FINAL

GETTY RUN WATERSHED TMDL

Westmoreland County

For Acid Mine Drainage Affected Segments

Prepared by:

Pennsylvania Department of Environmental Protection

August 27, 2004

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Introduction

This report presents the Total Maximum Daily Loads (TMDLs) developed for segments in the Getty Run Watershed (Attachments A). These were done to address the impairments noted on the 1996 Pennsylvania Section 303(d) list of impaired waters, required under the Clean Water Act, and covers one segment on this list and one additional segment from a subsequent list (shown in Table 1). High levels of metals, and in some areas depressed pH, caused these impairments. All impairments resulted from acid drainage from abandoned coalmines. The TMDL addresses the three primary metals associated with acid mine drainage (iron, manganese, aluminum) and pH.

Table 1. 303(d) Sub-List								
State Water Plan (SWP) Subbasin: 18-C Loyalhanna Creek								
Year	**Miles**	**Segment ID**	**DEP Stream Code**	**Stream Name**	**Designated Use**	**Data Source**	**Source**	**EPA 305(b) Cause Code**
1996	1	5006	43257	Getty Run	WWF	305(b) Report	RE	Metals
1998	2.73	5006	43257	Getty Run	WWF	SWMP	AMD	Metals
2002	5.3	New survey, new segment id 990511-0840-ALF	43257	Getty Run	WWF	SWAP	AMD	Metals & pH
1996	Not on 303(d) list							
1998	Not on 303(d) list							
2002	4	990511-1000-ALF	43257	Getty Run	WWF	SWAP	AMD	Metals & pH

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

See Attachment D, *Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists.*
The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.

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

Directions to the Getty Run Watershed

The Getty Run Watershed is located in southwestern Pennsylvania, occupying the northern central portion of Westmoreland County. The watershed area is found on the Slickville and Saltsburg 7.5-Minute Quadrangle United States Geological Survey maps. The area within the watershed consists of approximately 6.5 square miles. Getty Run drains to Loyalhanna Creek. Getty Run can be accessed by taking Route 819 north from Greensburg, PA to the town of Slickville and turning left onto township road 951. All sampling locations can be accessed off this road.

Segments addressed in this TMDL

There is one active mining operation in the watershed, Millwood Development, Inc. SMP 65880106. All of the remaining discharges in the watershed are from abandoned mines and will be treated as non-point sources. Each segment on the PA Section 303(d) list will be addressed as a separate TMDL. These TMDLs will be expressed as long-term, average loadings. Due to the nature and complexity of mining effects on the watershed, expressing the TMDL as a long-term average gives a better representation of the data used for the calculations. See Attachment C for TMDL calculations.

Clean Water Act Requirements

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

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

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

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

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

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

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

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

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

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

Section 303(d) Listing Process

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

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

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

After the survey is completed, the biologist determines the status of the stream segment. The decision is based on habitat scores and a series of narrative biological statements used to evaluate the benthic macroinvertebrate community. If the stream is determined to be impaired, the source and cause of the impairment is documented. An impaired stream must be listed on the state's Section 303(d) list with the source and cause. A TMDL must be developed for the stream

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

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 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 period on draft TMDL;
6. Submittal of final TMDL; and
7. EPA approval of the TMDL.

Watershed History

Getty Run is part of the Kiskiminetas River Basin in Westmoreland County and drains directly into Loyalhanna Creek approximately 1 ¾ miles upstream of the confluence of Loyalhanna Creek and the Conemaugh River. The watershed area is located in the Allegheny Plateau Physiographic Province. The plateau is characterized by gently rolling hills with a maximum elevation of 1340 feet and a minimum elevation of 840 feet where Getty Run enters the Loyalhanna Creek.

The watershed is located on the Elders Ridge syncline. The general strike of the area is approximately 15 degrees northeast and the dip is approximately 35 degrees northwest.

The town of Slickville is located in the headwaters of Getty Run along Rte 819. Land uses within the watershed include agriculture, abandoned mine lands, and rural residential properties with small communities scattered throughout the area. A portion of the main branch of Getty Run flows alongside the Penn Central Railroad tracks. Strip mining and coal refuse disposal, as labeled and shown on the map in Attachment A in a purple stipple pattern, have disturbed a lot of this area.

Several abandoned Pittsburgh and Upper Freeport coal seam deep mines underlie and discharge to the watershed area. The mining was conducted by Irwin Gas & Coal Co., Armstrong Westmoreland Coal Co., Howard Gas & Coal Co., and Avonmore Coal Co. In the 1970's and 1980's mining activities in the watershed became more widespread as companies including Albert Narhar, Irwin Gas & Coal Co., Electro Met Coal Co., Gavora Coal Co., John Kapusta, McGal Coal Co. Inc., and John Hyduke began strip-mining the previously unmined Pittsburgh coal seam and daylighting portions of the abandoned Pittsburgh deep mines. Both types of mining have affected ground and surface water in the area.

There is one active mining permit in the watershed. The Slickville SMP 65880106 was issued to M. B. Energy, Inc. on October 20, 1989 and transferred to Millwood Development, Inc. on October 20, 2002. The total permit area is 487.7 acres with 276.0 acres to be affected. The coal seam to be mined is the Pittsburgh coal seam (116.0 acres). Mining is temporarily ceased due to market conditions. Located on the permit area are seven pre-law discharges. The permit, therefore, is issued under DEP's subchapter F regulations, which provide that the permittee's effluent limits are based on baseline pollution conditions rather than standard coal mining BAT standards. Therefore, the subchapter F discharges on this site have been treated as nonpoint sources for the purpose of doing the TMDL, however, waste load allocations have been assigned to the permitted NPDES discharge points for this mine site.

The reduction necessary to meet applicable water quality standards from preexisting conditions (including discharges from areas coextensive with areas permitted under the remining program Subchapter F or G) are expressed in the LA portion of the TMDL. The WLAs express the basis for applicable effluent limitations on point sources. Except for any expressed assumptions, any WLA allocated to a remining permittee does not require the permittee to necessarily implement the reductions from preexisting conditions set forth in the LA. Additional requirements for the permittee to address the preexisting conditions are set forth in the applicable NPDES/mining permit. Table 2 contains the average concentration and flow from the seven abandoned discharges located on the Slickville site. The map in attachment A shows the location of these seven discharges. The individual discharges are not assigned load allocations, however; discharge affects on the stream are taken into account at the closest downstream sampling point and it is noted that the discharges are a contributing pollutant source to the segment.

Table 2. Slickville Site Pre-existing Discharge Average Concentrations and Flow

Discharge	Acidity mg/L	Iron mg/L	Manganese mg/L	Aluminum mg/L	Flow gpm
47	469.53	32.67	8.03	40.8	123.89
52	2.96	0.01	0.14	0.34	2.20
56	6.34	0.01	0.33	0.71	9.38
60	6.36	0.04	0.31	1.12	13.57
A	5.95	3.21	0.98	0.24	8.55
46	590.44	53.49	9.78	40.11	66.98
51	8.1	0.04	0.24	0.56	3.48

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 nonpoint sources, the equations shown below are applied using data for a point in the stream. The load allocation made at that point will be for all of the watershed area that is above that point. For situations where there are point-source impacts alone, or in combination with nonpoint sources, the evaluation will use the point-source data and perform a mass balance with the receiving water to determine the impact of the point source.

Allowable loads are determined for each point of interest using Monte Carlo simulation. Monte Carlo simulation is an analytical method meant to imitate real-life systems, especially when other analyses are too mathematically complex or too difficult to reproduce. Monte Carlo simulation calculates multiple scenarios of a model by repeatedly sampling values from the probability distribution of the uncertain variables and using those values to populate a larger data set. Allocations were applied uniformly for the watershed area specified for each allocation point. For each source and pollutant, it was assumed that the observed data were log-normally distributed. Each pollutant source was evaluated separately using @Risk[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)

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

LTA = allowable LTA source concentration in mg/l

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

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

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

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

For pH TMDLs, acidity is compared to alkalinity as described in Attachment B. Each sample point used in the analysis of pH by this method must have measurements for total alkalinity and total acidity. Net alkalinity is alkalinity minus acidity, both in units of milligrams per liter (mg/**l**) $CaCO_3$. Statistical procedures are applied, using the average value for total alkalinity at that point as the target to specify a reduction in the acid concentration. By maintaining a net alkaline stream, the pH value will be in the range between six and eight. This method negates the need to specifically compute the pH value, which for streams affected by low pH from AMD may not a true reflection of acidity. This method assures that Pennsylvania's standard for pH is met when the acid concentration reduction is met.

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

Method to Quantify Treatment Pond Pollutant Load

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

Surface coal mines remove soil and overburden materials to expose the underground coal seams for removal. After removal of the coal the overburden is replaced as mine spoil and the soil is replaced for revegetation. In a typical surface mining operation the overburden materials 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
Al <= 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, it is used along with the Best Available Technology (BAT) limits to quantify the WLA for one or more of the following: aluminum, iron, and manganese. The following formula is used:

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

The following is an approach that can be used to determine a 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, ttp://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 regraded mine spoil infiltrates, 5 percent evaporates, and 15 percent may run off to the pit for pumping and potential treatment (Jay Hawkins, Office of Surface Mining, Department of the Interior, Personal Communications 2003). Regrading and revegetation of the mine spoil is conducted as the mining progresses. 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.

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 to allow for future mining.

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 larges part of the TMDL is expressed as Load Allocations (LAs). All allocations will be specified as long-term average daily concentrations. These long-term average concentrations are expected to meet water-quality criteria 99% of the time as required in PA Title 25 Chapter 96.3(c). The following table shows the applicable water-quality criteria for the selected parameters.

Table 3. Applicable Water Quality Criteria

Parameter	***Criterion Value (mg/l)***	***Total Recoverable/Dissolved***
Aluminum (Al)	0.75	Total Recoverable
Iron (Fe)	1.50	30 day average; Total Recoverable
Manganese (Mn)	1.00	Total Recoverable
pH *	6.0-9.0	N/A

*The pH values shown will be used when applicable. In the case of freestone streams with little or no buffering capacity, the TMDL endpoint for pH will be the natural background water quality.

TMDL Elements (WLA, LA, MOS)

$$TMDL = WLA + LA + MOS$$

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

Allocation Summary

These TMDLs will focus remediation efforts on the identified numerical reduction targets for each watershed. The reduction schemes in Table 4 for each segment are based on the assumption that all upstream allocations are achieved and take into account all upstream reductions. Attachment C contains the TMDLs by segment analysis for each allocation point in a detailed discussion. As changes occur in the watershed, the TMDLs may be re-evaluated to reflect current conditions. An implicit MOS based on conservative assumptions in the analysis is included in the TMDL calculations.

The allowable LTA concentration in each segment is calculated using Monte Carlo Simulation as described previously. The allowable load is then determined by multiplying the allowable concentration by the flow and a conversion factor at each sample point. The allowable load is the TMDL.

Each permitted discharge in a segment is assigned a waste load allocation and the total waste load allocation for each segment is included in this table. There is currently one permit in the watershed with nine discharges. The difference between the TMDL and the WLA at each point is the load allocation (LA) at the point. The LA at each point includes all loads entering the segment, including those from upstream allocation points. The percent reduction is calculated to show the amount of load that needs to be reduced within a segment in order for water quality standards to be met at the point.

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

Table 4. TMDL Component Summary for the Getty Run Watershed

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
GETY02	*Getty Run, upstream of Unnamed Tributary 43275*						
	Fe	332.7	3.3	0.0	3.3	329.4	99
	Mn	69.8	4.9	0.0	4.9	64.9	93
	Al	262.5	2.6	0.0	2.6	259.9	99
	Acidity	3187.2	0.0	0.0	0.0	3187.2	100
GETY01	*Mouth of Unnamed Tributary 43275*						
	Fe	71.0	0.7	0.0	0.7	70.3	99
	Mn	10.7	0.7	0.0	0.7	10.0	93
	Al	47.7	0.5	0.0	0.5	47.2	99
	Acidity	620.1	0.0	0.0	0.0	620.1	100
GETY03	*Mouth of Unnamed Tributary 43274*						
	Fe	162.5	1.6	0.0	1.6	160.9	99
	Mn	15.1	1.5	0.0	1.5	13.6	90
	Al	107.9	1.1	0.0	1.1	106.8	99
	Acidity	1506.1	0.0	0.0	0.0	1506.1	100
GETY04	*Getty Run, upstream of Unnamed Tributary 43273*						
	Fe	574.4	11.5	0.1	11.4	2.4	18
	Mn	125.0	10.0	0.1	9.9	26.6	73
	Al	554.4	5.5	0.1	5.4	135.1	96
	Acidity	6709.0	0.0	0.0	0.0	1395.6	100
GETY05	*Mouth of Unnamed Tributary 43273*						
	Fe	43.4	1.7	0.0	1.7	41.7	96

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Mn	11.9	2.0	0.0	2.0	9.9	83
	Al	48.7	1.0	0.0	1.0	47.7	98
	Acidity	652.3	0.0	0.0	0.0	652.3	100
GETY07	*Getty Run, upstream of Unnamed Tributary 43272*						
	Fe	595.5	11.9	0.1	11.8	0.9	7
	Mn	135.5	9.5	0.1	9.4	2.5	21
	Al	597.8	6.0	0.1	5.9	0.6	9
	Acidity	6883.4	0.0	0.0	0.0	0.0	0
GETY06	*Mouth of Unnamed Tributary 43272*						
	Fe	75.4	2.3	0.0	2.3	73.1	97
	Mn	18.5	1.9	0.0	1.9	16.6	90
	Al	81.7	0.8	0.0	0.8	80.9	99
	Acidity	1034.5	0.0	0.0	0.0	1034.5	100
GETY08	*Getty Run, upstream of Unnamed Tributary 43261*						
	Fe	520.7	10.4	0.0	10.4	0.6	5
	Mn	124.8	10.0	0.0	10.0	0.0	0
	Al	546.4	5.5	0.0	5.5	0.0	0
	Acidity	6515.8	0.0	0.0	0.0	0.0	0
GETY09	*Mouth of Unnamed Tributary 43261*						
	Fe	3.9	3.9	0.6	3.3	0.0	0
	Mn	0.5	0.5	0.4	0.1	0.0	0
	Al	4.9	4.9	0.3	4.6	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
GETY10	*Mouth of Unnamed Tributary 43260*						
	Fe	1.6	1.6	NA	NA	0.0	0
	Mn	0.2	0.2	NA	NA	0.0	0
	Al	1.4	1.4	NA	NA	0.0	0
	Acidity	0.0	0.0	NA	NA	0.0	0
GETY11	*Getty Run, upstream of Unnamed Tributary 43259*						
	Fe	599.5	12.0	0.0	12.0	77.2	87
	Mn	148.3	11.9	0.0	11.9	20.8	64
	Al	646.1	6.5	0.0	6.5	98.7	94
	Acidity	7279.4	0.0	0.0	0.0	763.6	100
GETY12	*Mouth of Unnamed Tributary 43259*						
	Fe	0.5	0.5	NA	NA	0.0	0
	Mn	0.1	0.1	NA	NA	0.0	0
	Al	0.7	0.7	NA	NA	0.0	0
	Acidity	0.0	0.0	NA	NA	0.0	0
GETY14	*Mouth of Unnamed Tributary 43258*						
	Fe	0.46	0.25	0.0	0.25	0.21	46
	Mn	0.1	0.1	NA	NA	0.0	0

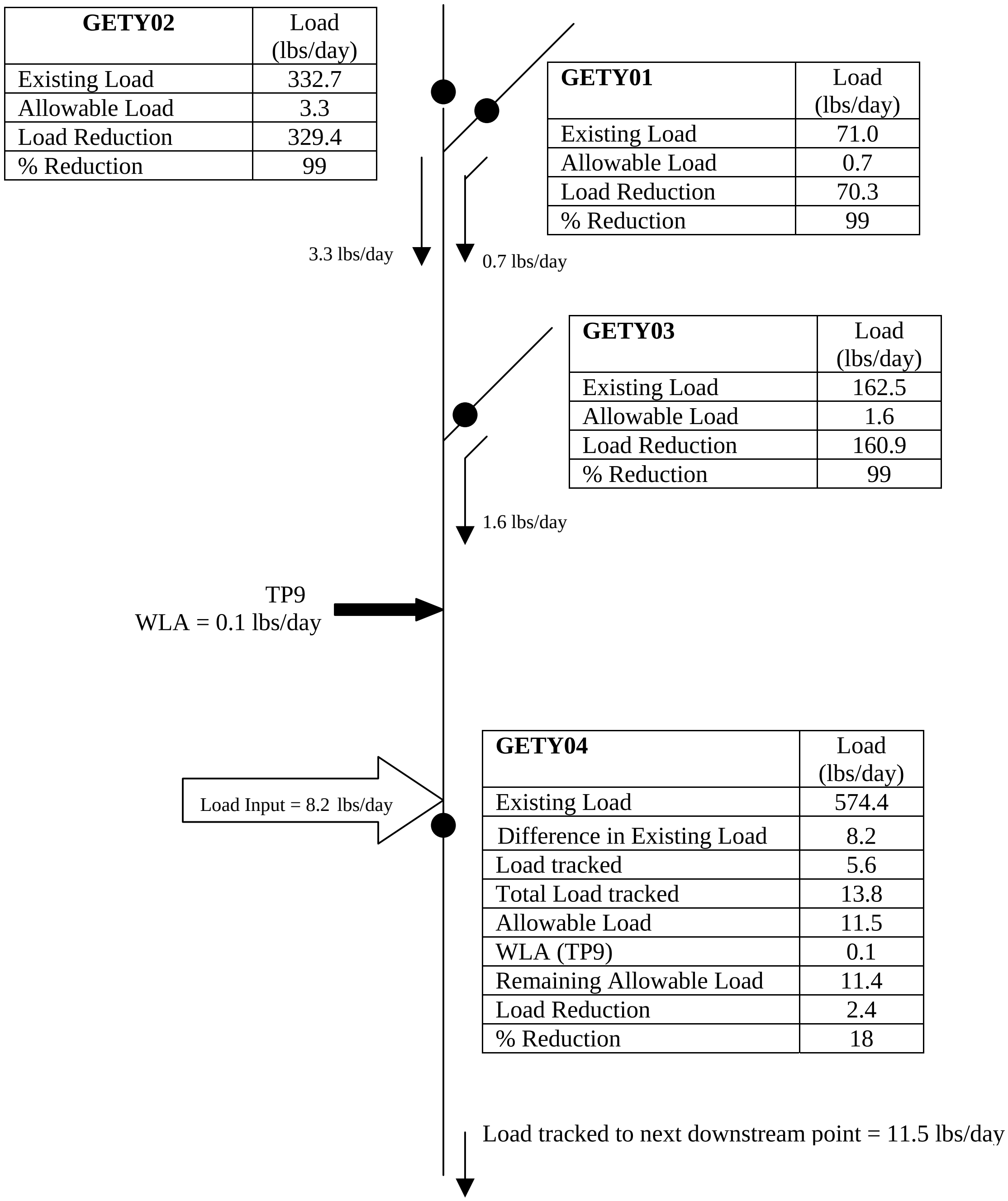
Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Al	0.54	0.12	0.0	0.12	0.42	77
	Acidity	0.0	0.0	NA	NA	0.0	0
GETY15	*Mouth of Getty Run*						
	Fe	832.5	16.6	0.0	16.6	228.2	93
	Mn	212.8	17.0	0.0	17.0	59.4	78
	Al	965.1	9.7	0.0	9.7	315.3	97
	Acidity	10593.6	0.0	0.0	0.0	3314.2	100

NA, meets WQS. No TMDL necessary.

In the instance that the allowable load is equal to the measured load (e.g. iron GETY10, Table 4), the simulation determined that water quality standards are being met instream and therefore no TMDL is necessary for the parameter at that point. Although no TMDL is necessary, the loading at the point is considered at the next downstream point.

No TMDL is required for GETY09. A stream assessment found the tributary to be attaining its uses and data at GETY09 shows that water quality standards are being met. However, because there are permitted discharges located on the segment, allocations are included in Table 4 for GETY09.

Following is an example of how the allocations, presented in Table 4, for a stream segment are calculated. For this example, iron allocations for GETY04 of Getty Run are shown. As demonstrated in the example, all upstream contributing loads are accounted for at each point. Attachment C contains the TMDLs by segment analysis for each allocation point in a detailed discussion. These analyses follow the example. Attachment A contains a map of the sampling point locations for reference.



GETY02	Load (lbs/day)
Existing Load	332.7
Allowable Load	3.3
Load Reduction	329.4
% Reduction	99

GETY01	Load (lbs/day)
Existing Load	71.0
Allowable Load	0.7
Load Reduction	70.3
% Reduction	99

GETY03	Load (lbs/day)
Existing Load	162.5
Allowable Load	1.6
Load Reduction	160.9
% Reduction	99

GETY04	Load (lbs/day)
Existing Load	574.4
Difference in Existing Load	8.2
Load tracked	5.6
Total Load tracked	13.8
Allowable Load	11.5
WLA (TP9)	0.1
Remaining Allowable Load	11.4
Load Reduction	2.4
% Reduction	18

Waste load allocations are assigned to the nine permitted mine drainage treatment ponds contained on the Millwood Development, Inc. SMP 65880106 Slickville site. Waste load allocations are calculated using the methodology explained previously in the *Method to Quantify Treatment Pond Pollutant Load* section of the report. The maximum permitted pit dimension for the Slickville site is 400’ x 75’or 30, 000 square feet. This value is used in calculating the waste load allocations. Treatment pond locations can be found on the map in Attachment A. The WLA for TP9 is being evaluated at sample point GETY04, TP8 at GETY07, and the remainder of the ponds (TP1-TP7) at point GETY09. The average monthly limit for aluminum contained in the permit is 1.4 mg/L, which is stricter than the standard effluent limit. This value is used to calculate the WLAs for aluminum.

No required reductions of permit limits are required at this time. All necessary reductions are assigned to non-point sources.

Table 5 below contains the WLAs for the nine mine drainage treatment ponds located on the Slickville site.

Table 5. Waste Load Allocations of Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/L)	Calculated Average Flow (MGD)	WLA (lbs/day)
Millwood Development, Inc. Slickville Site (NPDES PA0591220)			
TP1			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP2			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP3			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP4			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP5			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP6			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP7			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP8			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05

Parameter	Allowable Average Monthly Conc. (mg/L)	Calculated Average Flow (MGD)	WLA (lbs/day)
Al	1.4	0.0031	0.04
TP9			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04

Recommendations

Because of the geologic and topographic structure of the intersection of Getty Run with the Elders Ridge Syncline, Getty Run is the most difficult area in the Loyalhanna watershed in which to achieve any degree of water quality improvement. There are 12 acid mine discharges in the watershed discharging an acid load averaging 8,100 pounds per day to Getty Run. Unlike other watersheds, there is no single dominant discharge. The major discharge only accounts for 50 percent of the total acid load. Abatement is made difficult by the up-dip of the coal seam away from the outcrop line. Unlike other synclinal coal mine areas, the outcrop line in the Getty Run Valley is at the low point of the coal seam so that the natural drainage of the coal seam is towards the crop line. The sealing of any or all of the 12 discharges in the Elders Ridge area would only serve to divert discharge flow to other points along the outcrop. The fragmented nature of the coal seam prevents the utilization of any single discharge as a drainway for the area to conduct flows to a single treatment facility. The only method of mine drainage abatement feasible in the watershed is in-stream neutralization.[4]

There are three mine discharges affecting Getty Run that are currently being monitored by the Loyalhanna Creek Watershed Association. To date no projects have been designed to address the affects of these discharges, abandoned mines, and abandoned mine lands in the watershed. Remining of abandoned underground mines lands on the Millwood Development, Inc. (Slickville) surface mining permit may improve water quality of the seven pre-existing mine discharges on the permit area by decreasing the interaction of groundwater with the open mine voids.

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

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

[4] Operation Scarlift, Project No. SL-122, Loyalhanna Watershed Study, December 1972.

Pennsylvania's Growing Greener program has been used extensively to remedy mine drainage impacts. These many activities are expected to continue and result in water quality improvement.

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

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

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

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

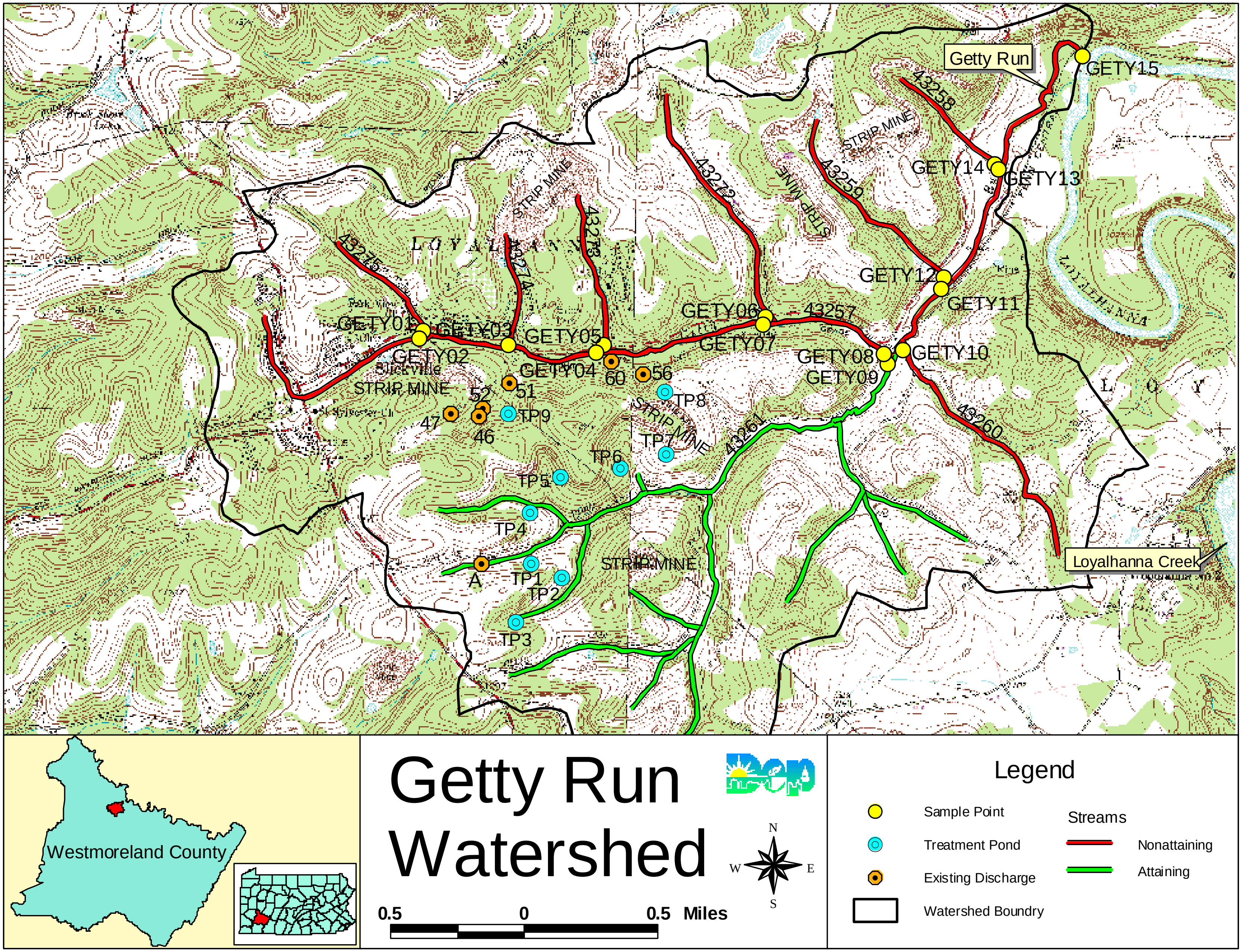
Reclaim PA is DEP's initiative designed to maximize reclamation of the state's quarter million acres of abandoned mineral extraction lands. Abandoned mineral extraction lands in Pennsylvania constituted a significant public liability – more than 250,000 acres of abandoned surface mines, 2,400 miles of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

Public Participation

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

Attachment A

Getty Run Watershed Maps



Getty Run
GETY15
43258
STRIP MINE
GETY14
GETY13
43259
STRIP MINE
43272
43273
43274
43275
STRIP MINE
GETY12
GETY11
GETY06
43257
GETY07
GETY01
GETY03
GETY05
GETY02
GETY04
60
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51
52
47
46
STRIP MINE
TP9
TP8
TP7
TP6
TP5
TP4
TP1
TP2
TP3
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STRIP MINE
43261
GETY08
GETY09
GETY10
43260
Loyalhanna Creek
Westmoreland County
Getty Run Watershed
0.5
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0.5 Miles
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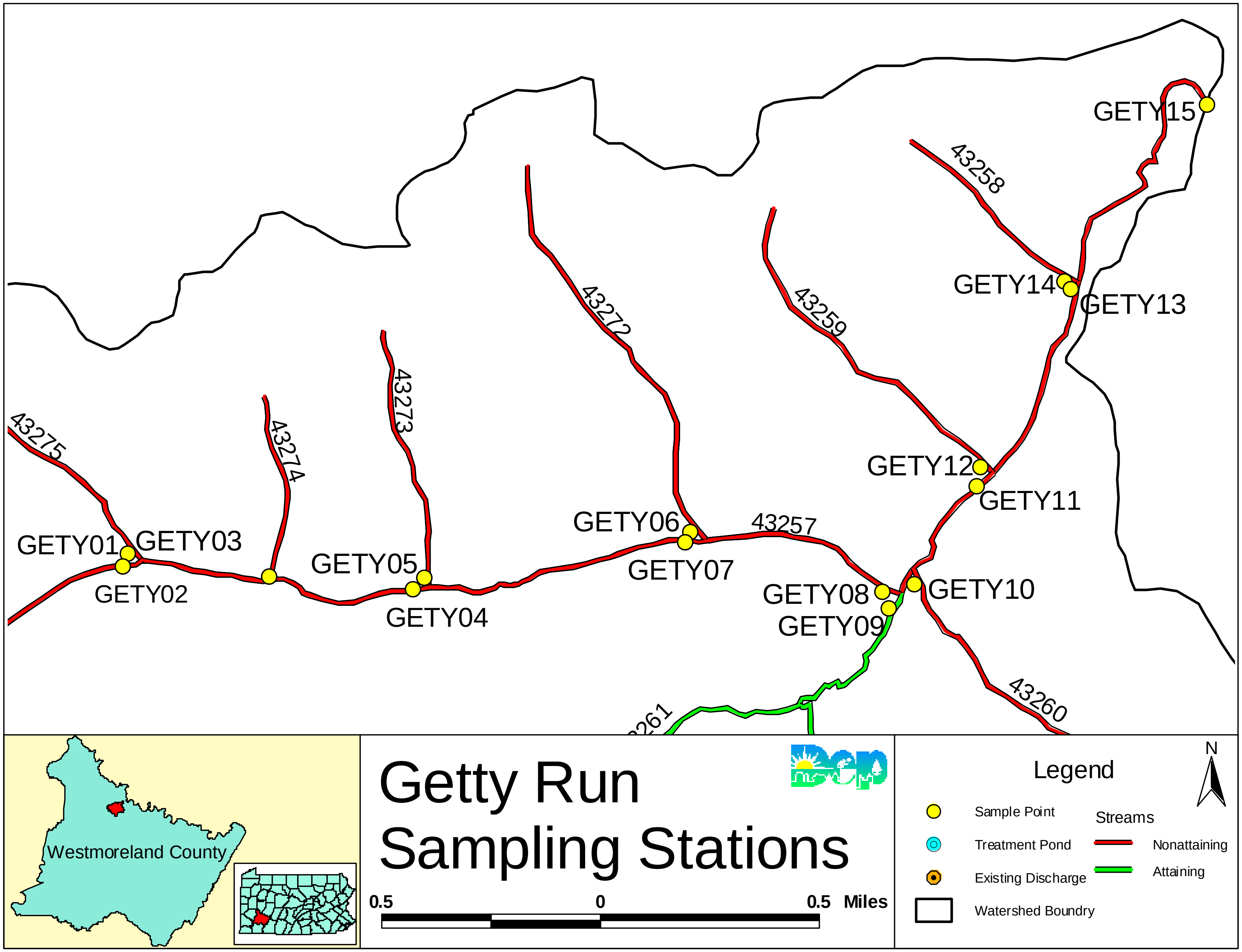
Legend
Sample Point
Treatment Pond
Existing Discharge
Watershed Boundry
Streams
Nonattaining
Attaining


GETY15
43258
GETY14
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GETY12
GETY11
GETY06
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GETY01
GETY03
GETY05
GETY07
GETY08
GETY10
GETY02
GETY04
GETY09
43260
Westmoreland County
Getty Run
Sampling Stations
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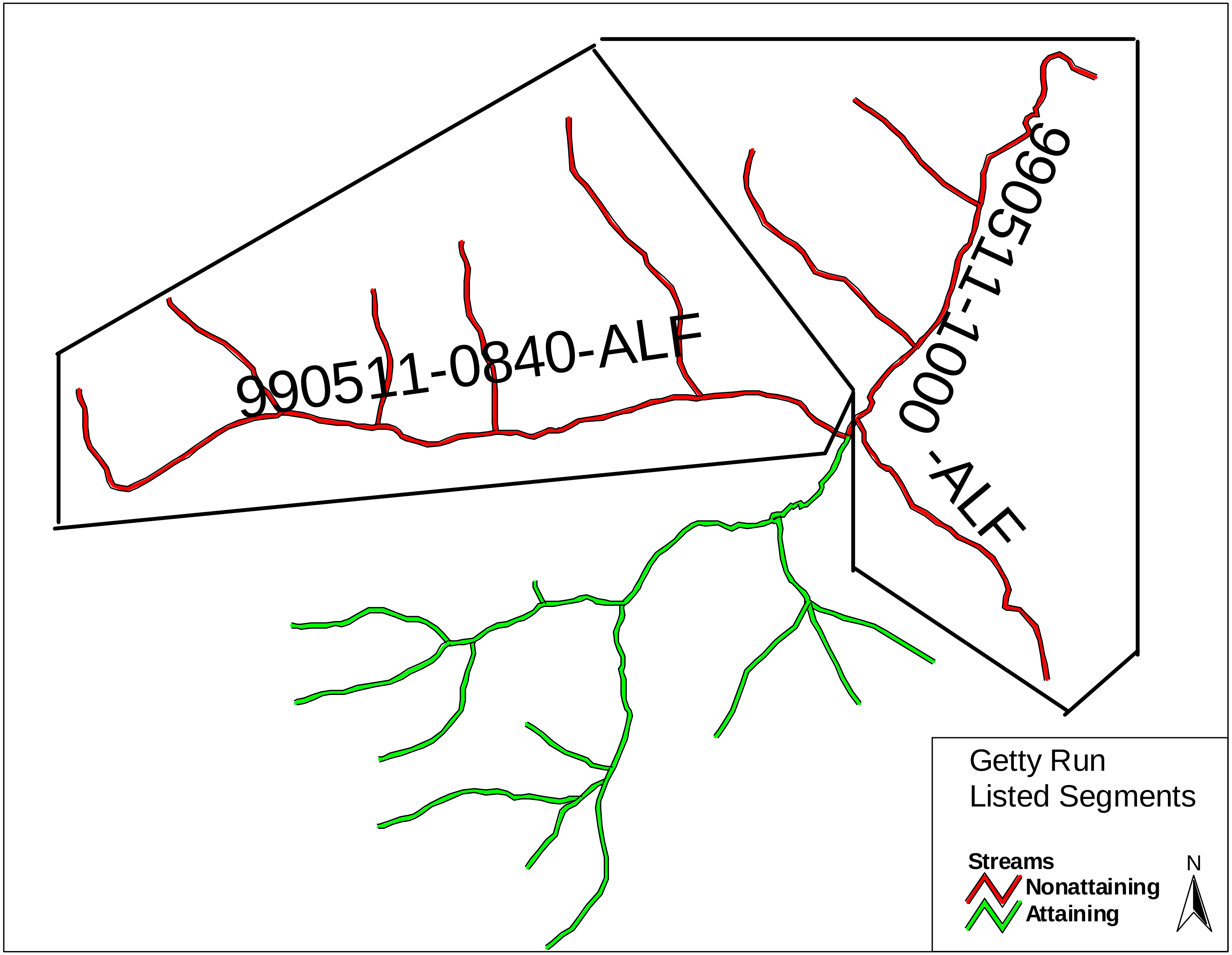
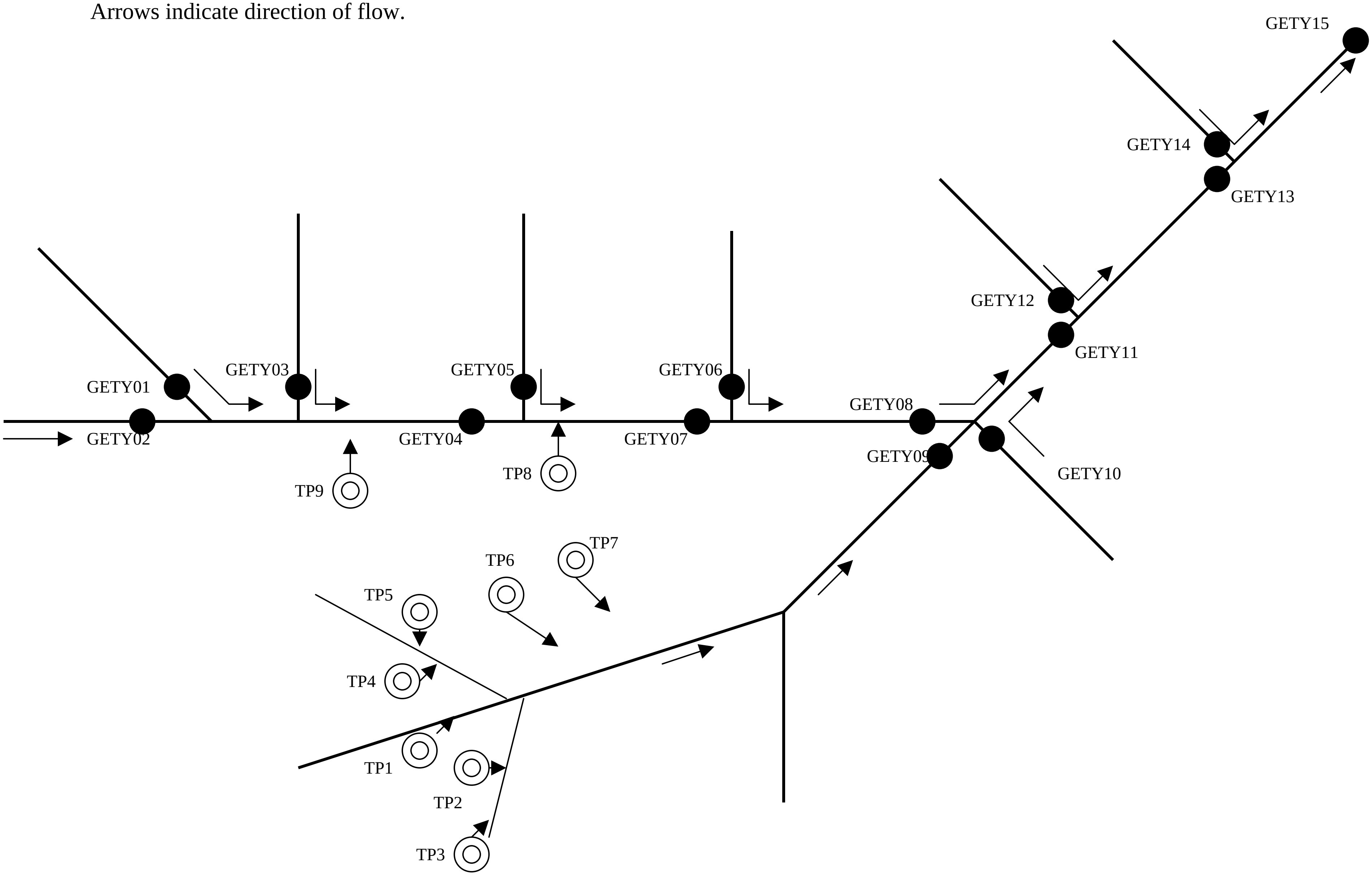
Sample Point
Streams
Treatment Pond
Nonattaining
Existing Discharge
Attaining
Watershed Boundry


990511-0840-ALF
990511-1000 -ALF
Getty Run
Listed Segments
Streams
Nonattaining
Attaining
N

Getty Run Sampling Station Diagram
Arrows indicate direction of flow.



Attachment B

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

Method for Addressing Section 303(d) Listings for pH

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

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

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

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

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

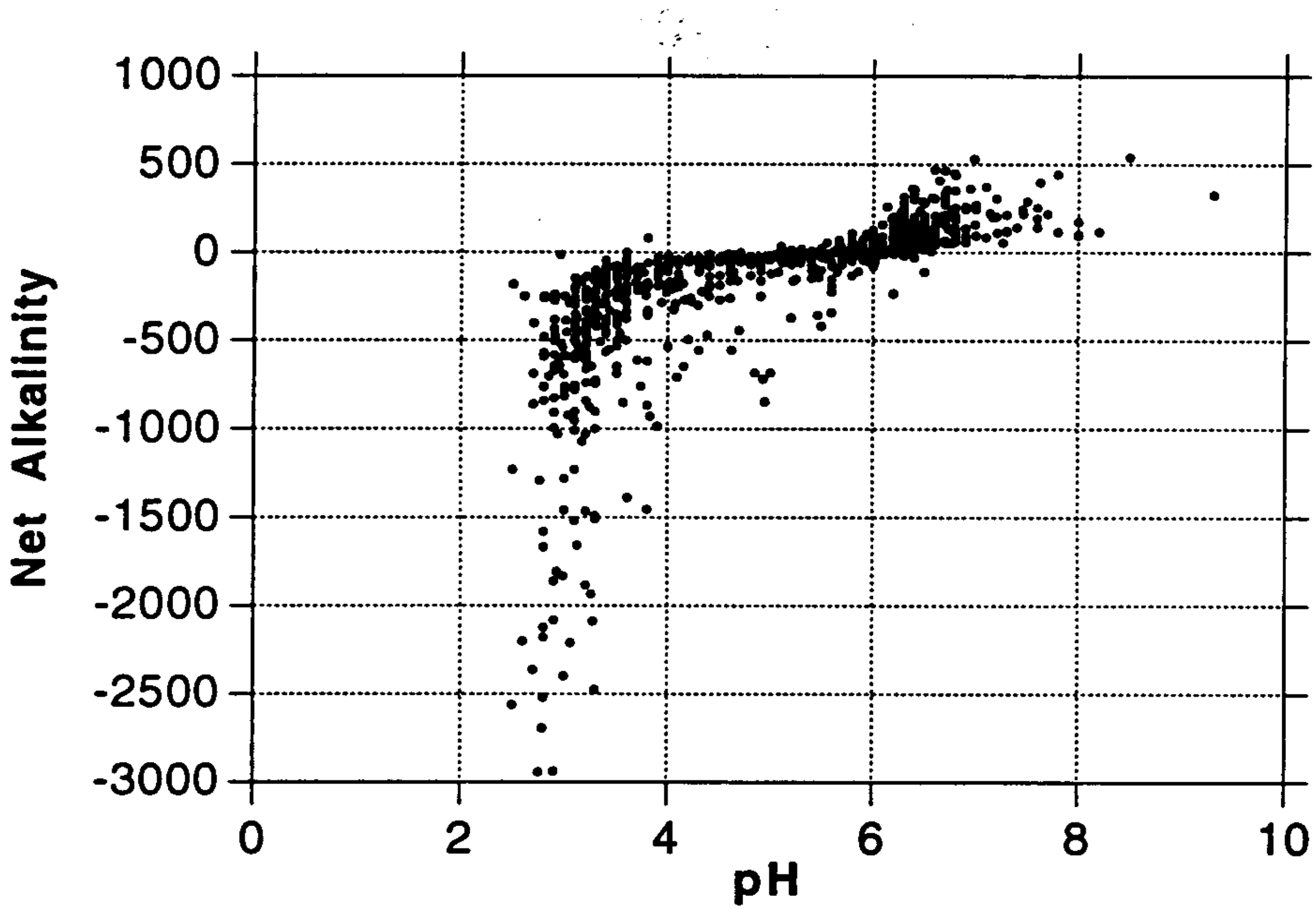


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Surface Mining Control and Reclamation Act

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

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

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

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

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

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

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

Related Definitions

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

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

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

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

Attachment C
TMDLs By Segment

Getty Run

The TMDL for the Getty Run consists of load allocations of eight tributaries and six sampling sites along the stream. WLAs are assigned to the nine discharges included in the Millwood Development, Inc. Slickville Site (NPDES PA0591220) permit.

The analysis was not completed at GETY13 because only five samples were taken at the point instead of seven. For the two days that data was not collected, which was in the year 2002, the flows for all points were lower than the flows in 2003. Because data was not collected for GETY13 in 2002 and the 2002 flows were lower than the 2003 flows, the GETY13 data set was not comparable to the data sets from the other points and therefore not used. The data at GETY13 is included in Appendix E.

Getty Run is listed as impaired on the CWA 303(d) list by both high metals and low pH from AMD as being the cause of the degradation to the stream. For pH, the objective is to reduce acid loading to the stream that will in turn raise the pH to the acceptable range. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

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

TMDL Calculations - Sample Point GETY02, Getty Run upstream of Unnamed Tributary 43275

The TMDL for sample point GETY02 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this segment was computed using water-quality sample data collected at point GETY02. The average flow of 0.85 MGD, measured at point GETY02, is used for these computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1999 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point GETY02 shows pH ranging between 2.8 and 3.0; pH is addressed as part of this TMDL because of the mining impacts.

Table C1. TMDL Calculations at Point GETY02				
Flow = 0.85 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	47.03	332.7	0.47	3.3
Mn	9.87	69.8	0.69	4.9
Al	37.10	262.5	0.37	2.6
Acidity	450.46	3187.2	0.00	0.0
Alkalinity	0.00	0.0		

Table C2. Calculation of Load Reduction Necessary at Point GETY02				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	332.7	69.8	262.5	3187.15
Allowable Load = TMDL	3.3	4.9	2.6	0.00
Load Reduction	329.4	64.9	259.9	3187.2
Total % Reduction	99	93	99	100

TMDL Calculations - Sample Point GETY01, mouth of Unnamed Tributary 43275

The TMDL for sample point GETY01 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point GETY01. The average flow (0.17 MGD), measured at point GETY01, is used for these computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1999 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point GETY01 shows pH ranging between 2.7 and 3.0; pH is addressed as part of this TMDL because of the mining impacts.

Table C3. TMDL Calculations at Point GETY01				
Flow = 0.17 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	49.96	71.0	0.50	0.7
Mn	7.52	10.7	0.53	0.7
Al	33.56	47.7	0.34	0.5
Acidity	436.49	620.1	0.00	0.0
Alkalinity	0.00	0.0		

Table C4. Calculation of Load Reduction Necessary at Point GETY01				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	71.0	10.7	47.7	620.1
Allowable Load = TMDL	0.7	0.7	0.5	0.0
Load Reduction	70.3	10.0	47.2	620.1
Total % Reduction	99	93	99	100

TMDL Calculations - Sample Point GETY03, mouth of Unnamed Tributary 43274

The TMDL for sample point GETY03 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point GETY03. The average flow (0.28 MGD), measured at point GETY03, is used for these computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1999 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point GETY03 shows pH ranging between 2.6 and 2.7; pH is addressed as part of this TMDL because of the mining impacts.

Table C5. TMDL Calculations at Point GETY03				
Flow = 0.28 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	70.14	162.5	0.70	1.6
Mn	6.53	15.1	0.65	1.5
Al	46.60	107.9	0.47	1.1
Acidity	650.26	1506.1	0.00	0.0
Alkalinity	0.00	0.0		

Table C6. Calculation of Load Reduction Necessary at Point GETY03				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	162.5	15.1	107.9	1506.1
Allowable Load = TMDL	1.6	1.5	1.1	0.0
Load Reduction	160.9	13.6	106.8	1506.1
Total % Reduction	99	90	99	100

Waste Load Allocation – Millwood Development, Inc., Slickville site, TP9

The Millwood Development, Inc., SMP 65880106, has nine permitted treatment ponds located within the permitted area. TP9, located on the map in Attachment A, discharges to Getty Run upstream of GETY04. The waste load allocation for TP9 was calculated as described in the *Method to Quantify Treatment Pond Pollutant Loading* section of the report. The limit for aluminum in the permit is 1.4 mg/L, which is more stringent than the BAT standard 2.0 mg/L. This value is used for the computations. The following table shows the waste load allocation for the discharge.

Table C7. Waste Load Allocations Slickville site			
Parameter	**Monthly Avg. Allowable Conc. (mg/L)**	**Average Flow (MGD)**	**Allowable Load (lbs/day)**
TP9			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04

TMDL Calculations - Sampling Point GETY04, Getty Run upstream of Unnamed Tributary 43273

The TMDL for sampling point GETY04 consists of a waste load allocation to one permitted discharge, TP9, and a load allocation to the area between sample points GETY04, GETY03, GETY02, and GETY01. The load allocation for this stream segment was computed using water-quality sample data collected at point GETY04. The average flow of 1.79 MGD, measured at the point, is used for these computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1999 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point GETY04 shows pH ranging between 2.8 and 2.9; pH is addressed as part of this TMDL because of the mining impacts.

Affects from the 46, 47, 51, and 52 preexisting discharges, located on the Millwood Development, Inc., Slickville site, are incorporated into the LA portion of the TMDL for point GETY04.

Table C8. TMDL Calculations at Point GETY04				
Flow = 1.79 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	38.57	574.4	0.77	11.5
Mn	8.40	125.0	0.67	10.0
Al	37.23	554.4	0.37	5.5
Acidity	450.51	6709.0	0.00	0.0
Alkalinity	0.00	0.0		

The calculated load reductions for all the loads that enter point GETY04 must be accounted for in the calculated reductions at sample point GETY04 shown is Table C9. A comparison of measured loads between points GETY01, GETY02, GETY03, and GETY04 shows that there is additional loading entering the segment for all parameters.

Table C9. Calculation of Load Reduction Necessary at Point GETY04				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	574.4	125.0	554.4	6709.0
Difference in Existing Load (GETY01, GETY02, GETY03, & GETY04)	8.2	29.4	136.3	1395.6
Load tracked from GETY01, GETY02, & GETY03 (Upstream Loads)	5.6	7.1	4.2	0.0
Total Load tracked	13.8	36.5	140.5	1395.6
Allowable Load = TMDL	11.5	10.0	5.5	0.0
WLA (TP9)	0.1	0.1	0.1	0.0
Remaining Allowable Load (Allowable Load – WLA)	11.4	9.9	5.4	0.0
Load Reduction	2.4	26.6	135.1	1395.6
% Load Reduction	18	73	96	100

TMDL Calculations - Sample Point GETY05, mouth of Unnamed Tributary 43273

The TMDL for sample point GETY05 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point GETY05. The average flow of 0.46 MGD, measured at point GETY05, is used for these computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1999 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point GETY05 shows pH ranging between 2.9 and 3.5; pH is addressed as part of this TMDL because of the mining impacts.

Table C10. TMDL Calculations at Point GETY05				
Flow = 0.46 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	11.31	43.4	0.45	1.7
Mn	3.09	11.9	0.53	2.0
Al	12.71	48.7	0.25	1.0
Acidity	170.03	652.3	0.00	0.0
Alkalinity	0.00	0.0		

Table C11. Calculation of Load Reduction Necessary at Point GETY05				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	43.4	11.9	48.7	652.3
Allowable Load = TMDL	1.7	2.0	1.0	0.0
Load Reduction	41.7	9.9	47.7	652.3
Total % Reduction	96	83	98	100

Waste Load Allocation – Millwood Development, Inc., Slickville site, TP8

The Millwood Development, Inc., SMP 65880106, has nine permitted treatment ponds located within the permitted area. TP8, located on the map in Attachment A, discharges to Getty Run upstream of GETY07. The waste load allocation for TP8 was calculated as described in the *Method to Quantify Treatment Pond Pollutant Loading* section of the report. The limit for aluminum in the permit is 1.4 mg/L, which is more stringent than the standard 2.0 mg/L. This value is used for the computations. The following table shows the waste load allocation for the discharge.

Table C12. Waste Load Allocations Slickville Site			
Parameter	**Monthly Avg. Allowable Conc. (mg/L)**	**Average Flow (MGD)**	**Allowable Load (lbs/day)**
TP8			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04

TMDL Calculations - Sampling Point GETY07, Getty Run upstream of Unnamed Tributary 43272

The TMDL for sampling point GETY07 consists of a waste load allocation to one permitted discharge, TP8, and a load allocation to the area between sample points GETY04, GETY05, and GETY07. The load allocation for this stream segment was computed using water-quality sample data collected at point GETY07. The average flow 2.10 MGD, measured at the point, is used for these computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1999 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point GETY07 shows pH ranging between 2.8 and 3.0; pH will be addressed as part of this TMDL because of the mining impacts.

Affects from the 56 and 60 preexisting discharges, located on the Millwood Development, Inc., Slickville site, are incorporated into the LA portion of the TMDL for point GETY07.

Table C13. TMDL Calculations at Point GETY07				
Flow = 2.10 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	33.94	595.5	0.68	11.9
Mn	7.73	135.5	0.54	9.5
Al	34.07	597.8	0.34	6.0
Acidity	392.34	6883.4	0.00	0.0
Alkalinity	0.00	0.0		

The calculated load reductions for all the loads that enter point GETY07 must be accounted for in the calculated reductions at sample point GETY07 shown is Table C14. A comparison of measured loads between points GETY04, GETY05, and GETY07 shows that there is a loss in load for all parameters indicated by the negative numbers in the second row of Table C14. This indicates that instream processes, such as settling, are taking place within the segment. To determine the total segment load, the percent decrease in existing loads between GETY04, GETY05, and GETY07 is applied to the upstream loads entering the segment. For metals the allowable load at GETY07 is less than the upstream loads entering the segment, which results in a load reduction for the segment. It is assumed that once allocations at upstream points are met, the TMDL at GETY07 will also be met.

Table C14. Calculation of Load Reduction Necessary at Point GETY07

	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	595.5	135.5	597.8	6883.4
Difference in Existing Load (GETY04, GETY05, & GETY07)	-22.3	-1.4	-5.3	-477.9
Load tracked from GETY04 & GETY05	13.2	12.0	6.5	0.0
Percent loss due to instream process	4	1	1	6
Percent load tracked from GETY04 & GETY05	96	99	99	94
Total Load tracked between points GETY04, GETY05 & GETY07	12.7	11.9	6.5	0.0
Allowable Load at GETY07	11.9	9.5	6.0	0.0
WLA (TP8)	0.1	0.1	0.1	0.0
Remaining Allowable Load at GETY07	11.8	9.4	5.9	0.0
Load Reduction at GETY07	0.9	2.5	0.6	0.0
% Reduction required at GETY07	7	21	9	0

TMDL Calculations - Sample Point GETY06, mouth of Unnamed Tributary 43272

The TMDL for sample point GETY06 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point GETY06. The average flow of 0.44 MGD, measured at point GETY06, is used for these computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1999 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point GETY06 shows pH ranging between 2.9 and 3.2; pH will be addressed as part of this TMDL because of the mining impacts.

Table C15. TMDL Calculations at Point GETY06

Flow = 0.44 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	20.32	75.4	0.61	2.3
Mn	4.99	18.5	0.50	1.9
Al	22.03	81.7	0.22	0.8
Acidity	278.77	1034.5	0.00	0.0
Alkalinity	0.00	0.0		

Table C16. Calculation of Load Reduction Necessary at Point GETY06				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	75.4	18.5	81.7	1034.5
Allowable Load	2.3	1.9	0.8	0.0
Load Reduction	73.1	16.6	80.9	1034.5
% Reduction required	97	90	99	100

TMDL Calculations - Sampling Point GETY08, Getty Run upstream of Unnamed Tributary 43261

The TMDL for sampling point GETY08 consists of a load allocation of the area between sample points GETY07, GETY06, and GETY08. The load allocation for this stream segment was computed using water-quality sample data collected at point GETY08. The average flow of 2.14 MGD, measured at the point, is used for these computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1999 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point GETY08 shows pH ranging between 2.8 and 3.1; pH will be addressed as part of this TMDL because of the mining impacts.

Table C17. TMDL Calculations at Point GETY08				
Flow = 2.14 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	29.21	520.7	0.58	10.4
Mn	7.00	124.8	0.56	10.0
Al	30.66	546.4	0.31	5.5
Acidity	365.60	6515.8	0.00	0.0
Alkalinity	0.00	0.0		

The calculated load reductions for all the loads that enter point GETY08 must be accounted for in the calculated reductions at sample point GETY08 shown is Table C18. A comparison of measured loads between points GETY07, GETY06, and GETY08 shows that there is a loss in load for all parameters indicated by the negative numbers in the second row of Table C18. This indicates that instream processes, such as settling, are taking place within the segment. To determine the total segment load, the percent decrease in existing loads between GETY07, GETY06, and GETY08 is applied to the upstream loads entering the segment.

For iron the allowable load at GETY08 is less than the upstream loads entering the segment, resulting in a load reduction for the segment. It is assumed that once allocations at upstream points are met, the TMDL at GETY08 will also be met.

Table C18. Calculation of Load Reduction Necessary at Point GETY08				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	520.7	124.8	546.4	6515.8
Difference in Existing Load between GETY06, GETY07, & GETY08	-150.2	-29.3	-133.1	-1402.1
Load tracked from GETY06 & GETY07	14.2	11.4	6.8	0.0
Percent loss due to instream process	22	19	20	18
Percentage of load tracked from GETY06 & GETY07	78	81	80	82
Total Load tracked between points GETY06, GETY07, & GETY08	11.0	9.2	5.5	0.0
Allowable Load at GETY08	10.4	10.0	5.5	0.0
Load Reduction at GETY08	0.6	0.0	0.0	0.0
% Reduction required at GETY08	5	0	0	0

Waste Load Allocation – Millwood Development, Inc., Slickville site, TP1 – TP7

The Millwood Development, Inc., SMP 65880106, has nine permitted treatment ponds located within the permitted area. TP1 – TP7, located on the map in Attachment A, discharge to Getty Run upstream of GETY09. The waste load allocations for these discharges were calculated as described in the *Method to Quantify Treatment Pond Pollutant Loading* section of the report. The limit for aluminum in the permit is 1.4 mg/L, which is more stringent than the standard 2.0 mg/L. This value is used for the computations. The following table shows the waste load allocations for the discharges.

Table C19. Waste Load Allocations Slickville Site			
Parameter	**Allowable Average Monthly Conc. (mg/L)**	**Calculated Average Flow (MGD)**	**WLA (lbs/day)**
TP1			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP2			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP3			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP4			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP5			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05

Table C19. Waste Load Allocations Slickville Site			
Parameter	**Allowable Average Monthly Conc. (mg/L)**	**Calculated Average Flow (MGD)**	**WLA (lbs/day)**
Al	1.4	0.0031	0.04
TP6			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04
TP7			
Fe	3.0	0.0031	0.08
Mn	2.0	0.0031	0.05
Al	1.4	0.0031	0.04

TMDL Calculations - Sample Point GETY09, mouth of Unnamed Tributary 43261

A TMDL for GETY09 is not necessary because WQS are met for all parameters. Also, a biological assessment of the stream found it to be attaining its uses. Although a TMDL is not necessary, loads are shown because there are seven permitted discharges on the tributary. Loads from the segment are considered at the next downstream point.

The TMDL for sample point GETY09 consists of waste load allocations to seven permitted discharges and a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point GETY09. The average flow of 1.18 MGD, measured at point GETY09, is used for these computations.

This segment is attaining its uses and is not included on the 303(d) list. Sample data at point GETY09 shows pH ranging between 7.3 and 7.7; pH is not addressed as part of this TMDL.

Affects from the preexisting discharge A, located on the Millwood Development, Inc., Slickville site are incorporated into the LA portion of the TMDL for point GETY09.

Table C20. TMDL Calculations at Point GETY09				
Flow = 1.18 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	0.39	3.9	0.39	3.9
Mn	0.05	0.5	0.05	0.5
Al	0.50	4.9	0.50	4.9
Acidity	0.00	0.0	0.00	0.0
Alkalinity	71.60	707.4		

Table C21. Calculation of Load Reduction Necessary at Point GETY09				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	3.9	0.5	4.9	0.0
Allowable Load	3.9	0.5	4.9	0.0
WLA (TP1-TP7)	0.6	0.4	0.3	0.0
LA	3.3	0.1	4.6	0.0
Load Reduction	0.0	0.0	0.0	0.0
% Reduction required	0	0	0	0

TMDL Calculations - Sample Point GETY10, mouth of Unnamed Tributary 43260

A TMDL for GETY10 is not necessary. Water quality standards are met for all parameters at GETY10.

This segment was included on the 2002 PA Section 303(d) list for metals and pH impairments from AMD. Sample data at point GETY10 shows pH ranging between 7.6 and 8.0; pH is not addressed as part of this TMDL.

Table C22. TMDL Calculations at Point GETY10				
Flow = 0.34 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	0.57	1.6	0.57	1.6
Mn	0.06	0.2	0.06	0.2
Al	0.50	1.4	0.50	1.4
Acidity	0.00	0.0	0.00	0.0
Alkalinity	89.37	250.4		

Table C23. Calculation of Load Reduction Necessary at Point GETY10				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	1.6	0.2	1.4	0.0
Allowable Load	1.6	0.2	1.4	0.0
Load Reduction	0	0	0	0
% Load Reduction	0	0	0	0

TMDL calculations - Sampling Point GETY11, Getty Run upstream of Unnamed Tributary 43259

The TMDL for sampling point GETY11 consists of a load allocation of the area between sample points GETY08, GETY09, GETY10, and GETY11. The load allocation for this stream segment was computed using water-quality sample data collected at point GETY11. The average flow of 3.22 MGD, measured at the point, is used for these computations.

This segment was included on the 2002 PA Section 303(d) list for metals and pH impairments from AMD. Sample data at point GETY11 shows pH ranging between 2.8 and 3.9; pH is addressed as part of this TMDL because of the mining impacts.

Table C24. TMDL Calculations at Point GETY11				
Flow = 3.22 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	22.30	599.5	0.45	12.0
Mn	5.52	148.3	0.44	11.9
Al	24.04	646.1	0.24	6.5
Acidity	270.80	7279.4	0.00	0.0
Alkalinity	0.00	0.0		

The calculated load reductions for all the loads that enter point GETY11 must be accounted for in the calculated reductions at sample point GETY11 shown is Table C25. A comparison of measured loads between points GETY08, GETY09, GETY10, and GETY11 shows that there is additional loading entering the segment for all parameters. The total segment load is the sum of the upstream allocated loads and any additional loading within the segment.

To determine the amount of current acidity loading to the segment, the difference in existing loads is calculated. This is done by first neutralizing acidity from point GETY08 with alkalinity from points GETY09 and GETY10. The result of this is 5558.0 lbs/day ($6515.8_{acidity}$ – $707.4_{alkalinity}$ - $250.4_{alkalinity}$) of acidity from point GETY08 enters the segment. The difference between the existing load at GETY11 and the amount of acidity that passes from upstream (point GETY08) is the additional load that enters the segment (7279.4 – 5558.0 = 1721.4 lbs/day). Because the allowable load that passes from point GETY08 is 0.0 lbs/day, the 957.8 lbs/day of alkalinity from points GETY09 and GETY10 is available to neutralize acid load entering within the segment.

Table C25. Calculation of Load Reduction Necessary at Point GETY11				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	599.5	148.3	646.1	7279.4
Difference in Existing Load between GETY08, GETY09, GETY10, & GETY11	73.4	22.8	93.4	1721.4
Load tracked from GETY08, GETY09, & GETY10	15.9	9.9	11.8	0.0
Total Load tracked between points GETY08, GETY09, GETY10, & GETY11	89.2	32.7	105.2	763.6
Allowable Load at GETY11	12.0	11.9	6.5	0.0
Load Reduction at GETY11	77.2	20.8	98.7	763.6
% Reduction required at GETY11	87	64	94	100

TMDL calculations - Sample Point GETY12, mouth of Unnamed Tributary 43259

A TMDL for GETY12 is not necessary. Water quality standards are met for all parameters at GETY12.

This segment was included on the 2002 PA Section 303(d) list for metals and pH impairments from AMD.

Table C26. TMDL Calculations at Point GETY12

Flow = 0.17 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	0.38	0.5	0.38	0.5
Mn	0.07	0.1	0.07	0.1
Al	0.50	0.7	0.50	0.7
Acidity	0.00	0.0	0.00	0.0
Alkalinity	120.51	171.0		

Table C27. Calculation of Load Reduction Necessary at Point GETY12

	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	0.5	0.1	0.7	0.0
Allowable Load	0.5	0.1	0.7	0.0
Load Reduction	0.0	0.0	0.0	0.0
% Reduction required	0	0	0	0

TMDL Calculations - Sample Point GETY14, mouth of Unnamed Tributary 43258

The TMDL for sample point GETY14 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point GETY14. The average flow of 0.073 MGD, measured at point GETY14, is used for these computations.

This segment was included on the 2002 PA Section 303(d) list for metals and pH impairments from AMD. Sample data at point GETY14 shows pH ranging between 7.1 and 8.2; pH is not addressed as part of this TMDL.

TMDLs for manganese and acidity are not necessary at GETY14 because water quality standards are met for both parameters.

Table C28. TMDL Calculations at Point GETY14				
Flow = 0.073 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	0.75	0.5	0.41	0.2
Mn	0.18	0.1	0.18	0.1
Al	0.88	0.5	0.20	0.1
Acidity	0.00	0.0	0.00	0.0
Alkalinity	102.26	62.5		

Table C29. Calculation of Load Reduction Necessary at Point GETY14				
	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	0.46	0.1	0.54	0.0
Allowable Load	0.25	0.1	0.12	0.0
Load Reduction	0.21	0.0	0.42	0.0
% Load Reduction at GETY14	46	0	77	0

TMDL Calculations - Sampling Point GETY15, Mouth of Getty Run

The TMDL for sampling point GETY15 consists of a load allocation of the area between sample points GETY11, GETY12, GETY14, and GETY15. The load allocation for this stream segment was computed using water-quality sample data collected at point GETY15. The average flow of 4.90 MGD, measured at the point, is used for these computations.

This segment was included on the 2002 PA Section 303(d) list for metals and pH impairments from AMD. Sample data at point GETY15 shows pH ranging between 2.9 and 4.0; pH is addressed as part of this TMDL because of the mining impacts.

Table C30. TMDL Calculations at Point GETY15				
Flow = 4.90 MGD	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Fe	20.39	832.5	0.41	16.6
Mn	5.21	212.8	0.42	17.0
Al	23.63	965.1	0.24	9.7
Acidity	259.43	10593.6	0.00	0.0
Alkalinity	0.29	11.7		

The calculated load reductions for all the loads that enter point GETY15 must be accounted for in the calculated reductions at sample point GETY15 shown is Table C31. Points GETY11, GETY12, and GETY14 are upstream of point GETY15. The existing loads at these points are compared to the existing loads at GETY15 to determine whether load is input or lost within the segment. For this segment, there is an increase in load for all parameters. The total segment load is the sum of the upstream allocated loads and any additional loading within the segment.

To determine the amount of current acidity loading to the segment, the difference in existing loads is calculated. This is done by first neutralizing acidity from point GETY011 with alkalinity from points GETY12 and GETY14. The result of this is 7045.9 lbs/day ($7279.4_{acidity}$ – $171.0_{alkalinity}$ - $62.5_{alkalinity}$) of acidity from point GETY11 enters the segment. The difference between the existing load at GETY15 and the amount of acidity that passes from upstream (point GETY11) is the additional load that enters the segment (10593.6 – 7045.9 = 3547.7 lbs/day). Because the allowable load that passes from point GETY11 is 0.0 lbs/day, the 233.5 lbs/day of alkalinity from points GETY12 and GETY14 is available to neutralize acid load entering within the segment.

Table C31. Calculation of Load Reduction Necessary at Point GETY15

	Fe (lbs/day)	Mn (lbs/day)	Al (lbs/day)	Acidity (lbs/day)
Existing Load	832.5	212.8	965.1	10593.6
Difference in Existing Load between GETY11, GETY12, GETY14, & GETY15	232.0	64.3	317.7	3547.7
Load tracked from GETY11, GETY12, & GETY14	12.8	12.1	7.3	0.0
Total Load tracked between points GETY11, GETY12, GETY14, & GETY15	244.8	76.4	325.0	3314.2
Allowable Load at GETY15	16.6	17.0	9.7	0.0
Load Reduction at GETY15	228.2	59.4	315.3	3314.2
% Reduction required at GETY15	93	78	97	100

Margin of Safety

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

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

Seasonal Variation

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

Critical Conditions

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

Attachment D

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

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

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

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

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

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

Attachment E

Water Quality Data Used In TMDL Calculations

Sample Point	Date	Flow (gpm)	pH	Alkalinity (mg/L)	Acidity (mg/L)	Iron (mg/L)	Manganese (mg/L)	Aluminum (mg/L)
GETY01	6/25/2002	50	2.9	0	534.2	51.9	10.5	39.1
	7/29/2002	30	2.7	0	651.4	81.7	9.5	49.9
Latitude:	4/3/2003	117	2.8	0	539.6	73	8.22	41
40 27' 44"	5/12/2003	255	3	0	312	32.5	4.78	23.2
	6/5/2003	180	3	0	222.8	20.6	4.15	16.6
Longitude:	7/10/2003	138	2.9	0	371.6	41.9	7.21	28.8
79 30' 30"	8/7/2003	58	2.9	0	423.8	48.1	8.27	36.3
	Average	118.28571	2.88571	0.00000	436.48571	49.95714	7.51857	33.55714
	St Dev	80.60338	0.10690	0.00000	148.26674	21.51479	2.33859	11.38842
GETY02	6/5/2002	300	2.8	0	782.6	97.2	9.78	53.8
	7/29/2002	200	2.9	0	447.6	50.6	11.6	40.8
Latitude:	4/3/2003	862	2.8	0	441.8	41.8	11.2	40.8
40 27' 44"	5/12/2003	1000	2.9	0	372.8	32.1	8.18	30.5
	6/5/2003	496	3	0	344.8	29.9	7.74	27.5
Longitude:	7/10/2003	750	3	0	372	40.4	10.6	32.5
79 30' 53"	8/7/2003	516	3	0	391.6	37.2	10	33.8
	Average	589.14286	2.91429	0.00000	450.45714	47.02857	9.87143	37.10000
	St Dev	293.87947	0.08997	0.00000	151.22596	23.14467	1.45560	8.88857
GETY03	6/25/2002	60	2.6	0	824.8	87.1	6.94	54.5
	7/29/2002	100	2.6	0	783.2	94.3	7.79	60.4
Latitude:	4/3/2003	241	2.6	0	715.6	82.6	7.72	54.2
40 27' 44"	5/12/2003	374	2.6	0	553.8	53	5.09	37.3
	6/5/2003	340	2.7	0	463.8	43.6	4.77	30.8
Longitude:	7/10/2003	151	2.6	0	578.2	65.7	6.66	41.3
79 30' 30"	8/7/2003	84	2.6	0	632.4	64.7	6.74	47.7
	Average	192.85714	2.61429	0.00000	650.25714	70.14286	6.53000	46.60000
	St Dev	126.92311	0.03780	0.00000	130.37769	18.59237	1.18350	10.61477
GETY04	6/25/2002	450	2.8	0	599.6	50.2	8.9	42.4
	7/29/2002	320	2.8	0	524.6	48.3	9.73	45.3
Latitude:	4/3/2003	1631	2.8	0	496	44.6	9.73	44.9
40 27' 42"	5/12/2003	2718	2.9	0	367.8	28	6.31	29.9
	6/5/2003	1832	2.9	0	338.2	25.8	6.3	27.4
Longitude:	7/10/2003	1059	2.8	0	400	37.7	8.96	34.1
79 30' 04"	8/7/2003	670	2.8	0	427.4	35.4	8.85	36.6
	Average	1240.00000	2.82857	0.00000	450.51429	38.57143	8.39714	37.22857
	St Dev	867.56268	0.04880	0.00000	93.38657	9.59074	1.47659	7.20225
GETY05	6/25/2002	36	2.9	0	317.2	24.4	4.48	20.7
	7/29/2002	15	3	0	180.2	10.8	3.47	14.2
Latitude:	4/3/2003	1631	3	0	220.2	17.3	3.76	16.8
40 27' 44"	5/12/2003	213	3.2	0	130.2	8.06	2.34	10.1

Sample Point	Date	Flow (gpm)	pH	Alkalinity (mg/L)	Acidity (mg/L)	Iron (mg/L)	Manganese (mg/L)	Aluminum (mg/L)
	6/5/2003	55	3.4	0	94.2	4.07	1.7	6.04
Longitude:	7/10/2003	186	3.2	0	129.4	8.88	3.15	10.9
79 30' 06"	8/7/2003	100	3.5	0	118.8	5.67	2.74	10.2
	Average	319.42857	3.17143	0.00000	170.02857	11.31143	3.09143	12.70571
	St Dev	583.15660	0.22147	0.00000	77.34274	7.16686	0.92611	4.89328
GETY06	6/25/2002	60	2.9	0	372.6	29.1	5.4	26
	7/29/2002	17	2.9	0	352	24.7	6.27	28.5
Latitude:	4/3/2003	458	2.9	0	298	23.8	5.23	23.7
40 27' 50"	5/12/2003	633	3.2	0	165.2	10.7	2.8	13.3
	6/5/2003	603	3.2	0	137.8	7.72	2.57	9.98
Longitude:	7/10/2003	248	2.9	0	314.4	24.5	6.5	25.7
79 29' 25"	8/7/2003	144	2.9	0	311.4	21.7	6.14	27
	Average	309.00000	2.98571	0.00000	278.77143	20.31714	4.98714	22.02571
	St Dev	255.54647	0.14639	0.00000	90.95914	7.94842	1.63906	7.30292
GETY07	6/25/2002	500	2.8	0	527.2	44.7	8.29	39.3
	7/29/2002	355	2.8	0	491.2	44	9.5	44.3
Latitude:	4/3/2003	2125	2.8	0	446	42.2	9.29	43.8
40 27' 48"	5/12/2003	2691	3	0	289.4	24.3	5.94	26.5
	6/5/2003	2346	3	0	253.8	17.9	4.59	19
Longitude:	7/10/2003	1185	2.9	0	353.4	31.7	8.07	30.5
79 29' 26"	8/7/2003	1024	2.9	0	385.4	32.8	8.4	35.1
	Average	1460.85714	2.88571	0.00000	392.34286	33.94286	7.72571	34.07143
	St Dev	926.54581	0.08997	0.00000	101.81223	10.34196	1.80315	9.35320
GETY08	6/25/2002	150	2.8	0	497.6	40.2	7.66	36.5
	7/29/2002	360	2.8	0	476	36.9	8.49	38.9
Latitude:	4/3/2003	1652	2.8	0	417.4	36.6	8.19	38.4
40 27' 43"	5/12/2003	2515	3	0	258.2	21.2	5.4	23.9
	6/5/2003	2635	3.1	0	215.6	13.8	3.91	16
Longitude:	7/10/2003	1730	2.9	0	333.2	28.5	7.57	28.7
79 28" 54"	8/7/2003	1346	2.9	0	361.2	27.3	7.78	32.2
	Average	1484.00000	2.90000	0.00000	365.60000	29.21429	7.00000	30.65714
	St Dev	960.77035	0.11547	0.00000	105.98685	9.48954	1.68885	8.45318
GETY09	6/25/2002	125	7.7	82	0	0.3	0.052	0.5
	7/29/2002	30	7.4	78	0	0.3	0.05	0.5
Latitude:	4/3/2003	823	7.5	55	0	0.72	0.058	0.5
40 27' 40"	5/12/2003	1928	7.3	59.8	0	0.327	0.05	0.5
	6/5/2003	2130	7.5	58.4	0	0.397	0.05	0.5
Longitude:	7/10/2003	429	7.6	80.8	0	0.388	0.05	0.5
79 28' 53"	8/7/2003	294	7.4	87.2	0	0.3	0.05	0.05

Sample Point	Date	Flow (gpm)	pH	Alkalinity (mg/L)	Acidity (mg/L)	Iron (mg/L)	Manganese (mg/L)	Aluminum (mg/L)
	Average	822.71429	7.48571	71.60000	0.00000	0.39029	0.05143	0.50000
	St Dev	864.13767	0.13452	13.33017	0.00000	0.15123	0.00299	0.00000
GETY10	6/25/2002	15	8	102	0	0.491	0.05	0.5
	7/29/2002	10	7.9	144	0	0.3	0.05	0.5
Latitude:	4/3/2003	169	7.6	62.2	0	0.369	0.05	0.5
40 27' 44"	5/12/2003	593	7.6	60	0	0.58	0.054	0.5
	6/5/2003	711	7.6	49.4	0	0.742	0.083	0.5
Longitude:	7/10/2003	94	7.9	95.6	0	1.11	0.097	0.5
79 28' 50"	8/7/2003	41	7.9	112.4	0	0.372	0.05	0.5
	Average	233.28571	7.78571	89.37143	0.00000	0.56629	0.06200	0.50000
	St Dev	293.14883	0.17728	33.94003	0.00000	0.28282	0.01960	0.00000
GETY11	6/25/2002	600	2.9	0	420.4	35.2	6.82	32.1
	7/29/2002	550	2.8	0	445.6	36.6	8.63	39.9
Latitude:	4/3/2003	3392	3	0	313.2	27	6.26	29
40 27' 55"	5/12/2003	4234	3.3	0	131	11.8	3.23	13.8
	6/5/2003	3457	3.9	0	107	6.91	1.92	7.86
Longitude:	7/10/2003	1805	3.1	0	212.6	18.7	5.42	20.3
79 28' 40"	8/7/2003	1630	3	0	265.8	19.9	6.33	25.3
	Average	2238.28571	3.14286	0.00000	270.80000	22.30143	5.51571	24.03714
	St Dev	1465.78952	0.36904	0.00000	131.98465	11.24583	2.26494	10.97975
GETY12	6/25/2002	30	8.1	132	0	0.3	0.05	0.5
	7/29/2002	10	7.9	162	0	0.3	0.05	0.5
Latitude:	4/3/2003	293	7.8	97.2	0	0.3	0.05	0.5
40 27' 57"	5/12/2003	232	7.7	87.6	0	0.585	0.05	0.5
	6/5/2003	187	7.8	81	0	0.455	0.05	0.5
Longitude:	7/10/2003	39	7.8	138	0	0.418	0.109	0.5
79 28' 40"	8/7/2003	36	7.8	145.8	0	0.3	0.129	0.5
	Average	118.14286	7.84286	120.51429	0.00000	0.37971	0.06971	0.50000
	St Dev	116.01355	0.12724	31.58689	0.00000	0.11157	0.03416	0.00000
GETY13	4/3/2003	2917	3	0	317.2	28	6.12	29.8
	5/12/2003	6179	3.4	0	127.2	11.9	3.11	13.9
Latitude:	6/5/2003	7233	4	1	96.4	7.59	1.86	8.07
40 28' 19"	7/10/2003	2645	3.1	0	206.6	16.5	4.86	19.5
	8/7/2003	1609	3.1	0	264.8	20.1	6.17	24.9
Longitude:	Average	4116.60000	3.32000	0.20000	202.44000	16.81800	4.42400	19.23400
79 28' 26"	St Dev	2442.24012	0.40866	0.44721	92.17032	7.83027	1.89840	8.61541
GETY14	6/25/2002	15	8.2	114	0	0.3	0.05	0.5
	7/29/2002	8	8	128	0	0.353	0.062	0.5

Sample Point	Date	Flow (gpm)	pH	Alkalinity (mg/L)	Acidity (mg/L)	Iron (mg/L)	Manganese (mg/L)	Aluminum (mg/L)
Latitude:	4/3/2003	20	7.1	74.6	0	0.485	0.128	0.5
40 28' 20"	5/12/2003	182	7.5	83	0	1.73	0.181	2.16
	6/5/2003	64	7.7	78.8	0	1.12	0.161	1.35
Longitude:	7/10/2003	48	7.5	111.6	0	0.979	0.433	0.677
79 28' 27"	8/7/2003	19	7.6	125.8	0	0.3	0.261	0.5
	Average	50.85714	7.65714	102.25714	0.00000	0.75243	0.18229	0.88386
	St Dev	61.19485	0.35989	22.83323	0.00000	0.54506	0.13192	0.64265
GETY15	6/25/2002	800	2.9	0	408.2	32	6.31	31.2
	7/29/2002	590	2.9	0	419	32.7	8.44	39.8
Latitude:	4/3/2003	2647	3	0	305.4	26.5	6.02	28.8
40 28' 42"	5/12/2003	5292	3.4	0	125.4	11.2	3.07	13.8
	6/5/2003	9161	4	2	94.4	6.71	1.82	7.94
Longitude:	7/10/2003	3206	3.1	0	203.4	15.5	4.87	19.5
79 28' 06"	8/7/2003	2105	3	0	260.2	18.1	5.95	24.4
	Average	3400.14286	3.18571	0.28571	259.42857	20.38714	5.21143	23.63429
	St Dev	2991.83764	0.39761	0.75593	127.83273	10.20143	2.19977	10.84710

Attachment F
Comment and Response

Comments/Responses on the Getty Run Watershed TMDL

EPA Region III Comments

Comment:
Table 1 shows information from the 1996, 1998, and 2002 Section 303(d) lists and the text states these TMDLs "cover one segment on this list and two additional non-listed segments." Please identify the segments on pages 23, 24, or 25. It is unclear if there are three separate segments or if there are two segments with the 1996 segment incorporated in into a 2002 segment.

Response:
Table 1 was edited as well as the text on page 3. In addition a map of segment ids was added to Attachment A.

Comment:
It is unclear how the pre-existing discharges shown in Table 2 on page 7 are accounted for in Attachment C, TMDLs by Segment. The Attachment should identify which stream segments receive the pre-existing discharges and explain how or why they are accounted for in the calculations.

Response:
Information was added to Attachment C identifying receiving stream segments. In addition and explanation of how preexisting discharges are accounted was added to the Watershed History section of the report.

Comment:
By not separating out upstream loads entering a segment in Table 4, page 14, individual stream segments have negative LAs. For example, GETY11 receives aluminum loads from upstream points GETY08, GETY09, and GETY10 of 5.5, 4.9, and 1.4 or 11.8 lbs/day. The allowable, or TMDL, load is 6.5 lbs/day and the TMDL Report shows the LA as 6.5 lbs/day.

TMDL = sum WLA + sum LA + background (upstream)
6.5 = 0 + LA + 11.8
LA = -5.3

While the negative LA does not affect the final TMDL, the location requiring treatment is obscured. EPA believes separating upstream loads from segment LAs provides more information.

Response:
The Department does not agree with separating upstream loads.

Comment:
Page 16 and Attachment C states that a TMDL is not necessary at GETY09 (and other points) because the stream is achieving its use. While a TMDL may not be necessary for the stream

itself to meet water quality standards, a TMDL is required for the downstream stream to achieve water quality standards. In this case, the GETY09 TMDL, or allocation, is the existing load.

Response:
The Department is not assigning TMDLs to segments in which water quality standards are met because it is not necessary; however, the loads from these segments are considered at downstream points.

Comment:
Table C25, page 43, contains arithmetic errors in the "Load tracked from GETY08, GETY09 & GETY10" line. The 16.4 should be 15.9 and the 9.9 should be 10.7.

Response:
The 16.4 was incorrect and was fixed. The 9.9 is the correct number, only 9.2 lbs will pass from point GETY08 through to GETY011, not 10.0 lbs.

Comment:
Please explain why sampling point GETY13 information was neglected in the calculations.

Response:
An explanation was added to page 33.

Comment:
The TMDLs for the national tracking system at GETY15 are the sum of the WLAs and the sum of the LAs for the watershed.

Iron	Sum of WLAs	=	0.72 lbs/day
	Sum of LAs	=	20.31 lbs/day
TMDL			21.03 lbs/day
Manganese	Sum of WLAs	=	0.45 lbs/day
	Sum of LAs	=	24.23 lbs/day
TMDL			24.68 lbs/day
Aluminum	Sum of WLAs	=	0.36 lbs/day
	Sum of LAs	=	17.14 lbs/day
TMDL			17.50 lbs/day
Acidity	TMDL		0.0 lbs/day

The negative LAs were included in the above summations.

Response:
The Department does not agree with the method of summing all LAs and WLAs in the watershed for input to the national tracking system.