UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
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Decision Rationale
Total Maximum Daily Loads
Wiconisco Creek Watershed
For Acid Mine Drainage, Sediment, and Nutrients
Dauphin and Schuylkill Counties, Pennsylvania

John Armstead For

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Jon M. Capacasa, Director

Date: 11/24/2008

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I. Introduction

The Clean Water Act (CWA) requires that Total Maximum Daily Loads (TMDLs) be developed for those waterbodies identified as impaired by the State where technology based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a Margin of Safety (MOS) that may be discharged to a waterbody without exceeding water quality standards.

The Pennsylvania Department of Environmental Protection (PADEP), Bureau of Watershed Management, electronically submitted the *Wiconisco Creek Watershed TMDL, Dauphin and Schuylkill Counties* (TMDL Report) to the U.S. Environmental Protection Agency (EPA) for final review on June 7, 2008. This report includes the TMDLs for the three primary metals associated with acid mine drainage (AMD) (i.e., iron, manganese, and aluminum) and pH, and addresses one segment on Pennsylvania's 1996 Section 303(d) List of impaired waters.

This report also addressed agriculture nutrients and siltation for the Wiconisco Creek tributaries, and also the Little Wiconisco Creek and its tributaries associated with agriculture. The impairment cause for the Unnamed Tributaries (UNT) (16951 and 16952) to Wiconisco Creek is listed as "unknown" and, although sediment and nutrient TMDLs are included in the TMDL Report, the "unknown" source and cause of the listing impairment was not identified and must be addressed at a future date.

EPA's rationale is based on the TMDL Report and information contained in the attachments to the report. EPA's review determined that the TMDL meets the following seven regulatory requirements pursuant to 40 CFR Part 130:

1. The TMDL is designed to implement applicable water quality standards.
2. The TMDL includes a total allowable load as well as individual wasteload allocations (WLAs) and load allocations (LAs).
3. The TMDL considers the impacts of background pollutant contributions.
4. The TMDL considers critical environmental conditions.
5. The TMDL considers seasonal environmental variations.
6. The TMDL includes a MOS.
7. The TMDL has been subject to public participation.

In addition, these TMDLs considered reasonable assurance that the TMDL allocations assigned to the nonpoint sources can be reasonably met.

II. Summary

Table 1 presents Pennsylvania's 1996, 1998, and 2002, Section 303(d) Listing and 2004 and 2006 Integrated Reports information for the impaired segment first listed in 1996. 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.*

Table 1. 303(d) Sublist for the Wiconisco Creek and Little Wiconisco Creek Watersheds, Dauphin and Schuylkill Counties, Pennsylvania

Year Listed	Assessment ID 2006	Segment ID	Stream Code	Stream Name	Source	Cause	Miles
1996	8253	2164	16895	Wiconisco Creek	Abandoned Mine Drainage	Metals, Suspended Solids, pH	6.42
1998	8253	2164	16895	Wiconisco Creek	Abandoned Mine Drainage	Metals, Suspended Solids	6.42
2002	8254	970515-1252-JLR	16895	Wiconisco Creek	Abandoned Mine Drainage	Metals, pH, Siltation	12.6
2002	8245	970512-1446-JLR	16898	Little Wiconisco Creek	Agriculture	Nutrients, Siltation	9.3
2002	8245	970512-1446-JLR	16903	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	2
2002	8245	970512-1446-JLR	16905	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.2
2002	8245	970512-1446-JLR	16906	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.4
2002	8245	970512-1446-JLR	16907	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.4
2002	8245	970512-1446-JLR	16908	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.4
2002	8245	970512-1446-JLR	16909	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	2
2002	8245	970512-1446-JLR	16911	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.5
2002	8245	970512-1446-JLR	16912	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.4
2002	8245	970512-1446-JLR	16913	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	1.5
2002	8245	970512-1446-JLR	16915	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.6
2002	8245	970512-1446-JLR	16916	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.5

Year Listed	Assessment ID 2006	Segment ID	Stream Code	Stream Name	Source	Cause	Miles
2002	8245	970512-1446-JLR	16918	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.9
2002	8245	970512-1446-JLR	16919	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.5
2002	8245	970512-1446-JLR	16920	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	1.2
2002	8245	970512-1446-JLR	16921	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.6
2002	8245	970512-1446-JLR	16922	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.53
2002	8245	970512-1446-JLR	16923	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	1.05
2002	8245	970512-1446-JLR	16924	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.99
2002	8245	970512-1446-JLR	16925	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.54
2002	8245	970512-1446-JLR	16926	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.8
2002	8245	970512-1446-JLR	16928	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.4
2002	8245	970512-1446-JLR	16929	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.5
2002	8245	970512-1446-JLR	16930	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	1.2
2002	8245	970512-1446-JLR	16931	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	2
2002	8245	970512-1446-JLR	16932	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.4
2002	8245	970512-1446-JLR	16933	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	1
2002	8245	970512-1446-JLR	16934	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	0.2
2002	8245	970512-1446-JLR	16935	UNT Little Wiconisco Creek	Agriculture	Nutrients, Siltation	1.1
2002	8244	970512-1215-JLR	16938	UNT Wiconisco Creek	Crop Related Ag	Siltation	2.3
2002	8244	970512-1215-JLR	16939	UNT Wiconisco Creek	Crop Related Ag	Siltation	0.6

Year Listed	Assessment ID 2006	Segment ID	Stream Code	Stream Name	Source	Cause	Miles
2002	8244	970512-1215-JLR	16941	UNT Wiconisco Creek	Crop Related Ag	Siltation	0.5
2002	8244	970512-1215-JLR	16942	UNT Wiconisco Creek	Crop Related Ag	Siltation	0.8
2002	8244	970512-1215-JLR	16945	UNT Wiconisco Creek	Crop Related Ag	Siltation	0.6
2002	8246	970513-0836-JLR	16951	UNT Wiconisco Creek	Unknown	Unknown	0.7
2002	8246	970513-0836-JLR	16952	UNT Wiconisco Creek	Unknown	Unknown	1.6
2002	8252	970515-1155-JLR	17052	UNT Wiconisco Creek	Removal of Vegetation, Small Residential Runoff	Nutrients/Siltation	1.5
2002	8252	970515-1155-JLR	17053	UNT Wiconisco Creek	Removal of Vegetation, Small Residential Runoff	Siltation/Nutrients	0.1
2002	8804	971217-1150-JLR	17058	UNT Wiconisco Creek	Grazing Related Ag	Siltation	2.5
2002	8804	971217-1150-JLR	17060	UNT Wiconisco Creek	Grazing Related Ag	Siltation	0.1
2002	8804	971217-1150-JLR	17061	UNT Wiconisco Creek	Grazing Related A	Siltation	0.4
2002	8804	971217-1150-JLR	17062	UNT Wiconisco Creek	Grazing Related A	Nutrients	0.1

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

See Attachment D of the TMDL Report, *Excerpts Justifying Changes Between the 1996, 1998, 2002, Section 303(d) Lists and 2004 and 2006 Integrated Reports.* The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.9m as shown in the following table. Section IV, Tables 5, 6, and 7 shows the TMDLs for the Wiconisco Creek Watershed.

In 1997, PADEP began utilizing the Statewide Surface Waters Assessment Protocol to assess Pennsylvania's waters. This protocol is a modification of EPA's 1989 Rapid Bioassessment Protocol II and provides for a more consistent approach to conducting biological assessments than previously used methods. The biological assessments are used to determine which waters are impaired and should be included on the State's Section 303(d) List.

The metals and pH TMDLs in this report were developed using a statistical procedure to ensure that water quality criteria are met 99 percent of the time as required by Pennsylvania's water quality standards at Pennsylvania Code Title 25, Chapter 96.3c. Table 5 of the TMDL Report lists the TMDLs for the Wiconisco Creek watershed, addressing metals and pH in the stream segment listed as PADEP stream code 16895. The sediment/suspended solids TMDLs for the tributaries of Wiconisco Creek and Little Wiconisco Creek were developed using the Arcview Generalized Watershed Loading Function (AVGWLF) model.

TMDLs are defined as the summation of the point source WLAs, plus the summation of the nonpoint source LAs, plus a MOS, and are often shown as follows:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

The TMDL is a written plan and analysis established to ensure that a waterbody will attain and maintain applicable water quality standards. The TMDL is a scientifically based strategy which considers current and foreseeable conditions, utilizes the best available data, and accounts for uncertainty with the inclusion of a MOS value. Since conditions, available data, and the understanding of natural processes can change more than anticipated by the MOS, there exists the option of refining the TMDL for resubmittal to EPA.

III. Background

The Wiconisco Creek watershed is approximately 116 square miles in area. The headwaters of Wiconisco Creek are located inside the Northwestern border of Schuylkill County, a few miles east-northeast of Muir, Pennsylvania. The 43-mile long stream flows east-southeast from Western Schuylkill County into Northern Dauphin County, where it joins Rattling Creek, Bear Creek, and Little Wiconisco Creek. The mouth of Wiconisco Creek is located at the Susquehanna River in Millersburg, Pennsylvania.

The watershed is primarily forested (58.5 percent), with approximately 5.6 percent developed lands. Agriculture, mainly croplands and hay fields, accounts for 35.3 percent of the land use. Coal surface mining and deep mines have impacted approximately 2.6 percent of the watershed. Waterbodies and wetlands account for the rest of the area. The landscape is dominantly agriculture. Pastures and croplands extend right up to the streambanks with little to no riparian buffer zones present. Livestock have unlimited access to streambanks throughout most of the watershed. Based on visual observations, streambank erosion is severe in most reaches of the stream.

Wiconisco Creek's tributaries in the upper watershed are affected by onsite wastewater, and grazing-related agriculture. Little Wiconisco and all of its tributaries are affected by agricultural siltation and nutrients. Nutrient and sediment TMDLs were developed for Little Wiconisco Creek and its tributaries and the tributaries of Wiconisco Creek.

There are active mining operations in the watershed; however, none of the operations produce a discharge.

PADEP treats each segment on the Section 303(d) List as a separate metals and pH TMDL, and expresses each TMDL as a long term average loading (see the *Wiconisco Creek Watershed TMDL* Report, Attachment C, for the TMDL calculations).

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

Wiconisco Creek was on the 1996 Section 303(d) List of impaired waters and counts toward the twelfth year (2009) TMDL milestone commitment under the requirements of the 1997 TMDL lawsuit settlement agreement.

Computational Procedures

The metals and pH TMDLs were developed using a statistical procedure to ensure that water quality criteria are met 99 percent of the time as required by Pennsylvania's water quality standards. A two-step approach was used for the TMDL analysis of impaired stream segments.

The first step used a statistical method for determining the allowable instream concentration at the point of interest necessary to meet water quality standards. An allowable long term average instream concentration was determined at each sample point for metals and acidity. The analysis was performed using Monte Carlo simulation to determine the necessary long term average concentration needed to attain water quality criteria 99 percent of the time, and the simulation was run assuming the dataset was log normally distributed. Using @RISK[1], each pollutant source was evaluated separately by performing 5,000 iterations of the model where each iteration was independent of all other iterations. This procedure was used to determine the required percent reduction that would allow the water quality criteria to be met instream at least 99 percent of the time. A second simulation that multiplied the percent reduction by the sampled value was run to ensure that criteria were met 99 percent of the time. The mean value from this dataset represents the long term average concentration that needs to be met to achieve water quality standards.

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

The second step was a mass balance of the loads as they passed through the watershed. Loads at these points were computed based on average flow. Once the allowable concentration and load for each pollutant was determined, mass balance accounting was performed starting at the top of the watershed and working downstream in sequence. This mass balance, or load tracking through the watershed, utilized the change in measured loads from sample location to sample location as a guide for expected changes in the allowable loads.

The existing and allowable long term average loads were computed using the mean concentration from @RISK multiplied by the average flow. The loads were computed based on average flow and should not be taken out of the context for which they are intended. They are intended to depict how the pollutants affect the watershed and where the sources and sinks are located spatially in the watershed. A critical flow was not identified, and the reductions specified in this TMDL apply at all flow conditions.

The primary source of sediment and nutrients in Wiconisco Creek is agriculture, including crop and grazing related, with streambank erosion the second largest source of sediment in Little Wiconisco Creek.

PADEP uses a Reference Watershed Approach in combination with the AVGWLF watershed loading model, which is the Generalized Watershed Loading Function or GWLF model with added Geographic Information System (GIS) capabilities. The GWLF model provides the ability to simulate runoff, sediment, and nutrient[2] (nitrogen and phosphors) loadings from a watershed given variable size source areas (e.g., agricultural, forested, and developed land). It also has algorithms for calculating septic system loads, and allows for the inclusion of point source discharge data. It is a continuous simulation model, which uses daily time steps for weather data and water balance calculations. Monthly calculations are made for sediment and nutrient loads, based on the daily water balance accumulated to monthly values.

AVGWLF is a combined distributed/lumped parameter watershed model. For surface loading, it is distributed in the sense that it allows multiple land use/cover scenarios. Each area is assumed to be homogenous in regard to various attributes considered by the model. Additionally, the model does not spatially distribute the source areas, but aggregates the loads from each area into a watershed total. In other words, there is no spatial routing. For subsurface loading, the model acts as a lumped parameter model using a water balance approach. No distinctly separate areas are considered for subsurface flow contributions. Daily water balances are computed for an unsaturated zone as well as a saturated subsurface zone, where infiltration is computed as the difference between precipitation and snowmelt minus surface runoff plus evapotranspiration. For further information see the *Wiconisco Creek Watershed TMDL* Report, Attachment G.

[2] Nutrients and septic loads are not part of these TMDLs.

The reference watershed is a watershed meeting its designated uses with similar designated uses, geology, land uses, physiographic province, land area, soils, and meteorological patterns. AVGWLF is then used with the reference watershed to determine allowable load in the impaired watershed. A ten percent MOS is subtracted from the allowable load leaving the total sediment load allocation. See the *Wiconisco Creek Watershed TMDL,* Watershed Assessment and Modeling.

Sediment and nutrient loads are reduced from all land uses except forests and wetlands. The amount of reduction from each land use is determined through the use of an allocation strategy, the Equal Marginal Percent Reduction (EMPR), *Wiconisco Creek Watershed TMDL,* Attachment K. The rationale of this method is that achieving nutrient and sediment loadings in the impaired watershed similar to those loadings of the reference watershed will ensure that the impaired watershed will attain and maintain its designated uses and general water quality criteria.

IV. Discussions of Regulatory Requirements

EPA has determined that these TMDLs are consistent with statutory and regulatory requirements and EPA policy and guidance.

1. The TMDLs are designed to implement the applicable water quality standards.

Water quality standards are state regulations that define the water quality goals of a waterbody. Standards are comprised of three components: (1) designated uses; (2) criteria necessary to protect those uses; and (3) antidegradation provisions that prevent the degradation of water quality. Wiconisco Creek watershed streams have been designated by Pennsylvania as warm water and cold water fishery with criteria to protect the aquatic life use, and the designation can be found at Pennsylvania Title 25 §93.9m. Rattling Creek has been designated as EV and high quality cold water fishery. To protect the designated use as well as the existing use, the water quality criteria shown in Table 2 apply to all evaluated segments. The table includes the instream numeric criterion for each parameter and any associated specifications. If TMDLs were necessary for Rattling Creek, more stringent criteria would be appropriate; however, Rattling Creek is not on the 2004 Section 303(d) List of impaired waters and TMDLs are not required.

Table 2. Applicable Water Quality Criteria

Parameter	Criterion Value (mg/l)	Duration	Total Recoverable/ Dissolved
Aluminum (Al)	0.75	Maximum	Total Recoverable
Iron (Fe)	1.50 0.30	30-day Average Maximum	Total Recoverable Dissolved
Manganese (Mn)	1.00	Maximum	Total Recoverable
pH	6.0 - 9.0	Inclusive	N/A

Pennsylvania Title 25 §96.3c requires that water quality criteria be achieved at least 99 percent of the time, and TMDLs expressed as long term average concentrations

are expected to meet these requirements. That is, the statistical Monte Carlo simulation used to develop TMDL WLAs and LAs for each parameter resulted in a determination that any required percent pollutant reduction would assure that the water quality criteria would be met instream at least 99 percent of the time. The Monte Carlo analysis performed 5,000 iterations of the model where each iteration was independent of all other iterations and the dataset was assumed to be log normally distributed.

EPA finds that these TMDLs will attain and maintain the applicable narrative and numeric water quality standards.

The pH values shown in Table 2 were used as the endpoints for these TMDLs. In the case of freestone streams with little or no buffering capacity, the allowable TMDL endpoint for pH may be the natural background water quality, and these values can be as low as 5.4 (Pennsylvania Fish and Boat Commission). However, PADEP chose to set the pH standard between 6.0 to 9.0, inclusive, which is presumed to be met when the net alkalinity is maintained above zero. This presumption is based on the relationship between net alkalinity and pH, on which PADEP based its methodology to addressing pH in the watershed (see the *Wiconisco Creek Watershed TMDL* Report, Attachment B). A summary of the methodology is presented as follows:

The parameter of pH, a measurement of hydrogen ion acidity presented as a negative logarithm of effective hydrogen ion concentration, is not conducive to standard statistics. Additionally, pH does not measure latent acidity that can be produced from the hydrolysis of metals. PADEP has been using an alternate approach to address the stream impairments noted on the Section 303(d) List due to pH. Because the concentration of acidity in a stream is partially dependent upon metals, it is extremely difficult to predict the exact pH values which would result from treatment of AMD. 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 able to measure the reduction of acidity. When acidity in a stream is neutralized or is restored to natural levels, pH will be acceptable ($\geq$6.0). 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 used to calculate the required 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. EPA finds this approach to addressing pH to be reasonable.

With respect to nutrients and suspended solids, Pennsylvania does not currently have specific numeric water quality criteria for sediments. Therefore, to establish endpoints for sediment such that the designated uses of Little Wiconisco Creek and the tributaries are attained and maintained, Pennsylvania utilized its narrative water quality criteria, which states that:

> *Water may not contain substances attributable to point or nonpoint source waste discharges in concentrations or amounts sufficient to inimical or*

harmful to the water uses to be protected or to human, animal, plant, or aquatic life.

In aquatic ecosystems the quantities of trace elements are typically plentiful; however, nitrogen (N) and phosphorus (P) may be in short supply. The nutrient that is in the shortest supply is called the limiting nutrient because its relative quantity affects the rate of production (growth) of aquatic biomass. If the limiting nutrient load to a waterbody can be reduced, the available pool of nutrients that can be utilized by plants and other organisms will be reduced; and, in general, the total biomass can subsequently be decreased as well. In most efforts to control the eutrophication processes in waterbodies, emphasis is placed on the limiting nutrient.

In most freshwater systems, phosphorus is the limiting nutrient for aquatic growth. The ratio of the amount of nitrogen to the amount of phosphorus is often used to determine the limiting nutrient. If the nitrogen/phosphorus (N/P) ratio is less than 10, nitrogen is limiting. If the N/P ratio is greater than 10, phosphorus is the limiting nutrient. For the Little Wiconisco Creek watershed, the average N/P ratio is approximately 15, which indicates phosphorus as the limiting nutrient. Controlling the phosphorus loading to the Little Wiconisco Creek watershed will limit plant growth, thereby helping to eliminate use impairments currently being caused by excess nutrients.

East Branch Stony Fork, located near Wellsboro in Tioga County, was selected for use as the Reference watershed. East Branch Stony Fork is attaining its designated uses, and is an appropriate reference for this purpose. The phosphorus and sediment reduction goals for the TMDL is based on setting the watershed-loading rate of the impaired Little Wiconisco Creek equal to the watershed-loading rate in the unimpaired East Branch Stony Fork.

EPA finds that these TMDLs will attain and maintain the applicable narrative and numeric water quality standards.

Table 3. Comparison of Little Wiconisco Creek Watershed with the Reference Watershed

Attribute	**Watershed**	
	Little Wiconisco	**East Branch Stony Fork**
Physiographic Province	Ridge and Valley (100%)	Appalachian Plateaus (100%)
Area (mi^2)	17.48	19.28
Land Use	Agriculture (70.56%)	Agriculture (56.98%)
	Development (1.65%)	Development (0.013%)
	Forested (22.51%)	Forested (39.52%)
Geology	Interbedded Sedimentary (95%)	Interbedded Sedimentary (95%)
	Sandstone (5%)	Sandstone (5%)
Soils	Leck Kill (90%)	Volusia-Mardin-Lordstown (55%)
	Hazelton (10%)	Wellsboro-Oquaga-Morris (30%)

Attribute	Watershed	
	Little Wiconisco	**East Branch Stony Fork**
		Oquaga-Lordstown-Wurtsboro (15%)
Dominant HSG	Leck Kill	Volusia-Mardin-Lordstown
	A (0%)	A (0%)
	B (43%)	B (0%)
	C (50%)	C (100%)
	D (7%)	D (0%)
	Hazelton	Wellsboro-Oquaga-Morris
	A (2%)	A (0%)
	B (45%)	B (0%)
	C (53%)	C (95%)
	D (0%)	D (5%)
Dominant HSG		Oquaga-Lordstown-Wurtsboro
		A (0%)
		B (0%)
		C (100%)
		D (0%)
K Factor	5	Volusia-Mardin-Lordstown (0.23)
	Hazelton (0.18)	Wellsboro-Oquaga-Morris (0.25)
		Oquaga-Lordstown-Wurtsboro (0.22)
20-Yr. Ave. Rainfall (in)	39.31	36.22
20-Yr. Ave. Runoff (in)	3.29	1.89

2. The TMDLs include a total allowable load as well as individual wasteload allocations and load allocations.

Metals and pH for the Wiconisco Creek Watershed

For purposes of these TMDLs only, point sources are identified as permitted discharge points or discharges having responsible parties, and nonpoint sources are identified as any pollution sources that are not point sources. Abandoned mine lands were treated in the allocations as nonpoint sources. As such, the discharges associated with these land uses were assigned LAs (as opposed to WLAs). The decision to assign LAs to abandoned mine lands does not reflect any determination by EPA as to whether there are unpermitted point source discharges within these land uses. In addition, by approving these TMDLs with mine drainage discharges treated as LAs, EPA is not determining that these discharges are exempt from NPDES permitting requirements. Table 4 is a compendium of permitted operations in the watershed with no apparent

NPDES permitted discharges. EPA is not determining that these discharges are exempt from NPDES permitting requirements.

Table 4. Summary of Existing Permitted Operations in the Wiconisco Creek Watershed

Permit No.	NPDES No.	Effective Date	Company Name	Status
22850201R2	none	1986- 2001	Meadowbrook Coal Company	Active
22030201	none	1985-2005	Meadowbrook Coal Company	Active
33851602AR2004	none	1998-2003	Meadowbrook Coal Company	Active
22851601T	none	1985-2000	The Harriman Coal Company	Active
54850204CB	none		Jeddo-Highland Coal Company	Active
22851304R2	none		S & M Coal Company	Active

Once PADEP determined the allowable concentration and load for each pollutant, a mass balance accounting was performed starting at the top of the watershed and working downstream in sequence. Load tracking through the watershed utilizes the change in measured loads from sample location to sample location as a guide for expected changes in the allowable loads.

PADEP used two basic rules for the load tracking between two ends of a stream segment: (1) if the measured upstream loads are less than the downstream loads, it is indicative that there is an increase in load between the points being evaluated, and no instream processes are assumed; (2) if the sum of the measured loads from the upstream points is greater than the measured load at the downstream point, it is indicative that there is a loss of instream load between the points, and the ratio of the decrease shall be applied to the allowable load being tracked from the upstream point.

Tracking loads through the watershed provides a picture of how the pollutants are affecting the watershed based on the available information. The analysis is performed to ensure that water quality standards will be met at all points in the stream. EPA finds this approach reasonable.

Table 5 presents a summary of the allowable loads, LAs, and WLAs for the Wiconisco Creek watershed.

Table 5. TMDL Component Summary for the Wiconisco Creek Watershed

Station	Parameter	Measured Sample Data		Allowable		Reduction Identified
		Conc. (Mg/l)	Load (lb/day)	LTA Conc. (mg/l)	Load (lb/day)	Percent
WICO 7.0	Fe	1.53	66.14	0.64	27.67	58*
	Mn	0.94	40.63	0.52	22.48	44*
	Al	1.27	54.9	0.22	16.89	62*
	Acidity	42.85	1,852.28	2.14	92.51	95*
	Alkalinity	3.2	138.33			
WICO 6.0	Fe	0.41	58.92	0.41	58.92	0*
	Mn	0.35	50.29	0.35	50.29	0*
	Al	0.6	86.22	0.6	86.22	0*
	Acidity	48.3	6,940.75	3.38	485.71	91*
	Alkalinity	9.8	1,408.27			
WICO 5.0	Fe	ND	NA	NA	NA	-*
	Mn	0.3	59.73	0.3	59.73	0*
	Al	ND	NA	NA	NA	-*
	Acidity	30.8	6,132.64	7.08	1,409.71	0*
	Alkalinity	10.6	2,110.58			
WICO 4.0	Fe	1.08	318.14	0.37	109	66*
	Mn	0.32	94.27	0.32	94.27	0*
	Al	ND	NA	NA	NA	-*
	Acidity	27.47	8,092.07	19.23	5,664.74	0*
	Alkalinity	22.45	6,613.29			
B3	Fe	2.6	144.8	0.1	5.6	0
	Mn	1.55	86.4	0.43	24	45
	Al	0.51	28.4	0.19	10.6	63
	Acidity	6.94	386.6	0.27	15	0
	Alkalinity	70.17	3,909.30			
WICO 3.0	Fe	1.7	753.73	0.71	314.79	22*
	Mn	0.46	203.95	0.46	203.95	0*
	Al	ND	NA	NA	NA	-*
	Acidity	28.55	12,658.21	13.99	6,202.70	37*
	Alkalinity	24.8	10,995.57			

Station	Parameter	Measured Sample Data		Allowable		Reduction Identified
		Conc. (Mg/l)	Load (lb/day)	LTA Conc. (mg/l)	Load (lb/day)	Percent
WICO 2.0	Fe	1.26	575.47	0.53	242.06	0*
	Mn	0.31	141.58	0.31	141.58	0*
	Al	ND	NA	NA	NA	-*
	Acidity	35.33	16,135.98	13.43	6,133.70	37*
	Alkalinity	23.15	10,573.11			
WICO 1.0	Fe	0.65	415.93	0.65	415.93	0*
	Mn	0.23	147.18	0.23	147.18	0*
	Al	ND	NA	NA	NA	-*
	Acidity	33.08	21,167.71	15.89	10,167.93	9*
	Alkalinity	21.56	13,796.13			

ND = not detected
NA = not applicable, meets water quality standards, no TMDL necessary
* Percent reduction after upstream reductions are made

Sediment and Nutrients for the Wiconisco Creek and Little Wiconisco Creek

The load reduction for phosphorous and sediment in the Little Wiconisco Creek watershed were assigned to land uses as shown in Table 6.

Table 6. Phosphorus and Sediment TMDLs and Land Use Reductions Little Wiconisco Creek Watershed

Source	Acreage	Existing lbs/day	Allowable lbs/day	MOS lbs/day	LA lbs/day	LNR lbs/day	ALA	Percent Reduction
Phosphorous TMDL	1,1085	19.715	11.085	1.109	9.976	2.986	7.008	64%
Reduced Loads - Phosphorous								
Hay/Pasture	2,935.6	1.551	0.93					40%
Cropland	5,011.3	12.064	4.201					65%
Developed	751.1	12.388	7.426					40%
Forest	2387	NA	NA	NA	NA	NA	NA	0%
Stream Banks		0.117	0.07					40%
Total	1,1085	26.12	12.627					
Sediment TMDL	11,085.00	19,973.84	18,755.82	1,875.58	16,880.24	821.35	16,058.91	20%

Source	Acreage	Existing lbs/day	Allowable lbs/day	MOS lbs/day	LA lbs/day	LNR lbs/day	ALA	Percent Reduction
Reduced Loads - Sediment								
Hay/Pasture	2,935.6	452.678	379.559					16%
Cropland	5,011.3	10,298.316	8,634.886					16%
Developed	751.1	12,750.103	10,690.65					16%
Forest	2,387	NA	NA	NA	NA	NA	NA	0%
Stream Banks		5,298.44	4,442.616					16%
Total	1,1085	28,799.537	24,147.711					

Wiconisco Creek Watershed has four UNTs to the mainstem of Wiconisco Creek above Loyalton, Pennsylvania, that are impaired and need to be addressed. The load reduction for phosphorous and sediment in the Wiconisco Creek subwatersheds were assigned to land uses loading and designations as established in the reference shed approach used on Little Wiconisco.

Table 7. Includes all the Subwatersheds' TMDLs for the Remainder of the Sediment and Nutrient Impaired Wiconisco Creek Watershed Listings

Pollutant Source	Acres	Unit Area Loading Rate (lbs/ac/day)		Pollutant Loading (lbs/day)		% Reduction
		Current	Allowable	Current	Allowable (LA)	
Phosphorus						
UNT 17052	885.06	0.002	0.001	1.77	0.885	50
UNT 17058	2,033.60	0.002	0.001	4.067	2.034	50
UNT 16951	870.04	0.002	0.001	1.74	0.87	50
UNT 16938	1,261.42	0.002	0.001	2.523	1.261	50
Sediment						
UNT 17052						
Agriculture	239.77	3.07	1.69	736.09	405.69	45
Developed	153.02	11.98	1.69	1,833.18	258.91	86
Disturbed	0	21.49	1.69	N/A	N/A	N/A
UNT 17058						
Agriculture	463.05	3.07	1.69	1,421.56	783.48	45
Developed	41.69	11.98	1.69	499.45	70.54	86
Disturbed	0	21.49	1.69	N/A	N/A	N/A
UNT 16951						
Agriculture	711.35	3.07	1.69	2,183.84	1,203.60	45
Developed	68.91	11.98	1.69	825.54	116.6	86
Disturbed	0	21.49	1.69	N/A	N/A	N/A

Pollutant Source	Acres	Unit Area Loading Rate (lbs/ac/day)		Pollutant Loading (lbs/day)		% Reduction
		Current	Allowable	Current	Allowable (LA)	
UNT 16938						
Agriculture	1,039.79	3.07	1.69	3,192.16	1,759.32	45
Developed	95.74	11.98	1.69	1,146.97	161.99	86
Disturbed	0	21.49	1.69	N/A	N/A	N/A
Wiconisco Creek above WICO 1.0						
Agriculture	3,975.90	3.07	1.69	12,206.01	6,727.22	45
Developed	1,235.50	11.98	1.69	14,801.29	2,090.47	86
Disturbed	459.6	21.49	1.69	9,876.80	777.64	92

PADEP allocated to nonpoint sources only, as there are no mining operations in the watershed with discharges. Where there are active mining operations, Federal regulations require that point source permitted effluent limitations be water quality based subsequent to TMDL development and approval[3]. In addition, PA Title 25, Chapter 96, Section 96.4d requires that WLAs serve as the basis for determination of permit limits for point source discharges regulated under Chapter 92 (relating to NPDES permitting, monitoring, and compliance). Therefore, no new mining may be permitted within the watershed without reallocation of the TMDL.

3. The TMDLs consider the impacts of background pollutant contributions.

The TMDLs were developed using instream data, which account for existing background conditions. For the sediment TMDLs there is an inherent assumption of the Reference watershed approach that, because of the similarities between the reference and impaired watershed, the background pollutant contributions will be similar. In addition, the AVGWLF model implicitly considers background pollutant contributions through the soil and groundwater component of the modeling process.

4. The TMDLs consider critical environmental conditions.

The acid mine drainage reductions specified in these TMDLs apply at all flow conditions. A critical flow condition was not identified from the available data.

The sediment TMDLs capture any critical conditions through the use of the AVGWLF model which uses daily average temperature, daily time steps, and total precipitation for each year simulated. The AVGWLF model was run for twenty years which effectively captured critical environmental conditions.

[3] It should be noted that technology based permit limits may be converted to water quality based limits according to EPA's *Technical Support Document For Water Quality based Toxics Control*, March 1991 recommendations.

5. The TMDLs consider seasonal environmental variations.

The dataset included data points from all seasons, thereby accounting for seasonal variation implicitly.

6. The TMDLs include a Margin of Safety.

The CWA and Federal regulations require TMDLs to include a MOS to take into account any lack of knowledge concerning the relationship between effluent limitations and water quality. EPA guidance suggests two approaches to satisfy the MOS requirement. First, it can be met implicitly by using conservative model assumptions to develop the allocations. Alternately, it can be met explicitly by allocating a portion of the allowable load to the MOS.

PADEP used an implicit MOS on the metals and pH TMDLs by assuming that the treated instream concentration variability was the same as the untreated stream's concentration variability. This is a more conservative assumption than the general assumption that a treated discharge has less variability than an untreated discharge. By retaining variability in the treated discharge, a lower average concentration is required to meet water quality criteria 99 percent of the time than if the variability of the treated discharge is reduced.

Additionally, calculations were performed using a daily average for iron rather than the 30-day average, thereby incorporating a MOS.

The sediment TMDLs used an explicit MOS of ten percent to account for the uncertainty in the data and computational methodology used in the analysis.

7. The TMDLs have been subject to public participation.

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on January 13, 2007, and the *Upper Dauphin Sentinel*, on February 5, 2007, to foster public comment on the calculated allowable loads. A public meeting was held on February 7, 2007, at the Lykens Township Municipal Building, to discuss the proposed TMDL. No comments were received. EPA's comments were also adequately addressed.

Extensive comments were submitted by PennFuture, a public interest membership organization dedicated to creating a just future in which the environment, communities, and the economy thrives. One focus of PennFuture's work is to improve and protect water resources and water quality across Pennsylvania through public outreach, education, advocacy, and litigation. PennFuture's comments included detailed analysis of the use of AVGWLF, which were incorporated into the TMDL Report.

PennFuture also contends that tunnels draining the mine pools are point sources requiring NPDES permits. However, the tunnel discharges pre-date SMCRA and have

no responsible party; therefore, PADEP disagrees and is supported by their Bureau of Regulatory Counsel.

V. Discussion of Reasonable Assurance

The Recommendations section of the TMDL Report highlights what can be done in the Wiconisco Creek watershed to eliminate or treat pollutant sources. Aside from PADEP's primary efforts to improve water quality in the Wiconisco Creek watershed through reclamation of abandoned mine lands, and through the NPDES permit program, additional opportunities for reasonable assurance exist. PADEP expects that activities such as research conducted by its Bureau of Abandoned Mine Reclamation, funding from EPA's §319 Grant program, and Pennsylvania's Growing Greener program will help remedy abandoned mine drainage impacts. PADEP also has in place an initiative that aims to maximize reclamation of Pennsylvania's abandoned mineral extraction lands. Through Reclaim PA, Pennsylvania's goal is to accomplish complete reclamation of abandoned mine lands and plugging of orphaned wells. Pennsylvania strives to achieve this objective through legislative and policy land management efforts and activities described in the TMDL Report.

The Dauphin County Conservation District (DCCD) and the Wiconisco Creek Restoration Association (WCRA), as well as other project partners, have been involved in inventorying and promoting the installation of Best Management Practices (BMPs) such as streambank fencing in the watershed, as well as manure storage facilities. Most of the efforts have been concentrated in the Little Wiconisco Creek watershed, identified by EPA assessment as a priority for BMP implementation. Although measuring a stream's recovery as a result of BMP installation is generally considered a long term and complex exercise (~10 years), a study by the U.S. Geological Survey (1999) indicates that total phosphorus levels decreased 31 percent over the study period. Since phosphorus is generally tied to sediment runoff during storm events, it may indicate that fencing efforts have contributed to reducing the runoff by stabilizing streambanks.

Numerous other entities, both public and private, have assisted with similar efforts throughout the county. Specific BMPs implemented in the county include stream fencing, manure storage systems, treatment of runoff from animal confinement areas and riparian tree planting. A number of projects in the Wiconisco Creek watershed are also addressing streambank erosion through the use of natural stream design and stabilization.

Although not specifically stated in the TMDL Report, PADEP routinely posts the approved TMDL Reports on their Website: www.dep.state.pa.us/watermanagementapps/tmdl/.