FINAL

DEER CREEK WATERSHED TMDL
Clarion County

For Acid Mine Drainage Affected Segments

Prepared by:

Pennsylvania Department of Environmental Protection

March 4, 2009

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ATTACHMENTS

TMDL[1]
Deer Creek Watershed
Clarion County, Pennsylvania

Introduction

This report presents the Total Maximum Daily Load (TMDL) developed for segments in the Deer Creek Watershed (Attachment A). These were done to address the impairments noted on the 1996 Pennsylvania Section 303(d) list of impaired waters, required under the Clean Water Act, and covers one segment on that list and additional segments on later lists/reports. Deer Creek is currently listed for impairments due to metals, pH and siltation. The TMDL addresses the three primary metals associated with acid mine drainage (iron, manganese, aluminum) and pH, the siltation impairments will be addressed in future TMDLs.

Table 1. 303(d) Sub-List

HUC 05010005; State Water Plan (SWP) Subbasin: 17-B

Year	Miles	Segment ID	DEP Stream Code	Stream Name	Designated Use	Data Source	Source	EPA 305(b) Cause Code
1996	10.6	5375	49407	Deer Creek	CWF	303 (d) List	Resource Extraction	Metals
1998	10.43	5375	49407	Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2000	10.46	5375	49407	Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2002	10.4	5375	49707	Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2004	10.4	5375	49707	Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2006 2008	1.54	6304 (Old 20040427-1000-JCB)		Cooper Run	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	10.47	7722 (Old 5375)		Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2006 2008	3.59	4606 (Old 20030329-1400-JLG)		Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2008	0.5	13031	49408	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2008	1.44	13030	49415	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2008	0.71	13030	49417	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2006 2008	1.31	6281 (Old 20040420-1100-JCB)	49422	UNT Deer Creek	CWF	SWMP	Land Development	Siltation

[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.*

2006 2008	0.07	6286 (Old 20040421-0900-JCB)	63326	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2006 2008	1.08	6286 (Old 20040421-0900-JCB)	63327	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2006 2008	0.12	6286 (Old 20040421-0900-JCB)	63328	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2006 2008	2.9	6820 (Old 20040702-1245-JCB)	63331	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2006 2008	0.58	6820 (Old 20040702-1245-JCB)	63332	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2006 2008	0.08	6820 (Old 20040702-1245-JCB)	63333	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2006 2008	2.18	6820 (Old 20040702-1245-JCB)	63334	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals
2006 2008	1.18	7133 (Old 20040903-1145-JCB)	63335	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.73	4606 (Old 20040903-1145-JCB)	63336	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	2.66	4606 (Old 20030326-1400-JLG)	63349	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.7	4606 (Old 20030329-1400-JLG)	63350	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	1.21	4606 (Old 20030329-1400-JLG)	63351	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.66	4606 (Old 20030329-1400-JLG)	63352	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.4	4606 (Old 20030329-1400-JLG)	63353	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.62	4606 (Old 20030329-1400-JLG)	63354	UNT Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	1.92	6335 (Old 20040429-0900-JCB)		Frills Run	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	3.75	6053 (Old 20031023-1400-JLG)		Judith Run	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.55	6053 (Old 20031023-1400-JLG)	63346	UNT Judith Run	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	1.69	6053 (Old 20031023-1400-JLG)	63347	UNT Judith Run	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	1.53	6053 (Old 20031023-1400-JLG)	63348	UNT Judith Run	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	1.5	7127 (Old 20040902-1030-JCB)		Lauer Run	CWF	SWMP	Abandoned Mine Drainage	pH

2006 2008	3.58	6321 (Old 20040428-1030-JCB)		Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	5.28	6339 (Old 20040429-1245-JCB)		Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.74	6339 (Old 20040429-1245-JCB)	49466	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.61	6339 (Old 20040429-1245-JCB)	49471	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.68	6339 (Old 20040429-1245-JCB)	49472	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.74	6339 (Old 20040429-1245-JCB)	49473	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.49	6339 (Old 20040429-1245-JCB)	49474	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	2.14	6339 (Old 20040429-0900-JCB)	49482	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	2.87	6321 (Old 20040428-1030-JCB)	49486	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	0.08	6321 (Old 20040428-1030-JCB)	49487	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	0.08	6321 (Old 20040428-1030-JCB)	49488	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	0.06	6321 (Old 20040428-1030-JCB)	49490	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	0.82	6321 (Old 20040428-1030-JCB)	49491	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	0.63	6321 (Old 20040428-1030-JCB)	49492	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	1.22	6321 (Old 20040428-1030-JCB)	49493	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	0.52	6339 (Old 20040429-1245-JCB)	64031	UNT Licking Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	5.08	6142 (Old 20031209-1330-JLG)		Little Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.65	6143 (Old 20031209-1330-JLG)	63338	UNT Little Deer Creek	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.63	6142 (Old 20031209-1330-JLG)	63339	UNT Little Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.46	6142 (Old 20031209-1330-JLG)	63340	UNT Little Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	1.03	6142 (Old 20031209-1330-JLG)	63341	UNT Little Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation

2006 2008	0.4	6142 (Old 20031209-1330-JLG)	63342	UNT Little Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	1.77	6142 (Old 20031209-1330-JLG)	63343	UNT Little Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.38	6142 (Old 20031209-1330-JLG)	63344	UNT Little Deer Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	2.49	6305 (Old 20040427-1100-JCB)		Little Paint Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	1.66	6346 (Old 20040430-1230-JCB)		Little Paint Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	2.2	6854 (Old 20040708-1215-JCB)		Little Paint Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	0.93	6305 (Old 20040427-1100-JCB)	49434	UNT Little Paint Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	0.47	6346 (Old 20040430-1230-JCB)	49437	UNT Little Paint Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.49	6854 (Old 20040430-1230-JCB)	49441	UNT Little Paint Creek	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	0.7	6342 (Old 20040430-0945-JCB)		Mahles Run	CWF	SWMP	Abandoned Mine Drainage	Metals & pH
2006 2008	2.83	6876 (Old 20040713-1030-JCB)		Mahles Run	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.91	6876 (Old 20040713-1030-JCB)	49457	UNT Mahles Run	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.36	6876 (Old 20040713-1030-JCB)	49458	UNT Mahles Run	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.59	6876 (Old 20040713-1030-JCB)	49459	UNT Mahles Run	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.47	6876 (Old 20040713-1030-JCB)	49460	UNT Mahles Run	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.69	6342 (Old 20040430-0945-JCB)	49461	UNT Mahles Run	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	7.72	6304 (Old 20040427-1000-JCB)		Paint Creek	CWF	SWMP	Abandoned Mine Drainage	Metals, pH & Siltation
2006 2008	0.85	7127 (Old 20040902-1030-JCB)	49446	UNT Paint Creek	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.57	7127 (Old 20040902-1030-JCB)	49447	UNT Paint Creek	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.6	7127 (Old 20040902-1030-JCB)	49449	UNT Paint Creek	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.58	7127 (Old 20040902-1030-JCB)	49451	UNT Paint Creek	CWF	SWMP	Abandoned Mine Drainage	pH

2006 2008	0.75	7127 (Old 20040902-1030-JCB)	49452	UNT Paint Creek	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.37	7127 (Old 20040902-1030-JCB)	49453	UNT Paint Creek	CWF	SWMP	Abandoned Mine Drainage	pH
2006 2008	0.41	7127 (Old 20040902-1030-JCB)	49455	UNT Paint Creek	CWF	SWMP	Abandoned Mine Drainage	pH
2006	3.36	6336 (Old 20040429-1015-JCB)		Step Run	CWF	SWMP	Abandoned Mine Drainage	pH
2006	0.79	6336 (Old 20040429-1015-JCB)	49468	UNT Step Run	CWF	SWMP	Abandoned Mine Drainage	pH
2006	0.41	6336 (Old 20040429-1015-JCB)	49469	UNT Step Run	CWF	SWMP	Abandoned Mine Drainage	pH
2006	1.01	6336 (Old 20040429-1015-JCB)	49470	UNT Step Run	CWF	SWMP	Abandoned Mine Drainage	pH

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.

Directions to the Deer Creek Watershed

The Deer Creek Watershed is approximately 74.1 square miles in area. It is located in north central Clarion County and flows for approximately 18.0 miles in a southwestern direction from the village of Tylersburg to its confluence with the Clarion River near the village of Piney. The Deer Creek Watershed is classified as a Cold Water Fishery (CWF) under Title 25 PA Code Chapter 93, Section 93.9r and can be found on the Clarion, Fryburg, Knox, Kossuth, Lucinda, President, Strattanville, Tionesta and Tylersburg 7-1/2 minute quadrangles. Deer Creek (stream code – 49407) is part of the Hydrologic Unit Code 05010005 - Clarion River (formerly State Water Plans 17A and 17B). Named tributaries to Deer Creek include: Boyd Run, Coal Run, Cooper Run, Frills Run, Foy Run, Grolemund Run, Judith Run, Lauer Run, Licking Creek, Little Deer Creek, Little Paint Creek, Mahles Run (above Huefner), Mahles Run (above Shippenville), Paint Creek, Rattlesnake Run, Step Run and Stony Run.

The mouth of the Deer Creek Watershed can be accessed by taking Exit 60 (Shippenville/ Route 66 North) from Interstate 80 (I-80) and traveling North on Rt. 66 for approximately 1.8 miles and turning left onto East End Road (TR4001). Travel on East End Road for approximately 4.5 miles and East End road turns into Huckleberry Ridge Road (TR 2007). Continue on Huckleberry Ridge Road for approximately 0.4 miles and Deer Creek flows under Huckleberry Ridge Road and flows into the Clarion River approximately 500 feet downstream from this point (monitoring point DC01). The headwaters of Deer Creek (Licking Creek) can be accessed by taking Exit 60 of I-80 and traveling on Rt. 66 North for approximately 14.1 miles and turning left onto Tylersburg Road (TR 4033). Proceed on Tylersburg Road for approximately 1.6 miles to Rt. 36 in the village of Tylersburg. Proceed on Rt. 36 north for approximately 0.1 mile and turn left onto Sunny Road (TR 4004). Travel on Sunny Road for approximately 1.7 miles and Licking Creek flows under the road at this point (monitoring point LC03).

Segments addressed in this TMDL

The Deer Creek Watershed is affected by pollution from AMD. This pollution has caused elevated levels of metals and depressed pH in the mainstem and tributaries of Deer Creek. The sources of the AMD are seeps and discharges from areas disturbed by surface mining. Most of the discharges originate from mining on the Lower Kittanning and Clarion coal seams or refuse piles associated with them. 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).

There are currently five surface mining permits issued in the Deer Creek Watershed. All five of these permits are non-coal mining operations and are not required to have Waste Load Allocations (WLAs) assigned to them. There is one industrial permitted discharge in the watershed. An NPDES permit has been included in the Deer Creek Watershed for Corner Water Supply and Service Corporation. All other 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.

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

This AMD TMDL document contains 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."

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

- States to develop lists of impaired waters for which current pollution controls are not stringent enough to meet water quality standards (the list is used to determine which streams need TMDLs);
- States to establish priority rankings for waters on the lists based on severity of pollution and the designated use of the waterbody; states must also identify those waters for which TMDLs will be developed and a schedule for development;
- States to submit the list of waters to EPA every two years (April 1 of the even numbered years);
- States to develop TMDLs, specifying a pollutant budget that meets state water quality standards and allocate pollutant loads among pollution sources in a watershed, e.g., point and nonpoint sources; and
- EPA to approve or disapprove state lists and TMDLs within 30 days of final submission.

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

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

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

Section 303(d) Listing Process

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

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

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

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

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

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 unreclaimed pits, spoil piles and post-mining discharges is evidence of a long history of mining and may contribute to the non-point source loading within the Deer Creek Watershed.

The majority of the mining within the Deer Creek 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 1981. 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 a brief outline of the mining history in the Deer Creek watershed:

Company	Mine Name	Permit Number	Date Issued	Acres	Coal Seam(s)	Status
COLT RESOURCES INC	ZACHERL 19 MINE	2766BSM63	1/19/1966	109.0	C1, C2	RECLAMATION COMPLETE - INACTIVE
COLT RESOURCES INC	ZACHREL 15B MINE	2766BSM37	9/27/1966	168.0	C1, C2	RECLAMATION COMPLETE - INACTIVE
AP WEAVER & SONS	PITCH PINE 2 & 2A MINE	2766BSM49	3/31/1970	304.0	C1, C2, LK	BOND FORFEITED - ABANDONED
AP WEAVER & SONS	HAHN MINE	3774SM7	7/26/1974	135.0	C2	BOND FORFEITED - ABANDONED
HAROLD A SIEGEL COAL CO	SIEGEL 18 MINE	3774SM25	2/8/1975	118.0	C1, C2, LK, MK	RECLAMATION COMPLETE - INACTIVE
AP WEAVER & SONS	ALLAMAN MINE	3775SM13	11/12/1975	42.0	C1, C2	RECLAMATION COMPLETE - INACTIVE
ZACHERL COAL CO INC	ZACHERL 33 MINE	3775SM24	2/4/1976	73.0	C1, C2, LK	BOND FORFEITED - ABANDONED
HAROLD A SIEGEL COAL CO	SIEGEL 19 MINE	3775SM8	4/28/1976	81.0	C1, C2	RECLAMATION COMPLETE - INACTIVE
AP WEAVER & SONS	MCCANNA MINE	2768BSM23	9/22/1976	139.0	UK	RECLAMATION COMPLETE - INACTIVE
CHERNICKY COAL CO INC	CHERNICKY 6 MINE	3777SM8	12/7/1977	28.0	C2	BOND FORFEITED - ABANDONED
ZACHERL COAL CO INC	ZACHERL 38 MINE	3776SM2	12/14/1977	380.0	C1, C2, LK	BOND FORFEITED - ABANDONED
GLACIAL MINERALS INC	HUTTON MINE	3778BC17	8/23/1979	121.0	C1	BOND FORFEITED - ABANDONED
COLT RESOURCES INC	ONEILL MINE	1680103	9/26/1980	23.0	LK	RECLAMATION COMPLETE - INACTIVE
COLT RESOURCES INC	COLT 1 MINE	3774SM16	4/13/1981	45.0	C2	RECLAMATION COMPLETE - INACTIVE
GLACIAL MINERALS INC	MCCANNA MINE	16800110	6/18/1981	90.0	C1, C2	RECLAMATION COMPLETE - INACTIVE
W DUANE KISER	SHIPPENVILLE TIPPLE	1682202	8/1/1984	5.0		RECLAMATION COMPLETE - INACTIVE
MANOR COAL CO	MANOR TIPPLE	PA0102148	11/16/1984	5.0	C3	RECLAMATION COMPLETE - INACTIVE
CNTY ENV SVC INC	KANE HARDWOODS MINE	16940308	4/12/1996	203.4	SEDIMENTARY	ACTIVE
DAVID MEALY	MAGNESS MINE	16990803	3/20/2000	1.0	SHALE	RECLAMATION COMPLETE - INACTIVE
LOPA MINING INC	LOPA 2 MINE	16050802	6/10/2005	3.0	SANDSTONE	ACTIVE
DANIEL C ZIMMERMAN	ZIMMERMAN MINE	16060806	6/27/2007	5.5	SANDSTONE, SHALE, TOPSOIL	ACTIVE
RON NICK EXCAVATING	TODD BEICHNER ROCK MINE	16082801	3/20/2008	5.0	SANDSTONE	ACTIVE
RON NICK EXCAVATING	RON NICK EXCAVATING	16082803	7/2/2008	3.0	SAND & GRAVEL	ACTIVE

In 1978, the Department of Environmental Resources contracted with the Gwin, Dobson and Foreman, Inc., Consulting Engineers to perform an acid mine drainage abatement study on the Deer Creek Watershed, located in north central Clarion County under the “Operation Scarlift” land reclamation program. The ensuing report, called the Deer Creek Mine Drainage Pollution Abatement Study, Operation ScarLift Project No. SL-193, established 18 sampling and flow measurement stations on Deer Creek and its major tributaries, along with 284 additional stations throughout the 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. The recommendations of the report focused on the restoration of twenty four project areas within the Deer Creek Watershed. Recommendations included the sealing of deep mines, reclamation and revegetation of abandoned strip mines, surface water management, plugging of abandoned flowing oil and gas wells, and better management of coal refuse disposal within the watershed. A copy of this report 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. The study found the entire length of Deer Creek to be severely degraded by AMD with a majority of the acid load coming from the Paint Creek subwatershed. Abandoned surface mines were determined to be the major source of AMD in the watershed. Other sources of AMD included abandoned flowing oil and gas wells, deep mines, springs and tipple runoff. Three alternative AMD abatement plans, along with cost estimates, were developed for the seven watersheds in the Clarion River Basin.

AMD Methodology

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

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

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

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

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

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

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

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

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

LTA = Mean * (1 – PR99) where (2)

LTA = allowable LTA source concentration in mg/l

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

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.

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

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

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

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

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

TMDL Endpoints

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

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

These long-term average concentrations are expected to meet water-quality criteria 99% of the time as required in PA Title 25 Chapter 96.3(c). Table 2 shows the water quality criteria for the selected parameters.

Table 2. Applicable Water Quality Criteria

Parameter	***Criterion Value (mg/l)***	***Total Recoverable/Dissolved***
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)

$$TMDL = WLA + LA + MOS$$

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

Allocation Summary

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

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

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 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.

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. Deer Creek Watershed Summary Table

Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	NPS Load Reduction (lbs/day)	NPS % Reduction
LC05 – UNT 49486 Licking Creek						
Aluminum (lbs/day)	16.06	6.23	1.68	4.55	9.83	61%
Iron (lbs/day)	12.65	12.06	6.75	5.31	0.59	5%
Manganese(lbs/day)	43.24	6.64	4.50	2.14	36.60	85%
Acidity (lbs/day)	357.28	45.96	-	45.96	311.32	87%
LC04 – Headwaters of Licking Creek						
Aluminum (lbs/day)	37.61	11.36	2.80	8.56	26.25	70%
Iron (lbs/day)	70.46	14.76	11.25	3.51	55.70	79%
Manganese(lbs/day)	77.70	9.03	7.50	1.53	68.67	88%
Acidity (lbs/day)	947.68	19.85	-	19.85	927.83	98%
LC03 – Licking Creek downstream of confluence with UNT 49486 Licking Creek						
Aluminum (lbs/day)	56.24	22.44	2.80	19.64	0.00	0%*
Iron (lbs/day)	148.49	26.97	11.25	15.72	65.23	71%*
Manganese(lbs/day)	132.98	17.47	7.50	9.97	10.24	37%*
Acidity (lbs/day)	1474.27	51.71	-	51.71	183.41	78%*
F01 – Mouth of Foy Run						
Aluminum (lbs/day)	20.68	5.60	1.68	3.92	15.08	73%
Iron (lbs/day)	15.08	10.39	6.75	3.64	4.69	31%
Manganese(lbs/day)	11.21	11.21	4.50	6.71	0.00	0%
Acidity (lbs/day)	113.15	8.56	-	8.56	104.59	92%
UNT39 – UNT 49482 Licking Creek						
Aluminum (lbs/day)	3.58	0.79	-	0.79	2.79	78%
Iron (lbs/day)	43.62	1.19	-	1.19	42.43	97%
Manganese(lbs/day)	9.78	1.69	-	1.69	8.09	83%
Acidity (lbs/day)	21.94	10.58	-	10.58	11.36	52%
FR01 Frills Run						
Aluminum (lbs/day)	3.35	1.12	-	1.12	2.23	67%
Iron (lbs/day)	65.38	3.57	-	3.57	61.81	95%
Manganese(lbs/day)	18.27	1.63	-	1.63	16.64	91%
Acidity (lbs/day)	315.66	5.55	-	5.55	310.11	98%

GR01 – Mouth of Grolemund Run						
Aluminum (lbs/day)	19.02	6.96	*1.12*	5.84	12.06	63%
Iron (lbs/day)	173.87	7.62	*4.50*	3.12	166.25	96%
Manganese(lbs/day)	63.36	6.47	*3.00*	3.47	56.89	90%
Acidity (lbs/day)	959.06	0.00	-	0.00	959.06	100%
UNT32 – UNT 49473 Licking Creek						
Aluminum (lbs/day)	5.13	1.69	*0.56*	1.13	3.44	67%
Iron (lbs/day)	6.99	3.17	*2.25*	0.92	3.82	55%
Manganese(lbs/day)	8.57	2.11	*1.50*	0.61	6.46	75%
Acidity (lbs/day)	152.87	9.07	-	9.07	143.80	94%
UNT35 – UNT 49472 Licking Creek						
Aluminum (lbs/day)	0.63	0.63	-	0.63	0.00	0%
Iron (lbs/day)	0.98	0.74	-	0.74	0.24	24%
Manganese(lbs/day)	0.524	0.518	-	0.518	0.006	1%
Acidity (lbs/day)	27.53	12.15	-	12.15	15.38	56%
LC02 – Licking Creek at Licking Road						
Aluminum (lbs/day)	133.20	78.76	*2.80*	75.96	0.00	0%*
Iron (lbs/day)	141.40	115.57	*11.25*	104.32	0.00	0%*
Manganese(lbs/day)	243.74	52.05	*7.50*	44.55	0.00	0%*
Acidity (lbs/day)	3568.25	225.56	-	225.56	375.83	62%*
UNT30 – UNT 49471 Licking Creek						
Aluminum (lbs/day)	2.43	1.03	-	1.03	1.40	58%
Iron (lbs/day)	359.21	2.44	-	2.44	356.77	99%
Manganese(lbs/day)	19.98	1.71	-	1.71	18.27	91%
Acidity (lbs/day)	707.69	18.44	-	18.44	689.25	97%
SR01 – Mouth of Step Run						
Aluminum (lbs/day)	9.73	9.35	*0.56*	8.79	0.38	4%
Iron (lbs/day)	4.55	4.55	*2.25*	2.30	0.00	0%
Manganese(lbs/day)	4.26	4.26	*1.50*	2.76	0.00	0%
Acidity (lbs/day)	168.42	69.12	-	69.12	99.30	59%
UNT26 – UNT 49466 Licking Creek						
Aluminum (lbs/day)	7.41	2.17	-	2.17	5.24	71%
Iron (lbs/day)	2.97	2.18	-	2.18	0.79	27%
Manganese(lbs/day)	11.79	2.94	-	2.94	8.85	75%
Acidity (lbs/day)	63.53	18.17	-	18.17	45.36	71%
LC01 – Mouth of Licking Creek in Huefner						
Aluminum (lbs/day)	201.01	96.91	*2.80*	94.11	42.64	31%*
Iron (lbs/day)	285.30	141.60	*11.25*	130.35	0.00	0%*
Manganese(lbs/day)	350.26	67.10	*7.50*	59.60	64.35	49%*
Acidity (lbs/day)	4351.27	369.71	-	369.71	0.00	0%*
MR01 – Mouth of Mahles Run						
Aluminum (lbs/day)	20.07	9.74	*2.80*	6.94	10.33	51%
Iron (lbs/day)	14.04	14.04	*11.25*	2.79	0.00	0%
Manganese(lbs/day)	71.62	15.03	*7.50*	7.53	56.59	79%
Acidity (lbs/day)	634.58	70.97	-	70.97	563.61	89%

LR01 – Lauer Run at Huefner Spring Road						
Aluminum (lbs/day)	8.06	0.76	-	0.76	7.30	91%
Iron (lbs/day)	2.36	1.27	-	1.27	1.09	46%
Manganese(lbs/day)	5.25	3.44	-	3.44	1.81	34%
Acidity (lbs/day)	82.91	6.17	-	6.17	76.74	93%
PC02 – Paint Creek at Paint Mills Road						
Aluminum (lbs/day)	347.68	157.98	*2.80*	155.18	67.97	30%*
Iron (lbs/day)	602.50	192.33	*11.25*	181.08	265.38	58%*
Manganese(lbs/day)	603.64	95.83	*7.50*	88.33	166.25	63%*
Acidity (lbs/day)	8162.85	381.85	-	381.85	3159.09	89%*
CR01 – Mouth of Cooper Run						
Aluminum (lbs/day)	3.81	3.81	-	3.81	0.00	0%
Iron (lbs/day)	5.01	5.01	-	5.01	0.00	0%
Manganese(lbs/day)	1.14	1.14	-	1.14	0.00	0%
Acidity (lbs/day)	0.00	0.00	-	0.00	0.00	0%
LPC01 – Little Paint Creek at Schimp/Banner Road						
Aluminum (lbs/day)	54.69	18.78	*2.80*	15.98	35.91	66%
Iron (lbs/day)	54.92	23.06	*11.25*	11.81	31.86	58%
Manganese(lbs/day)	79.73	18.26	*7.50*	10.76	61.47	77%
Acidity (lbs/day)	821.91	247.44	-	247.44	574.47	70%
PC01 – Mouth of Paint Creek at Rt. 322						
Aluminum (lbs/day)	412.31	169.84	(0.03) *2.80*	167.01	16.86	9%*
Iron (lbs/day)	559.60	356.14	(0.02) *11.25*	344.87	0.00	0%*
Manganese(lbs/day)	739.18	132.75	(0.01) *7.50*	125.24	37.15	22%*
Acidity (lbs/day)	9414.07	585.68	-	585.68	472.92	45%*
JR03 – UNT 63348 Judith Run at Millerstown Road						
Aluminum (lbs/day)	37.71	2.47	*0.56*	1.91	35.24	93%
Iron (lbs/day)	10.86	5.10	*2.25*	2.85	5.76	53%
Manganese(lbs/day)	43.60	3.64	*1.50*	2.14	39.96	92%
Acidity (lbs/day)	406.93	0.00	-	0.00	406.93	100%
JR02 – UNT 63347 Judith Run at Millerstown Road						
Aluminum (lbs/day)	14.98	1.17	-	1.17	13.81	92%
Iron (lbs/day)	6.15	2.61	-	2.61	3.54	58%
Manganese(lbs/day)	10.89	1.56	-	1.56	9.33	86%
Acidity (lbs/day)	186.80	6.24	-	6.24	180.56	97%
JR01 – Mouth of Judith Run						
Aluminum (lbs/day)	62.50	16.76	*2.80*	13.96	0.00	0%*
Iron (lbs/day)	587.26	16.52	*11.25*	5.27	561.44	97%*
Manganese(lbs/day)	200.56	10.63	*7.50*	3.13	140.64	93%*
Acidity (lbs/day)	2918.84	0.00	-	0.00	2331.35	100%

DC10 – Headwaters of Deer Creek						
Aluminum (lbs/day)	10.93	3.21	*1.12*	2.09	7.72	71%
Iron (lbs/day)	35.72	7.95	*4.50*	3.45	27.77	78%
Manganese(lbs/day)	52.57	5.16	*3.00*	2.16	47.41	90%
Acidity (lbs/day)	183.72	38.76	-	38.76	144.96	79%
DC09 – UNT 63349 Deer Creek						
Aluminum (lbs/day)	32.40	1.78	*0.56*	1.22	30.62	95%
Iron (lbs/day)	11.23	6.22	*2.25*	3.97	5.01	45%
Manganese(lbs/day)	38.96	2.79	*1.50*	1.29	36.17	93%
Acidity (lbs/day)	301.14	0.97	-	0.97	300.17	99.7%
DC08 – Deer Creek upstream of confluence with Judith Run						
Aluminum (lbs/day)	43.44	17.41	*2.24*	15.17	0.00	0%*
Iron (lbs/day)	309.42	12.80	*9.00*	3.80	263.84	95%*
Manganese(lbs/day)	165.73	10.56	*6.00*	4.56	71.59	87%*
Acidity (lbs/day)	2113.28	12.82	-	12.82	1655.33	99%*
DC07 – Deer Creek upstream of confluence with Little Deer Creek						
Aluminum (lbs/day)	124.38	40.13	*2.80*	37.33	12.48	24%*
Iron (lbs/day)	627.57	39.27	*11.25*	28.02	0.00	0%*
Manganese(lbs/day)	393.36	25.23	*7.50*	17.73	23.03	48%*
Acidity (lbs/day)	4823.59	29.21	-	29.21	0.00	0%*
LDC02 – Headwaters of Little Deer Creek						
Aluminum (lbs/day)	48.15	4.85	*1.12*	3.73	43.30	90%
Iron (lbs/day)	15.71	10.07	*4.50*	5.57	5.64	36%
Manganese(lbs/day)	26.27	5.00	*3.00*	2.00	21.27	81%
Acidity (lbs/day)	518.61	7.72	-	7.72	510.89	99%
LDC01 – Mouth of Little Deer Creek						
Aluminum (lbs/day)	37.18	14.46	*1.68*	12.78	0.00	0%*
Iron (lbs/day)	15.42	11.16	*6.75*	4.41	0.00	0%*
Manganese(lbs/day)	37.78	12.85	*4.50*	8.35	3.66	22%*
Acidity (lbs/day)	484.26	108.84	-	108.84	0.00	0%*
DC06 – Deer Creek upstream of confluence with UNT 63336						
Aluminum (lbs/day)	181.28	59.02	*2.80*	56.22	15.29	21%*
Iron (lbs/day)	568.26	63.91	*11.25*	52.66	0.00	0%*
Manganese(lbs/day)	491.42	38.05	*7.50*	30.55	60.31	61%*
Acidity (lbs/day)	5694.33	58.86	-	58.86	465.67	89%*
UNT23 – UNT 63331 Deer Creek						
Aluminum (lbs/day)	9.79	1.65	*0.56*	1.09	8.14	83%
Iron (lbs/day)	102.84	4.48	*2.25*	2.23	98.36	96%
Manganese(lbs/day)	21.05	8.03	*1.50*	6.53	13.02	62%
Acidity (lbs/day)	37.35	29.50	-	29.50	7.85	21%

DC05 – Deer Creek upstream of confluence with UNT 63326						
Aluminum (lbs/day)	205.29	66.59	*2.80*	63.79	8.30	11%*
Iron (lbs/day)	382.38	87.33	*11.25*	76.08	0.00	0%*
Manganese(lbs/day)	507.88	50.99	*7.50*	43.49	0.00	0%*
Acidity (lbs/day)	5044.31	120.80	-	120.80	0.00	0%*
DC04 – Deer Creek upstream of confluence with Paint Creek						
Aluminum (lbs/day)	222.54	79.28	*2.80*	76.48	4.56	5%*
Iron (lbs/day)	192.40	60.17	*11.25*	48.92	0.00	0%*
Manganese(lbs/day)	516.18	63.33	*7.50*	55.83	0.00	0%*
Acidity (lbs/day)	3458.17	159.58	-	159.58	0.00	0%*
DC03 – Deer Creek downstream of confluence with Paint Creek						
Aluminum (lbs/day)	581.79	224.35	*2.80*	221.55	3.95	2%*
Iron (lbs/day)	575.30	310.79	*11.25*	299.54	7.70	2%*
Manganese(lbs/day)	1164.48	183.27	*7.50*	175.77	0.00	0%*
Acidity (lbs/day)	15846.33	879.60	-	879.60	2839.75	76%*
UNT06 - UNT 49422 Deer Creek						
Aluminum (lbs/day)	2.63	1.91	-	1.91	0.72	27%
Iron (lbs/day)	2.18	2.18	-	2.18	0.00	0%
Manganese(lbs/day)	0.75	0.75	-	0.75	0.00	0%
Acidity (lbs/day)	0.00	0.00	-	0.00	0.00	0%
UNT04 – UNT 49415 Deer Creek						
Aluminum (lbs/day)	8.92	3.37	-	3.37	5.55	62%
Iron (lbs/day)	1.49	1.49	-	1.49	0.00	0%
Manganese(lbs/day)	12.16	2.88	-	2.88	9.28	76%
Acidity (lbs/day)	93.72	50.35	-	50.35	43.37	46%
DC02 – Deer Creek at Beaver Furnace Road						
Aluminum (lbs/day)	677.46	204.42	*2.80*	201.62	109.33	35%*
Iron (lbs/day)	791.55	300.33	*11.25*	289.08	226.71	43%*
Manganese(lbs/day)	1180.50	214.81	*7.50*	207.31	0.00	0%*
Acidity (lbs/day)	12099.27	1878.63	-	1878.63	0.00	0%*
DC01 – Mouth of Deer Creek						
Aluminum (lbs/day)	660.98	280.59	*2.80*	277.79	0.00	0%*
Iron (lbs/day)	447.43	447.43	*11.25*	436.18	0.00	0%
Manganese(lbs/day)	968.29	215.58	*7.50*	208.08	0.00	0%*
Acidity (lbs/day)	11917.09	1394.84	-	1394.84	455.50	25%*

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

Following is an example of how the allocations, presented in Table 3, for a stream segment are calculated. For this example, iron allocations for LDC01 of Little Deer Creek 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.

Little Deer Creek

Allocations LDC02	
LDC02	Fe (Lbs/day)
Existing Load @ LDC02	15.71
Allowable Load @ LDC02	10.07

Allowable Load = 10.07 lbs/day

Load lost = 0.29 lbs/day
(Difference between existing loads at LDC02
And LDC01)

ALLOCATIONS LDC01	
LDC01	Fe (Lbs/day)
Existing Load @ LDC01	15.42
Difference in measured Loads between the loads that enter and existing LDC01 (LDC02 – LDC01)	-0.29
Percent loss due calculated at LDC01	1.8%
Additional load tracked from above samples	10.07
Percentage of upstream loads that reach the LDC01	98.2%
Total load tracked between LDC02 and LDC01	9.88
Allowable Load @ LDC01	11.16
Load Reduction @ LDC01	-1.28
% Reduction required at LDC01	0%

Allowable Load = 11.16 lbs/day

The allowable iron load tracked from LDC02 was 10.07 lbs/day. The existing load at LDC02 was subtracted from the existing load at LDC01 to show the actual measured amount of iron load that has exited the stream system between this upstream site and LDC01 (0.29 lbs/day). This percentage of iron that reached LDC01 was multiplied to the additional load tracked from LDC02 to calculate the total load that was tracked between LDC02 and LDC01 (percentage of load that has reached LDC01 multiplied by the additional load tracked from LDC02). The calculated allowable load at LDC01 was then subtracted from the total load tracked to determine the amount of load to be reduced at LDC01. This total load value was found to be 9.88 lbs/day; it was 1.28 lbs/day less then the calculated allowable load at LDC01 (11.16 lbs/day). Therefore, no reduction for iron is necessary at LDC01.

No required reductions of this permit is 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 Corner Water Supply & Service Corporation (NPDES PA0104426) is a water treatment facility. Outfall 001 is a discharge that receives wastewater from an existing discharge of treated industrial waste from a municipal water treatment plant. The following table shows the waste load allocation for this discharge. The flow listed in the permit of 0.0014 MGD is used to calculate the WLA.

Table 4. Waste Load Allocation for permitted Industrial discharge

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Corner Water Supply & Service Corp. NPDES PA0104426			
001			
Al	4	0.0014	0.03
Fe	2	0.0014	0.02
Mn	1	0.0014	0.01

All future 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.

Recommendations

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

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

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

- Partnerships between the DEP, watershed associations, local governments, environmental groups, other state agencies, federal agencies and other groups organized to reclaim abandoned mine lands are essential to achieving reclamation and abating acid mine drainage in an efficient and effective manner.

- Partnerships between AML interests and active mine operators are important and essential in reclaiming abandoned mine lands.

- Preferential consideration for the development of AML reclamation or AMD abatement projects will be given to watersheds or areas for which there is an approved rehabilitation plan. (guidance is given in Appendix B to the Comprehensive Plan).

- Preferential consideration for the use of designated reclamation moneys will be given to projects that have obtained other sources or means to partially fund the project or to projects that need the funds to match other sources of funds.

- Preferential consideration for the use of available moneys from federal and other sources will be given to projects where there are institutional arrangements for any necessary long-term operation and maintenance costs.

- Preferential consideration for the use of available moneys from federal and other sources will be given to projects that have the greatest worth.

- Preferential consideration for the development of AML projects will be given to AML problems that impact people over those that impact property.

- No plan is an absolute; occasional deviations are to be expected.

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

In addition to the abandoned mine reclamation program, regulatory programs also are assisting in the reclamation and restoration of Pennsylvania's land and water. PADEP has been effective in implementing the NPDES program for mining operations throughout the Commonwealth. This reclamation was done, through the use of remining permits 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.
- 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 Deer Creek 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.

Future TMDL Modifications

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

Changes in TMDLs That May Require EPA Approval

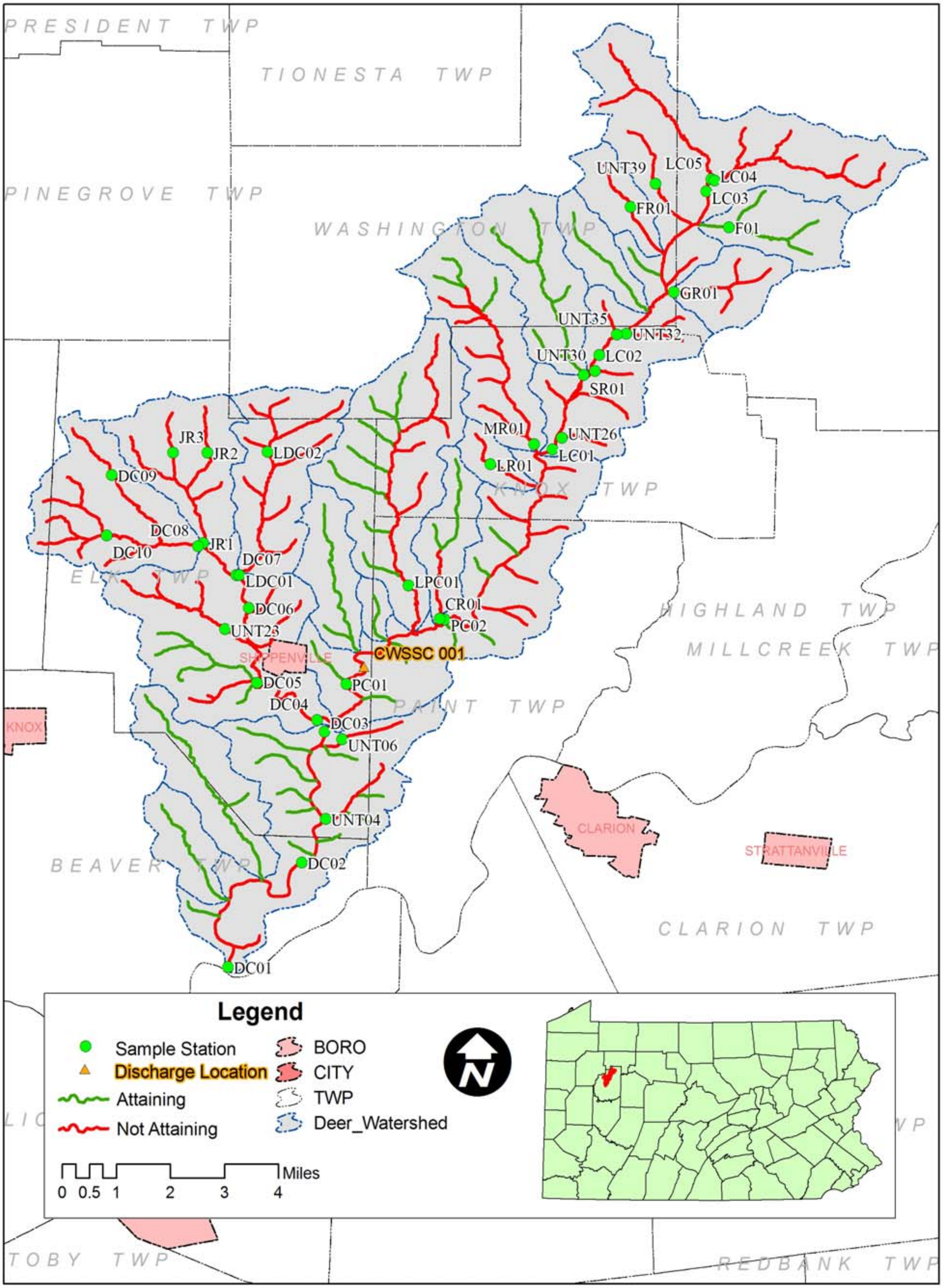
- Increase in total load capacity.
- Transfer of load between point (WLA) and nonpoint (LA) sources.
- Modification of the margin of safety (MOS).
- Change in water quality standards (WQS).
- Non-attainment of WQS with implementation of the TMDL.
- Allocations in trading programs.

Changes in TMDLs That May Not Require EPA Approval

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

Attachment A

Deer Creek Watershed Map


PRESIDENT TWP
TIONESTA TWP
PINEGROVE TWP
WASHINGTON TWP
KNOX TWP
ELK TWP
HIGHLAND TWP
MILLCREEK TWP
PAINT TWP
BEAVER TWP
CLARION TWP
TOBY TWP
REDBANK TWP
KNOX
CLARION
STRATTANVILLE
SHIPPENVILLE
CWSSC 001
UNT39
LC05
LC04
LC03
FR01
F01
GR01
UNT35
UNT32
UNT30
LC02
SR01
MR01
UNT26
LC01
LR01
JR3
JR2
LDC02
DC09
DC08
JR1
DC10
DC07
LDC01
DC06
UNT23
LPC01
CR01
PC02
DC05
PC01
DC04
DC03
UNT06
UNT04
DC02
DC01
Legend
Sample Station
Discharge Location
Attaining
Not Attaining
BORO
CITY
TWP
Deer_Watershed
0 0.5 1 2 3 4 Miles
N

Attachment B

Method for Addressing Section 303(d) Listings for pH

Method for Addressing Section 303(d) Listings for pH

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

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

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

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

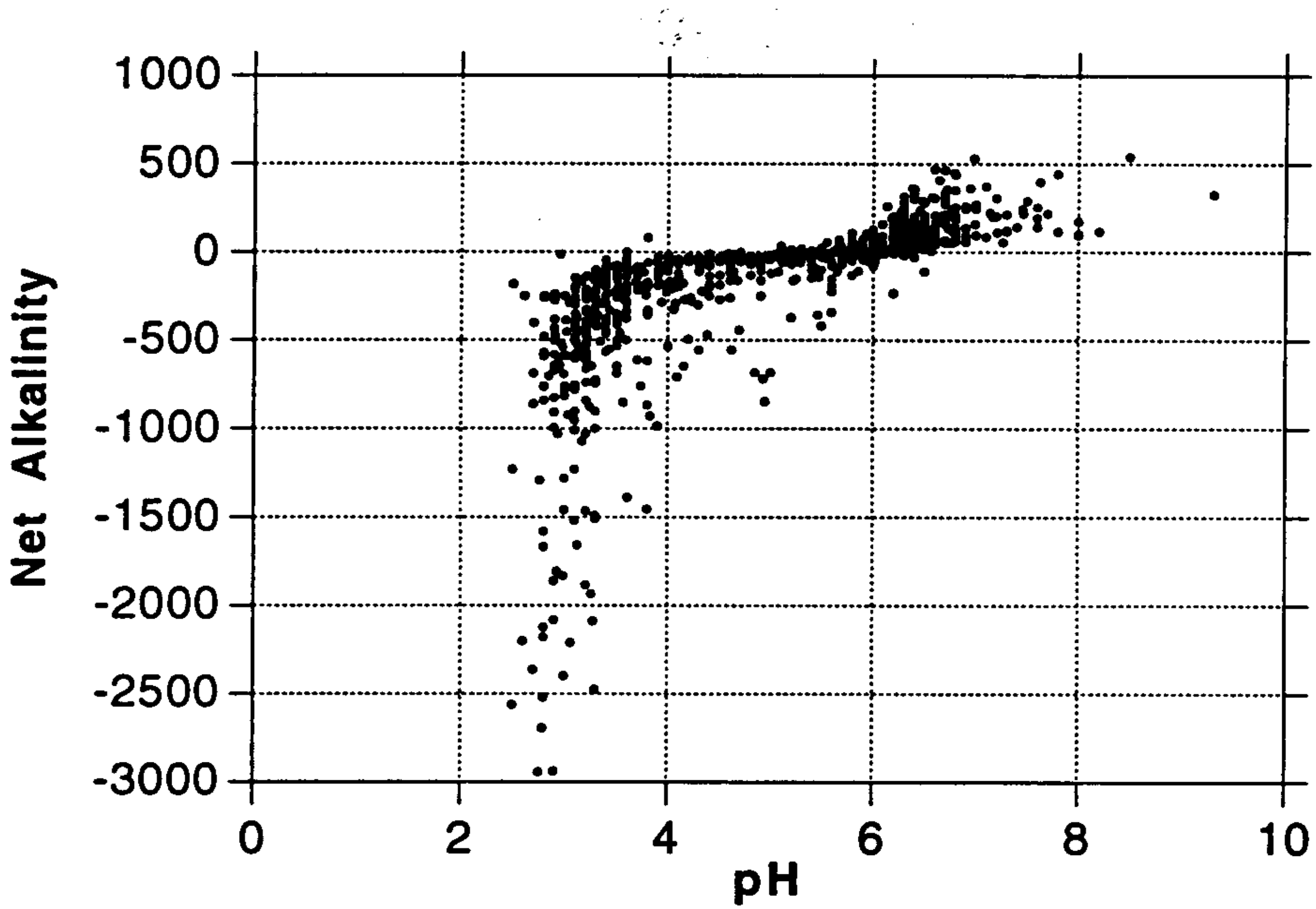


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C

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

Method to Quantify Treatment Pond Pollutant Load

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

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

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

Total Measured Load = Allowed Load + Reduced Load

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

Allowed Load (lbs/day) = WLA (lbs/day) + LA (lbs/day)

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

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

Standard Treatment Pond Effluent Limits:
Alkalinity > Acidity
6.0 <= pH <= 9.0
Fe < 3.0 mg/l
Mn < 2.0 mg/l

Discharge from treatment ponds on a mine site is intermittent and often varies as a result of precipitation events. Measured flow rates are almost never available. If accurate flow data are available, they can be used to quantify the WLA. The following is an approach that can be used to determine a waste load allocation for an active mining operation when treatment pond flow rates are not available. The methodology involves quantifying the hydrology of the portion of a surface mine site that contributes flow to the pit and then calculating waste load allocation using NPDES treatment pond effluent limits.

The total water volume reporting to ponds for treatment can come from two primary sources: direct precipitation to the pit and runoff from the unregraded area following the pit's progression through the site. Groundwater seepage reporting to the pit is considered negligible compared to the flow rates resulting from precipitation.

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

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

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

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

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

= 9.9 gal./min. average discharge from spoil runoff into the pit area.

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

Total Average Flow = Direct Pit Precipitation + Spoil Runoff

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

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

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

Allowable Manganese Waste Load Allocation:
30.9 gal./min. x 2 mg/l x 0.01202 = 0.7 lbs./day

Allowable Aluminum Waste Load Allocation:
30.9 gal./min. x 2 mg/l x 0.01202 = 0.7 lbs./day

(Note: 0.01202 is a conversion factor to convert from a flow rate in gal/min. and a concentration in mg/l to a load in units of lbs./day.)

There is little or no documentation available to quantify the actual amount of water that is typically pumped from active pits to treatment ponds. Experience and observations suggest that the above approach is very conservative and overestimates the quantity of water, creating a large margin of safety in the methodology. County specific precipitation rates can be used in place of the long-term state average rate, although the margin of safety is greater than differences from individual counties. It is common for many mining sites to have very "dry" pits that rarely accumulate water that would require pumping and treatment.

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

While most mining operations are permitted and allowed to have a standard, 1500' x 300' pit, most are well below that size and have a corresponding decreased flow and load. Where pit dimensions are greater than the standard size or multiple pits are present, the calculations to define the potential pollution load can be adjusted accordingly. Hence, the above calculated Waste Load Allocation is very generous and likely high compared to actual conditions that are generally encountered. A large margin of safety is included in the WLA calculations.

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

Waste Load Allocation is equal to the allowed load. The WLA is determined by the above calculations and the LA is determined by the difference between the allowed load and the WLA.

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

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

Derivation of the flow used in the future mining WLAs:

30.9 gal/min X 2 (assume two pits) X 0.00144 = 0.09 MGD

Attachment D

TMDLs By Segment

Deer Creek

The TMDL for Deer Creek consists of load allocations to 38 sampling sites in the Deer Creek Watershed. Sites are included on Deer Creek, Little Deer Creek, Judith Run, Licking Creek, Lauer Run, Mahles Run, Step Run, Paint Creek, Little Paint Creek, Frills Run, Foy Run, Grolemund Run and numerous unnamed tributaries. Sample data sets were collected in 2008. All sample points are shown on the map 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 StreamStats[4]. Obtaining flow measurements for all sample sites proved difficult, therefore StreamStats[4] was used. To keep consistency, StreamStats[4] was employed for all sample sites in this Deer Creek TMDL.

Deer Creek is listed on the 1996 PA Section 303(d) list for metals from AMD as being the cause of the degradation to this stream. This TMDL will focus primarily on metal loading to the Deer Creek 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. The siltation impairments from post 1996 listings will be addressed in future TMDLs.

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.

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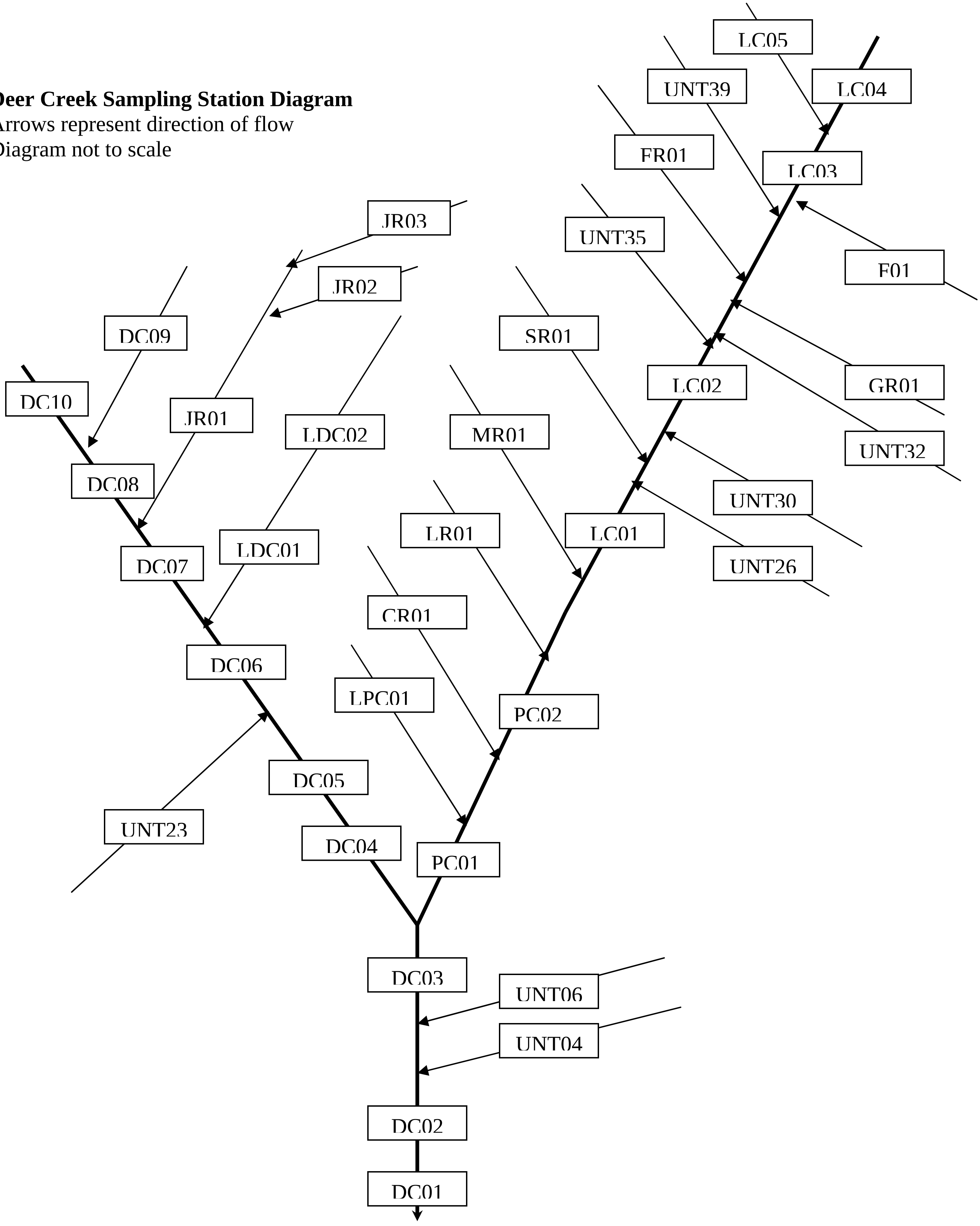
[4] StreamStats for Pennsylvania was developed by USGS in cooperation with the Pennsylvania Department of Protection, the Federal Emergency Management Agency, the Pennsylvania State Association of Township Supervisors, and the Susquehanna River Basin Commission.

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



TMDL calculations- LC05 – UNT 49486 Licking Creek

The TMDL for sample point LC05 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 Licking Creek was computed using water-quality sample data collected at point LC05. The average flow, calculated at the sampling point LC05 (2.67 MGD), is used for these computations. The allowable load allocations calculated at LC05 will directly affect the downstream point LC03.

Sample data at point LC05 shows that this unnamed tributary of Deer Creek has a pH ranging between 4.0 and 5.0. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH, a TMDL for acidity will be considered. Reductions for aluminum, iron, manganese and acidity have been calculated at this site.

Table D1 shows the measured and allowable concentrations and loads at LC05. Table D2 shows the percent reduction for aluminum, iron, manganese and acidity needed at LC05.

Table D1		Measured		Allowable	
Flow (gpm)=	1853.54	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.72	16.06	0.28	6.23
	Iron	0.57	12.65	0.54	12.06
	Manganese	1.94	43.24	0.30	6.64
	Acidity	16.05	357.28	2.06	45.96
	Alkalinity	4.35	96.83		

Table D2. Allocations LC05				
LC05	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ LC05	16.06	12.65	43.24	357.28
Allowable Load @ LC05	6.23	12.06	6.64	45.96
Load Reduction @ LC05	9.83	0.59	36.60	311.32
% Reduction required @ LC05	61%	5%	85%	87%

A waste load allocation for future mining was included for this segment of UNT Deer Creek 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 D3. 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- LC04 – Headwaters of Licking Creek

The TMDL for sample point LC04 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this most upstream segment of Licking Creek was computed using water-quality sample data collected at point LC04. The average flow, measured at sampling point LC04 (3.83 MGD), is used for these computations. The allowable load allocations calculated at LC04 will directly affect the downstream point LC03.

Sample data at point LC04 shows that the headwaters of Licking Creek have a pH ranging between 3.3 and 4.8. 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, iron, manganese and acidity has been calculated at this site.

Table D4 shows the measured and allowable concentrations and loads at LC04. Table D5 shows the percent reduction for aluminum, iron, manganese and acidity needed at LC04.

Table D4		Measured		Allowable	
Flow (gpm)=	2656.90	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.18	37.61	0.36	11.36
	Iron	2.21	70.46	0.46	14.76
	Manganese	2.44	77.70	0.28	9.03
	Acidity	29.70	947.68	0.62	19.85
	Alkalinity	1.70	54.24		

Table D5. Allocations LC04				
LC04	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ LC04	37.61	70.46	77.70	947.68
Allowable Load @ LC04	11.36	14.76	9.03	19.85
Load Reduction @ LC04	26.25	55.70	68.67	927.83
% Reduction required @ LC04	70%	79%	88%	98%

A waste load allocation for future mining was included for the headwaters of Licking 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 D6. 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- LC03 – Licking Creek downstream of confluence with UNT 49486 Licking Creek

The TMDL for sample point LC03 consists of a load allocation to all areas between LC05/LC04 and LC03 shown in Attachment A. The load allocation for this segment of Licking Creek was computed using water-quality sample data collected at point LC03. The average flow, measured at the sampling point LC03 (6.79 MGD), is used for these computations.

Sample data at point LC03 shows that this segment has a pH ranging between 3.4 and 4.8. 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, iron, manganese and acidity has been calculated at this site.

Table D7 shows the measured and allowable concentrations and loads at LC03. Table D8 shows the percent reduction for iron, manganese and acidity needed at LC03.

Table D7		Measured		Allowable	
Flow (gpm)=	4712.40	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.99	56.24	0.40	22.44
	Iron	2.62	148.49	0.48	26.97
	Manganese	2.35	132.98	0.31	17.47
	Acidity	26.05	1474.27	0.91	51.71
	Alkalinity	2.15	121.68		

The measured and allowable loading for point LC03 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 LC05/LC04 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points LC05/LC04 and LC03 to determine a total load tracked for the segment of stream between LC05/LC04 and LC03. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at LC03. Reductions for iron, manganese and acidity were necessary at LC03.

Table D8. Allocations LC03				
LC03	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ LC03	56.24	148.49	132.98	1474.27
Difference in measured Loads between the loads that enter and existing LC03	2.57	65.38	12.04	169.31
Additional load tracked from above samples	17.59	26.82	15.67	65.81
Total load tracked between LC04/LC05 and LC03	20.16	92.20	27.71	235.12
Allowable Load @ LC03	22.44	26.97	17.47	51.71
Load Reduction @ LC03	-2.28	65.23	10.24	183.41
% Reduction required @ LC03	0%	71%	37%	78%

A waste load allocation for future mining was included for this segment of Licking 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 D9. 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- F01 – Mouth of Foy Run

The TMDL for sample point F01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Foy Run was computed using water-quality sample data collected at point F01. The average flow, calculated at the sampling point F01 (2.17 MGD), is used for these computations. The allowable load allocations calculated at F01 will directly affect the downstream point LC02.

Sample data at point F01 shows that Foy Run has a pH ranging between 4.2 and 4.4. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, iron and acidity has been calculated at this site.

Table D10 shows the measured and allowable concentrations and loads at F01. Table D11 shows the percent reduction for aluminum, iron and acidity needed at F01.

Table D10		Measured		Allowable	
Flow (gpm)=	1503.48	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.15	20.68	0.31	5.60
	Iron	0.84	15.08	0.58	10.39
	Manganese	0.62	11.21	0.62	11.21
	Acidity	6.27	113.15	0.47	8.56
	Alkalinity	4.93	89.08		

Table D11. Allocations F01			
F01	Al (Lbs/day)	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load @ F01	20.68	15.08	113.15
Allowable Load @ F01	5.60	10.39	8.56
Load Reduction @ F01	15.08	4.69	104.59
% Reduction required @ F01	73%	31%	92%

A waste load allocation for future mining was included for Foy 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 D12. 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- UNT39 – Unnamed Tributary 49482 Licking Creek

The TMDL for sample point UNT39 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 Licking Creek was computed using water-quality sample data collected at point UNT39. The average flow, calculated at the sampling point UNT39 (0.71 MGD), is used for these computations. The allowable load allocations calculated at UNT39 will directly affect the downstream point LC02.

Sample data at point UNT39 shows that this tributary of Licking Creek has a pH ranging between 5.0 and 6.5. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D13 shows the measured and allowable concentrations and loads at UNT39. Table D14 shows the percent reduction for aluminum, iron, manganese and acidity needed at UNT39.

Table D13		Measured		Allowable	
Flow (gpm)=	493.68	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.60	3.58	0.13	0.79
	Iron	7.36	43.62	0.20	1.19
	Manganese	1.65	9.78	0.29	1.69

	Acidity	3.70	21.94	1.79	10.58
	Alkalinity	22.70	134.59		

Table D14. Allocations UNT39				
UNT39	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ UNT39	3.58	43.62	9.78	21.94
Allowable Load @ UNT39	0.79	1.19	1.69	10.58
Load Reduction @ UNT39	2.79	42.43	8.09	11.36
% Reduction required @ UNT39	78%	97%	83%	52%

TMDL calculations- FR01 – Frills Run

The TMDL for sample point FR01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Frills Run was computed using water-quality sample data collected at point FR01. The average flow, calculated at the sampling point FR01 (0.84 MGD), is used for these computations. The allowable load allocations calculated at FR01 will directly affect the downstream point LC02.

Sample data at point FR01 shows that Frills Run has a pH ranging between 3.2 and 6.3. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D15 shows the measured and allowable concentrations and loads at FR01. Table D16 shows the percent reduction for aluminum, iron, manganese and acidity needed at FR01.

Table D15		Measured		Allowable	
Flow (gpm)=	583.44	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.48	3.35	0.16	1.12
	Iron	9.33	65.38	0.51	3.57
	Manganese	2.61	18.27	0.23	1.63
	Acidity	45.05	315.66	0.79	5.55
	Alkalinity	3.15	22.07		

Table D16. Allocations FR01				
FR01	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ FR01	3.35	65.38	18.27	315.66
Allowable Load @ FR01	1.12	3.57	1.63	5.55
Load Reduction @ FR01	2.23	61.81	16.64	310.11
% Reduction required @ FR01	67%	95%	91%	98%

TMDL calculations- GR01 – Mouth of Grolemund Run

The TMDL for sample point GR01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Grolemund Run was computed using water-quality sample data collected at point GR01. The average flow, calculated at the sampling point GR01 (1.71 MGD), is used for these computations. The allowable load allocations calculated at GR01 will directly affect the downstream point LC02.

Sample data at point GR01 shows that Grolemund Run has a pH ranging between 3.2 and 3.6. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D17 shows the measured and allowable concentrations and loads at GR01. Table D18 shows the percent reduction for aluminum, iron, manganese and acidity needed at GR01.

Table D17		Measured		Allowable	
Flow (gpm)=	1184.83	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.34	19.02	0.49	6.96
	Iron	12.22	173.87	0.54	7.62
	Manganese	4.45	63.36	0.46	6.47
	Acidity	67.40	959.06	0.00	0.00
	Alkalinity	0.00	0.00		

Table D18. Allocations GR01				
GR01	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ GR01	19.02	173.87	63.36	959.06
Allowable Load @ GR01	6.96	7.62	6.47	0.00
Load Reduction @ GR01	12.06	166.25	56.89	959.06
% Reduction required @ GR01	63%	96%	90%	100%

A waste load allocation for future mining was included for Grolemund Run 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 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

<u>TMDL calculations- UNT32 – UNT 49473 Licking Creek</u>

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 Licking Creek was computed using water-quality sample data collected at point UNT32. The average flow, calculated at the sampling point UNT32 (0.85 MGD), is used for these computations. The allowable load allocations calculated at UNT32 will directly affect the downstream point LC02.

Sample data at point UNT32 shows that this unnamed tributary has a pH ranging between 3.5 and 6.3. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D20 shows the measured and allowable concentrations and loads at UNT32. Table D21 shows the percent reduction for aluminum, iron, manganese and acidity needed at UNT32.

Table D20		Measured		Allowable	
Flow (gpm)=	587.93	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.73	5.13	0.24	1.69
	Iron	0.99	6.99	0.45	3.17
	Manganese	1.21	8.57	0.30	2.11
	Acidity	21.65	152.87	1.28	9.07
	Alkalinity	4.65	32.83		

Table D21. Allocations UNT32				
UNT32	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ UNT32	5.13	6.99	8.57	152.87
Allowable Load @ UNT32	1.69	3.17	2.11	9.07
Load Reduction @ UNT32	3.44	3.82	6.46	143.80
% Reduction required @ UNT32	67%	55%	75%	94%

A waste load allocation for future mining was included for UNT32 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 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

TMDL calculations- UNT35 – UNT 49472 Licking Creek

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 Licking Creek was computed using water-quality sample data collected at point UNT35. The average flow, calculated at the sampling point UNT35 (0.30 MGD), is used for these computations. The allowable load allocations calculated at UNT35 will directly affect the downstream point LC02.

Sample data at point UNT35 shows that this unnamed tributary has a pH ranging between 5.6 and 6.2. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for iron, manganese and acidity has been calculated at this site.

Table D23 shows the measured and allowable concentrations and loads at UNT35. Table D24 shows the percent reduction for iron, manganese and acidity needed at UNT35.

Table D23		Measured		Allowable	
Flow (gpm)=	210.94	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.25	0.63	0.25	0.63
	Iron	0.39	0.98	0.29	0.74
	Manganese	0.21	0.524	0.20	0.518
	Acidity	10.87	27.53	4.80	12.15
	Alkalinity	9.00	22.80		

Table D24. Allocations UNT35			
UNT35	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ UNT35	0.98	0.524	27.53
Allowable Load @ UNT35	0.74	0.518	12.15
Load Reduction @ UNT35	0.24	0.01	15.38
% Reduction required @ UNT35	24%	1%	56%

TMDL calculations- LC02 –Licking Creek at Licking Road

The TMDL for sample point LC02 consists of a load allocation to all areas between LC03/F01/UNT39/FR01/GR01/UNT32/UNT35 and LC02 shown in Attachment A. The load allocation for this segment of Licking Creek was computed using water-quality sample data collected at point LC02. The average flow, measured at the sampling point LC02 (18.81 MGD), is used for these computations.

Sample data at point LC02 shows that this segment has a pH ranging between 3.8 and 4.9. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D25 shows the measured and allowable concentrations and loads at LC02. Table D26 shows the percent reduction for acidity needed at LC02.

Table D25		Measured		Allowable	
Flow (gpm)=	13060.08	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.85	133.20	0.50	78.76
	Iron	0.90	141.40	0.74	115.57
	Manganese	1.55	243.74	0.33	52.05
	Acidity	22.75	3568.25	1.44	225.56
	Alkalinity	3.75	588.17		

The measured and allowable loading for point LC02 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 LC03/F01/UNT39/FR01/GR01/UNT32/UNT35 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points LC03/F01/UNT39/FR01/GR01/UNT32/UNT35 and LC02 to determine a total load tracked for the segment of stream between LC03/F01/UNT39/FR01/GR01/UNT32/UNT35 and LC02. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at LC02.

Table D26. Allocations LC02				
LC02	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ LC02	133.20	141.40	243.74	3568.25
Difference in measured Loads between the loads that enter and existing LC02	24.57	-313.01	-0.95	503.77
Percent loss due calculated at LC02	NA	68.9%	0.4%	NA
Additional load tracked from above samples	39.23	53.65	41.10	97.62
Percentage of upstream loads that reach the LC02	NA	31.1%	99.6%	NA
Total load tracked between LC03/F01/UNT39/FR01/GR01/UNT32/UNT35 and LC02	63.80	16.69	40.94	601.39
Allowable Load @ LC02	78.76	115.57	52.05	225.56
Load Reduction @ LC02	-14.96	-98.88	-11.11	375.83
% Reduction required @ LC02	0%	0%	0%	62%

A waste load allocation for future mining was included for this segment of Licking 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 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
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- UNT30 – UNT 49471 Licking Creek

The TMDL for sample point UNT30 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 Licking Creek was computed using water-quality sample data collected at point UNT30. The average flow, calculated at the sampling point UNT30 (0.32 MGD), is used for these computations. The allowable load allocations calculated at UNT30 will directly affect the downstream point LC01.

Sample data at point UNT30 shows that this unnamed tributary has a pH ranging between 4.1 and 5.6. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH, 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 UNT30. Table D29 shows the percent reduction for aluminum, iron, manganese and acidity needed at UNT30.

Table D28		Measured		Allowable	
Flow (gpm)=	224.40	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.90	2.43	0.38	1.03
	Iron	133.29	359.21	0.91	2.44
	Manganese	7.41	19.98	0.64	1.71
	Acidity	262.60	707.69	6.84	18.44
	Alkalinity	10.40	28.03		

Table D29. Allocations UNT30				
UNT30	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ UNT30	2.43	359.21	19.98	707.69
Allowable Load @ UNT30	1.03	2.44	1.71	18.44
Load Reduction @ UNT30	1.40	356.77	18.27	689.25
% Reduction required @ UNT30	58%	99%	91%	97%

TMDL calculations- SR01 – Mouth of Step Run

The TMDL for sample point SR01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Step Run was computed using water-quality sample data collected at point SR01. The average flow, calculated at the sampling point SR01 (3.64 MGD), is used for these computations. The allowable load allocations calculated at SR01 will directly affect the downstream point LC01.

Sample data at point SR01 shows that this unnamed tributary has a pH ranging between 5.4 and 6.7. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum and acidity has been calculated at this site.

Table D30 shows the measured and allowable concentrations and loads at SR01. Table D31 shows the percent reduction for aluminum and acidity needed at SR01.

Table D30		Measured		Allowable	
Flow (gpm)=	2526.74	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.32	9.73	0.31	9.35
	Iron	0.15	4.55	0.15	4.55
	Manganese	0.14	4.26	0.14	4.26

	Acidity	5.55	168.42	2.28	69.12
	Alkalinity	9.15	277.66		

Table D31. Allocations SR01		
SR01	Al (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SR01	9.73	168.42
Allowable Load @ SR01	9.35	69.12
Load Reduction @ SR01	0.38	99.30
% Reduction required @ SR01	4%	59%

A waste load allocation for future mining was included for Step Run 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 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

<u>TMDL calculations- UNT26 – UNT 49466 Licking Creek</u>

The TMDL for sample point UNT26 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 Licking Creek was computed using water-quality sample data collected at point UNT26. The average flow, calculated at the sampling point UNT26 (0.46 MGD), is used for these computations. The allowable load allocations calculated at UNT26 will directly affect the downstream point LC01.

Sample data at point UNT26 shows that this unnamed tributary has a pH ranging between 4.9 and 5.0. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; 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 UNT26. Table D34 shows the percent reduction for aluminum, iron, manganese and acidity needed at UNT26.

Table D33		Measured		Allowable	
Flow (gpm)=	318.65	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.94	7.41	0.57	2.17
	Iron	0.78	2.97	0.57	2.18
	Manganese	3.08	11.79	0.77	2.94
	Acidity	16.60	63.53	4.75	18.17
	Alkalinity	8.93	34.19		

Table D34. Allocations UNT26				
UNT26	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ UNT26	7.41	2.97	11.79	63.53
Allowable Load @ UNT26	2.17	2.18	2.94	18.17
Load Reduction @ UNT26	5.24	0.79	8.85	45.36
% Reduction required @ UNT26	71%	27%	75%	71%

TMDL calculations- LC01 – Mouth of Licking Creek in Huefner

The TMDL for sample point LC01 consists of a load allocation to all areas between LC02/UNT30/SR01/UNT26 and LC01 shown in Attachment A. The load allocation for this segment of Licking Creek was computed using water-quality sample data collected at point LC01. The average flow, measured at the sampling point LC01 (25.20 MGD), is used for these computations.

Sample data at point LC01 shows that this segment has a pH ranging between 3.7 and 4.3. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D35 shows the measured and allowable concentrations and loads at LC01. Table D36 shows the percent reduction for aluminum and manganese needed at LC01.

Table D35		Measured		Allowable	
Flow (gpm)=	17503.20	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.96	201.01	0.46	96.91
	Iron	1.36	285.30	0.67	141.60
	Manganese	1.67	350.26	0.32	67.10
	Acidity	20.70	4351.27	1.76	369.71
	Alkalinity	2.45	515.01		

The measured and allowable loading for point LC01 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 LC02/UNT30/SR01/UNT26 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points LC02/UNT30/SR01/UNT26 and LC01 to determine a total load tracked for the segment of stream between LC02/UNT30/SR01/UNT26 and LC01. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at LC01.

Table D36. Allocations LC01				
LC01	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ LC01	201.01	285.30	350.26	4351.27
Difference in measured Loads between the loads that enter and existing LC01	48.24	-222.83	70.49	-156.62
Percent loss due calculated at LC01	NA	43.9%	NA	3.5%
Additional load tracked from above samples	91.31	124.74	60.96	331.29
Percentage of upstream loads that reach the LC01	NA	56.1%	NA	96.5%
Total load tracked between LC02/UNT30/SR01/UNT26 and LC01	139.55	70.04	131.45	319.78
Allowable Load @ LC01	96.91	141.60	67.10	369.71
Load Reduction @ LC01	42.64	-71.56	64.35	-49.93
% Reduction required @ LC01	31%	0%	49%	0%

A waste load allocation for future mining was included for this segment of Licking 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 D37. 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- MR01 – Mouth of Mahles Run

The TMDL for sample point MR01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Mahles Run was computed using water-quality sample data collected at point MR01. The average flow, calculated at the sampling point MR01 (4.32 MGD), is used for these computations. The allowable load allocations calculated at MR01 will directly affect the downstream point PC02.

Sample data at point MR01 shows that this unnamed tributary has a pH ranging between 4.5 and 6.4. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, manganese and acidity has been calculated at this site.

Table D38 shows the measured and allowable concentrations and loads at MR01. Table D39 shows the percent reduction for aluminum, manganese and acidity needed at MR01.

Table D38		Measured		Allowable	
Flow (gpm)=	2997.98	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.56	20.07	0.27	9.74
	Iron	0.39	14.04	0.39	14.04
	Manganese	1.99	71.62	0.42	15.03
	Acidity	17.63	634.58	1.97	70.97
	Alkalinity	7.82	281.44		

Table D39. Allocations MR01			
MR01	Al (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ MR01	20.07	71.62	634.58
Allowable Load @ MR01	9.74	15.03	70.97
Load Reduction @ MR01	10.33	56.59	563.61
% Reduction required @ MR01	51%	79%	89%

A waste load allocation for future mining was included for Mahles Run 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 D40. Waste Load Allocations for Future Mining Operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.09	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- LR01 – Lauer Run at Huefner Spring Road

The TMDL for sample point LR01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Lauer Run was computed using water-quality sample data collected at point LR01. The average flow, calculated at the sampling point LR01 (0.42 MGD), is used for these computations. The allowable load allocations calculated at LR01 will directly affect the downstream point PC02.

Sample data at point LR01 shows that Lauer Run has a pH ranging between 4.0 and 6.5. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH;

a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D41 shows the measured and allowable concentrations and loads at LR01. Table D42 shows the percent reduction for aluminum, iron, manganese and acidity needed at LR01.

Table D41		Measured		Allowable	
Flow (gpm)=	291.72	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	2.30	8.06	0.22	0.76
	Iron	0.67	2.36	0.36	1.27
	Manganese	1.50	5.25	0.98	3.44
	Acidity	23.67	82.91	1.76	6.17
	Alkalinity	8.53	29.90		

Table D42. Allocations LR01				
LR01	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ LR01	8.06	2.36	5.25	82.91
Allowable Load @ LR01	0.76	1.27	3.44	6.17
Load Reduction @ LR01	7.30	1.09	1.81	76.74
% Reduction required @ LR01	91%	46%	34%	93%

TMDL calculations- PC02 – Paint Creek at Paint Mills Road

The TMDL for sample point PC02 consists of a load allocation to all areas between LC01/MR01/LR01 and PC02 shown in Attachment A. The load allocation for this segment of Paint Creek was computed using water-quality sample data collected at point PC02. The average flow, measured at the sampling point PC02 (36.39 MGD), is used for these computations.

Sample data at point PC02 shows that this segment has a pH ranging between 3.4 and 4.3. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D43 shows the measured and allowable concentrations and loads at PC02. Table D44 shows the percent reduction for aluminum, iron, manganese and acidity needed at PC02.

Table D43		Measured		Allowable	
Flow (gpm)=	25267.44	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.15	347.68	0.52	157.98
	Iron	1.99	602.50	0.63	192.33
	Manganese	1.99	603.64	0.32	95.83
	Acidity	26.90	8162.85	1.26	381.85
	Alkalinity	2.05	622.08		

The measured and allowable loading for point PC02 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 LC01/MR01/LR01 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points LC01/MR01/LR01 and PC02 to determine a total load tracked for the segment of stream between LC01/MR01/LR01 and PC02. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at PC02.

Table D44. Allocations PC02				
PC02	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ PC02	347.68	602.50	603.64	8162.85
Difference in measured Loads between the loads that enter and existing PC02	118.54	300.80	176.51	3094.09
Additional load tracked from above samples	107.41	156.91	85.57	446.85
Total load tracked between LC01/MR01/LR01 and PC02	225.95	457.71	262.08	3540.94
Allowable Load @ PC02	157.98	192.33	95.83	381.85
Load Reduction @ PC02	67.97	265.38	166.25	3159.09
% Reduction required @ PC02	30%	58%	63%	89%

A waste load allocation for future mining was included for this segment of Paint 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 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- CR01 – Mouth of Cooper Run

The TMDL for sample point CR01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Cooper Run was computed using water-quality sample data collected at point CR01. The average flow, calculated at the sampling point CR01 (1.83 MGD), is used for these computations. The allowable load allocations calculated at CR01 will directly affect the downstream point PC01.

Sample data at point CR01 shows that Cooper Run has a pH ranging between 6.4 and 7.1. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. No reductions have been calculated at this site.

Table D46 shows the measured and allowable concentrations and loads at CR01.

Table D46		Measured		Allowable	
Flow (gpm)=	1270.10	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.25	3.81	0.25	3.81
	Iron	0.33	5.01	0.33	5.01
	Manganese	0.07	1.14	0.07	1.14
	Acidity	0.00	0.00	0.00	0.00
	Alkalinity	15.50	236.43		

TMDL calculations- LPC01 – Little Paint Creek at Schimp/Banner Road

The TMDL for sample point LPC01 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for Little Paint Creek was computed using water-quality sample data collected at point LPC01. The average flow, calculated at the sampling point LPC01 (6.59 MGD), is used for these computations. The allowable load allocations calculated at LPC01 will directly affect the downstream point PC01.

Sample data at point LPC01 shows that Little Paint Creek has a pH ranging between 4.2 and 6.1. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D47 shows the measured and allowable concentrations and loads at LPC01. Table D48 shows the percent reduction for aluminum, iron, manganese and acidity needed at LPC01.

Table D47		Measured		Allowable	
Flow (gpm)=	4577.76	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.99	54.69	0.34	18.78
	Iron	1.00	54.92	0.42	23.06
	Manganese	1.45	79.73	0.33	18.26
	Acidity	14.95	821.91	4.50	247.44
	Alkalinity	6.55	360.10		

Table D48. Allocations LPC01				
LPC01	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ LPC01	54.69	54.92	79.73	821.91
Allowable Load @ LPC01	18.78	23.06	18.26	247.44
Load Reduction @ LPC01	35.91	31.86	61.47	574.47
% Reduction required @ LPC01	66%	58%	77%	70%

A waste load allocation for future mining was included for Little Paint 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 D49. 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 Paint Creek at Rt 322

The TMDL for sample point PC01 consists of a load allocation to all areas between PC02/CR01/LPC01 and PC01 shown in Attachment A. The load allocation for this segment of Paint Creek was computed using water-quality sample data collected at point PC01. The average flow, measured at the sampling point PC01 (50.28 MGD), is used for these computations.

Sample data at point PC01 shows that this segment has a pH ranging between 3.6 and 4.5. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D50 shows the measured and allowable concentrations and loads at PC01. Table D51 shows the percent reduction for aluminum, manganese and acidity needed at PC01.

Table D50		Measured		Allowable	
Flow (gpm)=	34916.64	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.98	412.31	0.41	169.84
	Iron	1.33	559.60	0.85	356.14
	Manganese	1.76	739.18	0.32	132.75
	Acidity	22.45	9414.07	1.40	585.68
	Alkalinity	2.60	1090.27		

The measured and allowable loading for point PC01 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 PC02/CR01/LPC01 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points PC02/CR01/LPC01 and PC01 to determine a total load tracked for the segment of stream between PC02/CR01/LPC01 and PC01. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at PC01.

Table D51. Allocations PC01				
PC01	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ PC01	412.31	559.60	739.18	9414.07
Difference in measured Loads between the loads that enter and existing PC01	6.13	-102.83	54.67	429.31
Percent loss due calculated at PC01	NA	15.5%	NA	NA
Additional load tracked from above samples	180.57	220.40	115.23	629.29
Percentage of upstream loads that reach the PC01	NA	84.5%	NA	NA
Total load tracked between PC02/CR01/LPC01 and PC01	186.70	186.19	169.90	1058.60
Allowable Load @ PC01	169.84	356.14	132.75	585.68
Load Reduction @ PC01	16.86	-169.95	37.15	472.92
% Reduction required @ PC01	9%	0%	22%	45%

Waste Load Allocation – Corner Water Supply & Service Corporation Water Treatment Plant

The Corner Water Supply & Service Corporation (NPDES PA0104426) is a water treatment facility. Outfall 001 is a discharge that receives wastewater from an existing discharge of treated industrial waste from a municipal water treatment plant. The following table shows the waste load allocation for this discharge.

Table 52. Waste Load Allocation for permitted Industrial discharge			
Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Corner Water Supply & Service Corp. NPDES PA0104426			
001			
Al	4	0.0014	0.03
Fe	2	0.0014	0.02
Mn	1	0.0014	0.01

A waste load allocation for future mining was included for this segment of Paint 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 D53. Waste Load Allocations for Future Mining Operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.09	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- JR03 – UNT 63348 Judith Run at Millerstown Road

The TMDL for sample point JR03 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 to Judith Run was computed using water-quality sample data collected at point JR03. The average flow, calculated at the sampling point JR03 (0.65 MGD), is used for these computations. The allowable load allocations calculated at JR03 will directly affect the downstream point JR01.

Sample data at point JR03 shows that this tributary has a pH ranging between 3.4 and 3.6. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D54 shows the measured and allowable concentrations and loads at JR03. Table D55 shows the percent reduction for aluminum, iron, manganese and acidity needed at JR03.

Table D54		Measured		Allowable	
Flow (gpm)=	453.29	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	6.93	37.71	0.45	2.47
	Iron	1.99	10.86	0.94	5.10
	Manganese	8.01	43.60	0.67	3.64
	Acidity	74.75	406.93	0.00	0.00
	Alkalinity	0.00	0.00		

Table D55. Allocations JR03				
JR03	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ JR03	37.71	10.86	43.60	406.93
Allowable Load @ JR03	2.47	5.10	3.64	0.00
Load Reduction @ JR03	35.24	5.76	39.96	406.93
% Reduction required @ JR03	93%	53%	92%	100%

A waste load allocation for future mining was included for this unnamed tributary to Judith Run 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 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

<u>TMDL calculations- JR02 – UNT 63347 Judith Run at Millerstown Road</u>

The TMDL for sample point JR02 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 to Judith Run was computed using water-quality sample data collected at point JR02. The average flow, calculated at the sampling point JR02 (0.60 MGD), is used for these computations. The allowable load allocations calculated at JR02 will directly affect the downstream point JR01.

Sample data at point JR02 shows that this unnamed tributary has a pH ranging between 3.8 and 4.2. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D57 shows the measured and allowable concentrations and loads at JR02. Table D58 shows the percent reduction for aluminum, iron, manganese and acidity needed at JR02.

Table D57		Measured		Allowable	
Flow (gpm)=	417.38	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	2.99	14.98	0.23	1.17
	Iron	1.23	6.15	0.52	2.61
	Manganese	2.17	10.89	0.31	1.56
	Acidity	37.27	186.80	1.25	6.24
	Alkalinity	2.13	10.69		

Table D58. Allocations JR02				
JR02	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ JR02	14.98	6.15	10.89	186.80
Allowable Load @ JR02	1.17	2.61	1.56	6.24

Load Reduction @ JR02	13.81	3.54	9.33	180.56
% Reduction required @ JR02	92%	58%	86%	97%

TMDL calculations- JR01 – Mouth of Judith Run

The TMDL for sample point JR01 consists of a load allocation to all areas between JR03/JR02 and JR01 shown in Attachment A. The load allocation for this segment of Judith Run was computed using water-quality sample data collected at point JR01. The average flow, measured at the sampling point JR01 (3.61 MGD), is used for these computations.

Sample data at point JR01 shows that this segment has a pH ranging between 3.1 and 3.8. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D59 shows the measured and allowable concentrations and loads at JR01. Table D60 shows the percent reduction for iron, manganese and acidity needed at JR01.

Table D59		Measured		Allowable	
Flow (gpm)=	2504.30	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	2.08	62.50	0.56	16.76
	Iron	19.53	587.26	0.55	16.52
	Manganese	6.67	200.56	0.35	10.63
	Acidity	97.05	2918.84	0.00	0.00
	Alkalinity	0.00	0.00		

The measured and allowable loading for point JR01 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 JR03/JR02 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points JR03/JR02 and JR01 to determine a total load tracked for the segment of stream between JR03/JR02 and JR01. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at JR01.

Table D60. Allocations JR01				
JR01	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ JR01	62.50	587.26	200.56	2918.84
Difference in measured Loads between the loads that enter and existing JR01	9.81	570.25	146.07	2325.11
Additional load tracked from above samples	3.64	7.71	5.20	6.24
Total load tracked between JR03/JR02 and JR01	13.45	577.96	151.27	2331.35
Allowable Load @ JR01	16.76	16.52	10.63	0.00
Load Reduction @ JR01	-3.31	561.44	140.64	2331.35

% Reduction required @ JR01	0%	97%	93%	100%

A waste load allocation for future mining was included for this segment of Judith Run 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 D61. 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- DC10 – Headwaters of Deer Creek

The TMDL for sample point DC10 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for this headwaters segment of Deer Creek was computed using water-quality sample data collected at point DC10. The average flow, calculated at the sampling point DC10 (1.93 MGD), is used for these computations. The allowable load allocations calculated at DC10 will directly affect the downstream point DC08.

Sample data at point DC10 shows that this segment of Deer Creek has a pH ranging between 4.3 and 6.3. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D62 shows the measured and allowable concentrations and loads at DC10. Table D63 shows the percent reduction for aluminum, iron, manganese and acidity needed at DC10.

Table D62		Measured		Allowable	
Flow (gpm)=	1341.91	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.68	10.93	0.20	3.21
	Iron	2.22	35.72	0.49	7.95
	Manganese	3.26	52.57	0.32	5.16
	Acidity	11.40	183.72	2.40	38.76
	Alkalinity	11.75	189.36		

Table D63. Allocations DC10				
DC10	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ DC10	10.93	35.72	52.57	183.72
Allowable Load @ DC10	3.21	7.95	5.16	38.76
Load Reduction @ DC10	7.72	27.77	47.41	144.96
% Reduction required @ DC10	71%	78%	90%	79%

A waste load allocation for future mining was included for this segment of Deer Creek 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 D64. 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- DC09 – UNT 63349 Deer Creek

The TMDL for sample point DC09 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 Deer Creek was computed using water-quality sample data collected at point DC09. The average flow, calculated at the sampling point DC09 (0.72 MGD), is used for these computations. The allowable load allocations calculated at DC09 will directly affect the downstream point DC08.

Sample data at point DC09 shows that this tributary of Deer Creek has a pH ranging between 3.7 and 3.9. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D65 shows the measured and allowable concentrations and loads at DC09. Table D66 shows the percent reduction for aluminum, iron, manganese and acidity needed at DC09.

Table D65		Measured		Allowable	
Flow (gpm)=	498.17	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	5.42	32.40	0.30	1.78
	Iron	1.88	11.23	1.04	6.22
	Manganese	6.51	38.96	0.47	2.79
	Acidity	50.33	301.14	0.16	0.97
	Alkalinity	0.33	1.99		

Table D66. Allocations DC09				
DC09	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ DC09	32.40	11.23	38.96	301.14
Allowable Load @ DC09	1.78	6.22	2.79	0.97
Load Reduction @ DC09	30.62	5.01	36.17	300.17
% Reduction required @ DC09	95%	45%	93%	99.7%

A waste load allocation for future mining was included for this unnamed tributary of Deer Creek 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 D67. 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

<u>TMDL calculations- DC08 – Deer Creek upstream of confluence with Judith Run</u>

The TMDL for sample point DC08 consists of a load allocation to all areas between DC10/DC09 and DC08 shown in Attachment A. The load allocation for this segment of Deer Creek was computed using water-quality sample data collected at point DC08. The average flow, measured at the sampling point DC08 (3.66 MGD), is used for these computations.

Sample data at point DC08 shows that this segment has a pH ranging between 3.3 and 4.5. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D68 shows the measured and allowable concentrations and loads at DC08. Table D69 shows the percent reduction for iron, manganese and acidity needed at DC08.

Table D68		Measured		Allowable	
Flow (gpm)=	2544.70	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.42	43.44	0.57	17.41
	Iron	10.12	309.42	0.42	12.80
	Manganese	5.42	165.73	0.35	10.56
	Acidity	69.15	2113.28	0.42	12.82
	Alkalinity	1.45	44.31		

The measured and allowable loading for point DC08 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 DC10/DC09 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points DC10/DC09 and DC08 to determine a total load tracked for the segment of stream between DC10/DC09 and DC08.

This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at DC08.

Table D69. Allocations DC08				
DC08	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ DC08	43.44	309.42	165.73	2113.28
Difference in measured Loads between the loads that enter and existing DC08	0.11	262.47	74.20	1628.42
Additional load tracked from above samples	4.99	14.17	7.95	39.73
Total load tracked between DC10/DC09 and DC08	5.10	276.64	82.15	1668.15
Allowable Load @ DC08	17.41	12.80	10.56	12.82
Load Reduction @ DC08	-12.31	263.84	71.59	1655.33
% Reduction required @ DC08	0%	95%	87%	99%

A waste load allocation for future mining was included for this segment of Deer Creek allowing for four 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 D70. 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

TMDL calculations- DC07 – Deer Creek upstream of confluence with Little Deer Creek

The TMDL for sample point DC07 consists of a load allocation to all areas between DC08/JR01 and DC07 shown in Attachment A. The load allocation for this segment of Deer Creek was computed using water-quality sample data collected at point DC07. The average flow, measured at the sampling point DC07 (8.92 MGD), is used for these computations.

Sample data at point DC07 shows that this segment has a pH ranging between 3.1 and 4.3. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D71 shows the measured and allowable concentrations and loads at DC07. Table D72 shows the percent reduction for aluminum and manganese needed at DC07.

Table D71		Measured		Allowable	
Flow (gpm)=	6193.44	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.67	124.38	0.54	40.13
	Iron	8.44	627.57	0.53	39.27
	Manganese	5.29	393.36	0.34	25.23
	Acidity	64.85	4823.59	0.39	29.21
	Alkalinity	1.08	79.96		

The measured and allowable loading for point DC07 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 DC08/JR01 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points DC08/JR01 and DC07 to determine a total load tracked for the segment of stream between DC08/JR01 and DC07. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at DC07.

Table D72. Allocations DC07				
DC07	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ DC07	124.38	627.57	393.36	4823.59
Difference in measured Loads between the loads that enter and existing DC07	18.44	-269.11	27.07	-208.53
Percent loss due calculated at DC07	NA	30.0%	NA	4.1%
Additional load tracked from above samples	34.17	29.32	21.19	12.82
Percentage of upstream loads that reach the DC07	NA	70.0%	NA	95.9%
Total load tracked between DC08/JR01 and DC07	52.61	20.52	48.26	12.29
Allowable Load @ DC07	40.13	39.27	25.23	29.21
Load Reduction @ DC07	12.48	-18.75	23.03	-16.92
% Reduction required @ DC07	24%	0%	48%	0%

A waste load allocation for future mining was included for this segment of 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).

Table D73. Waste Load Allocations for Future Mining Operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.09	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- LDC02 – Headwaters of Little Deer Creek

The TMDL for sample point LDC02 consists of a load allocation to all of the area at and above this point shown in Attachment A. The load allocation for the headwaters segment of Little Deer Creek was computed using water-quality sample data collected at point LDC02. The average flow, calculated at the sampling point LDC02 (1.67 MGD), is used for these computations. The allowable load allocations calculated at LDC02 will directly affect the downstream point LDC01.

Sample data at point LDC02 shows that this segment of Little Deer Creek has a pH ranging between 3.9 and 4.0. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH, a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D74 shows the measured and allowable concentrations and loads at LDC02. Table D75 shows the percent reduction for aluminum, iron, manganese and acidity needed at LDC02.

Table D74		Measured		Allowable	
Flow (gpm)=	1162.39	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	3.45	48.15	0.35	4.85
	Iron	1.13	15.71	0.72	10.07
	Manganese	1.88	26.27	0.36	5.00
	Acidity	37.15	518.61	0.55	7.72
	Alkalinity	0.85	11.87		

Table D75. Allocations LDC02				
LDC02	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ LDC02	48.15	15.71	26.27	518.61
Allowable Load @ LDC02	4.85	10.07	5.00	7.72
Load Reduction @ LDC02	43.30	5.64	21.27	510.89
% Reduction required @ LDC02	90%	36%	81%	99%

A waste load allocation for future mining was included for this segment of Little Deer Creek 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 D76. 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- LDC01 – Mouth of Little Deer Creek

The TMDL for sample point LDC01 consists of a load allocation to all areas between LDC02 and LDC01 shown in Attachment A. The load allocation for this segment of Little Deer Creek was computed using water-quality sample data collected at point LDC01. The average flow, measured at the sampling point LDC01 (4.35 MGD), is used for these computations.

Sample data at point LDC01 shows that this segment has a pH ranging between 4.5 and 5.6. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D77 shows the measured and allowable concentrations and loads at LDC01. Table D78 shows the percent reduction for iron and manganese needed at LDC01.

Table D77		Measured		Allowable	
Flow (gpm)=	3020.42	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.03	37.18	0.40	14.46
	Iron	0.43	15.42	0.31	11.16
	Manganese	1.04	37.78	0.35	12.85
	Acidity	13.35	484.26	3.00	108.84
	Alkalinity	7.05	255.73		

The measured and allowable loading for point LDC01 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 point LDC02 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points LDC02 and LDC01 to determine a total load tracked for the segment of stream between LDC02 and LDC01. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at LDC01.

Table D78. Allocations LDC01				
LDC01	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ LDC01	37.18	15.42	37.78	484.26
Difference in measured Loads between the loads that enter and existing LDC01	-10.97	-0.29	11.51	-34.35
Percent loss due calculated at LDC01	22.8%	1.8%	NA	6.6%
Additional load tracked from above samples	4.85	10.07	5.00	7.72
Percentage of upstream loads that reach the LDC01	77.2%	98.2%	NA	93.4%
Total load tracked between LDC02 and LDC01	3.75	9.88	16.51	7.21
Allowable Load @ LDC01	14.46	11.16	12.85	108.84
Load Reduction @ LDC01	-10.71	-1.28	3.66	-101.63
% Reduction required @ LDC01	0%	0%	22%	0%

A waste load allocation for future mining was included for this segment of Little Deer Creek 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 D79. 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- DC06 – Deer Creek upstream of confluence with UNT 63336

The TMDL for sample point DC06 consists of a load allocation to all areas between LDC01/DC07 and DC06 shown in Attachment A. The load allocation for this segment of Deer Creek was computed using water-quality sample data collected at point DC06. The average flow, measured at the sampling point DC06 (13.77 MGD), is used for these computations.

Sample data at point DC06 shows that this segment has a pH ranging between 3.2 and 4.4. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D80 shows the measured and allowable concentrations and loads at DC06. Table D81 shows the percent reduction for aluminum, manganese and acidity needed at DC06.

Table D80		Measured		Allowable	
Flow (gpm)=	9559.44	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.58	181.28	0.51	59.02
	Iron	4.95	568.26	0.56	63.91
	Manganese	4.28	491.42	0.33	38.05
	Acidity	49.60	5694.33	0.51	58.86
	Alkalinity	1.35	154.99		

The measured and allowable loading for point DC06 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 LDC01/DC07 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points LDC01/DC07 and DC06 to determine a total load tracked for the segment of stream between LDC01/DC07 and DC06. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at DC06.

Table D81. Allocations DC06				
DC06	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ DC06	181.28	568.26	491.42	5694.33
Difference in measured Loads between the loads that enter and existing DC06	19.72	-74.73	60.28	386.48
Percent loss due calculated at DC06	NA	11.6%	NA	NA
Additional load tracked from above samples	54.59	50.43	38.08	138.05
Percentage of upstream loads that reach the DC06	NA	88.4%	NA	NA
Total load tracked between LDC01/DC07 and DC06	74.31	44.57	98.36	524.53
Allowable Load @ DC06	59.02	63.91	38.05	58.86
Load Reduction @ DC06	15.29	-19.34	60.31	465.67
% Reduction required @ DC06	21%	0%	61%	89%

A waste load allocation for future mining was included for this segment of 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).

Table D82. 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- UNT23 – UNT 63331 Deer Creek

The TMDL for sample point UNT23 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 Deer Creek was computed using water-quality sample data collected at point UNT23. The average flow, calculated at the sampling point UNT23 (1.63 MGD), is used for these computations. The allowable load allocations calculated at UNT23 will directly affect the downstream point DC05.

Sample data at point UNT23 shows that this tributary of Deer Creek has a pH ranging between 4.9 and 6.7. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH, a TMDL for acidity will be considered. A reduction for aluminum, iron, manganese and acidity has been calculated at this site.

Table D83 shows the measured and allowable concentrations and loads at UNT23. Table D84 shows the percent reduction for aluminum, iron, manganese and acidity needed at UNT23.

Table D83		Measured		Allowable	
Flow (gpm)=	1130.98	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.72	9.79	0.12	1.65
	Iron	7.57	102.84	0.33	4.48
	Manganese	1.55	21.05	0.59	8.03
	Acidity	2.75	37.35	2.17	29.50

	Alkalinity	26.70	362.66		

Table D84. Allocations UNT23				
UNT23	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ UNT23	9.79	102.84	21.050	37.35
Allowable Load @ UNT23	1.65	4.48	8.030	29.50
Load Reduction @ UNT23	8.14	98.36	13.02	7.85
% Reduction required @ UNT23	83%	96%	62%	21%

A waste load allocation for future mining was included for this unnamed tributary of Deer Creek 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 D85. 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- DC05 – Deer Creek upstream of confluence with UNT 63326

The TMDL for sample point DC05 consists of a load allocation to all areas between UNT23/DC06 and DC05 shown in Attachment A. The load allocation for this segment of Deer Creek was computed using water-quality sample data collected at point DC05. The average flow, measured at the sampling point DC05 (17.06 MGD), is used for these computations.

Sample data at point DC05 shows that this segment has a pH ranging between 3.4 and 4.7. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D86 shows the measured and allowable concentrations and loads at DC05. Table D87 shows the percent reduction for aluminum needed at DC05.

Table D86		Measured		Allowable	
Flow (gpm)=	11848.32	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.44	205.29	0.47	66.59
	Iron	2.69	382.38	0.61	87.33
	Manganese	3.57	507.88	0.36	50.99
	Acidity	35.45	5044.31	0.85	120.80
	Alkalinity	1.70	241.90		

The measured and allowable loading for point DC05 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 UNT23/DC06 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points UNT23/DC06 and DC05 to determine a total load tracked for the segment of stream between UNT23/DC06 and DC05. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at DC05.

Table D87. Allocations DC05				
DC05	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ DC05	205.29	382.38	507.88	5044.31
Difference in measured Loads between the loads that enter and existing DC05	14.22	-288.72	-4.59	-687.37
Percent loss due calculated at DC05	NA	43.0%	0.9%	12.0%
Additional load tracked from above samples	60.67	68.39	46.08	88.36
Percentage of upstream loads that reach the DC05	NA	57.0%	99.1%	88.0%
Total load tracked between UNT23/DC06 and DC05	74.89	38.97	45.67	77.76
Allowable Load @ DC05	66.59	87.33	50.99	120.80
Load Reduction @ DC05	8.30	-48.36	-5.32	-43.04
% Reduction required @ DC05	11%	0%	0%	0%

A waste load allocation for future mining was included for this segment of 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).

Table D88. 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- DC04 – Deer Creek upstream of confluence with Paint Creek

The TMDL for sample point DC04 consists of a load allocation to all areas between DC05 and DC04 shown in Attachment A. The load allocation for this segment of Deer Creek was computed using water-quality sample data collected at point DC04. The average flow, measured at the sampling point DC04 (20.68 MGD), is used for these computations.

Sample data at point DC04 shows that this segment has a pH ranging between 3.8 and 5.0. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D89 shows the measured and allowable concentrations and loads at DC04. Table D90 shows the percent reduction for aluminum needed at DC04.

Table D89		Measured		Allowable	
Flow (gpm)=	14361.60	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.29	222.54	0.46	79.28
	Iron	1.12	192.40	0.35	60.17
	Manganese	2.99	516.18	0.37	63.33
	Acidity	20.05	3458.17	0.93	159.58
	Alkalinity	1.85	319.08		

The measured and allowable loading for point DC04 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 point DC05 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points DC05 and DC04 to determine a total load tracked for the segment of stream between DC05 and DC04. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at DC04.

Table D90. Allocations DC04				
DC04	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ DC04	222.54	192.40	516.18	3458.17
Difference in measured Loads between the loads that enter and existing DC04	17.25	-189.98	8.30	-1586.14
Percent loss due calculated at DC04	NA	49.7%	NA	31.4%
Additional load tracked from above samples	66.59	87.33	50.99	120.80
Percentage of upstream loads that reach DC04	NA	50.3%	NA	68.6%
Total load tracked between DC05 and DC04	83.84	43.94	59.29	82.82
Allowable Load @ DC04	79.28	60.17	63.33	159.58
Load Reduction @ DC04	4.56	-16.23	-4.04	-76.76
% Reduction required @ DC04	5%	0%	0%	0%

A waste load allocation for future mining was included for this segment of 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).

Table D91. 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- DC03 – Deer Creek downstream of confluence with Paint Creek

The TMDL for sample point DC03 consists of a load allocation to all areas between DC04/PC01 and DC03 shown in Attachment A. The load allocation for this segment of Deer Creek was computed using water-quality sample data collected at point DC03. The average flow, measured at the sampling point DC03 (72.38 MGD), is used for these computations.

Sample data at point DC03 shows that this segment has a pH ranging between 3.8 and 4.9. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D92 shows the measured and allowable concentrations and loads at DC03. Table D93 shows the percent reduction for aluminum, iron and acidity needed at DC03.

Table D92		Measured		Allowable	
Flow (gpm)=	50265.60	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.96	581.79	0.37	224.35
	Iron	0.95	575.30	0.51	310.79
	Manganese	1.93	1164.48	0.30	183.27
	Acidity	26.25	15846.33	1.46	879.60
	Alkalinity	2.75	1660.09		

The measured and allowable loading for point DC03 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 DC04/PC01 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points DC04/PC01 and DC03 to determine a total load tracked for the segment of stream between DC04/PC01 and DC03. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at DC03.

Table D93. Allocations DC03				
DC03	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ DC03	581.79	575.30	1164.48	15846.33
Difference in measured Loads between the loads that enter and existing DC03	-53.06	-176.70	-90.88	2974.09
Percent loss due calculated at DC03	8.4%	23.5%	7.2%	NA
Additional load tracked from above samples	249.12	416.31	196.08	745.26
Percentage of upstream loads that reach the DC03	91.6%	76.5%	92.8%	NA
Total load tracked between DC04/PC01 and DC03	228.30	318.49	181.89	3719.35
Allowable Load @ DC03	224.35	310.79	183.27	879.60
Load Reduction @ DC03	3.95	7.70	-1.38	2839.75
% Reduction required @ DC03	2%	2%	0%	76%

A waste load allocation for future mining was included for this segment of 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).

Table D94. Waste Load Allocations for Future Mining Operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.09	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- UNT06 – UNT 49422 Deer Creek

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 Deer Creek was computed using water-quality sample data collected at point UNT06. The average flow, calculated at the sampling point UNT06 (0.90 MGD), is used for these computations. The allowable load allocations calculated at UNT06 will directly affect the downstream point DC02.

Sample data at point UNT06 shows that this unnamed tributary of Deer Creek 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; although not necessary, a TMDL for acidity will be considered. A reduction for aluminum has been calculated at this site.

Table D95 shows the measured and allowable concentrations and loads at UNT06. Table D96 shows the percent reduction for aluminum needed at UNT06.

Table D95		Measured		Allowable	
Flow (gpm)=	628.32	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.35	2.63	0.25	1.91
	Iron	0.29	2.18	0.29	2.18
	Manganese	0.10	0.75	0.099	0.75
	Acidity	0.00	0.00	0.00	0.00
	Alkalinity	38.20	288.25		

Table D96. Allocations UNT06	
UNT06	Al (Lbs/day)
Existing Load @ UNT06	2.63
Allowable Load @ UNT06	1.91
Load Reduction @ UNT06	0.72
% Reduction required @ UNT06	27%

TMDL calculations- UNT04 – UNT 49415 Deer Creek

The TMDL for sample point UNT04 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 Deer Creek was computed using water-quality sample data collected at point UNT04. The average flow, calculated at the sampling point UNT04 (1.19 MGD), is used for these computations. The allowable load allocations calculated at UNT04 will directly affect the downstream point DC02.

Sample data at point UNT04 shows that this tributary of Deer Creek has a pH ranging between 4.8 and 5.3. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity will be considered. A reduction for aluminum, manganese and acidity has been calculated at this site.

Table D97 shows the measured and allowable concentrations and loads at UNT04. Table D98 shows the percent reduction for aluminum, manganese and acidity needed at UNT04.

Table D97		Measured		Allowable	
Flow (gpm)=	825.79	Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.90	8.92	0.34	3.37
	Iron	0.15	1.49	0.15	1.49
	Manganese	1.23	12.16	0.29	2.88
	Acidity	9.45	93.72	5.08	50.35
	Alkalinity	7.40	73.39		

Table D98. Allocations UNT04			
UNT04	Al (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ UNT04	8.92	12.16	93.72
Allowable Load @ UNT04	3.37	2.88	50.35
Load Reduction @ UNT04	5.55	9.28	43.37
% Reduction required @ UNT04	62%	76%	46%

TMDL calculations- DC02 – Deer Creek at Beaver Furnace Road

The TMDL for sample point DC02 consists of a load allocation to all areas between DC03/UNT06/UNT04 and DC02 shown in Attachment A. The load allocation for this segment of Deer Creek was computed using water-quality sample data collected at point DC02. The average flow, measured at the sampling point DC02 (78.85 MGD), is used for these computations.

Sample data at point DC02 shows that this segment has a pH ranging between 3.9 and 5.1. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D99 shows the measured and allowable concentrations and loads at DC02. Table D100 shows the percent reduction for aluminum and iron needed at DC02.

Table D99		Measured		Allowable	
Flow (gpm)=	54753.60	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.03	677.46	0.31	204.42
	Iron	1.20	791.55	0.46	300.33
	Manganese	1.80	1180.50	0.33	214.81
	Acidity	18.40	12099.27	2.86	1878.63
	Alkalinity	4.15	2728.91		

The measured and allowable loading for point DC02 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 DC03/UNT06/UNT04 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points DC03/UNT06/UNT04 and DC02 to determine a total load tracked for the segment of stream between DC03/UNT06/UNT04 and DC02. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at DC02.

Table D100. Allocations DC02				
DC02	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ DC02	677.46	791.55	1180.50	12099.27
Difference in measured Loads between the loads that enter and existing DC02	84.12	212.58	3.11	-3840.78
Percent loss due calculated at DC02	NA	NA	NA	24.1%
Additional load tracked from above samples	229.63	314.46	186.90	929.95
Percentage of upstream loads that reach the DC02	NA	NA	NA	75.9%
Total load tracked between DC03/UNT06/UNT04 and DC02	313.75	527.04	190.01	705.88
Allowable Load @ DC02	204.42	300.33	214.81	1878.63
Load Reduction @ DC02	109.33	226.71	-24.80	-1172.75
% Reduction required @ DC02	35%	43%	0%	0%

A waste load allocation for future mining was included for this segment of 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).

Table D101. 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- DC01 – Mouth of Deer Creek

The TMDL for sample point DC01 consists of a load allocation to all areas between DC02 and DC01 shown in Attachment A. The load allocation for this mouth segment of Deer Creek was computed using water-quality sample data collected at point DC01. The average flow, measured at the sampling point DC01 (86.60 MGD), is used for these computations.

Sample data at point DC01 shows that this segment has a pH ranging between 4.0 and 5.1. Although there currently is not an entry for this segment on the Pa Section 303(d) list for impairment due to pH; a TMDL for acidity is considered.

Table D102 shows the measured and allowable concentrations and loads at DC01. Table D103 shows the percent reduction for acidity needed at DC01.

Table D102		Measured		Allowable	
Flow (gpm)=	60139.20	Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.92	660.98	0.39	280.59
	Iron	0.62	447.43	0.62	447.43
	Manganese	1.34	968.29	0.30	215.58
	Acidity	16.50	11917.09	1.93	1394.84
	Alkalinity	5.43	3924.21		

The measured and allowable loading for point DC01 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 DC02 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points DC02 and DC01 to determine a total load tracked for the segment of stream between DC02 and DC01. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at DC01.

Table D103. Allocations DC01				
DC01	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ DC01	660.98	447.43	968.29	11917.09
Difference in measured Loads between the loads that enter and existing DC01	-16.48	-344.12	-212.21	-182.18
Percent loss due calculated at DC01	2.4%	43.5%	18.0%	1.5%
Additional load tracked from above samples	204.42	300.33	214.81	1878.63
Percentage of upstream loads that reach the DC01	97.6%	56.5%	82.0%	98.5%
Total load tracked between DC02 and DC01	199.45	169.76	176.20	1850.34
Allowable Load @ DC01	280.59	447.43	215.58	1394.84
Load Reduction @ DC01	-81.14	-277.67	-39.38	455.50
% Reduction required @ DC01	0%	0%	0%	25%

A waste load allocation for future mining was included for this segment of 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).

Table D104. 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

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.

Attachment E

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

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

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

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

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

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

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 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.

Attachment F

Water Quality Data Used In TMDL Calculations

LC05 **UNT 49486 Licking Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/11/2008		5.0	7.40	17.20	0.73	0.91	1.04
7/8/2008		4.6	6.20	8.20	0.15	1.07	0.25
8/26/2008		4.0	1.60	16.80	0.58	2.13	0.63
11/18/2008		4.0	2.20	22.00	0.82	3.67	0.97
AVERAGE	*1853.54*	*4.4*	*4.35*	*16.05*	*0.57*	*1.94*	*0.72*
ST DEV		*0.5*	*2.88*	*5.74*	*0.30*	*1.27*	*0.36*

LC04 **Headwaters of Licking Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/11/2008		4.8	6.80	18.20	1.61	0.76	1.21
7/8/2008		3.9	0.00	18.80	0.91	1.30	0.80
8/26/2008		3.3	0.00	50.80	4.15	4.37	1.76
11/18/2008		3.7	0.00	31.00	2.15	3.31	0.94
AVERAGE	*2656.90*	*3.9*	*1.70*	*29.70*	*2.21*	*2.44*	*1.18*
ST DEV		*0.6*	*3.40*	*15.25*	*1.39*	*1.69*	*0.42*

LC03 **Licking Creek downstream of confluence with UNT 49486 Licking Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/11/2008		4.8	7.00	15.40	1.47	0.86	1.17
7/8/2008		4.0	1.60	19.40	1.42	1.31	0.63
8/26/2008		3.4	0.00	39.80	4.84	3.82	1.29
11/18/2008		3.8	0.00	29.60	2.77	3.41	0.88
AVERAGE	*4712.40*	*4.0*	*2.15*	*26.05*	*2.62*	*2.35*	*0.99*
ST DEV		*0.6*	*3.32*	*10.94*	*1.60*	*1.48*	*0.30*

F01 **Mouth of Foy Run**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
7/8/2008		4.4	5.40	-13.80	0.50	0.63	1.43
8/26/2008		4.2	4.20	18.80	1.28	0.69	1.44
11/18/2008		4.4	5.20	13.80	0.73	0.54	0.57
AVERAGE	*1503.48*	*4.3*	*4.93*	*6.27*	*0.84*	*0.62*	*1.15*
ST DEV		*0.1*	*0.64*	*17.56*	*0.40*	*0.08*	*0.50*

UNT39 **UNT 49482 Licking Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/11/2008		5	7.80	23.40	<u>0.15</u>	1.06	1.67
7/8/2008		5.9	12.00	6.60	1.68	1.68	<u>0.25</u>
8/26/2008		6.5	54.00	-18.00	25.78	3.23	<u>0.25</u>
11/18/2008		6.5	17.00	2.80	1.83	0.64	<u>0.25</u>
AVERAGE	*493.68*	*6.0*	*22.70*	*3.70*	*7.36*	*1.65*	*0.60*
ST DEV		*0.7*	*21.20*	*17.01*	*12.30*	*1.13*	*0.71*

FR01 **Frills Run**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/11/2008		6.3	10.20	17.60	4.07	0.60	<u>0.25</u>
7/8/2008		4.0	2.40	25.40	7.32	1.42	<u>0.25</u>
8/26/2008		3.2	0.00	97.00	16.45	5.77	1.16
11/18/2008		3.5	0.00	40.20	9.48	2.64	<u>0.25</u>
AVERAGE	*583.44*	*4.3*	*3.15*	*45.05*	*9.33*	*2.61*	*0.48*
ST DEV		*1.4*	*4.83*	*35.88*	*5.24*	*2.27*	*0.46*

GR01 **Mouth of Grolemund Run**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
7/8/2008		3.6	0.00	35.60	5.69	2.60	1.04
8/26/2008		3.2	0.00	69.60	12.39	4.82	1.47
11/20/2008		3.2	0.00	97.00	18.58	5.94	1.51
AVERAGE	*1184.83*	*3.3*	*0.00*	*67.40*	*12.22*	*4.45*	*1.34*
STDEV		*0.2*	*0.00*	*30.76*	*6.45*	*1.70*	*0.26*

UNT32 **UNT 49473 Licking Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/11/2008		4.6	6.00	20.40	0.35	0.50	0.84
7/9/2008		6.3	10.00	8.20	1.00	0.61	<u>0.25</u>
8/26/2008		4	2.60	14.40	0.73	1.60	0.54
11/18/2008		3.5	0.00	43.60	1.87	2.14	1.28

AVERAGE	*587.93*	*4.6*	*4.65*	*21.65*	*0.99*	*1.21*	*0.73*
ST DEV		*1.2*	*4.33*	*15.46*	*0.65*	*0.79*	*0.44*

UNT35 **UNT 49472 Licking Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/11/2008		5.6	7.60	14.00	0.15	0.10	0.25
7/9/2008		6.1	9.80	7.60	0.86	0.45	0.25
11/18/2008		6.2	9.60	11.00	0.15	0.08	0.25
AVERAGE	*210.94*	*6.0*	*9.00*	*10.87*	*0.39*	*0.21*	*0.25*
STDEV		*0.3*	*1.22*	*3.20*	*0.41*	*0.21*	*0.00*

LC02 **Licking Creek at Licking Road**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/11/2008		4.9	7.00	20.60	0.73	0.65	0.91
7/9/2008		4.4	5.20	17.00	0.82	0.97	0.62
8/26/2008		4.0	2.80	14.60	0.71	2.04	0.91
11/18/2008		3.8	0.00	38.80	1.35	2.57	0.96
AVERAGE	*13060.08*	*4.3*	*3.75*	*22.75*	*0.90*	*1.55*	*0.85*
STDEV		*0.5*	*3.03*	*10.98*	*0.31*	*0.90*	*0.15*

UNT30 **UNT 49471 Licking Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
7/10/2008		5.0	9.80	205.20	98.53	5.64	0.59
8/26/2008		5.6	17.80	288.60	157.31	8.27	0.96
11/18/2008		4.1	3.60	294.00	144.03	8.33	1.15
AVERAGE	*224.40*	*4.9*	*10.40*	*262.60*	*133.29*	*7.41*	*0.90*
ST DEV		*0.8*	*7.12*	*49.78*	*30.83*	*1.53*	*0.29*

SR01 **Mouth of Step Run**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/12/2008		5.4	7.80	10.80	0.15	0.26	0.53
7/9/2008		6.3	9.20	2.80	0.15	0.17	0.25
8/26/2008		6.4	9.20	1.00	0.15	0.11	0.25

11/18/2008		6.7	10.40	7.60	0.15	0.03	0.25
AVERAGE	*2526.74*	*6.2*	*9.15*	*5.55*	*0.15*	*0.14*	*0.32*
ST DEV		*0.6*	*1.06*	*4.47*	*0.00*	*0.10*	*0.14*

UNT26 **UNT 49466 Licking Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
7/8/2008		4.9	9.20	17.20	0.73	2.68	2.10
8/26/2008		5.0	8.80	11.40	1.18	3.38	1.66
11/18/2008		5.0	8.80	21.20	0.42	3.18	2.05
AVERAGE	*318.65*	*5.0*	*8.93*	*16.60*	*0.78*	*3.08*	*1.94*
ST DEV		*0.1*	*0.23*	*4.93*	*0.38*	*0.36*	*0.24*

LC01 **Mouth of Licking Creek in Huefner**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/12/2008		4.3	5.00	20.00	1.10	0.65	1.02
7/9/2008		4.3	4.80	18.40	1.01	1.01	0.65
8/26/2008		3.8	0.00	19.20	1.18	2.20	1.02
11/18/2008		3.7	0.00	25.20	2.14	2.81	1.14
AVERAGE	*17503.20*	*4.0*	*2.45*	*20.70*	*1.36*	*1.67*	*0.96*
ST DEV		*0.3*	*2.83*	*3.07*	*0.53*	*1.01*	*0.21*

MR01 **Mouth of Mahles Run**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
9/20/2006		5.3	7.60	5.20	0.15	0.85	0.25
10/12/2006		6.1	12.20	7.80	0.84	0.96	0.69
12/11/2006		5.1	7.40	40.20	0.73	1.46	0.54
1/3/2007		5.1	7.60	42.80	0.61	1.39	0.55
3/13/2007		6.3	9.20	7.40	0.56	0.99	0.25
4/25/2007		5	6.80	8.80	0.46	1.11	0.58
5/22/2007		4.8	7.00	33.20	0.15	1.99	0.85
6/20/2007		4.6	6.60	13.80	0.15	2.60	0.66
7/16/2007		4.5	6.40	44.20	0.15	3.37	0.97
8/22/2007		5.1	7.80	38.40	0.15	2.48	0.25
11/19/2007		5.2	7.60	9.60	0.15	2.41	0.25
1/31/2008		5.8	7.80	6.40	0.55	1.05	0.25
2/28/2008		5.2	7.40	12.60	1.17	1.58	0.81
3/12/2008		5.8	8.20	11.00	0.64	1.09	0.25
4/10/2008		4.9	7.00	44.40	0.49	1.89	1.18

5/1/2008		4.8	7.00	17.40	0.15	2.06	1.11
7/9/2008		6	8.60	10.40	0.49	1.47	0.25
7/24/2008		5	7.40	6.60	0.34	2.02	0.60
8/21/2008		5	8.20	9.20	0.33	2.10	0.56
8/26/2008		4.9	8.00	8.60	0.15	2.36	0.59
9/10/2008		4.8	7.20	14.80	0.33	3.37	0.69
10/21/2008		4.9	7.80	13.20	0.15	3.79	0.75
11/8/2008		4.9	7.20	9.20	0.15	3.41	0.25
12/3/2008		6.4	9.60	7.80	0.33	1.94	0.25
AVERAGE	*2997.98*	*5.2*	*7.82*	*17.63*	*0.39*	*1.99*	*0.56*
ST DEV		*0.5*	*1.20*	*13.94*	*0.27*	*0.86*	*0.29*

LR01 **Lauer Run at Huefner Spring Road**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/12/2008		4.0	1.60	43.60	0.60	1.49	3.59
7/9/2008		4.5	6.60	29.60	1.26	1.51	2.76
11/18/2008		6.5	17.40	-2.20	0.15	1.50	0.56
AVERAGE	*291.72*	*5.0*	*8.53*	*23.67*	*0.67*	*1.50*	*2.30*
ST DEV		*1.3*	*8.08*	*23.47*	*0.56*	*0.01*	*1.56*

PC02 **Paint Creek at Paint Mills Road**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/12/2008		4.3	5.00	23.00	1.35	0.76	1.08
7/9/2008		4.1	3.20	20.80	1.73	1.16	0.91
8/26/2008		3.4	0.00	33.60	1.64	2.74	1.29
11/18/2008		3.6	0.00	30.20	3.22	3.30	1.31
AVERAGE	*25267.44*	*3.9*	*2.05*	*26.90*	*1.99*	*1.99*	*1.15*
ST DEV		*0.4*	*2.48*	*6.01*	*0.84*	*1.22*	*0.19*

CR01 **Mouth of Cooper Run**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/12/2008		6.4	10.20	5.60	0.15	0.07	0.25
7/9/2008		6.9	15.40	2.60	0.63	0.06	0.25
8/26/2008		6.9	18.00	-7.40	0.39	0.14	0.25
11/18/2008		7.1	18.40	-3.80	0.15	0.03	0.25
AVERAGE	*1270.10*	*6.8*	*15.50*	*-0.75*	*0.33*	*0.07*	*0.25*
ST DEV		*0.3*	*3.78*	*5.92*	*0.23*	*0.05*	*0.00*

LPC01 **Little Paint Creek at Schimp/Banner Road**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/12/2008		5.3	7.60	14.00	0.93	0.53	0.66
7/9/2008		6.1	9.20	12.80	2.02	0.95	1.51
8/26/2008		4.3	5.60	14.40	0.49	2.26	1.05
11/18/2008		4.2	3.80	18.60	0.56	2.05	0.77
AVERAGE	*4577.76*	*5.0*	*6.55*	*14.95*	*1.00*	*1.45*	*0.99*
ST DEV		*0.9*	*2.35*	*2.53*	*0.71*	*0.84*	*0.38*

PC01 **Mouth of Paint Creek at Rt 322**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/12/2008		4.5	6.20	20.40	1.03	0.66	0.89
7/9/2008		4.2	4.20	15.60	1.55	1.05	0.62
8/27/2008		3.6	0.00	31.20	1.04	2.46	1.24
11/18/2008		3.7	0.00	22.60	1.72	2.89	1.17
AVERAGE	*34916.64*	*4.0*	*2.60*	*22.45*	*1.33*	*1.76*	*0.98*
ST DEV		*0.4*	*3.11*	*6.52*	*0.35*	*1.08*	*0.28*

JR3 **UNT 63348 Judith Run at Millerstown Road**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/13/2008		3.6	0.00	82.60	1.39	6.22	8.44
7/7/2008		3.4	0.00	69.80	2.03	7.61	7.01
8/27/2006		3.4	0.00	83.40	2.19	9.67	7.56
11/19/2008		3.5	0.00	63.20	2.37	8.55	4.71
AVERAGE	*453.29*	*3.5*	*0.00*	*74.75*	*1.99*	*8.01*	*6.93*
ST DEV		*0.1*	*0.00*	*9.91*	*0.43*	*1.46*	*1.59*

JR2 **UNT 63347 Judith Run at Millerstown Road**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/13/2008		4.2	3.80	26.80	0.57	0.79	1.46
7/7/2008		4.0	2.60	44.40	1.20	3.50	5.09
11/19/2008		3.8	0.00	40.60	1.91	2.23	2.42
AVERAGE	*417.38*	*4.0*	*2.13*	*37.27*	*1.23*	*2.17*	*2.99*
ST DEV		*0.2*	*1.94*	*9.26*	*0.67*	*1.35*	*1.88*

JR1 **Mouth of Judith Run**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/13/2008		3.8	0.00	44.20	10.85	2.72	2.38
7/7/2008		3.3	0.00	72.20	12.60	4.91	1.93
8/27/2008		3.1	0.00	156.00	32.62	10.79	2.23
11/18/2008		3.2	0.00	115.80	22.04	8.26	1.78
AVERAGE	*2504.30*	*3.4*	*0.00*	*97.05*	*19.53*	*6.67*	*2.08*
ST DEV		*0.3*	*0.00*	*49.12*	*10.02*	*3.57*	*0.27*

DC10 **Headwaters of Deer Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/13/2008		4.6	5.80	18.80	1.14	1.44	0.97
7/7/2008		4.3	5.00	16.60	1.99	2.43	0.25
8/27/2008		6.3	29.00	-5.60	4.09	3.17	0.25
11/18/2008		4.8	7.20	15.80	1.65	6.01	1.24
AVERAGE	*1341.91*	*5.0*	*11.75*	*11.40*	*2.22*	*3.26*	*0.68*
ST DEV		*0.9*	*11.54*	*11.40*	*1.29*	*1.97*	*0.51*

DC09 **UNT 63349 Deer Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/13/2008		3.9	0.40	52.80	2.13	3.80	5.90
7/7/2008		3.7	0.00	66.40	1.97	7.39	7.63
11/18/2008		3.9	0.60	31.80	1.53	8.34	2.72
AVERAGE	*498.17*	*3.8*	*0.33*	*50.33*	*1.88*	*6.51*	*5.42*
ST DEV		*0.1*	*0.31*	*17.43*	*0.31*	*2.40*	*2.49*

DC08 **Deer Creek upstream of confluence with Judith Run**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/13/2008		4.5	5.80	21.20	3.56	1.79	1.46
7/7/2008		3.8	0.00	39.20	7.04	4.51	1.65
8/27/2008		3.3	0.00	94.40	20.16	8.78	1.25
11/18/2008		3.6	0.00	121.80	9.74	6.62	1.33

AVERAGE	*2544.70*	*3.8*	*1.45*	*69.15*	*10.12*	*5.42*	*1.42*
ST DEV		*0.5*	*2.90*	*46.92*	*7.15*	*2.98*	*0.17*

DC07 **Deer Creek upstream of confluence with Little Deer Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/13/2008		4.3	4.30	31.40	5.45	1.90	1.63
7/7/2008		3.4	0.00	49.40	4.18	3.98	1.54
8/27/2008		3.1	0.00	109.00	14.16	8.73	2.03
11/18/2008		3.3	0.00	69.60	9.96	6.54	1.49
AVERAGE	*6193.44*	*3.5*	*1.08*	*64.85*	*8.44*	*5.29*	*1.67*
ST DEV		*0.5*	*2.15*	*33.31*	*4.55*	*2.98*	*0.25*

LDC02 **Headwaters of Little Deer Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/12/2008		4.0	1.80	31.60	0.99	0.78	2.36
7/7/2008		3.9	0.00	34.20	1.34	1.36	2.79
8/27/2008		4.0	1.60	35.00	0.64	2.43	3.38
11/19/2008		3.9	0.00	47.80	1.53	2.96	5.27
AVERAGE	*1162.39*	*4.0*	*0.85*	*37.15*	*1.13*	*1.88*	*3.45*
ST DEV		*0.1*	*0.98*	*7.25*	*0.39*	*0.99*	*1.28*

LDC01 **Mouth of Little Deer Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/12/2008		4.6	6.60	20.80	0.36	0.47	1.29
7/7/2008		4.5	6.00	13.00	0.15	0.83	0.98
8/27/2008		5.6	8.80	7.20	1.04	1.09	0.62
11/18/2008		4.8	6.80	12.40	0.15	1.78	1.22
AVERAGE	*3020.42*	*4.9*	*7.05*	*13.35*	*0.43*	*1.04*	*1.03*
ST DEV		*0.5*	*1.22*	*5.61*	*0.42*	*0.56*	*0.30*

DC06 **Deer Creek upstream of confluence with UNT 63336**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/13/2008		4.4	5.40	23.60	3.88	1.50	1.58

7/7/2008		3.5	0.00	40.00	2.00	3.19	1.43
8/27/2008		3.2	0.00	81.00	7.54	7.22	1.96
11/1/2008		3.4	0.00	53.80	6.39	5.22	1.35
AVERAGE	*9559.44*	*3.6*	*1.35*	*49.60*	*4.95*	*4.28*	*1.58*
ST DEV		*0.5*	*2.70*	*24.30*	*2.49*	*2.48*	*0.27*

UNT23 **UNT 63331 Deer Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/13/2008		4.9	7.40	18.80	0.57	1.25	2.13
7/7/2008		6.7	26.40	0.60	5.85	1.46	0.25
8/27/2008		6.4	46.20	-8.60	17.28	2.10	0.25
11/19/2008		6.5	26.80	0.20	6.59	1.39	0.25
AVERAGE	*1130.98*	*6.1*	*26.70*	*2.75*	*7.57*	*1.55*	*0.72*
ST DEV		*0.8*	*15.84*	*11.51*	*7.00*	*0.37*	*0.94*

DC05 **Deer Creek upstream of confluence with UNT 63326**

Date Collected	Flow	pH	ALK MG/L	OT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/13/2008		4.7	6.80	22.40	3.07	1.37	1.49
7/7/2008		3.6	0.00	31.80	1.02	2.90	1.33
8/27/2008		3.4	0.00	50.40	2.83	5.78	1.85
11/19/2008		3.6	0.00	37.20	3.83	4.23	1.11
AVERAGE	*11848.32*	*3.8*	*1.70*	*35.45*	*2.69*	*3.57*	*1.44*
ST DEV		*0.6*	*3.40*	*11.69*	*1.19*	*1.88*	*0.31*

DC04 **Deer Creek upstream of confluence with Paint Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/13/2008		5.0	7.40	13.80	2.44	1.16	1.26
7/7/2008		3.9	0.00	24.60	0.35	2.47	1.19
8/27/2008		3.8	0.00	26.80	0.44	4.73	1.70
11/19/2008		3.8	0.00	15.00	1.23	3.61	1.02
AVERAGE	*14361.60*	*4.1*	*1.85*	*20.05*	*1.12*	*2.99*	*1.29*
ST DEV		*0.6*	*3.70*	*6.60*	*0.97*	*1.53*	*0.29*

DC03 **Deer Creek downstream of confluence with Paint Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/18/2008		4.9	7.20	17.40	0.92	0.53	0.85
7/10/2008		4.2	3.80	24.00	0.42	1.24	0.59
8/27/2008		3.8	0.00	27.40	0.79	2.91	1.33
11/19/2008		3.8	0.00	36.20	1.68	3.03	1.09
AVERAGE	*50265.60*	*4.2*	*2.75*	*26.25*	*0.95*	*1.93*	*0.96*
ST DEV		*0.5*	*3.47*	*7.83*	*0.53*	*1.24*	*0.32*

UNT06 **UNT 49422 Deer Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/18/2008		7.1	17.40	0.40	0.15	0.21	0.64
7/10/2008		7.6	43.60	-31.00	0.31	0.03	0.25
8/27/2008		7.3	48.20	-33.40	0.55	0.14	0.25
11/19/2008		7.6	43.60	-31.80	0.15	0.03	0.25
AVERAGE	*628.32*	*7.4*	*38.20*	*-23.95*	*0.29*	*0.10*	*0.35*
ST DEV		*0.2*	*14.04*	*16.26*	*0.19*	*0.09*	*0.20*

UNT04 **UNT 49415 Deer Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/18/2008		5.3	7.20	9.40	0.15	0.55	0.52
7/10/2008		5.0	7.40	10.60	0.15	0.68	0.69
8/28/2008		5.0	8.20	7.20	0.15	2.36	1.20
11/19/2008		4.8	6.80	10.60	0.15	1.31	1.18
AVERAGE	*825.79*	*5.0*	*7.40*	*9.45*	*0.15*	*1.23*	*0.90*
ST DEV		*0.2*	*0.59*	*1.60*	*0.00*	*0.83*	*0.34*

DC02 **Deer Creek at Beaver Furnace Road**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
3/18/2008		5.1	7.20	14.40	0.97	0.55	0.81
7/10/2008		4.3	4.80	19.40	0.42	1.31	0.60
8/28/2008		4.1	4.00	18.00	2.25	2.45	1.64
11/19/2008		3.9	0.60	21.80	1.18	2.87	1.08

AVERAGE	*54753.60*	*4.4*	*4.15*	*18.40*	*1.20*	*1.80*	*1.03*
ST DEV		*0.5*	*2.73*	*3.09*	*0.77*	*1.06*	*0.45*

DC01 **Mouth of Deer Creek**

Date Collected	Flow	pH	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
1/15/2008		4.8	6.40	4.40	0.86	0.60	0.67
3/18/2008		5.1	7.40	11.80	0.79	0.51	0.74
6/3/2008		4.4	5.40	28.20	0.32	1.55	1.09
7/10/2008		4.4	5.20	18.40	0.32	1.24	0.58
8/28/2008		4.4	6.20	12.20	0.74	1.21	1.20
11/19/2008		4.0	2.00	24.00	0.69	2.93	1.21
AVERAGE	*60139.20*	*4.5*	*5.43*	*16.50*	*0.62*	*1.34*	*0.92*
ST DEV		*0.4*	*1.86*	*8.76*	*0.24*	*0.88*	*0.28*

Underlined data are included at one half the detection limit

Average flow was taken from USGS Streamstats.

Attachment G

TMDLs and NPDES Permitting Coordination

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

Load Tracking Mechanisms

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

Options for Permittees in TMDL Watersheds

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

Options identified

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

Other possible options

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

- Issue the permit with in-stream water quality criteria values as the effluent limits. The in-stream criteria value would represent the monthly average, with the other limits adjusted accordingly (e.g., for Fe, the limits would be 1.5 mg/L monthly average, 3.0 mg/L daily average and 4.0 instantaneous max mg/L).

- The applicant would agree to treat an existing source (point or non-point) where there is no responsible party and receive a WLA based on a portion of the load reduction to be achieved. The result of using these types of offsets in permitting is a net improvement in long-term water quality through the reclamation or treatment of an abandoned source.

Attachment H
Comment and Response

No official comments were received for the Deer Creek TMDL during the comment period.