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**LOWER CLARION RIVER
WATERSHED TMDL
Clarion County**

For Acid Mine Drainage Affected Segments



Prepared by:

Pennsylvania Department of Environmental Protection

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TMDL¹

Lower Clarion River Watershed Clarion County, Pennsylvania

Introduction

This Total Maximum Daily Load (TMDL) calculation has been prepared for segments in the Lower Clarion River Watershed (Attachment A). These were done to address the impairments noted on the 1996 Pennsylvania Section 303(d) list of impaired waters, required under the Clean Water Act, and covers one segment on that list and additional segments on later lists/reports shown in Table 1. Metals and depressed pH in acidic discharge water from abandoned coalmines causes the impairment. The TMDL addresses the three primary metals associated with acid mine drainage (iron, manganese, aluminum), and pH.

| Table 1. 303(d) Sub-List: Lower Clarion River | | | | | | | | |
|--|-------|---------------------------------|-----------------|--------------------|----------------|-----------------|---------------------|-----------------------|
| HUC 05010005; State Water Plan (SWP) Subbasin: 17B | | | | | | | | |
| Year | Miles | Segment ID | DEP Stream Code | Stream Name | Designated Use | Data Source | Source | EPA 305(b) Cause Code |
| 1996 | 4.3 | 5360 | 49224 | Clarion River | CWF | 303 (d) List | Resource Extraction | Metals |
| 1998 | 4.06 | 5360 | 49224 | Clarion River | CWF | SWMP | AMD | Metals |
| 2002 | 3.9 | 5360 | 49224 | Clarion River | CWF | SWMP | AMD | Metals |
| 2004 | 3.9 | 5360 | 49224 | Clarion River | CWF | SWMP | AMD | Metals |
| 2004 | 1.9 | 20030826-1100-JJM | 49696 | Unt. Clarion River | CWF | SWMP | AMD | pH |
| 2004 | 0.7 | 20030826-1100-JJM | 49697 | Unt. Clarion River | CWF | SWMP | AMD | pH |
| 2004 | 0.7 | 20030814-1230-JJM | 49701 | Unt. Clarion River | CWF | SWMP | AMD | pH & Metals |
| 2004 | 1.1 | 20030814-1000-JJM | 49702 | Unt. Clarion River | CWF | SWMP | AMD | pH |
| 2004 | 1.1 | 20030814-1000-JJM | 49703 | Unt. Clarion River | CWF | SWMP | AMD | pH |
| 2006 2008 | 3.96 | 7715 (Old 5360) | | Clarion River | CWF | Integrated List | AMD | Metals |
| 2006 2008 | 8.44 | 7054 (Old 20040818-1000-JCB) | | Clarion River | CWF | Integrated List | AMD | Metals |
| 2006 2008 | 1.17 | 6227 (Old 20040408-1200-JCB) | 49225 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |

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

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|--------------|------|---------------------------------|-------|--------------------|-----|-----------------|-----|------------------------|
| 2006 2008 | 0.41 | 6227 (Old 20040408-1200-JCB) | 49226 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 0.55 | 6227 (Old 20040408-1200-JCB) | 49227 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 0.67 | 6933 (Old 20040722-1245-JCB) | 49228 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 1.06 | 6227 (Old 20040408-1200-JCB) | 49253 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 3.26 | 6227 (Old 20040408-1200-JCB) | 49255 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 0.53 | 6227 (Old 20040408-1200-JCB) | 49256 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 0.49 | 6227 (Old 20040408-1200-JCB) | 49257 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 0.37 | 6227 (Old 20040408-1200-JCB) | 49258 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 1.19 | 6227 (Old 20040408-1200-JCB) | 49258 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 1.15 | 6227 (Old 20040408-1200-JCB) | 49265 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 1.1 | 6268 (Old 20040416-1230-JCB) | 49343 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 2.49 | 6268 (Old 20040416-1230-JCB) | 49344 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 0.42 | 6268 (Old 20040416-1230-JCB) | 49345 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 0.66 | 6268 (Old 20040416-1230-JCB) | 49346 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 0.61 | 6268 (Old 20040416-1230-JCB) | 49347 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 0.78 | 6268 (Old 20040416-1230-JCB) | 49349 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 0.97 | 6265 (Old 20040416-1100-JCB) | 49403 | Unt. Clarion River | CWF | Integrated List | AMD | Metals, pH & Siltation |
| 2006 2008 | 0.76 | 6265 (Old 20040416-1100-JCB) | 49405 | Unt. Clarion River | CWF | Integrated List | AMD | Metals, pH & Siltation |
| 2006 2008 | 0.52 | 6265 (Old 20040416-1100-JCB) | 49406 | Unt. Clarion River | CWF | Integrated List | AMD | Metals, pH & Siltation |
| 2006 2008 | 1.77 | 6283 (Old 20040420-1230-JCB) | 49642 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |

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|--------------|------|---------------------------------|-------|--------------------|-----|-----------------|-----|-------------|
| 2006 2008 | 0.51 | 6283 (Old 2004020-1230-JCB) | 49644 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 1.85 | 5642 (Old 20030826-1100-JJM) | 49696 | Unt. Clarion River | CWF | Integrated List | AMD | pH |
| 2006 2008 | 0.71 | 5642 (Old 20030826-1100-JJM) | 49697 | Unt. Clarion River | CWF | Integrated List | AMD | pH |
| 2006 2008 | 0.74 | 5563 (Old 20030814-1230-JJM) | 49701 | Unt. Clarion River | CWF | Integrated List | AMD | pH & Metals |
| 2006 2008 | 2.18 | 5556 (Old 20030814-1000-JJM) | 49702 | Unt. Clarion River | CWF | Integrated List | AMD | pH |
| 2006 2008 | 1.68 | 5556 (Old 20030814-1000-JJM) | 49703 | Unt. Clarion River | CWF | Integrated List | AMD | pH |
| 2006 2008 | 3.96 | 7715 | | Clarion River | CWF | Integrated List | AMD | Metals |
| 2006 2008 | 2.83 | 6085 (Old 20031104-1125-RLH) | | Henry Run | CWF | Integrated List | AMD | Metals |
| 2006 2008 | 1.02 | 6076 (Old 20031030-1247-RLH) | 49850 | Unt. Henry Run | CWF | Integrated List | AMD | pH & Metals |
| 2008 | 1.21 | 13034 | 49631 | Unt. Clarion River | CWF | Integrated List | AMD | Metals |
| 2008 | 0.46 | 13033 | 49634 | Unt. Clarion River | CWF | Integrated List | AMD | Metals |
| 2008 | 0.71 | 13072 | 49694 | Unt. Clarion River | CWF | Integrated List | AMD | Metals |
| 2008 | 0.67 | 13029 | 49695 | Unt. Clarion River | CWF | Integrated List | AMD | Metals |
| 2008 | 0.87 | 13028 | 49698 | Unt. Clarion River | CWF | Integrated List | AMD | Metals |
| 2008 | 0.39 | 13028 | 49699 | Unt. Clarion River | CWF | Integrated List | AMD | Metals |
| 2008 | 0.48 | 13028 | 49700 | Unt. Clarion River | CWF | Integrated List | AMD | Metals |
| 2008 | 1.38 | 13033 | | Courtleys Run | CWF | Integrated List | AMD | Metals |
| 2008 | 2.5 | 13036 | | Trout Run | CWF | Integrated List | AMD | Metals |
| 2008 | 0.46 | 13036 | | Unt. Trout Run | CWF | Integrated List | AMD | Metals |
| 2008 | 1.0 | 13036 | | Unt. Trout Run | CWF | Integrated List | AMD | Metals |

Cold Water Fish = CWF

Surface Water Monitoring Program = SWMP

See Attachment D, *Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists and the 2004, 2006 and 2008 Integrated Water Quality Report.*

The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.

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Directions to the Lower Clarion River Watershed

The Lower Clarion River Watershed is approximately 546.7 square miles in area. A majority of the watershed is located in Clarion County but it is also encompasses portions of southern Forest County, western Elk County and northern Jefferson County. The Lower Clarion River is classified as a Cold Water Fishery (CWF) under Title 25 PA Code Chapter 93, Section 93.9r and can be found on the Brookville, Carmen, Clarion, Corsica, Cooksburg, Emlenton, Fryburg, Hamilton, Knox, Kossuth, Lucinda, Lynch, Marienville East, Marienville West, Munderf, New Bethlehem, Parker, Rimersburg, Sigel, Sligo, Strattanville, Summerville, Tionesta and Tylersburg 7-1/2 minute quadrangles. The Lower Clarion River (stream code – 49224) is part of the Hydrologic Unit Code 5010005 – Lower Clarion River (formerly State Water Plan 17B).

The upper reaches of the Lower Clarion River can be accessed by taking exit 78 (Sigel/Brookville, SR 36) from Interstate 80 (I-80) and traveling North on SR 36 for approximately 15.5 miles to the village of Cooksburg. The Clarion River flows under SR 36 in Cooksburg (monitoring point CR20). The mouth of the Clarion River can be accessed by taking exit 45 (Emlenton/St. Petersburg, SR 478) from I-80 and traveling west on SR 478 W for approximately 2.0 miles to the town of St Petersburg. Turn right and travel on SR 58 west for approximately 2.4 miles to the town of Foxburg. Turn left at the stop sign onto Main Street and travel for approximately 0.1 miles to the Rails-to-Trails entrance. The Clarion River flows into the Allegheny River approximately 1.5 miles downstream from this location (monitoring point CR01).

Segments addressed in this TMDL

The Lower Clarion River Watershed is affected by pollution from AMD. This pollution has caused elevated levels of metals and depressed pH in areas throughout the watershed. The sources of the AMD are seeps and discharges from areas disturbed by surface mining. All of the discharges are considered to be nonpoint sources of pollution because they are from abandoned Pre-Act mining operations or from coal companies that have settled their bond forfeitures with the Pennsylvania Department of Environmental Protection (PADEP). TMDLs have already been completed and approved by the EPA for Jones and Douglass Run, Little Mill Creek, McGourvey Run, Parks Run and Whites Run watersheds. TMDLs for the Brush Run, Deer Creek, Gathers Run, Licking Creek (southern Clarion County) and Mill Creek Watersheds have been completed and are currently being reviewed by the EPA.

There are currently twenty two surface mining permits (SMPs) issued in the Lower Clarion River Watershed. Active mining has been completed on seven of these permits; therefore, waste load allocations (WLAs) will not be assigned to these permits. Ten of the active SMPs in the watershed are non coal operations that are not required to have WLAs assigned to them. The remaining five issued SMPs are active coal mining operations; Glen O Hawbaker Inc. SMP#16000101 and SMP#16060102, Timothy A Keck SMP#16050113, RFI Energy Inc. SMP#16070103 and Amerikhol Mining Inc. SMP#16070101; therefore, these permits will be assigned WLAs. There are two industrial NPDES permits requiring metal limits in the Lower Clarion River Watershed. The St Petersburg Borough Municipal Authority NPDES PA0223026 and the Piney Creek Limited Partnership NPDES PA0103632 have industrial wasteload

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allocations included in this TMDL. All of the remaining discharges in the watershed are from abandoned mines and will be treated as non-point sources. The distinction between non-point and point sources in this case is determined on the basis of whether or not there is a responsible party for the discharge. Where there is no responsible party the discharge is considered to be a non-point source. Each segment on the 303(d) list will be addressed as a separate TMDL. These TMDLs will be expressed as long-term, average loadings. Due to the nature and complexity of mining effects on the watershed, expressing the TMDL as a long-term average gives a better representation of the data used for the calculations.

Each segment on the 303(d) list will be addressed as a separate TMDL. These TMDLs will be expressed as long-term, average loadings. Due to the nature and complexity of mining effects on the watershed, expressing the TMDL as a long-term average gives a better representation of the data used for the calculations.

The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.

This AMD TMDL document contains one or more future mining Waste Load Allocations (WLA). These WLAs were requested by Knox District Mining Office (DMO) to accommodate one or more future mining operations. This will allow speedier approval of future mining permits without the time consuming process of amending this TMDL document. All comments and questions concerning the future mining WLAs in this TMDL are to be directed to Knox DMO. Future wasteload allocations are calculated using the method described for quantifying pollutant load in Attachment C.

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

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

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.”

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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

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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 segment and each pollutant. In order for the process to be more effective, adjoining stream segments with the same source and cause listing are addressed collectively, and on a watershed basis.

Basic Steps for Determining a TMDL

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

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

Watershed Background

There are limited records available to document mining that occurred prior to the 1970's, sometimes referred to as pre-Act mining (mining that occurred prior to the passage of the Federal Surface Mining Control and Reclamation Act of 1977). Although the date of the earliest mining within this watershed is not known, environmental scars from some of these operations such as

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

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unreclaimed pits, spoil piles and post-mining discharges are evidence of a long history of mining and may contribute to the non-point source loading within the Lower Clarion River Watershed.

The majority of the mining within the Lower Clarion River watershed occurred in the 1970's and 1980's and continues on a smaller scale today. The last application for a permit to mine coal in this watershed was issued by the Department of Environmental Protection in 2007. Although the complete files for the older mining permits no longer exist, the following information gathered from microfiche and more recent surface mining permits provides an outline of the mining history in the Lower Clarion River watershed:

Table 2. Lower Clarion River Watershed Mining History.

| Company | Mine Name | Permit Number | Date Issued | Acres | Coal Seam(s) | Status |
|---------------------------|-----------------------|---------------|-------------|-------|----------------|--|
| C & K COAL CO | C & K 40 MINE | 2766BSM1 | 1/20/1966 | 294.0 | C1, LK, MK | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | C & K 40A MINE | 2766BSM2 | 2/14/1966 | 27.0 | C1 | RECLAMATION COMPLETE - INACTIVE |
| AP WEAVER & SONS | REED MINE | 2766BSM46 | 10/25/1966 | 943.0 | C1, C2, LK | ABANDONED - BOND FORFEITED - INACTIVE |
| C & K COAL CO | C & K 55 MINE | 2766BSM80 | 1/5/1967 | 584.0 | C1, LK | RECLAMATION COMPLETE - INACTIVE |
| DONALD W DEITZ | JACK BROS 9 MINE | 2768BSM25 | 1/21/1969 | 299.0 | C1, C2 | ACTIVE - BOND FORFEITED-PASSIVE TREATMENT |
| C & K COAL CO | C & K 69 MINE | 2768BSM26 | 2/25/1969 | 767.0 | C2, LK, MK | ACTIVE - BOND FORFEITED-PASSIVE TREATMENT |
| C & K COAL CO | C & K 72 MINE | 2769BSM15 | 9/11/1969 | 533.0 | C1 | ABANDONED - BOND FORFEITED - PASSIVE TREATMENT |
| ZACHERL COAL CO INC | ZACHERL 27 MINE | 2769BSM28 | 11/12/1969 | 585.0 | C1,C2 | ABANDONED - BOND FORFEITED - INACTIVE |
| C & K COAL CO | C & K 78 MINE | 3672SM18 | 2/8/1972 | 427.0 | C1, C2, LK | ABANDONED - BOND FORFEITED - PASSIVE TREATMENT |
| C & K COAL CO | C & K 77 AMENDED MINE | 3671BSM19 | 2/11/1972 | 623.0 | C1, C2 | ACTIVE - BOND FORFEITED-PASSIVE TREATMENT |
| AH & RS COAL CORP | BAKER MINE | 3672BSM1 | 3/29/1972 | 220.0 | C1, C2, LK | ABANDONED - BOND FORFEITED - INACTIVE |
| C & K COAL CO | C & K 75 MINE | 3670BSM6 | 9/22/1972 | 6.0 | C1, C2, LK, MK | RECLAMATION COMPLETE - INACTIVE |
| TERRY COAL SALES INC | STARBURG MINE | 3674SM4 | 7/2/1974 | 42.0 | LF, LK, MK, UK | RECLAMATION COMPLETE - INACTIVE |
| COLT RESOURCES INC | COLT 4 MINE | 3674SM50 | 3/8/1975 | 24.0 | C1, C2 | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | C & K 92 MINE | 3775SM5 | 5/14/1975 | 267.0 | C1, C2 | ABANDONED - BOND FORFEITED-PASSIVE TREATMENT |
| COLT RESOURCES INC | COLT 13 MINE | 3776SM14 | 5/14/1975 | 12.0 | LK | RECLAMATION COMPLETE - INACTIVE |
| JOHN N WILSON | CLARK MINE | 3775SM1 | 5/19/1975 | 34.0 | C1, C2 | ABANDONED - BOND FORFEITED - INACTIVE |
| COLT RESOURCES INC | COLT 6 MINE | 3674SM56 | 6/4/1975 | 46.0 | C2, LK | RECLAMATION COMPLETE - INACTIVE |
| LEADBETTER COAL CO | MCDUNN MINE | 3675SM13 | 7/11/1975 | 108.0 | C2, LK, MK, UK | ABANDONED - BOND FORFEITED - INACTIVE |
| C & K COAL CO | C & K 81 MINE | 3673SM15 | 9/15/1975 | 197.0 | LK, MK | ABANDONED - BOND FORFEITED - PASSIVE TREATMENT |
| CLARION FOSSIL FUELS CORP | FOSSIL FUELS 1 MINE | 3675SM34 | 11/6/1975 | 41.0 | LK, MK, UK | ABANDONED - BOND FORFEITED - INACTIVE |
| WOODROW W YEANEY SR | YEANEY 1 MINE | 3675SM45 | 1/6/1976 | 175.0 | LK | ABANDONED - BOND FORFEITURE-RECLAIMED |
| CA MCCAULEY | MCCAULEY 1 MINE | 3775SM25 | 1/30/1976 | 36.0 | LK, MK, UK | RECLAMATION COMPLETE - INACTIVE |
| ZACHERL COAL CO INC | ZACHERL 34 MINE | 3675SM51 | 2/2/1976 | 92.0 | C1, C2 | ABANDONED - BOND FORFEITED - INACTIVE |
| C & K COAL CO | C & K 104 MINE | 3675SM52 | 2/4/1976 | 193.0 | LK, MK | RECLAMATION COMPLETE - |

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|-------------------------|-----------------------------|----------|------------|-------|--------------------|--|
| | | | | | | INACTIVE |
| C & K COAL CO | C & K 117 MINE | 3676SM33 | 2/12/1976 | 65.0 | C1, LK | RECLAMATION COMPLETE - INACTIVE |
| INGRAM COAL CO | INGRAM 2 MINE | 3675SM58 | 2/19/1976 | 122.0 | C1, C2, LK | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | C & K 103 MINE | 3775SM28 | 2/26/1976 | 198.0 | C1, C2, UK | ABANDONED - BOND FORFEITED - PASSIVE TREATMENT |
| DONALD W DEITZ | DEITZ 5 MINE | 3675SM25 | 6/8/1976 | 268.0 | C1, C2, LK, MK, UK | ABANDONED - BOND FORFEITED - INACTIVE |
| THOMAS E SIEGEL | RHONEMUS MINE | 3776SM1 | 6/15/1976 | 54.0 | C1, C2 | RECLAMATION COMPLETE - INACTIVE |
| ZACHERL COAL CO INC | FOX STRIP MINE | 3675SM39 | 6/16/1976 | 32.0 | LK, MK | ABANDONED - BOND FORFEITED - INACTIVE |
| MAUERSBERG COAL CO | HAMLER MINE | 3675SM38 | 6/23/1976 | 295.8 | | ABANDONED - BOND FORFEITED - INACTIVE |
| HAROLD A SIEGEL COAL CO | SIEGEL 20 MINE | 3675SM72 | 8/25/1976 | 238.0 | C1, C2, LK | RECLAMATION COMPLETE - INACTIVE |
| COLT RESOURCES INC | COLT 2 MINE | 3774SM22 | 2/7/1977 | 49.0 | C2 | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | C & K 125 MINE | 3777SM5 | 2/14/1977 | 267.0 | C1, C2, LK | RECLAMATION COMPLETE - INACTIVE |
| GLACIAL MINERALS INC | STRATTANVILLE MINE | 3676SM39 | 4/8/1977 | 154.0 | LK, MK | ABANDONED - BOND FORFEITED - INACTIVE |
| C & K COAL CO | C & K 63 MINE | 3677SM26 | 6/13/1977 | 536.0 | C2, LK, MK, LF | RECLAMATION COMPLETE - INACTIVE |
| COLT RESOURCES INC | COLT 22 MINE | 3776SM13 | 7/14/1977 | 147.0 | C2 | ACTIVE - RECLAIMED/CHEMICAL TREATMENT |
| GLACIAL MINERALS INC | MORRISON MINE | 3777SM11 | 9/11/1977 | 95.0 | C1, C2 | ABANDONED - BOND FORFEITED - INACTIVE |
| COLT RESOURCES INC | BEVERIDGE 2 MINE | 3677SM10 | 9/22/1977 | 174.0 | C1, C2, LK, MK, UK | RECLAMATION COMPLETE - INACTIVE |
| ANCIENT SUN INC | ANCIENT SUN 4 MINE | 3776SM5 | 9/28/1977 | 120.0 | C1, C2 | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | C & K 137 MINE | 3677SM39 | 3/1/1978 | 275.0 | C1, C2, LK | RECLAMATION COMPLETE - INACTIVE |
| HAROLD A SIEGEL COAL CO | SIEGEL 21 MINE | 3677SM40 | 4/3/1978 | 109.0 | C1, C2, LK | RECLAMATION COMPLETE - INACTIVE |
| CHERNICKY COAL CO INC | BECK MINE | 3778BC11 | 9/21/1978 | 307.0 | C1 | ABANDONED - BOND FORFEITED - INACTIVE |
| C & K COAL CO | OLD EMLENTON LIMESTONE MINE | 1679106 | 2/14/1979 | 56.0 | C1, C2, LK, MK | RECLAMATION COMPLETE - INACTIVE |
| GLACIAL MINERALS INC | SCHMADER MINE | 3778SM2 | 5/23/1979 | 77.0 | LK | RECLAMATION COMPLETE - INACTIVE |
| COLT RESOURCES INC | KOPPERS MINE | 1679101 | 10/5/1979 | 127.0 | C1,C2 | RECLAMATION COMPLETE - INACTIVE |
| CHERNICKY COAL CO INC | BROWN MINE | 1679127 | 11/16/1979 | 91.0 | LK | ABANDONED - BOND FORFEITED - INACTIVE |
| C & K COAL CO | C & K 147 MINE | 1679129 | 1/11/1980 | 20.0 | LF | RECLAMATION COMPLETE - INACTIVE |
| COLT RESOURCES INC | COLT 15 MINE | 1679133 | 1/11/1980 | 121.0 | C1 | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | C & K 59 MINE | 1679117 | 3/3/1980 | 88.0 | MK | RECLAMATION COMPLETE - INACTIVE |
| GLACIAL MINERALS INC | DITTMAN MINE | 1679121 | 3/10/1980 | 156.0 | C1, C2 | ABANDONED - BOND IN FORFEITURE |
| THOMAS E SIEGEL | RHONEMUS MINE | 1679122 | 4/10/1980 | 202.0 | C1, C2 | RECLAMATION COMPLETE - INACTIVE |
| GLACIAL MINERALS INC | REED MINE | 1679125 | 7/9/1980 | 130.0 | C1, C2 | ABANDONED - BOND FORFEITED - INACTIVE |
| C & K COAL CO | C & K 156 MINE | 16800102 | 7/15/1980 | 110.0 | C1, C2 | ABANDONED - BOND FORFEITED - PASSIVE TREATMENT |
| COLT RESOURCES INC | SHILL MINE | 1680101 | 10/23/1980 | 37.0 | C1, C2 | RECLAMATION COMPLETE - INACTIVE |
| KIT IND | KIT 4 MINE | 16810102 | 4/9/1982 | 18.0 | LK | RECLAMATION COMPLETE - INACTIVE |
| GLEN GERY CORP | STEELE MINE | 16810330 | 5/12/1982 | 76.0 | C1, C2, SANDSTONE | RECLAMATION COMPLETE - INACTIVE |
| GLACIAL MINERALS INC | MCNANY MINE | 1679104 | 7/1/1982 | 26.0 | LK | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | STAHLMAN 67 MINE | 16820127 | 7/30/1982 | 193.0 | LK, MK | RECLAMATION COMPLETE - INACTIVE |
| GLACIAL MINERALS | STOM MINE | 16810129 | 11/30/1982 | 90.0 | C1, C2 | RECLAMATION COMPLETE - |

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|----------------------------|-------------------------|----------|------------|--------|---------------------|--|
| INC | | | | | | INACTIVE |
| GLACIAL MINERALS INC | DUNKLE MINE | 16823021 | 9/6/1983 | 176.0 | C1, C2 | RECLAMATION COMPLETE - INACTIVE |
| SHAFFER MINING CORP | MONTANA MINE | 16820125 | 3/9/1984 | 26.6 | LK | ABANDONED - BOND FORFEITED - INACTIVE |
| COLT RESOURCES INC | MILLER MINE | 16830113 | 3/28/1984 | 112.5 | LK | ACTIVE - RECLAIMED/PASSIVE TREATMENT |
| GLACIAL MINERALS INC | MARTZ MINE | 16830103 | 6/1/1984 | 80.7 | LK, MK, UK | ABANDONED - BOND FORFEITED - INACTIVE |
| COLT RESOURCES INC | BEST MINE | 16820119 | 6/12/1984 | 49.1 | C1, C2 | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | GUTHRIE SAYERS MINE | 16820111 | 6/20/1984 | 172.0 | C2, C2, LK, MK | RECLAMATION COMPLETE - INACTIVE |
| DOVERSPIKE BROS COAL CO | HARVEY FAIR MINE | 16800132 | 5/6/1985 | 329.4 | C1, C2, LK | RECLAMATION COMPLETE - INACTIVE |
| GLACIAL MINERALS INC | DITTMAN 2 MINE | 16810131 | 5/31/1985 | 61.0 | C1, C2, LK | RECLAMATION COMPLETE - INACTIVE |
| THOMAS E SIEGEL | FLEMING MINE | 16803006 | 6/3/1985 | 39.0 | C1, C2 | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | HILL ESTATE MINE | 16713004 | 7/15/1985 | 304.0 | C1, C2, LK | ABANDONED - BOND FORFEITED - PASSIVE TREATMENT |
| C & K COAL CO | SMITH DYE GARRIS MINE | 16793013 | 7/18/1985 | 452.0 | LK, MK | RECLAMATION COMPLETE - INACTIVE |
| REM COAL CO INC | KEMMER MINE | 16753059 | 7/18/1985 | 962.0 | C1, C2, LK, MK | ACTIVE - RECLAIMED/PASSIVE TREATMENT |
| C & K COAL CO | MILES RHOADS MINE | 16803022 | 7/24/1985 | 169.0 | C1, C2, LK, MK, UK | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | C & K 75 MINE | 16703006 | 8/1/1985 | 1190.0 | C1, C2, LK | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | EMLENTON LIMESTONE MINE | 16793006 | 8/2/1985 | 983.0 | C1, C1, LK, MK | RECLAMATION COMPLETE - INACTIVE |
| COLT RESOURCES INC | BEVERIDGE 2 MINE | 16773010 | 8/9/1985 | 121.5 | LK, MK, UK | RECLAMATION COMPLETE - INACTIVE |
| COLT RESOURCES INC | TERWILLIGER MINE | 16813005 | 8/9/1985 | 77.0 | MK, LF | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | DEITZ 5 MINE | 16753025 | 9/27/1985 | 449.0 | C1, C2, LK, MK, UK | RECLAMATION COMPLETE - INACTIVE |
| C & K COAL CO | C & K 107 MINE | 3676SM3 | 12/29/1985 | 27.0 | C1 | RECLAMATION COMPLETE - INACTIVE |
| GLACIAL MINERALS INC | RHONEMUS MINE | 16793022 | 3/4/1986 | 162.6 | C1, C2 | RECLAMATION COMPLETE - INACTIVE |
| TERRY COAL SALES INC | YOUNG MINE | 16840110 | 8/4/1986 | 72.4 | MK, UK | RECLAMATION COMPLETE - INACTIVE |
| GLEN GERY CORP | HURRELBRINK MINE | 16860310 | 12/19/1986 | 256.0 | C1, C2, SHALE, CLAY | ACTIVE |
| C & K COAL CO | STAHLMAN 30 MINE | 3673SM1 | 8/28/1987 | 267.0 | C1, MK, UK | ABANDONED - BOND FORFEITED-PASSIVE TREATMENT |
| GLACIAL MINERALS INC | HEETER MINE | 16870104 | 12/29/1987 | 55.0 | C1, C2 | RECLAMATION COMPLETE - INACTIVE |
| COLT RESOURCES INC | LOGUE MINE | 16880101 | 7/6/1988 | 108.0 | MK, UK | RECLAMATION COMPLETE - INACTIVE |
| TDK COAL SALES INC | WEAVER MINE | 16890101 | 4/28/1989 | 50.9 | LK | RECLAMATION COMPLETE - INACTIVE |
| AMSLER OIL & GAS | AMSLER MINE | 16900803 | 2/26/1990 | 1.0 | SHALE | ACTIVE |
| TERRY COAL SALES INC | OCHS MINE | 16880104 | 2/26/1990 | 156.2 | UK, LF, UF | RECLAMATION COMPLETE - INACTIVE |
| ORIGINAL FUELS INC | MAUERSBERG MINE | 16890110 | 5/25/1990 | 175.6 | UK, LK | RECLAMATION COMPLETE - INACTIVE |
| MAF COAL & EXCAV INC | DOLBY MINE | 16900109 | 10/2/1990 | 199.2 | MK, UK | RECLAMATION COMPLETE - INACTIVE |
| ROBERT A SILVIS EXCAVATING | YEANEY FARMS MINE | 27910801 | 4/9/1991 | 4.0 | TOPSOIL, SANDSTONE | ACTIVE |
| FRED L MCCLEARY | PIT 1 MINE | 16910803 | 6/19/1991 | 3.0 | SHALE, SANDSTONE | ACTIVE |
| ORIGINAL FUELS INC | SMITH MINE | 16950101 | 6/28/1995 | 43.3 | LK, MK | RECLAMATION COMPLETE - INACTIVE |
| LOPA MINING INC | LOPA MINE | 16960801 | 3/13/1996 | 24.0 | SANDSTONE | RECLAMATION COMPLETE - INACTIVE |
| RANKIN & SON EXCAV INC | RANKIN 2 MINE | 16960803 | 7/15/1996 | 5.0 | SANDSTONE | ACTIVE |
| BROOKVILLE SVC | KRISCHELLE MINE | 16960808 | 2/5/1997 | 5.0 | SANDSTONE | ACTIVE |

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| GLENN O HAWBAKER INC | MYERS MINE | 16970307 | 5/1/1998 | 111.0 | LK, LIMESTONE | APPROVED CESSATION - ACTIVE |
| THOMAS STEHLE | THOMAS STEHLE MINE | 16982806 | 3/12/1999 | 5.0 | SANDSTONE | ACTIVE |
| GLENN O HAWBAKER INC | BEST MINE | 16000101 | 5/22/2001 | 83.6 | LK, C3, LIMESTONE, SANDSTONE | APPROVED CESSATION - ACTIVE |
| ALLEGHENY MILESTONE INC | MAIHLE MINE | 16000102 | 6/4/2001 | 38.6 | MK | STAGE 2 APPROVED |
| RFI ENERGY INC | RFI 549 MINE | 16010103 | 8/26/2002 | 136.5 | LK, MK | STAGE 2 APPROVED |
| QUALITY AGGREGATES INC | MASCHARKA MINE | 16030302 | 11/21/2003 | 130.0 | LIMESTONE | NOT STARTED |
| BEN HAL MINING CO | FARLEY MINE | 16040101 | 8/24/2004 | 29.5 | C2, SHALE, CLAY | STAGE1/REGRADED |
| ALLEGHENY MILESTONE INC | CHESTNUT RIDGE MINE | 16040102 | 11/22/2004 | 155.1 | C1, C2, LK, LIMESTONE | PRIMACY BOND FORFEITED |
| RFI ENERGY INC | CALLANDER MINE | 16050109 | 1/10/2006 | 85.0 | LK, MK | STAGE1/REGRADED |
| BEN HAL MINING CO | HUWAR MINE | 16060104 | 8/8/2006 | 16.0 | UK | STAGE1/REGRADED |
| TIMOTHY A KECK | BECK 1 MINE | 16050113 | 9/26/2006 | 19.0 | LF, SANDSTONE | ACTIVE |
| EAGLE CONTR INC | MAHLE FARM MINE | 16060808 | 5/2/2007 | 5.0 | SHALE | ACTIVE |
| GLENN O HAWBAKER INC | TEXTER MINE | 16060102 | 5/17/2007 | 29.0 | C1, C3, LK, LIMESTONE | APPROVED CESSATION - ACTIVE |
| AMERIKOHL MINING INC | ZACHERL MINE | 16060109 | 9/10/2007 | 44.0 | MK, UK | STAGE1/REGRADED |
| RFI ENERGY INC | RFI 548 NORTH MINE | 16070103 | 9/28/2007 | 145.0 | LK, MK | ACTIVE |
| AMERIKOHL MINING INC | THOMAS MINE | 16070101 | 11/8/2007 | 166.0 | LF, LK, MK, UK | NOT STARTED |
| BEN HAL MINING CO | MEGNIN MINE | 16070104 | 12/27/2007 | 30.2 | UK | STAGE1/REGRADED |
| ALLEGHENY MILESTONE INC | CHESTNUT RIDGE MINE | 16000104 | | | | PROPOSED BUT NEVER MATERIALIZED |
| ZACHERL COAL CO INC | ZACHERL PREP PLT | 365111 | | | | ABANDONED - BOND FORFEITED - INACTIVE |

During the 1970s, the Department of Environmental Resources (DER) contracted with several engineering firms to perform acid mine drainage abatement studies on watersheds throughout the state that were severely impacted by AMD under the “Operation Scarlift” land reclamation program. These studies, referred to as “Scarlift Reports,” were completed for the Deer Creek (SL-193), Licking Creek (SL-194), Mill Creek (SL-133-5), Piney Creek (SL-192) and Toby Creek (SL-191) watersheds within the Lower Clarion River watershed. Sampling and flow measurement stations were established in each watershed in order to determine the extent of pollution due to acid mine drainage and to determine the abatement measures necessary to reduce the pollution load. Recommendations included the sealing of deep mines, reclamation and revegetation of abandoned strip mines, plugging of abandoned flowing oil and gas wells, and better management of tipples within the watersheds. Copies of these reports can be found on the Abandoned Mine Reclamation Clearing House Website at the following link: <http://www.amrclearinghouse.org/Sub/SCARLIFTReports/>

The US Army Corps of Engineers completed a study focused on abating acid mine drainage in the Clarion River Basin in 1981. Seven watersheds were identified as having degraded water quality due to abandoned mine drainage from abandoned coal mining operations and oil and gas wells. The seven watersheds identified were the East Branch Clarion River, Little Toby Creek, Mill Creek, Toby Creek, Piney Creek, Deer Creek and Licking Creek. Four alternative AMD abatement plans, along with cost estimates, were developed for the Clarion River Basin.

A majority of the watershed restoration efforts related to AMD in the Lower Clarion River watershed have been focused in the Mill Creek Watershed. Utilizing a variety of funding

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sources and partnering with various organizations, the Mill Creek Coalition has been responsible for the installation of over seventeen treatment systems in the Mill Creek watershed, some of which have been treating AMD for over 10 years. Working with Headwaters Charitable Trust as its sponsor, the Mill Creek Coalition received a Growing Greener Grant in 2004 to develop a comprehensive Operation, Maintenance, and Replacement (OM&R) plan for treatment systems in the entire Mill Creek watershed. Existing information on the aging treatment systems along with water quality data was combined with a Geographical Information System (GIS) database for data management and system assessment that will allow the Coalition to make OM&R decisions and system evaluations.

Since 2001, six TMDLs have been completed by the Knox DMO and approved by the EPA in the Lower Clarion River Watershed. They include Parks Run, Jones Run, Douglass Run, McGourvey Run, Little Mill Creek and Whites Run. TMDLs for the Brush Run, Deer Creek, Gathers Run, Licking Creek and Mill Creek and Reids Run Watersheds were recently completed and submitted to the EPA.

Through a grant received by the Department of Conservation and Natural Resources (DCNR), the Clarion River Basin Commission (CRBC) completed the Clarion River Basin Assessment in March of 2001. The purpose of the study was to benchmark water quality conditions of the Clarion River and its major tributaries and to determine the effectiveness of current water quality management. The Assessment entailed a fish tissue analysis, evaluation of the fish and macroinvertebrate populations and analysis of water quality at various locations throughout the entire watershed. Project partners included the US Army Corps of Engineers, PA Fish and Boat Commission (PAFBC), Clarion University, Willamette Industries, and PA DEP.

AMD Methodology

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

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

Allowable loads are determined for each point of interest using Monte Carlo simulation. Monte Carlo simulation is an analytical method meant to imitate real-life systems, especially when other

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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 @Risk³ 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:

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

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

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

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

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

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

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

LTA = allowable LTA source concentration in mg/l

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

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

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

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

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

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

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

TMDL Endpoints

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

Because most of the pollution sources in the watershed are nonpoint sources, the TMDLs' component makeup will be load allocations (LAs) with waste load allocations (WLAs) for permitted discharges. All allocations will be specified as long-term average daily concentrations. These long-term average concentrations are expected to meet water-quality criteria 99% of the

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time as required in PA Title 25 Chapter 96.3(c). Table 2 shows the water quality criteria for the selected parameters.

Table 2 Applicable Water Quality Criteria

| Parameter | <i>Criterion Value (mg/l)</i> | <i>Total Recoverable/Dissolved</i> |
|----------------|-----------------------------------|--|
| Aluminum (Al) | 0.75 | Total Recoverable |
| Iron (Fe) | 1.50 | Total Recoverable |
| Manganese (Mn) | 1.00 | Total Recoverable |
| pH * | 6.0-9.0 | N/A |

*The pH values shown will be used when applicable. In the case of freestone streams with little or no buffering capacity, the TMDL endpoint for pH will be the natural background water quality. These values are typically as low as 5.4 (Pennsylvania Fish and Boat Commission).

TMDL Elements (WLA, LA, MOS)

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS}$$

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

Allocation Summary

These TMDLs will focus remediation efforts on the identified numerical reduction targets for each watershed. The reduction schemes in Table 3 for each segment are based on the assumption that all upstream allocations are implemented and take into account all upstream reductions. Attachment D contains the TMDLs by segment analysis for each allocation point in a detailed discussion. As changes occur in the watershed, the TMDLs may be re-evaluated to reflect current conditions. An implicit MOS based on conservative assumptions in the analysis is included in the TMDL calculations.

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

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. Waste load allocations have also been included at some points for future mining operations. 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 from nonpoint sources within a segment in order for water quality standards to be met at the point.

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

Table 3. Lower Clarion River Watershed Summary Table

| Parameter | Existing Load (lbs/day) | TMDL Allowable Load (lbs/day) | WLA (lbs/day) | LA (lbs/day) | NPS Load Reduction (lbs/day) | NPS % Reduction |
|---|-------------------------|-------------------------------|---------------|--------------|------------------------------|-----------------|
| CR20 - CLARION RIVER IN COOKSBURG, UPSTREAM RT 36 BRIDGE | | | | | | |
| Aluminum (lbs/day) | 2075.11 | 2075.11 | 2.80 | 2072.31 | 0.00 | 0% |
| Iron (lbs/day) | 1245.07 | 1245.07 | 11.25 | 1233.82 | 0.00 | 0% |
| Manganese(lbs/day) | 730.44 | 730.44 | 7.50 | 722.94 | 0.00 | 0% |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| HR01 - MOUTH OF HENRY RUN | | | | | | |
| Aluminum (lbs/day) | 32.73 | 9.00 | 1.68 | 7.32 | 23.73 | 73% |
| Iron (lbs/day) | 9.07 | 9.07 | 6.75 | 2.32 | 0.00 | 0% |
| Manganese(lbs/day) | 55.46 | 7.71 | 4.50 | 3.21 | 47.75 | 86% |
| Acidity (lbs/day) | 555.38 | 38.01 | - | 38.01 | 517.37 | 93% |
| MC11 – MOUTH OF MILL CREEK | | | | | | |
| Aluminum (lbs/day) | 283.00 | 79.20 | - | 79.20 | NA | NA |
| Iron (lbs/day) | 493.20 | 138.10 | - | 138.10 | NA | NA |
| Manganese(lbs/day) | 791.30 | 79.10 | - | 79.10 | NA | NA |
| Acidity (lbs/day) | 8209.30 | 985.10 | - | 985.10 | NA | NA |
| MPA – MOUTH OF MCGOURVEY RUN | | | | | | |
| Aluminum (lbs/day) | 20.40 | 1.20 | - | 1.20 | NA | NA |
| Iron (lbs/day) | 10.00 | 1.40 | - | 1.40 | NA | NA |
| Manganese(lbs/day) | 65.60 | 2.00 | - | 2.00 | NA | NA |
| Acidity (lbs/day) | 470.00 | 402.00 | - | 402.00 | NA | NA |
| UNT32 - UNT 49702 CLARION RIVER | | | | | | |
| Aluminum (lbs/day) | 134.86 | 2.24 | 0.56 | 1.68 | 132.62 | 98% |
| Iron (lbs/day) | 184.10 | 3.54 | 2.25 | 1.29 | 180.56 | 98% |
| Manganese(lbs/day) | 151.08 | 4.00 | 1.50 | 2.50 | 147.08 | 97% |
| Acidity (lbs/day) | 1192.00 | 16.27 | - | 16.27 | 1175.73 | 99% |
| UNT28 - UNT 49698 CLARION RIVER | | | | | | |
| Aluminum (lbs/day) | 127.82 | 3.82 | 1.12 | 2.70 | 124.00 | 97% |
| Iron (lbs/day) | 115.78 | 5.44 | 4.50 | 0.94 | 110.34 | 95% |
| Manganese(lbs/day) | 186.79 | 4.50 | 3.00- | 1.50 | 182.29 | 98% |
| Acidity (lbs/day) | 1463.93 | 0.00 | - | 0.00 | 1463.93 | 100% |
| UNT35 - UNT 49696 CLARION RIVER | | | | | | |
| Aluminum (lbs/day) | 284.50 | 5.99 | 1.12 | 4.87 | 278.51 | 98% |
| Iron (lbs/day) | 67.43 | 6.60 | 4.50 | 2.10 | 60.83 | 90% |
| Manganese(lbs/day) | 216.17 | 6.22 | 3.00 | 3.22 | 209.95 | 97% |

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| Parameter | Existing Load (lbs/day) | TMDL Allowable Load (lbs/day) | WLA (lbs/day) | LA (lbs/day) | NPS Load Reduction (lbs/day) | NPS % Reduction |
|---|-------------------------|-------------------------------|---------------|--------------|------------------------------|-----------------|
| Acidity (lbs/day) | 2456.42 | 0.00 | - | 0.00 | 2456.42 | 100% |
| CR07 - CLARION RIVER IN CLARION, UPSTREAM 5TH AVENUE BRIDGE | | | | | | |
| Aluminum (lbs/day) | 2358.08 | 2358.08 | 2.80 | 2355.28 | 0.00 | 0% |
| Iron (lbs/day) | 2994.77 | 2994.77 | 11.25 | 2983.52 | 0.00 | 0% |
| Manganese(lbs/day) | 3791.80 | 3791.80 | 7.50 | 3784.30 | 0.00 | 0% |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| UNT31 - UNT 49642 CLARION RIVER | | | | | | |
| Aluminum (lbs/day) | 220.86 | 8.82 | 2.80 | 6.02 | 212.04 | 96% |
| Iron (lbs/day) | 31.02 | 12.63 | 11.25 | 1.38 | 18.39 | 59% |
| Manganese(lbs/day) | 94.67 | 9.88 | 7.50 | 2.38 | 84.79 | 90% |
| Acidity (lbs/day) | 1665.81 | 5.83 | - | 5.83 | 1659.98 | 99.7% |
| CR06 - CLARION RIVER IN CLARION, DOWNSTREAM RT.322 BRIDGE | | | | | | |
| Aluminum (lbs/day) | 2452.41 | 2452.41 | 2.80 | 2449.61 | 0.00 | 0% |
| Iron (lbs/day) | 2285.64 | 2285.64 | 11.25 | 2274.39 | 0.00 | 0% |
| Manganese(lbs/day) | 4068.55 | 4068.55 | 7.50 | 4061.05 | 0.00 | 0% |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| TR01 - TROUT RUN, APPROX 1000 FEET UPSTREAM FROM MOUTH | | | | | | |
| Aluminum (lbs/day) | 5.36 | 5.36 | 0.56 | 4.80 | 0.00 | 0% |
| Iron (lbs/day) | 5.97 | 5.97 | 2.25 | 3.72 | 0.00 | 0% |
| Manganese(lbs/day) | 2.37 | 2.37 | 1.50 | 0.87 | 0.00 | 0% |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| COR01 - COURTLEYS RUN UPSTREAM FROM MOUTH | | | | | | |
| Aluminum (lbs/day) | 36.26 | 1.16 | - | 1.16 | 35.10 | 97% |
| Iron (lbs/day) | 104.60 | 2.45 | - | 2.45 | 102.15 | 98% |
| Manganese(lbs/day) | 77.67 | 1.87 | - | 1.87 | 75.80 | 98% |
| Acidity (lbs/day) | 432.87 | 25.11 | - | 25.11 | 407.76 | 94% |
| CR05 - CLARION RIVER UPSTREAM FROM CONFLUENCE WITH PINEY CREEK | | | | | | |
| Aluminum (lbs/day) | 2492.83 | 2492.83 | 2.80 | 2490.03 | 0.00 | 0% |
| Iron (lbs/day) | 3634.55 | 261.21 | 11.25 | 249.96 | 3363.03 | 93% |
| Manganese(lbs/day) | 5102.83 | 154.38 | 7.50 | 146.88 | 4940.80 | 97% |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| PC01 - MOUTH OF PINEY CREEK | | | | | | |
| Aluminum (lbs/day) | 937.53 | 182.74 | (1.97) 2.80 | 177.97 | 754.79 | 81% |
| Iron (lbs/day) | 3812.93 | 450.91 | (1.09) 11.25 | 438.57 | 3362.02 | 88% |
| Manganese(lbs/day) | 3485.44 | 326.92 | (1.29) 7.50 | 318.13 | 3158.52 | 91% |
| Acidity (lbs/day) | 16274.29 | 709.98 | - | 709.98 | 15564.31 | 96% |
| DC01 - MOUTH OF DEER CREEK | | | | | | |
| Aluminum (lbs/day) | 618.82 | 274.92 | 2.80 | 272.12 | 343.90 | 56% |
| Iron (lbs/day) | 437.97 | 437.97 | 11.25 | 426.72 | 0.00 | 0% |
| Manganese(lbs/day) | 738.57 | 297.94 | 7.50 | 290.44 | 440.63 | 60% |
| Acidity (lbs/day) | 10833.72 | 1434.11 | - | 1434.11 | 9399.61 | 87% |

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| Parameter | Existing Load (lbs/day) | TMDL Allowable Load (lbs/day) | WLA (lbs/day) | LA (lbs/day) | NPS Load Reduction (lbs/day) | NPS % Reduction |
|--|-------------------------|-------------------------------|---------------|--------------|------------------------------|-----------------|
| UNT20 – UNT 49405 CLARION RIVER ON STATE GAME LANDS 330 | | | | | | |
| Aluminum (lbs/day) | 78.42 | 2.49 | 0.56 | 1.93 | 75.93 | 97% |
| Iron (lbs/day) | 130.96 | 4.64 | 2.25 | 2.39 | 126.32 | 96% |
| Manganese(lbs/day) | 130.81 | 4.16 | 1.50 | 2.66 | 126.65 | 97% |
| Acidity (lbs/day) | 908.41 | 10.72 | - | 10.72 | 897.69 | 99% |
| CR04 - CLARION RIVER UPSTREAM FROM CANOE RIPPLE BRIDGE | | | | | | |
| Aluminum (lbs/day) | 2897.08 | 2897.08 | 2.80 | 2894.28 | 0.00 | 0% |
| Iron (lbs/day) | 3027.44 | 3027.44 | 11.25 | 3016.19 | 0.00 | 0% |
| Manganese(lbs/day) | 8276.95 | 8276.95 | 7.50 | 8269.45 | 0.00 | 0% |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| UNT14 – UNT 49344 CLARION RIVER | | | | | | |
| Aluminum (lbs/day) | 3.85 | 3.08 | - | 3.08 | 0.77 | 20% |
| Iron (lbs/day) | 1.71 | 1.71 | - | 1.71 | 0.00 | 0% |
| Manganese(lbs/day) | 40.85 | 3.88 | - | 3.88 | 36.97 | 91% |
| Acidity (lbs/day) | 7.39 | 7.39 | - | 7.39 | 0.00 | 0% |
| CR03 - CLARION RIVER IN CALLENBERG @ RT. 58 BRIDGE | | | | | | |
| Aluminum (lbs/day) | 2950.97 | 2950.97 | 2.80 | 2948.17 | 0.00 | 0% |
| Iron (lbs/day) | 3051.31 | 3051.31 | 11.25 | 3040.06 | 0.00 | 0% |
| Manganese(lbs/day) | 6288.53 | 6288.53 | 7.50 | 6281.03 | 0.00 | 0% |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| LC1 - MOUTH OF LICKING CREEK | | | | | | |
| Aluminum (lbs/day) | 124.80 | 48.70 | - | 48.70 | NA | NA |
| Iron (lbs/day) | 645.90 | 148.60 | - | 148.60 | NA | NA |
| Manganese(lbs/day) | 1095.70 | 164.40 | - | 164.40 | NA | NA |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| UNT08 – UNT 49265 CLARION RIVER | | | | | | |
| Aluminum (lbs/day) | 1.64 | 1.64 | - | 1.64 | 0.00 | 0% |
| Iron (lbs/day) | 1.34 | 1.34 | - | 1.34 | 0.00 | 0% |
| Manganese(lbs/day) | 2.16 | 2.16 | - | 2.16 | 0.00 | 0% |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| UNT06 – 49255 CLARION RIVER | | | | | | |
| Aluminum (lbs/day) | 21.03 | 8.43 | (1.02) 1.12 | 6.29 | 12.60 | 60% |
| Iron (lbs/day) | 12.80 | 11.63 | (4.09) 4.50 | 3.04 | 1.17 | 9% |
| Manganese(lbs/day) | 41.44 | 11.32 | (2.73) 3.00 | 5.59 | 30.12 | 73% |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| UNT05 – UNT 49228 CLARION RIVER | | | | | | |
| Aluminum (lbs/day) | 4.59 | 1.10 | - | 1.10 | 3.49 | 76% |
| Iron (lbs/day) | 3.36 | 2.06 | - | 2.06 | 1.30 | 39% |
| Manganese(lbs/day) | 1.06 | 1.06 | - | 1.06 | 0.00 | 0% |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| CR02 - CLARION RIVER APPROX 5 MILES UPSTREAM FROM MOUTH | | | | | | |
| Aluminum (lbs/day) | 3139.62 | 3139.62 | (0.79) 2.80 | 3136.03 | 0.00 | 0% |

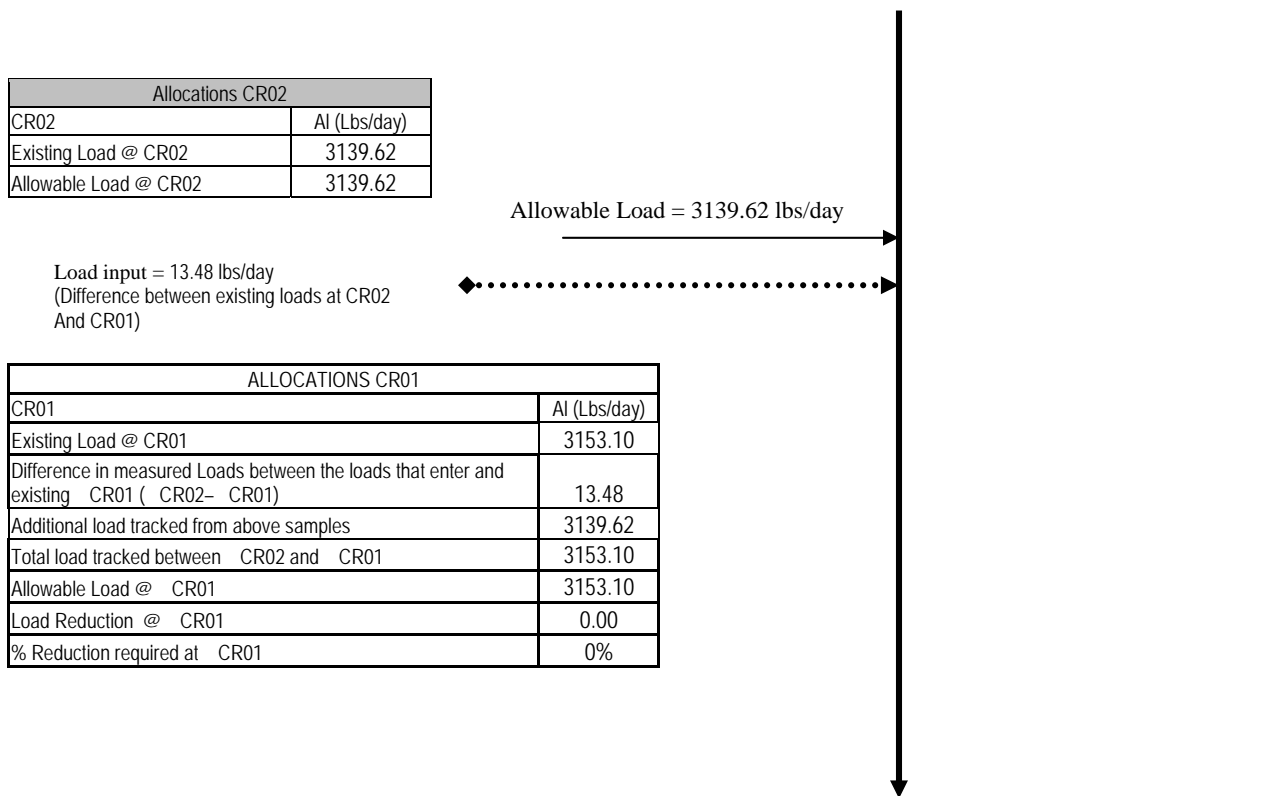
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| Parameter | Existing Load (lbs/day) | TMDL Allowable Load (lbs/day) | WLA (lbs/day) | LA (lbs/day) | NPS Load Reduction (lbs/day) | NPS % Reduction |
|--------------------------------------|-------------------------|-------------------------------|---------------|--------------|------------------------------|-----------------|
| Iron (lbs/day) | 3409.63 | 245.05 | (3.05) 11.25 | 230.75 | 2705.46 | 92%* |
| Manganese(lbs/day) | 6367.15 | 5130.26 | (2.03) 7.50 | 5120.73 | 427.64 | 8%* |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |
| CR01 - MOUTH OF CLARION RIVER | | | | | | |
| Aluminum (lbs/day) | 3153.10 | 3153.10 | 2.80 | 3150.30 | 0.00 | 0% |
| Iron (lbs/day) | 3402.19 | 3402.19 | 11.25 | 3390.94 | 0.00 | 0% |
| Manganese(lbs/day) | 7378.25 | 6102.22 | 7.50 | 6094.72 | 39.14 | 1%* |
| Acidity (lbs/day) | 0.00 | 0.00 | - | 0.00 | 0.00 | 0% |

* Takes into account load reductions from upstream sources.
 Numbers in italics are set aside for future mining operations.
 Numbers in parentheses are actual calculated WLA.

Following is an example of how the allocations, presented in Table 3, for a stream segment are calculated. For this example, aluminum allocations for CR01 of Lower Clarion River are shown. As demonstrated in the example, all upstream contributing loads are accounted for at each point. Attachment D contains the TMDLs by segment analysis for each allocation point in a detailed discussion. These analyses follow the example. Attachment A contains maps of the sampling point locations for reference.

Lower Clarion River



The allowable aluminum load tracked from C02 was 3139.62 lbs/day. The existing load at CR02 was subtracted from the existing load at CR01 to show the actual measured increase of

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aluminum load that has entered the stream between this upstream site and CR01 (13.48 lbs/day). This increased value was then added to the calculated allowable load from CR02 to calculate the total load that was tracked between CR02 and CR01 (allowable loads @ CR02 + the difference in existing load between CR02 and CR01). This total load tracked was then subtracted from the calculated allowable load at CR01 to determine the amount of load to be reduced at CR01. This total load value was found to be 3153.10 lbs/day; it was equal to the CR01 allowable load of 3153.10 lbs/day. Therefore, no reduction at CR01 is necessary.

All waste load allocations were calculated using the methodology explained in Method to Quantify Treatment Pond Pollutant Load in the Attachment C section of this report.

No required reductions of these permits are necessary at this time because there are upstream non-point sources that when reduced will meet the TMDL or there is available assimilation capacity. All necessary reductions are assigned to non-point sources.

The Amerikohl Mining, Inc. Thomas Mine (SMP#16070101, NPDES#PA0258270) has a non-standard pit size of 200 feet in length and a width of 100 feet. In addition there are two pits. This pit size was used in the Method to Quantify Treatment Pond Pollutant Load calculations described in Attachment C of this report.

The Glenn O. Hawbaker, Inc. has two permitted operations in the Lower Clarion River Watershed. The Best Mine (SMP#16000101, NPDES#PA0241695) has a non-standard pit size of 900 feet in length and a width of 550 feet. There are two pits included in the calculated waste load for this operation. The Texter Mine (SMP#16060102, NPDES#PA0258121) has non standard pit size for the three pits included in this permit. Pit sizes are 250 x 550 ft, 125 x 110 ft and 125 x 550 ft.

The RFI Energy, Inc. 548 North Mine (SMP#16070103, NPDES#PA0258326) has a non-standard pit size. There are two phases to this permit. The WLA was calculated using the maximum requested length in Phase II of 2200 ft and maximum width of 750 ft.

Timothy A. Keck, Beck 1 Mine (SMP#16050113, NPDES#PA0258075) has a non-standard pit size of 143 x 60 ft. used to calculate the WLA.

St. Petersburg Borough Municipal Water Authority, NPDES PA0223026 has an industrial wasteload allocation calculated using the metals limit in the permit and a discharge flow of 0.005 mgd.

Piney Creek Limited Partnership, PA0103632 has two industrial wasteload allocations calculated using the metals limits in the permit and a discharge flow of 0.18 mgd for outfall 001 and 0.045 mgd for outfall 401.

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Table 4. Waste Load Allocation of Permitted Discharges in Lower Clarion River Watershed

| Parameter | Allowable Average Monthly Conc. (mg/l) | Calculated Average Flow (MGD) | WLA (lbs/day) |
|---|--|-------------------------------|---------------|
| Amerikohl Mining, Inc. Thomas Mine NPDES PA0258270 | | | |
| Al | 0.75 | 0.002 | 0.025 |
| Fe | 3.0 | 0.002 | 0.099 |
| Mn | 2.0 | 0.002 | 0.066 |
| Glenn O. Hawbaker, Inc. Best Mine NPDES PA0241695 | | | |
| Al | 0.75 | 0.049 | 0.613 |
| Fe | 3.0 | 0.049 | 2.454 |
| Mn | 2.0 | 0.049 | 1.636 |
| Glenn O. Hawbaker, Inc. Texter Mine NPDES PA0258121 | | | |
| Al | 0.75 | 0.022 | 0.136 |
| Fe | 3.0 | 0.022 | 0.545 |
| Mn | 2.0 | 0.022 | 0.364 |
| RFI Energy, Inc. 548 North Mine NPDES PA0258326 | | | |
| Al | 0.75 | 0.163 | 1.022 |
| Fe | 3.0 | 0.163 | 4.090 |
| Mn | 2.0 | 0.163 | 2.727 |
| Timothy A Keck, Beck 1 Mine NPDES PA0258075 | | | |
| Al | 0.75 | 0.0008 | 0.005 |
| Fe | 3.0 | 0.0008 | 0.021 |
| Mn | 2.0 | 0.0008 | 0.014 |
| St. Petersburg Borough Municipal Water Authority NPDES PA0223026 | | | |
| Al | 1.5 | 0.005 | 0.04 |
| Fe | 2 | 0.005 | 0.05 |
| Mn | 1 | 0.005 | 0.03 |
| Piney Creek Limited Partnership NPDES PA0103632 | | | |
| 001 | | | |
| Al | 1 | 0.18 | 0.97 |
| Fe | 0.5 | 0.18 | 0.49 |
| Mn | 1 | 0.18 | 0.97 |

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| Piney Creek Limited Partnership NPDES PA0103632 | | | |
|---|---|-------|------|
| 401 | | | |
| Al | 4 | 0.045 | 0.97 |
| Fe | 2 | 0.045 | 0.49 |
| Mn | 1 | 0.045 | 0.24 |

Recommendations

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

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

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

- Partnerships between the DEP, watershed associations, local governments, environmental groups, other state agencies, federal agencies and other groups organized to reclaim abandoned mine lands are essential to achieving reclamation and abating acid mine drainage in an efficient and effective manner.
- Partnerships between AML interests and active mine operators are important and essential in reclaiming abandoned mine lands.
- Preferential consideration for the development of AML reclamation or AMD abatement projects will be given to watersheds or areas for which there is an approved rehabilitation plan. (guidance is given in Appendix B to the Comprehensive Plan).

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- Preferential consideration for the use of designated reclamation moneys will be given to projects that have obtained other sources or means to partially fund the project or to projects that need the funds to match other sources of funds.
- Preferential consideration for the use of available moneys from federal and other sources will be given to projects where there are institutional arrangements for any necessary long-term operation and maintenance costs.
- Preferential consideration for the use of available moneys from federal and other sources will be given to projects that have the greatest worth.
- Preferential consideration for the development of AML projects will be given to AML problems that impact people over those that impact property.
- No plan is an absolute; occasional deviations are to be expected.

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

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

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

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

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

There is currently no watershed group focused on the Lower Clarion River Watershed area. It is recommended that agencies work with local interests to form a watershed organization. This watershed organization could then work to implement projects to achieve the reductions recommended in this TMDL document.

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

Public Participation

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on January 31, 2009 to foster public comment on the allowable loads calculated. A public meeting was held on February 24, 2009 beginning at 9:00 am at the Knox District Office, to discuss the proposed TMDL.

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Future TMDL Modifications

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

Changes in TMDLs That May Require EPA Approval

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

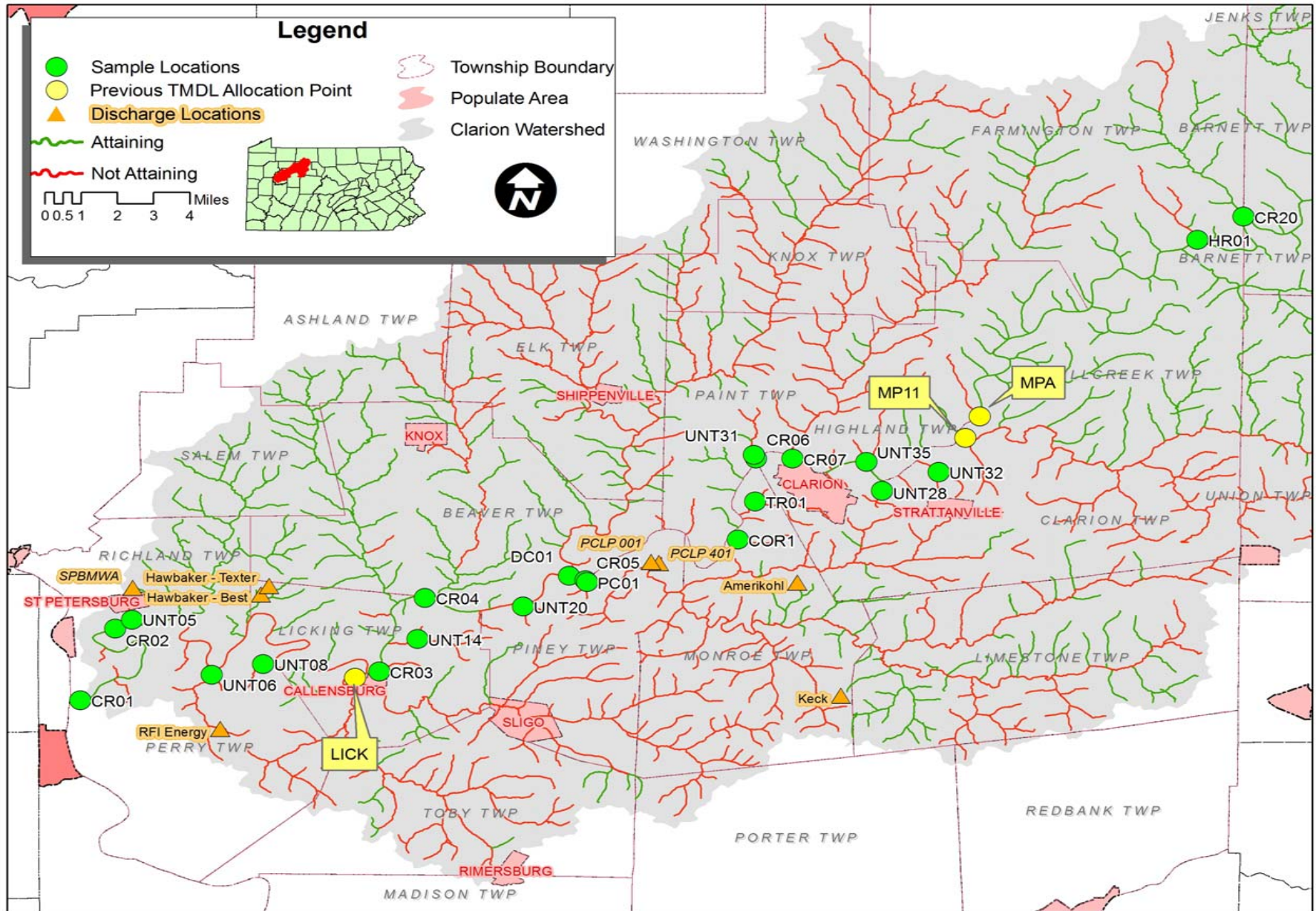
Changes in TMDLs That May Not Require EPA Approval

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

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Attachment A
Lower Clarion River Watershed Map

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Attachment B

Method for Addressing Section 303(d) Listings for pH

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Method for Addressing Section 303(d) Listings for pH

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

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

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

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

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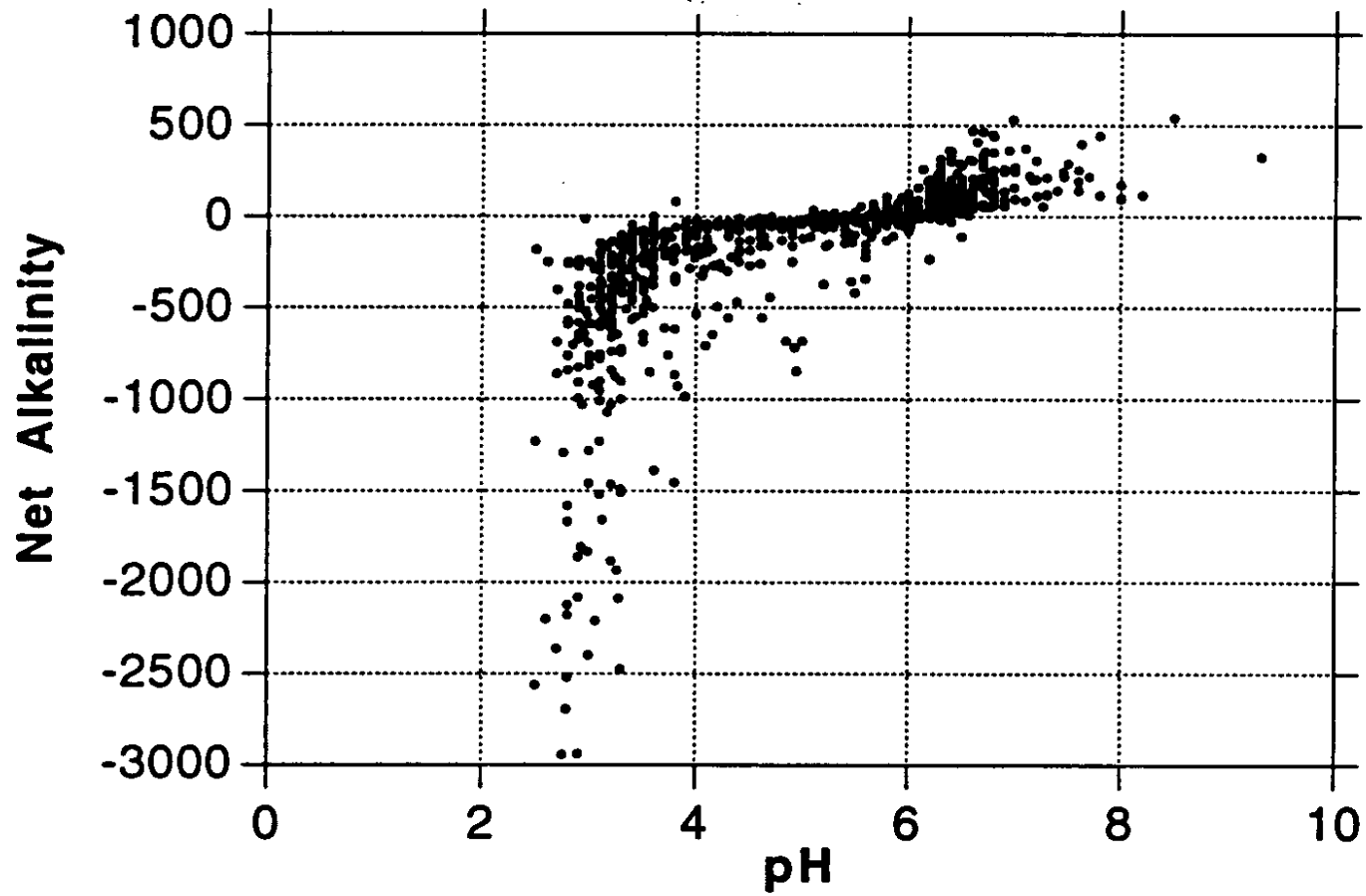


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

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Attachment C

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

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Method to Quantify Treatment Pond Pollutant Load

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

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

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

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

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

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

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

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

Standard Treatment Pond Effluent Limits:

Alkalinity > Acidity

6.0 <= pH <= 9.0

Fe < 3.0 mg/l

Mn < 2.0 mg/l

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

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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 ungraded area following the pit's progression through the site. Groundwater seepage reporting to the pit is considered negligible compared to the flow rates resulting from precipitation.

In an active mining scenario, a mine operator pumps pit water to the ponds for chemical treatment. Pit water is often acidic with dissolved metals in nature. At the treatment ponds, alkaline chemicals are added to increase the pH and encourage dissolved metals to precipitate and settle. Pennsylvania averages 41.4 inches of precipitation per year (Mid-Atlantic River Forecast Center, National Weather Service, State College, PA, 1961-1990, <http://www.dep.state.pa.us/dep/subject/hotopics/drought/PrecipNorm.htm>). A maximum pit dimension without special permit approval is 1500 feet long by 300 feet wide. Assuming that 5 percent of the precipitation evaporates and the remaining 95 percent flows to the low spot in the active pit to be pumped to the treatment ponds, results in the following equation and average flow rates for the pit area.

$$41.4 \text{ in. precip./yr} \times 0.95 \times 1 \text{ ft./12/in.} \times 1500' \times 300' / \text{pit} \times 7.48 \text{ gal/ft}^3 \times 1 \text{ yr}/365 \text{ days} \times 1 \text{ day}/24 \text{ hr.} \times 1 \text{ hr.}/60 \text{ min.} =$$
$$= 21.0 \text{ gal/min average discharge from direct precipitation into the open mining pit area.}$$

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

$$41.4 \text{ in. precip./yr} \times 3 \text{ pit areas} \times 1 \text{ ft./12/in.} \times 1500' \times 300' / \text{pit} \times 7.48 \text{ gal/ft}^3 \times 1 \text{ yr}/365 \text{ days} \times 1 \text{ day}/24 \text{ hr.} \times 1 \text{ hr.}/60 \text{ min.} \times 15$$
$$\text{in. runoff}/100 \text{ in. precipitation} =$$
$$= 9.9 \text{ gal./min. average discharge from spoil runoff into the pit area.}$$

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

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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:

$30.9 \text{ gal./min.} \times 3 \text{ mg/l} \times 0.01202 = 1.1 \text{ lbs./day}$

Allowable Manganese Waste Load Allocation:

$30.9 \text{ gal./min.} \times 2 \text{ mg/l} \times 0.01202 = 0.7 \text{ lbs./day}$

Allowable Aluminum Waste Load Allocation:

$30.9 \text{ gal./min.} \times 2 \text{ mg/l} \times 0.01202 = 0.7 \text{ lbs./day}$

(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.

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

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

Or

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

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

Derivation of the flow used in the future mining WLAs:

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

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Attachment D

TMDLs By Segment

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Lower Clarion River

The TMDL for Lower Clarion River consists of load allocations to eight sampling sites on Lower Clarion River (CR20, CR07, CR06, CR05, CR04, CR03, CR02 and CR01), nine sites on unnamed tributaries to Lower Clarion River (UNT35, UNT32, UNT31, UNT28, UNT20, UNT14, UNT08, UNT06 and UNT05). One site on Deer Creek (DC01), one site on Henry Run (HR01), one site on Courtleys Run (COR01), one site on Trout Run (TR01) and one site at the mouth of Piney Creek (PC01). Three previous TMDL streams (McGourvey Run, Mill Creek and Licking Creek) are included in this document. Sample data sets were collected in 2008. All sample points are shown on the maps included in Attachment A as well as on the loading schematic presented on the following page.

The average stream flows used for sample site calculations came from USGS StreamStats⁴. Obtaining flow measurements for the Clarion River sites proved difficult, therefore StreamStats⁴ was used. To keep consistency, StreamStats⁴ was employed for all sample sites in this Lower Clarion River TMDL.

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

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

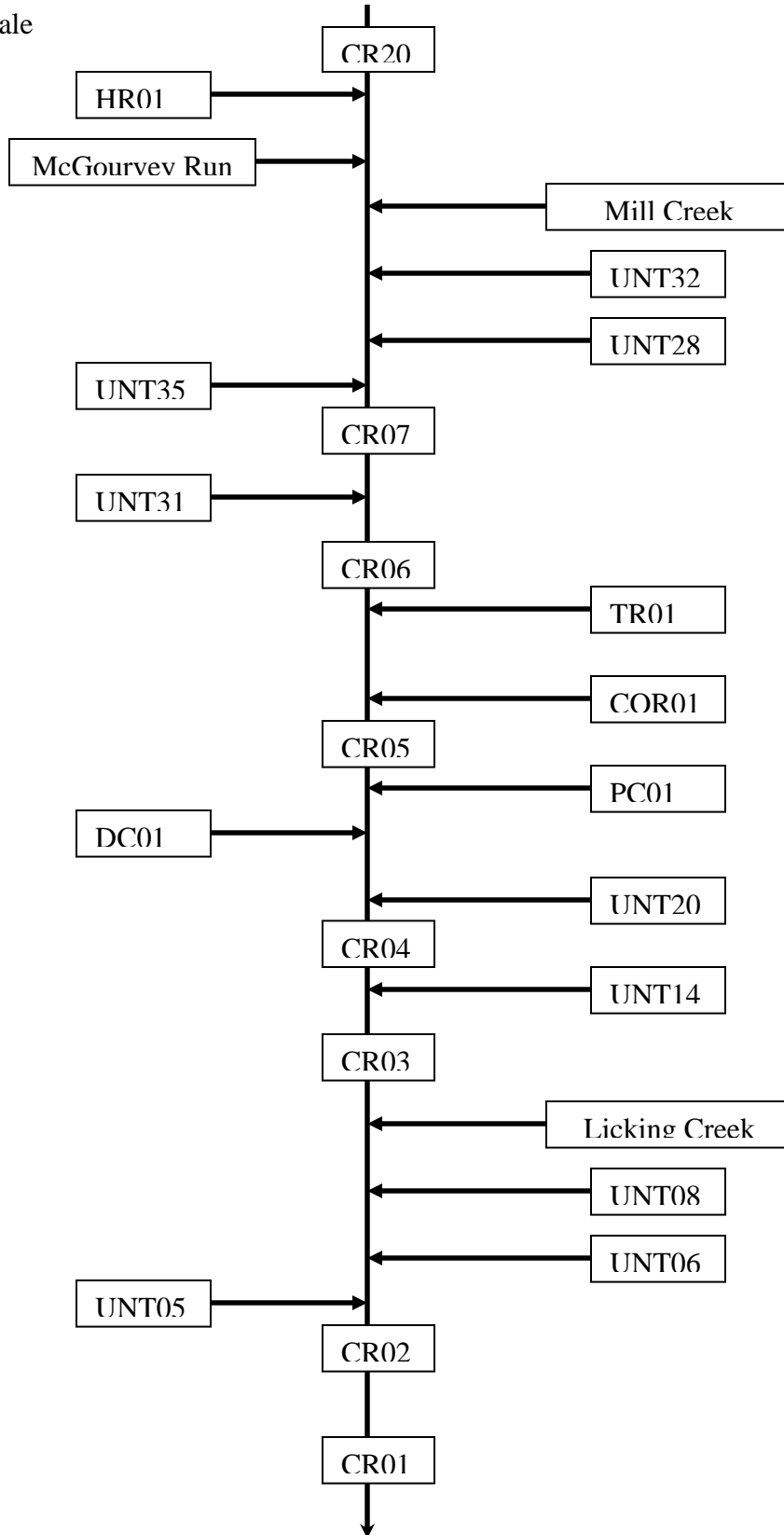
⁴ StreamStats for Pennsylvania was developed by USGS in cooperation with the Pennsylvania Department of Protection, the Federal Emergency Management Agency, the Pennsylvania State Association of Township Supervisors, and the Susquehanna River Basin Commission.

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Lower Clarion River Sampling Station Diagram

Arrows represent direction of flow

Diagram not to scale



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TMDL calculations- CR20 –Clarion River in Cooksburg, Upstream RT 36 Bridge

The TMDL for sample point CR20 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this uppermost segment of the Lower Clarion River was computed using water-quality sample data collected at point CR20. The average flow, calculated at the sampling point CR20 (995.26 MGD), is used for these computations. The allowable load allocations calculated at CR20 will directly affect the downstream point CR07.

Sample data at point CR20 shows that this uppermost segment of Lower Clarion River has a pH ranging between 6.9 and 7.4. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; although not necessary, a TMDL for acidity will be considered. No reductions for aluminum, iron, manganese and acidity have been calculated at this site.

Table D1 shows the measured and allowable concentrations and loads at CR20.

| Table D1 | Flow (gpm)= | Measured | | Allowable | |
|----------|-------------|---------------|-----------|---------------|---------|
| | | Concentration | Load | Concentration | Load |
| | 691152.00 | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.25 | 2075.11 | 0.25 | 2075.11 |
| | Iron | 0.15 | 1245.07 | 0.15 | 1245.07 |
| | Manganese | 0.09 | 730.44 | 0.09 | 730.44 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 20.50 | 170159.41 | | |

A waste load allocation for future mining was included for this segment of the Clarion River allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

| Table D2. Waste Load Allocations for Future Mining Operations | | | |
|---|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |

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| | | | |
|--------------------|------|------|------|
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 4 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 5 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- HR01 – Mouth of Henry Run

The TMDL for sample point HR01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this segment of Henry Run was computed using water-quality sample data collected at point HR01. The average flow, measured at sampling point HR01 (2.90 MGD), is used for these computations. The allowable load allocations calculated at HR01 will directly affect the downstream point CR07.

Sample data at point HR01 shows that the mouth of Henry Run has a pH ranging between 3.9 and 4.4. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; but water quality data indicates a TMDL for acidity is necessary. A TMDL for aluminum, manganese and acidity has been calculated at this site.

Table D3 shows the measured and allowable concentrations and loads at HR01. Table D4 shows the percent reduction for aluminum, manganese and acidity needed at HR01.

| Table D3 | | Measured | | Allowable | |
|-------------|------------|---------------|---------|---------------|---------|
| | | Concentration | Load | Concentration | Load |
| Flow (gpm)= | 2010.62 | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 1.36 | 32.73 | 0.37 | 9.00 |
| | Iron | 0.38 | 9.07 | 0.38 | 9.07 |
| | Manganese | 2.30 | 55.46 | 0.32 | 7.71 |
| | Acidity | 23.00 | 555.38 | 1.57 | 38.01 |
| | Alkalinity | 2.90 | 70.03 | | |

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| Table D4. Allocations HR01 | | | |
|-----------------------------|--------------|--------------|-------------------|
| HR01 | Al (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ HR01 | 32.73 | 55.46 | 555.38 |
| Allowable Load @ HR01 | 9.00 | 7.71 | 38.01 |
| Load Reduction @ HR01 | 23.73 | 47.75 | 517.37 |
| % Reduction required @ HR01 | 73% | 86% | 93% |

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

| Table D5. Waste Load Allocations for Future Mining Operations | | | |
|---|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- MC11- Previous TMDL – Mill Creek

The TMDL for Mill Creek was previously approved by EPA. Because Mill Creek flows directly into the Lower Clarion River, the existing and allowable loads from the mouth site of Mill Creek are included in this TMDL.

Table D6 shows the measured and allowable concentrations and loads at MC11.

| Table D6. Allocations Mill Creek | | | | |
|----------------------------------|--------------|--------------|--------------|-------------------|
| MC11 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ MC11 | 283.00 | 493.20 | 791.30 | 8209.30 |
| Allowable Load @ MC11 | 79.20 | 138.10 | 79.10 | 985.10 |

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TMDL calculations- MPA- Previous TMDL – McGourvey Run

The TMDL for McGourvey Run was previously approved by EPA. Because McGourvey Run flows directly into the Lower Clarion River, the existing and allowable loads from the mouth site of McGourvey Run are included in this TMDL.

Table D7 shows the measured and allowable concentrations and loads at MPA.

| Table D7. Allocations McGourvey Run | | | | |
|-------------------------------------|--------------|--------------|--------------|-------------------|
| MPA | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ MPA | 20.40 | 10.00 | 65.60 | 470.00 |
| Allowable Load @ MPA | 1.20 | 1.40 | 2.00 | 402.00 |

TMDL calculations- UNT32 –Unnamed Tributary 49702 Clarion River

The TMDL for sample point UNT32 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this unnamed tributary of the Lower Clarion River was computed using water-quality sample data collected at point UNT32. The average flow, calculated at the sampling point UNT32 (1.06 MGD), is used for these computations. The allowable load allocations calculated at UNT32 will directly affect the downstream point CR07.

Sample data at point UNT32 shows that this tributary of Lower Clarion River has a pH ranging between 3.5 and 4.9. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; although not necessary, a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D8 shows the measured and allowable concentrations and loads at UNT32. Table D9 shows the percent reduction for aluminum, iron, manganese and acidity needed at UNT32.

| Table D8 | Flow (gpm)= | Measured | | Allowable | |
|----------|-------------|---------------|---------|---------------|---------|
| | | Concentration | Load | Concentration | Load |
| | 736.03 | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 15.26 | 134.86 | 0.25 | 2.24 |
| | Iron | 20.83 | 184.10 | 0.40 | 3.54 |
| | Manganese | 17.09 | 151.08 | 0.45 | 4.00 |
| | Acidity | 134.85 | 1192.00 | 1.84 | 16.27 |
| | Alkalinity | 6.00 | 53.04 | | |

| Table D9. Allocations UNT32 | | | | |
|------------------------------|--------------|--------------|--------------|-------------------|
| UNT32 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ UNT32 | 134.86 | 184.10 | 151.08 | 1192.00 |
| Allowable Load @ UNT32 | 2.24 | 3.54 | 4.00 | 16.27 |
| Load Reduction @ UNT32 | 132.62 | 180.56 | 147.08 | 1175.73 |
| % Reduction required @ UNT32 | 98% | 98% | 97% | 99% |

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

| Table D10. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- UNT28 –Unnamed Tributary 49698 Clarion River

The TMDL for sample point UNT28 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this unnamed tributary of the Lower Clarion River was computed using water-quality sample data collected at point UNT28. The average flow, calculated at the sampling point UNT28 (0.90 MGD), is used for these computations. The allowable load allocations calculated at UNT28 will directly affect the downstream point CR07.

Sample data at point UNT28 shows that this tributary of Lower Clarion River has a pH ranging between 3.1 and 3.6. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; although not necessary, a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D11 shows the measured and allowable concentrations and loads at UNT28. Table D12 shows the percent reduction for aluminum, iron, manganese and acidity needed at UNT28.

| Table D11 | | Measured | | Allowable | |
|-----------|-------------|---------------|---------|---------------|---------|
| | | Concentration | Load | Concentration | Load |
| | Flow (gpm)= | 623.83 | | | |
| | | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 17.06 | 127.82 | 0.51 | 3.82 |
| | Iron | 15.45 | 115.78 | 0.73 | 5.44 |
| | Manganese | 24.93 | 186.79 | 0.60 | 4.50 |
| | Acidity | 195.40 | 1463.93 | 0.00 | 0.00 |
| | Alkalinity | 0.00 | 0.00 | | |

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| Table D12. Allocations UNT28 | | | | |
|------------------------------|--------------|--------------|--------------|-------------------|
| UNT28 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ UNT28 | 127.82 | 115.78 | 186.79 | 1463.93 |
| Allowable Load @ UNT28 | 3.82 | 5.44 | 4.50 | 0.00 |
| Load Reduction @ UNT28 | 124.00 | 110.34 | 182.29 | 1463.93 |
| % Reduction required @ UNT28 | 97% | 95% | 98% | 100% |

A waste load allocation for future mining was included for this unnamed tributary of the Clarion River allowing for two operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

| Table D13. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- UNT35 –Unnamed Tributary 49696 Clarion River

The TMDL for sample point UNT35 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this unnamed tributary of the Lower Clarion River was computed using water-quality sample data collected at point UNT35. The average flow, calculated at the sampling point UNT35 (1.49 MGD), is used for these computations. The allowable load allocations calculated at UNT35 will directly affect the downstream point CR07.

Sample data at point UNT35 shows that this tributary of Lower Clarion River has a pH ranging between 3.2 and 3.6. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; although not necessary, a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D14 shows the measured and allowable concentrations and loads at UNT35. Table D15 shows the percent reduction for aluminum, iron, manganese and acidity needed at UNT35.

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| Table D14 | | Measured | | Allowable | |
|-------------|------------|---------------|---------|---------------|---------|
| Flow (gpm)= | 1032.24 | Concentration | Load | Concentration | Load |
| | | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 22.95 | 284.50 | 0.48 | 5.99 |
| | Iron | 5.44 | 67.43 | 0.53 | 6.60 |
| | Manganese | 17.44 | 216.17 | 0.50 | 6.22 |
| | Acidity | 198.15 | 2456.42 | 0.00 | 0.00 |
| | Alkalinity | 0.00 | 0.00 | | |

| Table D15. Allocations UNT35 | | | | |
|------------------------------|--------------|--------------|--------------|-------------------|
| UNT35 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ UNT35 | 284.50 | 67.43 | 216.17 | 2456.42 |
| Allowable Load @ UNT35 | 5.99 | 6.60 | 6.22 | 0.00 |
| Load Reduction @ UNT35 | 278.51 | 60.83 | 209.95 | 2456.42 |
| % Reduction required @ UNT35 | 98% | 90% | 97% | 100% |

A waste load allocation for future mining was included for this unnamed tributary of the Clarion River allowing for two operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

| Table D16. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- CR07 –Clarion River in Clarion, Upstream 5th Avenue Bridge

The TMDL for sample point CR07 consists of a load allocation to all areas between CR20/HR01/UNT32/UNT28/UNT35/MC11/MPA and CR07 shown in Attachment A. The load allocation for this segment of Lower Clarion River was computed using water-quality sample data collected at point CR07. The average flow, measured at the sampling point CR07 (1130.98 MGD), is used for these computations.

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Sample data at point CR07 shows that this segment has a pH ranging between 6.9 and 7.4. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; therefore a TMDL for acidity is not necessary.

Table D17 shows the measured and allowable concentrations and loads at CR07.

| Table D17 | | Measured | | Allowable | |
|-------------|------------|---------------|-----------|---------------|---------|
| Flow (gpm)= | 1814.75 | Concentration | Load | Concentration | Load |
| | | Mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.25 | 2358.08 | 0.25 | 2358.08 |
| | Iron | 0.32 | 2994.77 | 0.32 | 2994.77 |
| | Manganese | 0.40 | 3791.80 | 0.40 | 3791.80 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 23.25 | 219301.90 | | |

The measured and allowable loading for point CR07 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points CR20/HR01/UNT32/UNT28/UNT35/MC11/MPA shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points CR20/HR01/UNT32/UNT28/UNT35/MC11/MPA and CR07 to determine a total load tracked for the segment of stream between CR20/HR01/UNT32/UNT28/UNT35/MC11/MPA and CR07. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at CR07. No reductions were necessary at CR07.

| Table D18. Allocations CR07 | | | |
|---|--------------|--------------|--------------|
| CR07 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) |
| Existing Load @ CR07 | 2358.08 | 2994.77 | 3791.80 |
| Difference in measured Loads between the loads that enter and existing CR07 | -600.34 | 870.12 | 1594.96 |
| Percent loss due calculated at CR07 | 20.3% | NA | NA |
| Additional load tracked from above samples | 2176.56 | 1409.22 | 833.97 |
| Percentage of upstream loads that reach the CR07 | 79.7% | NA | NA |
| Total load tracked between CR20/HR01/UNT32/UNT28/UNT35/MC11/MPA and CR07 | 1734.88 | 2279.34 | 2428.93 |
| Allowable Load @ CR07 | 2358.08 | 2994.77 | 3791.80 |
| Load Reduction @ CR07 | -623.20 | -715.43 | -1362.87 |
| % Reduction required @ CR07 | 0% | 0% | 0% |

A waste load allocation for future mining was included for this segment of Lower Clarion River allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

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| Table D19. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 4 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 5 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- UNT31 –Unnamed Tributary 49642 Clarion River

The TMDL for sample point UNT31 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this unnamed tributary of the Lower Clarion River was computed using water-quality sample data collected at point UNT31. The average flow, calculated at the sampling point UNT31 (2.20 MGD), is used for these computations. The allowable load allocations calculated at UNT31 will directly affect the downstream point CR06.

Sample data at point UNT31 shows that this tributary of Lower Clarion River has a pH ranging between 3.5 and 4.0. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; although not necessary, a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

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Table D20 shows the measured and allowable concentrations and loads at UNT31. Table D21 shows the percent reduction for aluminum, iron, manganese and acidity needed at UNT31.

| Table D20 | | Measured | | Allowable | |
|-------------|------------|---------------|---------|---------------|---------|
| Flow (gpm)= | 1525.92 | Concentration | Load | Concentration | Load |
| | | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 12.05 | 220.86 | 0.48 | 8.82 |
| | Iron | 1.69 | 31.02 | 0.69 | 12.63 |
| | Manganese | 5.17 | 94.67 | 0.54 | 9.88 |
| | Acidity | 90.90 | 1665.81 | 0.32 | 5.83 |
| | Alkalinity | 0.65 | 11.91 | | |

| Table D21. Allocations UNT31 | | | | |
|------------------------------|--------------|--------------|--------------|-------------------|
| UNT31 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ UNT31 | 220.86 | 31.02 | 94.67 | 1665.81 |
| Allowable Load @ UNT31 | 8.82 | 12.63 | 9.88 | 5.83 |
| Load Reduction @ UNT31 | 212.04 | 18.39 | 84.79 | 1659.98 |
| % Reduction required @ UNT31 | 96% | 59% | 90% | 99.7% |

A waste load allocation for future mining was included for this unnamed tributary of the Clarion River allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

| Table D22. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |

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| | | | |
|--------------------|------|------|------|
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 4 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 5 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- CR06 –Clarion River in Clarion, Downstream Rt. 322 Bridge

The TMDL for sample point CR06 consists of a load allocation to all areas between CR07/UNT31 and CR06 shown in Attachment A. The load allocation for this segment of Lower Clarion River was computed using water-quality sample data collected at point CR06. The average flow, measured at the sampling point CR06 (1176.22 MGD), is used for these computations.

Sample data at point CR06 shows that this segment has a pH ranging between 6.8 and 7.3. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; therefore a TMDL for acidity is not necessary.

Table D23 shows the measured and allowable concentrations and loads at CR06.

| Table D23 | | Measured | | Allowable | |
|-------------|------------|---------------|-----------|---------------|---------|
| | | Concentration | Load | Concentration | Load |
| Flow (gpm)= | 816816.00 | | | | |
| | | Mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.25 | 2452.41 | 0.25 | 2452.41 |
| | Iron | 0.23 | 2285.64 | 0.23 | 2285.64 |
| | Manganese | 0.41 | 4068.55 | 0.41 | 4068.55 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 22.50 | 220716.75 | | |

The measured and allowable loading for point CR06 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points CR07/UNT31 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points CR07/UNT31 and CR06 to determine a total load tracked for the segment of stream between CR07/UNT31 and CR06. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at CR06. No reductions were necessary at CR06.

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| Table D24. Allocations CR06 | | | |
|---|--------------|--------------|--------------|
| CR06 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) |
| Existing Load @ CR06 | 2452.41 | 2285.64 | 4068.55 |
| Difference in measured Loads between the loads that enter and existing CR06 | -126.53 | -740.15 | 182.08 |
| Percent loss due calculated at CR06 | 4.9% | 24.5% | NA |
| Additional load tracked from above samples | 2366.90 | 3007.40 | 3801.68 |
| Percentage of upstream loads that reach the CR06 | 95.1% | 75.5% | NA |
| Total load tracked between UNT31/CR07 and CR06 | 2250.77 | 2271.75 | 3983.76 |
| Allowable Load @ CR06 | 2452.41 | 2285.64 | 4068.55 |
| Load Reduction @ CR06 | -201.64 | -13.89 | -84.79 |
| % Reduction required @ CR06 | 0% | 0% | 0% |

A waste load allocation for future mining was included for this segment of Lower Clarion River allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

| Table D25. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 4 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 5 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

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TMDL calculations- TR01 –Trout Run, Approx 1000 ft Upstream from Mouth

The TMDL for sample point TR01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this tributary of the Lower Clarion River was computed using water-quality sample data collected at point TR01. The average flow, calculated at the sampling point TR01 (2.57 MGD), is used for these computations. The allowable load allocations calculated at TR01 will directly affect the downstream point CR05.

Sample data at point TR01 shows that this tributary of Lower Clarion River has a pH ranging between 7.7 and 7.9. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; therefore, a TMDL for acidity is not calculated. No reductions are necessary at TR01.

Table D26 shows the measured and allowable concentrations and loads at TR01.

| Table D26 | Flow (gpm)= | Measured | | Allowable | |
|-----------|-------------|---------------|---------|---------------|---------|
| | | Concentration | Load | Concentration | Load |
| | 1786.22 | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.25 | 5.36 | 0.25 | 5.36 |
| | Iron | 0.28 | 5.97 | 0.28 | 5.97 |
| | Manganese | 0.11 | 2.37 | 0.11 | 2.37 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 62.00 | 1330.01 | | |

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

| Table D27. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

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TMDL calculations- COR01 –Courtleys Run Upstream from Mouth

The TMDL for sample point COR01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this unnamed tributary of the Lower Clarion River was computed using water-quality sample data collected at point COR01. The average flow, calculated at the sampling point COR01 (1.00 MGD), is used for these computations. The allowable load allocations calculated at COR01 will directly affect the downstream point CR05.

Sample data at point COR01 shows that this tributary of Lower Clarion River has a pH ranging between 3.6 and 7.3. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; although not necessary, a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D28 shows the measured and allowable concentrations and loads at COR01. Table D29 shows the percent reduction for aluminum, iron, manganese and acidity needed at COR01.

| Table D28 | | Measured | | Allowable | |
|-------------|------------|---------------|---------|---------------|---------|
| Flow (gpm)= | 691.15 | Concentration | Load | Concentration | Load |
| | | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 4.37 | 36.26 | 0.14 | 1.16 |
| | Iron | 12.60 | 104.60 | 0.30 | 2.45 |
| | Manganese | 9.36 | 77.67 | 0.23 | 1.87 |
| | Acidity | 52.15 | 432.87 | 3.03 | 25.11 |
| | Alkalinity | 23.05 | 191.33 | | |

| Table D29. Allocations COR01 | | | | |
|------------------------------|--------------|--------------|--------------|-------------------|
| COR01 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ COR01 | 36.26 | 104.60 | 77.67 | 432.87 |
| Allowable Load @ COR01 | 1.16 | 2.45 | 1.87 | 25.11 |
| Load Reduction @ COR01 | 35.10 | 102.15 | 75.80 | 407.76 |
| % Reduction required @ COR01 | 97% | 98% | 98% | 94% |

TMDL calculations- CR05 –Clarion River Upstream from Confluence with Piney Creek

The TMDL for sample point CR05 consists of a load allocation to all areas between CR06/TR01/COR01 and CR05 shown in Attachment A. The load allocation for this segment of Lower Clarion River was computed using water-quality sample data collected at point CR05. The average flow, measured at the sampling point CR05 (1195.60 MGD), is used for these computations.

Sample data at point CR05 shows that this segment has a pH ranging between 6.6 and 7.1. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH;

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therefore a TMDL for acidity is not necessary. A reduction for iron and manganese has been calculated at this site.

Table D30 shows the measured and allowable concentrations and loads at CR05. Table D31 shows the percent reduction for iron and manganese needed at CR05.

| Table D30 | | Measured | | Allowable | |
|-------------|------------|---------------|-----------|---------------|---------|
| Flow (gpm)= | 830280.00 | Concentration | Load | Concentration | Load |
| | | Mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.25 | 2492.83 | 0.25 | 2492.83 |
| | Iron | 0.36 | 3634.55 | 0.03 | 261.21 |
| | Manganese | 0.51 | 5102.83 | 0.02 | 154.38 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 20.00 | 199426.61 | | |

The measured and allowable loading for point CR05 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points CR06/TR01/COR01 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points CR06/TR01/COR01 and CR05 to determine a total load tracked for the segment of stream between CR06/TR01/COR01 and CR05. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at CR05. No reductions were necessary at CR05.

| Table D31. Allocations CR05 | | | |
|---|--------------|--------------|--------------|
| CR05 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) |
| Existing Load @ CR05 | 2492.83 | 3634.55 | 5102.83 |
| Difference in measured Loads between the loads that enter and existing CR05 | -1.20 | 1238.34 | 954.24 |
| Percent loss due calculated at CR05 | 0.05% | NA | NA |
| Additional load tracked from above samples | 2458.93 | 2294.06 | 4072.79 |
| Percentage of upstream loads that reach the CR05 | 99.95% | NA | NA |
| Total load tracked between CR06/TR01/COR01 and CR05 | 2457.75 | 3532.40 | 5027.03 |
| Allowable Load @ CR05 | 2492.83 | 261.21 | 154.38 |
| Load Reduction @ CR05 | -35.08 | 3271.19 | 4872.65 |
| % Reduction required @ CR05 | 0% | 93% | 97% |

A waste load allocation for future mining was included for this segment of Lower Clarion River allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

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| Table D32. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 4 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 5 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- PC01 –Mouth of Piney Creek

The TMDL for sample point PC01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this tributary of the Lower Clarion River was computed using water-quality sample data collected at point PC01. The average flow, calculated at the sampling point PC01 (80.14 MGD), is used for these computations. The allowable load allocations calculated at PC01 will directly affect the downstream point CR04.

Sample data at point PC01 shows that this tributary of Lower Clarion River has a pH ranging between 3.8 and 5.8. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; although not necessary, a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D33 shows the measured and allowable concentrations and loads at PC01. Table D34 shows the percent reduction for aluminum, iron, manganese and acidity needed at PC01.

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| Table D33 | | Measured | | Allowable | |
|-------------|------------|---------------|----------|---------------|---------|
| Flow (gpm)= | 55651.20 | Concentration | Load | Concentration | Load |
| | | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 1.40 | 937.53 | 0.27 | 182.74 |
| | Iron | 5.71 | 3812.93 | 0.67 | 450.91 |
| | Manganese | 5.22 | 3485.44 | 0.49 | 326.92 |
| | Acidity | 24.35 | 16274.29 | 1.06 | 709.98 |
| | Alkalinity | 5.60 | 3742.75 | | |

| Table D34. Allocations PC01 | | | | |
|-----------------------------|--------------|--------------|--------------|-------------------|
| PC01 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ PC01 | 937.53 | 3812.93 | 3485.44 | 16274.29 |
| Allowable Load @ PC01 | 182.74 | 450.91 | 326.92 | 709.98 |
| Load Reduction @ PC01 | 754.79 | 3362.02 | 3158.52 | 15564.31 |
| % Reduction required @ PC01 | 81% | 88% | 91% | 96% |

Waste Load Allocations– Permitted Discharges

The Amerikohl Mining, Inc. Thomas Mine (SMP#16070101, NPDES#PA0258270) has a non-standard pit size of 200 feet in length and a width of 100 feet. In addition there are two pits. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall.

Timothy A. Keck, Beck 1 Mine (SMP#16050113, NPDES#PA0258075) has a non-standard pit size of 143 x 60 ft. used to calculate the WLA.

The Piney Creek Limited Partnership (NPDES PA0103632) has two discharge outfalls for their industrial wastewater facility.

| Table D35. Waste Load Allocation for Permitted Discharges | | | |
|---|--|-------------------------------|---------------|
| Parameter | Allowable Average Monthly Conc. (mg/l) | Calculated Average Flow (MGD) | WLA (lbs/day) |
| Amerikohl Mining, Inc. Thomas Mine NPDES PA0258270 | | | |
| Al | 0.75 | 0.002 | 0.025 |
| Fe | 3 | 0.002 | 0.099 |
| Mn | 2 | 0.002 | 0.066 |

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| Timothy A Keck, Beck 1 Mine NPDES PA0258075 | | | |
|--|------|--------|-------|
| Al | 0.75 | 0.0008 | 0.005 |
| Fe | 3 | 0.0008 | 0.021 |
| Mn | 2 | 0.0008 | 0.014 |
| Piney Creek Limited Partnership NPDES PA0103632 | | | |
| 001 | | | |
| Al | 1 | 0.18 | 0.97 |
| Fe | 0.5 | 0.18 | 0.49 |
| Mn | 1 | 0.18 | 0.97 |
| 401 | | | |
| Al | 4 | 0.045 | 0.97 |
| Fe | 2 | 0.045 | 0.49 |
| Mn | 1 | 0.045 | 0.24 |

A waste load allocation for future mining was included for Piney Creek allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

| Table D36. Waste Load Allocations for Future Mining Operations | | | |
|---|---|-----------------|-------------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 4 | | | |
| Al | 0.75 | 0.09 | 0.56 |

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| | | | |
|--------------------|------|------|------|
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 5 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- DC01 – Mouth of Deer Creek

The TMDL for sample point DC01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this segment of Deer Creek was computed using water-quality sample data collected at point DC01. The average flow, measured at sampling point DC01 (86.60 MGD), is used for these computations. The allowable load allocations calculated at DC01 will directly affect the downstream point CR04.

Sample data at point DC01 shows that the mouth of Deer Creek has a pH ranging between 4.4 and 5.1. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; but water quality data indicates a TMDL for acidity is necessary. A TMDL for aluminum, manganese and acidity has been calculated at this site.

Table D37 shows the measured and allowable concentrations and loads at DC01. Table D38 shows the percent reduction for aluminum, manganese and acidity needed at DC01.

| Table D37 | | Measured | | Allowable | |
|-------------|------------|---------------|----------|---------------|---------|
| Flow (gpm)= | 60139.20 | Concentration | Load | Concentration | Load |
| | | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.86 | 618.82 | 0.38 | 274.92 |
| | Iron | 0.61 | 437.97 | 0.61 | 437.97 |
| | Manganese | 1.02 | 738.57 | 0.41 | 297.94 |
| | Acidity | 15.00 | 10833.72 | 1.99 | 1434.11 |
| | Alkalinity | 6.12 | 4420.16 | | |

| Table D38. Allocations DC01 | | | |
|-----------------------------|--------------|--------------|-------------------|
| DC01 | Al (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ DC01 | 618.82 | 738.57 | 10833.72 |
| Allowable Load @ DC01 | 274.92 | 297.94 | 1434.11 |
| Load Reduction @ DC01 | 343.90 | 440.63 | 9399.61 |
| % Reduction required @ DC01 | 56% | 60% | 87% |

A waste load allocation for future mining was included for Deer Creek allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

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| Table D39. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 4 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 5 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- UNT20 –Unnamed Tributary 49405 Clarion River on State Game Lands 330

The TMDL for sample point UNT20 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this unnamed tributary of the Lower Clarion River was computed using water-quality sample data collected at point UNT20. The average flow, calculated at the sampling point UNT20 (0.63 MGD), is used for these computations. The allowable load allocations calculated at UNT20 will directly affect the downstream point CR04.

Sample data at point UNT20 shows that this tributary of Lower Clarion River has a pH ranging between 3.7 and 4.6. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; although not necessary, a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D40 shows the measured and allowable concentrations and loads at UNT20. Table D41 shows the percent reduction for aluminum, iron, manganese and acidity needed at UNT20.

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| Table D40 | | Measured | | Allowable | |
|-------------|------------|---------------|---------|---------------|---------|
| Flow (gpm)= | 435.34 | Concentration | Load | Concentration | Load |
| | | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 15.00 | 78.42 | 0.48 | 2.49 |
| | Iron | 25.05 | 130.96 | 0.89 | 4.64 |
| | Manganese | 25.02 | 130.81 | 0.80 | 4.16 |
| | Acidity | 173.75 | 908.41 | 2.05 | 10.72 |
| | Alkalinity | 2.60 | 13.59 | | |

| Table D41. Allocations UNT20 | | | | |
|------------------------------|--------------|--------------|--------------|-------------------|
| UNT20 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ UNT20 | 78.42 | 130.96 | 130.81 | 908.41 |
| Allowable Load @ UNT20 | 2.49 | 4.64 | 4.16 | 10.72 |
| Load Reduction @ UNT20 | 75.93 | 126.32 | 126.65 | 897.69 |
| % Reduction required @ UNT20 | 97% | 96% | 97% | 99% |

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

| Table D42. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- CR04 –Clarion River Upstream from Canoe Ripple Bridge

The TMDL for sample point CR04 consists of a load allocation to all areas between CR05/PC01/DC01/UNT20 and CR04 shown in Attachment A. The load allocation for this segment of Lower Clarion River was computed using water-quality sample data collected at point CR04. The average flow, measured at the sampling point CR04 (1389.49 MGD), is used for these computations.

Sample data at point CR04 shows that this segment has a pH ranging between 6.7 and 7.1. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; therefore a TMDL for acidity is not necessary.

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Table D43 shows the measured and allowable concentrations and loads at CR04.

| Table D43 | Flow (gpm)= | Measured | | Allowable | |
|-----------|-------------|---------------|-----------|---------------|---------|
| | | Concentration | Load | Concentration | Load |
| | 964920.00 | Mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.25 | 2897.08 | 0.25 | 2897.08 |
| | Iron | 0.26 | 3027.44 | 0.26 | 3027.44 |
| | Manganese | 0.71 | 8276.95 | 0.71 | 8276.95 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 19.10 | 221336.59 | | |

The measured and allowable loading for point CR04 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points CR05/PC01/DC01/UNT20 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points CR05/PC01/DC01/UNT20 and CR04 to determine a total load tracked for the segment of stream between CR05/PC01/DC01/UNT20 and CR04. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at CR04. No reductions were necessary at CR04.

| Table D44. Allocations CR04 | | | |
|---|--------------|--------------|--------------|
| CR04 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) |
| Existing Load @ CR04 | 2897.08 | 3027.44 | 8276.95 |
| Difference in measured Loads between the loads that enter and existing CR04 | -1230.52 | -4988.97 | -1180.70 |
| Percent loss due calculated at CR04 | 29.8% | 62.2% | 12.5% |
| Additional load tracked from above samples | 2952.98 | 1154.73 | 783.40 |
| Percentage of upstream loads that reach the CR04 | 70.2% | 37.8% | 87.5% |
| Total load tracked between CR05/PC01/DC01/UNT20 and CR04 | 2072.64 | 436.09 | 685.60 |
| Allowable Load @ CR04 | 2897.08 | 3027.44 | 8276.95 |
| Load Reduction @ CR04 | -824.44 | -2591.35 | -7591.35 |
| % Reduction required @ CR04 | 0% | 0% | 0% |

A waste load allocation for future mining was included for this segment of Lower Clarion River allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

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| Table D45. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 4 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 5 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- UNT14 –Unnamed Tributary 49344 Clarion River

The TMDL for sample point UNT14 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this unnamed tributary of the Lower Clarion River was computed using water-quality sample data collected at point UNT14. The average flow, calculated at the sampling point UNT14 (1.36 MGD), is used for these computations. The allowable load allocations calculated at UNT14 will directly affect the downstream point CR03.

Sample data at point UNT14 shows that this tributary of Lower Clarion River has a pH ranging between 6.7 and 7.2. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; although not necessary, a TMDL for acidity will be considered. A reduction for aluminum and manganese has been calculated at this site.

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Table D46 shows the measured and allowable concentrations and loads at UNT14. Table D47 shows the percent reduction for aluminum and acidity needed at UNT14.

| Table D46 | | Measured | | Allowable | |
|-------------|------------|---------------|---------|---------------|---------|
| Flow (gpm)= | 946.97 | Concentration | Load | Concentration | Load |
| | | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.34 | 3.85 | 0.27 | 3.08 |
| | Iron | 0.15 | 1.71 | 0.15 | 1.71 |
| | Manganese | 3.59 | 40.85 | 0.34 | 3.88 |
| | Acidity | 0.65 | 7.39 | 0.65 | 7.39 |
| | Alkalinity | 19.70 | 224.04 | | |

| Table D47. Allocations UNT14 | | |
|------------------------------|--------------|--------------|
| UNT14 | Al (Lbs/day) | Mn (Lbs/day) |
| Existing Load @ UNT14 | 3.85 | 40.85 |
| Allowable Load @ UNT14 | 3.08 | 3.88 |
| Load Reduction @ UNT14 | 0.77 | 36.97 |
| % Reduction required @ UNT14 | 20% | 91% |

TMDL calculations- CR03 –Clarion River in Callenberg @ Rt. 58 Bridge

The TMDL for sample point CR03 consists of a load allocation to all areas between CR04/UNT14 and CR03 shown in Attachment A. The load allocation for this segment of Lower Clarion River was computed using water-quality sample data collected at point CR03. The average flow, measured at the sampling point CR03 (1415.34 MGD), is used for these computations.

Sample data at point CR03 shows that this segment has a pH ranging between 6.8 and 7.3. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; therefore a TMDL for acidity is not necessary.

Table D48 shows the measured and allowable concentrations and loads at CR03.

| Table D48 | | Measured | | Allowable | |
|-------------|------------|---------------|-----------|---------------|---------|
| Flow (gpm)= | 982872.00 | Concentration | Load | Concentration | Load |
| | | Mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.25 | 2950.97 | 0.25 | 2950.97 |
| | Iron | 0.26 | 3051.31 | 0.26 | 3051.31 |
| | Manganese | 0.53 | 6288.53 | 0.53 | 6288.53 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 19.35 | 228405.46 | | |

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The measured and allowable loading for point CR03 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points CR04/UNT14 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points CR04/UNT14 and CR03 to determine a total load tracked for the segment of stream between CR04/UNT14 and CR03. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at CR03. No reductions were necessary at CR03.

| Table D49. Allocations CR03 | | | |
|---|--------------|--------------|--------------|
| CR03 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) |
| Existing Load @ CR03 | 2950.97 | 3051.31 | 6288.53 |
| Difference in measured Loads between the loads that enter and existing CR03 | 50.04 | 22.16 | -2029.27 |
| Percent loss due calculated at CR03 | NA | NA | 24.4% |
| Additional load tracked from above samples | 2900.16 | 3029.15 | 8280.83 |
| Percentage of upstream loads that reach the CR03 | NA | NA | 75.6% |
| Total load tracked between CR04/UNT14 and CR03 | 2950.20 | 3051.31 | 6260.58 |
| Allowable Load @ CR03 | 2950.97 | 3051.31 | 6288.53 |
| Load Reduction @ CR03 | -0.77 | 0.00 | -27.95 |
| % Reduction required @ CR03 | 0% | 0% | 0% |

A waste load allocation for future mining was included for this segment of Lower Clarion River allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

| Table D50. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 4 | | | |

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| | | | |
|--------------------|------|------|------|
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 5 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- MPA- Previous TMDL – Licking Creek

There currently is a TMDL for Licking Creek. Because Licking Creek flows directly into the Lower Clarion River, the existing and allowable loads from the mouth site of Licking Creek are included in this TMDL.

Table D51 shows the measured and allowable concentrations and loads at MPA.

| Table D51. Allocations Licking Creek | | | | |
|--------------------------------------|-----------------|-----------------|-----------------|----------------------|
| LC1 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) | Acidity (Lbs/day) |
| Existing Load @ LC1 | 124.80 | 645.90 | 1095.70 | 0.00 |
| Allowable Load @ LC1 | 48.70 | 148.60 | 164.40 | 0.00 |

TMDL calculations- UNT08 –Unnamed Tributary 49265 Clarion River

The TMDL for sample point UNT08 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this unnamed tributary of the Lower Clarion River was computed using water-quality sample data collected at point UNT08. The average flow, calculated at the sampling point UNT08 (0.79 MGD), is used for these computations. The allowable load allocations calculated at UNT08 will directly affect the downstream point CR02.

Sample data at point UNT08 shows that this tributary of Lower Clarion River has a pH ranging between 8.1 and 8.3. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; although not necessary, a TMDL for acidity will be considered.

Table D52 shows the measured and allowable concentrations and loads at UNT08.

| Table D52 | Flow (gpm)= | Measured | | Allowable | |
|-----------|-------------|---------------|---------|---------------|---------|
| | | Concentration | Load | Concentration | Load |
| | 547.54 | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.25 | 1.64 | 0.25 | 1.64 |
| | Iron | 0.20 | 1.34 | 0.20 | 1.34 |
| | Manganese | 0.33 | 2.16 | 0.33 | 2.16 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 165.35 | 1087.30 | | |

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TMDL calculations- UNT06 –UNT 49255 Clarion River

The TMDL for sample point UNT06 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this unnamed tributary of the Lower Clarion River was computed using water-quality sample data collected at point UNT06. The average flow, calculated at the sampling point UNT06 (2.83 MGD), is used for these computations. The allowable load allocations calculated at UNT06 will directly affect the downstream point CR02.

Sample data at point UNT06 shows that this tributary of Lower Clarion River has a pH ranging between 7.5 and 8.2. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; therefore a TMDL for acidity has not been calculated. A reduction for aluminum, iron and manganese has been calculated at this site.

Table D53 shows the measured and allowable concentrations and loads at UNT06. Table D54 shows the percent reduction for aluminum, iron and manganese needed at UNT06.

| Table D53 | | Measured | | Allowable | |
|-------------|------------|---------------|---------|---------------|---------|
| Flow (gpm)= | 1965.74 | Concentration | Load | Concentration | Load |
| | | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.89 | 21.03 | 0.36 | 8.43 |
| | Iron | 0.54 | 12.80 | 0.49 | 11.63 |
| | Manganese | 1.76 | 41.44 | 0.48 | 11.32 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 125.50 | 2962.77 | | |

| Table D54. Allocations UNT06 | | | |
|------------------------------|--------------|--------------|--------------|
| UNT06 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) |
| Existing Load @ UNT06 | 21.03 | 12.80 | 41.44 |
| Allowable Load @ UNT06 | 8.43 | 11.63 | 11.32 |
| Load Reduction @ UNT06 | 12.60 | 1.17 | 30.12 |
| % Reduction required @ UNT06 | 60% | 9% | 73% |

Waste Load Allocations– Permitted Discharges

The RFI Energy, Inc. 548 North Mine (SMP#16070103, NPDES#PA0258326) has a non-standard pit size. There are two phases to this permit. The WLA was calculated using the maximum requested length in Phase II of 2200 ft and maximum width of 750 ft.

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| Table D55. Waste Load Allocation of Permitted Discharges | | | |
|--|--|-------------------------------|---------------|
| Parameter | Allowable Average Monthly Conc. (mg/l) | Calculated Average Flow (MGD) | WLA (lbs/day) |
| RFI Energy, Inc. 548 North Mine NPDES PA0258326 | | | |
| Al | 0.75 | 0.163 | 1.02 |
| Fe | 3 | 0.163 | 4.09 |
| Mn | 2 | 0.163 | 2.73 |

A waste load allocation for future mining was included for this unnamed tributary to the Clarion River allowing for two operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

| Table D56. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- UNT05 –UNT 49228 Clarion River

The TMDL for sample point UNT05 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this unnamed tributary of the Lower Clarion River was computed using water-quality sample data collected at point UNT05. The average flow, calculated at the sampling point UNT05 (0.41 MGD), is used for these computations. The allowable load allocations calculated at UNT05 will directly affect the downstream point CR02.

Sample data at point UNT05 shows that this tributary of Lower Clarion River has a pH ranging between 6.9 and 7.3. There currently is not an entry for this segment on the Pa Section 303(d) list for

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impairment due to pH; therefore a TMDL for acidity has not been calculated. A reduction for aluminum and iron has been calculated at this site.

Table D57 shows the measured and allowable concentrations and loads at UNT05. Table D58 shows the percent reduction for aluminum and iron is needed at UNT05.

| Table D57 | Flow (gpm)= | Measured | | Allowable | |
|-----------|-------------|---------------|---------|---------------|---------|
| | | Concentration | Load | Concentration | Load |
| | 282.74 | mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 1.35 | 4.59 | 0.32 | 1.10 |
| | Iron | 0.99 | 3.36 | 0.61 | 2.06 |
| | Manganese | 0.31 | 1.06 | 0.31 | 1.06 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 37.10 | 125.98 | | |

| Table D58. Allocations UNT05 | | |
|------------------------------|--------------|--------------|
| UNT05 | Al (Lbs/day) | Fe (Lbs/day) |
| Existing Load @ UNT05 | 4.59 | 3.36 |
| Allowable Load @ UNT05 | 1.10 | 2.06 |
| Load Reduction @ UNT05 | 3.49 | 1.30 |
| % Reduction required @ UNT05 | 76% | 39% |

TMDL calculations- CR02 –Clarion River Approx 5 Miles Upstream of Mouth

The TMDL for sample point CR02 consists of a load allocation to all areas between CR03/LC01/UNT08/UNT06/UNT05 and CR02 shown in Attachment A. The load allocation for this segment of Lower Clarion River was computed using water-quality sample data collected at point CR02. The average flow, measured at the sampling point CR02 (1505.81 MGD), is used for these computations.

Sample data at point CR02 shows that this segment has a pH ranging between 7.0 and 7.6. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; therefore a TMDL for acidity is not necessary. A reduction for iron and manganese has been calculated at this site.

Table D59 shows the measured and allowable concentrations and loads at CR02. Table D60 shows the percent reduction for iron and manganese is needed at CR02.

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| Table D59 | Flow (gpm)= | Measured | | Allowable | |
|-----------|-------------|---------------|-----------|---------------|---------|
| | | Concentration | Load | Concentration | Load |
| | 1045704.00 | Mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.25 | 3139.62 | 0.25 | 3139.62 |
| | Iron | 0.27 | 3409.63 | 0.02 | 245.05 |
| | Manganese | 0.51 | 6367.15 | 0.41 | 5130.26 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 23.80 | 298891.98 | | |

The measured and allowable loading for point CR02 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points CR03/LC01/UNT08/UNT06/UNT05 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points CR03/LC01/UNT08/UNT06/UNT05 and CR02 to determine a total load tracked for the segment of stream between CR03/LC01/UNT08/UNT06/UNT05 and CR02. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at CR02.

| Table D60. Allocations CR02 | | | |
|---|--------------|--------------|--------------|
| CR02 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) |
| Existing Load @ CR02 | 3139.62 | 3409.63 | 6367.15 |
| Difference in measured Loads between the loads that enter and existing CR02 | 36.59 | -305.08 | -1061.74 |
| Percent loss due calculated at CR02 | NA | 8.2% | 14.3% |
| Additional load tracked from above samples | 3010.84 | 3214.94 | 6467.47 |
| Percentage of upstream loads that reach the CR02 | NA | 91.8% | 85.7% |
| Total load tracked between CR03/UNT08/UNT06/UNT05/LC1 and CR02 | 3047.43 | 2950.90 | 5543.14 |
| Allowable Load @ CR02 | 3139.62 | 245.05 | 5130.26 |
| Load Reduction @ CR02 | -92.19 | 2705.85 | 412.88 |
| % Reduction required @ CR02 | 0% | 92% | 7% |

Waste Load Allocations– Permitted Discharges

The Glenn O. Hawbaker, Inc. has two permitted operations in the Lower Clarion River Watershed. The Best Mine (SMP#16000101, NPDES#PA0241695) has a non-standard pit size of 900 feet in length and a width of 550 feet. There are two pits included in the calculated waste load for this operation. The Texter Mine (SMP#16060102, NPDES#PA0258121) has non standard pit size for the three pits included in this permit. Pit sizes are 250 x 550 ft, 125 x 110 ft and 125 x 550 ft.

The St. Petersburg Borough Municipal Water Authority’s Wastewater Treatment Plant (NPDES PA0223026) is a water treatment facility. Outfall 001 is a discharge that receives wastewater from a filter backwash treatment system.

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| Table D61. Waste Load Allocation of Permitted Discharges | | | |
|---|--|-------------------------------|---------------|
| Parameter | Allowable Average Monthly Conc. (mg/l) | Calculated Average Flow (MGD) | WLA (lbs/day) |
| Glenn O. Hawbaker, Inc. Best Mine NPDES PA0241695 | | | |
| | | | |
| Al | 0.75 | 0.049 | 0.613 |
| Fe | 3 | 0.049 | 2.454 |
| Mn | 2 | 0.049 | 1.636 |
| Glenn O. Hawbaker, Inc. Texter Mine NPDES PA0258121 | | | |
| | | | |
| Al | 0.75 | 0.022 | 0.136 |
| Fe | 3 | 0.022 | 0.545 |
| Mn | 2 | 0.022 | 0.364 |
| St. Petersburg Borough Municipal Water Authority NPDES PA0223026 | | | |
| | | | |
| Al | 1.5 | 0.005 | 0.04 |
| Fe | 2 | 0.005 | 0.05 |
| Mn | 1 | 0.005 | 0.03 |

A waste load allocation for future mining was included for this segment of Lower Clarion River allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

| Table D62. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |

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| | | | |
|--------------------|------|------|------|
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 4 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 5 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

TMDL calculations- CR01 –Mouth of Clarion River

The TMDL for sample point CR01 consists of a load allocation to all areas between CR02 and CR01 shown in Attachment A. The load allocation for this segment of Lower Clarion River was computed using water-quality sample data collected at point CR01. The average flow, measured at the sampling point CR01 (1512.28 MGD), is used for these computations.

Sample data at point CR01 shows that this segment has a pH ranging between 7.1 and 7.6. There currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; therefore a TMDL for acidity is not necessary. A reduction for manganese has been calculated at this site.

Table D63 shows the measured and allowable concentrations and loads at CR01. Table D64 shows the percent reduction for manganese is needed at CR01.

| Table D63 | | Measured | | Allowable | |
|-------------|------------|---------------|-----------|---------------|---------|
| Flow (gpm)= | 1050192.00 | Concentration | Load | Concentration | Load |
| | | Mg/L | lbs/day | mg/L | lbs/day |
| | Aluminum | 0.25 | 3153.10 | 0.25 | 3153.10 |
| | Iron | 0.27 | 3402.19 | 0.27 | 3402.19 |
| | Manganese | 0.59 | 7378.25 | 0.48 | 6102.22 |
| | Acidity | 0.00 | 0.00 | 0.00 | 0.00 |
| | Alkalinity | 23.95 | 302066.64 | | |

The measured and allowable loading for point CR01 for aluminum, iron, manganese and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points CR02 shows the total load that was permitted from upstream sources. This

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value was added to the difference in existing loads between points CR02 and CR01 to determine a total load tracked for the segment of stream between CR02 and CR01. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at CR01.

| Table D64. Allocations CR01 | | | |
|---|--------------|--------------|--------------|
| CR01 | Al (Lbs/day) | Fe (Lbs/day) | Mn (Lbs/day) |
| Existing Load @ CR01 | 3153.10 | 3402.19 | 7378.25 |
| Difference in measured Loads between the loads that enter and existing CR01 | 13.48 | -7.44 | 1011.10 |
| Percent loss due calculated at CR01 | NA | 0.2% | NA |
| Additional load tracked from above samples | 3139.62 | 245.05 | 5130.26 |
| Percentage of upstream loads that reach the CR01 | NA | 99.8% | NA |
| Total load tracked between CR02 and CR01 | 3153.10 | 244.52 | 6141.36 |
| Allowable Load @ CR01 | 3153.10 | 3402.19 | 6102.22 |
| Load Reduction @ CR01 | 0.00 | -3157.67 | 39.14 |
| % Reduction required @ CR01 | 0% | 0% | 1% |

A waste load allocation for future mining was included for this segment of Lower Clarion River allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (Attachment C for the method used to quantify treatment pond load).

| Table D65. Waste Load Allocations for Future Mining Operations | | | |
|--|-------------------------------------|--------------|----------------|
| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow | Allowable Load |
| | | (MGD) | (lbs/day) |
| Future Operation 1 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 2 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 3 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |
| Future Operation 4 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

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| | | | |
|--------------------|------|------|------|
| Future Operation 5 | | | |
| Al | 0.75 | 0.09 | 0.56 |
| Fe | 3 | 0.09 | 2.25 |
| Mn | 2 | 0.09 | 1.5 |

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 that the calculations were done with a daily Fe average instead of the 30-day average.

Seasonal Variation

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

Critical Conditions

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

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Attachment E

Excerpts Justifying Changes between the 1996, 1998, and 2002 Section 303(d) Lists and Integrated Report/List (2004, 2006)

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

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

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

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

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

Migration to National Hydrography Data (NHD)

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

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one of “dynamic segmentation” to “fixed segments”. The dynamic segmentation records were proving too difficult to manage from an historical tracking perspective. The fixed segment methods will remedy that problem. The stream assessment data management has gone through many changes over the years as system requirements and software changed. It is hoped that with the shift to the NHD and OIT’s (Office of Information Technology) fulltime staff to manage and maintain SLIMS the systems and formats will now remain stable over many Integrated Listing cycles.

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Attachment F

Water Quality Data Used In TMDL Calculations

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CR20 - CLARION RIVER IN COOKSBURG, UPSTREAM RT 36 BRIDGE

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|-------------|--------------|-------------|
| 1/8/2008 | | 6.9 | 10.8 | 2 | <u>0.15</u> | 0.131 | <u>0.25</u> |
| 5/29/2008 | | 7.1 | 14.6 | 8.4 | <u>0.15</u> | <u>0.025</u> | <u>0.25</u> |
| 7/16/2008 | | 7.3 | 17.8 | -6.8 | <u>0.15</u> | 0.113 | <u>0.25</u> |
| 9/16/2008 | | 7.4 | 38.8 | -26 | <u>0.15</u> | 0.083 | <u>0.25</u> |
| AVERAGE | 691152.00 | 7.18 | 20.50 | -5.60 | 0.15 | 0.09 | 0.25 |
| ST DEV | | 0.22 | 12.53 | 14.96 | 0.00 | 0.05 | 0.00 |

HR01 - MOUTH OF HENRY RUN

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|---------|---------|---------|
| 1/8/2008 | | 4.4 | 5.4 | 15 | 0.503 | 1.02 | 1.029 |
| 5/29/2008 | | 4.2 | 4.4 | 26 | 0.352 | 1.632 | 0.988 |
| 7/16/2008 | | 4 | 1.8 | 20.8 | 0.317 | 2.312 | 1.451 |
| 9/16/2008 | | 3.9 | 0 | 30.2 | 0.33 | 4.223 | 1.954 |
| AVERAGE | 2010.62 | 4.13 | 2.90 | 23.00 | 0.38 | 2.30 | 1.36 |
| ST DEV | | 0.22 | 2.46 | 6.57 | 0.09 | 1.39 | 0.45 |

UNT32 - UNT 49702 CLARION RIVER

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|---------|---------|---------|
| 1/8/2008 | | 3.7 | 0 | 79.4 | 2.078 | 7.41 | 8.538 |
| 5/29/2008 | | 4.9 | 14 | 97.2 | 15.365 | 21.752 | 19.954 |
| 7/16/2008 | | 3.5 | 0 | 262.4 | 37.61 | 20.37 | 25.02 |
| 9/16/2008 | | 4.6 | 10 | 100.4 | 28.257 | 18.835 | 7.515 |
| AVERAGE | 736.03 | 4.18 | 6.00 | 134.85 | 20.83 | 17.09 | 15.26 |
| ST DEV | | 0.68 | 7.12 | 85.53 | 15.47 | 6.56 | 8.61 |

UNT28 - UNT 49698 CLARION RIVER

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|---------|---------|---------|
| 1/14/2008 | | 3.6 | 0 | 111.8 | 9.058 | 16.646 | 13.878 |
| 5/29/2008 | | 3.3 | 0 | 200.8 | 13.299 | 25.252 | 19.324 |
| 7/16/2008 | | 3.1 | 0 | 234.4 | 18.28 | 28.03 | 19.82 |

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| | | | | | | | |
|----------------|--------|------|------|--------|-------|--------|--------|
| 9/16/2008 | | 3.1 | 0 | 234.6 | 21.18 | 29.801 | 15.221 |
| AVERAGE | 623.83 | 3.28 | 0.00 | 195.40 | 15.45 | 24.93 | 17.06 |
| ST DEV | | 0.24 | 0.00 | 57.95 | 5.36 | 5.83 | 2.96 |

UNT35 - UNT 49696 CLARION RIVER

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|---------|---------|---------|
| 1/8/2008 | | 3.6 | 0 | 135.4 | 2.227 | 9.889 | 17.266 |
| 5/29/2008 | | 3.5 | 0 | 193.2 | 4.005 | 16.463 | 25.319 |
| 7/16/2008 | | 3.2 | 0 | 246.6 | 6.759 | 20.44 | 27.74 |
| 9/16/2008 | | 3.2 | 0 | 217.4 | 8.766 | 22.959 | 21.474 |
| AVERAGE | 1032.24 | 3.38 | 0.00 | 198.15 | 5.44 | 17.44 | 22.95 |
| ST DEV | | 0.21 | 0.00 | 47.19 | 2.90 | 5.70 | 4.58 |

CR07 - CLARION RIVER IN CLARION, UPSTREAM 5TH AVENUE BRIDGE

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|-------------|---------|-------------|
| 1/14/2008 | | 6.9 | 13.2 | -1.6 | <u>0.15</u> | 0.242 | <u>0.25</u> |
| 5/29/2008 | | 7.3 | 22 | 1.4 | 0.32 | 0.43 | <u>0.25</u> |
| 7/16/2008 | | 7.4 | 25.4 | -13.6 | 0.422 | 0.356 | <u>0.25</u> |
| 9/16/2008 | | 7.1 | 32.4 | -17.2 | 0.378 | 0.58 | <u>0.25</u> |
| AVERAGE | 785400.00 | 7.18 | 23.25 | -7.75 | 0.32 | 0.40 | 0.25 |
| ST DEV | | 0.22 | 7.98 | 9.04 | 0.12 | 0.14 | 0.00 |

UNT31 - UNT 49642 CLARION RIVER

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|---------|---------|---------|
| 1/14/2008 | | 4 | 2.6 | 56 | 2.374 | 3.119 | 9.278 |
| 6/3/2008 | | 3.5 | 0 | 119.8 | 2.016 | 5.06 | 12.611 |
| 7/16/2008 | | 3.6 | 0 | 114 | 1.451 | 6.519 | 15.07 |
| 9/16/2008 | | 3.9 | 0 | 73.8 | 0.93 | 5.966 | 11.248 |
| AVERAGE | 1525.92 | 3.75 | 0.65 | 90.90 | 1.69 | 5.17 | 12.05 |
| ST DEV | | 0.24 | 1.30 | 30.98 | 0.63 | 1.49 | 2.43 |

CR06 - CLARION RIVER IN CLARION, DOWNSTREAM RT.322 BRIDGE

| Date | Initial | pH | ALK | HOT A | FE | MN | AL |
|------|---------|----|-----|-------|----|----|----|
|------|---------|----|-----|-------|----|----|----|

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| Collected | Flow | pH units | MG/L | MG/L | MG/L | MG/L | MG/L |
|----------------|-----------|----------|-------|-------|-------------|-------|-------------|
| 1/14/2008 | | 6.8 | 12.6 | 0.8 | 0.332 | 0.296 | <u>0.25</u> |
| 6/3/2008 | | 7.1 | 21.4 | 5.6 | 0.3 | 0.408 | <u>0.25</u> |
| 7/16/2008 | | 7.3 | 25.6 | -12.4 | <u>0.15</u> | 0.349 | <u>0.25</u> |
| 9/16/2008 | | 7 | 30.4 | -14.6 | <u>0.15</u> | 0.606 | <u>0.25</u> |
| AVERAGE | 816816.00 | 7.05 | 22.50 | -5.15 | 0.23 | 0.41 | 0.25 |
| ST DEV | | 0.21 | 7.56 | 9.88 | 0.10 | 0.14 | 0 |

TR01 - TROUT RUN, APPROX 1000 FEET UPSTREAM FROM MOUTH

| Date Collected | Initial Flow | pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|----------|----------|------------|-------------|---------|-------------|
| 1/14/2008 | | 7.7 | 44.6 | -30.4 | 0.337 | 0.186 | <u>0.25</u> |
| 6/3/2008 | | 7.8 | 64 | -37 | <u>0.15</u> | 0.059 | <u>0.25</u> |
| 7/17/2008 | | 7.9 | 77.4 | -65.6 | 0.348 | 0.087 | <u>0.25</u> |
| AVERAGE | 1786.22 | 7.80 | 62.00 | -44.33 | 0.28 | 0.11 | 0.25 |
| ST DEV | | 0.10 | 16.49 | 18.71 | 0.11 | 0.07 | 0.00 |

COR01 - COURTLEYS RUN UPSTREAM FROM MOUTH

| Date Collected | Initial Flow | pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|----------|----------|------------|---------|---------|-------------|
| 1/15/2008 | | 7.3 | 40.6 | -30 | 1.555 | 1.372 | <u>0.25</u> |
| 6/3/2008 | | 6.9 | 50.4 | -18.8 | 3.78 | 2.901 | <u>0.25</u> |
| 7/17/2008 | | 3.6 | 0 | 134.8 | 14.88 | 16.24 | 9.748 |
| 9/17/2008 | | 3.9 | 1.2 | 122.6 | 30.19 | 16.916 | 7.226 |
| AVERAGE | 691.15 | 5.43 | 23.05 | 52.15 | 12.60 | 9.36 | 4.37 |
| ST DEV | | 1.94 | 26.23 | 88.65 | 13.09 | 8.37 | 4.87 |

CR05 - CLARION RIVER UPSTREAM FROM CONFLUENCE WITH PINEY CREEK

| Date Collected | Initial Flow | pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|----------|----------|------------|-------------|---------|-------------|
| 1/15/2008 | | 6.6 | 11.2 | -2.4 | 0.369 | 0.295 | <u>0.25</u> |
| 6/3/2008 | | 6.8 | 16 | 11 | 0.516 | 0.624 | <u>0.25</u> |
| 7/17/2008 | | 7.1 | 24.8 | -10.4 | 0.423 | 0.508 | <u>0.25</u> |
| 9/17/2008 | | 6.9 | 28 | -9.6 | <u>0.15</u> | 0.62 | <u>0.25</u> |
| AVERAGE | 830280.00 | 6.85 | 20.00 | -2.85 | 0.36 | 0.51 | 0.25 |
| ST DEV | | 0.21 | 7.76 | 9.91 | 0.16 | 0.15 | 0.00 |

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PC01 - MOUTH OF PINEY CREEK

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|---------|---------|---------|
| 1/15/2008 | | 5.8 | 8.6 | -15.2 | 3.083 | 2.661 | 1.517 |
| 6/3/2008 | | 4.9 | 8 | 42 | 7.963 | 6.4 | 2.306 |
| 7/17/2008 | | 3.8 | 0 | 36.8 | 4.746 | 6.439 | 1.229 |
| 9/17/2008 | | 4.4 | 5.8 | 33.8 | 7.028 | 5.36 | 0.559 |
| AVERAGE | 55651.20 | 4.73 | 5.60 | 24.35 | 5.71 | 5.22 | 1.40 |
| ST DEV | | 0.85 | 3.92 | 26.58 | 2.21 | 1.77 | 0.72 |

DC01 - MOUTH OF DEER CREEK

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|---------|---------|---------|
| 1/15/2008 | | 4.8 | 6.4 | 4.4 | 0.862 | 0.604 | 0.669 |
| 3/18/2008 | | 5.1 | 7.4 | 11.8 | 0.793 | 0.508 | 0.737 |
| 6/3/2008 | | 4.4 | 5.4 | 28.2 | 0.317 | 1.548 | 1.094 |
| 7/10/2008 | | 4.4 | 5.2 | 18.4 | 0.319 | 1.241 | 0.581 |
| 8/28/2008 | | 4.4 | 6.2 | 12.2 | 0.741 | 1.212 | 1.203 |
| AVERAGE | 60139.20 | 4.62 | 6.12 | 15.00 | 0.61 | 1.02 | 0.86 |
| ST DEV | | 0.32 | 0.88 | 8.89 | 0.27 | 0.45 | 0.27 |

UNT20 – UNT 49405 CLARION RIVER ON STATE GAME LANDS 330

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|---------|---------|---------|
| 1/16/2008 | | 3.7 | 0 | 179.2 | 25.402 | 28.367 | 19.455 |
| 6/3/2008 | | 3.9 | 0 | 182.4 | 18.395 | 23.029 | 14.76 |
| 7/22/2008 | | 3.8 | 0 | 186.6 | 23.45 | 23.076 | 13.105 |
| 9/17/2008 | | 4.6 | 10.4 | 146.8 | 32.945 | 25.607 | 12.679 |
| AVERAGE | 435.34 | 4.00 | 2.60 | 173.75 | 25.05 | 25.02 | 15.00 |
| ST DEV | | 0.41 | 5.20 | 18.22 | 6.04 | 2.54 | 3.10 |

CR04 - CLARION RIVER UPSTREAM FROM CANOE RIPPLE BRIDGE

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|---------|---------|-------------|
| 1/16/2008 | | 6.7 | 11.6 | 0.6 | 0.429 | 0.35 | <u>0.25</u> |

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| | | | | | | | |
|----------------|-----------|------|-------|-------|-------------|-------|-------------|
| 6/3/2008 | | 6.9 | 15 | 8.6 | <u>0.15</u> | 0.731 | <u>0.25</u> |
| 7/17/2008 | | 7.1 | 20.4 | -5.4 | <u>0.15</u> | 0.879 | <u>0.25</u> |
| 9/19/2008 | | 6.9 | 29.4 | -14.8 | 0.316 | 0.897 | <u>0.25</u> |
| AVERAGE | 964920.00 | 6.90 | 19.10 | -2.75 | 0.26 | 0.71 | 0.25 |
| ST DEV | | 0.16 | 7.76 | 9.87 | 0.14 | 0.25 | 0.00 |

UNT14 – UNT 49344 CLARION RIVER

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|-------------|---------|-------------|
| 1/16/2008 | | 6.8 | 15.4 | 1.4 | <u>0.15</u> | 1.992 | 0.603 |
| 6/3/2008 | | 7 | 18.4 | 12.4 | <u>0.15</u> | 5.757 | <u>0.25</u> |
| 7/22/2008 | | 7.2 | 25.4 | -6 | <u>0.15</u> | 4.828 | <u>0.25</u> |
| 9/17/2008 | | 6.7 | 19.6 | -5.2 | <u>0.15</u> | 1.791 | <u>0.25</u> |
| AVERAGE | 946.97 | 6.93 | 19.70 | 0.65 | 0.15 | 3.59 | 0.34 |
| ST DEV | | 0.22 | 4.19 | 8.51 | 0.00 | 2.00 | 0.18 |

CR03 - CLARION RIVER IN CALLENBERG @ RT. 58 BRIDGE

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|-------------|---------|-------------|
| 1/16/2008 | | 6.8 | 12.4 | 3.2 | 0.419 | 0.357 | <u>0.25</u> |
| 6/3/2008 | | 7.1 | 15.8 | 13.6 | 0.315 | 0.707 | <u>0.25</u> |
| 7/22/2008 | | 7.3 | 23 | -7.8 | <u>0.15</u> | 0.613 | <u>0.25</u> |
| 9/17/2008 | | 7.1 | 26.2 | -11.2 | <u>0.15</u> | 0.454 | <u>0.25</u> |
| AVERAGE | 982872.00 | 7.08 | 19.35 | -0.55 | 0.26 | 0.53 | 0.25 |
| ST DEV | | 0.21 | 6.35 | 11.26 | 0.13 | 0.16 | 0.00 |

UNT08 – UNT 49265 CLARION RIVER

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|-------------|---------|-------------|
| 1/16/2008 | | 8.1 | 163 | -151.8 | <u>0.15</u> | 0.429 | <u>0.25</u> |
| 6/3/2008 | | 8.2 | 167.2 | -128.8 | 0.363 | 0.478 | <u>0.25</u> |
| 7/22/2008 | | 8.3 | 165.6 | -149.2 | <u>0.15</u> | 0.203 | <u>0.25</u> |
| 7/22/2008 | | 8.3 | 165.6 | -149.2 | <u>0.15</u> | 0.203 | <u>0.25</u> |
| AVERAGE | 547.54 | 8.23 | 165.35 | -144.75 | 0.20 | 0.33 | 0.25 |
| ST DEV | | 0.10 | 1.74 | 10.70 | 0.11 | 0.15 | 0.00 |

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UNT06 – 49255 CLARION RIVER

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|-------------|---------|---------|
| 1/16/2008 | | 7.5 | 67.2 | -51.2 | 0.922 | 2.358 | 1.258 |
| 6/3/2008 | | 8 | 160.6 | -122 | 0.499 | 2.081 | 1.05 |
| 7/22/2008 | | 8 | 123.2 | -103.4 | 0.598 | 0.941 | 0.666 |
| 9/17/2008 | | 8.2 | 151 | -334.6 | <u>0.15</u> | 1.641 | 0.59 |
| AVERAGE | 1965.74 | 7.93 | 125.50 | -152.80 | 0.54 | 1.76 | 0.89 |
| ST DEV | | 0.30 | 41.98 | 124.85 | 0.32 | 0.62 | 0.32 |

UNT05 – UNT 49228 CLARION RIVER

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|---------|---------|---------|
| 1/16/2008 | | 7 | 26.8 | -15.4 | 0.411 | 0.204 | 0.819 |
| 6/4/2008 | | 6.9 | 32 | -5.2 | 0.903 | 0.268 | 1.32 |
| 7/23/2008 | | 7.3 | 54.6 | -35 | 1.442 | 0.258 | 1.14 |
| 9/18/2008 | | 6.9 | 35 | -18.8 | 1.197 | 0.522 | 2.132 |
| AVERAGE | 282.74 | 7.03 | 37.10 | -18.60 | 0.99 | 0.31 | 1.35 |
| ST DEV | | 0.19 | 12.15 | 12.37 | 0.44 | 0.14 | 0.56 |

CR02 - CLARION RIVER APPROX 5 MILES UPSTREAM FROM MOUTH

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|-------------|---------|-------------|
| 1/16/2008 | | 7 | 14.8 | -3.2 | 0.447 | 0.418 | <u>0.25</u> |
| 6/4/2008 | | 7.4 | 25.4 | 0.4 | 0.339 | 0.842 | <u>0.25</u> |
| 7/23/2008 | | 7.6 | 28.2 | -12 | <u>0.15</u> | 0.406 | <u>0.25</u> |
| 9/18/2008 | | 7.1 | 26.8 | -11.4 | <u>0.15</u> | 0.362 | <u>0.25</u> |
| AVERAGE | 1045704.00 | 7.28 | 23.80 | -6.55 | 0.27 | 0.51 | 0.25 |
| ST DEV | | 0.28 | 6.11 | 6.13 | 0.15 | 0.22 | 0.00 |

CR01 - MOUTH OF CLARION RIVER

| Date Collected | Initial Flow | pH pH units | ALK MG/L | HOT A MG/L | FE MG/L | MN MG/L | AL MG/L |
|----------------|--------------|-------------|----------|------------|-------------|---------|-------------|
| 1/7/2008 | | 7.1 | 13.6 | -7 | 0.429 | 0.49 | <u>0.25</u> |
| 6/4/2008 | | 7.4 | 23 | 0.6 | <u>0.15</u> | 0.822 | <u>0.25</u> |
| 7/23/2008 | | 7.6 | 28.8 | -11.8 | 0.35 | 0.67 | <u>0.25</u> |

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| | | | | | | | |
|----------------|------------|------|-------|-------|-------------|-------|-------------|
| 9/18/2008 | | 7.2 | 30.4 | -11.8 | <u>0.15</u> | 0.358 | <u>0.25</u> |
| AVERAGE | 1050192.00 | 7.33 | 23.95 | -7.50 | 0.27 | 0.59 | 0.25 |
| ST DEV | | 0.22 | 7.60 | 5.85 | 0.14 | 0.20 | 0.00 |

*Underlined data are included at one half the detection limit
Average flow was taken from USGS Streamstats.*

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Attachment G

TMDLs and NPDES Permitting Coordination

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

Load Tracking Mechanisms

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

Options for Permittees in TMDL Watersheds

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

Options identified

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

Other possible options

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

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completion of the regulatory review and development of any applicable administrative mechanisms.

- Issue the permit with in-stream water quality criteria values as the effluent limits. The in-stream criteria value would represent the monthly average, with the other limits adjusted accordingly (e.g., for Fe, the limits would be 1.5 mg/L monthly average, 3.0 mg/L daily average and 4.0 instantaneous max mg/L).
- The applicant would agree to treat an existing source (point or non-point) where there is no responsible party and receive a WLA based on a portion of the load reduction to be achieved. The result of using these types of offsets in permitting is a net improvement in long-term water quality through the reclamation or treatment of an abandoned source.

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Attachment H
Comment and Response