FINAL

MCCUNE RUN WATERSHED TMDL
Westmoreland County

For Acid Mine Drainage Affected Segments

Prepared by:

Pennsylvania Department of Environmental Protection

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TMDL[1]
McCune Run Watershed
Westmoreland County, Pennsylvania

Introduction

This report presents the Total Maximum Daily Loads (TMDLs) developed for segments in the McCune Run 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 one segment on this list (shown in Table 1). High levels of metals, elevated suspended solids, and depressed pH, caused these impairments. All impairments resulted from acid drainage from abandoned coalmines. The TMDL addresses the three primary metals associated with acid mine drainage (iron, manganese, and aluminum) and pH.

Table 1. 303(d) Sub-List

State Water Plan (SWP) Subbasin: 18-C Loyalhanna Creek								
Year	**Miles**	**Segment ID**	**DEP Stream Code**	**Stream Name**	**Designated Use**	**Data Source**	**Source**	**EPA 305(b) Cause Code**
1996	1.4	NA	43397	McCune Run	WWF	305(b) Report	RE	Metals
1998	1.4	Part C of List	43397	McCune Run	WWF	305(b) Report	AMD	Metals
2002	2.56	New survey; new segment id. 990512-1415-ALF	43397	McCune Run	WWF	SWAP	AMD	Metals, pH, & Suspended Solids

Resource Extraction=RE
Warm Water Fishes = WWF
Abandoned Mine Drainage = AMD
Surface Water Assessment Program = SWAP

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 McCune Run Watershed

The McCune Run Watershed is located in southwestern Pennsylvania, occupying the northern central portion of Westmoreland County. The watershed is found on United States Geological survey map for the Derry, PA 7.5-Minute Quadrangle. The area within the watershed consists of approximately 11.5 square miles. McCune Run drains to Loyalhanna Creek.

From Greensburg, PA, take Rt. 119 East to the intersection with Rt. 22 at New Alexandria. Turning right onto Rt. 22 to the red light at the intersection with Rt. 981. Turn north (right) onto Rt. 981 and follow it until you reach township road 860. Turn left on T-860 and follow it to Keystone State Park and McCune Run.

Geology of the McCune Run Watershed

The watershed area is located in the Allegheny Plateau Physiographic Province. The Allegheny Plateau covers much of western Pennsylvania and the area consists primarily of extensively forested uplands dissected by major river valleys. Structurally, McCune Run is located on the Fayette Anticline. The general strike in the area is approximately 40 degrees trending northeast, and the dip of the area strata is approximately 30 degrees northwest.

The topography of the area includes gently rolling hills with slopes on the order of 20 percent. The maximum elevation around the stream area is 1240 feet and the minimum elevation where McCune Run enters the Loyalhanna is 940 feet. The Uniontown-Latrobe syncline rests below McCune Run.

Rocks of middle to Upper Pennsylvanian age underlie most of Westmoreland County. McCune Run encounters the following groups: Allegheny (oldest) in the middle of the anticline, and Conemaugh, towards the outside of the anticline. These Pennsylvanian aged rocks consist of alternating sandstones, shales, and coal beds, with an occasional limestone. The most significant strata in this series is the Pittsburgh coal seam of the Monongahela group, which has been extensively deep mined. Drainage from these deep mines is the prime source of pollution for McCune Run.

Segments addressed in this TMDL

There are no active mining operations in the watershed. All of the discharges in the watershed are from abandoned mines and will be treated as non-point sources. Each segment on the Section 303(d) list will be addressed as a separate TMDL. These TMDLs will be expressed as long-term, average loadings. Due to the nature and complexity of mining effects on the watershed, expressing the TMDL as a long-term average gives a better representation of the data used for the calculations. See Attachment C for TMDL calculations.

Clean Water Act Requirements

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

Additionally, the federal Clean Water Act and the Environmental Protection Agency's (EPA) implementing regulations (40 CFR Part 130) require:

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

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

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

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

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

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

In the cases that have been settled to date, the consent agreements require EPA to backstop TMDL development, track TMDL development, review state monitoring programs, and fund studies on issues of concern (e.g., AMD, implementation of nonpoint source Best Management Practices (BMPs), etc.).

These TMDLs were developed in partial fulfillment of the 1997 lawsuit settlement of *American Littoral Society and Public Interest Group of Pennsylvania v. EPA.*

Section 303(d) Listing Process

Prior to developing TMDLs for specific waterbodies, there must be sufficient data available to assess which streams are impaired and should be on the Section 303(d) list. With guidance from the EPA, the states have developed methods for assessing the waters within their respective jurisdictions.

The primary method adopted by the Pennsylvania Department of Environmental Protection (DEP) for evaluating waters changed between the publication of the 1996 and 1998 Section 303(d) lists. Prior to 1998, data used to list streams were in a variety of formats, collected under differing protocols. Information also was gathered through the Section 305(b)[2] reporting process. DEP is now using the Statewide Surface Waters Assessment Protocol (SSWAP), a modification of the EPA's 1989 Rapid Bioassessment Protocol II (RBP-II), as the primary mechanism to assess Pennsylvania's waters. The SSWAP provides a more consistent approach to assessing Pennsylvania's streams.

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

After the survey is completed, the biologist determines the status of the stream segment. The decision is based on habitat scores and a series of narrative biological statements used to evaluate the benthic macroinvertebrate community. If the stream is determined to be impaired, the source and cause of the impairment is documented. An impaired stream must be listed on the state's Section 303(d) list with the source and cause. A TMDL must be developed for the stream segment and each pollutant. In order for the process to be more effective, adjoining stream segments with the same source and cause listing are addressed collectively, and on a watershed basis.

Basic Steps for Determining a TMDL

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

1. Collection and summarization of pre-existing data (watershed characterization, inventory contaminant sources, determination of pollutant loads, etc.);
2. Calculating the TMDL for the waterbody using EPA approved methods and computer models;
3. Allocating pollutant loads to various sources;
4. Determining critical and seasonal conditions;
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

McCune Run is located in Derry Township, Westmoreland County. The land was occupied by settlers prior to 1769. Soldiers who came west with Forbes' army were among the first clearing

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

land, building crude log cabins, and living on corn, potatoes, wheat, and rye, which they grew. Some bartered with the Indians for fur and skins. After the revolution and Indian-wars, farming and trade continued to be the primary occupations. It appears coal mining became of interest in the 1870's. Property and mining rights were bought and sold many times over. Companies like Brenizer Coal, Latrobe Coal, and Graff Coal opened mines and built company towns. Towns like Cokeville, with 160 coke ovens and a crusher with a wash plant, became thriving mining communities and were taken over by H. C. Frick Company in 1900.

The Loyalhanna mining community built around the Loyalhanna Coal and Coke Co. was said to be the first shaft mine in Derry Township sunk in 1871 at a depth of 210 feet. This mine bordered two others, the Bradonville and Red Shaft. Coal was transported underground by mules to the surface. Electric motors transported it to different railroads and some was kept for coke ovens. Peak operations were reached between 1904-1908. The mines closed around 1917. The continued flooding of the abandoned mines forced the other mines in the area to also close.

In 1909, Keystone Coal and Coke Company purchased land from the McClelland family and constructed a dam in McCune Run. It formed a 78-acre lake for use in the mining and coking operations. Mining continued until the 1950's. The lake, now part of Keystone State Park, intersects McCune Run, with the lower reaches becoming polluted by mine drainage. In the early 1970's, under operation Scarlift, a mine-sealing project was conducted to abate the mine drainage. During the late 1970's a major blowout of mine water occurred approximately 150 feet behind the mine seals. Repairs have been made to collect the AMD prior discharging it to the stream.

The proposed Bureau of Abandoned Mine Reclamation (BAMR) Project No. AMD 65 (1183) 101.1 addresses construction of passive treatment systems at Keystone State Park to remediate the previously failed collection and seal system.

The information in this section was made available by the Derry Township History Club, BMAR, and Keystone State Park.

AMD Methodology

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

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

Allowable loads are determined for each point of interest using Monte Carlo simulation. Monte Carlo simulation is an analytical method meant to imitate real-life systems, especially when other analyses are too mathematically complex or too difficult to reproduce. Monte Carlo simulation calculates multiple scenarios of a model by repeatedly sampling values from the probability distribution of the uncertain variables and using those values to populate a larger data set. Allocations were applied uniformly for the watershed area specified for each allocation point. For each source and pollutant, it was assumed that the observed data were log-normally distributed. Each pollutant source was evaluated separately using @Risk[3] by performing 5,000 iterations to determine the required percent reduction so that the water quality criteria, as defined in the *Pennsylvania Code. Title 25 Environmental Protection, Department of Environmental Protection, Chapter 93, Water Quality Standards*, will be met instream at least 99 percent of the time. For each iteration, the required percent reduction is:

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

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

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

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

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

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

LTA = Mean * (1 – PR99) where (2)

LTA = allowable LTA source concentration in mg/l

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

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

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 permitted discharges in the watershed and therefore all waste load allocations are equal to zero. The difference between the TMDL and the WLA at each point is the load allocation (LA) at the point. The LA at each point includes all loads entering the segment, including those from upstream allocation points. The percent reduction is calculated to show the amount of load that needs to be reduced within a segment in order for water quality standards to be met at the point.

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

Table 3. TMDL Component Summary for the McCune Run Watershed

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
1	*McCune Run downstream of Keystone Lake*						
	Fe	ND	NA	NA	NA	0.0	0
	Mn	2.6	1.7	0.0	1.7	0.9	34
	Al	ND	NA	NA	NA	0.0	0
	Acidity	0.0	0.0	NA	NA	0.0	0
2	*Mouth of Unnamed Tributary 43400*						
	Fe	0.3	0.3	NA	NA	0.0	0
	Mn	0.1	0.1	NA	NA	0.0	0
	Al	ND	NA	NA	NA	0.0	0
	Acidity	0.02	0.02	NA	NA	0.0	0
7	*AMD Discharge downstream of Unnamed Tributary 43400*						
	Fe	15.6	0.5	0.0	0.5	15.1	97
	Mn	3.6	0.4	0.0	0.4	3.2	89
	Al	5.4	0.2	0.0	0.2	5.2	96
	Acidity	95.1	1.0	0.0	1.0	94.1	99
3	*McCune Run upstream of Unnamed Tributaries 43398 and 43399*						
	Fe	57.8	2.9	0.0	2.9	39.7	93
	Mn	15.8	2.1	0.0	2.1	9.6	82
	Al	25.0	1.5	0.0	1.5	18.3	92
	Acidity	486.2	34.0	0.0	34.0	358.0	91
4	*Mouth of Unnamed Tributary 43399*						
	Fe	1.3	0.5	0.0	0.5	0.8	60
	Mn	0.51	0.46	0.0	0.46	0.05	10
	Al	1.4	1.4	NA	NA	0.0	0
	Acidity	0.0	0.0	NA	NA	0.0	0
5	*Mouth of Unnamed Tributary 43398*						
	Fe	0.4	0.1	0.0	0.1	0.3	65
	Mn	0.1	0.1	NA	NA	0.0	0
	Al	0.12	0.04	0.0	0.04	0.08	64

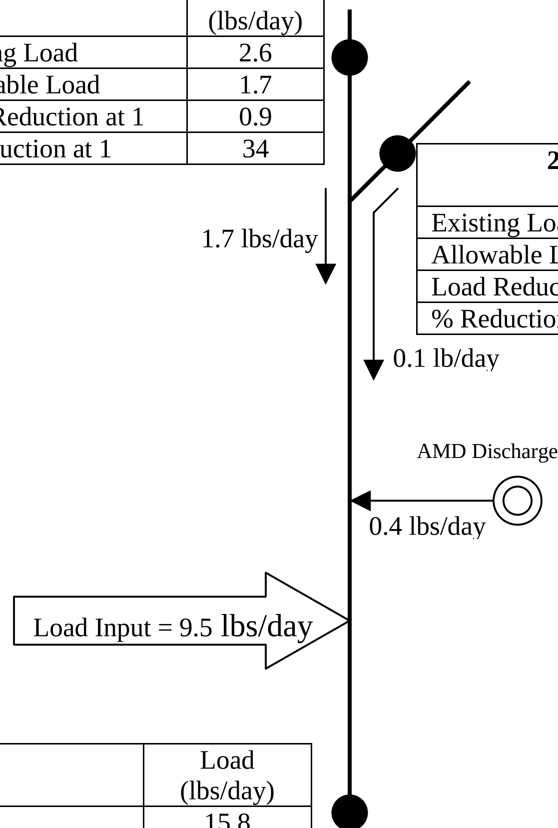
Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Acidity	0.0	0.0	NA	NA	0.0	0
6	*Mouth of McCune Run*						
	Fe	7.8	5.5	0.0	5.5	0.0	0
	Mn	16.9	2.2	0.0	2.2	0.9	29
	Al	10.7	1.5	0.0	1.5	0.0	0
	Acidity	99.2	41.7	0.0	41.7	0.0	0

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

In the instance that the allowable load is equal to the existing load (e.g. manganese point 2, 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 1, Table 3), no TMDL is necessary. In this case the accounting for upstream loads is not carried through to the next downstream point. Rather, there is a disconnect noted and the allowable load is considered to start over because the water quality standard is satisfied.

Following is an example of how the allocations, presented in Table 3 are calculated. For this example, manganese allocations for points 1, 2, 7, and 3 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.

1	Load (lbs/day)
Existing Load	2.6
Allowable Load	1.7
Load Reduction at 1	0.9
% Reduction at 1	34



2	Load (lbs/day)
Existing Load	0.1
Allowable Load	0.1
Load Reduction at 2	0.0
% Reduction at 2	0

7	Load (lbs/day)
Existing Load	3.6
Allowable Load	0.4
Load Reduction at 7	3.2
% Reduction at 7	89

3	Load (lbs/day)
Existing Load	15.8
Difference in Existing Load between 1,2, & 7	9.5
Load tracked from 1, 2, and 7	2.2
Total Load tracked between points 1, 2, & 7	11.7
Allowable Load at 3	2.1
Load Reduction at 3	9.6
% Reduction at 3	82

Recommendations

Considerable work has been performed by BAMR in the McCune Run Watershed. This includes an AMD collection system in an effort to prevent the discharge from the sealed main entries from encroaching upon the park's baseball field. Plugging from iron precipitate in the piping system has been a persistent problem requiring several rehabilitation efforts.

In addition, BAMR under the Scarlift program installed the mine seals and reclaimed an adjacent coal refuse disposal area. The mine-sealing project was conducted as part of an EPA research and monitoring project during the 1970's. During the 1970's a major blowout occurred about 150 ft. behind the location of the portal seals. BAMR installed a borehole at the blowout point and piped the discharge over the seals directly to the stream. In recent years this piping system has been repaired/replaced on several occasions. Lateral drains have also been added along the outcrop adjacent to the entries in an attempt to collect AMD that is leaking around the seals.

Phase I of Project No. AMD65 (1183) 101.1 was completed in 2002 and Phase II is scheduled to begin the summer of 2003. The continuation of Project No. AMD65 (1183) 101.1, under the guidance of Richard Beam, Hydrogeologist, PA BMAR will collect 3 AMD discharges from the abandoned underground mine and a reclaimed coal refuse disposal area located in Keystone State Park. The mine pool will be dewatered at the portal entries. Mine pool head will be reduced by approximately 20 to 25 feet. Treatment of the resulting discharge will consist of vertical flow wetlands, settling ponds, and aerobic wetlands. Other discharges from the reclaimed coal refuse disposal area and tipple area will be incorporated into the treatment system if not eliminated by the mine pool dewatering effort. This project will also repair the drainage system mentioned previously and route the discharge to the passive treatment facilities.

Two primary programs provide maintenance and improvement of water quality in the watershed. DEP's efforts to reclaim abandoned mine lands, coupled with its duties and responsibilities for issuing NPDES permits, will be the focal points in water quality improvement.

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

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

Mine reclamation and well plugging refers to the process of cleaning up environmental pollutants and safety hazards associated with a site and returning the land to a productive condition, similar to DEP's Brownfields program. Since the 1960's, Pennsylvania has been a national leader in establishing laws and regulations to ensure reclamation and plugging occur after active operation is completed.

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

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

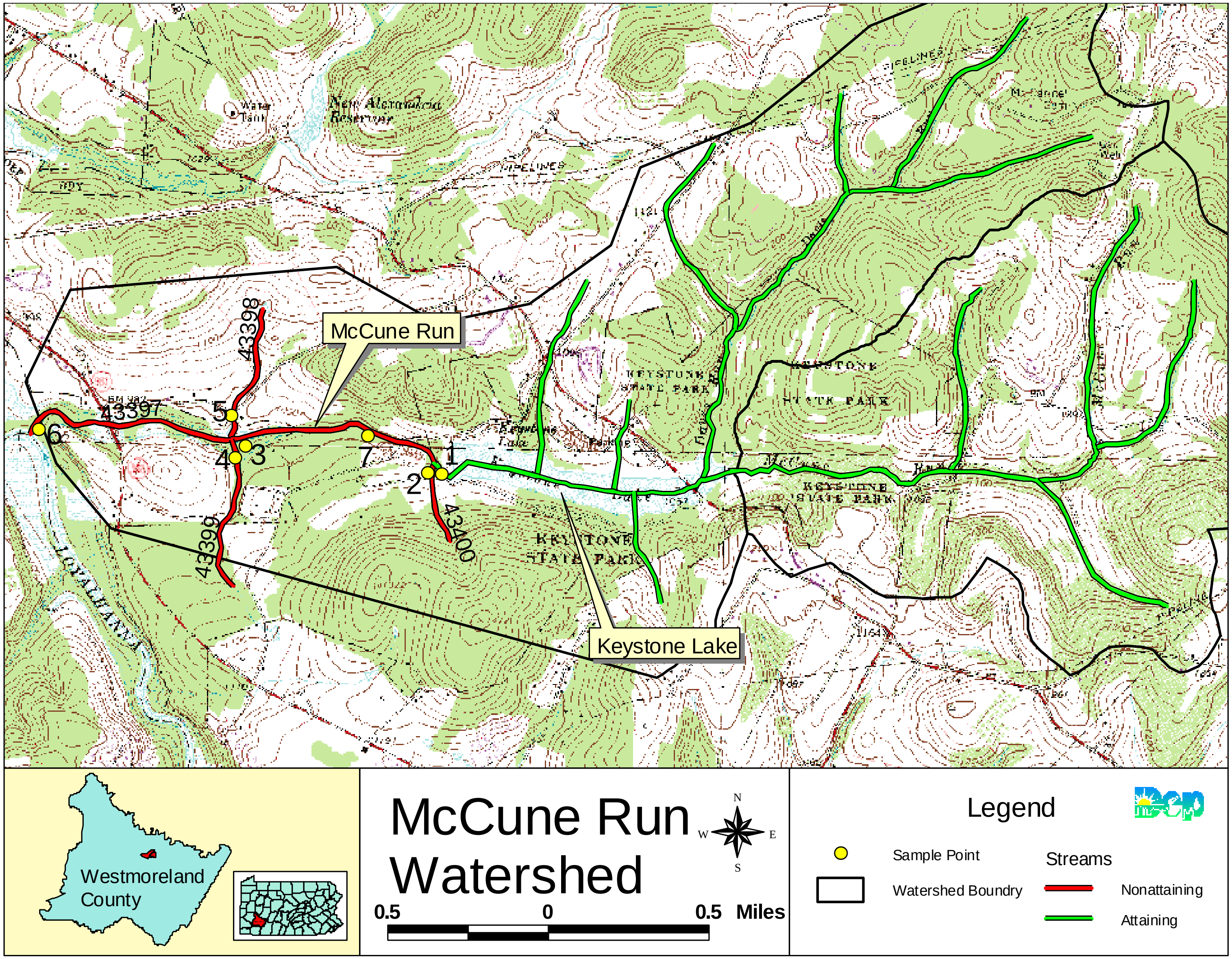
Reclaim PA is DEP's initiative designed to maximize reclamation of the state's quarter million acres of abandoned mineral extraction lands. Abandoned mineral extraction lands in Pennsylvania constituted a significant public liability – more than 250,000 acres of abandoned surface mines, 2,400 miles of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

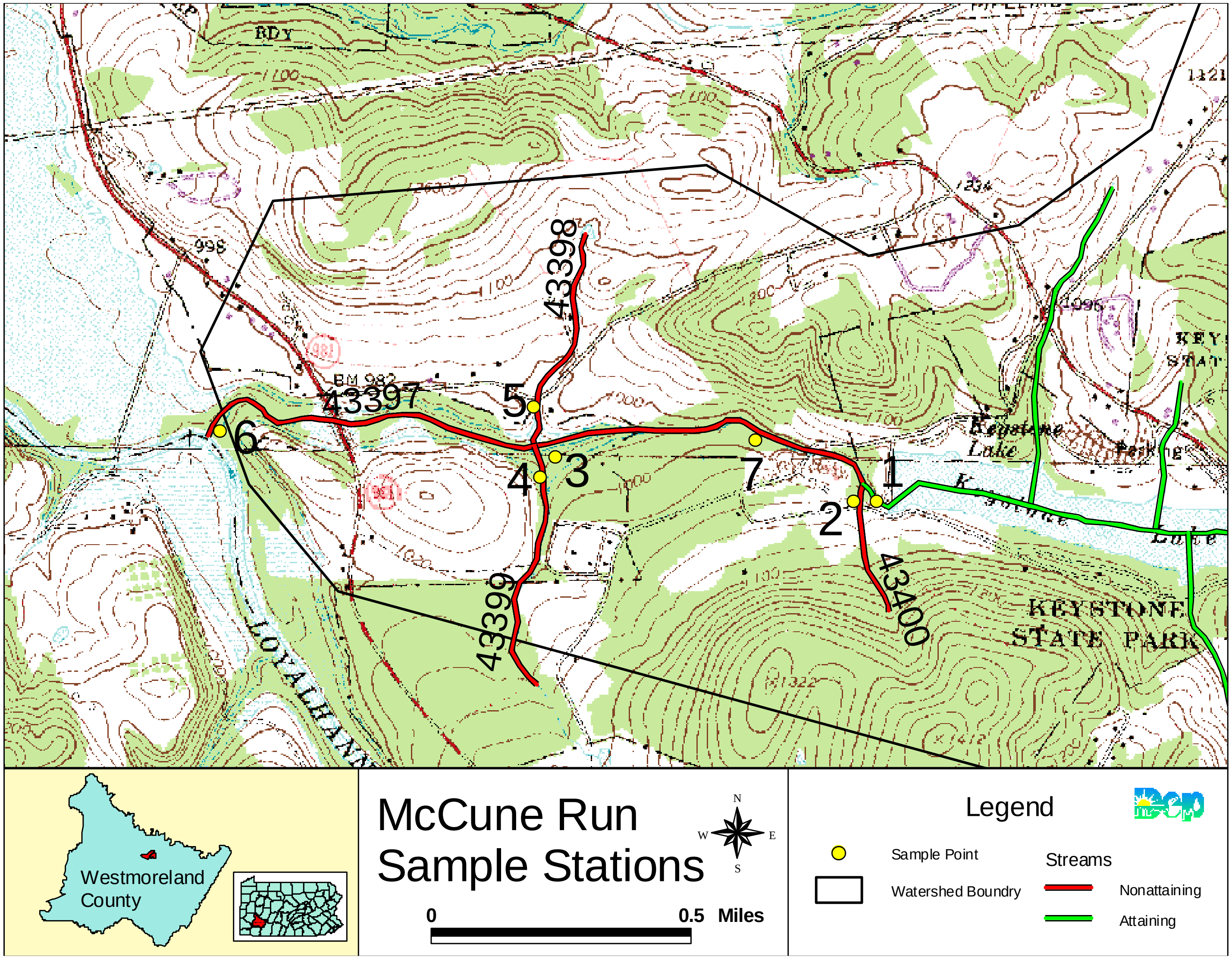
Public Participation

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on May 1, 2004 and the *Tribune-Review* on April 27, 2004 to foster public comment on the allowable loads calculated. The public comment period on this TMDL was open from May 1, 2004 to July 1, 2004. A public meeting was held on May 5, 2004 at the Stonelodge Environmental Center, Keystone State Park, in New Alexandria, PA to discuss the proposed TMDL.

Attachment A

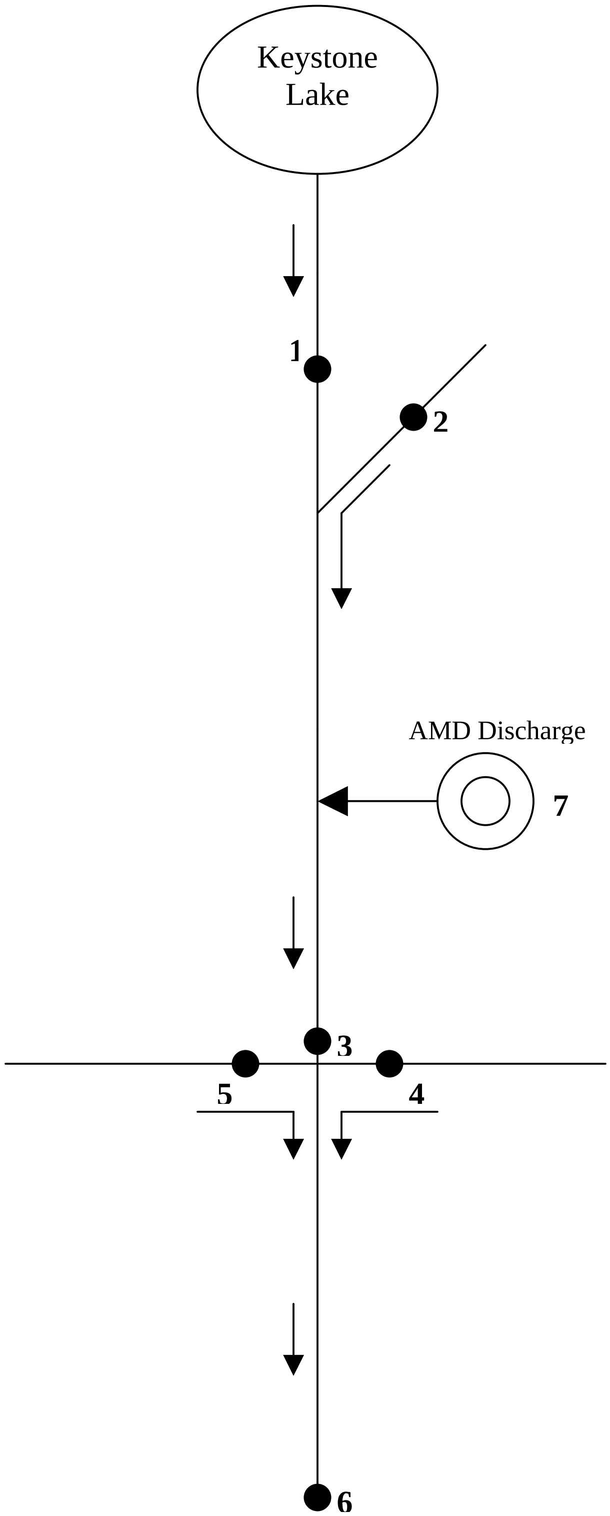
McCune Run Watershed Maps


McCune Run
Keystone Lake
43398
43397
43399
43400
1
2
3
4
5
6
7
Westmoreland
County
McCune Run
Watershed
0.5
0
0.5
Miles
Legend
Sample Point
Watershed Boundry
Streams
Nonattaining
Attaining



43398
43397
43399
43400
1
2
3
4
5
6
7
KEYSTONE STATE PARK
Westmoreland County
McCune Run
Sample Stations
0
0.5 Miles
Legend
Sample Point
Watershed Boundry
Streams
Nonattaining
Attaining

McCune Run Sampling Station Diagram
Arrows represent direction of flow
Diagram not to scale



Attachment B

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

Method for Addressing Section 303(d) Listings for pH

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

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

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

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

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

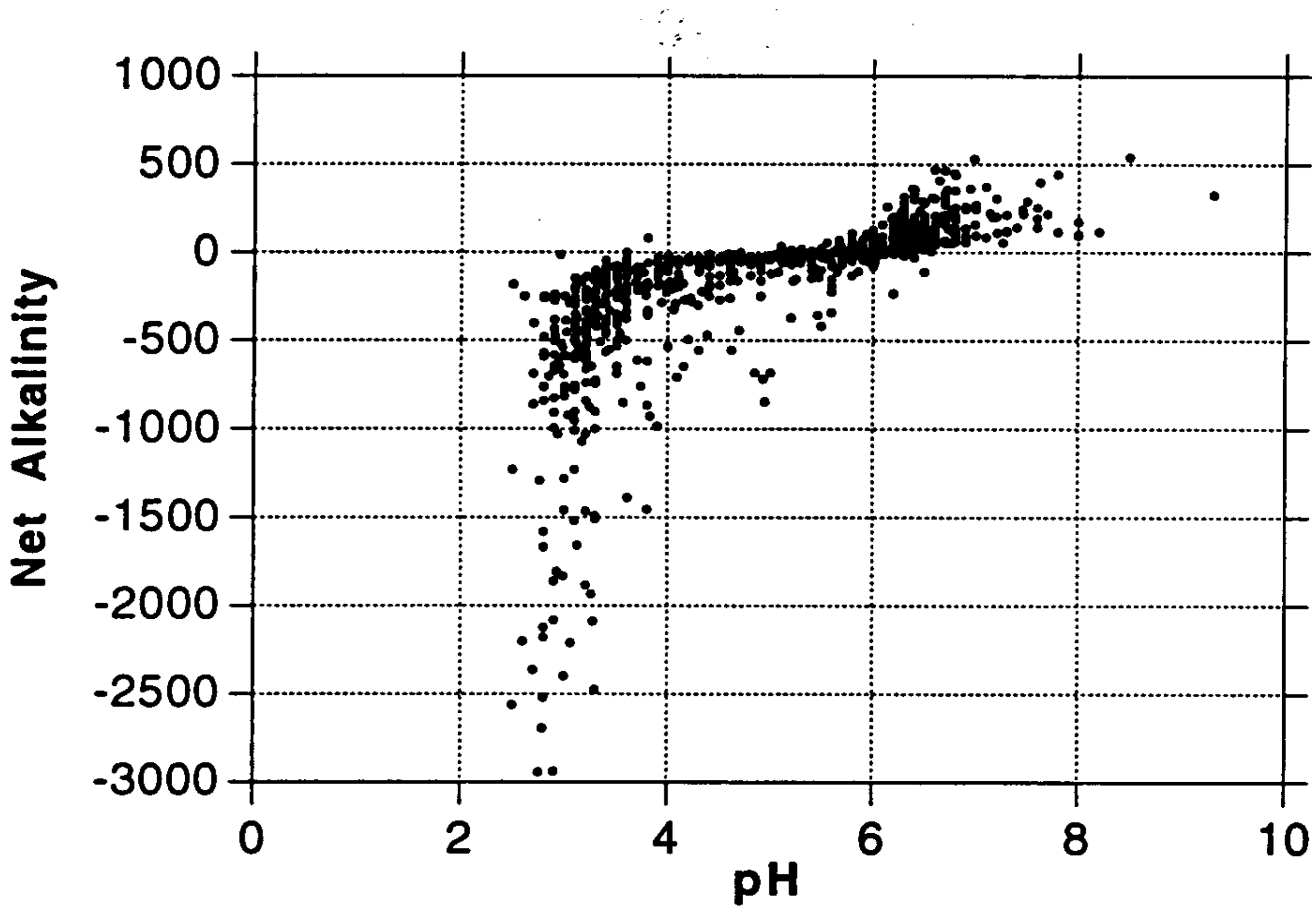


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Surface Mining Control and Reclamation Act

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

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

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

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

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

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

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

Related Definitions

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

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

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

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

Attachment C
TMDLs By Segment

McCune Run

The TMDL for McCune Run consists of load allocations of three tributaries, one abandoned mine discharge, and three sampling sites along the stream. No waste load allocations are assigned because there are currently no permitted discharges in the McCune Run Watershed. Following is an explanation of the TMDL for each allocation point.

McCune Run is listed as impaired on the PA Section 303(d) list by high metals and suspended solids and depressed pH from AMD. The elevated suspended solids is due to metals precipitation, and therefore by removing the metals loading to the stream, the suspended solids will in turn be removed. For pH, the objective is to reduce acid loading to the stream that will in turn raise the pH to the acceptable range. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

An allowable long-term average in-stream concentration was determined at each point for iron, manganese, aluminum, and acidity. The analysis is designed to produce an average value that, when met, will be protective of the water-quality criterion for that parameter 99% of the time. An analysis was performed using Monte Carlo simulation to determine the necessary long-term average concentration needed to attain water-quality criteria 99% of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and standard deviation of the data set, 5000 iterations of sampling were completed, and compared against the water-quality criterion for that parameter. For each sampling event a percent reduction was calculated, if necessary, to meet water-quality criteria. A second simulation that multiplied the percent reduction times the sampled value was run to insure that criteria were met 99% of the time. The mean value from this data set represents the long-term average concentration that needs to be met to achieve water-quality standards.

TMDL Calculations - Sample Point 1, McCune Run downstream of Keystone Lake

The TMDL for McCune Run consists of a load allocation to all of the area above sampling point 1 (Attachment A). The load allocation for this stream segment was computed using water-quality sample data collected at point 1. The average flow of 1.48 MGD, measured at the sampling point, is used for these computations.

There is currently no entry for this segment on the PA Section 303(d) list for impairment and McCune Run upstream of this point is attaining its designated uses. Sample data at point 1 shows pH ranging between 6.7 and 7.5; pH is not addressed as part of this TMDL.

All values for iron and aluminum are below the method detection limit, denoted by ND. Because WQS are met, TMDLs for aluminum and iron are not necessary. All values for manganese are below the criterion; however, the simulation determined that standards are not met 99% of the time resulting in a necessary reduction. Point 1 is the most upstream allocation point on McCune Run; therefore, accounting for loads allocated upstream is not necessary at point 1.

Table C1. TMDL Calculations at Point 1				
Flow = 1.48 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	ND	ND	NA	NA
Mn	0.21	2.6	0.14	1.7
Al	ND	ND	NA	NA
Acidity	0.00	0.0	0.00	0.0
Alkalinity	52.83	651.3		

Table C2. Calculation of Load Reduction Necessary at Point 1				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	ND	2.6	ND	0.0
Allowable Load = TMDL	NA	1.7	NA	0.0
Load Reduction	0.0	0.9	0.0	0.0
% Reduction Segment	0	34	0	0

TMDL Calculations - Sampling Points 2, mouth of Unnamed Tributary 43400

The TMDL for sampling point 2 consists of a load allocation to all of the area above the sampling point shown in Attachment A. The load allocation for this tributary was computed using water-quality sample data collected at point 2. The average flow of 0.058 MGD, measured at the sampling point, is used for these computations

This segment is on the 1996 and 1998 PA Section 303(d) lists for metals impairments. A reassessment of the segment in 1999 resulted in the addition of depressed pH and suspended solids as causes of impairment to the 2002 PA Section 303(d) list. Sample data at point 2 shows pH ranging between 6.4 and 7.1, pH will not be addressed in this TMDL.

All values for aluminum at the point are below the method detection limit, denoted by ND. Because WQS are met for all parameters, no TMDLs are necessary at point 2.

Table C3. TMDL Calculations at Point 2				
Flow = 0.058 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	0.57	0.3	0.57	0.3
Mn	0.20	0.1	0.20	0.1
Al	ND	ND	NA	NA
Acidity	0.05	0.02	0.05	0.02
Alkalinity	47.45	22.8		

Table C4. Calculation of Load Reduction Necessary at Point 2				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	0.3	0.1	ND	0.02
Allowable Load = TMDL	0.3	0.1	NA	0.02
Load Reduction	0.0	0.0	0.0	0.0
% Reduction Segment	0	0	0	0

TMDL Calculations - Sampling Point 7, abandoned mine discharge below Unnamed Tributary 43400

The TMDL for sampling point 7 consists of a load allocation to an abandoned mine discharge. The load allocation for this abandoned discharge was computed using water-quality sample data collected at point 7. The average flow of 0.082 MGD, measured at the sampling point, is used for these computations.

The segment of stream receiving the abandoned discharge is on the 1996 and 1998 PA Section 303(d) lists for metals impairments. A reassessment of the segment in 1999 resulted in the addition of depressed pH and suspended solids as causes of impairment to the 2002 PA Section 303(d) list. Sample data at point 7 shows pH ranging between 2.9 and 5.6; pH is addressed as part of this TMDL because of the mining impacts.

Table C5. TMDL Calculations at Point 7				
Flow = 0.082 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	22.92	15.6	0.69	0.5
Mn	5.25	3.6	0.58	0.4
Al	7.99	5.4	0.32	0.2
Acidity	139.60	95.1	1.40	1.0
Alkalinity	3.70	2.5		

Table C6. Calculation of Load Reduction Necessary at Point 7				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	15.6	3.6	5.4	95.1
Allowable Load = TMDL	0.5	0.4	0.2	1.0
Load Reduction	15.1	3.2	5.2	94.1
% Reduction Segment	97	89	96	99

TMDL Calculation - Sample Point 3, McCune Run upstream of tributaries 43398 and 43399

The TMDL for sample point 3 consists of a load allocation to all of the area between sample point 3 and sample points 1 and 2 shown in Attachment A. The load allocation for this stream segment was computed using water-quality sample data collected at point 3. The average flow of 1.83 MGD, measured at the sampling point, is used for these computations.

This segment is on the 1996 and 1998 PA Section 303(d) lists for metals impairments. A reassessment of the segment in 1999 resulted in the addition of depressed pH and suspended solids as causes of impairment to the 2002 PA Section 303(d) list. Sample data at point 3 shows pH ranging between 3.2 and 7.0; pH is addressed as part of this TMDL because of the mining impacts.

Table C7. TMDL Calculations at Point 3				
Flow = 1.83 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	3.79	57.8	0.19	2.9
Mn	1.04	15.8	0.14	2.1
Al	1.64	25.0	0.10	1.5
Acidity	31.88	486.2	2.23	34.0
Alkalinity	19.08	291.0		

The calculated load reductions for all the loads that enter point 3 must be accounted for in the calculated reductions at sample point 3 shown is Table C8. A comparison of measured loads between points 1, 2, 7, and 3 shows that there is additional loading entering the segment for all parameters. To determine the amount of current acidity loading to the segment, the difference in existing loads is calculated. Because there is no acidity at point 1, there is a 651.3 lbs/day buffering capacity within the segment. The additional acidity load entering the segment is 1042.4 lbs/day (486.2 – 95.1 – 0.02 + 651.3). The total segment load is the sum of the upstream allocated loads and any additional loading within the segment. For acidity, the alkalinity from point 1 will neutralize a portion of the loading to the segment. The total acidity load to the segment is 392.0 lbs/day ($0.02_{\text{from 2}}$ + $1.0_{\text{from 7}}$ + 1042.4_{segment} – $651.3_{\text{alkalinity from 1}}$)

Table C8. Calculation of Load Reduction Necessary at Point 3				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	57.8	15.8	25.0	486.2
Difference in Existing Load between 1, 2, 7, and 3	41.9	9.5	19.6	1042.4
Load tracked from 1, 2, and 7 (Upstream Loads)	0.7	2.2	0.2	1.0
Total Load tracked between points 1, 2, 7, and 3	42.6	11.7	19.8	392.0
Allowable Load = TMDL	2.9	2.1	1.5	34.0
Load Reduction	39.7	9.6	18.3	358.0
% Reduction Segment	93	82	92	91

TMDL Calculations - Sample Point 4, mouth of Unnamed Tributary 43399

The TMDL for sampling point 4 consists of a load allocation to all of the area above sample point 4 shown on the map in Attachment A. The load allocation for this tributary was computed using water-quality sample data collected at point 4. The average flow of 0.25 MGD, measured at the sampling point, is used for these computations.

This segment is on the 1996 and 1998 PA Section 303(d) lists for metals impairments. A reassessment of the segment in 1999 resulted in the addition of depressed pH and suspended solids as causes of impairment to the PA 2002 Section 303(d) list. Sample data at point 4 shows pH ranging between 6.5 and 7.3; pH is not addressed as part of this TMDL.

The simulation determined that the existing and allowable aluminum loads are equal. Because WQS are met, a TMDL for aluminum is not necessary.

Table C9. TMDL Calculations at Point 4

Flow = 0.25 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	0.60	1.3	0.24	0.5
Mn	0.25	0.51	0.22	0.46
Al	0.68	1.4	0.68	1.4
Acidity	0.00	0.0	0.00	0.0
Alkalinity	76.40	160.6		

Table C10. Calculation of Load Reduction Necessary at Point 4

	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	1.3	0.51	1.4	0.0
Allowable Load = TMDL	0.5	0.46	1.4	0.0
Load Reduction	0.8	0.05	0.0	0.0
% Reduction Segment	60	10	0	0

TMDL Calculation – Sample Point 5, mouth of Unnamed Tributary 43398

The TMDL for sampling point 5 consists of a load allocation to all of the area above sample point 5 shown on the map in Attachment A. The load allocation for this tributary was computed using water-quality sample data collected at point 5. The average flow of 0.07 MGD, measured at the sampling point, is used for these computations.

This segment is on the 1996 and 1998 PA Section 303(d) lists for metals impairments. A reassessment of the segment in 1999 resulted in the addition of depressed pH and suspended solids as causes of impairment to the PA 2002 Section 303(d) list. Sample data at point 5 shows pH ranging between 7.2 and 7.8; pH is not addressed as part of this TMDL

Table C11. TMDL Calculations at Point 5				
Flow = 0.07 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	0.61	0.4	0.21	0.1
Mn	0.09	0.1	0.09	0.1
Al	0.21	0.12	0.08	0.04
Acidity	0.00	0.0	0.00	0.0
Alkalinity	110.07	63.9		

Table C12. Calculation of Load Reduction Necessary at Point 5				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	0.35	0.1	0.12	0.0
Allowable Load = TMDL	0.12	0.1	0.04	0.0
Load Reduction	0.23	0.0	0.08	0.0
% Reduction Segment	65	0	64	0

TMDL Calculation - Sample Point 6, mouth of McCune Run

The TMDL for sample point 6 consists of a load allocation to all of the area between sample point 6 and sample points 3, 4, and 5 shown in Attachment A. The load allocation for this stream segment was computed using water-quality sample data collected at point 6. The average flow or 2.10 MGD, measured at the sampling point, is used for these computations.

This segment is on the 1996 and 1998 PA Section 303(d) lists for metals impairments. A reassessment of the segment in 1999 resulted in the addition of depressed pH and suspended solids as causes of impairment to the PA 2002 Section 303(d) list. Sample data at point 6 shows pH ranging between 4.7 and 7.1; pH is addressed as part of this TMDL because of the mining impacts.

Table C13. TMDL Calculations at Point 6				
Flow = 2.10 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	0.45	7.8	0.31	5.5
Mn	0.97	16.9	0.13	2.2
Al	0.61	10.7	0.09	1.5
Acidity	5.67	99.2	2.38	41.7
Alkalinity	22.93	401.4		

The calculated load reductions for all the loads that enter point 6 must be accounted for in the calculated reductions at sample point 6 shown is Table C14. A comparison of measured loads between points 3, 4, 5, and 6 shows that there is additional manganese load entering the segment and a loss in load, indicated by the negatives in Table C14, for iron, aluminum, and acidity. The buffering capacity of the segment is 387.0 lbs/day ($99.2_{acidity\ at\ 6} - 486.2_{acidity\ at\ 3}$). The total segment load is the sum of the upstream allocated loads and any additional loading within the segment. This segment has a high buffering capacity and no additional reduction for acidity is necessary to meet the TMDL. For loss of manganese loading, the percent of load lost within the segment is calculated and applied to the upstream-allocated loads to determine the amount of load that is tracked through the segment. No additional reductions are necessary for iron and aluminum.

Table C14. Calculation of Load Reduction Necessary at Point 6

	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	7.8	16.9	10.7	99.2
Difference in Existing Load between 3, 4, 5, and 6	-51.6	0.5	-15.9	-387.0
Load tracked from 3, 4, and 5	3.5	2.6	3.0	34.0
Percent loss due to instream process	87	NA	60	-
Percent of loads tracked through segment	13	NA	40	-
Total Load tracked between points 3, 4, 5, and 6	0.5	3.1	1.2	-353.0
Allowable Load at 6	5.5	2.2	1.5	41.7
Load Reduction at 6	0.0	0.9	0.0	0.0
% Reduction required at 6	0	29	0	0

Margin of Safety

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

- Effluent variability plays a major role in determining the average value that will meet water-quality criteria over the long-term. The value that provides this variability in our analysis is the standard deviation of the dataset. The simulation results are based on this variability and the existing stream conditions (an uncontrolled system). The general assumption can be made that a controlled system (one that is controlling and stabilizing the pollution load) would be less variable than an uncontrolled system. This implicitly builds in a margin of safety.
- An additional MOS is provided because that the calculations were done with a daily Fe average instead of the 30-day average

Seasonal Variation

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

Critical Conditions

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

Attachment D

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

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

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

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

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

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

Attachment E

Water Quality Data Used In TMDL Calculations

Station	Date	Flow	pH	Alkalinity	Acidity	Fe	Mn	Al
		gpm		mg/L	mg/L	mg/L	mg/L	mg/L
1	6/18/2002	50	7	40	0	ND	0	ND
Latitude:	7/23/2002	5	7.5	146	0	ND	0.225	ND
40 22' 26"	3/17/2003	254	6.7	26.8	0	ND	0.87	ND
	4/15/2003	3650	7.4	30.4	0	ND	0.057	ND
Longitude:	5/13/2003	450	6.9	34	0	ND	0.072	ND
79 23' 29"	6/10/2003	1750	7.9	39.8	0	ND	0.056	ND
	Average	1026.50000	7.23333	52.83333	0.00000	ND	0.21333	ND
	St Dev	1437.52061	0.44572	45.93533	0.00000	NA	0.33046	NA
2	6/18/2002	120	7.1	36	0	0.653	0.087	ND
Latitude:	7/23/2002	5	7.2	122	0	0.482	0.322	ND
40 22' 26"	3/17/2003	10	6.4	15.4	0.2	ND	ND	ND
	4/15/2003	25	6.6	16.4	0	ND	ND	ND
Longitude:	6/10/2003	0						
79 23' 32"	Average	40.00000	6.82500	47.45000	0.05000	0.56750	0.20450	ND
	St Dev	54.00617	0.38622	50.59680	0.10000	0.12092	0.16617	NA
3	6/18/2002	15	6.8	26	0	0.435	0.264	0
Latitude:	7/23/2002	120	3.2	0	133.2	16.1	4.13	7
40 22' 30"	3/17/2003	1090	6.4	17.6	26.2	1.37	0.381	0.623
	4/15/2003	2900	6.9	23.6	0	1.04	0.254	0.587
Longitude:	6/10/2003	2225	7	28.2	0	0	0.164	0
79 24' 11"	Average	1270.00000	6.06000	19.08000	31.88000	3.78900	1.03860	1.64200
	St Dev	1274.64211	1.61493	11.37682	57.76463	6.90245	1.72986	3.01048
4	6/18/2002	150	6.6	17.6	0	1.87	0.643	0.682
Latitude:	7/23/2002	30	7.3	286	0	0	0.101	ND
40 22' 28"	3/17/2003	100	6.5	19.6	0	0	0.145	ND
	4/15/2003	560	6.8	21	0	0.441	0.157	ND
Longitude:	6/10/2003	35	7.3	37.8	0	0.692	0.179	ND
79 24' 13"	Average	175.00000	6.90000	76.40000	0.00000	0.60060	0.24500	0.68200
	St Dev	220.85063	0.38079	117.44675	0.00000	0.76919	0.22430	NA
5	6/18/2002	10	7.5	104	0	0	0.052	0
Latitude:	7/23/2002	10	7.3	280	0	0	0.106	0
40 22' 35"	3/17/2003	110	7.4	59.6	0	0.378	0	0
	4/15/2003	100	7.8	63.2	0	2.47	0.173	1.28
Longitude:	5/13/2003	10	7.3	80.8	0	0.41	0.082	0
79 24' 14"	6/10/2003	50	7.2	72.8	0	0.378	0.104	0
	Average	48.33333	7.41667	110.06667	0.00000	0.60600	0.08617	0.21333
	St Dev	46.65476	0.21370	84.73825	0.00000	0.93288	0.05807	0.52256

Station	Date	Flow	pH	Alkalinity	Acidity	Fe	Mn	Al
		gpm		mg/L	mg/L	mg/L	mg/L	mg/L
6	6/18/2002	500	6.9	22	0	0	0.358	0
Latitude:	7/23/2002	300	4.7	8	34	0	4.48	3.13
40 22' 32"	3/17/2003	1360	6.5	19.6	0	1.16	0.324	0.537
	4/15/2003	3600	7.1	25.6	0	0.623	0.216	0
Longitude:	5/13/2003	625	6.9	28.4	0	0.449	0.272	0
79 24' 55"	6/10/2003	2360	7	34	0	0.449	0.155	0
	Average	1457.50000	6.51667	22.93333	5.66667	0.44683	0.96750	0.61117
	St Dev	1293.36673	0.91305	8.88204	13.88044	0.43335	1.72232	1.25253
7	6/18/2002	70	3.2	0	156.4	27.7	4.97	9.39
Latitude:	7/23/2002	30	3.1	0	184	36.3	5.83	10.3
40 22' 32"	3/17/2003	5	5.6	22.2	53	16.4	4.47	1.74
	4/15/2003		2.9	0	159.2	10.9	7.72	10.3
Longitude:	5/13/2003	122	3.3	0	129.6	23	4.22	7.11
79 23' 45"	6/10/2003		3.2	0	155.4	23.2	4.28	9.08
	Average	56.75000	3.55000	3.70000	139.60000	22.91667	5.24833	7.98667
	St Dev	51.07756	1.01341	9.06311	45.79729	8.81985	1.35099	3.27589

Attachment F
Comment and Response

Comments/Responses on McCune Run Watershed TMDL

The Department received no comments on the McCune Run Watershed TMDL.