Craig Run Watershed TMDL

Armstrong and Indiana Counties, Pennsylvania

Prepared by:

Pennsylvania Department of Environmental Protection

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TABLE OF CONTENTS

Introduction 4
Directions to the Craig Run Watershed 5
Segments addressed in this TMDL 5
Clean Water Act Requirements 5
303(d) Listing Process 6
Basic Steps for Determining a TMDL 7
Watershed History 7
AMD Methodology 8
Method to Quantify Treatment Pond Pollutant Load 25
Changes in TMDLs That May Require EPA Approval 17
Changes in TMDLs That May Not Require EPA Approval 17
TMDL Endpoints 10
TMDL Elements (WLA, LA, MOS) 11
TMDL Allocations Summary .... **Error! Bookmark not defined.**
Allocation Summary 11
Recommendations 14
Public Participation 16

TABLES

Table 1. 303(d) Sub-List Central Allegheny River 4
Table 2 Applicable Water Quality Criteria 11
Table 3. Summary Table–Craig Run Watershed 12

ATTACHMENTS

***Attachment A* 18**
Craig Run Watershed Maps 18
***Attachment B* 21**
Method for Addressing Section 303(d) Listings for pH 21
***Attachment C* 24**
Method to Quantify Treatment Pond Pollutant Load 24
***Attachment D* 29**
TMDLs By Segment 29
***Attachment D* 43**
Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists and Integrated Report/List (2004, 2006) 43
***Attachment E* 46**
Water Quality Data Used In TMDL Calculations 46
***Attachment F* 50**
TMDLs and NPDES Permitting Coordination 50
***Attachment G* 53**

Comment and Response.. 53

TMDL
Craig Run Watershed
Armstrong and Indiana Counties, Pennsylvania

Introduction

This Total Maximum Daily Load (TMDL) calculation has been prepared for segments in the Craig Run Watershed (Attachment A). It was done to address the impairments noted on the 1996 Pennsylvania 303(d) list, required under the Clean Water Act, and covers the one listed segment shown in Table 1. Metals in acidic discharge water from abandoned coalmines causes the impairment. The TMDL addresses the three primary metals associated with acid mine drainage (iron, manganese, aluminum), and pH.

Table 1. 303(d) Sub-List Central Allegheny River								
State Water Plan (SWP) Subbasin: 17E; HUC 05010006								
Year	Miles	Segment ID	DEP Stream Code	Stream Name	Desig-nated Use	Data Source	Source	EPA 305(b) Cause Code
1996	1.0	5234	49415	Craig Run	CWF	303 (d) List	Resource Extraction	Other Inorganics
1998	1.17	5234	46415	Craig Run	CWF	SWMP	AMD	Other Inorganics
2002	1.17	5234	46415	Craig Run	CWF	SWMP	AMD	Other Inorganics
2004	0.8	5234	Unt 46422	Craig Run	CWF	SWMP	AMD	Other Inorganics
2004	0.4	5234b	Unt 46422	Craig Run	CWF	SWMP	AMD	Other Inorganics
2004	0.5	20020625-0930-ALF	46415	Craig Run	CWF	SWMP	AMD	Metals, Organic Enrichment/ Low D.O. & Siltation
2006	0.79	7680	46415	Craig Run	CWF	SWMP	AMD	Cause Unknown
2006	0.4	7681	46415	Craig Run	CWF	SWMP	AMD	Cause Unknown
2006	0.79	7680	Unt 46422	Unt Craig Run	CWF	SWMP	AMD	Cause Unknown
2006	0.4	7681	Unt 46422	Unt Craig Run	CWF	SWMP	AMD	Cause Unknown
2006	0.65	3942	46415	Craig Run	CWF	SWMP	AMD	Metals, Organic Enrichment/ Low D.O. & Siltation

The other inorganics listing is was delisted as a cause of impairment on the 2006 Integrated list.
Cold Water Fishes=CWF
Surface Water Monitoring Program = SWMP
Abandoned Mine Drainage = AMD

Directions to the Craig Run Watershed

The Craig Run watershed is located in western Pennsylvania, in the southern portion of Armstrong County, approximately 50 miles northeast of Pittsburgh. Craig Run is tributary to Crooked Creek and part of the larger Allegheny River Basin. State Route 156 crosses lower Craig Run approximately two miles southeast of Girty, PA. State Route 156 is accessible from north to south by State Route 66 and from east to west by U.S. Route 422.

Segments addressed in this TMDL

The Craig Run Watershed is affected by pollution from AMD. This pollution has caused high levels of metals and low pH in the main stem and Unt 46422 of Craig Run. The sources of the AMD are seeps and discharges from areas disturbed by underground and surface mining. Most of the discharges originate from mining on the Allegheny series coals or refuse piles associated with them. All of the discharges are considered to be nonpoint sources of pollution because they are from abandoned Pre-Act mining operations or from coal companies that have settled their bond forfeitures with the Pennsylvania Department of Environmental Protection (PADEP).

There are no active mining operations in the watershed. All of the discharges in the watershed are from abandoned mines and will be treated as non-point sources. The distinction between non-point and point sources in this case is determined on the basis of whether or not there is a responsible party for the discharge. Where there is no responsible party the discharge is considered to be a non-point source. 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.

The designation for this stream segment can be found in PA Title 25 Chapter 93.

Clean Water Act Requirements

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

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

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

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

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

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

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

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

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

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

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

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

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

Basic Steps for Determining a TMDL

Although all watersheds must be handled on a case-by-case basis when developing TMDLs, 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. Calculate TMDL for the waterbody using USEPA approved methods and computer models;
3. Allocate pollutant loads to various sources;
4. Determine critical and seasonal conditions;
5. Submit draft report for public review and comments; and
6. USEPA approval of the TMDL.

This document will present the information used to develop the Craig Run Watershed TMDL.

Watershed History

Settling in the Craig Run area began in the early 1800's. The area was suitable for farming and the acreage cleared for cultivation increased as time passed. At present, approximately 40% of the watershed is used for agriculture. The remaining land is primarily forestland with a much lesser area used for residences. The watershed is a rural area and is sparsely populated.

There has been significant surface and underground coal mining in the watershed. Coal mining began in the early 20th century. The Allegheny series coals were mined in the lower watershed. The stratigraphically higher Monongahela coals were mined in the upper watershed. Less than 10% of the watershed has been surface mined. The deep mining is completed in the same coals as mentioned earlier.

The geology of the Craig Run Watershed is typical of southwestern PA. Topography consists of gently rolling hills and a maximum elevation of approximately 1,300 feet MSL at the hilltops. The minimum watershed elevation is found at Craig Run's confluence with Crooked Creek. The elevation here is approximately 940 feet MSL. This indicates a maximum relief of approximately 360 feet within the watershed.

The stratigrahpy consists of a series of sandstones and shales with lesser amounts of coal and some limestone. The oldest strata exposed at the surface are of the Allegheny series. The youngest rocks are of the Monongahela series.

Structurally the watershed is located southeast of the Murrysville Roaring Run Anticline. The strata here are mostly planner and dip on the order of 3-5^{o} to the southeast.

The most recent mining was the TJS Mining, Inc. (CMAP # 03901302) underground coal mine. Mining at this site has been completed, the site reclaimed and the mine water treatment facility removed. No NPDES discharge points remain.

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 describes 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 nonpoint 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 nonpoint 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[1] 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:

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

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

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

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

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

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

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

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

LTA = allowable LTA source concentration in mg/l

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

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.

In Low 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 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.

This document contains one or more future mining Waste Load Allocations (WLA) to accommodate possible future mining operations. The Knox District Mining Office determined the number of and location of the future mining WLAs. All comments and questions concerning permitting issues and future mining WLAs are to be directed to the appropriate DMO.

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

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

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 acceptable water quality. An instream numeric endpoint, therefore, represents the water quality goal that is to be achieved by implementing the load reductions specified in the TMDL. The endpoint allows for comparison between observed instream conditions and conditions that are expected to restore designated uses. The endpoint is based on either the narrative or numeric criteria available in water quality standards.

Because of the nature of the pollution sources in the watershed, the TMDLs component makeup will be load allocations that are specified above a point in the stream segment. All allocations will be specified as long-term average daily concentrations. These long-term average daily concentrations are expected to meet water quality criteria 99 percent of the time. Pennsylvania Title 25 Chapter 96.3(c) specifies that a minimum 99 percent level of protection is required. All metals criteria evaluated in this TMDL are specified as total recoverable. Table 2 shows the 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	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. These values are typically as low as 5.4 (Pennsylvania Fish and Boat Commission).

TMDL Elements (WLA, LA, MOS)

A TMDL equation consists of a wasteload allocation, load allocation and a margin of safety. The wasteload allocation is the portion of the load assigned to point sources. The load allocation is the portion of the load assigned to nonpoint 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).

Allocation Summary

This TMDL 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 in to 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 active permits in the watershed.

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. Summary Table–Craig 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 %
CR10	Most Upstream Sample Point on Craig Run 46415						
	Al	1.95	0.31	-	0.31	1.64	84%
	Fe	3.55	0.53	-	0.53	3.02	85%
	Mn	6.46	0.90	-	0.90	5.46	85%
	Acidity	ND	NA	NA	NA	NA	NA
CR9	Mouth of Unt 46422 Upstream of Confluence with Craig Run						
	Al	0.07	NA	NA	NA	NA	NA
	Fe	0.10	NA	NA	NA	NA	NA
	Mn	0.23	0.18	-	0.18	0.05	22%
	Acidity	ND	NA	NA	NA	NA	NA
CR8	Craig Run Up of Confluence of Craig Run and Unt 46420						
	Al	1.56	0.42	-	0.42	0*	0%*
	Fe	3.21	0.77	-	0.77	0*	0%*
	Mn	4.48	1.39	-	1.39	0*	0%*
	Acidity	ND	NA	NA	NA	NA	NA
CR7	Mouth of Unt 46421 of Craig Run						
	Al	0.08	NA	NA	NA	NA	NA
	Fe	0.13	NA	NA	NA	NA	NA
	Mn	0.05	NA	NA	NA	NA	NA
	Acidity	ND	NA	NA	NA	NA	NA
CR6	Most Upstream Sample Point on Unt 46420 of Craig Run						
	Al	0.12	NA	NA	NA	NA	NA
	Fe	0.30	NA	NA	NA	NA	NA
	Mn	0.06	NA	NA	NA	NA	NA
	Acidity	ND	NA	NA	NA	NA	NA
CR5	Mouth of Unt 46420 of Craig Run						
	Al	0.71	0.13	-	0.13	0.58	82%
	Fe	1.33	0.27	-	0.27	1.06	80%
	Mn	0.14	NA	NA	NA	NA	NA
	Acidity	ND	NA	NA	NA	NA	NA
CR4	Craig Run Upstream Confluence with Unt 46419						
	Al	8.12	1.14	*0.56*	0.58	5.26*	82%*
	Fe	16.88	2.36	*2.25*	0.11	11.08*	83%*
	Mn	7.71	2.39	*1.50*	0.89	2.23*	48%*
	Acidity	ND	NA	NA	NA	NA	NA
CR3	Mouth of Unt 46418 Upstream of Confluence with Craig Run						
	Al	0.10	0.04	-	0.04	0.06	60%
	Fe	0.18	0.06	-	0.06	0.12	67%
	Mn	0.02	NA	NA	NA	NA	NA
	Acidity	ND	NA	NA	NA	NA	NA
CR2	Craig Run						
	Al	3.04	1.49	*0.56*	0.93	0*	0%*
	Fe	6.05	2.60	*2.25*	0.35	0*	0%*
	Mn	5.08	2.84	*1.50*	1.34	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 %
	Acidity	ND	NA	NA	NA	NA	NA
CR1	Mouth of Craig Run Upstream of Confluence with Crooked Creek						
	Al	3.42	1.44	*0.56*	0.88	0.43*	23%*
	Fe	7.07	2.69	*2.25*	0.44	0.93*	26%*
	Mn	4.21	NA	NA	NA	NA	NA
	Acidity	ND	NA	NA	NA	NA	NA

In the instance that the allowable load is equal to the existing load (e.g. manganese CR1, 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. This is denoted as "NA" in the above table.

Following is an example of how the allocations, presented in Table 3, for a stream segment are calculated. For this example, aluminum allocations for CR1 of Craig Run are shown. As demonstrated in the example, all upstream contributing loads are accounted for at each point. Attachment D contains the TMDLs by segment analysis for each allocation point in a detailed discussion. These analyses follow the example. Attachment A contains maps of the sampling point locations for reference.

Allocations CR2	
	Al (Lbs/day)
Existing Load CR2	3.04
Allowable Load CR2	1.49

Craig Run

Allowable Load = 1.49 lbs/day

Load input = lbs/day
(Difference between existing loads upstream and CR1)

ALLOCATIONS CR1	
	Al (Lbs/day)
Existing Load @ CR1	3.42
Difference in measured loads between the loads that enter and existing CR1 (CR2)	0.38
Additional load tracked from above samples	1.49
Total load tracked between upstream and CR1	1.87
Allowable Load @ CR1	1.44
Load Reduction @ CR1	0.43
% Reduction required at CR1	23%

Allowable Load = 1.44 lbs/day

The allowable aluminum load tracked from upstream was 1.49 lbs/day. The existing load upstream was subtracted from the existing load at CR1 to show the actual measured increase of aluminum load that has entered the stream between these upstream sites and CR1 (0.38 lbs/day). This increased value was then added to the calculated allowable load from upstream to calculate the total load that was tracked between upstream and CR1 (allowable loads upstream + the difference in existing load between upstream and CR1). This total load tracked was then subtracted from the calculated allowable load at CR1 to determine the amount of load to be reduced at CR1. This total load value was found to be 1.87 lbs/day; it was 0.43 lbs/day greater than the CR1 allowable load of 1.44 lbs/day. Therefore, a 23% aluminum reduction at CR1 is necessary.

Recommendations

Various methods to eliminate or treat pollutant sources and to provide a reasonable assurance that the proposed TMDLs can be met exist in Pennsylvania. These methods include PADEP's primary efforts to improve water quality through reclamation of abandoned mine lands (for abandoned mining) and through the National Pollution Discharge Elimination System (NPDES) permit program (for active mining). Funding sources available that are currently being used for projects designed to achieve TMDL reductions include the Environmental Protection Agency (EPA) 319 grant program and Pennsylvania's Growing Greener Program. Federal funding is through the Department the Interior, Office of Surface Mining (OSM), for reclamation and mine drainage treatment through the Appalachian Clean Streams Initiative and through Watershed Cooperative Agreements.

OSM reports that nationally, of the $8.5 billion of high priority (defined as priority 1 & 2 features or those that threaten public health and safety) coal related AML problems in the AML inventory, $6.6 billion (78%) have yet to be reclaimed; $3.6 billion of this total is attributable to Pennsylvania watershed costs. Almost 83 percent of the $2.3 billion of coal related environmental problems (priority 3) in the AML inventory are not reclaimed.

The Bureau of Abandoned Mine Reclamation, Pennsylvania's primary bureau in dealing with abandoned mine reclamation (AMR) issues, has established a comprehensive plan for abandoned mine reclamation throughout the Commonwealth to prioritize and guide reclamation efforts for throughout the state to make the best use of valuable funds (www.dep.state.pa.us/dep/deputate/minres/bamr/complan1.htm). In developing and implementing a comprehensive plan for abandoned mine reclamation, the resources (both human and financial) of the participants must be coordinated to insure cost-effective results. The following set of principles is intended to guide this decision making process:

- Partnerships between the DEP, watershed associations, local governments, environmental groups, other state agencies, federal agencies and other groups organized to reclaim abandoned mine lands are essential to achieving reclamation and abating acid mine drainage in an efficient and effective manner.

- Partnerships between AML interests and active mine operators are important and essential in reclaiming abandoned mine lands.

- Preferential consideration for the development of AML reclamation or AMD abatement projects will be given to watersheds or areas for which there is an approved rehabilitation plan. (guidance is given in Appendix B to the Comprehensive Plan).

- Preferential consideration for the use of designated reclamation moneys will be given to projects that have obtained other sources or means to partially fund the project or to projects that need the funds to match other sources of funds.

- Preferential consideration for the use of available moneys from federal and other sources will be given to projects where there are institutional arrangements for any necessary long-term operation and maintenance costs.

- Preferential consideration for the use of available moneys from federal and other sources will be given to projects that have the greatest worth.

- Preferential consideration for the development of AML projects will be given to AML problems that impact people over those that impact property.

- No plan is an absolute; occasional deviations are to be expected.

A detailed decision framework is included in the plan that outlines the basis for judging projects for funding, giving high priority to those projects whose cost/benefit ratios are most favorable and those in which stakeholder and landowner involvement is high and secure.

In addition to the abandoned mine reclamation program, regulatory programs also are assisting in the reclamation and restoration of Pennsylvania's land and water. PADEP has been effective in implementing the NPDES program for mining operations throughout the Commonwealth. This reclamation was done, through the use of remining permits which have the potential for reclaiming abandoned mine lands, at no cost to the Commonwealth or the federal government. Long-term treatment agreements were initialized for facilities/operators who need to assure treatment of post-mining discharges or discharges they degraded which will provide for long-term treatment of discharges. According to OSM, "PADEP is conducting a program where active mining sites are, with very few exceptions, in compliance with the approved regulatory program".

The Commonwealth is exploring all options to address its abandoned mine problem. During 2000-2006, many new approaches to mine reclamation and mine drainage remediation have been explored and projects funded to address problems in innovative ways. These include:

- Project XL - The Pennsylvania Department of Environmental Protection ("PADEP"), has proposed this XL Project to explore a new approach to encourage the remining and reclamation of abandoned coal mine sites. The approach would be based on compliance with in-stream pollutant concentration limits and implementation of best management practices ("BMPs"), instead of National Pollutant Discharge Elimination System ("NPDES") numeric effluent limitations measured at individual discharge points. This XL project would provide for a test of this approach in up to eight watersheds with significant acid mine drainage ("AMD") pollution. The project will collect data to compare in-stream pollutant concentrations versus the loading from individual discharge points and provide for the evaluation of the performance of BMPs and this alternate strategy in PADEP's efforts to address AMD.

- Awards of grants for 1) proposals with economic development or industrial application as their primary goal and which rely on recycled mine water and/or a site that has been made suitable for the location of a facility through the elimination of existing Priority 1 or 2 hazards, and 2) new and innovative mine drainage treatment technologies that will provide waters of higher purity that may be needed by a particular industry at costs below conventional treatment costs as in common use today or reduce the costs of water treatment below those of conventional lime treatment plants. Eight contracts totaling $4.075 M were awarded in 2006 under this program.
- Projects using water from mine pools in an innovative fashion, such as the Shannopin Deep Mine Pool (in southwestern Pennsylvania), the Barnes & Tucker Deep Mine Pool (the Susquehanna River Basin Commission into the Upper West Branch Susquehanna River), and the Wadesville Deep Mine Pool (Excelon Generation in Schuylkill County).

There currently isn't a watershed organization interested in the Craig Run Watershed. It is recommended that agencies work with local interests to form a watershed group that will be dedicated to the remediation and preservation of these watersheds through public education, monitoring and assessment, and improvement projects. Information on formation of a watershed group is available through websites for the PADEP (www.dep.state.pa.us), the AMR Clearinghouse (www.amrclearinghouse.com), the EPA (www.epa.gov), the Susquehanna River Basin Commission (www.srbc.net) and others. In addition, each DEP Regional Office (6) and each District Mining Office (5) have watershed managers to assist stakeholder groups interested in restoration in their watershed. Most Pennsylvania county conservation districts have a watershed specialist who can also provide assistance to stakeholders (www.pacd.org). Potential funding sources for AMR projects can be found at www.dep.state.pa.us/dep/subject/pubs/water/wc/FS2205.pdf.

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

Public Participation

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on April 26, 2008 to foster public comment on the allowable loads calculated. A public meeting was held on May 28, 2008 beginning at 2 PM at the Greensburg District Mining Office, Armburst, PA, to discuss the proposed TMDL.

Future TMDL Modifications

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

Changes in TMDLs That May Require EPA Approval

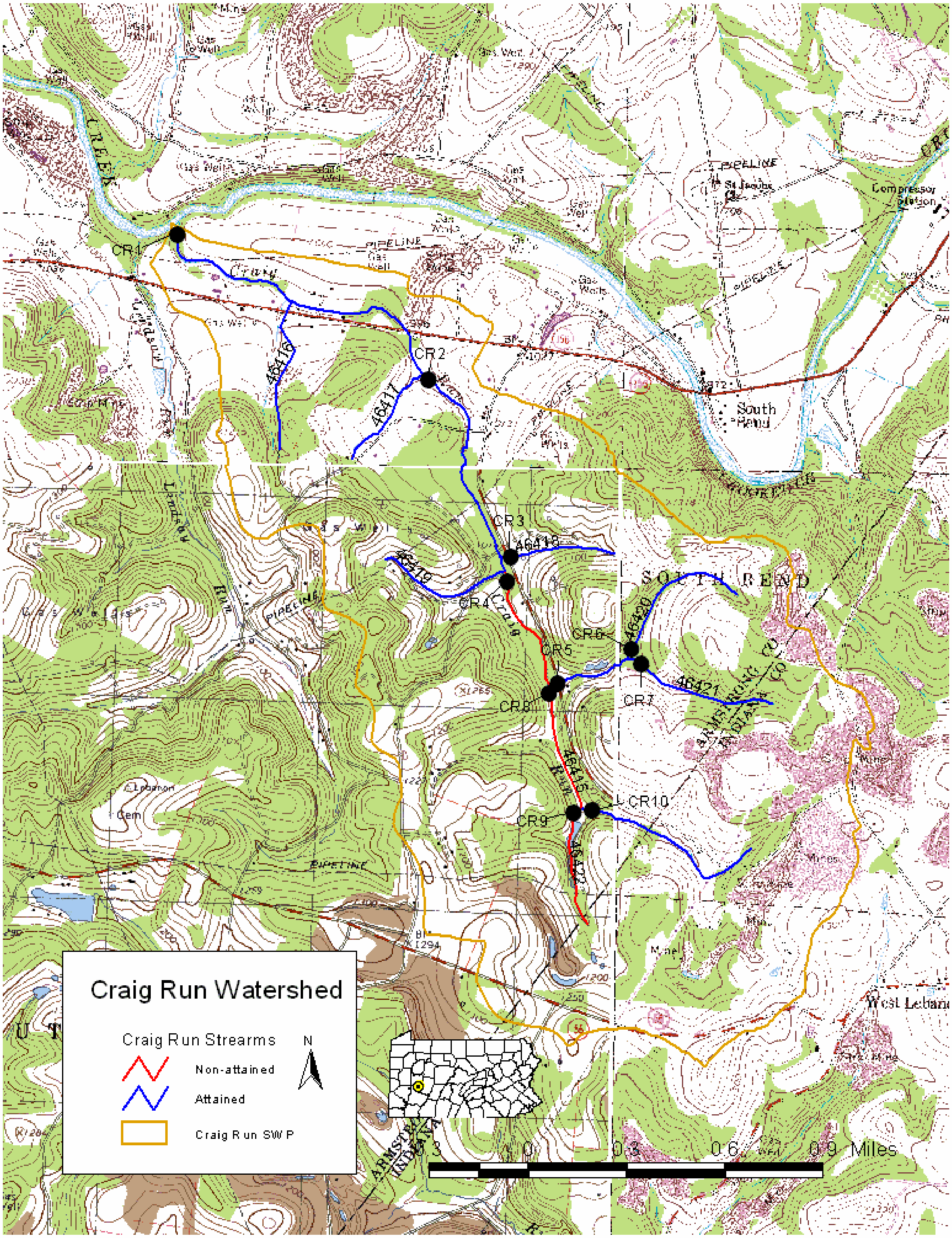
- Increase in total load capacity.
- Transfer of load between point (WLA) and nonpoint (LA) sources.
- Modification of the margin of safety (MOS).
- Change in water quality standards (WQS).
- Non-attainment of WQS with implementation of the TMDL.
- Allocations in trading programs.

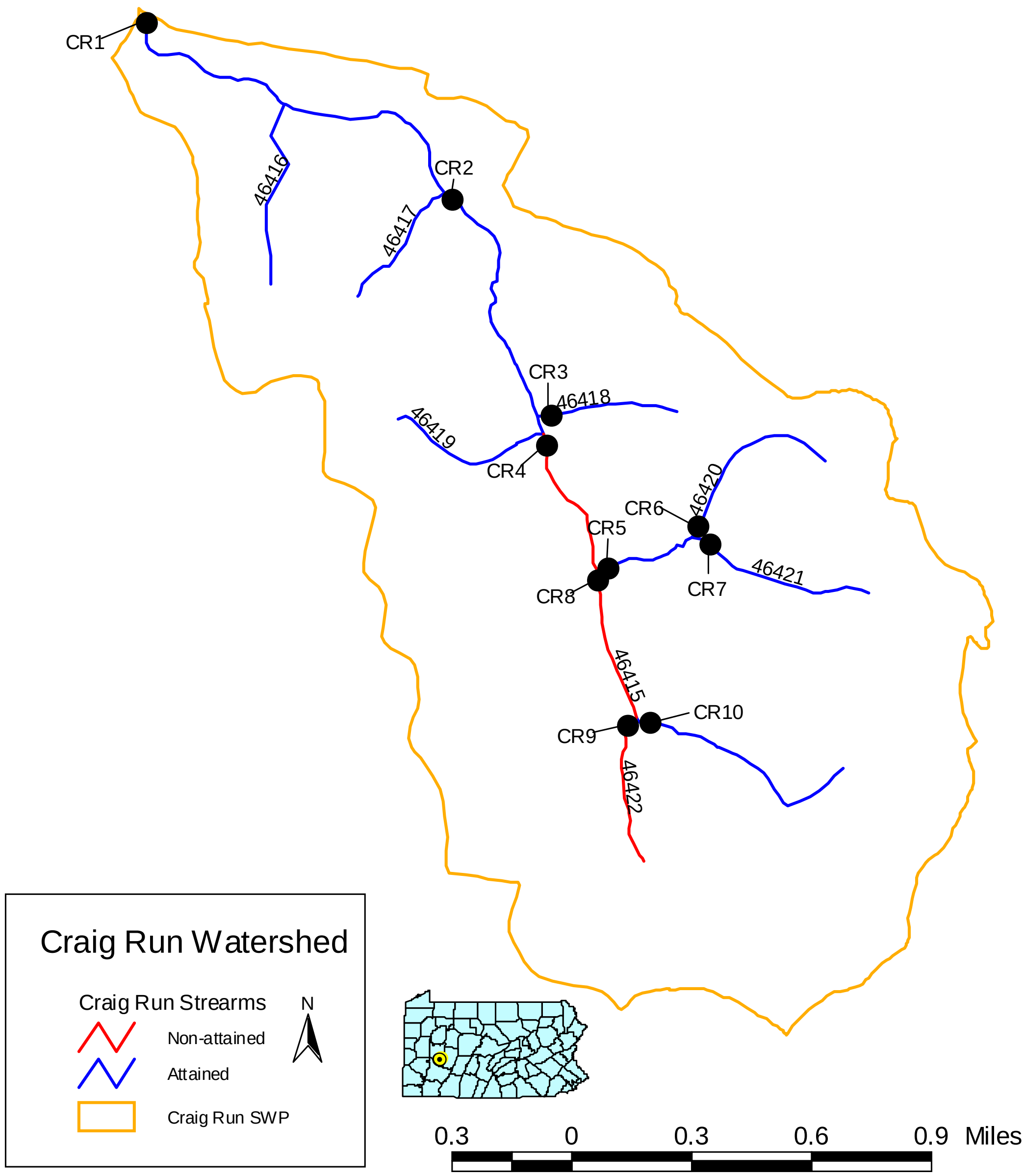
Changes in TMDLs That May Not Require EPA Approval

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

Attachment A

Craig Run Watershed Maps


Craig Run Watershed
Craig Run Streams
Non-attained
Attained
Craig Run SWP
N
0 0.3 0.6 0.9 Miles
CR1
CR2
CR3
CR4
CR5
CR6
CR7
CR8
CR9
CR10
46416
46417
46418
46419
46420
46421
46415
South Bend


CR1
CR2
CR3
CR4
CR5
CR6
CR7
CR8
CR9
CR10
46416
46417
46418
46419
46420
46421
46415
46422
Craig Run Watershed
Craig Run Strearms
Non-attained
Attained
Craig Run SWP
N
0.3
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0.3
0.6
0.9
Miles

Attachment B

Method for Addressing Section 303(d) Listings for pH

Method for Addressing 303(d) Listings for pH

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

The pH, a measurement of hydrogen ion acidity presented as a negative logarithm, is not conducive to standard statistics. Additionally, pH does not measure latent acidity. For this reason, and based on the above information, Pennsylvania is using the following approach to address the stream impairments noted on the 303(d) list due to pH. The concentration of acidity in a stream is at least partially chemically dependent upon metals. For this reason, it is extremely difficult to predict the exact pH values, which would result from treatment of abandoned mine drainage. 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.

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.*

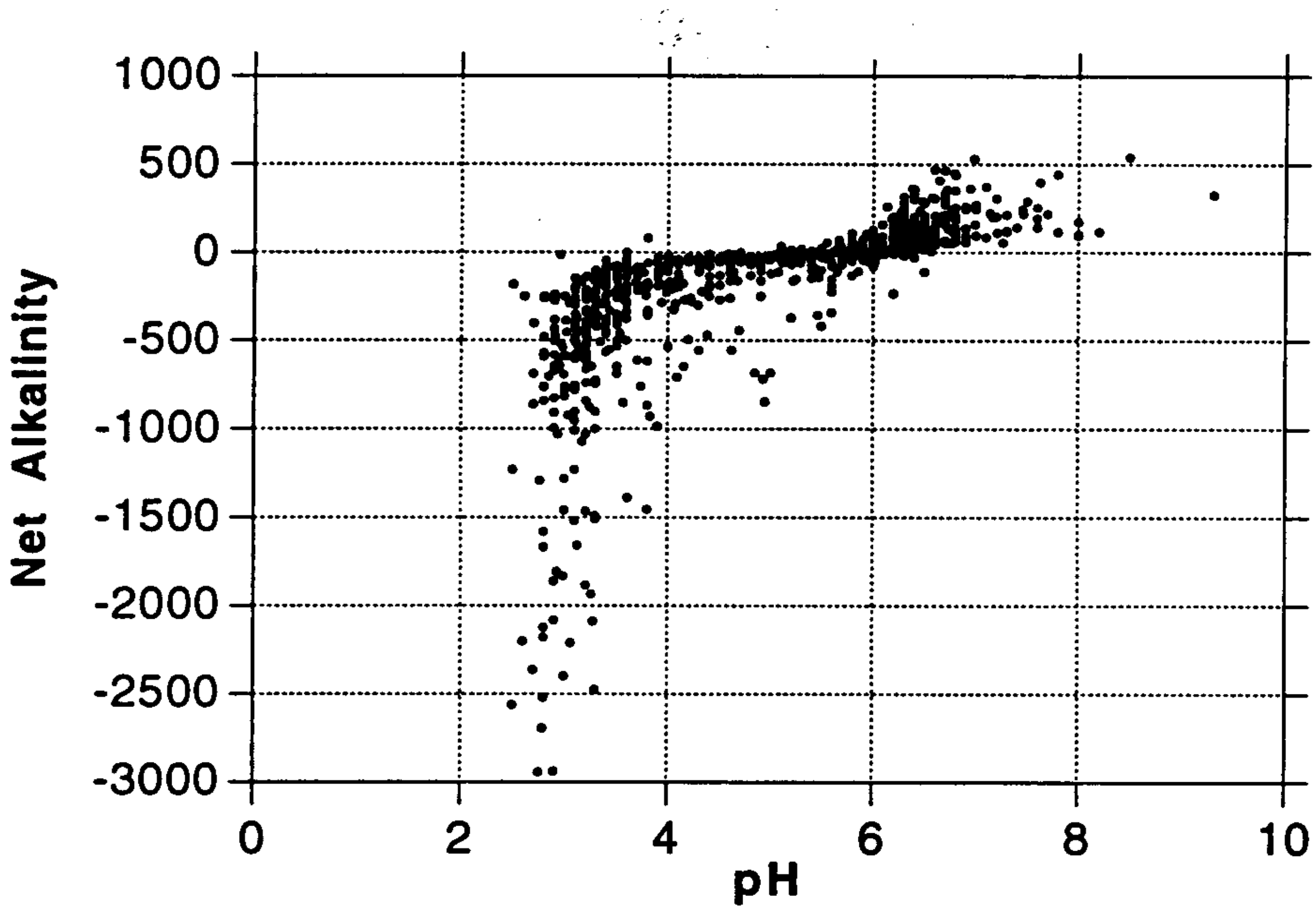


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C

Method to Quantify Treatment Pond Pollutant Load

Method to Quantify Treatment Pond Pollutant Load

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

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

Standard Treatment Pond Effluent Limits:
Alkalinity > Acidity
6.0 <= pH <= 9.0
Al <= 0.75 mg/l (Criteria)
Fe <= 3.0 mg/l (BAT)
Mn <= 2.0 mg/l (BAT)

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

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

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

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

In an active mining scenario, a mine operator pumps pit water to the ponds for chemical treatment. Pit water is often acidic with dissolved metals in nature. At the treatment ponds, alkaline chemicals are added to increase the pH and encourage dissolved metals to precipitate and settle. Pennsylvania averages 41.4 inches of precipitation per year (Mid-Atlantic River Forecast Center, National Weather Service, State College, PA, 1961-1990, ttp://www.dep.state.pa.us/dep/subject/hotopics/drought/PrecipNorm.htm). A maximum pit dimension without special permit approval is 1,500 feet long by 300 feet wide. Assuming that 5 percent of the precipitation evaporates and the remaining 95 percent flows to the low spot in the active pit to be pumped to the treatment ponds, results in the following equation and average flow rates for the pit area.

$$41.4 \text{ in. precip/yr} \times 0.95 \times 1 \text{ ft/12/in.} \times 1{,}500'\text{x}300'\text{/pit} \times 7.48 \text{ gal/ft}^3 \times 1\text{yr/365days} \times 1\text{day/24hr} \times 1\text{hr/60 min} =$$

$$= 21.0 \text{ gal/min average discharge from direct precipitation into the open mining pit area}$$

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

$$41.4 \text{ in. precip/yr} \times 3 \text{ pit areas} \times 1 \text{ ft/12/in.} \times 1{,}500'\text{x}300'\text{/pit} \times 7.48 \text{ gal/ft}^3 \times 1\text{yr/365days} \times 1\text{day/24hr} \times 1\text{hr/60 min} \times 15 \text{ in. runoff/100 in. precip} =$$

$$= 9.9 \text{ gal/min average discharge from spoil runoff into the pit area}$$

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

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

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

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

Allowable Aluminum WLA:
30.9 gal/min x 0.75 mg/l x 0.01202 = 0.3 lbs/day

Allowable Iron WLA:
30.9 gal/min x 3 mg/l x 0.01202 = 1.1 lbs/day

Allowable Manganese WLA:
30.9 gal/min x 2 mg/l x 0.01202 = 0.7 lbs/day

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

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

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

While most mining operations are permitted and allowed to have a standard, 1,500 ft x 300 ft pit, most are well below that size and have a corresponding decreased flow and load. Where pit dimensions are greater than the standard size or multiple pits are present, the calculations to define the potential pollution load can be adjusted accordingly. Hence, the above calculated WLA is very generous and likely high compared to actual conditions that are generally encountered. A large MOS is included in the WLA calculations.

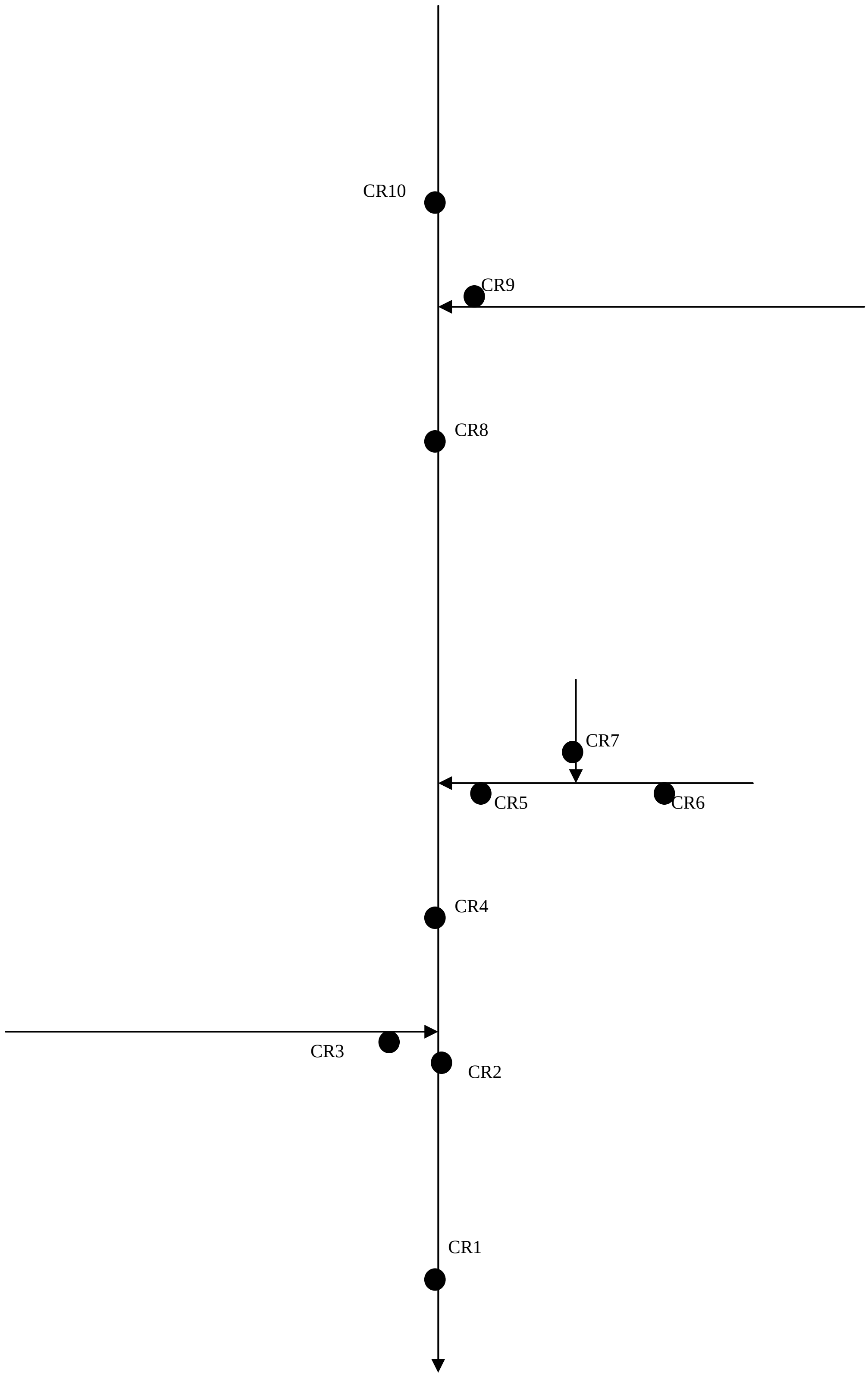
This is an explanation of the quantification of the potential pollution load reporting to the stream from permitted pit water treatment ponds that discharge water at established effluent limits. This allows for including active mining activities and their associated waste load in the TMDL calculations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

Derivation of the flow used in the future mining WLAs:

$$30.9 \text{ gal/min X } 2 \text{ (assume two pits) X } 0.00144 = 0.09 \text{ MGD}$$

Attachment D

TMDLs By Segment


CR10
CR9
CR8
CR7
CR5
CR6
CR4
CR3
CR2
CR1

Craig Run

The TMDL for Craig Run consists of load allocations for ten sampling sites along Craig Run and various unnamed tributaries.

Craig Run is listed for metals and other inorganics 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.

CR10 Most Upstream Sample Point on Craig Run 46415

The TMDL for this sample point on Craig Run consists of a load allocation to the segment upstream. The load allocation for this segment was computed using water-quality sample data collected at point CR10. The average flow, measured at the sampling point CR10 (0.31 MGD), is used for these computations.

There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point CR10 shows pH ranging between 7.3 and 8.0; pH will not be addressed in this TMDL because this segment is net alkaline.

Allocations were not calculated for acidity because there was no acidity present; a TMDL for acidity is not necessary. Although a TMDL is not necessary, the measured load is considered at the next downstream point CR9.

Table C1. Load Allocations for Point CR10				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day
Al	0.75	1.95	0.12	0.31
Fe	1.37	3.55	0.21	0.53
Mn	2.48	6.46	0.35	0.90
Acid	ND	ND	NA	NA
Alk	60.03	156.14		

Table C2. Calculation of Load Reductions Necessary at Point CR10			
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)
Existing Load	1.95	3.55	6.46
Allowable Load = TMDL	0.31	0.53	0.90
Load Reduction	1.64	3.02	5.46
% Reduction Segment	84%	85%	85%

CR9 Mouth of Unt 46422 Upstream of Confluence with Craig Run

The TMDL for this sample point on Unt 46422 of Craig Run consists of a load allocation to all of the area upstream of the sample point. The load allocation for this segment was computed using water-quality sample data collected at point CR9. The average flow, measured at the sampling point CR9 (0.07 MGD), is used for these computations.

There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point CR9 shows pH ranging between 6.5 and 7.6, pH will not be addressed in this TMDL because the segment is net alkaline.

Allocations were not calculated for aluminum, iron and acidity because WQS were met and there was no acidity present, TMDLs for aluminum, iron and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point CR8.

Table C3. Load Allocations for Point CR9				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.12	0.07	0.12	0.07
Fe	0.18	0.10	0.18	0.10
Mn	0.39	0.23	0.31	0.18
Acid	ND	ND	NA	NA
Alk	44.51	25.49		

Table C4. Calculation of Load Reductions Necessary at Point CR9	
	Mn (lbs/day)
Existing Load	0.23
Allowable Load = TMDL	0.18
Load Reduction	0.05
% Reduction Segment	22%

CR8 Craig Run Upstream of Confluence of Craig Run and Unt 46420

The TMDL for this sample point on Craig Run consists of a load allocation to all of the area between CR10/CR9 & CR8. The load allocation for this segment was computed using water-quality sample data collected at point CR8. The average flow, measured at the sampling point CR8 (0.45 MGD), is used for these computations.

There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point CR8 shows pH ranging between 6.7 and 7.8; pH will not be addressed in this TMDL because the segment is net alkaline.

Allocations were not calculated for acidity because there was no acidity present; a TMDL for acidity is not necessary. Although a TMDL is not necessary, the measured load is considered at the next downstream point CR7.

Table C5. Load Allocations for Point CR8				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day
Al	0.42	1.56	0.11	0.42
Fe	0.86	3.21	0.21	0.77
Mn	1.20	4.48	0.37	1.39
Acid	ND	ND	NA	NA
Alk	57.63	215.18		

The calculated load reductions for all the loads that enter point CR8 must be accounted for in the calculated reductions at sample point CR8 shown in Table C6. A comparison of measured loads between points CR10, CR9 and CR8 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.

Table C6. Calculation of Load Reduction at Point CR8			
	Al	Fe	Mn
Existing Load	1.56	3.21	4.48
Difference in Existing Load between CR10/CR9 & CR8	-046	-0.44	-2.21
Load tracked from CR10/CR9	0.38	0.63	1.08
Percent loss due to instream process	23	12	33
Percent load tracked from CR10/CR9	77	88	67
Total Load tracked from CR10/CR9	0.29	0.55	0.72
Allowable Load at CR8	0.42	0.77	1.39
Load Reduction at CR8	0.0	0.0	0.0
% Reduction required at CR8	0%	0%	0%

CR7 Mouth of Unt 46421 of Craig Run

The TMDL for this sample point on Craig Run consists of a load allocation to the segment upstream. The load allocation for this segment was computed using water-quality sample data collected at point CR7. The average flow, measured at the sampling point CR7 (0.08 MGD), is used for these computations.

There currently is not entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point CR7 shows pH ranging between 6.9 and 7.6; pH not will be addressed in this TMDL because this segment is net alkaline.

Allocations were not calculated for aluminum, iron, manganese and acidity because WQS were met for aluminum, iron and manganese and there was no acidity present, TMDLs for aluminum, iron, manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point CR6.

Table C7. Load Allocations for Point CR7				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day
Al	0.12	0.08	0.12	0.08
Fe	0.21	0.13	0.21	0.13
Mn	0.08	0.05	0.08	0.05
Acid	ND	ND	NA	NA
Alk	33.25	21.0		

CR6 Most Upstream Sample Point on Unt 46420 of Craig Run

The TMDL for this unnamed tributary of Craig Run consists of a load allocation to the watershed area upstream of sample point CR6. The load allocation for this segment was computed using water-quality sample data collected at point CR6. The average flow, measured at the sampling point CR6 (0.11 MGD), is used for these computations.

There currently is an entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point CR6 shows pH ranging between 6.9 and 7.7; pH will not be addressed in this TMDL because this segment is net alkaline.

Allocations were not calculated for aluminum, iron, manganese and acidity because WQS were met and there was no acidity present, TMDLs for aluminum, iron, manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point CR5.

Table C8. Load Allocations at Point CR6				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.13	0.12	0.13	0.12
Fe	0.32	0.30	0.32	0.30
Mn	0.07	0.06	0.07	0.06
Acid	ND	ND	NA	NA
Alk	48.79	45.2		

CR5 Mouth of Unt 46420 of Craig Run

The TMDL for sampling point CR5 consists of a load allocation to the area between sample points CR7/CR6, & CR5. The load allocation for this tributary was computed using water-quality sample data collected at point CR5. The average flow, measured at the sampling point CR5 (0.16 MGD), is used for these computations.

There currently is not entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point CR5 shows pH ranging between 6.2 and 7.6; pH will not be addressed in this TMDL because the segment is net alkaline.

Allocations were not calculated for manganese and acidity because WQS were met and there was no acidity present, TMDLs for manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point CR4.

Table C9. Load Allocations at Point CR5				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.52	0.71	0.10	0.13
Fe	0.98	1.33	0.20	0.27
Mn	0.11	0.14	0.11	0.14
Acid	ND	ND	NA	NA
Alk	34.38	46.9		

The calculated load reductions for all the loads that enter point CR5 must be accounted for in the calculated reductions at sample point CR5 shown in Table C10. A comparison of measured loads between points CR7/CR6 and CR5 shows that there is additional loading entering the segment for aluminum, iron and manganese. The total segment aluminum, iron and manganese load is the sum of the upstream allocated load and any additional loading within the segment.

Table C10. Calculation of Load Reduction at Point CR5		
	Al	Fe
Existing Load	0.71	1.33
Difference in Existing Load between CR7/CR6 & CR5	0.51	0.90
Load tracked from CR7/CR6	0.20	0.43
Percent loss due to instream process	0	0
Percent load tracked from CR7/CR6	100	100
Total Load tracked from CR7/CR6	0.71	1.33
Allowable Load at CR5	0.13	0.27
Load Reduction at CR5	0.58	1.06
% Reduction required at CR5	82%	80%

A waste load allocation for future mining was included for this segment of Craig Run (CR4) allowing for one operation with two active pits (1500' x 300') to be permitted in the future on this segment (see Attachment C for the method used to quantify treatment pond load).

Table C11. Waste load allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

CR4 CRAIG Run Upstream of Confluence with Unnamed Tributary 46419

The TMDL for sampling point CR4 consists of a load allocation to all of the area between sample points CR8/CR5 & CR4. The load allocation for this tributary was computed using water-quality sample data collected at point CR4. The average flow, measured at the sampling point CR4 (1.12 MGD), is used for these computations.

There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point CR4 shows pH ranging between 6.7 and 7.7; pH will not be addressed in this TMDL because the segment is net alkaline.

Allocations were not calculated for acidity because there was no acidity present, a TMDL for acidity is not necessary. Although a TMDL is not necessary, the measured load is considered at the next downstream point CR3.

Table C12. Load Allocations at Point CR4				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.87	8.12	0.12	1.14
Fe	1.81	16.88	0.25	2.36
Mn	0.83	7.71	0.26	2.39
Acid	ND	ND	NA	NA
Alk	48.22	450.08		

The calculated load reductions for all the loads that enter point CR4 must be accounted for in the calculated reductions at sample point CR4 shown in Table C13. A comparison of measured loads between points CR8/CR5 and CR4 shows that there is additional loading entering the segment for aluminum, iron and manganese. The total aluminum, iron and manganese segment loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C13. Calculation of Load Reduction at Point CR4			
	Al	Fe	Mn
Existing Load	8.12	16.88	7.71
Difference in Existing Load between CR8/CR5 & CR4	5.85	12.34	3.09
Load tracked from CR8/CR5	0.55	1.04	1.53
Percent loss due to instream process	0	0	0
Percent load tracked from CR8/CR5	100	100	100
Total Load tracked from CR8/CR5	6.40	13.44	4.62
Allowable Load at CR4	1.14	2.36	2.39
Load Reduction at CR4	5.26	11.08	2.23
% Reduction required at CR4	82%	83%	48%

CR3 Mouth of Unt 46418 Upstream of Confluence with Craig Run

The TMDL for sampling point CR3 consists of a load allocation to the all of the area upstream of point CR3. The load allocation for this tributary was computed using water-quality sample data collected at point CR3. The average flow, measured at the sampling point CR3 (0.03 MGD), is used for these computations.

There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point CR3 shows pH ranging between 5.8 and 7.9; pH will not be addressed in this TMDL because this segment is net alkaline.

Allocations were not calculated for manganese and acidity because WQS were met and there was no acidity present, TMDLs for manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point CR2.

Table C14. Load Allocations at Point CR3				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.37	0.10	0.14	0.04
Fe	0.65	0.18	0.23	0.06
Mn	0.08	0.02	0.08	0.02
Acid	ND	ND	NA	NA
Alk	53.57	14.47		

Table C15. Calculation of Load Reduction Necessary at Point CR3		
	Al	Fe
	(Lbs/day)	(Lbs/day)
Existing Load	0.10	0.18
Allowable Load=TMDL	0.04	0.06
Load Reduction	0.06	0.12
Total % Reduction	60%	67%

A waste load allocation for future mining was included for this segment of Craig Run (CR2) allowing for one operation with two active pits (1500’ x 300’) to be permitted in the future on this segment (see Attachment C for the method used to quantify treatment pond load).

Table C16. Waste Load Allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

CR2 Craig Run

The TMDL for this segment of Craig Run consists of a load allocation to the area between sample points CR3/CR4 and CR2. The load allocation for this segment was computed using water-quality sample data collected at point CR2. The average flow, measured at the sampling point CR2 (1.22 MGD), is used for these computations.

There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point CR2 shows pH ranging between 6.8 and 7.9; pH will not be addressed in this TMDL because this segment is net alkaline.

Allocations were not calculated for acidity because there was no acidity present, a TMDL for acidity is not necessary. Although a TMDL is not necessary, the measured load is considered at the next downstream point CR1.

Table C17. Load Allocations for Point CR2				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.30	3.04	0.15	1.49
Fe	0.59	6.05	0.26	2.60
Mn	0.50	5.08	0.28	2.84
Acid	ND	ND	NA	NA
Alk	48.49	494.27		

The calculated load reductions for all the loads that enter point CR2 must be accounted for in the calculated reductions at sample point CR2 shown in Table C18. A comparison of measured loads between points CR3/CR4 and CR2 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.

Table C18. Calculation of Load Reduction at Point CR2			
	Al	Fe	Mn
Existing Load	3.04	6.05	5.08
Difference in Existing Load between CR3/CR4 & CR2	-5.18	-11.01	-2.65
Load tracked from CR3/CR4	1.18	2.42	2.41
Percent loss due to instream process	63	65	34
Percent load tracked from CR3/CR4	37	35	66
Total Load tracked from CR3/CR4	0.44	0.85	1.59
Allowable Load at CR2	1.49	2.60	2.84
Load Reduction at CR2	0.0	0.0	0.0
% Reduction required at CR2	0%	0%	0%

A waste load allocation for future mining was included for this segment of Craig Run (CR1) allowing for one operation with two active pits (1500’ x 300’) to be permitted in the future on this segment (see Attachment C for the method used to quantify treatment pond load).

Table C19. Waste load allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

CR1 Mouth of Craig Run Upstream of Confluence with Crooked Creek

The TMDL for this segment of Craig Run consists of a load allocation to the area between sample points CR2 and CR1. The load allocation for this segment was computed using water-quality sample data collected at point CR1. The average flow, measured at the sampling point CR1 (1.24 MGD), is used for these computations.

There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point CR1 shows pH ranging between 6.6 and 7.8; pH will not be addressed in this TMDL because this segment is net alkaline.

Allocations were not calculated for manganese and acidity because WQS were met and there was no acidity present, TMDLs for manganese and acidity are not necessary.

Table C20. Load Allocations for Point CR1				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.33	3.42	0.14	1.44
Fe	0.69	7.07	0.26	2.69
Mn	0.41	4.21	0.41	4.21
Acid	ND	ND	NA	NA
Alk	54.42	561.49		

The calculated load reductions for all the loads that enter point CR1 must be accounted for in the calculated reductions at sample point CR1 shown in Table C21. A comparison of measured loads between points CR2 and CR1 shows that there is no additional loading entering the segment for manganese. For manganese the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is additional loading entering the segment for aluminum and iron. The total segment aluminum and iron loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C23. Calculation of Load Reduction at Point CR1		
	Al	Fe
Existing Load	3.42	7.07
Difference in Existing Load between CR2 & CR1	0.38	1.02
Load tracked from CR2	1.49	2.60
Percent loss due to instream process	0	0
Percent load tracked from CR2	100	100
Total Load tracked from CR2	1.87	3.62
Allowable Load at CR1	1.44	2.69
Load Reduction at CR1	0.43	0.93
% Reduction required at CR1	23%	26%

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:

- 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, and 2002 Section 303(d) Lists and Integrated Report/List (2004, 2006)

The following are excerpts from the Pennsylvania DEP Section 303(d) narratives that justify changes in listings between the 1996, 1998, 2002, 2004 and 2006 303(d) Lists and Integrated Report/List (2006). The Section 303(d) listing process has undergone an evolution in Pennsylvania since the development of the 1996 list.

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

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

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

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

<u>Migration to National Hydrography Data (NHD)</u>

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

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

Attachment E

Water Quality Data Used In TMDL Calculations

Site	Site Name	Bottle ID	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	Al	Fe	Mn
								(mg/l)	(mg/l)	(mg/l)
10	Craig Run	33A	12/13/2005	180	7.96	-39.53	66.00	0.38	0.27	3.4
10	Craig Run	14B	2/24/2006	184	7.30	-59.23	63.85	0.49	0.27	3.1
10	Craig Run	24C	4/7/2006	657	7.54	-45.74	49.61	2.6	5.5	3.6
10	Craig Run	39D	6/2/2006	213	7.33	-48.46	51.54	1.03	1.9	3.1
10	Craig Run	41E	8/1/2006	33.4	7.50	-52.84	57.49	0.00	0.08	0.40
10	Craig Run	24F	9/22/2006	32	7.82	-67.66	71.72	0.00	0.18	1.3
			avg=	216.57	7.58	-52.24	60.03	0.75	1.37	2.48
			stdev=			10.05		0.98	2.14	1.31

Site	Site Name	Bottle ID	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	Al	Fe	Mn
								(mg/l)	(mg/l)	(mg/l)
9	Craig Run	17A	12/13/2005	46.9	6.51	-28.16	35.55	0.31	0.12	0.2
9	Craig Run	9B	2/24/2006	59.4	7.05	-12.35	23.92	0.17	0.05	0.17
9	Craig Run	19C	43/7/2006	38.5	7.39	-18.46	23.08	0.16	0.36	0.36
9	Craig Run	21D	6/2/2006	56.1	7.16	-28.79	32.58	0.08	0.19	0.48
9	Craig Run	44E	8/1/2006	41.2	7.62	-97.88	102.73	0.00	0.32	0.83
9	Craig Run	32F	9/22/2006	44	7.38	-46.92	49.23	0.00	0.06	0.32
			avg=	47.68	7.19	-38.76	44.51	0.12	0.18	0.39
			stdev=			31.25		0.12	0.13	0.24

Site	Site Name	Bottle ID	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	Al	Fe	Mn
								(mg/l)	(mg/l)	(mg/l)
8	Craig Run	39A	12/13/2005	73.3	6.88	-47.38	54.26	0.22	0.10	1.3
8	Craig Run	44B	2/24/2006	312	6.70	-42.96	48.89	0.23	0.15	1.2
8	Craig Run	22C	4/7/2006	838	7.60	-39.39	45.45	1.6	3.6	1.8
8	Craig Run	61D	6/2/2006	439	7.11	-40.00	43.85	0.45	0.94	1.9
8	Craig Run	48E	8/1/2006	77	7.73	-81.67	87.73	0.00	0.26	0.46
8	Craig Run	19F	9/22/2006	126	7.76	-59.69	65.63	0.00	0.11	0.54
			avg=	310.88	7.30	-51.85	57.63	0.42	0.86	1.20
			stdev=			16.40		0.60	1.38	0.61

Site	Site Name	Bottle ID	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	Al	Fe	Mn
								(mg/l)	(mg/l)	(mg/l)
7	Craig Run	13B	2/24/2006	66.1	6.93	-17.54	23.08	0.23	0.09	0.02
7	Craig Run	-	4/7/2006	59.4						
7	Craig Run	1D	6/2/2006	84.7	7.09	-36.82	37.12	0.17	0.34	0.14
7	Craig Run	39E	8/1/2006	22.2	7.58	-35.23	40.77	0.00	0.26	0.09
7	Craig Run	11F	9/22/2006	31	7.33	-27.34	32.03	0.08	0.13	0.06
			avg=	52.68	7.2325	-29.2328	33.24965	0.12	0.205	0.0775
			stdev=			8.83		0.10	0.12	0.05

Site	Site Name	Bottle ID	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	Al	Fe	Mn
								(mg/l)	(mg/l)	(mg/l)
6	Craig Run	29B	2/24/2006	46.9	6.99	-21.21	29.55	0.19	0.07	0.00
6	Craig Run	-	4/7/2006	115						
6	Craig Run	43D	6/2/2006	46.9	6.92	-40.31	44.96	0.20	0.43	0.12
6	Craig Run	39E	8/1/2006	11.7	7.68	-62.29	64.61	0.14	0.64	0.09
6	Craig Run	25F	9/22/2006	165	7.62	-51.21	56.06	0.00	0.14	0.06
			avg=	77.10	7.30	-43.76	48.79	0.13	0.32	0.07
			stdev=			17.50		0.09	0.26	0.05

Site	Site Name	Bottle ID	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	Al	Fe	Mn
								(mg/l)	(mg/l)	(mg/l)
5	Craig Run	31A	12/13/2005	49.9	6.15	-25.38	34.88	0.18	0.05	0.1
5	Craig Run	39B	2/24/2006	119	6.70	-13.74	22.90	0.29	0	0.00
5	Craig Run	23C	4/7/2006	165	7.20	-22.73	27.27	2.3	4.5	0.16
5	Craig Run	34D	6/2/2006	251	6.91	-28.46	29.23	0.34	0.64	0.13
5	Craig Run	43E	8/1/2006	41.2	7.63	-50.00	53.69	0.00	0.37	0.13
5	Craig Run	22F	9/22/2006	56.1	7.41	-35.78	38.28	0.00	0.18	0.11
			avg=	113.70	7.00	-29.35	34.38	0.52	0.98	0.11
			stdev=			12.42		0.88	1.74	0.06

Site	Site Name	Bottle ID	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	Al	Fe	Mn
								(mg/l)	(mg/l)	(mg/l)
4	Craig Run	26B	2/24/2006	448	6.70	-35.28	42.94	0.23	0.1	0.73
4	Craig Run	21C	4/7/2006	1459	7.56	-35.11	39.69	2.3	4.5	1.1
4	Craig Run	18D	6/2/2006	1561	6.82	-23.56	24.32	1.82	4	1.8
4	Craig Run	49E	8/1/2006	126	7.69	-70.15	74.77	0.00	0.3	0.25
4	Craig Run	23F	9/22/2006	292	7.74	-56.25	59.38	0.00	0.14	0.25
			avg=	777.20	7.30	-44.07	48.22	0.87	1.81	0.83
			stdev=			18.76		1.10	2.24	0.65

Site	Site Name	Bottle ID	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	Al	Fe	Mn
								(mg/l)	(mg/l)	(mg/l)
3	Craig Run	42A	12/13/2005	-	5.75	-20.80	43.80	0.26	0.04	0
3	Craig Run	24B	2/24/2006	16.5	6.80	-29.71	34.56	0.21	0.06	0.00
3	Craig Run	32C	4/7/2006	38.5	7.47	-38.93	45.04	1.1	2.4	0.11
3	Craig Run	10d	6/2/2006	41.2	6.97	-48.03	52.27	0.57	1	0.12
3	Craig Run	34E	8/1/2006	4.58	7.75	-78.15	82.92	0.00	0.27	0.12
3	Craig Run	6F	9/22/2006	11.7	7.91	-74.22	62.81	0.1	0.13	0.10
			avg=	22.50	7.11	-48.31	53.57	0.37	0.65	0.08
			stdev=			23.46		0.41	0.93	0.06

Site	Site Name	Bottle ID	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	Al	Fe	Mn
								(mg/l)	(mg/l)	(mg/l)
2	Craig Run	24A	12/13/2005	521	7.63	-29.08	45.17	0.21	0.09	0.7
2	Craig Run	16B	2/24/2006	733	7.43	-32.98	37.58	0.27	0.18	0.5
2	Craig Run	11C	4/7/2006	795	7.87	-35.94	39.06	0.50	0.80	0.27
2	Craig Run	42D	6/2/2006	2565	6.77	-36.92	41.54	0.81	2	1.1
2	Craig Run	38E	8/10/2006	248	7.69	-64.59	69.76	0.00	0.33	0.25
2	Craig Run	14F	9/22/2006	231	7.61	-55.47	57.81	0.00	0.16	0.17
			avg=	848.83	7.50	-42.50	48.49	0.30	0.59	0.50
			stdev=			14.15		0.31	0.74	0.35

Site	Site Name	Bottle ID	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alkalinity (mg/L)	Al	Fe	Mn
								(mg/l)	(mg/l)	(mg/l)
1	Craig Run	9A	12/13/2005	-	6.58	-	48.06	0.27	0.08	0.5
1	Craig Run	34B	2/24/2006	787	7.51	-39.22	40.72	0.19	0.09	0.37
1	Craig Run	6C	4/7/2006	768	7.82	-43.61	49.62	0.14	0.32	0.24
1	Craig Run	2D	6/12/2006	1851	7.22	-46.46	51.54	1.07	2.2	0.52
1	Craig Run	33E	8/10/2006	419	7.53	-67.02	72.70	0.27	1.1	0.51
1	Craig Run	13F	9/22/2006	471	7.61	-60.00	63.85	0.05	0.32	0.31
			avg=	859.20	7.38	-51.26	54.42	0.33	0.69	0.41
			stdev=			11.74		0.37	0.83	0.12

Attachment F

TMDLs and NPDES Permitting Coordination

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

Load Tracking Mechanisms

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

Options for Permittees in TMDL Watersheds

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

Options identified

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

Other possible options

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

- Issue the permit with in-stream water quality criteria values as the effluent limits. The in-stream criteria value would represent the monthly average, with the other limits adjusted accordingly (e.g., for Fe, the limits would be 1.5 mg/L monthly average, 3.0 mg/L daily average and 4.0 instantaneous max mg/L).

- The applicant would agree to treat an existing source (point or non-point) where there is no responsible party and receive a WLA based on a portion of the load reduction to be achieved. The result of using these types of offsets in permitting is a net improvement in long-term water quality through the reclamation or treatment of an abandoned source.

Attachment G
Comment and Response

No public comments were received on the Craig Run TMDL.