FINAL

Welch Run Watershed TMDL
Jefferson County, Pennsylvania

Prepared by:

Pennsylvania Department of Environmental Protection

March 14, 2008

TABLE OF CONTENTS

TABLES

ATTACHMENTS

FINAL TMDL
Welch Run Watershed
Jefferson County, Pennsylvania

Introduction

This Total Maximum Daily Load (TMDL) calculation has been prepared for segments in the Welch 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 eight listed segments 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-Redbank Creek								
HUC 5010006 State Water Plan (SWP) Subbasin: 17C								
Year	Miles	Segment ID	DEP Stream Code	Stream Name	Desig-nated Use	Data Source	Source	EPA 305(b) Cause Code
1996	1.2	5319	48486	Welch Run	CWF	303 (d) List	RE	pH & Metals
1998	3.61	5319	48486	Welch Run	CWF	SWMP	AMD	pH, Metals & *other inorganicx
2002	3.61	20000814-1430-JJM	48486	Welch Run	CWF	SWMP	AMD	pH & Metals
2004	3.6	20000814-1430-JJM	48486	Welch Run	CWF	SWMP	AMD	pH, Metals & *other inorganicx
2004	0.6	20000814-1432-JJM	48487	Unt Welch Run	CWF	SWMP	AMD	pH & Metals
2004	0.7	2000814-1432-JJM	48488	Unt Welch Run,	CWF	SWMP	AMD	pH & Metals
2004	0.5	2000814-1432-JJM	48489	Unt Welch Run,	CWF	SWMP	AMD	pH & Metals
2004	0.7	2000814-1432-JJM	48490	Unt Welch Run	CWF	SWMP	AMD	pH & Metals
2006	3.37	1301	48486	Welch Run	CWF	SWMP	AMD	pH & Metals
2006	0.63	1305	48487	Unt Welch Run	CWF	SWMP	AMD	pH & Metals
2006	0.66	1305	48488	Unt Welch Run	CWF	SWMP	AMD	pH & Metals
2006	0.51	1305	48489	Unt Welch Run	CWF	SWMP	AMD	pH & Metals
2006	0.73	1305	48490	Unt Welch Run	CWF	SWMP	AMD	pH & Metals

*Other Inorganics listing is not included on 2006 Integrated List.
Cold Water Fisheries =CWF

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

Directions to the Welch Run Watershed

The Welch Run Watershed is approximately 4.1 square miles in area and is located in western Jefferson County near the town of Summerville, Pennsylvania. A very small portion of the watershed lies in eastern Clarion County. Welch Run flows in a southerly direction for approximately 4.5 miles from its headwaters in the town of Corsica to its confluence with Redbank Creek just north of the town of Summerville. Welch Run and all of its tributaries are classified as Cold Water Fisheries (CWF) under Title 25 PA Code Chapter 93, Section 93.9s and can be found on the Corsica and Summerville 7-1/2 minute quadrangles. Welch Run (stream code – 48486) is part of the Hydrologic Unit Code 5010006 – Redbank Creek (formerly State Water Plan 17C).

Welch Run can be accessed by taking exit 73 from Interstate 80 (I-80) and traveling approximately 0.4 miles on Rt. 949 south into the town of Corsica. Turn left onto Rt. 322 east and travel approximately 0.2 miles. The headwaters of Welch Run flow under Rt. 322 at this point. Continue traveling on Rt. 322 east for an additional 0.1 miles and turn right onto Summerville-Corsica Road (SR3007). Travel on Summerville-Corsica Road for approximately 4.2 miles to the intersection of Rt. 28. Welch Run flows alongside Summerville-Corsica road from its intersection with Rt. 322 and Rt. 28. Welch Run empties into Redbank Creek approximately 200 feet from where the stream runs under Rt. 28, just northeast of the town of Summerville.

Segments addressed in this TMDL

The Welch Run watershed is affected by pollution from AMD. This pollution has caused high levels of metals and low pH throughout the entire Welch Run watershed. The sources of the AMD are seeps and discharges from areas disturbed by surface mining. Most of the discharges originate from mining on the Lower Kittanning and Clarion coal seams or refuse piles associated with them.

There are currently two permitted bituminous coal surface mining permits and one Government Financed Construction Contract (GFCC) in the Welch Run watershed. Active mining has been completed on both of the issued surface mining permits (Ben Hal Mining Co. SMP#33960107 and SMP#33040104). Reclamation and incidental coal extraction associated with the Smith Mine GFCC (Reichard Contracting, Inc. GFCC#33-00-04) has also been completed. Since the two surface mining permits and the GFCC are not active, they do not contribute to the pollution loading into the Welch Run watershed, and therefore do not have Waste Load Allocations (WLAs) assigned to them. In order to accommodate any future mining operations in the Welch Run watershed, WLAs, calculated using the pit area method, will be assigned to sample points WR10, WR7, WR3 and the mouth of Welch Run (WR01).

This AMD TMDL document contains one or more future mining Waste Load Allocations (WLA). These WLAs were requested by the Knox District Mining Office (DMO) to accommodate one or more future mining operations. All comments and questions concerning permitting issuses and the

future mining WLAs in this TMDL are to be directed to the appropriate DMO. Future wasteload allocations are calculated using the method described for quantifying pollutant load on page 13.

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. Each future mining WLA is intended to accommodate one future mining NPDES permit.
4. The inclusion of future mining WLAs does not preclude the amending of this AMD TMDL to accommodate additional NPDES permits.

All of the remaining discharges in the watershed are from abandoned mines and 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). The distinction between non-point and point sources in this case is determined on the basis of whether or not there is a responsible party for the discharge. Where there is no responsible party the discharge is considered to be a non-point source. Each segment on the 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.

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 Welch Run Watershed TMDL.

Watershed History

The date of the earliest mining within the Welch Run watershed is not known. Environmental scars, such as unreclaimed pits, poorly vegetated mine spoils and mine drainage discharges suggest a long history of mining in the watershed, but most of the history prior to the 1970's was not documented through a formal permitting system.

Mining records are available in the Knox District Mining Office for the following permitted sites. Only limited data preserved on microfiche are available for many of the older completed operations; more extensive information is still available for those sites that were permitted in the last 15 – 20 years and for those sites with passive treatment systems.

Table 2. Welch Run Watershed Mining History

Company Name	Permit Number	Mine Name	Date Issued	Acreage	Coal Seam(s)	Status
Ingram Coal Co.	3875SM35	Green Mine	8/4/1975	101	LK	Bond Forfeited
Elbe Contracting Co.	3875SM50	Carrier	8/13/1976	80.8	LC, LK, MK, UK, LF	Completed
W.P. Stahlman Coal Co Inc	3874SM13	Stahlman #35	12/8/1976	125.4	LC, UC, UK	Completed
C&K Coal Co.	3671BSM4	Stahlman #33	12/20/1976	532	UC, LC, LF, MK, LK	Bond Forfeited - Passive Treatment
Terry P Kiefer Coal Co.	3875SM9	Smith Mine	5/30/1978	88	LK, MK, UK, B	Bond Forfeited
Colt Resources	3379130	Oaks Mine	3/10/1980	41	UC, LC	Completed (6/20/88)
Olive Afton	33773118	Afton #1	1/25/1984	53.4	LK	Completed (3/16/95)
C&K Coal Co.	33803003	Glen Aiken	7/15/1985	602	LK, UC, LC, B	Completed (3/14/95)
C&K Coal Co.	33773143	Smith Walton	7/15/1985	279.5	LK, MK	Bond Forfeited - Passive Treatment
Glacial Minerals	16753048	Dechant Mine	8/6/1985	91.4	MK	Canceled (7/2/86)
C&K Coal Co.	3068BSM12	Stahlman #27	8/28/1987	523	LK, C, B	Completed (12/15/87)
C&K Coal Co.	38A78SM3	#51 Mine	8/28/1987	84.8	LK, UC, LC, B	Completed (9/22/87)
C&K Coal Co.	3379126	#53	8/28/1987	130	MK, LK, UC, LC, B	Completed (11/30/88)
Glacial Minerals	33890107	Fitzsimmons	4/21/1989	49.5	B, LC, UC	Bond Forfeited
MSM Coal Co. Inc.	33940111	Glen Aiken	5/25/1995	36	LK	Completed (11/1/01)
Ben Hal Mining Co.	33960107	Corsica	8/26/1998	17.8	LK	Issued: Stage I (Stage II Eligible)
Reichard Contracting	33-00-04	Smith Reclamation Proj.	3/22/2001	17	Reclamation, LK, B	Issued - Stage II
Ben Hal Mining Co.	33040104	76 Acre Mine	12/22/2004	16.5	LK	Issued: Stage II
C&K Coal Co.	38A78SM43	#50 Mine				Completed

AMD Methodology

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

The statistical analysis described below can be applied to situations where all of the pollutant loading is from non-point sources as well as those where there are both point and non-point sources. The following defines what are considered point sources and non-point sources for the purposes of our evaluation; point sources are defined as permitted discharges, non-point sources are then any pollution sources that are not point sources. For situations where all of the impact is due to 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:

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

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

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

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

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

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

LTA = Mean * (1 – PR99) where (2)

LTA = allowable LTA source concentration in mg/l

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

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

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

---

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

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.

Method to Quantify Treatment Pond Pollutant Load

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

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

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

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

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

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

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

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

Standard Treatment Pond Effluent Limits:
Alkalinity > Acidity
$6.0 <= \text{pH} <= 9.0$
Al <0.75 mg/l
Fe < 3.0 mg/l
Mn < 2.0 mg/l

Discharge from treatment ponds on a mine site is intermittent and often varies as a result of precipitation events. Measured flow rates are almost never available. If accurate flow data are available, they can be used to quantify the WLA. The following is an approach that can be used to

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

$$\text{Flow (MGD)} \times \text{BAT limit (mg/l)} \times 8.34 = \text{lbs/day}$$

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, http://www.dep.state.pa.us/dep/subject/hotopics/drought/PrecipNorm.htm). A maximum pit dimension without special permit approval is 1500 feet long by 300 feet wide. Assuming that 5 percent of the precipitation evaporates and the remaining 95 percent flows to the low spot in the active pit to be pumped to the treatment ponds, results in the following equation and average flow rates for the pit area.

41.4 in. precip./yr x 0.95 x 1 ft./12/in. x 1500'x300'/pit x 7.48 gal/ft^3 x 1yr/365days x 1day/24hr. x 1hr./60 min. =

= 21.0 gal/min average discharge from direct precipitation into the open mining pit area.

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

41.4 in. precip./yr x 3 pit areas x 1 ft./12/in. x 1500'x300'/pit x 7.48 gal/ft^3 x 1yr/365days x 1day/24hr. x 1hr./60 min. x 15 in. runoff/100 in. precipitation =

= 9.9 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:

Total Average Flow = Direct Pit Precipitation + Spoil Runoff

Total Average Flow = 21.0 gal./min + 9.9 gal./min. = 30.9 gal./min.

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

Allowable Aluminum Waste Load Allocation:
30.9 gal./min. x 0.75 mg/l x 0.01202 = 0.28 lbs./day

Allowable Iron Waste Load Allocation:
30.9 gal./min. x 3 mg/l x 0.01202 = 1.1 lbs./day

Allowable Manganese Waste Load Allocation:
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 in the methodology. County specific precipitation rates can be used in place of the long-term state average rate, although the margin of safety is greater than differences from individual counties. It is common for many mining sites to have very "dry" pits that rarely accumulate water that would require pumping and treatment.

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

While most mining operations are permitted and allowed to have a standard, 1500' x 300' pit, most are well below that size and have a corresponding decreased flow and load. Where pit dimensions are greater than the standard size or multiple pits are present, the calculations to define the potential pollution load can be adjusted accordingly. Hence, the above calculated Waste Load Allocation is

very generous and likely high compared to actual conditions that are generally encountered. A large margin of safety is included in the WLA calculations.

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

$$\text{Allowed Load} = \text{Waste Load Allocation} + \text{Load Allocation}$$
$$\text{Or}$$
$$\text{Load Allocation} = \text{Allowed Load} - \text{Waste Load Allocation}$$

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

Derivation of the flow used in the future mining WLAs:

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

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.

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. Pennsylvania does have dissolved criteria for iron; however, the data used for this analysis report iron as total recoverable. Table 2 shows the water quality criteria for the selected parameters.

Table 3   Applicable Water Quality Criteria

Parameter	Criterion Value (mg/l)	Total Recoverable/Dissolved
Aluminum (Al)	0.75	Total Recoverable
Iron (Fe)	1.50	Total Recoverable
	0.3	Dissolved
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).

TMDL Allocations Summary

There were not enough samples at any sample point to check for correlation between metals and flow for the Welch Run Watershed.

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.

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 4.   **Summary Table–Welch 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 %
WR12	WR12 Most Upstream Sample Point on Welch Run						
	Al	10.6	1.0	0.0	1.0	9.6	91
	Fe	3.8	1.6	0.0	1.6	2.2	58
	Mn	18.9	1.3	0.0	1.3	17.6	93
	Acidity	120.9	15.7	0.0	15.7	105.2	87
WR11	WR11 Mouth of Unt 48490						
	Al	9.6	0.5	0.0	0.5	9.1	95
	Fe	78.1	0.8	0.0	0.8	77.3	99
	Mn	32.7	1.0	0.0	1.0	31.7	97
	Acidity	294.5	5.9	0.0	5.9	288.6	98
WR10	WR10 Welch Run upstream of Confluence with Unt 48489						
	Al	28.1	3.1	*0.56*	2.54	6.2	67
	Fe	169.2	3.4	*2.25*	1.15	86.3	96
	Mn	115.3	4.6	*1.5*	3.1	61.4	93
	Acidity	801.4	16.0	0.0	16.0	391.6	96
WR8	WR8 Mouth of Unt 48489						
	Al	0.45	0.08	0.0	0.08	0.37	83
	Fe	1.23	0.14	0.0	0.14	1.09	89
	Mn	1.06	0.15	0.0	0.15	0.91	86
	Acidity	8.34	1.08	0.0	1.08	7.26	87
WR7	WR7 Welch Run Upstream of Confluence with Unt 48488						
	Al	28.3	3.7	*1.68*	2.02	003	0
	Fe	125.8	8.8	*6.75*	2.05	0.0	0
	Mn	140.9	7.0	*4.5*	2.5	22.2	76
	Acidity	868.9	17.4	0.0	17.4	58.9	77
WR5	WR5 Mouth of Unt (48488) Upstream of Confluence with Welch Run						
	Al	5.2	0.5	0.0	0.5	4.7	90
	Fe	1.8	0.4	0.0	0.4	1.4	77
	Mn	9.8	0.7	0.0	0.7	9.1	93
	Acidity	60.1	5.4	0.0	5.4	54.7	91
WR4	WR4 Mouth of Unt 48487						
	Al	0.3	0.3	0.0	0.3	0.0	0
	Fe	0.5	0.3	0.0	0.3	0.2	44
	Mn	0.7	0.2	0.0	0.2	0.5	71
	Acidity	7.0	3.1	0.0	3.1	3.9	55
WR3	WR3 Welch Run Downstream of Confluence with Unt 48487						
	Al	39.9	5.6	*2.8*	2.8	5.1	48
	Fe	180.0	12.6	*11.25*	1.35	48.8	79
	Mn	179.0	10.7	*7.5*	3.2	24.9	70
	Acidity	1120.4	22.4	0.0	22.4	188.0	89
WR1	WR1 Mourth of Welch Run						
	Al	45.4	8.2	*2.8*	5.4	2.9	26
	Fe	185.1	13.0	*11.25*	1.75	4.7	27
	Mn	222.2	15.6	*7.5*	8.1	38.3	71
	Acidity	1203.4	48.1	0.0	48.1	57.3	54

Numbers in italics are set aside for future mining operations.

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 (which has awarded over almost $37 M since 1999 for watershed restoration and protection in mine-drainage impacted watersheds and abandoned mine reclamation). In 2006 alone, federal funding through the Office of Surface Mining (OSM) contributed $949 K for reclamation and mine drainage treatment through the Appalachian Clean Streams Initiative and another $298 K through Watershed Cooperative Agreements. According to the Department of the Interior, Office of Surface Mining (www.osmre.gov/annualreports/05SMCRA2AbandMineLandReclam.pdf), during 2005, Pennsylvania reclaimed 54 acres of gob piles, 73 acres of pits, 2,500 acres of spoil areas, 7,658 feet of highwall, and treated 94,465 gallons of mine drainage under their environmental (Priority 3) program only (priority 1&2 are for reclaiming features threatening public health and safety with much larger number of features reclaimed).

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 DE
- P, 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. During 2006, District Mining Offices issued 31 new remining permits with the potential for reclaiming 1,058 acres of abandoned mine lands; an additional 328 acres were reclaimed during 2006 from existing remining permits. This reclamation was done at no cost to the Commonwealth or the federal government. Long-term treatment agreements were initialized for 109 facilities/operators who need to assure treatment of post-mining discharges or discharges they degraded which will provide for long-term treatment of 211 discharges. Of the 109 agreements, 34 have been finalized with 17 conventional bonding agreements totaling $75 M and 17 with treatment trusts totaling $73 M. According to OSM, "PADEP is conducting a program where active mining sites are, with very few exceptions, in compliance with the approved regulatory program". In addition, the Commonwealth dedicates 359 full-time equivalents (staff) to its regulatory and AML programs.

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).

Citizen and stakeholder involvement is critical to watershed reclamation in Pennsylvania and is strongly encouraged through the TMDL program and process. There currently isn't a watershed organization interested in the Leatherwood Creek 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 February 9, 2008 to foster public comment on the allowable loads calculated. A public meeting was held on February 26, 2008 beginning at 1:00 pm, at the Knox District Mining Office in Knox, PA, to discuss the proposed TMDL.

WR11

WR12

WR10

WR8

WR7

WR5

WR4

WR3

WR1
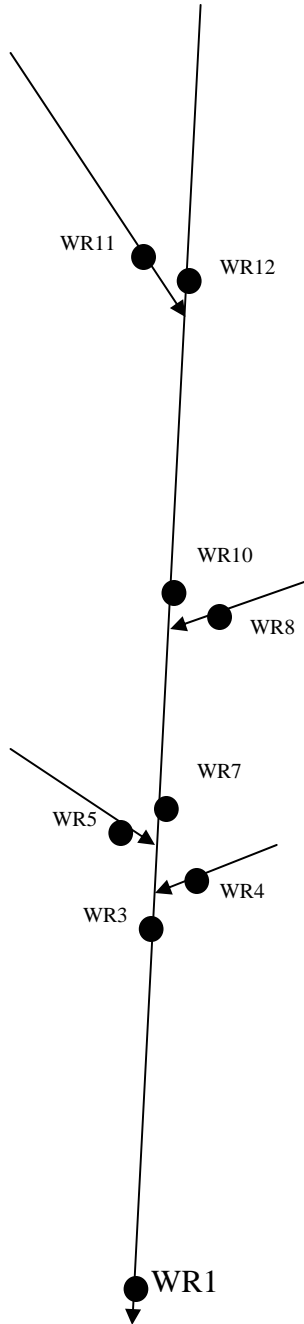
Attachment A

Welch Run Watershed Maps

Welch Run

Welch Run

⋀⋁ Non-attained

▭ Welch Run Watershed

N

0.7   0   0.7   1.4 Miles

24

Welch Run

Welch Run

⋀⋁ Non-attained

▢ Welch Run Watershed

N

48490

WR11 — WR12

48486

48489

WR10 — WR8

48488

WR7

WR5

48487

WR3 — WR4

WR1

0.7   0   0.7   1.4 Miles
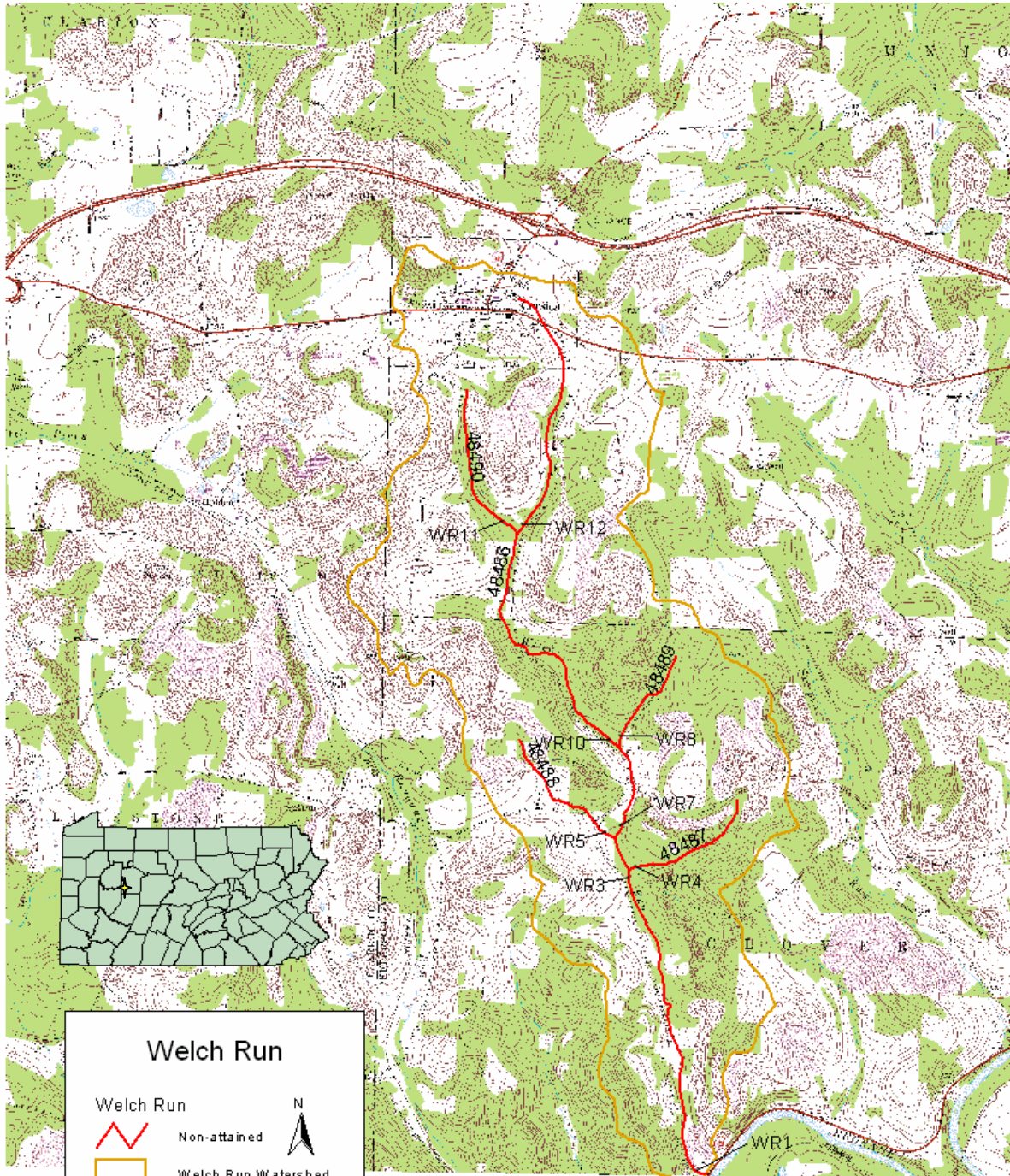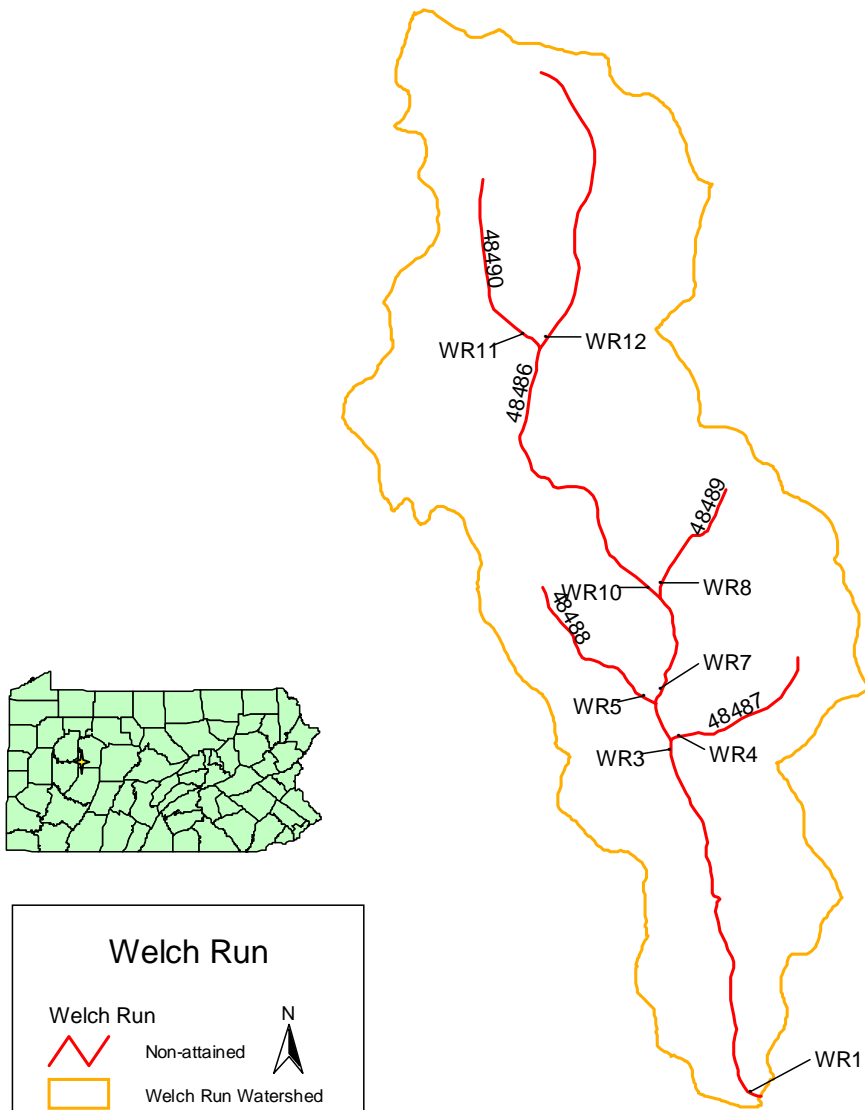
Attachment B

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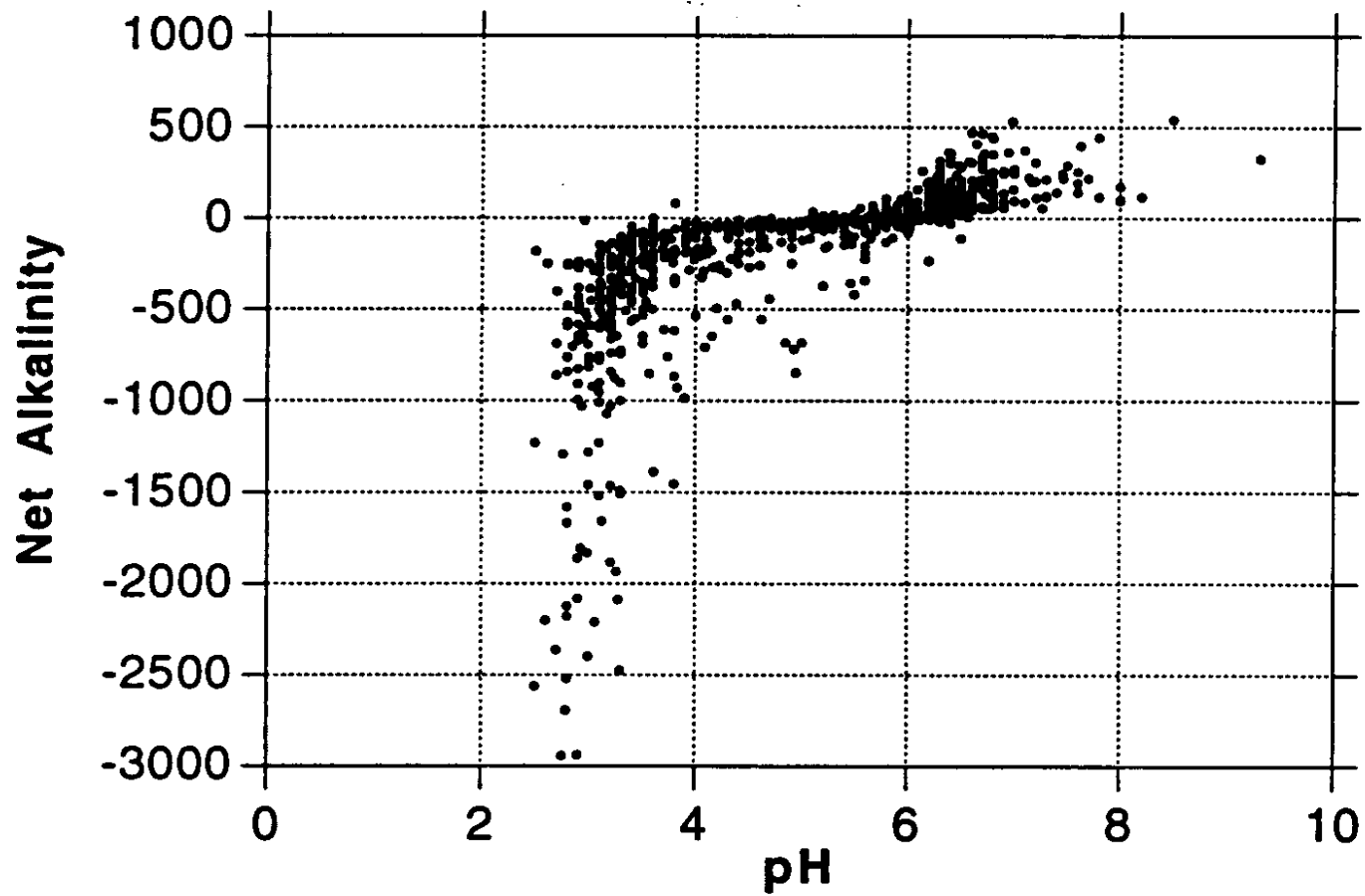
Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C

TMDLs By Segment

Welch Run

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

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

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

WR12 Most Upstream Sample Point on Welch Run

The TMDL for this sample point on Welch 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 WR12. The average flow, measured at the sampling point WR12 (0.37 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 WR12 shows pH ranging between 4.7 and 6.3; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	3.43	10.6	0.31	1.0
Fe	1.06	3.3	0.44	1.4
Mn	6.07	18.9	0.42	1.3
Acid	38.90	120.9	5.06	15.7
Alk	10.00	31.1		

Table C1. Load Allocations for Point WR12

Table C2. Calculation of Load Reductions Necessary at Point WR12				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	10.6	3.3	18.9	120.9
Allowable Load = TMDL	1.0	1.4	1.3	15.7
Load Reduction	9.6	1.9	17.6	105.2
% Reduction Segment	91%	59%	93%	87%

WR11 Mouth of Unt 48490

The TMDL for this sample point on Welch 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 WR11. The average flow, measured at the sampling point WR11 (0.20 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 WR11 shows pH ranging between 3.9 and 5.1; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C3. Load Allocations for Point WR11				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	5.79	9.6	0.29	0.5
Fe	47.08	78.1	0.47	0.8
Mn	19.72	32.7	0.59	1.0
Acid	177.50	294.5	3.55	5.9
Alk	5.23	8.7		

Table C4. Calculation of Load Reductions Necessary at Point WR11				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	9.6	78.1	32.7	294.5
Allowable Load = TMDL	0.5	0.8	1.0	5.9
Load Reduction	9.1	77.3	31.7	288.6
% Reduction Segment	95%	99%	97%	98%

A waste load allocation for future mining was included for this segment of Welch (WR10) Run allowing for one operation with one active pits (1500' x 300') to be permitted in the future on this segment (see page 11 for the method used to quantify treatment pond load).

Table C5. 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

WR10 Welch Run Upstream of Confluence with Unt 48489

The TMDL for this sample point on Welch Run consists of a load allocation to all of the area between sample points WR12, WR11 and WR10. The load allocation for this segment was computed using water-quality sample data collected at point WR10. The average flow, measured at the sampling point WR10 (1.18 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 WR10 shows pH ranging between 3.6 and 5.0; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C6. Load Allocations for Point WR10				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	2.85	28.1	0.31	3.1
Fe	17.14	169.2	0.34	3.4
Mn	11.68	115.3	0.47	4.6
Acid	81.17	801.4	1.62	16.0
Alk	3.13	30.9		

The calculated load reductions for all the loads that enter point WR10 must be accounted for in the calculated reductions at sample point WR10 shown in Table C7. A comparison of measured loads between points WR12, WR11 and WR10 shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. For aluminum, iron, manganese and

acidity the total segment loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C7. Calculation of Load Reduction at Point WR10				
	Al	Fe	Mn	Acidity
Existing Load	28.1	169.2	115.3	801.4
Difference in Existing Load between WR12, WR11 & WR10	7.9	87.8	63.7	386.0
Load tracked from WR12 & WR11	1.4	2.1	2.3	21.6
Percent loss due to instream process	-	-	-	-
Percent load tracked from WR12 & WR11	-	-	-	-
Total Load tracked from WR12 &WR11	9.3	89.9	66.0	407.6
Allowable Load at WR10	3.1	3.4	4.6	16.0
Load Reduction at WR10	6.2	86.6	61.4	391.6
% Reduction required at WR10	67	96	93	96

WR8 Mouth of Unt 48489

The TMDL for this sample point on Welch Run consists of a load allocation to all of the area upstream of sample point WR8. The load allocation for this segment was computed using water-quality sample data collected at point WR8. The average flow, measured at the sampling point WR8 (0.04MGD), 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 WR8 shows pH ranging between 4.8 and 5.2; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C8. Load Allocations for Point WR8				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	1.54	0.45	0.26	0.08
Fe	4.19	1.23	0.46	0.14
Mn	3.61	1.06	0.51	0.15
Acid	28.40	8.34	3.69	1.08
Alk	10.70	3.1		

Table C9. Calculation of Load Reductions Necessary at Point WR8				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	0.45	1.23	1.06	8.34
Allowable Load = TMDL	0.08	0.14	0.15	1.08
Load Reduction	0.37	1.09	0.91	7.26
% Reduction Segment	83%	89%	86%	87%

A waste load allocation for future mining was included for this segment of Welch Run (WR7) allowing for three operations with three active pits (1500' x 300') to be permitted in the future on this segment (page 11 for the method used to quantify treatment pond load).

Table C10. 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
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 3			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

WR7 Welch Run Upstream of Confluence with Unt 48488

The TMDL for sampling point WR7 consists of a load allocation to all of the area between sample points WR10, WR8 and WR7. The load allocation for this tributary was computed using water-quality sample data collected at point WR7. The average flow, measured at the sampling point WR7 (1.55 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 WR7 shows pH ranging between 3.4 and 4.2; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C11. Load Allocations at Point WR7				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	2.20	28.3	0.29	3.7
Fe	9.76	125.8	0.68	8.8
Mn	10.93	140.9	0.55	7.0
Acid	67.40	868.9	1.35	17.4
Alk	2.27	29.2		

The calculated load reductions for all the loads that enter point WR7 must be accounted for in the calculated reductions at sample point WR7 shown in Table C12. A comparison of measured loads between points WR10, WR8 and WR7 shows that there is there is no additional loading entering the segment for aluminum and iron. For aluminum and iron the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is additional loading entering the segment for manganese and acidity. The total segment manganese and acidity loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C12. Calculation of Load Reduction at Point WR7				
	Al	Fe	Mn	Acidity
Existing Load	28.3	125.8	140.9	868.9
Difference in Existing Load between WR10, WR8 & WR7	-0.3	-44.7	24.5	59.2
Load tracked from WR10 & WR8	3.2	3.5	4.8	17.1
Percent loss due to instream process	1	26	-	-
Percent load tracked from WR10 & WR8	99	74	-	-
Total Load tracked from WR10 & WR8	3.1	2.6	29.3	76.3
Allowable Load at WR7	3.9	8.8	7.0	17.4
Load Reduction at WR7	0.0	0.0	22.2	58.9
% Reduction required at WR7	0	0	76	77

WR5 Mouth of Unt 48488 Upstream of Confluence with Welch Run

The TMDL for sampling point WR5 consists of a load allocation to the area upstream of point WR8. The load allocation for this tributary was computed using water-quality sample data collected at point WR5. The average flow, measured at the sampling point WR5 (0.13 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 WR5 shows pH ranging between 4.5 and 4.8, pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C13. Load Allocations at Point WR5				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	4.60	5.2	0.46	0.5
Fe	1.63	1.8	0.37	0.4
Mn	8.74	9.8	0.61	0.7
Acid	53.60	60.1	4.82	5.4
Alk	9.07	10.2		

Table C14. Calculation of Load Reduction Necessary at Point WR5				
	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	5.2	1.8	9.8	60.1
Allowable Load=TMDL	0.5	0.4	0.7	5.4
Load Reduction	4.7	1.4	9.1	54.7
Total % Reduction	90%	77%	93%	91%

WR4 Mouth of Unt 48487

The TMDL for sampling point WR4 consists of a load allocation to the area upstream of point WR4. The load allocation for this tributary was computed using water-quality sample data collected at point WR4. The average flow, measured at the sampling point WR4 (0.08 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 WR4 shows pH ranging between 6.3 and 7.0, pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Water quality analysis determined that the measured aluminum loads were equal the laboratory detection limit. Because WQS are met, a TMDL for aluminum is not necessary. Although a TMDL is not necessary, the measured load is considered at the next downstream point, WR3.

Table C15. Load Allocations at Point WR4				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.50	0.3	ND	ND
Fe	0.66	0.5	0.37	0.3
Mn	0.93	0.7	0.27	0.5
Acid	10.00	7.0	4.50	3.1
Alk	32.87	23.0		

Table C16. Calculation of Load Reduction Necessary at Point WR4				
	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Load	0.3	0.5	0.7	7.0
Allowable Load=TMDL	ND	0.3	0.2	3.1
Load Reduction	0.0	0.2	0.5	3.9
Total % Reduction	0%	44%	71%	55%

A waste load allocation for future mining was included for this segment of Welch Run (WR3) allowing for five operations with five active pits (1500' x 300') to be permitted in the future on this segment (see page 11 for the method used to quantify treatment pond load).

Table C17. 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
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 3			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 4			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 5			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

WR3 Welch Run Downstream of Confluence With Unt 48487

The TMDL for sampling point WR3 consists of a load allocation to the area upstream of point WR3. The load allocation for this tributary was computed using water-quality sample data collected at point WR3. The average flow, measured at the sampling point WR3 (2.07 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 WR3 shows pH ranging between 3.6 and 4.8; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C18. Load Allocations at Point WR3				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	2.31	39.9	0.32	5.6
Fe	10.42	180.0	0.73	12.6
Mn	10.36	179.0	0.62	10.7
Acid	64.83	1120.4	1.30	22.4
Alk	3.10	53.6		

The calculated load reductions for all the loads that enter point WR3 must be accounted for in the calculated reductions at sample point WR3 shown in Table C19. A comparison of measured loads between points WR7, WR4 and WR3 shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. The total segment aluminum, iron, manganese and acidity loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C19. Calculation of Load Reduction at Point WR3	Al	Fe	Mn	Acidity
Existing Load	39.9	180.0	179.0	1120.4
Difference in Existing Load between WR7, WR5, WR4 & WR3	6.1	51.9	27.7	184.4
Load tracked from WR7 WR5& WR4	4.5	9.5	7.9	25.9
Percent loss due to instream process	-	-	-	-
Percent load tracked from WR7, WR5 & WR4	-	-	-	-
Total Load tracked from WR7 WR5 & WR4	10.7	61.4	35.6	210.4
Allowable Load at WR3	5.6	12.6	10.7	22.4
Load Reduction at WR3	5.1	48.8	24.9	188.0
% Reduction required at WR3	48	79	70	89

A waste load allocation for future mining was included for this segment of Welch Run (WR1) allowing for five operations with five active pits (1500' x 300') to be permitted in the future on this segment (see page 11 for the method used to quantify treatment pond load).

Table C20. 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
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 3			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 4			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 5			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

WR1 Mouth of Welch Run

The TMDL for this portion of Welch Run consists of a load allocation to the watershed area between sample points WR3 and WR1. The load allocation for this segment was computed using water-quality sample data collected at point WR1. The average flow, measured at the sampling point WR1 (2.95 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 WR1 shows pH ranging between 3.7 and 5.1; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C21. Load Allocations at Point WR1				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	1.85	45.4	0.33	8.2
Fe	7.53	185.1	0.53	13.0
Mn	9.03	222.2	0.63	15.6
Acid	48.93	1203.4	1.96	48.1
Alk	4.73	116.4		

The calculated load reductions for all the loads that enter point WR1 must be accounted for in the calculated reductions at sample point WR1 shown in Table C22. A comparison of measured loads between points WR3 and WR1 shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. The total segment aluminum, iron, manganese and acidity loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C22. Calculation of Load Reduction at Point WR1				
	Al	Fe	Mn	Acidity
Existing Load	45.4	185.1	222.2	1203.4
Difference in Existing Load between WR3 & WR1	5.5	5.1	43.1	83.0
Load tracked from WR3	5.6	12.6	10.7	22.4
Percent loss due to instream process	-	-	-	-
Percent load tracked from WR3	-	-	-	-
Total Load tracked from WR1	11.1	17.7	53.9	105.4
Allowable Load at WR1	8.2	13.0	15.6	48.1
Load Reduction at WR1	2.9	4.7	38.3	57.3
% Reduction required at WR1	26	27	71	54

Margin of Safety (MOS)

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

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

would be less variable than an uncontrolled system. This implicitly builds in a margin of safety.

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

Seasonal Variation

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

Critical Conditions

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

Attachment D

**Excerpts Justifying Changes Between the 1996, 1998, 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

Coll	Date	Initial	Final	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
WR12									
4251 444	7/20/2005	48	48	4.9	8.8	53.8	0.309	7.21	1.87
4251 594	11/4/2005	138	138	6.3	15.4	40.6	0.3	2.69	<.5
4251 762	4/3/2006	328	328	5	8.8	45.2	1.4	4.87	3.33
4251 927	8/8/2006	189	189	4.8	8.4	17.6	0.842	4.88	1.96
4251 035	11/14/2006	549	549	4.7	9	33.4	1.39	7.37	4.58
4251 112	2/8/2007	301	301	4.7	9.6	42.8	2.14	9.37	5.39
	avg=		258.83	5.07	10.00	38.90	1.06	6.07	3.43
	stdev=					12.36	0.72	2.37	1.56

Coll	Date	Initial	Final	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
WR11									
4251 445	7/20/2005	41	41	5.1	11.8	228.8	85.2	28.4	3.06
4251 593	11/4/2005	65	65	4.1	4.4	199	50	19.1	2.4
4251 761	4/3/2006	121	121	4	1.8	183.4	38.1	16.7	5.83
4251 926	8/8/2006	118	118	3.9	0	169.4	41.7	17.8	6.02
4251 036	11/14/2006	314	314	3.9	1.8	128.6	26.7	17.1	9.32
4251 111	2/8/2007	170	170	4.7	11.6	155.8	40.8	19.2	8.08
	avg=		138.17	4.28	5.23	177.50	47.08	19.72	5.79
	stdev=					34.80	20.13	4.37	2.71

Coll	Date	Initial	Final	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
WR10									
4251 446	7/20/2005	88	88	5	10.4	154	51.2	19.9	2.54
4251 592	11/4/2005	515	515	3.7	0	69.6	8.19	9.63	1.03
4251 760	4/3/2006	901	901	3.7	0	79.4	11	9.44	2.7
4251 925	8/8/2006	613	613	3.6	0	56.4	7.96	9.59	2.37
4251 038	11/14/2006	1792	1792	3.8	0	57.2	8.79	9.81	4.32
4251 110	2/8/2007	1024	1024	4.5	8.4	70.4	15.7	11.7	4.13
	avg=		822.17	4.05	3.13	81.17	17.14	11.68	2.85
	stdev=					36.73	16.93	4.11	1.22

Coll	Date	Initial	Final	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
WR8									
4251 443	7/20/2005	4	4	5.2	10	54.6	5.93	5.65	1.23
4251 591	11/4/2005	3	3	6	20.8	40	7.08	4.11	0.5
4251 759	4/3/2006	18.75	18.75	4.8	7.4	21.8	1	3.01	1.68
4251 924	8/8/2006	15	15	5	8	18.6	3.75	3.24	0.855
4251 037	11/14/2006	91	91	4.8	8.4	18.2	1.02	2.88	2.67
4251 113	2/8/2007	15	15	5.1	9.6	17.2	6.36	2.78	2.28
	avg=		24.46	5.15	10.70	28.40	4.19	3.61	1.54
	stdev=					15.43	2.70	1.11	0.84

Coll	Date	Initial	Final	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
WR7									
4251 442	7/20/2005	481	481	3.4	0	95.2	9.4	16.7	2.37
4251 590	11/4/2005	542	542	3.7	0	69	7.99	9.58	1.06
4251 758	4/3/2006	1211	1211	4.2	4.4	74.8	11.9	9.14	2.54
4251 923	8/8/2006	832	832	3.6	0	52.6	5.58	8.85	2.14
4251 040	11/14/2006	2269	2269	3.9	0	49	8.07	9.4	3.97
4251 109	2/8/2007	1106	1106	4.6	9.2	63.8	15.6	11.9	1.09
	avg=		1073.50	3.90	2.27	67.40	9.76	10.93	2.20
	stdev=					16.74	3.53	3.03	1.08

Coll	Date	Initial	Final	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
WR5									
4251 441	7/20/2005	20	20	4.7	9.6	66.2	4.18	12.7	5.03
4251 589	11/4/2005	45	45	4.7	9.4	76.2	0.716	8.44	4.48
4251 757	4/3/2006	62	62	4.8	9.2	57.6	0.72	6.52	3.86
4251 922	8/8/2006	99	99	4.5	7.8	34.6	0.931	7.33	3.52
4251 039	11/14/2006	287	287	4.7	7.8	38.6	1.32	8.03	4.47
4251 108	2/8/2007	47	47	4.7	10.6	48.4	1.91	9.44	6.24
	avg=		93.33	4.68	9.07	53.60	1.63	8.74	4.60
	stdev=					16.12	1.33	2.18	0.96

Coll	Date	Initial	Final	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
WR4									
4251 440	7/20/2005	27	27	6.9	35	12.4	1.45	1.26	0.5
4251 588	11/4/2005	4	4	6.4	19.8	41.6	1.27	1.61	0.5
4251 756	4/3/2006	47	47	6.9	32.8	6	0.3	0.501	0.5
4251 921	8/8/2006	20	20	6.3	43.8	0	0.362	0.46	0.5
4251 042	11/14/2006	153	153	7	31.4	0	0.3	1.72	0.5
4251 107	2/8/2007	98	98	7	34.4	0	0.3	0.05	0.5
	avg=		58.2	6.8	32.9	10.0	0.7	0.9	0.5
	stdev=					16.3	0.5	0.7	0.0

Coll	Date	Initial	Final	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
WR3									
4251 439	7/20/2005	654	654	3.6	0	91.8	12.4	15.3	2.05
4251 587	11/4/2005	804	804	3.7	0	62	9.63	9.22	1.01
4251 755	4/3/2006	1393	1393	4.1	4	89.4	9.81	8.52	2.07
4251 920	8/8/2006	1117	1117	3.6	0	45.2	6.95	8.62	1.8
4251 041	11/14/2006	2949	2949	4.1	4.2	42.8	7.8	8.9	3.39
4251 106	2/8/2007	1717	1717	4.8	10.4	57.8	15.9	11.6	3.54
	avg=		1439.0	4.0	3.1	64.8	10.4	10.4	2.3
	stdev=					21.3	3.3	2.7	1.0

Coll ID Seq	Date Collected	Initial Flow	Final Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
WR1									
4251 438	7/20/2005	1217	1217	3.7	0	56.4	4.93	13.1	1.73
4251 586	11/4/2005	1055	1055	3.8	0	51	5.19	8.19	0.903
4251 754	4/3/2006	2341	2341	4.9	8.8	82.6	8.81	7.74	1.65
4251 919	8/8/2006	1966	1966	3.9	0	27.4	4.46	7.76	1.43
4251 043	11/14/2006	3585	3585	4.7	9	34	6.86	7.41	2.38
4251 105	2/8/2007	2123	2123	5.1	10.6	42.2	14.9	10	2.98
	AVG=		2047.8	4.4	4.7	48.9	7.5	9.0	1.8
	stdev=					19.6	4.0	2.2	0.7

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 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