek consists of load allocations for thirty-four sampling sites within the Elk Creek Watershed.

Elk Creek is listed for metals from AMD as being the cause of the degradation to the stream. The method and rationale for addressing pH is contained in Attachment B.

An allowable long-term average in-stream concentration was determined at the points below for aluminum, iron, manganese 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.

HWEC Headwaters South Branch Elk Creek

TMDLs were not calculated for this sample point. Metals and acidity are negligible and only one flow was collected. This sample point is included in the allocation at the next downstream sample point SBEC8.

SBEC8 South Branch Elk Creek, first sample point downstream from the Headwaters

The TMDL for this sample point on Elk Creek consists of a load allocation to the all of the area upstream. The load allocation for this segment was computed using water-quality sample data collected at point SBEC8. The average flow, measured at the sampling point SBEC8 (0.34 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SBEC8 shows pH ranging between 6.1 and 7.0, pH will be addressed in this TMDL because of the mining impact. 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 aluminum TMDL was not calculated because aluminum was present in only one of five samples.

Table C1. Load Allocations for Point SBEC8				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load lbs/day
Aluminum	ND	ND	NA	NA
Iron	1.31	3.7	0.41	1.1
Manganese	0.98	2.8	0.56	1.6
Acidity	20.12	56.5	5.63	15.8
Alkalinity	26.48	74.4		

Table C2. Calculation of Load Reduction Necessary at Point SBEC8				
	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	ND	3.7	2.8	56.5
Allowable Load=TMDL	NA	1.1	1.6	15.8
Load Reduction	0.0	2.5	1.2	40.7
Total % Reduction	0	69	43	72

SBEC9 South Branch Elk Creek

The TMDL for this segment of Elk Creek consists of a load allocation to all of the watershed area between sample points SBEC8 and SBEC9. The load allocation for this segment was computed using water-quality sample data collected at point SBEC9. The average flow, measured at the sampling point SBEC9 (0.59 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SBEC9 shows pH ranging between 6.5 and 6.6, pH will be addressed in this TMDL because of the mining impacts. 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.

Table C3. Load Allocations at Point SBEC9				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.12	0.6	0.12	0.6
Manganese	0.85	4.2	0.59	2.9
Acidity	22.60	111.4	2.94	14.5
Alkalinity	14.07	69.3		

The calculated load reductions for all the loads that enter point SBEC9 must be accounted for in the calculated reductions at sample point SBEC9 shown in Table C4. A comparison of measured loads between points SBEC9, and SBEC5 shows that there is no additional loading entering the segment for aluminum and iron. For aluminum and iron percent decrease in existing load is applied to the allowable upstream load entering the segment. There is an increase in manganese and acidity loading within the segment. The total segment load manganese and acidity is the sum on the upstream allocated loads and any additional loading within the segment.

Table C4. Calculation of Load Reduction at Point SBEC9				
	Al	Fe	Mn	Acidity
Existing Load	ND	0.6	4.2	111.4
Difference in Existing Load between SBEC8 & SBEC9	-	-3.1	1.4	54.8
Load tracked from SBEC8	-	1.1	1.6	15.8
Percent loss due to instream process	-	84	-	-
Percent load tracked from BR01A	-	16	-	-
Total Load tracked between points SBEC8 & SBEC9	-	0.2	3.0	70.7
Allowable Load at SBEC9	NA	0.6	2.9	14.5
Load Reduction at SBEC9	0.0	0.0	0.1	56.2
% Reduction required at SBEC9	0	0	4	80

SBEC8A and SBEC7

SBEC8A is a seep and SBEC7 is a Unt to South Branch Elk Creek downstream of SBEC8. Neither of these had TMDLs calculated for them because one is a seep, with only three samples collected, and only two samples were collected on the Unt. Both of these are included in the next downstream sample point.

SBEC5 South Branch Elk Creek

The TMDL for sampling point SBEC5 consists of a load allocation of the area between sample points SBEC9 and SBEC5. The load allocation for this tributary was computed using water-quality sample data collected at point SBEC5. The average flow, measured at the sampling point SBEC5 (1.50 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SBEC5 shows pH ranging between 6.1 and 7.0, pH will be addressed in this TMDL because or the affects of mining. 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.

A TMDL was not calculated for aluminum because there was only one aluminum value in the six samples collected.

Table C5. Load Allocations at Point SBEC5

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	14.77	184.7	0.34	4.2
Manganese	0.62	7.7	0.52	6.6
Acidity	20.90	261.4	3.84	48.0
Alkalinity	6.67	83.4		

The calculated load reductions for all the loads that enter point SBEC5 must be accounted for in the calculated reductions at sample point SBEC5 shown in Table C6. A comparison of measured loads between points SBEC9, and SBEC5 shows that there is no additional loading entering the segment for manganese. For manganese percent decrease in existing load is applied to the allowable upstream load entering the segment. There is an increase in aluminum, iron, and acidity loading within the segment. The total segment load is the sum on the upstream allocated loads and any additional loading within the segment.

Table C6. Calculation of Load Reduction at Point SBEC5				
	Al	Fe	Mn	Acidity
Existing Load	ND	7.7	8.1	184.7
Difference in Existing Load between SBEC9 & SBEC5	-	7.1	3.9	73.3
Load tracked from SBEC9	-	0.6	2.9	14.5
Total Load tracked from SBEC9	-	7.7	6.8	87.8
Allowable Load at SBEC5	NA	4.2	6.6	48.0
Load Reduction at SBEC5	0.0	3.5	0.2	39.8
% Reduction required at SBEC5	0	45	4	45

SBECD3 and SBEC5A

Allocations were not calculated for either of these sample points. SBECD3 is a seep and only two flow samples were collected. SBEC5A is an Unt to South Branch Elk Creek the metals are all below the water quality standards and there was no acidity present. The affects of these sample points are included in the next downstream sample point SBEC4

SBEC4 South Branch Elk Creek

The TMDL for this sample point consists of a load allocation to the area between SBEC5 and SBEC4. The load allocation for this segment was computed using water-quality sample data collected at point SBEC4. The average flow, measured at the sampling point SBEC4 (2.17 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SBEC4 shows pH ranging between 6.2 and 6.7, pH will be addressed in this TMDL because of the mining impacts. 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.

Table C7. Load Allocations for Point SBEC4				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.84	15.1	0.23	4.2
Iron	3.99	72.3	0.64	11.6
Manganese	1.40	25.3	0.66	11.9
Acidity	17.73	321.0	4.79	86.7
Alkalinity	25.80	467.0		

The calculated load reductions for all the loads that enter point SBEC4 must be accounted for in the calculated reductions at sample point SBEC4 shown in Table C8. A comparison of measured loads between points SBEC5 and SBEC4 shows that there is additional loading entering the segment. There is an increase in aluminum, iron, manganese, and acidity loading within the segment. The total segment load is the sum on the upstream allocated loads and any additional loading within the segment.

Table C8. Calculation of Load Reduction at Point SBEC4				
	Al	Fe	Mn	Acidity
Existing Load	15.1	72.3	25.3	321.0
Difference in Existing Load between SBEC5 & SBEC4	15.1	64.6	17.2	136.3
Load tracked from SBEC5	1.0	4.2	6.6	48.0
Total Load tracked from SBEC5	16.1	68.8	23.7	184.3
Allowable Load at SBEC4	4.2	11.6	11.9	86.7
Load Reduction at SBEC4	11.9	57.2	11.8	97.6
% Reduction required at SBEC4	74	83	50	53

SBEC South Branch Elk Creek upstream of confluence with Elk creek

The TMDL for this segment consists of a load allocation to all of the watershed area between sample points SBEC4 and SBEC. The load allocation for this segment was computed using water-quality sample data collected at point SBEC. The average flow, measured at the sampling point SBEC (2.26 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SBEC shows pH ranging between 4.4 and 6.7, pH will be addressed in this TMDL because of the mining impacts. 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.

Table C9. Load Allocations at Point SBEC				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	2.52	47.4	0.10	1.90
Iron	8.86	167.0	0.18	3.34
Manganese	1.78	33.5	0.48	9.03
Acidity	32.89	619.6	6.91	130.11
Alkalinity	20.04	377.6		

The calculated load reductions for all the loads that enter point SBEC must be accounted for in the calculated reductions at sample point SBEC shown in Table C10. A comparison of measured loads between points SBEC4, and SBEC shows that there is additional loading entering the segment for aluminum, iron, manganese, and acidity. There is an increase in aluminum, iron, manganese and acidity loading within the segment. The total segment manganese and acidity load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C10. Calculation of Load Reduction at Point SBEC				
	Al	Fe	Mn	Acidity
Existing Load	47.4	167.0	33.5	619.6
Difference in Existing Load between SBEC4 & SBEC	32.3	94.7	8.2	298.6
Load tracked from SBEC4	4.2	11.6	11.9	86.7
Total Load tracked from SBEC4	36.5	106.3	20.1	385.3
Allowable Load at SBEC	1.9	3.3	9.0	130.1
Load Reduction at SBEC	34.6	103.0	11.1	255.2
% Reduction required at SBEC	95	97	55	66

NBEC7 Most Upstream sample point on the North Branch Elk Creek

A TMDL was not calculated for NBEC7 because the metals are all less than the water quality standards, there is no acidity and no flow data were captured.

NBEC8 Unt North Branch Elk Creek downstream of NBEC7

The TMDL for sampling point NBEC8 consists of a load allocation of the area upstream of NBEC8. The load allocation for this tributary was computed using water-quality sample data collected at point NBEC8. The average flow, measured at the sampling point NBEC8 (0.16 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point NBEC8 shows pH ranging between 3.2 and 4.0, pH will be addressed in this TMDL because of the affects of mining. 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.

Table C11. Load Allocations at Point NBEC8

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	7.43	10.0	0.52	0.7
Iron	2.81	3.8	0.67	0.9
Manganese	2.28	3.1	0.71	1.0
Acidity	91.60	123.2	0.37	0.5
Alkalinity	0.45	0.6		

Table C12. Calculation of Load Reduction Necessary at Point NBEC8

	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	10.0	3.8	3.1	123.2
Allowable Load=TMDL	0.7	0.9	1.0	0.5
Load Reduction	9.3	2.9	2.1	122.7
Total % Reduction	93	76	69	99.6

NBEC6 Unnamed Tributary North Branch Elk Creek downstream of NBEC8

The TMDL for sampling point NBEC6 consists of a load allocation of the area upstream of NBEC6. The load allocation for this tributary was computed using water-quality sample data collected at point NBEC6. The average flow, measured at the sampling point NBEC6 (0.43 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point NBEC6 shows pH ranging between 3.0 and 3.5, pH will be addressed in this TMDL because of the affects of mining. 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.

Table C13. Load Allocations at Point NBEC6				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	10.37	36.8	0.42	1.5
Iron	7.06	25.1	0.85	3.0
Manganese	2.68	9.5	0.72	2.6
Acidity	141.60	502.9	0.00	0.0
Alkalinity	0.00	0.0		

Table C14. Calculation of Load Reduction Necessary at Point NBEC6				
	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	36.8	25.1	9.5	502.9
Allowable Load=TMDL	1.5	3.0	2.6	0.0
Load Reduction	35.3	22.1	6.9	502.9
Total % Reduction	96	88	73	100

NBECD3 and NBECD2

NBECD3 is an abandoned discharged and NBECD2 is a discharge from a wetland. Both of these are reflected in the TMDL at NBEC5.

NBEC5 North Branch Elk Creek

The TMDL for sampling point NBEC5 consists of a load allocation of the area between sample points NBEC8, NBEC6 and NBEC5. The load allocation for this tributary was computed using water quality sample data collected at point NBEC5. The average flow, measured at the sampling point NBEC5 (3.32 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point NBEC6 shows pH ranging between 4.8 and 6.6, pH will be addressed in this TMDL because of the affects of mining. 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.

No TMDL was calculated for aluminum at this sample point because there was aluminum present in only one out of five samples.

Table C15. Load Allocations at Point NBEC5				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	1.03	28.4	0.75	20.7
Manganese	0.56	15.6	0.54	15.0
Acidity	28.92	801.0	3.76	104.1
Alkalinity	13.56	375.6		

The calculated load reductions for all the loads that enter point NBEC5 must be accounted for in the calculated reductions at sample point NBEC5 shown in Table C16. A comparison of measured loads between points NBEC8, NBEC6, and NBEC5 shows that there is no additional loading entering the segment for aluminum, iron, and manganese. For aluminum, iron, and manganese the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is an increase in acidity loading within the segment. The total segment acidity load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C16. Calculation of Load Reduction at Point NBEC5				
	Al	Fe	Mn	Acidity
Existing Load	ND	28.4	15.6	801.0
Difference in Existing Load between NBEC8, NBEC6 & NBEC5	-	-0.4	3.0	174.8
Load tracked from NBEC8 & NBEC6	-	3.9	3.5	0.5
Percent loss due to instream process	-	1	-	-
Percent load tracked from NBEC6	-	99	-	-
Total Load tracked from NBEC8 & NBEC6	-	3.9	6.5	175.3
Allowable Load at NBEC5	NA	20.7	15.0	104.1
Load Reduction at NBEC5	0.0	0.0	0.0	71.2
% Reduction required at NBEC5	0	0	0	41

NBECD1 Mine Seep into the North Branch Elk Creek

No TMDL was calculated for this seep. This sample point is considered in the TMDL at sample point NBEC.

NBEC North Branch Elk Creek

The TMDL for this segment of North Branch Elk Creek consists of a load allocation to all of the watershed area between sample points NBEC5 and NBEC. The load allocation for this segment was computed using water-quality sample data collected at point NBEC. The average flow, measured at the sampling point NBEC (1.84 MGD), is used for these computations.

The flow at this sample point of 1.84 MGD appears to be lower than the upstream and downstream flows would indicate. This is caused by two facts; first NBEC contains three additional flows from 2002 that the other North Branch Elk Creek sample points do not have and second NBEC does not contain any flow sample data from 2004 where the other North Branch Elk Creek sample points contain two.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point NBEC shows pH ranging between 6.1 and 6.8, pH will be addressed in this TMDL because of the mining impacts. 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.

There was no aluminum TMDL calculated at this sample point because aluminum is present in only two of six samples.

Table C17. Load Allocations for Point NBEC

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	3.47	53.3	0.24	3.7
Manganese	0.60	9.2	0.08	1.3
Acidity	19.63	301.1	4.52	69.3
Alkalinity	25.10	385.0		

The calculated load reductions for all the loads that enter point NBEC must be accounted for in the calculated reductions at sample point NBEC shown in Table C18. A comparison of measured loads between points NBEC5 and NBEC shows that there is no additional loading entering the segment for aluminum and acidity. For aluminum and acidity the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is an increase in iron and manganese loading within the segment. The total segment iron and manganese load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C18. Calculation of Load Reduction at Point NBEC				
	Al	Fe	Mn	Acidity
Existing Load	ND	53.3	9.2	301.1
Difference in Existing Load between NBEC5 & NBEC	-	24.9	-6.4	-499.9
Load tracked from NBEC5	-	20.7	15.0	104.1
Percent loss due to instream process	-	-	41	62
Percent load tracked from NBEC5	-	-	59	38
Total Load tracked from NBEC5	-	45.6	8.8	39.1
Allowable Load at NBEC	NA	3.7	1.3	69.3
Load Reduction at NBEC	0.0	41.9	7.3	0.0
% Reduction required at NBEC	0	92	85	0

NBEC1 North Branch Elk Creek before confluence with South Branch Elk Creek

The TMDL for this segment of North Branch Elk Creek consists of a load allocation to the area between sample points NBEC and NBEC1. The load allocation for this segment was computed using water-quality sample data collected at point NBEC1. The average flow, measured at the sampling point NBEC1 (4.83 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point NBEC1shows pH ranging between 4.8 and 6.7, pH will be addressed in this TMDL because of the mining impacts. 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.

Table C19. Load Allocations for Point NBEC1				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.64	25.9	0.12	4.9
Iron	0.92	37.0	0.92	37.0
Manganese	0.61	24.6	0.61	24.6
Acidity	36.14	1456.1	3.98	160.2
Alkalinity	13.64	549.6		

The calculated load reductions for all the loads that enter point NBEC1 must be accounted for in the calculated reductions at sample point NBEC1 shown in Table C20. A comparison of measured loads between points NBEC and NBEC1 shows that there is no additional loading entering the segment for iron, and manganese. For iron, and manganese the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is an increase in aluminum and acidity loading within the segment. The total segment aluminum and acidity, load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C20. Calculation of Load Reduction at Point NBEC1

	Al	Fe	Mn	Acidity
Existing Load	25.9	37.0	24.6	1456.1
Difference in Existing Load between NBEC & NBEC1	25.9	-16.3	15.4	1155.0
Load tracked from NBEC	0.0	3.7	1.3	69.3
Percent loss due to instream process	-	31	-	-
Percent load tracked from NBEC	-	69	-	-
Total Load tracked from NBEC	25.9	2.6	16.7	1224.2
Allowable Load at NBEC1	4.9	37.0	24.6	160.2
Load Reduction at NBEC1	21.0	0.0	0.0	1064.1
% Reduction required at NBEC1	81	0	0	87

EC10 Elk Creek downstream of where the North and South Branches Merge

The TMDL for this segment of Elk Creek consists of a load allocation to all of the watershed area between sample points SBEC, NBEC1, and EC10. The load allocation for this segment was computed using water-quality sample data collected at point EC10. The average flow, measured at the sampling point EC10 (6.40 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point EC10 shows pH ranging between 5.4 and 6.7, pH will be addressed in this TMDL because the mining impacts. 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.

Table C21. Load Allocations for Point EC10				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.39	20.8	0.14	7.7
Iron	2.19	117.1	0.39	21.1
Manganese	1.26	67.5	0.51	27.0
Acidity	26.87	1434.1	6.45	344.2
Alkalinity	26.67	1423.4		

The calculated load reductions for all the loads that enter point EC10 must be accounted for in the calculated reductions at sample point EC10 shown in Table C22. A comparison of measured loads between points SBEC, NBEC1 and EC10 shows that there is no additional loading entering the segment for aluminum and acidity. For the percent decrease in aluminum and acidity existing loads are applied to the allowable upstream loads entering the segment. There is an iron, and manganese increase in loading within the segment. The total segment iron, and manganese, load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C22. Calculation of Load Reduction at Point EC10				
	Al	Fe	Mn	Acidity
Existing Load	20.8	117.1	67.5	1434.1
Difference in Existing Load between SBEC, NBEC1 & EC10	-52.5	-86.9	9.3	-641.6
Load tracked from SBEC & NBEC1	6.8	40.4	33.7	290.3
Percent loss due to instream process	72	43	-	31
Percent load tracked from SBEC &NBEC1	28	57	-	69
Total Load tracked from SBEC &NBEC1	1.9	23.2	43.0	200.6
Allowable Load at EC10	7.7	21.1	27.0	344.2
Load Reduction at EC10	0.0	2.1	16.0	0.0
% Reduction required at EC10	0	9	37	0

UNT06D Unnamed Tributary to Elk Creek

The TMDL for this segment of the Unnamed Tributary to Elk Creek consists of a load allocation to all of the watershed area upstream of sample point UNT06D. The load allocation for this segment was computed using water-quality sample data collected at point UNT06D. The average flow, measured at the sampling point UNT06D (0.14 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point UNT06D shows pH ranging between 3.6 and 4.6, pH will be addressed in this TMDL because of the impact of mining. 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.

Table C23. Load Allocation at Point UNT06D

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	3.29	3.9	0.43	0.5
Iron	4.64	5.5	0.88	1.1
Manganese	1.26	1.5	0.57	0.7
Acidity	65.20	77.5	1.96	2.3
Alkalinity	2.47	2.9		

Table C24. Calculation of Load Reduction Necessary at Point UNT06D

	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	3.9	5.5	1.5	77.5
Allowable Load=TMDL	0.5	1.1	0.7	2.3
Load Reduction	3.4	4.4	0.8	75.2
Total % Reduction	87	81	55	97

UNT06 Unnamed Tributary to Elk Creek near confluence with Elk Creek

The TMDL for this segment of the Unnamed Tributary to Elk Creek consists of a load allocation to all of the watershed area between sample points UNT06D amd UNT06. The load allocation for this segment was computed using water-quality sample data collected at point UNT06. The average flow, measured at the sampling point UNT06 (0.27 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point UNT06 shows pH ranging between 6.8 and 7.6, pH will not be addressed in this TMDL because this segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Table C25. Load Allocation at Point UNT06				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.31	0.7	0.13	0.28
Iron	0.60	1.4	0.32	0.72
Manganese	0.24	0.5	0.24	0.54
Acidity	0.00	0.0	0.0	0.0
Alkalinity	41.80	93.8		

The calculated load reductions for all the loads that enter point UNT06 must be accounted for in the calculated reductions at sample point UNT06 shown in Table C26. A comparison of measured loads between points UNT06D and UNT06 shows that no additional loading entering the segment for aluminum, iron, manganese and acidity. For aluminum, iron, manganese and acidity the percent decrease in existing loads are applied to the allowable upstream loads entering

Table C26. Calculation of Load Reduction at Point UNT06				
	Al	Fe	Mn	Acidity
Existing Load	0.7	1.4	0.5	0.0
Difference in Existing Load between UNT06D & UNT06	-3.2	-4.2	-1.0	-77.5
Load tracked from UNT06D	0.5	1.0	0.7	2.3
Percent loss due to instream process	82	76	64	100
Percent load tracked from UNT06D	18	24	36	0
Total Load tracked from UNT06D	0.1	0.3	0.2	0.0
Allowable Load at UNT06	0.3	0.7	0.5	0.0
Load Reduction at UNT06	0.0	0.0	0.0	0.0
% Reduction required at UNT06	0	0	0	0

EC07 Elk Creek downstream of UNT06

The TMDL for this segment of Elk Creek consists of a load allocation to the area between EC10, UNT06 and sample point EC07. The load allocation for this segment was computed using water-quality sample data collected at point EC07. The average flow, measured at the sampling point EC07 (3.96 MGD), is used for these computations.

The flow at this sample point (EC07) appears to differ from what it might be considering the flow at the upstream sample point of EC10. Sample point EC10 contains two flow samples from 2004 that EC07 does not contain. In addition EC07 has two flows from 1986 and 2002 that EC10 does not have. The year of 2004 was a wet year compared to the previous years.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point EC07 shows pH ranging between 6.4 and 7.0, pH will not be addressed in this TMDL because the segment is net alkaline and there was acidity present in only one of six samples. The method and rationale for addressing pH is contained in Attachment B.

Table C27. Load Allocations for Point EC07				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.38	12.5	0.12	3.9
Iron	2.60	85.9	0.47	15.5
Manganese	1.23	40.5	0.67	22.3
Acidity	ND	ND	NA	NA
Alkalinity	31.80	1051.1		

The calculated load reductions for all the loads that enter point EC07 must be accounted for in the calculated reductions at sample point EC07 shown in Table C28. A comparison of measured loads between points EC10, UNT06 and EC07 shows that there is no additional loading entering the segment for manganese and acidity. For manganese and acidity the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is an increase in aluminum and iron loading within the segment. The total segment aluminum and iron load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C28. Calculation of Load Reduction at Point EC07				
	Al	Fe	Mn	Acidity
Existing Load	12.5	85.9	40.5	ND
Difference in Existing Load between EC10, UNT06 & EC07	-9.0	-32.5	-27.5	-
Load tracked from EC10 & UNT06	8.0	21.8	27.5	-
Percent loss due to instream process	42	27	40	-
Percent load tracked from EC10 & UNT06	58	73	60	-
Total Load tracked from EC10 & UNT06	4.6	15.8	16.4	-
Allowable Load at EC07	3.9	15.5	22.3	NA
Load Reduction at EC07	0.8	0.3	0.0	0.0
% Reduction required at EC07	17	2	0	0

IR1 Iron Run upstream of confluence with Elk Creek

The TMDL for Iron Run consists of a load allocation to all of the watershed area upstream of sample point IR1. The load allocation for this segment was computed using water-quality sample data collected at point IR1. The average flow, measured at the sampling point IR1 (6.25 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point IR1 shows pH ranging between 6.7 and 7.8, pH will be addressed in this TMDL because of the mining impacts. 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.

Table C29. Load Allocations at Point IR1

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.52	27.1	0.27	13.8
Manganese	0.10	5.2	0.10	5.2
Acidity	8.05	419.4	4.43	230.7
Alkalinity	37.33	1944.8		

Table C30. Calculation of Load Reduction Necessary at Point IR1

	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	ND	27.1	5.2	419.4
Allowable Load=TMDL	NA	13.8	5.2	230.7
Load Reduction	0.0	13.3	0.0	188.7
Total % Reduction	0	49	0	45

EC07A Elk Creek downstream of IR1, Iron Run

The TMDL for this segment of Elk Creek consists of a load allocation to the area between EC07, IR1 and sample point EC07A. The load allocation for this segment was computed using water-quality sample data collected at point EC07A. The average flow, measured at the sampling point EC07A (7.75 MGD), is used for these computations.

The flow at sample point EC07A does not compare favorably with the flow at EC10. The reasons are similar to those at EC07: EC10 contains two flows from 2004; EC07A does not. But, EC07A is missing two flows that are included in EC07 (1986 and one in 2002(.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point EC07A shows pH ranging between 6.1 and 7.6, pH will not be addressed in this TMDL because there were only two samples, out of seven, containing acidity. The method and rationale for addressing pH is contained in Attachment B.

An aluminum TMDL was not calculated for this segment because there were only three of seven samples containing aluminum.

Table C31. Load Allocations for Point EC07A				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	2.21	143.1	0.35	22.9
Manganese	0.81	52.5	0.48	31.0
Acidity	NA	NA	NA	NA
Alkalinity	28.60	1848.3		

The calculated load reductions for all the loads that enter point EC07A must be accounted for in the calculated reductions at sample point EC07A shown in Table C32. A comparison of measured loads between points EC07, IR1 and EC07A shows that there is no additional loading entering the segment for aluminum, iron and acidity. For aluminum, iron and acidity the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is an increase in manganese loading within the segment. The total segment manganese load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C32. Calculation of Load Reduction at Point EC07A				
	Al	Fe	Mn	Acidity
Existing Load	ND	143.1	52.5	0.0
Difference in Existing Load between EC07, IR1 & EC07A	-	30.1	6.7	-419.4
Load tracked from EC07 & IR1	-	29.3	27.5	230.7
Percent loss due to instream process	-	-	-	100
Percent load tracked from EC07 & IR1	-	-	-	0
Total Load tracked from EC07 & IR1	-	59.4	34.2	0.0
Allowable Load at EC07A	NA	22.9	31.0	0.0
Load Reduction at EC07A	0.0	36.5	3.3	0.0
% Reduction required at EC07A	0	61	10	0

UNT05 Unt to Elk Creek Upstream of EC06

TMDLs were not calculated at this sample point because the metals are less than water quality standards and acidity is negligible.

EC06 Elk Creek upstream of Silver Run

The TMDL for this segment of Elk Creek consists of a load allocation to the segment between EC07A and EC06. The load allocation for this segment was computed using water-quality sample data collected at point EC06. The average flow, measured at the sampling point EC06 (9.37 MGD), is used for these computations.

The flow at this sample point (EC06) appears to differ from what it might be considering the flow at the upstream sample point of EC10. Sample point EC10 contains two flow samples from 2004 that EC06 does not contain. In addition EC06 has two flows from 1986 and 2002 that EC10 does not have. The year of 2004 was a wet year compared to the previous years.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point EC06 shows pH ranging between 6.7 and 7.3, pH will not be addressed in this TMDL because EC06 is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Neither aluminum nor acidity were present in any of the samples collected at this sample point so TMDLs were not calculated.

Table C33. Load Allocations for Point EC06

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.97	76.2	0.11	8.38
Manganese	13.06	1020.9	0.13	10.21
Acidity	ND	ND	NA	NA
Alkalinity	37.67	2943.7		

Table C34. Calculation of Load Reduction at Point EC06				
	Al	Fe	Mn	Acidity
Existing Load	ND	76.2	1020.9	ND
Difference in Existing Load between EC07A & EC06	-	-66.9	968.5	-
Load tracked from EC07A	-	22.9	31.0	-
Percent loss due to instream process	-	47	-	-
Percent load tracked from EC07A	-	53	-	-
Total Load tracked from EC07A	-	12.2	999.4	-
Allowable Load at EC06	NA	8.4	10.2	NA
Load Reduction at EC06	0.0	3.8	989.2	0.0
% Reduction required at EC06	0	31	99	0

SR Silver Run Tributary to Elk Creek

The TMDL for the Silver Run Tributary to Elk Creek consists of a load allocation to all of the watershed area upstream of sample point SR. The load allocation for this segment was computed using water-quality sample data collected at point SR. The average flow, measured at the sampling point SR (3.00 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SR shows pH ranging between 6.0 and 7.0, pH will not be addressed in this TMDL because there was only one sample of seven that contained acidity. The method and rationale for addressing pH is contained in Attachment B.

Table C35. Load Allocation at Point SR				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.49	12.2	0.49	12.2
Manganese	0.10	2.5	0.10	2.5
Acidity	ND	ND	NA	NA
Alkalinity	17.93	449.4		

Table C36. Calculation of Load Reduction Necessary at Point SR				
	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	ND	12.2	2.5	NA
Allowable Load=TMDL	NA	12.2	2.5	NA
Load Reduction	0.0	0.0	0.0	0.0
Total % Reduction	0	0	0	0

TR Tencent Run, Tributary to Elk Creek Downstream of Silver Run

No TMDLs were calculated for this sample point because the metals and acidity were negligible.

EC05 Elk Creek Downstream of Tencent Run

The TMDL for sampling point EC05 consists of a load allocation of the area between sample points EC06, SR and EC05. The load allocation for this tributary was computed using water-quality sample data collected at point EC05. The average flow, measured at the sampling point EC05 (14.75 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point EC05 shows pH ranging between 6.7 and 7.4, pH will not be addressed in this TMDL because this segment is contains no acidity. The method and rationale for addressing pH is contained in Attachment B.

Table C37. Load Allocations at Point EC05				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.86	106.3	0.77	94.6
Manganese	0.41	50.6	0.40	49.1
Acidity	ND	ND	NA	NA
Alkalinity	39.93	4912.7		

The calculated load reductions for all the loads that enter point EC05 must be accounted for in the calculated reductions at sample point EC05 shown in Table C38. A comparison of measured loads between points EC06, SR and EC05 shows that there is no additional loading entering the segment for aluminum, iron, manganese and acidity. For aluminum, iron, manganese and acidity the percent decrease in existing load is applied to the allowable upstream load entering the segment.

Table C38. Calculation of Load Reduction at Point EC05				
	Al	Fe	Mn	Acidity
Existing Load	ND	106.3	50.6	ND
Difference in Existing Load between EC06, SR & EC06	-	18.0	-972.8	-
Load tracked from EC06 & SR	-	20.5	12.7	-
Percent loss due to instream process	-	-	95	-
Percent load tracked from EC06 & SR	-	-	5	-
Total Load tracked from EC06 & SR	-	38.5	0.6	-
Allowable Load at EC05	NA	94.6	49.1	NA
Load Reduction at EC05	0.0	0.0	0.0	0.0
% Reduction required at EC05	0	0	0	0

DH Dusty Hollow Tributary to Elk Creek

The TMDL for the Dusty Hollow Tributary to Elk Creek consists of a load allocation to all of the watershed area upstream of sample point DH. The load allocation for this segment was computed using water-quality sample data collected at point DH. The average flow, measured at the sampling point DH (0.34 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point DH shows pH ranging between 6.3 and 6.8, pH will not be addressed in this TMDL because of the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Table C39. Load Allocation at Point DH				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.08	0.2	0.08	0.2
Manganese	0.05	0.1	0.05	0.1
Acidity	1.96	5.6	1.96	5.6
Alkalinity	13.32	37.8		

Table C40. Calculation of Load Reduction Necessary at Point DH				
	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	ND	0.2	0.1	5.6
Allowable Load=TMDL	NA	0.2	0.1	5.6
Load Reduction	0.0	0.0	0.0	0.0
Total % Reduction	0	0	0	0

LR Laurel Run Tributary to Elk Creek

The TMDL for the Laurel Run Tributary to Elk Creek consists of a load allocation to all of the watershed area upstream of sample point LR. The load allocation for this segment was computed using water-quality sample data collected at point LR. The average flow, measured at the sampling point LR (0.01 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point LR shows pH ranging between 6.0 and 6.7, pH will not be addressed in this TMDL because there were only two samples of seven containing acidity. The method and rationale for addressing pH is contained in Attachment B.

Table C41. Load Allocation at Point LR				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.02	0.001	0.02	0.001
Manganese	0.37	0.03	0.24	0.02
Acidity	ND	ND	NA	NA
Alkalinity	16.57	1.3		

Table C42. Calculation of Load Reduction Necessary at Point LR				
	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	ND	0.001	0.03	ND
Allowable Load=TMDL	NA	0.001	0.02	NA
Load Reduction	0.0	0.0	0.01	0.0
Total % Reduction	0	0	35	0

WTR Water Tank Run Tributary to Elk Creek

The TMDL for the Water Tank Run Tributary to Elk Creek consists of a load allocation to all of the watershed area upstream of sample point WTR. The load allocation for this segment was computed using water-quality sample data collected at point WTR. The average flow, measured at the sampling point WTR (1.35 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point WTR shows pH ranging between 5.8 and 6.6, pH will be addressed in this TMDL because of the presence of acidity. 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.

Table C43. Load Allocation at Point WTR

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	ND	ND	NA	NA
Manganese	0.03	0.3	0.03	0.3
Acidity	5.04	56.8	2.47	27.82
Alkalinity	11.48	129.3		

Table C44. Calculation of Load Reduction Necessary at Point WTR

	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	ND	ND	0.3	56.8
Allowable Load=TMDL	NA	NA	0.3	27.8
Load Reduction	0.0	0.0	0.0	29.0
Total % Reduction	0	0	0	51

SO Seventy One Tributary to Elk Creek

The TMDL for the Seventy One Tributary to Elk Creek consists of a load allocation to all of the watershed area upstream of sample point SO. The load allocation for this segment was computed using water-quality sample data collected at point SO. The average flow, measured at the sampling point SO (1.26 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SO shows pH ranging between 5.5 and 6.1, pH will be addressed in this TMDL because of the presence of acidity. 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.

Table C45. Load Allocation at Point SO

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	MD	ND	NA	NA
Manganese	0.01	0.1	0.01	0.1
Acidity	12.43	130.1	4.10	42.9
Alkalinity	8.27	86.5		

Table C46. Calculation of Load Reduction Necessary at Point SO

	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	ND	ND	0.1	130.1
Allowable Load=TMDL	NA	NA	0.1	42.9
Load Reduction	0.0	0.0	0.0	87.2
Total % Reduction	0	0	0	67

EC04 Elk Creek Downstream of Seventy One

The TMDL for sampling point EC04 consists of a load allocation of the area between sample points EC05, DH, LR, WTR, SO and EC04. The load allocation for this tributary was computed using water-quality sample data collected at point EC04. The average flow, measured at the sampling point EC04 (25.17 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point EC04 shows pH ranging between 6.2 and 7.5, pH will not be addressed in this TMDL because of only two of seven samples contained acidity. 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.

There was no aluminum TMDL calculated for this sample point because just one of seven samples contained aluminum.

Table C47. Load Allocations at Point EC04				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.61	127.6	0.56	117.4
Manganese	0.57	119.1	0.14	28.6
Acidity	ND	ND	NA	NA
Alkalinity	28.34	5949.5		

The calculated load reductions for all the loads that enter point EC04 must be accounted for in the calculated reductions at sample point EC04 shown in Table C48. A comparison of measured loads between points EC05, DH, LR, WTR, SO and EC04 shows that there is no additional loading entering the segment for aluminum, iron acidity. For aluminum, iron and acidity the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is an increase in manganese loading within the segment. The total segment manganese load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C48. Calculation of Load Reduction at Point EC04				
	Al	Fe	Mn	Acidity
Existing Load	ND	127.6	119.1	ND
Difference in Existing Load between EC05, DH, LR, WTR, SO & EC04	-	21.0	67.9	-
Load tracked from EC05, DH, LR, WTR & SO	-	94.9	49.7	-
Percent loss due to Instream process	-	-	-	-
Percent load tracked from EC05, DH, LR, WTR, SO & SO	-	-	-	-
Total Load tracked from EC05, DH, LR, WTR, & SO	-	115.9	117.6	-
Allowable Load at EC04	NA	117.4	28.6	NA
Load Reduction at EC04	0.0	0.0	89.0	0.0
% Reduction required at EC04	0	0	76	0

DAG09 Daguscahond Run Tributary to Elk Creek

The TMDL for the Daguscahonda Run Tributary to Elk Creek consists of a load allocation to all of the watershed area upstream of sample point DAG09. The load allocation for this segment was computed using water-quality sample data collected at point DAG09. The average flow, measured at the sampling point DAG09 (12.97 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point DAG09 shows pH ranging between 3.7 and 5.6, pH will be addressed in this TMDL because of the impact of mining. 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.

Table C49. Load Allocation at Point DAG09

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	1.53	165.3	0.11	11.6
Iron	0.84	90.6	0.81	87.9
Manganese	5.42	586.2	0.11	11.7
Acidity	54.45	5888.2	2.72	294.4
Alkalinity	5.63	608.3		

Table C50. Calculation of Load Reduction Necessary at Point DAG09

	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	165.3	90.6	586.2	5888.2
Allowable Load=TMDL	11.6	87.9	11.7	294.4
Load Reduction	153.7	2.7	574.5	5593.8
Total % Reduction	93	3	98	95

EC04A Elk Creek Downstream of Daguscahonda Run

The TMDL for sampling point EC04A consists of a load allocation of the area between sample points EC04, DAG09 and EC04A. The load allocation for this tributary was computed using water-quality sample data collected at point EC04A. The average flow, measured at the sampling point EC04A (29.51 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point EC04A shows pH ranging between 6.37 and 7.34, pH will not be addressed in this TMDL because of six total samples only two contained acidity. The method and rationale for addressing pH is contained in Attachment B.

A TMDL was not calculated for aluminum because only one sample of six contained aluminum.

Table C51. Load Allocations at Point EC04A				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.55	136.1	0.38	93.9
Manganese	0.74	181.9	0.38	94.6
Acidity	ND	ND	NA	NA
Alkalinity	22.13	5447.8		

The calculated load reductions for all the loads that enter point EC04A must be accounted for in the calculated reductions at sample point EC04A shown in Table C52. A comparison of measured loads between points EC04, DAG09 and EC04A shows that there is no additional loading entering the segment for aluminum, manganese and acidity. For aluminum, manganese and acidity the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is an increase in iron loading within the segment. The total segment iron load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C52. Calculation of Load Reduction at Point EC04A				
	Al	Fe	Mn	Acidity
Existing Load	ND	136.1	181.9	ND
Difference in Existing Load between EC04, DAG09 & EC04A	-	-	-	-
Load tracked from EC04 & DAG09	-	205.2	40.3	-
Percent loss due to instream process	-	38	74	-
Percent load tracked from EC04 & DAG09	-	62	26	-
Total Load tracked from EC04 & DAG09	-	128.0	10.4	-
Allowable Load at EC04A	NA	93.9	94.6	NA
Load Reduction at EC04A	0.0	34.1	0.0	0.0
% Reduction required at EC04A	0	27	0	0

UNT04 Unnamed Tributary to Elk Creek

The TMDL for the Unnamed Tributary to Elk Creek consists of a load allocation to all of the watershed area upstream of sample point UNT04. The load allocation for this segment was computed using water-quality sample data collected at point UNT04. The average flow, measured at the sampling point UNT04 (1.21 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point UNT04 shows pH ranging between 5.8 and 6.5, pH will be addressed in this TMDL because of the presence of acidity. 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.

Table C53. Load Allocation at Point UNT04

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	ND	ND	NA	NA
Manganese	0.01	0.1	0.01	0.1
Acidity	4.00	40.3	2.36	23.8
Alkalinity	12.83	129.2		

Table C54. Calculation of Load Reduction Necessary at Point UNT04

	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	ND	ND	0.1	40.3
Allowable Load=TMDL	NA	NA	0.1	23.8
Load Reduction	0.0	0.0	0.0	16.5
Total % Reduction	0	0	0	41

RR Unnamed Tributary to Rocky Run

The TMDL for this unnamed tributary to Rocky Run consists of a load allocation to all of the watershed area upstream of sample point RR. The load allocation for this segment was computed using water-quality sample data collected at point RR. The average flow, measured at the sampling point RR (0.07 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point RR shows pH ranging between 4.0 and 7.0, pH will be addressed in this TMDL because of the impact of mining. 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.

There was no aluminum TMDL calculated for this unnamed tributary to Rocky Run because only one of seven samples contained aluminum.

Table C55 Load Allocation at Point RR

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	3.93	2.4	0.16	0.09
Manganese	4.34	2.6	0.13	0.08
Acidity	37.60	22.6	4.14	2.5
Alkalinity	35.97	21.6		

Table C56 Calculation of Load Reduction Necessary at Point RR

	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	ND	2.4	2.6	22.6
Allowable Load=TMDL	NA	0.09	0.08	2.5
Load Reduction	0.0	2.31	2.52	20.1
Total % Reduction	0	96	97	89

RR1 Rocky Run Tributary to Elk Creek

The TMDL for sampling point RR1 consists of a load allocation of the area between sample points RR and RR1. The load allocation for this tributary was computed using water-quality sample data collected at point RR1. The average flow, measured at the sampling point RR1 (2.26 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point RR1 shows pH ranging between 4.9 and 5.2, pH will be addressed in this TMDL because of the presence of acidity. 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.

Table C57. Load Allocations at Point RR1				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	ND	ND	NA	NA
Manganese	0.12	2.3	0.12	2.3
Acidity	12.33	232.2	4.19	78.9
Alkalinity	7.47	140.6		

The calculated load reductions for all the loads that enter point RR1 must be accounted for in the calculated reductions at sample point RR1 shown in Table C58. A comparison of measured loads between points RR and RR1 shows that there is no additional loading entering the segment for aluminum, iron and manganese. For aluminum, iron and manganese the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is an increase in acidity loading within the segment. The total segment acidity load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C58. Calculation of Load Reduction at Point RR1				
	Al	Fe	Mn	Acidity
Existing Load	ND	ND	2.3	232.2
Difference in Existing Load between RR & RR1	-	-	-0.3	209.6
Load tracked from RR	-	-	0.1	2.5
Percent loss due to instream process	-	-	11	-
Percent load tracked from RR	-	-	89	-
Total Load tracked from RR	-	-	0.1	212.1
Allowable Load at RR1	NA	NA	2.3	78.9
Load Reduction at RR1	0.0	0.0	0.0	133.2
% Reduction required at RR1	0	0	0	63

UNT03 Unnamed Tributary to Elk Creek

The TMDL for this Unnamed Tributary to Elk Creek consists of a load allocation to all of the watershed area upstream of sample point UNT03. The load allocation for this segment was computed using water-quality sample data collected at point UNT03. The average flow, measured at the sampling point UNT03 (0.43 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point UNT03 shows pH ranging between 5.0 and 6.6, pH will be addressed in this TMDL because of the Presence of acidity. 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.

Table C59. Load Allocation at Point UNT03

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	ND	ND	NA	NA
Manganese	ND	ND	NA	NA
Acidity	3.45	12.2	2.42	8.6
Alkalinity	13.55	48.0		

Table C60. Calculation of Load Reduction Necessary at Point UNT03

	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	ND	ND	ND	12.2
Allowable Load=TMDL	NA	NA	NA	8.6
Load Reduction	0.0	0.0	0.0	3.6
Total % Reduction	0	0	0	30

UNT02 Unnamed Tributary to Elk Creek

The TMDL for this Unnamed Tributary to Elk Creek consists of a load allocation to all of the watershed area upstream of sample point UNT02. The load allocation for this segment was computed using water-quality sample data collected at point UNT02. The average flow, measured at the sampling point UNT02 (0.25 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point UNT02 shows pH ranging between 4.7 and 5.0, pH will be addressed in this TMDL because of the presence of acidity. 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.

Table C61. Load Allocation at Point UNT02				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA0
Iron	ND	ND	NA	NA
Manganese	0.14	0.3	0.14	0.3
Acidity	13.63	27.9	4.50	9.2
Alkalinity	7.34	15.0		

Table C62. Calculation of Load Reduction Necessary at Point UNT02				
	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	ND	ND	0.3	27.9
Allowable Load=TMDL	NA	NA	0.3	9.2
Load Reduction	0.0	0.0	0.0	18.7
Total % Reduction	0	0	0	67

EC03 Elk Creek upstream of Mohan Run

The TMDL for sampling point EC03 consists of a load allocation of the area between sample points EC04A, RR1, UNT03, UNT02 and EC03. The load allocation for this segment was computed using water-quality sample data collected at point EC03. The average flow, measured at the sampling point EC03 (17.20 MGD), is used for these computations.

The flow here at sample point EC03 may not be what it should be compared to sample point EC04A because only three flow samples are available at EC03. On 8/14/2003 and 2/24/2004 the stream flow was too high to measure.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point EC03 shows pH ranging between 6.3 and 7.3, pH will be addressed in this TMDL because of the mining impact. 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.

DRAFT

Table C63. Load Allocations at Point EC03				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.45	64.8	0.45	64.8
Manganese	0.56	80.2	0.44	62.5
Acidity	10.06	1442.3	2.72	389.4
Alkalinity	20.74	2974.7		

The calculated load reductions for all the loads that enter point EC03 must be accounted for in the calculated reductions at sample point EC03 shown in Table C64. A comparison of measured loads between points EC04A, UNT04, RR1, UNT03, UNT02 and EC03 shows that there is no additional loading entering the segment for aluminum, iron, manganese and acidity. For aluminum, iron, manganese and acidity the percent decrease in existing load is applied to the allowable upstream load entering the segment.

Table C64. Calculation of Load Reduction at Point EC03				
	Al	Fe	Mn	Acidity
Existing Load	ND	64.8	80.2	1442.3
Difference in Existing Load between EC04A, UNT04, RR1, UNT03, UNT02, &EC03	-	-71.3	-104.4	1129.7
Load tracked from EC04A, UNT04, RR1, UNT03, & UNT02	-	93.9	97.3	120.5
Percent loss due to instream process	-	52	57	-
Percent load tracked from EC04A, UNT04, RR1, UNT03 & UNT02	-	48	43	-
Total Load tracked from EC04A, UNT04, RR1, UNT03, & UNT02	-	44.7	42.2	1250.2
Allowable Load at EC03	NA	64.8	62.5	389.4
Load Reduction at EC03	0.0	0.0	0.0	860.7
% Reduction required at EC03	0	0	0	69

MR and EC02 Mohan Run Elk Creek upstream of UNT01

No allocations were calculated for Mohan Run because the metals meet water quality standards and the acidity is negligible. A TMDL for EC02 were not calculated because the metals all met water quality standards and the acidity was negligible. And also, for EC02 there was only one flow sample.

UNT01 Unnamed Tributary to Elk creek

The TMDL for the Unnamed Tributary to Elk Creek consists of a load allocation to all of the watershed area upstream of sample point UNT01. The load allocation for this segment was computed using water-quality sample data collected at point UNT01. The average flow, measured at the sampling point UNT01 (0.54 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point UNT01 shows pH ranging between 6.3 and 7.0, pH will not be addressed in this TMDL because there were only two acidity samples out of six. The method and rationale for addressing pH is contained in Attachment B.

Table C65. Load Allocation at Point UNT01				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	ND	ND	NA	NA
Manganese	0.04	0.2	0.04	0.2
Acidity	NA	NA	NA	NA
Alkalinity	19.00	86.3		

Table C66. Calculation of Load Reduction Necessary at Point UNT01				
	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	ND	ND	0.2	ND
Allowable Load=TMDL	NA	NA	0.2	NA
Load Reduction	0.0	0.0	0.0	0.0
Total % Reduction	0	0	0	0

UNT01A UNT01B Unnamed Tributaries to Elk Creek

Allocations were not calculated for these two sample points because only two samples were calculated and the metals met water quality standards.

EC01 Sample Point near the mouth of Elk Creek

The TMDL for this segment of to Elk Creek consists of a load allocation to all of the watershed area between sample points EC03, UNT01 and EC01. The load allocation for this segment was computed using water-quality sample data collected at point EC01. The average flow, measured at the sampling point EC01 (44.92 MGD), is used for these computations.

The stream flow at this sample point is lower than it should be because on two dates, 8/11/2003 and 11/17/2003, the stream flow was too high to measure.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point EC01 shows pH ranging between 6.3 and 7.1, pH will not be addressed in this TMDL because there were only two of nine samples that contained acidity. The method and rationale for addressing pH is contained in Attachment B.

Table C67. Load Allocation at Point EC01

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.39	145.8	0.35	132.6
Manganese	0.35	132.6	0.35	131.3
Acidity	ND	ND	NA	NA
Alkalinity	20.13	7538.9		

The calculated load reductions for all the loads that enter point EC01 must be accounted for in the calculated reductions at sample point EC01 shown in Table C68. A comparison of measured loads between points EC03, UNT01 and EC01 shows that there is no additional loading entering the segment for aluminum, manganese and acidity. For aluminum, manganese and acidity the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is an increase in iron loading within the segment. The total segment iron load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C68. Calculation of Load Reduction at Point EC01				
	Al	Fe	Mn	Acidity
Existing Load	ND	145.8	132.6	0.0
Difference in Existing Load between EC03, UNT01 & EC01	-	80.9	52.3	-
Load tracked from EC03 & UNT01	-	64.8	62.7	-
Percent loss due to instream process	-	-	-	-
Percent load tracked from EC01 & UNT01	-	-	-	-
Total Load tracked from EC01 & UNT01	-0	145.8	115.0	-
Allowable Load at EC01	NA	132.6	131.3	NA
Load Reduction at EC01	0.0	13.1	0.0	0.0
% Reduction required at EC01	0	9	0	0

Margin of Safety (MOS)

PADEP used an implicit MOS in these TMDLs derived from the Monte Carlo statistical analysis. The Water-Quality standard states that water-quality criteria must be met at least 99% of the time. All of the @Risk analyses results surpass the minimum 99% level of protection. Another margin of safety used for this TMDL analysis results from:

- 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.

- A MOS is added when the calculations were performed with a daily iron average instead of the 30-day average.

Seasonal Variation

Seasonal variation is implicitly accounted for in these TMDLs because the data used represent 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, 2002 and 2004 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

DRAFT

Project ID: Elk Creek									
Monitoring Point:			HWEC	Headwaters of South Branch of Elk Creek					
			EC1	South Branch of Elk Creek (Elk Cr. Priority Waterbody Survey Report, 1986)					
Monitoring	Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
Point	ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
EC1		9/25/1986	24	6.3	32	22	0.436	0.278	0.258
HWEC	4251 050	4/10/2002		6.5	22	0	0	0	0
	4251 129	7/24/2002		7	54	0	0.654	0.193	0
	4251 208	9/25/2002		7.5	28	0	0	0	0
		avg=	24.00	6.83	34.00	5.50	0.27	0.12	0.06

Project ID: Elk Creek									
Monitoring Point:		NBEC8	Unt to NBEC below NBEC7						
Monitoring	Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
Point	ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
NBEC8	4251 573	8/14/2003	45	3.4	0	92.8	4.35	2.71	8.12
	4251 794	11/12/2003	21	4	1.8	76	2.69	2.35	5.68
	4251 841	3/10/2004	155	3.3	0	97.6	1.79	2.17	8.76
	4251 021	5/25/2004	227	3.2	0	100	2.4	1.89	7.17
		avg=	112.00	3.48	0.45	91.60	2.81	2.28	7.43
		stdev=				10.82	1.09	0.34	1.34

Project ID: Elk Creek									
Monitoring Point:		NBEC7	North Branch Elk Creek below Washington Street Bridge						
		EC5	North Branch of Elk Creek (Elk Cr. Priority Waterbody Survey Report, 1986)						
Monitoring	Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
Point	ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
EC5		9/25/1986		6.7	32	0	0.993	0.144	0.372
NBEC7	4251 389	5/20/2003		6.7	23.4	0	0	0.125	0
	4251 573	8/14/2003		7	31	0	0.553	0.319	0
	4251 798	11/12/2003		7	29.4	0	0.618	0.203	0
		avg=		6.85	28.95	0	0.54	0.20	0.09

DRAFT

Project ID: Elk Creek								
Monitoring Point:		**NBEC6 Unt to NBEC**						
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 574	8/14/2003	315	3	0	169.4	9.7	2.94	12
4251 793	11/12/2003	207	3.5	0	104.2	5.52	2.07	7.57
4251 842	3/10/2004	390	3	0	173.2	7.68	3.15	13.1
4251 020	5/25/2004	271	3.2	0	119.6	5.32	2.56	8.79
	avg=	295.75	3.175	0	141.6	7.055	2.68	10.365
	stdev=				30.22	1.79	0.41	2.26

Project ID: Elk Creek								
Monitoring Point:		**NBECD3 Dishcarge from hillside above NBECD2**						
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 387	5/20/2003	23	3.4	0	62.6	1.62	0.691	3.83
4251 572	8/14/2003	41	3.2	0	100.2	4.18	1.25	7.88
4251 796	11/12/2003	30	3.6	0	70	1.71	1.33	6.72
4251 800	11/17/2003	37.5	4.2	4	70	1.79	1.24	5.61
4251 845	3/10/2004	165	3.1	0	122	4.5	1.51	9.86
4251 041	6/3/2004	46	3.7	0	60.4	1.98	0.869	4.34
	avg=	57.08	3.53	0.67	80.87	2.63	1.15	6.37
	stdev=				24.72	1.33	0.31	2.27

DRAFT

Project ID: Elk Creek
Monitoring Point: NBECD2 Discharge from wetland above NBEC5

Coll ID Seq	Date Collected	Final Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 388	5/20/2003	10	7.1	85.2	0	1.07	0.447	0
4251 571	8/14/2003	25	7.3	82.6	0	2.33	0.619	0
4251 799	11/17/2003	18	6.6	30.2	0	1.4	0.878	0.998
4251 847	3/10/2004	7.5	7	28	25.4	0.73	0.492	0
4251 040	6/3/2004	3.75	7	89.8	0	1.49	0.947	0
	avg=	12.85	7	63.16	5.08	1.404	0.6766	0.1996
	stdev=				11.36	0.60	0.23	0.45

Project ID: Elk Creek
Monitoring Point: NBEC5 North Branch Elk Creek above NBECD1

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 386	5/20/2003	1160	6.3	17	27.4	1.05	0.434	0
4251 570	8/14/2003	1524	6	10.6	22.8	1.56	0.777	0
4251 801	11/17/2003	1744	6.6	21.2	0	0.694	0.384	0
4251 844	3/10/2004	2967	4.8	7.8	42.4	1.04	0.669	2.04
4251 019	5/25/2004	4136	6.2	11.2	52	0.784	0.554	0
	avg=	2306.20	5.98	13.56	28.92	1.03	0.56	0.41
	stdev=				19.94	0.34	0.16	0.91

DRAFT

Project ID: **Elk Creek**
Monitoring Point: NBECD1 Mine seep into the N. Branch Elk Creek below gravel job road

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4215 385	5/20/2003	52	6.4	17.4	35.2	0.398	0.46	0
4251 569	8/14/2003	66	6	14.8	37.4	2.19	0.663	0
4251 795	11/12/2003	75	6.2	18	20.4	1.37	0.434	0
4251 843	3/10/2004	110	6.6	23.2	26.4	0.46	0.363	0
4251 039	6/3/2004	69	6	22	34.8	4.17	0.559	0
	avg=	74.40	6.24	19.08	30.84	1.72	0.50	0.00
	stdev=				7.18	1.56	0.12	0.00

Project ID: Elk Creek
Monitoring Point: NBEC North Branch of Elk Creek

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
NBEC	4251 048	4/10/2002	1804	6.1	15	46.4	12.2	0.603	0.714
	4251 126	7/24/2002	685	6.8	44	0	2.96	0.561	0.984
	4251 211	9/26/2002	110	6.8	40	0	2.1	0.663	0
	4251 384	5/20/2003	1373	6.4	18	29.8	1.04	0.484	0
	4251 568	8/14/2003	1674	6.2	11.8	41.6	1.79	0.882	0
	4251 802	11/17/2003	2017	6.7	21.8	0	0.747	0.387	0
		avg=	1277.17	6.5	25.1	19.63	3.47	0.60	0.28
		stdev=				22.18	4.35	0.17	0.45

DRAFT

Project ID: **Elk Creek**
Monitoring Point: **NBEC1 North Branch Elk Creek before conf. With SBEC**

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 390	5/20/2003	1849	6.3	16.2	31.8	0.793	0.549	0
4251 567	8/12/2003	3196	6	13.6	34.2	1.15	0.723	0.549
4251 804	11/17/2003	2713	6.7	20.6	0	0.74	0.457	0
4251 848	3/10/2004	4371	4.8	7.2	43.8	0.871	0.67	2.08
4251 018	5/25/2004	4645	6.2	10.6	70.9	1.04	0.66	0.589
	avg=	3354.80	6.00	13.64	36.14	0.92	0.61	0.64
	stdev=				25.47	0.17	0.11	0.85

Project ID: **Elk Creek**
Monitoring Point: **SBEC9 South Branch Elk Creek above Trout Run Rd.**

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 811	11/17/2003	416	6.6	17.2	0	0	1.04	0
4251 854	3/22/2004	482	6.5	12.4	44.2	0	0.884	0
4251 015	5/25/2004	333	6.6	12.6	23.6	0.353	0.62	0
	avg=	410.33	6.57	14.07	22.60	0.12	0.85	0.00
	stdev=				22.12	0.20	0.21	0.00

DRAFT

Project ID: Elk Creek
Monitoring Point: SBEC8 South Branch Elk Creek above Trout Run Rd.

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 396	5/21/2003	87	6.1	23	32	2.85	1.22	1.69
4251 578	8/14/2003	114	7	40.8	0	0.538	0.836	0
4251 808	11/17/2003	32	6.9	23.6	0	0.582	1.29	0
4251 852	3/22/2004	581	6.8	17.4	28.2	1.46	0.892	0
4251 014	5/25/2004	356	7	27.6	40.4	1.11	0.68	0
	avg=	234.00	6.76	26.48	20.12	1.31	0.98	0.34
	stdev=				18.89	0.94	0.26	0.76

Project ID: Elk Creek
Monitoring Point: SBEC8A Seep

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 809	11/17/2003	6.25	4.7	8.2	51	1.02	1.88	5.87
4251 853	3/22/2004	21	6.2	16	30.2	1.64	1.46	3.66
4251 042	6/3/2004	5	6.2	15	38	1.77	1.23	3.33
	avg=	10.75	5.7	13.0667	39.7333	1.47667	1.52333	4.28667
	stdev=				10.51	0.40	0.33	1.38

Project ID: Elk Creek
Monitoring Point: SBEC7 Unt to SBEC below SBEC8

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 580	8/14/2003	168	6.9	25.8	0	0.343	0.126	0
4251 810	11/17/2003	291	6.9	22	0	0	0.173	0
	avg=	229.50	6.90	23.90	0.00	0.17	0.15	0.00

DRAFT

Project ID: Elk Creek
Monitoring Point: SBEC5 South Branch of Elk Creek

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
SBEC5	4251 274	1/29/2003		6.5	15.2	0	0	0.816	0
	4251 395	5/21/2003	1703	6.1	22.6	25	1.59	0.719	0.962
	4251 579	8/14/2003	519	7	24.4	0	0.317	0.4	0
	4251 807	11/17/2003	816	6.7	22.4	0	0.38	0.809	0
	4251 851	3/10/2004	1191	6.8	17.8	29.2	0.833	0.746	0
	4251 022	5/25/2004	979	6.9	23	34.4	0.583	0.395	0
		avg=	1041.60	6.67	20.90	14.77	0.62	0.65	0.16
		stdev=				16.45	0.55	0.20	0.39

Project ID: Elk Creek
Monitoring Point: SBEC5A UNT to SBEC below SBEC5

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
SBEC5A	4251 812	11/17/2003	70	7.6	84	0	0.696	0.637	0
	4251 855	3/22/2004	154	5.4	52	0	0.416	0.469	0
		avg=	112.00	6.50	68.00	0.00	0.56	0.55	0.00

DRAFT

Project ID: Elk Creek
Monitoring Point: SBECD3 Mine drainage seep into the S. Branch Elk Creek

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 393	5/20/2003		4.3	7.4	109.8	2.09	3.37	15
4251 581	8/14/2003		4.6	9.4	52.6	0.798	2.67	6.24
4251 797	11/12/2003	35	4.6	8.8	78	0.786	3.06	9.57
4251 856**	3/22/2004	113	3.7	0	119.4	2.56	2.35	11.5
	avg=	74.00	4.30	6.40	89.95	1.56	2.86	10.58
	stdev=				30.55	0.91	0.45	3.66

Project ID: Elk Creek
Monitoring Point: SBEC4 South Branch of Elk Creek

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
SBEC4	4251 273	1/29/2003		6.5	24	0	6.74	1.73	0
	4251 392	5/20/2003	1029	6.2	19.4	37.8	4.86	1.62	1.47
	4251 577	8/14/2003	1107	6.5	45.2	0	4.44	1.49	0.606
	4251 806	11/17/2003	1495	6.7	27	0	2.78	1.31	0.751
	4251 850	3/10/2004	2127	6.3	16.8	27.8	2.27	1.1	1.27
	4251 016	5/25/2004	1778	6.6	22.4	40.8	2.86	1.12	0.922
		avg=	1507.20	6.47	25.80	17.73	3.99	1.40	0.84
		stdev=				19.90	1.69	0.26	0.52

DRAFT

Project ID: Elk Creek
Monitoring Point: **EC10** — **Elk Creek where North and South Branches Merge**
EC8 — **Elk Creek (Elk Cr. Priority Waterbody Survey Report, 1996)**

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
EC8		9/23/1986		6	14	28	3.41	1.47	0.328
EC10	4251 128	7/24/2002	1399	6.7	30	0	2.34	1.61	0
	4251 210	9/26/2002	661	6.2	13.8	52.4	0.619	2.02	0.893
	4251 272	1/29/2003		5.9	93.2	48.2	5.47	1.52	1.08
	4251 383	5/20/2003	3000	6.3	17.2	35.4	2.76	1.16	0.575
	4251 566	8/12/2003	6125	6.5	22	0	1.35	0.991	0
	4251 805	11/17/2003	4401	6.7	24.8	0	1.88	0.843	0
	4251 849	3/10/2004	7766	5.4	9.2	29.8	0	0.885	0
	4251 017	5/25/2004	7760	6.5	15.8	48	1.91	0.874	0.633
		avg=	4444.57	6.24	26.67	26.87	2.19	1.26	0.39
		stdev=				21.80	1.61	0.41	0.42

Project ID: Elk Creek
Monitoring Point: **SBEC** — **South Branch of Elk Creek**
EC4 — **South Branch of Elk Creek (Elk Cr. Priority Waterbody Survey Report, 1996)**

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
EC4		9/23/1986	1738	6.2	30	14	42.7	0.875	15.7
SBEC	4251 049	4/10/2002	1398	6.3	22	39.4	5.42	1.48	1.17
	4251 127	7/24/2002	614	6.4	24	21.8	4.13	2.55	0
	4251 209	9/26/2002	451	4.4	5.6	55	0	2.78	1.57
	4251 271	1/29/2003		6.1	14.8	54.4	10.2	2.09	0.996
	4251 382	5/20/2003	1219	6	19.6	44.2	6.28	1.93	0.881
	4251 576	8/14/2003	1615	6.3	19.6	28	3.01	1.64	0
	4251 803	11/17/2003	1848	6.7	27.8	0	3.68	1.35	0.564
	4251 846	3/10/2004	3666	6.2	17	39.2	4.34	1.29	1.76
		avg=	1568.6	6.06667	20.0444	32.889	8.8622	1.7761	2.5157
		stdev=				18.53	12.98	0.62	4.98

DRAFT

Project ID: Elk Creek
Monitoring Point: EC07A Elk Creek below IR1
EC14 Elk Creek (Elk Cr. Priority Waterbody Survey Report, 1986)

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
EC14		9/22/1986		6.1	24	16	5.15	0.979	1.01
EC07A	4251 123	7/24/2002	2145	7.2	46	0	1.49	0.701	0
	4251 206	9/25/2002	816	7.6	34	0	0	1.06	0
	4251 266	1/28/2003		6.9	21	0	4.38	1.15	0.578
	4251 298	4/1/2003	8424	6.4	14.8	34.6	2.6	0.902	1.18
	4251 381	5/7/2003	5942	7.4	30.8	0	0.979	0.391	0
	4251 563	8/12/2003	9579	7.1	29.6	0	0.904	0.499	0
		avg=	5381.20	6.96	28.60	7.23	2.21	0.81	0.40
		stdev=				13.46	1.92	0.29	0.52

Project ID: Elk Creek
Monitoring Point: EC07 Elk Creek below UNT06
EC9 **Elk Creek (Elk Cr. Priority Waterbody Survey Report, 1996)**

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
EC9		9/25/1986	1778	6.5	22	0	3.82	1.45	0.479
EC07	4251 047	4/10/2002	3536	6.5	20	0	3.04	0.996	1.09
	4251 124	7/24/2002	1722	7	40	0	1.72	1.21	0
	4251 213	9/26/2002	705	6.8	24	0	0.559	1.5	0
	4251 269	1/29/2003		6.4	64.4	43	5.21	1.33	1.07
	4251 380	5/7/2003	2709	6.9	28.2	0	2.6	1.2	0
	4251 565	8/12/2003	6063	6.7	24	0	1.24	0.9	0
		avg=	2752.2	6.6857	31.8	6.1429	2.5984	1.2266	0.377
		stdev=				16.25	1.60	0.22	0.51

DRAFT

Project ID: Elk Creek
Monitoring Point: UNT06D Headwaters of UNT06 @ Lynch Rd where several culverts join.

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
UNT06D	4251 815	11/18/2003	45	4.6	7.4	62.6	5.34	1.49	4.03
	4251 857	3/22/2004	147	3.6	0	60.4	3.35	0.874	2.29
	4251 023	5/25/2004	105	3.4	0	72.6	5.24	1.42	3.54
		avg=	99.00	3.87	2.47	65.20	4.64	1.26	3.29
		stdev=				6.50	1.12	0.34	0.90

Project ID: Elk Creek
Monitoring Point: UNT06 Unnamed Tributary to Elk Creek above EC07

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
UNT06	4251 046	4/10/2002	146	6.8	34	0	1.59	0.415	0.831
	4251 125	7/24/2002	39	7.4	56	0	0	0	0
	4251 212	9/26/2002	23	7.3	44	0	0	0	0
	4251 270	1/29/2003		7	22.8	0	1.01	0.34	0.742
	4251 379	5/7/2003	194	7.6	48.4	0	0.374	0.205	0
	4251 564	8/12/2003	330	7.1	41.6	0	0.781	0.369	0.58
	4251 814	11/18/2003	389	7.1	45.8	0	0.457	0.367	0
		avg=	186.83	7.19	41.80	0.00	0.60	0.24	0.31
		stdev=				0.00	0.57	0.18	0.39

Project ID: Elk Creek
Monitoring Point: UNT05 Unt to Elk Creek below Iron Run

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
UNT05	4251 051	4/10/2002	252	6.2	13.2	8.8	0.303	0.222	0
	4251 121	7/17/2002	43	6.9	22	0	0	0	0
	4251 207	9/25/2002		7.3	32	0	0	0.082	0
	4251 264	1/28/2003		6.7	11	0	0	0.052	0
	4251 378	5/7/2003	158	6.7	14	0	0.337	0.092	0
	4251 562	8/12/2003	335	6.9	15.2	0	0	0.188	0
		avg=	197.00	6.78	17.90	1.47	0.11	0.11	0.00
		stdev=				3.59	0.17	0.08	0.00

DRAFT

Project ID: Elk Creek
Monitoring Point: **SR** **Silver Run**
EC23 **Silver Run (Elk Creek Priority Waterbody Survey Report)**

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
EC23		8/26/1986		6	8	0	0	0	0
SR	4251 043	4/10/2002	3512	6.4	11.4	40.6	0.366	0.144	0
	4251 119	7/17/2002	398	7	26	0	0.706	0	0
	4251 203	9/25/2002	111	7.4	34	0	0.651	0.069	0
	4251 376	5/7/2003	2132	6.6	13.4	0	0.543	0.143	0
	4251 560	8/12/2003	4280	6.9	14.8	0	0.644	0.246	0
		avg=	2086.60	6.72	17.93	6.77	0.49	0.10	0.00
		stdev=				16.57	0.27	0.10	0.00

Project ID: Elk Creek
Monitoring Point: **EC06** **Elk Creek above Silver Run**
EC15 **Elk Creek (Elk Cr. Priority Waterbody Survey Report, 1986)**

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
EC15		9/25/1986	2595	6.7	32	0	1.1	0.662	
EC06	4251 044	4/10/2002	9771	7	36	0	1.26	76	0
	4251 120	7/17/2002	2879	7.3	48	0	0.697	0.339	0
	4251 204	9/25/2002	1712	7.3	42	0	0.71	0.29	0
	4251 377	5/7/2003	8979	7.2	31.2	0	1.09	0.633	0
	4251 561	8/12/2003	13109	7.2	36.8	0	0.992	0.456	0
		avg=	6507.50	7.12	37.67	0.00	0.97	13.06	0.00
		stdev=				0.00	0.23	30.83	0.00

DRAFT

Project ID: Elk Creek
Monitoring Point: TR Tencent Run

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 042	4/10/2002	712	6.5	11.4	0	0	0	0
4251 118	7/17/2002	65	7.1	24	0	0	0.094	0
4251 202	9/25/2002		7.2	28	0	0	0	0
4251 375	5/7/2003	291	6.7	14	0	0	0	0
4251 559	8/12/2003	785	7	16.2	0	0	0.053	0
	avg=	463.25	6.9	18.72	0.00	0.00	0.03	0.00
	stdev=				0.00	0.00	0.04	0.00

Project ID: Elk Creek
Monitoring Point: EC05 Elk Creek above Dusty Hollow
EC15 Elk Creek (Elk Cr. Priority Waterbody Survey Report, 1986)

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
EC15		9/22/1986	3704	6.7	72	0	1.21	0.78	
EC05	4251 041	4/10/2002	15570	6.9	28	0	0.893	0.463	0
	4251 117	7/17/2002	3159	7.4	46	0	0.665	0.282	0
	4251 200	9/18/2002	3576	7.2	44	0	0.597	0.181	0
	4251 201	9/25/2002		7.4	42	0	0.655	0.269	0
	4251 267	1/29/2003		6.9	31	0	1.34	0.534	0
	4251 373	5/7/2003	11688	6.9	27.8	0	0.849	0.42	0
	4251 558	8/12/2003	23778	7.2	28.6	0	0.705	0.362	0
		avg=	10245.83	7.08	39.93	0.00	0.86	0.41	0.00
		stdev=				0.00	0.27	0.19	0.00

DRAFT

Project ID: Elk Creek
Monitoring Point: DH Dusty Hollow

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 040	4/8/2002	454	6.4	9.8	5.2	0	0	0
4251 116	7/17/2002	48	6.8	16	0	0	0	0
4251 199	9/18/2002	4	6.6	20	0	0	0	0
4251 372	5/7/2003	222	6.3	9.8	4.6	0	0	0
4251 557	8/12/2003	453	6.5	11	0	0.389	0.233	0
	avg=	236.20	6.52	13.32	1.96	0.08	0.05	0.00
	stdev=				2.69	0.17	0.10	0.00

Project ID: Elk Creek
Monitoring Point: LR Laurel Run
EC17 Laurel Run (Elk Cr. Priority Waterbody Survey Report, 1986)

Monitoring Point	Coll ID Seq	Date Collected	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
EC17		9/22/1986	6	24	14	0.112		
LR	4251 039	4/9/2002	6.1	13.2	14.2	0	0.101	0
	4251 112	7/16/2002	6.7	19	0	0	0.632	0
	4251 197	9/18/2002	6.7	22	0	0	0.86	0
	4251 268	1/29/2003	6.6	14.8	0	0	0.319	0
	4251 371	5/7/2003	6.5	11	0	0	0.151	0
	4251 553	8/11/2003	6.7	12	0	0	0.14	0
		avg=	6.47	16.57	4.03	0.02	0.37	0.00
		stdev=			6.88	0.04	0.31	0.00

DRAFT

Project ID: **Elk Creek**
Monitoring Point: **WTR** **Water Tank Run**

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 038	4/9/2002	1661	5.8	10.8	4	0	0	0
4251 111	7/16/2002	219	6.5	12	0	0	0.085	0
4251 198	9/18/2002	105	6.6	15	0	0	0	0
4251 370	5/6/2003	1161	6.3	10.2	10.4	0	0	0
4251 556	8/11/2003	1544	6.3	9.4	10.8	0	0.057	0
	avg=	938.00	6.30	11.48	5.04	0.00	0.03	0.00
	stdev=				4.77	0.00	0.04	0.00

Project ID: Elk Creek
Monitoring Point: **EC04** **Elk Creek Below Seventy One**
EC20 **Elk Creek (Elk Cr. Priority Watebody Survey Report, 1986)**

Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
EC20		9/22/1986		6.2	22	16	1.11	2.69	1.26
EC04	4251 037	4/9/2002	24603	6.3	19.2	34.6	0.603	0.291	0
	4251 115	7/17/2002	3362	7.5	38	0	0.304	0.09	0
	4251 195	9/18/2002	3110	7.2	44	0	0.43	0.063	0
	4251 262	1/28/2003		7.1	30.4	0	0.941	0.431	0
	4251 368	5/6/2003	17019	6.8	20.8	0	0.358	0.237	0
	4251 554	8/11/2003	39299	7.2	24	0	0.508	0.171	0
		avg=	17478.60	6.90	28.34	7.23	0.61	0.57	0.18
		stdev=				13.46	0.31	0.94	0.48

DRAFT

Project ID: **Elk Creek**
Monitoring Point: **SO** **Seventy One**

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 036	4/9/2002	1601	5.5	8.8	7.8	0	0	0
4251 110	7/16/2002	186	6	8	14	0	0	0
4251 196	9/18/2002	49	6.1	8.4	19.4	0	0	0
4251 263	1/28/2003		6.2	7.8	12.4	0	0	0
4251 369	5/6/2003	1096	6	8.6	11.4	0	0	0
4251 555	8/11/2003	1426	5.9	8	9.6	0	0.064	0
	avg=	871.60	5.95	8.27	12.43	0.00	0.01	0.00
	stdev=				4.04	0.00	0.03	0.00

Project ID: **Elk Creek**
Monitoring Point: **EC04A** **Elk Creek Below Confluence with Daguscahonda Run**

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 114	7/17/2002	4091	7.3	32	0	0	0.634	0
4251 193	9/18/2002	5010	6.8	28	0	0.348	1.08	0
4251 261	1/28/2003		6.7	20.8	0	1.06	1.2	0.67
4251 366	5/6/2003	21744	6.3	14.8	38.4	0.392	0.801	0
4251 582	8/14/2003		6.7	20.8	0	1.09	0.345	0
4251 870	3/23/2004	51135	6.7	16.4	44.8	0.428	0.373	0
	avg=	20495.00	6.75	22.13	13.87	0.55	0.74	0.11
	stdev=				21.58	0.43	0.36	0.27

DRAFT

Project ID: Elk Creek								
Monitoring Point:		UNT04	Unnamed Tributary to Elk Creek at Town of Daguscahonda					
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 035	4/9/2002	988	5.8	10.4	6	0	0	0
4251 108	7/16/2002		6.8	14.4	0	0	0	0
4251 194	9/18/2002	28	6.6	22	0	0	0	0
4251 367	5/6/2003	830	6.3	10.6	8.8	0	0	0
4251 552	8/11/2003	913	6.5	10.2	0	0	0	0
4251 874	3/24/2004	1433	6.2	9.4	9.2	0	0.056	0
	avg=	838.40	6.37	12.83	4.00	0.00	0.01	0.00
	stdev=				4.52	0.00	0.02	0.00

Project ID:	Elk Creek							
Monitoring Point:		RR1	Rocky Run					
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 034	4/9/2002	1058	4.9	8	11	0	0.084	0
4251 551	8/11/2003	1553	5.1	7	16	0	0.15	0
4251 816	11/18/2003	2092	5.2	7.4	10	0	0.135	0
	avg=	1567.67	5.07	7.47	12.33	0.00	0.12	0.00
	stdev=				3.21	0.00	0.03	0.00

DRAFT

Project ID: Elk Creek
Monitoring Point: RR Rocky Run

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 109	7/16/2002		7	86	0	1.76	0.698	0
4251 192	9/18/2002		4	3.4	216	1.18	25.7	21.5
4251 260	1/28/2003		6	12.2	24.8	0	0.394	0
4251 365	5/6/2003	30	6.3	21.4	18.4	0	0.069	0
4251 550	8/11/2003	30	6.6	75	0	23.9	3.44	0
4251 817	11/18/2003	35	6.7	31.6	0	0.7	0.09	0
4251 873	3/24/2004	105	6.9	22.2	4	0	0	0
	avg=	50.00	6.21	35.97	37.60	3.93	4.34	3.07
	stdev=				79.30	8.83	9.50	8.13

Project ID: Elk Creek
Monitoring Point: UNT03 Unnamed Tributary to Elk Creek (above UNT02)

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 032	4/9/2002	553	5	7.8	6.4	0	0	0
4251 361	5/6/2003		6.4	15.6	7.4	0	0	0
4251 548	8/11/2003		6.5	16.2	0	0	0	0
4251 819	11/18/2003	37.5	6.6	14.6	0	0	0	0
	avg=	295.25	6.125	13.55	3.45	0	0	0
	stdev=				4.00	0.00	0.00	0.00

DRAFT

Project ID: Elk Creek
Monitoring Point: UNT02 Unnamed Tributary to Elk Creek (above EC03)

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 031	4/9/2002	146	4.7	7.4	15.8	0	0.086	0
4251 106	7/16/2002		5	6.6	15	0	0.188	0
4251 189	9/18/2002		4.9	6.8	16.8	0	0.2	0
4251 258	1/28/2003		4.8	10.6	9.6	0	0.095	0
4251 362	5/6/2003	236	4.8	7.2	16.6	0	0.117	0
4251 549	8/11/2003	135	4.8	6.4	11.2	0	0.163	0
4251 818	11/18/2003	165	4.7	6.4	10.4	0	0.12	0
	avg=	170.50	4.81	7.34	13.63	0.00	0.14	0.00
	stdev=				3.11	0.00	0.05	0.00

Project ID: Elk Creek
Monitoring Point: EC03 Elk Creek above Mohan Run

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 030	3/20/2002		6.3	20	30.2	0.465	0.522	0
4251 107	7/16/2002	4250	7.3	28	0	0	0.302	0
4251 190	9/18/2002	5197	6.8	28	0	0.316	0.559	0
4251 259	1/28/2003		6.6	19	0	0.827	0.882	0.634
4251 363	5/6/2003	26377	6.7	15.6	0	0.359	0.855	0
4251 583*	8/14/2003		6.6	21.8	0	0.793	0.416	0
4251 872*	3/24/2004		6	12.8	40.2	0.405	0.377	0
	avg=	11941.33	6.61	20.74	10.06	0.45	0.56	0.09
	stdev=				17.42	0.29	0.23	0.24

DRAFT

Project ID: Elk Creek
Monitoring Point: MR Mohan Run

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 029	3/20/2002	2648	6.1	11.8	10.2	<.3	<.05	<.5
4251 105	7/16/2002	266	6.9	16	0	<.3	<.05	<.5
4251 191	9/18/2002	113	6.6	18.8	0	<.3	<.05	<.5
4251 257	1/28/2003		6.5	12	0	<.3	<.05	<.5
4251 364	5/6/2003	3211	6.1	11.6	8.8	<.3	<.05	<.5
4251 547	8/11/2003	2586	6.7	11.4	0	<.3	<.05	<.5

Project ID: Elk Creek
Monitoring Point: UNT01B Unnamed Tributary to Elk Creek

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 544	8/11/2003		7	18.6	0	<.3	0.106	<.5
4251 821	11/18/2003	180	5.2	7.2	7.8	<.3	0.071	<.5

Project ID: Elk Creek
Monitoring Point: UNT01A Unnamed Tributary to Elk Creek

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 543	8/11/2003		5.5	7.2	12.2	<.3	0.09	<.5
4251 820	11/18/2003	120	5.5	7.2	6.4	<.3	<.05	<.5

Project ID: Elk Creek
Monitoring Point: UNT01 Unnamed Tributary to Elk Creek

Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
4251 027	3/20/2002	303	6.5	12.4	0	0	0.089	0
4251 103	7/16/2002		7	26	0	0	0	0
4251 187	9/18/2002		7	42	0	0	0	0
4251 256	1/28/2003		6.4	11.2	7.4	0	0	0
4251 359	5/6/2003	395	6.3	9.4	19.6	0	0.081	0
4251 545	8/11/2003	437	6.9	13	0	0	0.07	0
	avg=	378.3	6.7	19.0	4.5	0.0	0.04	0.0
	stdev=				7.97	0.00	0.04	0.00

DRAFT

Project ID: Elk Creek									
Monitoring Point:		EC02	Elk Creek above UNT01						
		EC21	Elk Creek (Elk Cr. Priority Waterbody Survey Report, 1986)						
Monitoring	Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
Point	ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
EC21		9/22/1986	4310	6.1	14	22	0.497	0.749	0.492
EC02	4251 028	3/20/2002		6.8	19.2	0	0.325	0.488	<.5
	4251 104	7/16/2002		7	26	0	<.3	0.122	<.5
	4251 188	9/18/2002		6.9	28	0	0.543	0.319	<.5
	4251 360	5/6/2003		6.8	16.6	0	<.3	0.624	<.5
	4251 546	8/11/2003		7	20.2	0	0.52	0.262	<.5

Project ID: Elk Creek									
Monitoring Point:		EC01A	Gallagher Run (Enters Elk Creek Below EC01)						
Monitoring	Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
Point	ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
EC01A	4251 185	9/18/2002		7.9	66	0	<.3	<.05	<.5

Project ID: Elk Creek									
Monitoring Point:		EC01	Elk Creek Above Bridge (Rt. 219) in Ridgway						
		EC22	Elk Creek (Elk Cr. Priority Waterbody Survey Report, 1986)						
Monitoring	Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
Point	ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
EC22		9/22/1986		6.3	30	10	0.631	0.572	0.693
EC01	4251 026	3/20/2002	30663	6.8	20	0	0.324	0.472	0
	4251 113	7/17/2002	5200	7.3	28	0	0	0.054	0
	4251 186	9/18/2002	8300	7.1	28	0	0.483	0.182	0
	4251 255	1/28/2003		6.5	17.2	0	0.421	0.644	0
	4251 358	5/6/2003	29689	6.8	16.8	0	0	0.595	0
	4251 542	8/11/2003		7	20.8	0	1.18	0.302	0
	4251 813	11/17/2003		6.9	16.4	0	0.356	0.25	0
	4251 871	3/24/2004	82108	6.7	13.8	32.6	0.349	0.333	0
		avg=	31192.00	6.89	20.13	4.08	0.39	0.35	0.00
		stdev=				10.34	0.33	0.19	0.22

DRAFT

Project ID:	**Daguscahonda**								
Monitoring Point:									
		DAG09	**Daguscahonda Run above confluence with Elk Creek**						
		EC19	**Daguscahonda Run (Elk Cr. Primary Waterbody Survey Report, 1986)**						
Monitoring	**Coll**	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
Point	**ID Seq**	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
EC19		9/22/1986		3.7	0	100	1.14	30.6	7.29
DAG09	4251 016	2/28/2002		4.9	7	45.2	0.998	1.4	0.886
	4251 064	5/22/2002	18922	4.9	6.6	48.4	0.834	1.88	1.51
	4251 147	8/27/2002	373	4.4	6.4	57.4	1.14	5.86	2.54
	4251 231	11/14/2002	5510	5.3	5.8	46.2	0.47	1.16	0
	4251 292	3/19/2003		5.2	6	38.6	0.67	0.518	0
	4251 425	6/10/2003	13656	5.6	7	44.8	0.767	0.879	0
	4251 721	10/8/2003	6561	5.5	6.2	55	0.684	1.07	0
		avg=	9004.4	4.9375	5.625	54.45	0.83788	5.42088	1.52825
		stdev=				19.3405	0.23917	10.3139	2.50646

Project ID:	**Elk Creek**							
Monitoring Point:		**IR1**	**Iron Run at mouth**					
		EC12	**Iron Run (Elk Cr. Priority Waterbody Survey Report, 1986)**					
Monitoring	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
Point	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
EC12	9/25/1986	992	Meas	6.3	30	18	0.678	0.018
IR1	7/24/2002	764	7.4	58	0	1.98	0.057	0
	9/25/2002	234	7.8	62	0	0	0.065	0
	1/28/2003		7.3	30.4	0	0	0.124	0
	4/1/2003	4249	7	22.6	0	0	0.217	0
	6/24/2003	1793	7.5	37.8	0	0.49	0.086	0
	9/24/2003	6129	6.7	27.8	0	0.449	0.124	0
	5/25/2004	5183	7.2	30	46.4	0.56	0.104	0
	avg=	4338.50	7.27	34.36	9.55	2.68	0.18	0.002
	stdev=				17.04	5.82	0.19	0.01

Attachment F

Comment and Response

DRAFT

Comments form Knox District Mining Office

Elk Creek TMDL

Page 4, Directions

Second Paragraph, third line: Change the sentence starting with "The North Branch" to "The North Branch of Elk Creek can be reach by traveling approximately 24 miles north on Rt. 219 from exit 97 of Interstate 80 to the town of Ridgway.

Page 4, Segments Addressed in this TMDL

Second Paragraph, Second Line: Change "4.0-acre bituminous coal surface mine" to "4.0-acre Incidental Coal Extraction permit associated with a construction project."

Response:

Changes made.