FINAL WHITES CREEK WATERSHED TMDL
Somerset County

For Acid Mine Drainage Affected Segments

Prepared by:

Pennsylvania Department of Environmental Protection

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Introduction

This report presents the Total Maximum Daily Loads (TMDLs) developed for segments in the Whites Creek Watershed (Attachment A). These were done to address the impairments noted on the 1996 Pennsylvania Section 303(d) list of impaired waters, required under the Clean Water Act, and covers one segment on that list and additional segments on later lists/reports. Whites Creek was listed as impaired for metals. All impairments resulted from acid drainage from abandoned coalmines. The TMDL addresses the three primary metals associated with acid mine drainage (iron, manganese, aluminum) and pH.

Table 1. 303(d) Listed Segments

State Water Plan (SWP) Subbasin: 19F Casselman River

HUC: 05020006

Year	Miles	Use Designation	Assessment ID	Segment ID	DEP Stream Code	Stream Name	Designated Use	Data Source	Source	EPA 305(b) Cause Code
1996	2 2	*	*	*	38778	Whites Creek	HQ-CWF	305(b) Report	RE	Metals Other Inorganics*
1998	Not on list.				38778	Whites Creek	HQ-CWF	SWMP	AMD	Metals Other Inorganics*
2002	Not on list.				38778	Whites Creek	HQ-CWF	SWMP	AMD	Metals Other Inorganics*
2006	4.03	Aquatic Life	7467	*	38778	Whites Creek	HQ-CWF	SWMP	AMD	Metals

Resource Extraction = RE
HQ-CWF = High Quality Cold Water Fish
Surface Water Monitoring Program = SWMP
Abandoned Mine Drainage = AMD
See Attachment D, *Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists and the 2004 and 2006 Integrated Water Quality Report*. The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.
*Other inorganics has been delisted as a cause of impairment.

Directions to the Whites Creek Watershed

Whites Creek can be accessed by taking Route 523 traveling south/west from the town of Confluence towards the villages of Harnedsville, Dumas, and Bechly. Route 523, State Road

[1] Pennsylvania's 1996, 1998, and 2002 Section 303(d) lists and the 2004 and 2006 Integrated Water Quality Report were approved by the Environmental Protection Agency (EPA). The 1996 Section 303(d) list provides the basis for measuring progress under the 1997 lawsuit settlement of *American Littoral Society and Public Interest Group of Pennsylvania v. EPA.*

3001, and Township Road 339 all parallel Whites Creek and its tributaries in the lower watershed where the mining impairment exists.

Watershed Background

Whites Creek is located in southwest Somerset County, with its upper reaches originating in West Virginia and flowing into Pennsylvania. The watershed area is found on the Confluence US 7.5-Minute Quadrangle United States Geological Survey maps. The stream has been shown to be attaining its uses with the exception of the lower 1.6 mile segment and an unnamed tributary impacted by mine drainage. Land use in the watershed is largely forested, with some small amounts of mines, residential development, and agriculture.

Extensive surface mining has occurred along the downstream reaches of Whites Creek. Bituminous Coals, Inc. operated three mines in this area: SMPs 56773136, 4077SM11, and 5679116, generally known as the Addison Mines. The King Coal, Inc. permit (SMP 4076SM5) also was mined in the area and later acquired by Bituminous Coals, Inc. Mining has been completed on all permits in the watershed and no NPDES permits exist. These permits mined the Upper Kittanning and Upper Freeport Coal Seams. These permits included post-mining discharges which the operator had been treating with caustic soda. However, the operator filed for bankruptcy and forfeited the bonds associated with these sites. Currently, no treatment of these discharges is occurring. Thus, they will be treated as abandoned discharges and will be addressed as part of the load allocation portion of the TMDL.

Segments addressed in this TMDL

Whites Creek is affected by pollution from AMD. This pollution has caused high levels of metals, and in some cases low pH, in the watershed. The TMDLs will be expressed as long-term averages. Due to the nature and complexity of mining effects on the watershed, expressing the TMDL as a long-term average gives a better representation of the data used for the calculations. See Table 3 for TMDL calculations and see Attachment C for TMDL explanations.

Clean Water Act Requirements

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

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

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

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

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

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

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

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

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

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

Section 303(d) Listing Process

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

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

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

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

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

Basic Steps for Determining a TMDL

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

1. Collection and summarization of pre-existing data (watershed characterization, inventory contaminant sources, determination of pollutant loads, etc.);
2. Calculating the TMDL for the waterbody using EPA approved methods and computer models;
3. Allocating pollutant loads to various sources;
4. Determining critical and seasonal conditions;
5. Public review and comment and comment period on draft TMDL;
6. Submittal of final TMDL; and
7. EPA approval of the TMDL.

AMD Methodology

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

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

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

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

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

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

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

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

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

LTA = Mean * (1 – PR99) where (2)

LTA = allowable LTA source concentration in mg/l

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

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

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

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

Tracking loads through the watershed gives the best picture of how the pollutants are affecting the watershed based on the information that is available. The analysis is done to insure that water quality standards will be met at all points in the stream. The TMDL must be designed to meet standards at all points in the stream, and in completing the analysis, reductions that must be made to upstream points are considered to be accomplished when evaluating points that are lower in the watershed. Another key point is that the loads are being computed based on average annual flow and should not be taken out of the context for which they are intended, which is to depict how the pollutants affect the watershed and where the sources and sinks are located spatially in the watershed.

For pH TMDLs, acidity is compared to alkalinity as described in Attachment B. Each sample point used in the analysis of pH by this method must have measurements for total alkalinity and hot acidity. Statistical procedures are applied, using the average value for total alkalinity at that point as the target to specify a reduction in the acid concentration. By maintaining a net alkaline stream, the pH value will be in the range between six and eight. This method negates the need to specifically compute the pH value, which for streams affected by low pH from AMD may not be a true reflection of acidity. This method assures that Pennsylvania’s standard for pH is met when the acid concentration reduction is met.

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

TMDL Endpoints

One of the major components of a TMDL is the establishment of an instream numeric endpoint, which is used to evaluate the attainment of applicable water quality. An instream numeric endpoint, therefore, represents the water quality goal that is to be achieved by implementing the load reductions specified in the TMDL. The endpoint allows for a comparison between observed instream conditions and conditions that are expected to restore designated uses. The endpoint is based on either the narrative or numeric criteria available in water quality standards.

Because most of the pollution sources in the watershed are nonpoint sources, the TMDLs' component makeup will be load allocations (LAs) with waste load allocations (WLAs) for permitted discharges. All allocations will be specified as long-term average daily concentrations. These long-term average concentrations are expected to meet water-quality criteria 99% of the time as required in PA Title 25 Chapter 96.3(c). For high quality waters, applicable water-quality criteria are determined using the unimpaired segment of the TMDL water or the 95th percentile of a reference Water Quality Network (WQN) stream with the exception of manganese which uses the criterion value of 1.0 mg/L. For segments in the Whites Creek Watershed, WQN870 on Clear Shade Creek (SWP18E) is used as the reference water. The following table shows the criteria used in the Whites Creek TMDL. Attachment E explains how to select a reference stream for HQ TMDL development.

Table 3. Reference Clear Shade Creek Criteria

Parameter	Criterion Value
Aluminum (Al)	0.231 mg/L
Iron (Fe)	0.212 mg/L
Manganese (Mn)	1.0 mg/L
Area	16 square miles
Alkalinity	4.8 mg/L

TMDL Elements (WLA, LA, MOS)

$$TMDL = WLA + LA + MOS$$

A TMDL equation consists of a waste load allocation (WLA), load allocation (LA), and a margin of safety (MOS). The waste load allocation is the portion of the load assigned to point sources. The load allocation is the portion of the load assigned to non-point sources. The margin of safety is applied to account for uncertainties in the computational process. The margin of safety may be expressed implicitly (documenting conservative processes in the computations) or explicitly (setting aside a portion of the allowable load). The TMDL allocations in this report are based on available data. Other allocation schemes could also meet the TMDL.

Allocation Summary

These TMDLs will focus remediation efforts on the identified numerical reduction targets for each watershed. The reduction schemes in Table 3 for each segment are based on the assumption that all upstream allocations are implemented and take into account all upstream reductions. Attachment D 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 average flow and a conversion factor at each sample point. The allowable load is the TMDL at that point.

The load allocation at each point includes all loads entering the segment, including those from upstream allocation points. The percent reduction is calculated to show the amount of load that needs to be reduced from nonpoint sources within a segment in order for water quality standards to be met at the point.

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

Table 4. Whites Creek Watershed Summary Table

Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	NPS Load Reduction (lbs/day)	NPS % Reduction
SW3 – Unnamed tributary to Whites Creek						
Aluminum (lbs/day)	3.15	3.15	-	NA	NA	NA
Iron (lbs/day)	1.81	0.96	-	0.96	0.85	47%
Manganese(lbs/day)	0.47	0.47	-	NA	NA	NA
Acidity (lbs/day)	68.00	17.68	-	17.68	50.32	74%
BECHLY – Whites Creek upstream of SW3 unnamed tributary						
Aluminum (lbs/day)	95.23	16.19	-	16.19	79.04	83%
Iron (lbs/day)	302.13	6.04	-	6.04	296.09	98%
Manganese(lbs/day)	27.82	27.82	-	NA	NA	NA
Acidity (lbs/day)	2587.08	129.35	-	129.35	2457.73	95%
SW8 – Unnamed tributary to Whites Creek in the headwaters						
Aluminum (lbs/day)	23.38	0.16	-	0.16	23.22	99.3%
Iron (lbs/day)	0.17	0.12	-	0.12	0.05	33%
Manganese(lbs/day)	23.56	0.71	-	0.71	22.85	97%
Acidity (lbs/day)	190.84	3.82	-	3.82	187.02	98%
SW6 – Unnamed tributary to Whites Creek downstream of SW8						
Aluminum (lbs/day)	13.44	0.13	-	0.13	0*	0%*
Iron (lbs/day)	0.94	0.28	-	0.28	0.61*	69%*
Manganese(lbs/day)	25.01	1.75	-	1.75	0.41*	19%*
Acidity (lbs/day)	147.47	4.42	-	4.42	0*	0%*
DUMAS – Whites Creek near mouth						
Aluminum (lbs/day)	132.49	13.25	-	13.25	26.89*	67%*
Iron (lbs/day)	1265.70	7.59	-	7.59	960.51*	99.3%*
Manganese(lbs/day)	36.75	36.75	-	NA	NA	NA
Acidity (lbs/day)	3074.40	122.98	-	122.98	300.32*	71%*

NA = not applicable
* Takes into account load reductions from upstream sources.

Following is an example of how the allocations, presented in Table 4, for a stream segment are calculated. For this example, iron allocations for SW6 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.

Unnamed Tributary to Whites Creek

Allocations SW8	
SW8	Fe (Lbs/day)
Existing Load @ SW8	0.17
Allowable Load @ SW8	0.12

Allowable Load = 0.12 lbs/day

Load input = 0.77 lbs/day
(Difference between existing loads at SW6 and SW8)

ALLOCATIONS SW6	
SW6	Fe (Lbs/day)
Existing Load @ SW6	0.94
Difference in measured Loads between the loads that enter and existing SW6 (SW6–SW8)	0.77
Additional load tracked from above samples	0.12
Total load tracked between SW8 and SW6	0.89
Allowable Load @ SW6	0.28
Load Reduction @ SW6	0.61
% Reduction required at SW6	69%

Allowable Load = 0.28 lbs/day

The allowable aluminum load tracked from SW8 was 0.12 lbs/day. The existing load at SW8 was subtracted from the existing load at SW6 to show the actual measured increase of aluminum load that has entered the stream between these upstream sites and SW6 (0.77 lbs/day). This increased value was then added to the calculated allowable load from SW8 to calculate the total load that was tracked between SW8 and SW6 (allowable loads @ SW8 + the difference in existing load between SW8 and SW6). This total load tracked was then subtracted from the calculated allowable load at SW6 to determine the amount of load to be reduced at SW6. This total load value was found to be 0.89 lbs/day; it was 0.61 lbs/day greater than the SW6 allowable load of 0.28 lbs/day. Therefore, a 69% aluminum reduction at SW6 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 that 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 Whites 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.

Public Participation

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on September 27, 2008 to foster public comment on the allowable loads calculated. The public comment period on this TMDL is open from September 27, 2008 to November 27, 2008. A public meeting was held on October 28, 2008 at the Ebensburg District Mining Office 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 TMDLs 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

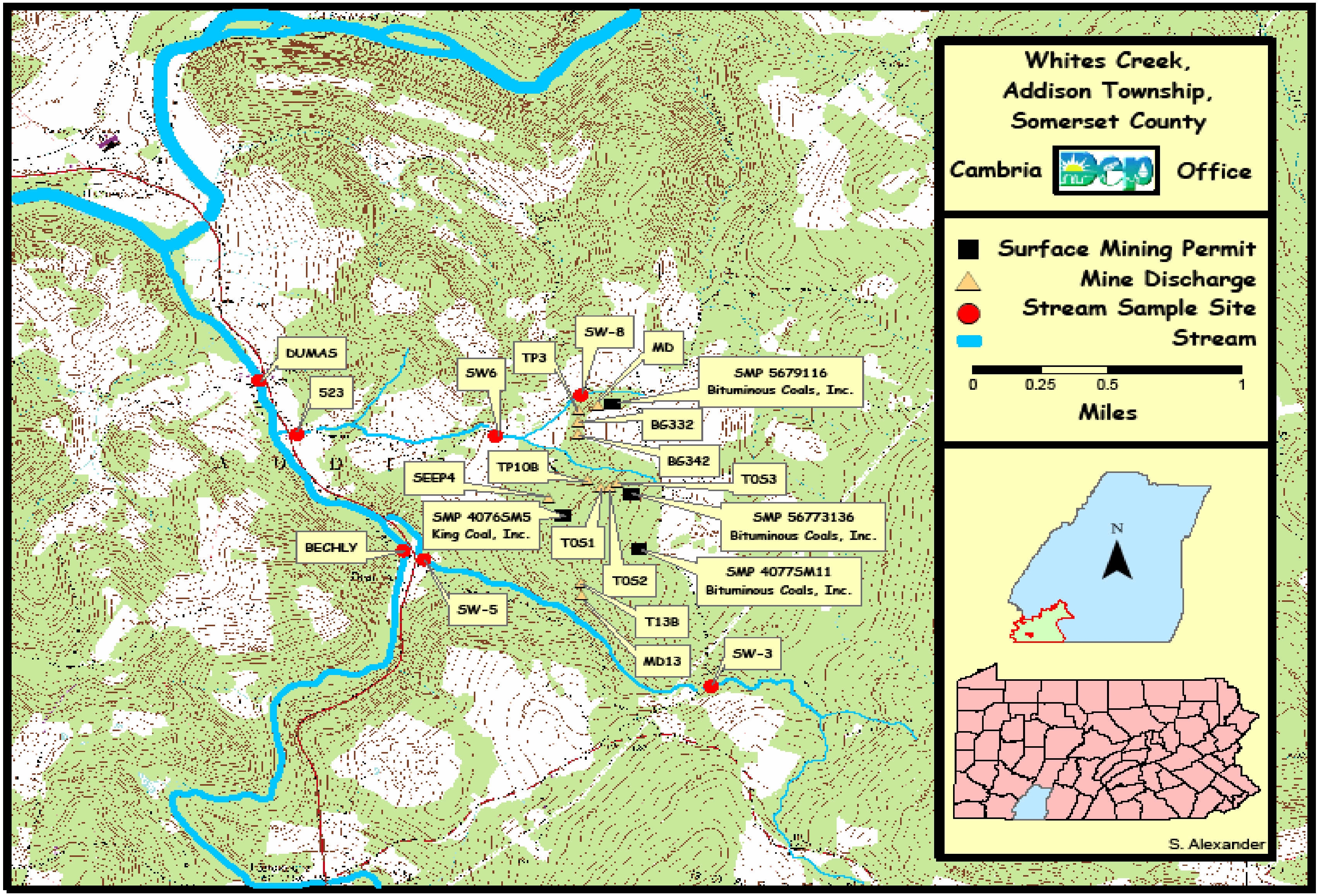
- Increase in total load capacity.
- Transfer of load between point (WLA) and nonpoint (LA) sources.
- Modification of the margin of safety (MOS).
- Change in water quality standards (WQS).
- Non-attainment of WQS with implementation of the TMDL.
- Allocations in trading programs.

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

Whites Creek Watershed Map



Whites Creek,
Addison Township,
Somerset County
Cambria
Office
Surface Mining Permit
Mine Discharge
Stream Sample Site
Stream
0
0.25
0.5
1
Miles
N
S. Alexander
DUMAS
523
SW6
TP3
SW-8
MD
SMP 5679116
Bituminous Coals, Inc.
B6332
B6342
T053
TP108
SEEP4
SMP 4076SM5
King Coal, Inc.
T051
SMP 56773136
Bituminous Coals, Inc.
BECHLY
SW-5
T052
SMP 4077SM11
Bituminous Coals, Inc.
T138
MD13
SW-3

Attachment B

Method for Addressing Section 303(d) Listings for pH

Method for Addressing Section 303(d) Listings for pH

There has been a great deal of research conducted on the relationship between alkalinity, acidity, and pH. Research published by the 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. 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. 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.*

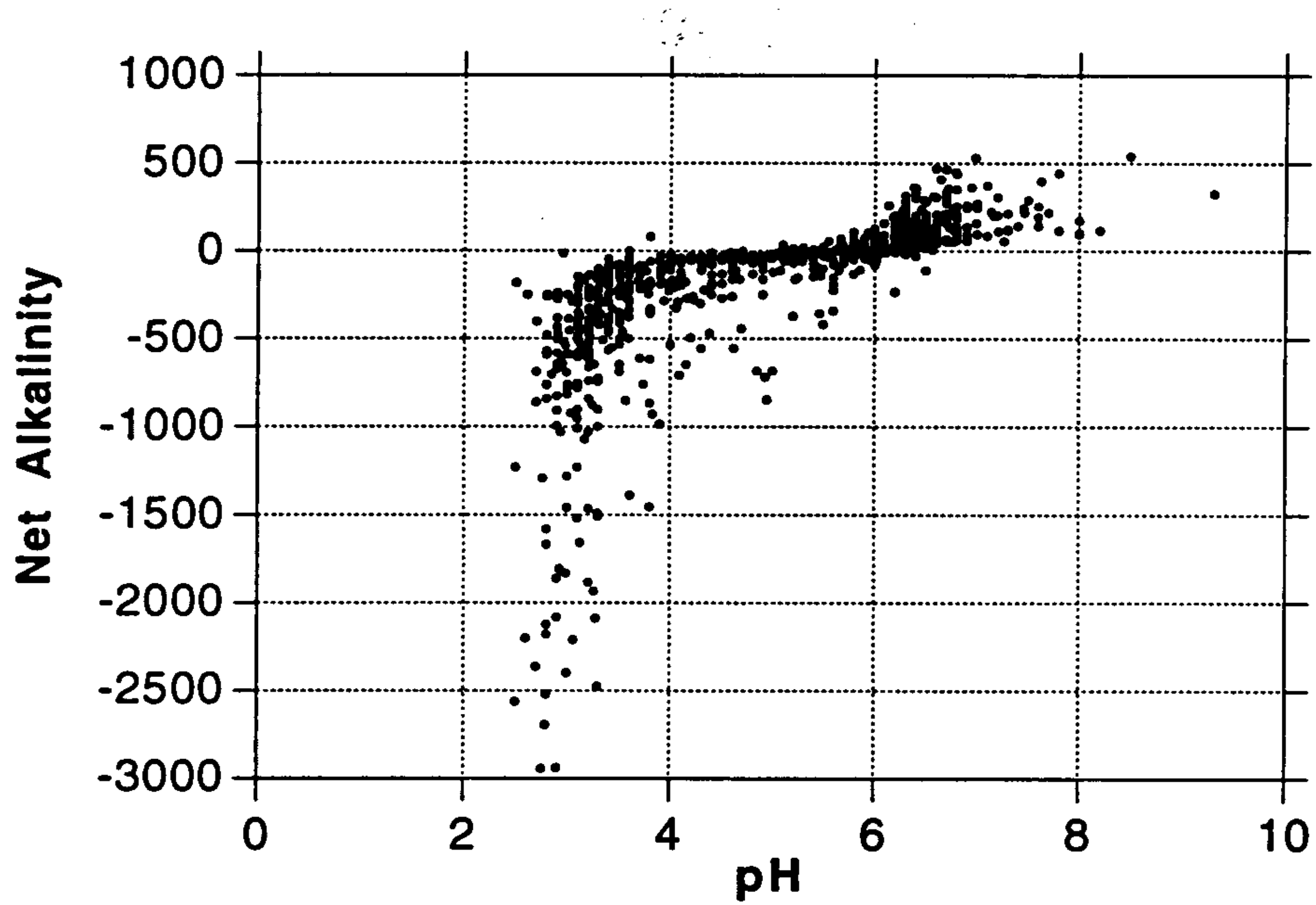


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C

Method for Calculating Loads from Mine Drainage Treatment Facilities from Surface Mines

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.

Total Measured Load = Allowed Load + 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.

Allowed Load (lbs/day) = WLA (lbs/day) + 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 <= pH <= 9.0
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 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 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

Allowable Aluminum 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.

Allowed Load = Waste Load Allocation + Load Allocation
Or
Load Allocation = Allowed Load – 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.

Attachment D

TMDLs By Segment

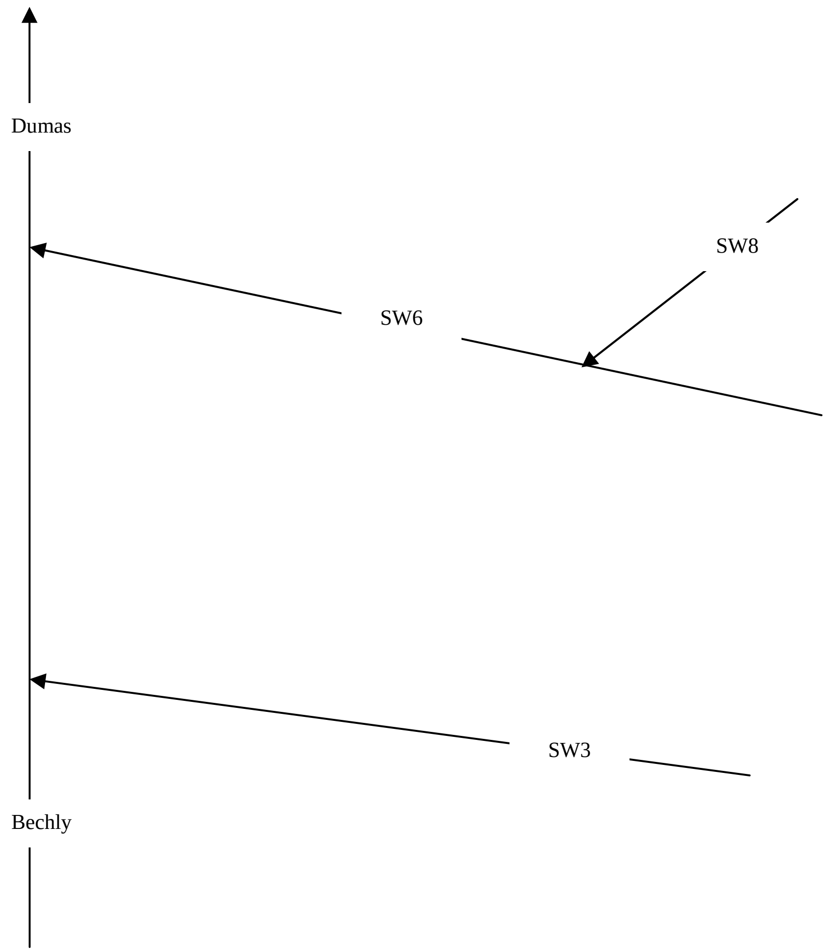
Whites Creek

The TMDL for Whites Creek consists of load allocations to two sampling sites on Whites Creek (BECHLY and DUMAS) and three sites on unnamed tributaries of Whites Creek (SW8, SW6, SW3). Sample data sets were collected from 2001 through 2006. All sample points are shown on the maps included in Attachment A as well as on the loading schematic presented on the following page.

Whites Creek is listed on the 1996 PA Section 303(d) list for metals from AMD as being the cause of the degradation to this stream. Although this TMDL will focus primarily on metal loading to the Whites Creek Watershed, acid loading analysis will be performed. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range (between 6 and 9) 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

An allowable long-term average in-stream concentration was determined at each sample point for metals 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 log normally 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. Following is an explanation of the TMDL for each allocation point.

Whites Creek Sampling Station Diagram
Arrows represent direction of flow
Diagram not to scale



TMDL calculations- SW3 – Unnamed tributary to Whites Creek at mouth

The TMDL for sample point SW3 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for the unnamed tributary to Whites Creek was computed using water-quality sample data collected at point SW3. The average flow, derived using the U.S. Geological Survey Streamstats Tool (1.51 MGD), is used for these computations. The allowable load allocations calculated at SW3 will directly affect the downstream point DUMAS.

Sample data at point SW3 shows that Whites Creek in this segment has a pH ranging between 5.9 and 6.4. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; pH will be addressed. A TMDL for aluminum, iron and manganese has been calculated at this site.

Table D1 shows the measured and allowable concentrations and loads at SW3. Table D2 shows the percent reductions for aluminum, iron, manganese, and acidity.

Table D1		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.25	3.15	0.25	3.15
	Iron	0.14	1.81	0.08	0.96
	Manganese	0.04	0.47	0.04	0.47
	Acidity	5.40	68.00	1.40	17.68
	Alkalinity	8.67	109.14		

Table D2. Allocations SW3		
SW3	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SW3	1.81	68.00
Allowable Load @ SW3	0.96	17.68
Load Reduction @ SW3	0.85	50.32
% Reduction required @ SW3	47%	74%

TMDL calculations- BECHLY – Whites Creek upstream of SW3 unnamed tributary

The TMDL for sampling point BECHLY consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this segment of the unnamed tributary to Whites Creek was computed using water-quality sample data collected at point BECHLY. The average flow, derived using the U.S. Geological Survey Streamstats Tool (1.51 MGD), is used for these computations.

Sample data at point BECHLY shows pH ranging between 6.2 and 7.6. There currently is not an entry for this segment on the Section Pa 303(d) list for impairment due to pH; pH will be addressed. A TMDL for aluminum, iron and manganese at BECHLY has been calculated.

Table D3 shows the measured and allowable concentrations and loads at BECHLY. Table D4 shows the percent reduction for aluminum, iron, manganese, and acidity needed at BECHLY.

Table D3		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.29	95.23	0.05	16.19
	Iron	0.93	302.13	0.02	6.04
	Manganese	0.09	27.82	0.09	27.82
	Acidity	7.96	2587.08	0.40	129.35
	Alkalinity	20.96	6812.21		

Table D4. Allocations BECHLY			
BECHLY	Al (Lbs/day)	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load @ BECHLY	95.23	302.13	2587.08
Allowable Load @ BECHLY	16.19	6.04	129.35
Load Reduction @ BECHLY	79.04	296.09	2457.73
% Reduction required @ BECHLY	83%	98%	95%

TMDL calculations- SW8 – Unnamed tributary to Whites Creek in headwaters

The TMDL for sampling point SW8 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this segment of the unnamed tributary to Whites Creek was computed using water-quality sample data collected at point SW8. The average flow, derived using the U.S. Geological Survey Streamstats Tool (0.18 MGD), is used for these computations.

Sample data at point SW8 shows pH ranging between 4.1 and 4.4. There currently is not an entry for this segment on the Section Pa 303(d) list for impairment due to pH; pH will be addressed. A TMDL for aluminum, iron and manganese at SW8 has been calculated.

Table D5 shows the measured and allowable concentrations and loads at SW8. Table D6 shows the percent reduction for aluminum, iron, manganese, and acidity needed at SW8.

Table D5		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	15.49	23.38	0.11	0.16
	Iron	0.11	0.17	0.08	0.12
	Manganese	15.61	23.56	0.47	0.71
	Acidity	126.42	190.84	2.53	3.82
	Alkalinity	5.26	7.94		

Table D6. Allocations SW8				
SW8	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SW8	23.38	0.17	23.56	190.84
Allowable Load @ SW8	0.16	0.12	0.71	3.82
Load Reduction @ SW8	23.22	0.05	22.85	187.02
% Reduction required @ SW8	99.3%	33%	97%	98%

TMDL calculations- SW6 – Unnamed tributary to Whites Creek downstream of SW8

The TMDL for sampling point SW6 consists of a load allocation to all of the area between SW8 and this point shown in Attachment A. The load allocation for this segment of the unnamed tributary to Whites Creek was computed using water-quality sample data collected at point SW6. The average flow, derived using the U.S. Geological Survey Streamstats Tool (0.59 MGD), is used for these computations.

Sample data at point SW6 shows pH ranging between 4.3 and 6.9. There currently is not an entry for this segment on the Section Pa 303(d) list for impairment due to pH; pH will be addressed. A TMDL for aluminum, iron, manganese, and acidity at SW6 has been calculated.

Table D7 shows the measured and allowable concentrations and loads at SW6. Table D8 shows the percent reduction for aluminum, iron, manganese, and acidity needed at SW6.

Table D7		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	2.71	13.44	0.03	0.13
	Iron	0.19	0.94	0.06	0.28
	Manganese	5.04	25.01	0.35	1.75
	Acidity	29.74	147.47	0.89	4.42
	Alkalinity	4.34	21.51		

The measured and allowable loading for point SW6 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points SW8 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points SW8 and SW6 to determine a total load tracked for the segment of stream between SW8 and SW6. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at SW6.

Table D8. Allocations SW6				
SW6	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SW6	13.44	0.94	25.01	147.47
Difference in measured loads between the loads that enter and existing SW6	-9.94	0.77	1.45	-43.37
Additional load tracked from above samples	0.16	0.12	0.71	3.82
Total load tracked between SW8 and SW6	0.09	0.89	2.16	2.94
Allowable Load @ SW6	0.13	0.28	1.75	4.42
Load Reduction @ SW6	0	0.61	0.41	0
% Reduction required at SW6	0%	69%	19%	0%

TMDL calculations- DUMAS- Whites Creek near mouth

The TMDL for sampling point DUMAS consists of a load allocation to all of the area upstream of this point shown in Attachment A. The load allocation for Whites Creek was computed using water-quality sample data collected at point DUMAS. The average flow, derived using the U.S. Geological Survey Streamstats Tool (43.88 MGD), is used for these computations.

Sample data at point DUMAS shows pH ranging between 4.9 and 7.6. There currently is not an entry for this segment on the Section Pa 303(d) list for impairment due to pH; pH will be addressed. A TMDL for aluminum, iron, manganese and acidity at DUMAS has been calculated.

Table D9 shows the measured and allowable concentrations and loads at DUMAS. Table D10 shows the percent reduction for aluminum, iron, manganese, and acidity needed at DUMAS.

Table D9		Measured		Allowable	
		Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.36	132.49	0.04	13.25
	Iron	3.46	1265.70	0.02	7.59
	Manganese	0.10	36.75	0.10	36.75
	Acidity	8.40	3074.40	0.34	122.98
	Alkalinity	20.96	7671.36		

The measured and allowable loading for point DUMAS for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points BECHLY/SW3/SW6 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points DUMAS and BECHLY/SW3/SW6 to determine a total load tracked for the segment of stream between BECHLY/SW3/SW6 and DUMAS. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at DUMAS.

Table D8. Allocations DUMAS			
DUMAS	Al (Lbs/day)	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load @ DUMAS	132.49	1265.70	3074.40
Difference in measured loads between the loads that enter and existing DUMAS	20.67	960.82	271.85
Additional load tracked from above samples	19.47	7.28	151.45
Total load tracked between BECHLY/SW3/SW6 and DUMAS	40.14	968.10	423.30
Allowable Load @ DUMAS	13.25	7.59	122.98
Load Reduction @ DUMAS	26.89	960.51	300.32
% Reduction required at DUMAS	67%	99.3%	71%

Margin of Safety

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

- An additional MOS is provided because that the calculations were done with a daily Fe average instead of the 30-day average.

Seasonal Variation

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

Critical Conditions

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

Attachment E

Use of Reference Stream Water Quality for High Quality Waters

Streams placed on the 1996 303 (d) list with a designated use of high quality (HQ) will be subject to Pennsylvania's anti degradation policy. Therefore, DEP must establish instream goals for TMDLs that restore the waterbody to existing (pre-mining) quality. This is accomplished by sampling an unaffected stretch of stream to use as a reference. This stretch typically is the headwaters segment of the high quality stream in question. If an unaffected stretch isn't available, a nearby-unimpaired stream will function as a surrogate reference. The reference stream data will be selected from statewide ambient Water Quality Network (WQN) stations. To determine which WQN station represents existing water quality appropriate for use in developing TMDLs for HQ waters, alkalinity and drainage area are considered.

1. First step is to match alkalinities of TMDL stream and WQN reference stream. If alkalinities for candidate stream are not available, use pH as a surrogate. As a last resort, if neither pH nor alkalinity are available match geologies using current geological maps.

2. The second consideration is drainage area.

3. Finally, from the subset of stations with similar alkalinity and drainage area select the station nearest the TMDL stream.

Once a reference stream is selected, the 95th percentile confidence limit on the median for aluminum, iron and manganese is used as the applicable water quality criteria and run the @Risk model.

Attachment F

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 G

Water Quality Data Used In TMDL Calculations

Point	Date	pH	Alkalinity	Acid	Fe	Mn	Al	Sulfate	TSS
BECHLY	10/5/2005	7.3	34.6	-14.6	0.024	0.061	0.1	50	1
BECHLY	1/5/2006	6.8	13.2	33.8	0.224	0.051	0.258	10	2
BECHLY	1/30/2006	6.9	14.6	7.6	0.116	0.057	0.1	10	4
BECHLY	5/18/2006	6.2	10.6	33.6	4.12	0.187	0.762	29.4	1
BECHLY	9/8/2006	7.6	31.8	-20.6	0.164	0.072	0.245	36.3	1
	Average	*6.96*	*20.96*	*7.96*	*0.93*	*0.09*	*0.29*	*27.14*	*1.80*
	StDev	*0.53*	*11.31*	*25.74*	*1.78*	*0.06*	*0.27*	*17.31*	*1.30*

Point	Date	pH	Alkalinity	Acid	Fe	Mn	Al	Sulfate	TSS
DUMAS	10/5/2005	7.4	36.2	-20	0.01	0.005	0.1	84.7	1
DUMAS	1/5/2006	6.8	15.2	5.8	0.202	0.08	0.263	10	1
DUMAS	1/30/2006	6.8	14.2	7	0.099	0.112	0.207	21.7	6
DUMAS	5/18/2006	4.9	7.4	66.2	16.9	0.277	1.14	45.4	52
DUMAS	9/8/2006	7.6	31.8	-17	0.08	0.028	0.1	34.6	2
	Average	*6.70*	*20.96*	*8.40*	*3.46*	*0.10*	*0.36*	*39.28*	*12.40*
	StDev	*1.07*	*12.37*	*34.65*	*7.51*	*0.11*	*0.44*	*28.67*	*22.23*

Point	Date	pH	Alkalinity	Acid	Fe	Mn	Al	Sulfate	TSS
SW-3	1/8/2001	5.9	9	1.2	0.15	0.025	0.25	10	1.5
SW-3	1/7/2003	6.1	7.6	8.2	0.15	0.025	0.25	85.3	1.5
SW-3	10/3/2003	6.3	8	6.6	0.15	0.052	0.25	21	1.5
SW-3	2/17/2004	6	7.4	6.6	0.15	0.025	0.25	10	6
SW-3	7/12/2004	6.3	10	5.8	0.15	0.063	0.25	10	12
SW-3	2/8/2005	6.4	9.2	10.4	0.309	0.025	0.25	10	1.5
SW-3	1/30/2006	6.2	8	7.2	0.039	0.046	0.25	10	1
SW-3	9/8/2006	6.6	10.2	-1.2	0.135	0.035	0.25	10	1
SW-3	1/10/2008	6.4	8.6	3.8	0.061	0.039	0.25	10	1
	Average	*6.24*	*8.67*	*5.40*	*0.14*	*0.04*	*0.25*	*19.59*	*3.00*
	StDev	*0.22*	*1.01*	*3.59*	*0.08*	*0.01*	*0.00*	*24.91*	*3.72*

Point	Date	pH	Alkalinity	Acid	Fe	Mn	Al	Sulfate	TSS
SW-8	1/8/2001	4.4	7.4	68	0.15	12.8	9.45	494.1	3.8
SW-8	1/7/2003	4.1	4.8	176.4	0.15	15.4	18.2	281	1.5
SW-8	10/3/2003	4.2	4.2	156.6	0.15	18.3	21.3	364	1.5
SW-8	2/17/2004	4.2	4.2	151.6	0.15	17.5	19.8	362.6	6
SW-8	3/22/2004	4.3	5	95.4	0.15	8.46	10	217.3	1.5
SW-8	7/12/2004	4.2	5.8	104.4	0.15	15.5	11.1	441.9	10
SW-8	2/8/2005	4.3	6	112.6	0.15	11.8	11.4	356.7	1.5
SW-8	1/30/2006	4.1	4.8	161	0.044	20.3	23.3	531.2	1
SW-8	9/8/2006	4.2	5.6	122	0.01	20.2	14.1	568.4	8
SW-8	1/10/2008	4.2	4.8	116.2	0.037	15.8	16.2	301.9	1
	Average	*4.22*	*5.26*	*126.42*	*0.11*	*15.61*	*15.49*	*391.91*	*3.58*
	StDev	*0.09*	*0.97*	*34.02*	*0.06*	*3.76*	*5.01*	*114.14*	*3.29*

Point	Date	pH	Alkalinity	Acid	Fe	Mn	Al	Sulfate	TSS
SW6	8/4/2000	6.4	28	0	<u>0.15</u>	3.09	<u>0.25</u>	639.3	16
SW6	8/4/2000	4.3	7.8	74	<u>0.15</u>	12.1	7.52	404.6	<u>1.5</u>
SW6	10/2/2000	6.7	24	0	<u>0.15</u>	3.18	<u>0.25</u>	680.7	<u>1.5</u>
SW6	1/8/2001	6.5	19.6	0	<u>0.15</u>	2.36	0.62	655.6	16
SW6	1/7/2003	5.4	8.4	45	<u>0.15</u>	4.3	3.11	599.8	16
SW6	10/3/2003	6.3	10.2	44.4	0.311	5.44	3.7	521.9	16
SW6	2/17/2004	5.4	8.6	42.2	<u>0.15</u>	4.21	2.62	473.4	10
SW6	3/22/2004	5.2	8	45.2	<u>0.15</u>	4.93	2.98	381.9	12
SW6	7/12/2004	6.8	31.2	-7.8	<u>0.15</u>	4.06	<u>0.25</u>	643.2	14
SW6	2/8/2005	5.1	8.4	48.2	0.587	5.31	3.87	564.9	20
SW6	1/30/2006	4.7	8.8	63.8	0.243	7.46	5.62	725.3	<u>1</u>
SW6	9/8/2006	6.9	20	-5.8	0.038	2.88	<u>0.1</u>	694.5	4
SW6	1/10/2008	4.7	8.4	37.4	0.09	6.235	4.338	415.4	<u>1</u>
	Average	*5.72*	*14.72*	*29.74*	*0.19*	*5.04*	*2.71*	*569.27*	*9.92*
	StDev	*0.91*	*8.62*	*28.41*	*0.14*	*2.56*	*2.35*	*118.52*	*7.11*

Underlined data are included at one half the detection limit.

All concentrations are expressed as milligrams per liter.

Attachment H

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 I

Comment and Response

No public comments were received for the Whites Creek Watershed TMDL.